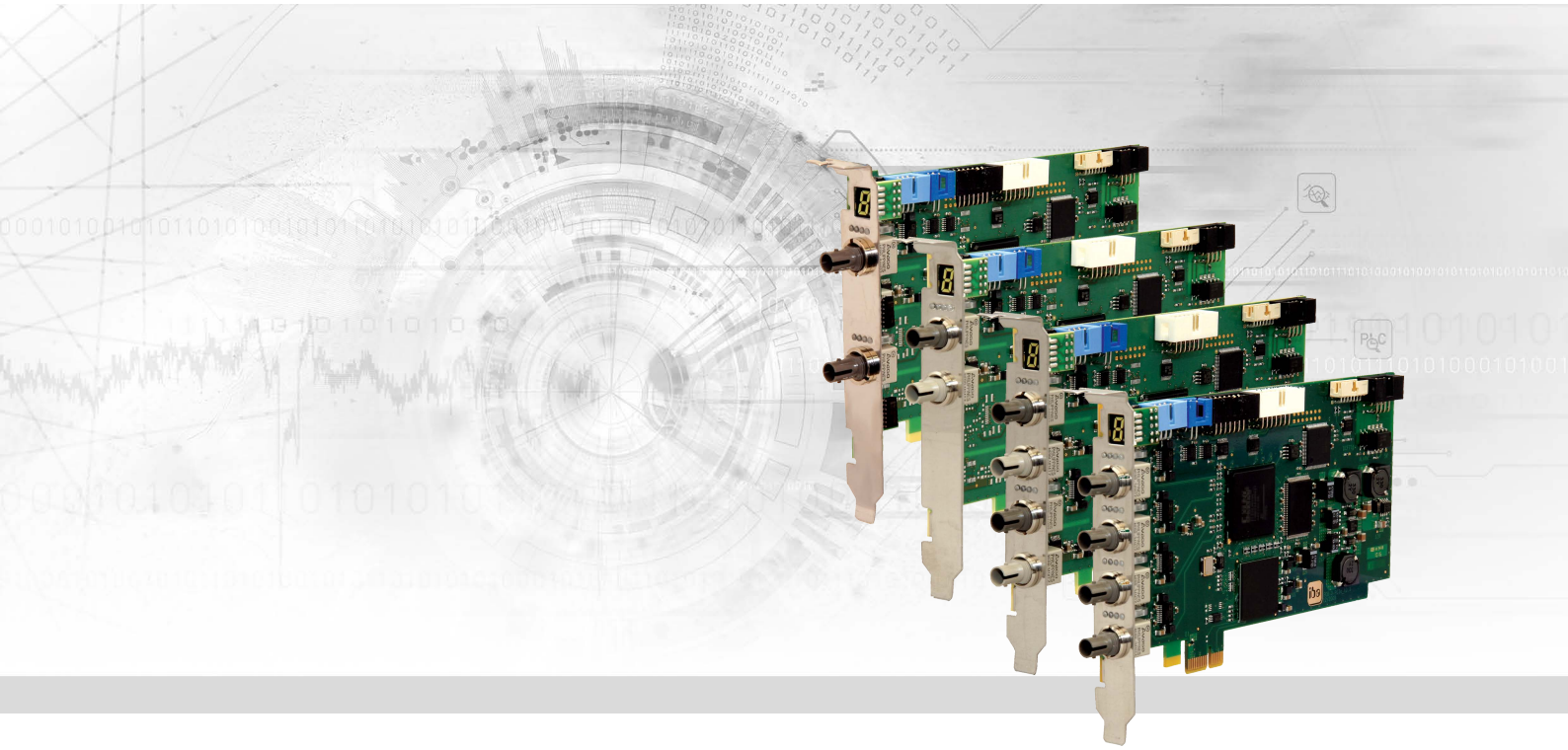

ibaFOB-D

PCI and PCI Express cards for ibaNet connections

Manual

Issue2.3

Measurement Systems for Industry and Energy

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The content of this publication has been checked for compliance with the described hardware and software. Nevertheless, deviations cannot be excluded completely so that the full compliance is not guaranteed. However, the information in this publication is updated regularly. Required corrections are contained in the following regulations or can be downloaded on the Internet.

The current version is available for download on our web site http://www.iba-ag.com.

Issue	Date	Revision	Author	Version HW/FW
2.3	10-2025	Front views	st	FPGA version 4.00, Release E0

Certification

The product is certified according to the European standards and directives. This product meets the general safety and health requirements.

Other international and national standards were observed.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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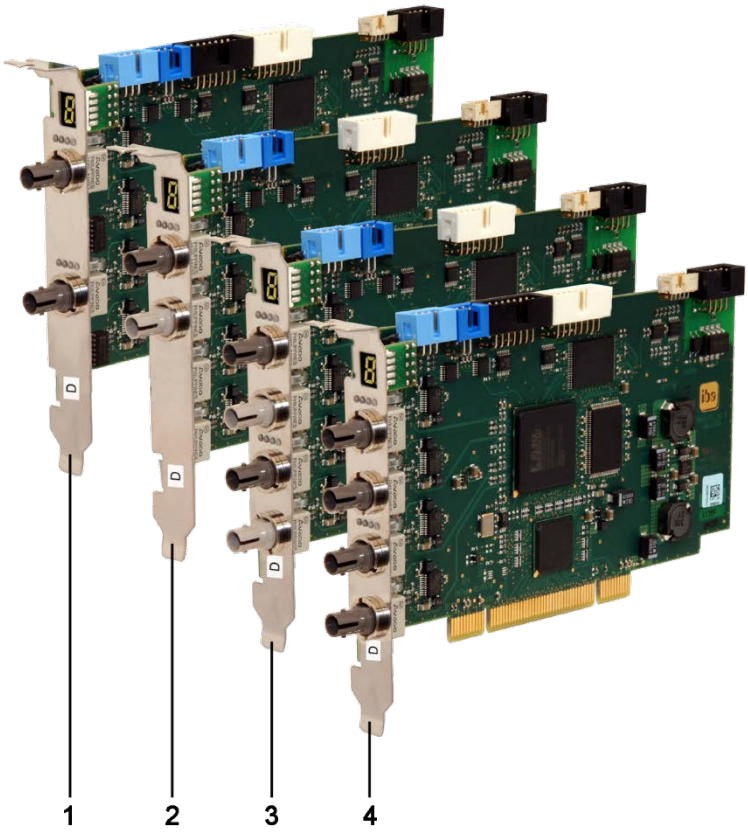
1 About this documentation

This documentation describes the structure, application and operation of the card family for PCI slot and *ibaFOB-Dexp* for PCIe 1.0 x1 slot and its add-on modules *ibaFOB-4o-D* (short and long).



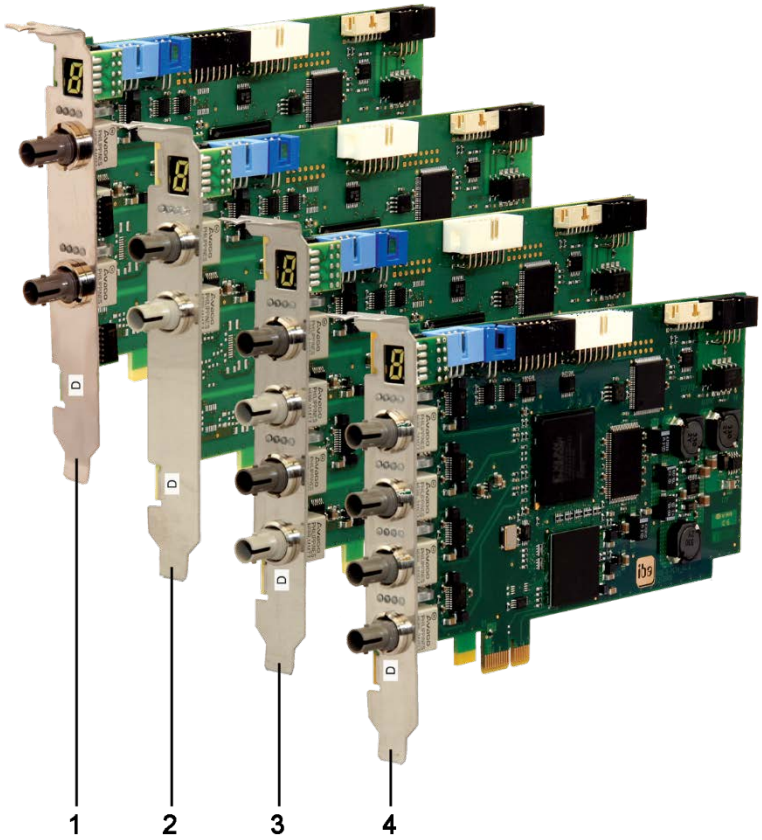
PCI cards

1 *ibaFOB-2i-D*

2 *ibaFOB-io-D*

3 *ibaFOB-2io-D*

4 *ibaFOB-4i-D*



PCI Express cards (HW version A)

1 *ibaFOB-2i-Dexp*

2 *ibaFOB-io-Dexp*

3 *ibaFOB-2io-Dexp*

4 *ibaFOB-4i-Dexp*

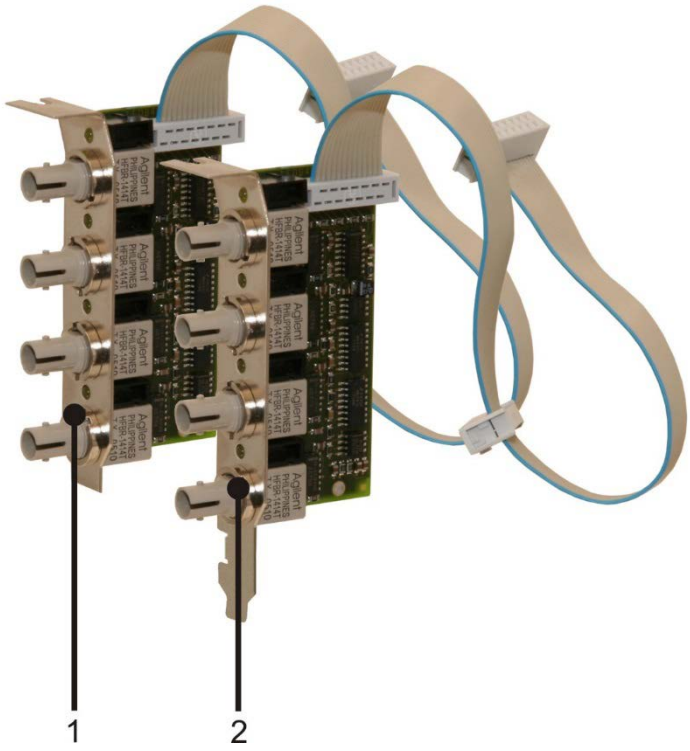
PCI Express cards (HW version B)

1 *ibaFOB-2i-Dexp*

2 *ibaFOB-io-Dexp*

3 *ibaFOB-2io-Dexp*

4 *ibaFOB-4i-Dexp*



Extension modules

1 *ibaFOB-4o-D rackline slot* (output module with short slot plate for *ibaRackline*)

2 *ibaFOB-4o-D-PCI* (output module with long slot plate for standard PCI slot)

1.1 Target group

This documentation is aimed at qualified professionals who are familiar with handling electrical and electronic modules as well as communication and measurement technology. A person is regarded as professional if he/she is capable of assessing safety and recognizing possible consequences and risks on the basis of his/her specialist training, knowledge and experience and knowledge of the standard regulations.

1.2 Notations

In this manual, the following notations are used:

Action	Notation
Menu command	Menu *Logic diagram*
Calling the menu command	*Step 1 – Step 2 – Step 3 – Step x* Example: Select the menu *Logic diagram – Add – New function block*.
Keys	<Key name> Example: <Alt>; <F1>
Press the keys simultaneously	<Key name> + <Key name> Example: <Alt> + <Ctrl>
Buttons	<Key name> Example: <OK>; <Cancel>
Filenames, paths	`Filename`, `Path` Example: `Test.docx`

1.3 Used symbols

If safety instructions or other notes are used in this manual, they mean:

Danger!

The non-observance of this safety information may result in an imminent risk of death or severe injury:

- Observe the specified measures.

Warning!

The non-observance of this safety information may result in a potential risk of death or severe injury!

- Observe the specified measures.

Caution!

The non-observance of this safety information may result in a potential risk of injury or material damage!

- Observe the specified measures

Note

A note specifies special requirements or actions to be observed.

Tip

Tip or example as a helpful note or insider tip to make the work a little bit easier.

Other documentation

Reference to additional documentation or further reading.

2 Introduction

2.1 General application

The cards of the *ibaFOB-D* family are communication cards for *ibaNet* fiber optics connections using DMA technology (DMA = Direct Memory Access). Mechanically, they have a standard design for PCI slots or PCI Express slots.

The cards are the successor models for the cards in the *ibaFOB-S* and *ibaFOB-X* families and can replace these former models completely.

The *ibaFOB-D* cards can be used to connect iba peripheral devices such as *ibaPADU* analog-digital-converters, *ibaNet750* devices, *ibaLink* signal modules and *ibaBM* bus monitors to a standard or industrial PC. The cards can also be used for connecting an iba-system to automation devices of other manufacturers, e. g. ABB AC 800PEC or SIMATIC TDC-interface boards LO5/LO6.

The cards have different numbers of fiber optic inputs which can be operated with different communication protocols depending on the connected devices.

The boards cover all current and former ibaNet communication protocols and thus can be used for processing of data from an old *ibaPADU* device (S/N <1000) and an ABB 800PEC high performance controller or a SIMATIC TDC LO6 board as well. The 5Mbit protocol is also supported by iba. This enables the cards to measure fast signals (25 kHz) from an *ibaPADU-8-ICP*, *ibaPADU-8-M* or *ibaPADU-16-M*.

2.2 Properties

- PCI cards: Full compliant PCI V2.2 card, supporting both 3.3 V and 5 V signal levels and supporting both 33 MHz and 66 MHz PCI bus clock speed
- PCI Express card: PCIe 1.0-x1 compatible slot (PCIe-x1, x4, x8, x16)
- Measurement data is written directly to the computer's main memory or read out without loading the CPU (PCI bus master DMA).

  In DMA mode, the drives access the memory directly. This is a significant relief for the CPU load while data traffic is boosted.
- Independent fiber optic input channels
- All currently existing ibaNet link protocols are supported:
  - 2Mbit (for *ibaPADU* devices with S/N < 1000)
  - 3Mbit
  - 5Mbit
  - 32Mbit
  - 32Mbit Flex
- 4 LEDs for each input channel indicating operational status, link status, data transmission rate and error

- 7 segment display for card-ID and indication of sync master card
- Expansion connector (white) for *ibaFOB-4o-D* module to mirror the inputs
- Extension plug (black) for add-on module *ibaFOB-4o-D* for transmitting analog and digital output signals

  Possible applications: ibaLogic outputs or alarms from *ibaPDA* and *ibaPADU-8-M/-ICP* bi-directional connection
- No jumpers or switches on the card

  All parameters are set in the software.
- Interrupt synchronization cable to connect multiple iba cards in one PC
- Firmware upgrade without uninstalling the card.

2.3 Operating modes

The following table gives an overview of the available operation modes, link speed, number of signals, data sampling time and typical devices:

Protocol	Max. number of signals per FO link	Sampling time	Typical device
Single fiber input-only modes			
2Mbit	32 INT + 32 Digital	≥1 ms	ibaPADU16/32 (old, S/N < 1000)
3Mbit	64 INT + 64 Digital	≥1 ms	ibaPADU8/16/32
	64 REAL + 64 Digital	≥1 ms	ibaLink-SM-64-i-o
5Mbit	8 INT + 8 Digital	≥50 µs	SIMATIC TDC LO5
32Mbit	64 INT + 64 Digital	≥50 µs	SIMATIC TDC LO6
	128 INT + 128 Digital	≥100 µs	SIMATIC TDC LO6
	512 REAL + 512 Digital	≥800 µs	ABB AC 800PEC (1 ms)
	DPM-S mode	≥800 µs	ibaBM-DPM-S (1 ms)
	8 x (64 INT + 64 Digital)	≥1 ms	ibaBM-COL-8i-o (1 ms)
Bidirectional fiber modes (output link required)			
5Mbit	8 INT + 8 Digital	≥40 µs	ibaPADU-8-M ibaPADU-8-ICP
32Mbit Flex	variable*	≥10 µs	ibaPADU-S-CM
Single fiber output-only modes (output link required)			
3Mbit	64 REAL + 64 Digital	≥1 ms	ibaNet750-BM
32Mbit	Not supported by PC software yet.		

* Example: Payload transmission of 64 Byte at 25 µs sampling time or 3100 Byte at 1 ms.

Besides the mere hardware parameters the usability of board and devices in combination with a certain operational mode depends also on the iba software application.

Not all of iba application software products support all modes or cards at the time.

The following table shows the supported combinations of modes of operation and software applications:

Protocol	3Mbit		5Mbit		32Mbit		32Mbit Flex	
Transmission rate	3.3 Mbit/s		5.0 Mbit/s		32 Mbit/s		32 Mbit/s	
Sampling rate	1 Hz -1 kHz		0.5 kHz - 25 kHz		1.25 kHz - 20 kHz		0.5 kHz - 100 kHz	
Number of signals per FO link	64 A + 64 D		8A + 8D		512 A + 512 D (1 ms) 64 A + 64 D (50 µs)		Up to 4060 bytes	
Application	**Input**	**Output**	**Input**	**Output**	**Input**	**Output**	**Input**	**Output**
ibaPDA	■	□ [1)]	■	-	■	-	■	■
ibaLogic	■	■	-	-	■	■	-	-

■ = Ok, □ = possible, - = not supported

[1)] Alarm outputs (50 ms) via ibaFOB-4o-D, -io-D, -2io-D

Note

The cards are not supported by *ibaScope* and *ibaLogic-V3*. If you need spare boards for these software applications, please contact iba support.

2.4 Extension modules

Each card can be extended with up to 2 add-on modules *ibaFOB-4o-D*. Two designs are available for the extension modules:

- Short, for *ibaRackline* (special housing slots)
- Long for standard PCI slots or PCIe slots 1.0-x1 compatible

The extension modules should be connected by a flat ribbon cable with the card. Depending on the intended function the module should be plugged into the appropriate connector.

- Mirroring the optical inputs

  The optical input channels are mirrored on the output channels, with almost no delay. Thus, other iba systems equipped with *ibaFOB* input boards can be supplied with the same measured data.

- Outputs of application software

  In this case the *ibaFOB-4i-D* board operates in duplex mode, i. e. signals can be received and transmitted independently. With *ibaPDA* you are able to use the alarm outputs, with *ibaLogic* you are able to use these output channels as output resources.

3 Safety instructions

Observe the following safety instructions for *ibaFOB-D*.

3.1 Intended use

The card is electrical equipment. It may be used only in the following applications:

- Automation of industrial plants
- Measurement data acquisition and analysis
- Applications of iba software products (*ibaPDA*, *ibaLogic*, etc.)

This card must only be connected to peripheral devices of iba AG or dedicated devices of other manufacturers.

This card must only be installed in Windows computers.

Note

The pass-through of the *ibaFOB* card family into virtual machines (VMs) is not supported, because additional latencies may result in loss of measurement data or firmware updates are not performed correctly and the *ibaFOB* board no longer functions as a result.

3.2 Special safety instructions

Danger from electric shock!

Switch off the computer and disconnect it from the mains power supply before opening!

Warning!

This is a class A device. This equipment may cause radio interference in residential areas. In this case, the operator will be required to take appropriate measures.

Caution

Electrostatic discharges can damage the module.

Before touching the board make sure that your body is electrically discharged or works in a designated ESD protected area! Observe the ESD guidelines for the handling of electrostatically sensitive assemblies and components.

4 Scope of delivery

After having unpacked the delivery, please check it for completeness and possible damages.

The scope of delivery comprises:

- *ibaFOB-D* card or *ibaFOB-Dexp* card
- Flat ribbon synchronization cable

5 System requirements

Note the following requirements for using the *ibaFOB-D* cards and the *ibaFOB-Dexp* cards.

Hardware

PC with the following minimum configuration:

- Multicore CPU 2 GHz or better
- 4 GB RAM or more
- 100 GB HDD
- 1 free PCI slot (32 bit or 64 bit) or PCIe 1.0-x1 compatible slot per card

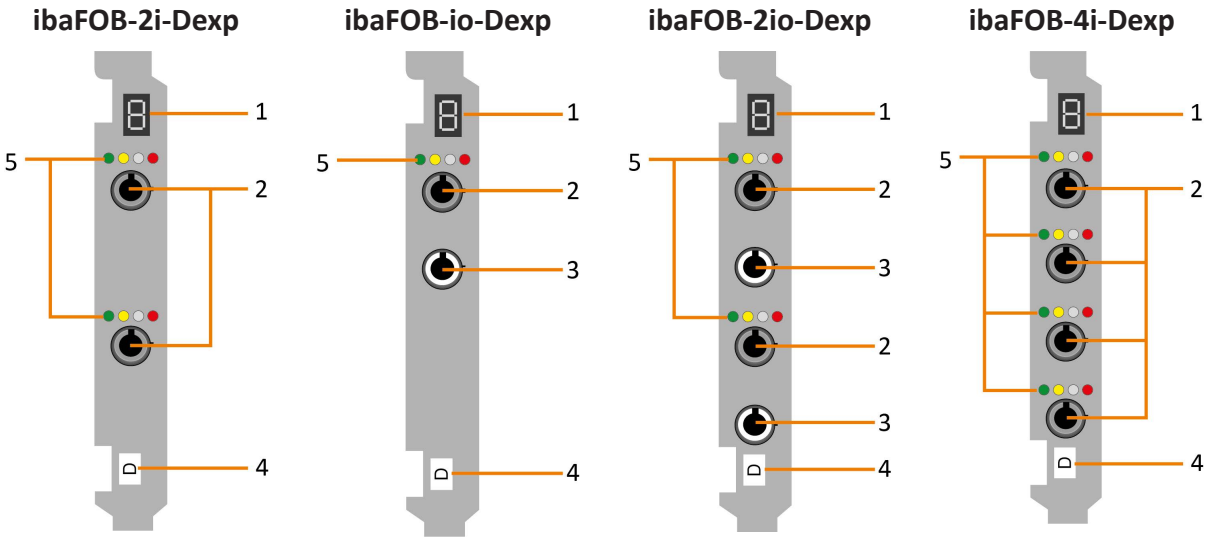
Software

- *ibaPDA* version 7.3.2 or higher
- *ibaQDR* version 6.23.1 or higher
- *ibaLogic*-V4 / -V5

6 Description

Here you will find views and descriptions of the *ibaFOB-D* card.

6.1 Front view



1 7 segment display

2 FO inputs (dark gray)

3 FO outputs (light gray)

4 Identifier for cards of the ibaFOB-D family

5 Communication status FO connection

The identifier (4) is used to distinguish the individual *ibaFOB* card types. The following identifier stands for the following card types:

D ibaFOB-D and ibaFOB-Dexp

TDC ibaFOB-TDC and ibaFOB-TDCexp

SD ibaFOB-SD and ibaFOB-SDexp

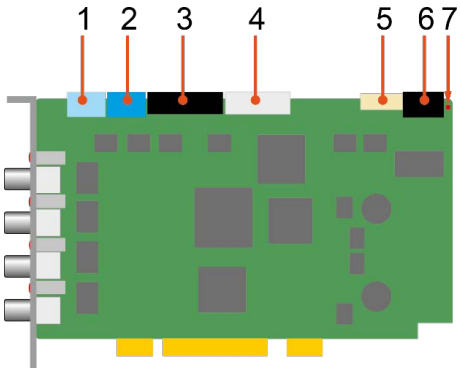
PC ibaFOB-PlusControl

R ibaFOB-R

6.2 Card connectors

PCI cards

Example ibaFOB-4i-D



1 SYNC: synchronization of iba cards (Sync-IRQ connector)

2 +5 V: power supply for Sync-i/Sync-o

3 TX-OUT: ibaFOB-4o (outputs)

4 TX-MIRROR: ibaFOB-4o (mirrored inputs)

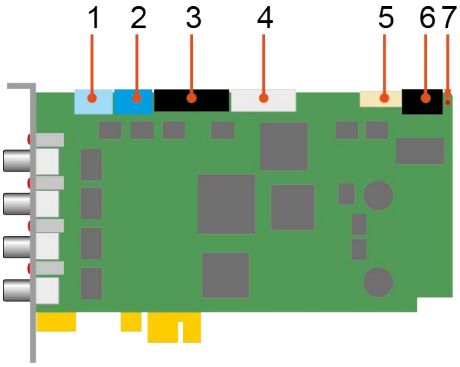
5 JTAG: Service interface

6 DCF77 & ALARM: spare connector, prepared for future extensions

7 ALARM STATUS: Debug LED

PCI Express cards (HW version A)

Example ibaFOB-4i- Dexp



1 SYNC: synchronization of iba cards (Sync-IRQ connector)

2 +5 V: power supply for Sync-i/Sync-o

3 TX-OUT: ibaFOB-4o (outputs)

4 TX-MIRROR: ibaFOB-4o (mirrored inputs)

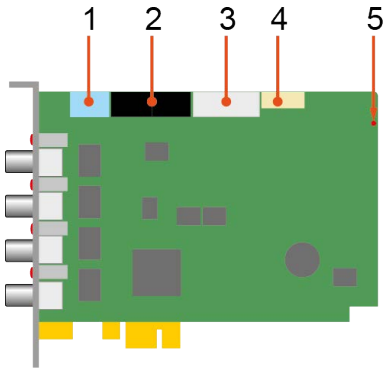
5 JTAG: Service interface

6 DCF77 & ALARM: spare connector, prepared for future extensions

7 ALARM STATUS: Debug LED

PCI Express cards (HW version B)

Example ibaFOB-4i- Dexp



1 SYNC: synchronization of iba cards (Sync-IRQ connector)

2 TX-OUT: ibaFOB-4o (outputs)

3 TX-MIRROR: ibaFOB-4o (mirrored inputs)

4 SERVICE: Service interface

5 STATUS: Debug LED

Maximum distance of fiber optic connections

The maximum distance of fiber optic connections between 2 devices depends on various influencing factors. This includes, for example, the specification of the fiber (e. g. 50/125 µm, 62.5/125 µm, etc.), or the attenuation of other components in the fiber optic cable plant such as couplers or patch panels.

However, the maximum distance can be estimated on the basis of the output power of the transmitting interface (TX) or the sensitivity of the receiving interface (RX). A model calculation can be found in chapter ↗ *Example for FO budget calculation*, page 67.

The specification of the transmitter's output power and the receiver's sensitivity of the fiber optic components installed in the device can be found in the technical data in chapter ↗ *Main data ibaFOB-D/ibaFOB-Dexp*, page 62 under "ibaNet interface".

6.3 Communication status

The communication status for the connections is indicated by colored LEDs on the front of the cards.

LED	Status	Description
Green (Run)	flashing	Power is on and the channel is functioning properly
	off	Controller stopped (hardware failure)
Yellow (Link Slow)	on	Receiving 2Mbit, 3Mbit or 5Mbit telegrams on this channel, link correctly configured
	flashing	Receiving 2Mbit, 3Mbit or 5Mbit telegrams on this channel, but link configured for another protocol 32Mbit Flex mode: TCP/UDP telegram detected via FO (flashing unsteady)
	off	No 2Mbit, 3Mbit or 5Mbit telegram detected
White (Link Fast)	on	Receiving 32Mbit or 32Mbit Flex telegrams on this channel, link correctly configured
	flashing	Receiving 32Mbit or 32Mbit Flex telegrams on this channel, but link configured for another protocol
	off	No 32Mbit or 32Mbit Flex telegram detected
Red (Error)	on	Watchdog alarm
	flashing	Running the “Golden FPGA Flash Rescue mode”
	off	Normal operation

6.4 7 segment display

The 7 segment display on the front of the card shows:

- Horizontal segment only: *ibaFOB-D* card not initialized
- Numbers 0 to 7: Ident number, *ibaFOB-D* card is initialized

The decimal point shows how the *ibaFOB-D* card is configured:

- Always lights up: Internal interrupt master
- Flashing: External interrupt master
- Off: Interrupt slave

6.5 Debug LED

This multicolor LED on the card is for debug and service purposes only.

LED	Operating status	Description
Debug	green	Card is running and ok
	red	Watchdog alarm or other error

6.6 Status display on outputs (extension modules)

On top of each FO connector one LED indicates the status of the link.*)

LED	Operating status	Description
Off	off	Computer out of operation or extension module not connected with ibaFOB-D card
Yellow	flickering	No outputs available No fiber optic outputs, i. e. no red laser light visible on output fiber
	flashing evenly	Outputs available At the same time, a red laser light is visible on the output fiber.

*) Applies to all modes of operation

7 Installing and removing the card

Observe the following warnings when working with the cards.

Danger from electric shock!

Switch off the computer and disconnect it from the mains power supply before opening!

Caution

Electrostatic discharges can damage the module.

Before touching the board make sure that your body is electrically discharged or works in a designated ESD protected area! Observe the ESD guidelines for the handling of electrostatically sensitive assemblies and components.

7.1 Installing the card

Proceed as follows to install the card.

Note

In order to take advantage of the plug and play function, be sure that *ibaPDA* V6.21.0 (V6.23.1 for PCIe), respectively *ibaLogic* has been installed before inserting the card. Otherwise the card will not be automatically recognized by Windows.

1. Shut down the computer.
2. Switch off the power supply of the computer.
3. Unplug the mains power line.
4. Open the computer on the side where you can reach the PCI(e) slots.
5. Carefully remove the card from its packaging.
6. Hold the card by the front panel and the top rear corner. Do not touch the contacts.
7. Carefully insert the card into a free PCI(e) slot.

   Tip

   To avoid damaging the card, press on the top of the front plate and on the top edge of the circuit board when inserting the card.

   Do **not** press on the plugs along the top edge of the card. They might brake off.

8. Attach the card to the housing of the computer.

   If you install more than one card, connect them with a flat ribbon cable (sync cable).
9. Close the computer.

10. Insert the mains plug into the earthed socket.
11. Switch on the power supply of the computer.
12. Start the computer.

7.2 Removing the card

Proceed as follows to remove the card.

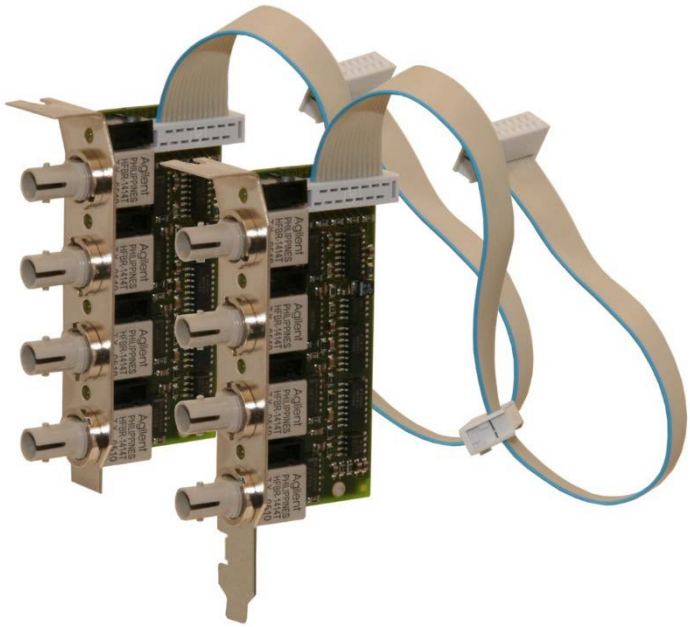
1. Shut down the computer.
2. Switch off the power supply of the computer.
3. Unplug the mains power line.
4. Open the computer on the side where you can reach the card freely.
5. Disconnect all external connecting cables from the card.
6. Release the fixing screws.
7. Carefully pull the card out of the PCI(e) slot.
8. Store the card in suitable packaging.
9. Close the computer.
10. Insert the mains plug into the earthed socket.
11. Switch on the power supply of the computer.
12. Start the computer.

7.3 Connecting a card to an ibaFOB-4o-D extension module

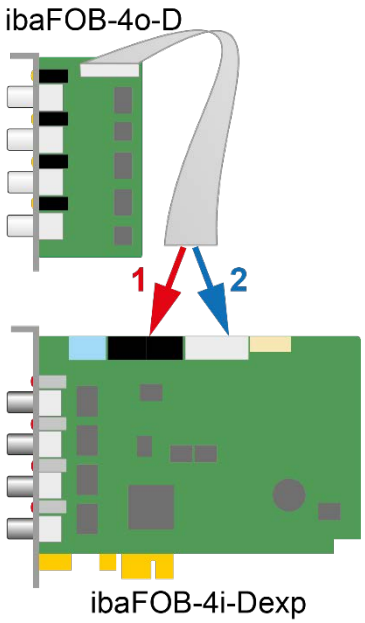
If you connect an *ibaFOB-4o-D* extension module to the board you can either mirror the incoming data or use output features of iba software applications *ibaPDA* or *ibaLogic*.

In mirror mode, the incoming data stream is copied from each fiber optic connection to an output channel with virtually no delay.

When using 2 *ibaFOB-4o-D* extension modules on one card, you can also use both functions at the same time.



Which of the two functions the extension module performs depends on the connector used to connect the module to the card.



1-black ibaFOB-4o-D (outputs)

2-white ibaFOB-4o-D (mirrored inputs 4i)

Establish connection

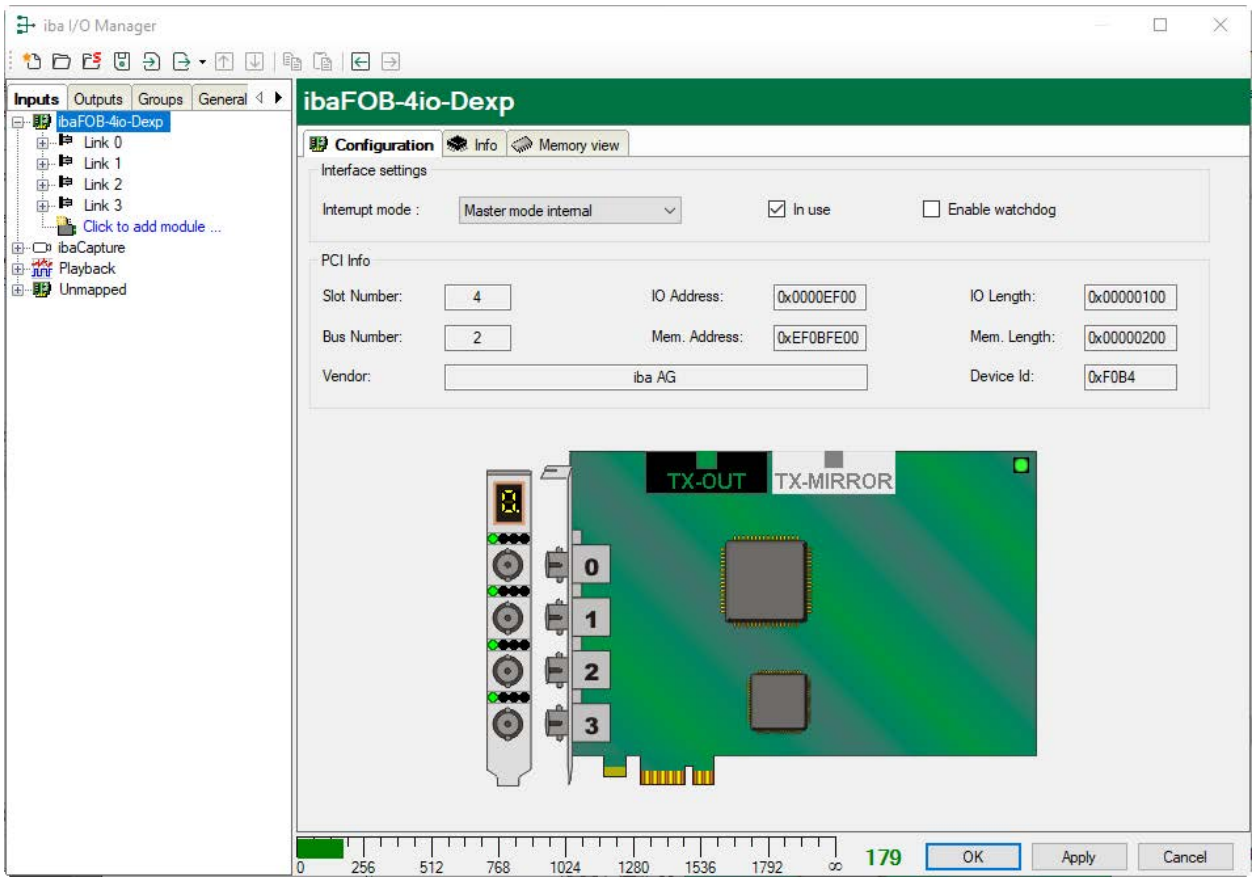
1. Shut down the computer.
2. Switch off the power supply of the computer.
3. Unplug the mains power line.
4. Open the computer so you can reach the PCI(e) cards.

5. Install the extension module in a suitable place.
6. Plug the connector of the extension module to the black or white connector depending on which function you want to use.
7. Close the computer.
8. Insert the mains plug into the earthed socket.
9. Switch on the power supply of the computer.
10. Start the computer.

Note

After the computer is switched back on for the first time after the add-on module has been installed, no message is displayed indicating that new hardware has been detected. The extension modules are controlled and administered by the *ibaFOB-D* card only.

→ Within the *ibaPDA* I/O-Manager it is indicated on which port the extension module is connected (marked green).



8 Installing driver software

The *ibaFOB-D* and *ibaFOB-Dexp* cards can be installed in the Windows operating system via plug and play.

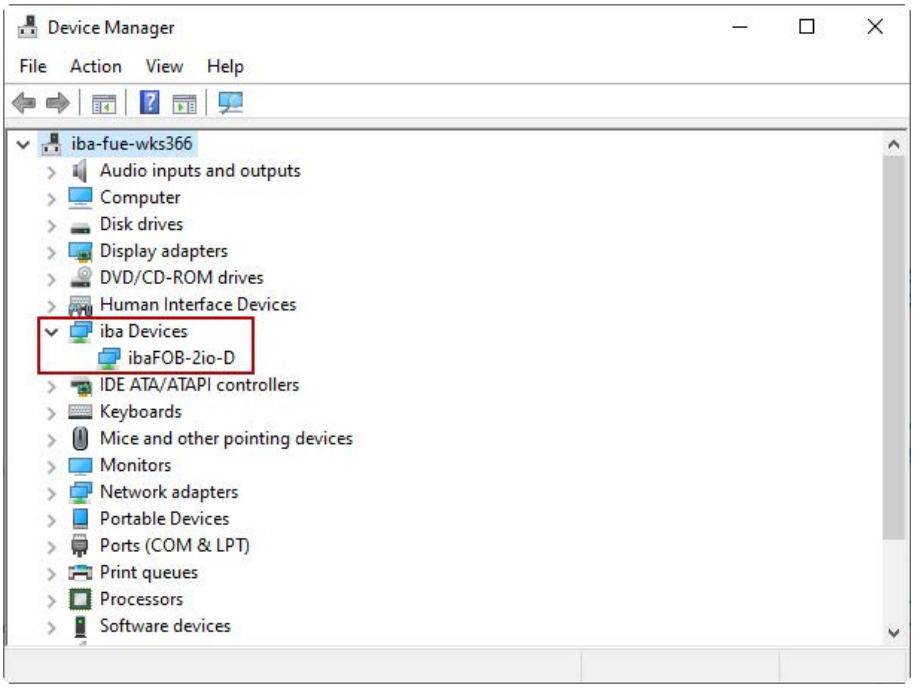
Note

For information on installing the card on an older Windows system, such as Windows XP, refer to one of the previous versions of this manual. Please contact the iba support.

With Windows versions 7 and higher, the process is automated as far as possible.

After the card has been plugged in and the computer has been started, the card is usually detected automatically and the drivers are installed. During this process, various messages appear in the Windows taskbar.

To check whether the card has been detected and the drivers installed, open the Device Manager in the Windows Control Panel.



An "iba Devices" node must be displyed and the relevant card (here "FOB-2io-D") below it.

If the card has not been detected automatically, execute the function *Scan for hardware changes* in the Device Manager.

Installing driver manually

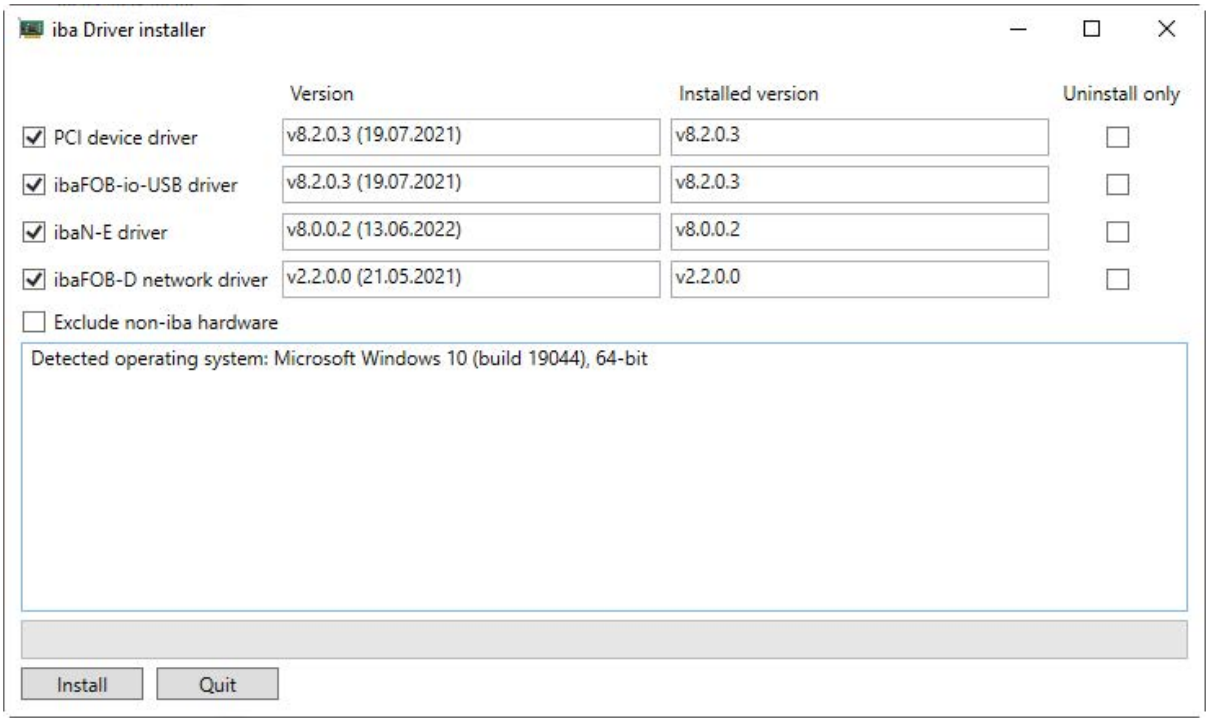
If this method does not work either, you can try to install the drivers manually.

Prerequisite: *ibaPDA* must already be installed on the computer.

1. Execute the following file `ibaDevDrvInstaller.exe`. You will find the file in the following directory:

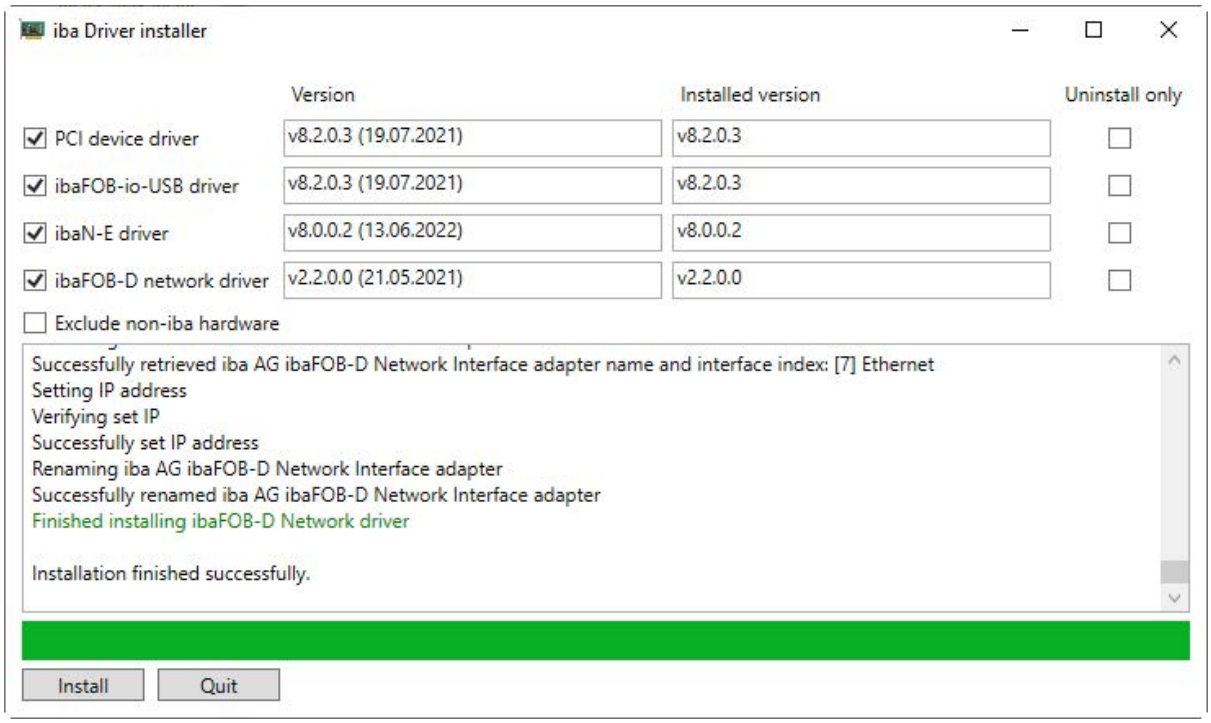
   `C:\Program Files\iba\ibaPDA\Installers`

→ The following dialog window opens:



2. To start the installation, click <Install>.

→ If the installation is successful, this will be displayed clearly:



Note

If the manual installation is not successful either, please contact iba support.

9 Configuration in ibaPDA

9.1 Configuration of the card

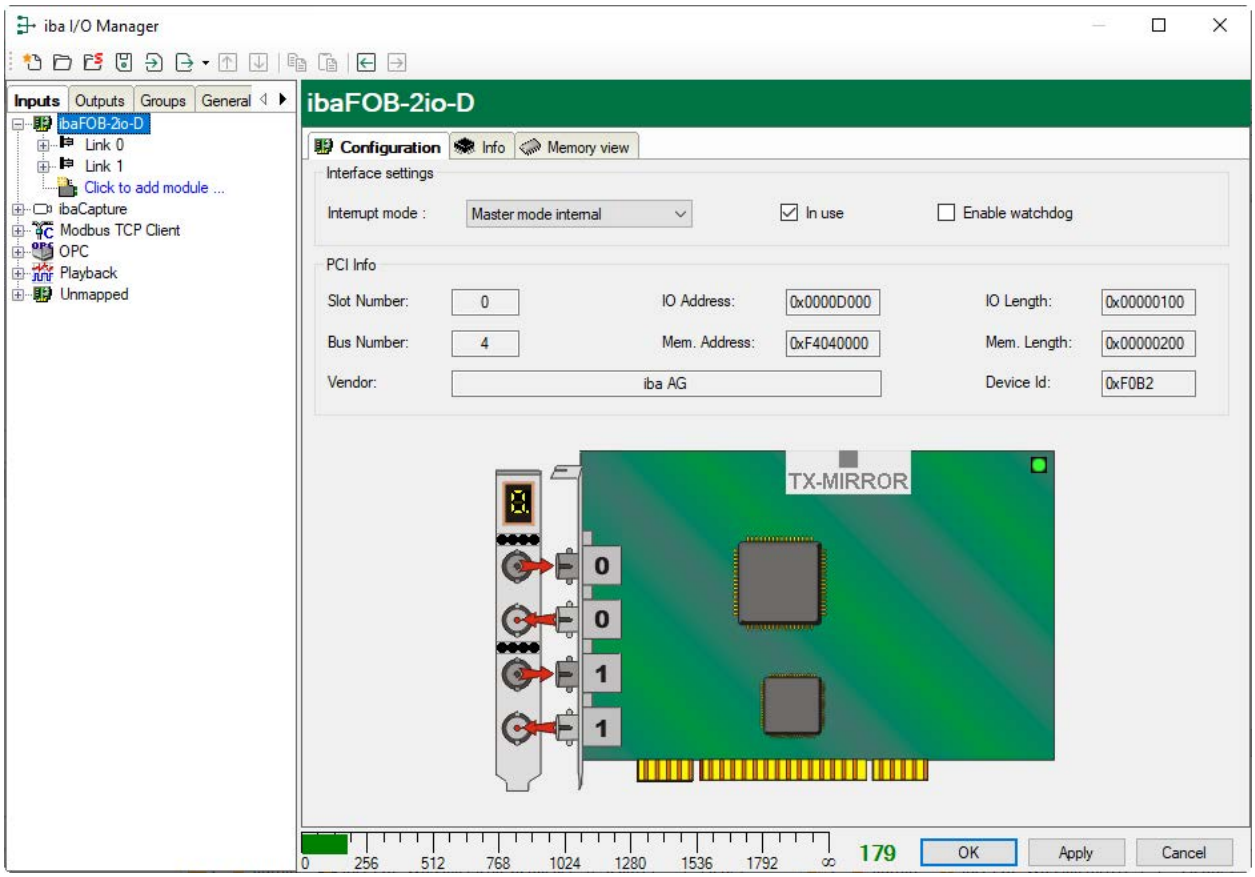
Up to 8 *ibaFOB-D* cards/*ibaFOB-Dexp* cards are supported simultaneously in *ibaPDA*, version 6.21.0/6.23.1 or higher.

In *ibaPDA* all the modules that could previously be added to *ibaFOB-F*, *ibaFOB-S* and *ibaFOB-X* boards can also be added to the *ibaFOB-D* card or *ibaFOB-Dexp* card. The description is based on the example of the *ibaFOB-2io-D* card.

9.1.1 Card view – Configuration tab

On the *Configuration* tab, you can setup the interrupt mode.

If you mark the node of the “ibaFOB-2io-D” interface (for example) in the tree view of *ibaPDA* I/O Manager, a graphical representation of the board is displayed on the right side of the dialog.



In use
Enable the option, if you want to use this card with *ibaPDA*.

Enable watchdog
Activate this option to monitor the function of the *ibaPDA* system by another system. If the watchdog is enabled then the board will generate an alarm telegram when the acquisition is not

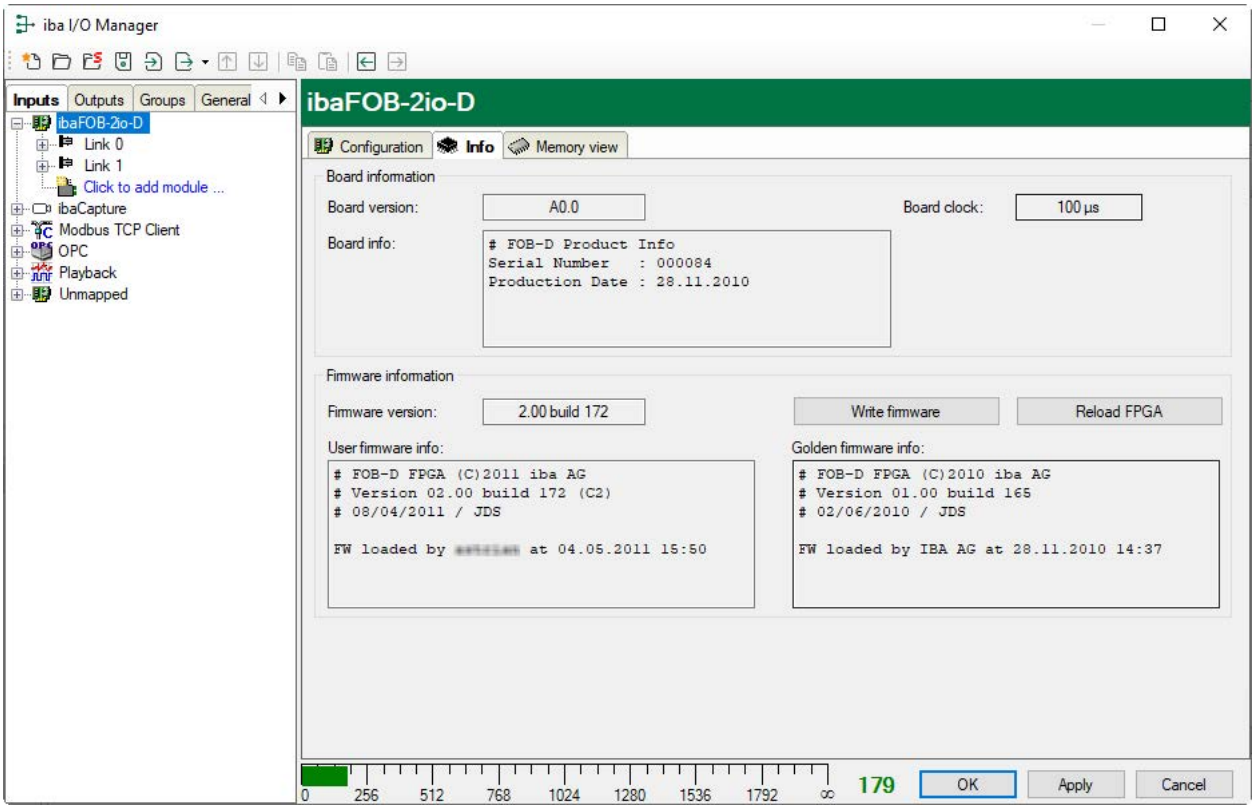
running for more than 2 seconds. The alarm telegram can only be used by the FO output channels (I/O Manager *Outputs*). Therefore, an *ibaFOB-io*, *ibaFOB-2io* or *ibaFOB-4o* card is required.

In case of an alarm, all output values will be set to 0 (zero) in the alarm telegram.

The alarm is also activated during the reset of the computer. If an alarm occurs, all red LEDs on the fiber optic inputs light up. The LED for the debug on the card then also lights up red.

9.1.2 Card view – Info tab

On the *Info* tab you can see information about the card and the loaded firmware. Functions for service and support, such as reloading the FPGA and updating the firmware are available on this tab.



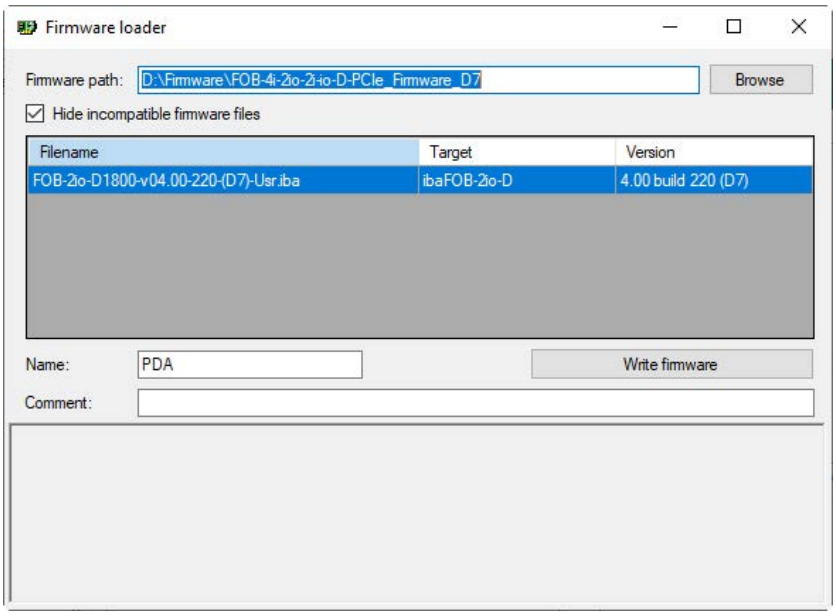
Note

A firmware update should only be performed after consulting the iba support.

Write firmware

1. Click on the <Write firmware> button.

1. The *Load loader* dialog opens.
2. Enter the path of the firmware directory under *Firmware path* or click <Browse> to select the path.

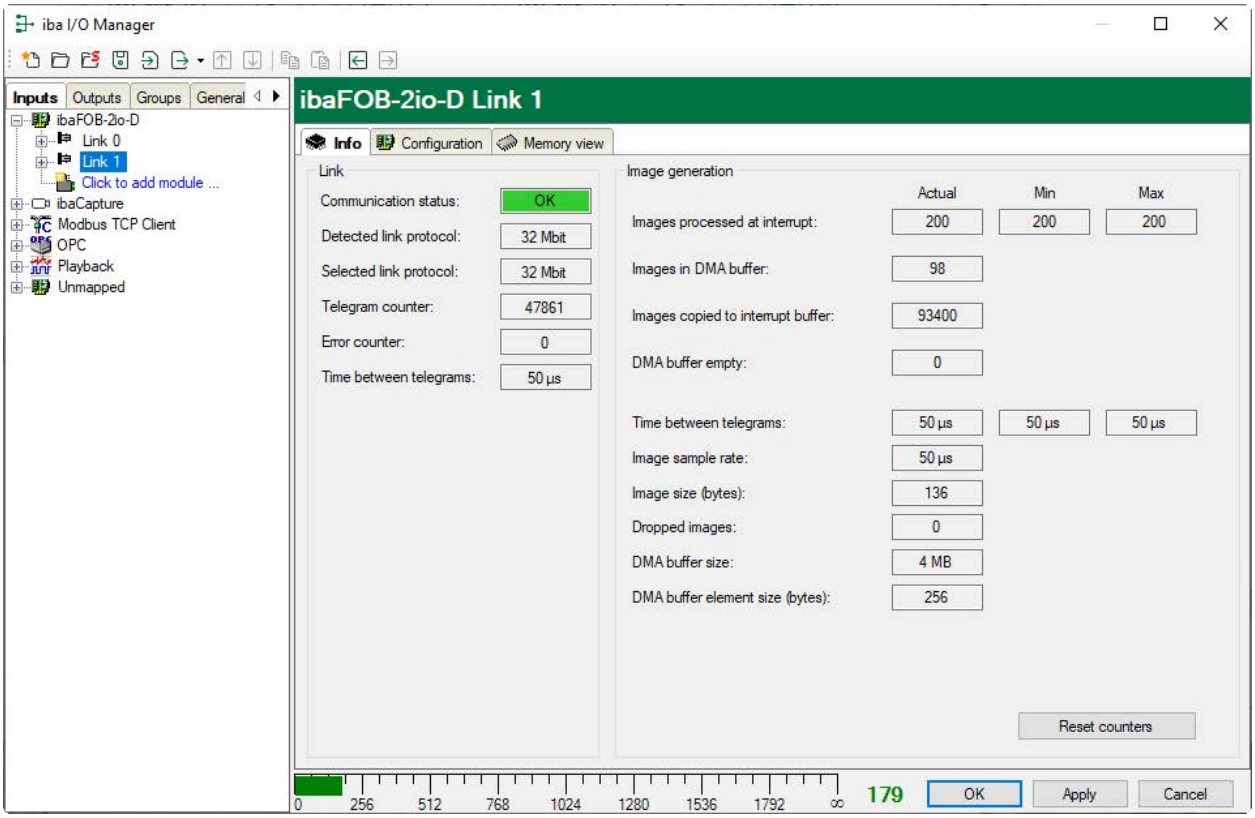


The firmware files in the directory are listed in a table. The file name, the associated card and the firmware version are specified. The files can contain the user firmware or the factory “Golden” firmware or both. The "Golden" firmware is only loaded during production.

3. Select the required firmware.
4. To load the firmware onto the card, click on <Write firmware>.

9.1.3 Link view – 32Mbit

If you select a card link in the tree structure in the I/O Manager, you will receive further information on this connection.



”Link” area

In the *Info* tab, information about the FO communication is displayed in the left part. The displayed information depends on the current protocol on the FO link.

Communication status

“OK” if the FO communication is working without interference.

This means that the telegrams that are being received correspond with the mode that is configured on the link. The transmission mode is determined by the device (module) connected to the link. For example, the transmission mode is set to 3Mbit if an *ibaPADU-8* is connected, or to 5Mbit for an *ibaPADU-8-ICP*.

Detected link protocol

Link protocol detected by the card

Possible values: 2Mbit, 3Mbit, 5Mbit, 32Mbit, 32Mbit Flex or "?" (no device connected).

Selected link protocol

Link protocol set for this link

It is determined by the attached module.

Telegram counter

Counter of correctly received telegrams

Error counter
Counter of telegrams received with errors (e.g. checksum errors)

If this counter reading changes, the fiber optic communication is not correct.

Time between telegrams
Time interval between the last 2 correctly received telegrams

“Image generation” area

The information on the right side of the dialog describes the image generation (process image). An image is a collection of bytes that the card writes into the PC system memory via DMA. This image contains all data of the measured signals on that link.

Here is a short description of the image generation information:

Images processed at interrupt
These counters show how many images were available in the DMA buffer when the last interrupt fired. This value should normally correspond with the interrupt time divided by the image sampling rate.

Images in DMA buffer
This is the number of images that are in the DMA buffer. This number should remain constant. If this number starts to increase, the system does not work correctly. This may happen if e.g. an interrupt is missed.

Images copied to interrupt buffer
This counter shows how many images have been retrieved from the DMA buffer and have been processed by ibaPDA. This counter should count up continuously.

DMA buffer empty
This counter increments each time the DMA buffer is empty when the interrupt fires. If this is the case, then the driver sets all signal values of the respective link to 0 (zero). This may happen if the FO link is disconnected.

Time between telegrams
Time interval between the last 2 correctly received telegrams

This is the same value as the time in the FO communication information but the driver maintains the minimum and maximum values. There shouldn’t be much difference between the minimum and maximum values.

Image sample rate
The rate at which the card writes images to the DMA buffer.

This should be faster or equal to the fastest time base of the modules connected to this link.

Image size (bytes)
Size of the image in bytes

If you multiply the image size with the image sample rate then you know how many bytes per second are transferred by this link over the PCI(e) bus.

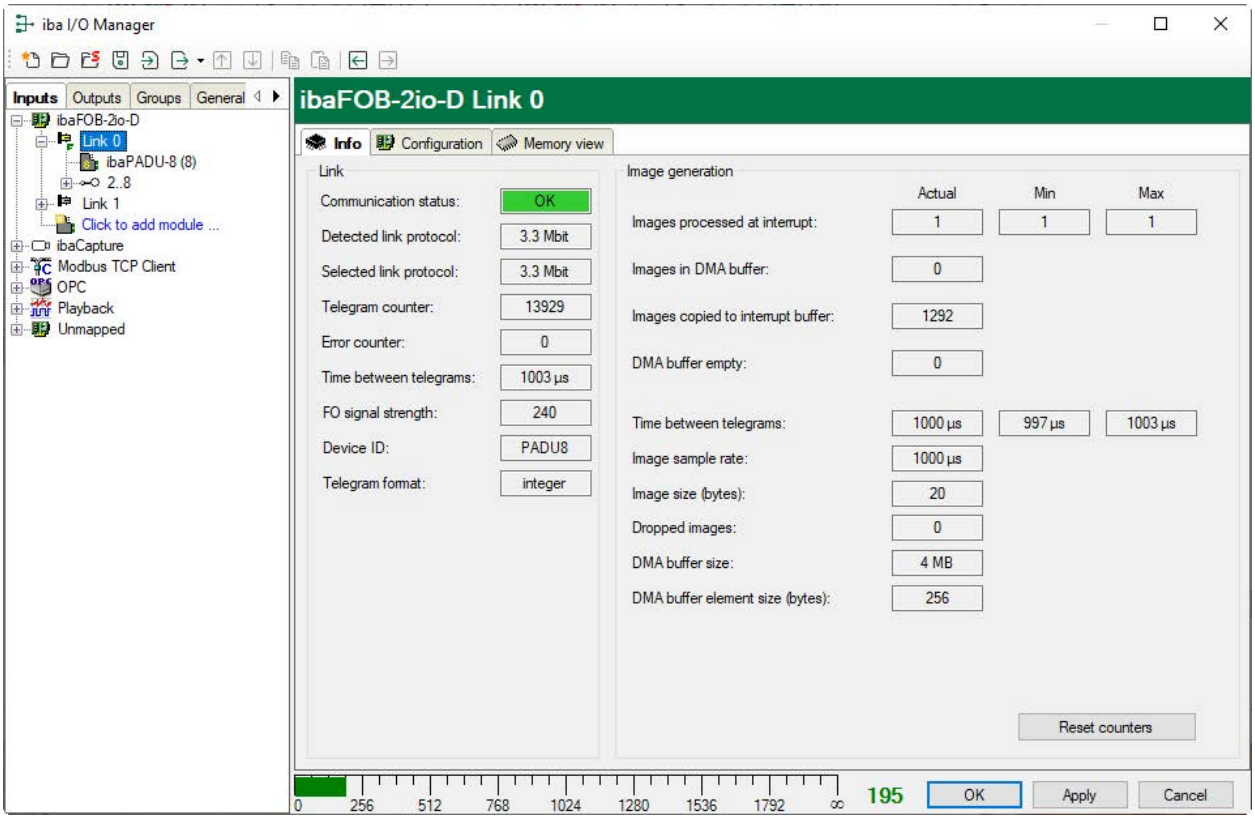
Dropped images
This counter increments when the card's DMA fifo is full and an additional image arrives. If this happens then something is seriously wrong. This means that the card is unable to transfer images over the PCI(e) bus.

DMA buffer size
Size of the DMA buffer for this interface

DMA buffer element size (bytes)
Size of the elements in the DMA buffer (in bytes)

9.1.4 Link view – 3/2Mbit

The following screenshot shows how the information is displayed for a link that works with 3Mbit (e. g. with an *ibaPADU-8*).



Information on the *Link* and *Image generation* areas can be found in chapter ↗ *Link view – 32Mbit*, page 34.

There are 3 parameters that are specific to 2Mbit and 3Mbit operation:

FO signal strength
Difference between the maximum value and the minimum value received from the FO unit

This can be a maximum 255. The higher this value the stronger the FO input signal.

Device ID
ID of the last device in the FO chain connected to this link

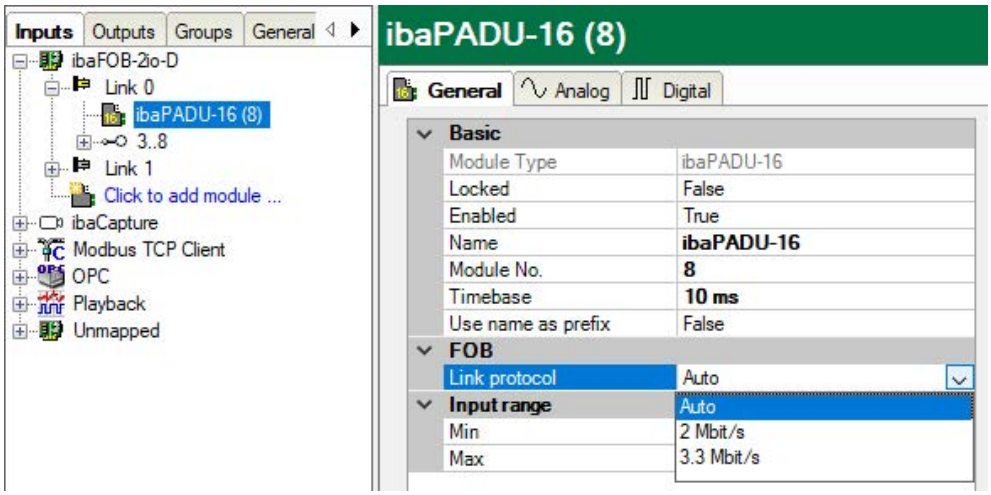
Telegram format

Format of the analog data that is transferred in the telegram

Possible formats are integer, real and S5 real.

Characteristics for ibaPADU-16 and ibaPADU-32 modules

In contrast to former interface cards *ibaFOB-F*, *ibaFOB-S* and *ibaFOB-X* there is an additional property in the general settings of modules for *ibaPADU-16* and *ibaPADU-32* devices, called *Link protocol*.

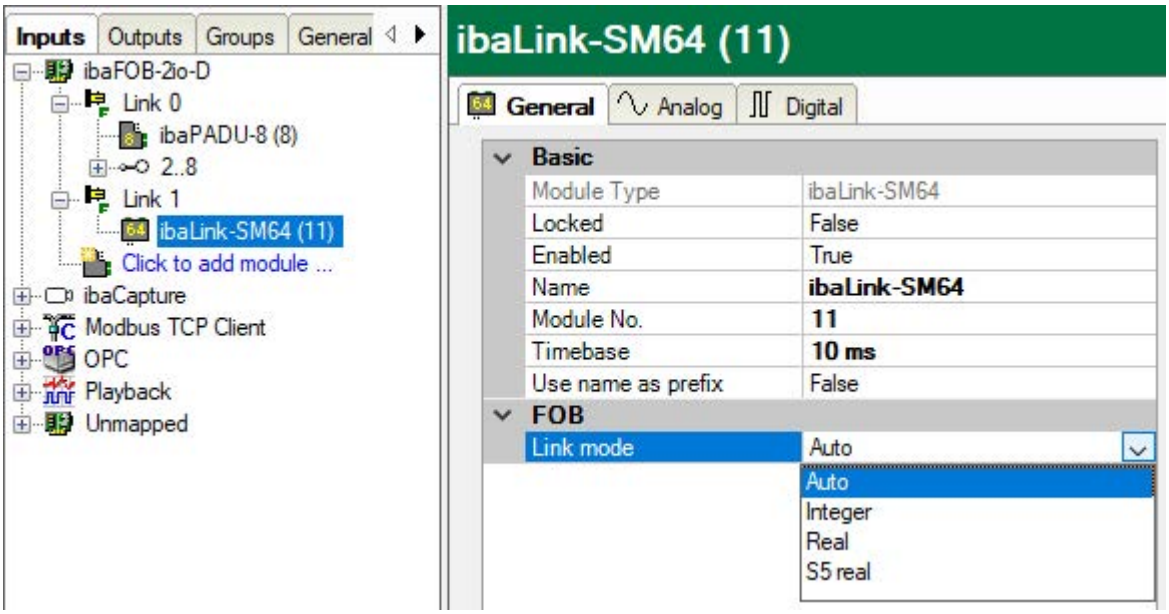


This property can be set to “Auto”, “2.0 Mbit/s” or “3.3 Mbit/s”.

- 2 Mbit/s: Suitable for older *ibaPADU* devices (S/N < 1000).
- 3.3 Mbit/s: To be used for newer devices.
- Auto: In this setting, the transfer rate is automatically detected and set at the start of the acquisition, provided that the device is active and connected to the link at the start of the acquisition.

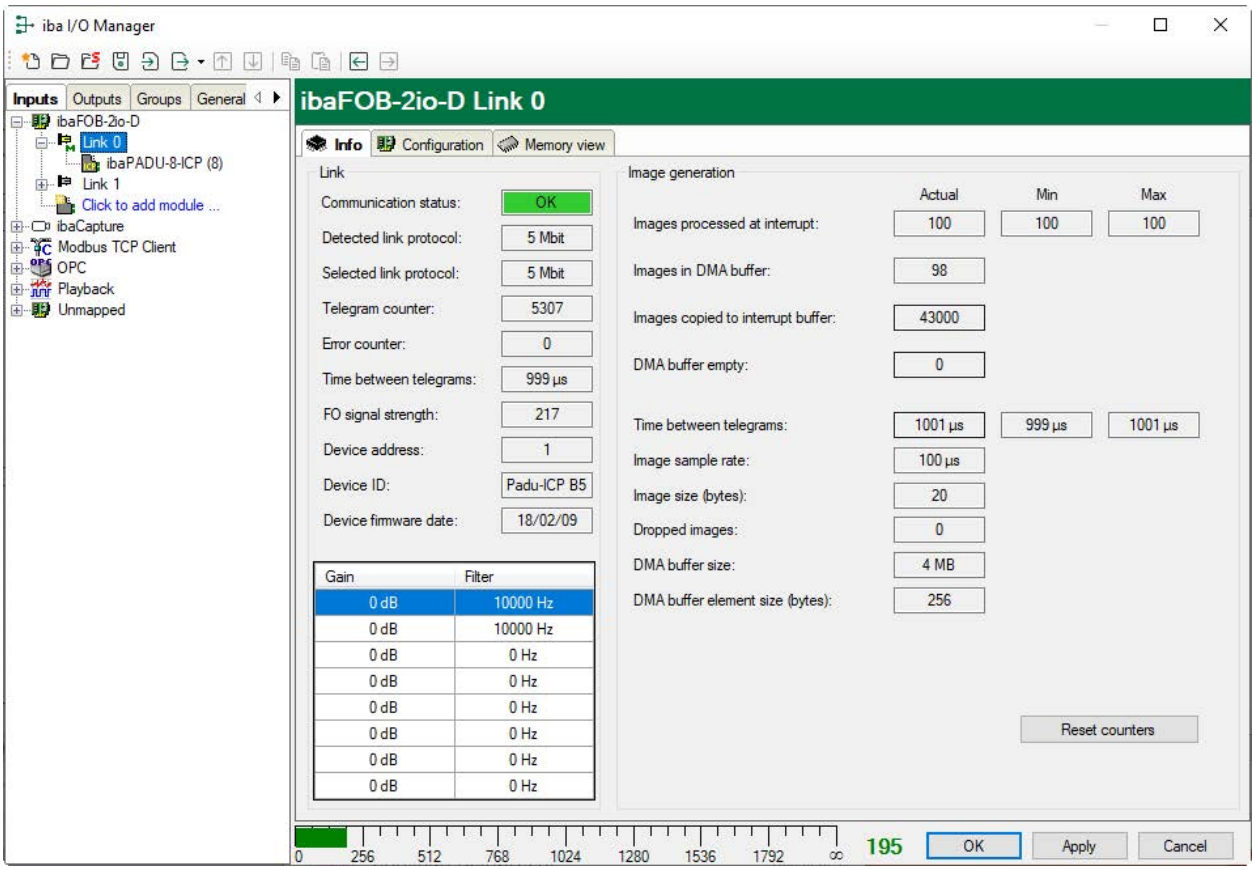
Characteristics für SM64 module

Furthermore, there is another difference to the previous *ibaFOB* cards concerning the module SM64. The system interface card *ibaLink-SM-64-io* can be put into a SIMATIC S5 system. The ibaLink-SM-64-io will then send S5 real instead of standard IEEE 754 real. As the *ibaFOB-D* cards do not automatically convert from S5 reals to IEEE 754 reals, the data type must be set manually. If an *ibaLink-SM-64-i-o* module is connected to the *ibaFOB-D* card, the "S5 Real" setting is used in the selection list for the connection protocol (link mode).



9.1.5 Link view – 5Mbit

The following screenshot shows the information you see when a link operates at 5Mbit, e. g. with *ibaPADU-8-ICP*.



Information on the *Link* and *Image generation* areas can be found in chapter ↗ *Link view – 32Mbit*, page 34.

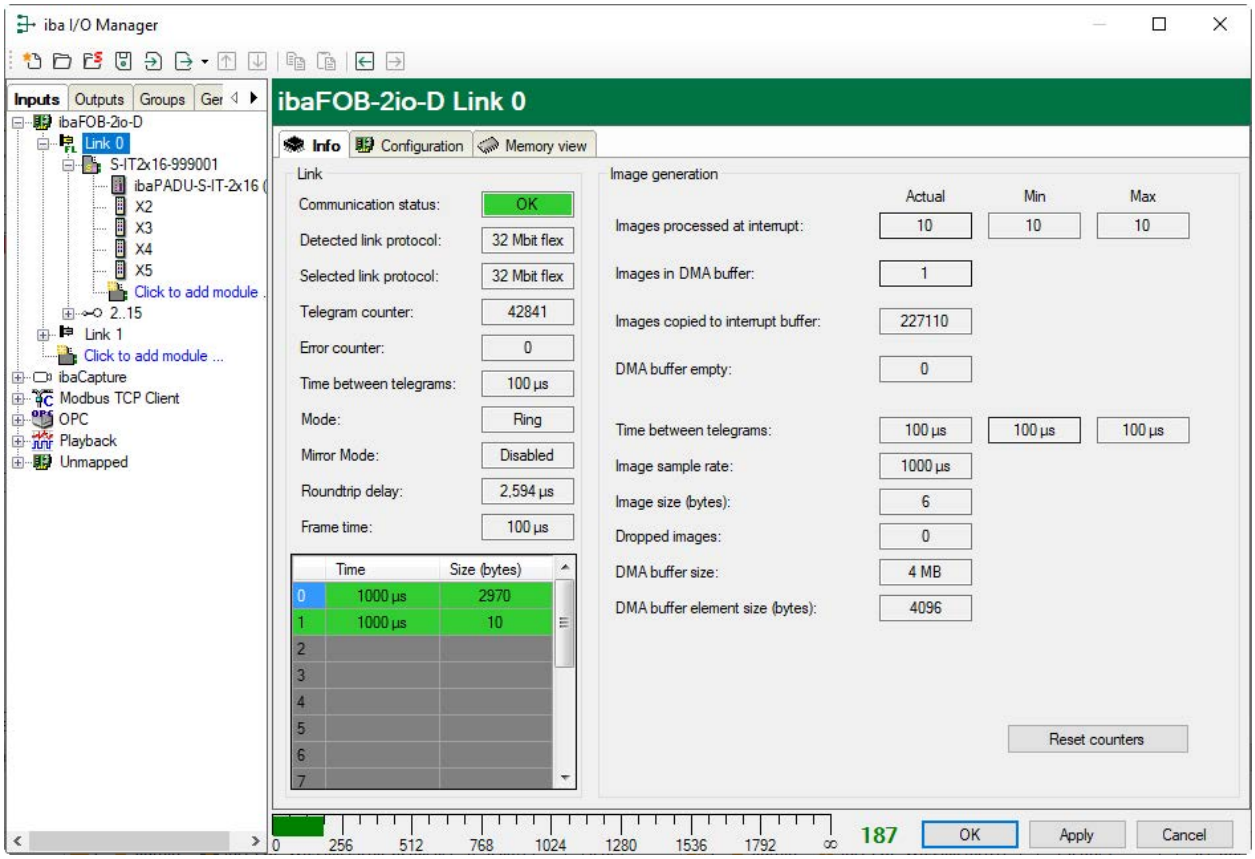
Additional information is:

Device firmware date
The firmware date of the connected device

Gain and filter table
The gains and filters that are configured in the device. This only applies to *ibaPADU-8-ICP* devices.

9.1.6 Link view – 32Mbit Flex

The following screenshot shows the information you see when the link is operating in 32Mbit Flex mode. Up to 15 devices can be connected in a ring topology per link. In the signal tree, links 1 – 15 below the *ibaFOB-D* card correspond to the address that is set with the rotary switch on the connected device.



Information on the *Link* and *Image generation* areas can be found in chapter ↗ *Link view – 32Mbit*, page 34.

Additional information are:

Link

Time between telegrams
Time between two telegrams measured by the ibaFOB-D card

It should be equal to the configured frame time.

Mode
The status of the connection is displayed:

- **Ring**: One or more devices (cascade) are bidirectionally connected and the FO ring is closed.
- **Open chain**: Only the FO input is connected to a device. The output is not connected or the ring is interrupted at one point in the cascade.

Mirror mode
Indicates whether mirror mode is disabled or enabled

If mirror mode is enabled, the display shows whether the board is configured as master or slave system. For a description of the mirror mode, see chapter ↗ *Mirror mode with 32Mbit Flex*, page 40.

Roundtrip delay
Telegram cycle in the closed FO ring.

The time depends on the number of the connected devices in the ring (approx. 2 µs per device).

Due to the roundtrip delay the data of the connected devices might be captured asynchronously (up to one telegram cycle).

Frame time
Cycle in which the data frames are sent. (Smallest configured timebase or 100 µs, when this timebase is an integer multiple of 100 µs. The timebase of all devices must be a multiple of the smallest timebase.)

Table
The table shows the cycle time and the data size of the respective channel:

- Row 0: Ethernet channel
- Rows 1-15: connected devices with the respective address 1-15

9.1.6.1 Mirror mode with 32Mbit Flex

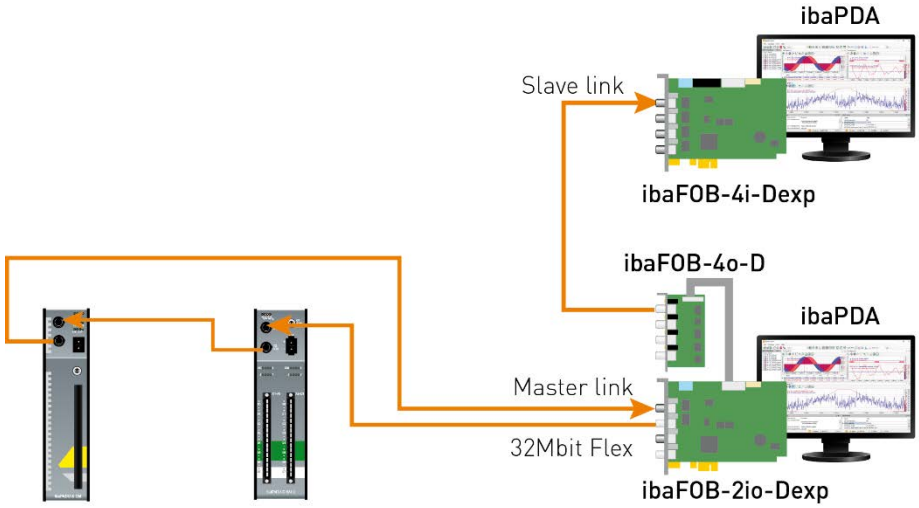
As of *ibaPDA* version 6.32.0, the *mirror mode* option is available. The mirror mode allows multiple *ibaPDA* systems to acquire simultaneously the data of the same Flex devices. For this purpose, one *ibaPDA* system is configured as master. The master system is the only one that can configure the Flex devices. The other *ibaPDA* systems are configured as slaves and can only acquire the data of the Flex devices, but not change the configuration.

The master *ibaPDA* system requires a bidirectional FO connection to receive and send data to the Flex devices. The *ibaPDA* slave only needs a single FO connection to receive data from the Flex devices and the device configuration.

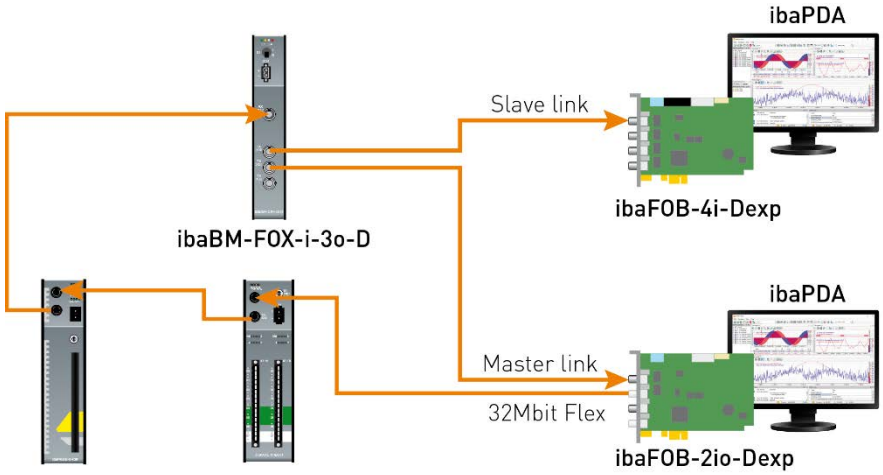
Note

The slave system cannot output data via fiber optics.

Possible connections

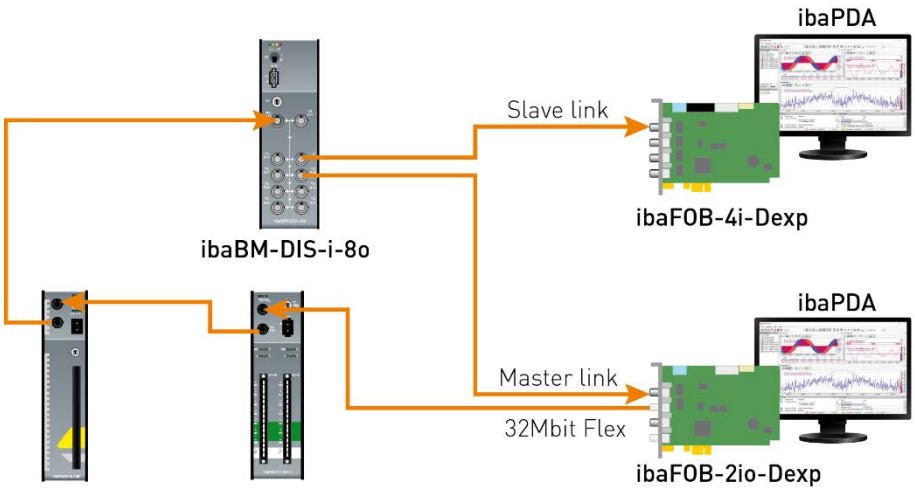


The data from the master is mirrored via an *ibaFOB-4o-D* output board, which is connected to the white connector of the *ibaFOB-2io-D* for mirror mode. See also chap. ↗ *Card connectors*, page 20. The slave *ibaPDA* receives the data via an *ibaFOB-D* input board.



The fiber optic output of the last Flex device is connected to the input of an *ibaBM-FOX-i-3o-D* device. One FO output each of *ibaBM-FOX-i-3o-D* is connected to an FO input of the *ibaPDA* master and the *ibaPDA* slave.

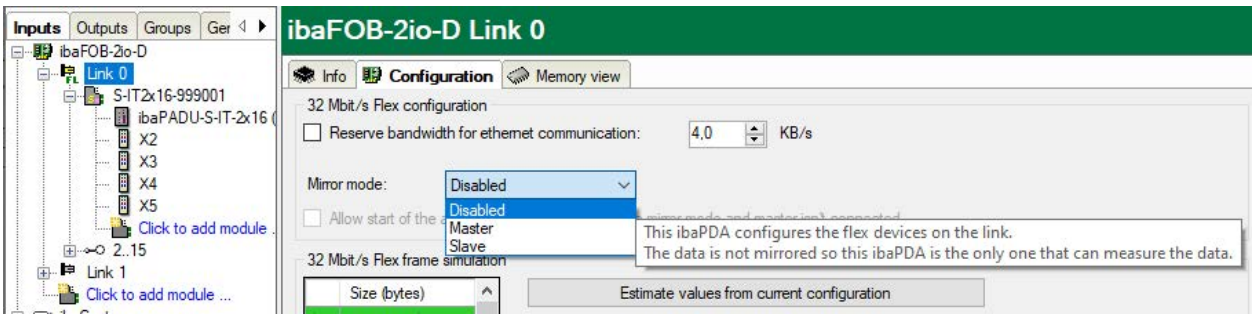
This connection allows the *ibaPDA* slave to acquire data even when the *ibaPDA* master has been shut down.



The example above with *ibaBM-DIS-i-8o* is similar to the example with *ibaBM-FOX-i-3oD*. The *ibaBM-DIS-i-8o* device must operate in copy mode (S1 = 0).

Configuration in ibaPDA

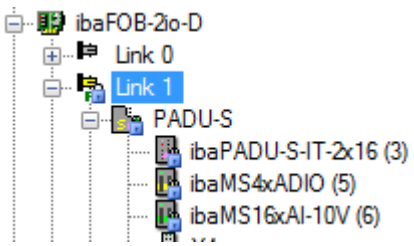
The mirror mode is configured in the *Configuration* tab in the link view of the *ibaFOB-D* card.



3 settings are available for mirror mode:

- **Disabled**: The data is not mirrored, so this *ibaPDA* system is the only one that can acquire data and configure the devices.
- **Master**: This *ibaPDA* system configures the Flex devices on the link. The data and the device configurations are mirrored so that other *ibaPDA* systems can also acquire the data.
- **Slave**: This *ibaPDA* system receives the device configuration from the master *ibaPDA* so that it can acquire data configured by the master *ibaPDA*.

If an *ibaPDA* system is configured as a slave, it can use the *autodetect* function to load the configuration of the devices from the *ibaPDA* master. A slave *ibaPDA* cannot change the device configuration. The slave *ibaPDA* shows the link and its modules in the signal tree with lock symbols.



When the acquisition has been started on the slave *ibaPDA*, the slave waits until it receives the configuration from the master. If this configuration is different from the current configuration, the slave will load the new configuration.

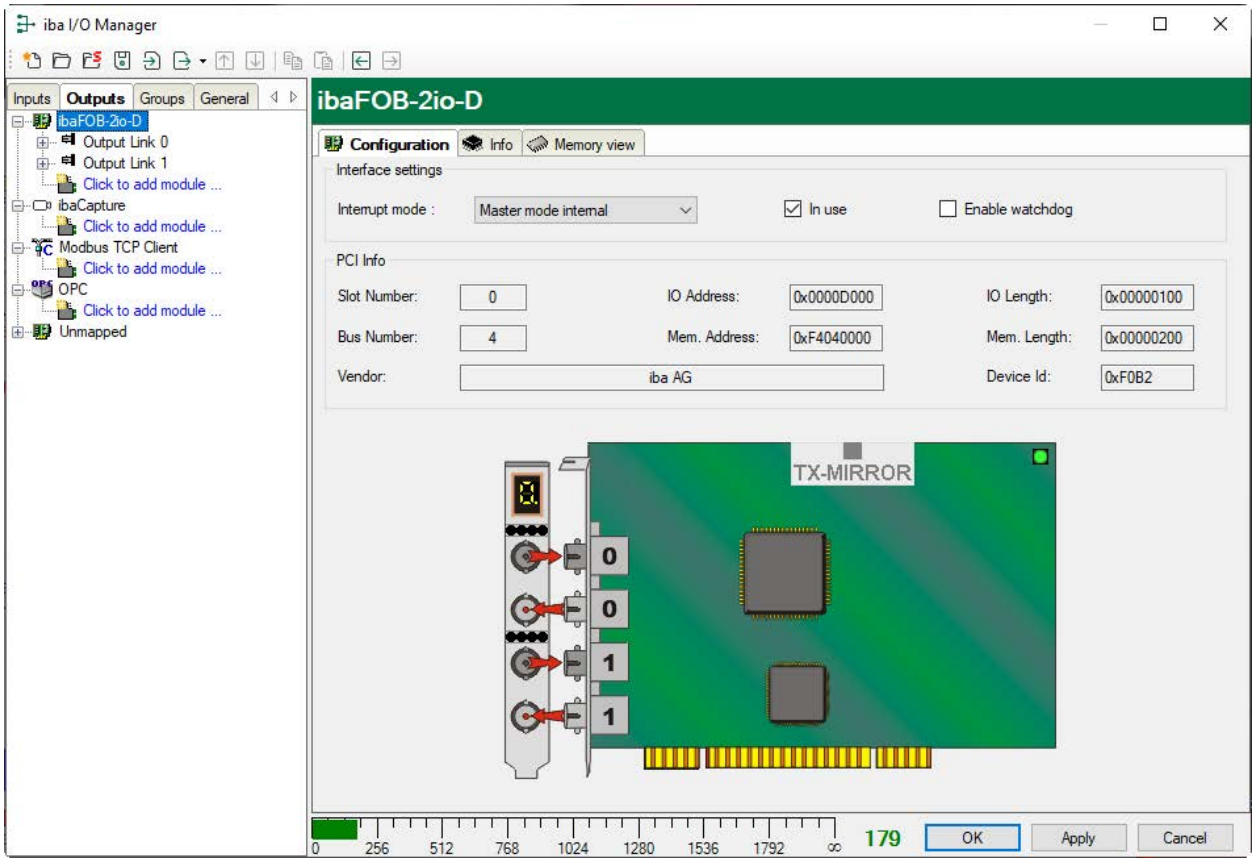
If the slave doesn't receive a configuration within 6 s, *ibaPDA* generates an error message. If the option *Allow start of the acquisition when the link is in slave mirror mode and master isn't connected* is enabled, then the acquisition will start anyway with the last configuration.

When the master *ibaPDA* changes the configuration while the slave *ibaPDA* is acquiring then the slave will automatically restart.

9.1.6.2 Calculation of the telegram size with 32Mbit Flex

In a flex ring with several participants, the data volume per participant is distributed dynamically and calculated by *ibaPDA*. The data size is calculated by *ibaPDA* and it depends on the configured number of analog and digital signals and the smallest configured time base in the ring.

Beginning with version 6.33.1, *ibaPDA* provides a simulator which calculates the data size that can be transmitted via fiber optics with 32Mbit Flex protocol. The simulator is available in the *Configuration* tab.



The data sizes in bytes of each device on the link and the timebase of the data acquisition on the link (in µs) is needed for the calculation.

The values can be manually entered or taken automatically from the current configuration, either with a click on the button <Estimate values from current configuration> or when the respective link of the *ibaFOB* card is marked in the module tree.

The devices in the Flex ring and the corresponding data sizes are listed in the grid on the left. Address 0 corresponds to the Ethernet channel and is not editable.

The section *Flex frame utilization* indicates how much of the bandwidth is still available. The color of the section changes with the utilization rate:

- Green: OK
- Orange: bandwidth for the Ethernet channel < 3 kB/s
- Red: too much data configured

The values taken automatically are estimated first. After the configuration has been applied with a click on <OK> or <Apply>, the actual data values are displayed on the *Info* tab.

When too much data is configured, you may either decrease the number of signals to be measured or increase the timebase.

Simulation of the load

Even if no devices have been connected and configured, the calculation of the telegram size can be used for calculating the expected data load in advance. However, an *ibaFOB-D* or *ibaFOB-io-ExpressBoard* card should be available in the computer.

Open the I/O Manager in *ibaPDA*, click on the link of the card and select the *Configuration* tab.

Set the smallest planned sampling time in the *Timebase* field. Now, you can enter manually the planned or expected data amount (in bytes) in the table rows 1 to 15. With every new entry, the result values in the *Flex frame utilization* field are re-calculated.

In this way, you can estimate if the planned number of signals can be processed on one Flex link or if you should use an additional Flex link.

Due to the large data amounts that are usually captured with *ibaBM-DP*, it makes sense in most cases to operate just one device on a 32Mbit Flex link.

Reserved bandwidth for Ethernet communication

The Ethernet channel (address 0) is used to transmit configuration data, to communicate with the web interface and especially with *ibaBM-DP* for the display of the Profibus diagnosis. If many devices are configured with a lot of signals, it may happen, that only the minimum size of 1 kB/s is reserved for Ethernet communication. This is not sufficient in many cases and may cause, that the PROFIBUS diagnosis cannot be displayed or the communication with the web interface is very slow.

It is now possible to reserve a fixed bandwidth for the Ethernet channel with the option *Reserve bandwidth for ethernet communication*. The default value of 4 kB/s is usually sufficient for configuration data and PROFIBUS diagnosis.

9.2 Configuration of output modules

9.2.1 Information on the configuration of the output modules

For a number of devices, it is possible to transmit signals from *ibaPDA* to a device via the FOB output channel. These output signals are mainly intended to signal events or to trigger alarms or warnings. Analog values can also be output. The configuration is carried out in *ibaPDA* in the I/O Manager.

On the device side, you need a device that is suitable for processing output signals, e. g. *ibaNet750-BM* with WAGO output terminals or an *ibaPADU-S-CM* device with one or more output modules.

An *ibaFOB* board with FO-output links is required on the computer side. The outputs are either the integrated outputs on the card (io and 2io) or the outputs when an extension module *ibaFOB-4o* (-PCI/-Rackline slot) is connected as an output card.

Below you find a list of the interface cards that can be used for digital and analog output and their corresponding output modules.

Interface cards	Output modules	Remark
ibaFOB-io-S, -X, -D/-Dexp (inkl. FOB-2io-, 4i+4o) ibaFOB-io-ExpressCard ibaFOB-io-USB	FOB alarm ibaNet750-BM	Only available when card is plugged in FOB link in 3Mbit mode
ibaFOB-io-D/-Dexp (inkc. FOB-2io-, 4i+4o) ibaFOB-io-ExpressCard ibaFOB-io-USB	ibaPADU-S-CM ibaPADU-S-IT-2x16 ibaPADU-S-IT-16 HAICMON CMU ibaCMU-S ibaPQU-S ibaBM-DP ibaBM-PN ibaLink-io-embedded ibaLink-VME ibaNet750-BM/-BM-D Generic Flex	Only available when card is plugged in FOB link in 32Mbit Flex mode

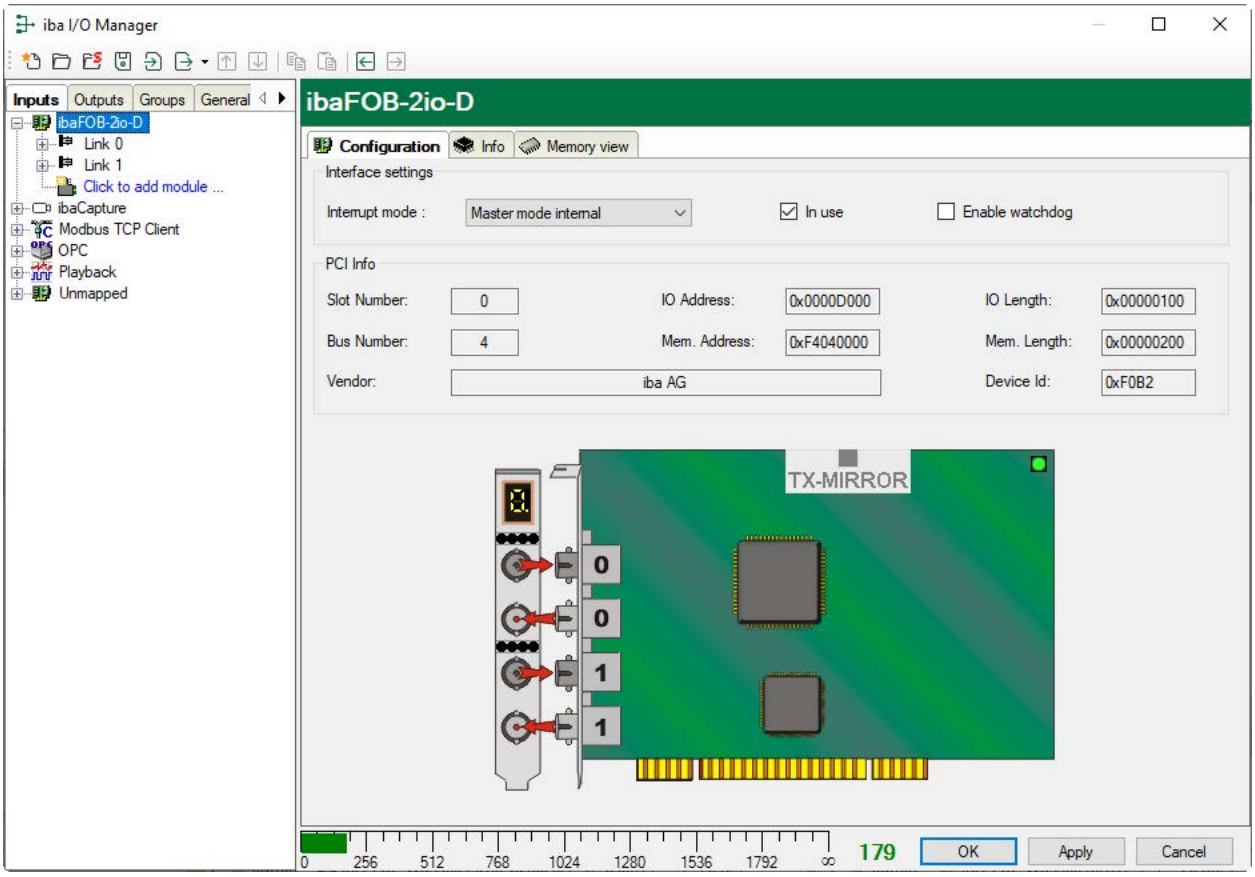
Which output modules you can use depends not only on the devices used but also on the communication mode used at the FO link.

In 3Mbit mode only the output modules "FOB alarm" and "ibaNet750-BM" (with corresponding output terminals) can be used.

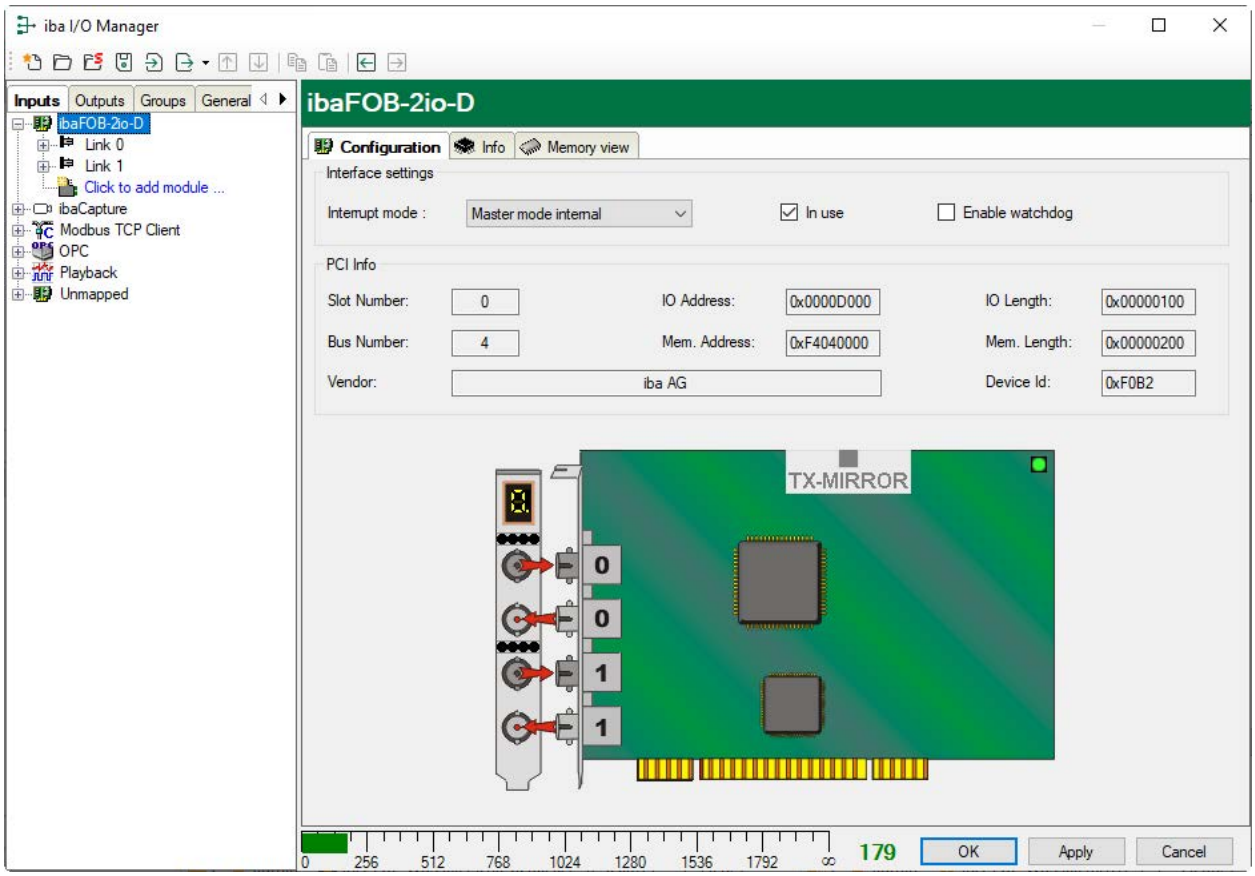
Most current devices, such as *ibaPADU-S-CM* or *ibaBM-DP*, only support the output function in 32Mbit Flex mode. In 32Mbit mode no output modules are available.

9.2.2 Configuration of the output modules

In the I/O Manager, Inputs tab you can see the *ibaFOB-D* board and the configured input modules.



The FOB outputs are assigned to the output links of the *ibaFOB-D* card in the Outputs tab.

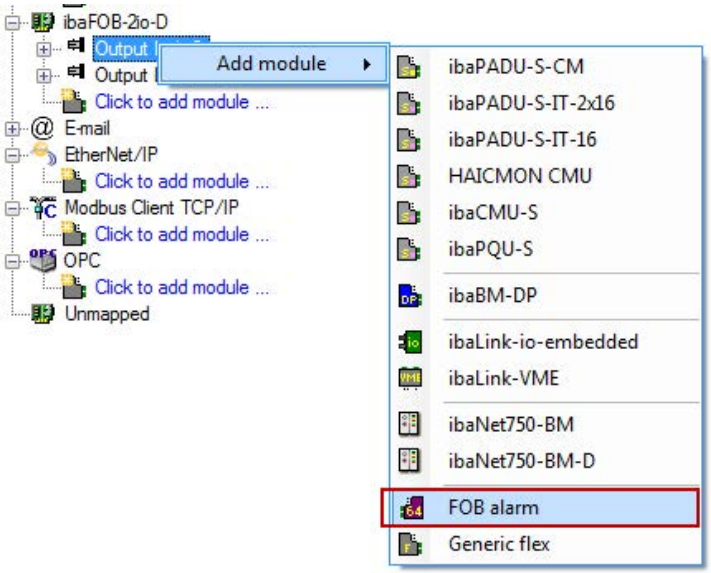


Depending on the FO communication mode used (3Mbit or 32Mbit Flex) other configuration options are available.

9.2.3 Output modules for systems in 3Mbit mode

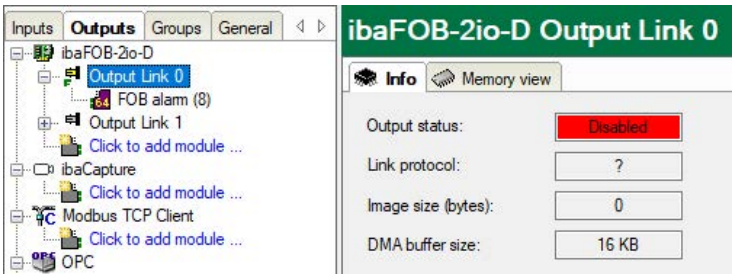
In this mode, only the "ibaNet750-BM" and "FOB alarm" output modules are available for selection. A maximum of 64 analog and 64 digital output signals can be configured for both modules.

Descriptions using the example of a "FOB alarm" module:
You can add an "FOB alarm" module to each output.

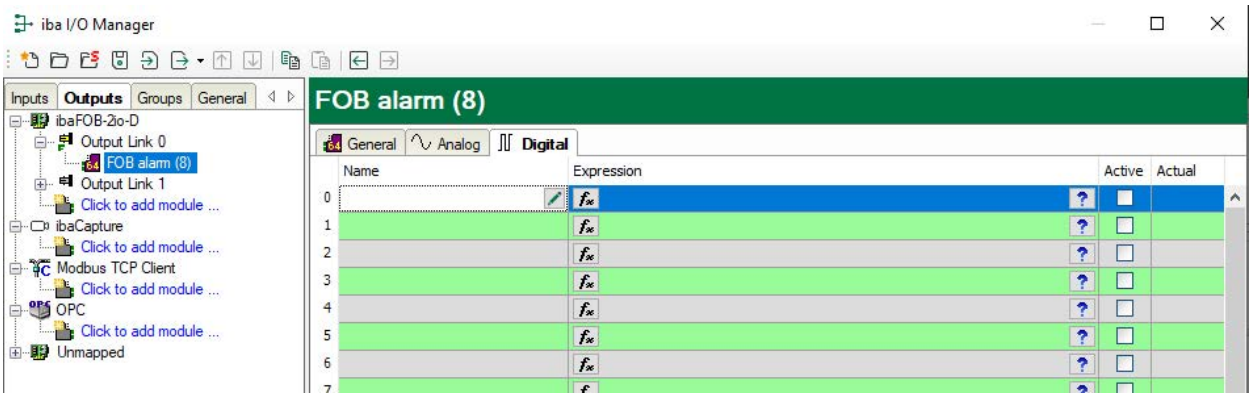


You can change the name of the "FOB alarm" module individually. This provides the advantage of a clear assignment within the measurement system.

Output links without “FOB alarm” modules or with “FOB alarm” modules assigned but without any signals configured will be marked as disabled in the *Info* tab.



After adding “FOB alarm” modules, you must configure the corresponding output signals (analog or digital) for each module.



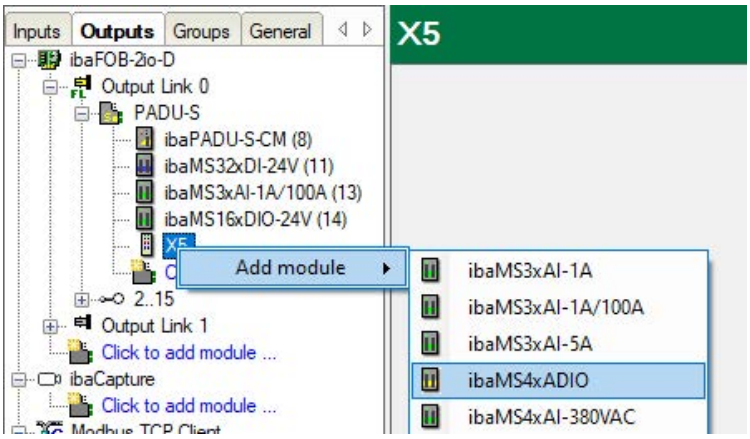
9.2.4 Systems with 32Mbit Flex mode

For device configurations that operate in 32Mbit Flex mode, all modules are displayed in both the *Inputs* tab and the *Outputs* tab in the I/O Manager.

Depending on which tab you are in, you can only configure either the input or output signals.

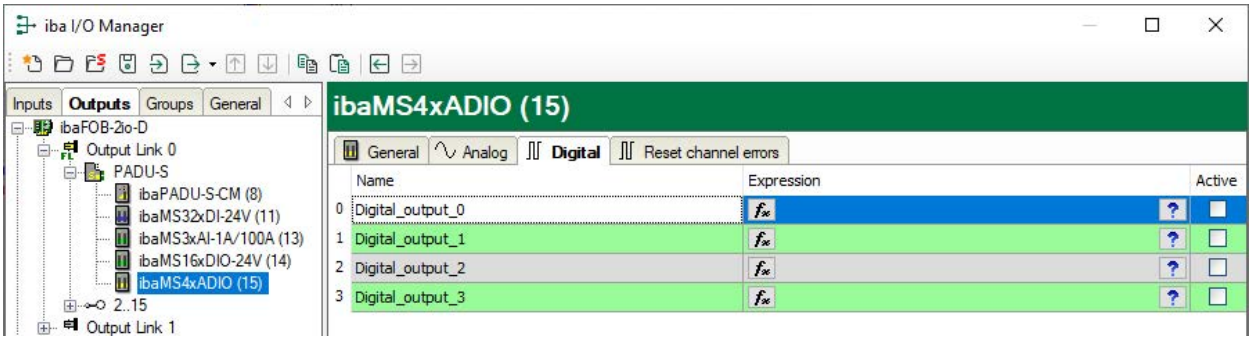
The configuration of the outputs is explained below using the iba modular system as an example.

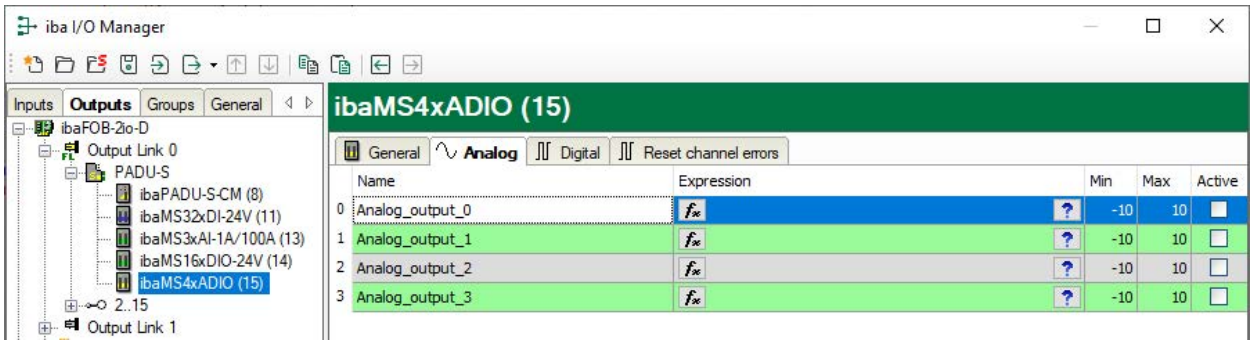
Modules, like in this example a mixed module with digital and analog inputs and outputs (*ibaMS4xADIO*), can be added both in the *Inputs* tab and in the *Outputs* tab.



To configure the output signals, select the *Outputs* tab.

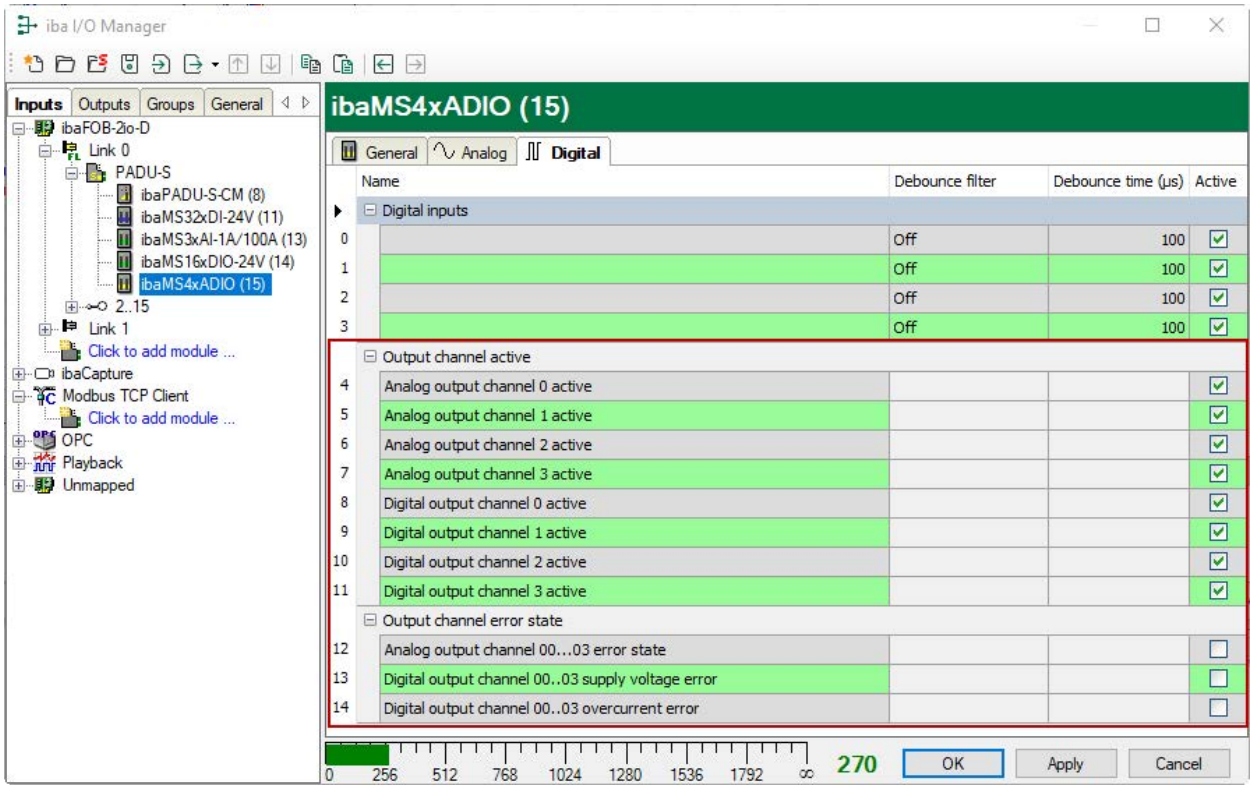
Depending on the module type, you can define analog and/or digital output signals here.





Note

Some device modules, which are only intended for outputs, also offer digital diagnostic signals in the *Inputs* tab. You can use these signals to monitor the output function.



10 Synchronization of more than one card

Observe the following notes when synchronizing several cards.

Note

A bad or missing synchronization can lead to inconsistent or contradictory data blocks. This can affect the signal correlation!

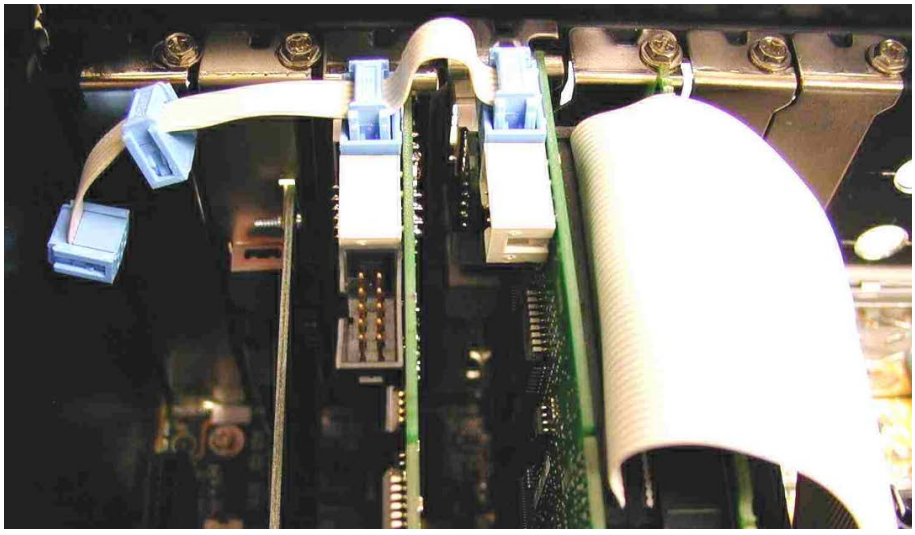
Each card is delivered with a synchronization cable (flat ribbon cable) for connecting up to 6 cards. Unused connections of the synchronization cable can remain unused and must not be terminated.

If you plug in or unplug PCI/PCIe cards this may change the PCI/PCIe configuration of the PC. This may also have an effect on the signals or the I/O configuration of the system, as the module ID may change. Plug the fiber optic cables into the corresponding card after making changes. Always save your system configuration before making any hardware changes.

Prerequisite: The cards are installed in the computer.

1. Connect the synchronization cable to all cards that are to be synchronized with each other (light blue plug SYNC).

   See chapter ↗ *Card connectors*, page 20).

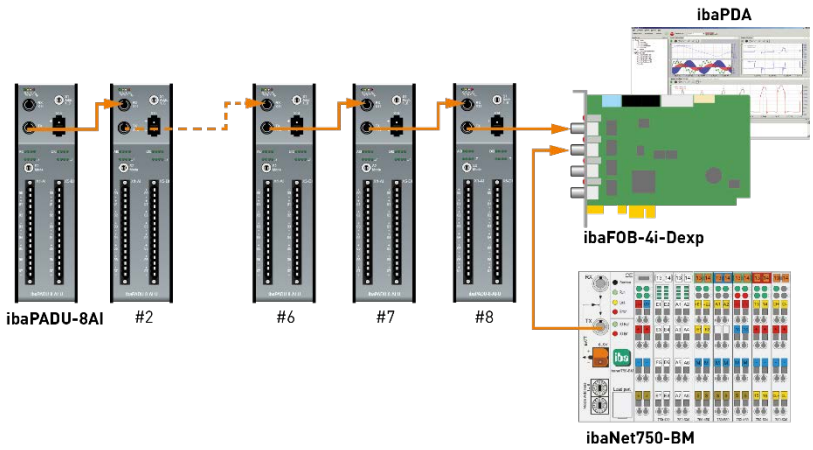


2. Close the computer.
3. Insert the mains plug into the earthed socket.
4. Switch on the power supply of the computer.
5. Start the computer.

11 System integration

11.1 Sample applications for ibaFOB-D

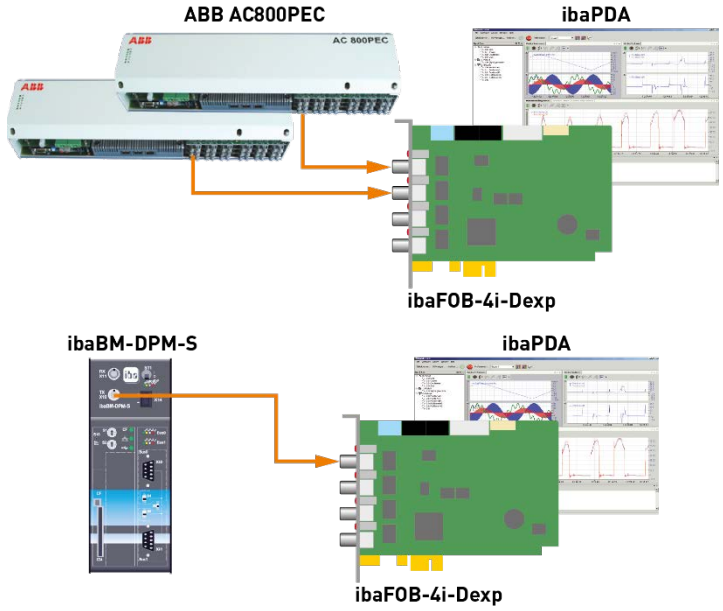
11.1.1 Operation for data acquisition



Transmission mode (FO)
3Mbit (input)
Sampling rate
1 kHz
Erfassungszeit
1 ms

Peripheral devices	Applications
All ibaPADU ibaDig-40, ibaBM-DDCSM, ibaBM-SLM, ibaBM-DPM-S, ibaLink-SM-64-io, ibaLink-SM-64-SD16, ibaLink-SM-128V-i-2o, ibaLink-MBII-io, etc.	ibaPDA ibaQDR ibaLogic

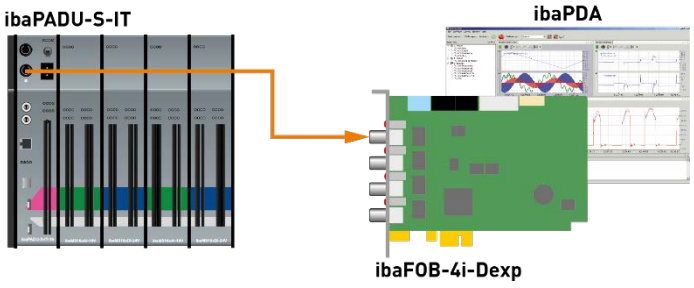
11.1.2 Operation with ibaPDA and 32Mbit transmission mode



Transmission mode (FO)
32Mbit
Sampling rate
1 kHz
Erfassungszeit
1 ms

Peripheral devices	Applications
ABB AC 800PEC with ibaNet output module SIMATIC TDC with LO5A interface modules ibaBM-DPM-S (Profibus bus monitor) etc.	ibaPDA ibaQDR

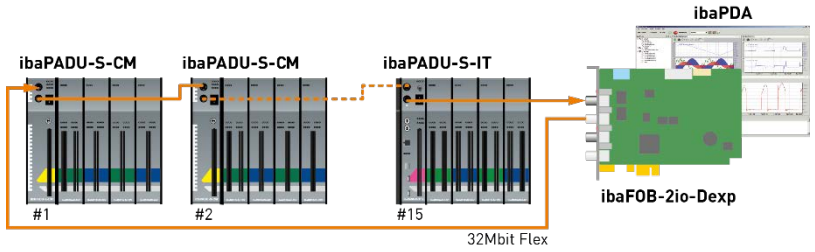
11.1.3 Operation with ibaPDA and ibaPADU-S-IT



Transmission mode (FO)
32Mbit
Sampling rate
20 kHz
Erfassungszeit
50 µs

Peripheral devices	Applications
ibaPADU-S-IT with ibaMS modules	ibaPDA

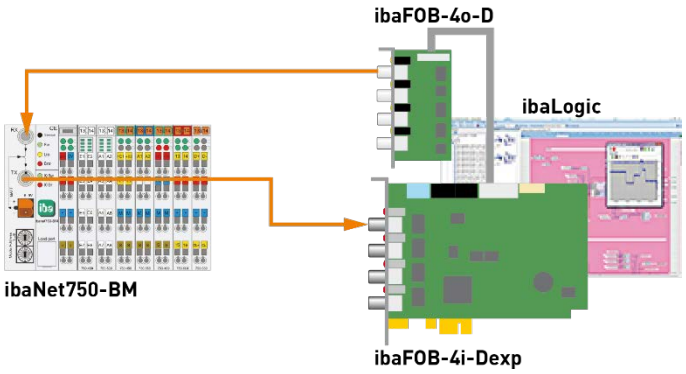
11.1.4 Operation with ibaPDA and 32Mbit Flex protocol



Transmission mode (FO)
32Mbit Flex
Sampling rate
up to 100 kHz
Sampling time
≥10 µs

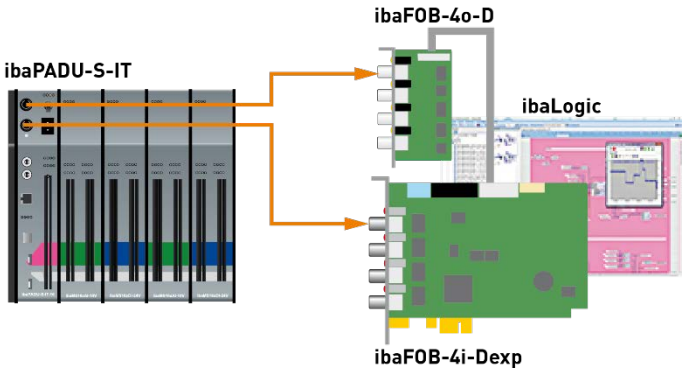
Peripheral devices	Applications
ibaPADU-S-IT or ibaPADU-S-CM with ibaMS modules, ibaBMDDCS, ibaBM-SiLink, ibaBM-eCAT, ibaBM-DP, ibaBM-PN, ibaPADU-D-8AI-U/-8AI-I (up to 15 devices can be cascaded in a ring), ibaPADU-4-AI-U, etc.	ibaPDA ibaQDR

11.1.5 Process control with ibaLogic



Transmission mode (FO)
3Mbit (input) 3Mbit (output)
Sampling rate
0.5 kHz
Erfassungszeit
2 ms

Peripheral devices	Applications
All ibaPADU, ibaNet750-BM ibaDig-40, ibaBM-DDCSM, ibaBM-SLM, ibaLink-SM-64-io, ibaLink-SM-64-SD16, ibaLink-SM-128V-i-2o, ibaLink-VME, etc.	ibaLogic



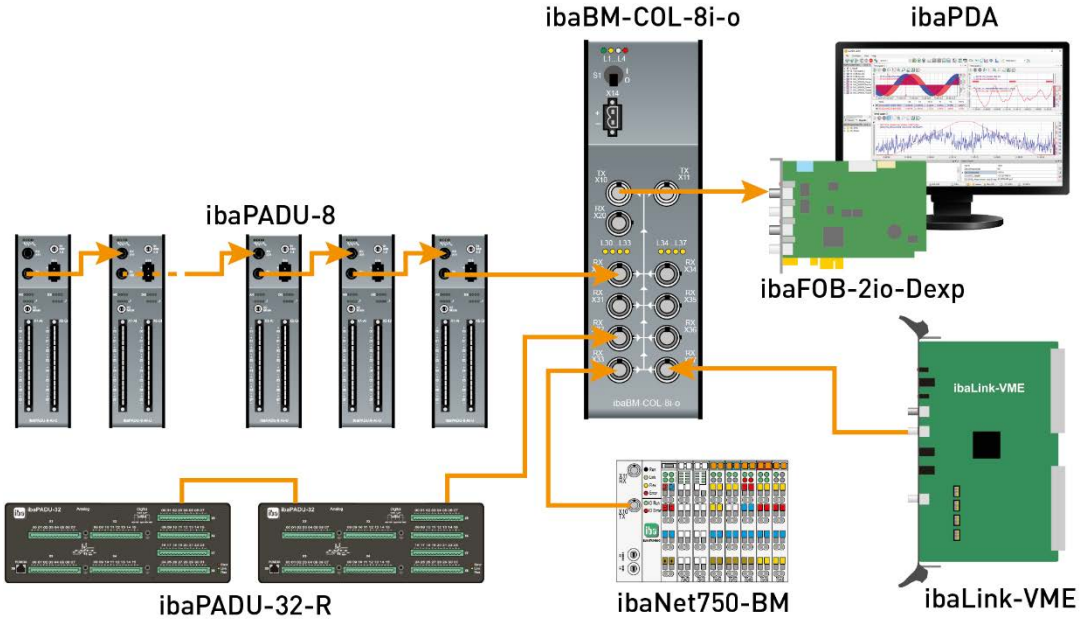
Transmission mode (FO)
32Mbit (input) 32Mbit (output)
Sampling rate
0.5 kHz to 20 kHz
Sampling time
2 ms to 50 µs

Peripheral devices	Applications
ibaPADU-S-IT with ibaMS modules, ibaBM-DPM-S, ibaNet750-BMD, ibaLink-VME, etc.	ibaLogic

11.2 Special topologies with ibaFOB-D

11.2.1 Operation with ibaBM-COL-8i-o

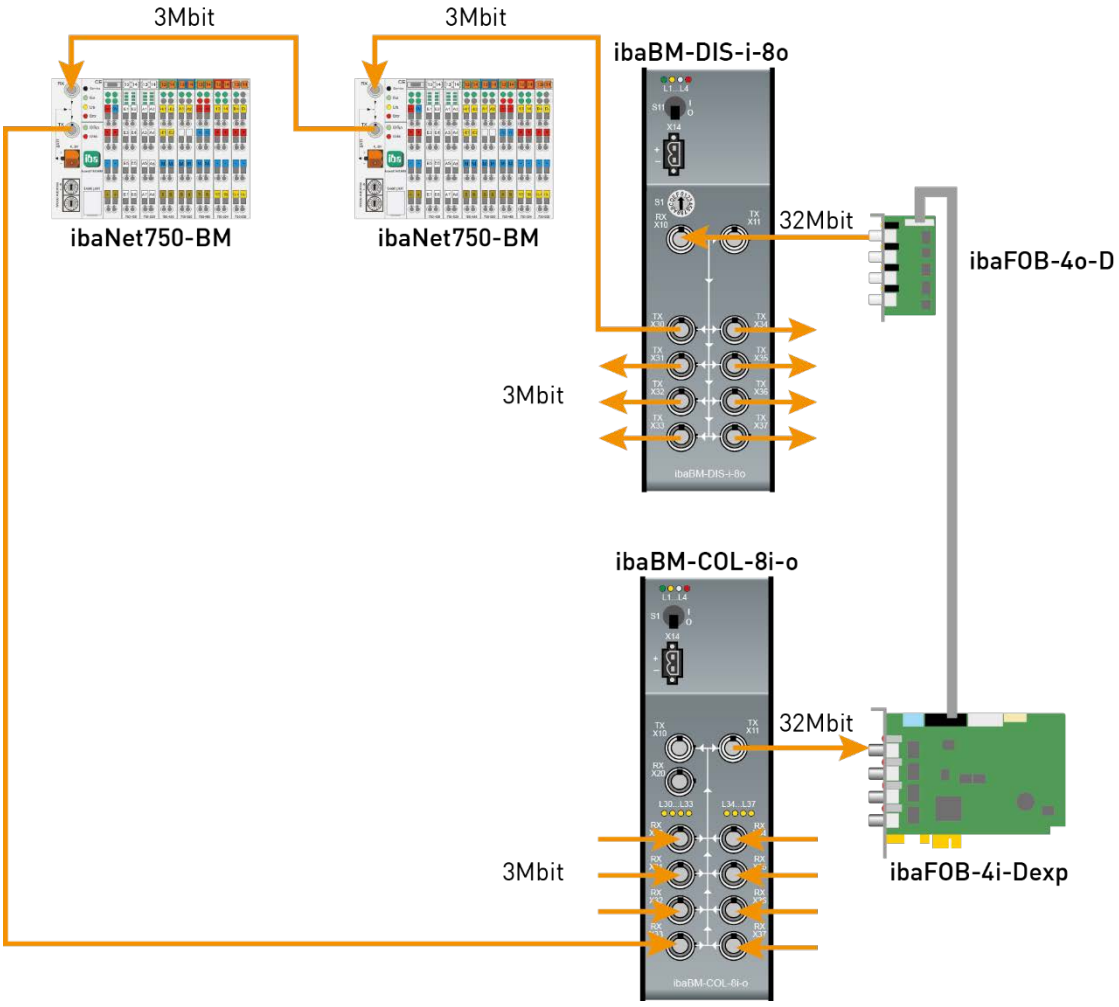
The use of *ibaBM-COL-8i-o* makes it possible to transmit 8 times the amount of data via a single fiber optic cable by combining the data from 8 input links with 3Mbit and outputting it via an output link with 32Mbit. In this way, the number of *ibaFOB* input cards can be significantly reduced in existing systems that have a large number of *ibaNet* peripheral devices. The cleared PCI/PCIe slots can be used for more iba input cards. This means that older devices can also be connected to the *ibaNet* technology with 32Mbit.



11.2.2 Operation with ibaBM-COL-8i-o and ibaBM-DIS-i-8o

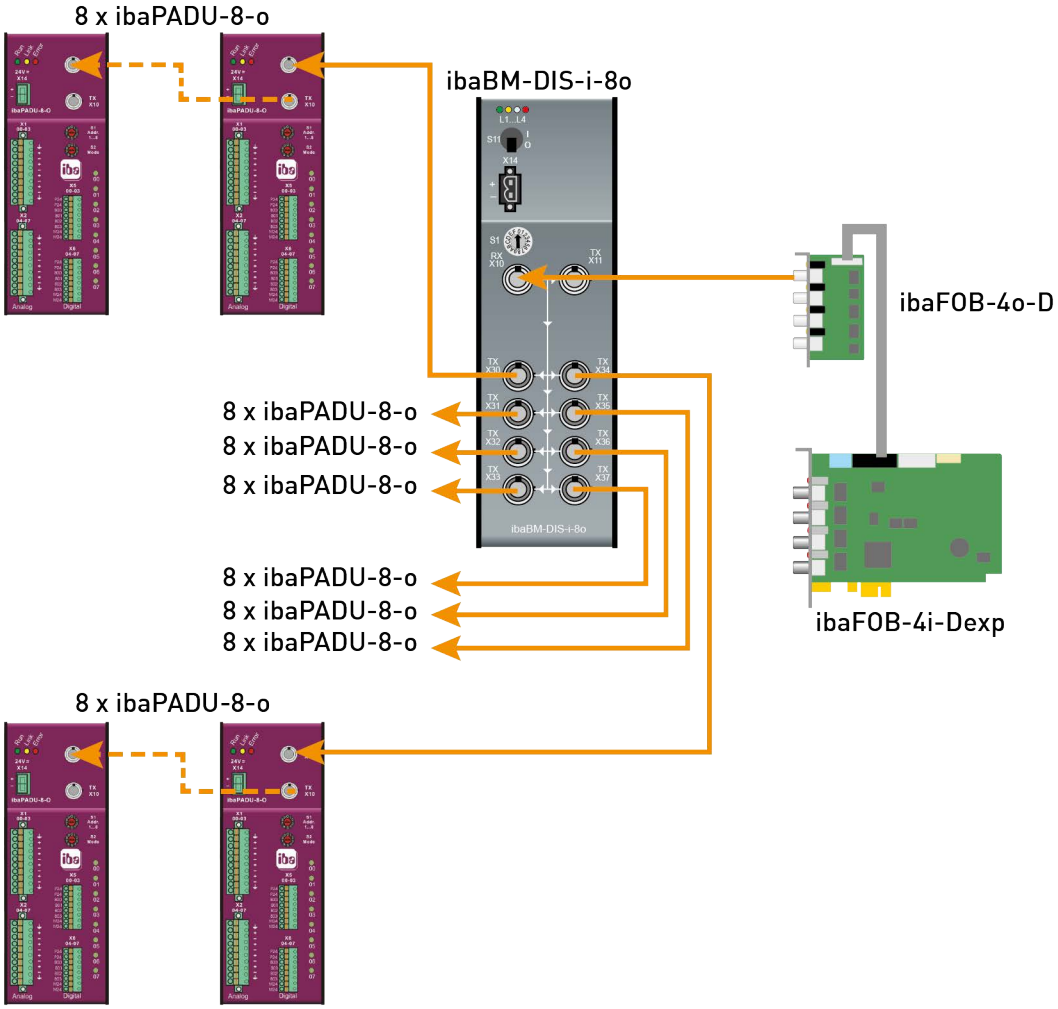
By using the data distributor *ibaBM-DIS-i-8o* in combination with the data concentrator *ibaBM-COL-8i-o* you can distribute e. g. the output signals of an *ibaLogic* system from one FO output link to several lines of devices, such as *ibaNet750*, and collect and merge the signals coming from these devices to be used as input signals for the *ibaLogic* system.

The number of *ibaFOB* input cards can be significantly reduced by replacement in this way for existing systems with many *ibaNet* peripheral devices. The cleared PCI/PCIe slots can be used for more iba input cards. This means that older devices can also be connected to the *ibaNet* technology with 32Mbit.



11.2.3 Operation with ibaBM-DIS-i-8o in output mode

If signals out of an *ibaPDA* or *ibaLogic* system should be transmitted to *ibaPADU-8-o* devices over fiber optic cable you can supply up to 8 lines of output devices (3Mbit) with data by using *ibaFOB-D* and *ibaBM-DIS-i-8o*. In case of using *ibaPADU-8-o* you can connect up to 8 devices in a daisy-chain on each output link of the *ibaBM-DIS-i-8o* (up to a total of 64 devices). Only 1 FO output of an *ibaFOB-D* card is needed.



12 32Mbit Flex protocol and ibaFOB-D network

The *ibaNet* 32Mbit Flex protocol (referred to as "Flex protocol") is a manufacturer-specific data transfer protocol by iba AG. This protocol serves to transfer measurement and configuration data via FO connections between different iba devices. The PC cards of the *ibaFOB-D*/*ibaFOB-Dexp* and *ibaFOB-io-ExpressBoard* series, the i*baFOB-io-USB* adapter as well as some devices for data acquisition support this protocol.

12.1 Data volume and sampling rate

The Flex protocol works with a data transfer rate of 32 Mbit/s and supports up to 15 "Flex-capable" devices connected in a ring topology.

With 32Mbit Flex, the data amount and the sampling rate can be flexibly customized. The data amount transferred per cycle depends on the sampling rate. Generally, the following applies: The less data are transferred, the higher is the possible sampling rate.

For the signals to be measured, sampling rates of 500 Hz to 100 kHz can be realized, which correspond to a timebase of 2 ms to 10 µs. The maximum sampling rate also depends on the acquisition device and can be found in the device manual. In *ibaPDA* you can select even smaller sampling rates down to 1 Hz. This corresponds to a timebase of 1000 ms. In this case, the timebase in the Flex ring is set to 2 ms and in *ibaPDA* a subsampling is carried out. Redundant data is discarded by *ibaPDA*.

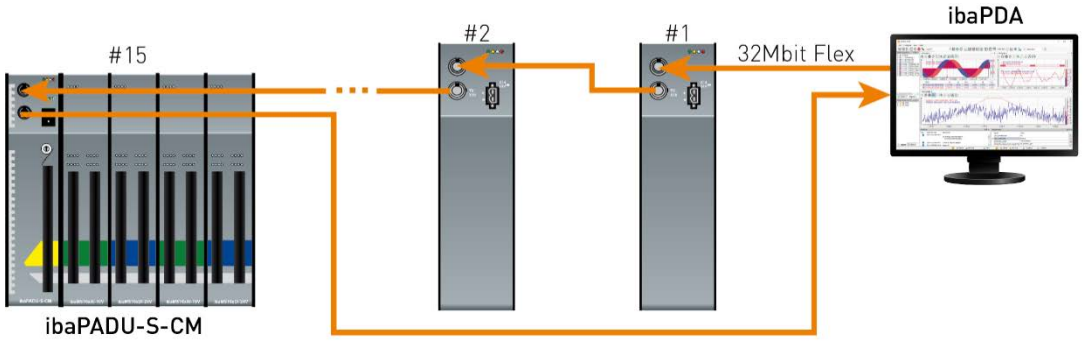
With 32Mbit Flex, up to 4060 bytes per cycle can be acquired and recorded depending on the sampling rate.

With the maximum possible data volume of 4060 bytes, the cycle time (timebase) is up to 1.4 ms. In the following table, you find reference values for the relation between cycle time and the max. transferable data amount per cycle. To acquire further samples, especially if several devices are connected in a Flex ring topology, iba recommends using the simulator integrated in *ibaPDA*, see chapter ↗ *Calculation of the telegram size with 32Mbit Flex*, page 43.

Timebase	Max. data amount
1.4 ms	4060 bytes
1.0 ms	3100 bytes
0.5 ms	1540 bytes
0.025 ms	64 bytes

The following data types are supported: BYTE, WORD, DWORD, INT, DINT, FLOAT and DOUBLE in Big/Little Endian format. These quantities each represent the limit values for the total amount of data on a Flex ring that can be transferred via a fiber optics link.

Cycle times in the 32Mbit Flex ring topology



ibaPDA automatically detects the devices in the Flex ring topology and determines the max. possible sampling rate, depending on the type and the number of devices.

The devices in the ring topology are addressed via the rotary switch for the device address.

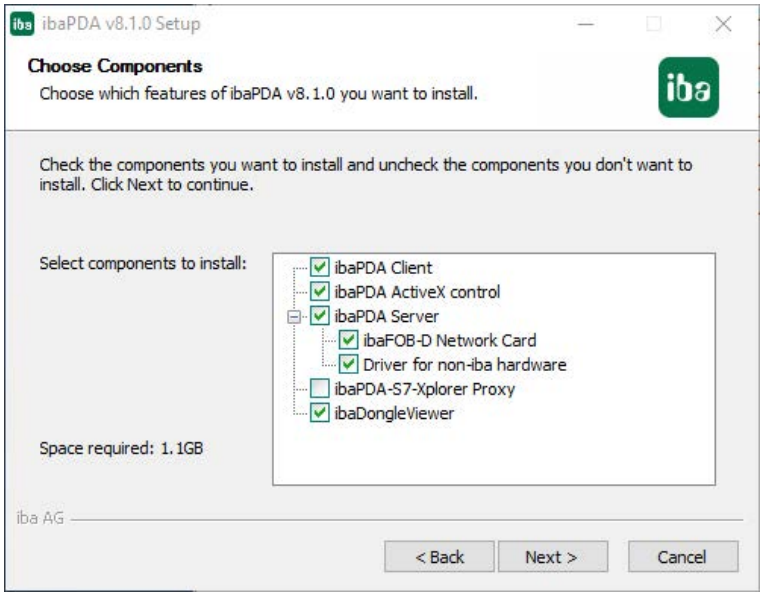
The individual devices in the ring can work with different cycle times. However, these cycle times have to be an integer multiple of the smallest cycle. Example: Device #1 works with 0.5 ms, device #2 with 1 ms, device #3 with 4 ms, etc. If the max. data rate is exceeded, *ibaPDA* issues an error message that advices you to enhance the timebase and decrease the data amount.

The calculation of the maximum data amount depends on the fastest device in the ring. This means: If you increase the cycle time of slow devices in the ring topology, this does not mean that a higher amount of data can be transferred. Only if you increase the cycle time of the fastest device, also the data amount can be increased.

For more information about data allocation in a 32Mbit Flex ring, see chapter ↗ *Calculation of the telegram size with 32Mbit Flex*, page 43.

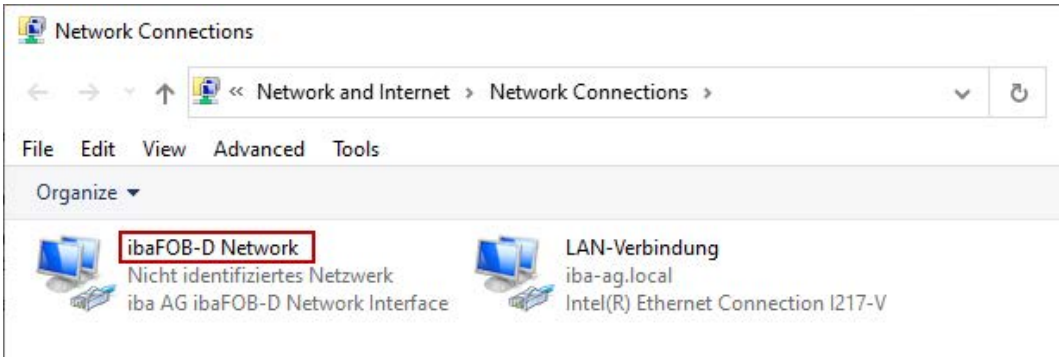
12.2 ibaFOB-D network

Beginning with *ibaPDA* version 6.26.0 or higher, an *ibaFOB-D* network adapter will be optionally installed.



Optionally, the installation of the driver can also be disabled in the installation wizard. The file `ibaDevDrvInstaller.exe` is available for an individual installation. You will find the file in the program directory of *ibaPDA*, e. g. `C:\Program Files\iba\ibaPDA\Installers`. If *ibaPDA* was not installed in the default path, the path may also differ.

The installation creates a network connection, the so-called *ibaFOB-D* network. The *ibaFOB-D* network is displayed as network connection in the Windows control panel.



This network connection is required in 32Mbit Flex mode to communicate via TCP/IP with other Flex devices that are also connected via an *ibaFOB-D* board. There is only one network connection for all *ibaFOB-D* boards installed in an *ibaPDA* computer.

12.2.1 IP addresses in the ibaFOB-D network

The Flex devices in the *ibaFOB-D* network are identified via IP addresses. The *ibaFOB-D* network adapter has the following IP address by default: 172.29.0.100 and the subnet mask 255.255.0.0.

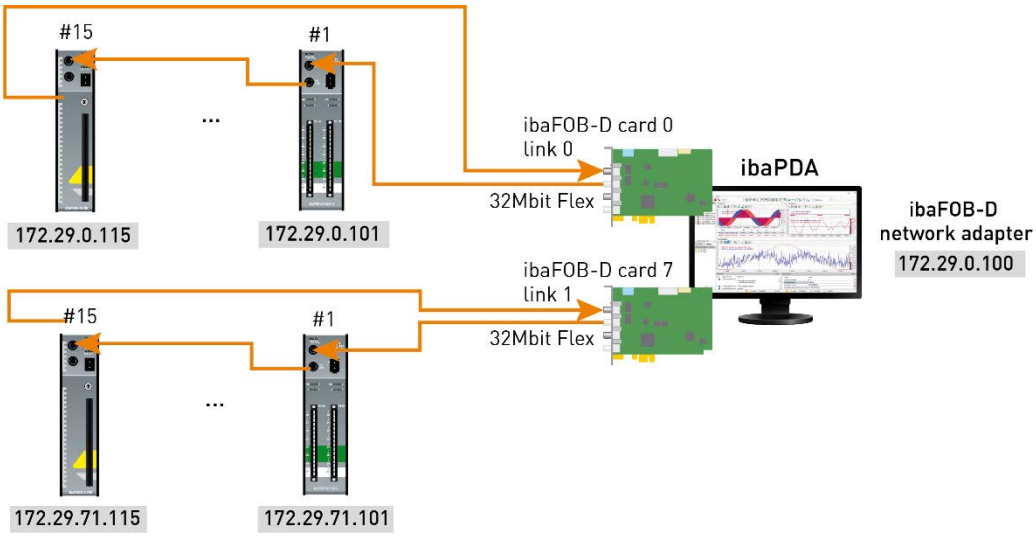
If this IP address is already in use in an existing network, it can be changed if the following rules are observed:

- The new IP address must also be a class B address.
- The subnet mask must not be changed.
- The last two digits 0.100 must not be changed.

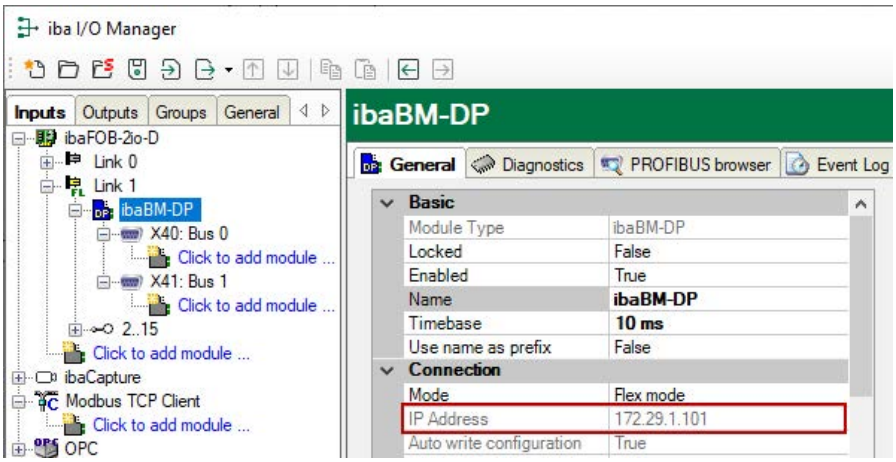
In 32Mbit Flex mode, each device in the Flex ring is automatically assigned a fixed IP address that cannot be changed. The IP addresses of the connected Flex devices are made up of 4 digits (W.V.X.Y) and are assigned according to the following rules:

- **W.V** correspond to the first two digits of the IP address of the *ibaFOB-D* network adapter (172.29 by default)
- **X** corresponds to the card number (display of the *ibaFOB-D* board in the computer) *10 + link number, the device is connected to
- **Y** is the device address set with address rotary switch + 100

Examples



The IP address of the Flex devices is shown in the I/O Manager in the *General* tab and cannot be changed.



Changing the IP address of the ibaFOB-D network adapter

If the first two digits of the IP address of the *ibaFOB-D* network adapter are changed in an existing configuration, the *ibaPDA* configuration of all connected Flex devices must be applied again (click on <OK> or <Apply>) so that the first two digits of the IP address of the device are adjusted. Otherwise communication will be interrupted.

13 Technical data

In the following you will find the technical data and dimensions for *ibaFOB-D*.

13.1 Main data ibaFOB-D/ibaFOB-Dexp

Short description

Name		ibaFOB-D/ibaFOB-Dexp		
Description		PCI and PCI Express cards for ibaNet connections		
Name	**Order no.**	**Name**	**Order no.**	**LWL connections**
ibaFOB-4i-D	11.115700	ibaFOB-4i-Dexp	11.118000	4 x Input
ibaFOB-2i-D	11.115710	ibaFOB-2i-Dexp	11.118030	2 x Input
ibaFOB-2io-D	11.115800	ibaFOB-2io-Dexp	11.118010	2 x Input 2 x Outputs
ibaFOB-io-D	11.115810	ibaFOB-io-Dexp	11.118020	1 x Input 1 x Outputs

Power supply and displays

Power supply	3,3 V or 5,0 V via PCI bus; 12 V via PCIe 1.0 x1-compatible slot
Bus clock	33 MHz or 66 MHz / 2.5 Gbit/s (PCIe)
Power consumption	PCI PCI/PCIe HW version A: Type 4.2 W HW B and higher: Type 3 W
Indicators	4 LED per FO connector (state of communication) 7 segment display 7 segment display

Operating and environmental conditions

Temperature ranges Operation Storage/transport	 32 °F to 122 °F (0 °C to 50 °C) -13 °F to 158 °F (-25 °C to 70 °C)
Installation	PCI slot for 32 bit or 64 bit or PCIe 1.0-x1 compatible slot (x1, x4, x8, x16)
Cooling	Passive
Certification/Standards	FCC part 15 class A

MTBF	
ibaFOB-4i-D (11.115700) [1)]	5,903,038 hours / 673 years
ibaFOB-2io-Dexp (11.118010)[2)]	10,693,045 hours / 1220 years
Assembly dimension (d x h) PCI card 32 Bit PCI Express card HW vers. A PCI Express card HW vers. B	 6.69 in x 3.82 in (170 mm x 97 mm) 6.69 in x 3.82 in (170 mm x 101 mm) 6.69 in x 3.82 in (132 mm x 101 mm)
Weight/incl. packaging	approx. 80 g/175 g

13.2 Interface data ibaFOB-D/ibaFOB-Dexp

ibaNet interface

FO connector type	ST connectors for RX and TX; iba recommends the use of FO with multimode fibers of type 50/125 µm or 62.5/125 µm. For information on cable length, see chap. ↗ *Example for FO budget calculation*, page 67	
ibaNet protocols	2Mbit, 3Mbit, 5Mbit, 32Mbit, 32Mbit Flex	
Transmitting interface (TX)	Valid for ibaFOB-io-D, ibaFOB-2io-Dexp, ibaFOB-io-Dexp	
Output power	50/125 µm FO cable	-19.8 dBm to -12.8 dBm
	62.5/125 µm FO cable	-16 dBm to -9 dBm
	100/140 µm FO cable	-12.5 dBm to -5.5 dBm
	200 µm FO cable	-8.5 dBm to -1.5 dBm
Temperature range	-40 °F to 185 °F (-40 °C to 85 °C)	
Light wavelength	850 nm	
Laser class	Class 1	
Receiving interface (RX)	Valid for ibaFOB-io-D, ibaFOB-2io-Dexp, ibaFOB-io-Dexp, ibaFOB-4i-D, ibaFOB-2i-D, ibaFOB-4i-Dexp, ibaFOB-2i-Dexp	
Receiving sensibility[3)]	62.5/125 µm FO cable	-33.2 dBm to -26.7 dBm
Temperature range	-40 °F to 185 °F (-40 °C to 85 °C)	

[1)] According to: Telcordia Issue 3 SR232 (Reliability Prediction Procedure of Electronic Equipment; Issue 3 Jan. 2011) and NPRD (Non-electronic Parts Reliability Data 2011)

[2)] According to: Telcordia Issue 3 SR332 (Reliability Prediction Procedure of Electronic Equipment; Issue 3 Jan. 2011) 2016) and NPRD (Non-electronic Parts Reliability Data 2011)

[3)] Information on other fiber optic cable diameters not specified

13.3 Main data extension module

Short description

Name	ibaFOB-4o-D	
Description	Extension module for ibaFOB-D	
Name	**Order no.**	**LWL connections**
ibaFOB-4o-D rackline slot (short design for ibaRackline)	11.116200	4 x Outputs
ibaFOB-4o-D-PCI (long design for PCI slot)	11.116201	4 x Outputs

Connections

FO connector type	4 ST connectors for TX; iba recommends the use of FO with multimode fibers of type 50/125 µm or 62.5/125 µm. For information on cable length, see chap. ↗ *Example for FO budget calculation*, page 67	
ibaNet protocols	2Mbit, 3Mbit, 5Mbit, 32Mbit, 32Mbit Flex	
Indicators	1 LED for status per connection	
Transmitting interface (TX)		
Output power	50/125 µm FO cable	-19.8 dBm to -12.8 dBm
	62.5/125 µm FO cable	-16 dBm to -9 dBm
	100/140 µm FO cable	-12.5 dBm to -5.5 dBm
	200 µm FO cable	-8.5 dBm to -1.5 dBm
Temperature range	-40 °F to 185 °F (-40 °C to 85 °C)	
Light wavelength	850 nm	

Operating and environmental conditions

Temperature ranges Operation Storage/transport	 32 °F to 122 °F (0 °C to 50 °C) -13 °F to 158 °F (-25 °C to 70 °C)
Installation	PCI slot in a PC or special housing slots in ibaRackline
Cooling	Passive
Certification/standards	FCC part 15 class A
MTBF	
ibaFOB-4o-D (11.116200) [4)]	35,869,731 hours / 4094 years
Assembly dimension (d x h)	6.69 in x 3.82 in (37 mm x 75 mm)
Weight/incl. packaging	43 g/123 g

[4)] According to: Telcordia Issue 3 SR232 (Reliability Prediction Procedure of Electronic Equipment; Issue 3 Jan. 2011)

13.4 Declaration of conformity

Supplier's Declaration of Conformity
47 CFR § 2.1077 Compliance Information

Unique Identifier:
11.115710 ibaFOB-2i-D
11.115800 ibaFOB-2io-D
11.115810 ibaFOB-io-D
11.116200 ibaFOB-4o-D rackline-slot
11.116201 ibaFOB-4o-D-PCI
11.118000 ibaFOB-4i-Dexp
11.118010 ibaFOB-2io-Dexp
11.118020 ibaFOB-io-Dexp
11.118030 ibaFOB-2i-Dexp

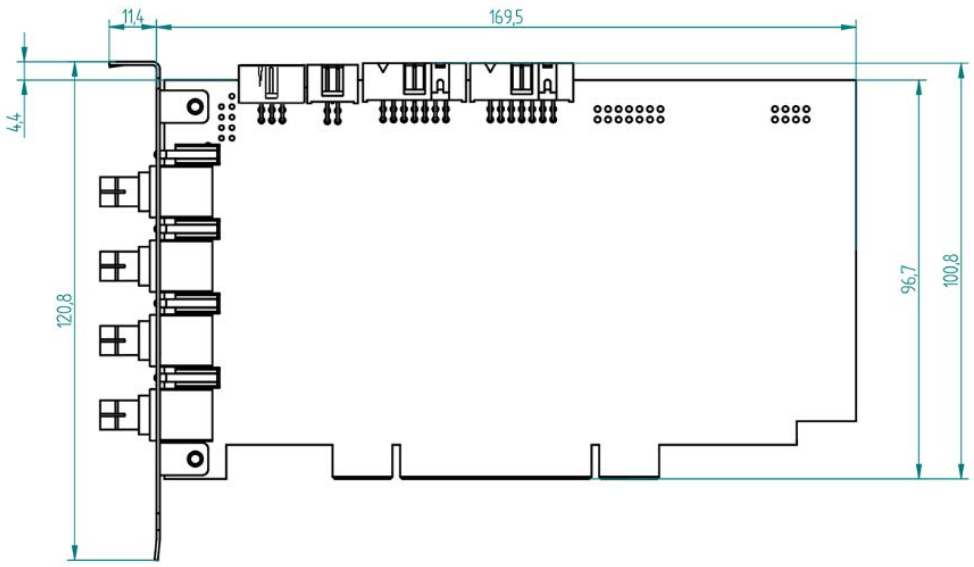
Responsible Party - U.S. Contact Information
iba America, LLC
370 Winkler Drive, Suite C
Alpharetta, Georgia
30004(770)
886-2318-102
www.iba-america.com

FCC Compliance Statement
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

13.5 Dimensions

PCI cards

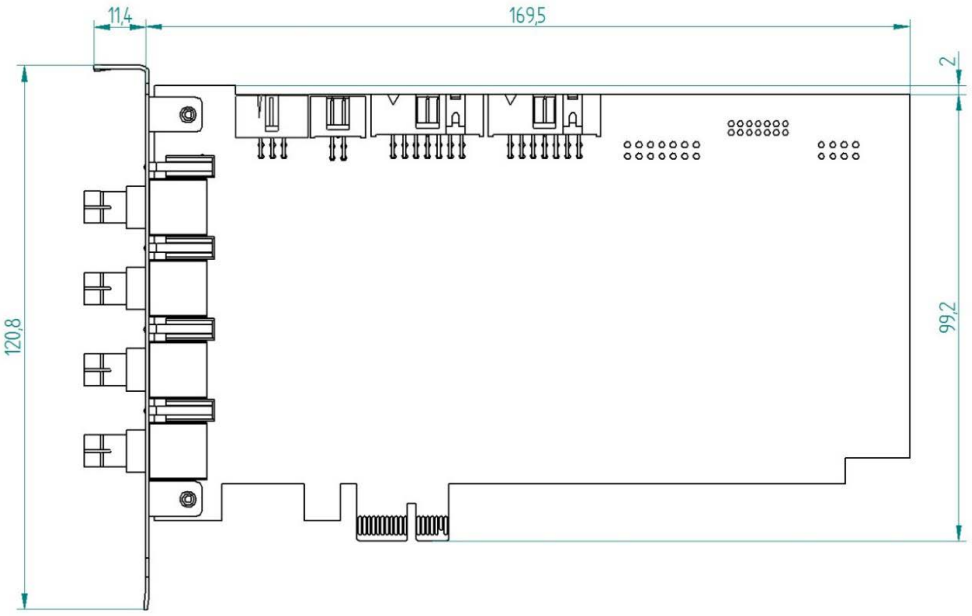
Example ibaFOB-4i-D



(dimensions in mm)

PCI Express cards (HW version A)

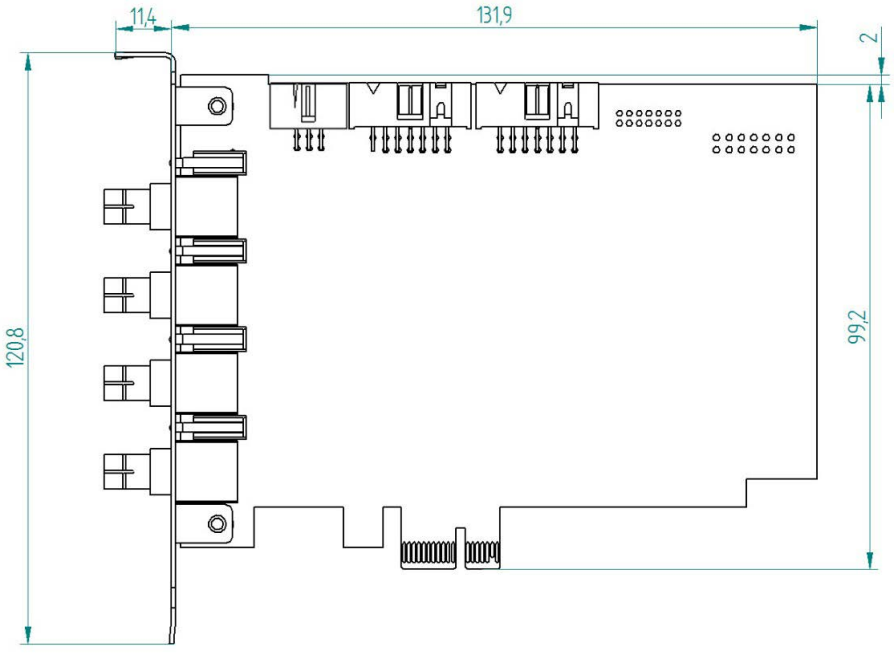
Example ibaFOB-4i- Dexp



(dimensions in mm)

PCI Express cards (HW version B)

Example ibaFOB-4i- Dexp

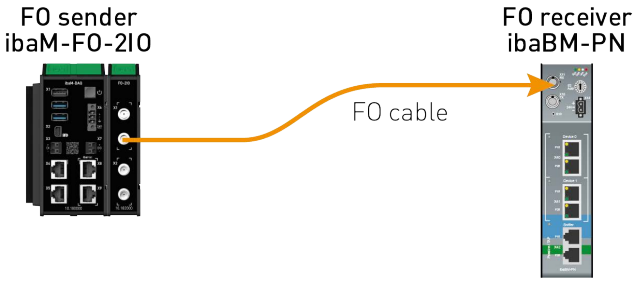


(dimensions in mm)

13.6 Example for FO budget calculation

A fiber optic link from an *ibaM-FO-2IO* module (FO transmitter) to an *ibaBM-PN* device (FO receiver) is used as an example.

The example only considers the transmission direction from the *ibaM-FO-2IO* module to the *ibaBM-PN* device. In actual operation, a connection from the *ibaBM-PN* device to the *ibaM-FO-2IO* module is also required.



The example refers to a P2P connection with an FO cable of type 62.5/125 µm. The light wavelength used is 850 nm.

The range of the minimum and maximum values of the output power or receiver sensitivity depends on the component and, among other things, on temperature and aging.

For the calculation, the specified output power of the transmitting device and, on the other side, the specified sensitivity of the receiving device must be used in each case. You will find the corresponding values in the relevant device manual in the chapter "Technical data" under "ibaNet interface".

ibaM-FO-2IO specification

Output power of FO transmitting interface		
FO cable in µm	Min.	Max.
62.5/125	-16 dBm	-9 dBm

ibaBM-PN specification

Sensitivity of FO receiving interface		
FO cable in µm	Min.	Max.
62.5/125	-30 dBm	

Specification FO cable

Refer to the data sheet for the fiber optic cable used:

FO cable	62.5/125 µm
Connector loss	0.5 dB connector
Cable attenuation at 850 nm wavelength	3.5 dB / km

Equation for calculating the FO budget (A_{Budget}):

$$A_{Budget} = |(P_{Receiver} - P_{Sender})|$$

$P_{Receiver}$ = sensitivity of FO receiving interface

P_{Sender} = output power of FO transmitting interface

Equation for calculating the fiber optic cable length (l_{Max}):

$$l_{Max} = \frac{A_{Budget} - (2 \cdot A_{Connector})}{A_{Fiberoptic}}$$

$A_{Connector}$ = connector loss

$A_{Fiberoptic}$ = cable attenuation

Calculation for the example ibaM-FO-2IO -> ibaBM-PN in the best case:

$$A_{Budget} = |(-30\ dBm - (-9\ dBm))| = 21dB$$

$$l_{Max} = \frac{21dB - (2 \cdot 0.5dB)}{3.5\ \frac{dB}{km}} = 5.71\text{km}$$

Calculation for the example ibaM-FO-2IO -> ibaBM-PN in the worst case:

$$A_{Budget} = |-30\ dBm - (-16\ dBm)| = 14dB$$

$$l_{Max} = \frac{14dB - (2 \cdot 0.5dB)}{3.5\ \frac{dB}{km}} = 3.71\text{km}$$

Note

When connecting several devices as a daisy chain or as a ring (e.g., *ibaPADU-S-CM* with 32Mbit Flex), the maximum distance applies to the section between two devices. The FO signals are re-amplified in each device.

Note

When using fiber optics of the 50/125 µm type, a reduced distance (by approx. 30–40%) must be expected.

Note

In addition to conventional multimode cable types OM1 (62.5/125 µm) and OM2 (50/125 µm), the other cable types OM3, OM4 and OM5 of the 50/125 µm fiber can also be used.

14 Support and contact

Support

Phone: +49 911 97282-14

Email: support@iba-ag.com

Note

If you need support for software products, please state the number of the license container. For hardware products, please have the serial number of the device ready.

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