



User manual
netANALYZER device NANL-B500G-RE
Installation, operation and hardware description



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DOC091110UM27EN | Revision 27 | English | 2022-04 | Released | Public

Table of contents

1	Introduction	5
1.1	About the user manual	5
1.1.1	Obligation to read and understand the manual	5
1.1.2	List of revisions	5
1.2	Product DVD and documentation	6
1.3	Hardware, firmware and driver versions	6
1.4	Licenses	7
2	Safety	8
2.1	General note	8
2.2	Intended use	8
2.3	Personnel qualification	8
2.4	Property damage	9
2.4.1	Exceeding permissible supply voltage	9
2.4.2	Exceeding permissible signaling voltage	9
2.4.3	Exceeding the permissible current consumption at the external I/O interface	10
2.4.4	Damage of externally attached hardware	10
2.4.5	Assignment of wrong IP addresses, malfunction (NANL-B500G-RE)	11
2.4.6	Power drop during write and delete accesses in the file system	11
2.4.7	Exceeding the maximum number of permitted write and delete accesses	11
3	Description	12
3.1	Recording and analyzing data traffic	13
3.2	Interactive and Autonomous operating mode	15
4	Device drawings	16
4.1	Analyzer device NANL-B500G-RE	16
5	System requirements	17
5.1	Hardware requirements	17
5.2	Power supply and host interface	18
5.3	Maximum permissible current consumption (external IO interface)	18
5.4	Requirements NANL-B500G-RE (Autonomous operating mode)	19
6	Getting started	20
6.1	Notes for installation and operation	20
6.2	Overview installation	21
6.3	Overview installation update	22
6.4	Property damage messages	23
6.4.1	Exceeding permissible supply voltage	23
6.4.2	Exceeding permissible signaling voltage	23
6.4.3	Exceeding the permissible current consumption at the external I/O interface	23
6.4.4	Damage of externally attached hardware	24
6.4.5	Assignment of wrong IP addresses, malfunction (NANL-B500G-RE)	24
6.4.6	Power drop during write and delete accesses in the file system	25
6.5	Configure IP address	26

7	Commissioning	28
7.1	Check firewall settings	28
7.2	netANALYZER Configuration page.....	29
7.3	Interactive operating mode, connection to PC	31
7.4	Autonomous operating mode, general conditions and requirements.....	32
7.4.1	PCAP files (file name and size)	33
7.4.2	Requirements for using the Autonomous operating mode.....	33
7.4.3	Default settings for the behavior of the GPIO signals in "Live dump mode" ...	34
7.4.4	Set the time for the autonomous operating mode.....	35
7.4.5	Estimate required USB memory capacity for snapshot mode theoretically	37
7.4.6	Set maximum number of snapshots for autonomous operating mode	39
7.4.7	Starting or stopping NANL-B500G-RE in the Autonomous operating mode... ..	41
7.5	Autonomous operating mode, capturing on USB memory device	42
7.5.1	Full capturing process (Live-Dump-Mode).....	42
7.5.2	Capturing snapshots (snapshot mode)	44
7.5.3	Displaying lost frames in Wireshark	46
7.6	Inserting netANALYZER hardware into the communication link.....	48
7.6.1	Application case 1	49
7.6.2	Application case 2.....	50
7.6.3	Application case 3.....	51
7.6.4	Application case 4.....	52
7.7	Data load limitation.....	54
7.8	Auto-crossover and port-switching.....	55
7.9	How to update the NANL-B500G-RE firmware	56
7.9.1	How to update the NANL-B500G-RE firmware using a web browser.....	56
7.9.2	How to update the NANL-B500G-RE firmware via FTP	58
7.10	Temperature control of the fan (NANL- B500G-RE)	61
7.11	Disposal of waste electronic equipment.....	61
8	Hardware properties	62
8.1	Timestamp	63
8.2	Transparent Mode.....	64
9	Troubleshooting	65
10	LEDs	67
10.1	LEDs NANL-B500G-RE	67
10.1.1	SYS, STA0, STA1, I/O, LINK and RX (NANL-B500G-RE, front side).....	67
10.1.2	LINK-ACT and LINK-1000/LINK100 (NANL-B500G-RE, reverse side)	70
11	Connectors and interfaces	71
11.1	Power Supply NANL-B500G-RE.....	71
11.2	Ethernet interface.....	72
11.2.1	Ethernet pinning at the RJ45 socket.....	72
11.2.2	Data of the Ethernet connection	72
11.3	External IO interface	73
11.3.1	Connection cable for external IO interface.....	73
11.3.2	Characteristics of the input signal at the I / O interface	74
12	Technical data	75
12.1	Analyzer device NANL-B500G-RE.....	75

13 Annex	78
13.1 References safety	78
13.2 Conventions in this document.....	79
13.3 Legal notes.....	80
13.4 Registered trademarks.....	83
Glossary	86
Contacts	87

1 Introduction

1.1 About the user manual

This user manual contains descriptions for installation and operation of the netANALYZER hardware for **netANALYZER portable device** with Gigabit Ethernet PC interface of the device type NANL-B500G-RE (stand-alone device), for real-time Ethernet and all 10/100BASE-T Ethernet networks.



For the descriptions of the software installation, see installation guide **Software installation for netANALYZER devices**, respectively for software operation, see operating instruction manual **netANALYZER Scope** on the product DVD.

1.1.1 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 as ZIP file providing the product manuals.

1.1.2 List of revisions

Index	Date	Revisions
26	2019-07-10	Section <i>Connection cable for external IO interface</i> [▶ page 73] Adaption: Max. cable length 3 m.
27	2022-04-04	Revisions.

Table 1: List of revisions

1.2 Product DVD and documentation

All necessary installation components and the documentation for your netANALYZER hardware can be found on the **netANALYZER Scope DVD**. You can download the product DVD as a ZIP file from the website <http://www.hilscher.com> (under **Products**, directly at the information about your product).

Important installation components on the netANALYZER Scope DVD

- **netANALYZER Scope**
- **netANALYZER / netSCOPE Device Driver**; for Windows® 7, Windows® 8 and Windows® 10 (each for 32-bit and 64-bit architecture)
- **Remote Access client** (for analyzer device NANL-B500G-RE)
- **Hilscher Licenses Manager**
- **WinPcap driver**
The supplied WinPcap driver is required in order that your netANALYZER device is available as a recording device in the network monitoring program installed on your PC.
- **Ethernet Device Configuration Tool** (for NANL-B500G-RE)
- **Documentation and examples**
- **NANL-B500G-RE firmware update** (nanl-b500g-re.update)



Detailed information about the contents of the product DVD and about the documentation for netANALYZER, see installation guide **Software installation for netANALYZER devices**.

1.3 Hardware, firmware and driver versions

Device name	Device type	Part no.	Revision
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 / netSCOPE Device Driver	NSCP-100.nxf	2.0.x.x	C:\Programs\ netANALYZER Device Driver\...
netANALYZER toolkit			
NANL-B500G-RE image version	<no data name>	1.10.x.x	<no path>

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

1.4 Licenses

In order to be able to fully utilizing the netANALYZER Scope data acquisition and analysis program for the analyzer device NANL-B500G-RE, you need a basic license. Additional protocol-dependent or other additional licenses (add-ons) may be required.



Details to the licenses for netANALYZER devices or the data acquisition and analysis program netANALYZER Scope, see user manual "netANALYZER Scope Licensing" (DocID: DOC150205UMXXDE).

"Autonomous operating mode" and "Snapshot mode"



Note:

The analyzer device NANL-B500G-RE can be used both in the "Interactive operating mode" with a connected PC, as well as in the "Autonomous operating mode" without a PC.

As a prerequisite to use the "Autonomous operating mode", a license (netANALYZER autonomous operating mode LIC/NANL/SA) is required.

If you want to use the "Snapshot mode" in the "Autonomous operating mode", an additional license is required.

Part number	Parte title	Description	Legend
8582.001	LIC/SCPBS	netANALYZER Scope base	netANALYZER Scope software license, basic license Note: In order to use the "Snapshot Mode" in the "Autonomous operating mode", the netANALYZER Scope software basic license is required in addition to the netANALYZER Scope add-on "Autonomous operation NANL-B500G-RE". (delivery without netANALYZER device)
8.582.060	LIC/NANL/SA	Autonomous operation NANL-B500G-RE	netANALYZER add-on: Required additional license for the analyzer device NANL-B500G-RE, for the execution of the "Autonomous operating mode"

Table 4: Required licenses for "Autonomous operating mode" and "Snapshot mode"

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 qualified personnel. When using the products, all Safety Messages, Integrated Safety Messages, Property Damage Messages and all valid legal regulations must be obeyed. Technical knowledge is presumed. The user has to assure that all legal regulations are obeyed.

2.2 Intended use

The NANL-B500G-RE analyzer device described in this user manual operates as a passive Ethernet analyzer in RT Ethernet systems. The netANALYZER device analyzes the data traffic in a communication path and logs the incoming Ethernet frames.

Device name	Device type
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 device

If the analyzer device NANL-B500G-RE is used outside the range of application described in this user manual or the associated documentation, an error free function of the device cannot be guaranteed.

2.3 Personnel qualification

The NANL-B500G-RE analyzer device may only be installed, configured, operated or 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 Property damage

To avoid system damage and device destruction, you necessarily must read, understand, and comply with the safety instructions and safety messages in this manual before you install and operate your device.

2.4.1 Exceeding permissible supply voltage

Device 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 permitted range for the supply voltage are not exceeded. A supply voltage above the upper limit can cause serious damage to the device! A supply voltage below the lower limit can lead to malfunctions of the device. The permissible range for the supply voltage is determined 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.

2.4.2 Exceeding permissible signaling voltage

Device 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.

2.4.3 Exceeding the permissible current consumption at the external I/O interface

Device NANL-B500G-RE

In order to avoid damage to your device due to excessive current consumption at the external IO interface, you must observe the following instructions. These apply to all devices described in this manual.

- When operating the NANL-B500G-RE device, the prescribed device-specific maximum values for the current consumption at the I/O signal pins of the external I/O interface must not be exceeded.
- The netX chip and other components of the NANL-B500G-RE device can be damaged if the current consumption at the I/O signal pins of the external I/O interface exceeds the maximum permitted values!



The information on the maximum current consumption at the I/O signal pins for the device described in this manual can be found in section *Maximum permissible current consumption (external I/O interface)* [► page 18].

2.4.4 Damage of externally attached hardware

NANL-B500G-RE

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

Note on USB handling in autonomous operating mode: The .nsprj configuration is applied immediately when the USB memory device is connected. This means that the GPIO configuration is also applied. It is therefore important to ensure that switching GPIO, e.g. to the 24 V output, does not damage any externally connected circuit.

- 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.

2.4.5 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.

2.4.6 Power drop during write and delete accesses in the file system

The FAT file system in the netX firmware is subject to certain limitations in its operation. Write and delete accesses in the file system (firmware update, configuration download etc.) can destroy the FAT (File Allocation Table) if the accesses cannot be completed if the power drops. Without a proper FAT, a firmware may not be found and cannot be started.

- Make sure, that the power supply of the device does not drop during write and delete accesses in the file system (firmware update, configuration download etc.).

2.4.7 Exceeding the maximum number of permitted write and delete accesses

This device uses a serial flash chip to store remanent data such as firmware storage, configuration storage, etc. This device allows a maximum of 100,000 write/delete accesses that are sufficient for standard operation of the device. However, writing/deleting the chip excessively (e.g. changing the configuration or changing the name of station) leads to the maximum number of permitted write/delete accesses being exceeded and to device damage. For example, if the configuration is changed once an hour, the maximum number is reached after 11.5 years. If the configuration is changed even more frequently, for example once a minute, the maximum number is reached after approx. 69 days.

Avoid exceeding the maximum permitted write/delete accesses by writing too often.

3 Description

With the analyzer device NANL-B500G-RE you can record the performance and functions of individual systems or system components of bus systems that comply with the Ethernet II IEEE 802.3 specification.

The NANL-B500G-RE analyzer device described in this user manual operates as a passive Ethernet analyzer in Real-Time Ethernet systems. The NANL-B500G-RE device analyzes the data traffic in a communication path and logs the incoming Ethernet frames.

The additionally available software extension netANALYZER Scope can be used for process data acquisition and for the clear presentation of process values. Recorded frame data can be used for detailed protocol analysis in Wireshark.

3.1 Recording and analyzing data traffic

For devices with two Ethernet channels, the NANL-B500G-RE analyzer device records the Ethernet frames and adds timestamps to the frames. Therefore, the analyzer device must be connected from one of the TAP via two patch cables to the Ethernet device connections.

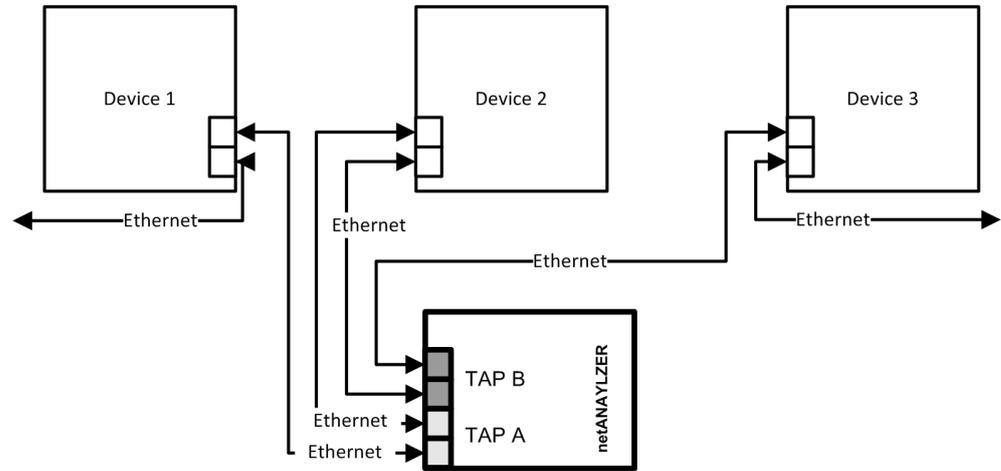


Figure 1: Typical application (Use Case 2) - The communication between a device and its connection partners in a network should be analyzed

Interactive operating mode, autonomous operating mode

- In the "Interactive operating mode", data capturing must be configured or started via the PC software. The analyzer device NANL-B500G-RE and the PC software collect the data packets of the communication path, transfer the data packets and store them on the hard disk.
- In the "Autonomous operating mode", data recording with the NANL-B500G-RE analyzer device alternatively is performed with start and stop via the REC key, without PC software.

Test Access Points (TAP)

Two TAPs are integrated into the NANL-B500G-RE analyzer device so that two communication channels are ready for use.

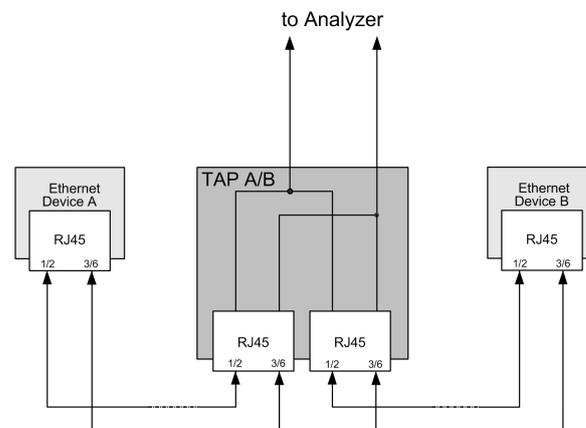


Figure 2: Example representation physical TAP

Delay of the Ethernet signals by the TAP

The delay of the Ethernet signals through the Test Access Point (TAP) in an Ethernet path is:

Ports	TAP Delay [ns]
0 → 1	< 1
1 → 0	< 1
3 → 4	< 1
4 → 3	< 1

Table 6: TAP Delay

Data recording

In the "Interactive operating mode", the NANL-B500G-RE analyzer device stores the data on the hard disk of the PC. Using the PC software and its export function, the data can be transferred to the open WinPcap format (*.pcap), which can be analyzed with Wireshark, for example. Alternatively, a live recording directly from Wireshark is also possible via the WinPcap driver on the product DVD.

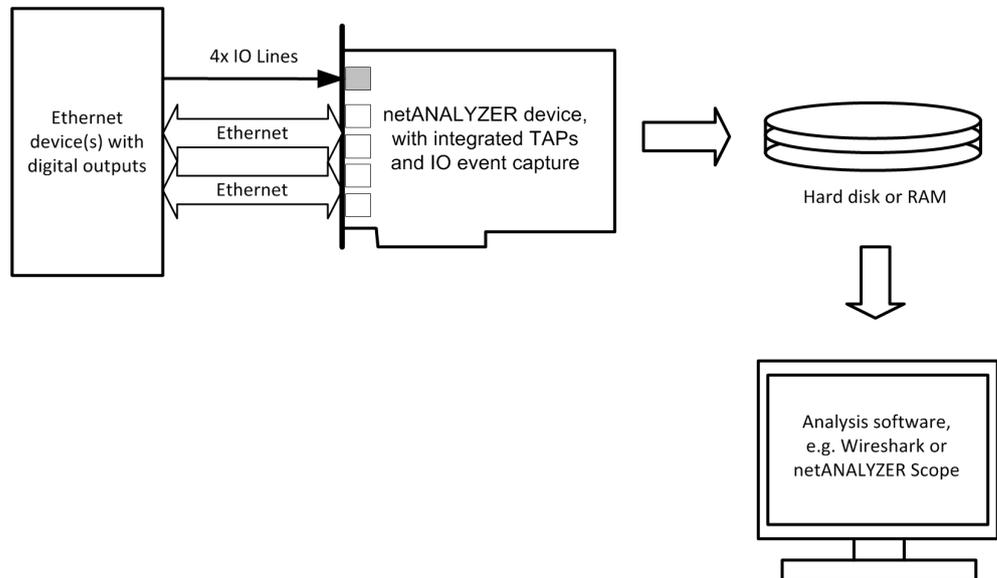


Figure 3: Typical analyzer application with the capturing of the Ethernet data transfer and IO events

Digital inputs

In addition, events from up to four digital inputs can be recorded. At the four digital inputs, the input signals generate a special pseudo Ethernet frame in the NANL-B500G-RE analyzer device. This frame is generated by the analyzer device and evaluated accordingly by the analysis software.



Note:

For the GPIO events a pseudo Ethernet frame is generated (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. This frame is then decoded by Wireshark or netANALYZER Scope as a GPIO event.

3.2 Interactive and Autonomous operating mode

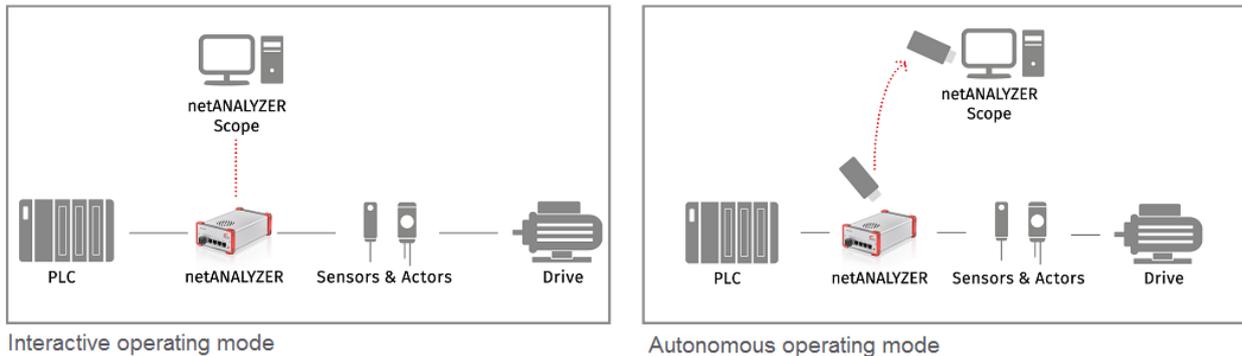


Figure 4: Interactive and Autonomous operating mode

Interactive operating mode

In the "Interactive operating mode" the NANL-B500G-RE device is connected to a PC.

Autonomous operating mode

The NANL-B500G-RE device allows you (starting with the netANALYZER firmware image version 1.2.0.0) to additionally use the "Autonomous operating mode", in which the device is not connected to a PC. In this operating mode, you can integrate the analyzer device into a communication link and start and stop the recording of frames by pressing the button (red REC key). The data is stored directly on the connected USB memory device.

- In the "Autonomous operating mode" usable **"Live dump mode"** the NANL-B500G-RE analyzer device stores all recorded data traffic directly on a connected USB memory device.
- The **"Snapshot mode"** that can be used in the "Autonomous operating mode" is suitable for long-term measurements. The analyzer device NANL B500G-RE uses the decoding capabilities of netANALYZER Scope available in the "Autonomous operating mode". A trigger criterion is defined using netANALYZER Scope. Each time the trigger criterion occurs, the NANL B500G-RE analyzer device stores an Ethernet frame snapshot of a short period of time before or after the trigger time on the USB memory device. The snapshots can then be conveniently opened and analyzed in netANALYZER Scope.



Important:

Further descriptions for the use of the analyzer device NANL-B500G-RE in the Interactive operating mode as well as the Autonomous operating mode can be found in chapter *Commissioning* [▶ page 28].

4 Device drawings

4.1 Analyzer device NANL-B500G-RE

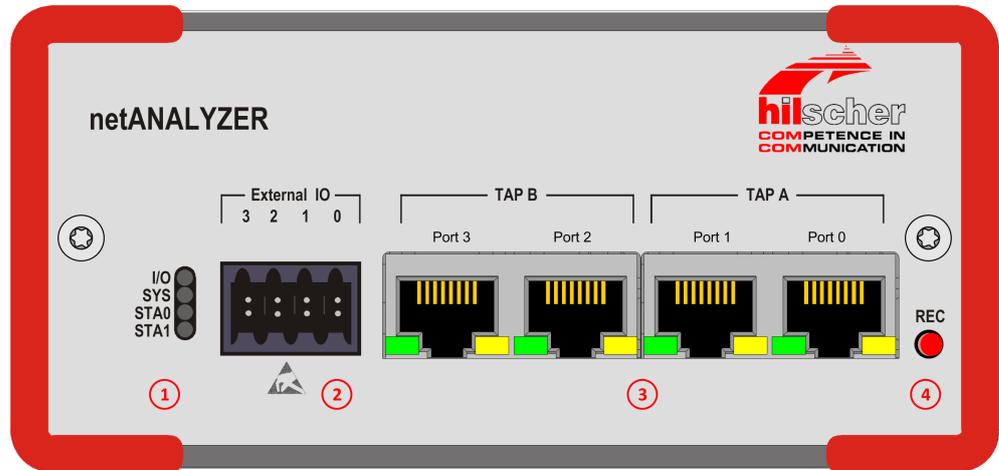


Figure 5: Front side analyzer device NANL-B500G-RE

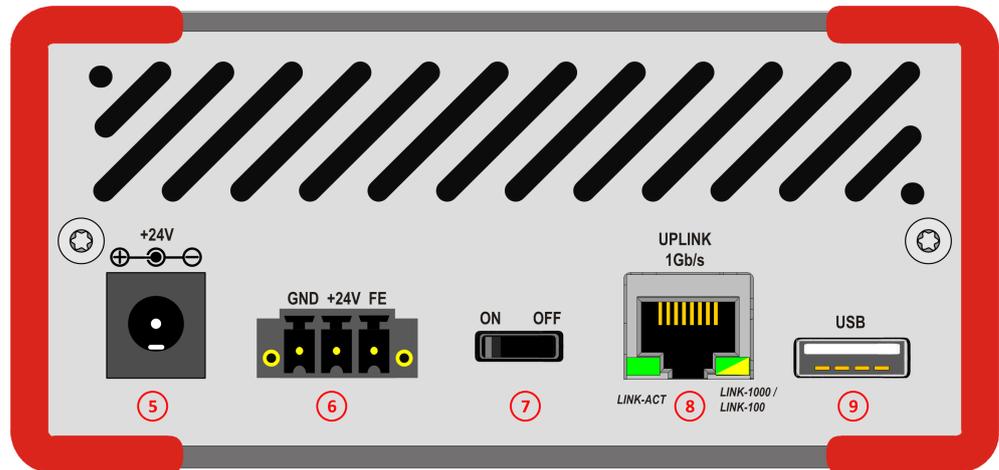


Figure 6: Reverse side analyzer device NANL-B500G-RE

①	SYS system LED (yellow/green), STA0 , STA1 Status LEDs (red/green), I/O Status LED (red/green)
②	External I/O 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 in the "Autonomous operating mode", refer to section <i>Autonomous operating mode, capturing on USB memory device</i> [page 42]. (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 1 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 socket (Type A, USB 2.0, 4-pin)

Table 7: Explanations to the front side and reverse side NANL-B500G-RE

5 System requirements

- In order to download the product DVD, you need an Internet access.
- The following systems are supported/not supported: Windows®7, Windows®8, Windows®8.1, and Windows®10. Windows®10 Server is not supported.

5.1 Hardware requirements

PC with the following specification:

- Intel compatible CPU, approx. 2 GHz or faster
- SVGA 1024x768 16bit colors or better
- free hard disk memory space for the Wireshark software and for netANALYZER Scope software; additionally required memory capacity depends from the current use case.
- 1 separate network card with RJ45 Ethernet socket (1 Gb/s)
(for the NANL-B500G-RE device)

Accessories:

- 2 patch cable (Ethernet)



Note:

The total length of the Ethernet cables via which the NANL-B500G-RE device in an Ethernet system is connected to devices in this system via a TAP must not exceed 100 meters.

- The maximum permitted 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 supplied with the NANL-B500G-RE device (for standard applications) is designed as follows: 24V DC / 1.25A (1.8M KAB). See also section Power supply and host interface.

5.2 Power supply and host interface

For the power supply as well as the host interface for the analyzer device NANL-B500G-RE you have to consider the following specifications:

netANALYZER hardware	Supply voltage	Host interface	Signaling voltage external IO
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 8: Requirements power supply and host interface NANL-B500G-RE

The data in the table above have the following meaning:

Supply voltage

The required or permissible supply voltage at the analyzer device.

Host interface Type of the host interface

Signal voltage External IO

The required or tolerated signal voltage at the I/O signal pins of the external I/O interface of 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 (24 V DC / 1.3 A).



For more see section Power supply NANL-B500E-RE.

5.3 Maximum permissible current consumption (external IO interface)

NANL-B500G-RE

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

1 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 permissible current consumption 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 9: Maximum permissible current consumption (external IO interface NANL-B500G-RE)

5.4 Requirements NANL-B500G-RE (Autonomous operating mode)

In the "Autonomous operating mode" of the NANL-B500G-RE device (starting with the netANALYZER image version 1.2.0.0) the analyzer device is not connected to a PC. In the function mode "**Live dump mode**" the netANALYZER device NANL-B500G-RE stores all recorded data traffic directly on a connected USB memory device.

Requirements for using the Autonomous operating mode

- netANALYZER image version 1.2.0.0 (or higher)
- License (netANALYZER Scope): 8582.060 LIC/NANL/SA
- For „snapshot mode“: Additionally required license 8582.001 LIC/SCPBS
- If necessary, further protocol-dependent or other additional licenses (add-ons)
- USB memory device, FAT32 formatted or ext4 formatted, at least 100 MByte memory capacity

The USB memory device can be an USB stick or an USB hard disk. The USB socket on the NANL-B500G-RE device supplies a maximum of 500 mA, sufficient to connect an USB stick. If an USB hard disk with higher power consumption is connected, a separate power supply is required.



Important:

FAT file system damage and data loss in case of power failure

If you are using a FAT32 file system for your USB memory device, be aware that file system errors can occur in the event of a power failure. This means if the power supply to the analyzer device will be interrupted while a recording is in progress, and if a snapshot is being saved, the FAT file system may be damaged. For all snapshots taken up to the time of the power interruption data can be damaged and the USB memory device can become completely unreadable.

Power-failure-proof data capturing using ext4 formatting

If you are using an ext4 file system, no file system errors occur as a result of a power interruption. However you must note, that even if you are using an ext4 file system, the data in the snapshot affected by the power failure may still be damaged. In this case, only the snapshot whose data was captured at the time of the power failure is likely to be damaged. However, all previously saved snapshots are backed up and remain undamaged.



Details on the requirements for the use of the Autonomous operating mode can be found in section *Notes for installation and operation* [▶ page 20] and in section *Requirements for using the Autonomous operating mode* [▶ page 33].

6 Getting started

6.1 Notes for installation and operation

You must read and follow the following instructions for installing and operating your analyzer device NANL-B500G-RE to ensure proper installation and operation of your device.

Note	Description
Installation sequence	<ol style="list-style-type: none"> 1. Install software from DVD. 2. Connect analyzer device NANL-B500G-RE.
Inserting netANALYZER hardware into the communication Link	<p>To analyze the data transfer of a communication line between two devices, these devices must be connected to the same TAP.</p> <p>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.</p> <p>NANL-B500G-RE:</p> <p>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.</p> <p>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.</p> <p>Before you connect the analyzer device NANL-B500G-RE to any network, ensure that DHCP server operation mode is disabled.</p>
Damage of externally attached Hardware	<p>NANL-B500G-RE:</p> <ul style="list-style-type: none"> • If the +3.3V output of the external IO interface is enabled (I/O 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 (I/O status LED lights up red), externally attached hardware could be damaged as voltage is driven. <p>Note on USB handling in autonomous mode: The .nsprj configuration is applied immediately when the USB memory device is connected. This means that the GPIO configuration is also applied. It is therefore important to ensure that switching GPIO, e.g. to the 24 V output, does not damage any externally connected circuit.</p> <ul style="list-style-type: none"> • 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.
Auto crossover and port-switching	<p>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 <i>Auto-crossover and port-switching</i> [▶ page 55].</p>
Transferring NANL-B500G-RE data save without loss to the PC	<p>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 transfer rate to the PC is less than 1 Gb/s, by consequence insufficient bandwidth may occur. For more see section <i>LINK-ACT and LINK-1000/LINK100 (Reverse Side)</i> [▶ page 70].</p>
Saved Ethernet connection from NANL-B500G-RE to the PC	<p>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.</p>
Autonomous operating mode for NANL-B500G-RE (connection to an USB memory device)	<ul style="list-style-type: none"> • If no license for "Autonomous operating mode" is available, the file "NoLicence.txt" is created on the USB memory device with the contents: "No valid netANALYZER license found for autonomous operation." The STA1 LED flashes red, see section <i>SYS, STA0, STA1, I/O, LINK and RX (NANL-B500G-RE, front side)</i> [▶ page 67]. • If when switching on the analyzer device NANL-B500G-RE an USB memory device with a partition marked as "bootable" is connected to the analyzer device NANL-B500G-RE, the netANALYZER device may not start correctly (SYS LED is yellow).

Note	Description
ext4 file system support on USB memory device	<p>Files written to a FAT32-formatted USB memory device are not power fail-safe. The user can use the ext4 file system on the USB memory device for autonomous operation mode to ensure failsafe recovery, even if the power supply of the netANALYZER is interrupted during write access to the USB memory device.</p> <ul style="list-style-type: none"> In order to format the USB memory device with the ext4 file system, the user must use a PC with a LINUX operating system or a corresponding additional file system driver for Windows. In order to read the files from the USB memory device with the ext4 file system, the user must use a PC with a LINUX operating system or a corresponding additional file system driver for Windows.

Table 10: Notes about installation and operation

6.2 Overview installation

No	Step	Description	Detailed information, see chapter / section
1	Software installation		
1.1	Requirements	<ul style="list-style-type: none"> - NET Framework - Install Wireshark - Windows®10 Server is not supported. 	<i>System requirements</i> [▶ page 17]
1.2	Install netANALYZER Scope software	<ul style="list-style-type: none"> - Download the product DVD as a ZIP file to the local hard disk of your PC - Unzip the ZIP file - Double-click the *.exe file in the root directory of the DVD to open the autostart menu. - Install netANALYZER Scope software. <p>If Wireshark live records are desired, install WinPcap driver for netANALYZER.</p>	<i>User manual software installation for netANALYZER</i>
2	Hardware installation		
2.1	Safety messages	<p>Adhere</p> <ul style="list-style-type: none"> - to the Property damage messages given in this manual. 	<i>Property damage messages</i> [▶ page 23]
2.2	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.	<i>Interactive operating mode, connection to PC</i> [▶ page 31]
2.3	Inserting Hardware in the communication link	<p>Note! The RJ45 connector may only be used for LAN, not for telecommunications connections.</p> <p>Important! As long as the analyzer device NANL-B500G-RE works in DHCP server mode, the analyzer device must not be inserted directly into a company network via a switch or hub in which other devices are also located.</p> <p>Insert the analyzer device NANL-B500G-RE into the communication path to be analyzed.</p>	<i>Inserting netANALYZER hardware into the communication Link</i> [▶ page 48]

Table 11: Overview installation

6.3 Overview installation update

No	Step	Description	Detailed Information, see the Documentation / Chapter / Section
1	Update driver and software	<ul style="list-style-type: none"> Uninstall older driver and software versions. Install current drivers and software. After restarting your PC, complete the driver installation. 	Installation guide, Software installation for netANALYZER devices
2	Update NANL-B500G-RE firmware	<p>Note: The IP address of the device and the IP address of the PC must be in the same network or the DHCP server must be online.</p> <ul style="list-style-type: none"> Determine the IP address of the device using the Ethernet Device Configuration program. Continue with option 1 or alternatively with option 2. 	<i>How to update the NANL-B500G-RE firmware</i> [▶ page 56]
		<p>Option 1 (with a web browser):</p> <ul style="list-style-type: none"> Enter the IP address determined in the address bar of the web browser. Below Firmware image update select the firmware update file and load it into the device. 	<i>How to update the NANL-B500G-RE firmware using a web browser</i> [▶ page 56]
		<p>Alternative option 2 (via FTP):</p> <ul style="list-style-type: none"> Enter the determined IP address in the address bar of Windows Explorer. Enter the user name "update" and the password "nanl-b500g-re" in the login mask for the FTP server. <p>Copy the firmware update file from the product DVD into the netANALYZER FTP server directory.</p>	<i>How to update the NANL-B500G-RE firmware via FTP</i> [▶ page 58]

Table 12: Overview how to update the installation

6.4 Property damage messages

When installing the analyzer device NANL-B500G-RE, observe the following property damage messages.

6.4.1 Exceeding permissible 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.

6.4.2 Exceeding permissible 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 prescribed signaling voltage, refer to section Power supply and host interface.

6.4.3 Exceeding the permissible current consumption at the external I/O interface

NOTICE**Device destruction!**

The netX chip, as well as further components of the NANL-B500G-RE device, can be damaged, if the current consumption at the I/O signal pins of the external IO interface pins exceeds the maximum permitted values!

- When operating the NANL-B500G-RE device, the prescribed device-specific maximum values for the current consumption at the I/O signal pins of the external I/O interface must not be exceeded.

The information on the maximum current consumption at the I/O signal pins for the devices described in this manual can be found in section *Maximum permissible current consumption (external I/O interface)* [▶ page 18].

6.4.4 Damage of externally attached hardware

NANL-B500G-RE

NOTICE

Damage of externally attached hardware

If the +3.3V output of the **external IO interface** is enabled (I/O 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 (I/O 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.
-

Note on USB handling in autonomous operating mode: The .nsprj configuration is applied immediately when the USB memory device is connected. This means that the GPIO configuration is also applied. It is therefore important to ensure that switching GPIO, e.g. to the 24 V output, does not damage any externally connected circuit.

6.4.5 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.
-

6.4.6 Power drop during write and delete accesses in the file system

NOTICE

Power drop during write and delete accesses in the file system

The FAT file system in the netX firmware is subject to certain limitations in its operation. Write and delete accesses in the file system (firmware update, configuration download etc.) can destroy the FAT (File Allocation Table) if the accesses cannot be completed if the power drops. Without a proper FAT, a firmware may not be found and cannot be started.

- Make sure, that the power supply of the device does not drop during write and delete accesses in the file system (firmware update, configuration download etc.).
-

6.5 Configure IP address

**Note:**

The IP address 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.
- **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.
- **DHCP server operation (*device operates as DHCP server*)**
As a 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 portable device NANL-B500G-RE using the **Ethernet Device Configuration** program. In **Ethernet Device Configuration**, to find the NANL-B500G-RE device, you must enable the **NetIdentV2** protocol.



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

7 Commissioning

In order to install and commission the NANL-B500G-RE device, you must proceed as described in the following sections.



For installation and operation of the netANALYZER device check any notes in the overview in chapter *Getting started* [▶ page 20].

7.1 Check firewall settings

What	Description
Problem	NANL-B500G-RE does not work with active firewall software.
Question	My firewall seems to block communication with netANALYZER. What do I have to consider in my firewall rule set?
Workaround	If your firewall is blocking TCP or UDP communication you have to consider the NANL-B500G-RE TCP/IP and UDP/IP communication behaviour in your firewall rule set or disable your firewall temporarily while working with the netANALYZER.

Table 13: Workaround if firewall blocks communication

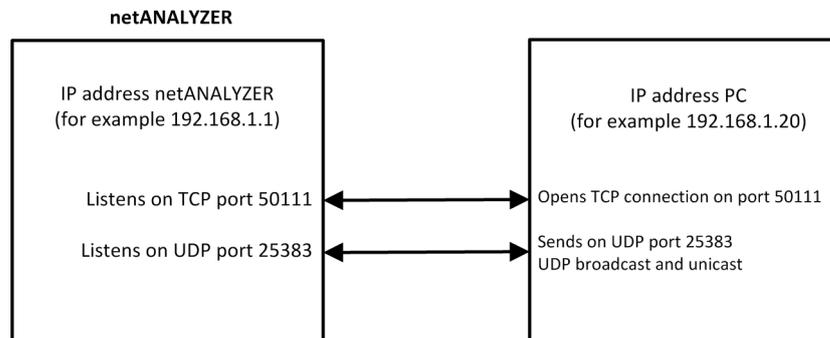


Figure 7: Firewall settings

7.2 netANALYZER Configuration page

With a web browser you can open the configuration page of the analyzer device NANL-B500G-RE. On this page you can make settings:

- the time for autonomous mode,
- the behaviour of the fan,
- the maximum number of snapshots for autonomous operating mode
- and update the firmware if necessary.

Area	Function	Details in section
Firmware image version (1)	Displays the firmware image version of the device.	-
Time configuration (2)	Sets the time of the device. Required for the time stamp of a data recording.	<i>Set the time for the autonomous operating mode</i> [▶ page 35]
Fan behaviour (3)	Sets the temperature threshold for the fan.	<i>Temperature control of the fan (NANL- B500G-RE)</i> [▶ page 61]
Snapshot behaviour in autonomous mode (4)	Sets the maximum number of snapshots to be stored on the USB memory device.	<i>Set maximum number of snapshots for autonomous operating mode</i> [▶ page 39]
Firmware image update (5)	Update firmware	<i>How to update the NANL- B500G-RE firmware</i> [▶ page 56]
Apply changes and restart device (6)	Button to apply the settings or a new firmware. The device is restarted.	-
Information about autonomous mode operation (7)	Further information, e.g. on autonomous operating mode, licenses, etc.	-
Misc (8)	Indication of important references for further information	-
Third party license information (9)	Reference to information about used third-party libraries	-

Table 14: netANALYZER configuration page

- To display the configuration page, enter the IP address of the analyzer device in the address line of the browser.

netANALYZER 

netANALYZER image version: 1.10.0.0 **1**

Time configuration **2**

Current time of netANALYZER: April 25, 2019 10:53:40 Europe/Berlin

New time zone:

April 2019									
Su	Mo	Tu	We	Th	Fr	Sa	^	^	^
31	1	2	3	4	5	6			
7	8	9	10	11	12	13	10	:	42
14	15	16	17	18	19	20	:	:	08
21	22	23	24	25	26	27			
28	29	30	1	2	3	4	▼	▼	▼
5	6	7	8	9	10	11			

New time: 10 : 42 : 08

Fan behaviour **3**

Select fan temperature control behaviour

Snapshot behaviour in autonomous mode **4**

Select, how many snapshots shall be stored at maximum on the USB memory (0 = until memory is full).

For more information, refer to the notes given below.

Firmware image update **5**

No file chosen

Note: After uploading, firmware image update will be applied with next device restart.

6

Information about autonomous mode operation **7**

There exist two ways to operate the netANALYZER in autonomous mode without PC.

- In the "Live dump mode" mode, the device stores the entire recorded data traffic directly to a connected USB mass storage device. The created PCAP files fill the entire USB memory. When the USB memory is full, the oldest captured frames are overwritten by newer ones. To use this mode, simply connect an empty USB memory to the device and press the REC button.
- The "Snapshot mode" is suitable for long-term measurements. The device stores an Ethernet frame snapshot each time a trigger condition occurs. The trigger condition was previously defined by a "snap" trigger block in netANALYZER Scope software. To use this mode, define a trigger condition in netANALYZER Scope, store the netANALYZER Scope project file (.nsprj) file in the USB memory root folder, connect the USB memory to the netANALYZER device and press the REC button. The number of snapshots stored depends on the specified maximum number (see setting above). If "0" is specified, snapshots are stored until the USB memory is full. After that, no more snapshots will be stored. If a number greater than "0" is specified, the USB memory will contain this maximum number of snapshots. When the maximum amount is reached, the oldest snapshots are automatically deleted. Thus, the USB memory contains only the most recent snapshot events. Note that if there is not enough space left on the USB memory, no more snapshots will be taken.

Note, that autonomous operation mode requires an additional license.

Misc **8**

Check out www.hilscher.com and kb.hilscher.com for software updates and further information about netANALYZER.

Third party license information **9**

See third party license information.

Figure 8: netANALYZER configuration page

7.3 Interactive operating mode, connection to PC

**Note:**

The installation sequence must be obeyed.

- 1. Install software from DVD.**
- 2. Mount NANLB500GRE device.**

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 voltages 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 transfer rate to the PC is less than 1 Gb/s, by consequence insufficient bandwidth may occur.

7.4 Autonomous operating mode, general conditions and requirements

In the "Autonomous operating mode" of the NANL-B500G-RE device (from the netANALYZER image version 1.2.0.0) the analyzer device is not connected to a PC. Data recording is started or stopped via the red REC button on the device front side. The created PCAP files are stored in a ring buffer.

"Live dump mode" and "Snapshot mode"

There are two possibilities to operate the netANALYZER in autonomous operating mode without PC.

- In "**Live dump mode**", the unit stores all recorded traffic directly to a connected USB memory device. The PCAP files created fill the entire USB memory. When the USB memory is full, the oldest recorded Ethernet frames are overwritten by newer ones. To use this mode, simply connect an empty USB memory to the device and press the REC button. For more information, refer to the section *Full capturing process (Live-Dump-Mode)* [▶ page 42].
- The "**Snapshot mode**" is suitable for long-term measurements. The device saves an Ethernet frame snapshot each time a trigger condition occurs. The trigger condition was previously defined by a "Snap" trigger block in the netANALYZER Scope software. For further information see section *Capturing snapshots (snapshot mode)* [▶ page 44].



Important:

If the power supply of the NANL-B500G-RE is expected to fail during capturing, the USB memory device can be used with an ext4 file system to prevent data loss. For further information, see section *Notes for installation and operation* [▶ page 20].

7.4.1 PCAP files (file name and size)

The created PCAP file settings are named with the abbreviation (prefix) "pcapdump", a 5-digit sequential number or a time stamp and have the file extension ".pcap".

File name: pcapdump_XXXXX_YYYYMMDDhhmmss.pcap

XXXXX = 00000, 00001, 00002 (sequence number*),

YYYYMM Time of the capturing start (time stamp)

The PCAP files have a file size of up to 50 MByte.

*The USB memory device is filled with individual capturing files during capturing process. If the USB memory device is full, the oldest files will be overwritten during capturing process. This behavior is indicated by the sequence number.



Note:

Wireshark recognizes the file sets belonging to the "Autonomous operating mode" with the prefix "pcapdump" and suffix ".pcap". All pcap files recorded in the "Autonomous operating mode" are recognized by Wireshark as a file set regardless of their time stamp! Distribute the pcap files manually into different directories in order to separate your recordings according to file sets suitable for you.

7.4.2 Requirements for using the Autonomous operating mode

- netANALYZER image version 1.2.0.0 (or higher)
- License (for netANALYZER Scope) 8582.060 LIC/NANL/SA
If no license for "Autonomous operating mode" is available, the file "NoLicence.txt" is created on the USB memory device, with the contents: "No valid netANALYZER license found for autonomous operation." The STA1 LED flashes red, see section *SYS, STA0, STA1, I/O, LINK and RX (NANL-B500G-RE, front side)* [▶ page 67].
- For „snapshot mode“: Additionally required license 8582.001 LIC/SCPBS

For the "Snapshot mode" netANALYZER Scope is required, because of the decoding capabilities of netANALYZER Scope or to configure the trigger criteria, and also to open and analyze the snapshots. Additional protocol-dependent or other license add-ons may be required. For details see user manual "netANALYZER Scope Licensing" (DocID: DOC150205UMXXEN).

- USB memory device, FAT32 formatted, at least 100 MByte memory capacity

The USB memory device can be an USB stick or an USB hard disk. The USB socket on the NANL-B500G-RE device supplies a maximum of 500 mA, sufficient to connect an USB stick. If an USB hard disk with higher power consumption is connected, a separate power supply is required.

To use the "Snapshot mode", an USB memory device with sufficient free memory capacity for storing snapshots must be used. The memory capacity required depends on the network load and the snapshot duration. With parallel recording on both TAPs, snapshots can theoretically occur up to 50 MByte per second at maximum network load.

If the power supply of the NANL-B500G-RE is expected to fail during capturing, the USB memory device can be used with an ext4 file system to prevent data loss. For further information, see section *Notes for installation and operation* [▶ page 20].

**Note:**

During recording, data is permanently written to the USB storage device. Note that some storage media have a limited write life and thus the life of the USB memory device may be reduced during continuous operation.

- Restart of the network for EtherNet/IP as prerequisite for process value analysis in autonomous mode in snapshot mode
-

**Important:**

If the analyzer device NANL-B500G-RE is inserted into an EtherNet/IP network, the recording must first be activated via the REC button and then the network must be restarted for decoding the process values in autonomous operating mode in snapshot mode. Only then can the trigger of the snapshot mode work correctly on the basis of the process values. The necessity for a restart is indicated by an LED flashing code, see section *LEDs NANL-B500G-RE* [▶ page 67].

7.4.3 Default settings for the behavior of the GPIO signals in "Live dump mode"

In the function mode "Live dump mode" the following default configuration is configured for the GPIOs:

- 24 V
- GPIO 0: Input rising edge
- GPIO 1: Input rising edge
- GPIO 2: input falling edge
- GPIO 3: input falling edge

7.4.4 Set the time for the autonomous operating mode

The analyzer device NANL-B500G-RE has an onboard RTC (real-time clock). The clock is buffered and holds the clock time about 10 days without a connected power supply. If the NANL-B500G-RE device has detected that the device clock is not set or the RTC buffering has failed (e. g., because the device has not been used for several weeks), the STA1 LED on the front side of the device will flash orange at 1 Hz (see section *SYS, STA0, STA1, I/O, LINK and RX (NANL-B500G-RE, front side)* [▶ page 67]).

**Note:**

Autonomous data capturing is still possible in spite of, the clock time is not set, but the timestamps of the recorded Ethernet frames have an absolute offset to a past date. The relatively measured time stamps between the frames are furthermore recorded in a highly precise manner.

Set the time for the autonomous operating mode

The clock time can be set in the analyzer device NANL-B500G-RE via a web browser or via netANALYZER Scope.

**Note:**

When setting the clock time using the netANALYZER configuration web page, the analyzer device is restarted. This way a running data capturing is aborted.

To set the clock time using a web browser, perform the following steps.

- Enter the IP address of the analyzer device NANL-B500G-RE (e. g. 192.168.1.1.) in the address line of the browser.
- The netANALYZER configuration web page appears.

netANALYZER



netANALYZER image version: 1.10.0.0

Time configuration

Current time of netANALYZER: April 25, 2019 10:53:40 Europe/Berlin

New time zone:

April 2019

Su	Mo	Tu	We	Th	Fr	Sa	▲	▲	▲
31	1	2	3	4	5	6			
7	8	9	10	11	12	13	10	:	42
14	15	16	17	18	19	20			
21	22	23	24	25	26	27			
28	29	30	1	2	3	4	▼	▼	▼
5	6	7	8	9	10	11			

New time: : :

Fan behaviour

Select fan temperature control behaviour

Snapshot behaviour in autonomous mode

Select, how many snapshots shall be stored at maximum on the USB memory (0 = until memory is full).

For more information, refer to the notes given below.

Firmware image update

No file chosen

Note: After uploading, firmware image update will be applied with next device restart.

Information about autonomous mode operation

There exist two ways to operate the netANALYZER in autonomous mode without PC.

- In the "Live dump mode" mode, the device stores the entire recorded data traffic directly to a connected USB mass storage device. The created PCAP files fill the entire USB memory. When the USB memory is full, the oldest captured frames are overwritten by newer ones. To use this mode, simply connect an empty USB memory to the device and press the REC button.
- The "Snapshot mode" is suitable for long-term measurements. The device stores an Ethernet frame snapshot each time a trigger condition occurs. The trigger condition was previously defined by a "snap" trigger block in netANALYZER Scope software. To use this mode, define a trigger condition in netANALYZER Scope, store the netANALYZER Scope project file (.nsprj) file in the USB memory root folder, connect the USB memory to the netANALYZER device and press the REC button. The number of snapshots stored depends on the specified maximum number (see setting above). If "0" is specified, snapshots are stored until the USB memory is full. After that, no more snapshots will be stored. If a number greater than "0" is specified, the USB memory will contain this maximum number of snapshots. When the maximum amount is reached, the oldest snapshots are automatically deleted. Thus, the USB memory contains only the most recent snapshot events. Note that if there is not enough space left on the USB memory, no more snapshots will be taken.

Note, that autonomous operation mode requires an additional license.

Misc

Check out www.hilscher.com and kb.hilscher.com for software updates and further information about netANALYZER.

Third party license information

See third party license information.

Figure 9: Website netANALYZER configuration

- Under **New time zone**, select the time zone.
- Under **New time**, set the date and time.
- Click **Apply changes and restart device**.
- ⇒ The new date and time are stored in the analyzer device NANL-B500G-RE and are then used as the basis for the time stamp for each recorded frame.
- ⇒ The device is restarted.

7.4.5 Estimate required USB memory capacity for snapshot mode theoretically

In order to prevent the USB memory from overflow when capturing data in the autonomous mode in snapshot mode, the capacity of the USB memory device must be sufficiently dimensioned and have reserves to be able to absorb the amount of data that is expected to occur when recording data with netANALYZER. To achieve this, you can make a theoretical estimate of the required size of the USB memory device.

You can specify the maximum number of snapshots to be recorded. For more information, see the section *Set maximum number of snapshots for autonomous operating mode* [▶ page 39].

The size of a snapshot varies depending on the application, the network load, and the number of Ethernet frames that occur during the recording period.

Dimension the size of the USB memory device according to the number of snapshots to be recorded and the expected size of the snapshots. Prerequisites for the size of the USB memory device are also listed in the section *Requirements for using the Autonomous operating mode* [▶ page 33].

Example

If in the netANALYZER configuration page under **Snapshot behaviour in autonomous mode** the maximum number is set to "4", for example, the capacity of the USB memory must be at least the size of 4 snapshots. In this case, a maximum of 4 snapshots will be recorded. To record the data for the 5th snapshot, the data of the 1st snapshot recorded on the USB memory device is overwritten again.

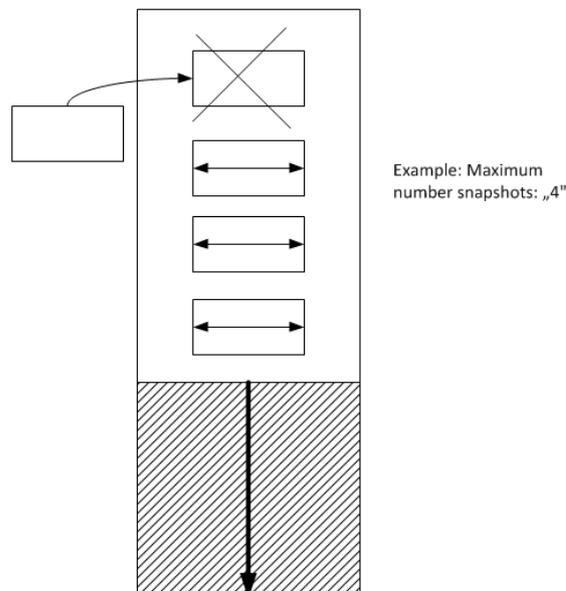


Figure 10: Schematic representation of the reserve capacity of the USB memory device with a maximum number of snapshots = "4"

Snapshot size estimation

How many snapshots can be stored on the USB memory device if the netANALYZER is operated in autonomous mode?

When operating the analyzer in snapshot mode, the size of a snapshot highly depends on the network configuration and the specified snapshot time span.

As `.nsprj` snapshot files are compressed, the size of a file also highly depends on the compressibility of the captured data.

So it is recommended to observe the size of a snapshot file dependent on the concrete capture use-case. And make a specific calculation on that actual snapshot file size.

Nevertheless, following worst-case scenario can be assumed:

A snapshot file will reach a maximum size of 370 MBytes. Due to the netANALYZER's internal 300 MByte frame buffer and adding the project file's maximum overhead.

netANALYZER requires at least 2048 MBytes (=2 GBytes) of free file system space for temporary operations.

Thus the absolute worst case consideration for the number of storable snapshots would be: $\langle \text{number snapshots} \rangle = (\langle \text{disk capacity} \rangle - 2048 \text{ MBytes temp space}) / 370 \text{ Mbytes per snapshot}$

For example a 256 GBytes (=262144 MBytes) memory can save 702 snapshots: $(262144 \text{ MBytes} - 2048 \text{ MBytes}) / 370 \text{ Mbytes} = 702 \text{ snapshots}$

As already mentioned, this is an absolute worst case consideration, real snapshot files would be much smaller due to the data compression used for `.nsprj` snapshot files.

7.4.6 Set maximum number of snapshots for autonomous operating mode

For data recording in autonomous mode in snapshot mode, you can specify the maximum number of snapshots to be stored on the connected USB memory device.

**Important:**

Avoid overflow of the USB memory by using a USB memory device with sufficient memory reserve for your application or by setting a correspondingly lower maximum number of snapshots. See also section *Estimate required USB memory capacity for snapshot mode theoretically* [▶ page 37].

To set the maximum number of snapshots from a web browser, follow the steps below.

- Enter the IP address of the analyzer device NANL-B500G-RE (e.g. 192.168.1.1.) into the address line of the browser.
- The web page netANALYZER configuration appears.



netANALYZER

netANALYZER image version: 1.10.0.0

Time configuration

Current time of netANALYZER: April 25, 2019 10:53:40 Europe/Berlin

New time zone:

Calendar for April 2019:

Su	Mo	Tu	We	Th	Fr	Sa			
31	1	2	3	4	5	6			
7	8	9	10	11	12	13	10	:	42
14	15	16	17	18	19	20		:	08
21	22	23	24	25	26	27			
28	29	30	1	2	3	4			
5	6	7	8	9	10	11			

Fan behaviour

Select fan temperature control behaviour

Snapshot behaviour in autonomous mode

Select, how many snapshots shall be stored at maximum on the USB memory (0 = until memory is full).

For more information, refer to the notes given below.

Firmware image update

No file chosen

Note: After uploading, firmware image update will be applied with next device restart.

Information about autonomous mode operation

There exist two ways to operate the netANALYZER in autonomous mode without PC.

- In the "Live dump mode" mode, the device stores the entire recorded data traffic directly to a connected USB mass storage device. The created PCAP files fill the entire USB memory. When the USB memory is full, the oldest captured frames are overwritten by newer ones. To use this mode, simply connect an empty USB memory to the device and press the REC button.
- The "Snapshot mode" is suitable for long-term measurements. The device stores an Ethernet frame snapshot each time a trigger condition occurs. The trigger condition was previously defined by a "snap" trigger block in netANALYZER Scope software. To use this mode, define a trigger condition in netANALYZER Scope, store the netANALYZER Scope project file (.nsprj) file in the USB memory root folder, connect the USB memory to the netANALYZER device and press the REC button. The number of snapshots stored depends on the specified maximum number (see setting above). If "0" is specified, snapshots are stored until the USB memory is full. After that, no more snapshots will be stored. If a number greater than "0" is specified, the USB memory will contain this maximum number of snapshots. When the maximum amount is reached, the oldest snapshots are automatically deleted. Thus, the USB memory contains only the most recent snapshot events. Note that if there is not enough space left on the USB memory, no more snapshots will be taken.

Note, that autonomous operation mode requires an additional license.

Misc

Check out www.hilscher.com and kb.hilscher.com for software updates and further information about netANALYZER.

Third party license information

See third party license information.



Figure 11: Website netANALYZER configuration

- Under **Snapshot behaviour in autonomous mode**, set the maximum number of snapshots to be stored on the USB memory device.
- If "0" is specified, snapshots are saved until the USB memory is full. After that, no more snapshots will be saved.
- If a number greater than "0" is specified, the USB memory contains this maximum number of snapshots. When the maximum number is reached, the oldest snapshots are automatically deleted. Thus, the USB memory device contains only the most recent snapshot events. Note that if there is not enough space left on the USB memory device, no more snapshots will be taken.
- Click **Apply changes and restart device**.
- ⇒ The set value is stored in the analyzer device NANL-B500G-RE and defines the maximum number of snapshots that are stored on the USB memory device in the autonomous mode in snapshot mode.
- ⇒ The device is restarted.

7.4.7 Starting or stopping NANL-B500G-RE in the Autonomous operating mode

Starting: Press briefly the red REC button on the device front side.

Stopping: Press and hold the red REC button on the device front side for at least 1 second.

7.5 Autonomous operating mode, capturing on USB memory device

7.5.1 Full capturing process (Live-Dump-Mode)

Proceed as follows if you want to use the analyzer device NANL-B500G-RE in the Autonomous operating mode *in Live dump mode* with an USB memory device and want to record data during the entire time span of an analysis process:

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 voltages lead to severe damage to the NANL-B500G-RE device!

Step 2: Connect the device to USB, use the autonomous operating mode *in "live dump mode"* and transfer evaluation data to a PC

- Connect the analyzer device NANL-B500G-RE to an **external 24V power supply**.
- Connect the USB memory device (USB stick or USB hard disk with at least 100 MByte capacity) to the USB socket on the reverse side of the NANL-B500G-RE analyzer device.
- When using an USB device with a power consumption of more than 500 mA, connect a separate power supply; If required, it is also possible to feed it via an USB hub.
- ↻ The analyzer device NANL-B500G-RE displays the autonomous operating mode (live dump mode) as a particular LED state (STA0-LED/ orange/On, refer to section *SYS, STA0, STA1, I/O, LINK and RX (NANL-B500G-RE, front side)* [▶ page 67]).
- To start capturing, briefly press the red REC button on the front side of the device.



Note:

If when switching on the analyzer device NANL-B500G-RE an USB memory device with a partition marked as "bootable" is connected to the analyzer device NANL-B500G-RE, the netANALYZER device may not start correctly (SYS LED is yellow).

- ↻ The analyzer device NANL-B500G-RE starts capturing the data traffic in .pcap files, which are stored in the root directory of the USB memory device.
- To stop capturing, press the red REC button on the front side of the device for at least 1 second.

**Note:**

After stopping capturing, the NANL-B500G-RE analyzer device stores the previously recorded data on the USB memory device for a few seconds. Wait until the STA0 LED changes from red to orange before disconnecting the USB memory device. Otherwise, data may be lost, i.e. the recorded pcap files may be incomplete.

- Remove the USB memory device from the USB socket on the back of the unit and connect it to a PC.
- Download .pcap files and open them in Wireshark or import them to netANALYZER-Scope.

7.5.2 Capturing snapshots (snapshot mode)

Proceed as follows if you want to use the analyzer device NANL-B500G-RE in the autonomous operating mode *in Snapshot mode* with an USB memory device and only want to capture data from certain time windows via defined triggers:

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 voltages lead to severe damage to the NANL-B500G-RE device!

Step 2: Connect the device to USB, use the autonomous operating mode *in the snapshot mode* and transfer evaluation data to a PC

- Connect the analyzer device NANL-B500G-RE to an **external 24V power supply**.
- Create a netANALYZER Scope project and configure the trigger criteria for the Autonomous mode.
- Save the netANALYZER Scope project as a .prj file.
- Copy the .nsprj file to the root directory of an USB memory device.
- Connect the USB memory device (with sufficient free memory capacity to store snapshots, see section *Autonomous operating mode, general conditions and requirements* [▶ page 32]) to the USB socket on the reverse side of the analyzer device NANL-B500G-RE.
- When using an USB device with a power consumption of more than 500 mA, connect a separate power supply. If required, it is also possible to feed it via an USB hub.
- The analyzer device NANL-B500G-RE displays the autonomous operating mode (snapshot mode) as a particular LED state (STA0-LED/ orange/flashing cyclic at 1 Hz, refer to section *SYS, STA0, STA1, I/O, LINK and RX (NANL-B500G-RE, front side)* [▶ page 67]).
- To start capturing, briefly press the red REC button on the front side of the device, provided that in the project configuration, in the settings for the Autonomous operating mode, the autostart behavior is set to "Manual".
- If the behavior is configured to "Autostart", the capturing process will start immediately without pressing the REC button. This is especially useful if the analyzer device NANL-B500G-RE is to be switched automatically to the capturing mode after a power failure.



Note:

If when switching on the analyzer device NANL-B500G-RE a USB memory device with a partition marked as "bootable" is connected to the analyzer device NANL-B500G-RE, the netANALYZER device may not start correctly (SYS LED is yellow).

- Each time a trigger criterion is met, a snapshot is stored to the USB memory device.

**Note:**

The internal memory of the analyzer device NANL-B500G-RE can buffer a maximum of 300 MB of Ethernet frame data, so that this maximum past events depth is available for snapshots. Depending on the network load, this results in the maximum detectable time period.

- To stop capturing, press the red REC button on the front side of the device for at least 1 second.

**Note:**

After stopping capturing, the NANL-B500G-RE analyzer device stores the previously captured data on the USB memory device for a few seconds. Wait until the STA0 LED changes from red to orange, before disconnecting the USB memory device. Otherwise, data may be lost, i.e. the captured pcap files may be incomplete.

- The number of stored snapshots depends on the maximum number specified (see section *Set maximum number of snapshots for autonomous operating mode* [▶ page 39]).
- Remove the USB memory device from the USB socket on the reverse side of the device and connect it to a PC.
- The generated .nsprj files are located in the saved_snapshots directory. They can be opened in netANALYZER Scope.

7.5.3 Displaying lost frames in Wireshark

If the NANL-B500G-RE analyzer device uses very high transfer rates for data transfer via Ethernet during autonomous operation and the write rate to the USB memory device increases accordingly, Ethernet frame losses occur when storing on the USB memory device, i.e. frames are discarded and no complete capturing of the transferred analysis data takes place.

Starting with Wireshark version 2.3, the lost frames can be made visible. If an affected pcap file is opened in Wireshark, the entry (1) **"Buffer overflow" (frames will be dropped until next buffer recovery)** and the corresponding timestamp appear in the frame view, indicating that Ethernet frame losses have occurred since this time. This means that no more frames could be saved or individual frames were discarded. The entry (2) **"Buffer recovery" (Frame reception has recovered)** and the corresponding time stamp indicate that the system has recovered, the network load has decreased and full write capacity has been reached again. From this point on, all Ethernet frames could be received again without gaps. The following screenshot shows the two events that mark the beginning and end of the buffer overflow. Before the entry (1) or after the entry (2), all frames are received completely, in between Ethernet frame losses must be assumed.

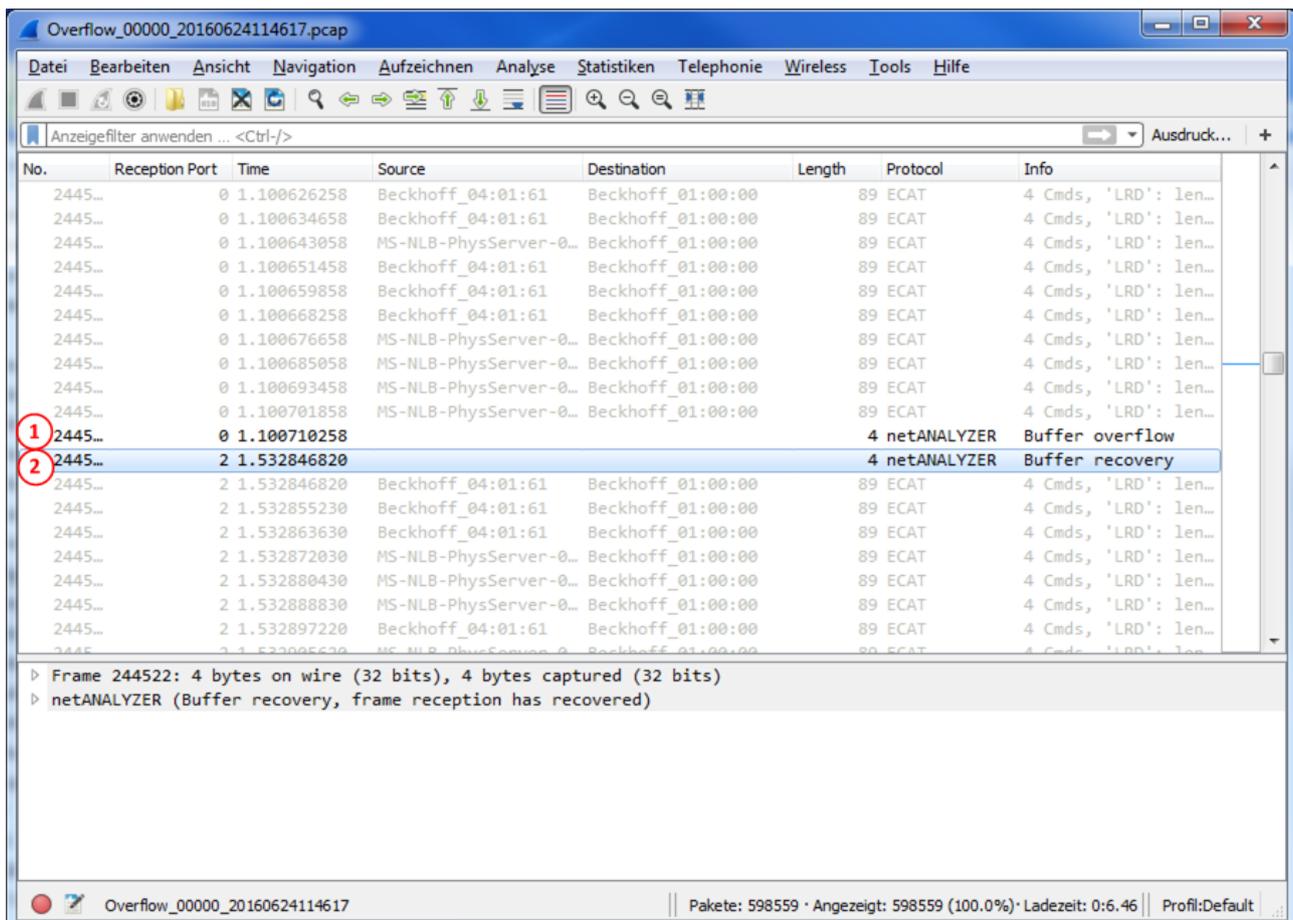


Figure 12: Buffer overflow

**Note:**

If the STA1 LED flashes 1x in red (=FIFO overflow), the (1) "**Buffer overflow**" entry is made in Wireshark. I. e., a buffer overflow has occurred and frames have been discarded.

Possible causes of Ethernet frame losses and workaround

If the maximum transfer rate on the Ethernet is greater than the write rate on the USB memory device, Ethernet frame losses may occur. This applies in particular to systems that operate with very high loads during data transmission on the bus.

- Capture only on one TAP to reduce the data load. It is not possible to write all data to the USB memory device.
- Please note that in the "Autonomous Mode" if the network is loaded with very high network loads greater than 25% (bidirectional or 50% unidirectional), not all frame data can be captured when capturing on one TAP. These details refer to permanent average loads. Short load peaks can also be higher.
- In "Snapshot mode" the use of hardware filters can help to reduce the amount of data if necessary. In "Snapshot mode" the performance depends on the number of configured variables and the complexity of the trigger condition, since the processing of the frames in the trigger and during the decoding of the variables requires computation time.
- Switch to interactive operating mode with PC, to record higher data rates.

**Note:**

If necessary, use an external USB hard disk, since you can achieve higher writing rates in comparison to an USB stick.

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 device NANL-B500G-RE to the Ethernet device connections via two patch cables, parallel to the communication path to be analyzed. In principle, different configurations 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, connect the analyzer device NANL-B500G-RE via Ethernet cable (as shown in the figure).
- Connect both Ethernet cable only in TAP A (or in TAP B).

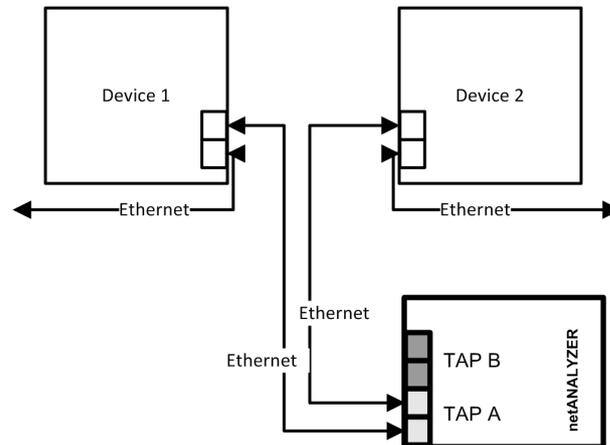


Figure 13: Application case 1

Furthermore, the analyzer device analyzes the number of faulty Ethernet frames.

A forwarding time of frames by a device cannot be determined. See [Application case 2](#) [▶ page 50].

7.6.2 Application case 2

Application case 2 is the typical application case

The analyzer device NANL-B500G-RE can analyze the following processes 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 Ethernet frames.
- To capture the communication of two channels, connect the analyzer device NANL-B500G-RE via Ethernet cable (as shown in the figure).

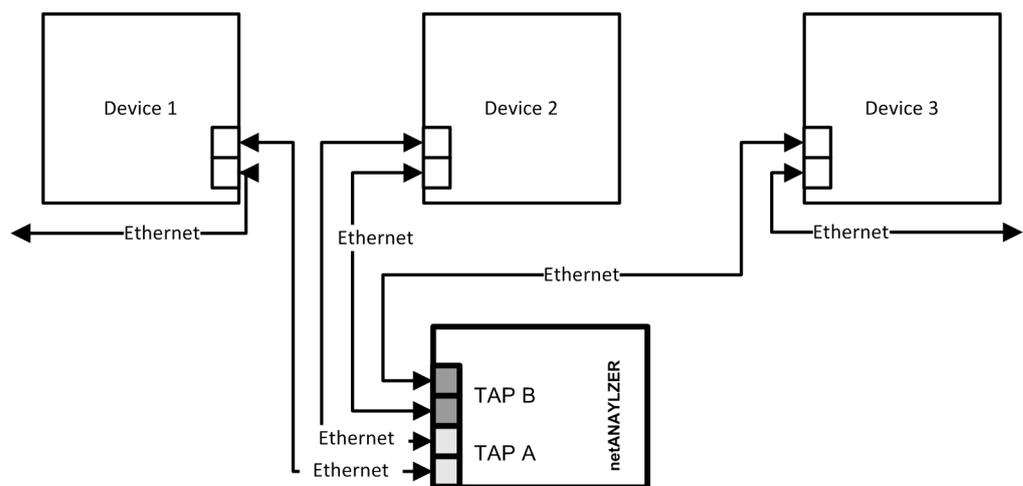


Figure 14: Application case 2

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.

The analyzer device NANL-B500G-RE can analyze the following processes 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 Ethernet frames.
- To capture the communication of two channels, connect the analyzer device NANL-B500G-RE via Ethernet cable (as shown in the figure).

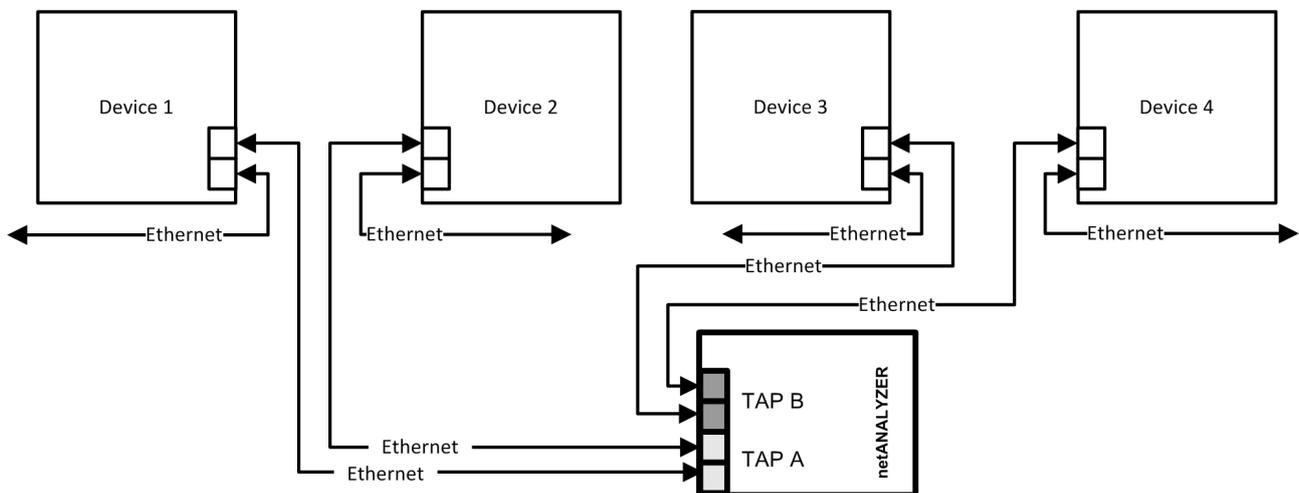


Figure 15: Application case 3

7.6.4 Application case 4

Like application case 2, but with analysis of input signals

This application case corresponds to application case 2, but in addition to Ethernet communication, one to four input signals are included in the analysis. When there is an edge reverse at the digital input, a pseudo Ethernet frame with time stamp is generated in the NANL-B500G-RE analyzer device.

The analyzer device NANL-B500G-RE can analyze the following processes 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 Ethernet frames.

NOTICE Device Destruction

- Only apply a signal voltage of 3.3 V or 24 V to the I/O signal pins of the **external I/O interface**! Higher signaling voltages lead to severe damage to the NANL-B500G-RE device!
- To operate the NANL-B500G-RE device, take a maximum of 1 mA (at 3.3V) or 600 mA (at 24V) current at the I/O signal pins on the **external I/O interface**. Otherwise the netX chip and other components may be damaged.

NOTICE Damage of externally attached Hardware

NANL-B500G-RE

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

Note on USB handling in autonomous operating mode: The .nsprj configuration is applied immediately when the USB memory device is connected. This means that the GPIO configuration is also applied. It is therefore important to ensure that switching GPIO, e.g. to the 24 V output, does not damage any externally connected circuit.

- 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 two channels, connect the analyzer device NANL-B500G-RE via Ethernet cable (as shown in the figure).

The figure also shows schematically how a digital output signal from the device is connected to the digital input of the analyzer device NANL-B500G-RE.

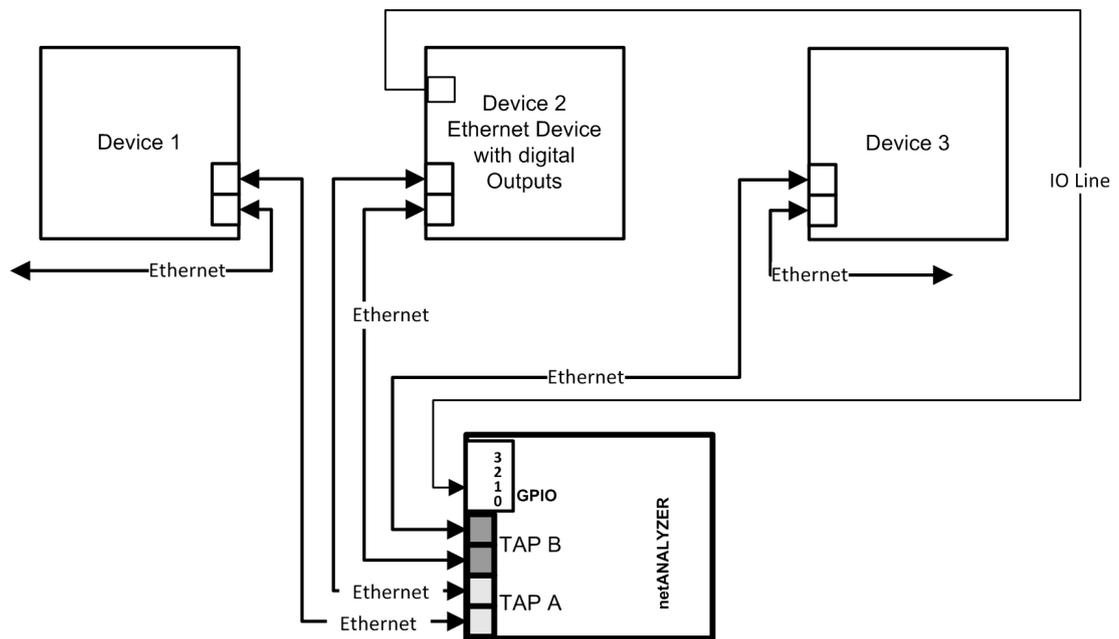


Figure 16: Application case 4 – Recording of the runtime in the device

7.7 Data load limitation

Problems with capturing high network loads

When capturing with extremely high network loads on all 4 netANALYZER ports, the capture stops with the error code 0xC066000C (no intram buffer) or 0xC0660004 (no DMA channel).

When capturing on 4 Ethernet ports simultaneously, a maximum network load of approx. 96 % can be monitored. For higher loads a special high-load capture mode is available. See "High-load capture mode" for details. The high-load capture mode is set in the netANALYZER Scope software.

**Note:**

This restriction does not apply when capturing only on 2 Ethernet ports.

Possible workarounds:

1. Use the hardware filters to filter out specific frames, which are not of interest.
2. Use the high-load capture mode, available via netANALYZER Scope software. Using the high-load capture mode would not require a Scope license. In the high-load capture mode all frames will be cut off at byte offset 58, in order to reduce the total data amount transferred to the PC. Cutting off at offset 58 would still allow observing all the Ethernet and IP header information, but would cut off data payload.
3. Only capture on one TAP, then you can capture 100% load on that TAP

7.8 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

Example		
Device 1	Device 2	
PROFINET IO	PROFINET IO	
----- netANALYZER Device -----		
	1. Measurement	2. Measurement
Line A on Port 0	"Transmission Line"	"Receiving Line"
Line B on Port 1	"Receiving Line"	"Transmission Line"

Figure 17: Example - Auto-Crossover and Port-Switching

For the 2nd measurement in this example the reception of the Ethernet frames is wrong. The port numbers in the frames 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

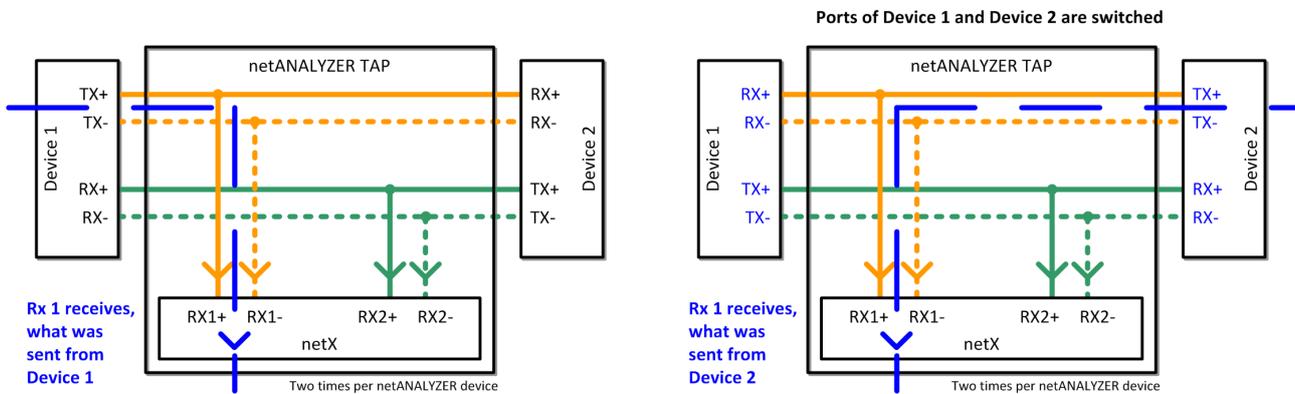


Figure 18: Design of a TAP, at the right Side Ports of Device 1 and Device 2 exchanged

The schematic design of a TAP 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.

7.9 How to update the NANL-B500G-RE firmware

The device offers two possibilities to update the firmware.

- *How to update the NANL-B500G-RE firmware using a web browser* [▶ page 56] or
- *How to update the NANL-B500G-RE firmware via FTP* [▶ page 58].

7.9.1 How to update the NANL-B500G-RE firmware using a web browser



Note:

The IP address of the analyzer device NANL-B500G-RE must be configured according to section *Configure IP address* [▶ page 26]. The IP address of the device and the IP address of the PC must be in the same network respectively the DHCP server must be online.

Prerequisites

- You need the firmware update file `nanl-b500g-re.update`. The firmware update file is located on the product DVD in the folder `NANL-B500G-RE firmware update`.
- Firmware version V1.8 or higher has already to be used in the device in order that you can use web browser for updating the firmware. You can update earlier firmware versions via FTP as described in section *How to update the NANL-B500G-RE firmware via FTP* [▶ page 58].

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.

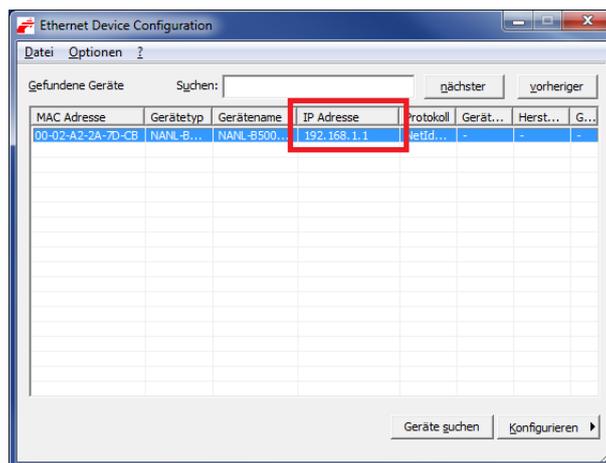


Figure 19: Ethernet Device Configuration - NANL-B500G-RE found (Example)

- Read the IP address of the NANL-B500G-RE device whose firmware you want to update. For the example shown in the figure above, the 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: Upload current firmware image

- Open a web browser.
- Enter the IP address in the web browser's address bar and press the Enter key.
- ↻ The netANALYZER configuration page is displayed.
- Below **Firmware image update**: Click **Browse**.
- ↻ A dialog for file selection is displayed.
- Select the firmware update file `nanl-b500g-re.update`. The firmware update file is located on the product DVD in the folder *NANL-B500G-RE firmware update*.
- Click **Open**.
- Click **Upload to device**.
- ↻ During the upload process, **uploading** is displayed in front of the **Upload to device**. This process takes a few seconds.
- ↻ The upload is finished as soon as **done** is displayed in front of the **Upload to device** button.
- ↻ The device is prepared.
- In order that the device uses the new firmware version, click **Apply changes and restart device**.
- ↻ Your web browser displays **Waiting for device restart**.
- ↻ The device restarts and executes a firmware update.
- **NOTICE** **Make sure that the power supply of the device does not drop during the firmware update and do not switch the device off!**
- Wait until the device is full functional again.



Important:

Wait until the LEDs will stay in state "SYS LED = green, STA0 LED = red, STA1 LED = off" for approx. 10 seconds. During the update process, the LEDs may flash up in different colors.

- ↻ Your device is now updated.

Step 3: Check whether the update was successful

- In your web browser, update the netANALYZER configuration web page, e.g. by pressing the F5 key (depends on your web browser).
- Check the version displayed next to **netANALYZER image version**.

7.9.2 How to update the NANL-B500G-RE firmware via FTP



Note:

Requirements: The IP address of the analyzer device NANL-B500G-RE must be configured according to section *IP address configuration (only NANL-B500G-RE)* [▶ page 26]. The IP address 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.

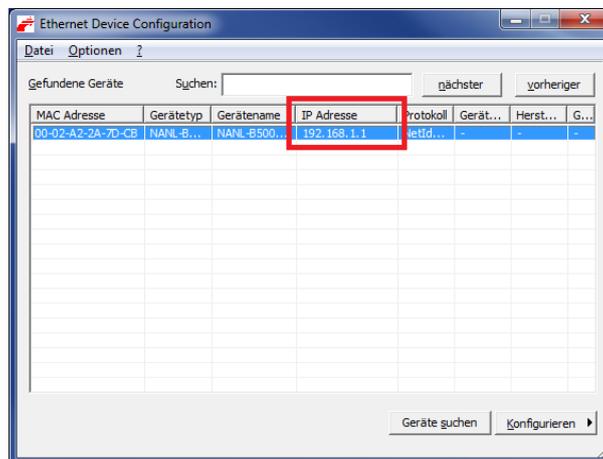


Figure 20: Ethernet Device Configuration - NANL-B500G-RE found (Example)

- 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 address]**.
Alternatively you can use a common FTP utility. Then only enter the IP address [IP address].
- 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).

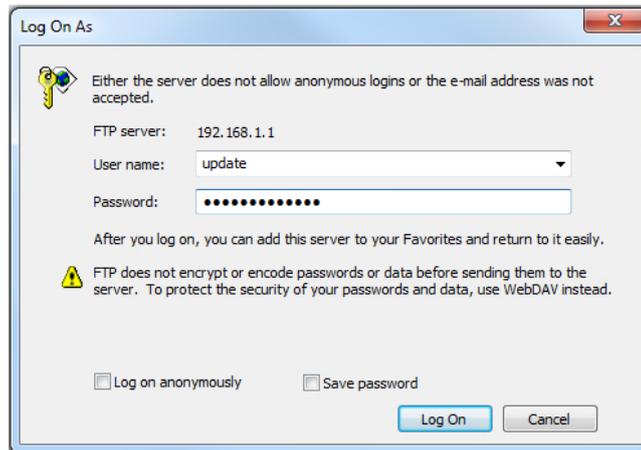


Figure 21: FTP server Log On Screen

- 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 product DVD in the directory *NANL-B500G-RE firmware update*.

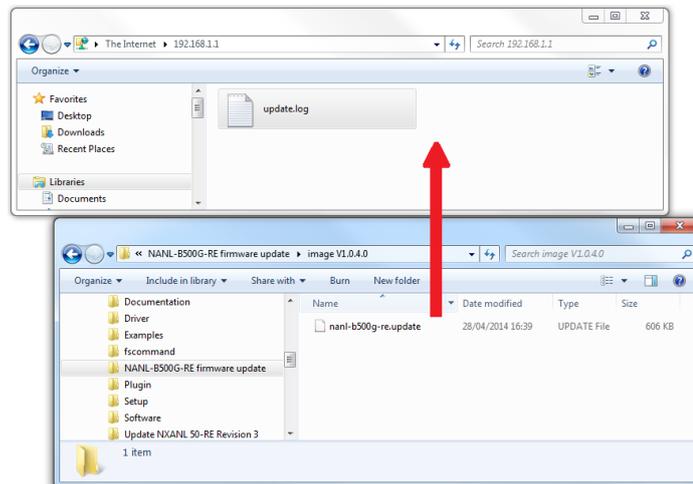


Figure 22: Copy the firmware update file to the netANALYZER FTP server directory.

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

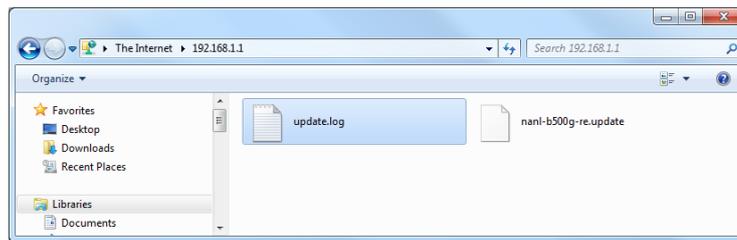


Figure 23: netANALYZER FTP server directory containing the firmware update file

- 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.



Important:

Wait until the LEDs will stay in state "SYS LED = green, STA0 LED = red, STA1 LED = off" for approx. 10 seconds. During the update process, the LEDs may flash up in different colors.

- 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. Alternatively, you can check the version information in the netANALYZER configuration web site (see figure *Website netANALYZER configuration* in section *Set the time for the autonomous operating mode* [▶ page 35]).
- 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.

7.10 Temperature control of the fan (NANL- B500G-RE)

The device has a fan for cooling the CPU. The fan operates temperature controlled. You can set the temperature threshold via a web browser.

Option	Description
Low temperature threshold (cool device, but fan is running more often)	For a CPU temperature more than 47°C, the fan turns on (Default).
High temperature threshold (warm device, but silent operation)	For a CPU temperature more than 60°C, the fan turns on. The device heats up more before the fan turns on and is more silent.

Table 15: Threshold for the temperature control of the fan

To set the temperature threshold using a web browser, perform the following steps.

- Enter the IP address of the analyzer device NANL-B500G-RE (e.g. 192.168.1.1.) in the address line of the browser.
- The web page netANALYZER configuration appears.
- Under **Fan behaviour**, select **Low temperature threshold** for the low threshold or **High temperature threshold** for the high threshold.
- Click **Apply changes and restart device**.
- ⇒ The setting is stored in the analyzer device NANL-B500G-RE.
- ⇒ The device is restarted.

7.11 Disposal of waste electronic equipment

Important notes from the European Directive 2012/19/EU “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.

8 Hardware properties

This chapter explains how to identify the hardware feature of the time stamp and how to collect Ethernet frames 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, Data recording and analysis**.

8.1 Timestamp

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

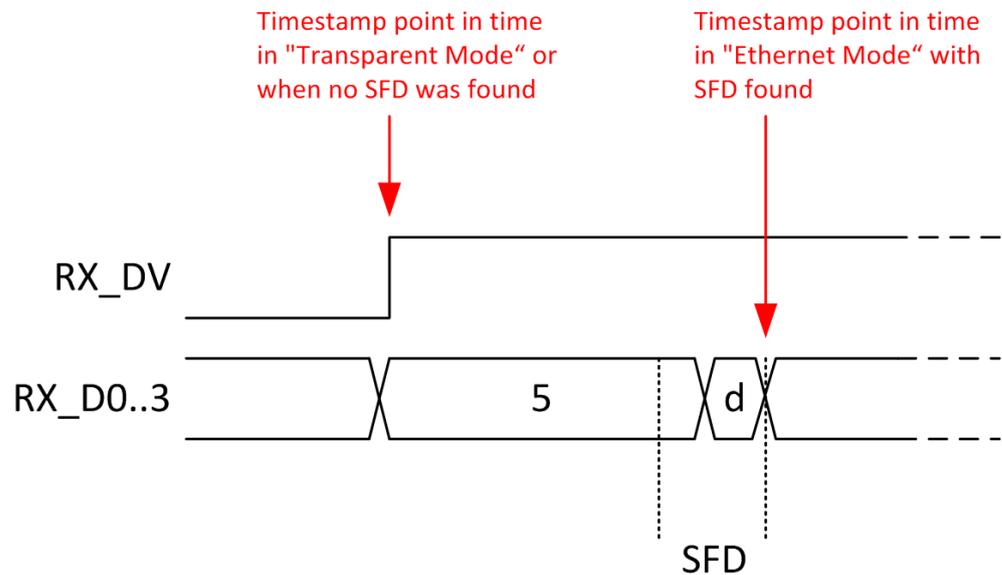


Figure 24: Ethernet frame timestamp-point for „Ethernet Mode“ and „Transparent Mode“

„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 Ethernet frames. This makes it possible to find a reference point also for faulty frames. Thereby the preamble and SFD are not interpreted.

Accuracy of the time stamping

Time stamps on port 0 and port 1 on the NANL-B500G-RE device can have an offset of up to 40 ns. After a settling time of approx. 100 ms from reception of the first frame on a port, the offset on this port is max. 8 ns.

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

8.2 Transparent Mode

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



Note:

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

The figure below shows the basic principle of an Ethernet frame in the in the **Ethernet Mode** or in the **Transparent Mode**.

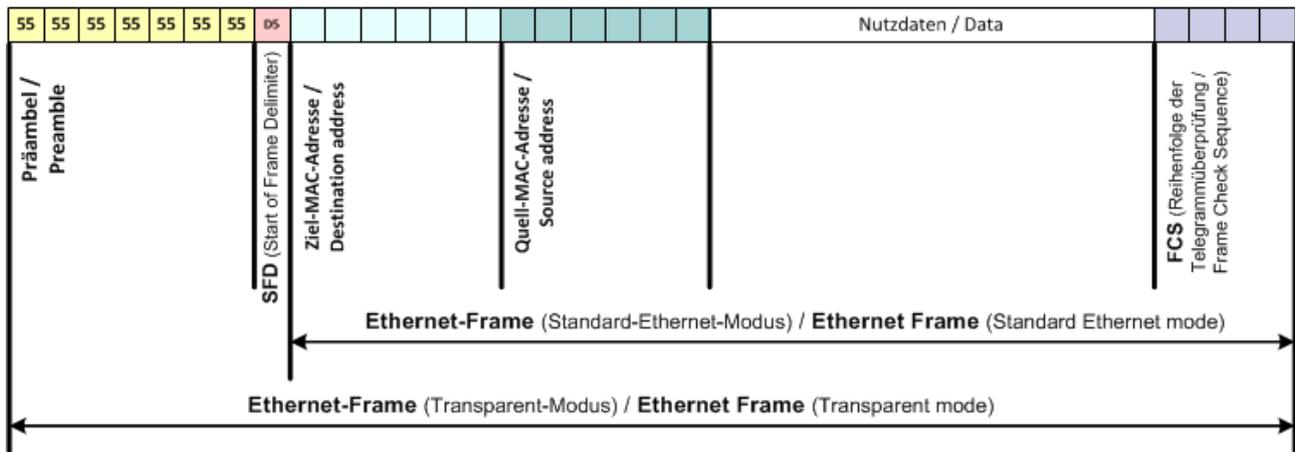


Figure 25: Basic principle of an Ethernet frame in the Ethernet Mode or in the Transparent Mode

As during the Ethernet Mode the preamble and the SFD (=Start of Frame Delimiter) are not included to the frame, these parts are captured during 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 26: Ethernet frame in Wireshark in the 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 27: Ethernet frame in Wireshark in the Transparent Mode

9 Troubleshooting

General

- Check whether the prerequisites for the operation of the analyzer device NANL-B500G-RE are fulfilled:

Further information to this you find in section *System requirements* [▶ page 17].

Link is not recognized

**Note:**

For 10-Mbit/s-connections and for increased bus load the PHY can not correctly detect the link. If the link is not established (Link DOWN), for troubleshooting the speed must be set manually to 10 Mbit/s.

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 67].

Cable

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

Analyzer device 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 1 minute. Then the default setting for the IP address of your device (DHCP server mode) is restored.

Notes on Autonomous operating mode for NANL-B500G-RE (connection to an USB memory device)

- If no license for "Autonomous mode" is available, the file "NoLicence.txt" is created on the USB memory device with the contents: "No valid netANALYZER license found for autonomous operation. The STA1 LED flashes red, see section *SYS, STA0, STA1, I/O, LINK and RX (NANL-B500G-RE, front side)* [▶ page 67].
- If the power supply of the NANL-B500G-RE is expected to fail during capturing, the USB memory device can be used with an ext4 file system to prevent data loss. For further information, see section *Notes for installation and operation* [▶ page 20].
- If the NANL-B500G-RE analyzer device uses very high transfer rates for data transfer via Ethernet during autonomous operation and the write rate to the USB memory device increases accordingly, Ethernet frame losses occur when storing on the USB memory device, i.e. frames are discarded and no complete recording of the transferred analysis data takes place. For further information see section *Displaying lost frames in Wireshark* [▶ page 46].
- If when switching on the analyzer device NANL-B500G-RE an USB memory device with a partition marked as "bootable" is connected to the analyzer device NANL-B500G-RE, the netANALYZER device may not start correctly (SYS LED is yellow).
- If the analyzer device is used via the UPLINK socket in the interactive operating mode (see section *Interactive operating mode, connection to PC* [▶ page 31]), and you still attempt to switch to the autonomous operating mode by pressing the REC key, the file "DeviceBusy.txt" is created on the USB memory device, with the contents: "netANALYZER is in use and could not be opened for autonomous operation."

Firewall and port settings

The user must check the firewall settings and make rule settings if necessary:

- TCP: Add rule to allow TCP connection on port 50111.
- UDP: Add rule to allow sending on UDP port 25384 (UDP broadcast and unicast).

10 LEDs

10.1 LEDs NANL-B500G-RE

10.1.1 SYS, STA0, STA1, I/O, LINK and RX (NANL-B500G-RE, front side)

System status

LED	Color	State	Description
SYS	 green	On	Operating system running
	 yellow	Flashing cyclic at 1Hz	Device indicates boot error.
	 yellow	On	Device starts (is in boot process).
	 off	Off	Power supply for the device is missing or hardware defect

Table 16: States of the SYS LED (NANL-B500G-RE)

LED state	Definition
Flashing cyclic at 1 Hz	The indicator turns on and off phase with a frequency of 1 Hz: on for 500 ms followed by off for 500 ms.

Table 17: Definition of the states of the SYS-LED

Status STA0 and STA1

LED	Color	State	Description
STA0	 green	On	Capturing process active, with or without connected USB memory device, live dump mode
	 green	Flashing cyclic at 1 Hz	Autonomous operating mode only: Capturing process active, snapshot mode
	 green  orange	Flashing cyclic at 1 Hz	Autonomous operating mode only: Capturing process active, snapshot mode; <i>No restart of the network has been detected yet.</i>
	 green	Flashing cyclic at 5 Hz	Autonomous operating mode only: Snapshot mode available Snapshot mode: At least one snapshot was saved.
	 green  orange	Flashing cyclic green at 5 Hz (and orange flash every 500 ms)	Autonomous operating mode only: Snapshot mode available Snapshot mode: At least one snapshot was saved. <i>No restart of the network has been detected yet.</i>
	 orange	Flashing cyclic at 1 Hz	Autonomous operating mode only: USB memory device connected, capturing process inactive, snapshot mode
	 orange	On	Autonomous operating mode only: USB memory device connected, capturing process inactive, live dump mode
	 red	On	Capturing process is inactive, with or without USB memory device connected or USB memory device is not compatible or defective.

LED	Color	State	Description
STA1	 green	Single Flash	GPIO event: Activity by signals on the GPIO (external input/output)
	 orange	Single Flash	Autonomous operating mode only: Faulty Ethernet frames detected.
	 orange	Flashing cyclic at 1 Hz	Autonomous mode only: date/time not set, check when USB memory device is connected and when NANL-B500G-RE device is ready for operation.
	 red	Single Flash	Autonomous operating mode only: FIFO overflow change A buffer overflow occurred and consequently Ethernet frames were discarded. More details on the frames losses or possible causes, see section <i>Displaying lost frames in Wireshark</i> [▶ page 46].
	 red	Flashing cyclic at 5 Hz	Autonomous operating mode only: No license, check with connected USB memory device
	 red	On	Error between PCI device and firmware to the PC Interactive operating mode only: Additional SYS yellow and STA0 red on, means " Fatal Error ": Firmware cannot start due to a hardware problem. Autonomous operating mode only: Additional STA0 orange, flashing at 1 Hz means " Fatal Error ": a) nsprj file invalid, interactive operating mode already active, b) insufficient USB memory capacity, snapshot mode Autonomous operating mode: Additional STA0 red on, means " Fatal Error ": Insufficient USB memory capacity, live dump mode

Table 18: States of the Status LEDs STA0 and STA1 (NANL-B500G-RE), Interactive and Autonomous operating Mode

LED	Color	State	Description
STA0	 red	Single Flash	Autonomous operating mode only: LED flashing code after pressing the REC button: REC button cannot be used
STA1	 red	Single Flash	
I/O	 red	Single Flash	
STA0	 green	Single Flash	Autonomous operating mode only: LED flashing code after pressing the REC button: Confirmation of the REC button
STA1	 green	Single Flash	
I/O	 green	Single Flash	

Table 19: States of the Status LEDs STA0 and STA1 (NANL-B500G-RE), Autonomous operating mode only

LED states	Definition
Flashing cyclic at 1 Hz	The indicator turns on and off phase with a frequency of 1 Hz: on for 500 ms followed by off for 500 ms.
Flashing cyclic at 1 Hz (green/orange)	The display is switched on in green or orange phases, alternating with a frequency of 1 Hz: Green On for 500 ms followed by Orange On for 500 ms.
Flashing cyclic at 5 Hz	The indicator turns on and off with a frequency of 5 Hz: "on" for 100 ms, followed by "off" for 100 ms.
Flashing cyclic green at 5 Hz (additionally orange flash)	The display turns on and off in phases, with a frequency of 5 Hz: Green On for 100 ms followed by Off for 100 ms; additionally a flash in orange appears every 500 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 20: Definition of the states of the status LEDs STA0 and STA1

I/O status

The I/O status LED shows the configuration status of the GPIOs.

LED	Color	State	Description
I/O	 green	On	The +3.3V input is enabled. Externally attached hardware will not be damaged, but make sure that voltage level is sufficient, to get proper signal detection.
	 red	On	The +24V output is enabled Notice: Externally attached hardware could be damaged as voltage is applied to the device. Note on USB handling in Autonomous operating mode: The .nsprj configuration becomes effective immediately when the USB memory device is connected to the NANL-B500G-RE device. This means that the GPIO configuration is also applied. It must therefore be ensured that switching GPIO, e.g. to the 24 V output, does not damage any externally connected circuit.
	 orange	On	The +3.3V output is enabled. Notice: Externally attached hardware could be damaged as voltage is applied to the device.
	 off	Off	The +24V input is enabled. Note: Externally attached hardware will not be damaged, but make sure that voltage level is sufficient to get proper signal detection.

Table 21: States of the I/O Status LED (NANL-B500G-RE)

Ethernet status (RJ45 Ethernet sockets Ch0 and Ch1, TAP A and TAP B)

LED	Color	State	Description
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 cyclic at 2.5 Hz / On	The device receives Ethernet frames

Table 22: States of the Ethernet Status LEDs (NANL-B500G-RE, RJ45 Ethernet sockets Ch0 and Ch1, TAP A and TAP B)

LED states	Definition
Flashing cyclic at 2.5 Hz	The indicator turns on and off phase with a frequency of 2.5 Hz: On for 200 ms followed by off for 200 ms.

Table 23: Definition of the states of the Ethernet Status LEDs

10.1.2 LINK-ACT and LINK-1000/LINK100 (NANL-B500G-RE, reverse side)

Ethernet status (Gigabit Ethernet RJ45 socket)

From the Ethernet status LEDs on the Gigabit RJ45 Ethernet socket to the PC (1 port with 1 Gb/s) on the reverse side of the analyzer device NANL-B500G-RE you can see whether the recorded data is transferred secure from loss to the PC.



Important:

The color of both Ethernet status LEDs (NANL-B500G-RE, Gigabit Ethernet RJ45 socket) must be green! If the right LED lights up in orange, the transfer rate to the PC is less than 1 Gb/s, by consequence insufficient bandwidth may occur.

LED	Color	State	Description
LED left side			
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 is transferred 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 right side			
LINK-1000 / RJ45 Ch0	green	On	The Ethernet data of the NANL-B500G-RE device is transferred to the PC with a transfer rate of 1000 Mbits/s (1 GB/s). Note! Only at a data transfer rate of 1 GB/s, the recorded data can be transferred secure from loss to the PC on.
LINK-100 / RJ45 Ch0	orange	On	The Ethernet data of the NANL-B500G-RE device is transferred to the PC with a transfer rate of 100 Mbits/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. The data is no longer transferred to the PC and data recording is stopped.
LINK-1000 LINK-100 / J45 Ch0	off	Off	The Ethernet data of the NANL-B500G-RE device is not transferred to the PC.

Table 24: States of the Ethernet status LEDs E (NANL-B500G-RE, Gigabit Ethernet RJ45 socket)

LED states	Definition
Flashing at 12 Hz	The indicator turns on and off phase with a frequency of 12 Hz: On for about 42 ms followed by off for about 42 ms.

Table 25: Definition of the states of the Ethernet Status LEDs

11 Connectors and interfaces

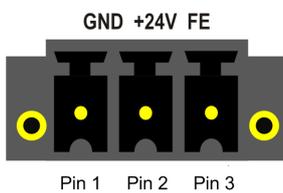
11.1 Power Supply NANL-B500G-RE

The analyzer device NANL-B500G-RE can be operated by a DC power supply from 18V to 30V. The connectors 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:

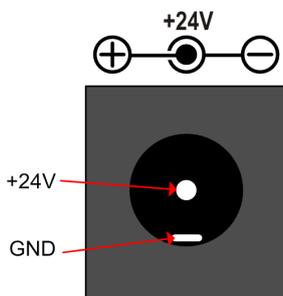


Voltage supply 24V DC, $\pm 6V$,

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

Maximum permitted cable length: 3 m

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

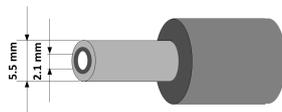


Voltage supply 24V DC, $\pm 6V$; max. 3A

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

Maximum permitted cable length: 3 m

The female connector +24 V fits for the power supply: **TR30RA240** power.



Technical Data of TR30RA240-Power with barrel plug

Input: 90-264 VAC \sim 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.

11.2 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 transfer rate of 100 MBit/s (CAT5).

11.2.1 Ethernet pinning at the RJ45 socket

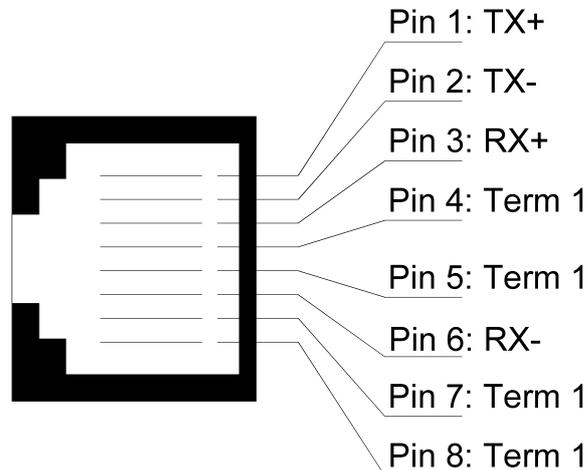


Figure 28: Ethernet pinning at the RJ45 socket

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	Connected to each other and terminated to PE through RC circuit*
6	RX-	Receive data -
7	Term 2	Connected to each other and terminated to PE through RC circuit*
8	Term 2	Connected to each other and terminated to PE through RC circuit*
		* 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.

11.2.2 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

11.3 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 use exclusively 3.3 V or 24 V signaling voltage. Higher signaling voltages lead to severe damage to the NANL-B500G-RE device!
- To operate the NANL-B500G-RE device, at the I/O signal pins of the external I/O interface, take a maximum of 1 mA (at 3.3V) or 600 mA (at 24V) current. Otherwise the netX chip and other components may be damaged.

Male connector external IO interface with GPIOs 0 to 3:

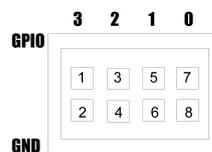


Figure 29: Male Connector external IO interface

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

11.3.1 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	3 m
Shielding	Shielded cables

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

11.3.2 Characteristics of the input signal at the I / O interface

The following voltage thresholds for the low and high levels at 3.3 V and 24 V are used to indicate the behavior of the input voltage at the external I/O interface (GPIOs 0-3) on the NANL-B500G-RE analyzer device.

If the external I/O interface is set to input and 3.3 V or 24 V logic, the following logic levels apply:

	Input	NANL-B500G-RE, value at T = -20 ... + 55°C
Low-level	$V_{\text{input}} = 3.3 \text{ V}$	0.9 V
	$V_{\text{input}} = 24 \text{ V}$	6.5 V
High-level	$V_{\text{input}} = 3.3 \text{ V}$	2.3 V
	$V_{\text{input}} = 24 \text{ V}$	16.7 V

Table 30: Low and High Voltage Thresholds for NANL-B500G-RE

- Below the mentioned voltage thresholds, the input is interpreted as "low", i. e. logic "zero".
- Above the voltage thresholds mentioned above, the input is interpreted as guaranteed "high", i. e. logic "one".



Important:

The voltage range between the lower voltage threshold (low level) and the upper voltage threshold (high level) is undefined and should be traversed as quickly as possible.

The signal rise time must be as low as possible in order to ensure the measuring accuracy of 10 ns, i.e. the flank slope of the input signal must correspond to the required measuring accuracy.

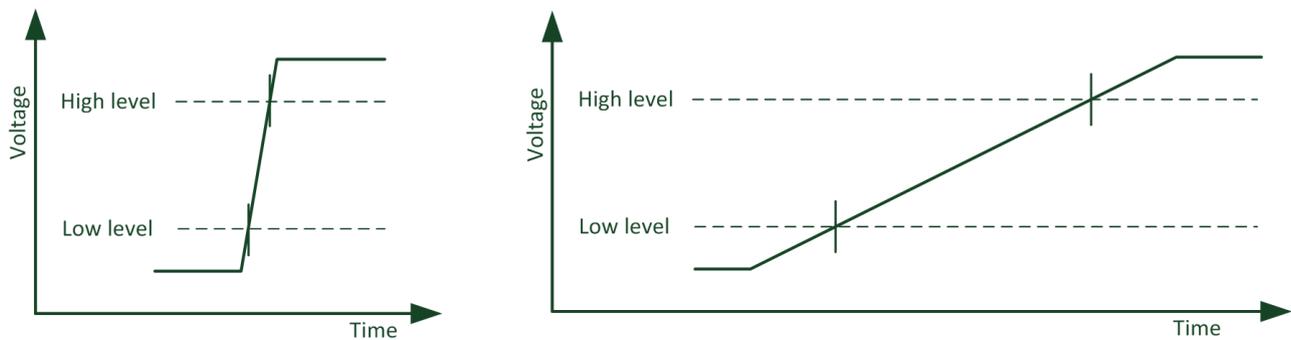
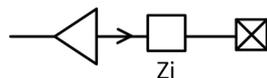


Figure 30: Behavior of the input voltage, examples flank rise: left - steep (desired), right - flat (not desired)



$Z_i > 2 \text{ k}\Omega$ for $f < 100\text{kHz}$

Figure 31: Equivalent circuit diagram NANL-B500G-RE

12 Technical data

12.1 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. Interactive operating mode, Autonomous operating mode (see section <i>Autonomous operating mode, general conditions and requirements</i> [▶ page 32]).
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)
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
	Isolation voltage	1000 VDC (tested for 70 seconds)
	Half duplex/full duplex	supported
	Connector	4* RJ45 Socket, refer also to section <i>Ethernet interface</i> [▶ page 72].
	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)
	Filters	2 filters 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
	Delay time network interface	Delay TAP < 1 ns Signal dealy

NANL-B500G-RE	Parameters	Value	
Diagnosis interface	USB interface for autonomous operating mode	USB socket (type A, 4-pin) The USB socket provides a maximum of 500 mA, sufficient for the connection of an USB stick. When connecting an USB hard disk, a separate power supply is required.	
	USB memroy device for autonomous operating mode	USB stick or USB hard drive, USB 2.0, FAT32 formatted, at least 100 Mbyte memory capacity <ul style="list-style-type: none"> The write rate on the USB memory device depends on the type of USB memory device. In the "Autonomous Mode" if the network is loaded with very high network loads greater than 25% (bidirectional or 50% unidirectional), not all frame data can be captured when capturing on one TAP. These details refer to permanent average loads. Short load peaks can also be higher. In "Snapshot mode", the use of hardware filters can help to reduce the amount of data if necessary. In "Snapshot mode", the performance depends on the number of configured variables and the complexity of the trigger condition, since the processing of the frames in the trigger and during the decoding of the variables requires computation time. 	
External I/O 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 <i>Maximum permissible current consumption (external IO Interface)</i> [▶ page 18]); Minimum distance for GPIO events > 150 μs	
Displays	LED Display (at the front side of the devices)	SYS	System status
	LED display (at the reverse side of the devices) Indicates whether the recorded data is transmitted secure from loss to the PC.	STA0	Capturing active / inactive
		STA1	Event signal detected
		I/O	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 <i>LEDs</i> [▶ page 67]. Descriptions of the LED flashing codes in the autonomous operating mode, see section <i>SYS, STA0, STA1, I/O, LINK and RX (NANL-B500G-RE, front side)</i> [▶ page 67].			
		LED green/ orange	Ethernet LINK 1000 LINK 100 status (to Gigabit Ethernet RJ45 socket)
		LED green	Ethernet LINK ACT status
Refer to chapter <i>LEDs</i> [▶ page 67].			
Power supply	Supply voltage nominal	24V DC / 700 mA / 16.8 W (refer to sections Power Supply and Host Interface and <i>Power Supply NANL-B500G-RE</i> [▶ page 71])	
	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	

NANL-B500G-RE	Parameters	Value
Operation	REC button	Button for activating data acquisition in the "Autonomous operating mode", see section <i>Autonomous operating mode, capturing on USB memory device</i> [▶ page 42] (or restore DHCP server operation, see section <i>Analyzer device NANL-B500G-RE</i> [▶ page 16] legend to the figure, position (4)).
Environmental conditions	Operating temperature range*	- 20 °C ... +55 °C
	*Air flow during measurement	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	-
CE sign	CE sign	Yes
	Emission	EN 55011:2009/A1:2010, Class A
	Immunity	EN 61000-6-2:2005/AC:2005
	Documentation to prove the restriction of hazardous substances	EN 50581:2012
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 in industrial networks.
	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-B500G-RE

13 Annex

13.1 References safety

- [S1] American National Standards Institute, Inc.: American National Standard, Product Safety Information in Product Manuals, Instructions, and Other Collateral Materials, ANSI Z535.6-2016, English, 2016.
- [S2] DIN Deutsches Institut für Normung e. v. and VDE Verband der Elektrotechnik Elektronik Informationstechnik e. V.: German standard, Equipment for audio/video, information and communication technology - Part 1: Safety requirements, (IEC 62368-1:2014, modified + Cor.:2015); English version EN 62368-1:2014 + AC:2015, English, 2016-05.
- [S3] DIN Deutsches Institut für Normung e. v. and VDE Verband der Elektrotechnik Elektronik Informationstechnik e. V.: German standard, Electrostatics - Part 5-1: Protection of electronic components against electrostatic phenomena, General requirements, (IEC 61340-5-1:2016); English version EN 61340-5-1:2016, English, 2017-07.

DIN Deutsches Institut für Normung e. v. and VDE Verband der Elektrotechnik Elektronik Informationstechnik e. V.: German standard, Electrostatics - Part 5-2: Protection of electronic components against electrostatic phenomena, User manual, (IEC TR 61340-5-2:2018), DIN IEC/TR 61340-5-2 (VDE V 0300-5-2), English, 2019-04.

13.2 Conventions in this document

Instructions

1. Operation purpose
2. Operation purpose
 - Instruction

Results

- ↻ Intermediate result
- ⇒ Final result

Signs

Sign	Note
	General note
	Important note that must be followed to prevent malfunctions.
	Reference to further information

Table 32: Signs

Signal words

Signal word	Description
	Indicates a hazardous situation, which if not avoided, will result in death or serious injury.
	Indicates a hazardous situation, which if not avoided, could result in death or serious injury.
	Indicates a hazardous situation, which if not avoided, may result in minor or moderate Injury.
	Indicates a property damage message.

Table 33: Signal words

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List of figures

Figure 1:	Typical application (Use Case 2) - The communication between a device and its connection partners in a network should be analyzed	13
Figure 2:	Example representation physical TAP	13
Figure 3:	Typical analyzer application with the capturing of the Ethernet data transfer and IO events	14
Figure 4:	Interactive and Autonomous operating mode	15
Figure 5:	Front side analyzer device NANL-B500G-RE	16
Figure 6:	Reverse side analyzer device NANL-B500G-RE	16
Figure 7:	Firewall settings	28
Figure 8:	netANALYZER configuration page	30
Figure 9:	Website netANALYZER configuration	36
Figure 10:	Schematic representation of the reserve capacity of the USB memory device with a maximum number of snapshots = "4	37
Figure 11:	Website netANALYZER configuration	40
Figure 12:	Buffer overflow	46
Figure 13:	Application case 1	49
Figure 14:	Application case 2	50
Figure 15:	Application case 3	51
Figure 16:	Application case 4 – Recording of the runtime in the device	53
Figure 17:	Example - Auto-Crossover and Port-Switching	55
Figure 18:	Design of a TAP, at the right Side Ports of Device 1 and Device 2 exchanged ...	55
Figure 19:	Ethernet Device Configuration - NANL-B500G-RE found (Example)	56
Figure 20:	Ethernet Device Configuration - NANL-B500G-RE found (Example)	58
Figure 21:	FTP server Log On Screen	59
Figure 22:	Copy the firmware update file to the netANALYZER FTP server directory.	59
Figure 23:	netANALYZER FTP server directory containing the firmware update file	60
Figure 24:	Ethernet frame timestamp-point for „Ethernet Mode“ and „Transparent Mode“ ...	63
Figure 25:	Basic principle of an Ethernet frame in the Ethernet Mode or in the Transparent Mode	64
Figure 26:	Ethernet frame in Wireshark in the Ethernet Mode	64
Figure 27:	Ethernet frame in Wireshark in the Transparent Mode	64
Figure 28:	Ethernet pinning at the RJ45 socket	72
Figure 29:	Male Connector external IO interface	73
Figure 30:	Behavior of the input voltage, examples flank rise: left - steep (desired), right - flat (not desired)	74
Figure 31:	Equivalent circuit diagram NANL-B500G-RE	74

List of tables

Table 1:	List of revisions	5
Table 2:	netANALYZER hardware	6
Table 3:	Installed netANALYZER files (firmware, driver, toolkit)	6
Table 4:	Required licenses for "Autonomous operating mode" and "Snapshot mode"	7
Table 5:	netANALYZER device	8
Table 6:	TAP Delay	14
Table 7:	Explanations to the front side and reverse side NANL-B500G-RE	16
Table 8:	Requirements power supply and host interface NANL-B500G-RE	18
Table 9:	Maximum permissible current consumption (external IO interface NANL-B500G-RE)	18
Table 10:	Notes about installation and operation	20
Table 11:	Overview installation	21
Table 12:	Overview how to update the installation	22
Table 13:	Workarround if firewall blocks communication	28
Table 14:	netANALYZER configuration page	29
Table 15:	Threshold for the temperature control of the fan	61
Table 16:	States of the SYS LED (NANL-B500G-RE)	67
Table 17:	Definition of the states of the SYS-LED	67
Table 18:	States of the Status LEDs STA0 and STA1 (NANL-B500G-RE), Interactive and Autonomous operating Mode	67
Table 19:	States of the Status LEDs STA0 and STA1 (NANL-B500G-RE), Autonomous operating mode only	68
Table 20:	Definition of the states of the status LEDs STA0 and STA1	68
Table 21:	States of the I/O Status LED (NANL-B500G-RE)	69
Table 22:	States of the Ethernet Status LEDs (NANL-B500G-RE, RJ45 Ethernet sockets Ch0 and Ch1, TAP A and TAP B)	69
Table 23:	Definition of the states of the Ethernet Status LEDs	69
Table 24:	States of the Ethernet status LEDs E (NANL-B500G-RE, Gigabit Ethernet RJ45 socket)	70
Table 25:	Definition of the states of the Ethernet Status LEDs	70
Table 26:	Ethernet pinning at the RJ45 socket	72
Table 27:	Data of the Ethernet connection	72
Table 28:	Pin out external IO interface	73
Table 29:	Requirements for the connection cable for external IO interface	73
Table 30:	Low and High Voltage Thresholds for NANL-B500G-RE	74
Table 31:	Technical data analyzer device NANL-B500G-RE	75
Table 32:	Signs	79
Table 33:	Signal words	79

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
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-B500G-RE	netANALYZER portable device with Gigabit Ethernet PC interface for real-time Ethernet and all 10/100BASE-T Ethernet networks
netANALYZER	System for recording and analyzing data traffic in Ethernet networks developed and manufactured by Hilscher, consisting of a special hardware (portable device) and the corresponding software.
PHY	Physical Interface
TAP	Test access point
WinPcap	Library WinPcap; http://www.winpcap.org/
Wireshark	Network monitoring program Wireshark; http://www.wireshark.org

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