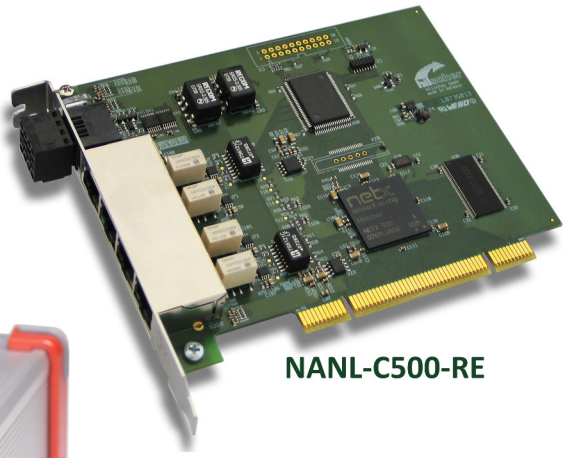
User Manual

netANALYZER devices

Installation, operation and hardware description

NANL-B500E-RE



NANL-C500-RE

NANL-B500G-RE

Hilscher Gesellschaft für Systemautomation mbH
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1 Introduction

1.1 About the user manual

This user manual contains descriptions about the installation and the operation of the netANALYZER hardware for the devices:

netANALYZER **PC card with PCI Interface** for real-time Ethernet and all 100BASE-T Ethernet networks
NANL-C500-RE and

netANALYZER portable device with ExpressCard Interface for real-time Ethernet and all 10/100BASE-T Ethernet networks
NANL-B500E-RE (Stand-alone Device),

netANALYZER portable device with Gigabit Ethernet PC interface for real-time Ethernet and all 10/100BASE-T Ethernet networks
- **NANL-B500G-RE** (Stand-alone Device).

1.1.1 List of revisions

Index	Date	Chapter	Revisions
15	15-02-05	All	Any descripions about the software removed.

Table 1: List of revisions

For the descriptions about the software installation and operationlsee the user manual **Software installation for netANALYZER** and **netANALYZER Scope, Installation and Operation for Windows 7/8 V2.0.xx** on the installation DVD.

1.1.2 Hardware, firmware and driver versions

Device name	Device type	Part no.	Revision
netANALYZER PC card with PCI interface for real-time Ethernet and all 100BASE-T Ethernet networks *** Note:** If you have already installed the netANALYZER card of the hardware revision 2 or 3 in your PC, you must apply the **netANALYZER hardware update** and then update the driver and the software.	NXANL 500-RE	7.310.100	2*
	NXANL 500-RE	7.310.100	3*
	NANL-C500-RE	7.310.100	4
netANALYZER portable device with ExpressCard interface for real-time Ethernet and all 10/100BASE-T Ethernet networks	NANL-B500E-RE	7.311.100	1
	NANL-B500E-RE	7.311.100	2
	NANL-B500E-RE	7.311.100	3
netANALYZER portable Device with Gigabit Ethernet PC Interface for Real-Time Ethernet and all 10/100BASE-T Ethernet Networks	NANL-B500G-RE	7.313.100	3
	NANL-B500G-RE	7.313.100	4

Table 2: netANALYZER hardware

Name	File name	Version	Path
netANALYZER firmware	NANL-500.nxf	1.5.x.x	*C:\Programme\ netANALYZER Device Driver \...*
netANALYZER / netSCOPE Device Driver	NSCP-100.nxf	1.5.x.x	
netANALYZER toolkit			

Table 3: Installed netANALYZER files (firmware, driver, toolkit)

1.1.3 Conventions in this manual

Notes, instructions and results of operating steps are marked as follows:

Notes

Important:
<important note you must follow to avoid malfunction>

Note:
<general note>

<note where to find further information>

Instructions

1. Operation purpose
2. Operation purpose
   ➢ Instruction

Results

Intermediate result

Final result

Safety messages

The labeling of safety messages is explained in the chapter Safety.

1.2 Installation DVD and documentation

Name	DVD
netANALYZER / netSCOPE Device Driver; for Windows® 7 or. Windows® 8 (32-Bit and 64-Bit)	netANALYZER and netANALYZER Scope
Remote Access client (only for analyzer device NANL-B500G-RE)	
netANALYZER Scope	
Ethernet Device Configuration Tool (only for NANL-B500G-RE)	
Documentation and examples	
netANALYZER hardware update (netANALYZER_hw_update.iso)	netANALYZER
NANL-B500G-RE firmware update (nanl-b500g-re.updat)	

Table 4: Important installation components on the DVD

Detailed information about the contents of the installation DVD and about the documentation for netANALYZER, see user manual **Software installation for netANALYZER**.

1.3 Legal notes

1.3.1 Copyright

1.3.2 Important notes

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- in life support systems;
- in systems in which failures in the software could lead to personal injury or injuries leading to death.

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1.3.7 Obligation to read and understand the manual

Important:

To avoid personal injury and to avoid property damage to your system or to your device, you must read and understand all instructions in the manual and all accompanying texts to your PC card, before installing and operating your device.

- ➢ First read the **Safety instructions** in the *Safety chapter*.
- ➢ Obey to all **Safety messages** in the manual.
- ➢ Keep the product DVD providing the product manuals.

2 Safety

2.1 General note

The documentation in the form of a user manual, an operating instruction manual or other manual types, as well as the accompanying texts have been created for the use of the products by educated personnel. When using the products, all Safety Messages, Safety Messages, Property Damage Messages and all valid legal regulations have to be obeyed. Technical knowledge is presumed. The user has to assure that all legal regulations are obeyed.

2.2 Intended use

The netANALYZER devices described in this user manual each work as a passive Ethernet analyzer in RT-Ethernet systems. The analyzer card NANL-C500-RE and the analyzer device NANL-B500E-RE or NANL-B500G-RE analyze the data in a communication link and capture the incoming Ethernet frames.

Device name	Device type
netANALYZER PC card with PCI interface for real-time Ethernet and all 100BASE-T Ethernet networks	NANL-C500-RE
netANALYZER portable device with ExpressCard interface for real-time Ethernet and all 10/100BASE-T Ethernet networks	NANL-B500E-RE
netANALYZER portable device with Gigabit Ethernet PC interface for real-time Ethernet and all 10/100BASE-T Ethernet networks	NANL-B500G-RE

Table 5: netANALYZER devices

If the analyzer card NANL-C500-RE and the analyzer device NANL-B500E-RE or NANL-B500G-RE are used outside of the scope described in this user manual respectively in the other netANALYZER documentations, an error free function can not be guaranteed.

2.3 Personnel qualification

The analyzer card NANL-C500-RE and the analyzer device NANL-B500E-RE or NANL-B500G-RE must only be installed, configured and removed by qualified personnel. Job-specific technical skills for people professionally working with electricity must be present concerning the following topics:

- Safety and health at work
- Mounting and connecting of electrical equipment
- Measurement and Analysis of electrical functions and systems
- Evaluation of the safety of electrical systems and equipment
- Installing and Configuring IT systems

2.4 Safety instructions to avoid personal injury

To ensure your own personal safety and to avoid personal injury, you necessarily must read, understand and follow the following safety instructions as well as all the other safety messages in this manual about danger causing personal injury, before you install and operate your device.

2.4.1 Electrical shock hazard (NANL-C500-RE)

Devices: NANL-C500-RE

The danger of a lethal electrical shock caused by parts with more than 50V may occur if you open the PC cabinet to install the NANL-C500-RE card.

- HAZARDOUS VOLTAGE is present inside of the PC or of the connecting device, into which the NANL-C500-RE card is integrated. Strictly obey to all safety rules provided by the device's manufacturer in the documentation!
- First disconnect the power plug of the PC or of the connecting device, before you open the cabinet.
- Make sure, that the power supply is off at the PC or at the connecting device.
- Open the PC cabinet and install or remove the NANL-C500-RE card only after disconnecting power.

An electrical shock is the result of a current flowing through the human body. The resulting effect depends on the intensity and duration of the current and on its path through the body. Currents in the range of approximately ½ mA can cause effects in persons with good health, and indirectly cause injuries resulting from startle responses. Higher currents can cause more direct effects, such as burns, muscle spasms, or ventricular fibrillation.

In dry conditions permanent voltages up to approximately 42.4 V peak or 60 V DC are not considered as dangerous if the contact area is equivalent to the size of a human hand.

Reference safety [S2]

2.5 Safety instructions to avoid property damage

To avoid property damage respectively device destruction to the device and to your system, you necessarily must read, understand and follow the following safety instructions as well as all the other safety messages in this manual about danger causing property damage, before you install and operate your device.

2.5.1 Device destruction by exceeding allowed supply voltage

Devices: NANL-C500-RE, NANL-B500E-REand NANL-B500G-RE

To avoid destruction to your device due to high supply voltage, you must observe the following instructions. These instructions apply to all devices described in this manual.

The device may only be operated with the specified supply voltage. Make sure that the limits of the allowed range for the supply voltage are not exceeded. A supply voltage above the upper limit can cause severe damage to the device! A supply voltage below the lower limit can cause malfunction of the device. The allowed range for the supply voltage is defined by the tolerances specified in this manual.

The data on the permissible supply voltage of the devices described in this manual you find in the section *Power supply and host interface* [page 22].

Only NANL-C500-RE:

The device may not be powered by a 5 V supply voltage! The device may only be powered by a 3.3 V ±5 % supply voltage.

2.5.2 Device destruction by exceeding allowed signaling voltage

Devices: NANL-C500-RE, NANL-B500E-RE and NANL-B500G-RE

To avoid destruction to your device due to high signaling voltage, you must observe the following instructions. These instructions apply to all devices described in this manual.

- All I/O signal pins at the device tolerate only the specified signaling voltage!
- Operating the device with a signaling voltage other than the specified signaling voltage may lead to severe damage to the device!

The data on the permissible signaling voltage of the devices described in this manual you find in the section *Power supply and host interface* [page 22].

2.5.3 Device destruction by exceeding allowed external IO interface output current

Devices: NANL-C500-RE, NANL-B500E-RE and NANL-B500G-RE

To avoid destruction to your device due to exceeding allowed external IO interface output current, you must observe the following instructions. These instructions apply to all devices described in this manual.

- During operation of the NANL-C500-RE card, of the NANL-B500E-RE device or of the NANL-B500G-RE device the specified device specific maximum values for the output current at the external IO interface I/O signal pins must not be exceeded.
- The netX chip and other components of the NANL-C500-RE card, of the NANL-B500E-RE device or of the NANL-B500G-RE device can be damaged if the output current at the external IO interface I/O signal pins exceeds the maximum permissible value!

The data on the maximum permissible output current at the I/O signal pins for the devices described in this manual you find in the section *Maximum permissible Output Current (external IO Interface)* [page 23].

2.5.4 Damage of externally attached hardware

NANL-C500-RE, NANL-B500E-RE

- If the +3.3V output of the external IO interface is enabled, externally attached hardware could be damaged as voltage is driven.
- Before an external device is connected to the NANL-C500-RE card or the NANL-B500E-RE device, check that the external device is suitable for the application.

NANL-B500G-RE

- If the +3.3V output of the external IO interface is enabled (IO status LED lights up orange), externally attached hardware could be damaged as voltage is driven.
- If the +24V output of the external IO interface is enabled (IO status LED lights up red), externally attached hardware could be damaged as voltage is driven.
- Before an external device is connected to the NANL B500G device, check whether the value for the voltage for the NANL B500G device set in the software is correct. Furthermore, check whether the external device is suitable for the application.

2.5.5 Electrostatically sensitive devices (NANL-C500-RE)

Devices: NANL-C500-RE

This equipment is sensitive to electrostatic discharge, which cause internal damage and affect normal operation. Therefore adhere to the necessary safety precautions for components that are vulnerable with electrostatic discharge if you install or replace your device. Follow the guidelines listed hereafter when you handle this equipment:

- Touch a grounded object to discharge potential static.
- Wear an approved grounding wriststrap.
- Do not touch connectors or pins on the device.
- Do not touch circuit components inside the equipment.
- If available, use a static-safe workstation.
- When not in use, store the equipment in appropriate static-safe packaging.

Reference safety [S2]

2.5.6 Assignment of wrong IP addresses, malfunction (NANL-B500G-RE)

The analyzer device NANL-B500G-RE must not be inserted via a switch or hub directly into a corporate network with other devices, as long as the analyzer device is operating in DHCP server operation mode. Otherwise, it may lead to wrong assignment of IP addresses and malfunction.

The analyzer device NANL-B500G-RE works by default as an external DHCP server in the DHCP server operation mode and independently assigns IP addresses to other devices. This may happen also to devices which are not concerned by the netANALYZER measurements.

In order to connect the analyzer device NANL-B500G-RE to any network ensure that DHCP server operation mode is disabled.

2.6 References safety

[S1]	ANSI Z535.6-2006 American National Standard for Product Safety Information in Product Manuals, Instructions, and Other Collateral Materials
[S2]	IEC 60950-1, Information technology equipment - Safety - Part 1: General requirements, (IEC 60950-1:2005, modified); German Edition EN 60950-1:2006
[S3]	EN 61340-5-1 and EN 61340-5-2 as well as IEC 61340-5-1 and IEC 61340-5-2

2.7 Labeling of safety messages

In this document all Safety Instructions and Safety Messages are designed according both to the international used safety conventions as well as to the ANSI Z535.6 standard, refer to reference safety [S1].

- The **Section Safety Messages** at the beginning of a chapter are pinpointed particularly and highlighted by a signal word according to the degree of endangerment. The kind of danger is specified exactly by the safety message text and optionally by a specific safety sign.
- The**Integrated Safety Messages** within an instruction description are highlighted with a signal word according to the degree of endangerment. The kind of danger is specified exactly by the safety message text.

Signal words and safety signal in safety messages on personal injury

Signal word	Meaning (international)
DANGER	Indicates a direct hazard with high risk, which will have as consequence death or grievous bodily harm if it isn't avoided.
WARNING	Indicates a possible hazard with medium risk, which will have as consequence death or (grievous) bodily harm if it isn't avoided.
CAUTION	Indicates a minor hazard with medium risk, which could have as consequence simple battery if it isn't avoided.

Table 6: Signal words and safety signs in safety messages on property damage

Safety sign	Sort of warning or principle
	Warning of lethal electrical shock
	Principle: Disconnect the power plug

Table 7: Safety signs in safety messages on personal injury

Signal words and safety signs in safety messages on property damage

Signal word	Meaning
NOTICE	Indicates a property damage message.

Table 8: Signal words in safety messages on property damage

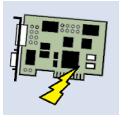
Safety signs	Sort of warning or principle
	Warning on damages by electrostatic discharge
	Example: Warning on device destruction due by too high supply voltage

Table 9: Safety signs for warning of property damage

3 Description

You can use the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE or NANL-B500G-RE to record the performance and the functions of individual systems or system components of bus systems, which conform to the Ethernet II IEEE 802.3 specification.

The analyzer card NANL-C500-RE and the analyzer device NANL-B500E-RE or NANL-B500G-RE described in this user manual, act as a passive Ethernet analyzer in Real-Time Ethernet systems. The NANL-C500-RE card and the NANL-B500E-RE device or the NANL-B500G-RE device analyze the data traffic in a communication stretch and protocol the arriving Ethernet frames.

For process data aquisition and for the clear presentation of process values for netANALYZER the software extension netANALYZER Scope serves. The frame data are captured on the hard disk and can be used for further analysis in Wireshark.

3.1 Recording and analyzing data traffic

For devices with two Ethernet channels the analyzer card NANL-C500-RE and the analyzer device NANL-B500E-RE or NANL-B500G-RE capture the Ethernet frames and adds the time stamps to them. Therefore the analyzer card or the analyzer device must be connected over two patch cables from one of the TAP to the Ethernet device connections.

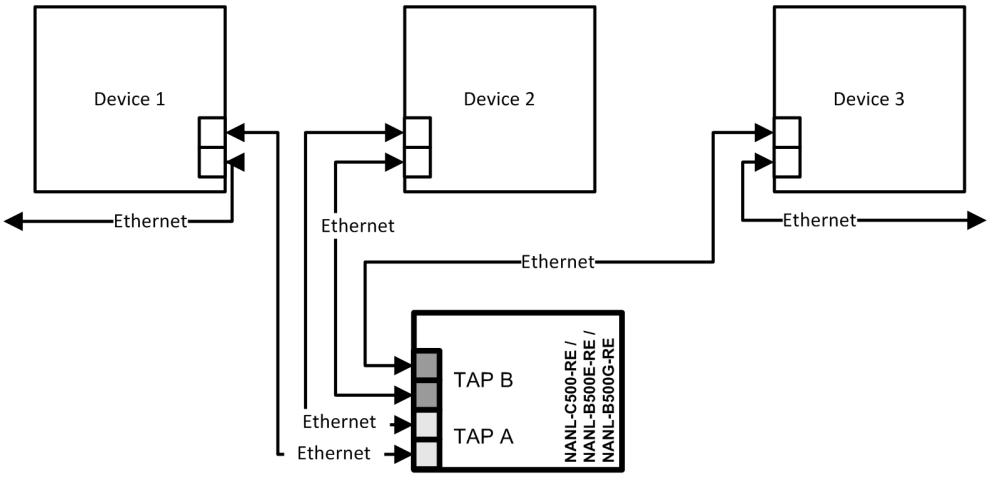


Figure 1: Typical application (Use Case 2) - The communication between a device and its connection partners in a network should be analyzed

The data capturing must be configured and started via the netANALYZER Scope software. This way the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE or NANL-B500G-RE and the **netANALYZER Scope** software capture the data packets of the communication line, transmit the data packets and save them on the hard disk.

On the analyzer card NANL-C500-RE or at the analyzer device NANL-B500E-RE or NANL-B500G-RE two TAP are integrated so that two communication channels are operational.

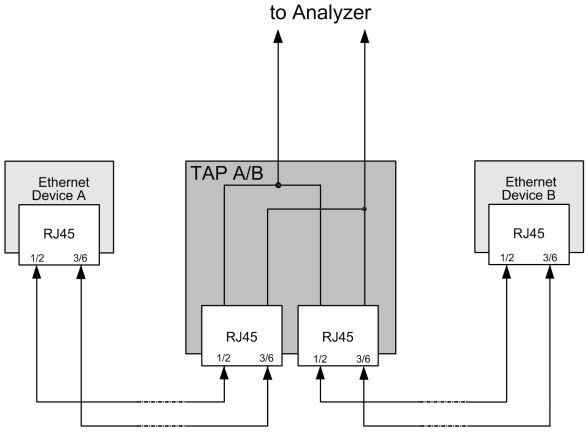


Figure 2: Example representation physical TAP

In combination with the driver and the firmware the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE or NANL-B500G-RE store the data via DMA on the hard disk of the PC. Using the **netANALYZER Scope** software and its export function the data can be transformed to the open WinPcap format (*.pcap), which can be analyzed e. g. with Wireshark.

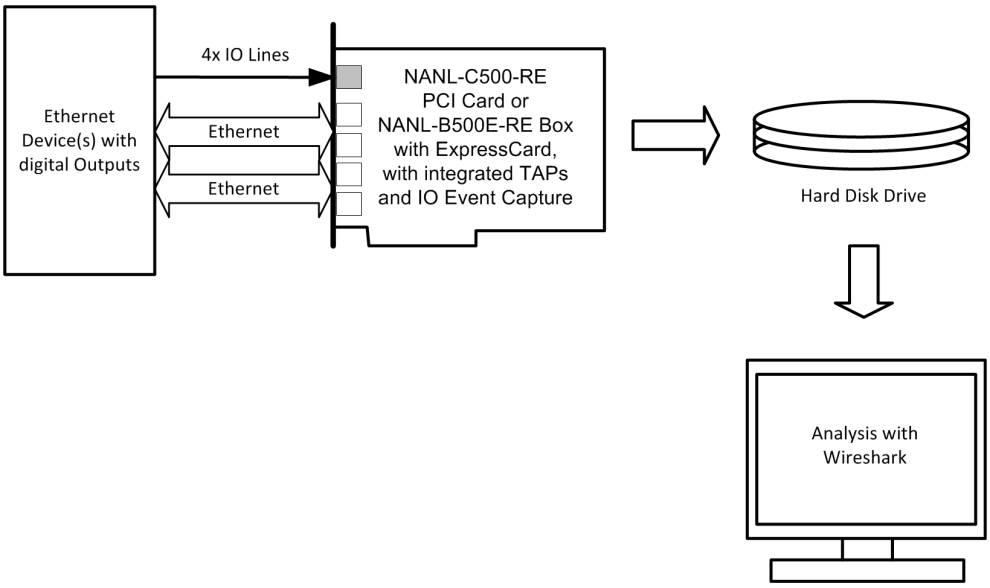


Figure 3: Typical analyzer application with the capturing of the Ethernet data transfer and IO events

Additionally, events of up to four digital inputs can be captured. At the four digital inputs the input signals produce a special Ethernet frame in the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE or NANL-B500G-RE. This frame is not on the line, but is created for evaluation purposes.

Note:

For the GPIO events in Wireshark a pseudo Ethernet frame is shown (MAC Address 00:02: A2: FF: FF: FF, Ether Type = 0x88ff), this is not a true Ethernet frame, but is inserted as wildcard in the firmware. Then this frame is decoded as GPIO event e. g. with Wireshark.

4 System requirements

4.1 Hardware requirements

PC or Notebook with the following specification:

- Intel compatible CPU, approx. 2 GHz or faster
- DVD ROM drive
- SVGA 1024x768 16bit colors or better
- Approx. 73 MB free hard disk memory for the **Wireshark** software
- 1 PCI slot* for NANL-C500-RE card
  (*supply voltage 3.3 V, signaling voltage 5 V or 3.3 V)
- 1 ExpressCard slot (notebook) for NANL-B500E-RE device
- 1 separate network card with RJ45 Ethernet socket
  (1 Gb/s) (only for NANL-B500G-RE device)

Accessories:

- 2 patch cable (Ethernet)

Note:
The maximum allowed total length of the Ethernet cable via which the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE or NANL-B500G-RE within the Ethernet system are connected via a TAP to the devices in the system is 100 meters.

- The maximum allowed cable length for the 24V power supply is 3 meters.
- Power supply unit for NANL-B500G-RE device: 24V dc/ 1.3A

Note:
The power supply unit (for standard applications) delivered with the NANL-B500G-RE device is designed as follows: 24V dc, 1.25A (1.8M KAB). See also section *Power supply and host interface* [page 22].

4.2 Power supply and host interface

For the power supply and the host interface used for the analyzer card NANL-C500-RE and the analyzer device NANL-B500E-RE you must observe the following requirements:

netANALYZER hardware	Supply voltage	Signaling voltage host interface	Host interface	Signaling voltage external IO
NANL-C500-RE	+3.3 VDC ±5 % / 800 mA	5 V or 3.3 V	PCI slot	3.3 V
NANL-B500E-RE	24V DC / 180mA / 4.3W, 18V ... 30V DC	PCIe compatible	PCI Express slot (ExpressCard)	3.3 V
NANL-B500G-RE	24V DC / 1.3A / 31.2W, 18V ... 30V DC	-	RJ45 Ethernet socket (1 Gb/s)	3.3 V 1 mA or 24V / max. 600 mA

Table 10: Requirements power supply and host interface for NANL-C500-RE, NANL-B500E-RE or NANL-B500G-RE

The data in the table above have the following meaning:

Supply voltage
The required and permissible supply voltage at the analyzer card and the analyzer device

Signaling voltage host interface
The required or tolerated signaling voltage at the I/O signal pins at the PCI bus of the analyzer card NANL-C500-RE or at the ExpressCard of the analyzer device NANL-B500E-RE.

Host interface Type of the host interface

Signaling voltage external IO
The required or tolerated signaling voltage at the I/O signal pins of the External IO interface of the analyzer card and the analyzer device.

Note:
If the power supply unit delivered with the NANL-B500G-RE device (dc 24V / 1.25 A) is used, at 500 mA at the external IO interface of the NANL-B500G-RE device the current limiter is turned on. To avoid a reset of the analyzer device, use for this special case a more powerful power supply (24V dc / 1.3A).

For more see section *Power supply NANL-B500E-RE* [▷ page 58] and section *Power supply NANL-B500G-RE* [▷ page 59].

4.3 Maximum permissible output current (external IO interface)

NANL-C500-RE and NANL-B500E-RE

For the analyzer card NANL-C500-RE and the analyzer device NANL-B500E-RE (all hardware revisions) the maximum permissible output current for each of the I/O signal pins (pins 1, 3, 5, 7) at the external IO interface is:

10 mA (at 3.3V signaling voltage at the external IO interface).

Device name	Device type	Revision	Maximum permissible output current at the external IO interface in [mA] at 3.3 V signaling voltage			
			Pin 1	Pin 3	Pin 5	Pin 7
netANALYZER card PCI RTE	NXANL 500-RE	2	10 mA	10 mA	10 mA	10 mA
	NXANL 500-RE	3				
	NANL-C500-RE	4				
netANALYZER portable device PCIe RTE	NANL-B500E-RE	1				
	NANL-B500E-RE	2				

Table 11: Maximum permissible output current (external IO interface NANL-C500-RE, NANL-B500E-RE)

NANL-B500G-RE

For the analyzer device NANL-B500G-RE the maximum permissible output current at the external IO interface (for all I/O signal pins 1, 3, 5 and 7 in total) is:

25 mA (at 3.3V signaling voltage at the external IO interface).

600 mA (at 24V signaling voltage at the external IO interface).

Device name	Device type	Revision	Maximum output current at the external IO interface in [mA] at 3.3 V or 24V signaling voltage
			For Pin 1, Pin 3, Pin 5 and Pin 7 in total
netANALYZER portable device RTE Gigabit	NANL-B500G-RE	2	at 3,3V: 1 mA
	NANL-B500G-RE	3	at 24V: 600 mA
	NANL-B500G-RE	4	

Table 12: Maximum permissible output current (external IO interface NANL-B500G-RE)

5 Getting started

5.1 Notes for installation and operation

You must read and obey the following notes about installation and operation of your analyzer card NANL-C500-RE or your analyzer device NANL-B500E-RE or NANL-B500G-RE to guarantee proper installation and an error-free operation of your device.

Note	Description
Installation sequence	The **installation sequence:** **1. Install Software from DVD.** **2. Mount NANL-C500-RE or connect NANL-B500E-RE or NANL-B500G-RE.** must be obeyed. Otherwise the result could be incorrect entries in the Registry. This again leads to malfunctions during later installation of software updates.
Optimum operation if view participants at PCI or PCI express bus	The capturing feature of the NANL-C500-RE card or the NANL-B500E-RE device works under heavy load optimally only if the number of participants in the communications PCI bus or PCI Express bus is minimized. It is advantageous when the NANL-C500-RE card is the only PCI card in the PC or when the NANL-B500E-RE device is the only ExpressCard at the notebook.
Inserting netANALYZER hardware into the communication Link	To analyze the data transfer of a communication line between two devices, these devices must be connected to the same TAP. The bandwidth of the network connection between the NANL-B500G-RE device and the PC must be sufficiently large to transport the resulting data of the four capturing interfaces. NANL-B500G-RE: **Important!** The analyzer device NANL-B500G-RE must not be inserted via a switch or hub directly into a corporate network with other devices, as long as the analyzer device is operating in DHCP server operation mode. Otherwise, it may lead to wrong assignment of IP addresses and malfunction. The analyzer device NANL-B500G-RE works by default as an external DHCP server in the DHCP server operation mode independently and assigns IP addresses to other devices. This may happen also to devices which are not concerned by the netANALYZER measurements. In order to connect the analyzer device NANL-B500G-RE to any network ensure that **DHCP server operation mode** is disabled.
Damage of externally attached Hardware	NANL-C500-RE, NANL-B500E-RE: • If the +3.3V output of the external IO interface is enabled, externally attached hardware could be damaged as voltage is driven. • Before an external device is connected, check that the external device is suitable for the application. NANL-B500G-RE: • If the +3.3V output of the external IO interface is enabled (IO status LED lights up orange), externally attached hardware could be damaged as voltage is driven. • If the +24V output of the external IO interface is enabled (IO status LED lights up red), externally attached hardware could be damaged as voltage is driven. • Before an external device is connected to the NANL B500G device, check whether the value for the voltage for the NANL B500G device set in the software is correct. Furthermore, check whether the external device is suitable for the application.
Do not unplug the ExpressCard during the device operation	During device operation do not unplug the ExpressCard of the analyzer device NANL-B500E-RE from the ExpressCard slot at the Notebook. Otherwiese data capturing is stopped and an error message is displayed, as the device is not any more detected at the notebook.
Auto crossover and port-switching	Because of the auto-crossover function of most of the RTE systems, the assignment of port 0 and 1 or port 2 and 3 at the netANALYZER device can change between different test runs. For more information refer to section *Auto-crossover and port-switching* [▷ page 46].

Note	Description
Transferring NANL-B500G-RE data save without loss to the PC	**Important!** The color of both LEDs on the Gigabit RJ45 Ethernet socket on the reverse side of the analyzer device NANL-B500G-RE must be green! If the right LED lights up in orange, the transmission rate to the PC is less than 1 Gb/s, by consequence insufficient bandwidth may occur. For more see section *LINK-ACT and LINK-1000/LINK100 (Reverse Side)* [page 57].
Saved Ethernet connection from NANL-B500G-RE to the PC	Transmission errors on the host Gigabit interface cable (such as EMC interference or bad connections) do not cause any data loss. However, to strong interference can lead to a disconnection.

Table 13: Notes about installation and operation

5.2 Overview installation

No	Step	Description	Detailed information, see chapter / section
1	**Software installation**		
1.1	Requirements	- Install .NET Framework - Install Wireshark	System requirements
1.2	Install **netANALYZER Scope** software	- Insert the **netANALYZER Scope DVD**. -Install **netANALYZER Scope** software.	*User manual software installation for netANALYZER*
2	**Hardware installation**		
2.1	Safety messages	Adhere - to the **Safety messages on personal injury** - and to the **Property damage messages** given in this manual.	*Safety messages on personal injury* [page 33], *Property damage messages* [page 34]
2.2	**NANL-C500-RE**	Mount the analyzer card NANL-C500-RE into a free PCI slot in the PC.	*Mounting analyzer card NANL-C500-RE to the PC* [page 37]
2.3	OR **NANL-B500E-RE**	Connect the analyzer device NANL-B500E-RE to the notebook. **NOTICE!** Connect only one 24 V DC power supply to the device.	*Connecting analyzer device NANL-B500E-RE to the notebook* [page 38]
2.4	OR **NANL-B500G-RE**	Connect the analyzer device NANL-B500G-RE to the RJ45 Ethernet socket (1 Gb/s) at the separate network card with in the PC.	*Connecting analyzer device NANL-B500G-RE to the PC* [page 39]
2.5	Inserting Hardware in the communication link	**Note!** The RJ45 socket is only for use in LAN, not for telecommunication circuits. **Important!** The analyzer device NANL-B500G-RE must not be inserted via a switch or hub directly into a corporate network with other devices, as long as the analyzer device is operating in DHCP Server Operation mode. Insert the NANL-C500-RE card or the NANL-B500E-RE or NANL-B500G-RE device into the communication link to be analyzed.	*Inserting hardware in the communication link* [page 40]

Table 14: Overview installation

5.3 Overview installation update

No	Step	Description	Detailed Information, see the Documentation / Chapter / Section
1.	**Hardware update**	**Only for existing hardware installation for NXANL 500-RE Rev 2 und Rev 3:** Apply the netANALYZER hardware update and then update the driver and the software.	*Hardware update for NXANL 500-RE Rev 2 and Rev 3* [page 68]
2	**Update driver and software**	- Unistall earlier drivers and software. - Install current driver and software. - Complete the driver installation after rebooting the PC.	*User manual software installation for netANALYZER*
3	**How to update the NANL-B500G-RE firmware**	**Note!** The IP addresse of the device and the IP address of the PC must be in the same network respectively the DHCP server must be online. - Find out the IP address of the device by using the **Ethernet Device Configuration program**. - Enter the found IP address in the address bar of Windows Explorer. - Enter the user name "update" and the password "nanl-b500g-re" into the FTP server log on screen. - Copy the firmware update file from the netANALYZER DVD into the netANALYZER FTP server directory.	*How to update the NANL-B500G-RE firmware* [page 47]

Table 15: Overview how to update the installation

5.4 Configuring the NANL-B500G-RE IP address

Note:
The IP addresse of the device and the IP address of the PC must be in the same network respectively the DHCP server must be online.

The NANL-B500G-RE device can operate in three different modes:

- Static IP address (*manual assignment*)
  A fixed IP address is assigned to the analyzer device NANL-B500G-RE. The user must manually assign the IP address designated. *This option is used only in special cases.*
- DHCP client mode (external DHCP server required)
  The IP address is assigned to the analyzer device NANL-B500G-RE.The device gets an IP address from the external DHCP server using the DHCP protocol. This IP address then automatically is assigned. *This option is used only in special cases.*
- DHCP server operation (*device operates as DHCP server*)
  As an DHCP server, the analyzer device NANL-B500G-RE assigns itself IP addresses to other devices.
  This option is the default setting in the most common use case. The user must not make any configuration.

Important:
The analyzer device NANL-B500G-RE must not be inserted via a switch or hub directly into a corporate network with other devices. Otherwise, it may lead to wrong assignment of IP addresses and malfunction. The analyzer device works by default as an external DHCP server in the **DHCP server operation mode** independently and assigns IP addresses to other devices. This may happen also to devices which are not concerned by the netANALYZER measurements.

For the data captured by the analyzer device NANL-B500G-RE and transmitted over an Ethernet connection to the PC arrive safely, you may use the analyzer device exclusively with a laptop or a PC with a separate network card.

DHCP server operation

Therefore you must set your LAN connection to (IP V4) **Automatically obtain IP address**.

Static IP address or DHCP client operation

To use **Static IP address** or **DHCP client mode**, you can configure your netANALYZER protable device NANL-B500G-RE using the **Ethernet Device Configuration** program.

For details refer to the *operating instruction manual* Ethernet Device Configuration, **Address setting for Ethernet capable Hilscher devices**. You find this manual on the netANALYZER Installation DVD under **Documentation**.

Note:
In case of problems due to incorrect settings of the IP address (e. g. device is not accessible), restart your device. While turning on your device press the REC button for about 1 minute. Then the default setting for the IP address of your device (DHCP server mode) is restored.

6 Device drawings

6.1 Analyzer card NANL-C500-RE

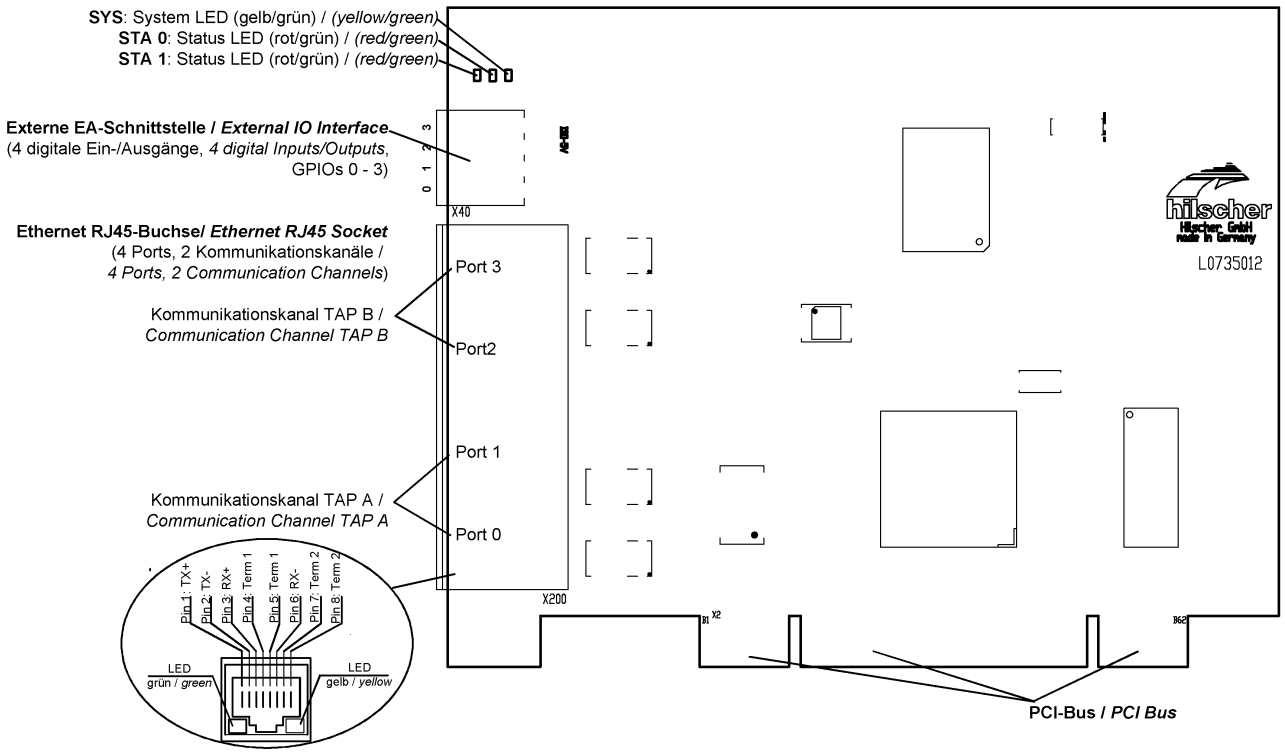


Figure 4: Top side analyzer card NANL-C500-RE

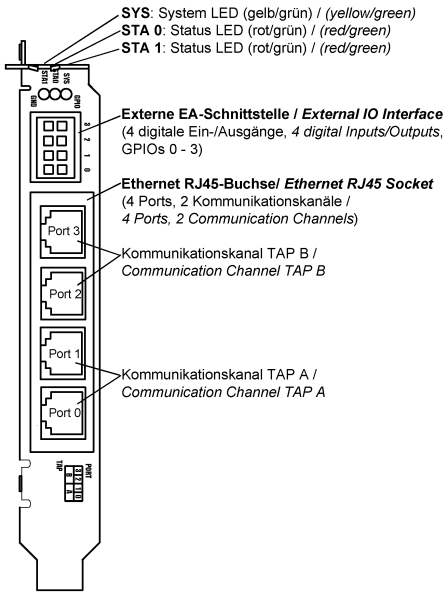


Figure 5: Slot plate analyzer card NANL-C500-RE

Note:
To analyze the data transfer of a communication line between two devices, these devices must be connected to the same TAP.

6.2 Analyzer device NANL-B500E-RE

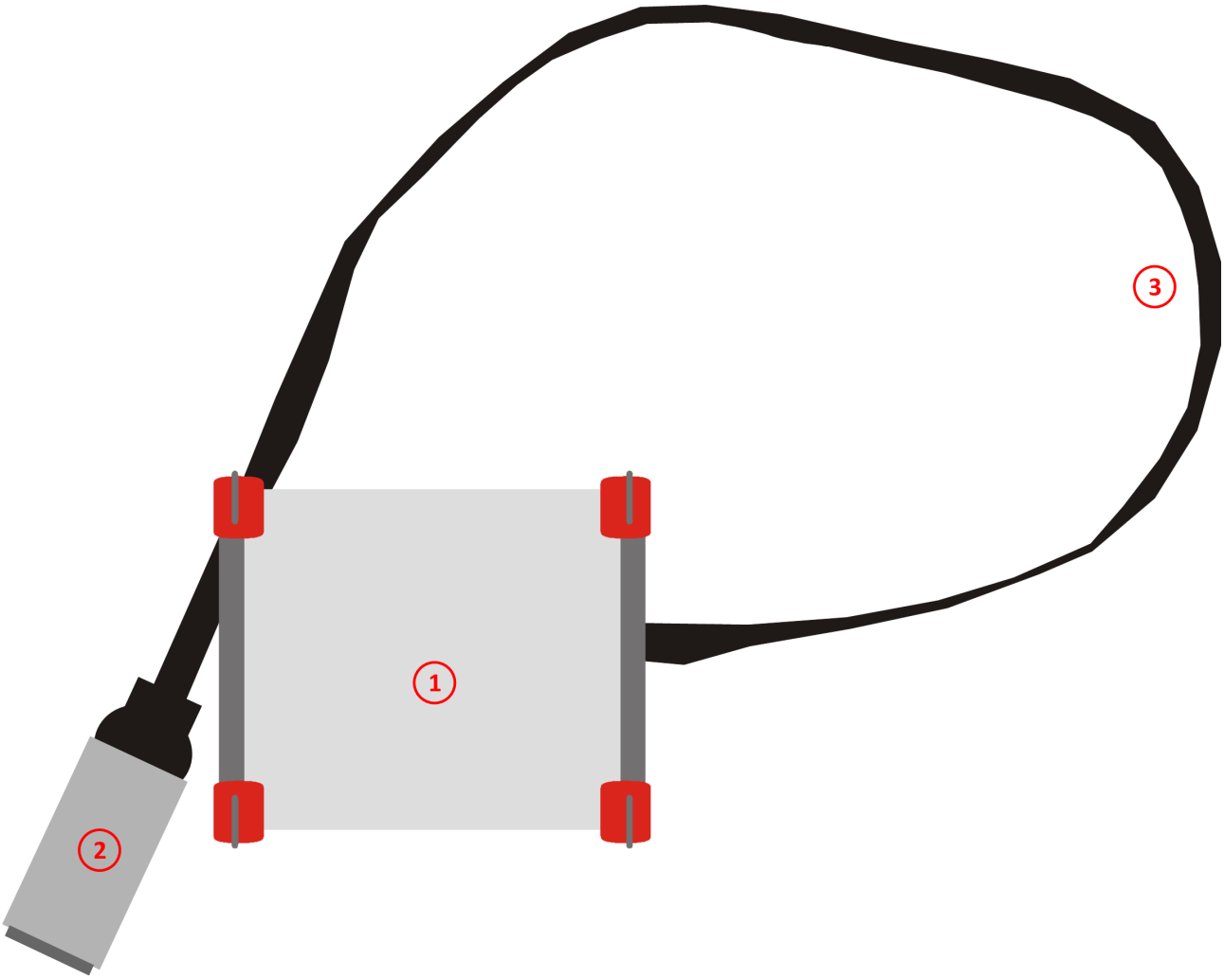


Figure 6: Overview analyzer device NANL-B500E-RE (with ExpressCard)

1	Analyzer device NANL-B500E-RE
2	**ExpressCard**
3	**ExpressCard cable**

Table 16: Explanations to the overview NANL-B500E-RE

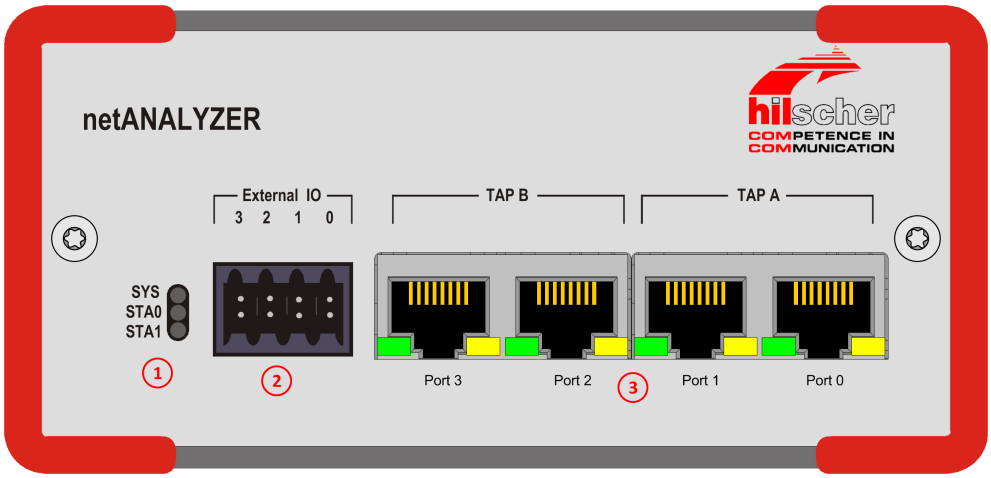


Figure 7: Front side analyzer device NANL-B500E-RE

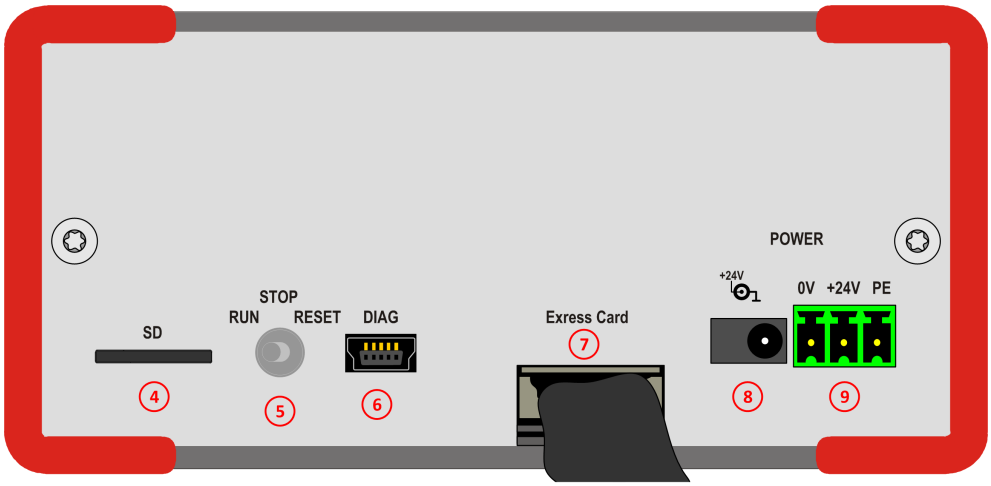


Figure 8: Reverse side analyzer device NANL-B500E-RE

1	**SYS** System LED (yellow/green), **STA 0, STA1** Status LEDs (red/green)
2	**External IO Interface** External Interface Input/Output Signals with 4 digital Inputs/Outputs (GPIOs 0 to 3)
3	**Ethernet RJ45 Sockets** (4 Ports): Port 0 to Port 3, 2 Communication Channels: TAP B, TAP A **Note:**To analyze the data transfer of a communication line between two devices, these devices must be connected to the sameTAP.
4	**Micro SD card slot***
5	**Switch*** (RUN / STOP / RESET)
6	**Mini B USB Plug*** (5-pin)
7	**Cable to ExpressCard**
8	Alternative **female connector +24V** to connect power supply
9	**24V Voltage supply** Combicon: 0V/+24V/PE
	**for future use only*

Table 17: Explanations to the front side and reverse side NANL-B500E-RE

6.3 Analyzer device NANL-B500G-RE

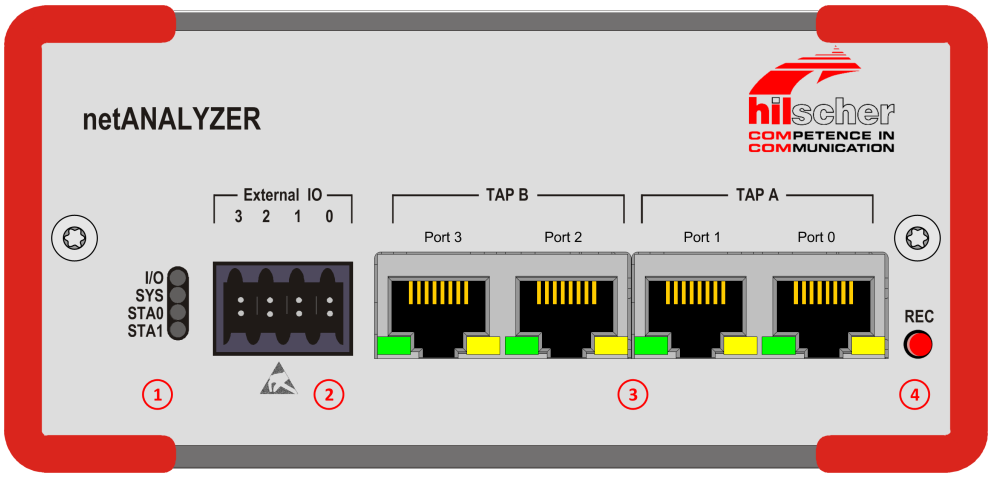


Figure 9: Front side analyzer device NANL-B500G-RE

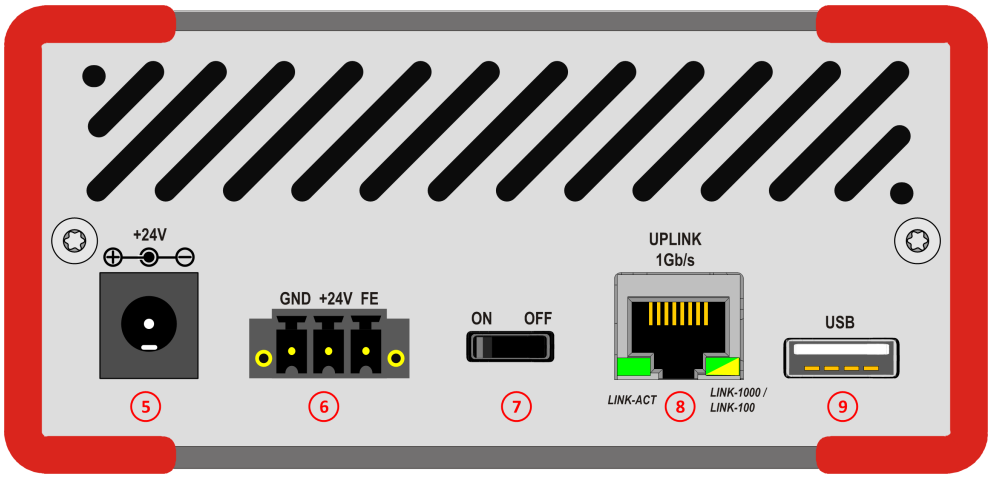


Figure 10: Reverse side analyzer device NANL-B500G-RE

1	**SYS** system LED (yellow/green), **STA 0, STA1** Status LEDs (red/green) , **IO** Status-LED (red/green)
2	**External IO interface** external interface input/output signals with 4 digital inputs/outputs (GPIOs 0 to 3)
3	**Ethernet RJ45 Sockets** (4 Ports): Port 0 to Port 3, 2 Communication Channels: TAP B, TAP A **Note:** To analyze the data transfer of a communication line between two devices, these devices must be connected to the same TAP.
4	**REC:** Button to enable data recording* (Additional function: Restores the default setting for the IP address of your device (DHCP server mode) - While turning on your device press the REC button for about minute.)
5	Alternative **female connector +24V** to connect power supply
6	**24V Voltage supply** Combicon: GND/+24V/FE
7	**Power switch** (ON / OFF)
8	**Gigabit Ethernet RJ45 socket to the PC** (1 Port with 1 Gb/s)
9	**USB plug*** (Typ A, 4-pin)
	**for future use only*

Table 18: Explanations to the front side and reverse side NANL-B500G-RE

7 Hardware installation

To install the NANL-C500-RE card or NANL-B500E-RE or NANL-B500G-RE device handle as described in the sections hereafter.

For the installation of the netANALYZER device check any notes in the overview in chapter *Getting started* [page 24].

7.1 Safety messages on personal injury

Obey to the following safety messages on personal injury, when installing, uninstalling or replacing the NANL-C500-RE card.

7.1.1 Electrical shock hazard (NANL-C500-RE)

NANL-C500-RE card:

WARNING

Lethal Electrical Shock caused by parts with more than 50V!

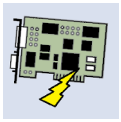
HAZARDOUS VOLTAGE inside of the PC or of the connecting device.

- Strictly obey to all safety rules provided by the device's manufacturer in the documentation!
- First disconnect the power plug of the PC or of the connecting device, before you open the cabinet.
- Make sure, that the power supply is off at the PC or at the connecting device.
- Open the PC cabinet and install or remove the NANL-C500-RE card only after disconnecting power.

7.2 Property damage messages

Obey to the following property damage messages, when installing the netANALYZER device (NANL-C500-RE card or NANL-B500E-RE or NANL-B500G-RE device).

7.2.1 Device destruction by exceeding allowed supply voltage



NOTICE

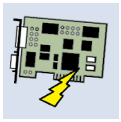
Device destruction!

Operating the netANALYZER device with a supply voltage above of the specified range leads to device destruction.

➢ Use only the permissible supply voltage to operate the netANALYZER device.

For detailed information on the supply voltage, refer to section *Power supply and host interface* [page 22].

7.2.2 Device destruction by exceeding allowed signaling voltage



NOTICE

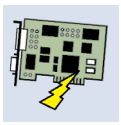
Device destruction!

All I/O signal pins at the netANALYZER device tolerate only the specified signaling voltage!

Operating the netANALYZER device with a signaling voltage other than the specified signaling voltage may lead to severe damage to the netANALYZER device!

For detailed information on the signaling voltage, refer to section *Power supply and host interface* [page 22].

7.2.3 Device destruction by exceeding permissible external IO interface output current



NOTICE

Device destruction!

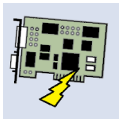
During operation of the NANL-C500-RE card and the NANL-B500E-RE or NANL-B500G-RE device the specified device specific maximum values for the output current at the external IO interface I/O signal pins must not be exceeded.

➢ The netX chip and other components of the NANL-C500-RE card and the NANL-B500E-RE or NANL-B500G-RE device can be damaged if the output current at the external IO interface I/O signal pins exceeds the maximum permissible value!

The data on the maximum permissible output current at the I/O signal pins for the devices described in this manual you find in the section *Maximum permissible Output Current (external IO Interface)* [page 23].

7.2.4 Damage of externally attached hardware

NANL-C500-RE, NANL-B500E-RE



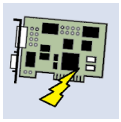
NOTICE

Damage of externally attached hardware

If the +3.3V output of the **external IO interface** is enabled, externally attached hardware could be damaged as voltage is driven.

➢ Before an external device is connected, check that the external device is suitable for the application.

NANL-B500G-RE



NOTICE

Damage of externally attached Hardware

If the +3.3V output of the **external IO interface** is enabled (IO status LED lights up orange), externally attached hardware could be damaged as voltage is driven.

If the +24V output of the **external IO interface** is enabled (IO status LED lights up red), externally attached hardware could be damaged as voltage is driven.

➢ Before an external device is connected to the NANL B500G device, check whether the value for the voltage for the NANL B500G device set in the software is correct. Furthermore, check whether the external device is suitable for the application.

7.2.5 Electrostatically sensitive devices (NANL-C500-RE)

NANL-C500-RE card:

Adhere to the necessary safety precautions for components that are vulnerable with electrostatic discharge.

NOTICE

Electrostatically sensitive devices

To prevent damage to the PC and the NANL-C500-RE, make sure:

- ➢ that the NANL-C500-RE card is grounded via the endplate and the PC and make sure,
- ➢ that you are discharged when you mount/demount the NANL-C500-RE card.

7.2.6 Assignment of wrong IP addresses, malfunction (NANL-B500G-RE)

Important:

The analyzer device NANL-B500G-RE must not be inserted via a switch or hub directly into a corporate network with other devices, as long as the analyzer device is operating in **DHCP server operation mode**. Otherwise, it may lead to wrong assignment of IP addresses and malfunction.

The analyzer device NANL-B500G-RE works by default as an external DHCP server in the **DHCP server operation mode** independently and assigns IP addresses to other devices. This may happen also to devices which are not concerned by the netANALYZER measurements.

- ➢ In order to connect the analyzer device NANL-B500G-RE to any network ensure that **DHCP server operation mode** is disabled.

7.3 Mounting analyzer card NANL-C500-RE to the PC

Note:
The installation sequence must be obeyed.

1. Install software from DVD.

2. Mount NANL-C500-RE card.

Otherwise, there will be incorrect registry entries. This in turn leads to disturbances in subsequent installation of software updates.

For mounting the analyzer card NANL-C500-RE to the PC handle as follows:

Step 1: Safety precautions

WARNING Lethal Electrical Shock caused by parts with more than 50V!

- Disconnect the power plug of the PC or of the connecting device.
- Make sure, that the power supply is off at the PC or at the connecting device.

NOTICE Electrostatically sensitive devices

- Make sure, that the NANL-C500-RE card is grounded via the endplate and the PC and make sure, that you are discharged when you install/ uninstall the NANL-C500-RE card.

NOTICE Device Destruction!

- Use exclusively 3.3 V for supply voltage to operate the NANL-C500-RE card. Operation with 5 V supply voltage leads to device destruction.
- At the I/O signal pins of the PCI bus use exclusively 5 V or 3.3 V signaling voltage and at the I/O signal pins of the External IO interface use exclusively 3.3 V signaling voltage. Higher signaling voltage may lead to severe damage to the NANL-C500-RE card!

Step 2: Installing card

- Open the cabinet of the PC.
- Plug in the analyzer card NANL-C500-RE on a free PCI slot.
- Fix the slot plate of analyzer card NANL-C500-RE to the slot plate of the PC by using a screw.
- Close the PC casing.
- Connect the PC to the power supply and switch on the PC.

7.4 Connecting analyzer device NANL-B500E-RE to the notebook

Note:
The**installation sequence**:
1. Install software from DVD.
2. Mount NANL-B500E-RE device
must be obeyed. Otherwise, there will be incorrect registry entries. This in turn leads to disturbances in subsequent installation of software updates.

For connecting the analyzer device NANL-B500E-RE to the Notebook handle as follows:

Step 1: Safety precautions

NOTICE **Device destruction!**

- The voltage applied at the NANL-B500E-RE device must not exceed 30 V, otherwise the device may be destroyed.
- Connect only **one** 24 V DC power supply to the device. If the device is connected to both power connectors (**0V/+24V/PE** and **+24V**) simultane¬ously, this may lead to damage to the used power supply units!
- At the **ExpressCard** use exclusively a PCIe compatible signaling voltage and at the I/O signal pins of the **external IO interface** use exclusively 3.3 V signaling voltage. Higher signaling voltage may lead to severe damage to the NANL-B500E-RE device!

Step 2: Installing device

- Plug in the ExpressCard of the analyzer device NANL-B500E-RE to a free ExpressCard slot at the Notebook.
- Connect the analyzer device NANL-B500E-RE to an external 24V power supply.

7.5 Connecting analyzer device NANL-B500G-RE to the PC

Note:
The **installation sequence:**
1. Install software from DVD.
2. Mount NANLB500GRE device.
must be obeyed. Otherwise, there will be incorrect registry entries. This in turn leads to disturbances in subsequent installation of software updates.

For connecting the analyzer device NANL-B500G-RE to the PC handle as follows:

Step 1: Safety precautions

NOTICE **Device destruction!**

- The voltage applied at the NANL-B500G-RE device must not exceed 30 V, otherwise the device may be destroyed.
- At the I/O signal pins of the External IO interface use exclusively 3.3 V or 24 V signaling voltage. Higher signaling voltage may lead to severe damage to the NANL-B500G-RE device!

Step 2: Installing device

- Establishing an Ethernet connection from the analyzer device NANL-B500G-RE to the PC.

Note:
The Ethernet connection from the analyzer device NANL-B500G-RE to the PC is a saved connection without loss. Transmission errors on the host Gigabit interface cable (such as EMC interference or bad connections) do not cause any data loss. However, to strong interference can lead to a disconnection.

- Connect the Ethernet cable to the Gigabit RJ45 Ethernet socket **UPLINK 1 Gb/s** at the reverse side of the device.
- Connect the Ethernet cable to the RJ45 Ethernet socket (1 Gb/s) at the separate network card with in the PC.
- Connect the analyzer device NANL-B500G-RE to an **external 24V power supply**.

Important:
The color of both LEDs on the Gigabit RJ45 Ethernet socket on the reverse side of the analyzer device NANL-B500G-RE must be green! If the right LED lights up in orange, the transmission rate to the PC is less than 1 Gb/s, by consequence insufficient bandwidth may occur.

7.6 Inserting netANALYZER hardware into the communication link

Important:
The analyzer device NANL-B500G-RE must not be inserted via a switch or hub directly into a corporate network with other devices, as long as the analyzer device is operating in **DHCP server operation mode**. Otherwise, it may lead to wrong assignment of IP addresses and malfunction.

Connect the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE or NANL-B500G-RE via two patch cables with the Ethernet device connections, in parallel to the communication connection to be analyzed. Basically, different assemblies are possible.

Note:
(1) To analyze the data transfer of a communication line between two devices, these devices must be connected to the same TAP.
(2) The RJ45 socket is only for use in LAN, not for telecommunication circuits.

In the following subsections typical application cases are described.

7.6.1 Application case 1

Capturing and analyzing the communication between two devices

- To capture the communication between two Ethernet devices, mount the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE or NANL-B500G-RE over Ethernet cables as displayed in the picture below.
- Connect both Ethernet cable only in TAP A (or in TAP B).

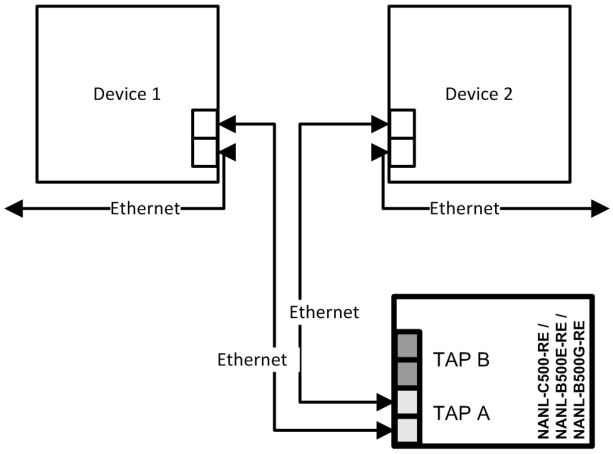


Figure 11: Application case 1

Furthermore, it analyzes the number of erroneous messages.

A forwarding time of telegrams by a device can not be determined. See *Application case 2* [page 42].

7.6.2 Application case 2

Application case 2 is the typical application case

In this case the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE or NANL-B500G-RE can analyze the following procedures and parameters:

- the communication between two devices each for two channels each,
- the forwarding time through the device,
- the cycle time and the jitter in the cyclically running protocols,
- the changes of the data in the Ethernet frame through the device,
- the number of erroneous telegrams.

➢ To capture the communication of the two channels, mount the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE or NANL-B500G-RE via Ethernet cables as shown in the picture.

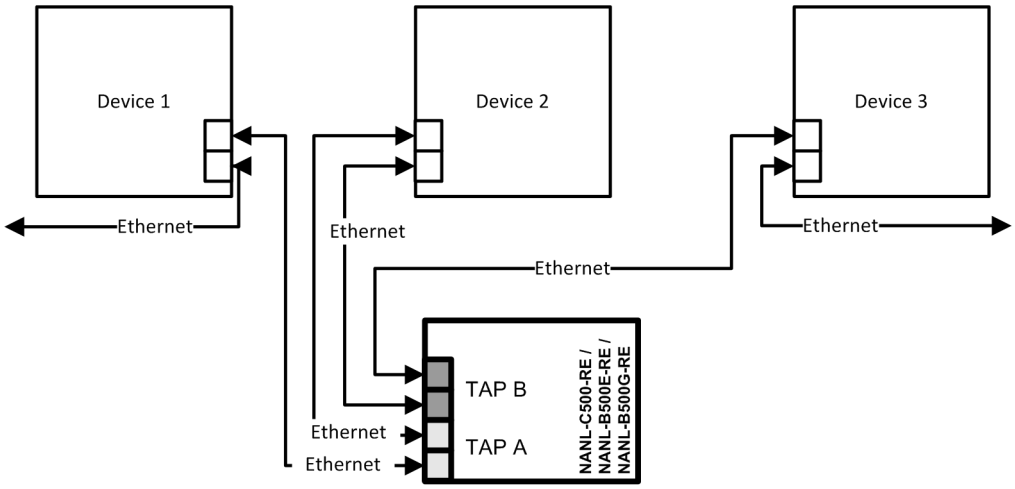


Figure 12: Application case 2

7.6.3 Application case 3

Like application case 2, but with further devices

This use case corresponds to the application case 2, but with the difference that further devices are between the two analyzed Ethernet channels.

In this case the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE or NANL-B500G-RE can analyze the following procedures and parameters:

- the communication for two channels,
- the forwarding time through several devices,
- the cycle time and the jitter in the cyclically running protocols,
- the changes of the data in the Ethernet frame through several devices,
- the number of erroneous telegrams.

➢ To capture the communication of the two channels, mount the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE or NANL-B500G-RE via Ethernet cables as shown in the picture.

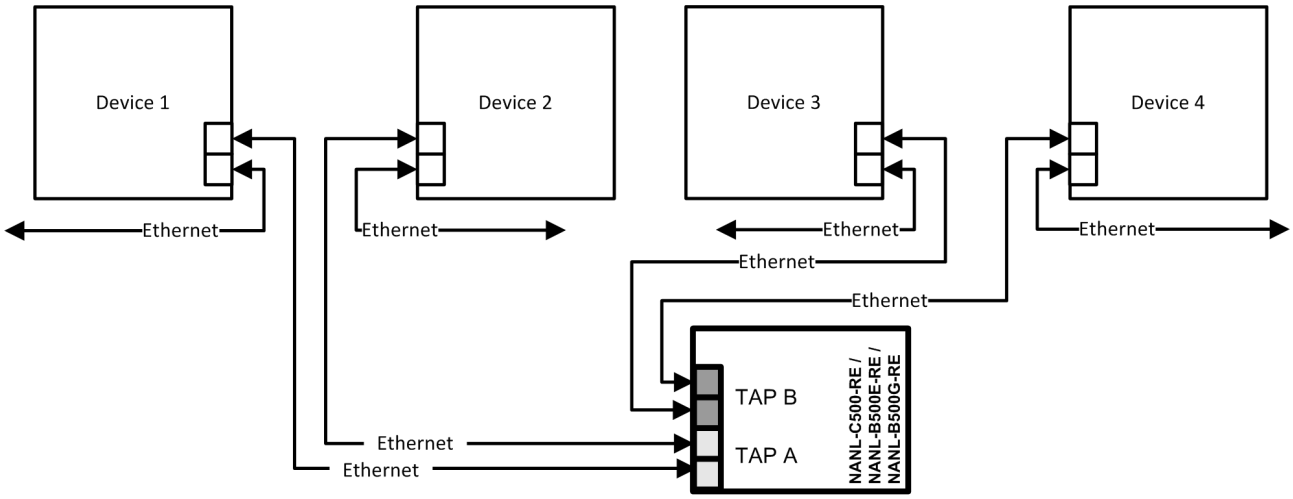


Figure 13: Application case 3

7.6.4 Application case 4

Like application case 2, but with analysis of input signals

This use case corresponds to the application case 2, but in addition to the Ethernet communication one to four input signals are included in the analysis. If an edge reversal at the digital input happens, a pseudo Ethernet frame with timestamp is created in the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE or NANL-B500G-RE.

In this case the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE or NANL-B500G-RE can analyze the following procedures and parameters:

- the communication between two devices for two channels,
- the forwarding time through the device,
- the cycle time and the jitter in the cyclically running protocols,
- the changes of the data in the Ethernet frame through the device,
- protocol-stack processing time from Ethernet frame reception to digital output switching,
- the input signal events on the basis of time-stamps,
- the number of erroneous telegrams.

NOTICE **Device Destruction!**

- At the I/O signal pins of the **external IO interface** use exclusively 3.3 V signaling voltage. Higher signaling voltage may lead to severe damage to the NANL-C500-RE card or the NANL-B500E-RE device!
- At the I/O signal pins of the **external IO interface** use exclusively 3.3 V or 24 V signaling voltage. Higher signaling voltage may lead to severe damage to the NANL-B500G-RE device!
- To operate the NANL-C500-RE card or the NANL-B500E-RE device use maximally 10 mA output current at the **external IO interface** I/O signal pins. Otherwise the netX chip and other components may be damaged.
- To operate the the NANL-B500G-RE device use maximally 1 mA (bei 3,3V) or 600 mA (bei 24V) output current at the **external IO interface** I/O signal pins. Otherwise the netX chip and other components may be damaged.

NOTICE **Damage of externally attached Hardware**

NANL-C500-RE, NANL-B500E-RE

- If the +3.3V output of the external IO interface is enabled, externally attached hardware could be damaged as voltage is driven.
- Before an external device is connected, check that the external device is suitable for the application.

NANL-B500G-RE

- If the +3.3V output of the external IO interface is enabled (IO status LED lights up orange), externally attached hardware could be damaged as voltage is driven.
- If the +24V output of the external IO interface is enabled (IO status LED lights up red), externally attached hardware could be damaged as voltage is driven.
- Before an external device is connected to the NANL B500G device, check whether the value for the voltage for the NANL B500G device set in the software is correct. Furthermore, check whether the external device is suitable for the application.

➢ To capture the communication of the two channels, mount the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE via Ethernet cables as shown in the picture.

The picture also shows schematically how a digital output signal is connected from the device to the digital input of the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE.

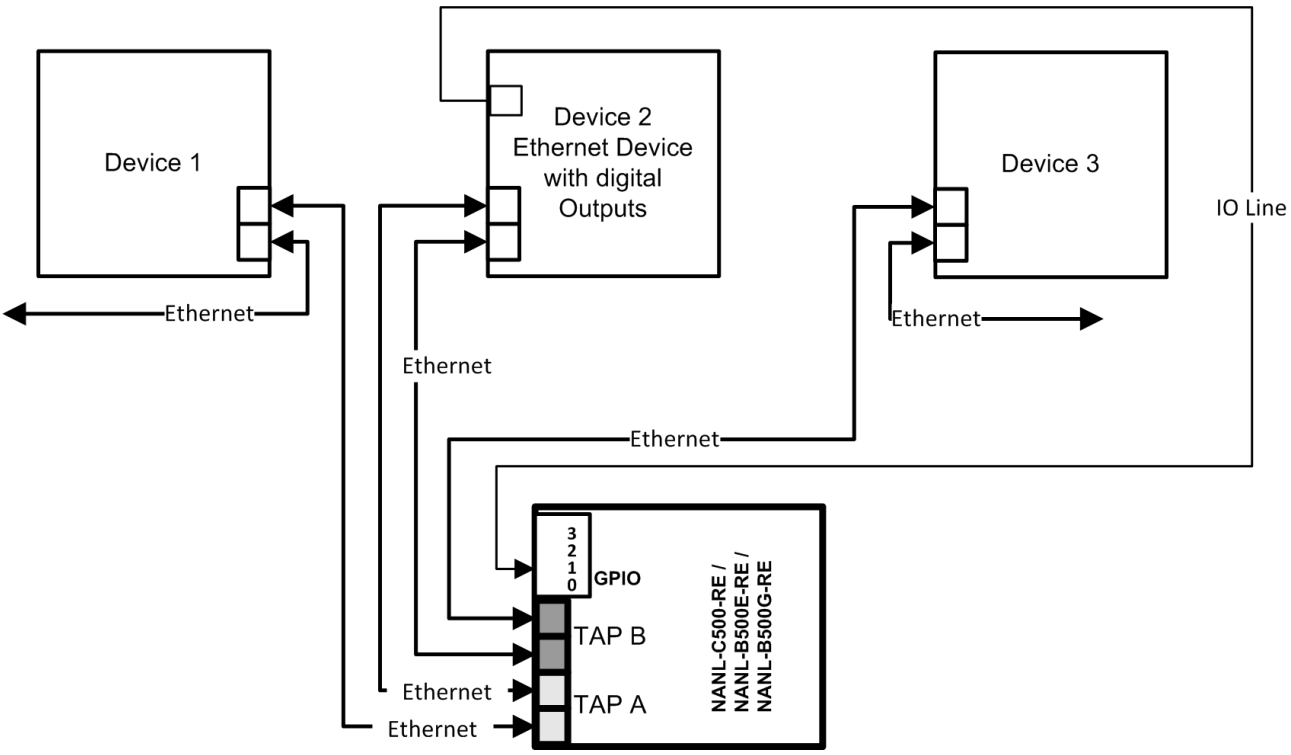


Figure 14: Application case 4 – Recording of the runtime in the device

7.7 Auto-crossover and port-switching

In a system with for example one netANALYZER device and two RTE devices, the assignment of port 0 and port 1 or port 2 and port 3 can change between different test runs. This is due to the auto-crossover feature of most RTE systems. For auto-crossover the cable assignment by the devices is given randomly. The assignment of the lines as a "transmission line" or "receiving line" is random.

Example

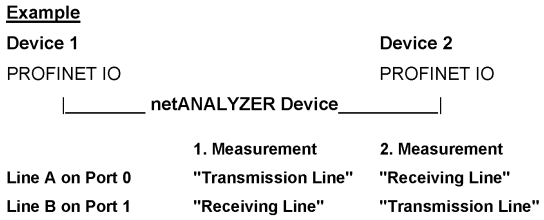


Figure 15: Example - Auto-Crossover and Port-Switching

At the 2nd Measurement in this example the receipt of the telegrams is wrong. The port numbers in the telegrams were exchanged.

If both devices use auto-crossover, there is the possibility that port 0 and port 1 will be exchanged for subsequent measurements. This is also true for port 2 and port 3.

Schematic Design of a TAP

The schematic design of a TAP shown in Figure 13 makes evident which effects an interchange of the lines of the two devices has.

Workaround

A workaround is possible, by drawing conclusions from the records of two consecutive test runs. In the records for the second test run compared with the first test run, modified port numbers can be found.

7.8 How to update the NANL-B500G-RE firmware

Note:
Requirements: The IP addresse of the analyzer device NANL-B500G-RE must be configured according to section *IP address configuration (only NANL-B500G-RE)* [page 27] on page 34. The IP addresse of the device and the IP address of the PC must be in the same network respectively the DHCP server must be online.

Step 1: Identify ip address of the device.

- Open the **Ethernet Device Configuration** program.
- Scan for devices.
- Your analyzer device NANL-B500G-RE is displayed.

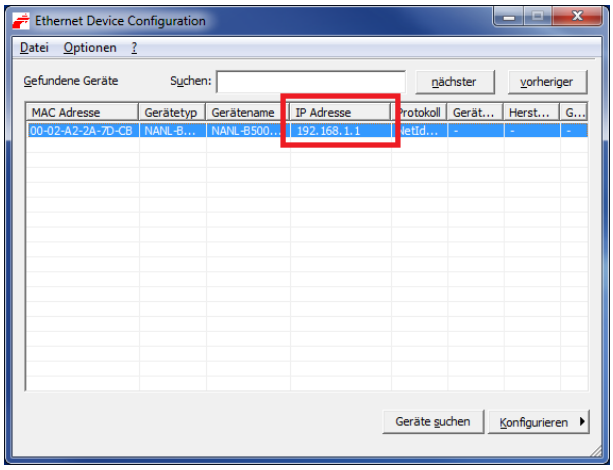


Figure 16: Ethernet Device Configuration - NANL-B500G-RE found (Example)

- Obtain the IP address of your NANL-B500G-RE device the firmware of which you want to update. For the example shown in the figure above the obtained IP address is *192.168.1.1*.

For details to the **Ethernet Device Configuration** program refer to the *operating instruction manual* **Ethernet Device Configuration, Address setting for Ethernet capable Hilscher devices**.

Step 2: Copy current firmware in netANALYZER FTP server directory

➢ Open the Windows explorer.

➢ Enter the IP address obtained from step 3 to the address bar of the Windows explorer as follows: **ftp://[IP addresse]**.
Alternatively you can use a common FTP utility. Then only enter the IP addresse [IP addresse].

↬ The Windows explorer **Log On As** screen appears.

➢ On the Windows explorer **Log On As** screen enter "update" as user name and "nanl-b500g-re" as password (without the double quotes).

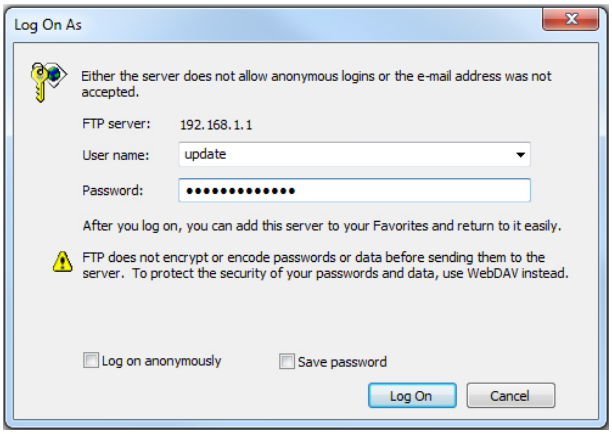


Figure 17: FTP server Log On Screen

↬ The the netANALYZER FTP server directory opens.

➢ Copy the incremental firmware update file *nanl-b500g-re.update* to the netANALYZER FTP server directory.

↬ The firmware update file can be found on the netANALYZER DVD in the diectory *NANL-B500G-RE firmware update*.

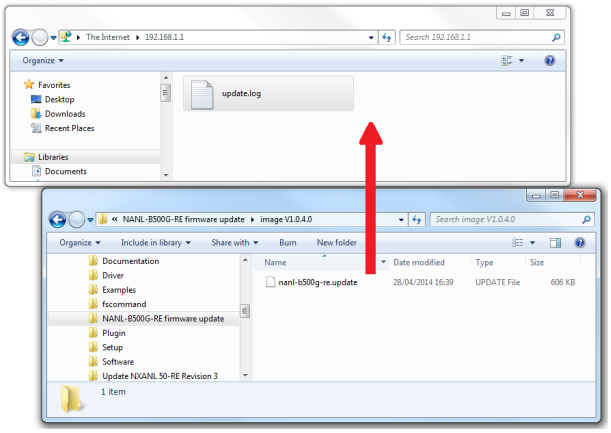


Figure 18: Copy the firmware update file to the netANALYZER FTP server directory.

↬ Once the file is copied the FTP Server directory should contain the file *nanl-b500g-re.update*.

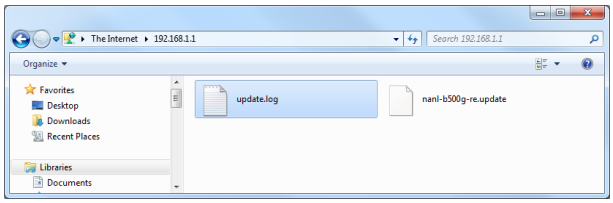


Figure 19: netANALYZER FTP server directory containing the firmware update file

- ➢ There may exist a file *update.log* from a previous update process, the log file can be ignored.
- ➢ Power off your NANL-B500G-RE device.
- ➢ Power on your NANL-B500G-RE device and wait until the device is fully operational (SYS LED = green, STA0 LED = red, STA1 LED = off).
- ⇘ Your device is now updated.

Step 3: Check whether the update was successful

- ➢ To verify if the update process was successfully, verify the version information.
- ➢ Open the netANALYZER Scope software and select under **Device Assignment** your device.
- ⇘ The main functions of the netANALYZER Scope software now are enabled. Data can be recorded.
- ➢ Check under **Device Assignment** the firmware version, the version of the remote access Windows client as well as of the device driver for your NANL-B500G-RE device.
- ⇨ The information for your device should be current now.

7.9 Demounting Analyzer Card NANL-C500-RE

For demounting the analyzer card NANL-C500-RE out of the PC handle as follows:

Step 1: Safety precautions

WARNING Lethal Electrical Shock caused by parts with more than 50V!

- Disconnect the power plug of the PC or of the connecting device.
- Make sure, that the power supply is off at the PC or at the connecting device.

NOTICE Electrostatically sensitive devices

- Make sure, that the NANL-C500-RE card is grounded via the endplate and the PC and make sure, that you are discharged when you install/ uninstall the NANL-C500-RE card.

Step 2: Remove the card

- Open the cabinet of the PC.
- Pull out the male connector of the IO cable from the female connector of the external IO interface, see device drawing Figure 4: *Top side and front plate analyzer card NANL-C500-RE* [page 29].
- Loosen the screws the analyzer card NANL-C500-RE card is fixed with.
- Take the NANL-C500-RE card from the PCI slot.
- Close the PC casing.

8 Hardware properties

This chapter explains how to identify the hardware feature of the time stamp and how to collect Ethernet telegrams in transparent mode.

For information on how to preset the operating modes for data recording Ethernet or transparent mode in the user interface, refer to the operating instruction manual **netANALYZER software, Installation and Use the Analysis Software**.

8.1 Timestamp

The figure hereafter shows for „Ethernet Mode“ or for „Transparent Mode“, where the timestamp for the associated data packet is taken.

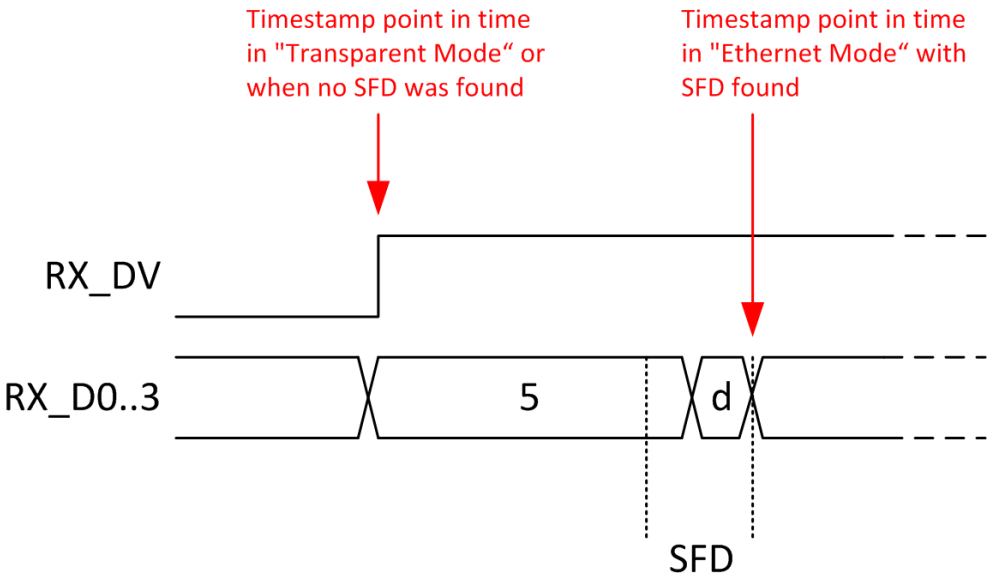


Figure 20: Message Timestamp-Point for „Ethernet Mode“ and „Transparent Mode“

„DV“ = Data Valid, „D0..3“ = Data, „5 d“ = SFD identifier

„SFD“ = Start-of-Frame-Delimiter

„Ethernet Mode“ (Standard Capturing):

In „Ethernet Mode“ the time stamp is taken at the reception of the SFD (Start-of-Frame-Delimiter).

„Transparent Mode“ (SFD is disturbed):

In „Transparent Mode“ the time stamp is always taken at the very front with the "data valid" lateral growth, i. e. at the proper start of the frame. This makes it possible to find a reference point also for faulty telegrams. Here preamble and SFD are not interpreted.

Accuracy of the time stamping

Time stamps on port 0 and port 1 on the NANL-C500-RE card or NANL-B500E-RE or NANL-B500G-RE device can have an offset of up to 40 ns. After a settling time of approx. 100 ms after receiving the first telegram at one port the offset at this port is max. 8 ns.

Time stamps on port 2 and port 3 on the NANL-B500E-RE or NANL-B500G-RE device have always a max. offset of 8 ns, without settling.

Time stamps on port 2 and port 3 on the NANL-C500-RE card of the Rev. 4 and older have always an up to 70 ns offset.

8.2 Transparent Mode

The **Transparent Mode** is used with the data capturing to register any telegram data, i. e., any bits transmitted including the frame data, preamble and SFD (=Start of Frame Delimiter).

Note:
The usage of the Transparent Mode only makes sense with a 100 Mbit connection.

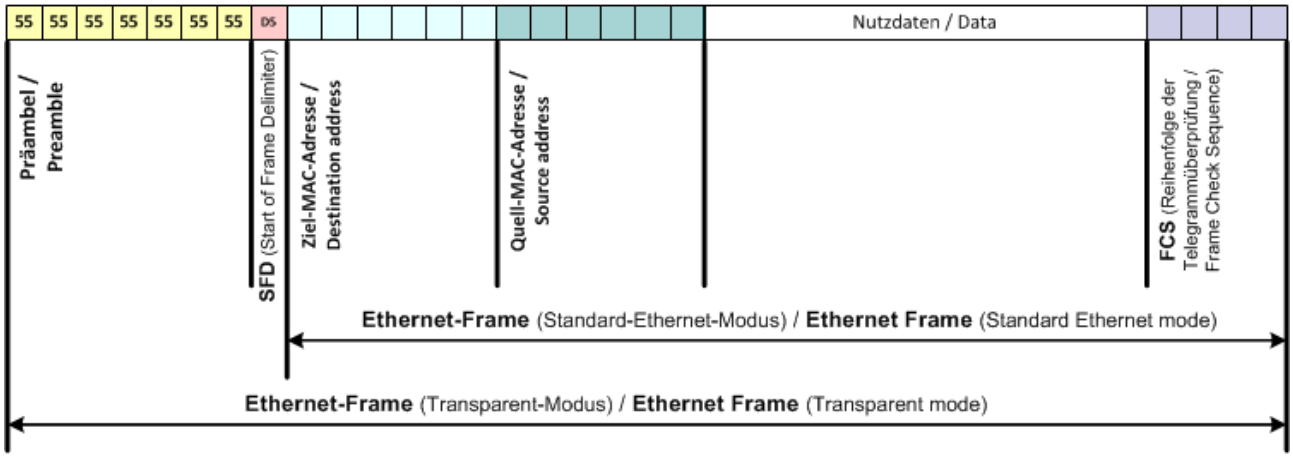


Figure 21: Basic Principle of an Ethernet Frame in the Standard Ethernet Mode or in the Transparent Mode

As during the Standard Ethernet Mode the preamble and the SFD (=Start of Frame Delimiter) are not included to the telegram, these parts are captured in the Transparent Mode.

```
0000  01 80 c2 00 00 0e 00 14  22 40 4f e4 88 cc 02 07   ........ "@o.....
0010  04 00 14 22 40 4f e4 04  09 07 70 6f 72 74 2d 30   ..."@o.. ..port-0
0020  30 31 06 02 00 14 08 41  42 72 6f 61 64 63 6f 6d   01.....A Broadcom
0030  20 4e 65 74 58 74 72 65  6d 65 20 35 37 78 78 20    NetXtre me 57xx
0040  47 69 67 61 62 69 74 20  43 6f 6e 74 72 6f 6c 6c   Gigabit  Controll
0050  65 72 20 2d 20 50 61 6b  65 74 70 6c 61 6e 65 72   er - Pak etplaner
0060  2d 4d 69 6e 69 70 6f 72  74 0a 0a 53 49 4d 41 54   -Minipor t..SIMAT
0070  49 43 20 50 43 0c 23 53  49 45 4d 45 4e 53 20 41   IC PC.#S IEMENS A
0080  47 20 53 49 4d 41 54 49  43 20 50 43 20 2b 20 65   G SIMATI C PC + e
0090  6e 67 69 6e 65 65 72 69  6e 67 0e 04 00 80 00 80   ngineeri ng......
00a0  10 14 05 01 c0 a8 0a 25  02 00 00 00 01 08 2b 06   .......% ......+.
00b0  01 04 01 81 c0 6e fe 08  00 0e cf 02 00 00 00 00   .....n.. ........
00c0  fe 0a 00 0e cf 05 00 14  22 40 4f e4 fe 09 00 12   ........ "@o.....
00d0  0f 01 02 00 00 00 10 00  00 5a bb b9 68            ........ .Z..h
```

Figure 22: Ethernet telegram (Ethernet frame) in Wireshark in the standard Ethernet Mode

```
0000  55 55 55 55 55 55 55 d5  01 80 c2 00 00 0e 00 14   UUUUUUU. ........
0010  22 40 4f e4 88 cc 02 07  04 00 14 22 40 4f e4 04   "@o..... ..."@o..
0020  09 07 70 6f 72 74 2d 30  30 31 06 02 00 14 08 41   ..port-0 01.....A
0030  42 72 6f 61 64 63 6f 6d  20 4e 65 74 58 74 72 65   Broadcom  NetXtre
0040  6d 65 20 35 37 78 78 20  47 69 67 61 62 69 74 20   me 57xx  Gigabit
0050  43 6f 6e 74 72 6f 6c 6c  65 72 20 2d 20 50 61 6b   Controll er - Pak
0060  65 74 70 6c 61 6e 65 72  2d 4d 69 6e 69 70 6f 72   etplaner -Minipor
0070  74 0a 0a 53 49 4d 41 54  49 43 20 50 43 0c 23 53   t..SIMAT IC PC.#S
0080  49 45 4d 45 4e 53 20 41  47 20 53 49 4d 41 54 49   IEMENS A G SIMATI
0090  43 20 50 43 20 2b 20 65  6e 67 69 6e 65 65 72 69   C PC + e ngineeri
00a0  6e 67 0e 04 00 80 00 80  10 14 05 01 c0 a8 0a 25   ng...... .......%
00b0  02 00 00 00 01 08 2b 06  01 04 01 81 c0 6e fe 08   ......+. .....n..
00c0  00 0e cf 02 00 00 00 00  fe 0a 00 0e cf 05 00 14   ........ ........
00d0  22 40 4f e4 fe 09 00 12  0f 01 02 00 00 00 10 00   "@o..... ........
00e0  00 5a bb b9 68                                     .Z..h
```

Figure 23: Ethernet telegram (Ethernet frame) in Wireshark in the Transparent Mode

9 Troubleshooting

General

➢ Check if the preconditions are served for the operation of the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE or NANL-B500G-RE:

Further information to this you find in section System requirements.

Link is not recognized

Note:

For 10-Mbit/s-connections and for increased bus load the PHY can not correctly detect the link. If in such a case in the netANALYZER main window under Link DOWN is displayed, for troubleshooting the speed must be set manually to 10 Mbit/s in the PHY Settings dialog.

LINK-LED

➢ Check using the LINK LED status if a connection to the Ethernet is established.

Further information to this you find in chapter *LEDs* [page 55].

Cable

➢ Check that the pin occupation of the used cable is correct.

Analyzer device NANL-B500E-RE or NANL-B500G-RE

➢ Check that the power supply of the device is connected to the mains voltage.

Host connecting interference (NANL-B500G-RE)

The Ethernet connection from the analyzer device NANL-B500G-RE device to the PC is a saved connection without loss. Transmission errors on the host Gigabit interface cable (such as EMC interference or bad connections) do not cause any data loss. However, to strong interference can lead to a disconnection.

Device is not accessible (NANL-B500G-RE)

Note:

In case of problems due to incorrect settings of the IP address (e. g. device is not accessible), restart your device. While turning on your device press the REC button for about minute. Then the default setting for the IP address of your device (DHCP server mode) is restored.

10 LEDs

10.1 LEDs NANL-C500-RE and NANL-B500E-RE

LEDs	Color	State	Meaning
SYS	grün	On	Operating System running
	yellow	Flashing cyclic at 1Hz	Device indicates boot error
	yellow	On	Bootloader is waiting for booting procedure or device is deinitialized
	off	Off	Power supply for the device is missing or hardware defect
STA0	green	On	Capturing process active
	red	On	Capturing process inactive
STA1	green	Single flash / on	Activity by signals on the GPIO (external input/output)
	red	On	Error between PCI device and firmware to the PC
LINK / RJ45 Ch0 to Ch3	green	On	A connection to the Ethernet exists
	off	Off	The device has no connection to the Ethernet
RX / RJ45 Ch0 to Ch3	yellow	Flashing / on	The device sends/receives Ethernet frames

Table 19: LEDs NANL-C500-RE and NANL-B500E-RE

Fatal error

LED	Color	State	Meaning
SYS	yellow	On	Fatal error: Firmware is not able to start because of an hardware problem.
STA0	red	On	
STA1	red	On	

Table 20: LEDs NANL-C500-RE and NANL-B500E-RE – Fatal error

Indicator states

Indicator state	Definition
On	The indicator is constantly on.
Off	The indicator is constantly off.
Blinking	The indicator turns on and off phase with a frequency of 2,5 Hz: on for 200 ms followed by off for 200 ms.
Single Flash	The indicator shows one short flash followed by an off phase. The interval period for the flash when triggering a GPIO event is 100 ms.

Table 21: Indicator states

10.2 LEDs NANL-B500G-RE

10.2.1 SYS, STA0, STA1, IO, LINK und RX (Front side)

LED	Color	State	Meaning
Front side NANL-B500G-RE			
SYS	green	On	Operating system running
	yellow	Flashing cyclic at 1Hz	Device indicates boot error
	yellow	On	Bootloader is waiting for booting procedure or device is deinitialized
	off	Off	Power supply for the device is missing or hardware defect
STA0	green	On	Capturing process active
	red	On	Capturing process inactive
STA1	green	Single flash / on	Activity by signals on the GPIO (external input/output)
	red	On	Error between PCI device and firmware to the PC
The IO Status LED shows the configuration state of the GPIOs.			
IO	green	On	The +3.3V output is enabled. Externally attached hardware will not be damaged, but make sure that voltage level matches to get proper signal detection.
	red	On	The +24V output is enabled. Notice: Externally attached hardware could be damaged as voltage is driven.
	orange	On	The +3.3V output is enabled. Notice: Externally attached hardware could be damaged as voltage is driven.
	off	Off	The +24V input is enabled. Externally attached hardware will not be damaged, but make sure that voltage level matches to get proper signal detection.
Front side NANL-B500G-RE - RJ45 Ethernt socket Ch0 and Ch1, TAP A and TAP B			
LINK / RJ45 Ch0 to Ch3	green	On	A connection to the Ethernet exists
	off	Off	The device has no connection to the Ethernet
RX / RJ45 Ch0 to Ch3	yellow	Flashing / on	The device sends/receives Ethernet frames

Table 22: LEDs NANL-B500G-RE (Front side)

Indicator states

Indicator state	Defintition
On	The indicator is constantly on.
Off	The indicator is constantly off.
Blinking	The indicator turns on and off phase with a frequency of 2,5 Hz: on for 200 ms followed by off for 200 ms.
Single Flash	The indicator shows one short flash followed by an off phase. The interval period for the flash when triggering a GPIO event is 100 ms.

Table 23: Indicator states

10.2.2 Fatal error

LED	Color	State	Meaning
Front side NANL-B500G-RE			
SYS	yellow	On	Fatal Error: Firmware is not able to start because of an hardware problem.
STA0	red	On	
STA1	red	On	

Table 24: LEDs NANL-B500G-RE (front side) - fatal error

10.2.3 LINK-ACT and LINK-1000/LINK100 (reverse side)

From the LEDs on the Gigabit RJ45 Ethernet socket on the reverse side of the analyzer device NANL-B500G-RE you can see whether the recorded data are transmitted secure from loss to the PC.

Important:
The color of both LEDs must be green! If the right LED lights up in orange, the transmission rate to the PC is less than 1 Gb/s, by consequence insufficient bandwidth may occur.

LED	Color	State	Meaning
Rückseite NANL-B500G-RE - Gigabit-Ethernet-RJ45-Buchse zum PC (1 Port mit 1 Gb/s)			
LED at the left			
LINK-ACT / RJ45 Ch0	green	On	From the NANL-B500G-RE device to the PC an Ethernet connection is established.
	green	Blinking (12 Hz)	Ethernet data are transmitted from the NANL-B500G-RE device to the PC.
	off	Off	There is no Ethernet connection between the NANL-B500G-RE device and PC.
LED at the right side			
LINK-1000 / RJ45 Ch0	green	On	The Ethernet data of the NANL-B500G-RE device are transferred to the PC with a transmission rate of 1000 bits/s (1 GB/s). **Note!**Only at a data transfer rate of 1 GB/s, the recorded data can be transmitted secure from loss to the PC on.
LINK-100 / RJ45 Ch0	orange	On	The Ethernet data of the NANL-B500G-RE device are transferred to the PC with a transmission rate of 100 bits/s. **Note!**If the LED at the right side lights orange during the analyzer device NANL-B500G-RE records large amounts of data, in the device a buffer overflow happens. There is no transmission to the PC and the data recording is stopped.
LINK-1000 LINK-100 / J45 Ch0	off	Off	There is no transmission of the Ethernet data of the NANL-B500G-RE device to the PC.

Table 25: LEDs NANL-B500G-RE (reverse side)

11 Connections and interfaces

11.1 Power supply NANL-B500E-RE

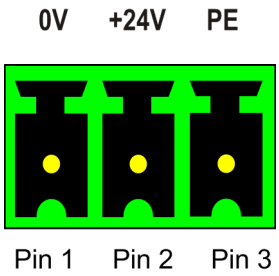
The analyzer device NANL-B500E-RE can be operated by a DC power supply from 18V to 30V. The connector for the power supply are on the reverse side of the analyzer device. The power consumption is 4.3 W.

The polarity of the power plug has to be considered. No alternating (AC) power supply can be used, because the board is not designed for this type of power supply. The current consumption of the analyzer device NANL-B500E-RE depends on different factors, for example the operating mode of the netX, CPU load and mainly from the level of the real input voltage (the higher the voltage the lower the current).

Connector 24V voltage supply

1. **Device destruction!**
   - ➢ Connect only **one** 24 V DC power supply to the device.

Combicon: 0V/+24V/PE:

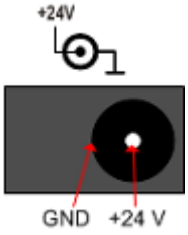


Voltage supply 24V DC, ±6V,

Pin	Name	Description
1	GND	Ground
2	+24V	18-30 V DC
3	PE	Protective earth

Maximum permitted cable length: 3 m

Alternatively Female Connector +24 V (only alternative use permitted!):



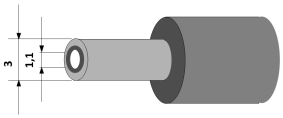
Voltage supply 24V DC, ±6V; max. 0.5 A,

External = GND, Pin = +24V; for barrel plug: (ø 3,0 / ø 1,1), L = 8,5 mm;

Maximum permitted cable length: 3 m

The female connector +24 V fits for the power supply: **TR15RA240**-Power.

Technical Data of TR15RA240-Power with barrel plug



Input: 90-264 VAC ~0.4 A (47-63 Hz)

Output: 24 V / 0,625 mA

cable length:1.8 m

Operating temperature range: 0 ... 60 ° C

(from 40 ° C, the current decreases with increasing temperature)

Order number: TR15RA240-331A03

Manufacturer: Cinon Electronics Ltd.

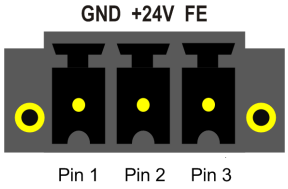
11.2 Power Supply NANL-B500G-RE

The analyzer device NANL-B500G-RE can be operated by a DC power supply from 18V to 30V. The connector for the power supply are on the reverse side of the analyzer device. The power consumption is 31.2 W.

The polarity of the power plug has to be considered. No alternating (AC) power supply can be used, because the board is not designed for this type of power supply. The current consumption of the analyzer device NANL-B500G-RE depends on different factors, for example the operating mode of the netX, CPU load, the load at the outputs and mainly from the level of the real input voltage (the higher the voltage the lower the current).

Connector 24V voltage supply

Combicon: 0V/+24V/FE:

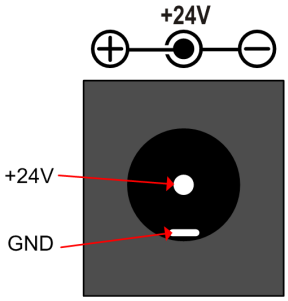


Voltage supply 24V DC, ±6V,

Pin	Name	Description
1	GND	Ground
2	+24V	18-30 V DC
3	FE	Functiional earth

Maximum permitted cable length: 3 m

Alternatively female connector +24 V (only alternative use permitted!):



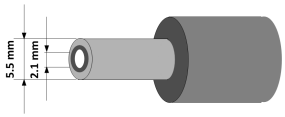
Voltage supply 24V DC, ±6V; max. 3A,

External = GND, Pin = +24V; for barrel plug: (ø 5,5 / ø 2,1), L = 12 mm;

Maximum permitted cable length: 3 m

The female connector +24 V fits for the power supply: **TR15RA240** power.

Technical Data of TR15RA240-Power with barrel plug



Input: 90-264 VAC ~ 0.4 … 0.8 A (47-63 Hz)

Output: 24 V / 1.25 A

cable length:1.8 m

Operating temperature range: 0 ... 60 ° C

(from 40 ° C, the current decreases with increasing temperature)

Order number: TRG30RA240V-11E03-BE-BK

Manufacturer: Cinon Electronics Ltd.

11.3 Ethernet interface

For the Ethernet interface use RJ45 plugs and twisted pair cable of category 5 (CAT5) or higher, which consists of 4 twisted cores and has a maximum transmission rate of 100 MBit/s (CAT5).

11.3.1 Ethernet pinning at the RJ45 socket

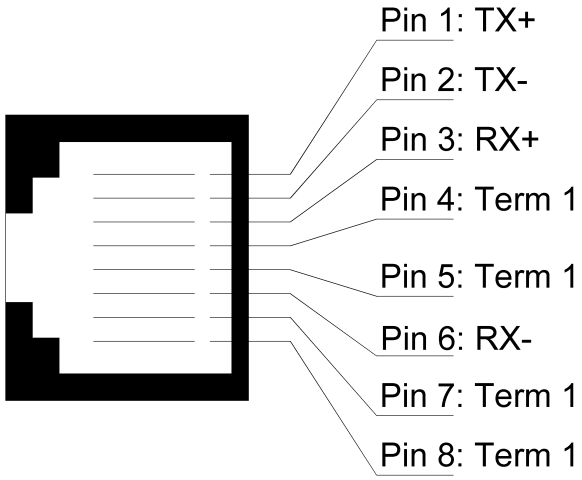


Figure 24: Ethernet pinning at the RJ45 socket

Pin	Signal	Meaning
1	TX+	Transmit data +
2	TX–	Transmit data -
3	RX+	Receive data +
4	Term 1	Connected to each other and terminated to PE through RC circuit*
5	Term 1	
6	RX–	Receive data –
7	Term 2	Connected to each other and terminated to PE through RC circuit*
8	Term 2	
		* Bob Smith Termination

Table 26: Ethernet pinning at the RJ45 socket

Note:
The RJ45 socket is only for use in LAN, not for telecommunication circuits.

11.3.2 Data of the Ethernet connection

Medium	2 x 2 Twisted-Pair cupric cable, CAT5 (100 MBit/s)
Length of cable	max. 100 m
Reception rate	10 MBit/s / 100 MBit/s

Table 27: Data of the Ethernet connection

11.4 External IO interface

The external IO interface has 4 digital inputs or outputs, the GPIOs 0 to 3. Each GPIO can be configured as input or output.

NOTICE **Device Destruction!**

- At the I/O signal pins of the External IO interface of the NANL-C500-RE card or of the NANL-B500E-RE device use exclusively 3.3 V signaling voltage. Higher signaling voltage may lead to severe damage to the NANL-C500-RE card or to the NANL-B500E-RE device!
- At the I/O signal pins of the External IO interface use exclusively 3.3 V or 24 V signaling voltage. Higher signaling voltage may lead to severe damage to the NANL-B500G-RE device!
- To operate the NANL-C500-RE card or the NANL-B500E-RE device use maximally 10 mA output current at the external IO interface I/O signal pins. Otherwise the netX chip and other components may be damaged.
- To operate the the NANL-B500G-RE device use maximally 1 mA (bei 3,3V) or 600 mA (bei 24V) output current at the external IO interface I/O signal pins. Otherwise the netX chip and other components may be damaged.

Male connector external IO interface with GPIOs 0 to 3:

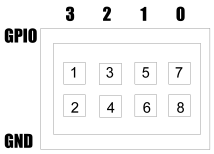


Figure 25: Male Connector external IO interface

Pin	Signal	Pin	Signal
2	GND	1	3
4	GND	3	2
6	GND	5	1
8	GND	7	0

Table 28: Pin out external IO interface

11.4.1 Connection cable for external IO interface

To access the digital signals of the GPIOs 0 to 3 of the external IO interface, you must use a cable that complies with the following requirements.

Parameters	Requirement
Min. conductor cross section	0,2 mm^2
Max. conductor cross section	1 mm^2
Max. cable length	5 m
Shielding	Shielded cables

Table 29: Requirements for the connection cable for external IO interface

12 Technical data

Note:
All technical data are temporarily and can be altered without notice.

12.1 Analyzer card NANL-C500-RE

NANL-C500-RE	Parameters	Value		
Part no.	Name	NANL-C500-RE		
	Part no.	7.310.100		
	Description	netANALYZER PC card with PCI Interface for Real-Time Ethernet and all 100BASE-T Ethernet Networks		
	Function	Passive Ethernet analyzer for Real-time Ethernet systems; analyzes data traffic in a communication link and logs the incoming Ethernet frames. In addition, events of four digital inputs can be recorded.		
Communication Controller	Type	netX 500 processor with ARM 926 CPU		
Integrated memory	Size of the dual-port memory	64 KByte		
System Interface	Bus type	PCI V2.3		
	Transmission rate	33 MHz		
	Data access	DPM and DMA		
	Width for the data access to the dual-port memory (DPM)	32-Bit		
	Data throughput PCI bus	Getestet bis 35 MB/s		
Ethernet communication	Ethernet communication	Receipt of Ethernet frames		
	Ethernet frame types	Ethernet II		
Ethernet interface	Transmission rate	10 MBit/s, 100 MBit/s		
	Interface type	100 BASE-TX, 10 BASE-T		
	Galvanic isolation	isolated		
	Half duplex/Full duplex	supported		
	Connector	2* RJ45 Socket, refer also to section *Ethernet Interface* [page 60].		
	Ethernet cable	2 x 2 Twisted-Pair cupric cable, CAT5 (100 MBit/s), Length of cable max. 100 m		
	Channels / ports	2 communication channels with integrated TAP (TAP B, TAP A), and each with two ports for capturing data in both directions (together 4 Ports: Port 0 to Port 3)		
	Filter	2 filter on the first 512 Bytes of the Ethernet frames (source and destination MAC address, Ether-Type and 498 following Bytes)		
	Time stamp resolution	10 ns		
External IO interface	External interface input signals/ output signals (female connector X40):	4 x digital inputs/outputs (GPIOs 0 to 3), 3.3 V / 10mA (refer to section *Maximum permissible output current (external IO Interface)* [page 23]; Minimum distance for GPIO events > 150 µs		
Displays	LED displays	**SYS**	System status	
		STA 0	Capturing active / inactive	
		STA 1	Event signal detected	
		LED yellow **REPLACEME**	Ethernet RX status	(*each at RJ45Ch0 and RJ45Ch1*)
		LED green	Ethernet Link status	
		Refer to chapter *LEDs* [page 55]		

NANL-C500-RE	Parameters	Value
Power supply	Supply voltage	+3,3 V dc ±5 %, refer to section *Power supply and host interface* [▷ page 22].
	Maximum current at 3.3 V (typically)	800 mA
	Connector	Via PCI bus
Environmental conditions	Operating temperature range*	0 °C ... +55 °C
	*Air flow during measurment	0.5m/s
	Storage temperature range	0 °C ... +70 °C
	Humidity	10 … 95% relative humidity, no condensation permitted
	Environment	The device must be used in a pollution degree 2 environment.
Device	Dimensions (L x W x H)	137 x 107 x 17,5 mm
	Mounting/installation	PCI slot (5 V or 3.3 V)
	RoHS	Yes
Analyzer software	netANALYZER Scope software* (provided; full version requires license)	Graphical user software for Windows for data capturing as well as for timing and network load analysis and for analyzis of EtherCAT and PROFINET data.
	Data format	Open WinPcap data format
	Network monitoring program Open Source Wireshark (recommended)	To display the recorded analysis data of the Ethernet frames (supports WinPcap format)

Table 30: Technical data analyzer card NANL-C500-RE

12.2 Analyzer device NANL-B500E-RE

NANL-B500E-RE	Parameters	Value		
Part	Name	NANL-B500E-RE		
	Part no.	7.311.100		
	Description	netANALYZER portable Device with ExpressCard Interface for Real-Time Ethernet and all 10/100BASE-T Ethernet Networks (Stand-alone Device),		
	Function	Passive Ethernet analyzer for Real-time Ethernet systems; analyzes data traffic in a communication link and logs the incoming Ethernet frames. In addition, events of four digital inputs can be recorded.		
Communication controller	netX 500 processor with ARM 926 CPU	netX 500 processor with ARM 926 CPU		
Integrated memory	Size of the dual-port memory	64 KByte		
System interface	Bus type	ExpressCard 34, PCI Express Base Specification Revision 2.0 and PCI Express to PCI/PCI-X Bridge Specification Revision 1.0		
	Data throughput PCI bus	Tested to 35 MB/s		
Ethernet communication	Ethernet communication	Receipt of Ethernet frames		
	Ethernet frame types	Ethernet II		
Ethernet interface	Transmission rate	10 MBit/s, 100 MBit/s		
	Interface type	100 BASE-TX, 10 BASE-T		
	Galvanic isolation	isolated		
	Half duplex/full duplex	supported		
	Connector	2* RJ45 Socket, refer also to section *Ethernet interface* [page 60].		
	Ethernet cable	2 x 2 Twisted-Pair cupric cable, CAT5 (100 MBit/s), Length of cable max.		
	Channels / ports	2 communication channels with integrated TAP (TAP B, TAP A), and each with two ports for capturing data in both directions (together 4 Ports: Port 0 to Port 3)		
	Filter	2 filter on the first 512 Bytes of the Ethernet frames (Source and destination MAC address, Ether-type and 498 following Bytes)		
	Time stamp resolution	10 ns		
Diagnosis interface	USB plug	USB Plug Mini B USB Plug (5-pin) (*for future use only*)		
External IO interface	External interface input signals/ output signals (female connector X40):	4 x digital Inputs/Outputs (GPIOs 0 to 3), 3.3 V / 10mA (refer to section *Maximum permissible output current (external IO interface)* [page 23]); Minimum distance for GPIO events > 150 µs		
Displays	LED displays	**SYS**	System status	
		STA 0	Capturing active / inactive	
		STA 1	Event signal detected	
		LED yellow	Ethernet RX status	(*each at RJ45Ch0 and RJ45Ch1*)
		LED green	Ethernet Link status	
		Refer to chapter *LEDs* [page 55]		

NANL-B500E-RE	Parameters	Value
Power supply	Supply voltage nominal	24V DC / 180 mA / 4,3 W (refer to sections *power supply and host interface* [page 22] and *power supply NANL-B500E-RE* [page 58])
	Range of the operating voltage	18V ... 30V DC
	Connector 24V voltage supply	Combicon 0V/+24V/PE: Voltage supply 24V DC, ±6V, Pin 1 = GND; Pin 2 = +24V; Pin 3 = PE; Maximum permitted cable length: 3 m Alternatively female connector +24 V (only alternative use permitted!): Voltage supply 24V DC, ±6V max. 0.5 A, External = GND, Pin = +24V; for barrel plug: (ø 3,0 / ø 1,1), L = 8,5 mm; maximum permitted cable length: 3 m
Operation	SD	Micro SD card slot (*for future use only*)
	Switch	RUN / STOP / RESET (*for future use only*)
Environmental conditions	Operating temperature range*	0 °C ... +55 °C
	*Air flow during measurment	0.5m/s
	Storage temperature range	0 °C ... +70 °C
	Humidity	10 … 95% relative humidity, no condensation permitted
	Environment	The device must be used in a pollution degree 2 environment.
Device	Dimensions (L x W x H)	115 x 62 x 133 mm
	Mounting/installation	PCI Express slot for notebook (ExpressCard), (PCIe compatible)
	RoHS	Yes
Analyzer software	netANALYZER Scope software* (provided; full version requires license)	Graphical user software for Windows for data capturing as well as for timing and network load analysis and for analyzis of EtherCAT and PROFINET data.
	Data format	Open WinPcap data format
	Network monitoring program Open Source Wireshark (recommended)	To display the recorded analysis data of the Ethernet frames (supports WinPcap format)

Table 31: Technical data analyzer device NANL-B500E-RE

12.3 Analyzer device NANL-B500G-RE

NANL-B500G-RE	Parameters	Value		
Part	Name	NANL-B500G-RE		
	Part no.	7.313.100		
	Description	netANALYZER portable Device with Gigabit Ethernet PC Interface for Real-Time Ethernet and all 10/100BASE-T Ethernet Networks (Stand-alone Device).		
	Function	Passive Ethernet analyzer for Real-time Ethernet systems; analyzes data traffic in a communication link and logs the incoming Ethernet frames. In addition, events of four digital inputs can be recorded.		
Communication controller	Type	netX 500 processor with ARM 926 CPU		
Integrated memory	Size of the dual-port memory	64 KByte		
System interface	PC interface	Gigabit Ethernet RJ45 socket to the PC		
	Required Connector (at the reverse side of the device)	‚UPLINK 1Gb/s': Ethernet RJ45 socket (1 port)		
	Data throughput PCI bus	Tested to 35 MB/s		
Ethernet communication	Ethernet communication	Receipt of Ethernet frames		
	Ethernet frame types	Ethernet II		
Ethernet interface (at the front side of the device)	Transmission rate	10 MBit/s, 100 MBit/s		
	Interface type	100 BASE-TX, 10 BASE-T		
	Galvanic isolation	isolated		
	Half duplex/full duplex	supported		
	Connector	2* RJ45 Socket, refer also to section *Ethernet interface* [page 60].		
	Ethernet cable	2 x 2 Twisted-pair cupric cable, CAT5 (100 MBit/s), length of cable max.		
	Channels / ports	2 communication channels with integrated TAP (TAP B, TAP A), and each with two ports for capturing data in both directions (together 4 Ports: Port 0 to Port 3)		
	Filter	2 filter on the first 512 Bytes of the Ethernet frames (Source and destination MAC address, Ether-type and 498 following bytes)		
	Time stamp resolution	10 ns		
Diagnosis interface	USB interface	USB Plug (type A, 4-pin) *(for future use only)*		
External IO interface	External Interface Input Signals/ Output Signals (female connector):	4 digital inputs/outputs (GPIOs 0 to 3), 3.3 V / 1 mA or 24V / 600 mA (refer to section *Maximum permissible output current* [page 23] (external IO Interface)); Minimum distance for GPIO events > 150 µs		
Displays	LED Display (at the front side of the devices)	**SYS**	System status	
		STA 0	Capturing active / inactive	
		STA 1	Event signal detected	
		IO	Indicates the GPIO status (3.3V input, 24V input, 3,3V output, 24V output)	
		LED yellow	Ethernet RX status	(*each at RJ45Ch0 and RJ45Ch1*)
		LED green	Ethernet Link status	
		Refer to chapter *LEDs* [page 55]		
	LED Display (at the reverse side of the devices) Indicates whether the recorded data are transmitted secure from loss to the PC.	**LED green/ orange**	Ethernet LINK 1000 LINK 100 status	(*to Gigabit Ethernet RJ45 socket*)
		LED green	Ethernet LINK ACT status	
		Refer to chapter *LEDs* [page 55].		

NANL-B500G-RE	Parameters	Value
Power supply	Supply voltage nominal	24V DC / 700 mA / 16.8 W (refer to sections *Power Supply and Host Interface* [▶ page 22] and *Power Supply NANL-B500G-RE* [▶ page 59])
	Range of the operating voltage	18V ... 30V DC
	Connector 24V voltage supply	Combicon 0V/+24V/FE: Voltage supply 24V DC, ±6V, Pin 1 = GND; Pin 2 = +24V; Pin 3 = FE; Maximum permitted cable length: 3 m Alternatively Female Connector +24 V: Voltage supply 24V DC, ±6V max. 3 A, External = GND, Pin = +24V; for barrel plug: (ø 5,5 / ø 2,1) L = 12 mm; Maximum permitted cable length: 3 m
	Power switch	ON / OFF
Operation	REC button	Enables data recording* (and reset to DHCP server operation mode) (*for future use only*)
Environmental conditions	Operating temperature range*	- 20 °C ... +55 °C
	*Air flow during measurment	0.5m/s
	Storage temperature range	-10 °C ... +70 °C
	Humidity	10 … 95% relative humidity, no condensation permitted
	Environment	The device must be used in a pollution degree 2 environment.
Device	Dimensions (L x W x H)	115 x 62 x 133 mm
	RoHS	Yes
	Mounting/installation	-
Analyzer software	netANALYZER-Software* (provided; full version requires license)	Graphical user software for Windows for data capturing as well as for timing and network load analysis and for analyzis of EtherCAT and PROFINET data.
	Data format	Open WinPcap data format
	Network monitoring program Open Source Wireshark (recommended)	To display the recorded analysis data of the Ethernet frames (supports WinPcap format)

Table 32: Technical data analyzer device NANL-B500G-RE

13 Annex

13.1 Hardware update for NXANL 500-RE Rev 2 and Rev 3

For existing installation of the analyzer cards NXANL 500-RE of the hardware revisions 2 and 3 you must apply the netANALYZER hardware update „Update NXANL 500-RE Revision 3“ and then update the netANALYZER driver and the netANALYZER software.

Therefore proceed as described below:

1. Burn an ISO image of the netANALYZER Hardware Update on a CD.

➢ Burn the file *update NXANL 500-RE Revision 3\netANALYZER_ hw_update.iso* from the netANALYZER installation DVD as ISO image on a CD.

2. Boot the PC with the existing hardware installation.

3. Put the CD with the ISO image of the netANALYZER hardware update into the DVD-ROM drive of this PC.

The system of the PC boots and after a short time the following text is displayed at the screen:

```
--------------------------------------------------------------------------------
This is an update CD for netANALYZER Rev 2 an Rev 3 card which do not work
under Windows Vista and Windows 7.
This happens due to an invalid subvendor ID provided by the cards on the PCI
bus. Please call "netanalyzer-update" to start the update procedure.
--------------------------------------------------------------------------------
user@netANALYZER-update: ~$
```

4. Start the hardware update.

➢ Therefore enter `netanalyzer-updater`.

```
user@netANALYZER-update: ~$netanalyzer-updater
```

➢ Press **Enter**.

The hardware update utility searches for Hilscher devices and then for netANALYZER portable Device.

The following text is displayed at the screen:

```
Initializing drivers: Done
Search Hilscher Devices: Done
Found Hilscher Devices
-------------------------------------------------------------------------------
Bus| Dev |Func | Phys Addr. | Vendor | Device | SubVendor | SubDevice | DevClass
[Werte der Liste der Geräte]
-------------------------------------------------------------------------------
Do you want to continue with the update? (y/n)
```

5. Continue the hardware update.

➢ Therefore enter `y`.

```
Do you want to continue with the update? (y/n)y
```

➢ Press **Enter**.

The following text is displayed at the screen:

```
Please reboot your computer now, to activate the changes!
user@netANALYZER-update: ~$
```

6. Reboot the PC with the existing hardware installation.

The hardware update is finished.

7. Now actualize the netANALYZER driver and the netANALYZER software, as described in the user manual *software installation for netANALYZER*.

13.2 Failure in 10 MBit/s half duplex mode and workaround

Note:
The failure described here only affects older **NANL-C500-RE** devices with serial numbers up to **20233** and **NANL-B500E-RE** devices with serial numbers up to **20040**.

Affected hardware

Hardware with the communication controller netX 50, netX 100 or netX 500; netX/Internal PHYs.

When can this Failure occur?

When using standard Ethernet communication with 10 MBit/s half duplex mode, the PHY gets stuck in case of network collisions. Then no further network communication is possible. Only device power cycling allows Ethernet communication again.

This problem can only occur with Ethernet TCP/UDP IP, EtherNet/IP or Modbus TCP protocols when using hubs at 10 MBit/s. The issue described above is not applicable for protocols which use 100 MBit/s or full duplex mode.

Solution / Workaround:

Do not use 10 MBit/s-only hubs. Use either switches or 10/100 MBit/s Dual Speed hubs, to make sure the netX Ethernet ports are connected with 100 MBit/s or in full duplex mode.

This erratum is fixed with all components of the ‘Y’ charge (9 digit charge number shows ‘Y’ at position 5 (nnnnYnnnn).

Reference

“Summary of 10BT problem on EthernetPHY”,

RenesasElectronics Europe, April 27, 2010

13.3 Disposal of waste electronic equipment

Important notes from the European Directive 2002/96/EG “Waste Electrical and Electronic Equipment (WEEE)”

Waste electronic equipment

.

This product must not be treated as household waste.

This product must be disposed of at a designated waste electronic equipment collecting point.

Waste electronic equipment may not be disposed of as household waste. As a consumer, you are legally obliged to dispose of all waste electronic equipment according to national and local regulations.

List of figures

List of tables

Glossary

DHCP	Dynamic host configuration protocol: protocol simplifying the configuration of IP networks by automatically assigning IP addresses
DHCP client	requests from the DHCP server the IP address, subnet mask, gateway address and other parameters for the Ethernet communication
DHCP server	provides the assignment of IP address via DHCP protocol as a service to other network participants and facilitates the IP address assignment essentially
DMA	Direct memory access
DPM	Dual-port memory
Ethernet Device Configuration	Hilscher Software tool used eg for the netANALYZER device NANL-B500G-RE to configure the IP address and which is used for the modes "static IP address" or "DHCP Client"
GPIO	General purpose input/output
NANL-B500E-RE	netANALYZER portable device with ExpressCard interface for real-time ethernet and all 10/100BASE-T Ethernet networks
NANL-B500G-RE	netANALYZER portable device with Gigabit Ethernet PC interface for real-time Ethernet and all 10/100BASE-T Ethernet networks
NANL-C500-RE	netANALYZER PC card with PCI interface for real-time Ethernet and all 100BASE-T Ethernet networks
netANALYZER	system for recording and analyzing data traffic in Ethernet networks which has been developed and is manufactured by Hilscher, consisting of a special hardware (netANALYZER card or portable device) and software
netANALYZER Scope	intelligent high level analysis software for recording and analyzing EtherCAT and PROFINET networks together with the netANALYZER hardware (card or portable device)
PHY	Physical interface
TAP	Test access point
WinPcap	library WinPcap; http://www.winpcap.org/
Wireshark	Network monitoring program Wireshark; http://www.wireshark.org

Contacts

HEADQUARTERS

Germany

Hilscher Gesellschaft für
Systemautomation mbH
Rheinstrasse 15
D-65795 Hattersheim
Phone: +49 (0) 6190 9907-0
Fax: +49 (0) 6190 9907-50
E-Mail: info@hilscher.com

Support

Phone: +49 (0) 6190 9907-99
E-Mail: de.support@hilscher.com

SUBSIDIARIES

China

Hilscher Systemautomation (Shanghai) Co. Ltd.
200010 Shanghai
Phone: +86 (0) 21-6355-5161
E-Mail: info@hilscher.cn

Support

Phone: +86 (0) 21-6355-5161
E-Mail: cn.support@hilscher.com

France

Hilscher France S.a.r.l.
69500 Bron
Phone: +33 (0) 4 72 37 98 40
E-Mail: info@hilscher.fr

Support

Phone: +33 (0) 4 72 37 98 40
E-Mail: fr.support@hilscher.com

India

Hilscher India Pvt. Ltd.
Pune, Delhi, Mumbai
Phone: +91 8888 750 777
E-Mail: info@hilscher.in

Italy

Hilscher Italia S.r.l.
20090 Vimodrone (MI)
Phone: +39 02 25007068
E-Mail: info@hilscher.it

Support

Phone: +39 02 25007068
E-Mail: it.support@hilscher.com

Japan

Hilscher Japan KK
Tokyo, 160-0022
Phone: +81 (0) 3-5362-0521
E-Mail: info@hilscher.jp

Support

Phone: +81 (0) 3-5362-0521
E-Mail: jp.support@hilscher.com

Korea

Hilscher Korea Inc.
Seongnam, Gyeonggi, 463-400
Phone: +82 (0) 31-789-3715
E-Mail: info@hilscher.kr

Switzerland

Hilscher Swiss GmbH
4500 Solothurn
Phone: +41 (0) 32 623 6633
E-Mail: info@hilscher.ch

Support

Phone: +49 (0) 6190 9907-99
E-Mail: ch.support@hilscher.com

USA

Hilscher North America, Inc.
Lisle, IL 60532
Phone: +1 630-505-5301
E-Mail: info@hilscher.us

Support

Phone: +1 630-505-5301
E-Mail: us.support@hilscher.com