Manual

VN5600 Interface Family

VN5610 Ethernet/CAN Network Interface

Version 1.4

English

Imprint

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Contents

1 Introduction

In this chapter you find the following information:

1.1 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 interface. Keep this documentation (manual) always near the interface.

1.1.1 Proper Use and Intended Purpose

Caution: The interface is designed for analyzing, controlling and otherwise influencing control systems and electronic control units. This includes, inter alia, bus systems like CAN, LIN, K-Line, MOST, FlexRay, Ethernet and/or BroadR-Reach.

The interface may only be operated in a closed state. In particular, printed circuits must not be visible. The interface may only be operated (i) according to the instructions and descriptions of this manual; (ii) with the electric power supply designed for the interface, e.g. USB-powered power supply; and (iii) with accessories manufactured or approved by Vector.

The interface 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 interface who (i) have understood the possible effects of the actions which may be caused by the interface; (ii) are specifically trained in the handling with the interface, bus systems and the system intended to be influenced; and (iii) have sufficient experience in using the interface safely.

The knowledge necessary for the operation of the interface can be acquired in workshops and internal or external seminars offered by Vector. Additional and interface 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 interface.

1.1.2 Hazards

Caution: The interface 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 interface is operated in public areas (e.g. public traffic, airspace). Therefore, you must always ensure that the interface is used in a safe manner. This includes, inter alia, the ability to put the system in which the interface 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.

1.1.3 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 interface 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 interface.

1.2 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
Microsoft	Legally protected proper names and side notes.
`Source Code`	File name and source code.
Hyperlink	Hyperlinks and references.
<CTRL>+<S>	Notation for shortcuts.

Symbol	Utilization
	Here you can obtain supplemental information.
	This symbol calls your attention to warnings.
	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.

1.2.1 Certification

Certified Quality Management System

Vector Informatik GmbH has ISO 9001:2008 certification. The ISO standard is a globally recognized standard.

1.2.2 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.

1.2.3 Registered Trademarks

Registered trademarks

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> Windows, Windows 7, Windows 8 are trademarks of the Microsoft Corporation.

2 VN5610 Ethernet/CAN Network Interface

In this chapter you find the following information:

2.1 Introduction

About the VN5610

The VN5610 is an entirely new development from Vector which supports the Ethernet physical layer 100BASE-TX, 1000BASE-T and BroadR-Reach from Broadcom. BroadR-Reach is a physical layer especially used in automotive electronics.

Figure 1: VN5610 Ethernet/CAN Interface

The VN5610 enables the transparent monitoring and logging of Ethernet data streams and CAN events with minimal latency times and high resolution time stamps. With this, the VN5610 enables a variety of applications such as simple bus analyses, complex remaining bus simulations as well as diagnostic and calibration (e. g. with CANalyzer.Ethernet/CANoe.Ethernet).

Highlights

Main features of the VN5610:

- Support of two independent Ethernet ports, available as 2x RJ45 or 1x D-SUB9
- Support of standard Ethernet (IEEE 802.3) and BroadR-Reach physical layer
- Support of two independent CAN channels, available as 1x D-SUB9
- High resolution time stamps for Ethernet frames
- High resolution time stamps for CAN frames
- Software and hardware time synchronization of multiple Vector network interfaces (CAN, LIN, MOST, FlexRay)
- Internal three-way-routing in/monitor/out
- Robustness, power supply and temperature ranges suitable for automotive and industrial applications

2.2 Accessories

Reference: Information on suitable cables and adapters can be found in the separate accessories manual on the driver CD in `\Documentation\Accessories`.

2.3 Use Case Examples

2.3.1 Standalone Media Converter

BroadR-Reach/ IEEE 802.3

The Ethernet channels of the VN5610 can be configured independently. That way the VN5610 can be used as a media converter between an ECU using the BroadR-Reach physical layer and any standard Ethernet equipment (e. g. loggers) using IEEE 802.3.

Setup

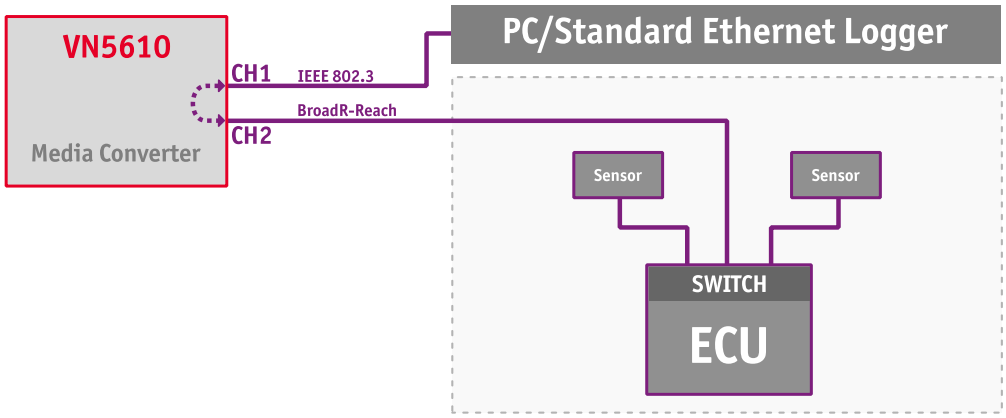


Figure 2: Media Converter

2.3.2 Transparent Ethernet Monitoring

Bypassing

The VN5610 can be used for Ethernet monitoring between an ECU and a connected sensor without influencing the Ethernet bus (bypassing). In this particular setup the VN5610 receives and forwards incoming data packages from one channel to the other.

Setup

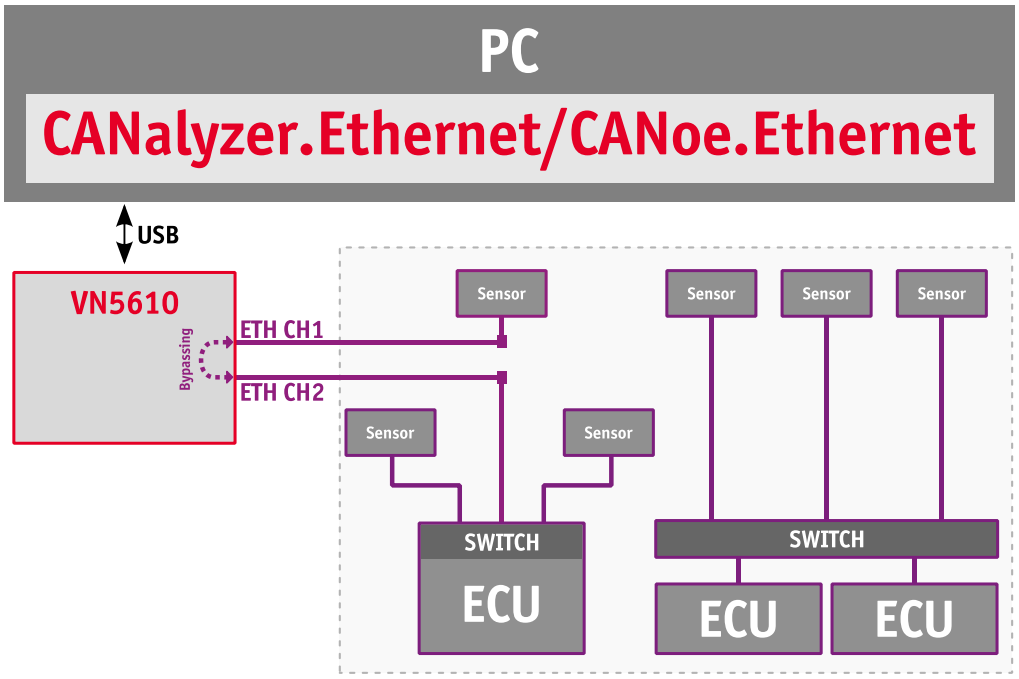


Figure 3: Bypassing Ethernet data

This allows applications such as CANalyzer.Ethernet or CANoe.Ethernet to trace Ethernet data with accurate time stamps.

Bypassing modes

For bypassing two modes are available, which can be used depending on the needed application:

> **PHY bypassing**
Use this mode if you want to monitor Ethernet packets without influencing the constant processing time. Sending of additional Ethernet packets is not possible in this mode.

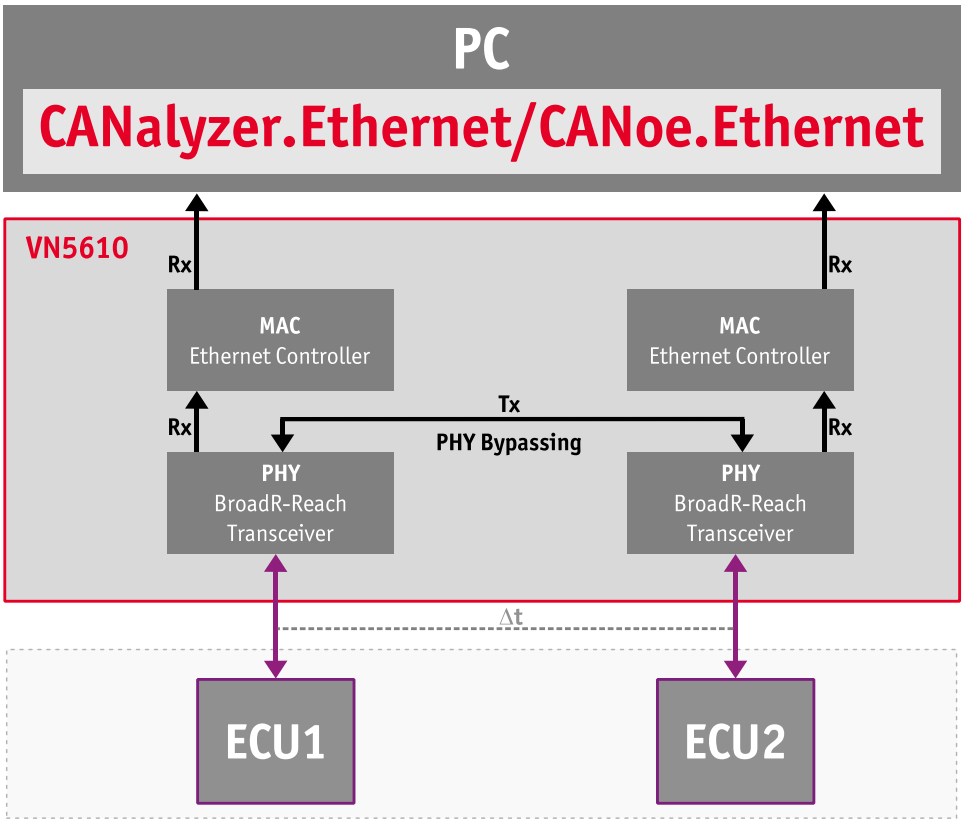


Figure 4: PHY bypassing

Physical Layer	Bypassing Latency Δt
BroadR-Reach ←→ BroadR-Reach	1.9 µs
BroadR-Reach ←→ IEEE 100 Mbit	1.5 µs
IEEE 100 Mbit ←→ IEEE 100 Mbit	1.1 µs
IEEE 1000 Mbit ←→ IEEE 1000 Mbit	0.5 µs

> **MAC bypassing**
Use this mode if you want to monitor Ethernet packets and also send additional packets. In this mode, the processing time is dynamic.

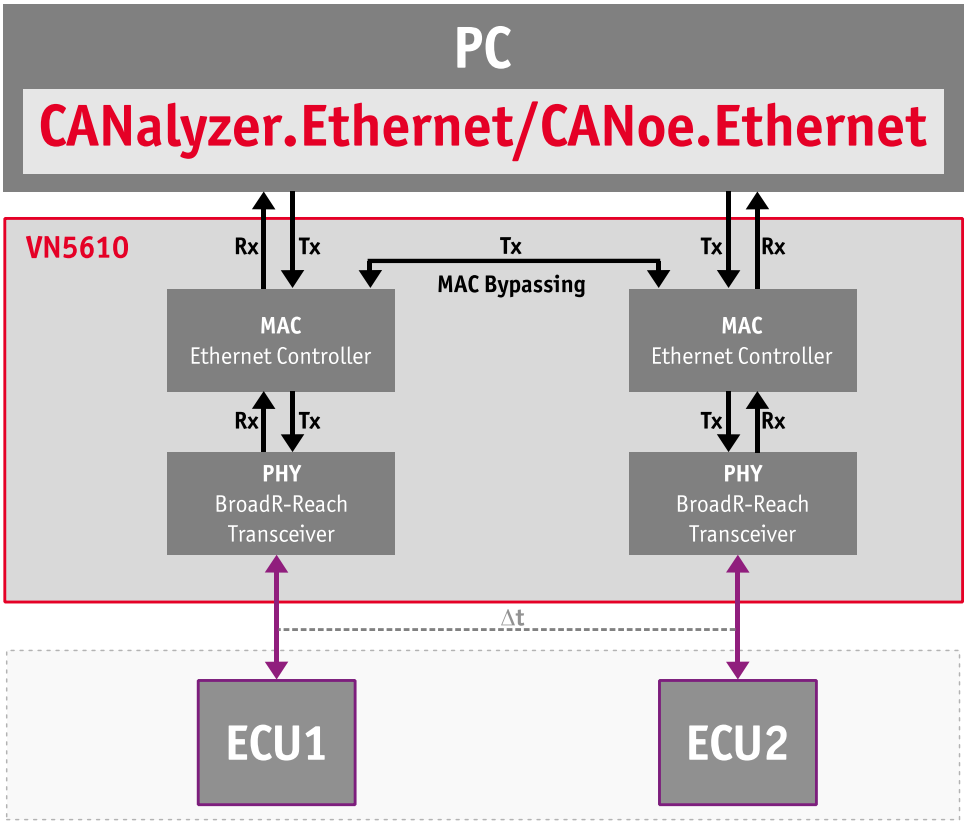


Figure 5: MAC bypassing

Physical Layer	Dynamic Bypassing Latency Δt*	
	Frame Length 64 Byte	Frame Length 1500 Byte
BroadR-Reach ←→ BroadR-Reach	approx. 9.4 µs	approx. 131.5 µs
BroadR-Reach ←→ IEEE 100 Mbit	approx. 9.1 µs	approx. 131.3 µs
IEEE 100 Mbit ←→ IEEE 100 Mbit	approx. 8.7 µs	approx. 130.7 µs
IEEE 1000 Mbit ←→ IEEE 1000 Mbit	approx. 1.6 µs	approx. 18.9 µs

* Processing time without additional frames through the application (CANalyzer.Ethernet/CANoe.Ethernet)

Note: The MAC bypassing latency depends on the frame length as well as on frames which are additionally sent.

Time stamp clock for Ethernet and CAN

The VN5610 uses a common time stamp clock for Ethernet and CAN events. So if the measurement setup is extended by a CAN network, the generated CAN time stamps are always in sync with the Ethernet time stamps which helps analyzing the network.

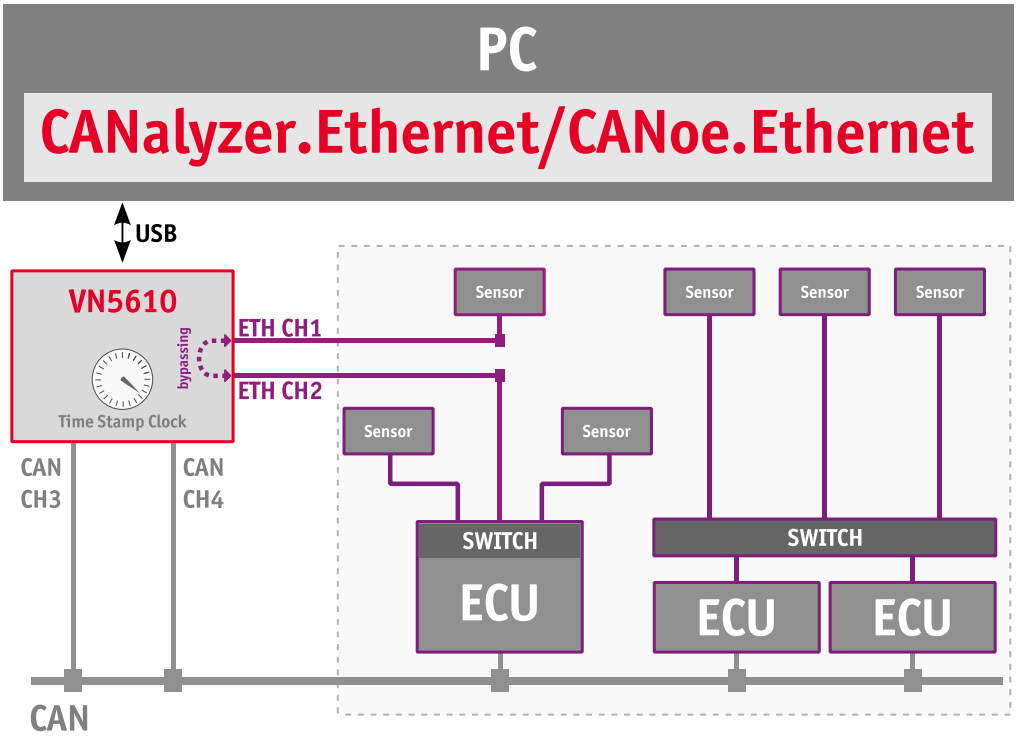


Figure 6: Extended measuring setup

Note: Additional Vector network interfaces can be synchronized by software or hardware (see section Time Synchronization on page 24).

2.3.3 Remaining Bus Simulation

Developing networks

The VN5610 is able to send and receive data packages on two separate Ethernet channels as well as events on two separate CAN channels. With this, the VN5610 is a perfect choice for the remaining bus simulation during the development of complex networks.

Setup

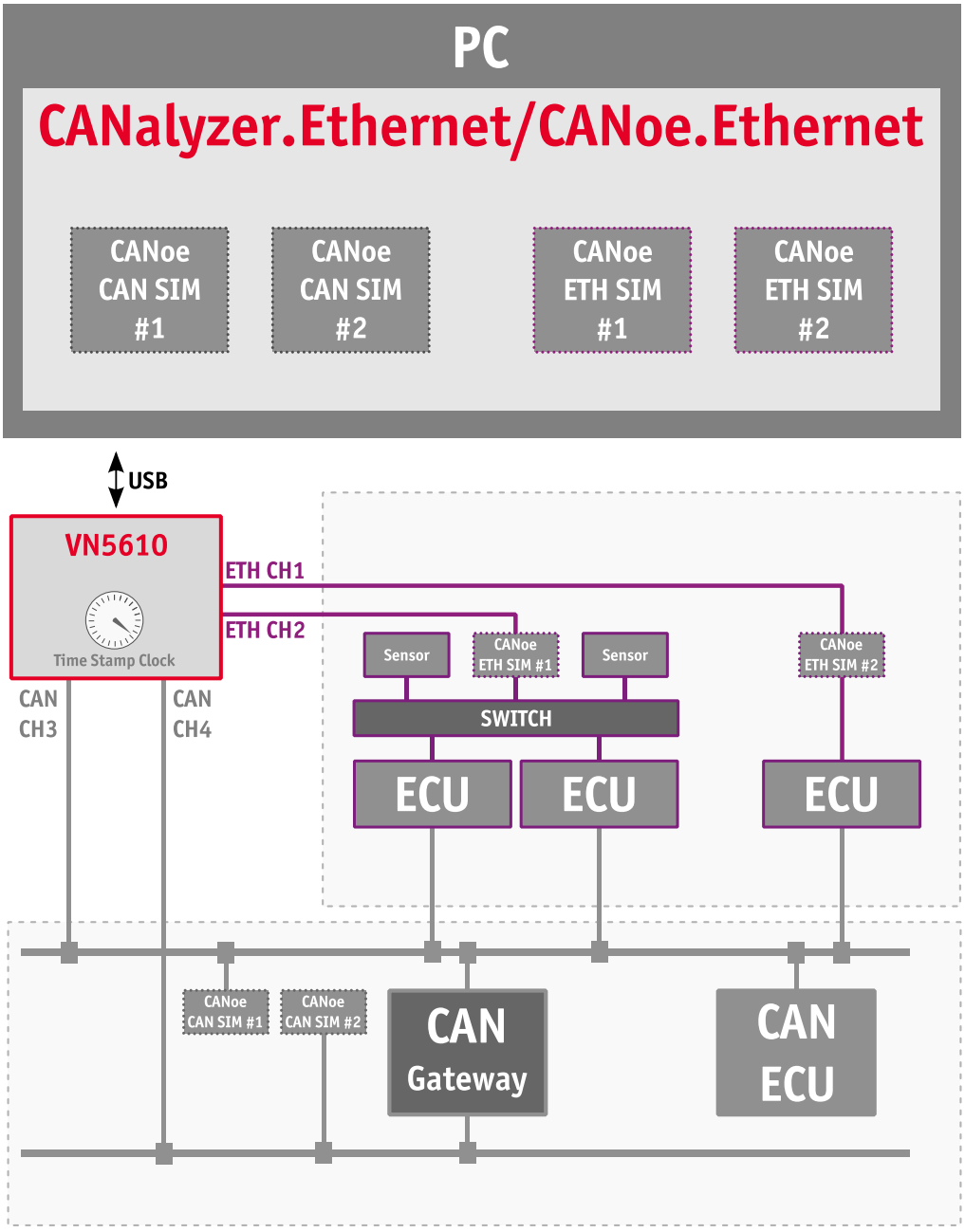


Figure 7: Simulated nodes

Note: For the complex remaining bus simulation CANoe.Ethernet is required.

2.3.4 Avionics Full Duplex Switched (X) Ethernet

Redundant networks

The VN5610 and its independent Ethernet channels are suitable for monitoring and stressing safety-critical networks like in AFDX. Ethernet frames can be simultaneously sent over both channels as well as received with high resolution time stamps. With this, the VN5610 is a great device for AFDX measurements and test benches.

Setup

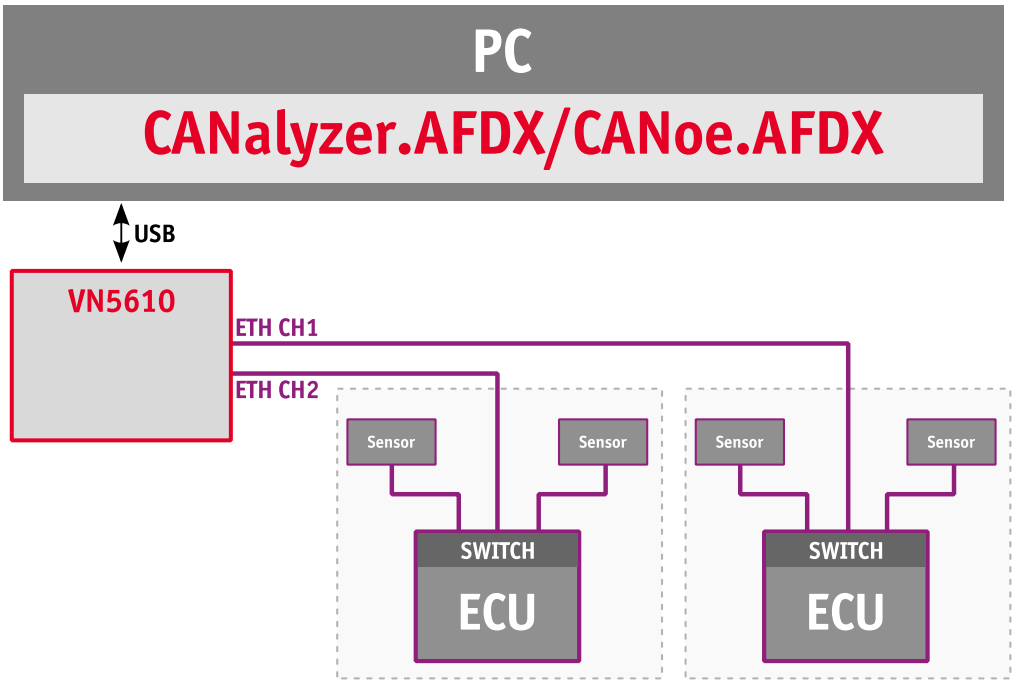


Figure 8: Redundant networks

Note: To access AFDX networks with the VN5610 either CANalyzer.AFDX or CANoe.AFDX is required.

2.4 Getting Started

2.4.1 Step 1: Driver Installation

Please use the drivers from the included Vector Driver Disk.

1. Execute **Vector Driver Setup** from the auto start menu or directly from `\Drivers\Setup.exe` before the VN5610 is connected to the PC over USB. If you have already connected the VN5610, the **Windows found new Hardware** wizard appears. Close this wizard and then execute the driver setup.
2. Finish the driver installation with the setup.

Note: Further information on the driver installation can be found in the separate installation instructions at the end of this manual.

2.4.2 Step 2: Device Installation

1. Install the drivers as described before.
2. Connect the power supply and plug it into a power outlet (for use in 1000 Mbit/s mode).
3. Connect the VN5610 to a free USB2.0 port via the USB cable.

2.4.3 Step 3: Device Configuration

Configuration

Before the installed device can be used in an application (e. g. CANalyzer, CANoe), 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.

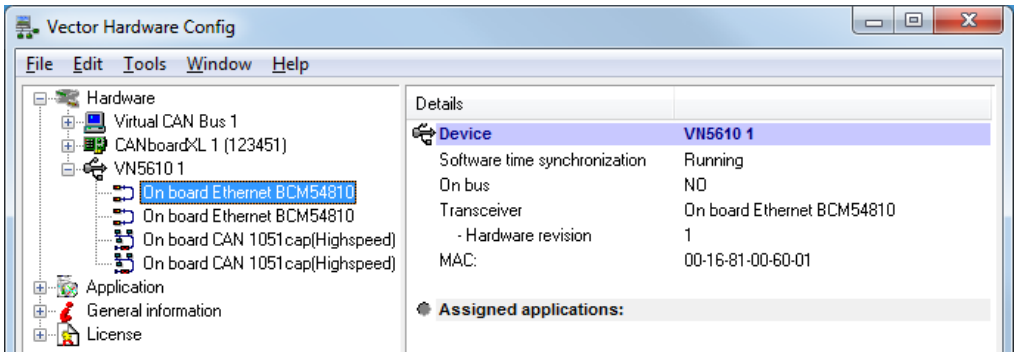


Figure 9: Vector Hardware Config.

For the quick test described in this manual no further configuration is required.

If you want to change the default Ethernet configuration, select a connected VN5610 from the list and double click **Default Ethernet Configuration**.

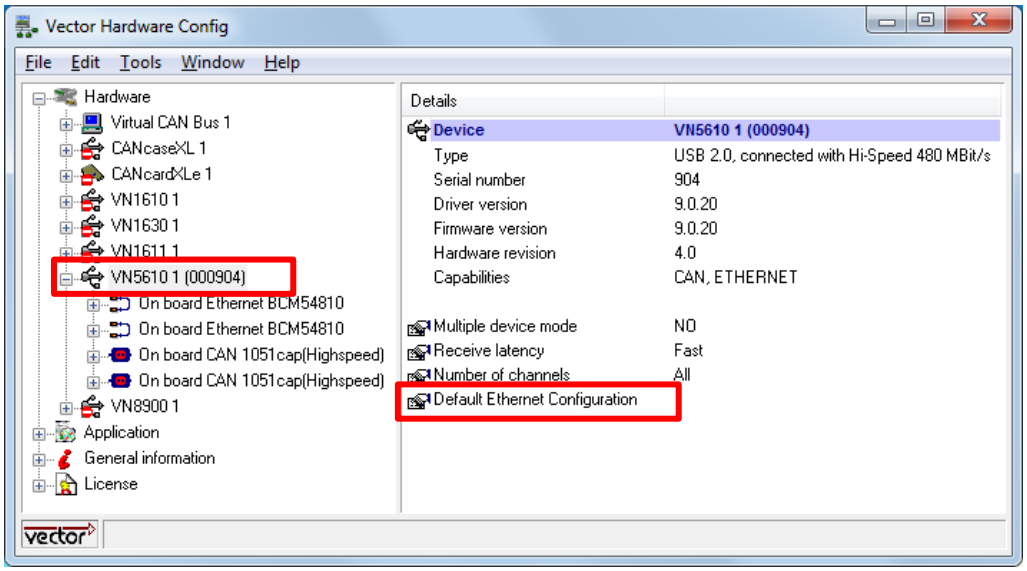


Figure 10: Accessing the Default Ethernet Configuration dialog.

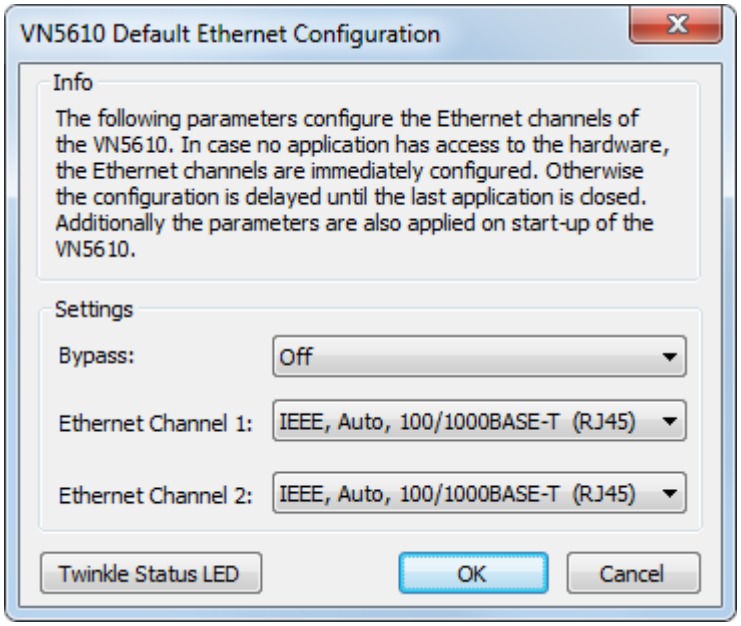


Figure 11: Default Ethernet Configuration

Note: Further details on the **Vector Hardware Config** tool can be found in the separate installation instructions at the end of this manual.

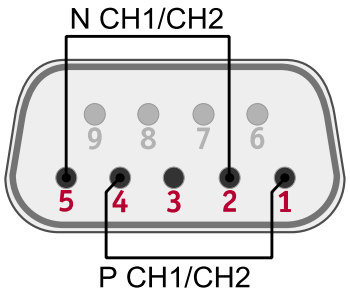
Note: In order to get a working Ethernet link between the VN5610 and another Ethernet device, the auto negotiation has to be activated in both devices.

Alternatively, both devices can be manually configured with the same parameters (only full duplex mode).

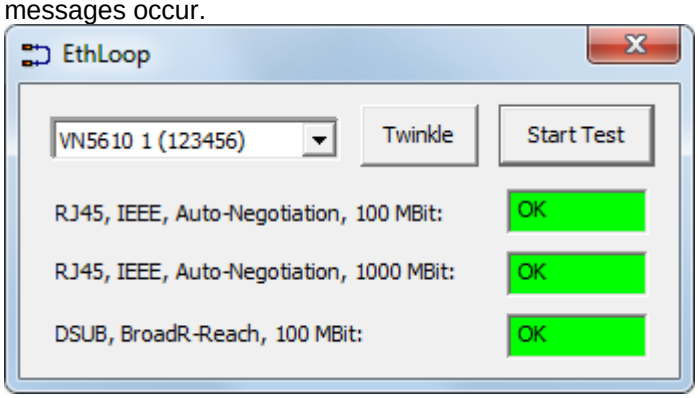
Please note that the Ethernet link will run in half duplex mode if one device uses auto negotiation while the other one is manually configured. **The VN5610 supports only full duplex mode.**

2.4.4 Step 4: Quick Test

1. Connect both Ethernet channels of the VN5610 with an Ethernet cable.
2. Connect both BroadR-Reach channels at the D-SUB9 connector as follows:



3. Start `\Drivers\Common\ETHloop.exe` from the driver CD.
4. Select an installed VN5610 from the list.
5. Press **[Twinkle]** and check if the LED **Status** (see section LEDs on page 21) blinks.
6. Start the test by pressing the button **[Start Test]**. The test is successful if no error messages occur.



2.5 Device Description

2.5.1 Connectors Ethernet Side

Device connectors

Figure 12: Ethernet CH1, D-SUB9 (BroadR-Reach), Ethernet CH2

> **Ethernet CH1**
> Standard Ethernet connector for 100BASE-TX and 1000BASE-T.

LED ACT
- Illuminates if there is an Ethernet link.
- Blinks if there is Ethernet activity.

LED SPEED
- Orange: 100 Mbit
- Green: 1000 Mbit

> **Ethernet CH2**
> Standard Ethernet connector for 100BASE-TX and 1000BASE-T.

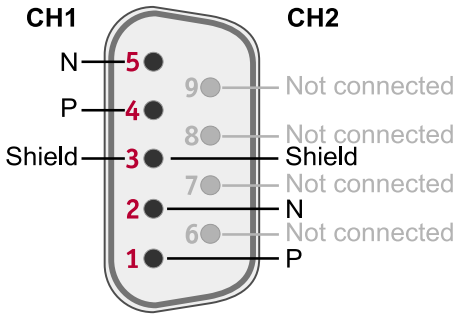
LED ACT
- Illuminates if there is an Ethernet link.
- Blinks if there is Ethernet activity.

LED SPEED
- Orange: 100 Mbit
- Green: 1000 Mbit

> **Ethernet CH1/CH2 (D-SUB9)**
> D-SUB9 connector for BroadR-Reach.

Pin assignment:

(1) CH2 P	
(2) CH2 N	(6) -
(3) Shield	(7) -
(4) CH1 P	(8) -
(5) CH1 N	(9) -



The connector configuration can be done in the **Network Hardware Configuration** of CANalyzer.Ethernet /CANoe.Ethernet.

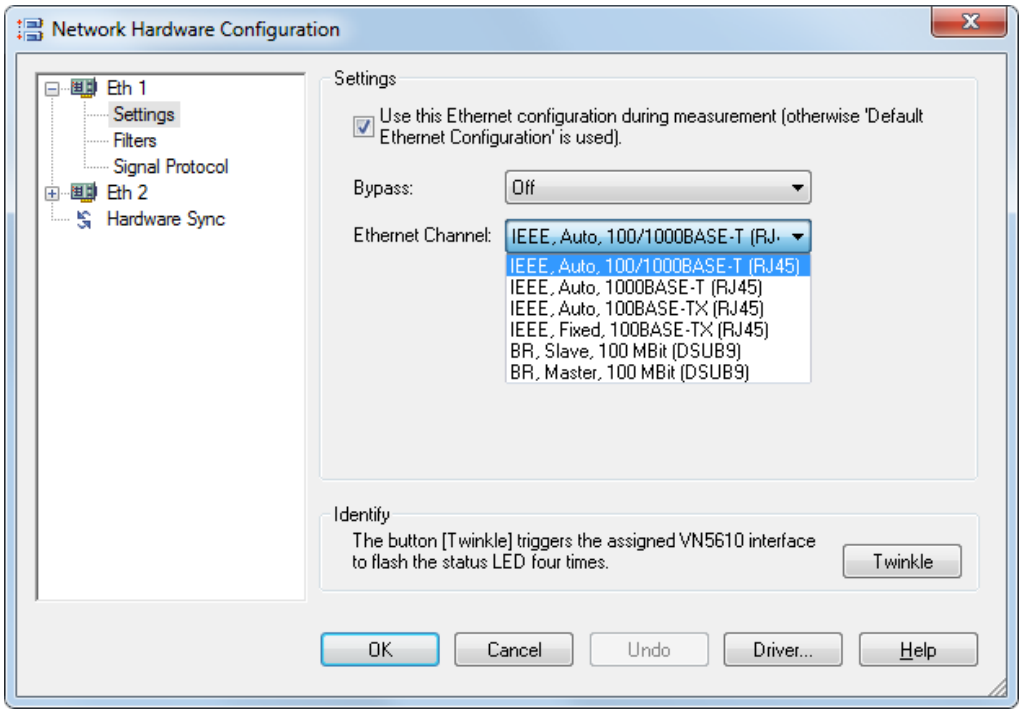
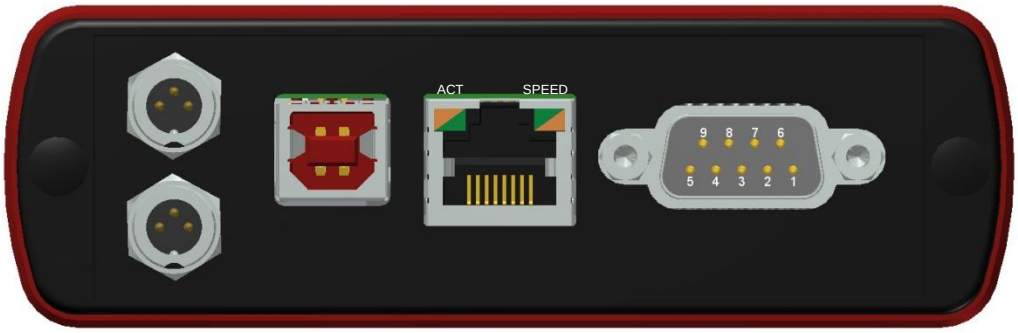


Figure 13: Network Hardware Configuration

2.5.2 Connectors USB Side

Back side



> **2x Power/Sync (Binder connector)**
> The VN5610 has two power/sync connectors (Binder type 711) which can be used for time synchronization of different Vector devices (see section Time Synchronization on page 24) or for power. It does not matter which connector is used to supply the device.

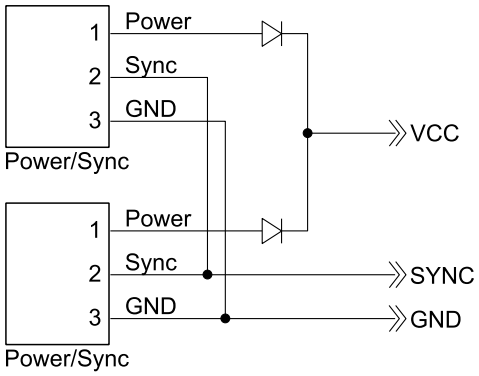


Figure 14: Internal wiring of the power/sync connector.

Pin	Assignment
1	Power supply (6 V … 50 V DC, typ. 12 V)
2	Synchronization line
3	Ground

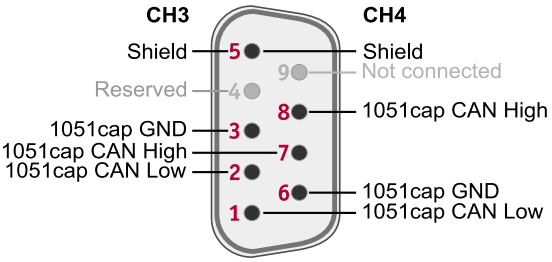
Note: The VN5610 requires at least 9 V to power up. Afterwards the power supply can be reduced to 6 V for operation (typ. 12 V DC).

> **USB**
> Connect your PC and the VN5610 over USB to install and to use the device with measurement applications (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).

Note: It is recommended to use an external power supply if the VN5610 is operated in 1000 Mbit/s mode.

> **Host (Ethernet)**
Host connector. Reserved for future purposes.

> **CAN CH3/4 (D-SUB9)**
(1) CH4 1051cap CAN Low
(2) CH3 1051cap CAN Low
(3) CH3 1051cap GND
(4) Reserved. Please do not use.
(5) Shield
(6) CH4 1051cap GND
(7) CH3 1051cap CAN High
(8) CH4 1051cap CAN High
(9) -



Use the CANcable 2Y to access both channels on separate D-SUB9 connectors (see accessories manual, article number 05075).

2.5.3 LEDs

LEDs on top side

> **Activity (Ethernet CH1/CH2)**
Same as LED ACT at RJ45 connectors.
LED illuminates if there is an Ethernet link or blinks if there is Ethernet activity at CH1/CH2.
- Green: link to RJ45
- Yellow: link to D-SUB9

> **Master (Ethernet CH1/CH2)**
Illuminates if CH1/CH2 is configured as Master.
- Green: link to RJ45
- Yellow: link to D-SUB9

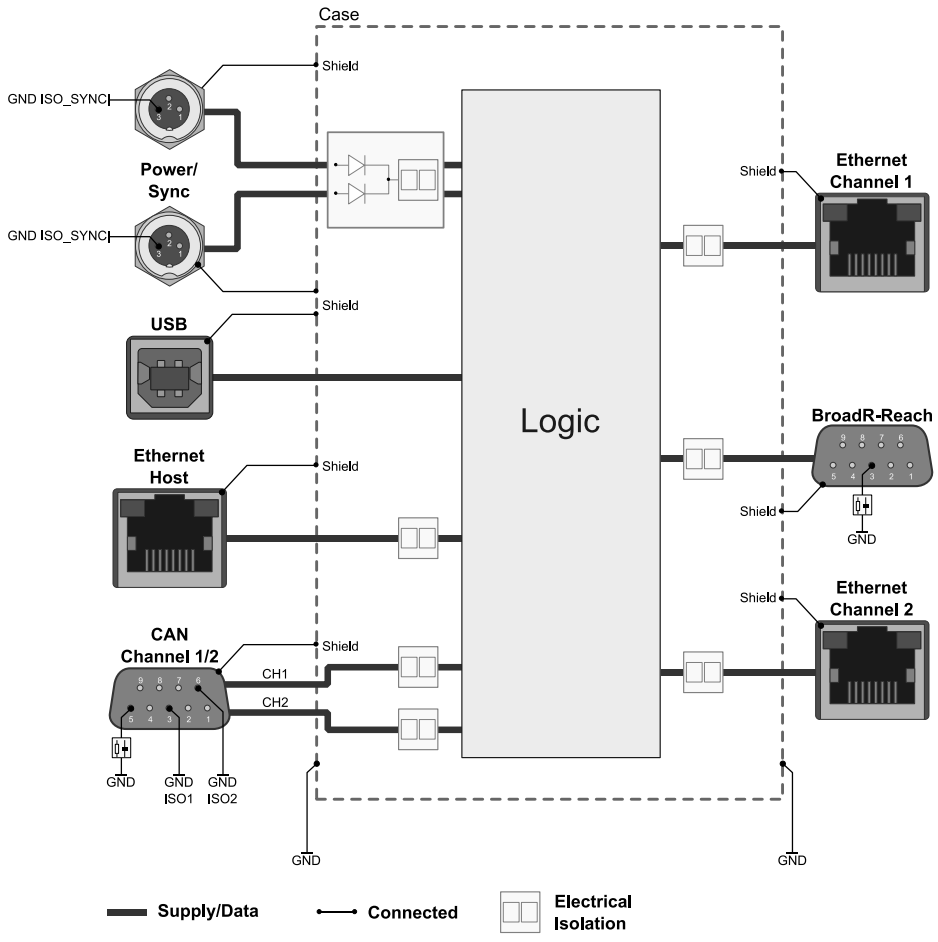
> **Status**

Color	Description
Green	- Blinks 4x at power up and illuminates afterwards. - Blinks quicker during an update progress. Please wait for the automatic reboot of the device (approx. 30s) after the update has been finished.
Red	- An error has occurred. Please disconnect the power supply as well as the USB cable. Re-connect the power supply and the USB cable and try again.

2.5.4 Technical Data

Ethernet channels	Max. 2 2x RJ45 100BASE-TX, 1000BASE-T 1x D-SUB9 BroadR-Reach
CAN channels	Max. 2 (on-board TJA1051 transceivers) 1x D-SUB9, up to 2 Mbit/s
PC interface	USB 2.0
Temperature range	Operating: -40 °C...+65 °C Storage: -40 °C...+85 °C
Relative humidity of ambient air	15 %...95 %, non-condensing
Operating system requirements	Windows 7 (32 bit / 64 bit) Windows 8 (32 bit / 64 bit)
Dimensions (LxWxH)	Approx. 115 mm x 106 mm x 32 mm
Power supply	6 V … 50 V DC, typ. 12 V DC Power-up: 9 V DC
Power consumption	Approx. 5 W

Electrical isolation of the connectors



3 Common Features

In this chapter you find the following information:

3.1 Time Synchronization

3.1.1 General Information

Time stamps and events

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

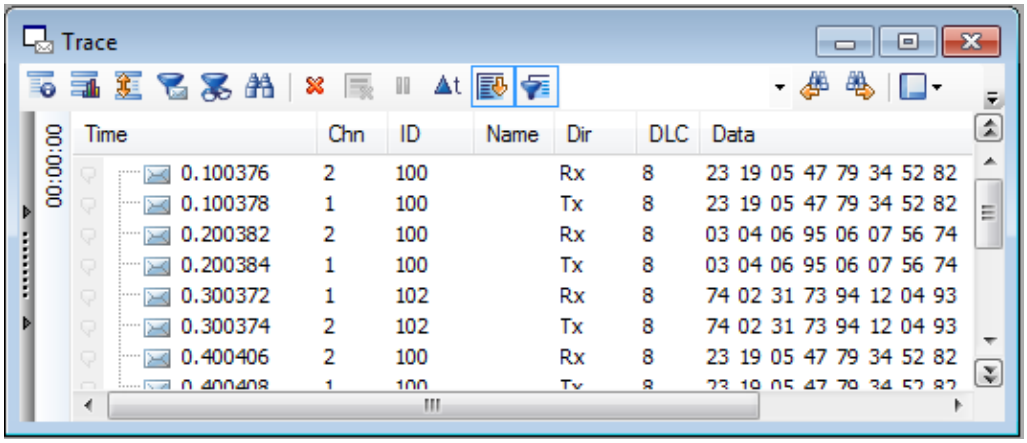


Figure 15: Time stamps of two CAN channels in CANalyzer

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.

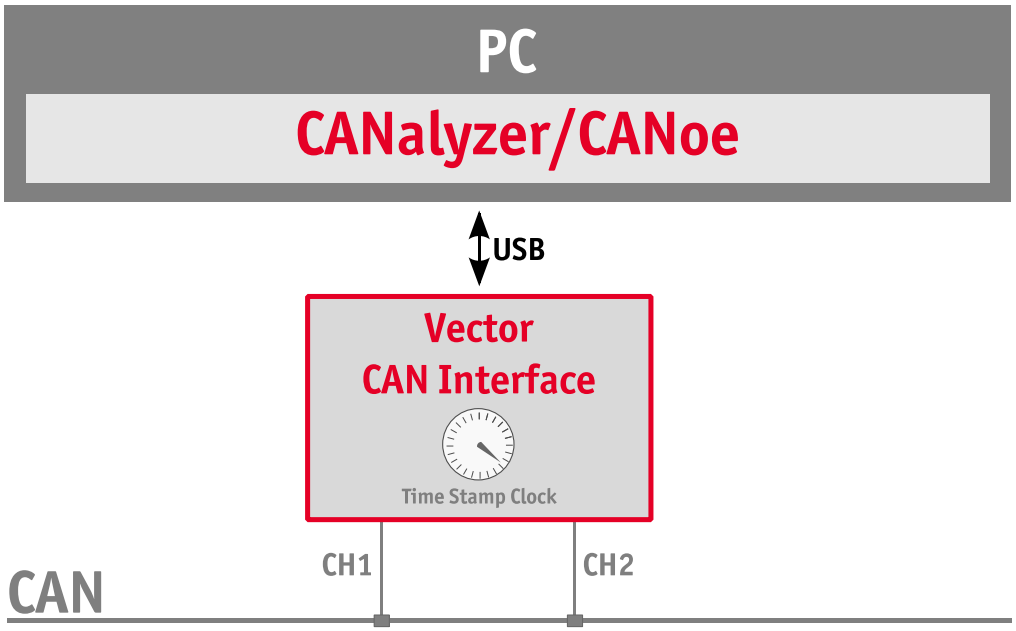


Figure 16: Common time stamp clock for each channel

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.

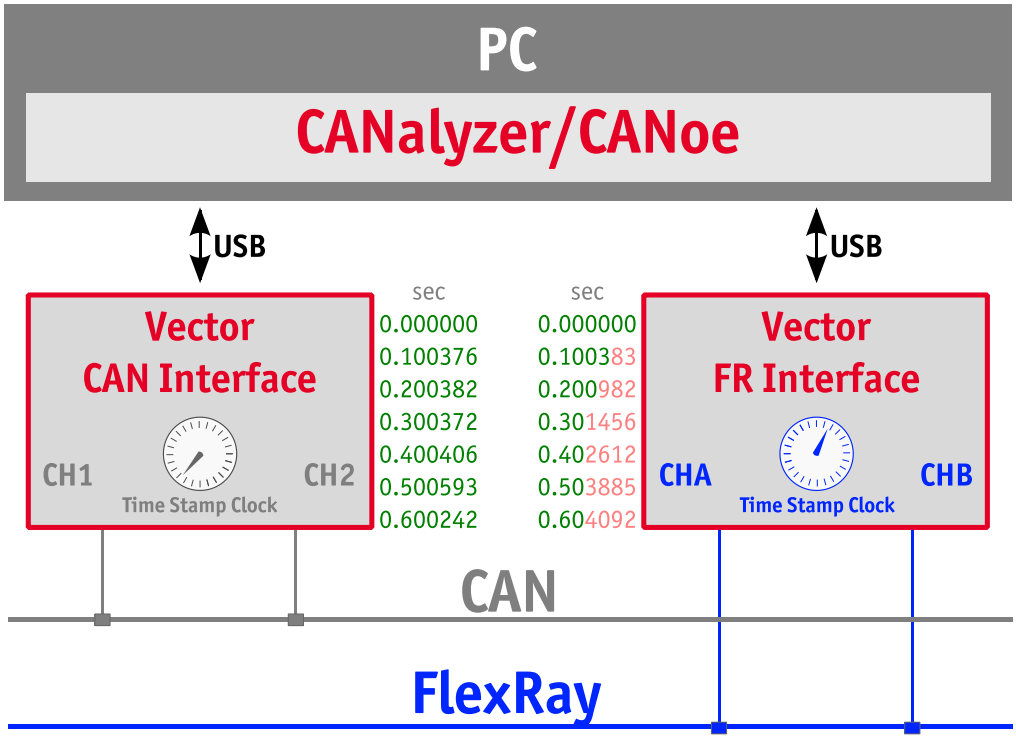


Figure 17: Example of unsynchronized network interfaces. Independent time stamps drift apart.

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 sync** is typically in range of **100 µs**.

Note: The accuracy of the **hardware sync** is typically in range of **1 µs**.

3.1.2 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.

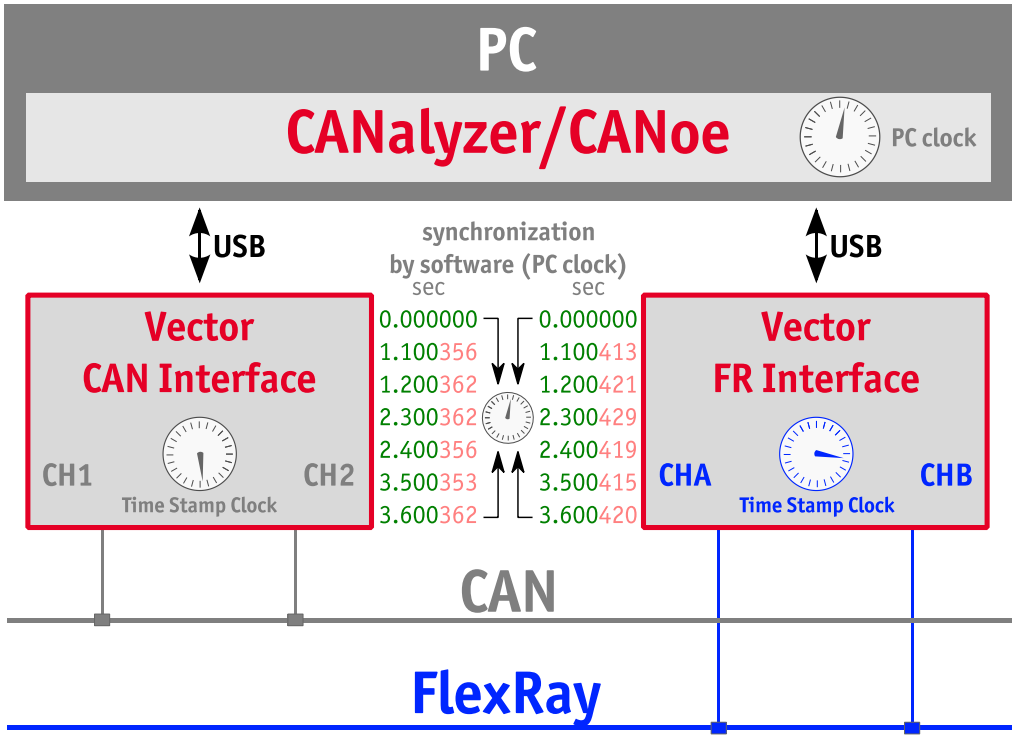


Figure 18: Time stamps of devices are synchronized to the PC clock (accuracy in range of 100 µs)

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

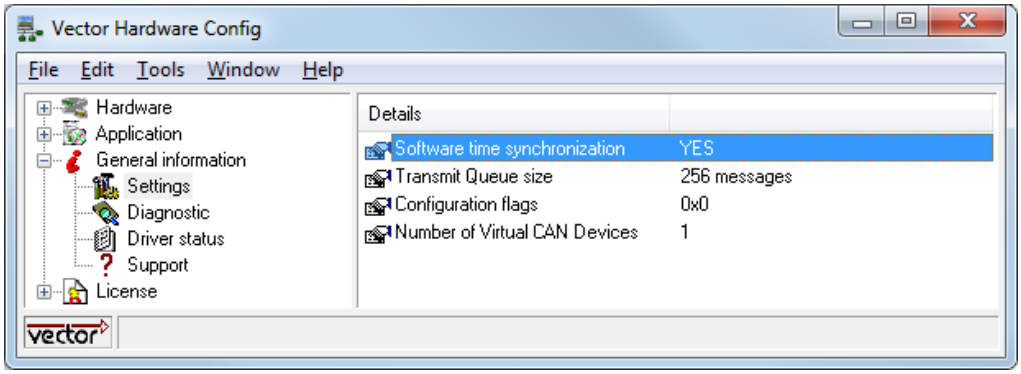


Figure 19: Switching on the software synchronization

> **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.

3.1.3 Hardware Sync

Synchronization by hardware

A more accurate time synchronization of multiple devices is provided by the hardware synchronization which has to be supported by the application (e. g CANalyzer, CANoe). Two Vector network interfaces can therefore be connected with the SYNCcableXL (see accessories manual, article number 05018).

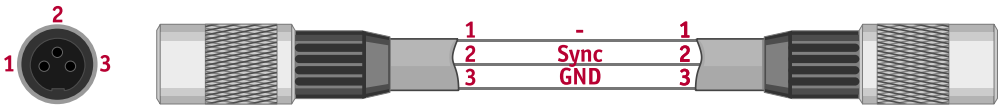


Figure 20: SYNCcableXL to synchronize two devices via 3-pin connector (Binder type 711)

In order to synchronize up to five devices at the same time, a distribution box is available (see accessories manual, article number 05085).

At each falling edge on the sync line which is initiated by the application, the Vector network interface generates a time stamp that is provided to the application. This allows the application to calculate the deviations between the network interfaces and to synchronize the time stamps to a common time base (master clock) which is defined by the application.

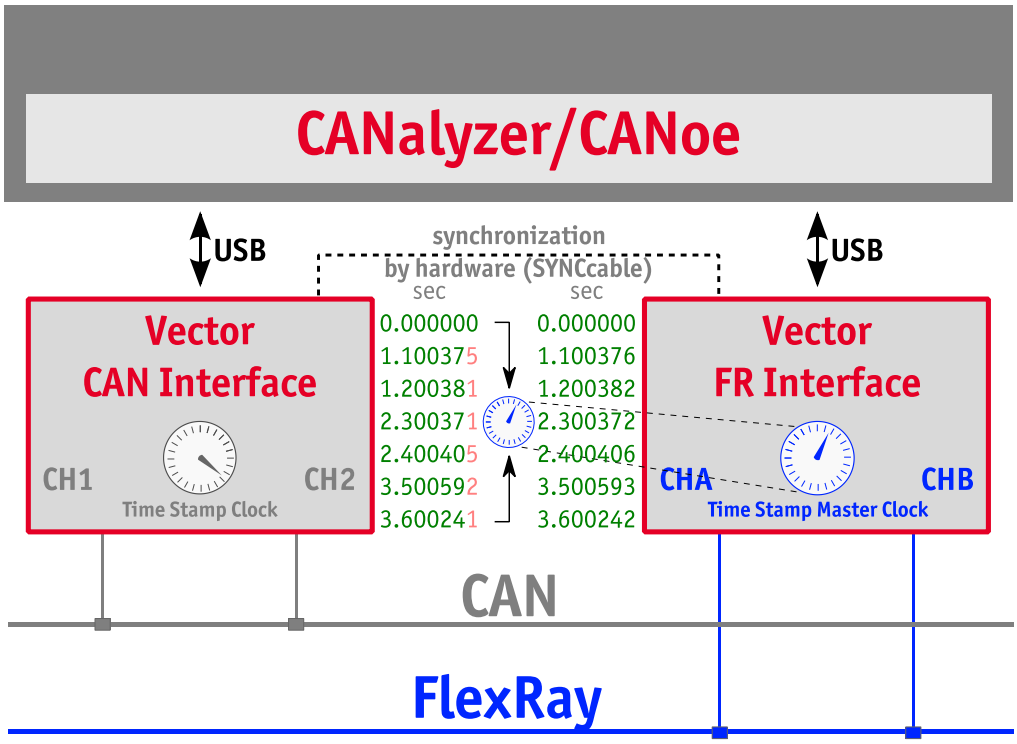


Figure 21: Time stamps are synchronized to the master clock (accuracy in range of 1 µs)

Note: The hardware synchronization must be supported by the application. For further information please refer to the relevant application manual. Please note that the software synchronization must be disabled (see **Vector Hardware Config | General information | Settings | Software time synchronization**) if the hardware synchronization is used.

4 Driver Installation

In this chapter you find the following information:

4.1 Minimum Requirements

Hardware

CPU	Pentium 4 or higher
Memory	512 MB or more
Network interface	CANcardXL : PCMCIA CANcardXLe : ExpressCard 54 CANboardXL PCI : PCI CANboardXL PCIe : PCI Express 1x CANboardXL PXI : Compact PCI/PXI CANcaseXL : USB CANcaseXL log : USB VN1610 : USB VN1611 : USB VN1630 : USB VN1640 : USB VN2610 : USB VN2640 : USB VN3300 : PCI VN3600 : USB VN5610 : USB VN7570 : PCI Express 1x VN7600 : USB VN8910 : USB VN8912 : USB

Software

Operating system	Windows 7 (32/64 bit) Windows 8 (32/64 bit)
Driver version	8.x
Measurement application	The devices can be run with several applications from Vector (e. g. CANoe, CANalyzer) or with measurement applications from other companies. The devices require a related license. Applications based on the Vector XL Driver Library can be run without a license.

4.2 Hints

Note: Many desktop PCs have power managers which block the CPU for a specific time. This impairs accuracy of the time system. If your application has stringent timing requirements (e. g. time-driven sending of messages or time-driven evaluations), you have to deactivate these power managers. Power management settings may be contained in the BIOS setup or on the Control Panel of Windows 7 / Windows 8 (e. g. Power options).

No further mention will be made of the power manager in this document.

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

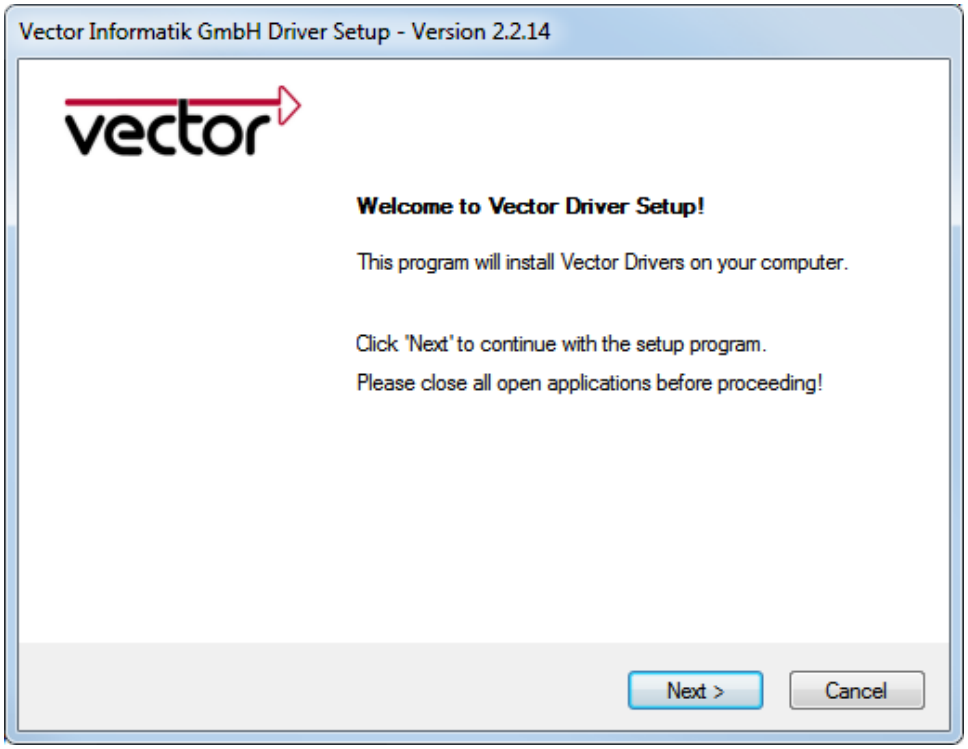
4.3 Vector Driver Setup

General information

The Vector Driver Disk offers a driver setup which allows the installation or the removal of Vector devices.

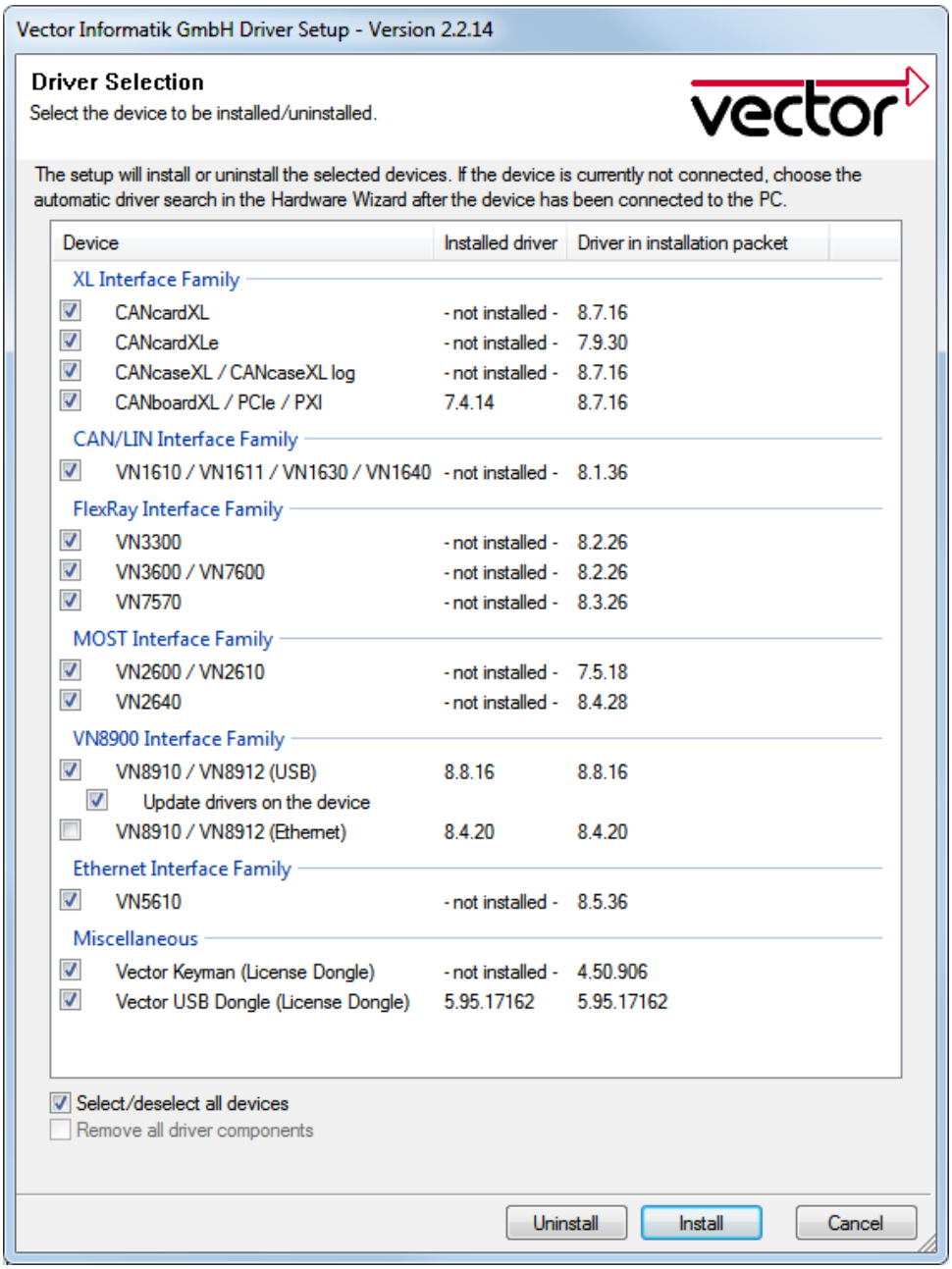
1. Execute the driver setup from the autostart menu or directly from `\Drivers\Setup.exe` before the device is inserted or connected to the PC with the included USB cable.

   If you have already inserted or 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.
If the driver has been installed properly, the device can be inserted or connected to the PC with the included USB cable. The device is ready for operation now.

4.4 Vector Hardware Configuration

Executing Vector Hardware Config

After the successful 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.

Control panel Windows 7

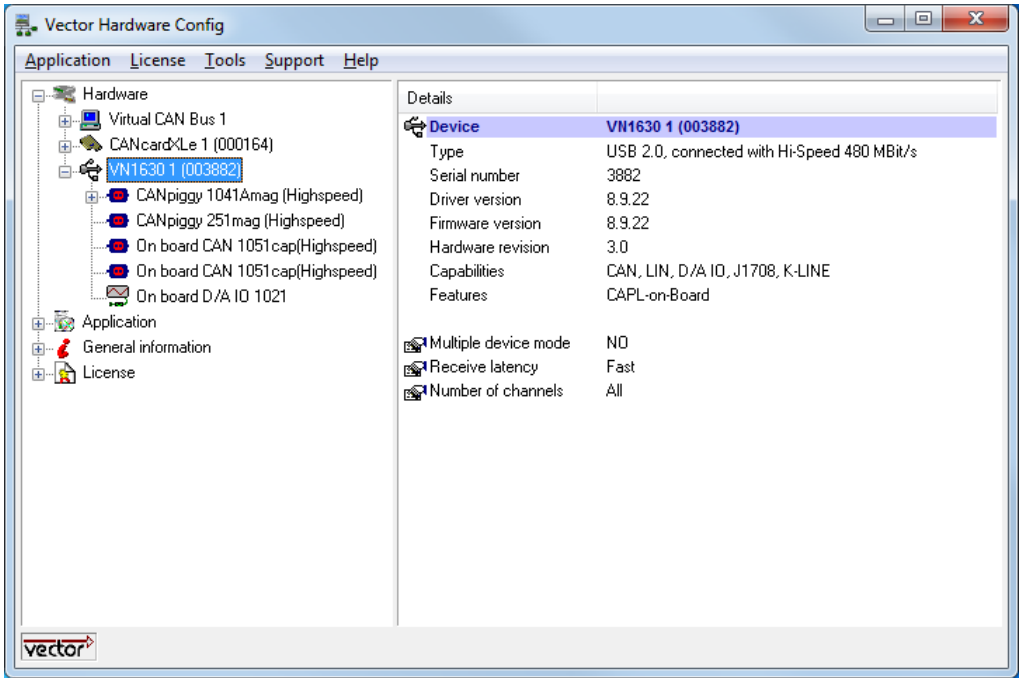
> Category view
Windows Start | Control Panel | Hardware and Sound, click **Vector Hardware** in the list.

> Symbols view
Windows Start | Control Panel, click **Vector Hardware** in the list.

Control panel Windows 8

> 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.



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

Hardware

Each installed Vector device is shown in **Hardware**. Additional details of available channels are shown in a tree view. Status information on the device components and the channels are also shown in this dialog.

Application

In **Application**, all available applications are shown with their configured channels. If you click on an application, all of its channels are displayed in the right pane on the screen.

General information

The **General information** section contains general information on Vector devices and

applications.

License

The **License** section contains information on all current valid licenses.

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

4.5 Loop Tests

Operating test

The test described here can be performed to check the functional integrity of the driver and the device. This test is identical for Windows 7 / Windows 8 and independent of the used application.

4.5.1 CAN

Device test

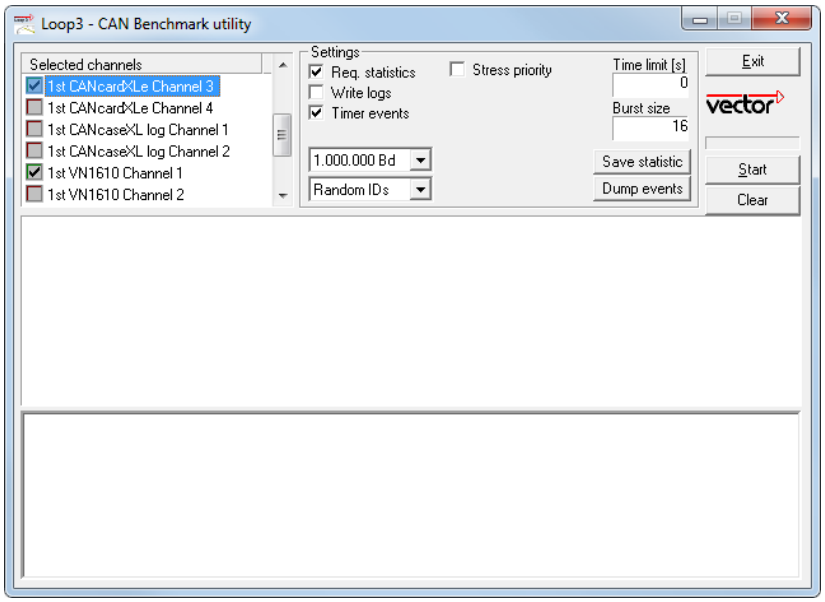
The operating test for CAN can be executed with the following devices:

- CANcardXL
- CANcardXLe
- CANcaseXL
- CANcaseXL log
- CANboardXL Family
- VN1610
- VN1630
- VN1640
- VN5610
- VN7570
- VN7600
- VN8910A
- VN8912

Loop3.exe

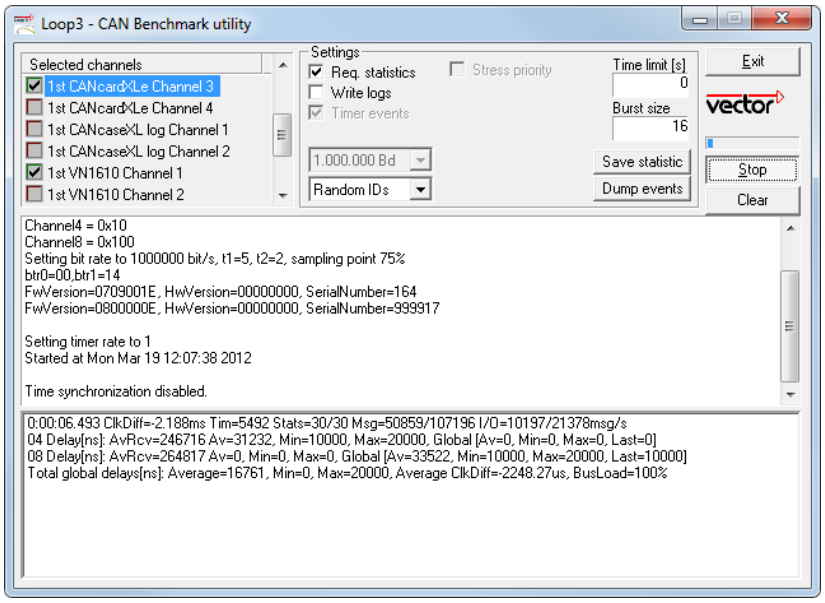
Either two High-Speed or two Low-Speed transceivers are necessary for this functional test:

1. Connect two CAN channels with a suitable cable. If two High-Speed transceivers are being used, we recommend our CANcable 1 (CANcable 0 for Low-Speed transceivers).
2. Start `\Drivers\Common\Loop3.exe` from the driver CD.
   This program accesses the Vector devices and transmits CAN messages.
3. Select the connected CAN channels of the device(s) to be tested.
4. Set the appropriate baudrate depending on the transceiver being used (High-Speed max. 1,000,000 Bd, Low-Speed max. 125,000 Bd).

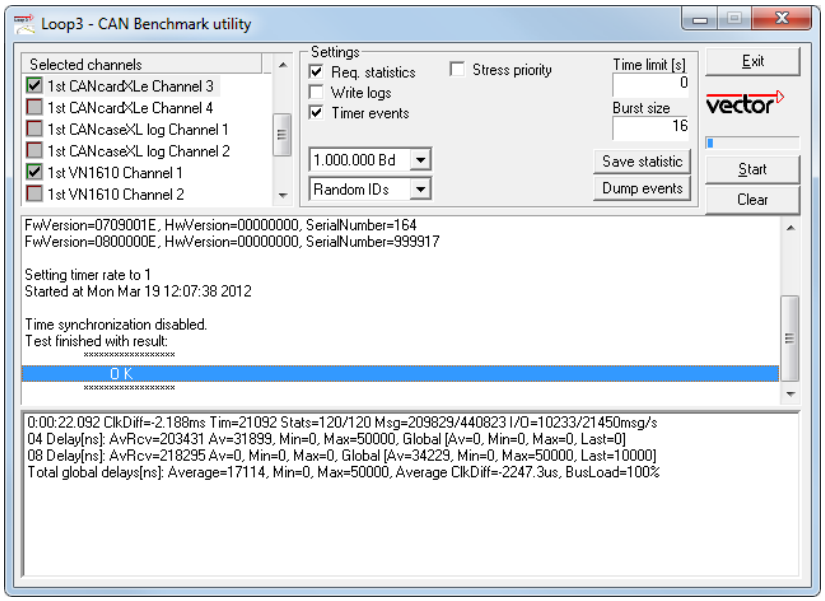


5. Click **[Start]**.
6. You will see statistical data in the lower part of the window if the system has been configured properly.

Loop3 application



7. The test procedure can be terminated with the **[Stop]** button.
   An **OK** should appear in the upper part of the window.



4.5.2 FlexRay

Device test

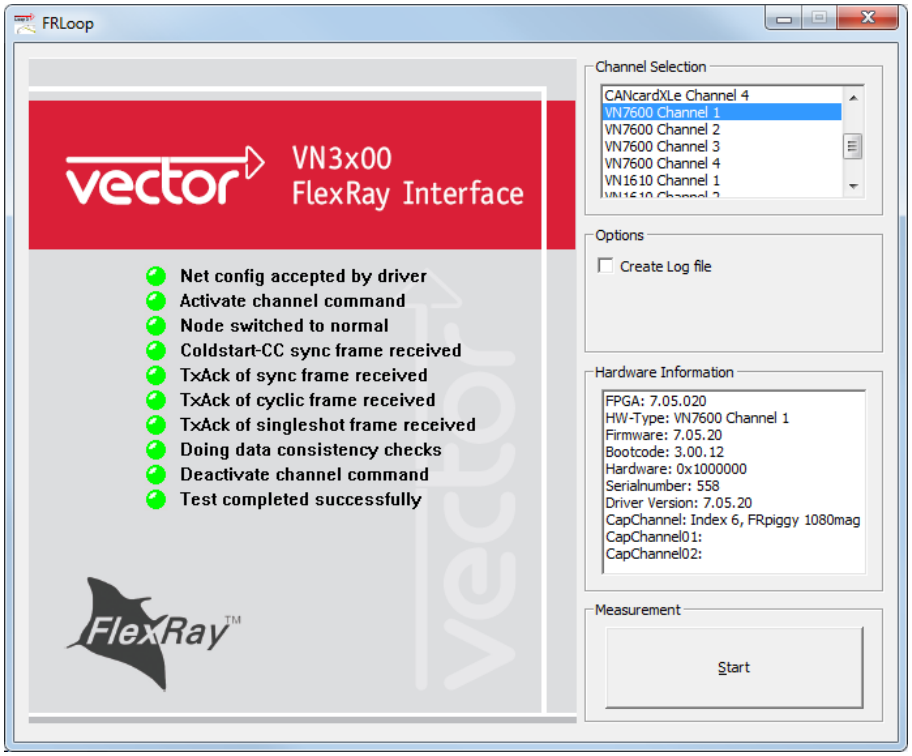
The operating test for FlexRay can be executed with the following devices:

- VN3300
- VN3600
- VN7570
- VN7600
- VN8910A with VN8970
- VN8912 with VN8970

FRLoop.exe

This operating test requires an inserted FRpiggy.

1. Remove the FlexRay cable if it is connected.
2. Start `\Drivers\Common\FRLoop.exe` from the driver CD.
3. Execute the test.
4. If no error messages occur, the operating test was successful.



4.5.3 MOST

Device test

The operating test for MOST can be executed with the following devices:

> VN2610
> VN2640

MLoop.exe

This functional test requires a MOST fiber optic cable and a fiber coupler for HFBR connectors.

1. VN2610
   Start `\Drivers\Common\MLoop.exe` from the driver CD

   VN2640
   Start `\Drivers\Common\M150Loop.exe` from the driver CD.
2. Select the VN2610/VN2640 to be tested from the list of detected devices.
3. Click **[Twinkle]** and check if the power LED of the VN2610/VN2640 is blinking at least for one second.
4. Connect the MOST fiber optic cable with the VN2610/VN2640 device, select **Master** mode and check if the program displays the status **Unlock**. Check if red light comes out of the TX fiber of the MOST fiber optic cable.
5. Connect both ends of the fiber with one fiber coupler to a ring and check if the program displays the status **Lock**.
6. Close `MLoop.exe` with **[Exit]**.

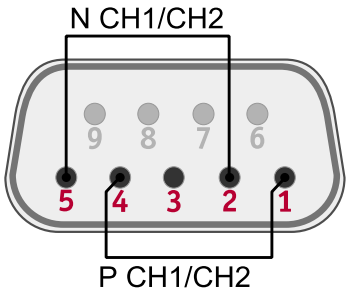
4.5.4 Ethernet

Device test

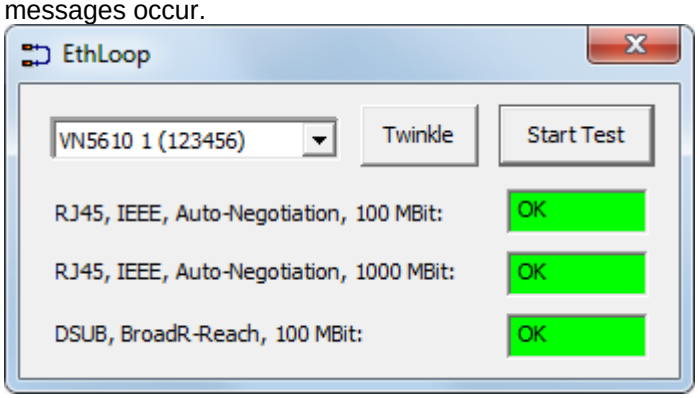
The operating test for Ethernet can be executed with the following devices:

> VN5610

1. Connect both Ethernet channels of the VN5610 with an Ethernet cable.
2. Connect both BroadR-Reach channels at the D-SUB9 connector as follows:



3. Start `\Drivers\Common\ETHloop.exe` from the driver CD.
4. Select an installed VN5610 from the list.
5. Press **[Twinkle]** and check if the LED **Status** blinks.
6. Start the test by pressing the button **[Start Test]**. The test is successful if no error messages occur.



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