



Komodo FXP CoaXPress over Fiber acquisition system Hardware Reference and Installation Guide

(Part-No. KY-FXP)

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Revision History

Version	Date	Notes
0.1	20.07.15	Initial Release

2.1 Safety Precautions

With your *Komodo FXP* system components in hand, please take a minute to read carefully the precautions listed below in order to prevent unnecessary injuries to you or other personnel or cause damage to property.

- **Before using the product, read these safety precautions carefully to assure correct use.**
- **These precautions contain serious safety instructions that must be observed.**
- **After reading through this manual, be sure to act upon it to prevent misuse of product.**



Caution

In the event of a failure, disconnect the power supply.

If the product is used as is, a fire or electric shock may occur. Disconnect the power supply immediately and contact our sales personnel for repair.

If an unpleasant smell or smoking occurs, disconnect the power supply.

If the product is used as is, a fire or electric shock may occur. Disconnect the power supply immediately. After verifying that no smoking is observed, contact our sales personnel for repair.

Do not disassemble, repair or modify the product.

Otherwise, a fire or electric shock may occur due to a short circuit or heat generation. For inspection, modification or repair, contact our sales personnel.

Do not touch a cooling fan.

As a cooling fan rotates in high speed, do not put your hand close to it. Otherwise, it may cause injury to persons. Never touch a rotating cooling fan.

Do not place the product on unstable locations.

Otherwise, it may drop or fall, resulting in injury to persons or failure.

If the product is dropped or damaged, do not use it as is.

Otherwise, a fire or electric shock may occur.

Do not touch the product with a metallic object.

Otherwise, a fire or electric shock may occur.

Do not place the product in dusty or humid locations or where water may splash.

Otherwise, a fire or electric shock may occur.

Do not get the product wet or touch it with a wet hand.

Otherwise, the product may break down or it may cause a fire, smoking or electric shock.

Do not touch a connector on the product (gold-plated portion).

Otherwise, the surface of a connector may be contaminated with sweat or skin oil, resulting in contact failure of a connector or it may cause a malfunction, fire or electric shock due to static electricity.

Do not use or place the product in the following locations.

- Humid and dusty locations
- Airless locations such as closet or bookshelf
- Locations which receive oily smoke or steam
- Locations close to heating equipment
- Closed inside of a car where the temperature becomes high
- Static electricity replete locations
- Locations close to water or chemicals

Otherwise, a fire, electric shock, accident or deformation may occur due to a short circuit or heat generation.

Do not place heavy things on the product.

Otherwise, the product may be damaged.

Be sure to drain static electricity from body before you touch any electronics component

The electronic circuits in your computer and the circuits on Komodo board are sensitive to static electricity and surges. Improper handling can seriously damage the circuits. In addition, do not let your clothing come in contact with the circuit boards or components.

Otherwise, the product may be damaged.

2.2 Disclaimer

This product should be used for interfacing of CoaXPress camera and acquiring of CoaXPress video streams. KAYA Instruments assumes no responsibility for any damages resulting from the use of this product for purposes other than those stated.

Even if the product is used properly, KAYA Instruments assumes no responsibility for any damages caused by the following:

- Earthquake, thunder, natural disaster or fire resulting from the use beyond our responsibility, acts caused by a third party or other accidents, the customer's willful or accidental misuse or use under other abnormal conditions.
- Secondary impact arising from use of this product or its unusable state (business interruption or others).
- Use of this product against the instructions given in this manual or malfunctions due to connection to other devices.

KAYA Instruments assumes no responsibility or liability for:

- Erasure or corruption of data arising from use of this product.
- Any consequences or other abnormalities arising from use of this product, or damage of this product not due to our responsibility or failure due to modification.

Repair of this product is carried out by replacing it on a chargeable basis, not repairing the faulty devices. However, non-chargeable replacement is offered for initial failure if such notification is received within two weeks after delivery of the product.

3.1 Overview

Komodo FXP 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 10km in single-mode and up to 300m in multi-mode. The Komodo FXP 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 6.25 Gbps. This system is ideally suited for industrial, defense and aerospace Machine Vision Systems and applications. The system consists of Komodo Fiber frame grabber and KY-FEXT-D remote unit. The remote unit converts CoaXPress links to fiber optic interface. The Komodo Fiber FXP 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.

3.2 Features

- Solves distance limitation of CoaXPress
- Extension for distances up to 10km in single-mode and up to 300m in multi-mode
- Plug and Play , no need to configure
- 1 to 4 CoaXPress links support
- PCIe Gen3 x8 Half-length card
- Up to 144 Gb image buffer
- Multi-stream support
- Camera controls and triggers
- Per-link LED indication on card bracket
- Flexible machine I/O:
 - 4 TTL configurable I/Os
 - 4 LVCMOS configurable I/Os
 - 2 LVDS inputs
 - 2 LVDS outputs
 - 4 opto-isolated outputs
 - 4 opto-isolated inputs
 - 8 quadrature rotary encoders
 - Integrated strobe controller

- CoaXPress V1.1 compliant
- Power over CoaXPress with 13W per link
- Multiple Camera synchronization
- Multiple Frame Grabbers synchronization
- DIN 1.0/2.3 connectors for CoaXPress links
- GUI interface
- Supporting Windows and Linux OS
- API for developing custom applications
- Plug-ins modules for Matlab, HALCON and Labview
- GenCam compliant
- GenTL support
- Data rates up to 6.25 Gbps per link
- Transfer Rate of up to 55 Gbps
- 0°C to 50°C operating environment temperature

3.3 Product Applications

- AOI
- Printing inspection
- 3D
- Broadcasting and sports analytics
- High-speed DVRs
- Defense remote systems
- Surveillance

3.4 Related documents and accessories

Documents:

- Vision Point App User Manual
- Vision Point API Reference Book
- CoaXPress standard 1.1

Accessories:

- CoaXPress cables (DIN to DIN)
- CoaXPress cables (DIN to BNC)
- Fiber cables (Multi or Single mode)

4.1 System Structure

The Komodo FXP system consists of a CoaXPress camera, a CoaXPress extender box (KY-FEXT-D) that translates the CoaXPress interface to fiber optic interface and a Komodo Fiber frame grabber that is able to acquire video directly from fiber optic cables.

The Komodo Frame Grabber supports multiple modes of configuration and system topology. Few of these are presented in following diagrams.

Single Camera Topology:

One Single, Dual or Quad CoaXPress links with up to 6.25 Gb per link topology.

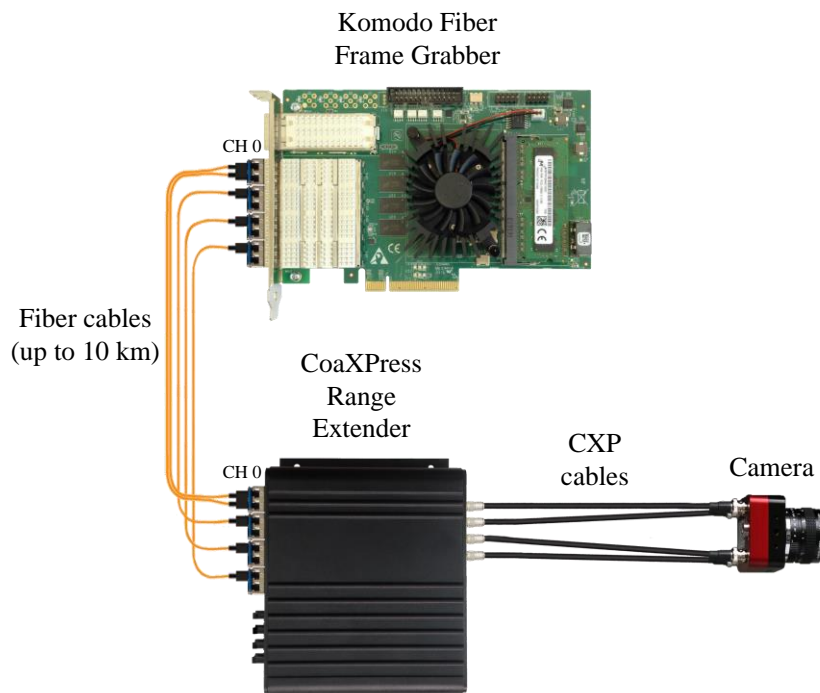


Figure 1: Single camera topology block diagram

Dual Camera Topology:

Two Single or Dual CoaXPress links with up to 6.25 Gb per link topology.

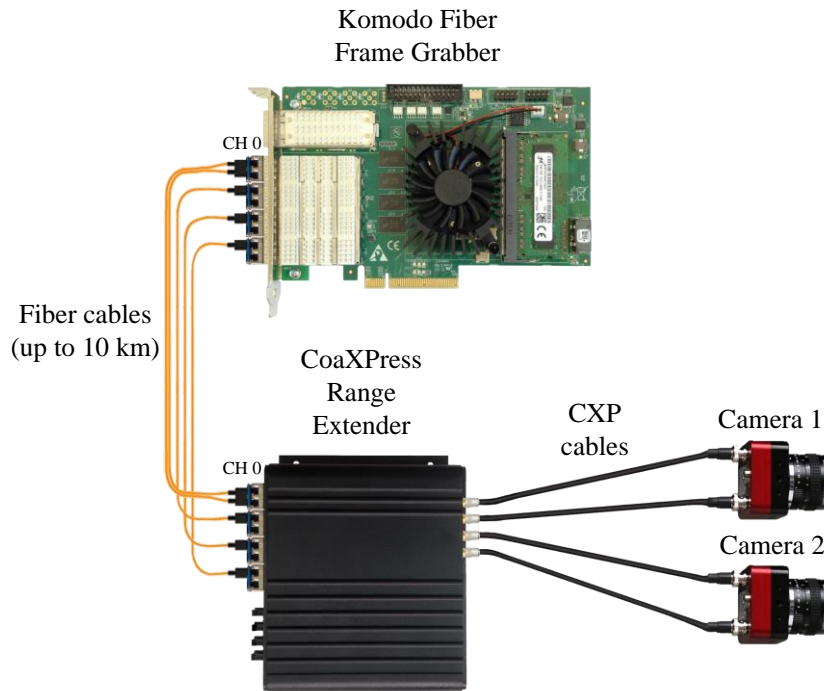


Figure 2: Dual camera topology block diagram

4.2 External View of the Komodo Fiber frame grabber

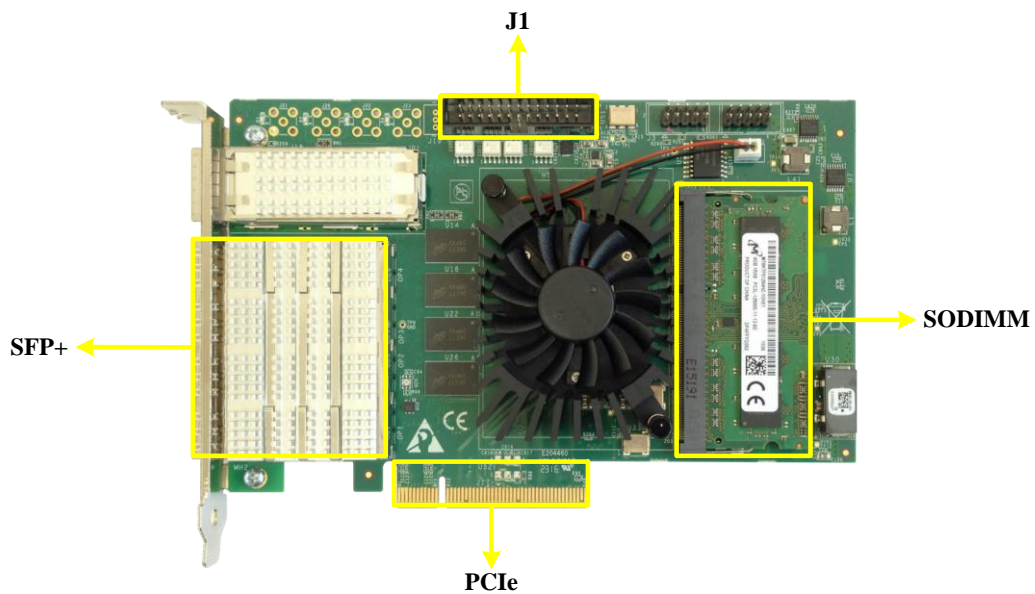


Figure 3: Komodo board external view

4.3 External View of the KY-FEXT-D

Each *KY-FEXT-D* unit is housed in a compact, metal enclosure. Each unit has a power connector, 4 coax connectors, 4 SFP+ cages and a Mini USB Terminal interface, as shown in Figure 4.

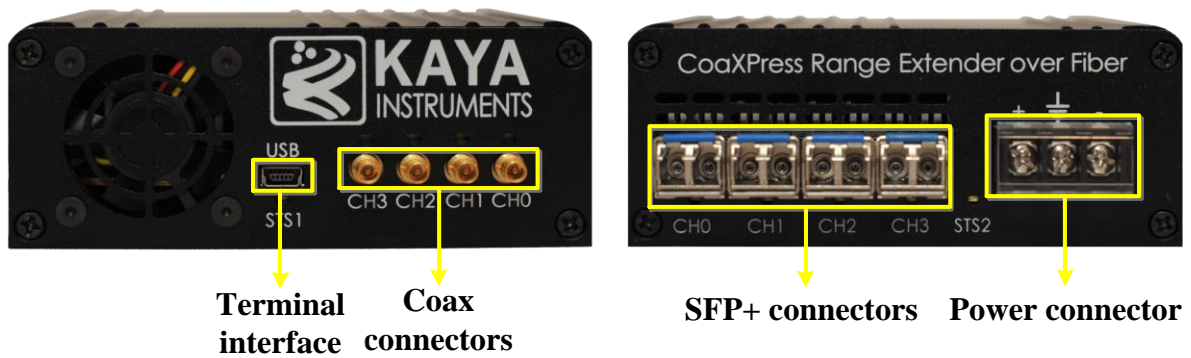


Figure 4: KY-FEXT-D external view

Each of the 4 coax and SFP+ connector is paired with a status LED and there is a system status LED (see section 7.2.1 describing the LED status).

KY-FEXT-D unit also has mount ears for an easy and secure installation on any flat surface.

5.1 Essentials to get started

To begin using your Komodo FXP system, you must have the following:

- ✓ A computer with the following:
 - Processor with an Intel 64-bit architecture, or equivalent.
 - An available x4 (or x8 or x16) PCIe slot. Gen 3 support is recommended to faster data transfer.
 - Vision Point Application installation
- ✓ CoaXPress camera
- ✓ CoaXPress cables
- ✓ Fiber optic cables

NOTE: KAYA Instruments doesn't guarantee compatibility with all computers that have the above specifications. Please, consult KAYA representative for any specific issue.

6.1 Installation instructions

The typical *Komodo FXP* system is connected as described in Figure 5:

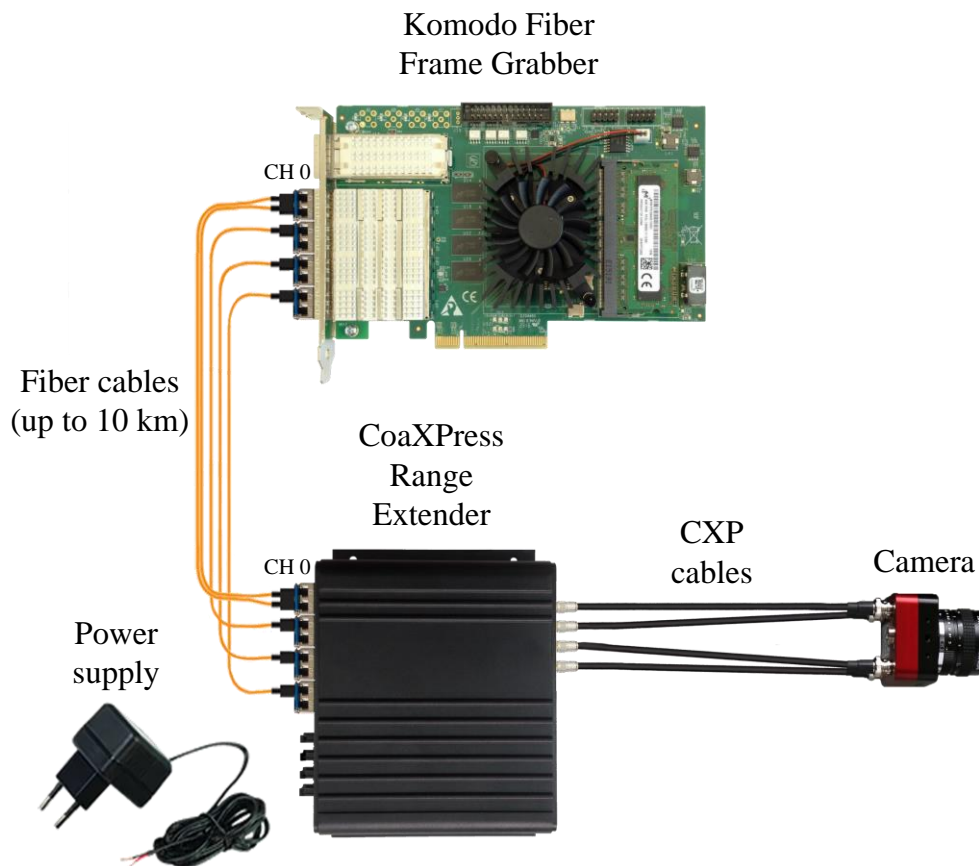


Figure 5: Komodo FXP system connection diagram

The first stage of the system installation is Komodo Fiber board installation as described in section 6.1.1 below. The second stage is connection of KY-FEXT-D box and camera as described in section 6.1.2.

6.1.1 Komodo Fiber board installation

Before system installation the Komodo Fiber board should be installed into host computer.

Komodo Fiber board is standard PCIe card with 8 lanes connector.

It can be installed in any PCIe connector of the motherboard with 8 lanes and up.

Note: Board should be installed before you install your software.

1. Before installing, turn off the power of the computer and its peripherals.
2. Firmly insert the Komodo Fiber board to PCIe connector of the motherboard.
3. Anchor the PCIe bracket to the computer chassis using M3 screw.
4. Verify the Komodo board inserted correctly to the PCIe slot.
5. Power up the computer.
6. After OS is up, you will be asked to install a driver for new Multimedia Device.
At this stage, you should cancel the installation.

Under Windows and Linux the compatible drivers for Komodo board will be installed during installation of Vision Point App software.

You can install and use multiple Komodo Fiber boards in a single computer.

The number of Komodo boards that can be installed in a computer depends on the number of available PCIe slots.

6.1.2 Completing the Komodo FXP system installation

In order to properly complete the Komodo FXP system installation, the following steps must be taken for initial power up:

1. Make sure there is no dirt or any other foreign matter inside the SFP+ module, or blocking any of the connectors.
2. Make sure that the male connectors on the SFP+ module will align with the female connectors inside the cage.
3. Insert the SFP+ module(s) into the *KY-FEXT-D and Komodo Fiber board* and close the locking mechanism (*).
4. Connect the fiber cables using one of the configurations available:

4.1. Single connectivity, as described in Figure 6:

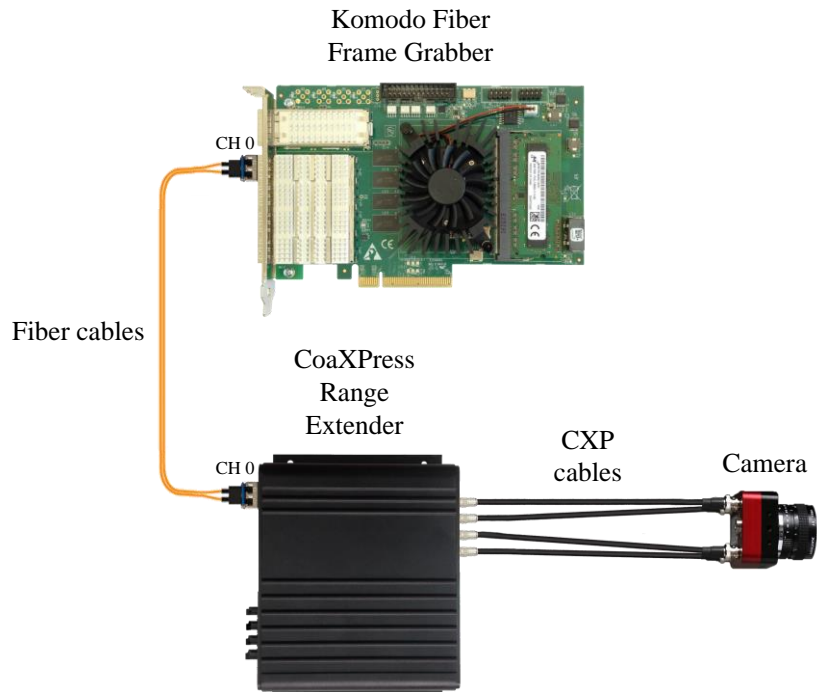


Figure 6: Single connectivity order

4.2 Dual connectivity, as described in Figure 7:

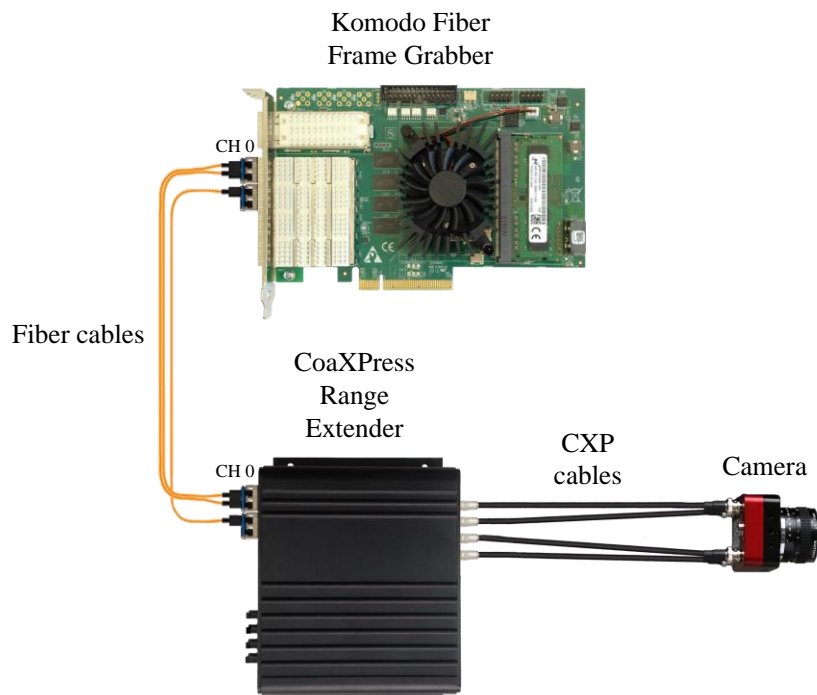


Figure 7: Dual connectivity order

4.3. Quad connectivity, as described in Figure 8:

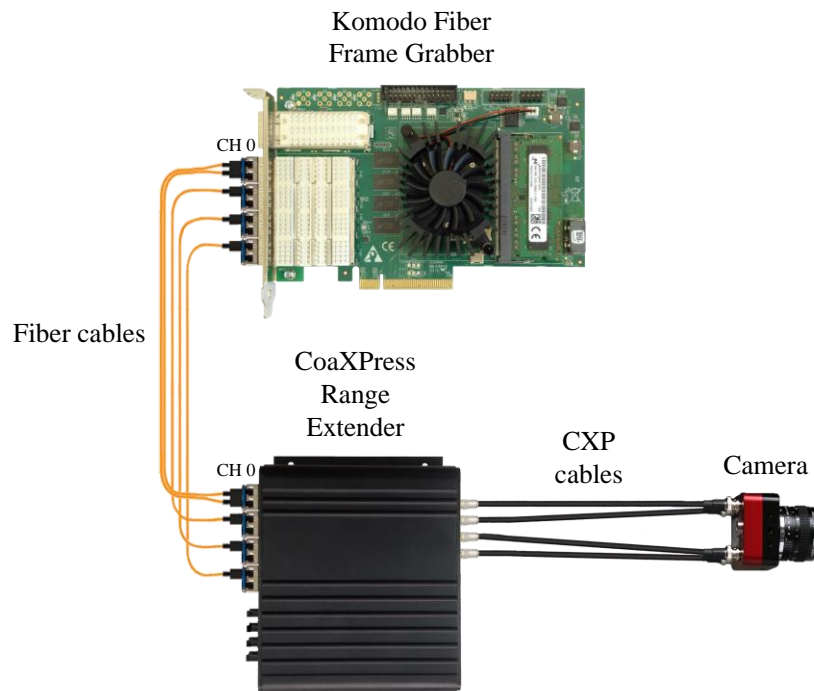


Figure 8: Quad connectivity order

5. Connect the Coax cables in the right order, as shown in Figure 6, Figure 7 or Figure 8.
6. Connect the Power Adaptor to the **KY-FEXT-D** unit
 The KY-FEXT-D requires 24V power supply for proper function and for PoCXP power for camera. Please, refer to Electrical specification section of this document for exact Power Supply requirements.
7. Below is shown the power supply connector of the **KY-FEXT-D** unit. Connect the positive wire from the power supply to the “+” connector, connect the GND pin of connector to the ground wire and the negative wire to the “-“ connector, as seen in Figure 9.

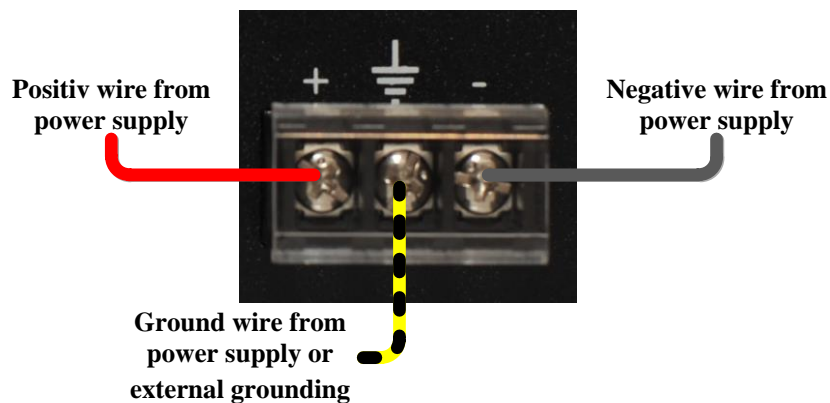


Figure 9: KY-FEXT-D power connector

8. Turn the camera and the frame grabber on and start your application software.

(*) The Komodo FXP system supports the following SFP+ modules:

1. KY-SFP-10G31-10 – Allows of up to 10Km connection over single mode fiber cable
2. KY-SFP-10G85-3M – Allows of up to 300m connection over multi-mode fiber cable

Note: to remove the SFP+ module, first remove the fiber cable connected to it, then open the SFP+ module's locking mechanism (see Figure 10 and Figure 11) and remove module.

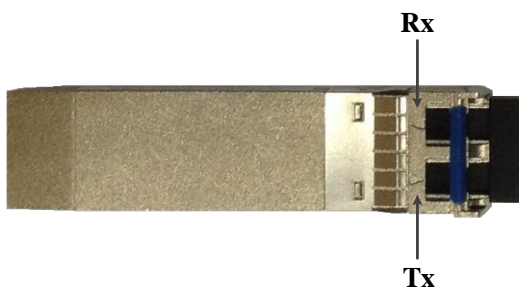


Figure 10: Module with locking mechanism closed

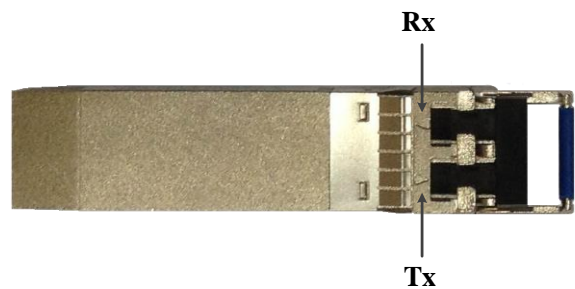


Figure 11: Module with locking mechanism open

NOTES:

1. Link 0 of the system must always be connected as power and controls are delivered with this port
2. A Fiber connection and CoaXPress connection must be done to the same port number all over the way from camera to frame grabber.
3. A fiber cable should match an SFP type. If a single mode SFP is used a single mode fiber (yellow) should be attached to it. If a multi-mode SFP is used a multi-mode fiber (orange) should be attached.
4. On Fiber channel 0 both the TX and RX fiber cables must be connected. On channels 1 through 3 only one fiber cable should be connected. This cable is connected between TX output (Marked with TX or Arrow outwards the SFP) on **KY-FEXT-D** unit and RX input (Marked with RX or Arrow inwards the SFP) on Komodo Fiber frame grabber.
5. In Komodo FXP system a standard DIN 1.0/2.3 connectors for CoaXPress interface. When attaching cables to your system, 75 Ω coaxial cables must be used. For best performance, it's recommended to use high quality cables, such as Belden 1694A.
6. If more than a single cable is used to connect to the same frame grabber, the cables must be of the same type and length.

6.2 Reducing the fiber optic cable count

The system requires N+1 fiber optical cables in order to properly operate. The N is the number of CoaXPress links required for the camera. But sometimes it required transferring the data over smaller number of cables.

Several options listed in the sections below exist in order to reduce the number of required optical cables. Please note that these options are available for single mode fiber infrastructure only.

Please contact KAYA representative for details of those options.

6.2.1 Bidirectional (BIDI) SFP option

This option allows reducing one fiber optic cable from the system. The total required number of cables will be as number of CoaxPress cables. For example 4 link cameras will require 4 fiber cables.

In this option the SFP in link 0 is replaced by bidirectional (BIDI) SFP that transmits and receives on the same fiber cable. Example connection for four link camera is described in Figure 12.

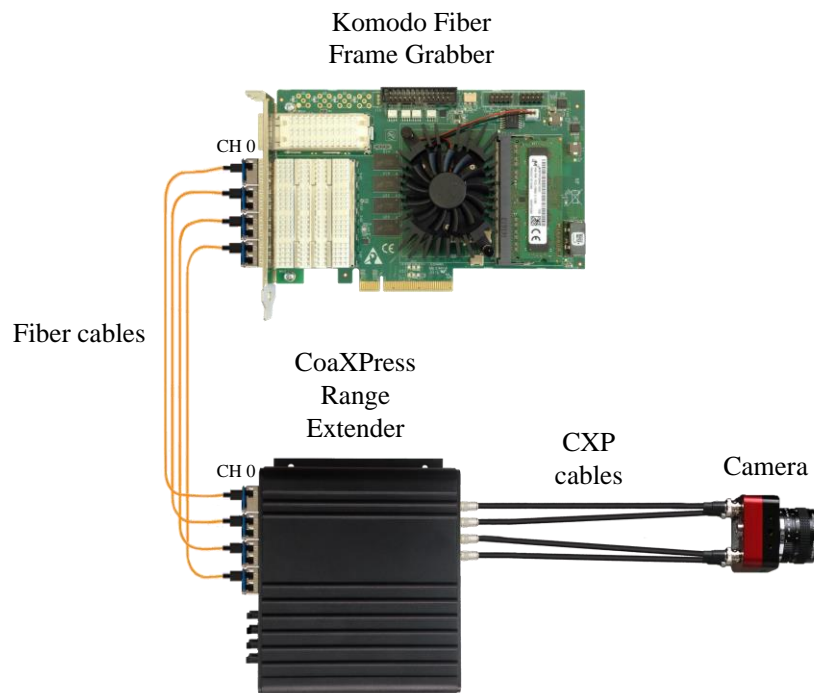


Figure 12: Bidirectional camera link connection

6.2.2 CWDM Option

In CWDM each optical SFP module operates at different wavelength and then an optical multiplexer is used to mix all the signals into a single fiber. In this mode the number of cables required in the infrastructure can be reduced from 5 down to two cables or even single cable. The CWDM also can be used to use the CoaXPress over existing infrastructure, sharing the same fiber cables with other applications.

Two available CWDM modes (for single or dual fibers) are described in Figure 13 and Figure 14. For assignment of CWDM wavelengths please contact KAYA Instruments representative.

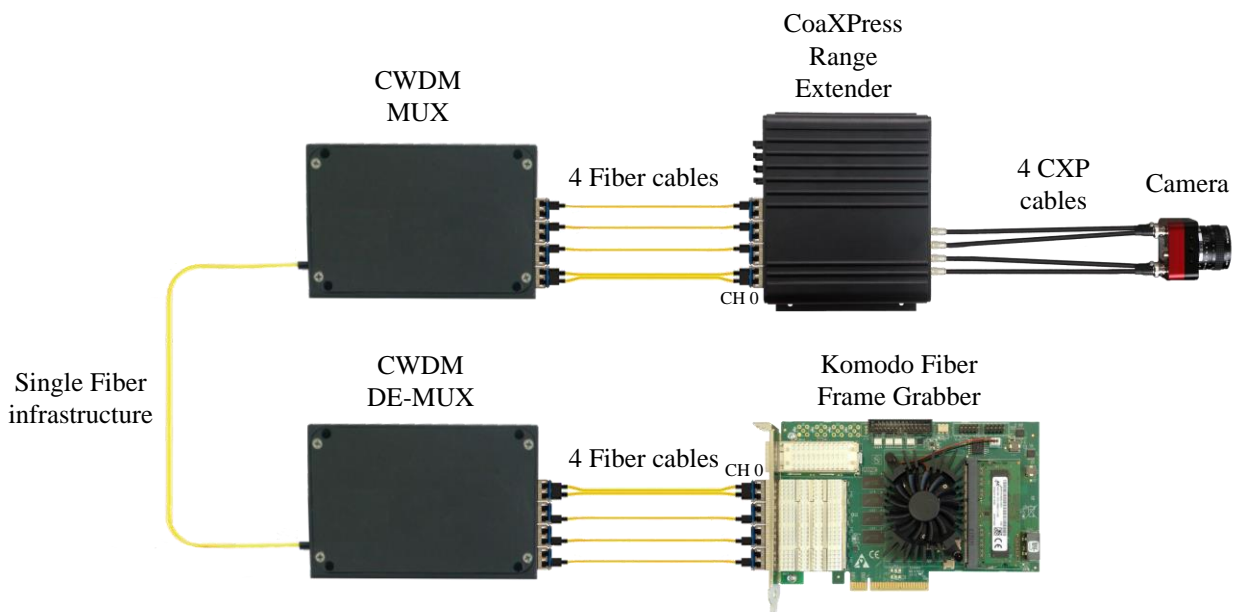


Figure 13: CWDM mode for single fiber

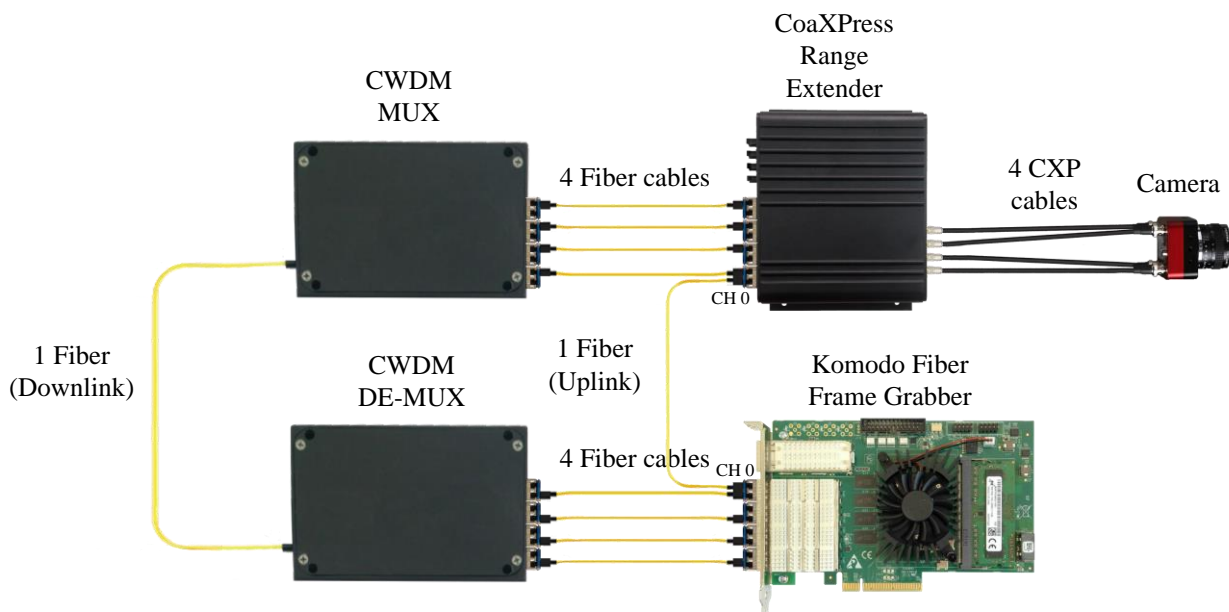


Figure 14: CWDM mode for dual fiber

7.1 Komodo Fiber Hardware Reference

This chapter provides information on Komodo board hardware. It covers architecture, features and pin assignments for various connectors.

7.1.1 Komodo Board Block Diagram

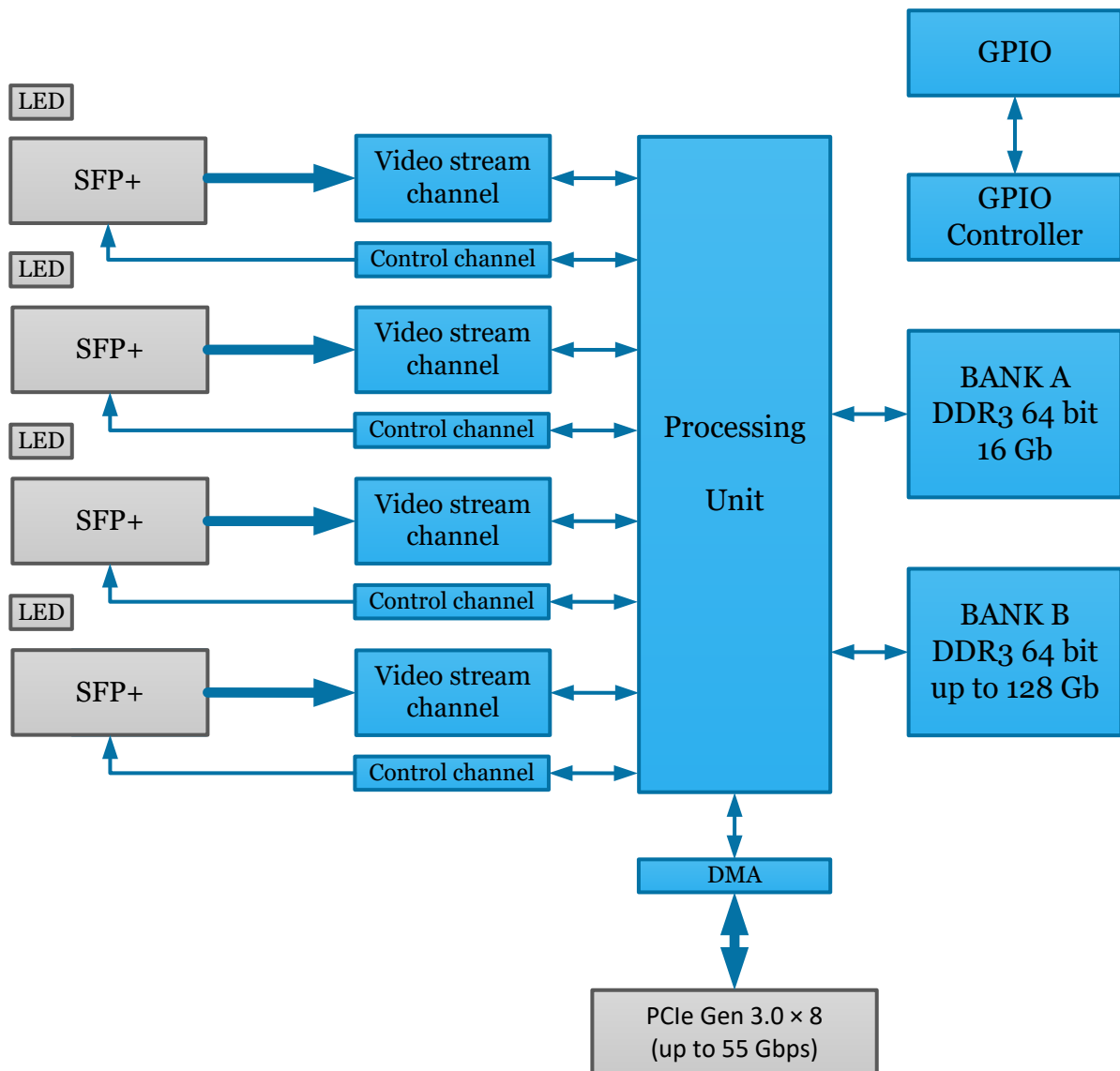


Figure 15: Komodo Board Block Diagram

7.1.2 Komodo Fiber LEDs

Komodo Fiber is equipped with indication bi-color LED for each SFP connector. The LEDs behave according to definition in section 5.4 of the CXP standard. The LEDs' different states are described in Table 1.

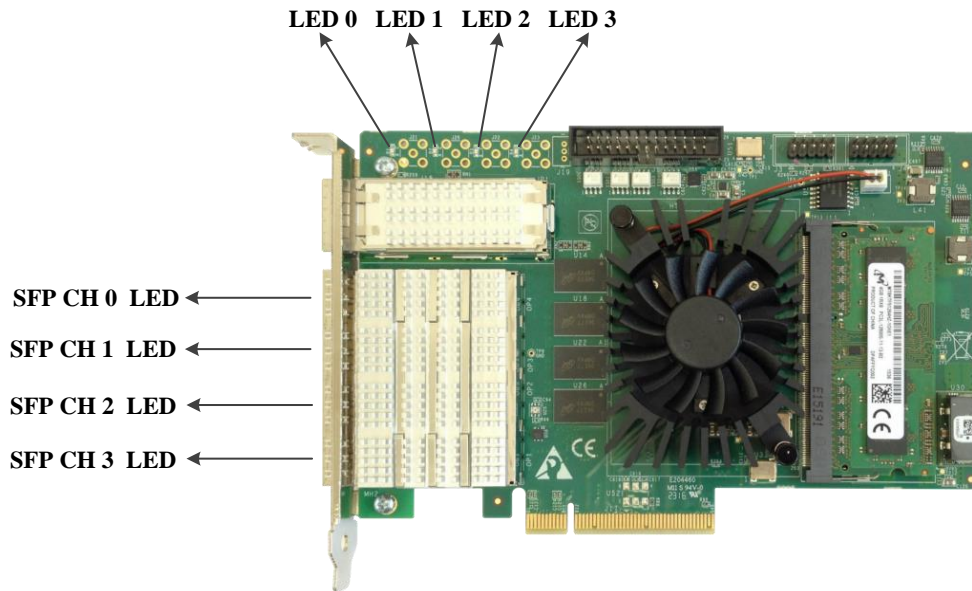


Figure 16: Komodo Board LED's locations

LED state	Description
Solid orange	System is not initialized
Slow pulse red	No camera is connected
Fast flash alternate green / orange	Connection detection in progress, PoCXP active
Fast flash orange	Connection detection in progress, PoCXP not in use
Solid red	PoCXP over-current
Solid green	Camera is connected, no data being transferred
Slow pulse orange	Camera connected. Waiting for trigger event
Fast flash green	Camera connected , data is being transferred
Slow flash alternate green / orange	Connection test packets being sent

Table 1: Komodo Fiber links status LED's

In addition to SFP links LEDs, the Komodo Board is equipped with status LEDs.

Board Status LEDs functionality is described in Table 2:

LED #	Description
LED 0	Alive led. Blinks when the board receives clock from PCIe
LED 1	PCIe L0 state. When lit, indicates that the PCIe interface is powered up at active state.
LED 2	Gen3 PCIe indicator. When lit indicates that PCIe is working as Gen3. When not lit the boards works either as PCIe Gen1 or Gen2
LED 3	Lane's indicator. When lit, indicates that all 8 PCIe lanes are up. If not lit, one or four lanes are up.

Table 2: Komodo Fiber board status LED's

7.1.3 Auxiliary Input/Output signals

The auxiliary signal of Komodo Fiber board can be used to initiate on-board events, transmitted to other devices or rerouted from other signals, such as CoaXPress triggers and GPIO's.

Additionally, these auxiliary signals can be used to communicate with complex devices, such as encoders, strobe controls and drive controls.

The GPIOs can be controlled from the Vision Point API and be set as a trigger sources. The API enables routing of any input to any output as well as to the CXP IO and Trigger lines. Please see the API documentation for more information regarding the GPIO configuration.

The GPIOs of Komodo Fiber are routed to single IO header with 2.54 mm (100 th) pitch.

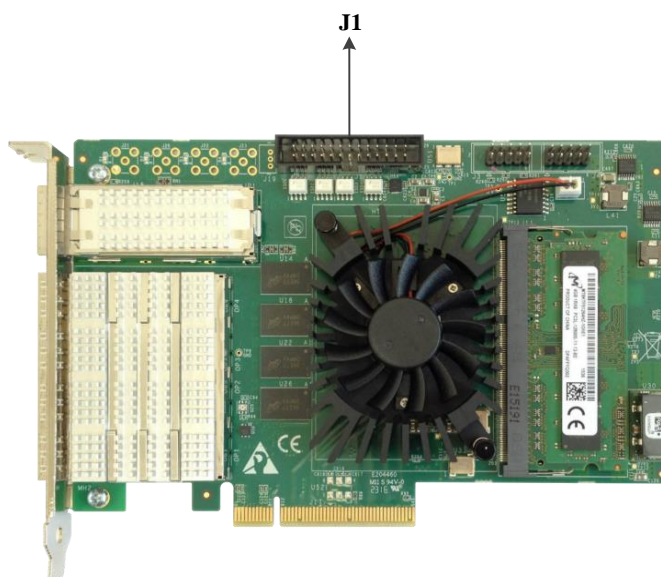


Figure 17: GPIO connectors location

The pinout of IO connector is as described in Table 3.

Pin Number	Signal Name	Function	Electrical Standard	Description
1	LVDS Input 0p	LVDS input	LVDS	Positive signal of LVDS pair
2	LVDS Input 0n	LVDS input	LVDS	Positive signal of LVDS pair
3	LVDS Input 1p	LVDS input	LVDS	Negative signal of LVDS pair
4	LVDS Input 1n	LVDS input	LVDS	Negative signal of LVDS pair
5	LVDS Output 0p	LVDS output	LVDS	Positive signal of LVDS pair
6	LVDS Output 0n	LVDS output	LVDS	Positive signal of LVDS pair
7	LVDS Output 1p	LVDS output	LVDS	Negative signal of LVDS pair
8	LVDS Output 1n	LVDS output	LVDS	Negative signal of LVDS pair
9	OptoCoupled Output 0	Opto-Isolated output	Up to 70V	Optically isolated outputs
10	OptoCoupled Output 1	Opto-Isolated output	Up to 70V	Optically isolated outputs
11	OptoCoupled Output 2	Opto-Isolated output	Up to 70V	Optically isolated outputs
12	OptoCoupled Output 3	Opto-Isolated output	Up to 70V	Optically isolated outputs
13	OptoCoupled Input 0	Opto-Isolated input	Up to 70V	Optically isolated inputs
14	OptoCoupled Input 1	Opto-Isolated input	Up to 70V	Optically isolated inputs
15	OptoCoupled Input 2	Opto-Isolated input	Up to 70V	Optically isolated inputs
16	OptoCoupled Input 3	Opto-Isolated input	Up to 70V	Optically isolated inputs
17	OptoCoupled GND	External GND		Ground signal for opto-isolated signals on this connector.
18	GND	Board GND		Reference ground signal
19	TTL 0	GPIO	TTL (Open-drain)	General Purpose IO
20	TTL 1	GPIO	TTL (Open-drain)	General Purpose IO
21	TTL 2	GPIO	TTL (Open-drain)	General Purpose IO
22	TTL 3	GPIO	TTL (Open-drain)	General Purpose IO
23	LVTTL 0	GPIO	LVTTL	General Purpose IO
24	LVTTL 1	GPIO	LVTTL	General Purpose IO
25	LVTTL 2	GPIO	LVTTL	General Purpose IO
26	LVTTL 3	GPIO	LVTTL	General Purpose IO

Table 3: J1 connector pinout

The electrical connection of the GPIO connector is described following principal schematic diagram:

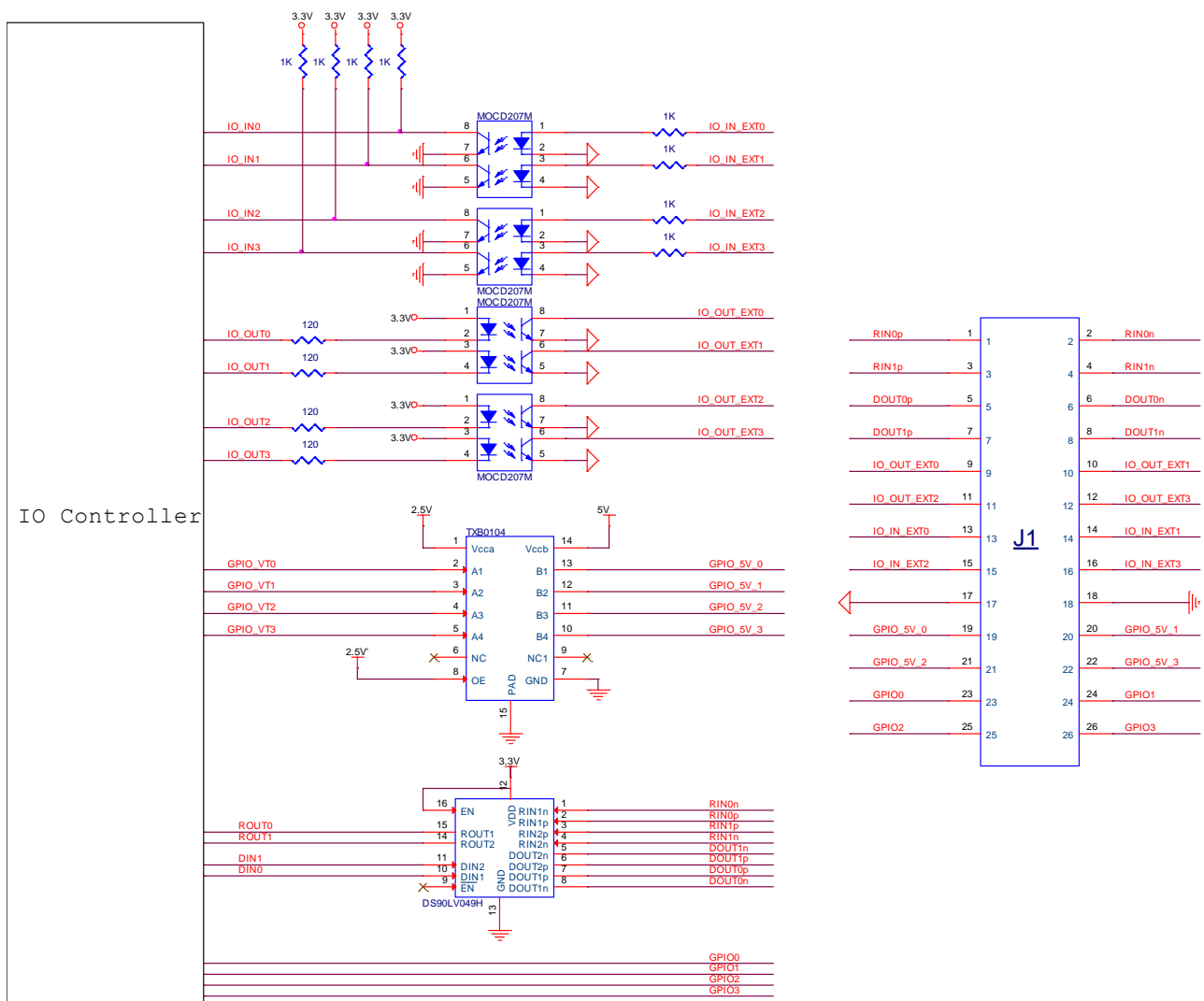


Figure 18: GPIO Connector schematic

7.2 KY-FEXT-D unit Hardware Reference

This chapter provides information on KY-FEXT-D unit hardware.

7.2.1 KY-FEXT-D unit LEDs

Each unit has several status LEDs, as seen in Figure 19 and Figure 20.

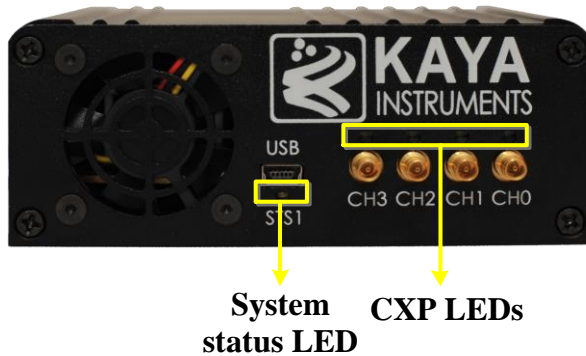


Figure 19: KY-FEXT-D coax side LEDs

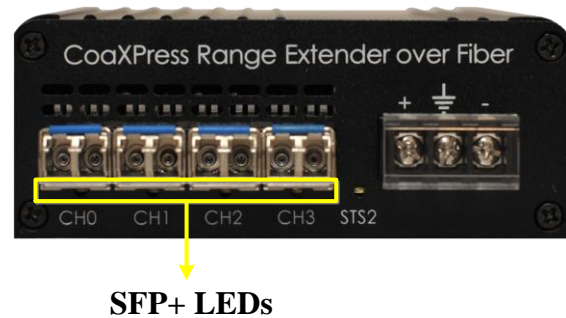


Figure 20: KY-FEXT-D fiber side LEDs

The System status LED, located on the coax side, always slow pulses in green while the system is ON. While in firmware update mode, this LED slow pulses orange. In any case of system failure, the LED will constantly light orange.

The CXP LED's behavior is described in Table 4:

LED state	Condition
Slow pulse red	No valid CoaXPress low speed link detected
Solid red	PoCXP failure (Overcurrent/Under voltage/Overvoltage)
Fast flash green	CoaXPress link speed is being negotiated
Solid green	CoaXPress link is active

Table 4: KY-FEXT-D status LEDs behavior

The SFP+ LED's behavior is described in Table 5:

LED state	Condition
Fast flash red	SFP+ is unplugged
Solid red	SFP is not compatible
Slow pulse red	No signal detected on optic fiber
Fast flash green	CoaXPress link speed is being negotiated
Solid green	CoaXPress link is active

Table 5: SFP+ status LEDs behavior

7.2.2 KY-FEXT-D Terminal control

A Mini USB port is available for individual link & general information status and firmware update. The port uses a Silabs CP2101 chip. A driver from the Silabs website might have to be installed on certain PCs to gain access to the terminal port. Free supporting driver can be found at: <http://www.silabs.com/products/mcu/pages/usbtouartbridgevcpcdrivers.aspx>

After driver installation and USB connection is acquired a serial emulated terminal (i.e Tera Term use is recommended) can be used with the following configurations, described in Table 6:

Parameter	Value
Baud rate	115200
Start bits	1
Stop bits	1
Parity	None
Flow Control	None

Table 6: Serial emulated terminal configurations

The following commands are supported by the terminal; each command must be followed by carriage return (Enter) in order to execute:

Command	Description
firmware	Sets the system to firmware update mode. See 7.2.3 chapter for firmware update information
status	Prints the system and individual link status and general information

Table 7: Terminal commands

NOTE: The commands are not case sensitive.

7.2.3 KY-FEXT-D Firmware update

1. The extender supports firmware update via USB using a serial emulated terminal. To initiate firmware update the following steps should be taken:
2. Connect the USB cable to the extender and acquire connection using Silabs drivers (drivers need to be downloaded manually if an automatic download isn't initiated).
3. Open serial emulated terminal (usage of Tera Term terminal is recommended) and set serial communication protocol as described in Table 6.
4. In the terminal window type "status" followed by carriage return and checks the current firmware version.
5. Choose the firmware update option by entering "firmware" followed by carriage return and wait for the following message: "Now starting firmware update, please start file transfer using XMODEM:"
6. At this point all the LEDs will turn off and the "System status LED" will slow pulse orange indicating the extender is ready to receive the firmware binary file. Under "File" tab use the terminal "transfer" capability using the XMODEM protocol to initiate the firmware update. Choose "Send" and the firmware version: CXP_EXT_x_xx.rbf, when x_xx is the version number.
7. If no firmware will be sent during 1 minute, or in case of an error the firmware update will fail and return to previous operation mode.
8. A successful update will result in appropriate message and a reboot of the extender to new firmware.
9. Check the firmware version by typing "status" followed by carriage return. Make sure that the firmware version matches the version on the firmware update package supplied; that would insure the success of the firmware update operation.

7.4 Absolute maximum ratings

Specification	Values
3.3V power supply	-1.0V to +7.0V
12V power supply	-0.3V to 14V
Storage temperature	-55°C to 125°C
Operating ambient temperature	0°C to 50°C

Table 8: Komodo Fiber absolute maximum ratings

Specification	Values
Power supply voltage	0V to 30V
Storage Temperature	-40°C to 85°C
Operating Temperature	0°C to 50°C

Table 9: KY-FEXT-D absolute maximum ratings

7.5 Operating conditions

Parameter	Description	Minimum	Typical	Maximum
V _{cc}	Supply voltage	20.3V	24V	26 V
I _{cc} (Host)	Supply Current from PoCXP or external power supply (4 active channels)	-	0.25A	0.33A
I _{cc} (Device)	Supply Current from external power supply (4 active channels)	-	0.25A	2.61A ⁽¹⁾
I _{PoCXP}	PoCXP Output current per link	0A	-	0.57A

Table 10: KY-FEXT-D operating conditions

(1) In case all the 4 CXP channels supply 13.5W of power to connected camera

Parameter	Description	Minimum	Typical	Maximum
3.3 V _{cc}	3.3V Supply voltage from PCIe	3.04V	3.3V	3.56V
12V V _{cc}	12V Supply voltage from PCIe	11.04V	12V	12.96V
3.3 I _{cc} (Host)	Supply Current from 3.3V PCIe power rail	-	2.1A	-
12 I _{cc}	Supply Current from 12V PCIe power rail	-	2A	-

Table 11: Komodo Fiber operating conditions

Electrical characteristics for Komodo Fiber board IO's:

Symbol	Parameter	Condition	Pin	MIN	Typ	MAX	Units	
V _{OD}	Differential Output Voltage	R _L = 100 Ω	D _{OUT-} D _{OUT+}	250	350	450	mV	
ΔV _{OD}	Change in Magnitude of V _{OD} for Complementary Output States				1	35	mV 	
V _{OS}	Offset Voltage			1.12 5	1.23	1.375	V	
ΔV _{OS}	Change in Magnitude of V _{OS} for Complementary Output States				1	25	mV 	
I _{OS}	Output Short Circuit Current ⁽⁴⁾	ENABLED, D _{IN} = V _{DD} , D _{OUT+} = 0 V or D _{IN} = GND, D _{OUT-} = 0 V			-5.8	-9.0	mA	
I _{OSD}	Differential Output Short Circuit Current ⁽⁴⁾	ENABLED, V _{OD} = 0 V			-5.8	-9.0	mA	
I _{OFF}	Power-off Leakage	V _{OUT} = 0 V or 3.6 V V _{DD} = 0 V or Open			-20	±1	+20	μA
I _{OZ}	Output TRI-STATE Current	EN = 0 V and EN = V _{DD} V _{OUT} = 0 V or V _{DD}			-10	±1	+10	μA

Table 12: Komodo Fiber LVDS Output DC specifications (Driver Outputs)

Symbol	Parameter	Condition	Pin	MIN	Typ	MAX	Units	
V _{TH}	Differential Input High Threshold	V _{CM} = 1.2 V, 0.05 V, 2.35 V	R _{IN+} R _{IN-}		-15	35	mV	
V _{TL}	Differential Input Low Threshold				-100	-15		mV
V _{CMR}	Common-Mode Voltage Range	V _{ID} = 100 mV, V _{DD} = 3.3 V			0.05		3	V
I _{IN}	Input Current	V _{DD} = 3.6 V V _{IN} = 0 V or 2.8 V			-12	±4	+12	μA
		V _{DD} = 0 V V _{IN} = 0 V or 2.8 V or 3.6 V			-10	±1	+10	μA

Table 13: Komodo Fiber LVDS Input DC specifications (Receiver Inputs)

Symbol	Parameter	Test condition (note 1)	MIN	MAX	Units
V _{IH}	Input High Voltage	V _{OUT} ≥ V _{OH (min)} OR V _{OUT} ≤ V _{OL (max)}	2	V _{DD} +0.3	V
V _{IL}	Input Low Voltage		-0.3	0.8	V
I _{IN}	Input Current	V _{IN} = 0 V OR V _{IN} = V _{DD}		±5	μA

Note: V_{dd} = 3.3V, unless specified otherwise

Table 14: Komodo Fiber LVTTTL input specifications

Symbol	Parameter	Test condition	MIN	MAX	Units
V _{OH}	Output High Voltage	V _{DD} = min, I _{OH} = -2 mA	2.4		V
V _{OL}	Output Low Voltage	V _{DD} = min, I _{OL} = 2 mA		0.4	V

Note: V_{dd} = 3.3V, unless specified otherwise

Table 15: Komodo Fiber LVTTTL output specifications

Symbol	Parameter	Test condition (note 1)	MIN	MAX	Units
V _{IH}	Input High Voltage	V _{OUT} ≥ V _{OH (min)} OR V _{OUT} ≤ V _{OL (max)} 0	2	5	V
V _{IL}	Input Low Voltage		-0.3	0.8	V
I _{IN}	Input Current	V _{IN} = 0 V OR V _{IN} = V _{DD}		±5	μA

Note: V_{dd} = 5V, unless specified otherwise

Table 16: Komodo Fiber TTL input specifications

Symbol	Parameter	Test condition	MIN	MAX	Units
V _{OH}	Output High Voltage	V _{DD} = min, I _{OH} = -2 mA	4		V
V _{OL}	Output Low Voltage	V _{DD} = min, I _{OL} = 2 mA		0.4	V

Note: V_{dd} = 5V, unless specified otherwise

Table 17: Komodo Fiber TTL output specifications

7.6 Absolute maximum ratings for GPIO

Specification	Minimum voltage [V]	Maximum voltage [V]
LVDS	-0.3	3.6
Opto-isolated (in)	-6	60

Opto-isolated (out)	-7	70
TTL	-0.5	6
LVTTL	-0.5	3.9

Note: The maximum current that the Opto-isolated (out) IOs can support is 150mA

Table 18: Absolute maximum ratings for GPIO

7.7 Mechanical dimensions

The Komodo Fiber board is a half-length PCIe card according to PCI Express Card Electromechanical Specification.

The exact board mechanical dimensions are as defined in Figure 21.

For more detailed information please, contact KAYA Instruments representative.

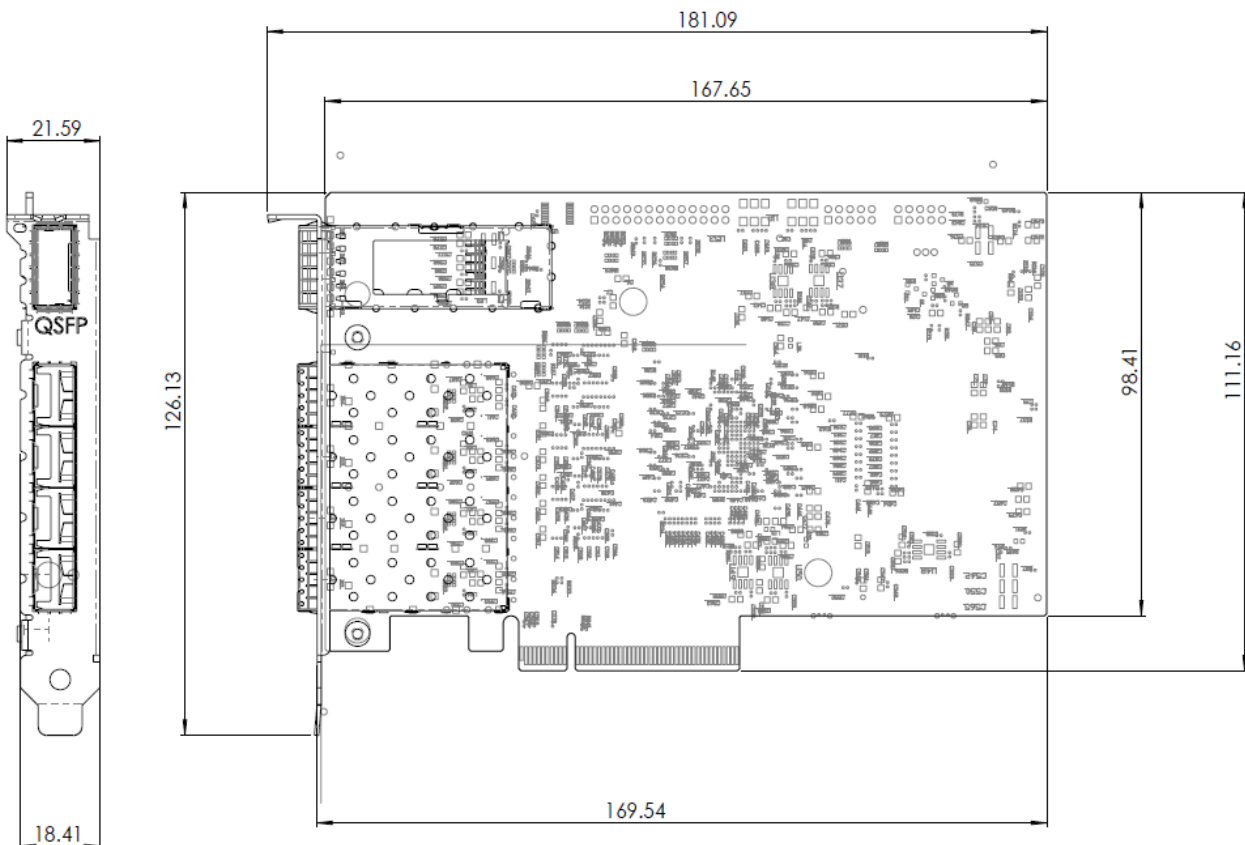


Figure 21: PCB Mechanical Dimensions

Each *KY-FEXT-D* unit is housed in a metal enclosure as shown in Figure 22:

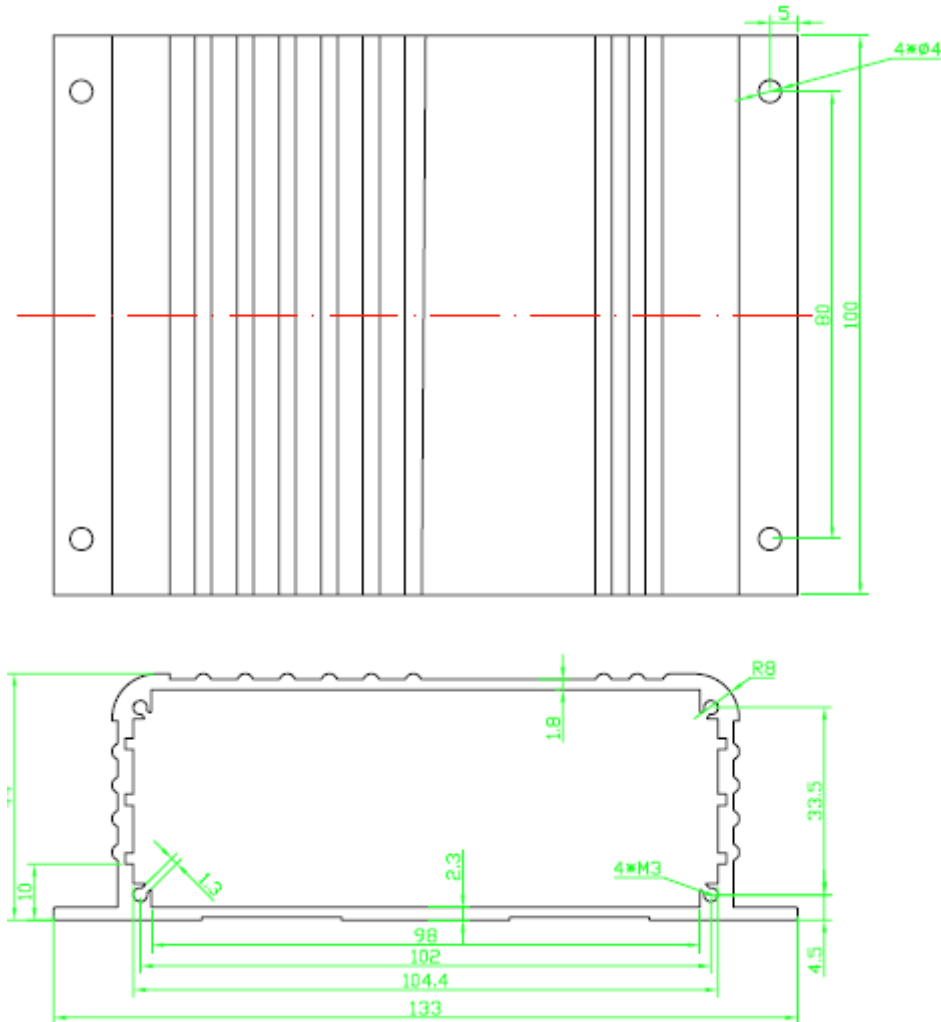


Figure 22: External dimensions of the KY-FEXT-D enclosure box

8.1 CoaXPress cables

CoaXPress is a new digital transmission standard that allows high speed data from a device, such as a camera, to be transferred to a host, such as a frame grabber. Each CoaXPress link supports up to 6.25 Gbps data rates, along with device power up to 13W and device control at 20 Mbps – all on a single coax cable. For very fast devices, the links can be aggregated to provide multiples of the single coax bandwidth. Long cable lengths are supported – up to 40 meters at 6.25 Gbps and over 100 meters at 3.125 Gbps.



8.2 Fiber cables

Optical fibers are widely used to permits transmission over longer distances and at higher bandwidths than other forms of communication. Fibers are used instead of metal wires because signals travel along them with less loss and are also immune to electromagnetic interference.

Fibers that support many propagation paths or transverse modes are called multi-mode fibers (MMF), while those that only support a single mode are called single-mode fibers (SMF). Multi-mode fibers generally are used for short-distance communication links and for applications where high power must be transmitted. Single-mode fibers are used for most communication links longer than 300 meters (1,200 ft.).

9.1 Ordering information

Item name	Item part number
CoaXPress Range Extender over Fiber – device unit	KY-FEXT-D
Komdo Fiber Frame Grabber	KY-FGF
SFP+ single-mode module	KY-SFP-10G31-10
SFP+ multi-mode module	KY-SFP-10G85-3M
Fiber cable - single-mode X m	KY-FCA-S-SM-LC-LC-XXX.X
Fiber cable - multi-mode X m	KY-FCA-S-MM-LC-LC-XXX.X
Coaxial cable x meter	KY-FCC-000-XXX.X
Power supply 24V , 72W	KY-PWR24

Table 19: Ordering Information

International Distributors



Sky Blue Microsystems GmbH
 Geisenhausenerstr. 18
 81379 Munich, Germany
 +49 89 780 2970, info@skyblue.de
 www.skyblue.de



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