ibaPDA-Interface-Raw-Ethernet

Data Interface for ibaPDA

Manual

Issue 2.0

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 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-Raw-Ethernet

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

This documentation in particular addresses persons, who are concerned with the configuration, test, commissioning or maintenance of Programmable Logic Controllers of the supported products. For the handling of *ibaPDA-Interface-Raw-Ethernet* the following basic knowledge is required and/or useful:

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

1.2 Notations

In this manual, the following notations are used:

Action	Notation
Menu command	Menu *Logic diagram*
Calling the menu command	*Step 1 – Step 2 – Step 3 – Step x* Example: Select the menu *Logic diagram - Add - New function block*.
Keys	<Key name> Example: <Alt>; <F1>
Press the keys simultaneously	<Key name> + <Key name> Example: <Alt> + <Ctrl>
Buttons	<Key name> Example: <OK>; <Cancel>
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 Raw Ethernet data interface:

- *ibaPDA* v7.2.0 or higher
- License for *ibaPDA-Interface-Raw-Ethernet*
- Network connection 10/100 Mbits

For more requirements on the PC hardware used and the supported operating systems, see the *ibaPDA* documentation.

Note

It is highly recommended to operate the TCP/IP communication on a separate network segment in order to exclude a mutual influence by other network components.

For repeat orders please specify the dongle number!

Licenses

Order No.	Product name	Description
31.001030	ibaPDA-Interface-RAW-Ethernet	Reads data from up to 4 links. The links can be defined on different network interface cards (NICs).

3 Introduction

The Raw Ethernet communication uses IEEE 802.3 Multicast Frames. Up to 4 links are supported for data acquisition. Each link can be defined on a different NIC (network interface card). On each link the data sent must have a fixed layout.

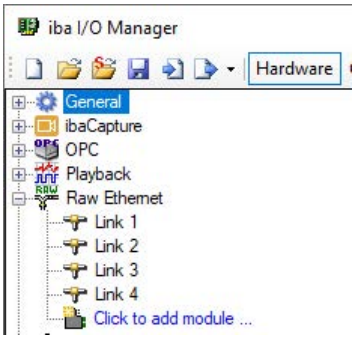
If 2 links are defined on the same NIC the multicast address must be different.

Up to 1024 modules are supported per interface.

The Raw Ethernet interface is visible in the tree of the I/O manager when a dongle with the corresponding license enabled is attached.

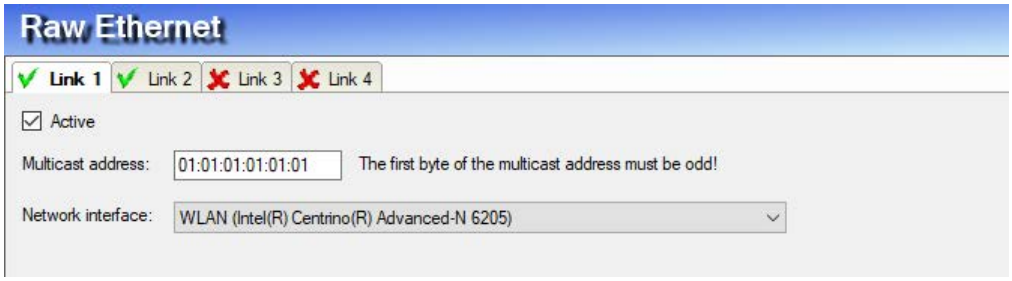
4 Configuration and engineering ibaPDA

Subsequently, the engineering for *ibaPDA* is described. If all system requirements are met, the interface "Raw Ethernet" is displayed in the signal tree.



4.1 General interface settings

The interface itself has the following functions and configuration options:



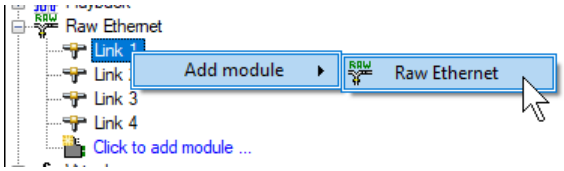
Multicast address
Enter different Multicast addresses for different links if they use the same network interface card (NIC).

Network interface
Select for each link the network interface card (NIC) which is used for Raw Ethernet communication.

4.2 Add module

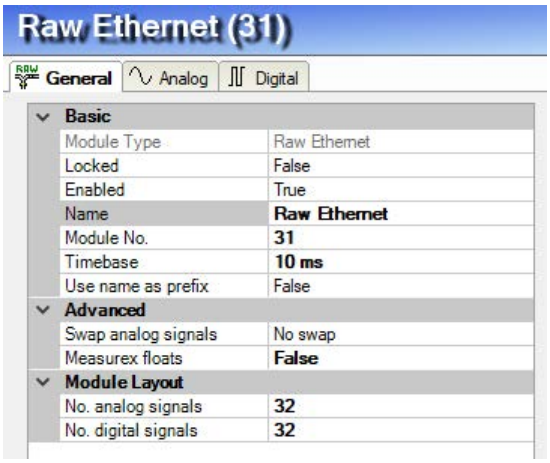
The “Raw Ethernet” module is a generic Ethernet module which can be freely configured by the user.

In the tree structure, select the link of the Raw Ethernet interface you want to use and add a "Raw Ethernet" module.



4.3 General module settings

The following module settings can be configured on the *General* tab:



Basic settings

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
All signals of the module will be sampled on this time base.

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

Advanced

Swap analog signals
Set the swap mode according to the signal source. You can choose between 4 options:

Mode	16 bit	32 bit
No swap	AB	ABCD
Depending on data type	BA	DCBA

Mode	16 bit	32 bit
Swap 16 bit	AB	CDAB
Swap 8 bit	BA	BADC

Table 1: Swap modes

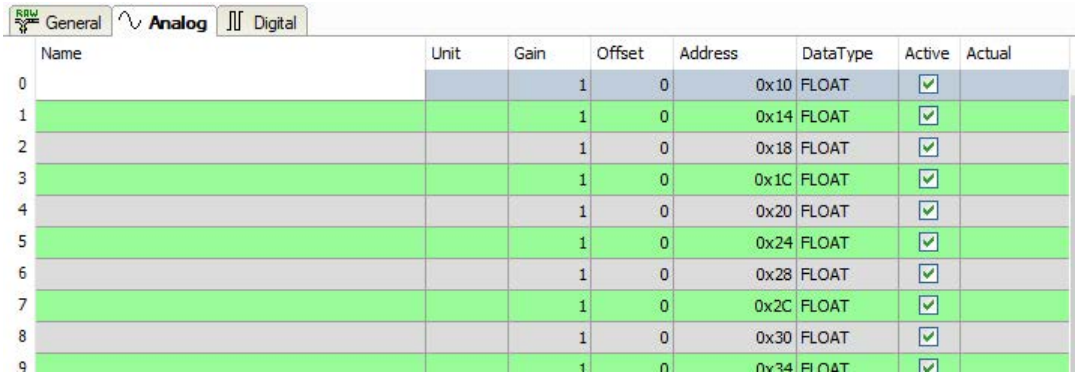
Which swap mode is the correct one depends on the swap mode of the signal source.

Measurex floats
If this option is enabled (TRUE) floating point values will be considered as Measurex floats instead of IEEE 754 floats.

Module Layout

No. analog signals/No. digital signals
With this option you can increase or decrease the number of signals in the module. Default is 32 signals. You can enter any value between 0 and 1000. The signal tables will be adjusted accordingly.

4.4 "Analog" tab



You can assign name, unit, scale factor, address and data type to the analog signals. Moreover, you can enable or disable the signals.

Other documentation

For a description of the columns, please see the *ibaPDA* manual or the online help.

Address
In this column you should specify the offset of the first byte of the value within the raw data stream. The offset can be entered as hexadecimal or decimal values by selecting the desired setting in the context menu. In order to get some default values just click on the column header. The offset values are filled in automatically starting with the value in the first row, respectively in the field the cursor is currently in, downwards in address steps according to the selected data types.

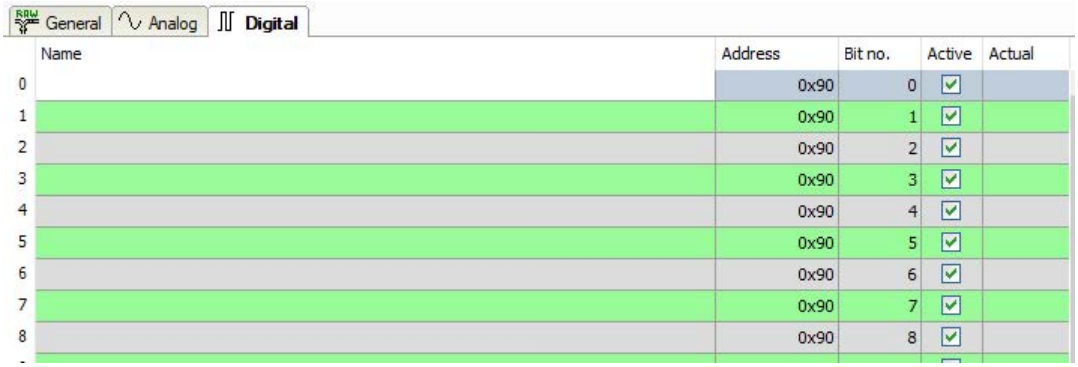
Data type

In the fields of this column you can select the data type of each signal. Just click in the corresponding field and select the data type from the drop-down list. The address space is depending on the data type. Hence, an adjustment of address entries may be necessary after change of data types.

Data type	Description	Value range
BYTE	8 Bit without positive or negative sign	0 … 255
INT	16 Bit with positive or negative sign	-32768 … 32767
WORD	16 Bit without positive or negative sign	0 … 65535
DINT	32 Bit with positive or negative sign	-2147483648 … 2147483647
DWORD	32 Bit without positive or negative sign	0 … 4294967295
FLOAT	IEEE754; Single Precision; 32 Bit floating point	$1.175 \cdot 10^{-38}$ …$3.403 \cdot 10^{38}$

Table 2: Available data types

4.5 “Digital” tab



You can assign name and address to the digital signals. Moreover, you can enable or disable the signals.

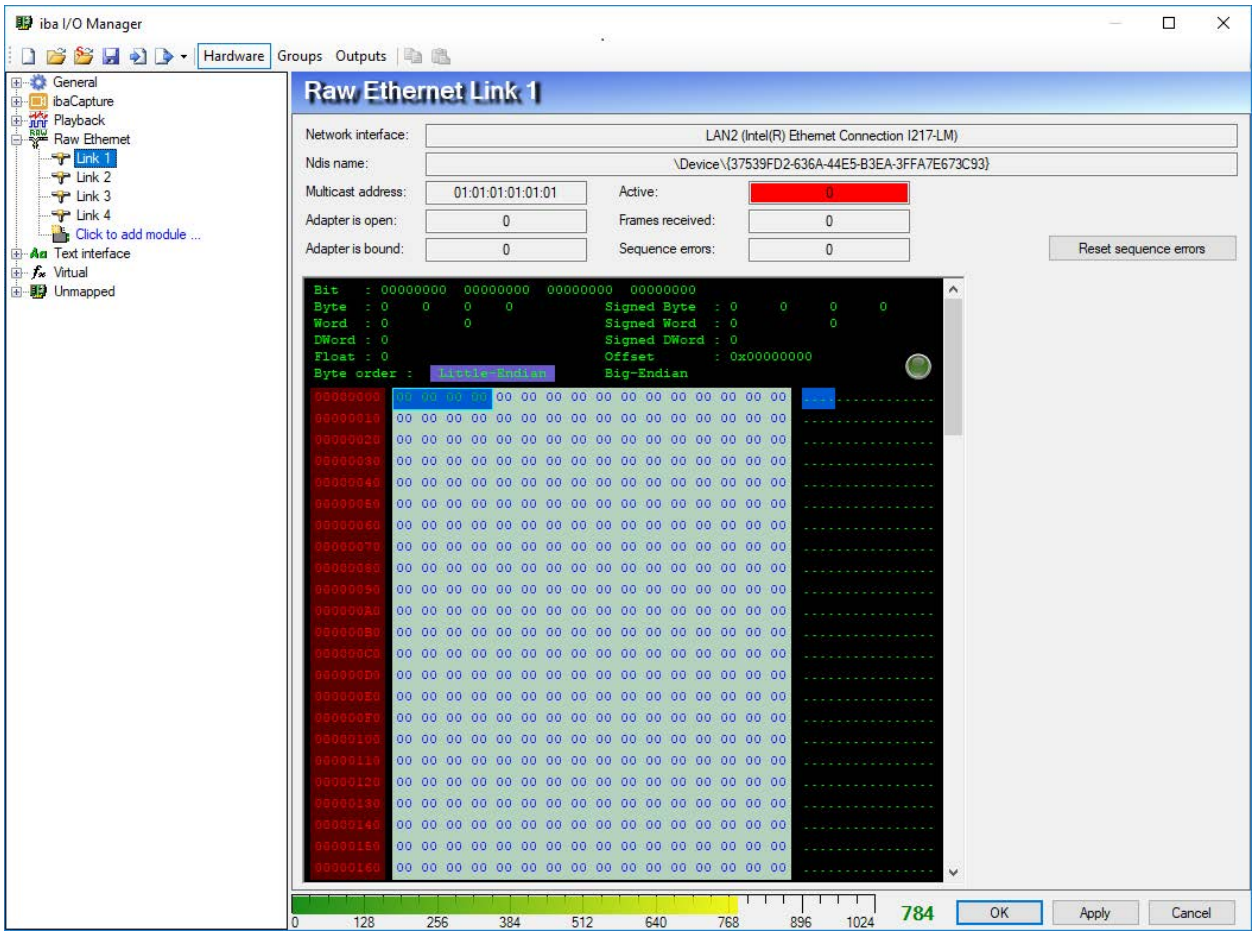
For digital signals you have the possibility to get 32 single bits out of a DINT or DWORD.

Address
In this column you can specify the offset of the first byte of the value carrying binary signals within the raw data stream. The offset can be entered as hexadecimal or decimal value by selecting the desired setting in the context menu. In order to get some default values just click on the column header. The offset values are filled in automatically starting with the value in the first row, respectively in the field the cursor is currently in, downwards in address steps according to the selected data types.

Bit no.
The number 0...31, specifies the position of the digital signal in a 32-bit block in the data stream with reference to the address entry (offset). Increment of bit no. by 1 up to 31, then increase address by 4.

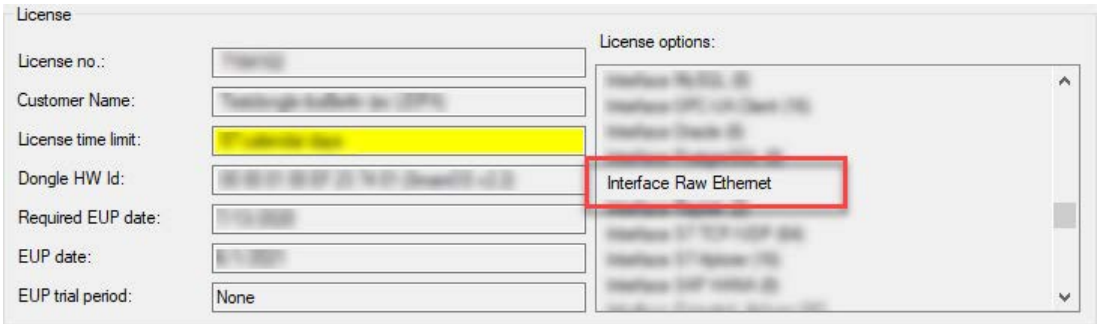
5 Diagnostics

For each link there is a diagnostic hex view, providing information about network card, Ndis name, Multicast address, adapter status and counters.



5.1 License

If the “Raw Ethernet” interface is not displayed in the signal tree, you can either check in *ibaPDA* under *General - Settings - License info* in the I/O Manager or in the *ibaPDA* service status application, whether your license “Interface Raw Ethernet” has been properly recognized. The number of licensed connections is indicated in brackets.



5.2 Log files

If connections to target platforms or clients have been established, all connection-specific actions are logged in a text file. You can open this (current) file and, e.g., scan it for indications of possible connection problems.

The log file can be opened via the button <Open log file>. The button is available in the I/O Manager:

- for many interfaces in the respective interface overview
- for integrated servers (e.g. OPC UA server) in the *Diagnostics* tab.

In the file system on the hard drive, you will find the log files in the program path of the *ibaPDA* server (...\Programs\iba\ibaPDA\Server\Log\). The file names of the log files include the name or abbreviation of the interface type.

Files named `interface.txt` are always the current log files. Files named `Interface_yyyy_mm_dd_hh_mm_ss.txt` are archived log files.

Examples:

- `ethernetipLog.txt` (log of EtherNet/IP connections)
- `AbEthLog.txt` (log of Allen-Bradley Ethernet connections)
- `OpcUAServerLog.txt` (log of OPC UA server connections)

5.3 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.

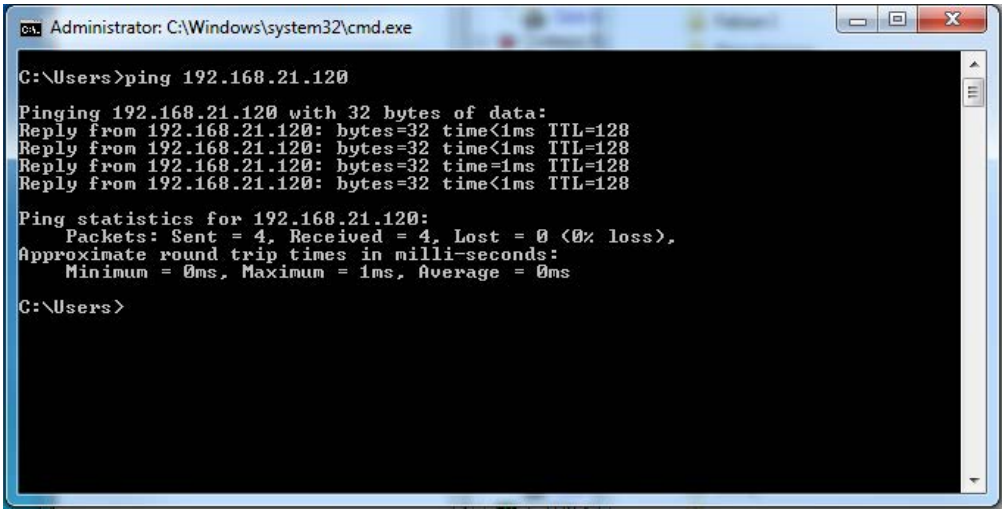


Fig. 1: PING successful

With no existing connection you receive error messages.

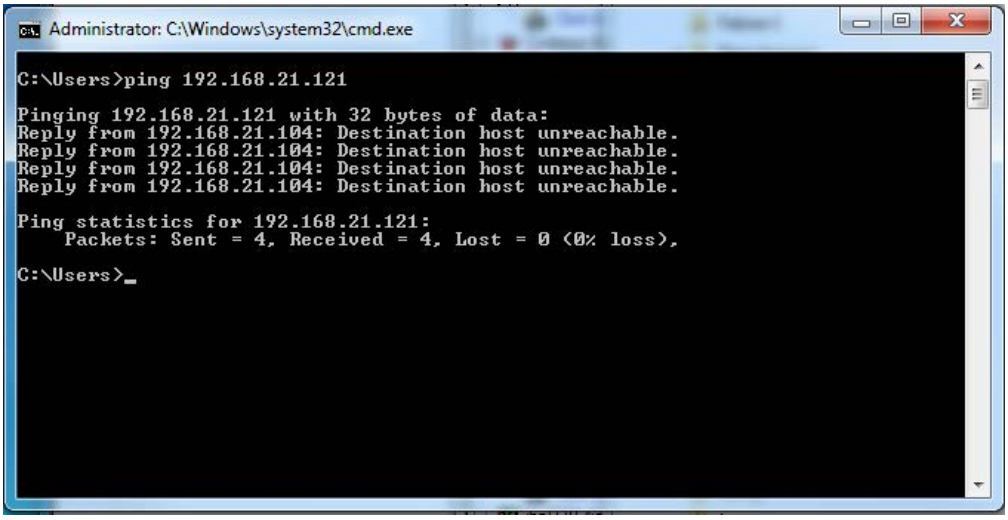


Fig. 2: PING unsuccessful

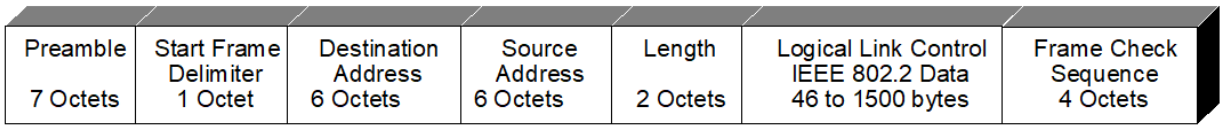
6 IEEE 802.3

This chapter gives a short overview of the IEEE 802.3 Ethernet frame. Following OSI Model Conceptual View shows that the IEEE 802.3 frames are situated on the datalink layer (layer 29).

<table>
<tr><th colspan="2">LAYER</th><th>USER APPLICATION</th><th colspan="2"></th><th>DATA FORMAT</th><th>ENABLING TECHNOLOGY</th><th></th></tr>
<tr><td>7</td><td>APPLICATION</td><td>Provides common services to user applications.
➨X.400 E-MAIL interoperability specification
➨X.500 E-MAIL directory synchronization specification
➨Strictly speaking, does not include user applications</td><td rowspan="5">Higher layer protocols - independant of underlying communications network</td><td></td><td></td><td></td><td rowspan="6">SOFTWARE</td></tr>
<tr><td>6</td><td>PRESENTATION</td><td>Provides presentation services for network communications.
➨Encryption
➨Code translation (ASCII to EBCDIC)
➨Text compression
Not to be confused with
➨Graphical User Interfaces(GUIs)</td><td rowspan="3">Node-to-node sessions</td><td></td><td></td></tr>
<tr><td>5</td><td>SESSION</td><td>Establishes, maintains, terminates node-to-node interactive sessions.</td><td>sessions
Interactive, real-time dialogue between 2 user nodes</td><td>Distributed applications, middleware, or network operating systems.</td></tr>
<tr><td>4</td><td>TRANSPORT</td><td>Assures reliability of end-to-end network connections.</td><td rowspan="2">End-to-end user network connection.</td><td>messages
Asembles packets into messages.</td><td>Network Operating Systems</td></tr>
<tr><td>3</td><td>NETWORK</td><td>Establishes, maintains, and terminates end-to-end network connections.</td><td>Network</td><td>packets
Embedded within frames.</td><td>Network Operating Systems.</td></tr>
<tr><td colspan="5">HARDWARE/SOFTWARE INTERFACE</td><td>NIC DRIVERS</td><td></td></tr>
<tr><td>2</td><td>DATA LINK</td><td>Logical Link control sub-layer.
Media access control sub-layer.
Specified by 802.X protocols.
➨Assures reliability of point-to-point data links.</td><td rowspan="2">Communications</td><td rowspan="2">Point-to-point data link</td><td>frames
Recognizable as data.</td><td>Network Interface Cards.</td><td rowspan="2">HARDWARE</td></tr>
<tr><td>1</td><td>PHYSICAL</td><td>Establishes, maintains, and terminates point-to-point data links.</td><td>bits
Unrecognizable as data</td><td>Media</td></tr>
</table>

In the following graphic you can see the layout of the IEEE802.3 frame:

IEEE 802.3 Frame Layout



The overall frame length varies from 64 to 1518 Octets

NOTE: 1 Octet = 8 bits

The data received in *ibaPDA* includes the destination address, source address, length and the IEEE 802.2 data. The length field is ignored in *ibaPDA*. The first 2 bytes of the IEEE 802.2 data have to be a 16 bit sequence counter.

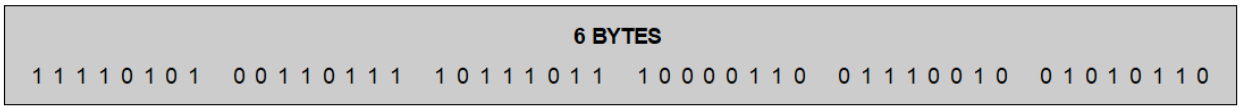
7 Multicast Frames

Multicast Ethernet frames are distinguished from directed packets by having the Individual/ Group (I/G) bit of the destination address set to 1 (Group).

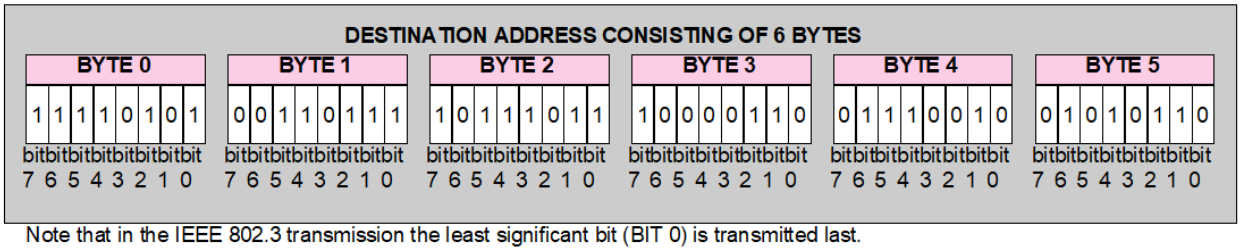
Multicast is like broadcast, but specific multicast addresses must be set up to receive it. Multicast Ethernet addresses have bit 0 in byte 0 set (i.e. it is odd): For instance, Windows network software uses multicast address 03:00:00:00:00:01 to send and receive "find name" packets. Without this use of multicast addresses, network browsing would not work.

As shown in the following figure, first Byte 0 is transmitted over the network:

Original Data Stream of 6 bytes



IEEE 802.3 Transmission



Note that in the IEEE 802.3 transmission the least significant bit (BIT 0) is transmitted last.

Multicasting is like networking, where one computer sends a single copy of data over the network and many computers receive this data.

When streaming frames over the network, the advantage to unicast is that only a single copy of the data is sent across the network. This ensures that network bandwidth is maintained without losses. In large companies the bandwidth savings can be substantial. The disadvantage is that it is connectionless. The clients have no control over the streams they receive and therefore cannot pause or skip forward or backward in the frame stream.

8 Support and contact

Support

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Note

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

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