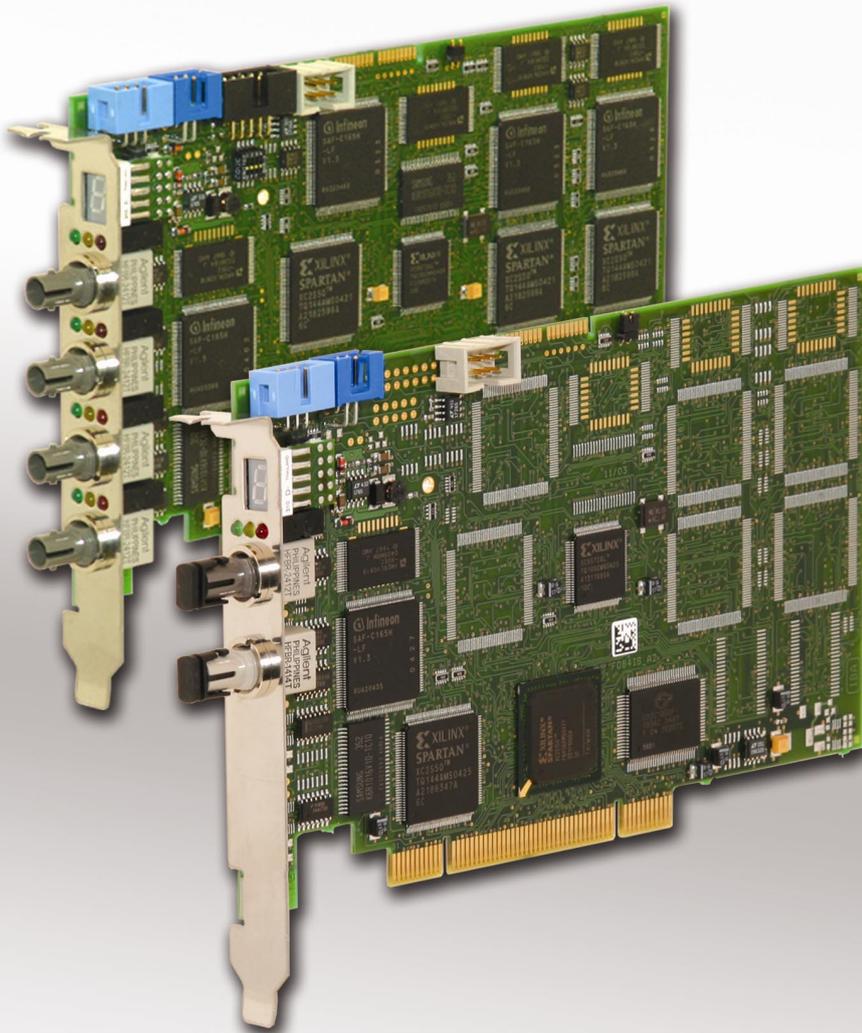


ibaFOB-4i-S

PCI Interface Boards incl. ibaFOB-io-S,
ibaFOB-4o, ibaFOB-OF-Link, ibaFOB-Sync



Manual

Version 3.2

Measurement and Automation Systems



ibaFOB-4i-S / -io-S -Manual

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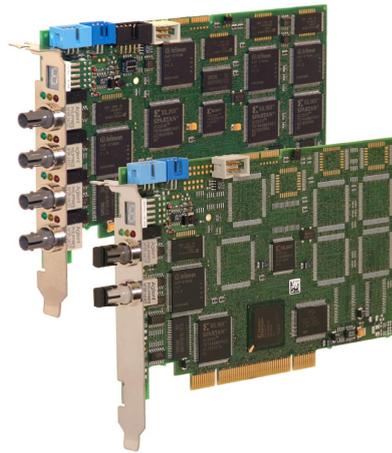
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ibaFOB-4i-S / -io-S - Manual V 3.2 en / ibaFOB A2 / A8

We have checked that the contents of this manual match the hardware and software described here. However, deviations cannot be fully ruled out, so that we cannot assume any warranty should any deviations actually exist. This manual is regularly updated. Necessary revisions are included in future editions, or can be downloaded from the Internet.

The latest version is always available for downloading at:

<http://www.iba-ag.com>

We would welcome any suggestions for improvements which you may have.

Version	Date	Revision	Chapter / pages	Author	Version HW/FW
V 3.2	03/05/12	Chapter Accessories removed		st	

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This manual

This compact manual provides the information for installation and handling of the devices ibaFOB-4i-S / -io-S, ibaFOB-io-S, ibaFOB-4o, ibaFOB-OF-Link and ibaFOB-Sync.

For further information concerning the system integration and software configuration please refer to the corresponding engineering manuals and / or software documentation of our software products used in conjunction with this device.

You can find the latest issue of this manual always on our website <http://www.iba-g.com> in the download area.

This manual uses several symbols which essentially have the following meanings:



Important hint or warning in order to avoid hazard against material or life.



A useful tip or clue to make your work easier.



This draws your attention to special features, such as exceptions to rules, etc.



A reference to additional documentation or more in-depth literature.



iba training courses

Hint for training courses by iba concerning related products or subjects

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1 Introduction

The boards ibaFOB-io-PCI, ibaFOB-io-S, ibaFOB-4i-PCI, ibaFOB-4i-S, ibaFOB-4o and ibaFOB-OF-Link are fiber optic communication cards which are used to connect a standard PC to the iba peripheral devices such as ibaPADUs, ibaNet750-BM devices and ibaLink signal modules (SM).

As far as the following text does not refer to a particular card, the boards are referred to as ibaFOB boards.

The unique peripheral I/O concept based on the ibaFOB boards, features characteristics otherwise unknown on standardized field buses such as:

- ❑ Full deterministic transmission profiles for all fiber optic buses and connected devices (1ms).
- ❑ Internal and/or external synchronization on the bus, even for more than one bus with programmable cycle times between 1.0 and 9.9 ms in steps of 100 μ s.
- ❑ Deviation less than 2 μ s between several busses (external synchronization)
- ❑ The iba fiber optic transmission standard integrates not only A/D converters (ibaPADU) but a huge variety of PLC interfaces and hence allows the realization of heterogeneous measuring and I/O topologies. The following devices can be connected:
 - ibaFOB x/4 (ISA)
 - ibaFOB x/4-F (ISA) with ibaFOB-OF-Link
 - ibaFOB 2/2 I/O (ISA)
 - ibaLink-SM-64-io (Siemens Simatic S5 115U, 135U 155U; MMC216 all types)
 - ibaLink-SM-128V-i-2o (VME32 & VME64 rack)
 - ibaNet750-BM (Wago IO system 750)
 - ibaBM-FOX-i-3o (FO-splitter and repeater)
 - ibaPADU-8, ibaPADU-8-ICP, ibaPADU-8-M, ibaPDAU-8-S, ibaPADU-16, ibaPADU-32-T, ibaPADU-32-R and ibaPADU-8-O (A/D & D/A -converter)
 - ibaBM-SLM (Simolink Monitor for Siemens Motion Link Bus)
 - ibaBM-DDCSM (Monitor for ABB DDCS+ Drivebus)
- ❑ Adjustable bus timing (ring topology in combination with ibaLogic only!)
- ❑ Easy handling without the termination problems of copper based systems
- ❑ The integration in hazardous areas is no problem in terms of EMI due to the fiber optic communication concept.
- ❑ One source can be accessed by multiple clients at the same time by just multiplying the optical fibers (ibaFOx-3 and ibaFOB-OF-Link splitting devices) – so I/O peripherals may be used for process control and measuring at the same time. This also makes redundant structures easy.
- ❑ 100% compatibility to its predecessors based on the ISA bus

The ibaFOB-4i-S or ibaFOB-io-S devices represent the new generation of iba's fiber optic PC boards. These boards replace the ibaFOB x/4, ibaFOB x/4-F and ibaFOB 2/2 IO boards which were based on the PC ISA bus definition. The new boards are 100% compatible on the fiber optical bus side while in the PC the interface and dual port ram layout differ between the old and new boards.

The new cards features are:

- Full Plug&Play functionality.
- Enhanced throughput on the PC bus side.
- Enhanced card diagnostics and card information (LEDs and 7-segment display).
- Two modes of operation: F-mode and M-mode, to be selected for each FO-port individually
- Optional synchronization modules for synchronizing multiple systems in conjunction with ibaScope

2 Scope of Delivery

The following components are included with the delivery.

- ibaFOB-4i-S or ibaFOB-io- PCI device (6-wire flat ribbon cable with four jacks for iba card synchronization)
- Manual

3 Safety Information

Please consider the following safety advises:



WARNING!

To avoid electrical shock during installation or uninstallation of the device disconnect the power supply from the computer before opening.



CAUTION!

This board contains components which can be destroyed by electrostatic discharge. Prior to touching any electronics board, your body must be electrically discharged. This can be simply done by touching a conductive, grounded object immediately beforehand (e.g. bare metal cabinet components, socket protective conductor contact).

4 Installation / Uninstallation

4.1 Preparation

The card fits in every compatible PCI slot.



CAUTION!

Use a ground line or discharge any electrostatic charge from yourself before touching the card.



The standards for handling electrostatic sensitive devices (ESD) must be followed.



Note

Please follow carefully the advises below. Not to do so may void your warranty.

- Remove and install cards only in a ESD designated workspace.
- Remove all power connections from the PC before opening the PC and/or installing/removing any device.
- Never remove or (un-)solder chips or other parts of the device because this may damage the device and void your warranty.

4.2 Installing the Card

- 1 Switch off the PC, disconnect it from power supply and open it, so that you can see the PCI slots.
- 2 Unpack the card carefully. Use a ground line or discharge any electrostatic charge from yourself before touching the card.
- 3 No settings of jumpers or switches are required.
- 4 Take hold of the card on the board edges and the front panel.
- 5 Press the card carefully into the desired PCI connector of the main board. Check that the card is fully plugged into the slot and fix the card with the screw on the front panel.
- 6 Close the computer, connect the power supply and start it.

4.3 Removing the Card

In order to remove the card from the PC please follow these steps:

- 1 Stop and switch off the computer, disconnect it from the power supply and open it.
- 2 Release the screw in the front panel.
- 3 Pull out the card off the PCI slot carefully and put in a safe place or conductive plastic bag.

5 System Requirements

5.1 Hardware

IBM-compatible PC with the following minimum configuration:

- 400 MHz Pentium II or better
- At least one free PCI slot
- 128 MB RAM or better

Please see <http://www.iba-ag.com> for further details on a properly outfitted workstation.

5.2 Software

- Microsoft Windows NT 4.0 (Service Pack 5 or higher), 2000, XP or 2003 Server
- ibaPDA Version 4.0 with PCI support or higher, > 10 GB disk space
- ibaLogic
- ibaScope
- ibaQDR

6 Driver installation

6.1 Windows XP

The ibaFOB-4i-S and ibaFOB-io-S cards comply with the Plug & Play standard of Windows.

After the card has been plugged in for the first time and after Windows has finished its startup after booting the Found New Hardware Wizard pops up for introduction to the installation of the drivers. In case the dialog should not open use the Windows “Add Hardware Wizard” in the control panel in order to look for new hardware..



If the dialog appears select “No, not this time“. Continue with <Next>.

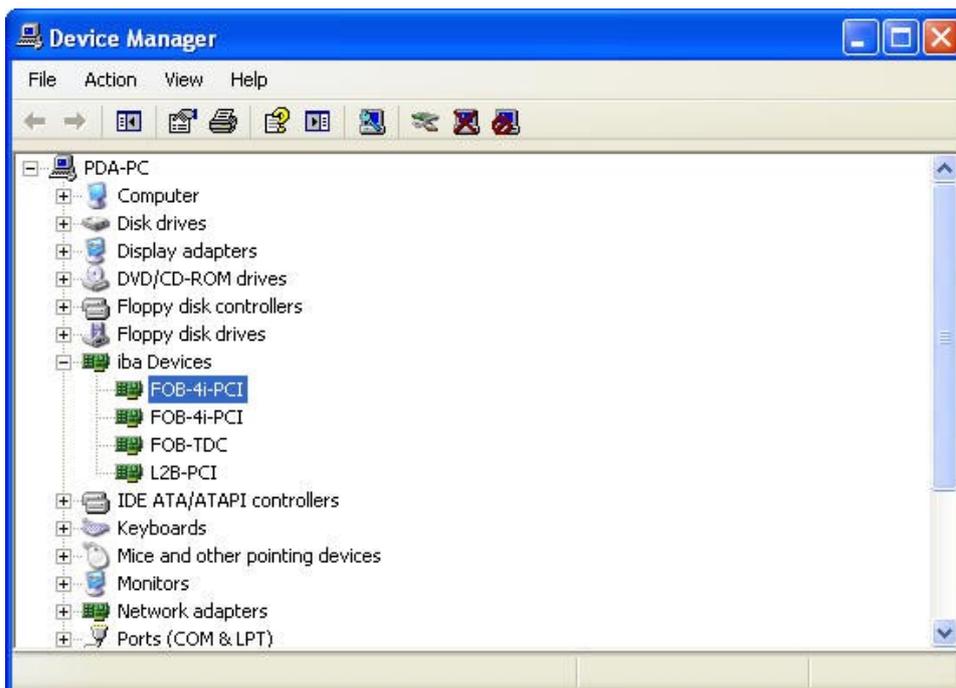


In the next step select the option “Install the software automatically“ and click on <Next>.



The system is looking for driver software and installs it automatically. Finally click on <Finish>.

If you like to check if the card was properly installed open the Windows „Device Manager“ and look for the card under the iba devices node.



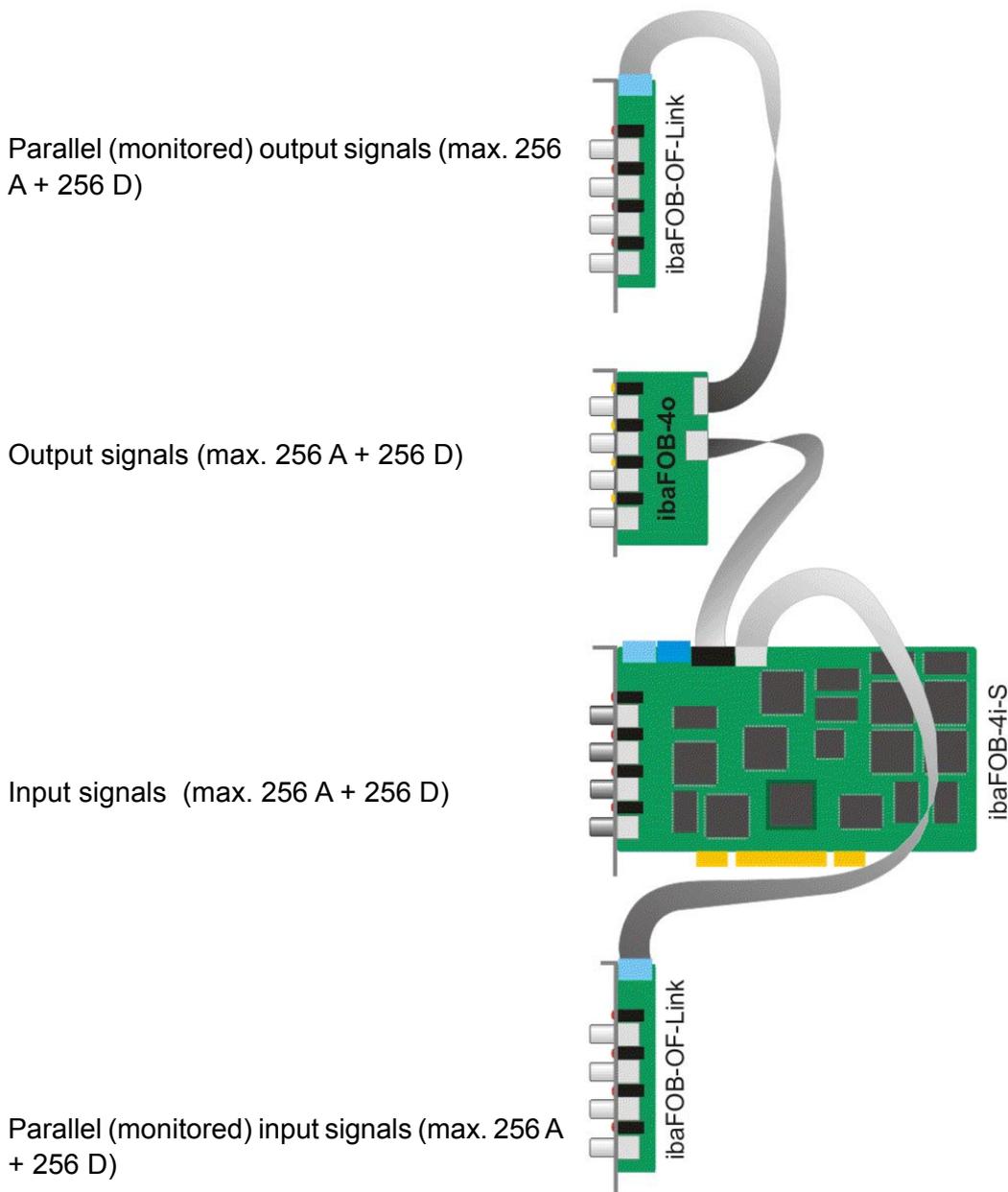
7 System Integration

7.1 Topologies

The following schematics show how the different boards may be combined to achieve a full monitored process I/O system for 256 analog and 256 digital in- and outputs.

To do this connect the ibaFOB-4o to the ibaFOB-4i-S (with the 10 pole connector).

The ibaFOB-4o as well as the ibaFOB-4i-S hold the additional connector (6-pole) to wire the ibaFOB-OF-Link card which monitors the in and outputs without additional time delay.





If the PC power supply is switched OFF, all “monitored signals” are off because the monitoring involves an optical – electrical –optical conversion - which cannot work without the PC’s power supply.



The ibaFOB-io-S card can only monitor the input signals – not the output signals! If this feature is needed please use the ibaFOx-3 device.

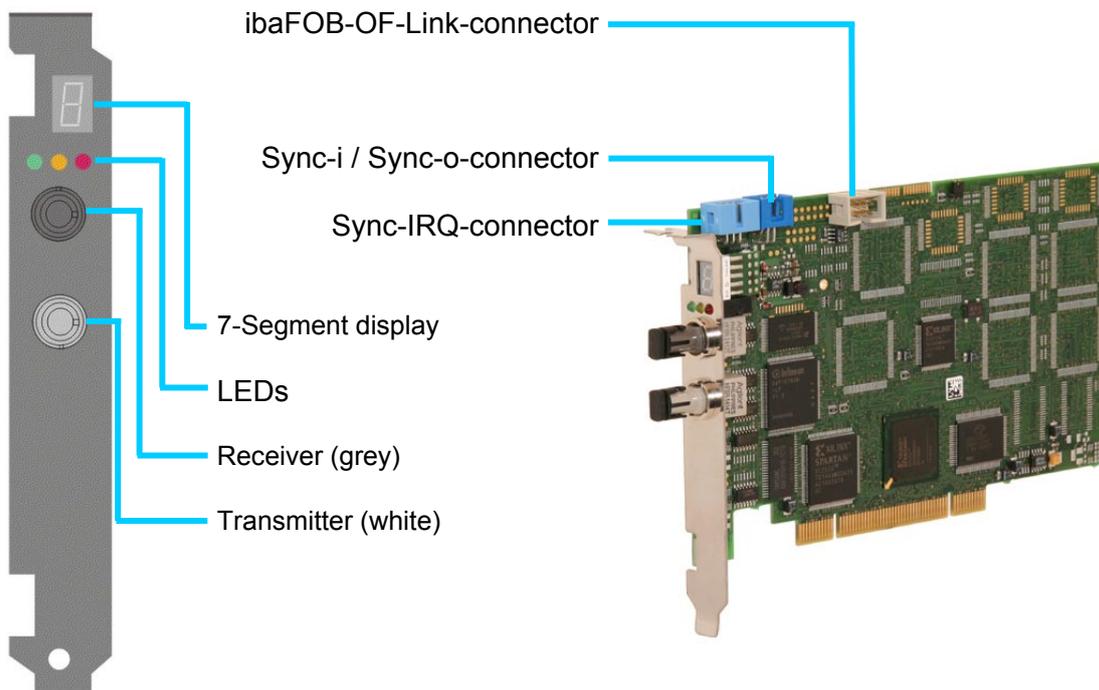
8 Device description

8.1 Device properties

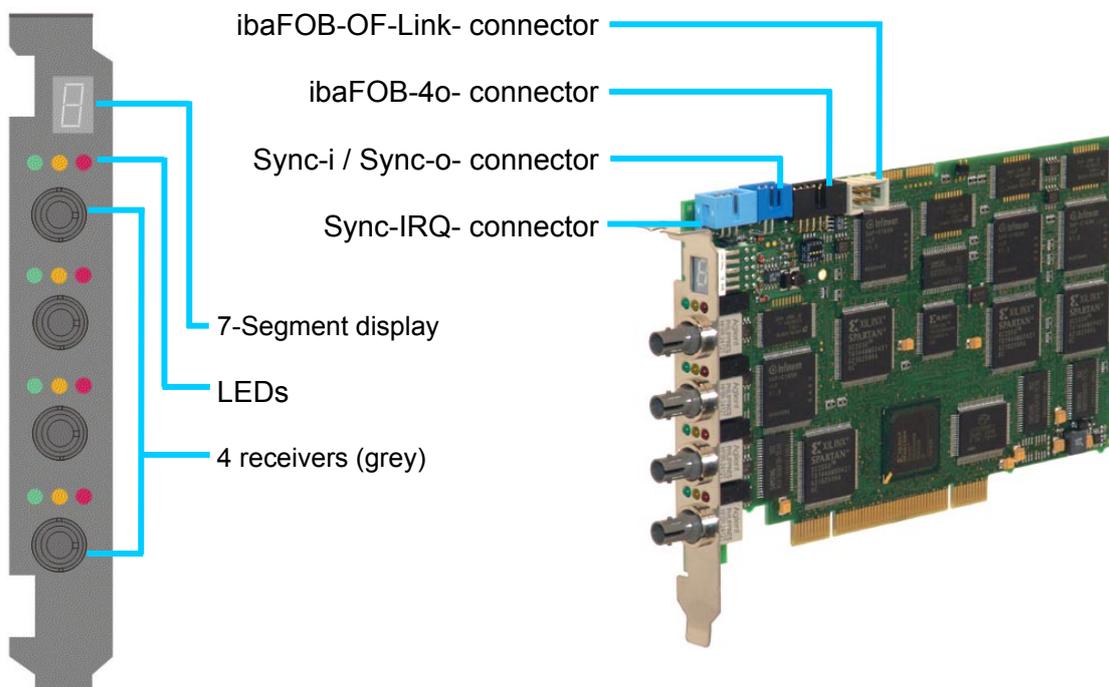
- Full compliant PCI V2.2 board
- One bi-directional (ibaFOB-io-S) or four unidirectional (ibaFOB-4i-S) independent fiber optic channels
- Expansion connector for ibaFOB-4o to get four bi-directional channels on an ibaFOB-4i-S.
- Each optical link has its own processor with up to 5 Mbit/s
- 1 MByte of PCI dual port ram for PC access
- Firmware upgrade in the PC without deinstalling the card (starts with card version 3)
- Three LEDs for each channel indicating CPU life counter (green), optical transmission status (yellow) and processor error (red)
- 7-segment display for board-ID, indication of sync master board and external or internal synchronization.
- Expansion connector for FOB-OF-Link to monitor the input data streams on ibaFOB-4i-S or ibaFOB-io-S.
- No jumpers or DIL switches, all parameters are software controlled (the switch on top of the board is for iba internal use only)
- Dynamic reassigning of interrupt sources and interrupt generation (board and driver synchronization)
- Dynamic assignment of bus cycle time in steps of 1 μ s (accuracy +/-400 ns). Minimum cycle is 1.000 ms; max cycle 9.900 ms; Default 1.000 ms (ring topology only!)
- Synchronous sampling on daisy chained devices on the fiber optic bus can differ with a maximum of -800 ns to + 1300 ns relative to device #1 channels (worst case measured with 1 ms basic sampling time); the fiber optics between devices should not exceed 1 m.

8.2 Views, Displays and Connectors

8.2.1. ibaFOB-io-S



8.2.2. ibaFOB-4i-S



8.3 Front Side Elements

8.3.1. LEDs

Run, Link and Error LEDs indicate the operational state of the ibaFOB channels. The following table describes the states in which you may find the LEDs and their respective meanings. When switching on power all LEDs are on for a few seconds to prove their proper function.

LED	Status	Description
Run (green)	FLASHING	power is on and the channel is functioning properly
	OFF	controller stopped
Link (yellow)	ON	receiving / sending telegrams on this channel
	OFF	no telegrams received; fiber optics not connected or sending device
Error (red)	ON	internal error in controller link
	OFF	normal state; after resolution of error, LED automatically resets

8.3.2. 7-Segment Display

The 7-segment display shows the following information

- Board-ID (ranging from 0...7) - after board was initialized; when board is not initialized a horizontal line is displayed.
- The decimal point in the display indicates whether the board is dedicated to be...
 - an internal interrupt master (dot is on) or
 - an external interrupt master (dot is blinking) or
 - an interrupt slave (dot is off).

8.3.3. Fiber Optic Interface of ibaFOB-io-S

The ibaFOB-io-S provides two ST type jacks - one optical sender (white) and one optical receiver (grey).



If the card was configured for external synchronization, e. g. for operation with an ibaBM-SLM, the input channel needs to be connected with the external device for proper function (otherwise the whole PC process will be stopped).

The external sync configuration channel will be indicated by a blinking point in the 7-segment display so that the correct data input can be identified easily.

8.3.4. Fiber Optic Interfaces of ibaFOB-4i-S

The ibaFOB-4i-S provides four optical receivers (grey ST jacks). Channel 1 is located nearest to the 7-segment display.

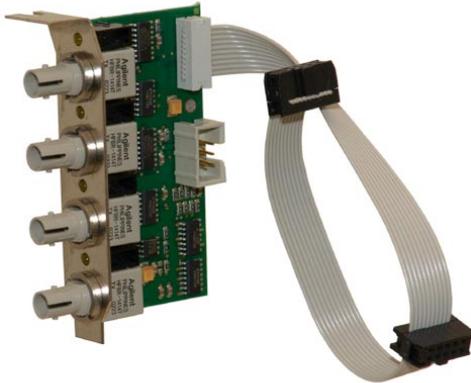


If the card was configured for external synchronization, e. g. for operation with an ibaBM-SLM, the first (upper) input channel needs to be connected with the external device for proper function (otherwise the whole PC process will be stopped).

The external sync configuration channel will be indicated by a blinking point in the 7-segment display so that the correct data input can be identified easily.

8.3.5. Fiber Optic Interfaces of ibaFOB-4o (optional)

The ibaFOB-4o provides four optical transmitters (white ST jacks). Channel #1 is the upper channel.



Beside the fiber optic ports, this module provides further connections to...

- ibaFOB-4i-S (compatible to all predecessors)
- ibaFOB-OF-Link

Two different builds are available:

- a) with short front plate (picture)

ibaRackline PCs have special slots in the housing for this kind of build. They enable installation of these modules without blocking regular PCI slots.

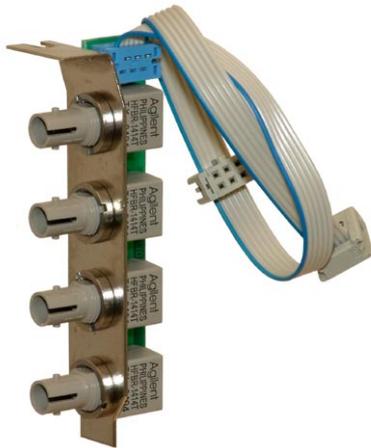
- b) with long standard front plate

This kind may be installed on all standard slots in any PC. The opening in the housing will be blocked for other PC cards though the PCI connector is not used.

8.3.6. Fiber Optic Interfaces of ibaFOB-OF-Link (optional)

The ibaFOB-OF-Link provides four optical senders (white ST jacks)

Channel #1 is the upper channel.



Shown with connector cable to

- ibaFOB-4i-S (incl. all predecessors) or
- ibaFOB-4o-S

Two different builds are available:

- a) with short front plate (picture)

ibaRackline PCs have special slots in the housing for this kind of build. They enable installation of these modules without blocking regular PCI slots.

- b) with long standard front plate

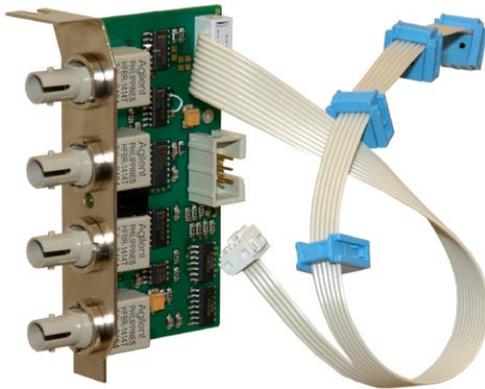
This kind may be installed on all standard slots in any PC. The opening in the housing will be blocked for other PC cards though the PCI connector is not used.

8.3.7. Synchronisation Output Module ibaFOB-Sync-Out (optional)

When working with ibaScope in distributed configurations it may be required to connect and synchronize multiple ibaScope acquisition PCs.

We've developed a pair of synchronization modules which use a fiber optic connection to send and receive a synchronization impulse.

The module ibaFOB-Sync-Out has to be installed in the PC which is supposed to be the synchronization master.



The synchronization output module is designed for assembly in a short housing slot.

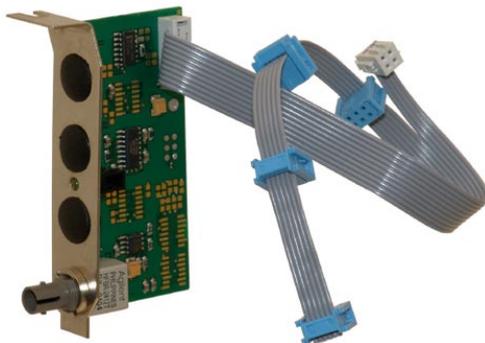
It provides four fiber optic outputs which transmit the synchronization signal. Hence, up to four other PCs can be synchronized. If an ibaFOB-OF-Link is connected to the grey connector on the module, the fiber optic outputs can be doubled and four more PCs may be synchronized.

The blue jacks on the flat ribbon cable should be plugged into the light blue connectors on the iba PCI-cards in the master PC. One card among these must be configured as interrupt master.

The white jack on the flat ribbon cable should be plugged into the dark blue Sync-i / Sync-o connector of an ibaFOB-4i-S or ibaFOB-io-S card for power supply of the synchronization module.

8.3.8. Synchronisation Input Module ibaFOB-Sync-In (optional)

The module ibaFOB-Sync-In has to be installed in the PC(s) which is (are) supposed to be the synchronization slave(s). One ibaFOB-Sync-In must be installed in each slave PC.



The synchronization input module is designed for assembly in a short housing slot.

It provides one fiber optic inputs which receives the synchronization signal.

The blue jacks on the flat ribbon cable should be plugged into the light blue connectors on the iba PCI-cards in the slave PC. One card among these (ibaFOB-4i-S or ibaFOB-io-S) must be configured as interrupt master/external.

The white jack on the flat ribbon cable should be plugged into the dark blue Sync-i / Sync-o connector of an ibaFOB-4i-S or ibaFOB-io-S card for power supply of the synchronization module.



The use of this synchronization function is supported by ibaScope only.

9 Configuration and Engineering

9.1 Configuration and Diagnostics with ibaPDA-V6



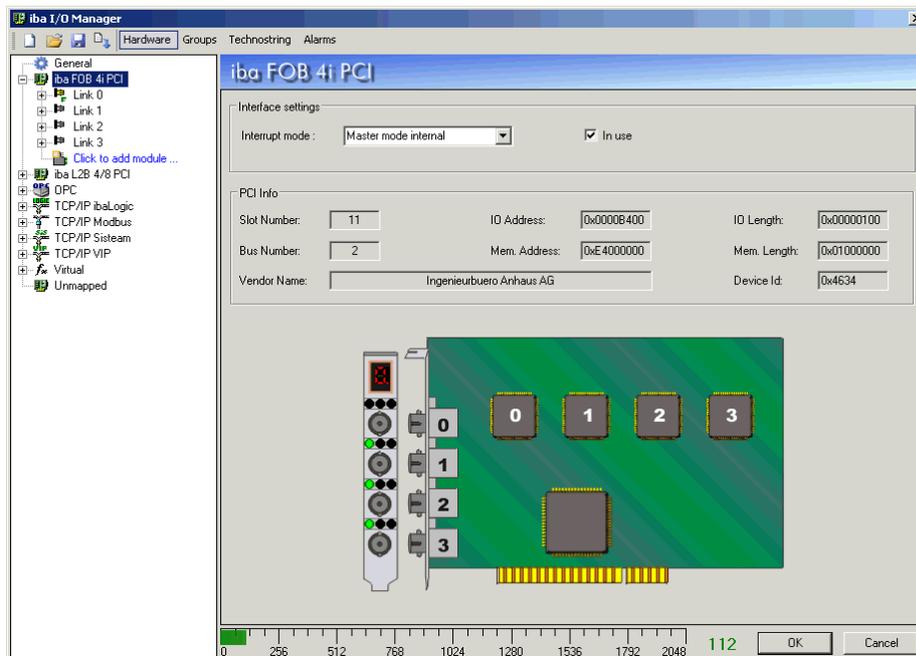
You will find a detailed description of the configuration parameters for the card in ibaPDA-V6 in the manual and/or in the online help of ibaPDA-V6..

The entire configuration is to be done in the I/O-manager of ibaPDA-V6. The board is managed as data interface of type FOBF-PCI.

The same interface type is used for ibaFOB-4i-S and ibaFOB-io-S. The system automatically detects which type(s) of card(s) are installed in the PC and displays them in the signal tree

9.1.1. Configuration of the Card

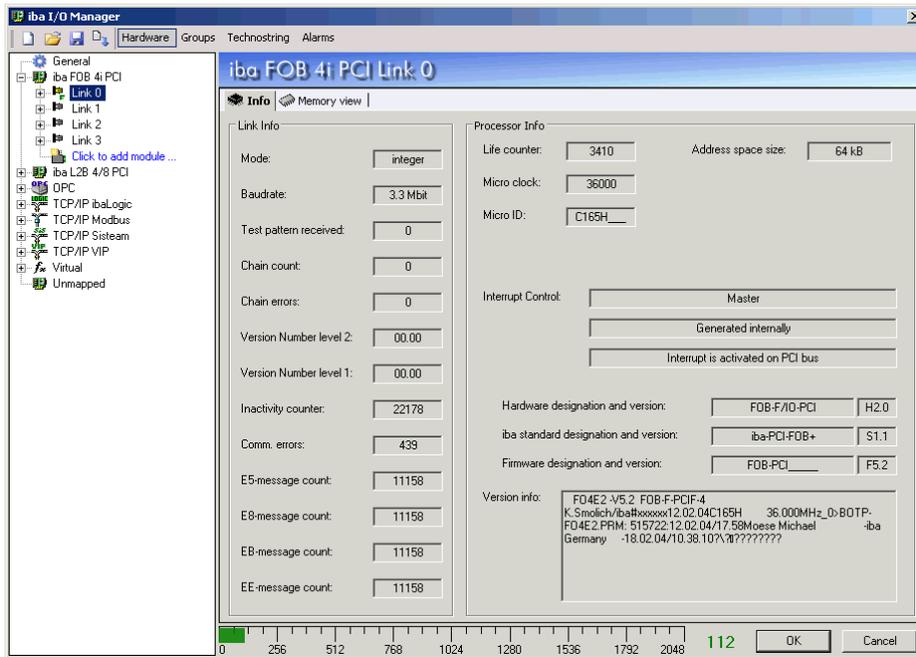
If you mark the branches in the tree view you'll get the relevant information and you can make the required settings respectively.



A mimic of the card is displayed in the dialog box when you mark the main branch of the card in the tree view.

At this point you should set the interrupt mode (master internal / master external / slave).

If you mark the sub branches with the links you'll get further information about the processors.



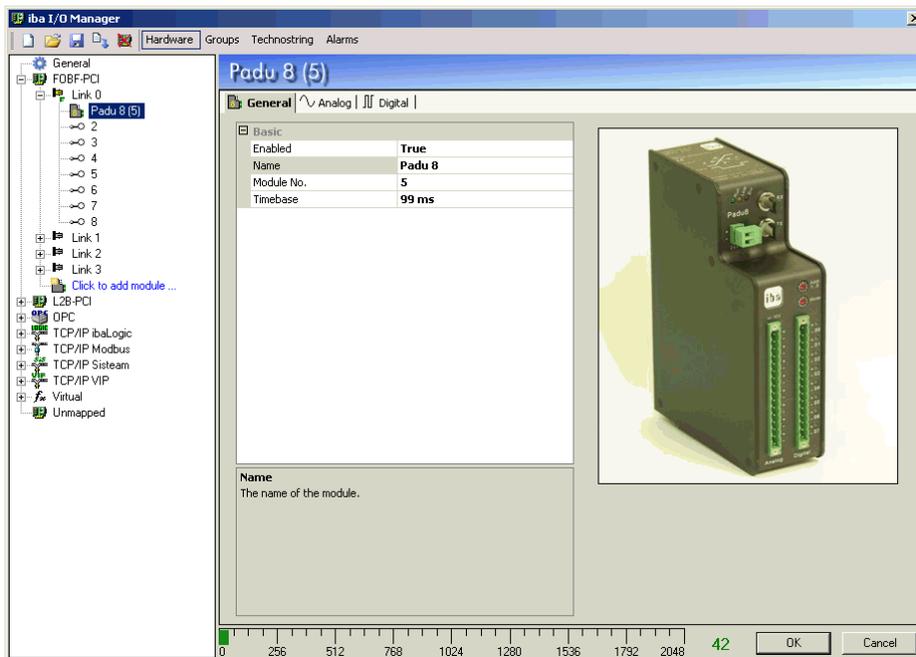
If you open the "link"-branches you can see the connected devices (= modules). Each link is subdivided in eight groups of eight channels each (64 in total per link) which corresponds to the smallest information package in the ibaPADU-8 philosophy.

9.1.2. Module and Signal Configuration

In order to measure signals you should map the modules (i. e. the devices) to the links. Let's take an ibaPADU-8 for example.

If a connected and active ibaPADU-8 was not detected automatically you may add the device in the I/O manager in the tree view by a right mouse click on the desired link.

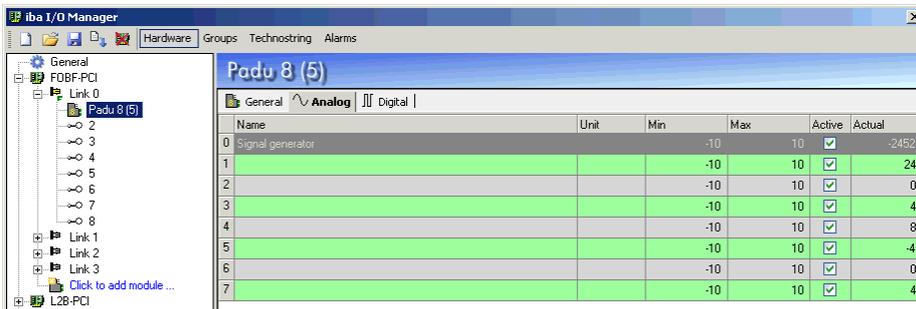
In order to configure the signals you should mark the module in the tree view.



Click on the tab *General* in this dialog box and you can make the general settings for the module, such as module name, module number and sample time (if different from basic sample time).

Under the tabs *Analog* and *Digital* you can enter and configure the signals.

In the signal tables you can give a name to the signals assign physical units and limit values (Max, Min) or set the signals active or passive. The column *Actual* shows already incoming values when an active device is physically connected.



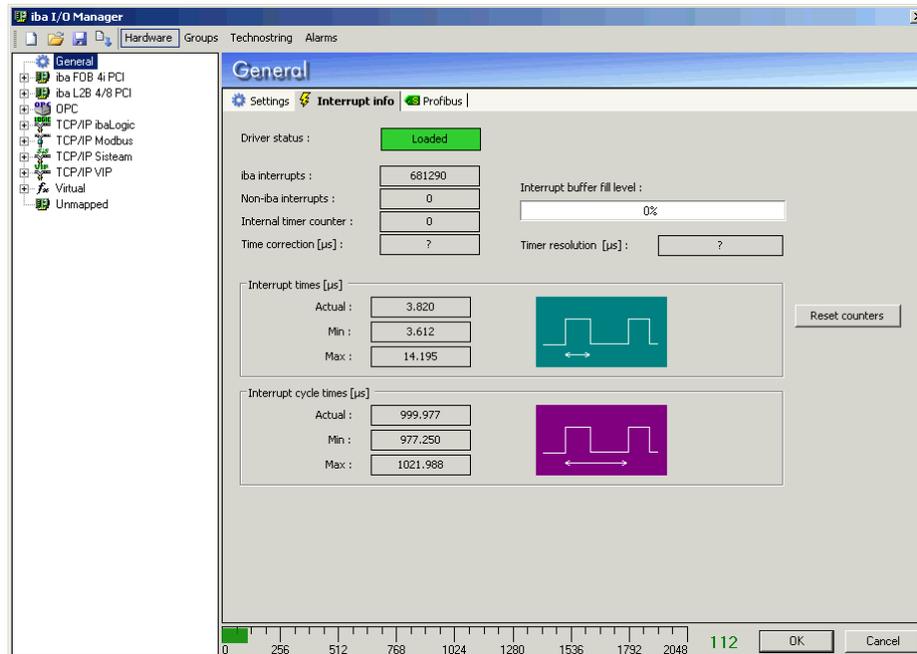
The screenshot shows the 'iba 1/O Manager' software interface. The left sidebar displays a tree view of hardware components, including 'FOBF-PCI', 'Link 0', 'Padu 8 (5)', 'Link 1', 'Link 2', 'Link 3', and 'L28-PCI'. The main window is titled 'Padu 8 (5)' and has tabs for 'General', 'Analog', and 'Digital'. The 'Analog' tab is active, displaying a table with the following data:

Name	Unit	Min	Max	Active	Actual
0 Signal generator		-10	10	<input checked="" type="checkbox"/>	-2452
1		-10	10	<input checked="" type="checkbox"/>	24
2		-10	10	<input checked="" type="checkbox"/>	0
3		-10	10	<input checked="" type="checkbox"/>	4
4		-10	10	<input checked="" type="checkbox"/>	8
5		-10	10	<input checked="" type="checkbox"/>	-4
6		-10	10	<input checked="" type="checkbox"/>	0
7		-10	10	<input checked="" type="checkbox"/>	4

9.1.3. Diagnosis

The most important diagnosis features are an integrated part of the I/O manager in ibaPDA-V6.

The main branch *General* in the tree view, tab *Interrupt Info*, shows the interrupt counter. The counter iba-Interrupts must have 1000 increments per second! If not, the interrupt master is missing. In this case check the card settings.



In the dialog box of the link level (see 9.1.1), tab *Info*, you can see if the communication between ibaFOB card and ibaPADU device is working by checking the baud rate value. A stable baud rate means that the communication is working well. An alternating baud rate indicates that the link is broken or the ibaPADU device is off.

When exiting the I/O manager by pressing OK the system performs a consistency check of the configuration. If the configuration is valid it will be applied.

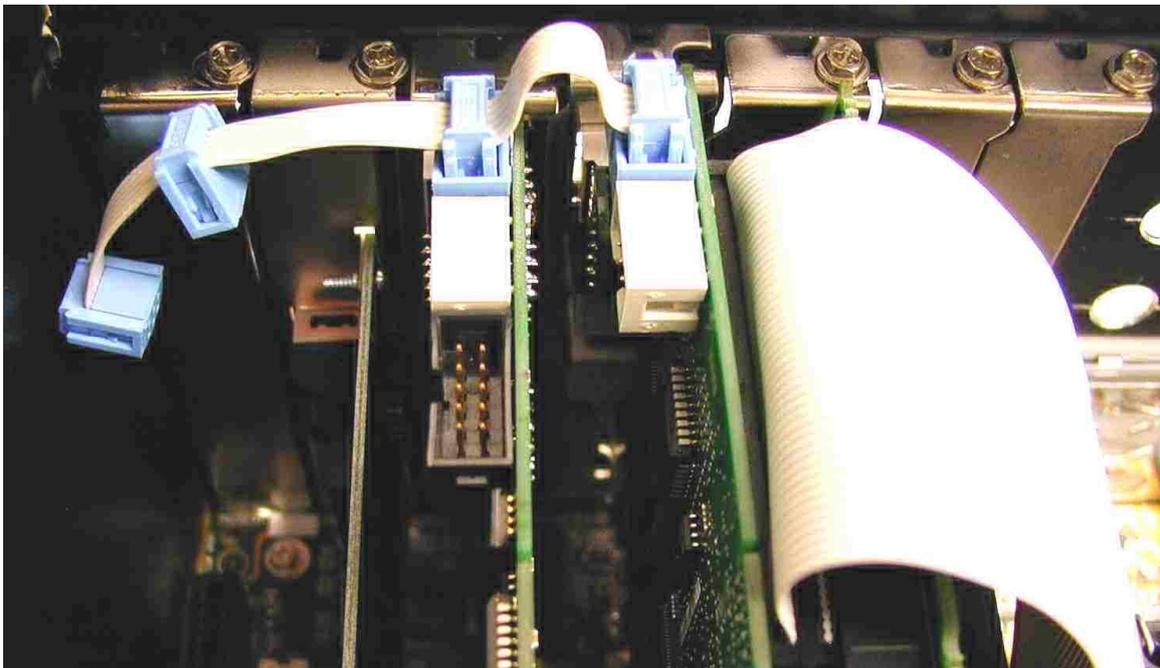


For a detailed description of the system configuration please refer to the corresponding manuals of our software products ibaPDA, ibaLogic or ibaScope.

10 Synchronization of Several Boards

Shut down the computer, remove the power connection and plug in the other iba PCI cards.

Connect the sync-wire between the devices. This is now necessary because the PCI bus does not support any synchronization signal on the bus which is available at all slots simultaneously. The sync line (a 6-pole flat ribbon connector) ensures that all buffers (and data streams) of multiple fiber optic cards are exactly synchronized.



A bad or missing sync-connection may lead to inconsistent data blocks. This would affect the data integrity and data correlation!



Every delivered card comes with a synchronization cable (sync cable) for connecting up to four cards. Unused plugs of the cable can left unconnected and must not be terminated.



Installing additional components may alter your signal configuration (if a system upgrade is made) and interrupt assignments. Save all settings before doing any changes.

Start the PC again, boot Windows and start ibaPDA.

11 Technical Data

Order No.: ibaFOB-4i-S	11.115200
Order No.: ibaFOB-io-S	11.115300
Order No.: ibaFOB-4o	11.116000
Order No.: ibaFOB-OF-Link	11.113100
Mechanical:	short PCI card
Operating temperature:	0 °C to 50 °C (32 °F...122 °F)
Storage temperature:	-25 °C to 70 °C (-13 °F...158 °F)
Transport temperature:	-25 °C to 70 °C (-13 °F...158 °F)
Cooling:	air cooled
Power:	via PCI bus
Current consumption:	950 mA max. (without connected modules)
FO-cable	62,5/125 µm
Coupling	ST Lean
Max. distance of fiber optical cable between devices (without repeater)	up to 2000 m (6,560 ft)
Weight (incl. package/documents)	200 g

12 Support

Support

Phone: +49 911 97282-14

Fax: +49 911 97282-33

E-Mail: support@iba-ag.com



Note

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

Contact

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Phone: +49 911 97282-0
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Regional and Worldwide

For contact data of your regional iba office or representative please refer to our web site

www.iba-ag.com.