VECTOR



VX0312 Ethernet/CAN Interface Manual

Version 2.2 | English

Imprint

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1 Introduction

In this chapter you find the following information:

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1.1 About this User Manual

Conventions

In the two following charts you will find the conventions used in the user manual regarding utilized spellings and symbols.

Style	Utilization
bold	Blocks, surface elements, window- and dialog names of the software. Accentuation of warnings and advices. **[OK]** Push buttons in brackets **File|Save** Notation for menus and menu entries
`Source Code`	File name and source code.
Hyperlink	Hyperlinks and references.
<CTRL>+<S>	Notation for shortcuts.

Symbol	Utilization
	This symbol calls your attention to warnings.
	Here you can obtain supplemental information.
	Here you can find additional information.
	Here is an example that has been prepared for you.
	Step-by-step instructions provide assistance at these points.
	Instructions on editing files are found at these points.
	This symbol warns you not to edit the specified file.

1.1.1 Warranty

Restriction of warranty

We reserve the right to change the contents of the documentation and the software without notice. Vector Informatik GmbH assumes no liability for correct contents or damages which are resulted from the usage of the documentation. We are grateful for references to mistakes or for suggestions for improvement to be able to offer you even more efficient products in the future.

1.1.2 Registered Trademarks

Registered trademarks

All trademarks mentioned in this documentation and if necessary third party registered are absolutely subject to the conditions of each valid label right and the rights of particular registered proprietor. All trademarks, trade names or company names are or can be trademarks or registered trademarks of their particular proprietors. All rights which are not expressly allowed are reserved. If an explicit label of trademarks, which are used in this documentation, fails, should not mean that a name is free of third party rights.

- Windows, Windows 7, Windows 8.1, Windows 10 are trademarks of the Microsoft Corporation.

1.2 Important Notes

1.2.1 Safety Instructions and Hazard Warnings



Caution!
In order to avoid personal injuries and damage to property, you have to read and understand the following safety instructions and hazard warnings prior to installation and use of this hardware. Keep this documentation (manual) always near the hardware.

1.2.1.1 Proper Use and Intended Purpose



Caution!
The hardware may only be operated (i) according to the instructions and descriptions of this manual; (ii) with the electric power supply designed for the hardware, e.g. USB-powered power supply; and (iii) with accessories manufactured or approved by Vector.

The hardware is exclusively designed for use by skilled personnel as its operation may result in serious personal injuries and damage to property. Therefore, only those persons may operate the hardware who (i) have understood the possible effects of the actions which may be caused by the hardware; (ii) are specifically trained in the handling with the hardware, bus systems and the system intended to be influenced; and (iii) have sufficient experience in using the hardware safely.

The knowledge necessary for the operation of the hardware can be acquired in work-shops and internal or external seminars offered by Vector. Additional and hardware specific information, such as „Known Issues“, are available in the „Vector KnowledgeBase“ on Vector´s website at www.vector.com. Please consult the „Vector KnowledgeBase“ for updated information prior to the operation of the hardware.

1.2.1.2 Hazards



Caution!
The hardware may control and/or otherwise influence the behavior of control systems and electronic control units. Serious hazards for life, body and property may arise, in particular, without limitation, by interventions in safety relevant systems (e.g. by deactivating or otherwise manipulating the engine management, steering, airbag and/or braking system) and/or if the hardware is operated in public areas (e.g. public traffic, airspace). Therefore, you must always ensure that the hardware is used in a safe manner. This includes, inter alia, the ability to put the system in which the hardware is used into a safe state at any time (e.g. by „emergency shutdown“), in particular, without limitation, in the event of errors or hazards.

Comply with all safety standards and public regulations which are relevant for the operation of the system. Before you operate the system in public areas, it should be tested on a site which is not accessible to the public and specifically prepared for performing test drives in order to reduce hazards.

1.2.2 Disclaimer



Caution!
Claims based on defects and liability claims against Vector are excluded to the extent damages or errors are caused by improper use of the hardware or use not according to its intended purpose. The same applies to damages or errors arising from insufficient training or lack of experience of personnel using the hardware.

2 VX0312 Ethernet/CAN Interface

In this chapter you find the following information:

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2.1 Scope of Delivery

Contents

The delivery includes:

- VX0312 Ethernet/CAN Interface
- USB Cable, 1.8 m
- VX1000 Quick Start Guide

2.2 Introduction

About the VX0312

The VX0312 is a compact Ethernet/CAN to USB Interface.Beside standard Ethernet IEEE802.3 Physical Layer with 100 Mbit/s and 1 Gbit/s, the VX0312 also supports BroadR-Reach/100BASE-T1..

The VX0312 also provides one CAN channel via a Lemo connector.For diagnostic purposes, the Lemo connector can alternatively also act as DoIP activation line.



Figure 1: VX0312 Ethernet/CAN Interface

Highlights

Main features of the VX0312:

- Support of standard Ethernet IEEE802.3 (100 Mbit/s, 1000 Mbit/s) or BroadR-Reach/100BASE-T1 physical layer (100 Mbit/s) on a RJ45 connector.
- Support of one High-Speed CAN channel (also CAN FD ISO) on a Lemo connector.
- Best performance in combination with Vector tools like CANape or CANoe.
- Supports the Vector XL Driver Library for Ethernet and CAN (open API also for third party tools).
- Windows network driver (NDIS) to also allow the usage as standard Ethernet device.
- Robustness, power supply and temperature ranges suitable for automotive and industrial applications

Caution!
Please note that the VX0312 Ethernet port supporting both 1000BASE-T and BroadR-Reach/100BASE-T1 is only intended as interface to measurement and calibration hardware, like an XPOD. It is not designed to be connected to automotive Ethernet networks.

Especially when using the VX0312 via the NDIS driver, the port may be exposed to unexpected Ethernet traffic, like broadcasts, which might not be tolerable in an automotive Ethernet network. Also, due to supporting both, standard Ethernet, and BroadR-Reach/100BASE-T1 on the same port, the electrical circuit slightly differs from what is common in automotive Ethernet networks, which also might not be tolerable in an automotive Ethernet network.

To communicate with automotive Ethernet networks, please use dedicated Vector Network Interface Hardware.

2.3 Accessories

Reference
Information on available accessories can be found in the separate accessories manual on our website.

3 Device Description

In this chapter you find the following information:

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3.1 Main Connectors

3.1.1 Target Side

Device connectors

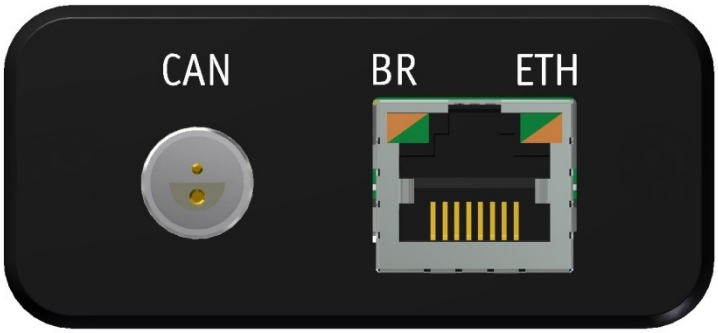


Figure 2: Connectors on the target side

- **CAN**

  Lemo connector (type 302) for CAN and DoIP activation line.

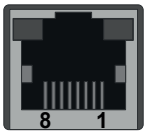
Pin	Assignment
1	CAN Low / DoIP GND
2	CAN High / DoIP Activation Line
3	Shield



- **BR/ETH**

  Standard Ethernet connector (RJ45) for 100BASE-TX, 1000BASE-T or BroadR-Reach/100BASE-T1.

Pin	Assignment for BroadR-Reach/100BASE-T1
1	BR+
2	BR-
3...8	Not connected



Caution!

Please note that the VX0312 Ethernet port supporting both 1000BASE-T and BroadR-Reach/100BASE-T1 is only intended as interface to measurement and calibration hardware, like an XPOD. It is not designed to be connected to automotive Ethernet networks.

Especially when using the VX0312 via the NDIS driver, the port may be exposed to unexpected Ethernet traffic, like broadcasts, which might not be tolerable in an automotive Ethernet network. Also, due to supporting both, standard Ethernet, and BroadR-Reach/100BASE-T1 on the same port, the electrical circuit slightly differs from what is common in automotive Ethernet networks, which also might not be tolerable in an automotive Ethernet network.

To communicate with automotive Ethernet networks, please use dedicated Vector Network Interface Hardware.

- **LED BR**
  LED illuminates if there is an Ethernet link or blinks if there is Ethernet activity at the according channel.

Color	Description
Green	BroadR-Reach Master
Orange	BroadR-Reach Slave

- **LED ETH**
  LED illuminates if there is an Ethernet link or blinks if there is Ethernet activity at the according channel.

Color	Description
Green	100 Mbit/s
Orange	1000 Mbit/s

3.1.2 Host Side

Device connectors

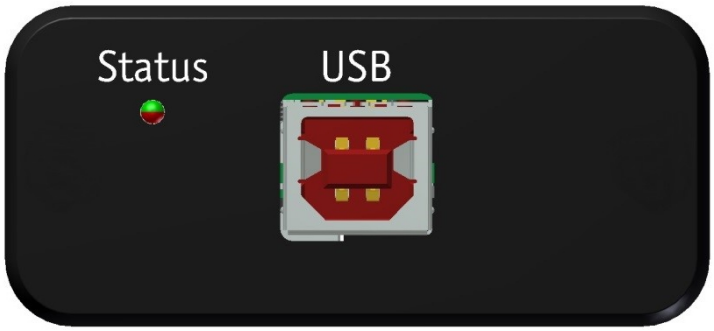


Figure 3: Connectors on the host side

- **Status**
  Multicolored LED indicating the status.

Color	Description
Green	► Blinks 4 times at power up and stays on afterwards. ► Permanently blinks quickly during an update progress. Please wait for the automatic reboot of the device after the update has been finished (updating takes about 30s).
Red	► An error has occurred. Please disconnect the USB cable. Re-connect the USB cable and try again.

- **USB**
  Connect your PC and the VX0312 over USB to use the device with measurement applications (CANape, CANoe, CANalyzer). Use the USB2.0 compliant cable found in the delivery (USB extension cables may generate faults between the PC and the device). Connect the device directly to a USB port at your PC or use a USB hub with its own power supply (self-powered).

3.1.3 Technical Data

CAN channels	1x CAN High-Speed (CAN FD), DoIP Activation Line via NXP TJA1051 and Lemo connector CAN: up to 2 Mbit/s CAN FD: up to 8 Mbit/s
Ethernet channels	1x BroadR-Reach,IEEE802.3 (100BASE-TX and 1000BASE-T) via BCM54810 and RJ45 connector 100 Mbit/s (BroadR-Reach) 100 Mbit/s, 1000 Mbit/s (IEEE802.3)
PC Interface	USB 2.0 Hi-Speed, bus powered (without external power supply)
Driver Library	XL Driver Library for CAN and Ethernet
Temperature range (ambient temp. of the device)	Operation: -40 °C ... +55 °C Storage: -40 °C ... +85 °C
Relative humidity of ambient air	15 %...95 %, non-condensing
Dimensions (LxWxH)	Approx. 86 mm x 57 mm x 26 mm
Weight	120 g
Housing	Robust aluminum housing
Operating system requirements	Windows 7 SP1 (32 bit / 64 bit) Windows 8.1 (32 bit / 64 bit) Windows 10 (64 bit)

Electrical isolation of the connectors

BR/ETH and CAN are galvanically isolated from each other and the device logic. Also their shields are isolated from each other and from the housing. USB data and power is not isolated from the device and the shield is connected to the housing.

4 Getting Started

In this chapter you find the following information:

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4.1 Driver Installation

General information

The Vector Driver Setup allows the installation or the removal of Vector devices.

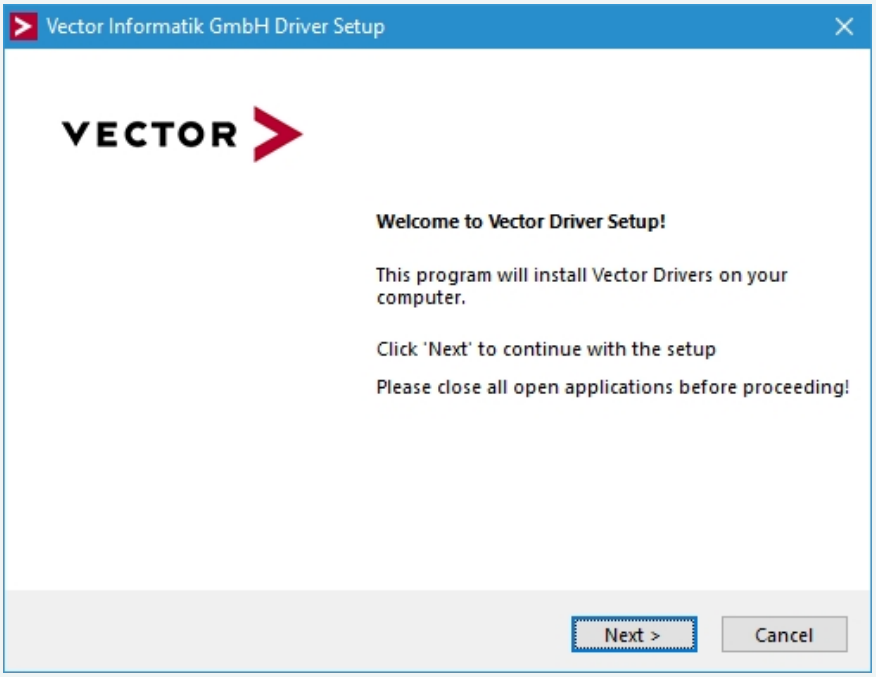
Note

Please note that you will need **Administrator Rights** for the following steps.

Step by Step Procedure

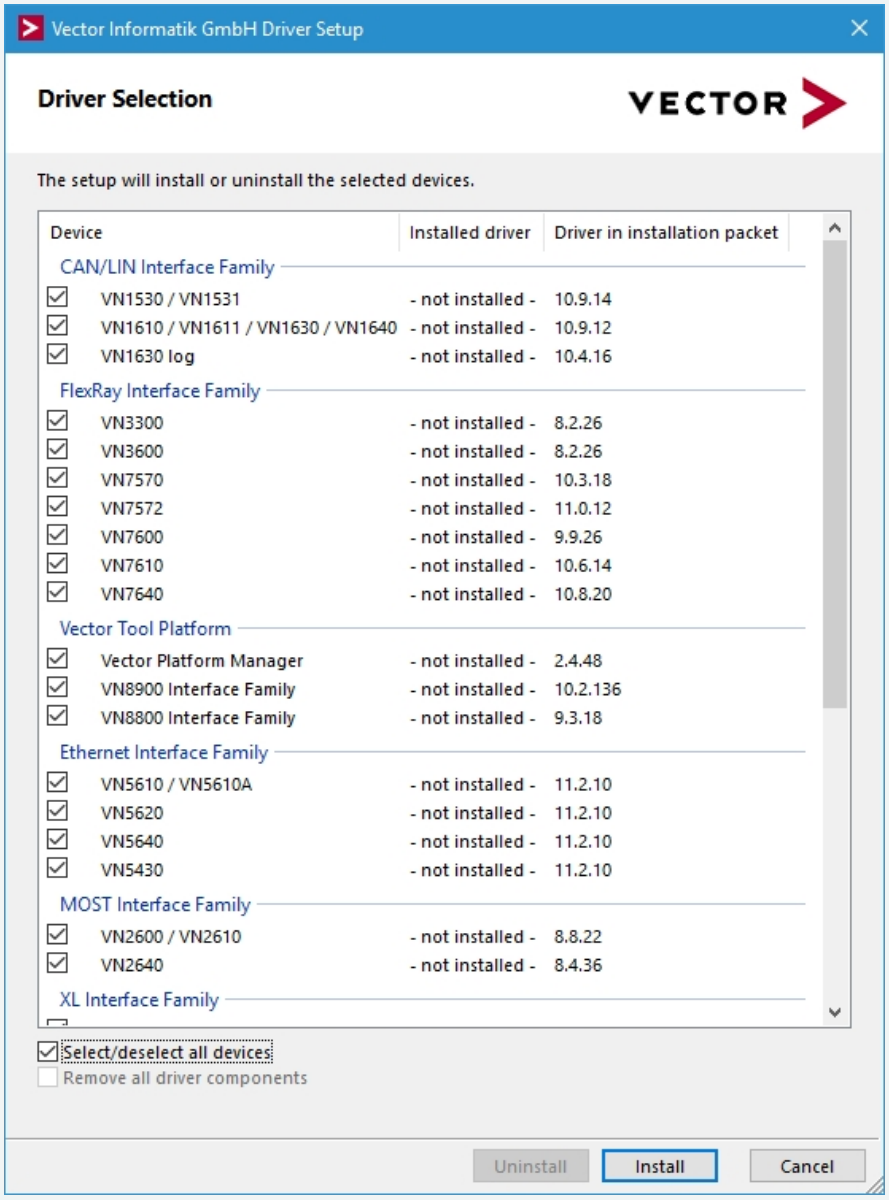
1. Execute the driver setup from `\Drivers\Setup.exe` before the device is connected to the PC with the included USB cable.

   If you have already connected the device to the PC, the **Windows found new Hardware** wizard appears. Close this wizard and then execute the driver setup.



2. Click **[Next]** in the driver setup dialog. The initialization process starts.

3. In the driver selection dialog, select your devices to be installed (or to be uninstalled).



4. Click **[Install]** to execute the driver installation, or **[Uninstall]** to remove existing drivers.
5. A confirmation dialog appears. Click **[Close]** to exit. After successful installation, the device is ready for operation and can be connected to the PC with the included USB cable.

4.2 Device Configuration

Configuration

Before the installed device can be used in an application, it must be properly configured for the needed use case. This configuration is done with the **Vector Hardware Config** tool which comes with the driver installation. The tool can be found in **Windows | Start | Settings | Control Panel | Vector Hardware** and manages all installed Vector devices.

Reference
Further details on **Vector Hardware Config** can be found in the installation instructions (see section Vector Hardware Configuration on page 21).

Device configuration

If you want to change the Ethernet configuration, select a connected VX0312 from the list and double click on **Device Configuration**.

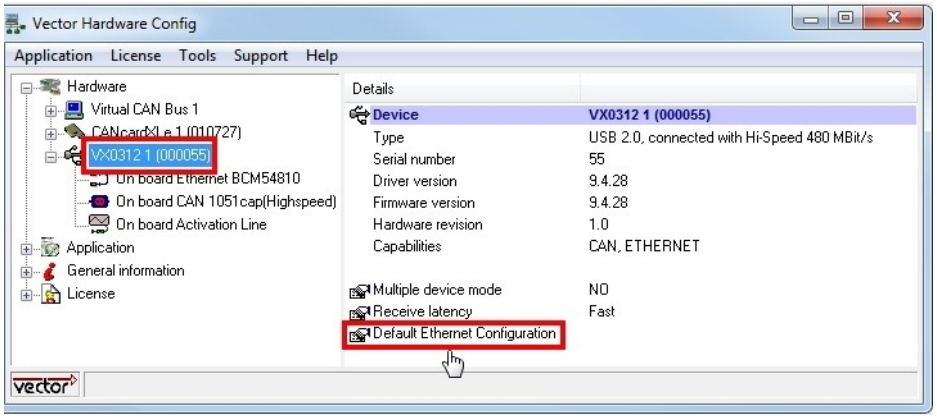


Figure 4: Vector Hardware Config

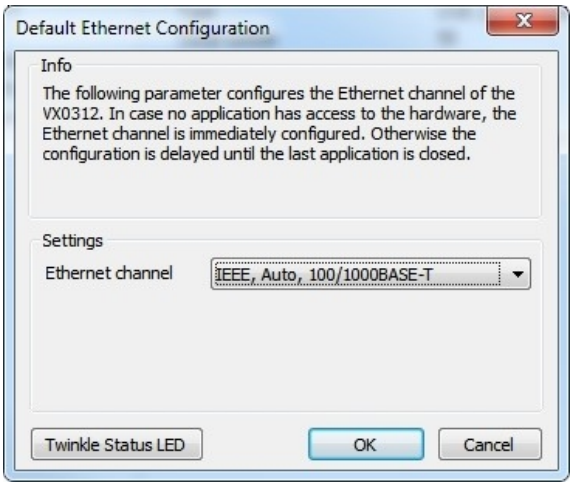


Figure 5: Device Configuration dialog

If you choose one of the Auto mode settings for the default Ethernet configuration, the VX0312 switches through the different modes until a connection on the Ethernet port is established. The VX0312 then is locked in this mode until it is restarted or if the tool reactivates the Auto mode via XL API after the device on the Ethernet port is disconnected.

5 Vector Hardware Configuration

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5.1 General Information

Executing Vector Hardware Config

After the successful driver installation, you will find the configuration application **Vector Hardware** in the Control Panel (see below). The tool gives you information about the connected and installed Vector devices. There are also several settings that can be changed.



Figure 6: Icon in Control Panel

Control Panel Windows 7

- Category view
  Windows Start | Control Panel | Hardware and Sound,
  click **Vector Hardware** in the list.
- Symbols view
  Windows Start | Control Panel,
  click **Vector Hardware** in the list.

Control Panel Windows 8.1

- Category view
  <Windows key>+<X> | Control Panel | Hardware and Sound,
  click **Vector Hardware** in the list.
- Symbols view
  <Windows key>+<X> | Control Panel,
  click **Vector Hardware** in the list.

Control Panel Windows 10

- Category view
  <Windows key>+<X> | Control Panel | Hardware and Sound,
  click **Vector Hardware** in the list.
- Symbols view
  <Windows key>+<X> | Control Panel,
  click **Vector Hardware** in the list.

5.2 Tool Description

5.2.1 Introduction

Vector Hardware Config

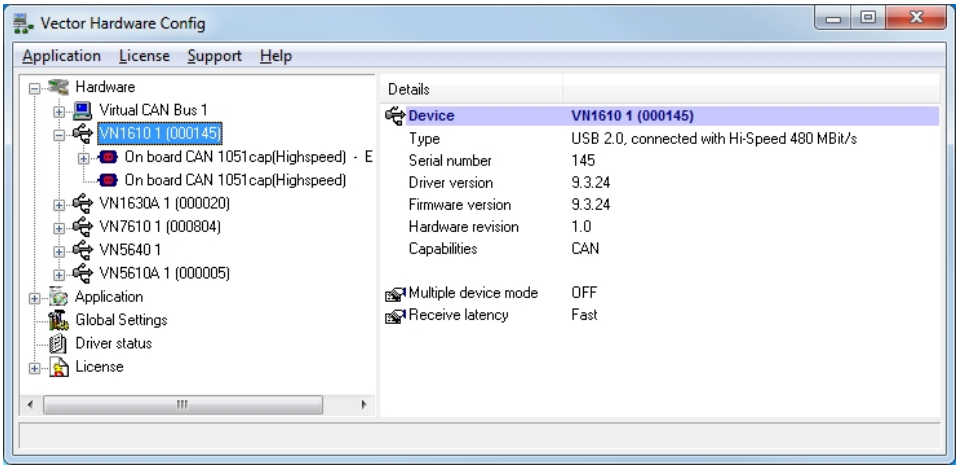


Figure 7: General view of Vector Hardware Config

Logical and physical channels

Vector Hardware Config enables the channel configuration between installed Vector devices and applications. Applications use so-called logical channels which are hardware independent and have to be assigned to real hardware channels.

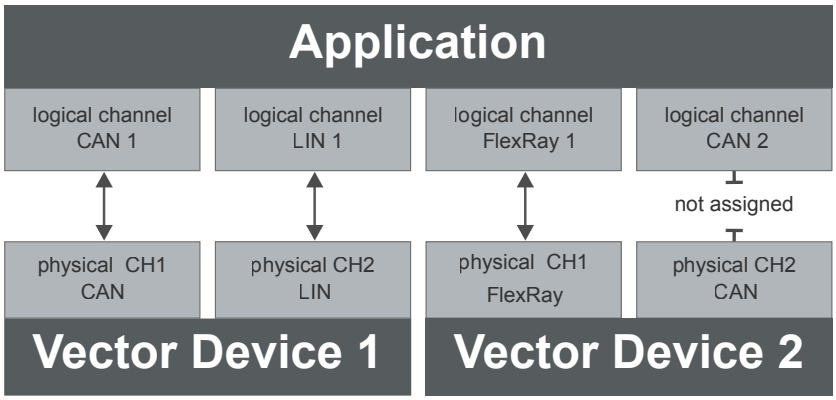


Figure 8: Concept of channel assignments

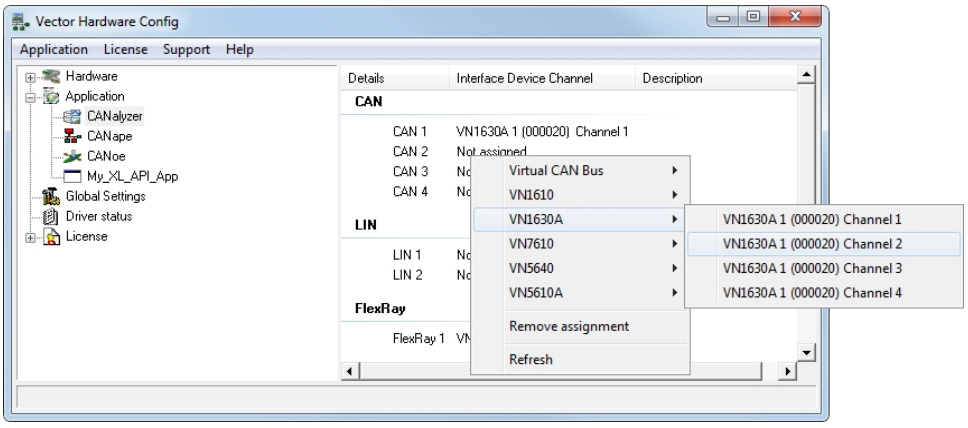


Figure 9: Channel assignment in Vector Hardware Config

5.2.2 Tree View

Accessing Vector devices

The tool is split into two windows. The left window has a tree view and lets you access the installed Vector devices, the right window displays the details of the selection. The following nodes are available in the tree view:

Hardware

The **Hardware** section lists the installed Vector devices. Each device item has physical channels which can be assigned to any number of logical channels (e. g. CANalyzer CAN 1). A logical channel can be assigned to only one physical channel.

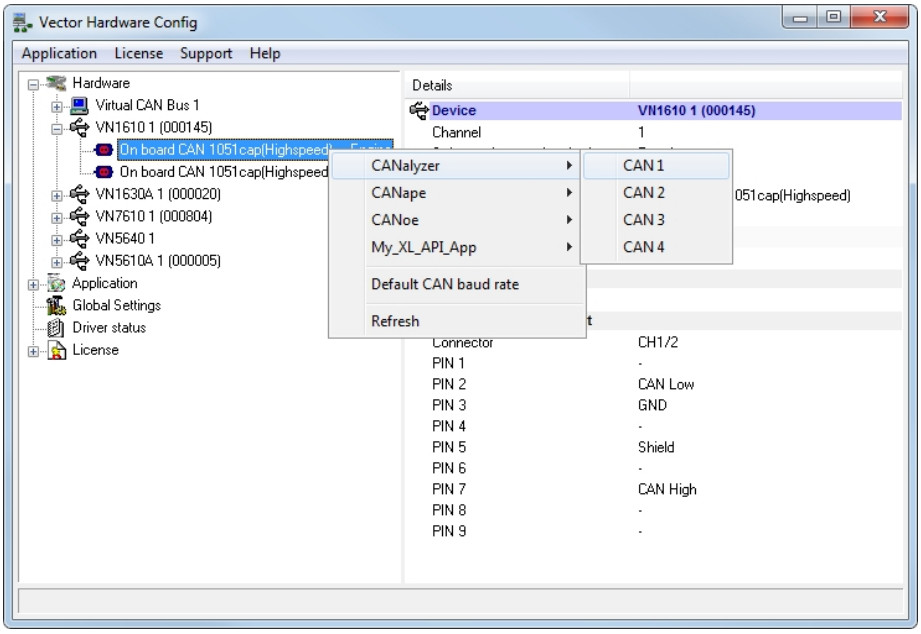


Figure 10: Hardware

Application

In **Application**, all available applications are displayed in a tree view. According to each application, the assignments of logical and physical channels are displayed in the right part of the window. If no assignment exists, the information **Not assigned** appears. The assignment can be edited via a right-click.

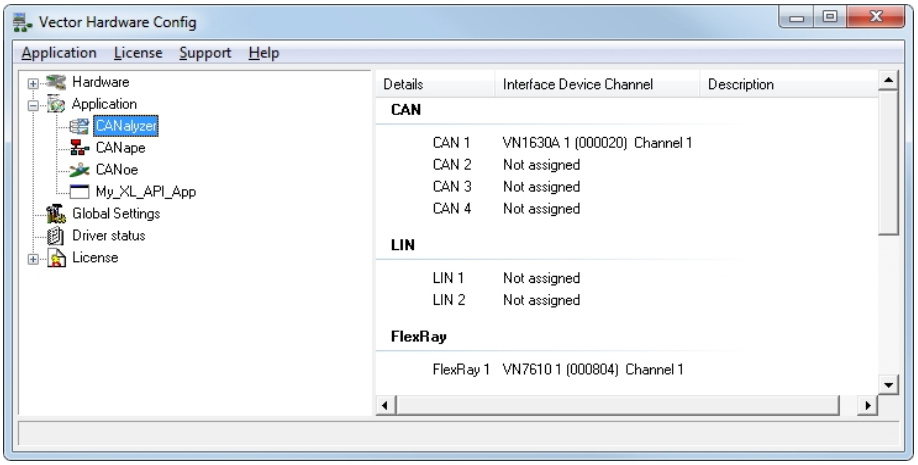


Figure 11: Application

Global settings

Global settings contains global device configuration possibilities, e. g. software time synchronization, GNSS time synchronization, transmit queue size, configuration flags or the number of virtual CAN devices.

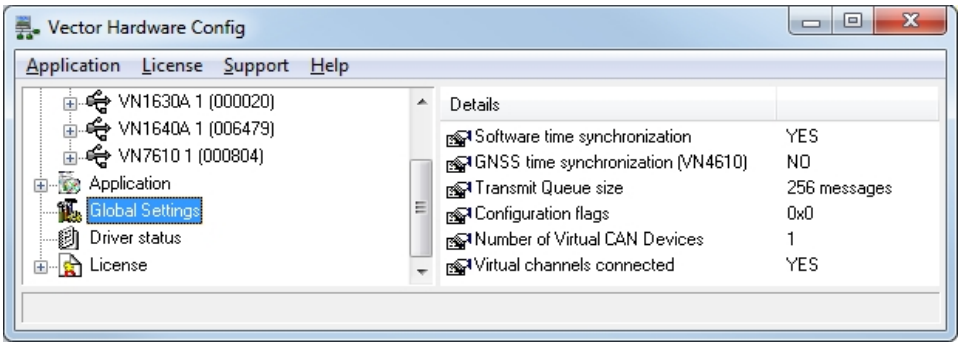


Figure 12: Global settings

Driver status

Driver status offers an overall status information of devices and applications currently in use. You can see whether the channels are connected to the bus (online/offline) and whether the time synchronization is activated or not (Time-Sync-On/Time-Sync-Off).

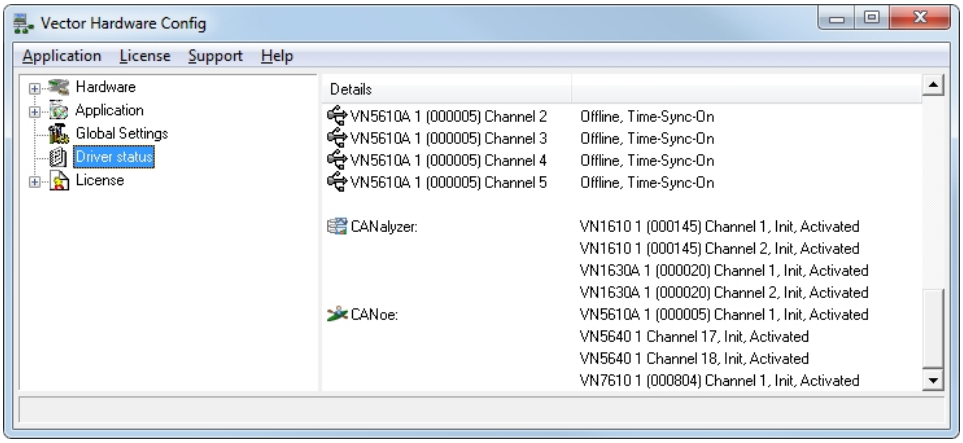


Figure 13: Driver status

License

The **License** section contains information on all current available licenses (Vector bus devices, Vector License USB dongle devices).

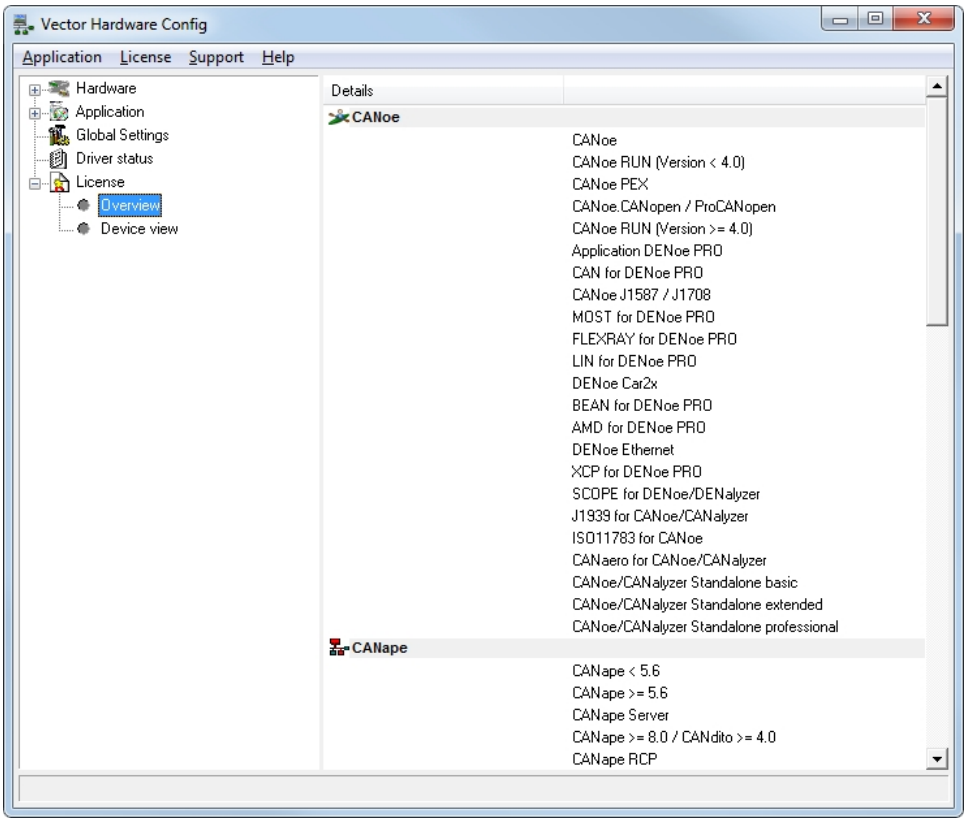


Figure 14: License

Reference

You will find a detailed description of **Vector Hardware Config** in the online help **(Help | Contents)**.

6 Time Synchronization

In this chapter you find the following information:

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6.1 General Information

Time stamps and events

Time stamps are useful when analyzing incoming or outgoing data or event sequences on a specific bus.

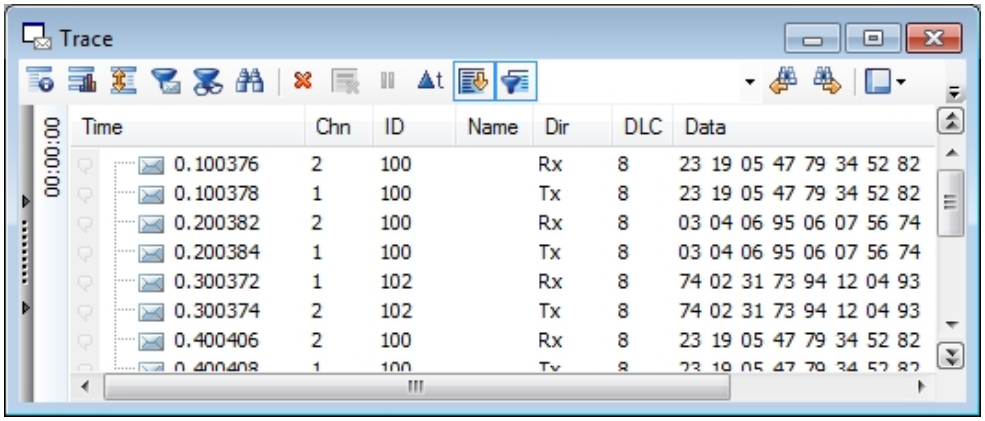


Figure 15: Time stamps of two CAN channels in CANalyzer

Generating time stamps

Each event which is sent or received by a Vector network interface has an accurate time stamp. Time stamps are generated for each channel in the Vector network interface. The base for these time stamps is a common hardware clock in the device.

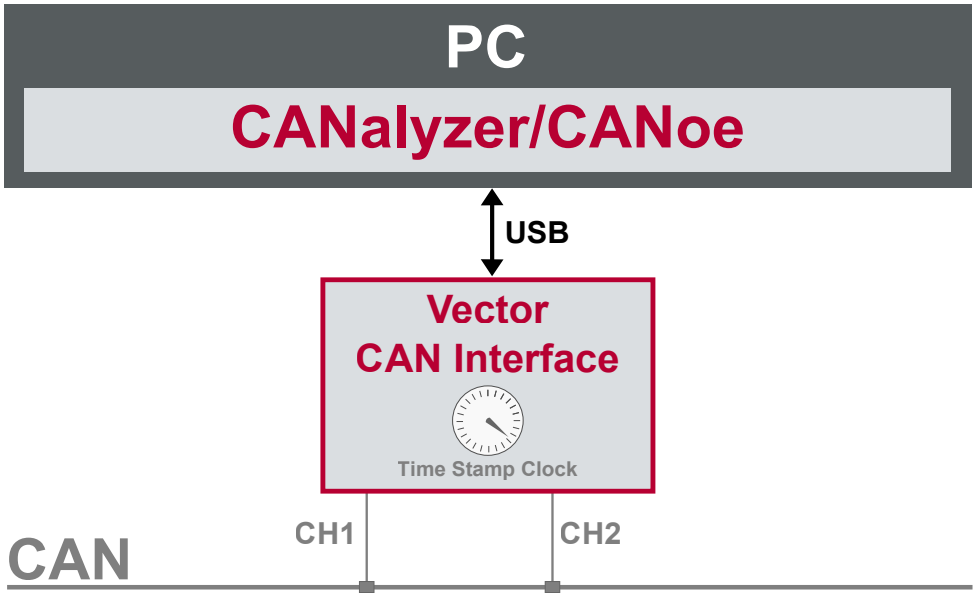


Figure 16: Common time stamp clock for each channel

If the measurement setup requires more than one Vector network interface, a synchronization of all connected interfaces and their hardware clocks is needed.

Due to manufacturing and temperature tolerances, the hardware clocks may vary in speed, so time stamps of various Vector devices drift over time.

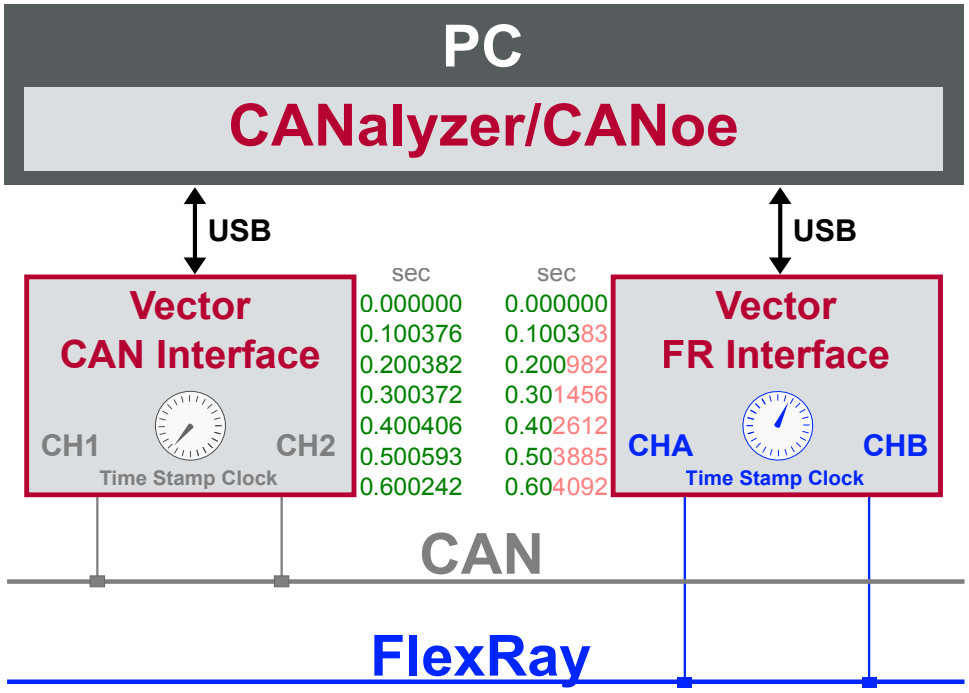


Figure 17: Example of unsynchronized network interfaces. Independent time stamps drift apart

To compensate for these time stamp deviations between the Vector network interfaces, the time stamps can be either synchronized by software or by hardware (see next section).

Note

The accuracy of the software and hardware sync depends on the interface. Further information on specific values can be found in the technical data of the respective devices.

6.2 Software Sync

Synchronization by software

The software time synchronization is driver-based and available for all applications without any restrictions. The time stamp deviations from different Vector network interfaces are calculated and synchronized to the common PC clock. For this purpose no further hardware setup is required.

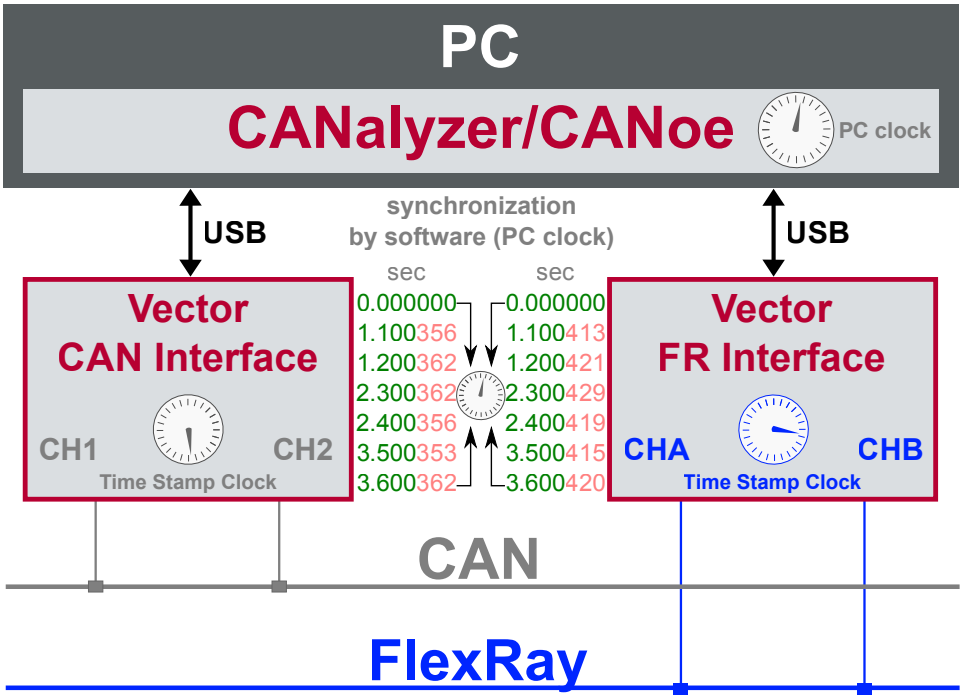


Figure 18: Time stamps of devices are synchronized to the PC clock

The setting of the software time synchronization can be changed in the **Vector Hardware Config** tool in **General information | Settings | Software time synchronization**.

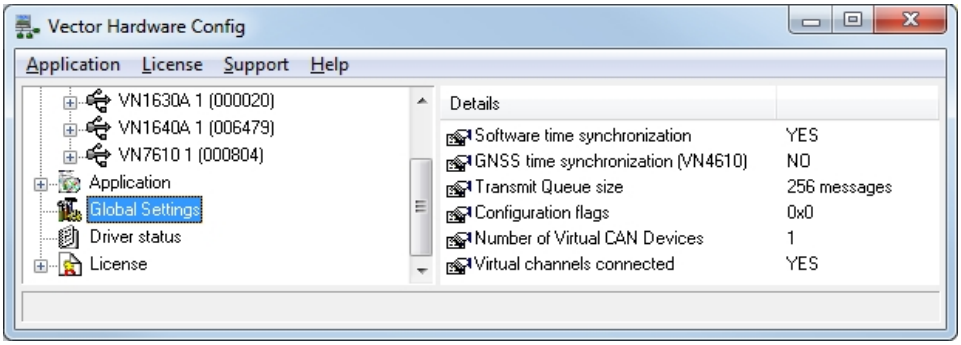


Figure 19: Switching on the software synchronization

- **YES**
  The software time synchronization is active.
- **NO**
  The software time synchronization is not active. Use this setting only if the Vector network interfaces are being synchronized over the sync line or if only a single device is used.

6.3 Hardware Sync

Synchronization by hardware

The hardware time synchronization is not available for this device. Please use the software time synchronization instead (see section Software Sync on page 30).

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