



ibaPDA-Interface-IEC61850-9-2

Data interface for sampled values streams according to IEC 61850-9-2

Manual
Issue 1.0

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

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1 About this Manual

This document describes the function and application of the software interface

ibaPDA-Interface-IEC61850-9-2

This documentation is a supplement to the *ibaPDA* manual. Information about all the other characteristics and functions of *ibaPDA* can be found in the *ibaPDA* manual or in the online help.

1.1 Target group and previous knowledge

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

This documentation in particular addresses persons who are concerned with the configuration, test, commissioning or maintenance of IEC 61850-compliant devices in the area of substation automation. For the handling of *ibaPDA-Interface-IEC61850-9-2* the following basic knowledge is required and/or useful

- Windows operating system
- Basic knowledge of *ibaPDA*
- Knowledge of configuration and operation of the relevant target system/device

1.2 Notations

In this manual, the following notations are used:

Action	Notation
Menu command	Menu <i>Logic diagram</i>
Calling the menu command	<i>Step 1 – Step 2 – Step 3 – Step x</i> Example: Select the menu <i>Logic diagram - Add - New function block</i> .
Keys	<Key name> Example: <Alt>; <F1>
Press the keys simultaneously	<Key name> + <Key name> Example: <Alt> + <Ctrl>
Buttons	<Key name> Example: <OK>; <Cancel>
File names, paths	"Filename", "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:

- Observe the specified measures.

Warning!



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

- Observe the specified measures.

Caution!



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

- Observe the specified measures

Note



A note specifies special requirements or actions to be observed.

Tip



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

Other documentation



Reference to additional documentation or further reading.

2 System requirements

The following system requirements are necessary for the use of the IEC 61850-9-2 data interface:

- *ibaPDA* v7.1.0 or higher
- License for *ibaPDA-Interface-IEC61850-9-2*
- For recording more than 2 streams, you will need additional one-step-up-Interface-IEC61850-9-2 licenses for each additional 2 streams.

For further requirements for the used computer hardware and the supported operating systems, please refer to the *ibaPDA* documentation.

License information

Order no.	Product name	Description
31.001400	ibaPDA-Interface-IEC61850-9-2	Extension license for an ibaPDA system for an IEC61850-9-2 interface Number of streams: 2
31.101400	one-step-up-Interface-IEC61850-9-2	Extension license for an existing interface ibaPDA-Interface-IEC61850-9-2 for another 2 streams, maximum of 3 extension licenses permissible

Table 1: Available IEC 61850-9-2 interface licenses

3 IEC 61850-9-2

3.1 General information

The standard IEC 61850 of the International Electrotechnical Commission (IEC) describes a general transmission protocol for protection and control technology in electrical switchgear of medium and high-voltage technology (substation automation). Part 9-2 describes the so-called sampled values.

These are currents and voltages that are measured in real time and sent via Ethernet frames. The acquisition of up to two streams is supported with one interface license. In total, a maximum of 4 licenses (=8 streams) can be used.

3.2 System topologies

Sampled values streams are sent by IEC61850 devices as multicast ISO telegrams. *ibaPDA* can receive these via the standard Ethernet interfaces of the computer.

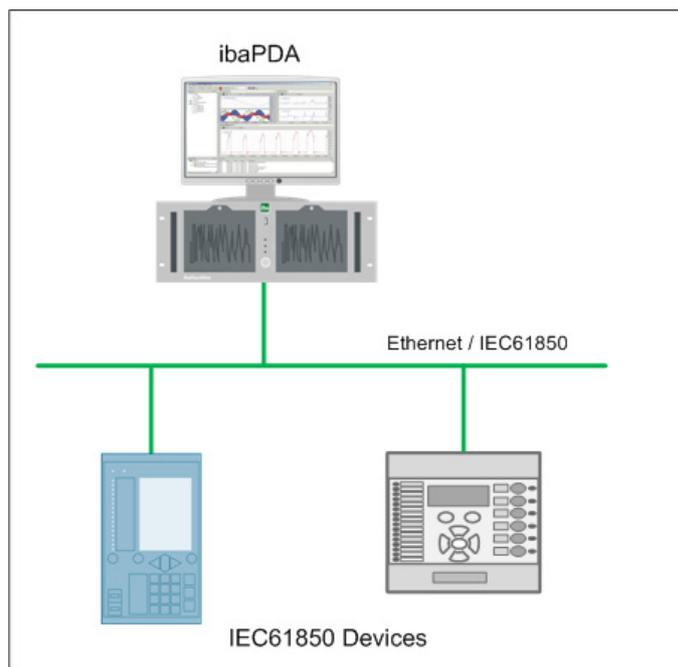


Fig. 1: Example topology

Note



It is recommended carrying out the communication on a separate network segment to exclude a mutual influence by other network components.

3.3 Configuration and engineering ibaPDA

Open the I/O Manager, e.g., from the toolbar .

If all system requirements are met (see chapter [System requirements](#), page 6) the interface “IEC 61850-9-2” is displayed in the signal tree.

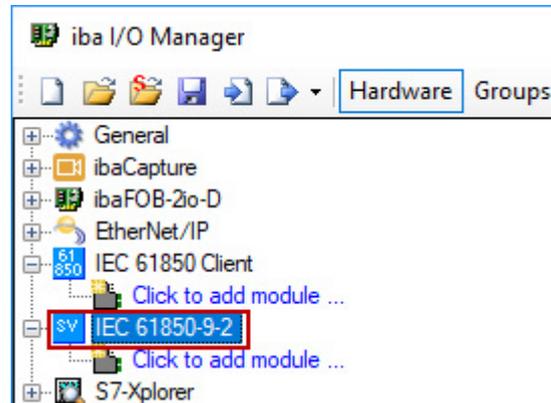


Fig. 2: Interface in the I/O Manager

3.3.1 Interface settings

The interface IEC 61850-9-2 has the following functions and configuration options:

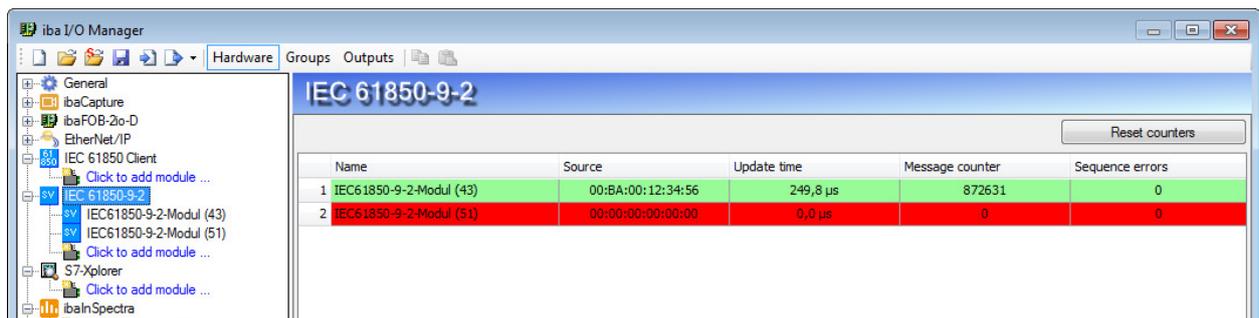


Fig. 3: General interface settings

Connection table

The table shows different diagnostic values of the individual connections during data acquisition. Click on the <Reset counters> button to reset the update time, the message counter and the sequence errors to zero.

The message counter is a continuous counter that is incremented by one with each received message. A message can contain multiple samples. The update time shows the measured time between the samples. Sequence errors indicate that no consecutive sequence counter was detected in consecutive received telegrams.

The diagnostic data from this connection table can also be acquired via a diagnostic module. Each diagnostic module can be coupled with a sampled values stream via the *Target module* property. See chapter [Diagnostic modules](#), page 16.

3.3.2 Add module

One module is required for every sampled values stream. You can also add one or more diagnostic modules. For more information about the diagnostic modules, see chapter [Diagnostic modules](#), page 16.

Add a module by clicking below the interface. Select the module type *IEC61850-9-2 module* and click <OK>.

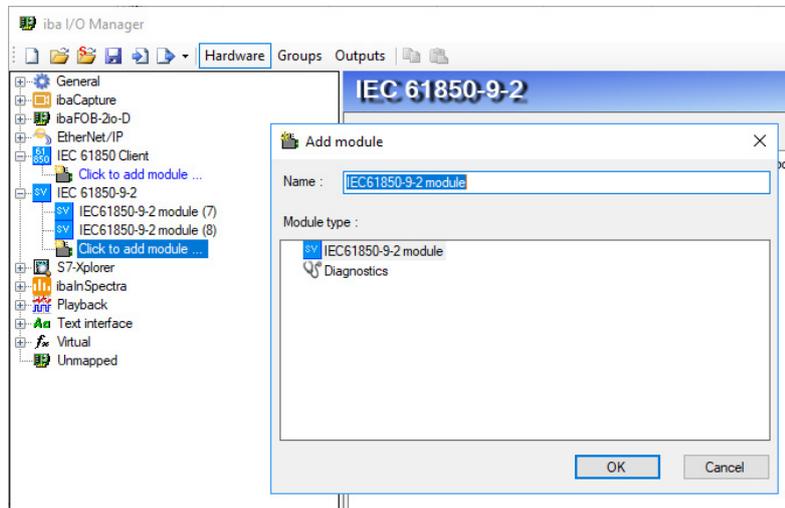


Fig. 4: Add module

3.3.3 General module settings

All modules have the following common settings:

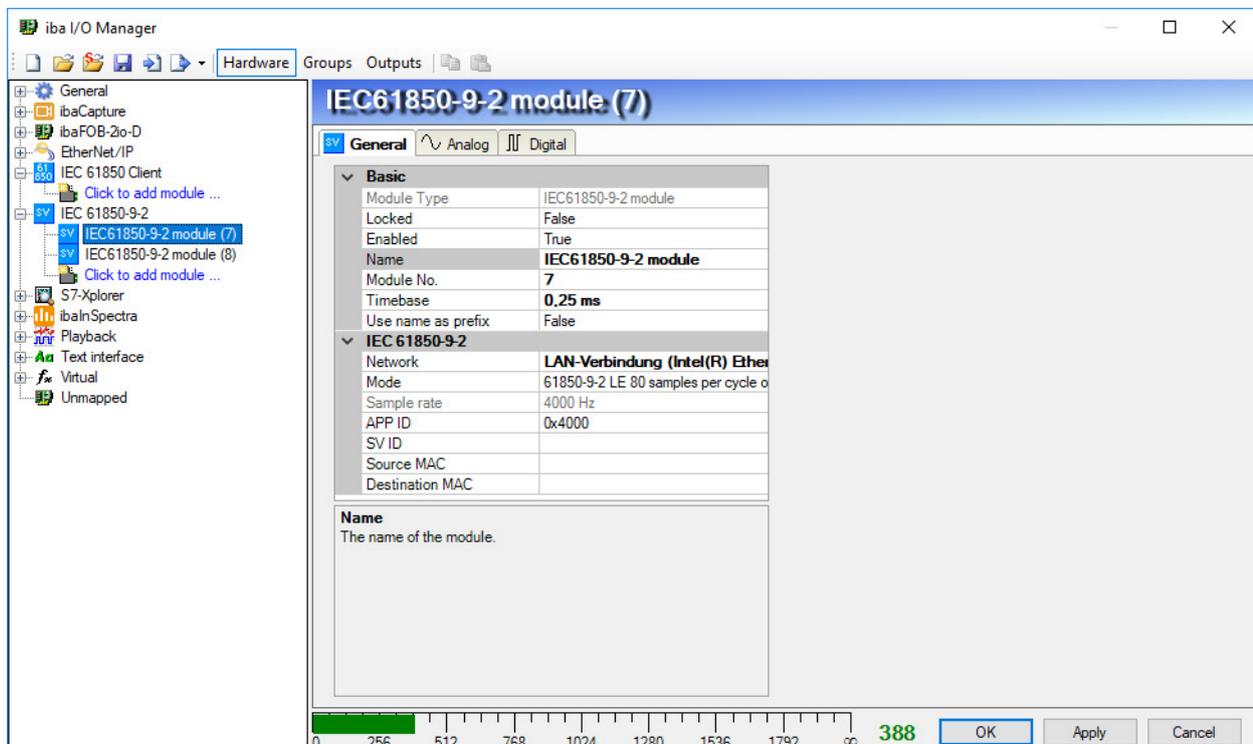


Fig. 5: General settings of an IEC61850-9-2 module

Basic settings

Module Type (information only)

Indicates the type of the current module.

Locked

A module can be locked in order to prevent change of module settings by accident or unauthorized users.

Enabled

Disabled modules are excluded from the 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

All signals of the module will be sampled on this timebase.

Use name as prefix

Puts the module name in front of the signal names.

Note



The sampled values streams are always resampled with the configured timebase here. Even if the timebase matches the nominal sample time, there are occasionally double or missing samples. This is due to the fact that the sample clock in *ibaPDA* is not 100% the same as the sample clock in the IEC 61850-9-2 device.

IEC 61850-9-2

Network

Select the network card that should be used to receive the IEC 61850-9-2 stream.

Mode

Select the mode for the sampled values. You can use one of the pre-defined standards or configure your own sample rate and signals via the “Custom” setting. The selected mode must correspond to the mode in which the IEC61850-9-2 device sends data. These standard modes are available:

- 61850-9-2 LE 80 samples per cycle on 50Hz
- 61850-9-2 LE 80 samples per cycle on 60Hz
- 61850-9-2 LE 256 samples per cycle on 50Hz
- 61850-9-2 LE 256 samples per cycle on 60Hz
- 61869-9 4800 Hz
- 61869-9 14400 Hz

The sample rate can be set in the “Custom” mode. You can change the number of signals and configure their offset and data types.

Sample rate

Acquisition rate of sampled values. If standard modes were selected, the sample rate is automatically configured and only shown here. In “Custom” mode the sample rate can be set here.

APP ID

Application identifier of the sampled values stream. You must enter this to filter the correct sampled values stream. The APP ID is a 16-bit integer that is sent in every message. The input must be in hexadecimal form. The default value is 0x4000.

SV ID

Identifier for sampled values. The SV identifier is a string with a maximum of 35 characters that is sent in every message. This ID can be used to filter the correct sampled values stream. Leave the field empty to disable the SV ID filter.

Source MAC

The MAC address of the source. This address can be used to filter the correct sampled values stream. Leave the field empty to disable the source MAC address filter.

Destination MAC

The MAC address of the destination. This address can be used to filter the correct sampled values stream. Leave the field empty to disable the destination MAC address filter.

3.3.4 Signal configuration

The data consists of 4 currents and 4 voltages in all standard modes (*Mode* setting in the *General* tab). Every current and every voltage is characterized by a quality value as well. This quality value is automatically decoded by *ibaPDA* in various analog and digital signals.

The signals are already pre-defined in the *Analog* and *Digital* tabs. The signals can be individually enabled or disabled in the *Active* column for acquisition in *ibaPDA*.

Note

Observe the maximum signal number referring to your license.

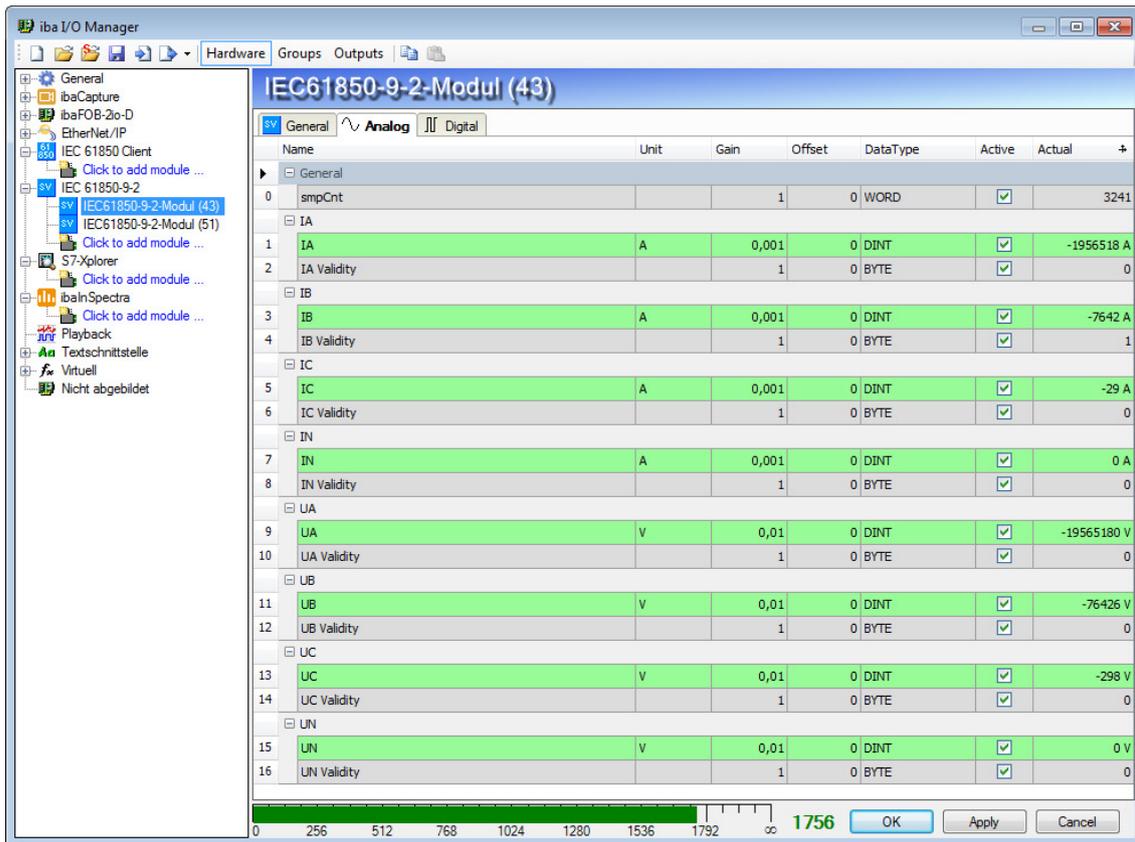


Fig. 6: Signal table Analog

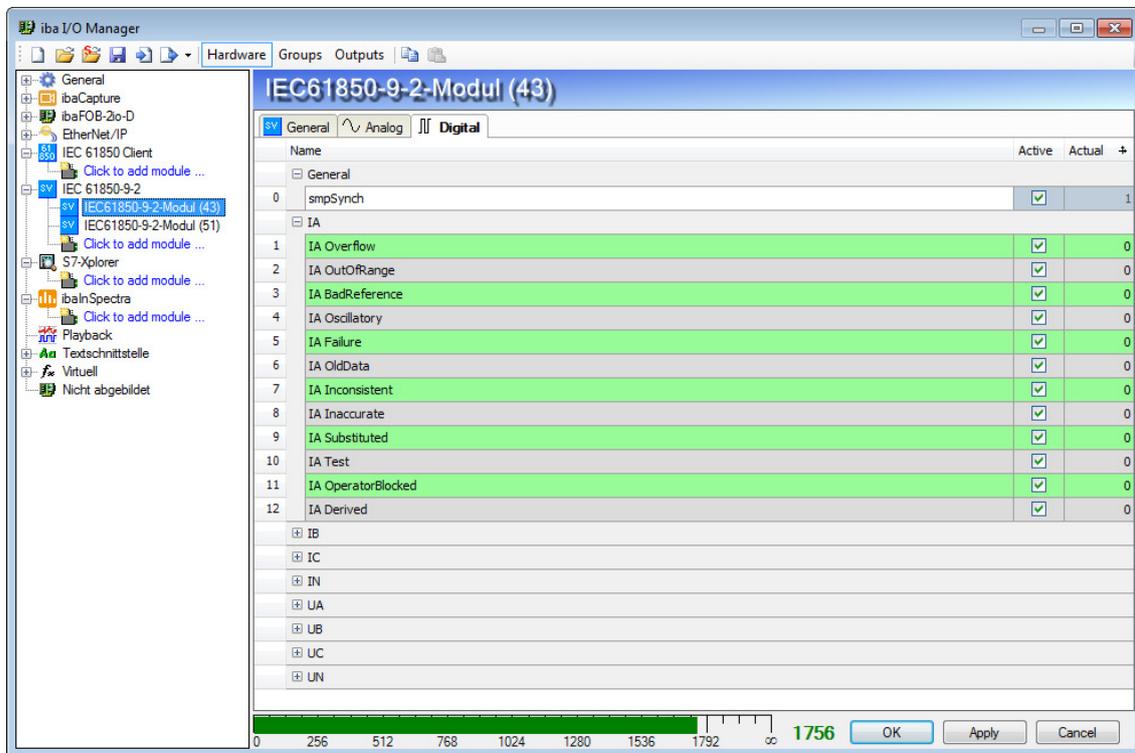


Fig. 7: Signal table Digital

4 Diagnostics

4.1 License

If the "IEC 61850-9-2" interface is not displayed in the signal tree, you can either check in *ibaPDA* under *General - Settings - License* in the I/O Manager or in the *ibaPDA* service status application to see whether your license "Interface IEC 61850-9-2" has been properly recognized. The number of licensed streams is indicated in brackets.

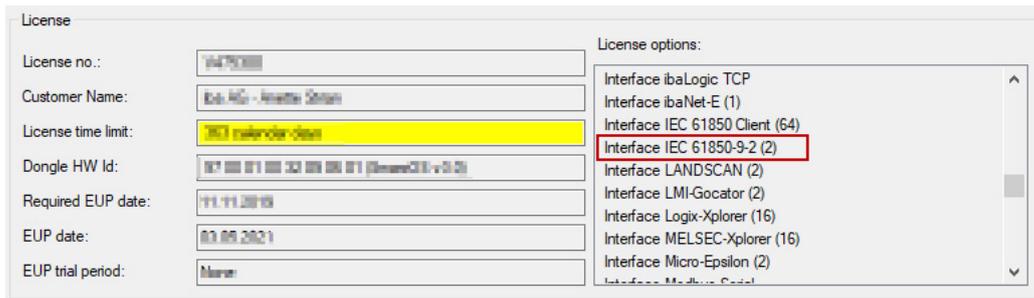


Fig. 8: License display in the ibaPDA I/O Manager

4.2 Connection diagnostics with PING

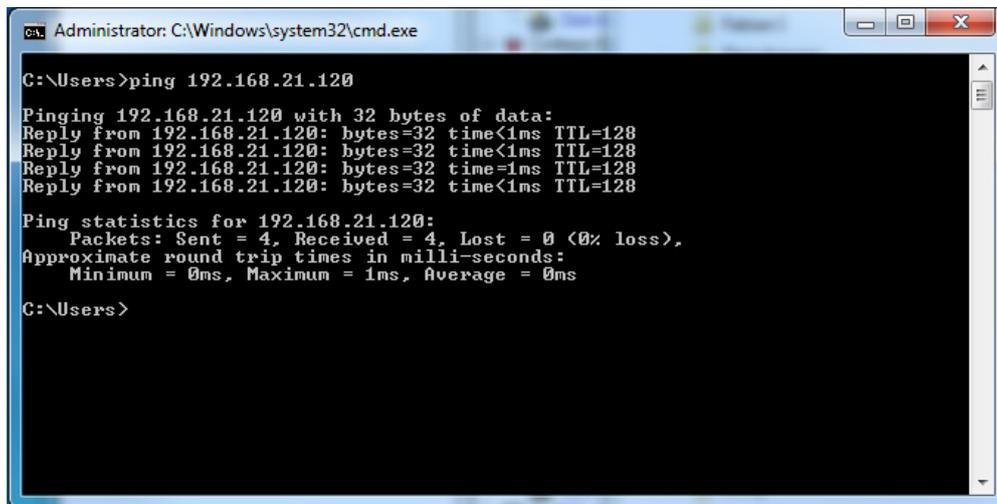
PING is a system command with which you can check if a certain communication partner can be reached in an IP network.

Open a Windows command prompt.



Enter the command “ping” followed by the IP address of the communication partner and press <ENTER>.

With an existing connection you receive several replies.

A screenshot of a Windows command prompt window titled 'Administrator: C:\Windows\system32\cmd.exe'. The prompt shows the command 'ping 192.168.21.120' and its output. The output indicates that the ping was successful, with four replies received from 192.168.21.120, each with 32 bytes of data, a time of less than 1ms, and a TTL of 128. Ping statistics show 4 packets sent, 4 received, and 0% loss.

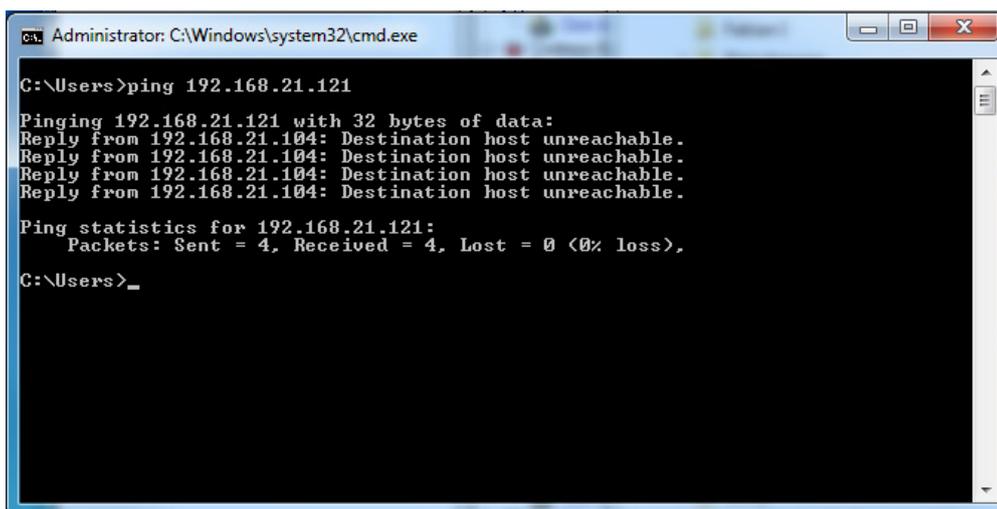
```
Administrator: C:\Windows\system32\cmd.exe
C:\Users>ping 192.168.21.120
Pinging 192.168.21.120 with 32 bytes of data:
Reply from 192.168.21.120: bytes=32 time<1ms TTL=128
Reply from 192.168.21.120: bytes=32 time<1ms TTL=128
Reply from 192.168.21.120: bytes=32 time=1ms TTL=128
Reply from 192.168.21.120: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.21.120:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\Users>
```

Fig. 9: PING successful

With no existing connection you receive error messages.

A screenshot of a Windows command prompt window titled 'Administrator: C:\Windows\system32\cmd.exe'. The prompt shows the command 'ping 192.168.21.121' and its output. The output indicates that the ping was unsuccessful, with four replies received from 192.168.21.104, each with the message 'Destination host unreachable'. Ping statistics show 4 packets sent, 4 received, and 0% loss.

```
Administrator: C:\Windows\system32\cmd.exe
C:\Users>ping 192.168.21.121
Pinging 192.168.21.121 with 32 bytes of data:
Reply from 192.168.21.104: Destination host unreachable.

Ping statistics for 192.168.21.121:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

C:\Users>_
```

Fig. 10: PING unsuccessful

4.3 Connection table

All Ethernet-based interfaces have a table available in the I/O Manager that shows the status of each connection. Each row represents one connection.

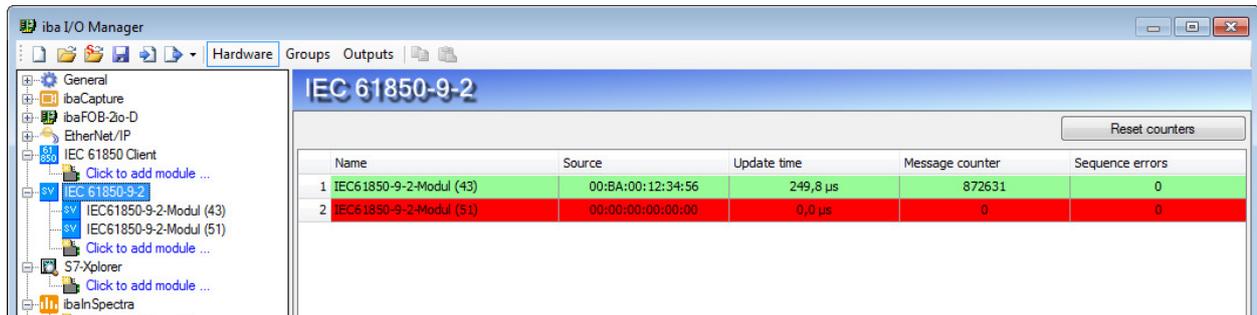


Fig. 11: Connection table IEC61850-9-2 streams

The status of a sampled values stream is shown line-by-line in the connection overview.

The name of the associated module is shown in the *Name* column. *Source* is the MAC address of the sending IEC61850 device. The *Update time* shows the time between individual samples. The *Message counter* specifies the number of messages received. A message may contain several samples, depending on the mode.

The *Sequence errors* counter shows in how many consecutive received messages no consecutive sequence counter was detected.

Click the <Reset counter> button to reset the diagnostic data shown in the connection table.

Additional information is provided by the background color of the table rows:

Color	Meaning
Green	Messages are being received.
Red	No messages are being received.

Table 2: Color code for background colors of the connection table

4.4 Diagnostic modules

Diagnostic modules are available for most Ethernet based interfaces and Xplorer interfaces. Using a diagnostic module, information from the diagnostic displays (e. g. diagnostic tabs and connection tables of an interface) can be acquired as signals.

A diagnostic module is always assigned to a data acquisition module of the same interface and supplies its connection information. By using a diagnostic module you can record and analyze the diagnostic information continuously in the *ibaPDA* system.

Diagnostic modules do not consume any license connections, since they do not establish their own connection, but refer to another module.

Example for the use of diagnostic modules:

- A notification can be generated, whenever the error counter of a communication connection exceeds a certain value or the connection gets lost.
- In case of a disturbance, the current response times in the telegram traffic may be documented in an incident report.
- The connection status can be visualized in *ibaQPanel*.
- You can forward diagnostic information via the SNMP server integrated in *ibaPDA* or via OPC DA/UA server to superordinate monitoring systems like network management tools.

In case the diagnostic module is available for an interface, a "Diagnostics" module type is shown in the "Add module" dialog.

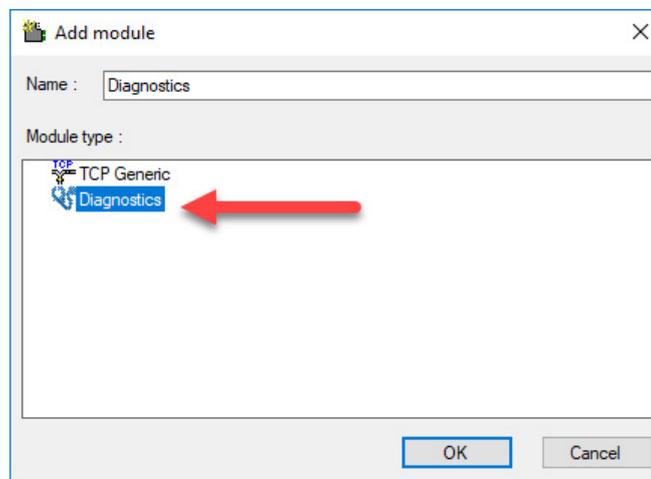


Fig. 12: Add diagnostic module, example Generic TCP

Module settings diagnostic module

For a diagnostic module, you can make the following settings:

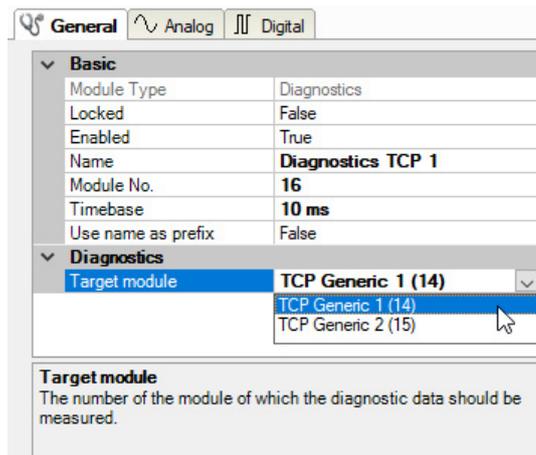


Fig. 13: Module settings diagnostic module, example TCP Generic

The basic settings of a diagnostic module equal those of other modules.

There is only one setting which is specific for the diagnostic module: the target module.

By selecting the target module, you assign the diagnostic module to the module on which you want to acquire information about the connection. You can select the supported modules of this interface in the drop down list of the setting. You can assign exactly one data acquisition module to each diagnostic module. When having selected a module, the available diagnostic signals are immediately added to the *Analog* and *Digital* tabs. It depends on the type of interface, which signals exactly are added.

General Analog Digital						
Name	Unit	Gain	Offset	Active	Actual	
0 IP address (part 1)			1	0	<input checked="" type="checkbox"/>	
1 IP address (part 2)			1	0	<input checked="" type="checkbox"/>	
2 IP address (part 3)			1	0	<input checked="" type="checkbox"/>	
3 IP address (part 4)			1	0	<input checked="" type="checkbox"/>	
4 Port			1	0	<input checked="" type="checkbox"/>	
5 Message counter			1	0	<input checked="" type="checkbox"/>	
6 Incomplete errors			1	0	<input checked="" type="checkbox"/>	
7 Packet size (actual)	bytes		1	0	<input checked="" type="checkbox"/>	
8 Packet size (max)	bytes		1	0	<input checked="" type="checkbox"/>	
9 Time between data (actual)	ms		1	0	<input checked="" type="checkbox"/>	
10 Time between data (min)	ms		1	0	<input checked="" type="checkbox"/>	
11 Time between data (max)	ms		1	0	<input checked="" type="checkbox"/>	

Fig. 14: Example: Analog values of a diagnostic module for a TCP Generic module

For example, the IP (v4-) address of a TCP Generic module (see fig. above) will always be split into 4 parts derived from the dot-decimal notation, for better reading. Also other values are being determined, as there are port number, counters for telegrams and errors, data sizes and telegram cycle times.

General Analog Digital		
Name	Active	Actual
0 Active connection mode	<input checked="" type="checkbox"/>	
1 Invalid packet	<input checked="" type="checkbox"/>	
2 Connecting	<input checked="" type="checkbox"/>	
3 Connected	<input checked="" type="checkbox"/>	

Fig. 15: Example: Digital values of a diagnostic module for a TCP Generic module

5 Support and contact

Support

Phone: +49 911 97282-14
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Email: support@iba-ag.com

Note



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

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