Manual

VN2600 Interface Family

MOST Interfaces VN2610/VN2640

Version 1.5

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 8.1 are trademarks of the Microsoft Corporation.

2 VN2600 Interface Family

In this chapter you find the following information:

2.1 Introduction to VN2600 Family

2.1.1 General Information

VN2600 MOST Interface Family

The devices of the VN2600 MOST Family are high-performance hardware interfaces for the analysis, simulation, and testing of MOST networks. Even at large quantities of data, several devices can be used simultaneously with short reaction times, which is especially advantageous for the analysis of ring position-dependent procedures and high-load tests.

2.1.2 Scope of Delivery

Device and accessories

- 1 x VN26xx MOST Interface (VN2610 or VN2640)
- 1 x User manual English/German
- 1 x Driver CD
- 1 x Power supply 100…240 V AC, 12 V DC, 1.25 A
- 1 x MOST fiber optic cable (1 x MOST 2+0 connector and 2 x HFBR 4531)
- 2 x Fiber optic couplers for HFBR connectors
- 1 x Power supply cable, 1.5 m with open end
- 1x Toslink-S/PDIF fiber optic cable, 5 m, 2.2 mm POF
- 1 x ECL cable, 1.5 m with stripped wires (only with VN2640), see accessories manual for further information

2.1.3 Installation

Note: You can find a detailed description of the driver installation in the separate installation instructions at the end of this manual.

2.1.4 Device Connectors (Rear)

Rear

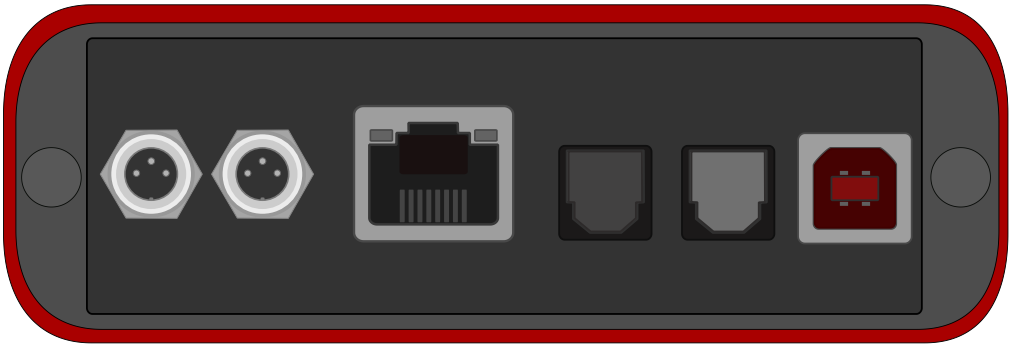


Figure 1: 2x Power/Sync, Ethernet (only VN2640), 2x S/PDIF, and USB

2.1.4.1 Power Supply

External power supply

The VN26xx must be externally supplied by one of the two **Power/Sync** jacks on the rear of the device. A power supply via USB is not possible.

After the VN26xx has been supplied with the startup voltage, any voltage dip does not disturb the device function (see the technical data of the according VN26xx MOST Interface in this manual). The device consumes about 7 W during full operation.

Connectors

Two identical and equivalent Binder connectors are available on the rear of the device. It does not matter which connector is used to supply the device.

It is not possible to chain the power supply through the VN26xx (e. g. to operate several VN26xx interfaces on one power supply) due to internal diodes.

Scheme of connector

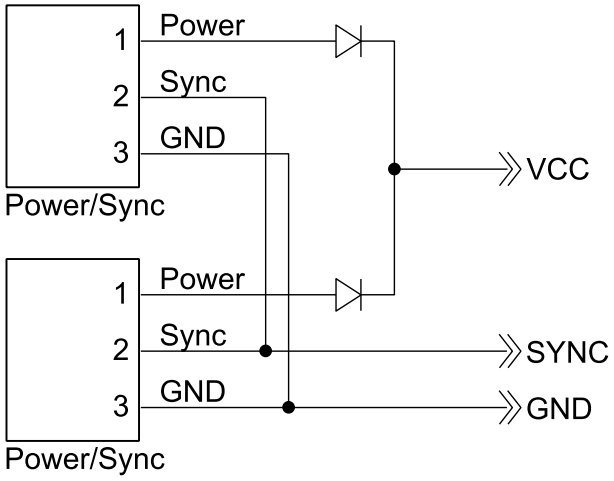


Figure 2: Scheme of Binder connector on the device rear

Alternative supply

Alternatively to the main supply, the VN26xx can be operated from other sources. For this purpose a power supply cable with stripped wires is included in the scope of delivery.

Power/Sync

The pin assignment of the **Power/Sync** connector is as follows:

Pin	Assignment
1	Power supply (voltage)
2	Sync line, 5 V compatible
3	GND, ground of the power supply and of the sync line

2.1.4.2 Sync (Time Synchronization)

Note: Further information on time synchronization can be found in section Time Synchronization on page 31.

2.1.4.3 Ethernet (VN2640)

Connection to the PC

The Ethernet connector is reserved for future use.

2.1.4.4 S/PDIF (Audio)

Digital by optical S/PDIF

The devices of the VN2600 interface family have additional S/PDIF connectors (Toslink) for digital audio input to the MOST bus and digital audio output from the MOST bus. One stereo channel can be provided per connector through the optical S/PDIF connectors. This means that only the MSB and CSB for the left and right channel of the S/PDIF data stream can be routed to/from MOST via connection labels. The LSB and CUV bytes are omitted or transmitted as zeros.

Both sampling frequencies of MOST and S/PDIF can be optionally equalized by two sample rate converters (SRC) to avoid clicks.

The following operation modes are available:

- MOST Timing Slave, S/PDIF Master (SRC off)
- MOST Timing Slave, S/PDIF Slave (SRC on)
- MOST Timing Master, S/PDIF Master (SRC off), MOST clock by quartz with 44.1 kHz or 48 kHz.
- MOST Timing Master, S/PDIF Slave (SRC on), MOST clock by quartz with 44.1 kHz or 48 kHz.
- MOST Timing Master, S/PDIF Slave (SRC off), MOST clock by S/PDIF (only VN2610).

2.1.4.5 USB

Connection to the PC	In order to use the VN26xx MOST Interface, it must be connected to a USB port on the PC using the included USB cable. The device does not burden the PC's electrical power supply since it has to be externally supplied.
USB3.0 Superspeed	The VN26xx can be operated at a USB3.0 Superspeed connector, but the bandwidth is limited to USB3.0 Highspeed.
USB2.0 Highspeed	In order to use the VN26xx, the PC's USB port must be USB2.0 Highspeed compliant to make us of the MOST bandwidth.
USB1.1 Fullspeed	USB1.1 is not supported by the VN26xx MOST Interface. Due to the high data rate of MOST a USB1.1 connection is not sufficient.

2.1.5 Device Connectors (Front)

Front

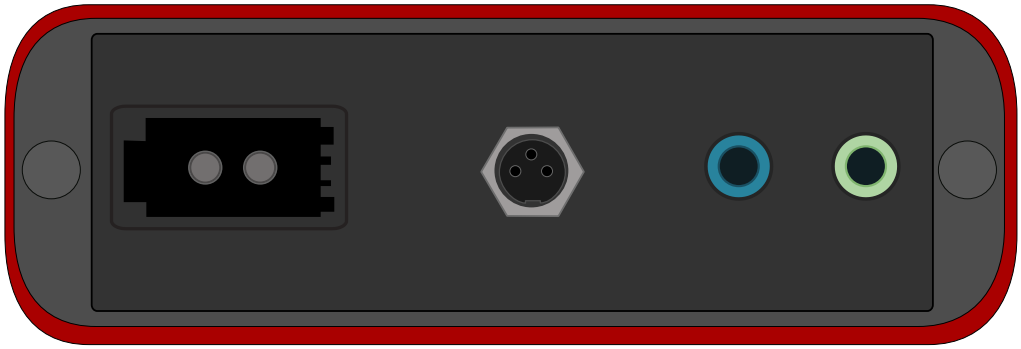


Figure 3: Optic fiber, ECL (only VN2640), and analog audio input/output

2.1.5.1 MOST

Optic fiber

In order to incorporate the VN26xx into an existing MOST network, the fiber optic cable of the MOST ring must be cut through between two nodes and the HFBR connectors attached (not included in the scope of delivery). Then, the Vector MOST fiber optic cable has to be connected with the VN26xx using the included coupling pieces (see accessories manual) and the fiber optic cable of the MOST network.

Example

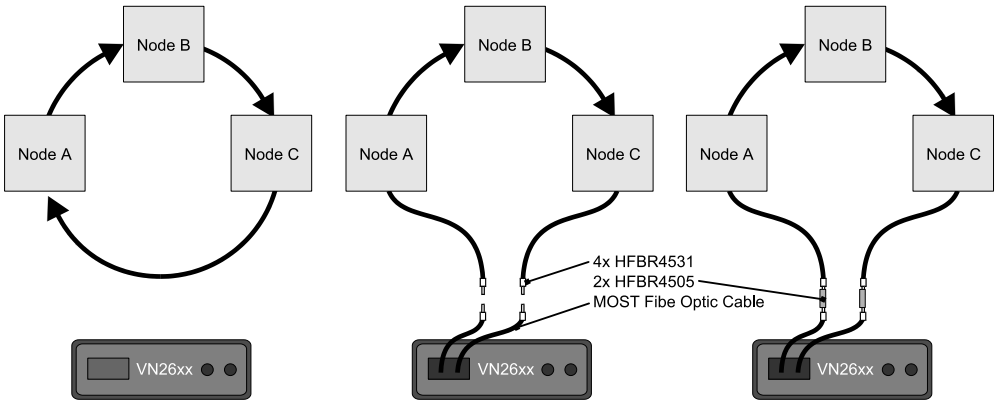


Figure 4: Example of a connection.

The signal direction and the correct connection of light output and light input respectively must be heeded here. The fibers of the MOST fiber optic cable are marked for easier identification (see accessories manual).

Alternative

Alternatively, the MOST 2+0 connector can be connected with a custom fiber optic cable.

Note: For the function test (loop test) described in the installation instructions, the Rx and Tx fibers of the MOST fiber optic cable must be connected to each other using a coupler.

Optical transmitter power

The power of the optical transmitter can be lowered according to the MOST specification from 100% to 50% (-3 dB).

2.1.5.2 Electrical Control Line (ECL)

Description

The VN2640 has an ECL port according to the MOST specification which is used for exchanging wake up and diagnostic information along the MOST ring.

Use the included ECL cable with stripped wires to connect to this port. For further information please refer to the accessories manual included on the Vector Driver CD.

The Vbat voltage has to be externally applied to pin 1 and supplies the ECL pull-ups and the transceiver. This allows testing the ECL in variable voltage scenarios such as engine starts. The voltage of Vbat can be in the range of 0 V … 30 V, but for a proper function it has be in the range of 5.5 V ... 30 V. Vbat is also protected against inverse polarity.

Pin 3 (ECL) is an open collector bus. The internal output driver can drive the bus only to GND. To avoid high currents under faulty conditions it has an internal current limitation to 40 mA. High levels are generated with the internal or additional external pull-up resistors. Inside the VN2640 there are two pull-up resistors between Vbat and ECL. The first resistor with 60 kOhm is permanently connected. The second pull-up with 1.1k Ohm in parallel to the first resistor can be switched on by software. The ECL line is protected against inverse polarity and electromagnetic discharges of 4 kV.

The used transceiver (ATA6664) uses Vbat as reference voltage for its receiver. A save low level is detected if the ECL line is below 40 % of Vbat. A save high level is detected if the ECL line is above 60 % of Vbat. The detected logic state is undefined between 40 % and 60 % of Vbat.

Pin 3 (GND) of the ECL connector is the reference ground for Vbat and ECL.

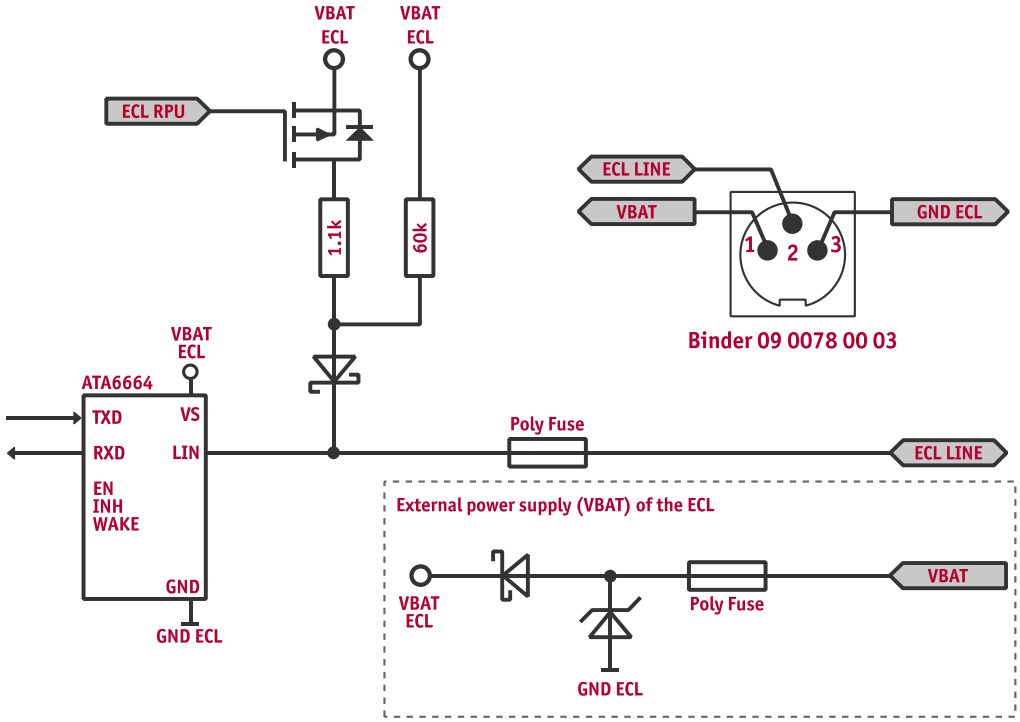


Figure 5: Scheme of the ECL port

2.1.5.3 Line In and Line Out

Analog by Line In and Line Out

The VN26xx offers a line in and line out/headphone connector for input and output of analog audio signals.

Scheme

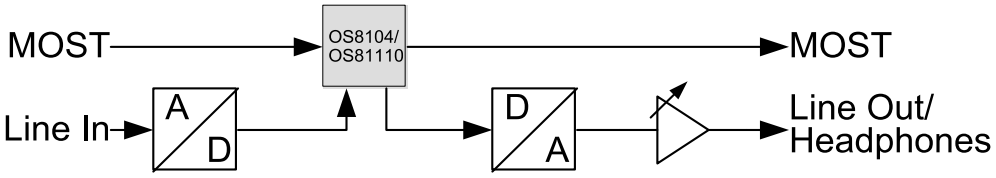


Figure 6: Scheme of line in and line out

Connector signal assignment

The connection of the analog signals to the device is done via two 3.5 mm stereo jacks. The signal assignment is as follows.

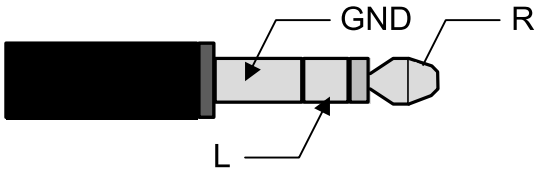


Figure 7: Signal assignment on the stereo jack

Note: Further information on signal routing can be found in the according device description of this manual (VN2610, VN2640).

2.2 VN2610

2.2.1 Main Features

VN2610 features

The main features of the VN2610 MOST Interface are:

- MOST25 interface
- Routing engine for audio
- Sending up to 1400 control messages per second
- Receiving up to 900 control messages per second

2.2.2 Description

Power up

After supplying the power, the VN2610 immediately switches into **bypass mode**. The power of the optical transmitter building block (FOT) is set to 100% (0 dB). This state is maintained until the application sets another configuration. The status LEDs always display the current state of the device and of the ring network (lock/unlock).

Node and spy position

The VN2610 supports the simultaneous operation of the **node mode** (**master** or **slave**) and the **spy mode** for all messages and packets transmitted on the MOST bus. The control spy follows the transmitting node of the VN2610.

Example

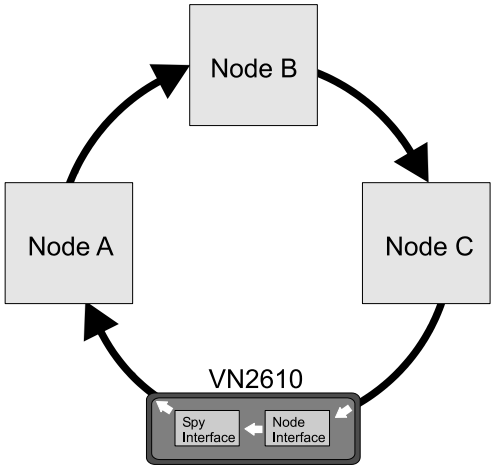


Figure 8: Example for spy/node application

2.2.3 Details

OS8104

The used MOST network controller is an OS8104, which guarantees full compatibility to existing MOST systems. The device can be used as a **timing master, timing slave** or in **bypass operation**. Parallel to each of these three modes, all control messages and asynchronous packets can be recorded online via a suitable application (e. g. CANoe) without influencing the MOST bus using the **spy function**. In **master mode**, a frame frequency of 44.1 kHz or 48 kHz can be set.

Amount of control messages

If the device is a visible node in **master** or **slave mode** in the MOST network, up to 1400 control messages per second can be received and up to 900 control messages per second can be transmitted. The usable bandwidth is shared between transmission and receiving. The bandwidth is determined by the OS8104.

Packet length

Asynchronous packets like control messages can only be transmitted in **master** and **slave mode**. Receiving is also possible in **bypass mode** and always provides all packets to the application which are transmitted via MOST. Transmission and receiving are supported with packet lengths up to 1014 data bytes (1024 bytes packet length) at full bandwidth (1.45 MB/s).

Synchronous channels

Multi-channel synchronous data streams can be analyzed with or without time stamps; test signals for synchronous channels in the PC can also be generated via USB. This allows for example:

- Logging of the complete MOST data communication for offline analysis and error logging for suppliers
- Test of transfer functions of digital-analog or analog-digital converters
- Implementation of optimized flash algorithms with full bandwidth in production (1...60 bytes)
- ECU diagnostics via hidden communication in idle synchronous channels
- Implementation and test of DTCP algorithms with the PC
- Creation of test signals of any complexity

2.2.4 Audio

S/PDIF synchronization

It is possible to synchronize the S/PDIF output to the S/PDIF input to avoid synchronization errors in special cases. Synchronization errors occur when neither the S/PDIF source nor the S/PDIF drain or both at the same time synchronize to their inputs.

For the following standard cases the synchronization is automatically set. In other cases the activation and deactivation of synchronization respectively is done by the user in the application.

Audio analysis and audio stimulation as MOST slave

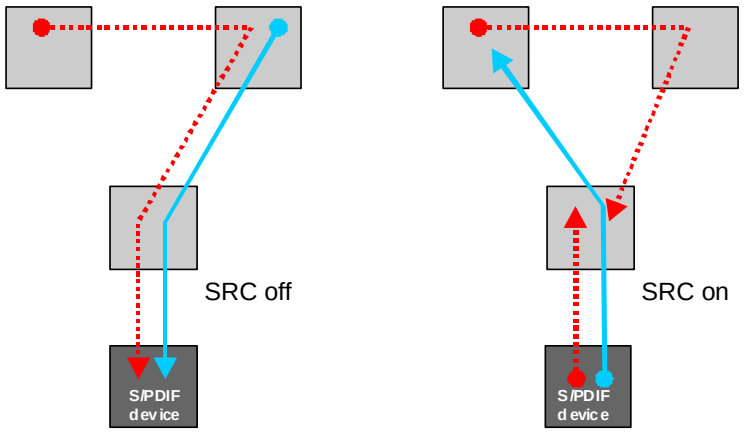


Figure 9: Left: audio analysis as MOST slave, right: the audio stimulation as MOST slave with not synchronized source

Audio analysis and audio stimulation as MOST master

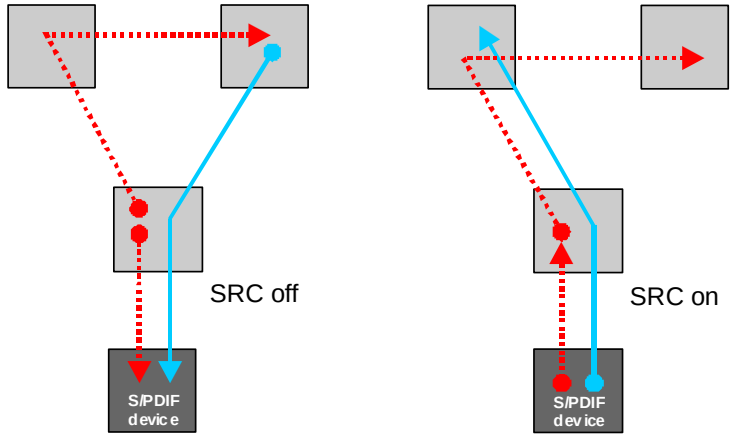


Figure 10: Left: audio analysis as MOST master (44.1 kHz/48 kHz), right: audio stimulation as MOST master with fixed frame rate (44.1 kHz/48 kHz) and not synchronized source

Audio stimulation as MOST master with clock from S/PDIF

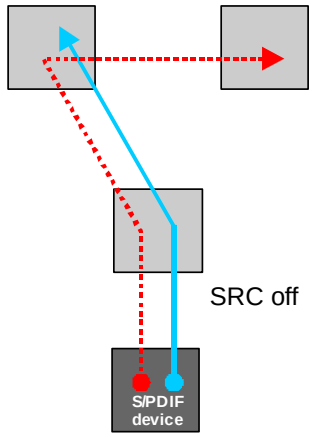
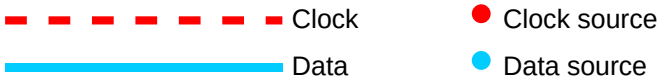


Figure 11: Audio stimulation as MOST master with S/PDIF clock

Legend



Analog by line in and line out

Analog signals fed through the line in are first digitalized and can be routed via the routing engine of the OS8104 on the MOST bus then. Digital audio signals from MOST can also be converted into analog audio signals with adjustable volume, provided on the line out connector. With the built-in amplifier it is also possible to operate headphones (16 Ω, 150 mW) on the line out.

Routing engine OS8104

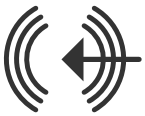
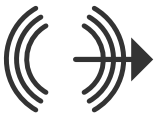
In order to transmit and receive asynchronous packets via the used MOST network controller (OS8104), the controller's routing table must be set to particular values in the range of MRT**0x44** to MRT**0x7F**. This is automatically done by the firmware on power up.

Caution: The range MRT**0x44** to MRT**0x7F** must not be manually edited! A change of these values can interrupt the receiving and transmission of asynchronous packets, and compromises other aspects of the operation of the VN2610!

The routing of synchronous channels via the line in or line out/headphone jacks of the VN2610 is controlled by the routing engine of the MOST network controller. For this purpose the following register values and addresses have to be used:

Line in and line out

Addresses in the routing engine for line in and line out:

Source/Drain	Channel	Byte	Address in routing engine
Line IN 	Left	MSB	MRA0x40
		LSB	MRA0x41
	Right	MSB	MRA0x42
		LSB	MRA0x43
Line OUT 	Left	MSB	MRT0x40
		LSB	MRT0x41
	Right	MSB	MRT0x42
		LSB	MRT0x43

S/PDIF

Addresses in the routing engine for S/PDIF:

Source/Drain	Channel	Byte	Address in routing engine
S/PDIF IN	Left	MSB	MRA0x44
		CSB	MRA0x45
		LSB	MRA0x46
		CUV	MRA0x47
	Right	MSB	MRA0x48
		CSB	MRA0x49
		LSB	MRA0x4A
		CUV	MRA0x4B
S/PDIF OUT	Left	MSB	MRT0x44
		CSB	MRT0x45
		LSB	MRT0x46
		CUV	MRT0x47
	Right	MSB	MRT0x48
		CSB	MRT0x49
		LSB	MRT0x4A
		CUV	MRT0x4B

Abbreviations

MSB = Most Significant Byte
CSB = Center Significant Byte
LSB = Least Significant Byte
CUV (S/PDIF) = Channel Status Data/User Data/Validity

Firmware

Used address range:

Description	Address in routing engine
reserved for firmware	MRT0x4C
reserved for firmware	…
reserved for firmware	MRT0x7F

2.2.5 LEDs

Device state

The VN2610 has five LEDs that indicate the state of the device:

LED	Color	State	Meaning
Lock	Green	OFF	Device is not synchronized to the **master's** clock
Lock	Green	ON	Device is synchronized with the **master**
Master	Yellow	OFF	Device is either **slave** or **bypass**[1]
Master	Yellow	ON	Device is configured as **master**
Slave	Yellow	OFF	Device is either **master** or **bypass**[1]
Slave	Yellow	ON	Device is configured as **slave**
Rx/Tx	Green	OFF	No packets or messages transmitted
Rx/Tx	Red	(( ))	Packet or message received (Rx)
Rx/Tx	Green	(( ))	Packet or message transmitted (Tx)
Rx/Tx	Orange	(( ))	Packet or message received and transmitted
Power	Green	OFF	Device is not ready for operation
Power	Green	(( ))	Device is initializing
Power	Green	ON	Device is ready for operation

Legend

(( )) Pulse, blinking.

[1] In **bypass** mode, neither the **master** nor the **slave** LED illuminates.

2.2.6 Technical Data

MOST network controller	OS8104
Number of MOST channels	1
Operating modes	Master, slave, spy, bypass
Spy for Control- und asynchronous channel	Can also be activated separately parallel to other modes at any time
Control messages (master / slave)	Up to 985/s (Tx), up to 1453/s (Rx)
Control messages (spy)	Full bandwidth receivable
Asynchronous packets	Packet length up to 1014 bytes Up to 9600 packets/s (Tx), Up to 25000 packets/s (Rx), Up to 1.45 MB/s (Tx and/or Rx)
Synchronous channels	USB: 1..60 byte per frame, Tx and/or Rx, with optional Rx time stamps 1x Line In 1x Line Out/Headphone 1 x S/PDIF optical IN 1 x S/PDIF optical OUT 2 x sample rate converter for S/PDIF
Line in connector	3.5 mm stereo jack
Line out/headphone connector	3.5 mm stereo jack
S/PDIF In Connector	Toslink, optical, 16 bit, stereo
MOST connector	Standard MOST 2+0, Full Physical Compliant Mix401 Infineon
Master frame rates	Fs, 44.1 and 48 kHz
PC interface	USB2.0, USB1.1 (reduced bandwidth)
Temperature range	Operation : -20 °C ... +70 °C Storage : -40 °C … +85 °C
Relative humidity of ambient air	15 %...90 %, non-condensing
Software requirements	Windows 7, (32 bit / 64 bit) Windows 8.1, (32 bit / 64 bit)
Dimensions (LxWxH)	Approx. 140 x 105 x 32 mm
Power supply	Externally (not by USB) Startup : 7 V…50 V, approx. 5 W Operation : 5 V…50 V, approx. 7 W
Time stamp accuracy	1 µs
Input impedance	21.8 kΩ
Input voltage	Max. 2000 mVrms
Output voltage	Max. 4000 mVpp
Output power	150 mW @ 16 Ω
Weight	0.36 kg

2.3 VN2640

2.3.1 Main Features

VN2640 features

The main features of the VN2640 MOST Interface are:

- MOST150 interface
- Vector Spy150-IP-core in the FPGA
- ECL for exchanging wake up and diagnostic information
- Sending up to 800 control messages per second (depending on the driver version)
- Receiving up to 800 control messages per second (depending on the driver version)

2.3.2 Description

Power up

After supplying the power, the VN2640 switches immediately into **bypass mode**. The power of the optical transmitter building block (FOT) is set to 100% (0 dB). This state is maintained until the application sets another configuration. The status LEDs always display the current state of the device and of the ring network (lock/unlock).

The VN2640 will support the configuration of the power up mode with a future driver release. With this feature, the VN2640 can start either in **(static-)master**, **slave** or **bypass mode** to prevent later unlocks when the ring has to be accessed. This is useful when the VN2640 has to be connected to a PC when a ring failed and unlocking would reset the problem.

To set the INIC power up reference frequency to either 44.1 kHz or 48 kHz a switch inside the VN2640 can be used (factory setting 48 kHz). To change the setting, the device must be opened. This setting can be overridden by the application.

Switch for reference frequency

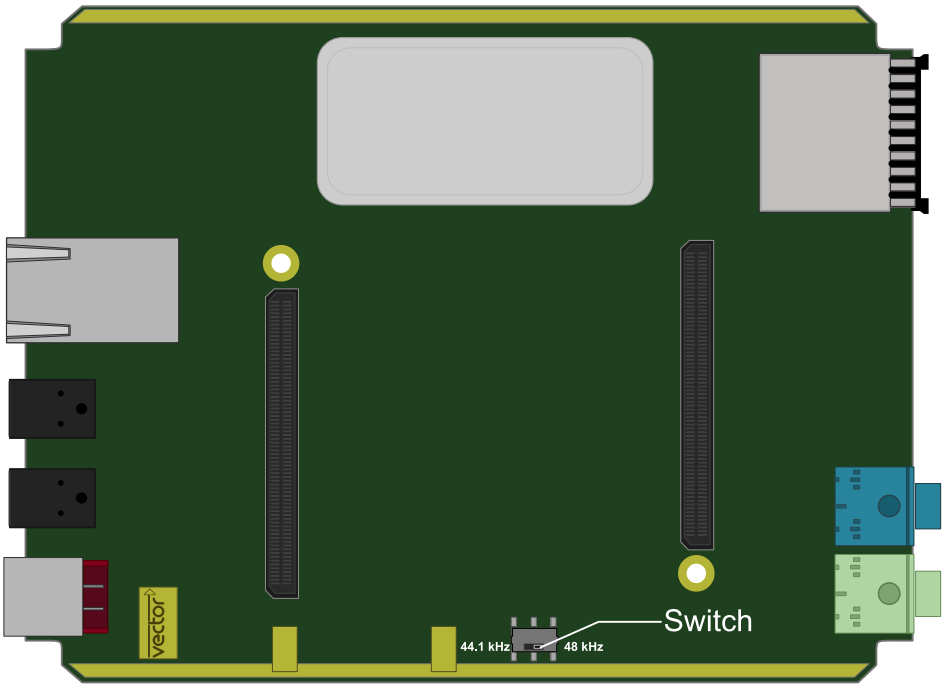


Figure 12: Switching the reference frequency

Node and

The VN2640 supports the simultaneous operation of the **node mode** (**(static-)master**

spy position

or **slave**) and the **spy mode** for all messages and packets transmitted on the MOST bus. The spy follows the transmitting node of the VN2640.

Example

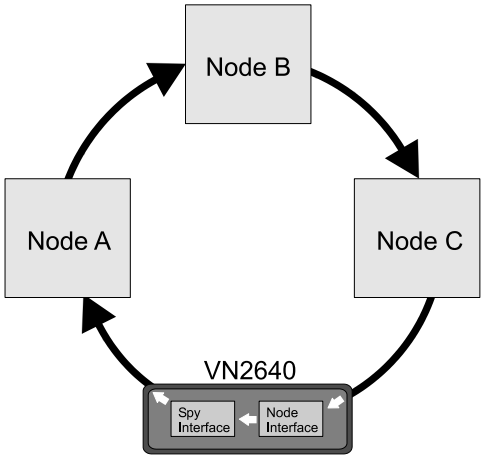


Figure 13: Example for spy/node application

2.3.3 Details

OS81110

The used MOST network controller is an OS81110 INIC, which guarantees full compatibility to existing MOST150 systems. The OS81110 is connected to a low power FPGA via a Vector proprietary MediaLB+® IP-core with the maximum possible bandwidth of 400 Mbps (8192 Fs).

The firmware of the OS81110 INIC is automatically updated by the driver.

Spy

The Vector proprietary Spy150-IP-core in the FPGA decodes and extracts all bits and bytes as well as ring states and statistics for ring analyses. This information is forwarded with low latency and high bandwidth to the PC.

Unlock

An FPGA internal unlock generator accurately destroys two of three preambles in order to cause **unlocks** in following devices without that their PLLs drift apart. In this way precise unlock times can be generated.

Galvanic isolation

USB/analog audio, power, sync, Ethernet, and ECL are all individually and galvanically isolated from each other to prevent high current ground loops especially in cars. Such ground loops can destroy the VN2640, the notebook and the ECUs if the VN2640 and the notebook are supplied at different positions in the car for example. The housing of the VN2640 is connected to the USB/analog audio potential.

Modes and functions

The device can be used as a **timing master**, **timing slave**, as a **static master** or in **bypass operation**. Parallel to each of these modes, all control messages, asynchronous data and Ethernet packets can be recorded online via a suitable application (e. g. CANoe) without influencing the MOST bus using the **spy function**.

In **(static-)master mode**, a frame frequency of 44.1 kHz or 48 kHz can be set.

Amount of control messages

When the device is a visible node in **(static-)master** or **slave mode** in the MOST network, up to 800 control messages per second can be received and transmitted (depending on the driver version). The bandwidth is limited by the OS81110 INIC.

Packet length

Asynchronous data and Ethernet packets can only be transmitted in **(static-)master** and **slave mode**. Receiving is also possible in **bypass mode** which always provides

all packets to the application that are transmitted on the ring. Transmission and reception are supported with packet lengths up to 1524 bytes payload for MOST Data Packets (MDP) and up to 1506 bytes payload for MOST Ethernet Packets (MEP) at a maximum bandwidth limited by USB/INIC.

2.3.4 Audio

Analog by line in and line out

Analog signals fed through the line in are first digitalized and can be routed via connection labels of the OS81110 INIC to the MOST ring. Digital audio signals from MOST can also be converted into analog audio signals with adjustable volume, provided on the line out connector. With the built-in amplifier it is also possible to operate headphones (16 Ω, 150 mW) on the line out. Digital line in and line out signals have a 2 x 16 bit resolution.

2.3.5 LEDs

Device state

The VN2640 has five LEDs that indicate the state of the device:

LED	Color	State	Meaning
Lock	Green	OFF	Device is not synchronized to the **master's** clock
Lock	Green	ON	Device is synchronized with the **master**
Master	Yellow	OFF	Device is either **slave** or **bypass**[1]
Master	Yellow	ON	Device is configured as **master**
Slave	Yellow	OFF	Device is either **master** or **bypass**[1]
Slave	Yellow	ON	Device is configured as **slave**
Rx/Tx	Green	OFF	No packets or messages transmitted
Rx/Tx	Red	(( ))	Packet or message received (Rx)
Rx/Tx	Green	(( ))	Packet or message transmitted (Tx)
Rx/Tx	Orange	(( ))	Packet or message received and transmitted
Power	Green	OFF	Device is not ready for operation
Power	Green	(( ))	Device is initializing
Power	Green	ON	Device is ready for operation

Legend

(( )) Pulse, blinking.
[1] In **bypass** mode, neither the **master** nor the **slave** LED illuminates.

2.3.6 Technical Data

MOST network controller	OS81110 INIC150
Number of MOST channels	1
Operating modes	Master, static master, slave, spy, bypass
Spy for Control- und asynchronous channel	Can also be activated separately parallel to other modes at any time
Control messages (master / slave)	Up to 800/s; limited by INIC (depending on the driver version)
Control messages (spy)	Full bandwidth receivable
Asynchronous data and Ethernet packets (master / slave)	Packet length up to 1524 /1506 payload bytes. Up to 24000 packets/s ; limited by INIC (Tx and/or Rx); (depending on the driver version)
Asynchronous data and Ethernet packets (spy)	Full bandwidth receivable; limited by USB
Synchronous channels	1x Line In 1x Line Out/Headphone 1x S/PDIF optical IN 1x S/PDIF optical OUT 2x sample rate converter for S/PDIF
Line in connector	3.5 mm stereo jack
Line out/headphone connector	3.5 mm stereo jack
S/PDIF In Connector	Toslink, optical, 16 bit, stereo
MOST connector	Standard MOST 2+0, Full Physical Compliant AFBR-1150L / AFBR-2150L Infineon
Master frame rates	Fs, 44.1 and 48 kHz
PC interface	USB2.0 Highspeed USB1.1 not supported Ethernet (currently not supported)
Temperature range	Operation : -40 °C ... +60 °C Storage : -40 °C ... +85 °C
Relative humidity of ambient air	15 %...90 %, non-condensing
Software requirements	Windows 7, (32 bit / 64 bit) Windows 8.1, (32 bit / 64 bit)
Dimensions (LxWxH)	Approx. 140 x 105 x 32 mm
Power supply	Externally (not by USB) Startup : 7 V…50 V, approx. 7 W Operation : 5 V…50 V, approx. 7 W
Port isolation	USB/analog audio connected to housing. Power, sync, Ethernet and ECL are on separately isolated isles.
Time stamp accuracy	1 µs with hardware synchronization
Line in impedance	11.2 kΩ
Line in voltage	Max. 1000 mVp

Line out voltage	Max. 447 mVpp
Line out power	6 W @ 16 Ohm
Weight	0.36 kg
Ethernet*	10/100 Base-TX with Auto-MDIX (crossing det.) support; no device control possible
ECL connector	
Vbat (pin 1)	0 V ... 30 V to GND
Voltage protection	ESD 4 kV
Current limiting	40 mA (polyfuse)
ECL signal (pin 2)	
Transceiver	ATA6664
Pull up resistor	60 kOhm permanent; optional 1.1 kOhm in parallel to Vbat
Voltage protection	ESD 4 kV
Current limiting	40 mA (polyfuse)
High level	0.6 * Vbat ... 30 V (ATA6664)
Low level	0 V … 0.4 * Vbat (ATA6664)
GND (pin 3)	Reference to Vbat and ECL signal

3 VN2600 Accessories

In this chapter you find the following information:

3.1 Accessories

Reference: Further information on the available accessories can be found in the separate accessories manual on the driver CD in `\Documentation\Accessories`.

4 Common Features

In this chapter you find the following information:

4.1 Time Synchronization

4.1.1 General Information

Time stamps and events

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

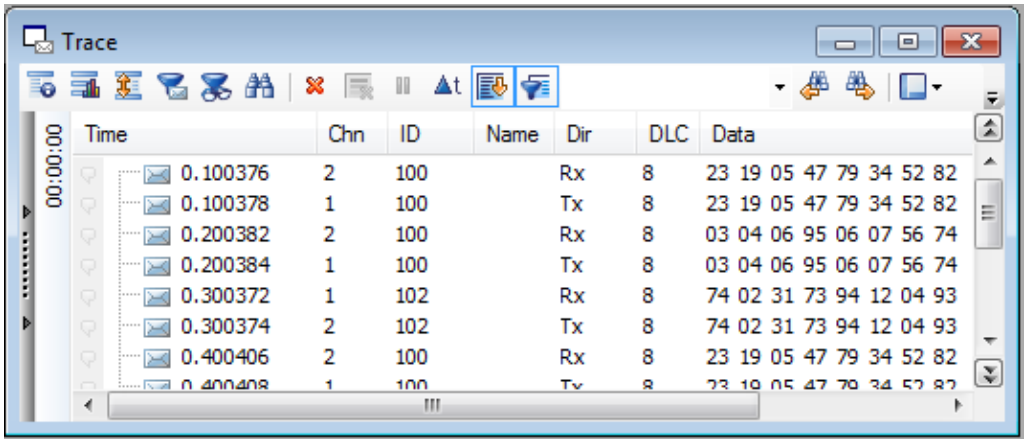


Figure 14: Time stamps of two CAN channels in CANalyzer

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.

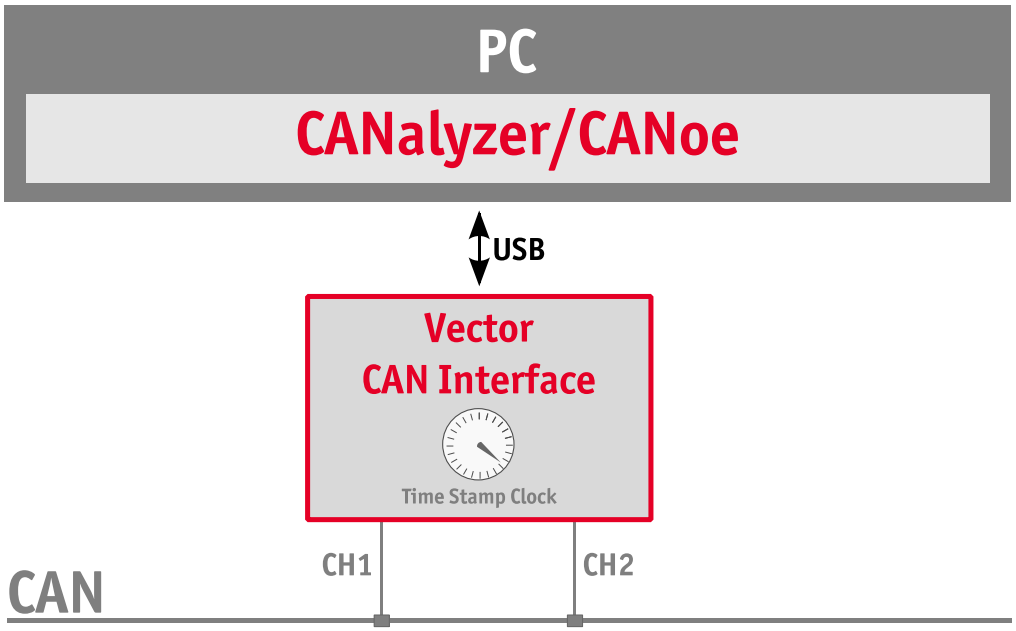


Figure 15: Common time stamp clock for each channel

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.

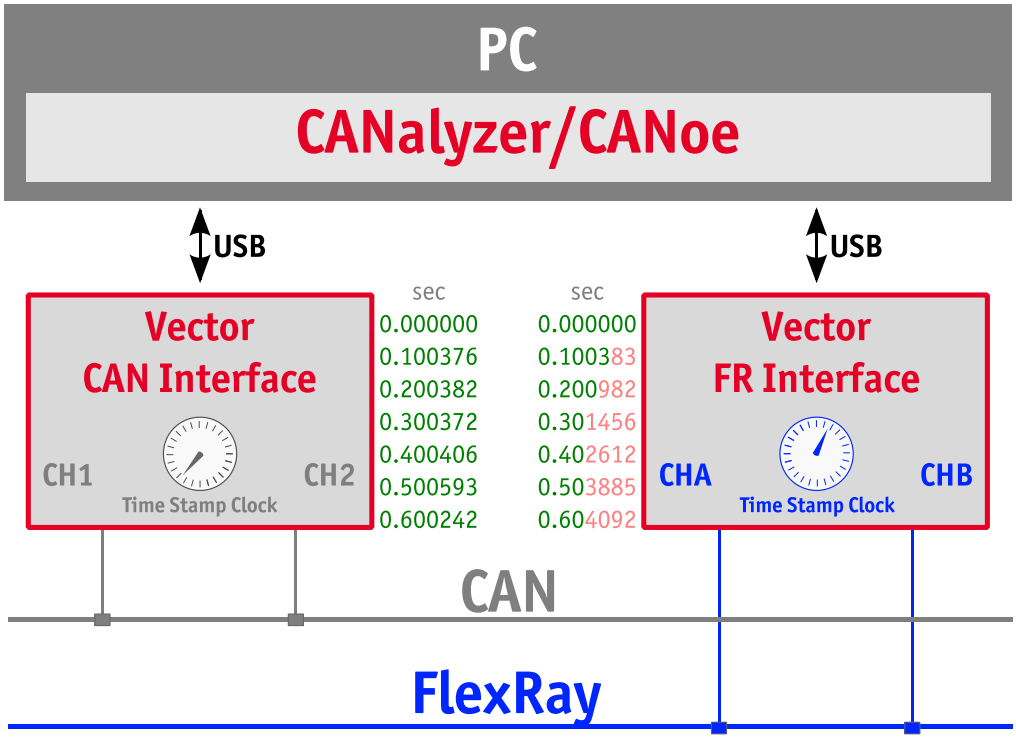


Figure 16: Example of unsynchronized network interfaces. Independent time stamps drift apart

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**.

4.1.2 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.

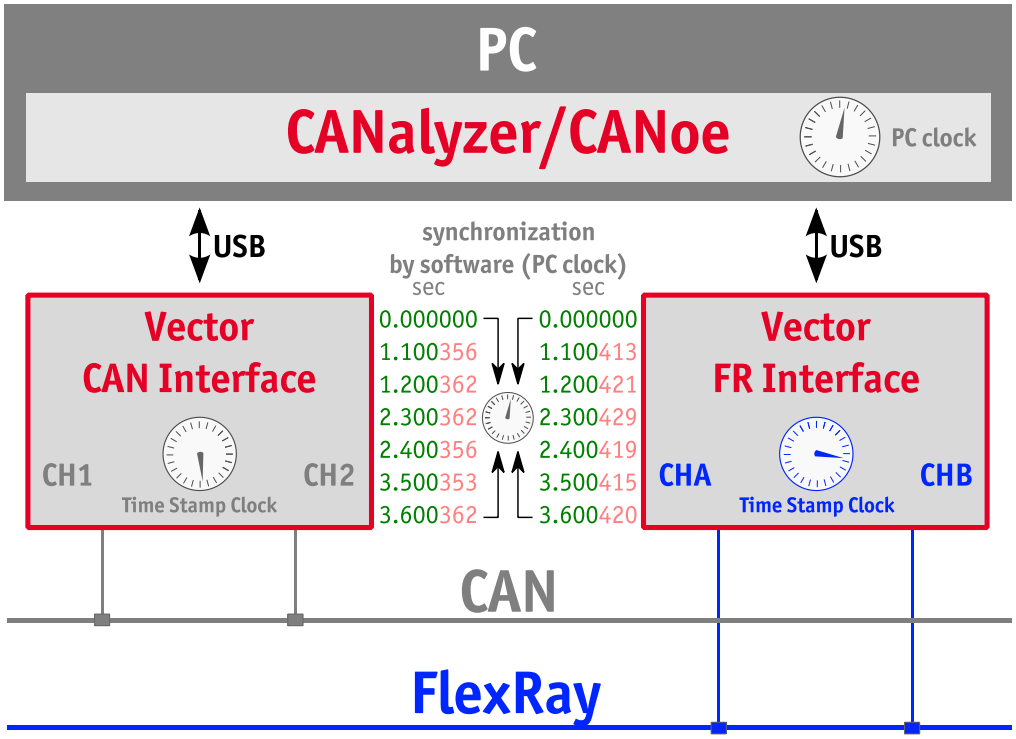


Figure 17: Time stamps of devices are synchronized to the PC clock (accuracy in range of 100 µs)

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

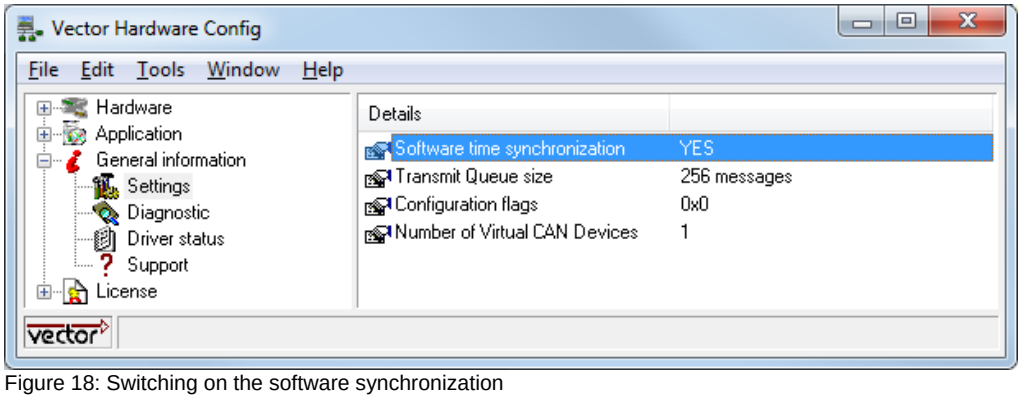


Figure 18: Switching on the software synchronization

> **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.

4.1.3 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, 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).

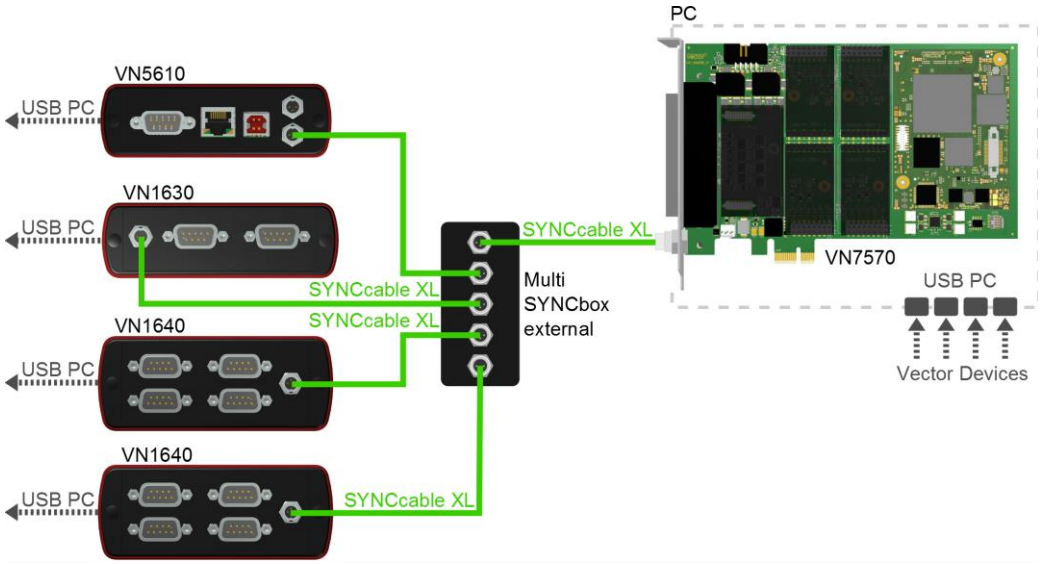


Figure 19: Example of a time synchronization with multiple devices

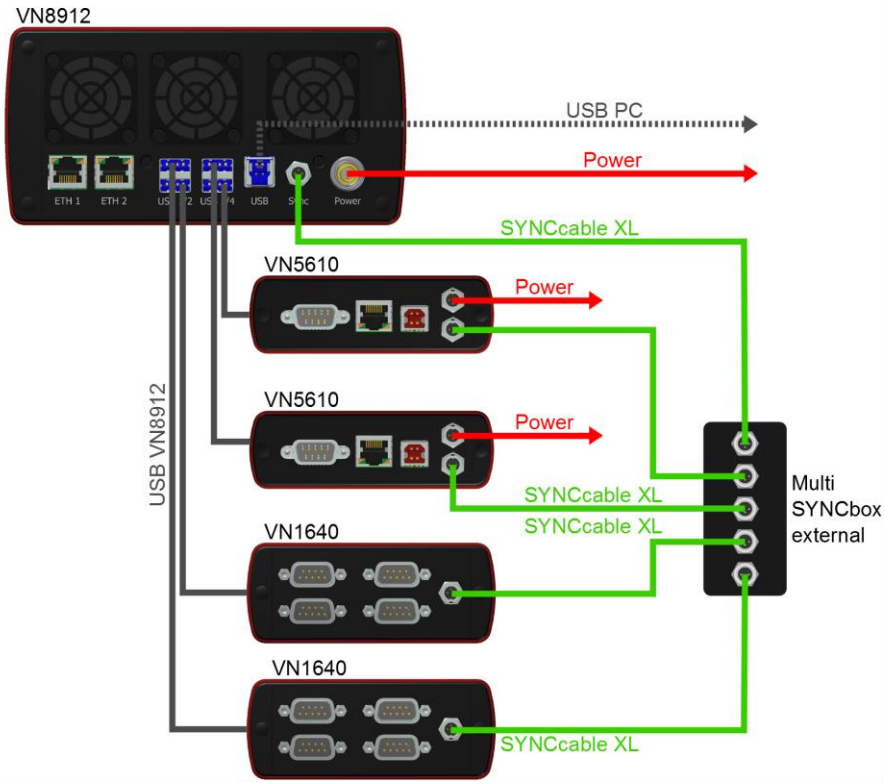


Figure 20: Example of a time synchronization with VN8912 and additional devices

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.

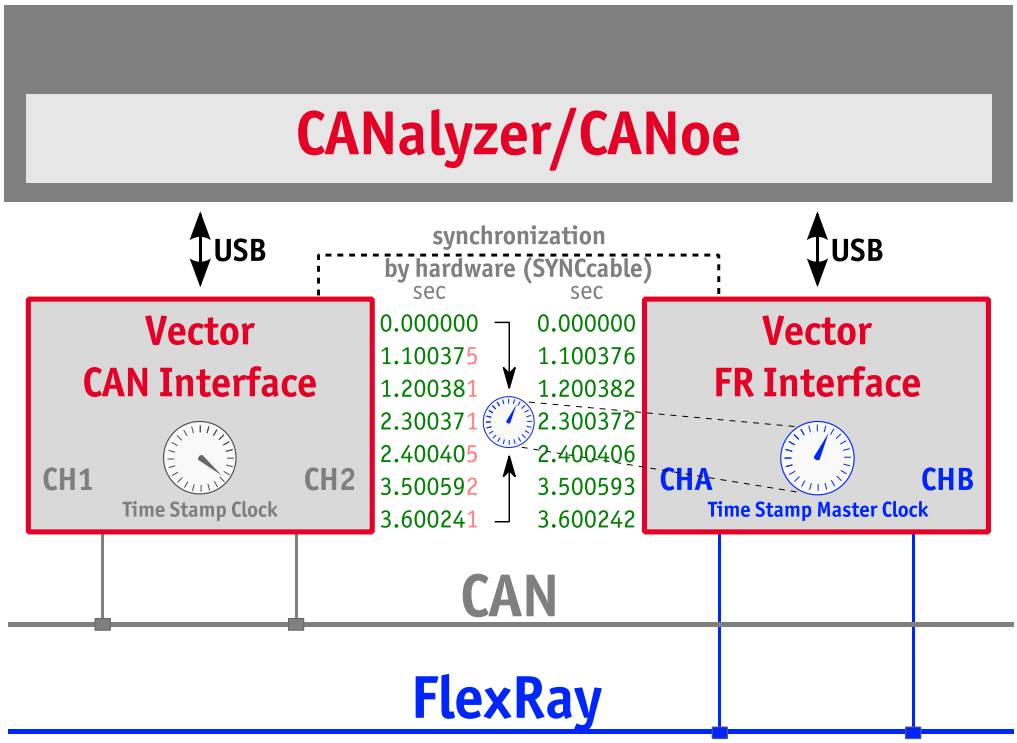


Figure 21: Time stamps are synchronized to the master clock (accuracy in range of 1 µs)

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.

5 Driver Installation

In this chapter you find the following information:

5.1 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 x1 CANboardXL pxi : Compact PCI/PXI CANcaseXL : USB CANcaseXL log : USB VN1610 : USB VN1611 : USB VN1630A : USB VN1640A : USB VN2610 : USB VN2640 : USB VN3300 : PCI VN3600 : USB VN5610 : USB VN7570 : PCI Express x1 VN7572 : PCI Express x1 VN7600 : USB VN7610 : USB VN8910A : USB VN8912 : USB

Software

Operating system	Windows 7 (32/64 bit) Windows 8.1 (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.

5.2 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 8.1 (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.

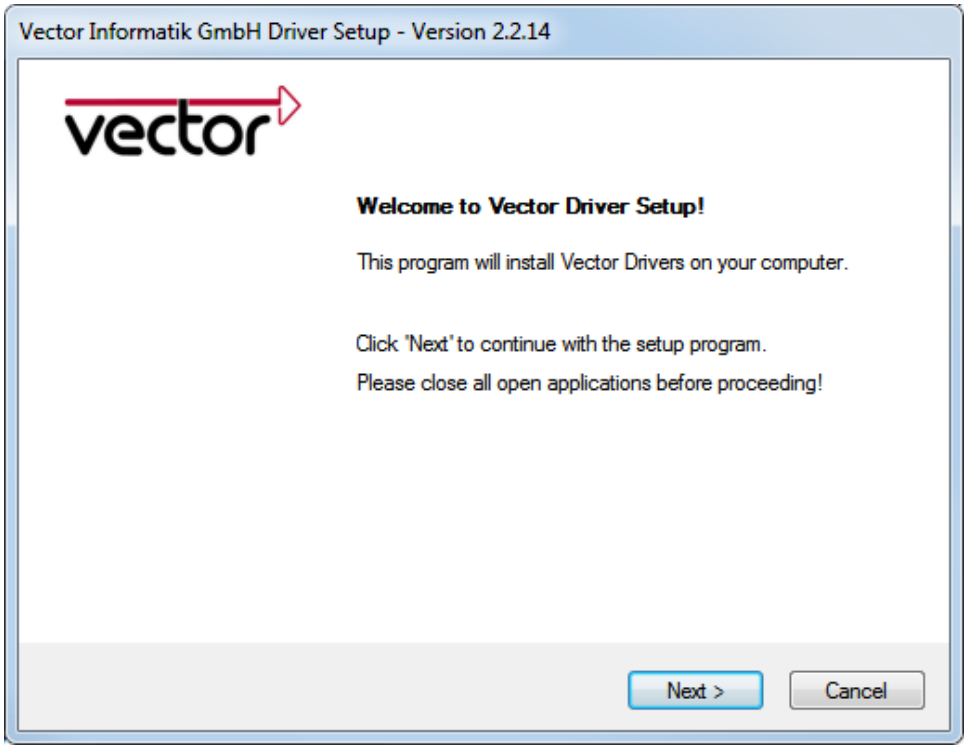
5.3 Vector Driver Setup

General information

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

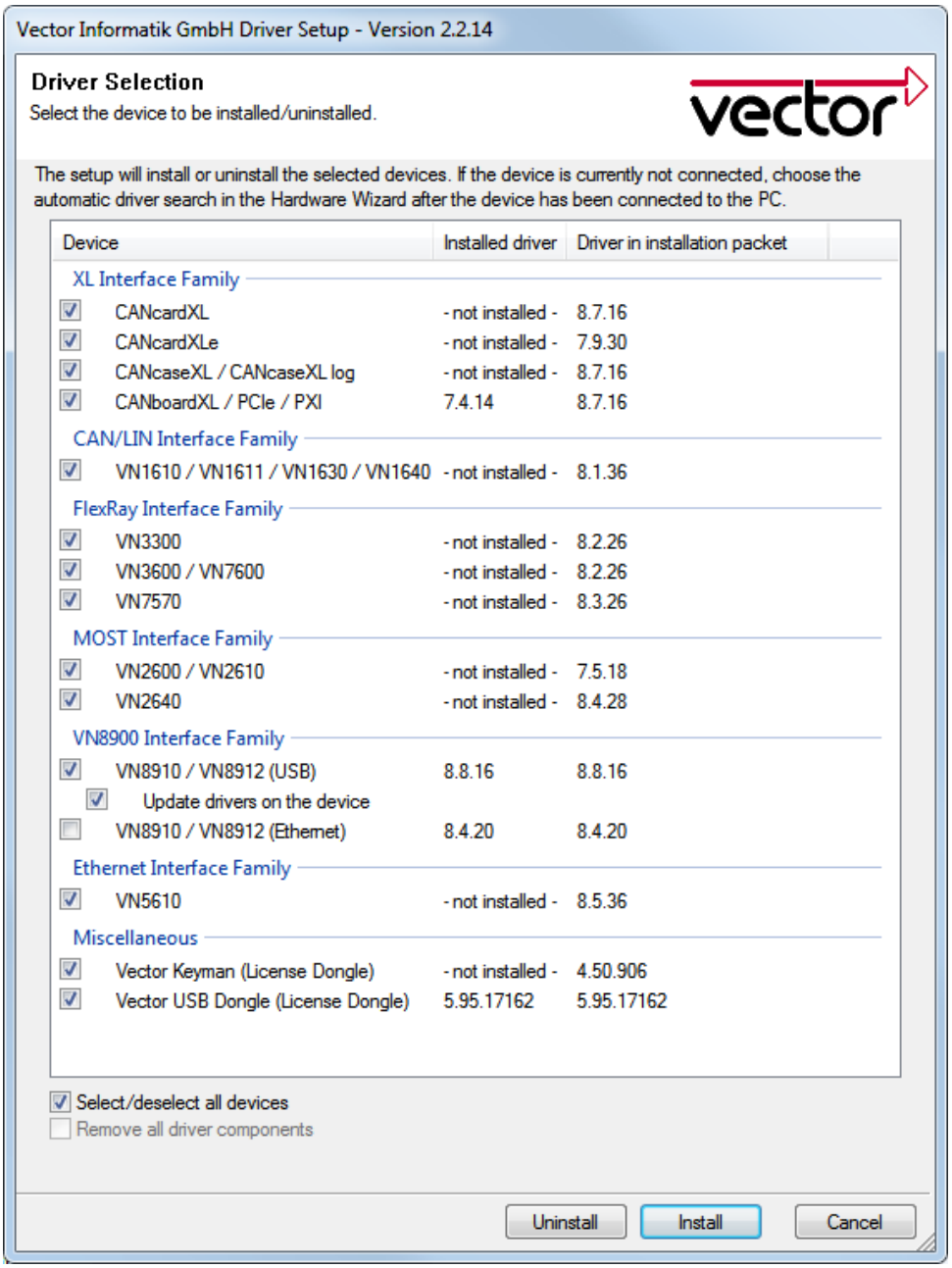
1. Execute the driver setup from the autostart menu or directly from `\Drivers\Setup.exe` before the device is inserted or connected to the PC with the included USB cable.

   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.

5.4 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

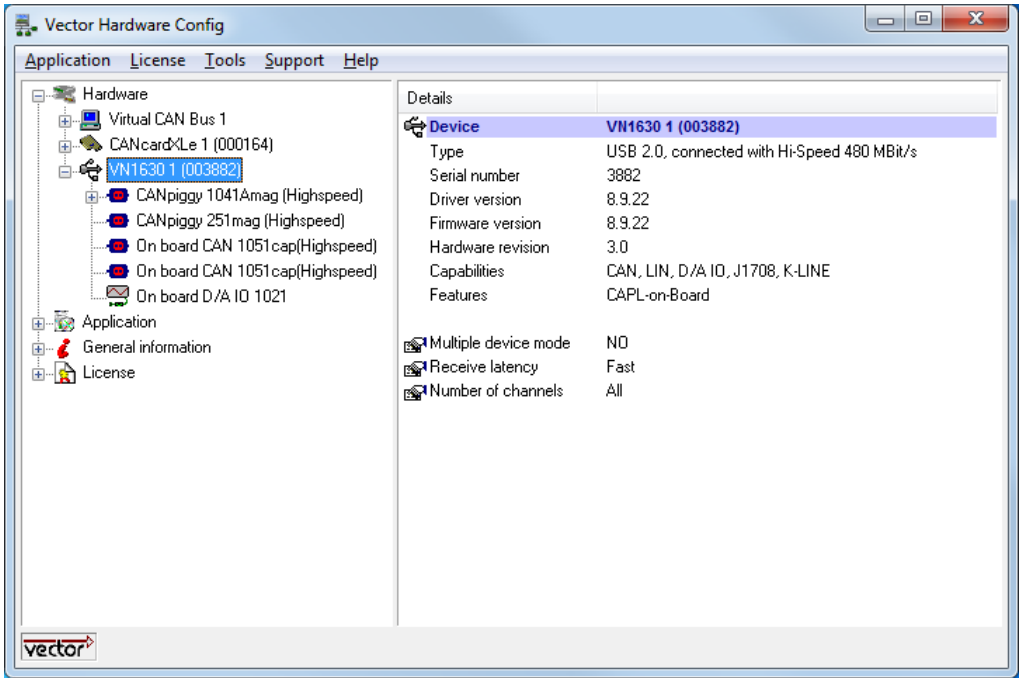
> Category view
Windows Start | Control Panel | Hardware and Sound, click **Vector Hardware** in the list.

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

Control panel Windows 8.1

> 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.



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**).

5.5 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 8.1 and independent of the used application.

5.5.1 CAN

Device test

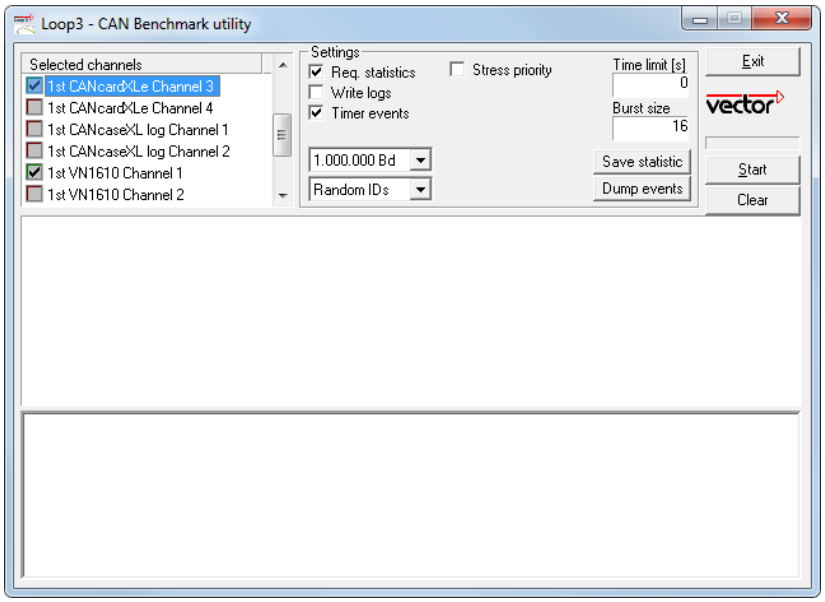
The operating test for CAN can be executed with the following devices:

- CANcardXL
- CANcardXLe
- CANcaseXL
- CANcaseXL log
- CANboardXL Family
- VN1610
- VN1630A
- VN1640A
- VN5610
- VN7570
- VN7572
- VN7600
- VN8910A
- VN8912

Loop3.exe

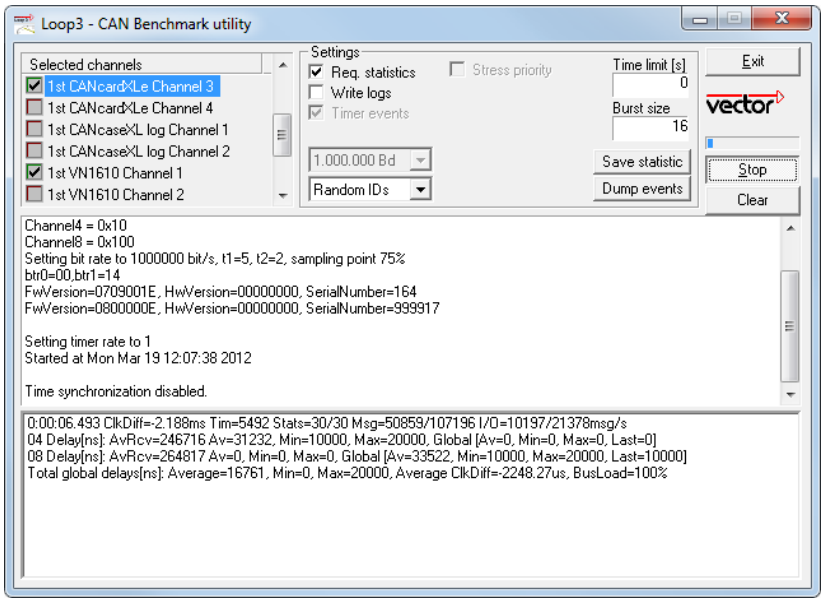
Either two High-Speed or two Low-Speed transceivers are necessary for this functional test:

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).

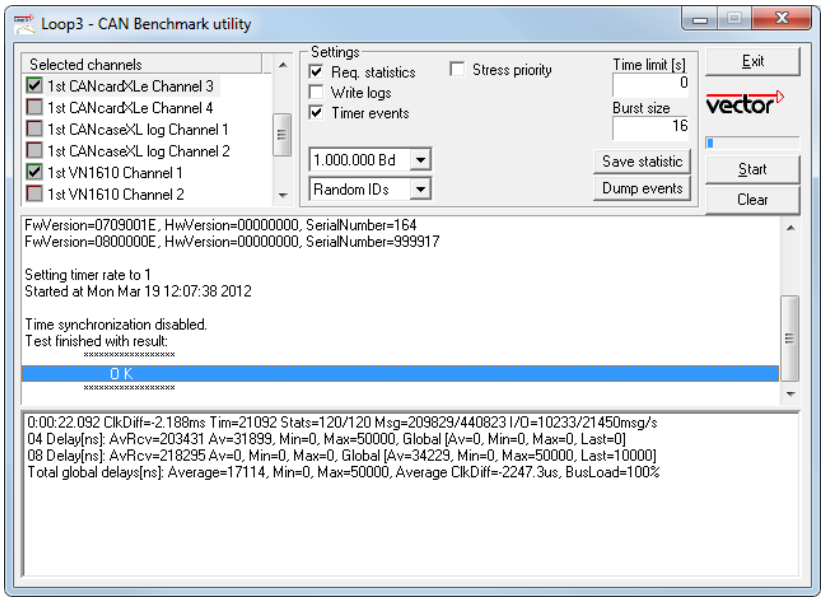


5. Click **[Start]**.
6. You will see statistical data in the lower part of the window if the system has been configured properly.

Loop3 application



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



5.5.2 FlexRay

Device test

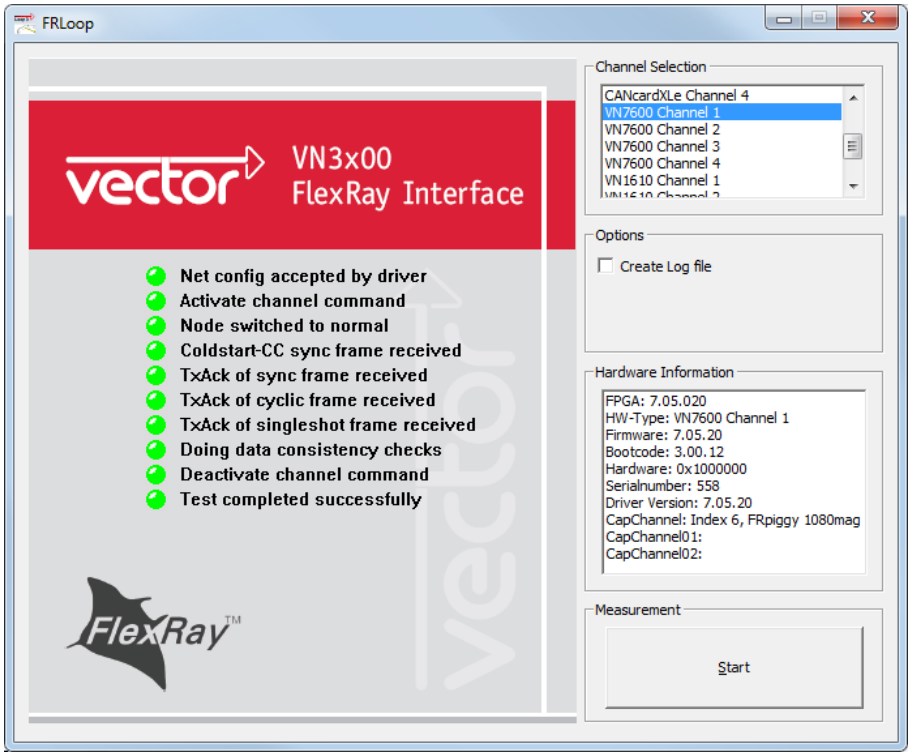
The operating test for FlexRay can be executed with the following devices:

- VN3300
- VN3600
- VN7570
- VN7572
- VN7600
- VN7610
- VN8910A with VN8970
- VN8912 with VN8970/VN8972

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.



5.5.3 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]**.

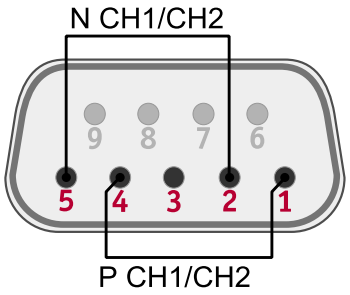
5.5.4 Ethernet

Device test

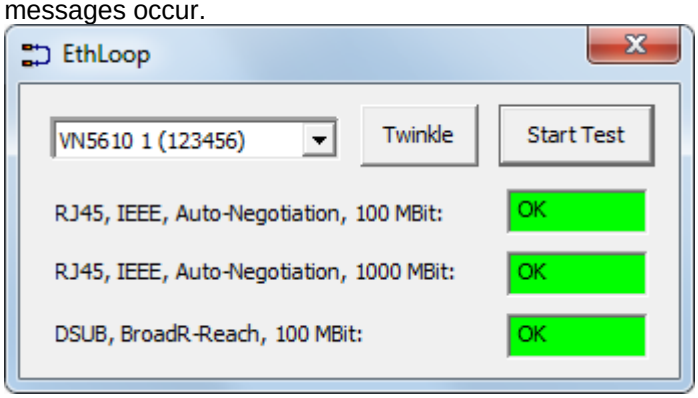
The operating test for Ethernet can be executed with the following devices:

> 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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