ibaFOB-io-USB

USB-Adapter with ibaNet Fiber Optic Connection

Manual

Issue 1.4

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, discrepancies cannot be ruled out, and we do not provide guarantee for complete conformity. However, the information furnished 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	Chapter	Author	Version HW/FW
1.4	09-2023	Scope of delivery			

Table of contents

1 About this manual

This manual describes the construction, the use and the operation of the ibaFOB-io-USB adapter.

1.1 Target group

This manual addresses in particular the qualified professionals who are familiar with handling electrical and electronic modules as well as communication and measurement technology. A person is regarded to 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

The following designations are used in this manual:

Action	Notations
Menu command	Menu *Logic diagram*
Call of menu command	*Step 1 – Step 2 – Step 3 – Step x* Example: Select menu *Logic diagram – Add – New logic diagram*
Keys	<Key name> Example: <Alt>; <F1>
Press keys simultaneously	<Key name> + <Key name> Example: <Alt> + <Ctrl>
Buttons	<Button name> Example: <OK>; <Cancel>
File names, Paths	„File name“, „Path” Example: „Test.doc“

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:

- By an electric shock!
- Due to the improper handling of software products which are coupled to input and output procedures with control function!

If you do not observe the safety instructions regarding the process and the system or machine to be controlled, there is a risk of death or severe injury!

⚠ WARNING

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

⚠ CAUTION

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

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 Safety and other devices

2.1 Intended application

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

- ❑ Measurement data logging and analysis
- ❑ Applications of iba software products (ibaPDA, ibaLogic, etc.)
- ❑ This board must only be connected to peripheral devices of iba AG or dedicated devices of other manufacturers.

Important note

Connecting ibaFOB-io-USB to virtual machines (VMs) is not supported, because additional latencies cause the loss of measuring data.

3 Scope of delivery

After unpacking, check the completeness and intactness of the delivery.

The scope of delivery includes:

- ❑ ibaFOB-io-USB
- ❑ Connection cable USB 2.0 plug type A / plug type B

↗ For more accessories not included in delivery, please see www.iba-ag.com.

4 System requirements

4.1 Hardware

Notebook with at least:

- ❑ Processor with 2 GHz or faster
- ❑ 4 GB RAM or more
- ❑ USB 2.0 or 3.x interface

4.2 Software

- ❑ Microsoft Windows 7 SP1 or higher
- ❑ ibaPDA v6.38.5 or higher
- ❑ ibaLogic v5.3.0 or higher

Note

The fastest basic cycle in ibaLogic is limited to 10 ms due to the system. This applies to inputs and outputs.

However, values can be read in faster (buffered mode).

With a maximum buffer depth of 1024, values can be read in at 10 ms/1024 = approx. 10 µs.

5 Description

5.1 Properties

- ❑ USB 2.0 adapter with a bidirectional fiber optic interface (1 FO input + 1 FO output) for connecting a notebook
- ❑ Supports all ibaNet protocols (2Mbit, 3Mbit, 5Mbit, 32Mbit and 32Mbit Flex)
- ❑ Automatic detection of the ibaNet protocol at the FO input
- ❑ Sampling time between 10 µs and 2 ms
- ❑ Replacement for ibaFOB-io-ExpressCard
- ❑ Suitable for USB 2.0 and 3.x
- ❑ Power supply via USB interface
- ❑ LEDs indicating operational status, link status, data transmission rate and error
- ❑ Plug and play function

5.2 Usage

The adapter is a member of the ibaFOB-D card family and should be used with mobile computers, e. g. notebooks, for measurement purposes. The adapter realizes the connection via ibaNet fiber optic connections for data acquisition applications.

It can be used for connecting a notebook computer with iba field devices like ibaPADU analog-digital converter units, ibaNet750 devices, ibaLink system couplings and iba bus monitors.

The ibaFOB-io-USB adapter with its integrated fiber optic adapter provides for high data transmission rates (up to 32 Mbit/s) and shows a performance like the ibaFOB-io-D card.

Considered this, a measurement with mobile computers can be of the same quality level like with stationary systems.

ibaPDA version 6.38.5 or higher is required for operation of this adapter.

Only one ibaFOB-io-USB adapter can be connected to a notebook. It is not possible to synchronize several adapters.

When using an ibaFOB-io-USB adapter, no other ibaFOB card (neither another ibaFOB-io-USB adapter nor a PCI/PCIe card) can be used at the same measuring computer.

Note

The ibaFOB-io-USB adapter cannot be used with devices of the ibaDAQ family (ibaDAQ/-C/-S).

5.3 Communication protocols

All current and former ibaNet communication protocols are supported. Thus, data from an old ibaPADU device (S/N < 1000) as well as from an ibaPADU-S-IT of the new generation can be processed by this card.

Furthermore, the ibaNet protocol 5 Mbit/s for fast data acquisition (25 kHz) over devices ibaPADU-8-ICP, ibaPADU-8-M or -16-M is supported.

The valid ibaNet protocol of the fiber optic input data stream is detected and adjusted automatically. The 32Mbit Flex protocol is also supported.

5.4 Modes of operation

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

Link speed	Max. number of signals per FO link	Sampling time	Typical device
Single fiber input-only modes			
2.0 MBit/s	32 INT + 32 Digital	≥1 ms	ibaPADU16/32 (old, S/N <1000)
3.3 MBit/s	64 INT + 64 Digital	≥1 ms	ibaPADU-8/-16/-32
	64 REAL + 64 Digital	≥1 ms	ibaLink-SM-64-i-o
5.0 MBit/s	8 INT + 8 Digital	≥50 µs	SIMATIC TDC LO5
32 MBit/s	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)			
5.0 MBit/s	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)			
3.3 MBit/s	64 REAL + 64 Digital	≥1 ms	ibaNet750-BM
32 MBit/s	Not supported by software yet.		

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

Besides the mere hardware parameters the usability of card 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.

Transmission rate	3.3 MBit/s		5.0 MBit/s		32 MBit/s		32 MBit Flex	
Sampling rate	1 Hz - 1 kHz		0.5 - 25 kHz		1.25 - 20 kHz		0.5 – 100 kHz	
Number of signals per FO link	64 A + 64 D		8A + 8D		512A + 512D (1ms) 64 A + 64 D (50 µs)		max. 4060 Bytes	
Application	**Input**	**Output**	**Input**	**Output**	**Input**	**Output**	**Input**	**Output**
ibaPDA	■	□ [1]	■	-	■	-	■	■
ibaLogic-V5 [2]	■	■	-	-	■	■	-	-

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

[1] Alarm outputs (50 ms) via ibaFOB-io-USB

2) The fastest basic cycle in ibaLogic is limited to 10 ms due to the system. This applies to inputs and outputs. However, values can be read in faster (buffered mode). With a maximum buffer depth of 1024, values can be read in at 10 ms/1024 = approx. 10 µs.

5.5 Special features of the 32Mbit Flex protocol

5.5.1 Data amount 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 selected in a flexible way. The data amount transferred per cycle depends on the sampling rate. Generally, the following applies: The less data is 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 from 10 µs up to 2 ms. 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 ibaPDA performs a subsampling. Data which is not relevant for the configured sampling rate is discarded by ibaPDA.

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

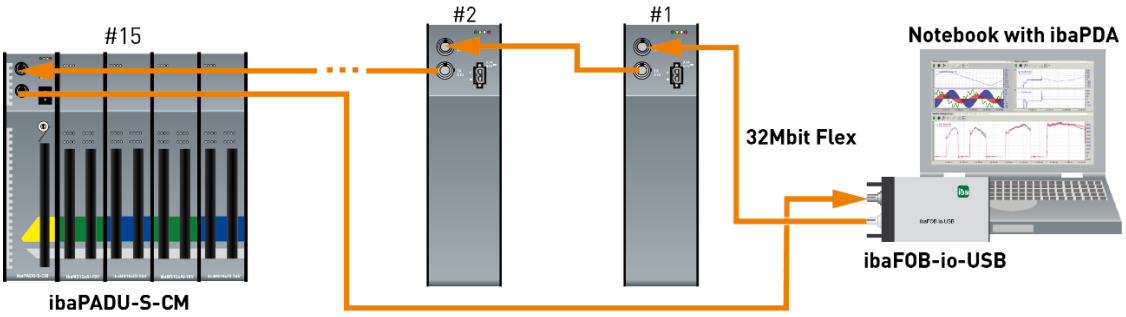
For the max. possible data amount of 4060 Bytes, the cycle time (timebase) is up to 1.4 ms. In the following table, you find reference values for the relation between cycle time and the max. transferable data amount per cycle.

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

If you want to get more values, especially if several devices are connected in a Flex ring topology, iba recommends using the simulator integrated in ibaPDA, see chapter 8.2.4.

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

5.5.2 Ring topology



Up to 15 devices can be connected in a 32Mbit Flex ring. Configuration as well as process data are transmitted within the ring.

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

All 32Mbit Flex capable device of the iba AG can be integrated in the ring, e. g. ibaPADU-S-CM like in the example above. The devices in the ring topology are addressed via the rotary switch for the device address.

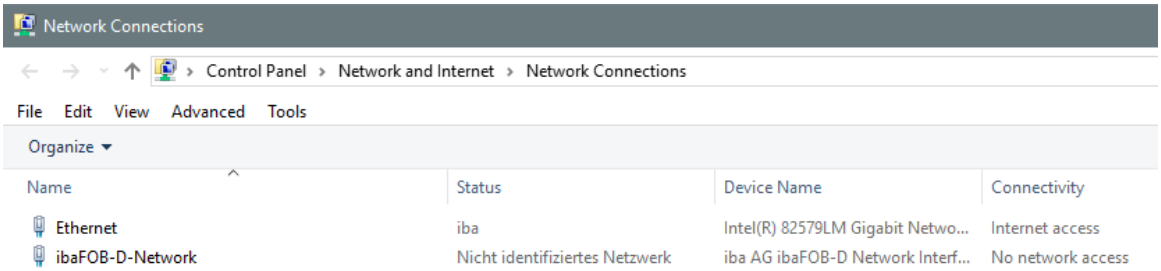
The individual devices in the ring can work with different cycle times. However, these cycle times have to be an integer multiple of the smallest cycle. Example: Device #1 works at a cycle of 0.5 ms, device #2 with 1 ms, device #3 with 4 ms, etc. If the maximum data rate has been exceeded, ibaPDA issues an error message with the indication that the timebase has to be increased or the data amount has to be lowered.

The calculation of the maximum data amount depends on the fastest device in the ring topology. 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.

↗ More information about data size in the Flex ring, see chap 8.2.4.

5.5.3 ibaFOB-D Network

An ibaFOB-D network adapter will be installed during ibaPDA installation. The ibaFOB-D network is displayed as network connection in the Windows control panel.



This network connection is needed in 32Mbit Flex mode for the communication with other Flex devices via TCP/IP, which are also connected via the ibaFOB-io-USB adapter. This network connection is unique for all installed iba-FOB-cards.

5.5.3.1 IP Addresses in the ibaFOB-D network

The Flex devices are identified via an IP address in the ibaFOB-D network. The IP address of the ibaFOB-D network adapter is by default: 172.29.0.100 and the subnet mask 255.255.0.0.

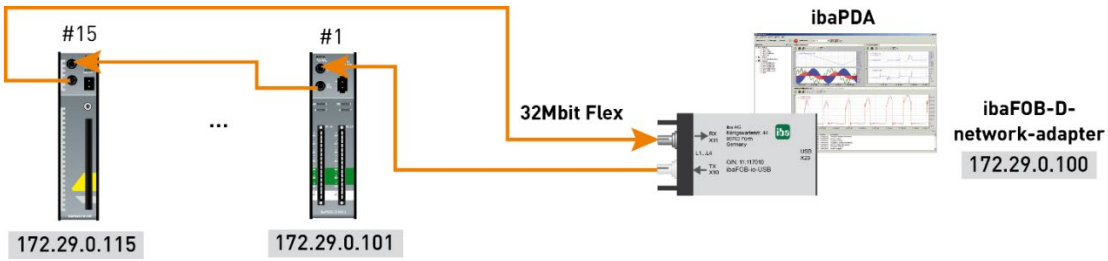
If this IP address is already used in a network, it may be changed in accordance with the following rules:

- ❑ The new IP address must also be a Class B address
- ❑ The subnet mask must not be changed
- ❑ The last two octets 0.100 must not be changed.

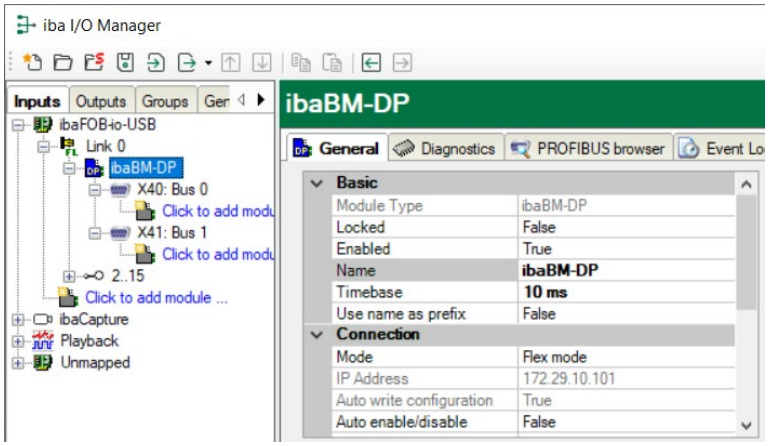
In 32Mbit Flex mode, a fixed IP address is automatically assigned to each device in the Flex ring, which cannot be changed. The IP address of the Flex devices consists of 4 octets (W.V.X.Y) and is assigned according to the following rules:

- **W.V** are the first two octets of the IP address of the ibaFOB-D network adapter (by default 172.29)
- **X** is the 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.

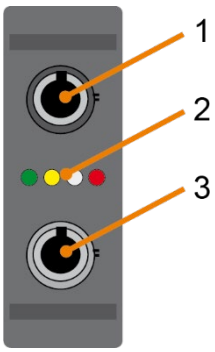


Changing the IP address of the ibaFOB-D network adapter

When the IP address of the ibaFOB-D network adapter has been changed (only the first two octets are allowed), the connected Flex devices have to apply the configuration again in ibaPDA by clicking on <OK> or <Apply> in order to apply the new IP address (the first two octets). Otherwise the connection will be interrupted.

6 Device description

6.1 Front view



1 FO input

2 Link status indication

3 FO output

6.2 Link status indicators

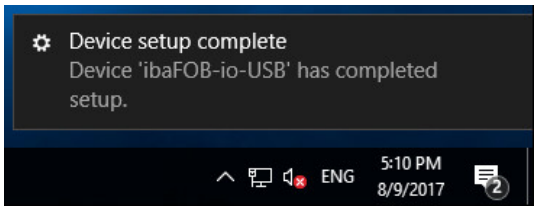
LED	Status	Description
Green	Flashing	Power is on and the channel is functioning properly
	Off	Controller stopped (hardware failure)
Yellow	On	Receiving telegrams on this channel with 2Mbit, 3Mbit or 5Mbit, link correctly configured
	Flashing	Receiving telegrams on this channel with 2Mbit, 3Mbit or 5Mbit, but link configured for another protocol 32Mbit Flex network channel is active
	Off	No 2Mbit, 3Mbit or 5Mbit telegrams detected or fiber not connected
White	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 or fiber not connected
Red	On	Watchdog alarm
	Flashing	Running the „Golden FPGA Flash Rescue mode“
	Off	Normal state

7 Connecting, installing and removing

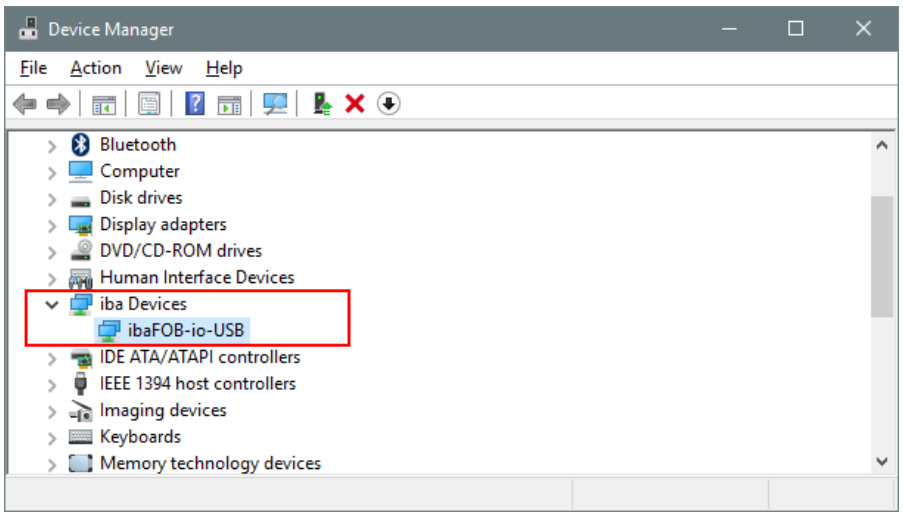
7.1 Connecting and installing the drivers

The adapter can be connected via plug and play while the computer is running.

1. Connect the adapter to the USB port of the notebook. When the adapter is connected properly, the green LED starts flashing and the red LED is on for a moment. The red LED will be permanently lit if the drivers are not installed or started by Windows.
2. If you use the adapter with your notebook for the first time a message “New hardware found” appears and the driver software will be automatically installed.
3. After the drivers have been installed successfully on the notebook you will get a message „Device setup complete“.



4. You can check the proper installation of the adapter in the Windows Device Manager.



Important note

If the card is not listed then the driver software is not correctly installed. Please contact iba support desk.

5. Connect the required fiber optic cables.

7.2 Removing the adapter

The adapter can be unplugged while the computer is running.

1. Disconnect the fiber optic cables.
2. Remove the USB cable from the USB port of the notebook.

8 Configuration in ibaPDA

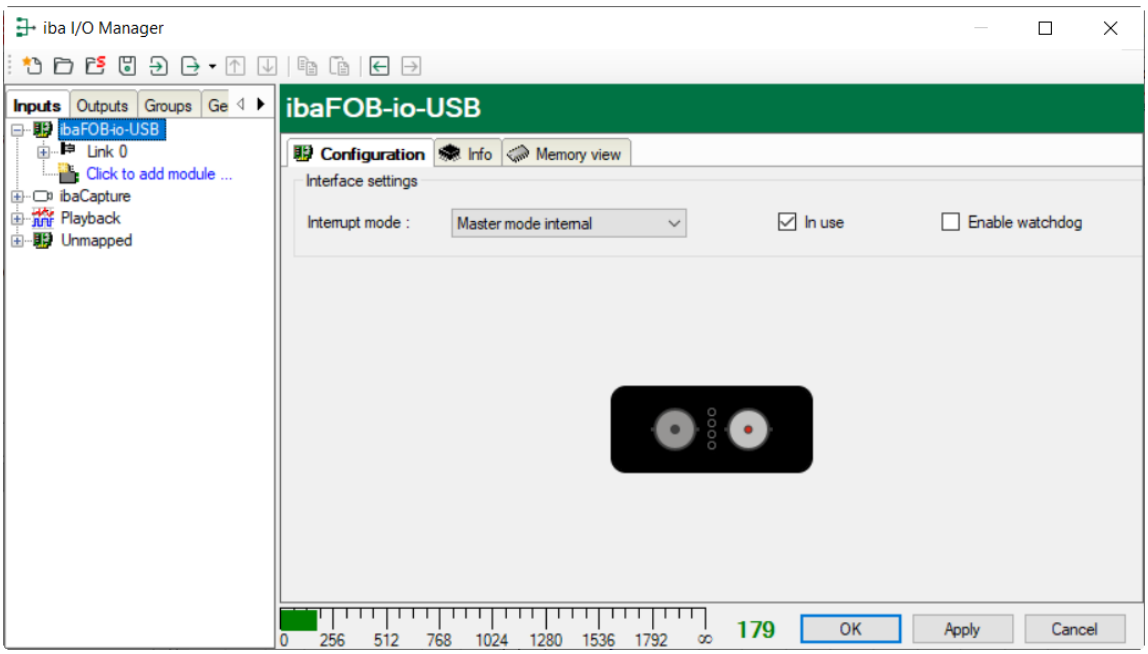
8.1 Procedure

After you have installed ibaFOB-io-USB and drivers you can configure the adapter in ibaPDA.

1. Start the ibaPDA (client) and select the local ibaPDA server in case this doesn't happen automatically.
2. Open the I/O Manager with a click on the icon in the toolbar. Alternatively, you can open the I/O Manager via the menu *Configuration - I/O Manager*.
3. Select ibaFOB-io-USB in the tree on the left side.
   In the right pane of the dialog you can see a simplified representation of the adapter.

8.2 Settings

8.2.1 „Configuration“ tab

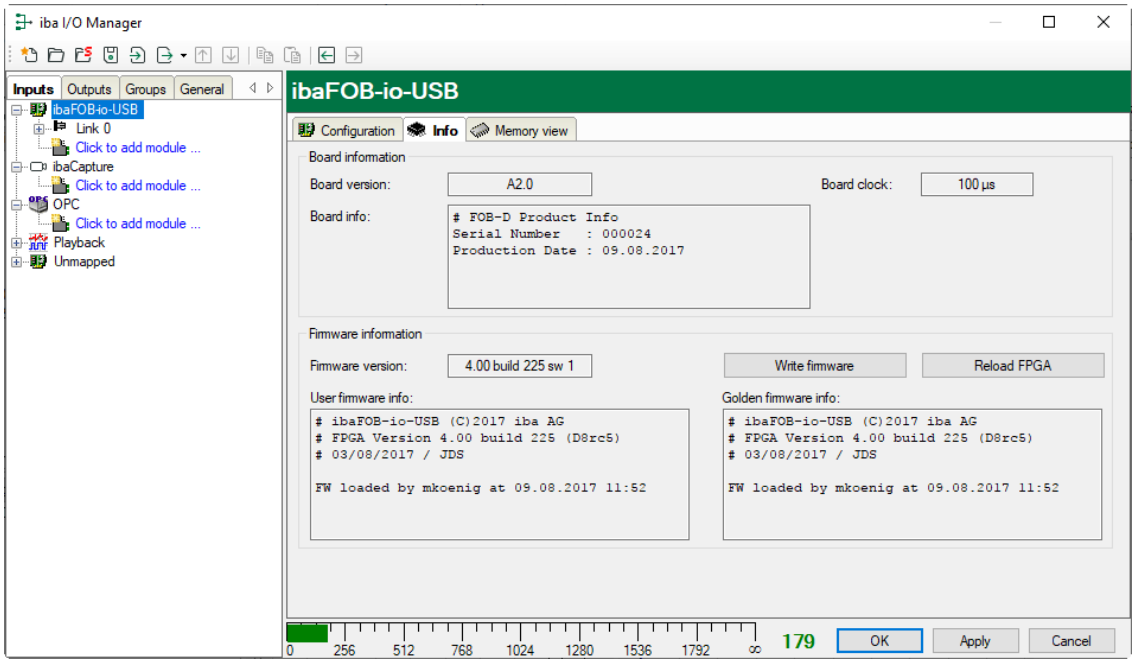


Select the interrupt mode from the drop-down list in the „configuration“ tab, typically „Master mode internal“. Enable the “In use” option if you want to use the adapter by ibaPDA.

The watchdog can also be enabled for the purpose of monitoring the proper operation of ibaPDA by another system. If the watchdog is enabled then the adapter 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 channel (I/O manager: “Outputs”).

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 notebook. When the alarm occurs then the red LED will be lit.

8.2.2 „Info“ tab

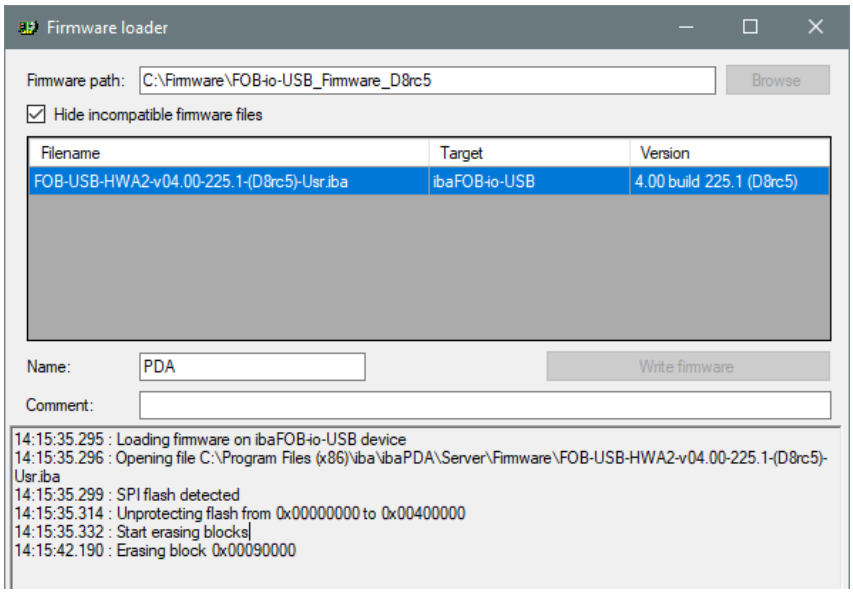


On the “Info” tab you can see information about the board and the loaded firmware. Functions for service and support, such as reloading the FPGA and updating the firmware are available on this tab.

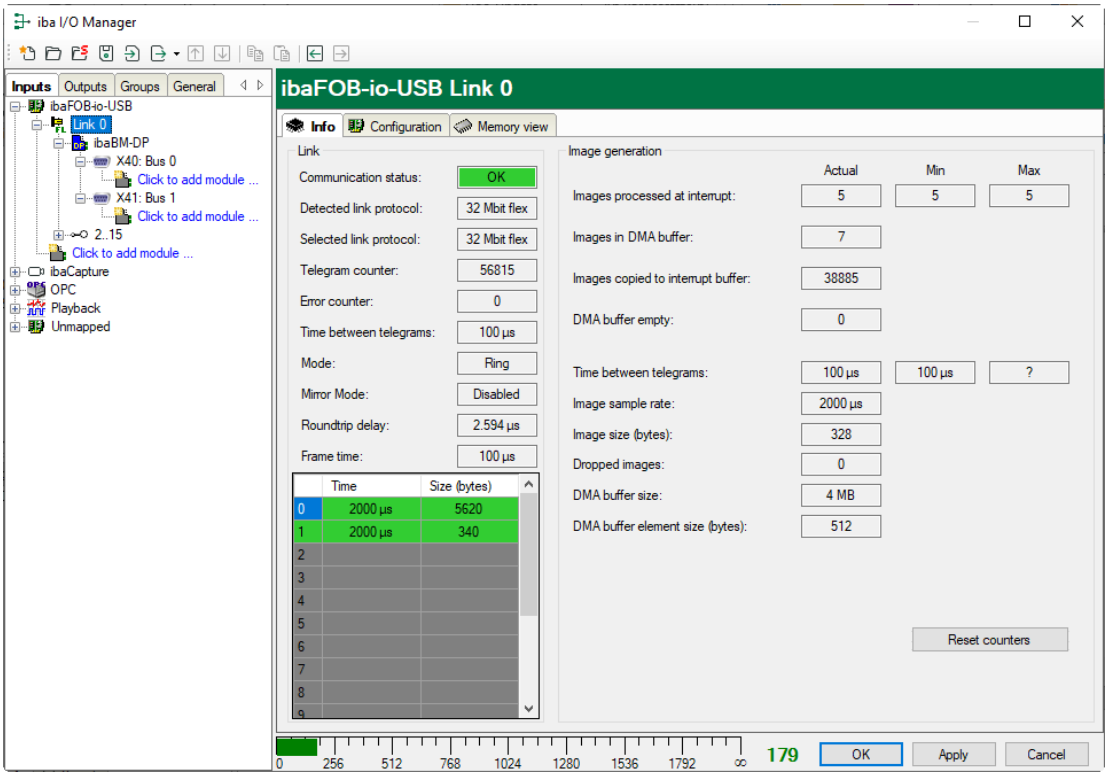
Important note

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

The button <Write firmware> opens a dialog where you can select and load the correct file.



8.2.3 Link 0 „Info“ tab



When you click on the link 0 in the tree view then you get information about this FO link. On the “Info” tab the information on the left describes the fiber optic (FO) communication. The displayed information will depend on the current protocol on the FO link.

In the example shown here the 32Mbit Flex protocol is used.

8.2.3.1 „Link“ area

❑ Communication status
OK when the FO communication is working well. This means that the telegrams that are being received correspond with the mode that is configured on the link. The link mode is determined by the device (module) that is attached to the link.

❑ Detected link protocol
This is the link protocol that the board detects.

❑ Selected link protocol
This is the link protocol that the link is configured in. It is determined by the module that is attached to the link.

❑ Telegram counter
Counter of correctly received telegrams.

❑ Error counter
Counter of received telegrams that have errors (e.g. incorrect checksum).
If this counter is changing then it means the FO communication is not working correctly.

❑ Time between telegrams
The time between the last 2 correctly received telegrams.

❑ Mode
Status of the connection mode.
Ring: one or more devices (cascade) are bidirectionally connected and the FO ring is closed.
Open chain: Only the fiber optic input is connected to a device. The output is not connected or the FO ring is interrupted.

❑ 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).

❑ Frame time
Fixed cycle time the data frames are being sent. When the ring is closed, the frame time is equal to the time between two telegrams.

When the protocols 2Mbit, 3Mbit, 5Mbit or 32Mbit are used, some items described here are not relevant and are therefore not displayed. The following information is displayed for the mentioned protocols:

Additional information for 3MBit and 2MBit

❑ FO signal strength
This is the difference between the maximum value and the minimum value received from the FO unit. This can be maximum 255. The higher this value is the stronger the FO input signal is.

❑ Device ID
This is the ID of the last device in the FO chain connected to this link.

❑ Telegram format
This is the format of the analog data that is transferred in the telegram. The possible values are integer, real and S5 real.

Additional information for 5MBit

❑ 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 the ibaPADU-8-ICP device.

8.2.3.2 “Image generation” area

The information on the right side of the dialog describes the image generation. An image is a collection of bytes that the adapter writes into the PC system memory via DMA. This image contains all the 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 where 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 increasing then something is wrong. This can 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 be constantly increasing.

❑ DMA buffer empty
This counter increments each time the DMA buffer is empty when the interrupt fires. The driver will use the value 0 (zero) for all signals that are on this link when this happens. This can happen if the FO link is disconnected.

❑ Time between telegrams
The time between the last 2 correctly received telegrams.
This is the same 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 adapter writes images to the DMA buffer. This should be faster than or equal to the fastest time base of the modules connected to this link.

❑ Image size
This is the 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 bus.

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

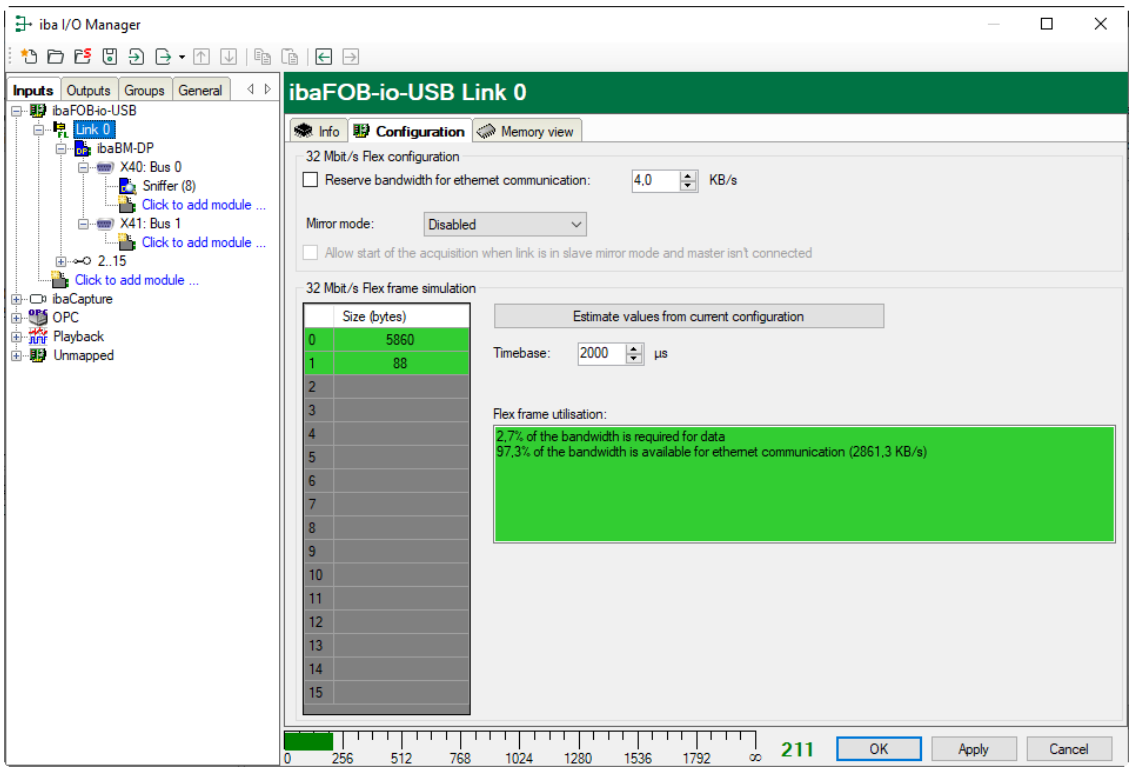
❑ DMA buffer size
DMA buffer size for this interface.

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

8.2.4 Link 0 „Configuration" tab

The data size per participant is dynamically allocated in a 32Mbit Flex ring. 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.

ibaPDA provides a simulator (32 Mbit/s Flex frame simulation) which calculates the data size that can be transmitted per participant via fiber optics with 32Mbit Flex protocol.



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 adapter 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

The values taken automatically are estimated first. When the configuration is applied by a click on <OK> or <Apply> the actual data sizes are shown on the “Info” tab.

When too much data are 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-io-USB adapter should be connected.

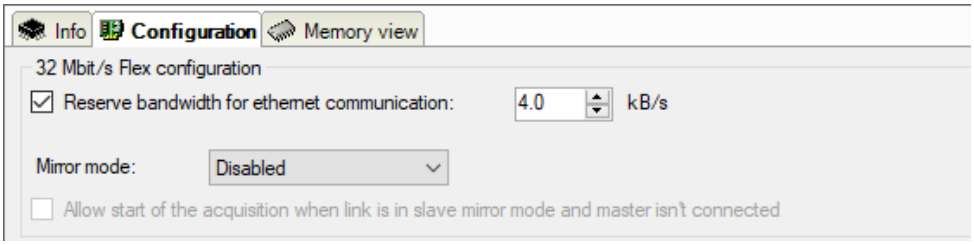
Set the smallest planned sampling time in the "Timebase" field. Now, you can enter manually the planned or expected data amount (in Bytes) in the table rows 1 to 15. With every new entry, the result values in the "Flex frame utilization" field are re-calculated.

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.

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. When ibaPQU-S is used, the value should be set to ≥ 250kB/s.

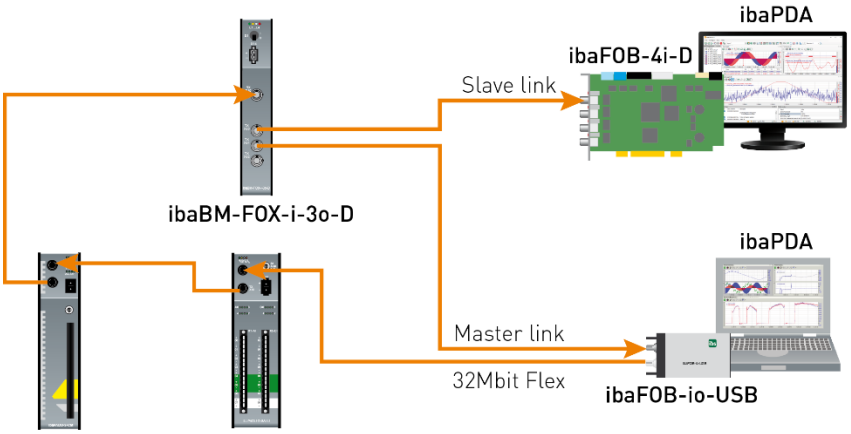


8.2.4.1 Mirror mode with 32Mbit Flex

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 configures 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.

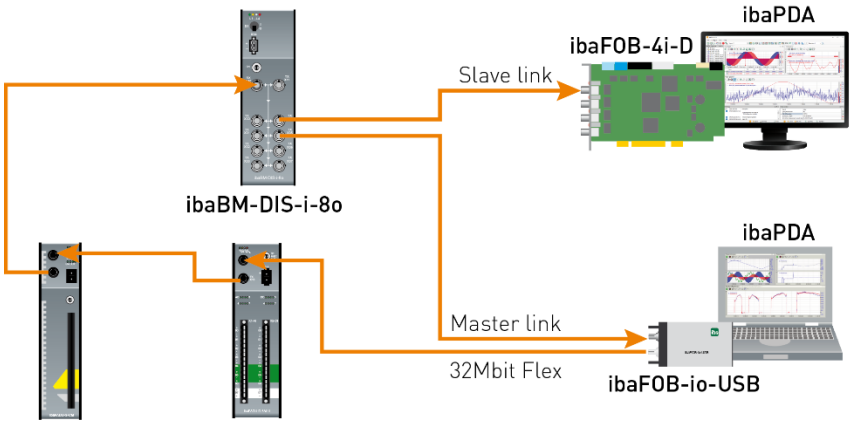
The master ibaPDA system requires a bidirectional fiber optic connection to receive and send data to the Flex devices. The slave ibaPDA only needs a single fiber optic connection to receive data from the Flex devices and the device configuration.

Possible connections



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

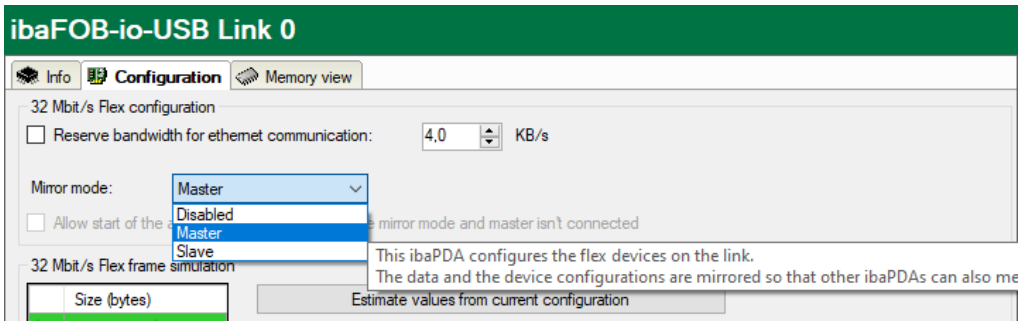
This connection allows the slave ibaPDA to acquire data even when the master ibaPDA has been shut down.



The example above with ibaBM-DIS-i-8o is similar to the example with ibaBM-FOX-i-3o-D. The ibaBM-DIS-i-8o device mode must be set to copy mode (S1 = 0).

Configuration in ibaPDA

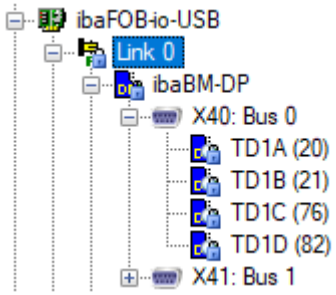
Open the “Configuration” tab in the link view of the ibaFOB-io-USB adapter to configure the mirror mode.



3 settings are available for mirror mode:

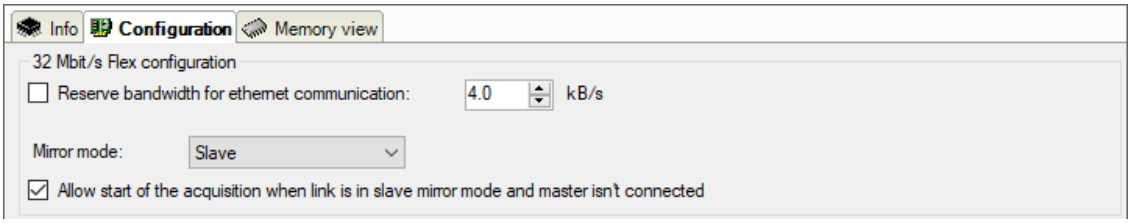
- **Disabled**: The data is not mirrored, so this ibaPDA system is the only one that can acquire data and configure the devices.
- **Master**: This ibaPDA system configures the Flex devices on the link. The data and the device configurations are mirrored so that other ibaPDA systems can also acquire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

The slave ibaPDA can get the device configuration from the master ibaPDA by using the “autodetect” function. 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, an error message will be generated. When 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.

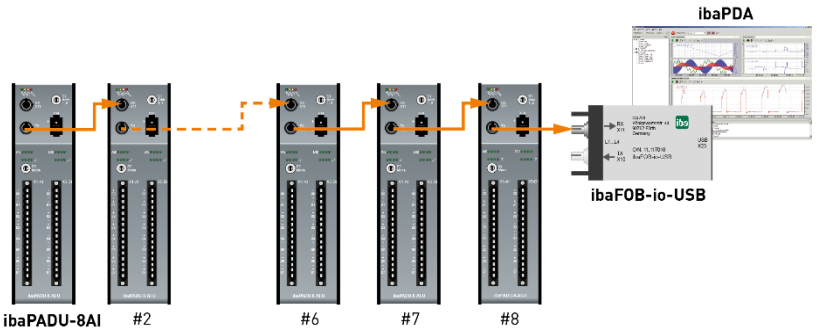


When the master ibaPDA changes the configuration while the slave ibaPDA is acquiring then the slave will automatically restart.

9 System integration

9.1 Sample applications for ibaFOB-io-USB

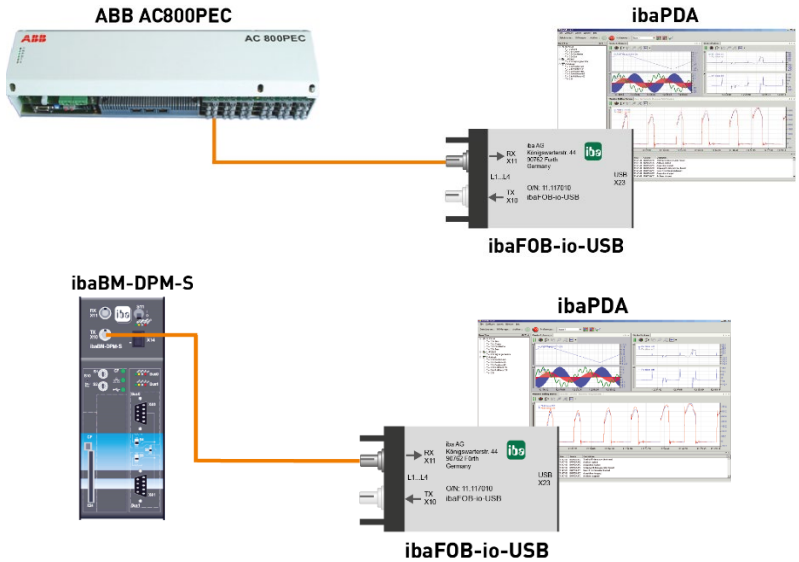
9.1.1 Operation for data acquisition



Transmission type (FO)
3Mbit (input)
Sampling rate
1 kHz
Sampling time
1 ms

Peripheral devices	Applications
All ibaPADU, ibaDig-40, ibaBM-DDCSM, ibaBM-SLM, ibaBM-DPM-S-64 ibaLink-SM-64-io, ibaLink-SM-64-SD16, ibaLink-SM-128V-i-2o, ibaLink-MBII-io	ibaPDA ibaQDR-V6 ibaLogic[1]

9.1.2 Operation with ibaPDA and 32Mbit data transmission

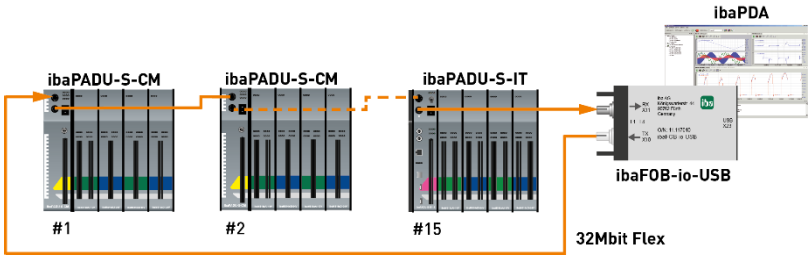


Transmission type (FO)
32Mbit
Sampling rate
1 kHz
Sampling time
1 ms

Peripheral devices	Applications
ABB AC 800PEC with ibaNet-output module SIMATIC TDC with LO5A or LO6 interface board ibaBM-DPM-S (Profibus-Monitor)	ibaPDA

[1] Sampling rate: ≥ 10 ms, sampling time, unbuffered ≥ 10 ms, buffered ≥ 10 µs

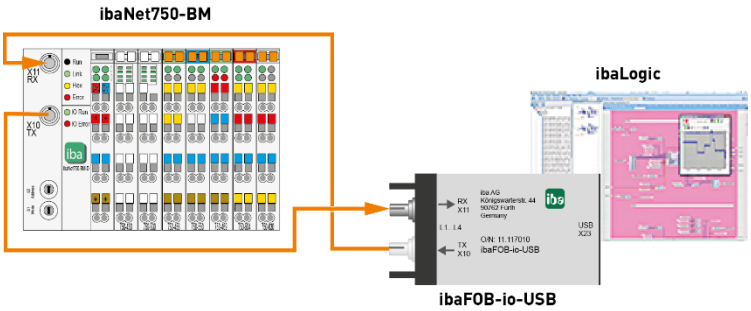
9.1.3 Operation with ibaPDA and 32Mbit Flex protocol



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

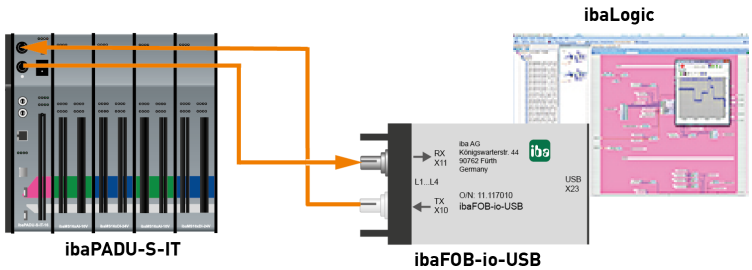
Peripheral devices	Applications
ibaPADU-S-IT or ibaPADU-S-CM with ibaMS modules (ibaPADU-S), ibaBM-DDCS, ibaBM-SiLink, ibaBM-eCAT, ibaBM-DP, ibaPADU-D-8AI-U/-8AI-I (up to 15 devices can be cascaded in a ring)	ibaPDA

9.1.4 Process control with ibaLogic



Transmission type (FO)
3Mbit (input) 3Mbit (output)
Sampling rate
≥ 10 ms
Sampling time
unbuffered ≥ 10 ms
buffered ≥ 10 µs

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	ibaLogic



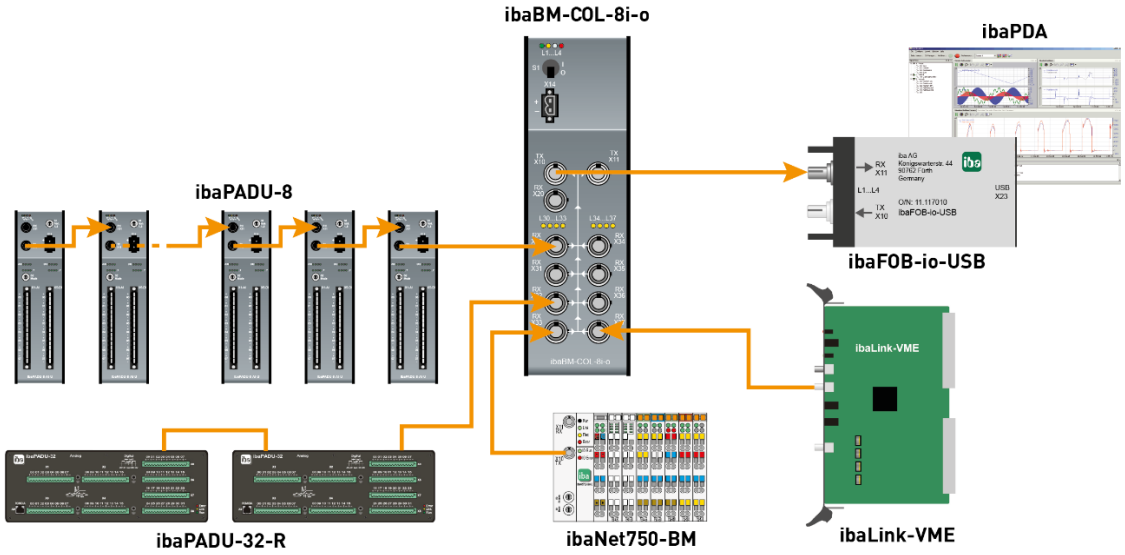
Transmission type (FO)
32Mbit (input) 32Mbit (output)
Sampling rate
≥ 10 ms
Sampling time
unbuffered ≥ 10 ms
buffered ≥ 10 µs

Peripheral devices	Applications
ibaPADU-S-IT with ibaMS modules (ibaPADU-S), ibaBM-DPM-S, ibaNet750-BM-D, ibaLink-VME	ibaLogic

9.2 Special topologies with ibaFOB-io-USB

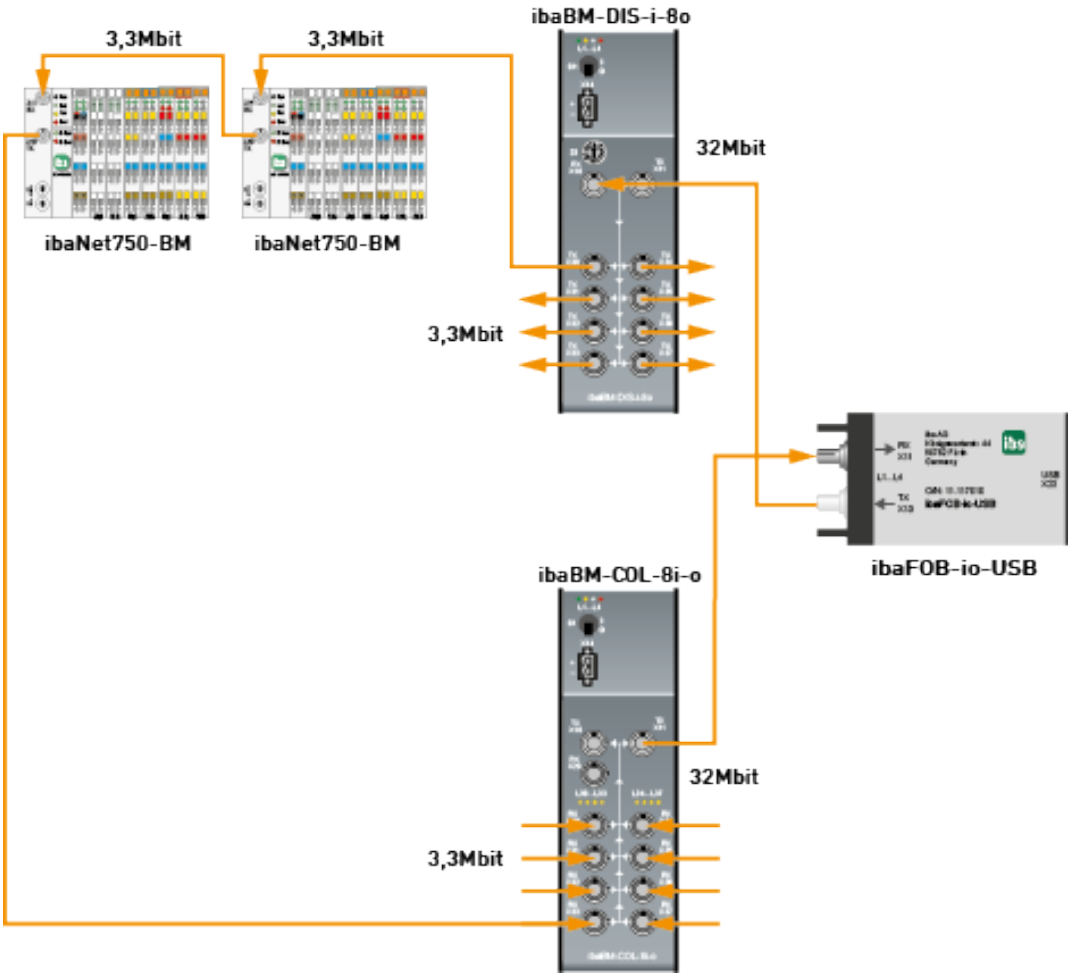
9.2.1 Operation with ibaBM-COL-8i-o

The device ibaBM-COL-8i-o concentrates the data streams of up to 8 ibaNet fiber optic inputs with 3/2Mbit into one (fiber optic) output with 32Mbit.



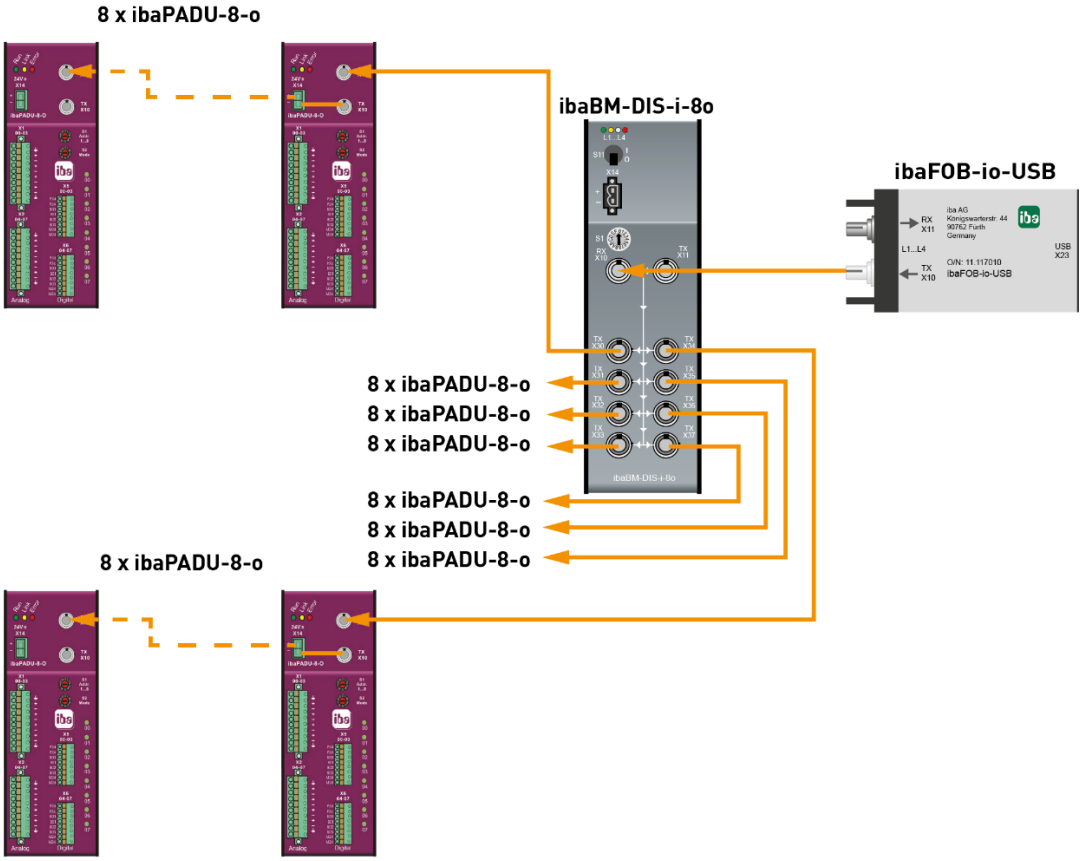
9.2.2 Operation with ibaBM-COL-8i-o and ibaBM-DIS-i-8o

By using the data distributor ibaBM-DIS-i-8o in combination with the data concentrator ibaBM-COL-8i-o you can distribute 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.



9.2.3 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-io-USB 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 the FO output of an ibaFOB-io-USB adapter is needed.



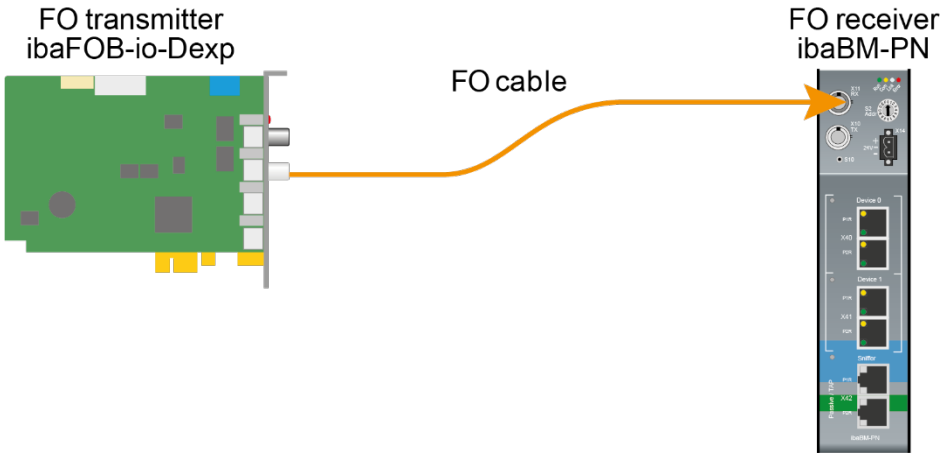
10 Technical data

Short description		
Designation	ibaFOB-io-USB	
Order no.	11.117010	
Description	USB adapter with 1 FO input and 1 FO output	
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. 10.1.	
ibaNet protocols	2Mbit, 3Mbit, 5Mbit, 32Mbit, 32Mbit Flex	
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	
Receiving interface (RX)		
Sensitivity[2]	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)	
USB interface		
USB	1x USB 2.0 socket type B	
Power supply and indicators		
Power supply	via USB port	
Power consumption	max. 1.25 W	
Indicators	4 LEDs (adapter status)	
Operating and environmental conditions		
Temperature ranges		
Operation	32 °F to 122 °F (0 °C to 50 °C)	
Storage/transport	-13 °F to 158 °F (-25 °C to 70 °C)	
Cooling	passive	
Dimensions and weight		
Dimensions (depth x width x height)	3.9 in x 2.17 in x 0.94 in (99 mm x 55 mm x 24 mm)	
Weight (incl. packaging and documentation)	Approx. 180 g	

[2] Data for other FO cable diameters not specified

10.1 Example for FO budget calculation

As an example, an FO connection from an ibaFOB-io-Dexp card (FO transmitter) to an ibaBM-PN device (FO receiver) is used.



The example refers to a point-to-point 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 respective device manual in the chapter "Technical data" under "ibaNet interface".

Specification ibaFOB-io-Dexp:

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

Specification ibaBM-PN:

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

Specification FO cable

To be found in the data sheet of 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 ibaFOB-io-Dexp -> 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 ibaFOB-io-Dexp -> 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 daisy chain (e.g. ibaPADU-8x with 3Mbit) or as 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 distance reduction of approx. 30-40% must be expected.

11 Support and contacts

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Note

If you require support, please specify the serial number (iba-S/N) of the product.

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