ibaPADU-8AI-U/-8AI-I

Parallel-Analog-Digital-Converter for 8 channels

Manual

Issue 2.0

Manufacturer

iba AG
Koenigswarterstr. 44
90762 Fuerth
Germany

Contacts

Head office   +49 911 97282-0

Fax   +49 911 97282-33

Support   +49 911 97282-14

Technology   +49 911 97282-13

E-Mail: iba@iba-ag.com

Web: www.iba-ag.com

This manual must not be circulated or copied, or its contents utilized and disseminated, without our express written permission. Any breach or infringement of this provision will result in liability for damages.

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.

Protection note

Windows® is a label and registered trademark of the Microsoft Corporation. Other product and company names mentioned in this manual can be labels or registered trademarks of the corresponding owners.

Certification

The device is certified according to the European standards and directives. This device corresponds to the general safety and health requirements. Further international customary standards and directives have been observed.

$C\!\epsilon$

Note: 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.

Issue	Date	Revision	Chapter	Author	Version HW / FW
2.0	08-2023	Warning note, Scope of delivery, ibaPDA GUI			

Table of contents

1   About this manual

This manual describes the construction, the use and the operation of the devices ibaPADU-8AI-U and ibaPADU-8AI-I.

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   Introduction

The ibaPADU (Parallel Analog Digital Unit) device family is designed for data acquisition of analog and digital signals. The new models ibaPADU-8AI-U and ibaPADU-8AI-I provide 8 digital inputs and 8 analog voltage or current inputs and replace previous devices.

ibaPADU-8AI-U (voltage inputs) replaces the following previous devices and integrates the known functions in one device:

- ibaPADU-8 (order no. 10.120000)
- ibaPADU-8-F1 (order no. 10.120001)
- ibaPADU-8-60 (order no. 10.120006)
- ibaPADU-8-HI (order no. 10.120010)
- ibaPADU-8-HI-F1 (order no. 10.120011)
- ibaPADU-8-HI-25 (order no. 10.120014)
- ibaPADU-8-HI-60 (order no. 10.120015)

Different device modes, which provide the device specific properties of the previous devices like measuring range, input impedance and filters, are set by means of a rotary switch. The measuring range of the inputs is selectable in three stages: ±10 V, ±24 V or ±60 V. An integrated analog low-pass filter reduces possible disturbances of the signals. A digital antialiasing filter and a digital low-pass filter are additionally activated depending on the device mode. The filter characteristics may differ from the previous devices.

ibaPADU-8AI-I (analog current inputs) provides an input level of ±20 mA and replaces this device:

- ibaPADU-8-I (order no. 10.120020)

If no special reference to a device is made in the following text the devices are named as ibaPADU-8AI in general and the description applies to both devices.

Each channel of both models is galvanically isolated and equipped with its own A/D converter in order to measure simultaneously all channels.

The existing ibaFOB cards and the I/O configuration in ibaPDA can remain in use.

Up to 8 devices can be linked in a daisy-chain on the fiber optics link. In ibaPDA, the synchronization of the data recording of all devices on the line is ensured within an accuracy of a millisecond. The data acquisition cycle for all devices in one line is 1 ms. Up to 64 analog and 64 digital signals are transmitted per cycle.

Each device provides a RJ11 jack for the connection to a notebook with an ibaCom-PCMCIA-F card. Thus, it is possible to carry out measurements in parallel at the RJ11 jack without affecting the data transmission on the fiber optic cable.

In brief:

❑ Replacement for the previous ibaPADU-8 devices

❑ ibaPADU-8AI-U

  ▪ 8 digital inputs and 8 analog voltage inputs

  ▪ Input level ±10 V, ±24 V or ±60 V

  ▪ Input impedance 100 kΩ or 1 MΩ (selectable)

  ▪ Filter: RC low-pass 4 kHz (permanent), digital antialiasing and digital low-pass filter (optional, depending on device mode)

❑ ibaPADU-8AI-I

  ▪ 8 digital voltage inputs and 8 analog current inputs

  ▪ Input level ±20 mA

  ▪ Input impedance 50 Ω

  ▪ Filter: RC low-pass 4 kHz (permanent)

❑ Galvanically isolated, single ended

❑ A/D converter per channel with 16 bit resolution

❑ Sampling rate 1 kHz

❑ ibaNet protocol 3Mbit

❑ Up to 8 devices can be cascaded in a daisy-chain using fiber optics

❑ RJ11 jack to connect a notebook with an ibaCom-PCMCIA-F card

❑ Rugged design, easy mounting

Fields of application:

❑ Process data acquisition

❑ Commissioning

❑ Trouble shooting and error detection

❑ Portable measuring devices

Important note

When ibaPADU-8AI is used as replacement for previous devices, please note:

The lower switching threshold of the digital inputs is now ±6 V (old ±9 V).

The filter characteristics of the analog inputs have slightly changed.

---

3   Scope of delivery

After unpacking check the completeness and intactness of the delivery.

The scope of delivery includes:

❑ Device ibaPADU-8AI-U or ibaPADU-8AI-I

❑ 2-pin terminal block with spring terminals (voltage supply)

❑ 2x 16-pin terminal block with spring terminals (analog and digital input channels)

4   Safety instructions

4.1   Designated use

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

❑ Automation of industrial systems

❑ Measurement data logging and analysis

❑ Applications of iba software products (ibaPDA, ibaLogic etc.)

The device is only to be applied as shown in the Technical Data chapter.

4.2   Special advices

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.

Important note

Do not open the device!

There are no serviceable parts inside the device.

Opening the device will void the warranty.

Note

Cleaning

To clean the device, use a dry or slightly moistened cloth. A note specifies special requirements or actions to be observed.

5   System requirements

5.1   Hardware

❑ Computer with at least:

  ▪ 1 free PCI/PCIe slot

  ▪ 512 MB RAM

  ▪ 4 GB free memory on the hard drive for measurement values

    On the iba website http://www.iba-ag.com, you find suitable industry-type and desktop-type PC systems.

❑ One of the following cards in the PC:

  ▪ ibaFOB-4i or ibaFOB-io

  ▪ ibaFOB-4i-S or ibaFOB-io-S

  ▪ ibaFOB-4i-X, -2i-X, -2io-X or -io-X

  ▪ ibaFOB-4i-D, -2i-D, -2io-D or –io-D

❑ or notebook with ibaCom-PCMCIA-F card

5.2   Software

For data acquisition, recording or process control you'll need one of the following software applications:

❑ ibaPDA

❑ ibaQDR

❑ ibaLogic

6   Mounting and dismounting

6.1   Mounting

1. Locate the DIN rail mounting clip on the rear side of the device. Slowly push down and in so that the bottom part of the mounting clips snaps onto the bottom part of the rail and firmly fixes the device to the DIN rail.

2. If there is a rule to ground the device, connect the device to the ground (grounding screw X29).

3. Connect the 24 V DC power supply to the termination shown on the device. Ensure that the polarity is correct prior to applying power. Then connect the device to the ibaPDA system via a bidirectional FO cable.
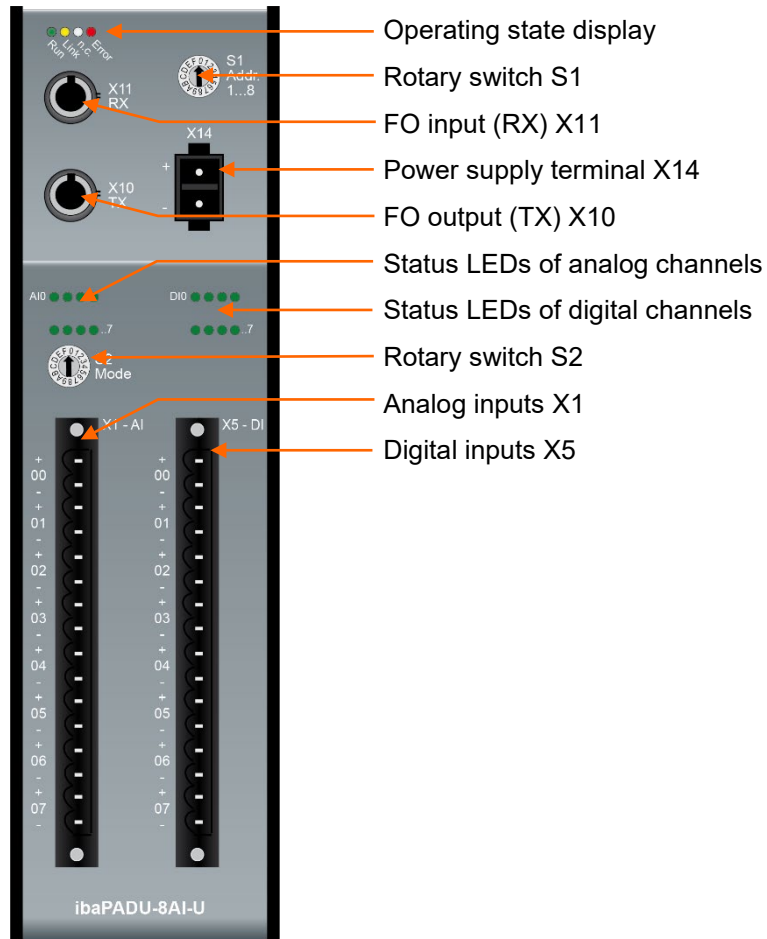
6.2   Dismounting

1. Disconnect all external connections from the device.

2. Grasp the device with one hand firmly on the top side. With your free hand, grasp the bottom of the device and push it lightly down.

3. After that pull the device and lift it up. With this action, the device should free itself from the DIN rail.
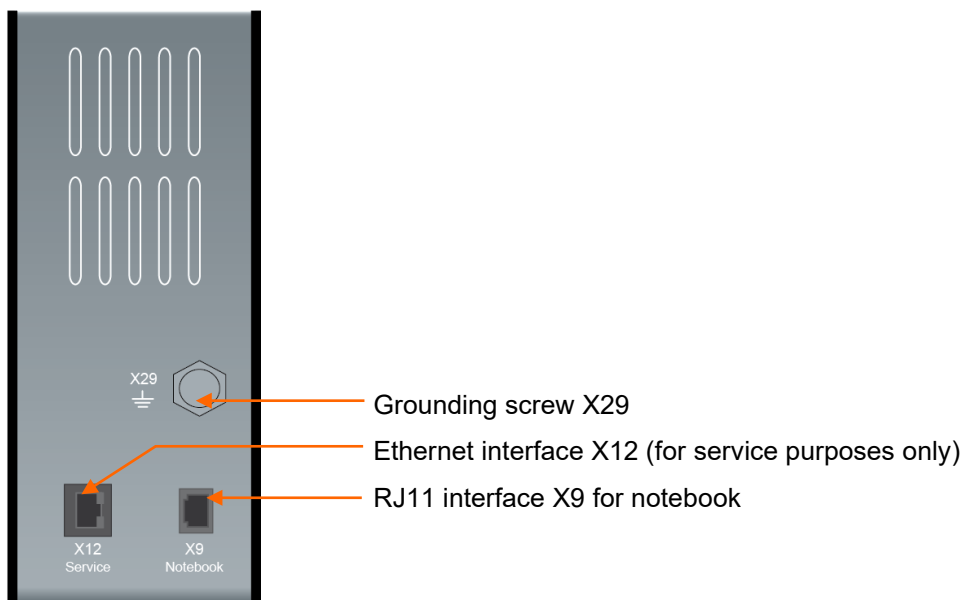
7   Device description

7.1   Device view

7.1.1   Front view

Operating state display

Rotary switch S1

FO input (RX) X11

Power supply terminal X14

FO output (TX) X10

Status LEDs of analog channels

Status LEDs of digital channels

Rotary switch S2

Analog inputs X1

Digital inputs X5

ibaPADU-8AI-U

7.1.2   Bottom view

Grounding screw X29

Ethernet interface X12 (for service purposes only)

RJ11 interface X9 for notebook

7.2   Indicating elements

Operating state (both devices)

LED	Status	Description
Run (green)	Off	No power
	Blinking	Ready for operation
	Blinking fast	Programming mode
	On	Device is booting
Link (yellow)	Off	Rotary switch S1 is set to an invalid address (0, 9…F)
	Blinking	No valid 3Mbit signal at RX
	On	Valid 3Mbit signal at RX
n.c.(white)		without function
Error (red)	Blinking	Software error or Rotary switch S1 is set to an invalid address (0, 9…F)
	On	Hardware error

Status of analog inputs of ibaPADU-8AI-U

LED per channel	Status/meaning		Description (approx. values)		
			Input range ±10 V	Input range ±24 V	Input range ±60 V
AI 0…7	Off	No signal, signal too low	± (0 … 0.1) V	± (0 … 0.3) V	± (0 … 0.6) V
	Green	Within measuring range	± (0.1 … 9) V	± (0.3 …21.6) V	± (0.6 … 54) V
	Yellow	End of measuring range	± (9 … 10) V	± (21.6 … 24) V	± (54 … 60) V
	Red	Out of measuring range	> ± 10 V	> ± 24 V	> ± 60 V

Status of analog inputs of ibaPADU-8AI-I

LED per channel	Status/meaning		Description (approx. values) Input range ±20 mA
AI 0…7	Off	No signal, signal too low	± (0 A … 0.2 mA)
	Green	Within measuring range	± (0.2 mA … 18 mA)
	Yellow	End of measuring range	± (18 mA … 20 mA)
	Red	Out of measuring range	> ± 20 mA

Status of digital inputs (both devices)

LED per channel	Status	Description
DI 0…7	Off	No signal, logical 0
	Green	Signal ok, logical 1

7.3   Connections

7.3.1   Fiber optic connections X10 and X11

❑ X11 (RX): FO input

❑ X10 (TX): FO output

The X10 output has all data of the device itself and the data from all previous devices. Chaining is done when X10 of a device is connected to X11 of the next device. The last output must then be connected to a fiber optic input of the ibaFOB card. Connecting and disconnecting of devices on the fiber optic links is allowed at all times. Interrupting the fiber optic link leads to missing data for the time period of the interruption.

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. 62.5/125 μm, 50/125 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 10.3.

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 chapter "Technical data" 10.1 under "ibaNet interface".

7.3.2   Power supply X14

The device requires an external DC 24 V ±10% power supply (unregulated). The operating voltage should be run through the provided 2-pin Phoenix threaded coupling connector. If desired, you can order DIN rails or plug-in power supply units from iba.

7.3.3   Analog / digital inputs

Connection diagram

It is possible to connect 8 analog input signals and 8 digital input signals, each bipolar and electrical isolated. Each channel is connected by means of two-wire connection. Due to the reverse polarity protection, the measuring signal is indicated logically correct, even if the connection is polarity-reversed.
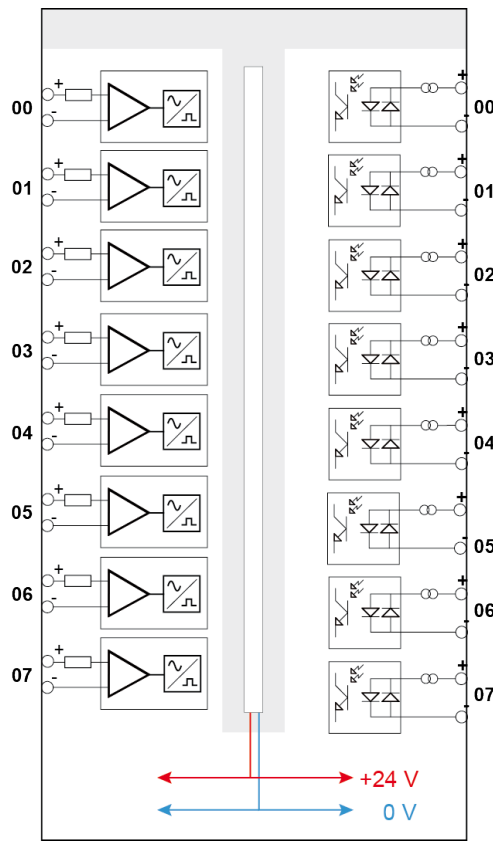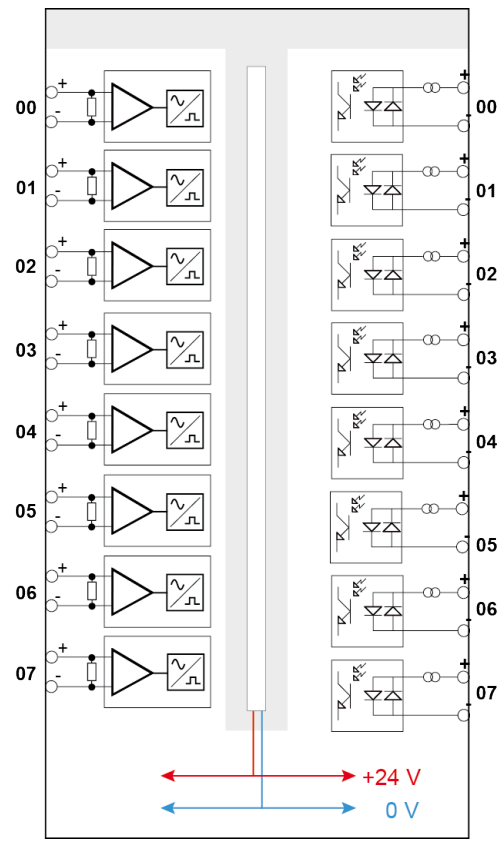
ibaPADU-8AI-U   ibaPADU-8AI-I

Pin assignment

X1 Pin...	Connection	LED	X5 Pin...	Connection	LED
1	Analog input 00 +	AI0	1	Digital input 00 +	DI0
2	Analog input 00 −		2	Digital input 00 −	
3	Analog input 01 +	AI1	3	Digital input 01 +	DI1
4	Analog input 01 −		4	Digital input 01 −	
5	Analog input 02 +	AI2	5	Digital input 02 +	DI2
6	Analog input 02 −		6	Digital input 02 −	
7	Analog input 03 +	AI3	7	Digital input 03 +	DI3
8	Analog input 03 −		8	Digital input 03 −	
9	Analog input 04 +	AI4	9	Digital input 04 +	DI4
10	Analog input 04 −		10	Digital input 04 −	
11	Analog input 05 +	AI5	11	Digital input 05 +	DI5
12	Analog input 05 −		12	Digital input 05 −	
13	Analog input 06 +	AI6	13	Digital input 06 +	DI6
14	Analog input 06 −		14	Digital input 06 −	
15	Analog input 07 +	AI7	15	Digital input 07 +	DI7
16	Analog input 07 −		16	Digital input 07 −	

Filter of analog inputs

For description of the filter types see chapter 7.4.2 "Rotary switch S2".

7.3.4   Grounding screw X29

Proper connection of cable shielding to the device should be ensured. The shield connector (M6 screw) found on the bottom of the device should be connected with any total shield that serves for all sensor cables. Use a M6 cable lug for the connection.

Important note!

Connect shield on one cable side only to avoid ground loops!

Always ground the DIN rail on which the device is installed!

7.3.5   Ethernet interface X12

The Ethernet interface on the bottom of the device is used to load a new firmware version.

The Ethernet interface is set as default to the IP address 192.168.1.1.

Note

Please contact iba regarding loading new firmware. You will get the required files and further information.

Important note

In normal operation mode the Ethernet cable must not be connected.

Procedure for update via FTP connection

1. Connect the computer and the device with a network cable. Computer and device must be in the same network.

2. Assign a static IP address to the interface of the computer from which you want to connect via FTP. The address has to be from this range:
   192.168.1.n with n = 2…254 and the subnet mask 255.255.255.0

3. Establish an FTP connection to the device. You may use an FTP client or the Windows File Explorer. In both cases, the address is "**192.168.1.1**" and the user is "anonymous" without any password.

4. Please note that you have to configure the passive mode in the FTP client. Example Windows File Explorer:
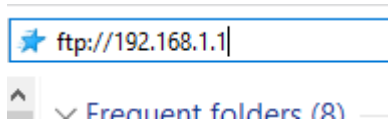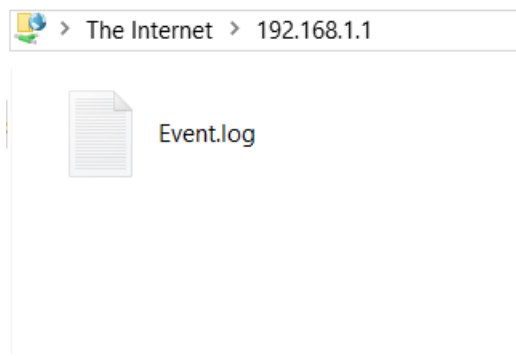
The file "Event.log" is always present by default and contains various device information, such as the current firmware version.

```
[t=8s : Device name       ] ibaPADU-8AI-U
[t=8s : Serial number     ] 999124
[t=8s : Hardware version ] A0
[t=8s : Firmware version ] v01.01.002
[t=9s : signal copy maschine] New configuration for fiber optic
```

5. Rename the update file "padu*_v*.iba" to "padu*_v*.iba.**ready**" and copy it via the FTP connection to the directory on the device.
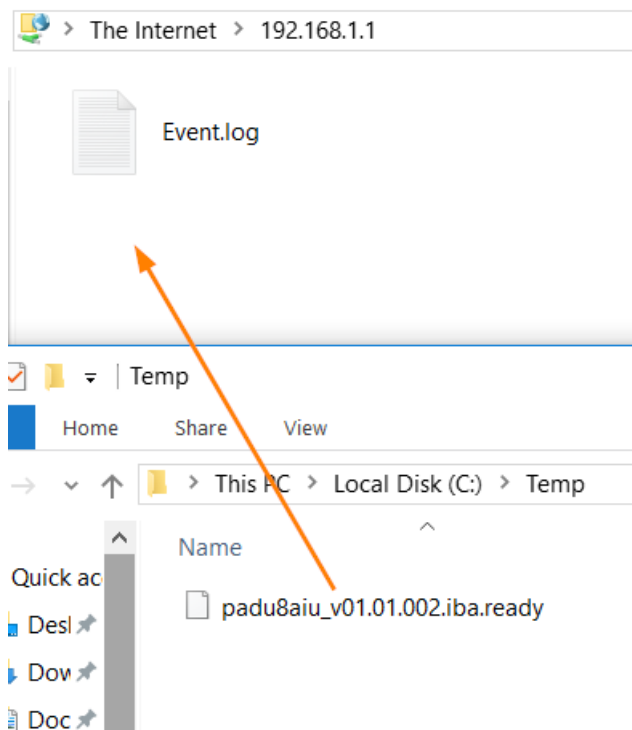
6. When the file is copied, the update is started immediately and the LED L1 of the device starts flashing fast.

7. The device will automatically restart when the update is complete. The FTP client can now be closed.

7.3.6 RJ11 connection X9

A notebook equipped with an ibaCom-PCMCIA-F card can be connected at the RJ11 jack at the bottom of the device.

Thus, it is possible to carry out measurements in parallel at the RJ11 jack without affecting the data transmission on the fiber optic cable.

7.4 Operating elements

7.4.1 Rotary switch S1

S1 is used to set the device address (1 … 8). Each address represents 8 A + 8 D channels.

Important note

The position of the address switch S1 must not be "0, 9…F", since otherwise the link is broken.

7.4.2 Rotary switch S2

7.4.2.1 ibaPADU-8AI-U

S2 is used to set the device mode (different measuring range, filters, input impedance):

Mode (S2)	Measuring range	Filter*	input im-pedance	Replacement for device
0	±10 V	1	100 kΩ	ibaPADU-8
1	±10 V	1, 2	100 kΩ	(new)
2	±10 V	1, 2, 3	100 kΩ	ibaPADU-8-F1
3	±10 V	1	1 MΩ	ibaPADU-8-HI
4	±10 V	1, 2	1 MΩ	(new)
5	±10 V	1, 2, 3	1 MΩ	ibaPADU-8-HI-F1
6	±24 V	1	100 kΩ	(new)
7	±24 V	1, 2	100 kΩ	(new)
8	±24 V	1	1 MΩ	ibaPADU-8-HI-25
9	±24 V	1, 2	1 MΩ	(new)
A	±60 V	1	100 kΩ	ibaPADU-8-60
B	±60 V	1, 2	100 kΩ	(new)
C	±60 V	1	1 MΩ	ibaPADU-8-HI-60
D	±60 V	1, 2	1 MΩ	(new)
E, F	undefined			

*Filter: 1 = R/C low-pass 4 kHz, 2 = Antialiasing digital 330 Hz, 3 = Butterworth, digital 250 Hz

Filter type	Order	Cutoff frequency
R/C low-pass (1)		4 kHz
Antialiasing digital (2)	8th	330 Hz
Butterworth, digital (3)	2nd	250 Hz

i **Note**

The 330 Hz cutoff frequency of the digital Antialiasing filter is optimized for the sampling rate 1 ms.

Please note, that despite the digital Antialiasing filter Aliasing effects may occur with sampling rates > 1 ms.

7.4.2.2   ibaPADU-8AI-I

The rotary switch S2 of the ibaPADU-8AI-I device is without function, as the device provides only a single device mode.

Filter type	Order	Cutoff frquency
R/C low-pass		4 kHz

8 System integration

8.1 Homogeneous ibaPADU-8AI chain

Up to 8 devices can be connected in a line topology. The outputs of the devices are to be connected with the input of the following devices until all devices are interconnected and the last device is connected to the ibaFOB card. All addresses (1...8) within a chain must be unique. If 2 devices carry the same address the subsequent device in the fiber optic link overwrites the content of the previous device.
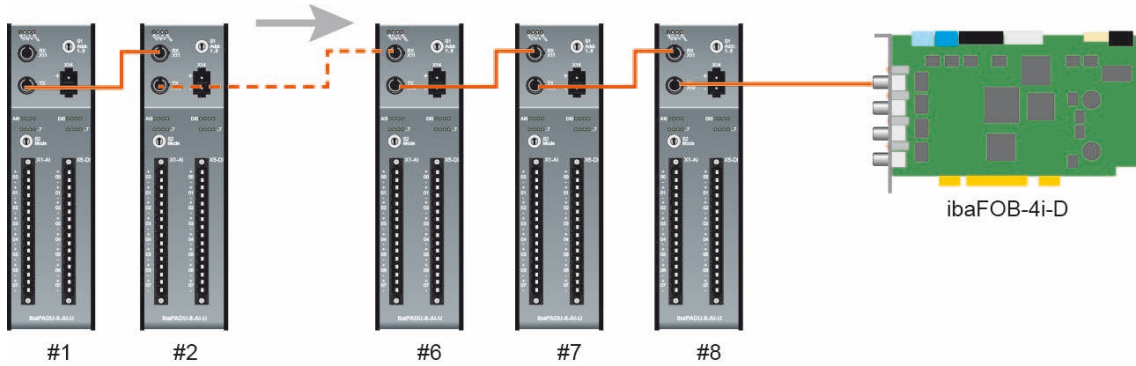

Principle of the data packages in a FOB telegram

Each box (address) contains 8 analog + 8 digital signals. The device address determines where the data are placed in the telegram. Therefore, the position of a device in the chain is independent of the address setting.
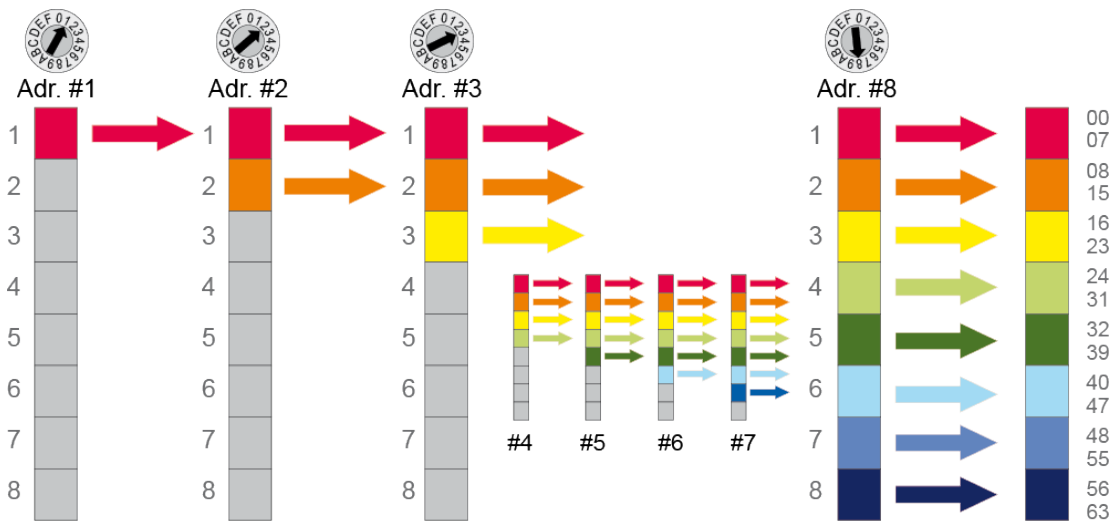
8.2   Ring topology with ibaLogic-V3 (Asynchronous mode)

When used as replacement for previous devices ibaPADU-8AI supports also the function described here. The sampling rate may be changed for the devices within one ring topology between 1.0 ms and 9.9 ms in steps of 100 μs. This function can only be used with ibaLogic-V3 and with older ibaFOB cards (except ibaFOB-D).
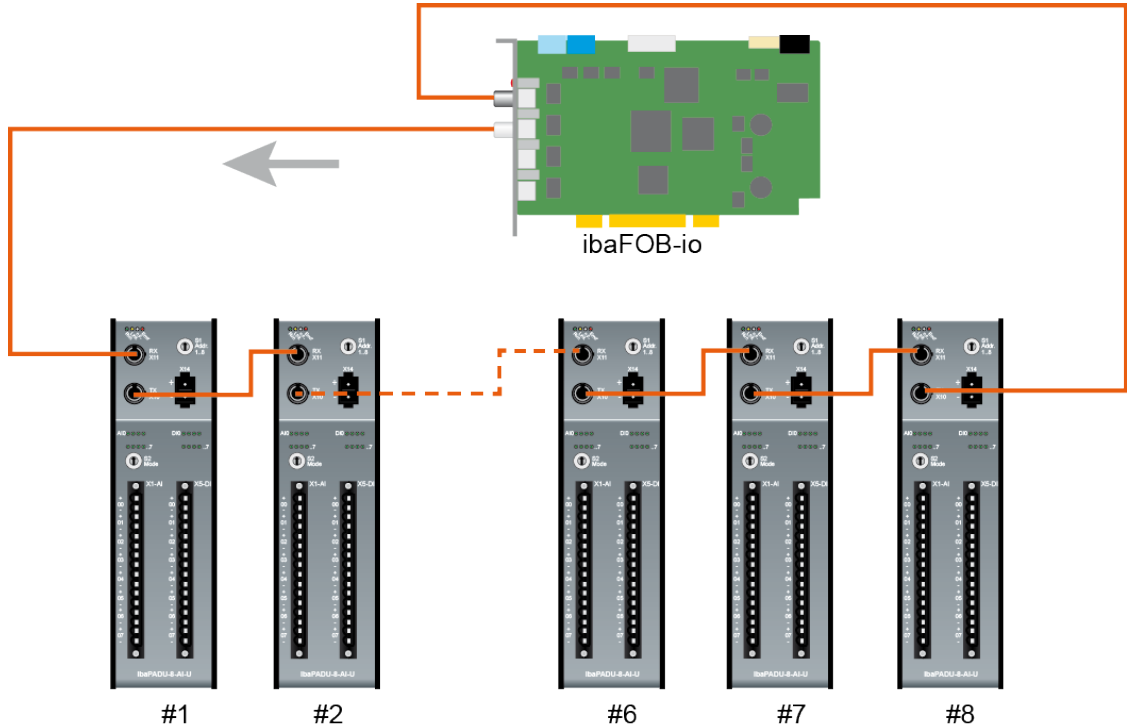
Ring topology for external synchronization of ibaPADU-8AI devices

9   Configuration

The description of the device configuration is based on ibaPDA.

9.1   Configuration in ibaPDA

Set the desired device mode with the rotary switch S2 before initial operation, see also chapter 7.4.2 "Rotary switch S2".

The familiar program interface of the previous devices is retained for ibaPADU-8AI.

9.1.1   First steps

1. Start the ibaPDA client and open the I/O Manager.

2. Choose the correct ibaFOB-D input card in the signal tree (on the left hand side) and mark the link ibaPADU-8AI is connected to. Right-click on the link and choose "Auto-detect".
Note: The autodetect function is not possible with ibaPADU-8AI-I. Therefore the device must manually be added, continue with step 3.
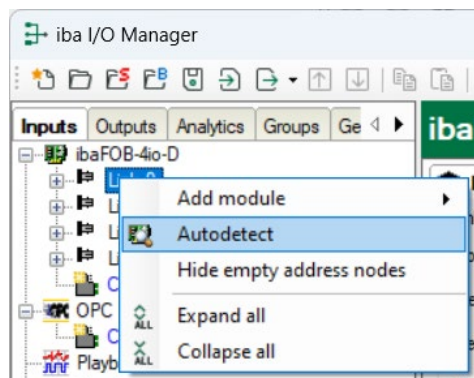

ibaPDA recognizes the device automatically. The device will be listed in the signal tree.
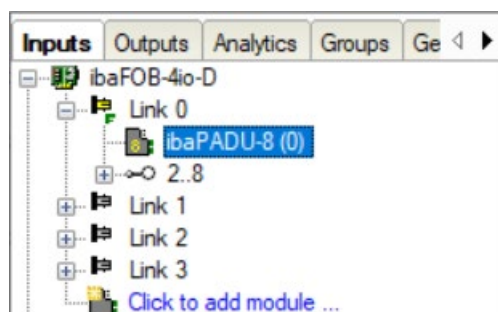
	Note
	If there are several devices in a chain, only the device which is furthest from the ibaPDA system will be detected with the "Autodetect" function. This is independent from the device address set at the device. The other devices must manually be added.

3. Alternatively you can add the device manually. Right-click on the link of the ibaFOB-D card the device should be connected to. Select "Add module…" and then:
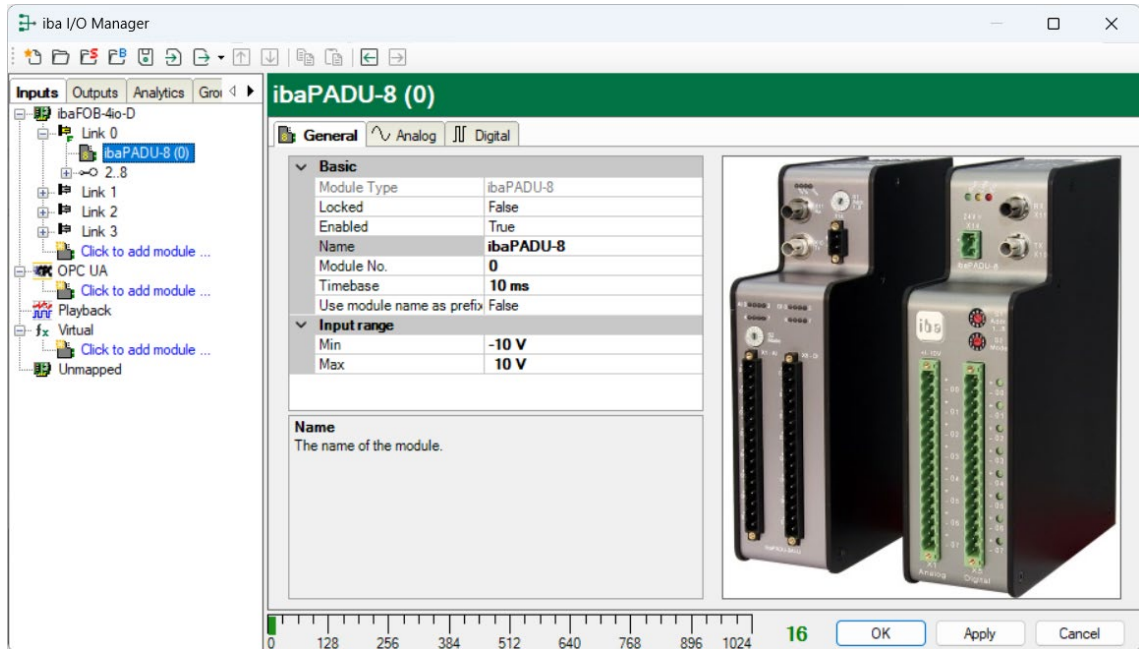- "Padu 8" for ibaPADU-8AI-U
- "Padu 8-I" for ibaPADU-8AI-I.
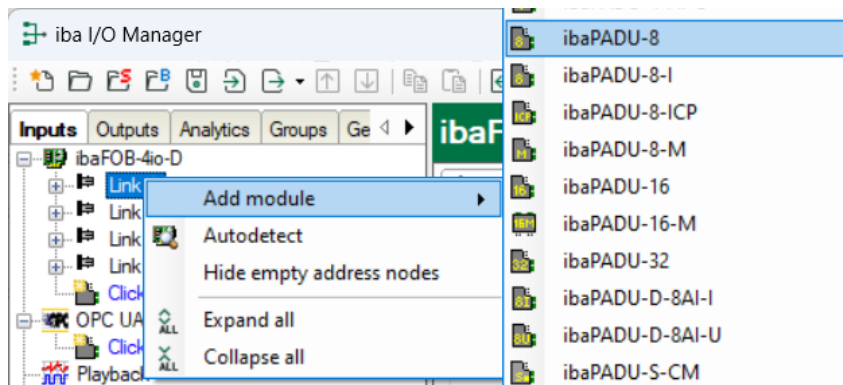
The device will be listed in the signal tree.
Hold down the mouse button and drag the device to the address (link 1 – 8 below the device), the device address switch S1 is set to.

4. Make your settings in the „Padu 8" or "Padu 8-I" module of the I/O Manager.

9.1.2   Padu 8/-I – „General" tab

Basic

❑ Module type (information only)
Indicates the type of the current module

❑ Locked
A module can be locked to avoid unintentional or unauthorized changing of the module settings.

❑ Enabled
Disabled modules are excluded from signal acquisition.

❑ Name
The plain text name should be entered here as the module designation.

❑ Module No.
Internal reference number of the module. This number determines the order of the modules in the signal tree of ibaPDA client and ibaAnalyzer.

❑ Timebase
Timebase that is used for the device, given in ms. The default setting is 1 ms.

❑ Use name as prefix
Puts the module name in front of the signal names.

Input range

❑ Min/Max
The high and low end of the input range is displayed here and may be adjusted if needed (e. g. ibaPADU-8AI-U with input level 24 V or 60 V). The input range depends on the type of analog inputs (voltage or current) and the adjusted device mode (see chapter 7.4.2).

9.1.3   Padu 8/-I – "Analog" tab

❑ Name

Assign a meaningful name to each signal and you can enter additionally two comments when clicking on the ✏ symbol in the field "Name".

❑ Unit

Here, you can enter the physical unit of the analog value, default value is "V".

❑ Min

You can define a lower limit for the measuring range. The analog normalized value of -10 V is assigned to a physical value, e. g. -100 V.

❑ Max

Here, you can define an upper limit for the measuring range. The analog normalized value of +10 V is assigned to a physical value, e. g. +100 V.

❑ Active

The signal will be measured when active.

❑ Actual

Displays the actual value of the signal (only available when the measurement is already running with the specified configuration).

Further columns can be shown or hidden by using the context menu (right mouse click in the table header).

9.1.4 Padu 8 – „Digital" tab

❑ Name, Active, Actual, see "Analog" tab.

10   Technical Data

10.1   Main data

Short description		
Name	ibaPADU-8AI-U	ibaPADU-8AI-I
Description	Input module with 8 digital and 8 analog voltage inputs	Input module with 8 digital voltage inputs and 8 analog current inputs
Order no.	10.100000	10.100010
Analog inputs		
Number	8	
Design	Galvanically isolated, single ended	
Resolution	16 bit	
Filter		
permanent	R/C low-pass 4 kHz	R/C low-pass 4 kHz
selectable by rotary switch	Digital Antialiasing Tschebyscheff 8th order 330 Hz	
	Digital low-pass Butterworth 2nd order 250 Hz	
Input signal range	±10 V; ±24 V; ±60 V[1] (max. for all ranges: ±60V)	±20 mA (max.)
Input impedance	100 kΩ / 1 MΩ[1]	50 Ω
Sampling rate	Synchronous with ibaNet sampling rate	
Accuracy	< 0.1% of total measuring range	
Electrical isolation		
Channel-channel	AC 1.5 kV	
Channel-housing/power supply	AC 1.5 kV	
Connector type	1 x 16-pin multi-pin connector; clamp-type terminal (0.2 mm^2 to 2.5 mm^2), screw connection, included in delivery	
Digital inputs		
Number	8	
Design	Galvanically isolated, single ended, protected against reverse polarity	
Input signal	24 V DC	
Max. input voltage	±60 V permanent	
Signal level		
log. 0	> -6 V; < +6 V[2]	
log. 1	< -10 V; > +10 V	
Input current	1 mA, constant	
Sampling rate	Synchronous with ibaNet sampling rate	

---

[1] Selectable by rotary switch
[2] when used as replacement for previous devices, please note: signal level log. 0 before: > -9 V; < +9 ;

Connector type	1 x 16-pin multi-pin connector; clamp-type terminal (0.2 mm^2 to 2.5 mm^2), screw connection, included in delivery

ibaNet interface

Number	1
Design	Fiber optic cable
ibaNet protocol	3Mbit
Data transmission rate	3.3 Mbit/s
Sampling rate	1 kHz
Connector type	2 ST connectors for RX and TX; iba recommends the use of fiber optic cables of type 50/125 µm or 62.5/125 µm; For information on cable length, see chap. 10.3.
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[3]	100/140 µm FO cable	-24 dBm to -10 dBm
Temperature range	-40 °F to 185 °F (-40 °C to 85 °C)	

Power supply

Power supply	24 V DC (±10%)
Power consumption max.	8 W
Connector type	1 x 2-pin multi-pin connector; clamp-type terminal (0.2 mm^2 to 2.5 mm^2), screw connection, included in delivery

Further interfaces, operating and indicating elements

Ethernet	RJ45 socket (for service purposes only)
Notebook	RJ11 socket (for ibaCom-PCMCIA-F card only)
Indicators (LEDs)	4 LEDs for device status 8 LEDs for status of analog inputs 8 LEDs for status of digital inputs
Rotary switches	
ibaPADU-8AI-U	2, address setting, device mode
ibaPADU-8AI-I	2, address setting, without function

---

[3] Data for other FO cable diameters not specified

Operating and environmental conditions

Temperature ranges	
Operation	32 °F to 122 °F (0 °C to 50 °C)
Storage/transport	-13 °F to 149 °F (-25 °C to 65 °C)
Mounting	DIN rail according to EN50022 (TS 35, DIN Rail 35)
Cooling	Passive
Humidity class	F, no condensation
Protection class	IP20
Standards	EMC (EN 61326-1:2006) FCC part 15 class A
Mechanical stability	DIN IEC 60068-2-6 (when installed correctly)
Dimensions (width x height x depth)	2.1 in x 7.9 in x 5.6 in (53 mm x 200 mm x 141 mm)
Weight / incl. box and documentation	1.54 lbs (0.7 kg) / 2.42 lbs (1.1 kg)

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

Unique Identifier: 10.100000   ibaPADU-8AI-U
                          10.100010   ibaPADU-8AI-I

**Responsible Party - U.S. Contact Information**
iba America, LLC
370 Winkler Drive, Suite C
Alpharetta, Georgia
30004

(770) 886-2318-102
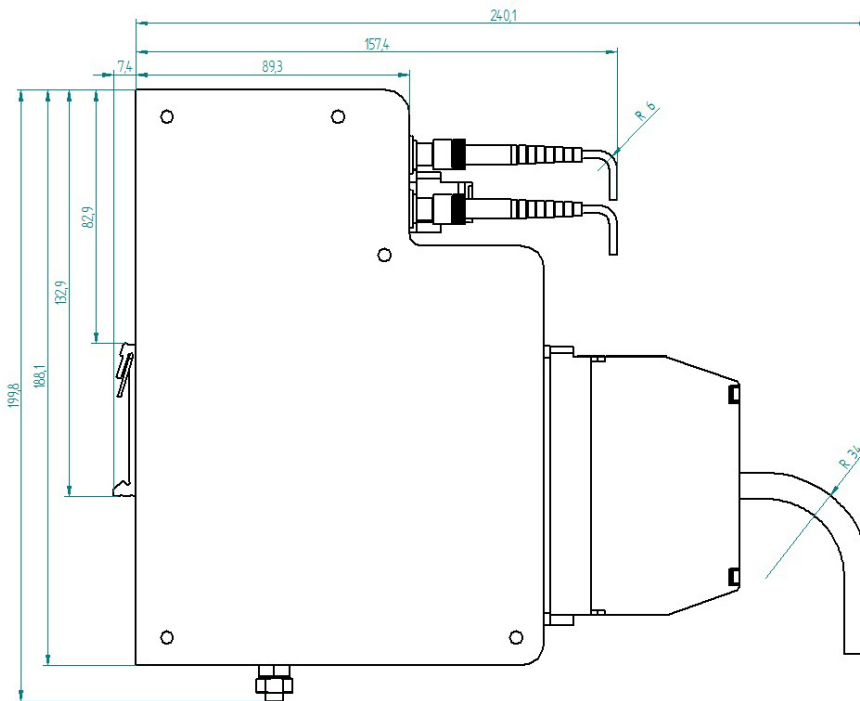www.iba-america.com

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.

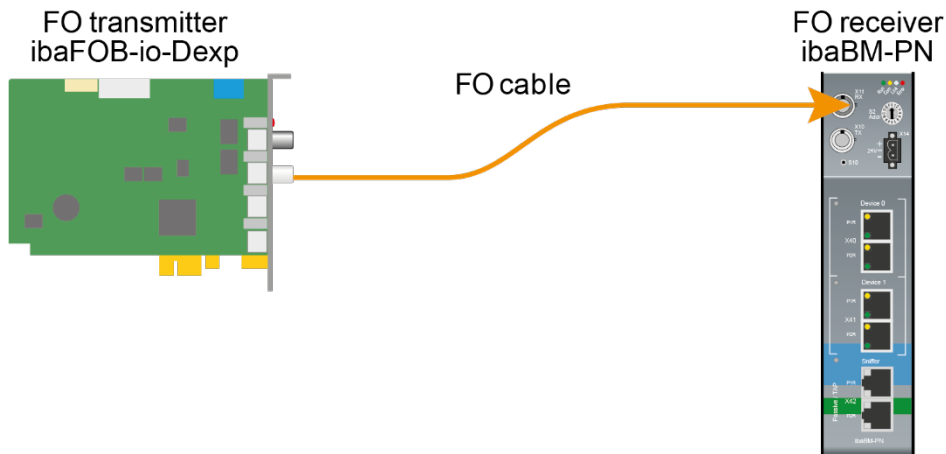## 10.2   Dimension sheet
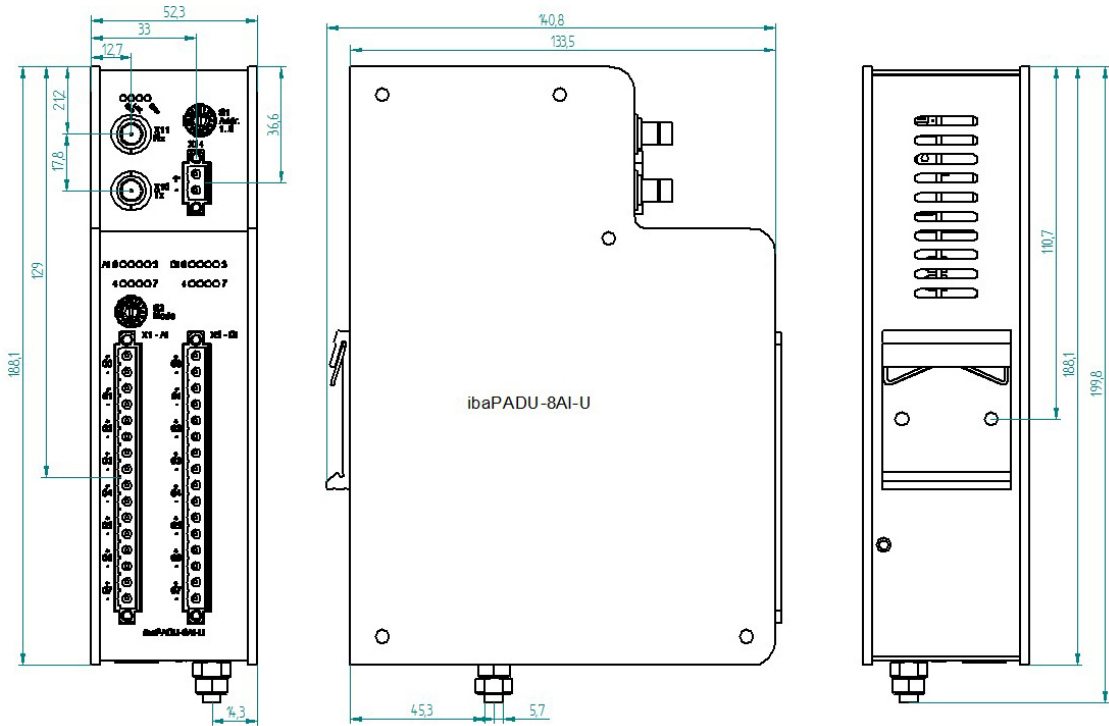
(Dimensions in mm)

Dimension sheet with cables (dimensions given in mm)

10.3   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

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

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

Calculation for the example ibaFOB-io-Dexp -> ibaBM-PN in the worst case:
$$A_{Budget} = |-30\ dBm - (-16\ dBm)| = 14dB$$

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

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 contact

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

Headquarters

iba AG

Koenigswarterstrasse 44
D-90762 Fuerth
Germany

Phone.:   +49 911 97282-0
Fax: +49 911 97282-33
E-mail: iba@iba-ag.com

Mailing address

iba AG
Postbox 1828
D-90708 Fuerth
Germany

Delivery address

iba AG
Gebhardtstrasse 10
D-90762 Fuerth
Germany

Regional and Worldwide

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

www.iba-ag.com.