VECTOR >

VN1600 Interface Family
Manual

Version 4.1 | English

Contents

1 Introduction

In this chapter you find the following information:

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
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
	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 Certification

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

1.1.2 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.

1.1.3 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.

> and
  are trademarks of the SD Card Association.

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

1.2.1.1 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, BroadR-Reach and/or ARINC 429.
>
> 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.

1.2.1.2 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.

1.2.1.3 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.

1.2.2 SEGGER emFile Module

Caution!
The firmware of the VN1630 log contains the copyright protected emFile module of SEGGER Microcontroller GmbH & Co. KG.

It should be noted that, in addition to the safety and hazard notes provided in section Important Notes on page 8, the Licensing Terms of the Licensor expressly prohibit the use of the SEGGER emFile module in weapons/weapons systems and/or their deployment in same. A "weapons system" is to be understood as meaning, in particular, a system whose primary or material purpose is to injure, incapacitate or kill a person or an opponent, or to destroy or damage the property of a person or an opponent, or to threaten a person or an opponent, irrespective of whether the weapon or the weapon system can be used to attack, defend, threaten or protect.

2 VN1600 Interface Family

In this chapter you find the following information:

2.1 Introduction

General
information

The VN1600 interface family is an advanced development of the proven CANcaseXL, which is a flexible and cost-efficient solution for CAN, LIN, K-Line and J1708 applications. An excellent performance with minimal latency times and high time stamp accuracy is also guaranteed.

The multi-application functionality of the VN1600 interface family supports simultaneous operation of different applications on one channel, e. g. CANoe and CANape. Tasks range from simple bus analyses to complex remaining bus simulations also diagnostic, calibration and reprogramming tasks as well as LIN 2.1 compliance tests. You can also program your own applications using the XL Driver Library.

Bus types

Depending on the VN1600 interface, built-in transceivers as well as exchangeable CAN/LIN and J1708 transceivers can be used. The exchangeable transceivers are available as plug-in boards (Piggybacks) and are inserted in the VN1600. A list of compatible Piggybacks can be found in the accessories manual on the Vector Driver Disk.
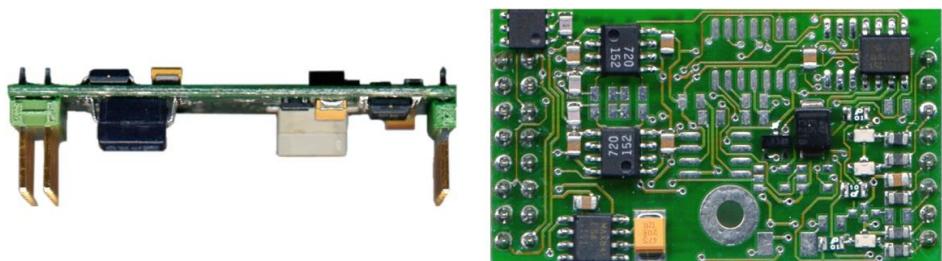
Figure 1: Piggyback

2.2 Accessories

Reference
Information on available accessories can be found in the separate accessories manual on the Vector Driver Disk in `\Documentation\Accessories`.

2.3 VN1610

2.3.1 Main Features

VN1610 features

The main features of the VN1610 interface are:

> 2x CAN high-speed 1051cap transceiver (capacitively decoupled)

> Software sync

Figure 2: VN1610 CAN Interface

2.3.2 Connectors

> **D-SUB9 (CH1/2)**
The VN1610 has a D-SUB9 connector with two CAN channels. Further inform-
ation on the pin assignment for CH1/CH2 can be found in section Pin Assignment
CH1 and CH2 on page 13.
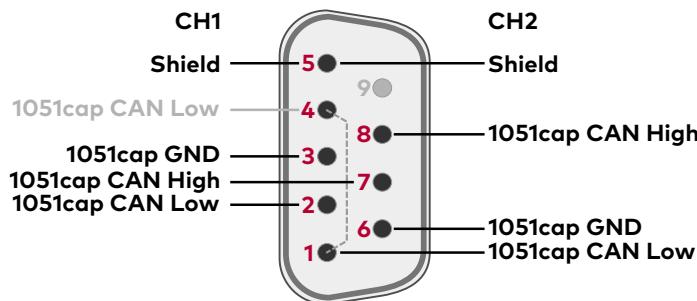
> **USB**
Connect your PC and the VN1610 via USB to install and to use the device with
measurement applications (e. g. CANoe, CANalyzer).

2.3.3 Pin Assignment CH1 and CH2

D-SUB9 connector   The pin assignment of the D-SUB9 connector (CH1 and CH2) is as follows:

CH1/CH2

CAN Y cable   Use the CANcable 2Y to access both channels on separate D-SUB9 connectors (see accessories manual, part number 05075).
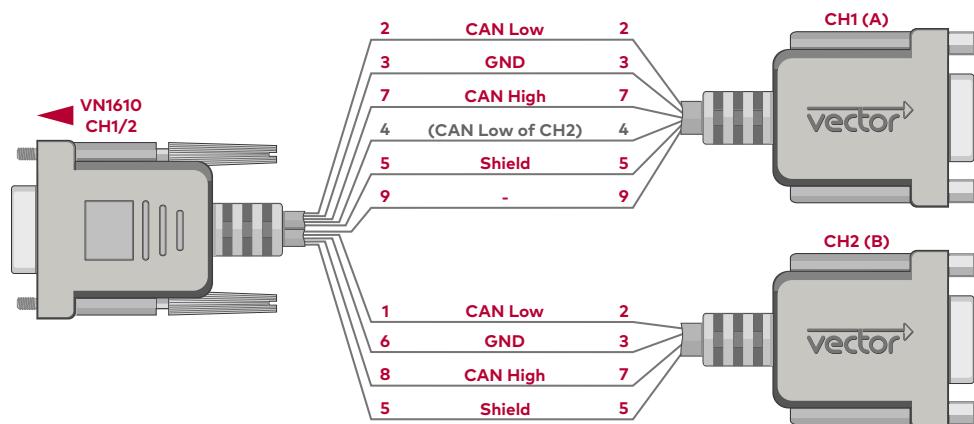
Figure 3: CANcable 2Y connected to VN1610

2.3.4 Technical Data

CAN channels	2x CAN high-speed 1051cap CAN: up to 2 Mbit/s CAN FD: up to 8 Mbit/s
Temperature range	Operating: -40 °C...+70 °C Shipping and storage: -40 °C...+85 °C
Relative humidity of ambient air	15 %...95 %, non-condensing
Dimensions (LxWxH)	65 mm x 42 mm x 20 mm
Weight	80 g
Operating system requirements	Windows 7 SP1 (32 bit / 64 bit) Windows 8.1 (32 bit / 64 bit) Windows 10 (64 bit)

2.4 VN1611

2.4.1 Main Features

VN1611 features   The main features of the VN1611 interface are:

> 1x LIN 7269cap transceiver (capacitively decoupled)

> 1x CAN high-speed 1051cap transceiver (capacitively decoupled)

> Software sync

Figure 4: VN1611 LIN/CAN Interface

> **Note**
> The VN1611 does not support LIN2.1 compliance tests. Please use the VN1630A or the VN1640A for these purposes.

2.4.2 Connectors

> **D-SUB9 (CH1/2)**
> The VN1611 has a D-SUB9 connector with one LIN and one CAN channel. Further information on the pin assignment for CH1/CH2 can be found in section Pin Assignment CH1 and CH2 on page 15.
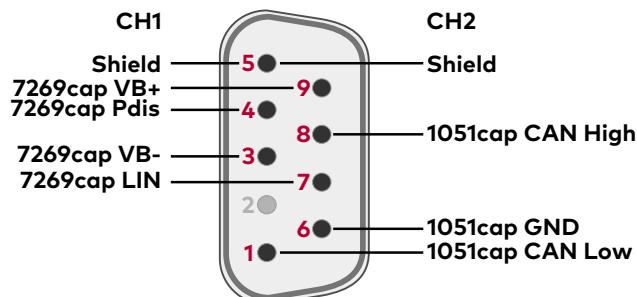
> **USB**
> Connect your PC and the VN1611 via USB to install and to use the device with measurement applications (e. g. CANoe, CANalyzer).

2.4.3 Pin Assignment CH1 and CH2

D-SUB9 connector   The pin assignment of the D-SUB9 connector (CH1 and CH2) is as follows:

CH1/CH2

Pdis: power disable

CAN/LIN Y cable   Use the CANcable 2Y to access both channels on separate D-SUB9 connectors (see accessories manual, part number 05075).
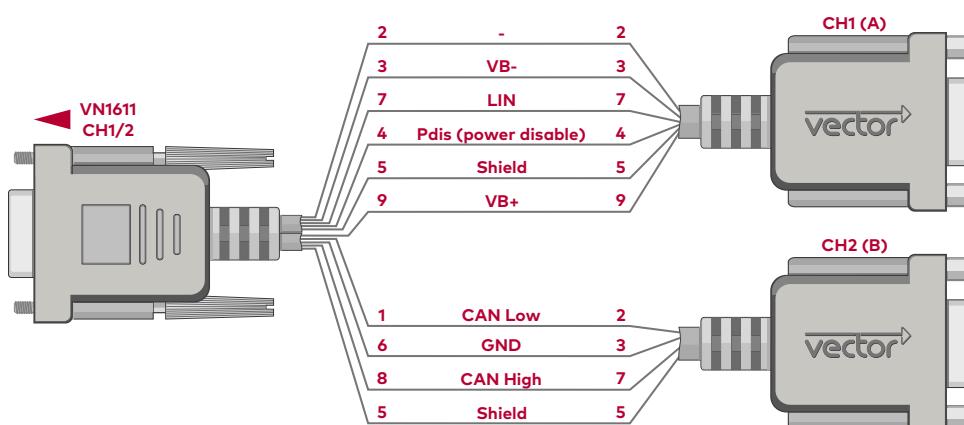
Figure 5: CANcable 2Y connected to VN1611

> **i**   **Note**
> If pin 4 (Pdis) is connected to pin 3 (VB-), the internal power supply is disabled. In this case an external power supply is required at pin 9 (VB+).

2.4.4 Technical Data

CAN channels	1x CAN high-speed 1051cap CAN: up to 2 Mbit/s CAN FD: up to 8 Mbit/s
LIN channels	1x LIN 7269cap up to 330 kbit/s
K-Line channels	1
Temperature range	Operating: -40 °C…+70 °C Shipping and storage: -40 °C…+85 °C
Relative humidity of ambient air	15 %…95 %, non-condensing
Dimensions (LxWxH)	65 mm x 42 mm x 20 mm
Weight	80 g
Operating system requirements	Windows 7 SP1 (32 bit / 64 bit) Windows 8.1 (32 bit / 64 bit) Windows 10 (64 bit)

2.5 VN1630A

2.5.1 Main Features

VN1630A features

The main features of the VN1630A interface are:

> 2x CAN high-speed 1051cap transceiver (capacitively decoupled)

> 2x additional plug-in location for CAN-/LINpiggies

> Fifth channel for dedicated digital-analog input/output tasks

> Five LEDs indicating bus activities and status

> Software sync

> Hardware sync (via SYNCcableXL)

Figure 6: VN1630A CAN/LIN Interface

2.5.2 Connectors Bus Side
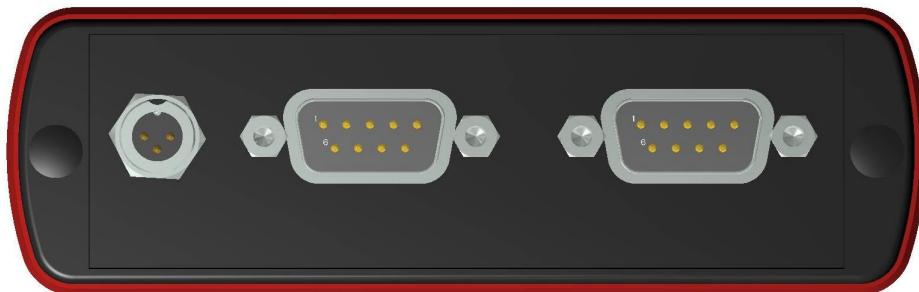
Device connectors

Figure 7: VN1630A with sync and D-SUB9 connectors

> **Binder connector (Sync)**
This connector (Binder type 711) can be used for time synchronization of different Vector devices (see section Time Synchronization on page 77). **The sync connector is not intended to connect a power supply.**

Pin	Assignment
1	Not connected
2	Synchronization line
3	Ground

> **D-SUB9 (CH1/3 and CH2/4)**
> The VN1630A has two D-SUB9 connectors, each with up to two channels (CAN/CAN or LIN/CAN). Further information on the pin assignment for CH1/CH3 and CH2/CH4 can be found in section Pin Assignment CH1/3 and CH2/4 on page 23.

2.5.3 Connectors USB Side

Device connectors

Figure 8: VN1630A with USB and D-SUB9 connector

> **USB**
> Connect your PC and the VN1630A via USB to install and to use the device with measurement applications (e. g. 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 USB at your PC or use a USB hub with its own power supply (self-powered). Depending on the used Piggyback, the VN1630A requires the entire USB current (500 mA) which cannot be provided by a bus-powered USB hub.

> **D-SUB9 (CH5)**
> The VN1630A has a D-SUB9 connector (CH5) for dedicated digital-analog input/output tasks. The pin assignment can be found in section Pin Assignment CH5 on page 27.

2.5.4 LEDs

Description The VN1630A has five LEDs indicating bus activities and status:
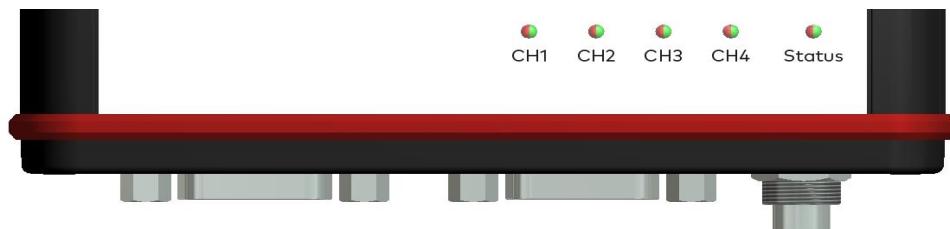
Figure 9: LEDs of the VN1630A

> **CH1 … CH4 (with CAN-/LINpiggies)**
  Multicolored channel LEDs, each indicating the bus activity for CAN, LIN or K-Line.

Color	Description
Green	Data frames have been sent or received correctly.
Orange	CAN: Error frames have been sent or received. LIN/K-Line: Protocol errors as well as valid messages on the bus.
Red	CAN: Bus off. LIN/K-Line: Protocol errors on the bus.

CAN: The flashing frequency depends on the bus load.

> **Status**
  Multicolored LED that indicates the status of the device.

Color	Description
Green	Device is ready for operation/running measurement.
Orange	Initializing driver. Please wait.
Red	Error. Device not working.

2.5.5 Bus Configuration

Piggybacks for CH1 and CH2

An advantage of the VN1630A is its two Piggyback plug-in locations (primary channels CH1 and CH2). Depending on requirements, electrically decoupled CAN High-Speed, CAN Low-Speed, CAN Single Wire, J1708 or LIN transceivers may be used. In addition, two electrically decoupled built-in CAN TJA1051 (high-speed) transceivers are available (secondary channels CH3 and CH4). CH5 is reserved for dedicated IO tasks.
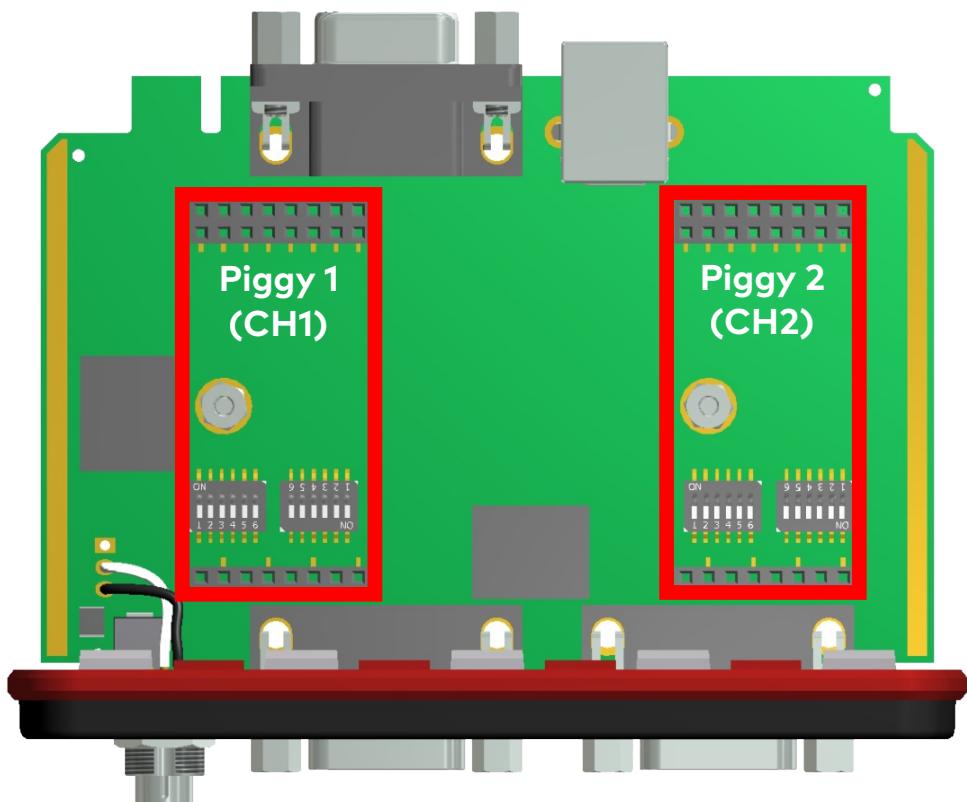
Figure 10: Piggyback plug-in locations for CH1 and CH2

Note
LINpiggies have to be inserted before CANpiggies (in ascending order). If you intend to use only one LINpiggy, please use the first plug-in location (CH1). J1708 should be handled like CAN.

Each empty plug-in location is loaded with a built-in transceiver from the secondary channel according to the DIP switch settings.

Reference
Further information on DIP switches can be found in section Pin Assignment CH1/3 and CH2/4 on page 23.

Piggyback order

Primary	CH1	CH2
Piggyback	LIN1 or CAN2	LIN2 or CAN1

| Secondary	CH3	CH4
Built-in Transceiver	CAN 1051cap	CAN 1051cap

Examples

The following tables show examples of possible configurations:

2x CAN without Piggybacks 1x IO

	CH1/CH3	CH2/CH4	CH5
Piggyback	-	-	-
Primary	**CH1**	**CH2**	**CH5**
	↑	↑	
Built-in Transceiver	CAN 1051cap	CAN 1051cap	
Secondary	CH3	CH4	

Configuration
CH1: no Piggyback, built-in CAN 1051cap transceiver (CH3).
CH3: not usable.
CH2: no Piggyback, built-in CAN 1051cap transceiver (CH4).
CH4: not usable.
CH5: on-board IO.

4x CAN 1x IO

	CH1/CH3	CH2/CH4	CH5
Piggyback	CAN	CAN	-
Primary	**CH1**	**CH2**	**CH5**
	-	-	
Built-in Transceiver	CAN 1051cap	CAN 1051cap	
Secondary	**CH3**	**CH4**	

Configuration
CH1: CANpiggy.
CH3: built-in CAN 1051cap transceiver.
CH2: CANpiggy.
CH4: built-in CAN 1051cap transceiver.
CH5: on-board IO.

1x LIN
2x CAN
1x IO

		CH1/CH3	CH2/CH4	CH5
Piggyback		LIN	-	-
Primary		**CH1**	**CH2**	**CH5**
		-	⬆	
Built-in Transceiver		CAN 1051cap	CAN 1051cap	
Secondary		**CH3**	**CH4**	

Configuration
CH1: LINpiggy.
CH3: built-in CAN 1051cap transceiver.
CH2: no Piggyback, built-in CAN 1051cap transceiver (CH4).
CH4: not usable.
CH5: on-board IO.

2.5.6 Pin Assignment CH1/3 and CH2/4

Double assignment of D-SUB9 connectors CH1 and CH2

Before installing a Piggyback in the plug-in location (see section Replacing Piggy-backs on page 29), the pin assignment of the D-SUB9 connector (CH1/CH3 and CH2/CH4) has to be selected via DIP switches, which can be found inside the device at the plug-in locations.
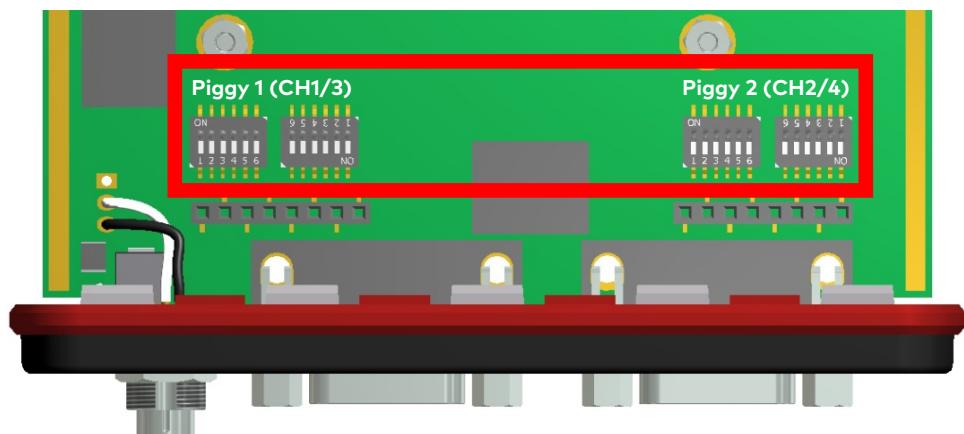
Figure 11: DIP switches (left: CH1/3, right: CH2/4)

Pin assignment CH1 … CH4

The pin assignments of the D-SUB9 connectors depend on the used bus transceiver configuration inside the VN1630A. A list of available Piggybacks and their D-SUB9 pin assignments is included in the separate accessories manual.

> **No Piggyback inserted**
  If no Piggyback is inserted, only the built-in CAN transceiver at CH1 (CH2) is active (no double assignment of the D-SUB9 connector):

Pin	Assignment
1	Not connected
2	1051cap CAN Low
3	GND
4	Not connected
5	Shield
6	Not connected
7	1051cap CAN High
8	Not connected
9	Not connected

A: all ,OFF' / B: all ,ON'
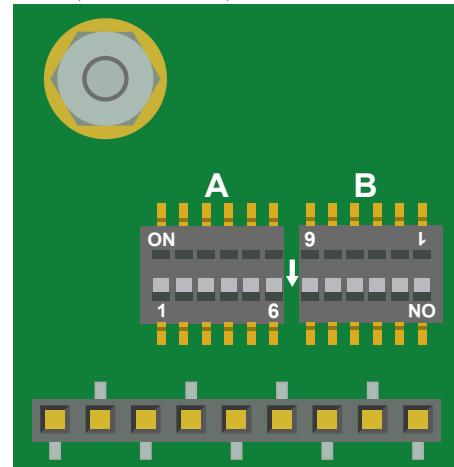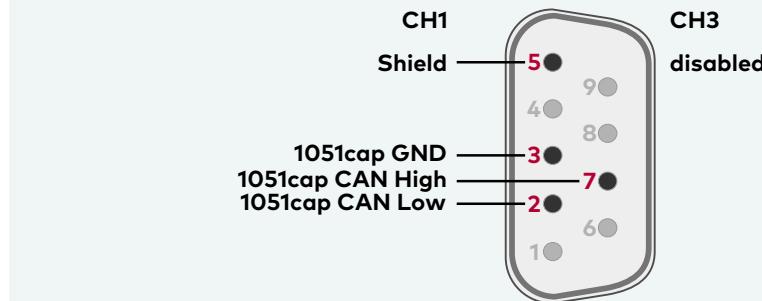
Figure 12: Configuration without Piggyback

Example
No Piggyback
The following example shows the pin assignment of CH1/CH3 if no Piggyback is inserted in the plug-in location at channel 1.

CH1		CH3
Shield	5	disabled
	9	
4	8	
1051cap GND	3	
1051cap CAN High	7	
1051cap CAN Low	2	
	6	
1		

> **CAN/LIN Piggyback inserted**
> If a CAN- or LINpiggy is inserted, the Piggyback is assigned to CH1 (CH2) and the built-in CAN transceiver is assigned to CH3 (CH4):

Pin	Assignment
1	1051cap CAN Low
2	Piggyback-dependent
3	Piggyback-dependent
4	Piggyback-dependent
5	Shield
6	GND
7	Piggyback-dependent
8	1051cap CAN High
9	Piggyback-dependent

A: all ‚ON' / B: all ‚OFF'
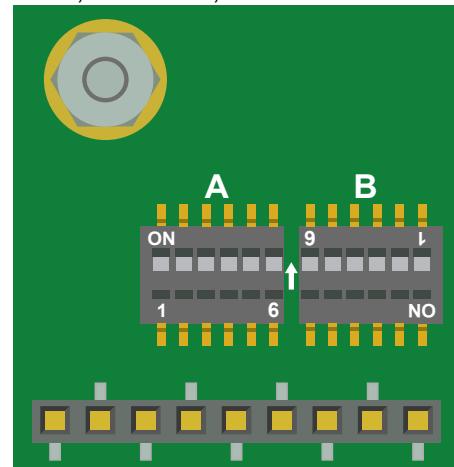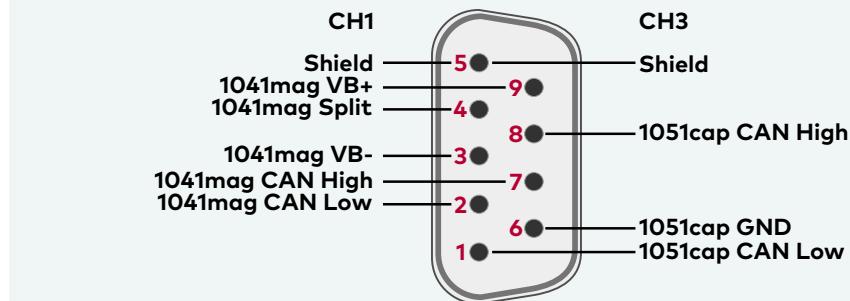
Figure 13: Configuration with Piggyback

Example
CANpiggy 1041mag
The following example shows the pin assignment of CH1/CH3 if a CANpiggy 1041mag is inserted in the plug-in location at channel 1.

CH1		CH3
Shield	5	Shield
1041mag VB+	9	
1041mag Split	4	
	8	1051cap CAN High
1041mag VB-	3	
1041mag CAN High	7	
1041mag CAN Low	2	
	6	1051cap GND
1		1051cap CAN Low

Note

The described pin assignment is also valid for CH2/CH4. A warning message appears in **Vector Hardware Config** if the DIP switch settings are improperly set. Check your DIP switch settings in this case.

CAN/LIN Y cable

Use the CANcable 2Y to access both channels on separate D-SUB9 connectors (see accessories manual, part number 05075). The pin assignments of the D-SUB9 connectors depend on the used bus transceiver configuration inside the VN1630A. A list of available Piggybacks and their D-SUB9 pin assignments is included in the accessories manual.

Figure 14: 2x CANcable 2Y connected to VN1630A

2.5.7 Pin Assignment CH5

Digital/analog IO

The pin assignment for CH5 is as follows:

Pin	Assignment
1	Analog input
2	Not connected
3	Not connected
4	Digital input 0
5	Digital input 1
6	Analog GND
7	Not connected
8	Digital output
9	Digital GND

Internal interconnection of digital input 0/1
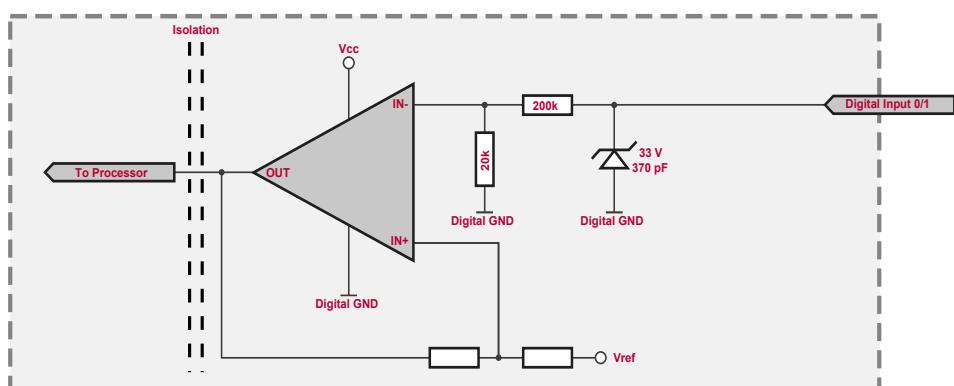
Figure 15: Digital input 0/1

Internal interconnection of digital output
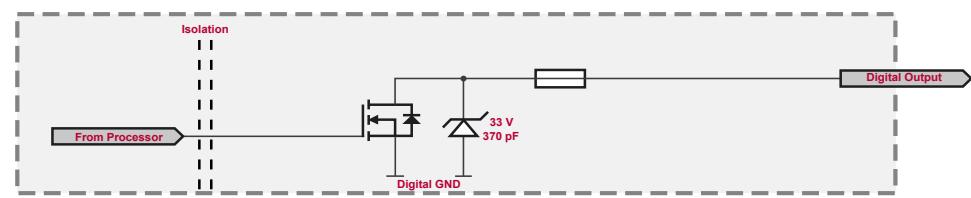
Figure 16: Digital output

Internal interconnection of analog input
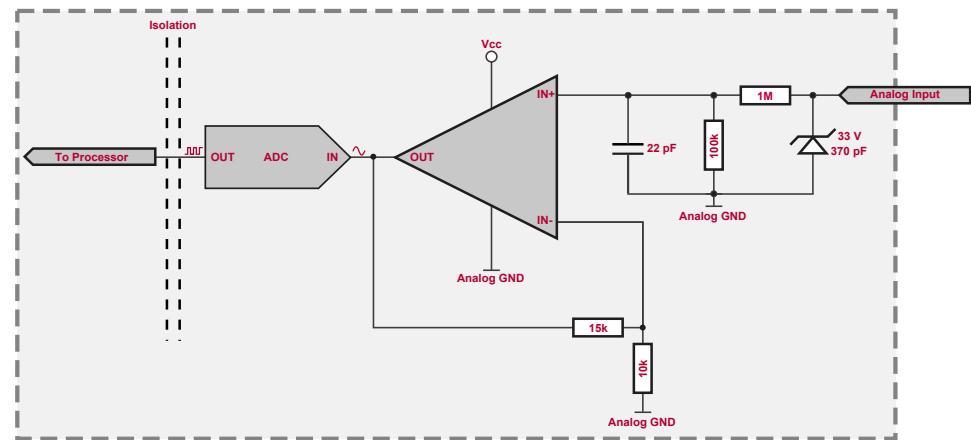
Figure 17: Analog input

Extended measuring range of the analog input	In normal operation, voltages up to 18 V can be applied and measured at the analog input. The cutoff frequency f_c (-3 dB) for AC voltages is approx. 7.2 kHz.

For measurements above 18 V (max. 50 V), an external series resistor has to be applied to the analog input. The series resistor R_{ext} depends on the input voltage U_{input} and can be calculated as follows: |

$$R_{ext}\,[kOhm] \;=\; [(U_{input} * 0.61111) - 11] * 100$$
$$with\ 18\,V < \ U_{input} \ \leq 50\,V$$

The cutoff frequency for AC voltages is also affected by the external series resistor:

$$f_c\Big[Hz\Big] \;=\; \frac{1}{2.33 * 10^{-6} * R_{ext}\,[kOhm]}$$

Examples

	24 V	32 V	36 V	48 V
R_{ext}	367 kΩ	856 kΩ	1100 kΩ	1833 kΩ
R_{ext} (E96)	374 kΩ (24.12 V)	866 kΩ (32.17 V)	1100 kΩ (36.00 V)	1870 kΩ (48.60 V)
f_c (-3 dB)	1148 Hz	496 Hz	390 Hz	230 Hz

2.5.8 Replacing Piggybacks

Caution!
When performing this operation be sure not to touch the top or bottom of the boards (VN1630A main board or Piggybacks) to avoid damages due to electrical discharges.

Step by Step Procedure
1. First, loosen the VN1630A housing screws on the side with the two D-SUB9 connectors. This requires removing the two black decorative caps. Then carefully pull the PC-board out of the housing.
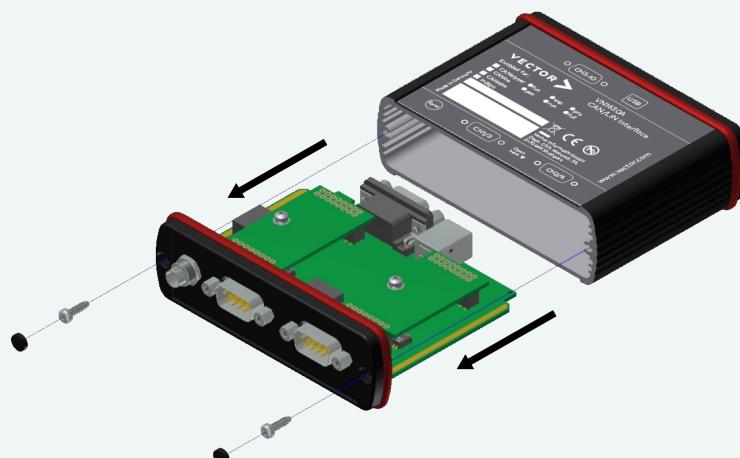
Figure 18: Opening the housing

2. You will find the plug-in location 1 (CH1) at the sync connector side and plug-in location 2 (CH2) at the edge of the PC-board.
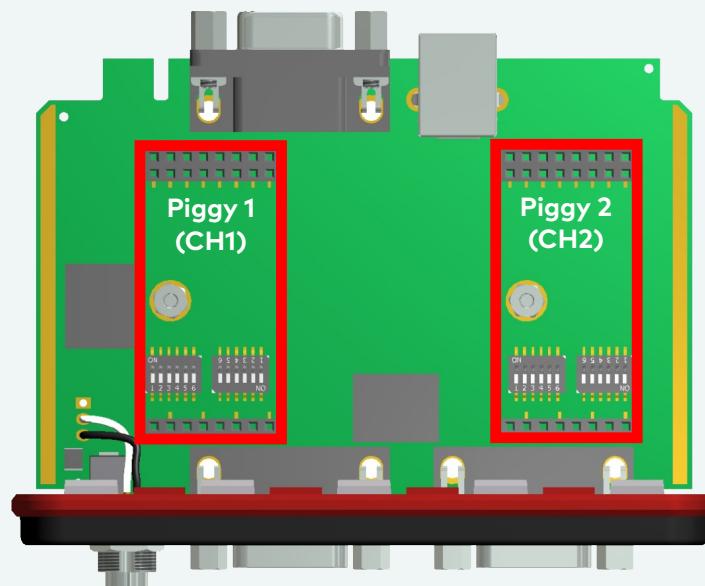
Figure 19: Piggyback plug-in locations CH1 and CH2

3. Each Piggyback is fastened by a screw and retainer. Please loosen the appropriate screw including the retainer and carefully remove the Piggyback from the plug-in location.
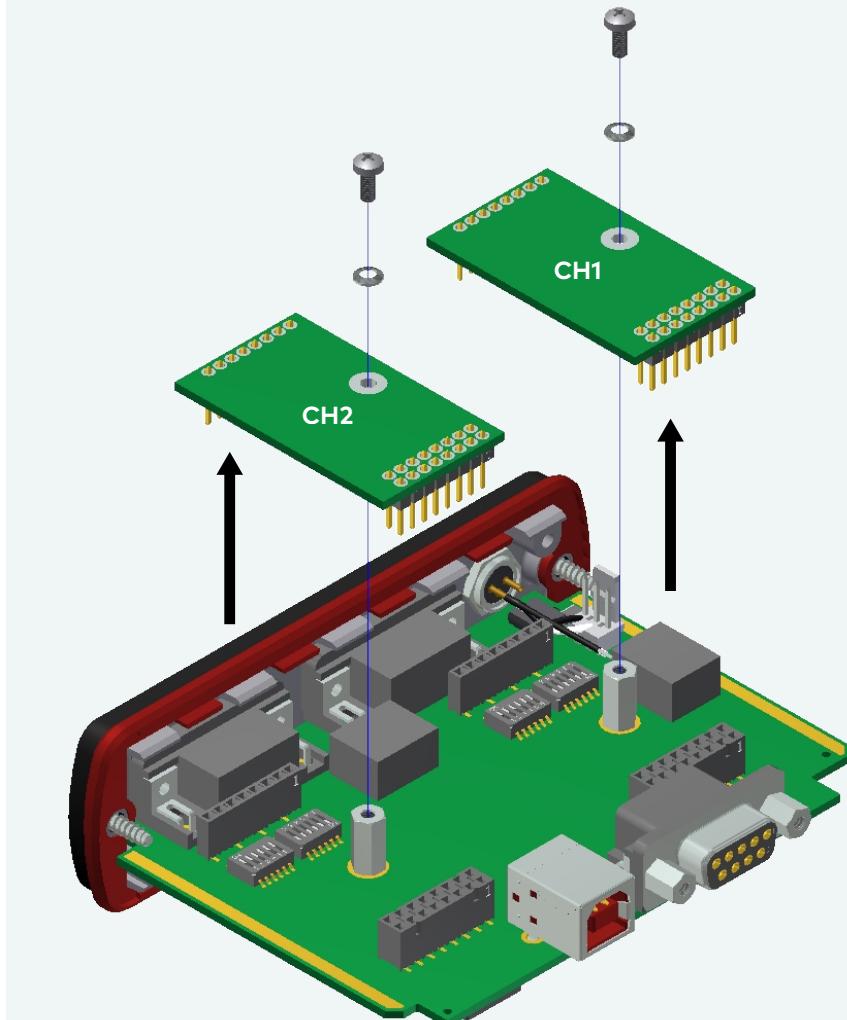
Figure 20: Unmount/mount Piggybacks

4. Set the DIP switches as described in section Pin Assignment CH1/3 and CH2/4 on page 23.

5. Insert the replacement Piggyback. When doing this please make sure that the single and dual-row connectors are not laterally offset.

6. Secure the new Piggyback with the appropriate screw and retainer.

7. Place the VN1630A main board back in the housing. This operation involves placing the housing on a table with its back side (side with the bar code) facing upward. Then the main board with the Piggybacks facing upward is inserted into the second guide rails.
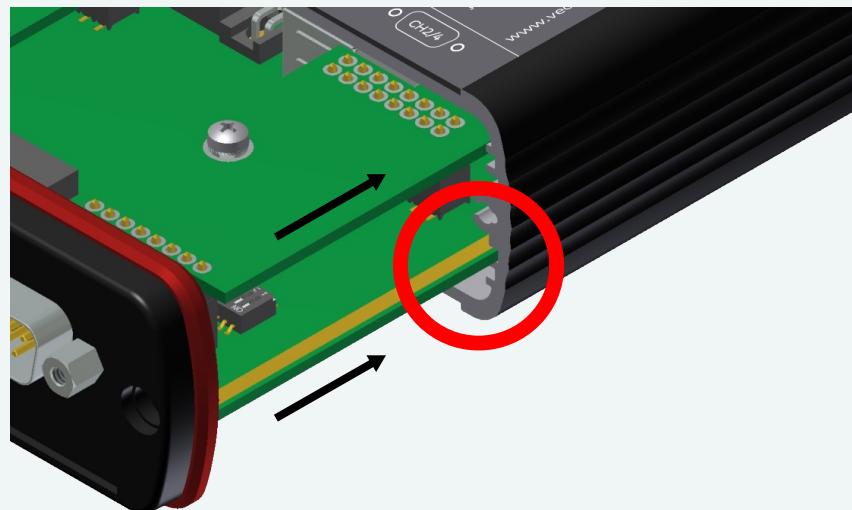
Figure 21: Second guide rails

8. It should be possible to slide the main board in the housing up to a few millimeters from the end without forcing it in. Close the housing by applying light pressure and then secure it with the appropriate screw fasteners. The screws should be secure but not excessively tight.

9. Please also attach the two black decorative caps.

10. Connect the VN1630A and the PC via the USB cable and check the bus configuration in **Vector Hardware Config**.
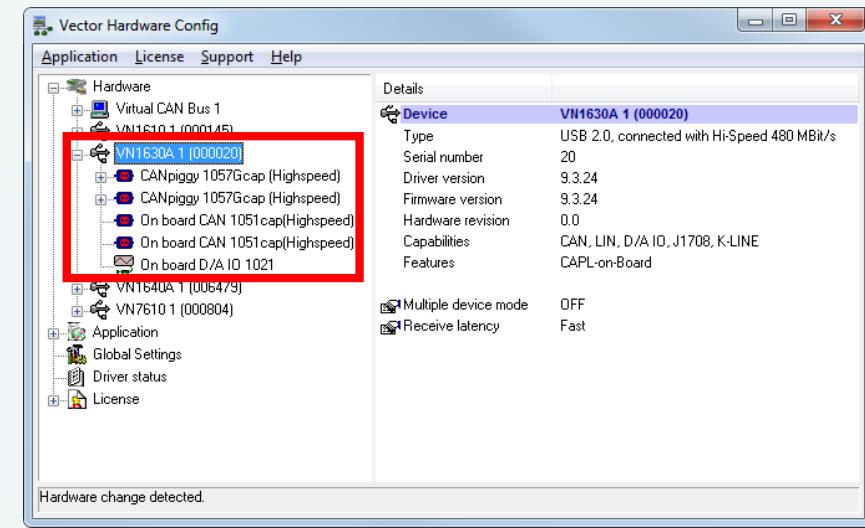
Figure 22: Check inserted Piggybacks

2.5.9 Technical Data

CAN channels	Max. 4 2x CAN high-speed 1051cap 2x configurable via Piggybacks CAN: up to 2 Mbit/s CAN FD: up to 8 Mbit/s
LIN channels	Max. 2 configurable via Piggybacks up to 330 kbit/s
K-Line channels	Max. 2 with LINpiggy 7269mag at CH1/CH2
J1708 channels	Max. 2 configurable via Piggybacks
Analog input	10 bit Input 0 V…18 V Voltage tolerance up to 50 V (with series resistor) Sampling rate up to 1 kHz
Digital input	Range 0 V…32 V Schmitt trigger high 2.7 V, low 2.2 V Hysteresis 0.5 V Input frequencies up to 1 kHz
Digital output	Open Drain External supply up to 32 V Current max. 500 mA Short circuit / over voltage protected
Power consumption	Approx. 2.5 W
Temperature range	Operating: -40 °C…+70 °C Shipping and storage: -40 °C…+85 °C
Relative humidity of ambient air	15 %…95 %, non-condensing
Dimensions (LxWxH)	Approx. 90 mm x 110 mm x 35 mm
Weight	230 g (without accessories)
Operating system requirements	Windows 7 SP1 (32 bit / 64 bit) Windows 8.1 (32 bit / 64 bit) Windows 10 (64 bit)

2.6 VN1630 log

2.6.1 Main Features

VN1630 log features The main features of the VN1630 log interface are:

> 2x CAN high-speed 1051cap transceiver (capacitively decoupled)

> 2x additional plug-in location for CAN-/LINpiggies

> Fifth channel for dedicated digital-analog input/output tasks

> LEDs indicating bus activities and status

> Software sync

> Hardware sync (via SYNCcableXL)

The recording features are:

> Recording data of CAN, CAN FD, LIN, digital and analog inputs

> Data storage on SD/SDHC card

> Separate LED for logging status

> Filter and Trigger symbolically configurable

> Real time clock for date/time information

> External power supply for standalone mode

Figure 23: VN1630 log CAN/LIN Interface

2.6.2 Connectors Bus Side

Device connectors
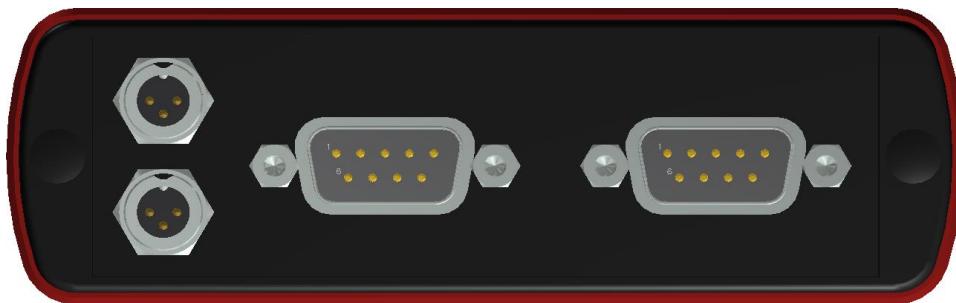
Figure 24: VN1630 log with sync and D-SUB9 connectors

> **Power/hardware sync connector**
  The VN1630 log has two identical power/sync connectors (Binder type 711) which can be used for power or in Interface Mode for time synchronization of different Vector devices (see section Time Synchronization on page 77). It does not matter which connector is used to supply the device.

Pin	Assignment
1	Power supply (typ. 12 V)
2	Synchronization line (for Interface Mode)
3	Ground

> **D-SUB9 (CH1/3 and CH2/4)**
  The VN1630 log has two D-SUB9 connectors, each with up to two channels (CAN/CAN or LIN/CAN). Further information on the pin assignment for CH1/CH3 and CH2/CH4 can be found in section Pin Assignment CH1/3 and CH2/4 on page 42.

! **Caution!**
It is recommended to connect the VN1630 log to the same voltage supply (e. g. battery of the vehicle) as the vehicle or test equipment. If two different voltage supplies are being used for the VN1630 log and the test equipment, the ground (GND) pins of the two voltage supplies must be connected.

2.6.3 Connectors USB Side

Figure 25: VN1630 log with SD card slot, LED push-button, USB and D-SUB9 connector

> **SD card slot**
> The VN1630 log has a push-and-pull card holder in which the SD card is inserted and removed. To insert a SD card push it until it latches in place securely. To securely remove the SD card, press the LED push button at least for three seconds. Remaining data in the ring buffer is copied to the SD card which can take approx. 15 seconds. During this time, the LED flashes yellow. Remove the SD card only if the LED lights green. During this sequence the VN1630 log must not be disconnected from the power supply. This protects the SD card from memory losses. Then unlatch the SD card by pushing it into the holder slot. Remove the card.

> **!** **Caution!**
> To avoid mechanical damage do not pull the SD card from the card holder forcefully.

> **LED push button**
> LED that indicates the SD card status.

Color	Description
Green	SD card can be removed.
Yellow	On: SD card inserted and identified. Do not remove the SD card. Flashing: Logging in progress. Do not remove the SD card.

> **USB**
> Connect your PC and the VN1630 log via USB to install, to configure and to use the device with measurement applications (e. g. 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 USB at your PC or use a USB hub with its own power supply (self-powered). Depending on the used Piggyback, the VN1630 log requires the entire USB current (500 mA) which cannot be provided by a bus-powered USB hub. The VN1630 log also supports two operating modes which can be switched by using the USB connection and power supply respectively:

Mode	USB	External Power Supply
Interface Mode/ Logging configuration	connected to PC	optional
Logging Mode	not connected	yes

Interface Mode

In Interface Mode, the VN1630 log operates as a CAN/LIN interface between a PC and the bus. Messages can be received and sent over both channels with suitable tools (identical to VN1630A). The VN1630 log must be in the Interface Mode to configure the logging mode.

While used as interface by a Vector tool, recorded data can be read from the SD card. In this case the interface functionality has priority and the card access takes places with reduced speed.

Logging Mode

The Logging Mode enables the PC independent usage of the VN1630 log and allows the logging of CAN and LIN events. For this purpose, the VN1630 log must be unplugged from the USB connector of the PC and externally supplied via the Binder connector.

Caution!
During logging, the VN1630 log must not be connected to the PC via the USB cable, since the logging mode would otherwise be exited!

Reference
Information on the configuration of the logging mode can be found in the separate manual provided with the **Vector Logger Configurator** on the Vector Driver Disk in `\Tools\VN1630_log`.

> **D-SUB9 (CH5)**
  The VN1630 log has a D-SUB9 connector (CH5) for dedicated digital-analog input/output tasks. The pin assignment can be found in section Pin Assignment CH5 on page 45.

2.6.4 LEDs

Description | The VN1630 log has five LEDs indicating bus activities and status as well one LED for Logging Mode.
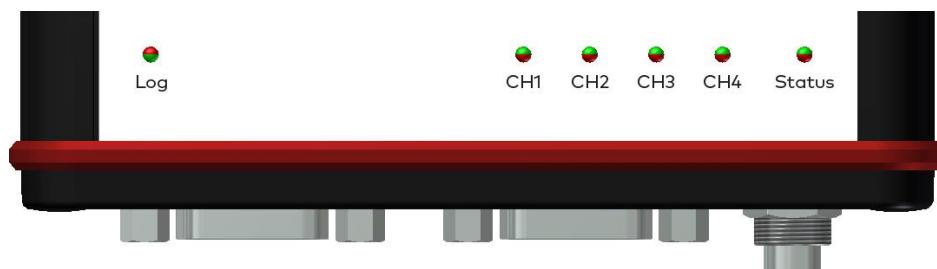

Figure 26: LEDs of the VN1630 log

> **Log**

Multicolored LED that indicates the status of the logging mode.

Color	Description
Green	Device is accessing the SD card.
Orange	On: SD card full. Flashing: Error while accessing SD card.
Red	Flashing (1 Hz): Piggyback equipment not compatible with logging configuration. Flashing (>1 Hz): Error while logging.

> **CH1 … CH4 (with CAN-/LINpiggies)**

Multicolored channel LEDs, each indicating the bus activity for CAN, LIN or K-Line.

Color	Description
Green	Data frames have been sent or received correctly.
Orange	CAN: Error frames have been sent or received. LIN/K-Line: Protocol errors as well as valid messages on the bus.
Red	CAN: Bus off. LIN/K-Line: Protocol errors on the bus.

CAN: The flashing frequency depends on the bus load.

> **Status (Interface Mode)**

Multicolored LED that indicates the status of the device.

Color	Description
Green	Device is ready for operation/running measurement.
Orange	Initializing driver. Please wait.
Red	Error. Device not working.

> **Status (Logging Mode)**
  Multicolored LED that indicates the status of the device.

Color	Description
Green	Device is ready for operation and logging configuration is started.
Orange	Flashing (slow): SD card not inserted. Flashing (fast): Firmware update in progress.
Red	Error. Flashing (slow): Device not working or logging firmware missing. Flashing (fast): Logging configuration missing on SD card or incompatible with firmware.

2.6.5 Bus Configuration

Piggybacks for
CH1 and CH2

An advantage of the VN1630 log is its two Piggyback plug-in locations (primary channels CH1 and CH2). Depending on requirements, electrically decoupled CAN High-Speed, CAN Low-Speed, CAN Single Wire, J1708 or LIN transceivers may be used. In addition, two electrically decoupled built-in CAN TJA1051 (high-speed) transceivers are available (secondary channels CH3 and CH4). CH5 is reserved for dedicated IO tasks.
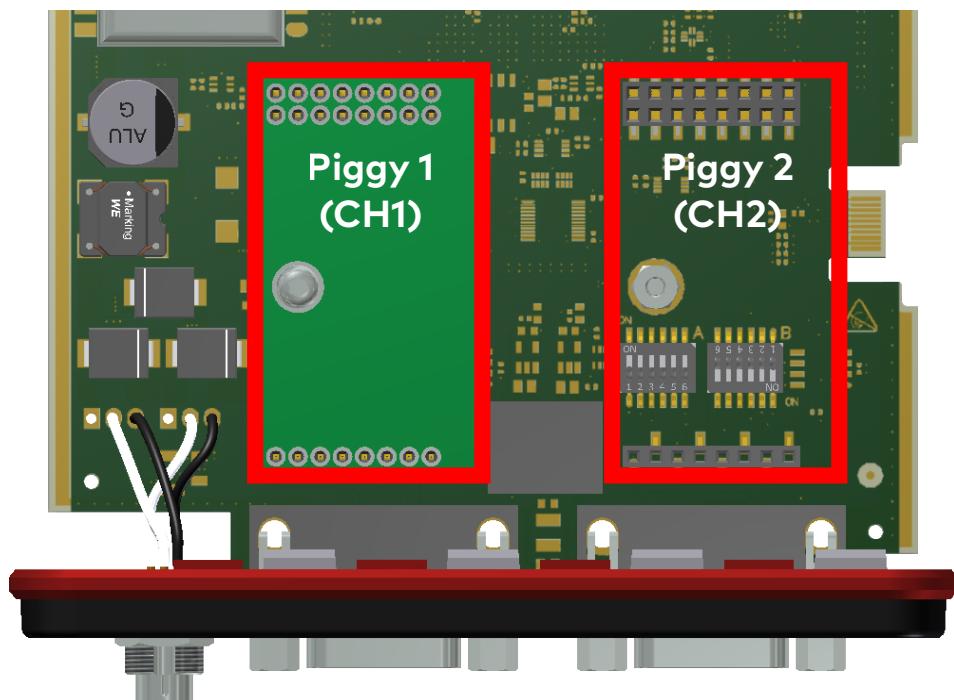

Figure 27: Piggyback plug-in locations for CH1 and CH2

Note

LINpiggies have to be inserted before CANpiggies (in ascending order). If you intend to use only one LINpiggy, please use the first plug-in location (CH1). J1708 should be handled like CAN.

Each empty plug-in location is loaded with a built-in transceiver from the secondary channel according to the DIP switch settings.

Reference
Further information on DIP switches can be found in section Pin Assignment CH1/3 and CH2/4 on page 42.

Piggyback
order

Primary	CH1	CH2
Piggyback	LIN1	LIN2
	or	or
	CAN2	CAN1

Secondary	CH3	CH4
Built-in Transceiver	CAN 1051cap	CAN 1051cap

Examples

The following tables show examples of possible configurations:

2x CAN without
Piggybacks
1x IO

	CH1/CH3	CH2/CH4	CH5
Piggyback	-	-	-
Primary	**CH1**	**CH2**	**CH5**
	↑	↑	
Built-in Transceiver	CAN 1051cap	CAN 1051cap	
Secondary	CH3	CH4	

Configuration
CH1: no Piggyback, built-in CAN 1051cap transceiver (CH3).
CH3: not usable.
CH2: no Piggyback, built-in CAN 1051cap transceiver (CH4).
CH4: not usable.
CH5: on-board IO.

4x CAN
1x IO

	CH1/CH3	CH2/CH4	CH5
Piggyback	CAN	CAN	-
Primary	**CH1**	**CH2**	**CH5**
	-	-	
Built-in Transceiver	CAN 1051cap	CAN 1051cap	
Secondary	**CH3**	**CH4**	

Configuration
CH1: CANpiggy.
CH3: built-in CAN 1051cap transceiver.
CH2: CANpiggy.
CH4: built-in CAN 1051cap transceiver.
CH5: on-board IO.

1x LIN
2x CAN
1x IO

	CH1/CH3	CH2/CH4	CH5
Piggyback	LIN	-	-
Primary	**CH1**	**CH2**	**CH5**
	-	↑	
Built-in Transceiver	CAN 1051cap	CAN 1051cap	
Secondary	**CH3**	**CH4**	

Configuration

CH1: LINpiggy.

CH3: built-in CAN 1051cap transceiver.

CH2: no Piggyback, built-in CAN 1051cap transceiver (CH4).

CH4: not usable.

CH5: on-board IO.

2.6.6 Pin Assignment CH1/3 and CH2/4

Double assignment of D-SUB9 connectors CH1 and CH2

Before installing a Piggyback in the plug-in location (see section Replacing Piggybacks on page 47), the pin assignment of the D-SUB9 connector (CH1/CH3 and CH2/CH4) has to be selected via DIP switches, which can be found inside the device at the plug-in locations.
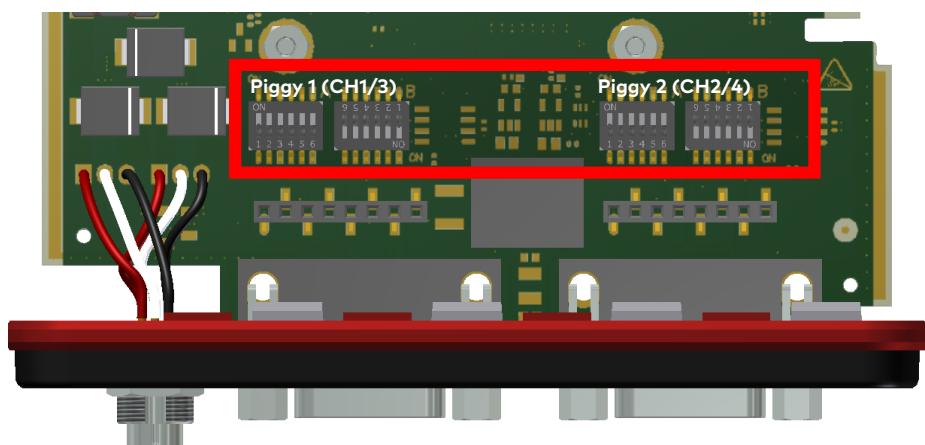
Figure 28: DIP switches (left: CH1/3, right: CH2/4)

Pin assignment CH1 … CH4

The pin assignments of the D-SUB9 connectors depend on the used bus transceiver configuration inside the VN1630 log. A list of available Piggybacks and their D-SUB9 pin assignments is included in the separate accessories manual.

> **No Piggyback inserted**
   If no Piggyback is inserted, only the built-in CAN transceiver at CH1 (CH2) is active (no double assignment of the D-SUB9 connector):

Pin	Assignment
1	Not connected
2	1051cap CAN Low
3	GND
4	Not connected
5	Not connected
6	Not connected
7	1051cap CAN High
8	Not connected
9	Not connected

A: all ‚OFF’ / B: all ‚ON’
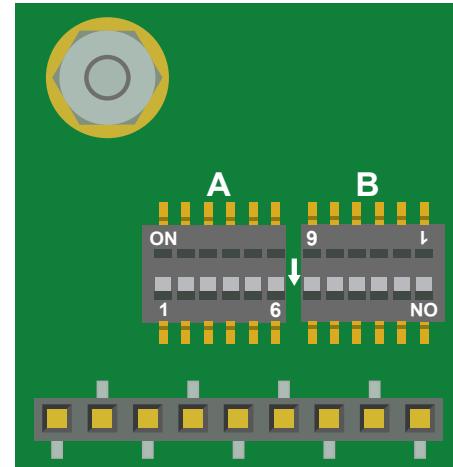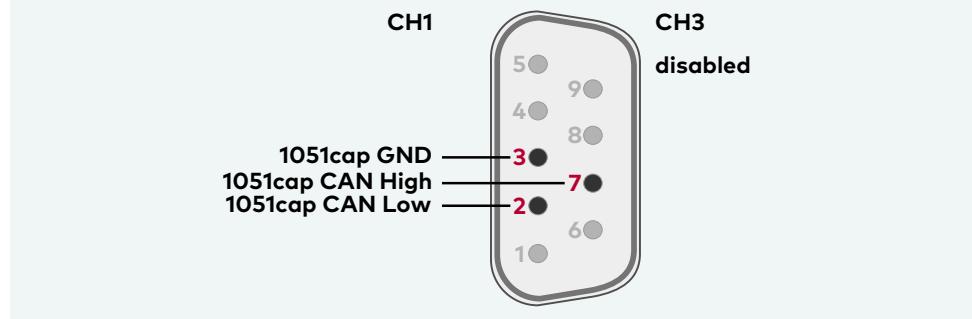
Figure 29: Configuration without Piggyback

Example
**No Piggyback**
The following example shows the pin assignment of CH1/CH3 if no Piggyback is inserted in the plug-in location at channel 1.

CH1 **CH3**
disabled

1051cap GND — 3
1051cap CAN High — 7
1051cap CAN Low — 2

> **CAN/LIN Piggyback inserted**
If a CAN- or LINpiggy is inserted, the Piggyback is assigned to CH1 (CH2) and the built-in CAN transceiver is assigned to CH3 (CH4):

Pin	Assignment
1	1051cap CAN Low
2	Piggyback-dependent
3	Piggyback-dependent
4	Piggyback-dependent
5	Not connected
6	GND
7	Piggyback-dependent
8	1051cap CAN High
9	Piggyback-dependent

A: all ‚ON' / B: all ‚OFF'
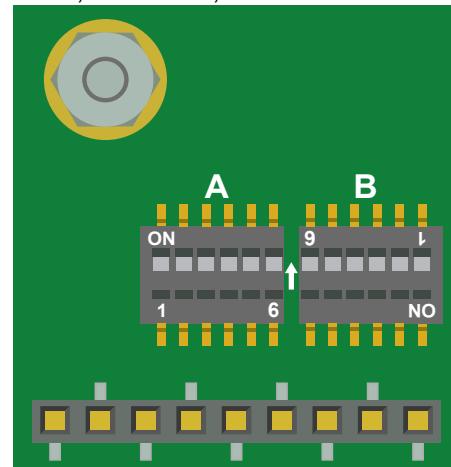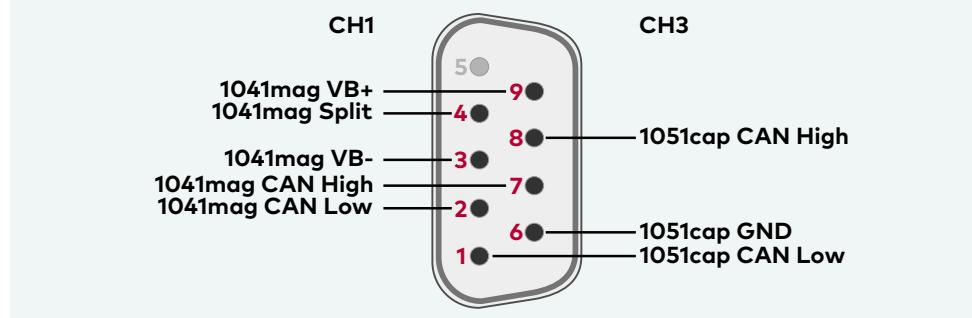
Figure 30: Configuration with Piggyback

Example
CANpiggy 1041mag
The following example shows the pin assignment of CH1/CH3 if a CANpiggy 1041mag is inserted in the plug-in location at channel 1.

CH1 **CH3**

1041mag VB+ — 9
1041mag Split — 4
8 — 1051cap CAN High
1041mag VB- — 3
1041mag CAN High — 7
1041mag CAN Low — 2
6 — 1051cap GND
1 — 1051cap CAN Low

> **Note**
> The described pin assignment is also valid for CH2/CH4. A warning message appears in **Vector Hardware Config** if the DIP switch settings are improperly set. Check your DIP switch settings in this case.

CAN/LIN Y cable

Use the CANcable 2Y to access both channels on separate D-SUB9 connectors (see accessories manual, part number 05075). The pin assignments of the D-SUB9 connectors depend on the used bus transceiver configuration inside the VN1630 log. A list of available Piggybacks and their D-SUB9 pin assignments is included in the accessories manual.

Figure 31: 2x CANcable 2Y connected to VN1630 log

2.6.7 Pin Assignment CH5

Digital/analog IO

The pin assignment for CH5 is as follows:

Pin	Assignment
1	Analog input
2	Not connected
3	Not connected
4	Digital input 0
5	Digital input 1
6	Analog GND
7	Not connected
8	Digital output
9	Digital GND

Analog In		1
Analog GND		6
Digital In 0		4
Digital In 1		5
Digital Out		8
Digital GND		9

Internal interconnection of digital input 0/1
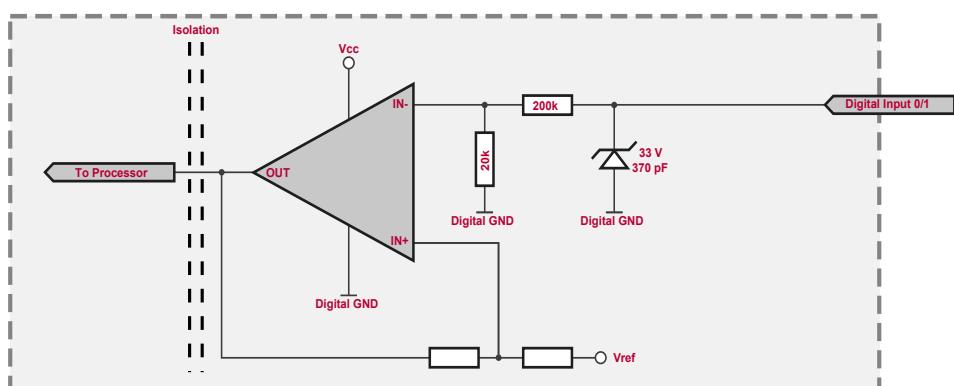
Figure 32: Digital input 0/1

Internal interconnection of digital output
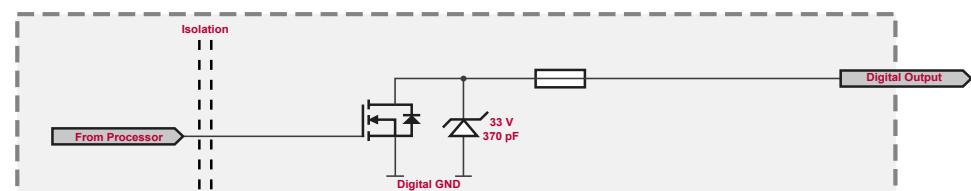
Figure 33: Digital output

Internal interconnection of analog input
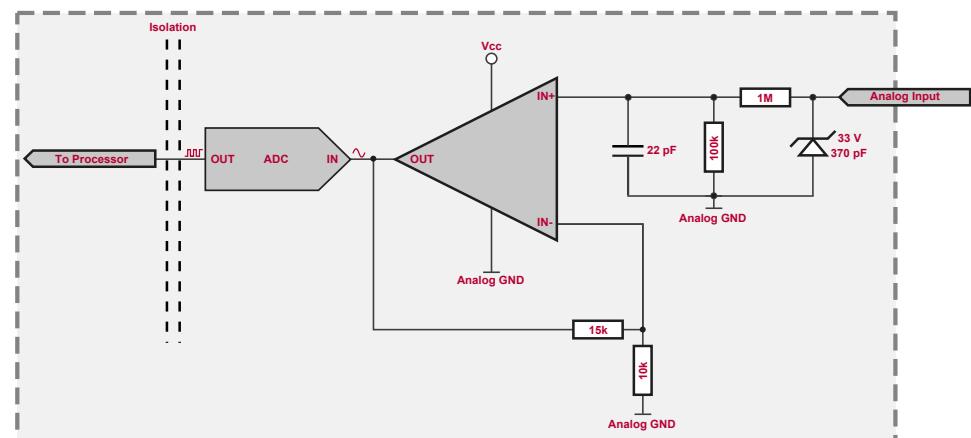
Figure 34: Analog input

Extended measuring range of the analog input

In normal operation, voltages up to 18 V can be applied and measured at the analog input. The cutoff frequency f_c (-3 dB) for AC voltages is approx. 7.2 kHz.

For measurements above 18 V (max. 50 V), an external series resistor has to be applied to the analog input. The series resistor R_{ext} depends on the input voltage U_{input} and can be calculated as follows:

$$R_{ext}\,[kOhm] = [(U_{input} * 0.61111) - 11] * 100$$
$$with\ 18\,V < \ U_{input}\ \le 50\,V$$

The cutoff frequency for AC voltages is also affected by the external series resistor:

$$f_c\left[Hz\right] = \frac{1}{2.33 * 10^{-6} * R_{ext}\,[kOhm]}$$

Examples

	24 V	32 V	36 V	48 V
R_{ext}	367 kΩ	856 kΩ	1100 kΩ	1833 kΩ
R_{ext} (E96)	374 kΩ (24.12 V)	866 kΩ (32.17 V)	1100 kΩ (36.00 V)	1870 kΩ (48.60 V)
f_c (-3 dB)	1148 Hz	496 Hz	390 Hz	230 Hz

2.6.8 Replacing Piggybacks

> **Caution!**
> When performing this operation be sure not to touch the top or bottom of the boards (VN1630 log main board or Piggybacks) to avoid damages due to electrical discharges.

Step by Step Procedure

1. First, loosen the VN1630 log housing screws on the side with the two D-SUB9 connectors. This requires removing the two black decorative caps. Then carefully pull the PC-board out of the housing.
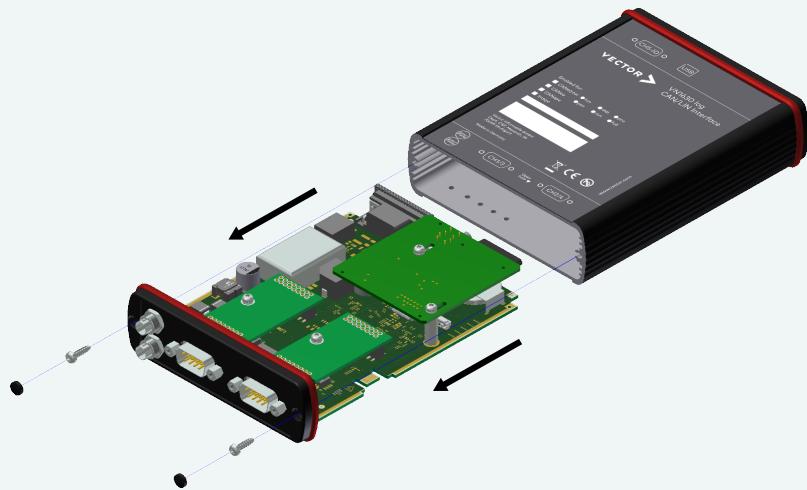
Figure 35: Opening the housing

2. You will find the plug-in location 1 (CH1) at the sync connector side and plug-in location 2 (CH2) at the edge of the PC-board.
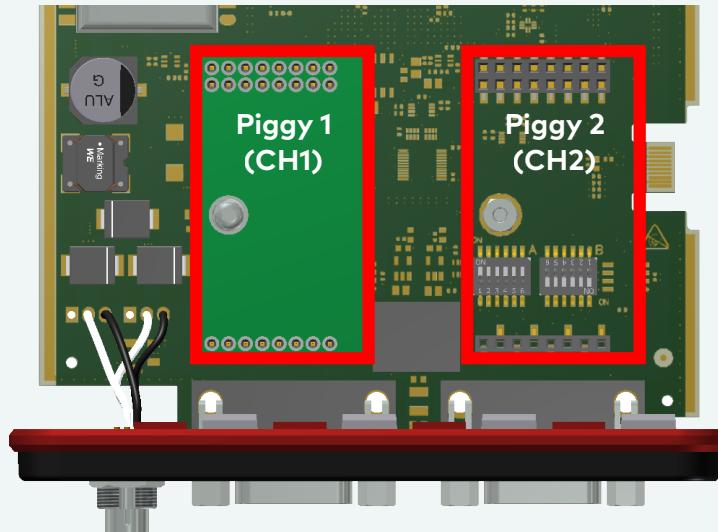
Figure 36: Piggyback plug-in locations CH1 and CH2

3. Each Piggyback is fastened by a screw and retainer. Please loosen the appropriate screw including the retainer and carefully remove the Piggyback from the plug-in location.
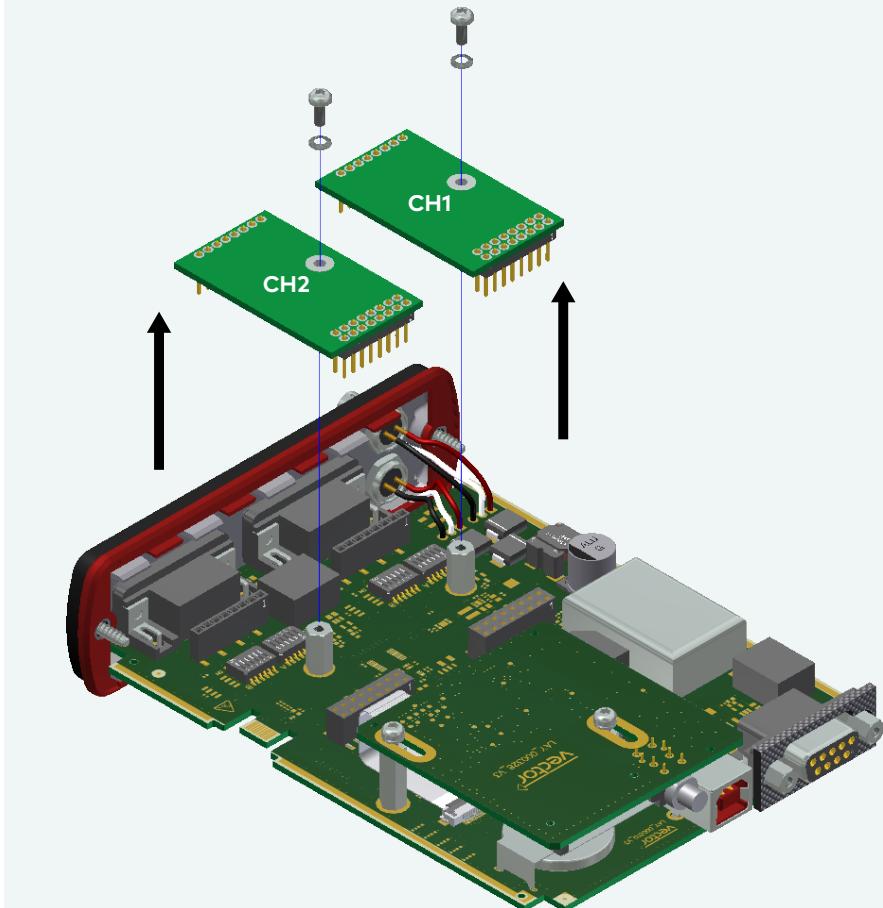
Figure 37: Unmount/mount Piggybacks

4. Set the DIP switches as described in section Pin Assignment CH1/3 and CH2/4 on page 42.

5. Insert the replacement Piggyback. When doing this please make sure that the single and dual-row connectors are not laterally offset.

6. Secure the new Piggyback with the appropriate screw and retainer.

7. Place the VN1630 log main board back in the housing. This operation involves placing the housing on a table with its back side (side with the bar code) facing upward. Then the main board with the Piggybacks facing upward is inserted into the first guide rails.
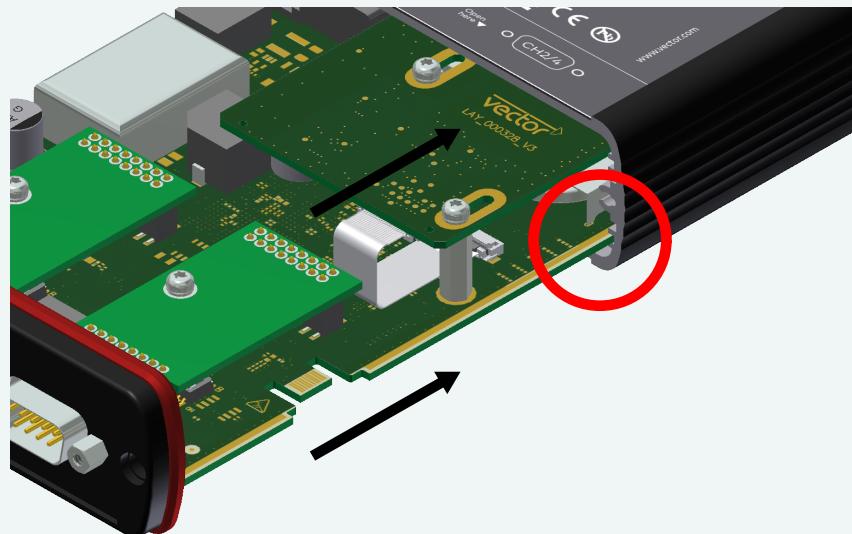
Figure 38: First guide rails

8. It should be possible to slide the main board in the housing up to a few millimeters from the end without forcing it in. Close the housing by applying light pressure and then secure it with the appropriate screw fasteners. The screws should be secure but not excessively tight.

9. Please also attach the two black decorative caps.

10. Connect the VN1630 log and the PC via the USB cable and check the bus configuration in **Vector Hardware Config**.
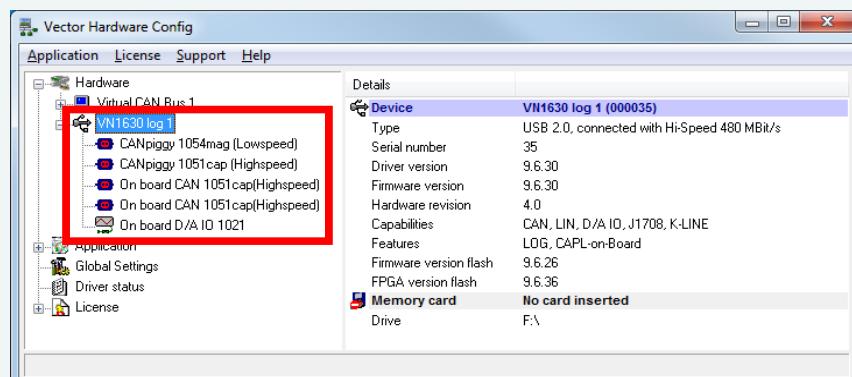
Figure 39: Check inserted Piggybacks

2.6.9 SD/SDHC Memory Cards

SD/SDHC cards   The logger supports industrial grade SD/SDHC memory cards up to 32 GB. For the proper use only industrial grade cards released by Vector are recommended:

SD card

> Xmore industrial 2 GB (SD-2G0-XIE82)

SDHC cards

> Xmore industrial 8 GB (SD-8G0-XIE82)

> Xmore industrial 16 GB (SD-16G-XIE82)

> SanDisk Industrial XT 32 GB (SDSDAF-032G-XI)

> **i**   **Note**
> The memory cards have to be FAT32 formatted. For optimum speed, we recommend FAT32 formatting with the maximum available cluster size.

2.6.10 Ring Buffer in RAM

Memory   The VN1630 log has an allocated ring buffer in its RAM (32 MB) which is used to buffer received data. During recording, the data is continually written to the SD card. When using a triggered recording, the data is only stored into the ring buffer until the trigger event occurs. The data is then copied from the ring buffer to the SD card according to the set pre-trigger time.

2.6.11 Real Time Clock

Description   The VN1630 log has a real time clock for date/time information while logging. The real time clock can be set up in the **Vector Logger Configurator**. It is recommended to set the real time clock before first logging.

2.6.12 Battery

Lifetime   The VN1630 log is equipped with a lithium battery that powers the integrated real time clock. The battery has a typical durability of approx. 5 years.

2.6.13 Beep

Beep   VN1630 log has an acoustic signal generator which acoustically alerts the user e. g. in case of a trigger. Triggers with beeps can be defined in the **Vector Logger Configurator**.

2.6.14 Technical Data

CAN channels	Max. 4 2x CAN high-speed 1051cap 2x configurable via Piggybacks CAN: up to 2 Mbit/s CAN FD: up to 8 Mbit/s
LIN channels	Max. 2 configurable via Piggybacks up to 330 kbit/s
K-Line channels	Max. 2 with LINpiggy 7269mag at CH1/CH2
J1708 channels	Max. 2 configurable via Piggybacks
Analog input	10 bit Input 0 V…18 V Voltage tolerance up to 50 V (with series resistor) Sampling rate up to 1 kHz
Digital input	Range 0 V…32 V Schmitt trigger high 2.7 V, low 2.2 V Hysteresis 0.5 V Input frequencies up to 1 kHz
Digital output	Open Drain External supply up to 32 V Current max. 500 mA Short circuit / over voltage protected
Operation mode	Interface and logging
Memory function	Logging on SD/SDHC card
Extras	Real time clock
Startup time (Logging Mode)	3 seconds after power-up
Battery	Lithium primary cell type BR2330A
Power supply	Interface Mode: via USB Logging Mode: 6 V…50 V
Power consumption	Approx. 2.5 W
Temperature range	Operating: -40 °C…+65 °C Shipping and storage: -40 °C…+85 °C
Relative humidity of ambient air	15 %…95 %, non-condensing
Dimensions (LxWxH)	Approx.150 mm x 110 mm x 35 mm
Weight	400 g (without accessories)
Operating system requirements	Windows 7 SP1 (32 bit / 64 bit) Windows 8.1 (32 bit / 64 bit) Windows 10 (64 bit)

2.7 VN1640A

2.7.1 Main Features

VN1640A features

The main features of the VN1640A interface are:

> 4x plug-in location for CAN-/LINpiggies

> Fifth channel for dedicated digital-analog input/output tasks

> 5x D-SUB9 connector

> Five LEDs indicating bus activities and status

> Software sync

> Hardware sync (via SYNCcableXL)

Figure 40: VN1640A CAN/LIN Interface

2.7.2 Connectors Bus Side
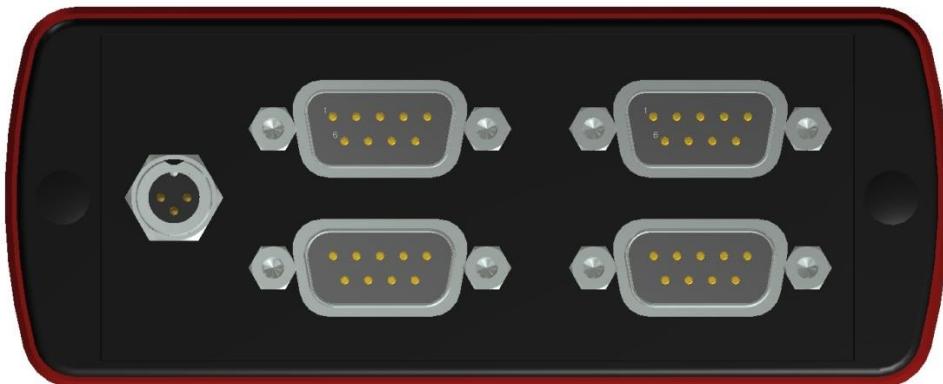
Device connectors

Figure 41: VN1640A with sync and D-SUB9 connectors

> **Binder connector (Sync)**
  This connector (Binder type 711) can be used for time synchronization of different Vector devices (see section Time Synchronization on page 77). **The sync connector is not intended to connect a power supply.**

Pin	Assignment
1	Not connected
2	Synchronization line
3	Ground

> **D-SUB9 (CH1...4)**
> The VN1640A has four D-SUB9 connectors, each assigned to a dedicated Piggy-back plug-in location. Further information on the pin assignment can be found in section Pin Assignment CH1...CH4 on page 56.

2.7.3 Connectors USB Side

Device connectors

Figure 42: VN1640A with USB and D-SUB9 connector

> **USB**
> Connect your PC and the VN1640A via USB to install and to use the device with measurement applications (e. g. 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 USB at your PC or use a USB hub with its own power supply (self-powered). Depending on the used Piggy-back, the VN1640A requires the entire USB current (500 mA) which cannot be provided by a bus-powered USB hub.

> **D-SUB9 (CH5)**
> The VN1640A has a D-SUB9 connector (CH5) for dedicated digital-analog input/output tasks. The pin assignment can be found in section Pin Assignment CH5 on page 57.

2.7.4 LEDs

Description

The VN1640A has five LEDs indicating bus activities and status:
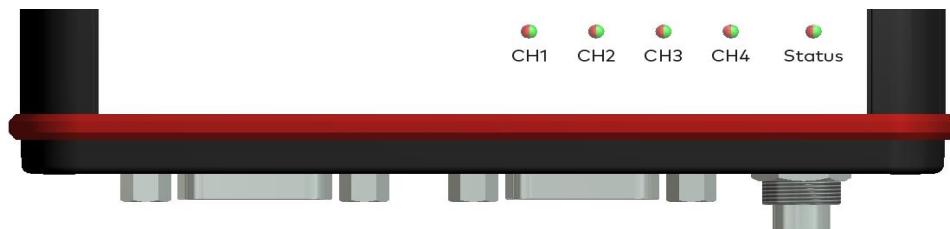
Figure 43: LEDs of the VN1640A

> **CH1 … CH4 (with CAN-/LINpiggies)**
Multicolored channel LEDs, each indicating the bus activity for CAN, LIN or K-Line.

Color	Description
Green	Data frames have been sent or received correctly.
Orange	CAN: Error frames have been sent or received. LIN/K-Line: Protocol errors as well as valid messages on the bus.
Red	CAN: Bus off. LIN/K-Line: Protocol errors on the bus.

CAN: The flashing frequency depends on the bus load.

> **Status**
Multicolored LED that indicates the status of the device.

Color	Description
Green	Device is ready for operation/running measurement.
Orange	Initializing driver. Please wait.
Red	Error. Device not working.

2.7.5 Bus Configuration

Piggybacks

An advantage of the VN1640A is its four Piggyback plug-in locations (CH1…CH4). Depending on requirements, electrically decoupled CAN High-Speed, CAN Low-Speed, CAN Single Wire, J1708 or LIN transceivers may be used. CH5 is reserved for dedicated IO tasks.
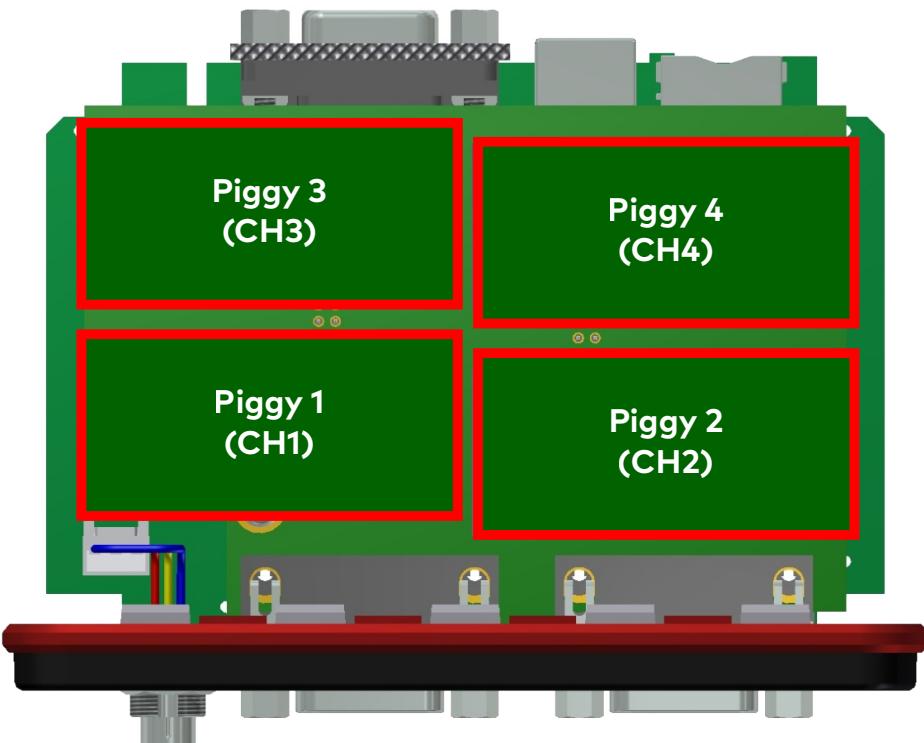

Figure 44: Piggyback plug-in locations for CH1…CH4

> **i**
>
> **Note**
> LINpiggies have to be inserted before CANpiggies (in ascending order). If you intend to use only one LINpiggy, please use the first plug-in location (CH 1). J1708 should be handled like CAN.

Piggyback Configurations			
CH1	**CH2**	**CH3**	**CH4**
CAN1	CAN2	CAN3	CAN4
LIN1	CAN1	CAN2	CAN3
LIN1	LIN2	CAN1	CAN2
LIN1	LIN2	LIN3	CAN1
LIN1	LIN2	LIN3	LIN4

Examples   The following tables show examples of possible configurations:

1x CAN

CH1	CH2	CH3	CH4
CANpiggy 1	-	-	-

1x LIN

CH1	CH2	CH3	CH4
LINpiggy 1	-	-	-

1x LIN
1x CAN

CH1	CH2	CH3	CH4
LINpiggy 1	CANpiggy 1	-	-

1x LIN
1x CAN

CH1	CH2	CH3	CH4
-	LINpiggy 1	-	CANpiggy 1

2x LIN
1x CAN

| CH1	CH2	CH3	CH4
LINpiggy 1	LINpiggy 2	CANpiggy 1	-

2.7.6 Pin Assignment CH1...CH4

Assignment of the
D-SUB9 connectors
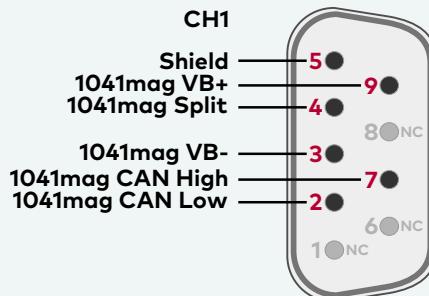
The pin assignments depend on the inserted Piggybacks. A list of available Piggybacks and their D-SUB9 pin assignments can be found in the separate accessories manual on the Vector Driver Disk in `\Documentation\Accessories`.

Example
CANpiggy 1041mag
The following example shows the pin assignment of CH1 if a CANpiggy 1041mag is inserted in the plug-in location at channel 1:


CH1

Shield —— 5
1041mag VB+ —— 9
1041mag Split —— 4
8 NC
1041mag VB- —— 3
1041mag CAN High —— 7
1041mag CAN Low —— 2
6 NC
1 NC
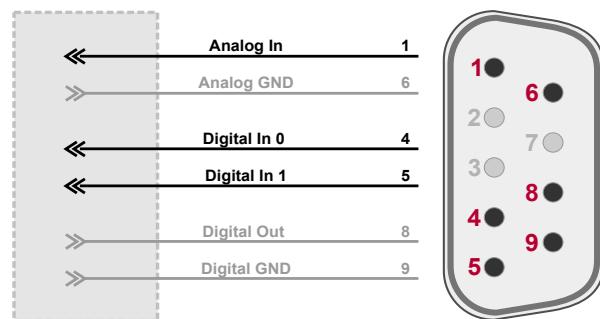
2.7.7 Pin Assignment CH5

Digital/analog IO

The pin assignment for CH5 is as follows:

Pin	Assignment
1	Analog input
2	Not connected
3	Not connected
4	Digital input 0
5	Digital input 1
6	Analog GND
7	Not connected
8	Digital output
9	Digital GND

Internal interconnection of digital input 0/1
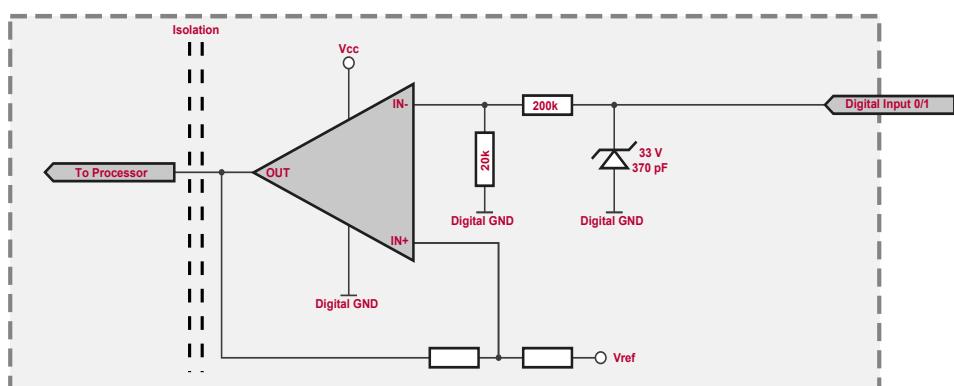
Figure 45: Digital input 0/1

Internal interconnection of digital output
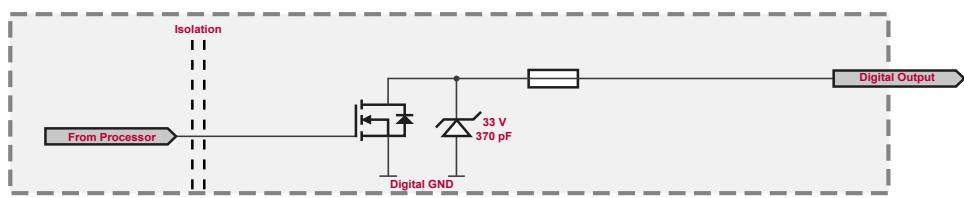
Figure 46: Digital output

Internal interconnection of analog input
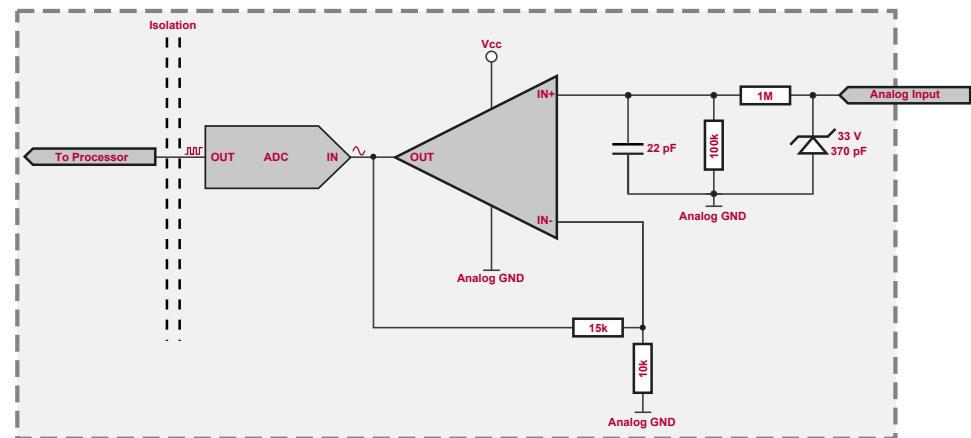
Figure 47: Analog input

Extended measuring range of the analog input

In normal operation, voltages up to 18 V can be applied and measured at the analog input. The cutoff frequency f_c (-3 dB) for AC voltages is approx. 7.2 kHz.

For measurements above 18 V (max. 50 V), an external series resistor has to be applied to the analog input. The series resistor R_{ext} depends on the input voltage U_{input} and can be calculated as follows:

$$R_{ext}\,[kOhm] \;=\; [(U_{input} * 0.61111) - 11] * 100$$
$$with\ 18\,V < \ U_{input}\ \leq 50\,V$$

The cutoff frequency for AC voltages is also affected by the external series resistor:

$$f_c\Big[Hz\Big] \;=\; \frac{1}{2.33*\,10^{-6}*\,R_{ext}\,[kOhm]}$$

Examples

	24 V	**32 V**	**36 V**	**48 V**
R_{ext}	367 kΩ	856 kΩ	1100 kΩ	1833 kΩ
R_{ext} (E96)	374 kΩ (24.12 V)	866 kΩ (32.17 V)	1100 kΩ (36.00 V)	1870 kΩ (48.60 V)
f_c (-3 dB)	1148 Hz	496 Hz	390 Hz	230 Hz

2.7.8 Replacing Piggybacks

Caution!
When performing this operation be sure not to touch the top or bottom of the boards (VN1640A main board or Piggybacks) to avoid damages due to electrical discharges.

Step by Step Procedure
1. First, loosen the VN1640A housing screws on the side with the four D-SUB9 connectors. This requires removing the two black decorative caps. Then carefully pull the PC-board out of the housing.
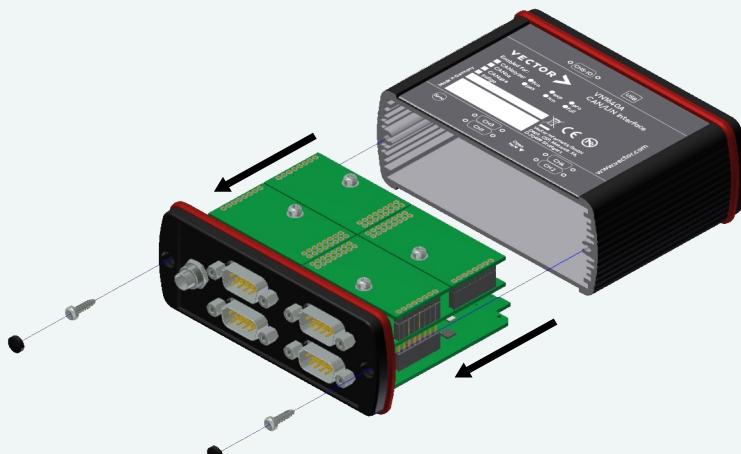
Figure 48: Opening the housing

2. The plug-in locations are defined as follows:
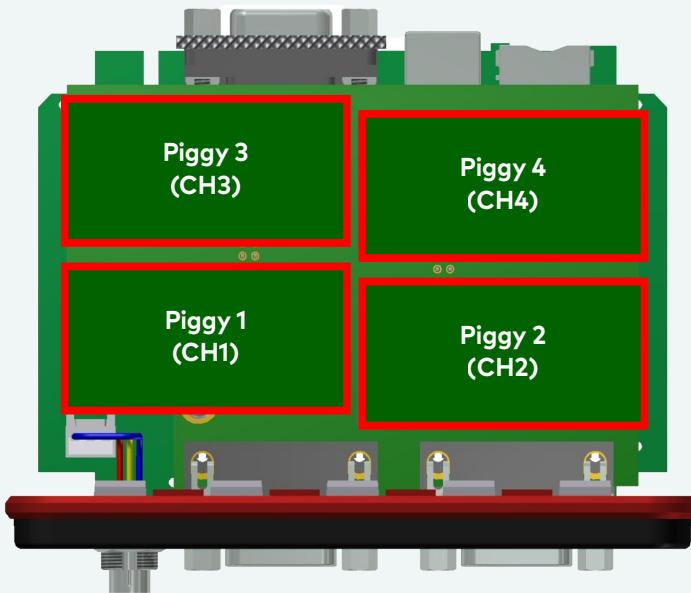
Figure 49: Piggyback plug-in locations CH1…CH4

3. Each Piggyback is fastened by a screw and retainer. Please loosen the appropriate screw including the retainer and carefully remove the Piggyback from the plug-in location.
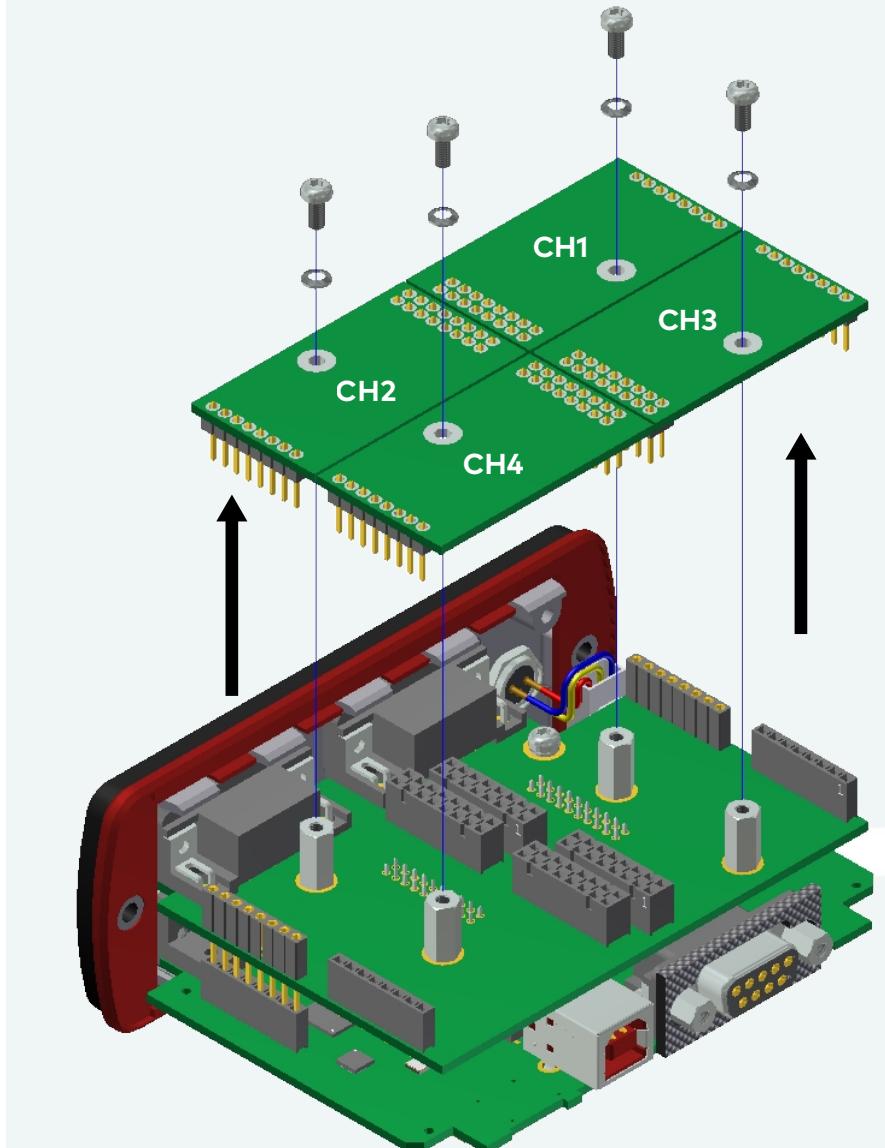

Figure 50: Unmount/mount Piggybacks

4. Insert the replacement Piggyback. When doing this please make sure that the single and dual-row connectors are not laterally offset.

5. Secure the new Piggyback with the appropriate screw and retainer.

6. Place the VN1640A main board back in the housing. This operation involves placing the housing on a table with its back side (side with the bar code) facing upward. Then the main board with the Piggybacks facing upward is inserted into the first guide rails.
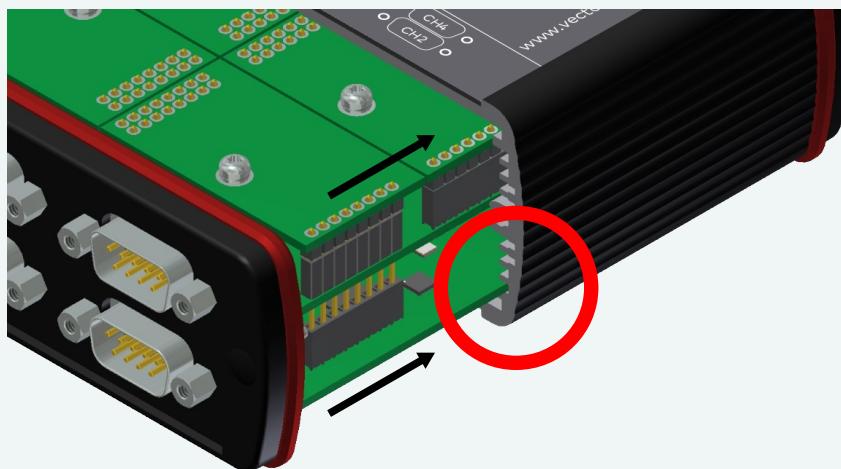

Figure 51: First guide rails

7. It should be possible to slide the main board in the housing up to a few millimeters from the end without forcing it in. Close the housing by applying light pressure and then secure it with the appropriate screw fasteners. The screws should be secure but not excessively tight.

8. Please also attach the two black decorative caps.

9. Connect the VN1640A and the PC via the USB cable and check the bus configuration in **Vector Hardware Config**.
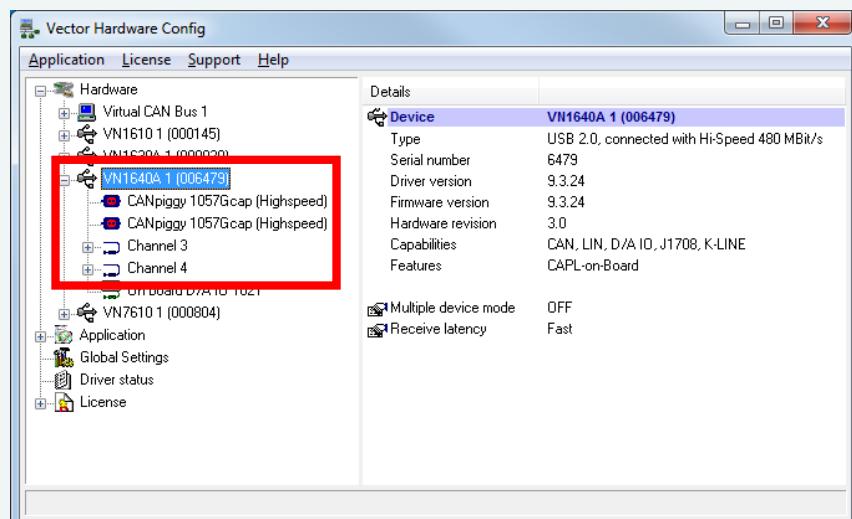

Figure 52: Check inserted Piggybacks

2.7.9 Technical Data

CAN channels	Max. 4 configurable via Piggybacks CAN: up to 2 Mbit/s CAN FD: up to 8 Mbit/s
LIN channels	Max. 4 configurable via Piggybacks up to 330 kbit/s
K-Line channels	Max. 2 with LINpiggy 7269mag at CH1/CH2
J1708 channels	Max. 4 configurable via Piggybacks
Analog input	10 bit Input 0 V…18 V Voltage tolerance up to 50 V (with series resistor) Sampling rate up to 1 kHz
Digital input	Range 0 V…32 V Schmitt trigger high 2.7 V, low 2.2 V Hysteresis 0.5 V Input frequencies up to 1 kHz
Digital output	Open Drain External supply up to 32 V Current max. 500 mA Short circuit / over voltage protected
Power consumption	Approx. 2.5 W
Temperature range	Operating: -40 °C…+70 °C Shipping and storage: -40 °C…+85 °C
Relative humidity of ambient air	15 %…95 %, non-condensing
Dimensions (LxWxH)	Approx. 88 mm x 111 mm x 45 mm
Weight	330 g (without accessories)
Operating system requirements	Windows 7 SP1 (32 bit / 64 bit) Windows 8.1 (32 bit / 64 bit) Windows 10 (64 bit)

3 Getting Started

In this chapter you find the following information:

3.1 Driver Installation

General information

The Vector Driver Disk offers a driver setup which 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
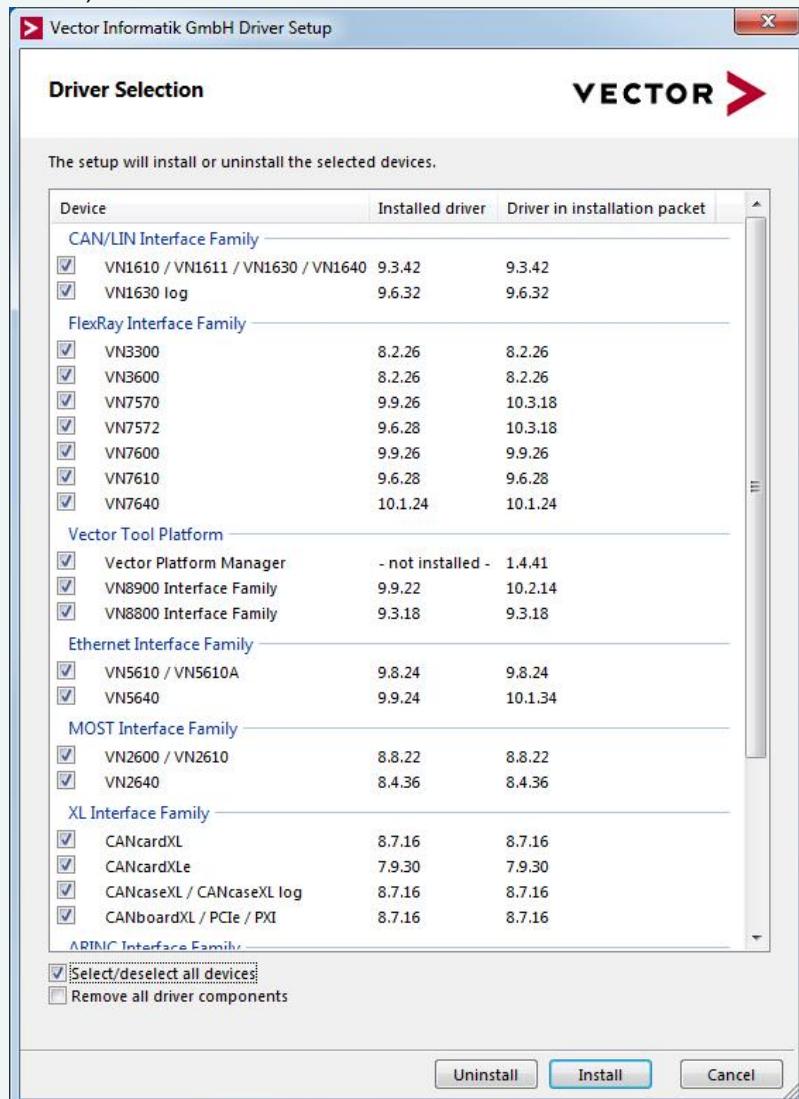
1. Execute the driver setup from the autostart menu or directly from `\Drivers\Setup.exe` before the device is connected to the PC with the included USB cable.

   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.

Step by Step Procedure
For VN1630 log users only:
Please also install the **Vector Logger Configurator** as follows:

1. Execute `\Tools\VN1630_log\Setup.exe`.

2. Finish the installation with the setup.

Reference
Information on the configuration of the Logging Mode and export of recorded data can be found in the separate manual provided with the **Vector Logger Configurator**.

3.2 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 71).

3.3 Quick Test

> **Reference**
> Please execute the test as descibed in section Loop Tests on page 69.

3.4 Loop Tests

Operation 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 8.1 / Windows 10 and independent of the used application.

3.4.1 CAN

Device test   The operating test for CAN can be executed with the following devices:
> CANcardXL/XLe
> CANcaseXL/XL log
> CANboardXL Family
> VN1610 / VN1630A / VN1630 log / VN1640A
> VN5610A
> VN7570 / VN7572 / VN7600 / VN7640
> VN8911 with VN8970
> VN8912A / VN8914 with VN8970 / VN8972
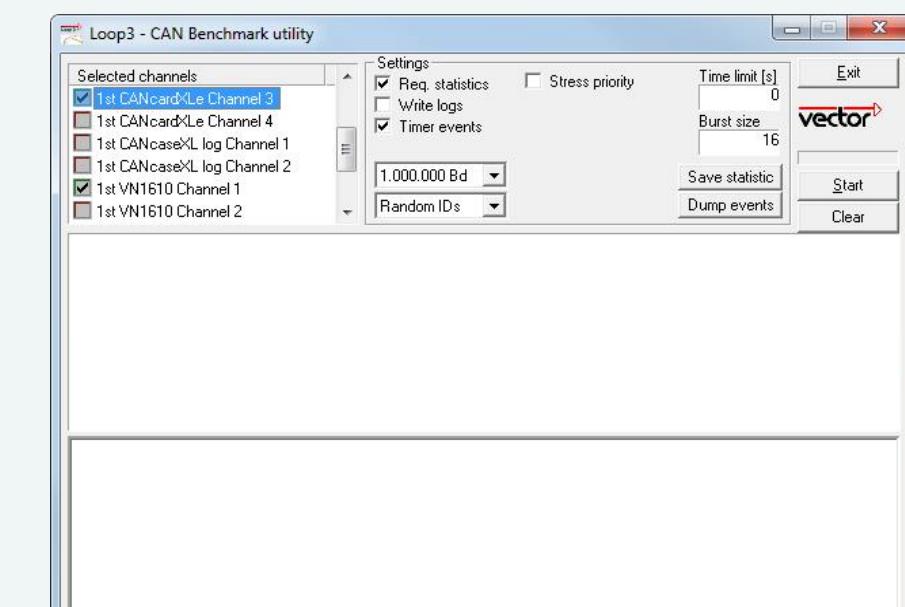
Loop3.exe   Either two high-speed or two low-speed transceivers are necessary for this functional test:

Step by Step Procedure
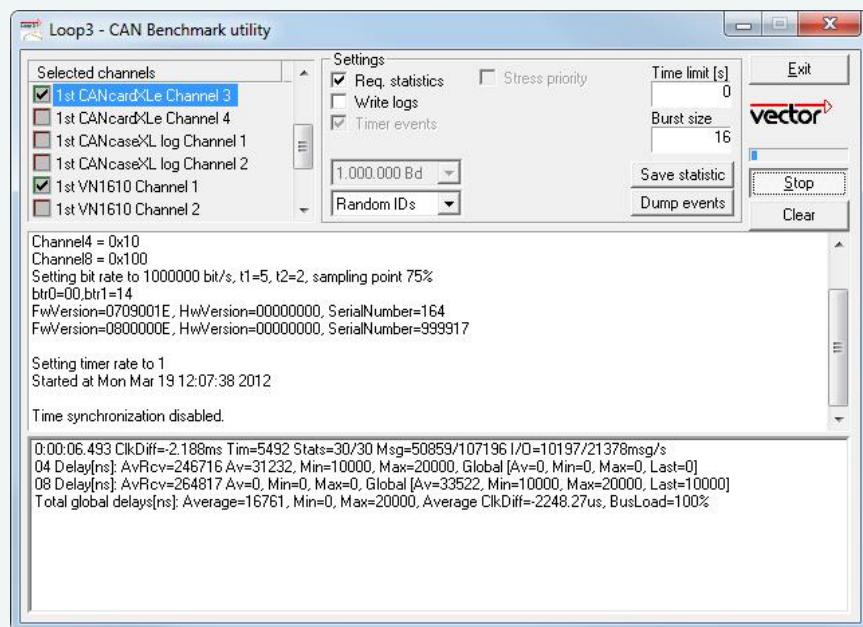
1. Connect two CAN channels with a suitable cable.
   If two high-speed transceivers are being used, we recommend our
   CANcable1 (**CANcable0** for low-speed transceivers).

2. Start `\Drivers\Common\Loop3.exe` from the Vector Driver Disk.
   This program accesses the Vector devices and transmits CAN messages.
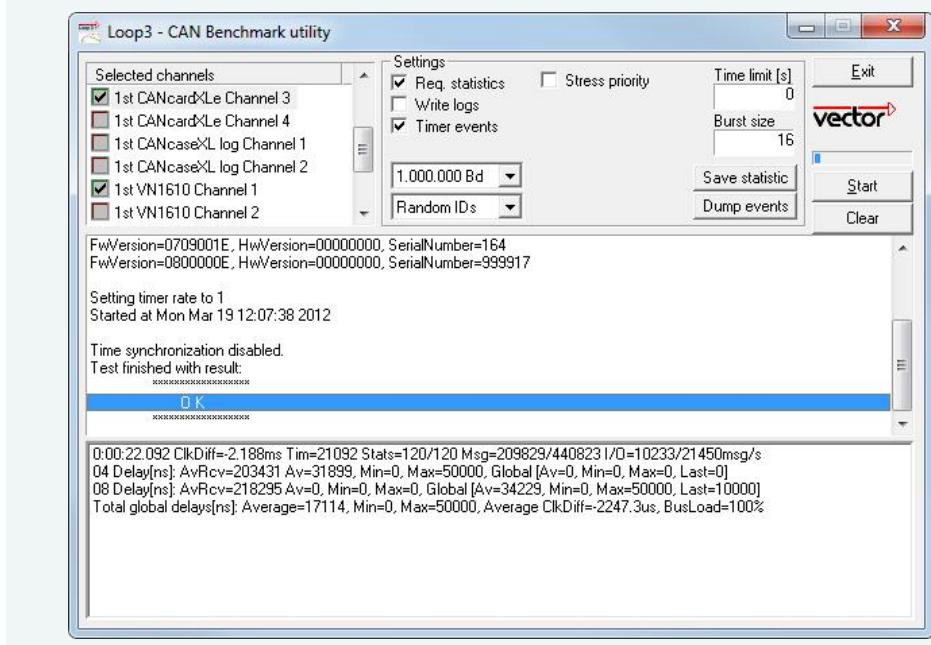
3. Select the connected CAN channels of the device(s) to be tested.

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.

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

4 Vector Hardware Configuration

In this chapter you find the following information:

4.1 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 53: 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.

4.2 Tool Description

## 4.2.1 Introduction

Vector
Hardware Config
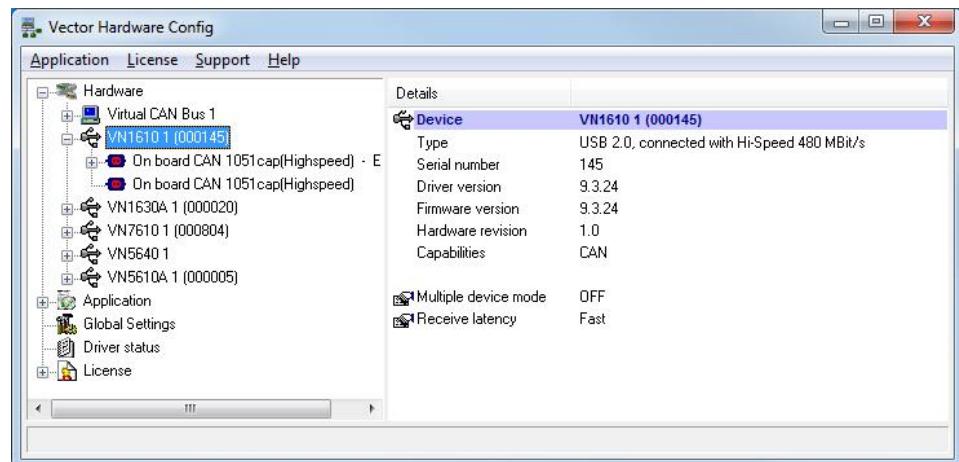
Figure 54: General view of Vector Hardware Config

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.
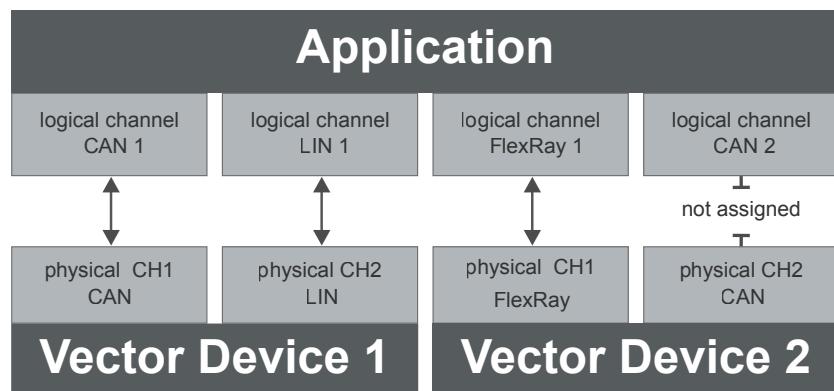

Figure 55: Concept of channel assignments
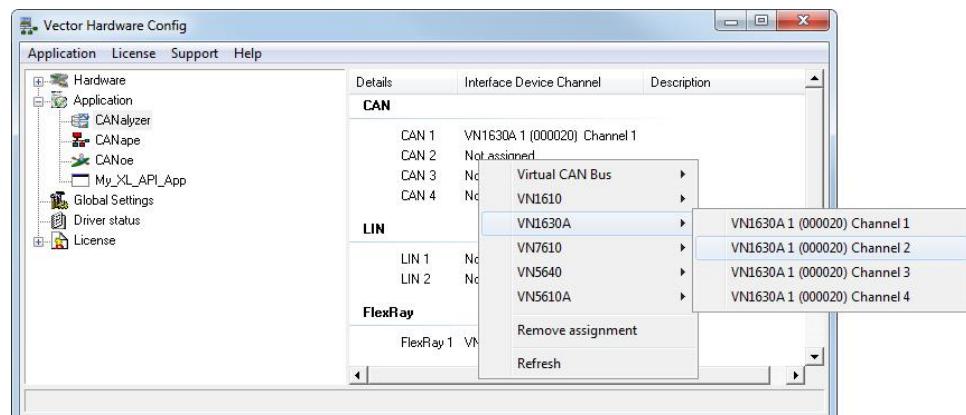
Figure 56: Channel assignment in Vector Hardware Config

4.2.2 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.
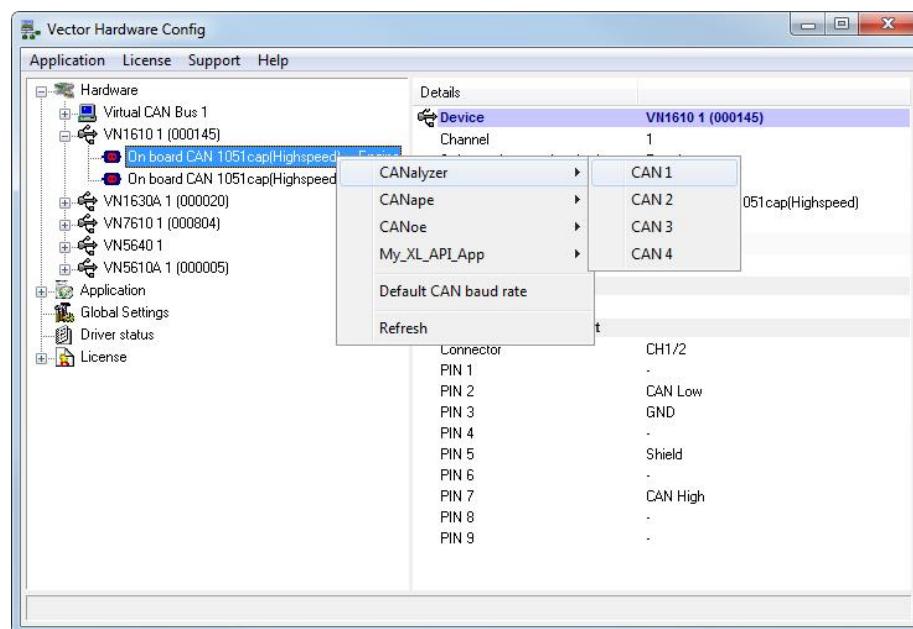
Figure 57: Hardware

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.
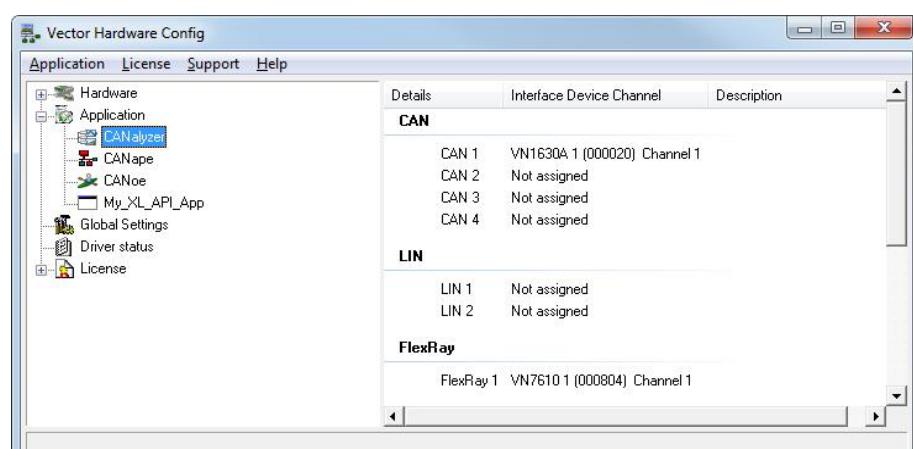

Figure 58: Application

Global settings

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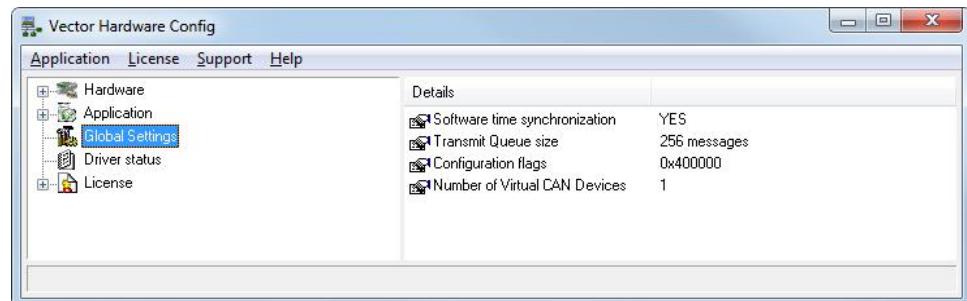

Figure 59: Global settings

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).
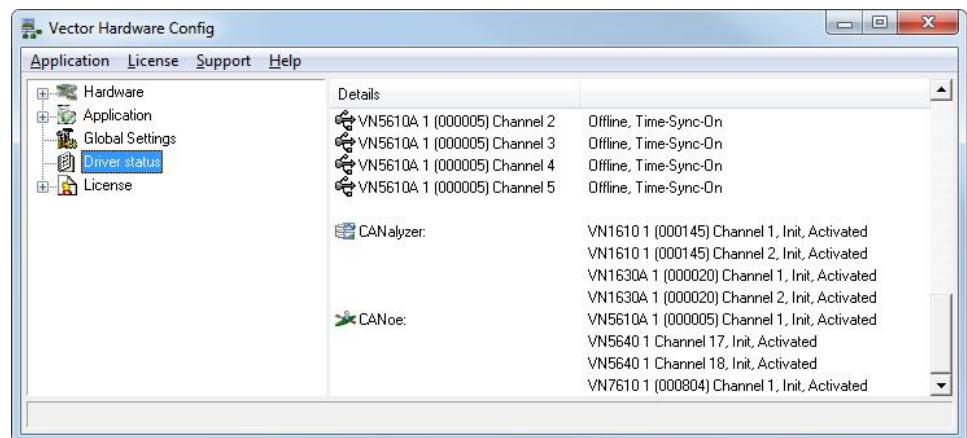

Figure 60: Driver status

License

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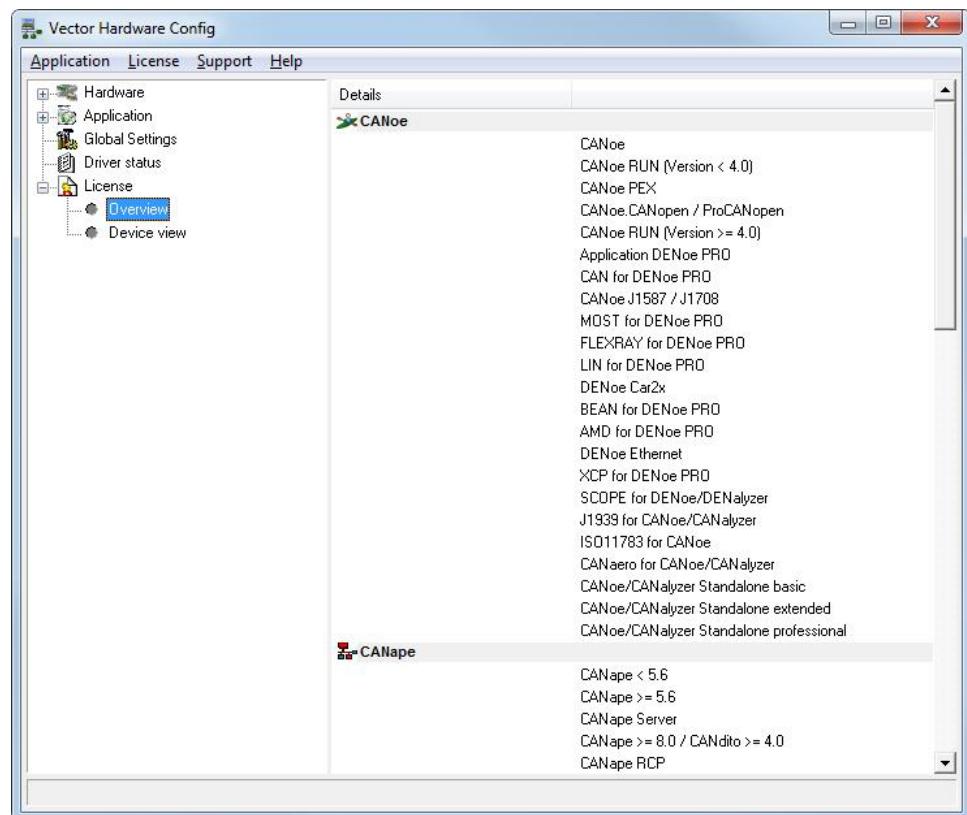

Figure 61: License

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

5 Time Synchronization
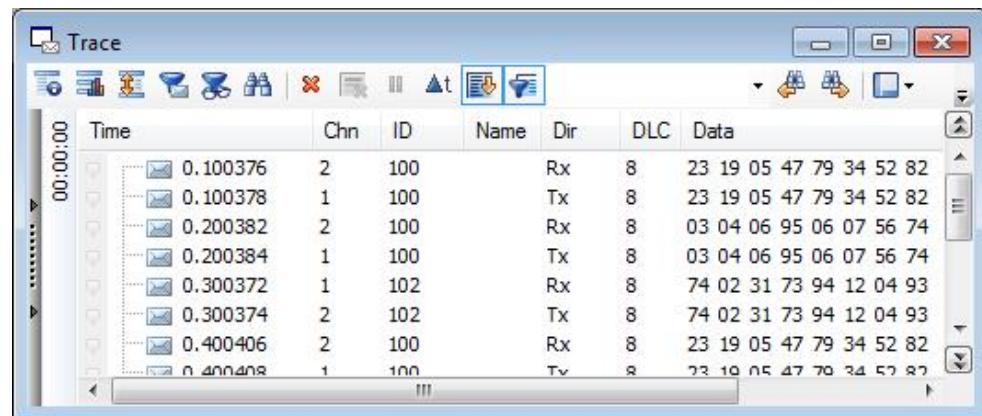
In this chapter you find the following information:

5.1 General Information

Time stamps and events

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

Figure 62: 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.
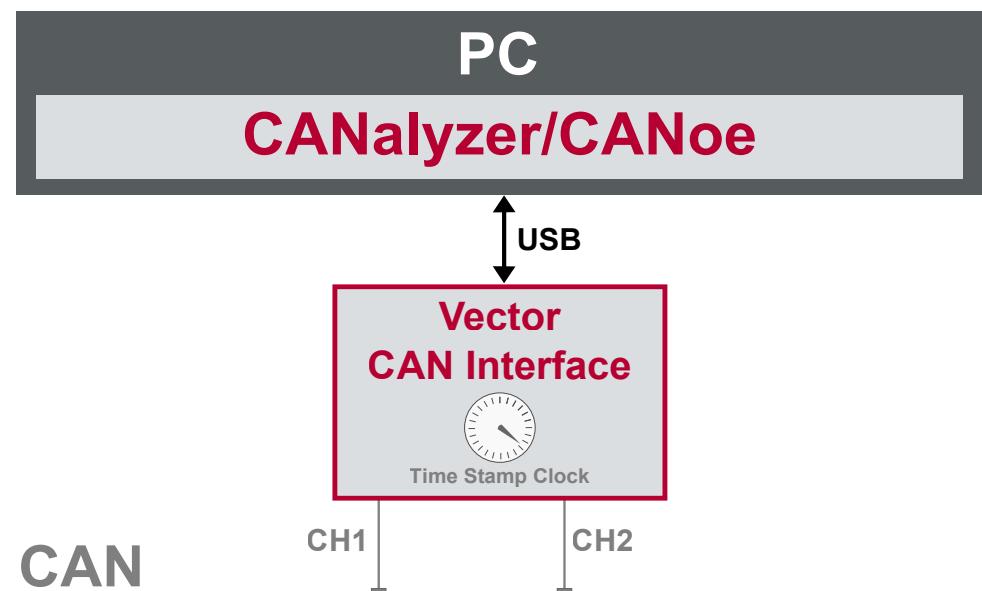

Figure 63: Common time stamp clock for each channel

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.
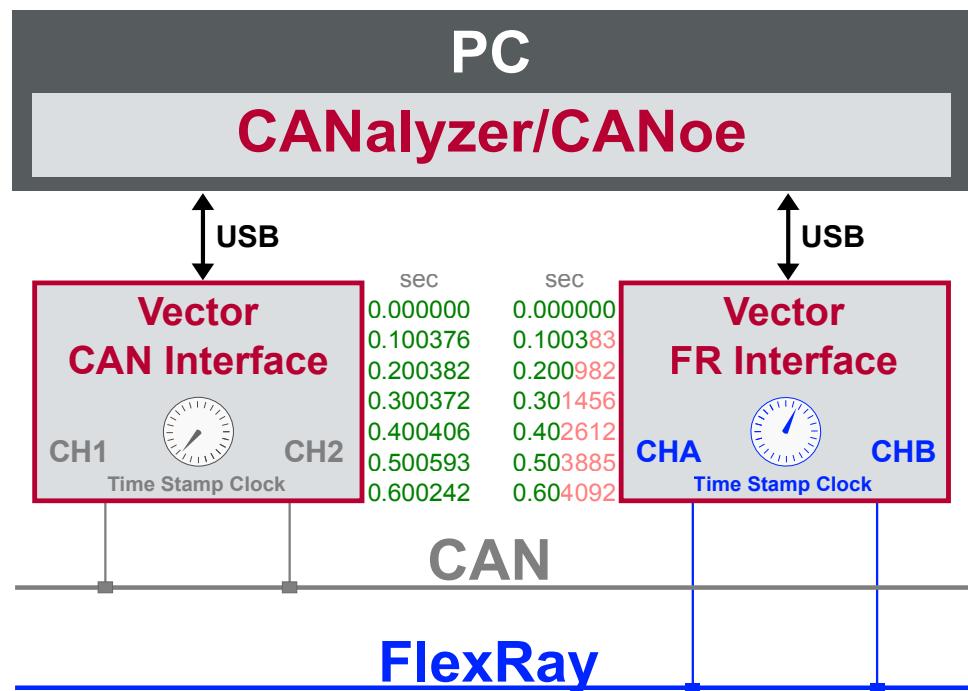
Figure 64: Example of unsynchronized network interfaces. Independent time stamps drift apart

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.

5.2 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.
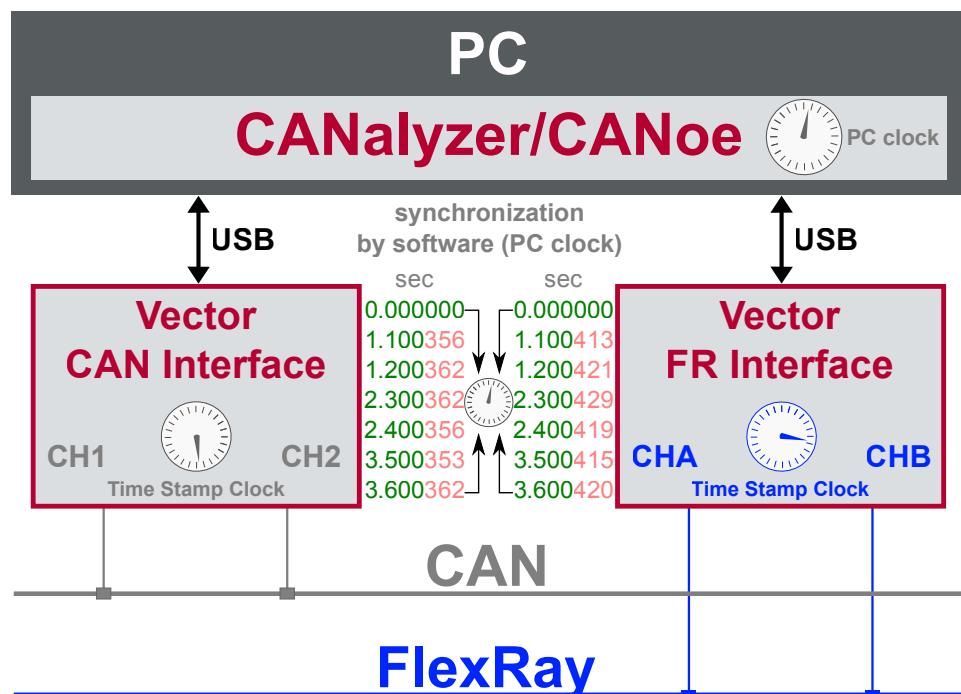

Figure 65: Time stamps of devices are synchronized to the PC clock

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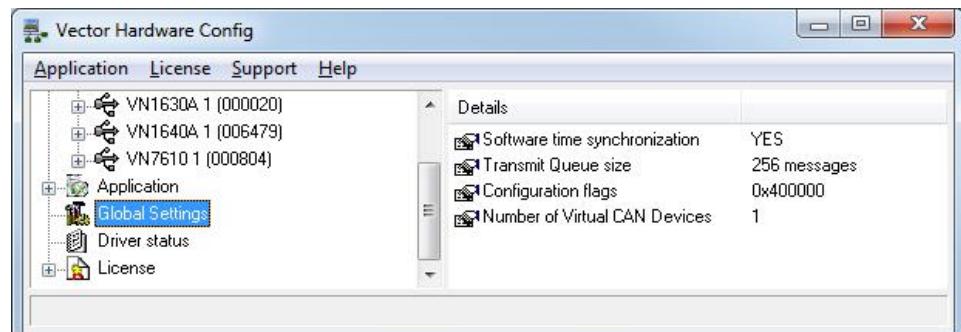

Figure 66: Switching on the software synchronization

> **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.

5.3 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, part number 05018).

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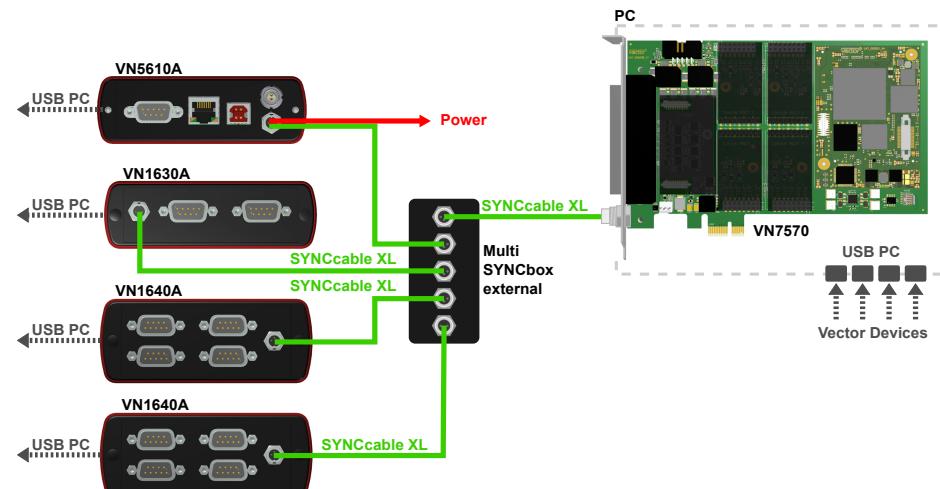

Figure 67: Example of a time synchronization with multiple devices
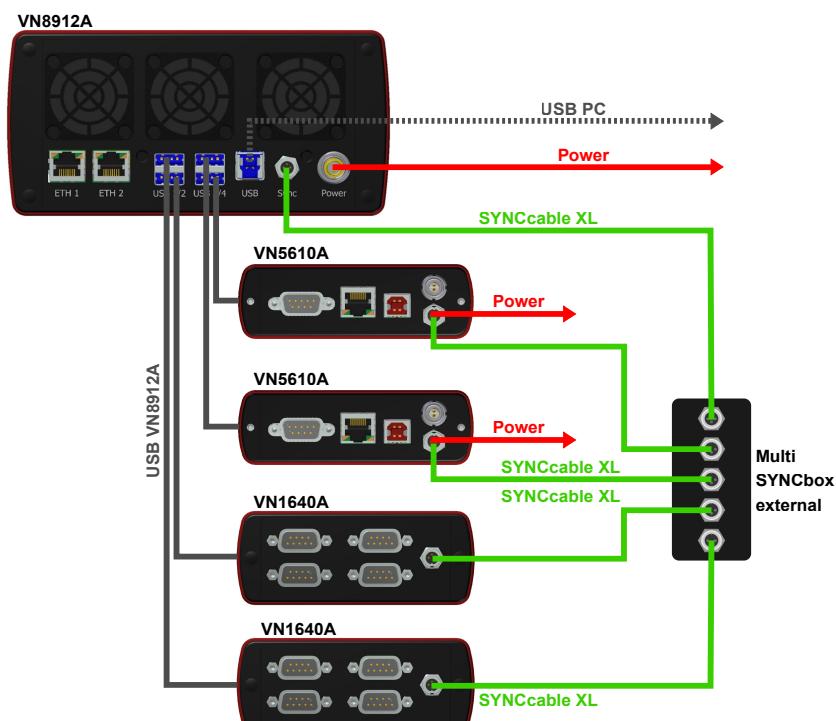
Figure 68: Example of a time synchronization with VN8912A and additional devices

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.
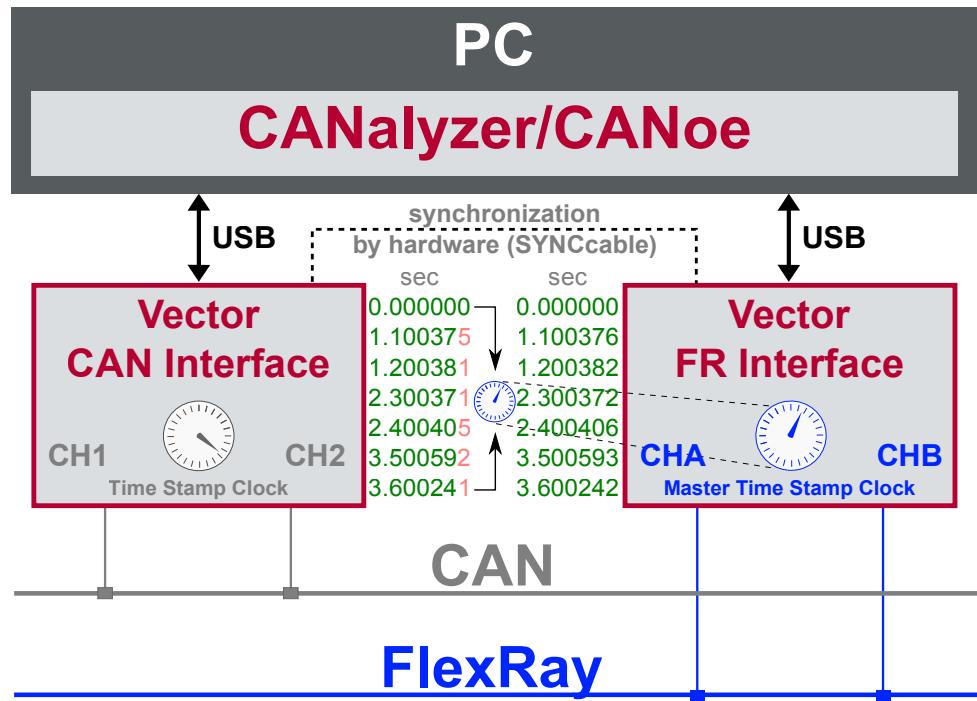

Figure 69: Time stamps are synchronized to the master clock

> **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.

VECTOR >

Get More Information

Visit our website for:
> News
> Products
> Demo software
> Support
> Training classes
> Addresses

www.vector.com