



## User-Manual TAP-2100

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# 1 Disclaimer

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## 2 Limitation of Liability

Warranty and liability claims will lapse if:

- the product has been used incorrectly,
- damage is due to non-observance of the operating manual,
- damage is caused by inadequately qualified personnel,
- damage is caused by technical modification to the product (e.g. soldering).

### 3 Customer Service

If you have any questions or suggestions concerning this product, please do not hesitate to contact us:

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+49 (0)711 3409 7077  
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## 4 Safe Use

### Intended Use

The TAP-2110 is made for analysis of ethernet based data flow.

### Qualified personnel

The TAP2110 may only be assembled, installed and put into operation by trained, qualified personnel. Before assembly, it is absolutely essential that this documentation has been read carefully and understood. Expertise in the following fields is assumed:

- Evaluation of the security of electrical equipment
- Installing and Configuring IT systems
- Measuring and analyzing electrical functions and systems
- Safety and health at work
- Assembly and connection of electrical equipment
- Locally applicable rules and regulations for occupational safety.

### Safety instructions to prevent damage to property and personal injuries

The following safety instructions and warnings are intended to avert hazards and to prevent damage to property and personal injuries.

#### DANGER

#### Electric shock

Improper handling or opening the housing can result in electric shock.

#### NOTICE

#### Damage due using wrong voltage

Only use the TAP-2110 with the supply voltage of 24V DC  $\pm 5\%$ . Using other voltages result in damages or faults.

#### NOTICE

#### Damage due using wrong level voltage

TAP-2110 is unsuitable for PoE applications.

#### NOTICE

#### Damage due using the wrong socket

Only use the bunch plugs/banana plugs with design laboratory apparatus. Don't plug the bunch plugs/banana plugs in to a conventional socket.

#### NOTICE

#### susceptible to electrical discharge

Only work on a place which is shielded against electrostatic charge

#### NOTICE

#### Damage due wrong storage

Store the TAP-2110 in the storage case.

## 5 Introduction

With the KUNBUS-TAP 2100, KUNBUS makes a network monitor available for the analysis of all current industrial ethernet solutions. Using four probe ports, this device allows logging of up to two independent real-time ethernet connections. An internal delay of 0  $\mu$ s makes the KUNBUS-TAP Data Sniffer nearly transparent for the data channels to be tested.

The Data-Sniffer is connected to a PC via a standard Gigabyte ethernet interface. Network monitors read and analyze the tapped packet data, such as the freely available „Wireshark“.

### Scope of delivery

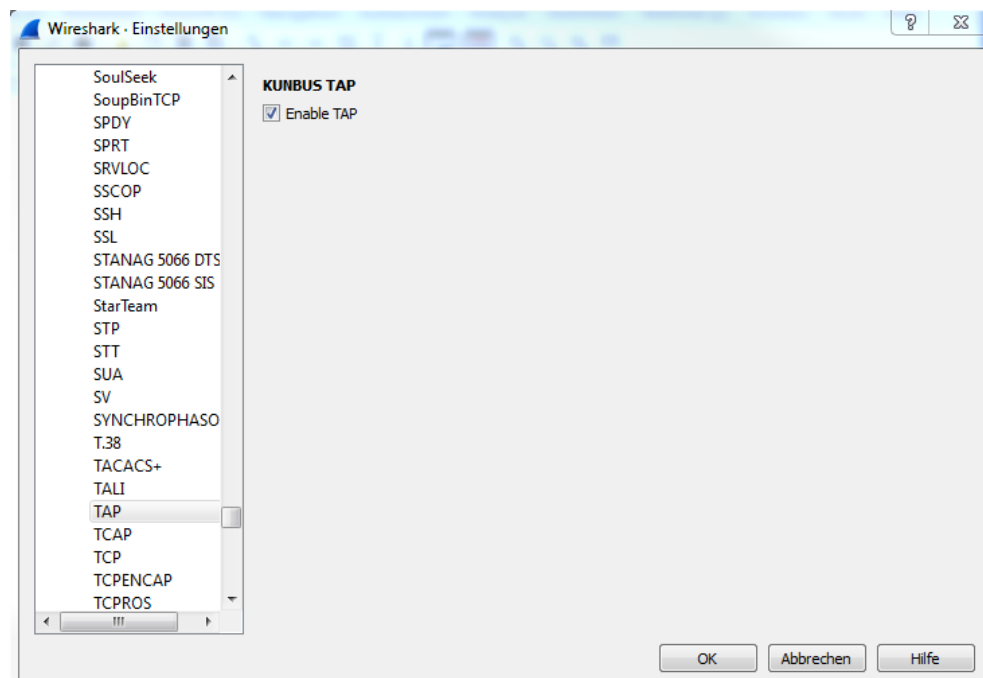
- Storage case
- TAP-2100
- Plastic cover
- Cable for power supply
- Euro Adapter
- Operating manual on USB-Stick (Present version at <http://tap.kunbus.de>)
- Wireshark plugins on USB-Stick (Present version at <http://tap.kunbus.de>)

### Areas of use

- Measuring system for real-time Ethernet bus systems
- Number of Ethernet ports 4+1 (cutting of 2 lines)
- Uplink-Port: - 1 GBit/s 1000BASE-T Ethernet - RJ45 socket
- Probe Ports: - 100 MBit/s 100BASE-TX Ethernet - RJ45 port, full and half-duplex
- Zero delay  $\sim 0 \mu$ s
- Resolution time stamp 1 ns
- Diagnostics: 3 LEDs
- Unfiltered forwarding of CRC errors

## 6 Installation

- After taking the delivery, please check whether all items listed in Chapter „1.1. Scope of delivery“ are present.
- Connect the device using the included power cable
  - ⇒ The POWER LED lights
- Download the Wireshark plugin DLL from the KUNBUS website, and copy it to the Wireshark plugin directory (e. g.: C:\Programme\Wireshark\plugins\1.10.2).
  - 32-Bit-Version: tap32\_1xxx.dll (Wireshark-Plugin WIN32)
  - 32-Bit-Version: tap32\_2xxx.dll (Wireshark-Plugin WIN32)
  - 64-Bit-Version: tap64\_1xxx.dll (Wireshark-Plugin WIN64)
  - 64-Bit-Version: tap64\_3xxx.dll (Wireshark-Plugin WIN64)
  - xxxx stands for the version of Wireshark. (i.e. 1.10.2)
- Connect the TAP-2100 with the RJ45 cable to a Gigabyte Ethernet interface of the PC. If the connection between PC and TAP is successful, the X0 link LED lights up.
- Plug the line to be tested into the probe ports. The two ports ‘Port 1’ and ‘Port 2’ are connected directly. Therefore a connection is also possible when the TAP is turned off. If the TAP is on and the a connection is established, the link LEDs will be on. Between the two Ports the TX and RX pins are exchanged. If a 1:1 cable must be monitored it must be connected to the TAP and the TAP must be connected to the other device using a crossover cable. If the devices are Auto-MDI-X capable no attention must be paid on the kind of cable.
- Start Wireshark on the PC. The plug-in ,TAP‘ must be ,enabled‘ in the menu „Edit > Preferences > Protocols > TAP“.



- In the main menu, you can see all available Interfaces. Click on the desired Interface.
  - ⇒ Now the data can be analyzed using Wireshark.



The TAP 2100 can also be used without a plugin or another Ethernet analysis program. However, the 20 byte supplemental information attached by TAP 2100 to the Ethernet package cannot be decoded. Furthermore, it may happen that a packet is displayed as faulty, although it just cannot be fully decoded because of the supplemental information.

## 7 Wireshark

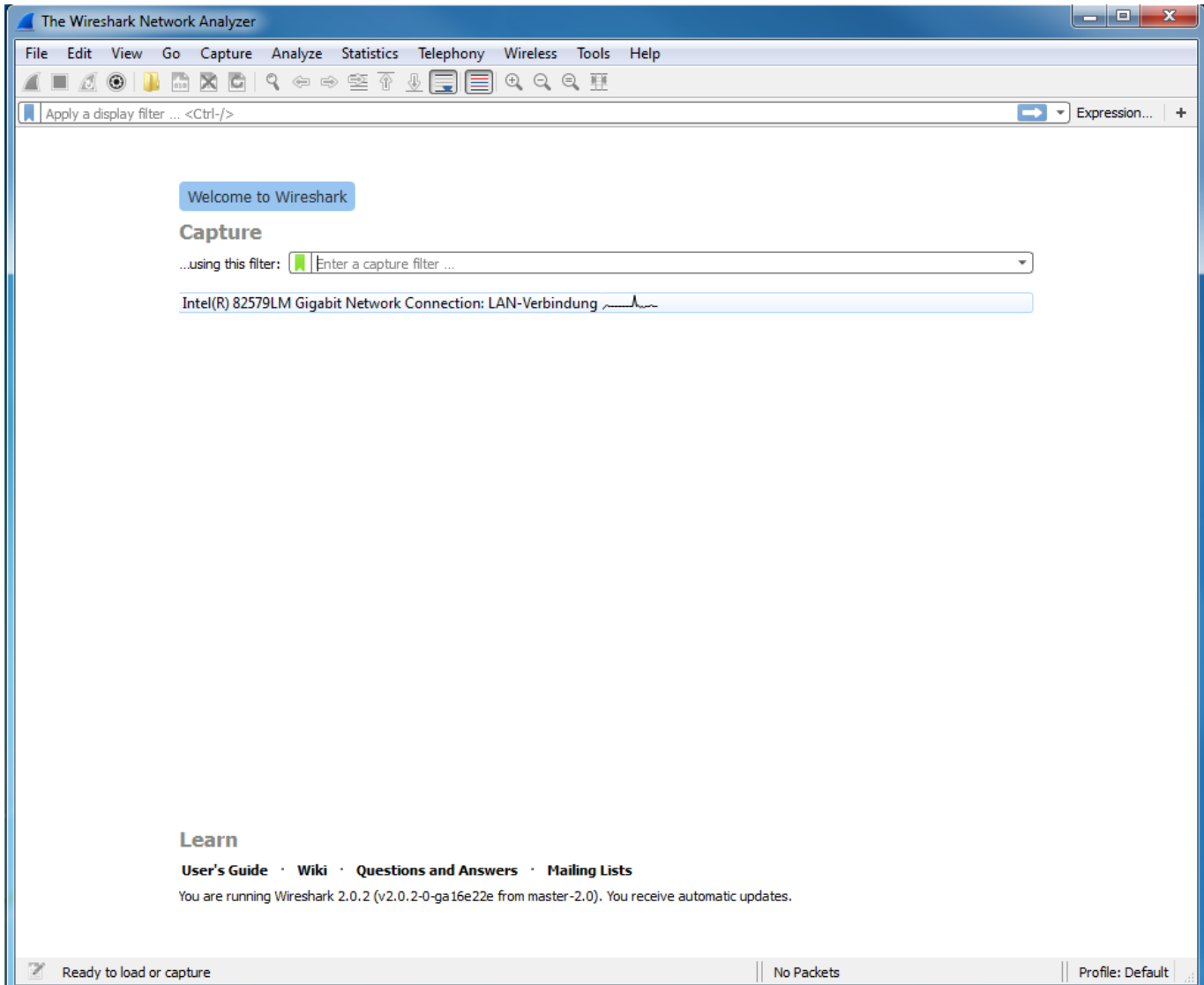
Wireshark is a free and very popular analysis program for network communication connections.

With this Tool, you can:

- map the data traffic of an interface (generally Ethernet TCP/IP) after or while capturing a data packet,
- make a simplified data analysis,
- examine individually captured data packets,
- sort by specific contents,
- extracting for example images (binary content),
- process and prepare clear data flow statistics.

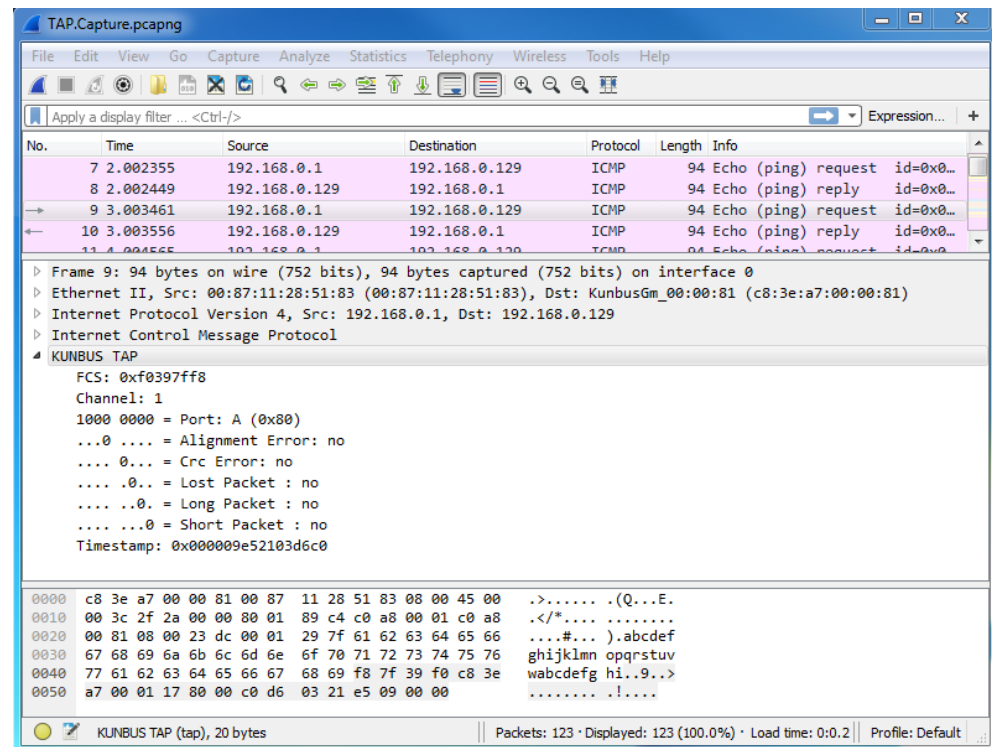
WinPcap allows transparent recording from the respective data traffic under Microsoft Windows. Wireshark works on almost all platforms.

## Starting a Wireshark capture



- ✓ Wireshark is installed. In the main menu, under the category “Capture”, you can see all available Ethernet interfaces.
  - Double click on the interface, you want to observe.
- ⇒ A status window opens. You’ll see now a recording of the data frames

## Wireshark status window



The Wireshark status window consists of 3 parts:

- packet list
- packet details
- packet raw data

The packet list

Here, all packets are displayed in chronological order. As soon as the KUNBUS TAP Spy plugin is activated, the „Time“ column will display the more accurate TAP 2100 time stamp instead of the operating system time stamp.

It is possible to display TAP 2100 values in additional columns. For this purpose, select the field type ‚Custom‘ in settings (Menu Edit/ Preferences) under columns. Enter for example ‚tap.port‘ as the field name. As soon as ‚tap.‘ has been entered, all possible values are displayed. A description is provided below. With ‚Add‘, a column can be added. Using the mouse, the lines can be moved and thus change the order.

To specifically evaluate traces, Wireshark offers a filter function. This allows limiting the display and analysis to those frames that are the most interesting. For example, with the filter the incoming and outgoing data traffic of your own IP address can be observed. An exclusive observation of the Ping command can be realized with Wireshark. Here you can filter according to TAP additional information. With the filter expression ‚tap.port==a‘, for example only packets are displayed that were received at TAP 2100

## Packet details

If the TAP plugin is activated and the ethernet packet was captured with TAP 2100, then additional information is displayed on the bottom line in section „KUNBUS TAP“ :

Display	Meaning
FSC	Original test total
Channel	Channel on which the data was captured. 1: top ports X1 2: bottom ports X2
Port	„A“, „B“, „C“ oder „D“ indicates which port received the data. „A“:connecter X1, Port1 „B“: connecter X1, Port2 „C“: connecter X2, Port1 „D“: connecter X2, Port2 Since most devices today support automatic crossover (MDIX), it may happen that both devices switch over to MDIX and the display of A/B is swapped. The same applies to C/D.
CRC Error	The received packet has a faulty test total.
Alignment Error	The packet is faulty
Timestamp	The packet time stamp is in ns, since turning on the Sniffer. However, this value can be ignored, since the normal operating system time stamp is replaced by the TAP time stamp, as soon as the plugin is activated.

## Packet raw data

This section shows the packet data hexadecimal and as ASCII-text. The last 20 bytes in the packet were attached from TAP 2100.

## 8 Troubleshooting

Error	Answer
No Link on the Snifferports X1 or X2.	Between the ports 'Port 1' and 'Port 2' the TX and RX pins are switched (crossover). There it is necessary to use a crossover cable on one side of the sniffer if the devices are not Auto-MDI-X capable.
Not all packets are displayed in Wireshark.	If the TAP plug-in is not activated, a test sum error may be displayed. This is due to the additional data TAP 2100 attaches to the packet and it can be ignored.
Wireshark does not display big packets.	The TAP adds 20 Bytes additional information to the packets. If a packet is already more than 1480 bytes long the packet on the output port X0 will exceed the maximal allowed length of the Ethernet standard and the packet will be discarded by the network adapter. To solve this a network adapter that support 'Jumbo Packets' must be used and 'Jumbo Packets' must be enabled in the driver settings.
Packets are displayed as faulty.	If the TAP plug-in is not activated, a test sum error may be displayed. This is due to the additional data TAP 2100 attaches to the packet and it can be ignored.
Wireshark displays additional packets.	It may happen that the PC that runs Wireshark transmits Broadcast on the interface being used. This is prevented by disabling all elements (client for Microsoft networks, internet protocol (TCP/IP), etc.) in the LAN adapter properties under Windows

## 9 Errata

This chapter contains all known problems with the TAP-2110 (Revision SW0030R02) up to 17th September 2015.

- The very first Ethernet frame sent on one of the lines observed by the TAP-2110 after a restart of the device (i. e. TAP-2110 runs through power up sequence) will not be transmitted over the Gigabit-Port (Uplink) but will get lost.

## 10 Technical Data

Dimensions	
Wide	100 mm
High	150 mm
Deep	40 mm
Weight	0,33 lb

External Conditions	
Permissible ambient temperature range in operation	0°C...+55°C
Permissible ambient temperature range in storage	-25°C...+85°C
Permissible relative humidity	95%, no condensation
Protection type	IP20

Performance	
Supply voltage	24 V DC $\pm$ 20% or 230 V AC plug power supply
Number of Ethernet ports	4+1 (cutting of 2 lines)
Uplink port	Up to 1 GBit/s (1000BASE-T-Ethernet, RJ45 socket)
Test ports	100 MBit/s 100BASE-TX Ethernet - RJ45 port, full and half-duplex
Propagation delay	$\sim$ 0 $\mu$ s (zero delay)
Resolution time stamp	1 ns
Diagnostics	3 LEDs

Certificate	
EMC-tested	
CE authorization	