VECTOR

VN5000
Ethernet Interface Family
Manual

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1 Introduction

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1.1 About this User Manual

Conventions

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

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

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

1.1.1 Warranty

Restriction of warranty

We reserve the right to modify the contents of the documentation or the software without notice. Vector disclaims all liabilities for the completeness or correctness of the contents and for damage which may result from the use of this documentation.

1.1.2 Registered Trademarks

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> Windows, Windows 7, Windows 8.1, Windows 10, Windows 11 are trademarks of the Microsoft Corporation.

1.2 Important Notes



WARNING!

We provide our important notes and safety instructions in several languages, including Englisch (EN) and German (DE). For more details, see the relevant section:

- EN: Important Notes - Details
- DE: Wichtige Hinweise

2 General Information

In this chapter you find the following information:

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2.1 Examples of Usage

2.1.1 Transparent Ethernet Monitoring

Monitoring

The VN5000 network interface can be used for Ethernet monitoring between an ECU and a connected sensor without influencing the Ethernet bus (Test Access Point). In this particular setup the VN5000 network interface receives and forwards incoming data packages transparently from one port to the other. The VN5000 network interface offers up to six TAP (Test Access Point) paths which can be used in parallel.

Setup

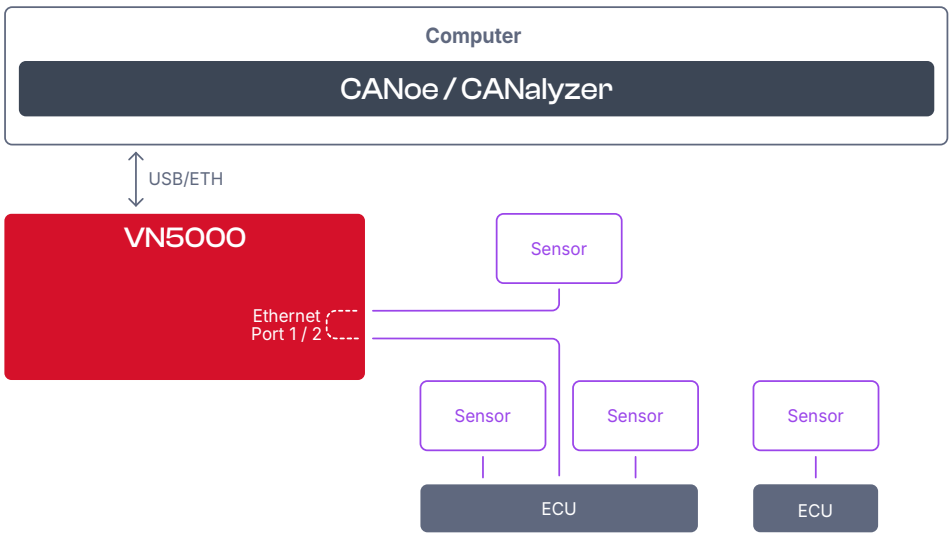


Figure 1: TAP Ethernet data

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

VN5610A

Physical Layer	Bypassing Latency Δt
100BASE-T1<>100BASE-T1	8.1 µs
1000BASE-T<>1000BASE-T	1.6 µs

VN5611

Physical Layer	Bypassing Latency Δt
100BASE-T1<>100BASE-T1	10.9 µs
1000BASE-T1<>1000BASE-T1	6.4 µs

VN5612

Physical Layer	Bypassing Latency Δt
1000BASE-T <>1000BASE-T	1.6 µs

VN5430

Physical Layer	Bypassing Latency Δt
100BASE-T1<>100BASE-T1	8.3 µs
1000BASE-T1<>1000BASE-T1	5.7 µs

VN5620

Physical Layer	Bypassing Latency Δt
100BASE-T1<>100BASE-T1	8.3 µs
1000BASE-T1<>1000BASE-T1	5.7 µs
1000BASE-T <>1000BASE-T	1.6 µs

VN5640

Physical Layer	Bypassing Latency Δt
100BASE-T1<>100BASE-T1	7.7 µs
1000BASE-T1<>1000BASE-T1	6.6 µs
1000BASE-T<>1000BASE-T	2.3 µs

VN5650/VN5240

Physical Layer	PHY	Port	Latency Δt
100BASE-T1<>100BASE-T1	BCM89883	1...12	12.2 µs
1000BASE-T1<>1000BASE-T1	BCM89883	1...12	7.7 µs
1000BASE-T<>1000BASE-T	BCM54210	13/14	11.5 µs
1000BASE-T<>1000BASE-T	BCM84891	15/16	8.5 µs

Note

The latency values depend on PHY characteristics, used MII interface and VN5000 specific TAP handling.

Note

For a network tap, you have to connect the VN5000 interface between the ECUs. In the event of a fault or when the VN5000 is switched off, the network connection between the ECUs will be interrupted. This can lead to malpractice of the vehicle. The feature **Physical Bypass Relay** of VN5650/VN5240 (see according sections) solves this potential problem.

Time stamp clock for Ethernet and CAN

The VN5000 network interface uses a common time stamp clock for Ethernet and CAN events. So if the measurement setup is extended by a CAN network, the generated CAN time stamps are always in sync with the Ethernet time stamps which helps analyzing the network.

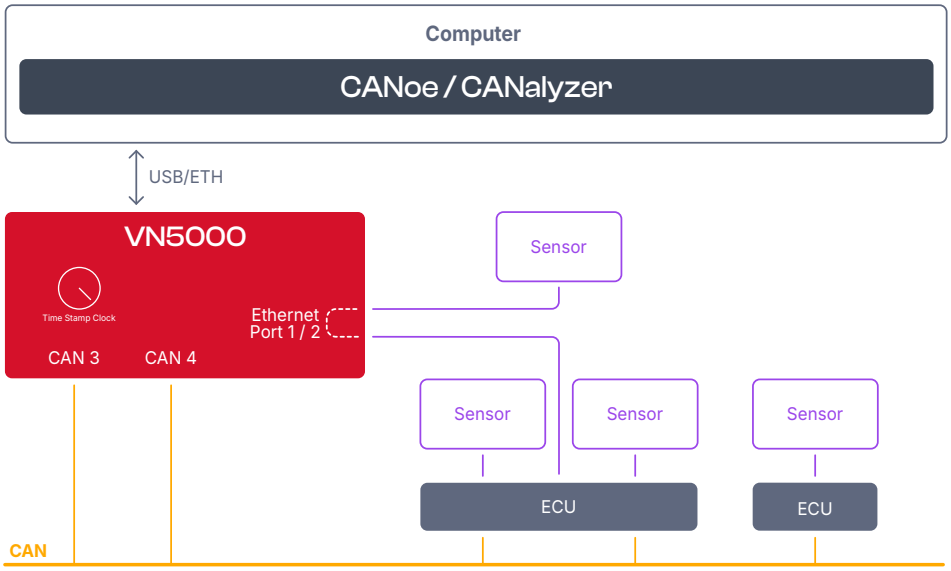


Figure 2: Extended measuring setup

Note

Additional Vector network interfaces can be synchronized by software, hardware or IEEE 1588 (see section Time Synchronization on page 349).

2.1.2 Remaining Bus Simulation

Developing networks

The VN5000 network interface is able to send and receive data packages on separate Ethernet ports as well as events on two separate CAN channels. With this, the VN5000 network interface is a perfect choice for the remaining bus simulation during the development of complex networks.

Setup

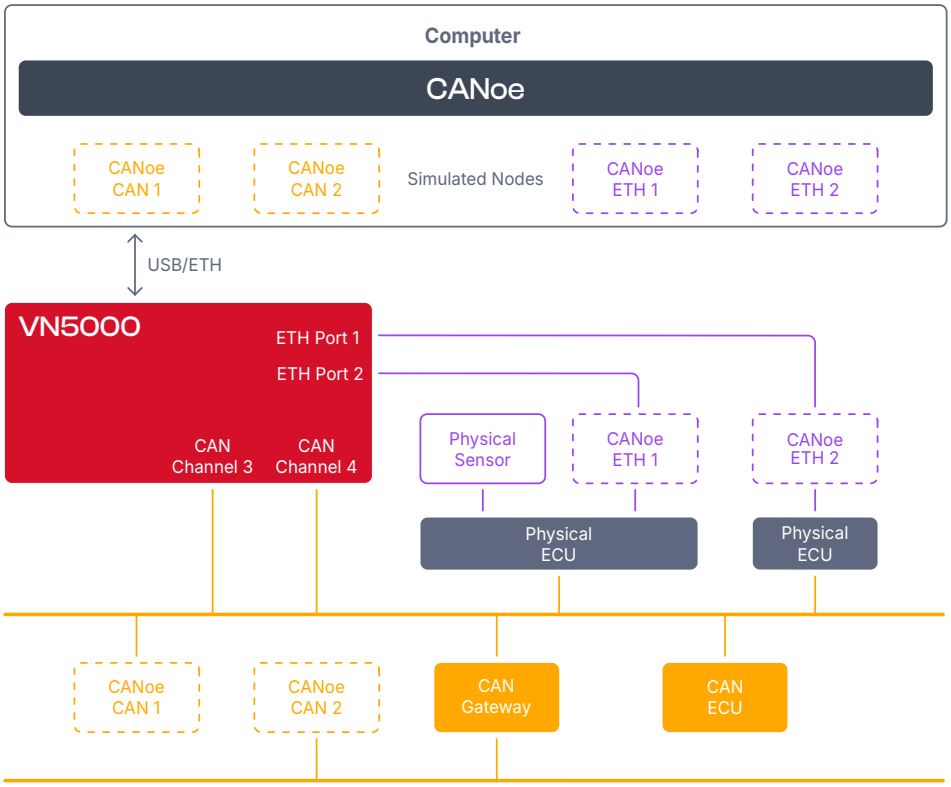


Figure 3: Simulated nodes

Note

For the remaining bus simulation CANoe.Ethernet is required.

2.1.3 Standalone Media Converter

Physical layer conversion

The Ethernet ports of the VN5000 network interface can be configured independently. That way the VN5000 network interface can be used as a media converter between an ECU using the 100BASE-T1/1000BASE-T1 Ethernet standard and any standard Ethernet equipment (e. g. loggers) using 100BASE-TX/1000BASE-T. The VN5000 network interfaces offer up to four media converters which can be used independently.

Setup

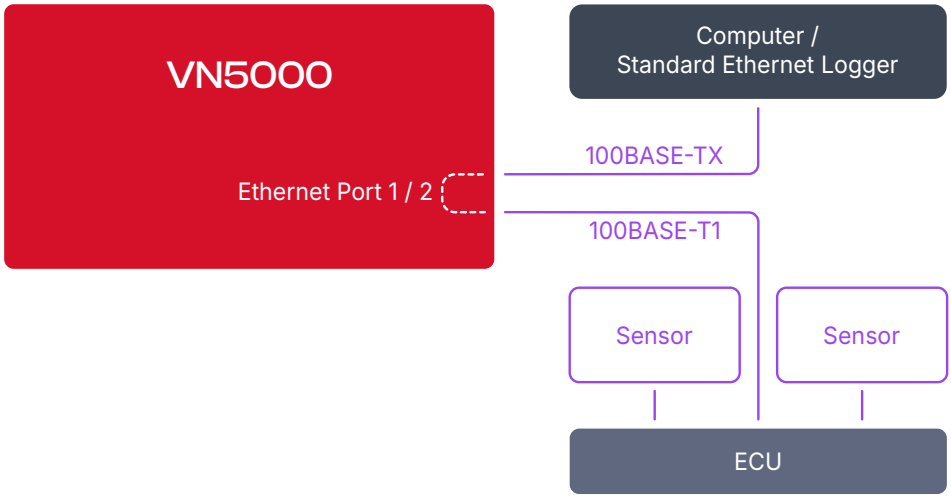


Figure 4: Media converter

Media converter

Device	Count
VN5610(A)	1
VN5620	2
VN5430	1
VN5640	4
VN5240	3
VN5650	4

2.1.4 Diagnostics over IP

DoIP activation line

For diagnostics over IP, the VN5000 network interface supports, beside the necessary 100BASE-TX port, an digital IO channel which has a DoIP activation line according to the ISO specification (ISO DIS 13400-3). The activation level can be set by the VN5000 network interface to switch the ECU to diagnostic mode.

Setup

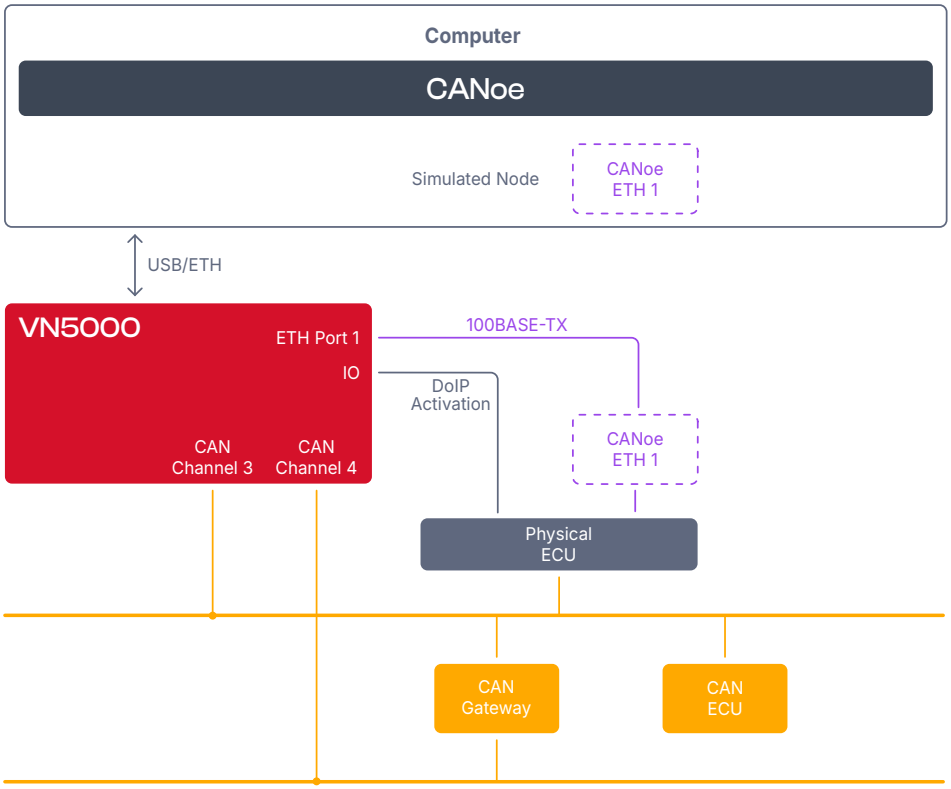


Figure 5: Simulated nodes

2.1.5 Port Mirroring

Reference

You can find a list of supported devices in the Vector Hardware Manager help.

Description

The VN5000 network interface supports mirroring of incoming packets of selected source port to a specific target port. For example, this mirroring feature can be used to attach an Ethernet logger to the target port. Additionally, the outgoing logging traffic can be reduced by setting protocol filters.

Setup

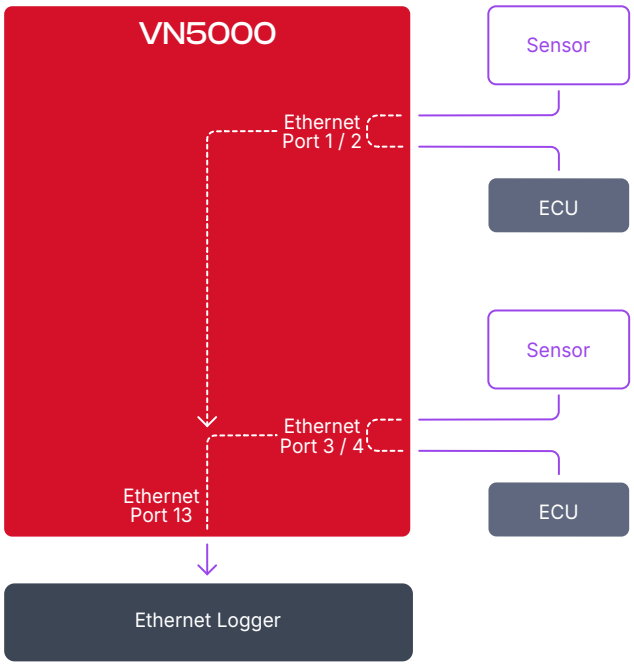


Figure 6: Ethernet port 13 configured as target, port 1...4 as source

Note

The configuration is done in the Vector Hardware Manager.

Note

In addition to the raw frame mirroring port, the VN5650 and VN5240 also offer an advanced mirroring port that forwards the data to the logging computer using CMP.

2.1.6 USB Adapter/Connection of Sub Devices

Description

For easy connection and use of further Vector hardware (e. g. VN5430, VX1135, ...), the USB adapter function can be activated on the CASC port of the following devices:

- VN5601
- VN5601A
- VN5620
- VN5620A

This allows devices to be easily connected as an extension and used with perfect synchronization to the first device.

Setup

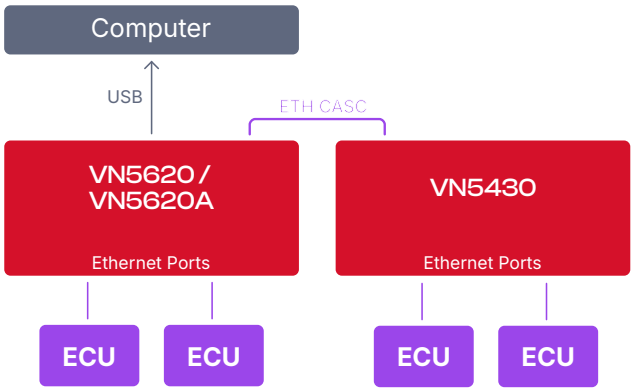
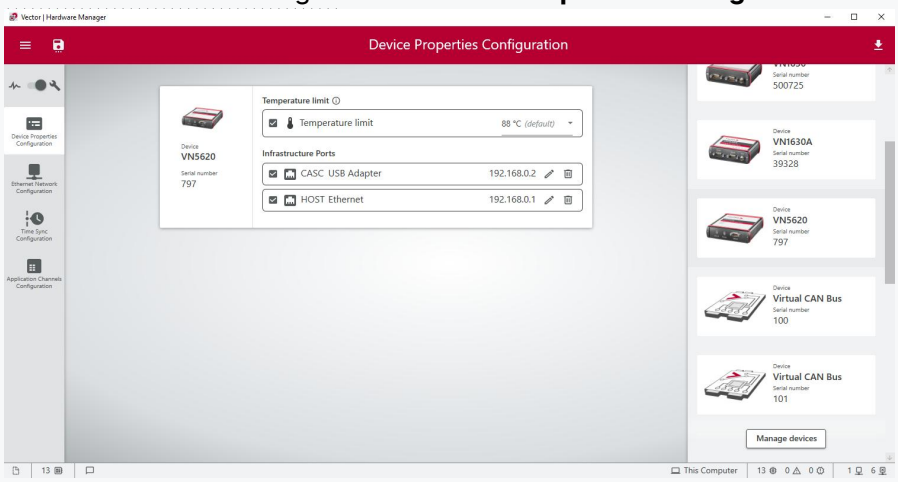


Figure 7: Example of sub device connection

Note

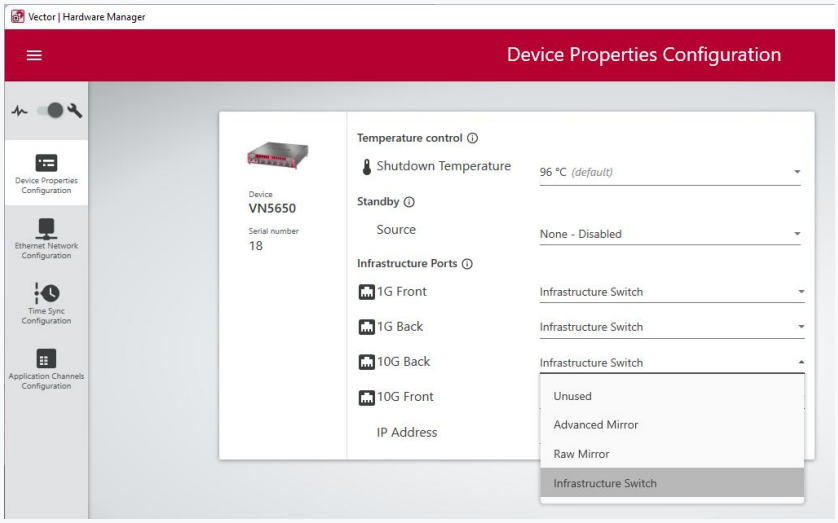
Please note that this function is only supported on the VN5620 and VN5601. Please note further that this function can only be activated via the Vector Hardware Manager in the **Device Properties Configuration**.



2.1.7 Infrastructure Switch /Connection of Sub Devices

Note

This feature is only supported on the VN5240/VN5650 and must be enabled via the Vector Hardware Manager in the **Device Properties Configuration**.



Description

For easy connection and use of other Vector devices (e. g. VN5240, VN1670, ...), the infrastructure switch can be activated on the four fix RJ45 ports. This makes it easy to connect devices to the computer via a single Ethernet cable. The infrastructure switch implements a PTP transparent clock. Therefore the synchronization of all devices via PTP is optimally supported.

Setup

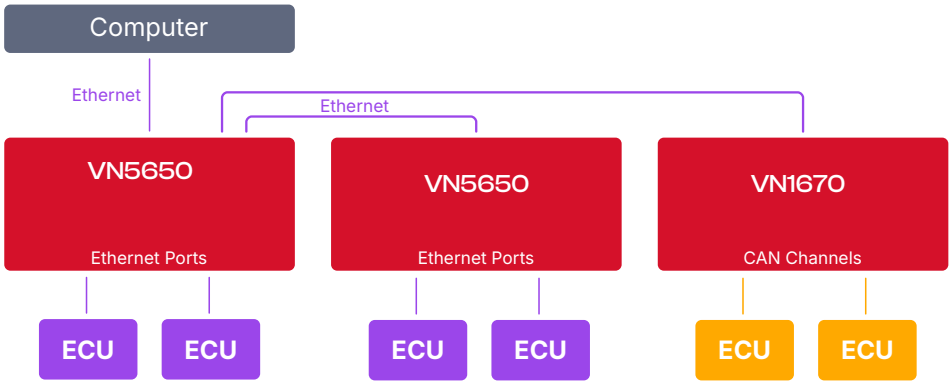


Figure 8: A second VN5650 and a VN1670 as an extension

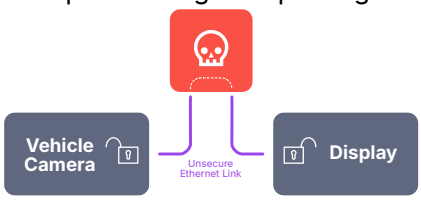
2.1.8 Media Access Control Security (MACsec)

2.1.8.1 General Information

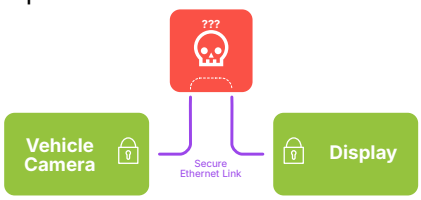
Use cases

Media Access Control Security (MACsec) provides point-to-point security for Ethernet connections and is defined in the IEEE 802.1AE standard. MACsec is useful, for example, in preventing man-in-the-middle attacks between ECUs:

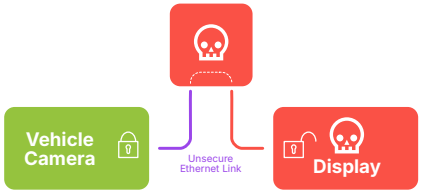
> **Eavesdropping**
An unknown (malicious) participant attaches between two existing nodes to capture or log data packages. Unsecured data can be read.



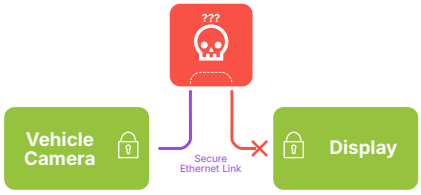
With MACsec enabled, the data cannot be read by the unknown participant.



> **Modifying Data Packages**
An unknown participant attaches between two existing nodes to modify received data or to transmit other. Even if one node has MACsec enabled, the intruder could transmit data via the unsecured data link.



However, unsecured data will be blocked if MACsec is enabled on all nodes and the link is secure (integrity protection).



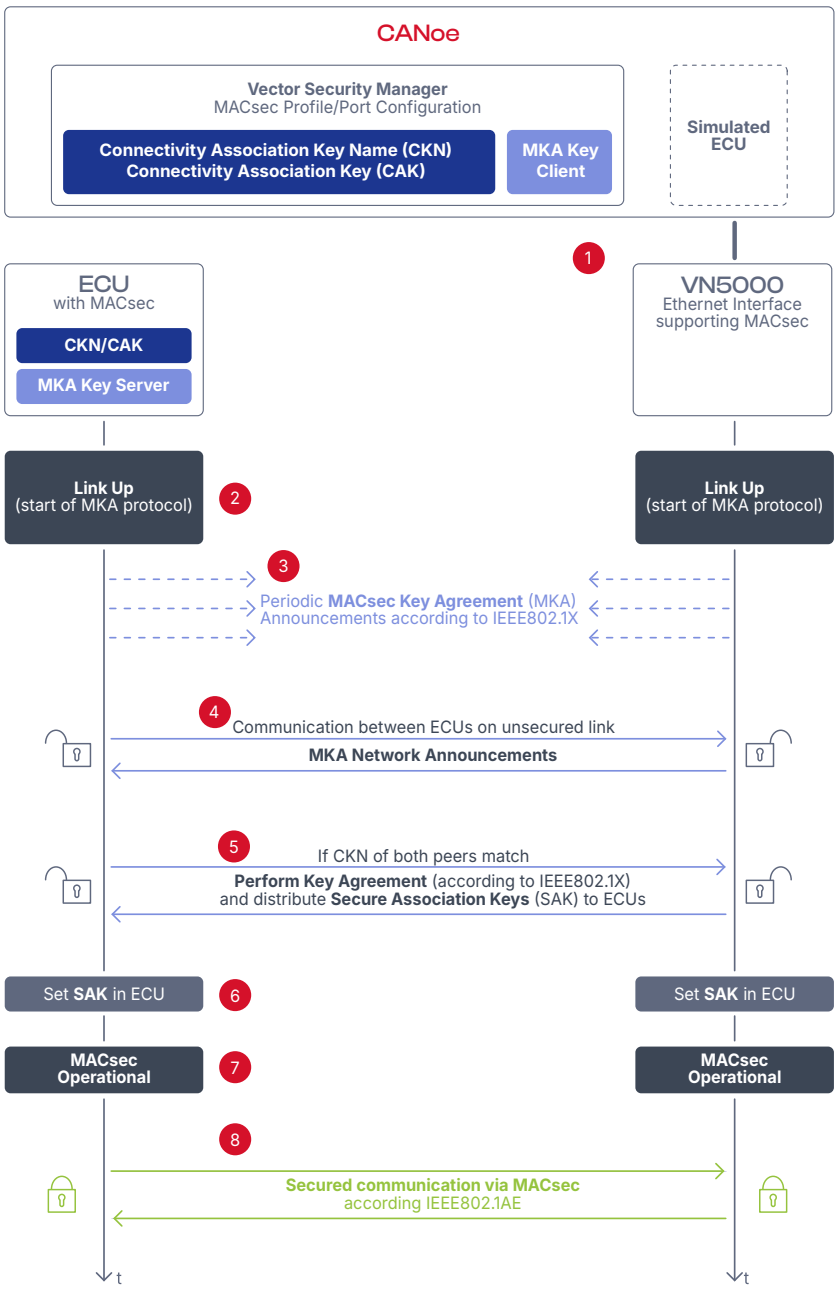
2.1.8.2 MACsec Support

Hardware and software support

MACsec is implemented at Layer 2 of the OSI model and provides high-performance encryption on the hardware to reduce CPU load.

In conjunction with CANoe/CANalyzer, the VN5650 and VN5620A support the entire MACsec encryption process in hardware. This ensures efficient decryption without taxing the CPU.

The principle interaction of a VN5650 with CANoe is shown below. The individual steps are described after the diagram.



Step	Description
1	In this example, CANoe is used to simulate an ECU with MACsec capability in order to connect to an existing ECU with MACsec enabled. Therefore CANoe requires: > The Vector Security Manager, which contains the MACsec profile and any associated MACsec Port Configuration. This includes the pre-shared key (Connectivity Association Key, CAK) and the Connectivity Association Key Name (CKN), which must match those of the connected ECU. In this example, CANoe is also set up to be the MKA Key Client (while the existing ECU may be the MKA Key Server). > A Vector Ethernet interface supporting MACsec on hardware (e. g. VN5650).
2	Once the physical and simulated ECUs are connected and the VN5650 port configuration is set, the link up procedure is ready to be initiated automatically. When the CANoe simulation is started, the MACsec Key Agreement (MKA) protocol is automatically started.
3	Both nodes send MKA announcements to signal their readiness.
4	At some point in time, the MKA is then negotiated between the two nodes. This is based on the IEEE802.1X standard and must be present in the physical ECU. In CANoe, this is implemented by the Vector device. Until now, communication has been over an unsecured connection.
5	All required MACsec parameters are compared between the two ECUs, including the CKN. If all parameters match, the Key Agreement is automatically performed and the Secure Association Keys (SAK) are generated. There is a key server and a key client in MKA. The SAK is derived by the key server and distributed through MKA protocol messages.
6	The SAKs are finally set in the ECUs.
7	MACsec is now operational.
8	Secure communication via MACsec is fully established.

3 VN5601

In this chapter you find the following information:

3.1 Scope of Delivery **31**

3.2 Introduction **31**

3.3 Connectors **33**

3.3.1 Front Side 33

3.3.2 Back Side 33

3.4 LEDs **34**

3.5 Accessories **35**

3.6 Technical Data **36**

3.1 Scope of Delivery

Contents

The delivery includes:

> 1x VN5601 Ethernet Adapter

3.2 Introduction

About the VN5601

The VN5601 is a very compact and high performance USB-to-Ethernet adapter for standard IEEE 1000BASE-T and IEEE 2.5GBASE-T. It is used to easily connect devices with standard Ethernet-based Vector hardware (such as VN5240, VX1135, VX1161 and CSM modules) to the computer.

The connection of the Vector hardware to the VN5601 is independent of the Windows network infrastructure such as firewall or drivers. Therefore, the VN5601 allows for a fast and reliable connection of your Vector devices to your computer.The VN5601 provides accurate hardware time stamps and allows synchronization of connected devices via IEEE 1588 (PTP).

Since the VN5601 also has the USB adapter function, it can also be used to obtain a Capture Module Protocol (CMP) data stream.



Figure 9: VN5601 Ethernet Interface

Highlights

Features of the VN5601:

> 1x IEEE 2.5GBASE-T/ 1000BASE-T / 100BASE-TX port to connect Vector Ethernet devices such as VN5240, VX1135, VX1161 or CSM modules
> Useable as a CMP sink for analysis in applications (see Vector Hardware Manager help for further details)
> Host connection USB 3.0

Note

The VN5601 cannot be used for remaining bus simulation or testing in CANoe/CAnalyzer. For these applications we recommend the VN5612 (see section VN5612 on page 71).

The VN5601 serves as an adapter to connect additional Vector devices or

to acquire data from a Capture Module protocol logger.

3.3 Connectors

3.3.1 Front Side

Device connectors

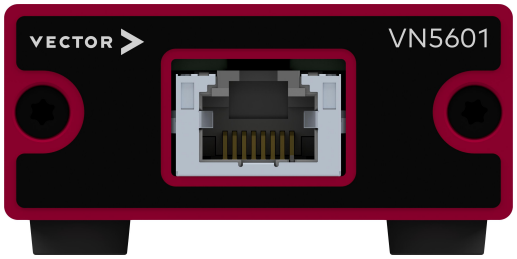


Figure 10: Connectors on the Ethernet side

> **2.5G/1G (RJ45 connector)**
> Connect Vector Ethernet devices (e. g. VN5430) to this port to adapt it via USB to the computer.

3.3.2 Back Side

Device connectors

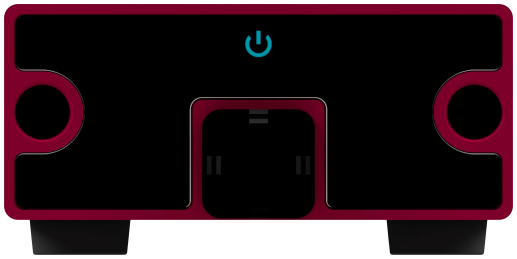


Figure 11: Connectors on the USB side

> **USB**
> Connect your computer and the VN5601 over USB to install and to use the device. Connect the device directly to a USB Type-A port at your computer or use a USB hub with its own power supply (self-powered).

3.4 LEDs

> **Power**

Multicolored LED indicating the device status.

Color	Description
Green	> Blinks 4x at power up and illuminates afterwards. > Blinks quicker during an update progress. Please wait for the automatic reboot of the device after the update has been finished. Do not disconnect the USB cable while the LED is blinking.
Red	An error has occurred. Please disconnect the USB cable. Re-connect the USB cable and try again.

> **RJ45**

LEDs illuminate if there is an Ethernet link or blink if there is Ethernet activity.

Color (Left)	Color (Right)	Description
Orange	-	100 Mbit/s
Green	-	1 Gbit/s
-	Orange	2.5 Gbit/s

3.5 Accessories



Note

Detailed information on the listed accessories can be found in the separate accessories manual on our website.

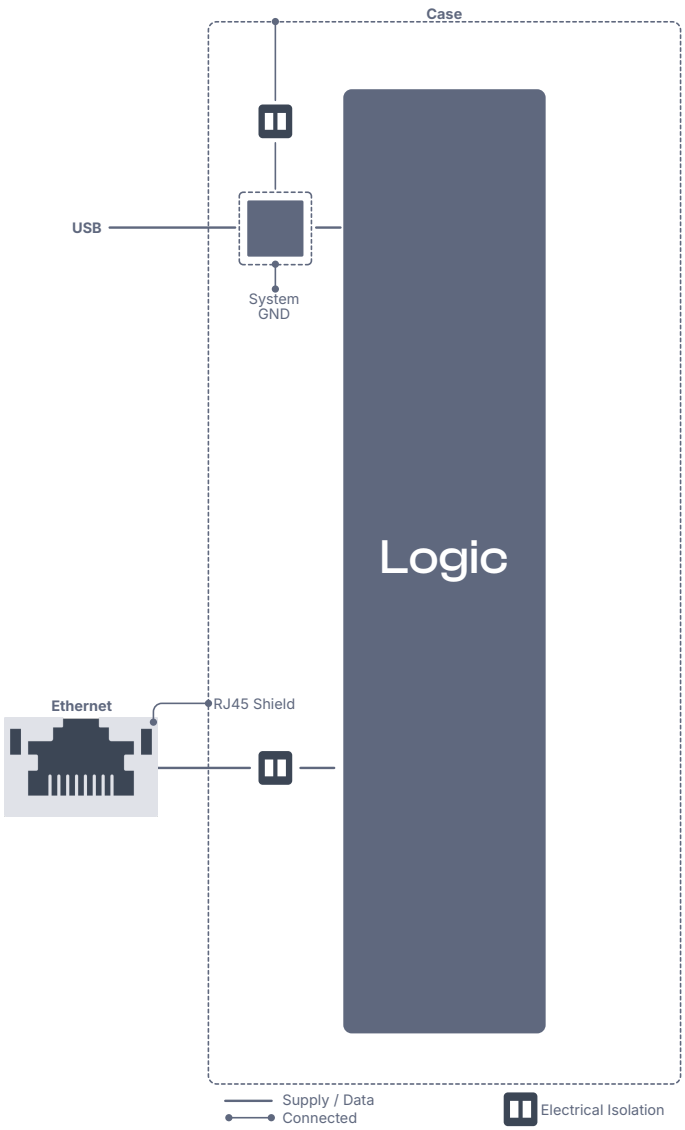
Cables and connectors

- USBadapter 3.2 Gen 1 C-A SDSL (Single Screw Lock)
- Ethernet cables

3.6 Technical Data

Ethernet ports	> 1x RJ45 – 1x Infineon AQR115C – 2.5GBASE-T – 1000BASE-T – 100BASE-TX
Computer interface	USB 3.0, bus-powered, fixed cable (length 1 m, min. bend radius 45 mm) with Type-A connector
Input voltage	Nom. 5 V (USB bus-powered)
Power consumption	Max. 4.5 W (USB bus-powered)
Temperature range (ambient temp. of the device)	Operation: -25 °C ... +55 °C Storage: -40 °C ... +85 °C
Relative humidity of ambient air	15 %...95 %, non-condensing
Dimensions (LxWxH)	54 mm x 98 mm x 23 mm
Weight	175 g
Operating system requirements	Windows 10 (x64, 64 bit) Windows 11 (x64, 64 bit)

Electrical isolation of the connectors



4 VN5601A

In this chapter you find the following information:

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4.3 Connectors **41**

4.3.1 Front Side 41

4.3.2 Back Side 41

4.4 LEDs **42**

4.5 Accessories **43**

4.6 Technical Data **44**

4.1 Scope of Delivery

Contents

The delivery includes:

> 1x VN5601A Ethernet Adapter

4.2 Introduction

About the VN5601A

The VN5601A is a very compact and high performance USB-to-Ethernet adapter for standard IEEE 1000BASE-T and IEEE 2.5GBASE-T. It is used to easily connect devices with standard Ethernet-based Vector hardware (such as VN5240, VX1135, VX1161 and CSM modules) to the computer.

The connection of the Vector hardware to the VN5601A is independent of the Windows network infrastructure such as firewall or drivers. Therefore, the VN5601A allows for a fast and reliable connection of your Vector devices to your computer.The VN5601A provides accurate hardware time stamps and allows synchronization of connected devices via IEEE 1588 (PTP).

Since the VN5601A also has the USB adapter function, it can also be used to obtain a Capture Module Protocol (CMP) data stream.

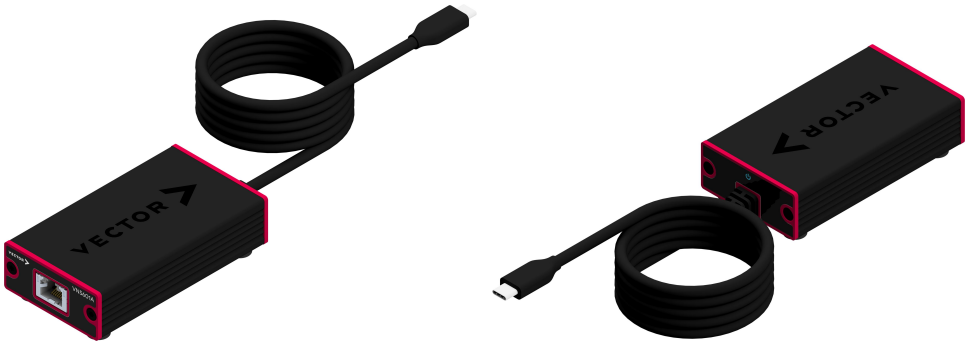


Figure 12: VN5601A Ethernet Interface

Highlights

Features of the VN5601A:

> 1x IEEE 2.5GBASE-T/ 1000BASE-T / 100BASE-TX port to connect Vector Ethernet devices such as VN5240, VX1135, VX1161 or CSM modules
> Useable as a CMP sink for analysis in applications (see Vector Hardware Manager help for further details)
> Host connection USB 3.2 Gen 1

Note

The VN5601A cannot be used for remaining bus simulation or testing in CANoe/CAnalyzer. For these applications we recommend the VN5612 (see section VN5612 on page 71).

The VN5601A serves as an adapter to connect additional Vector devices

or to acquire data from a Capture Module protocol logger.

4.3 Connectors

4.3.1 Front Side

Device connectors

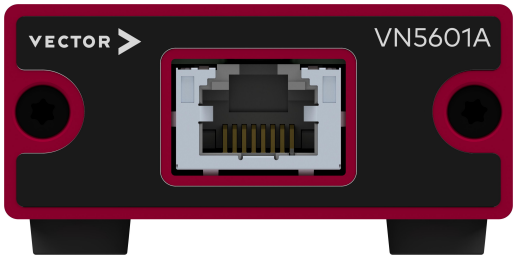


Figure 13: Connectors on the Ethernet side

> **2.5G/1G (RJ45 connector)**
> Connect Vector Ethernet devices (e. g. VN5430) to this port to adapt it via USB to the computer.

4.3.2 Back Side

Device connectors



Figure 14: Connectors on the USB side

> **USB**
> Connect your computer and the VN5601A over USB 3.2 Gen 1 to install and to use the device. Connect the device directly to a USB Type-C port at your computer or use a USB hub with its own power supply (self-powered).

4.4 LEDs

> **Power**

Multicolored LED indicating the device status.

Color	Description
Green	> Blinks 4x at power up and illuminates afterwards. > Blinks quicker during an update progress. Please wait for the automatic reboot of the device after the update has been finished. Do not disconnect the USB cable while the LED is blinking.
Red	An error has occurred. Please disconnect the USB cable. Re-connect the USB cable and try again.

> **RJ45**

LEDs illuminate if there is an Ethernet link or blink if there is Ethernet activity.

Color (Left)	Color (Right)	Description
Orange	-	100 Mbit/s
Green	-	1 Gbit/s
-	Orange	2.5 Gbit/s

4.5 Accessories



Note

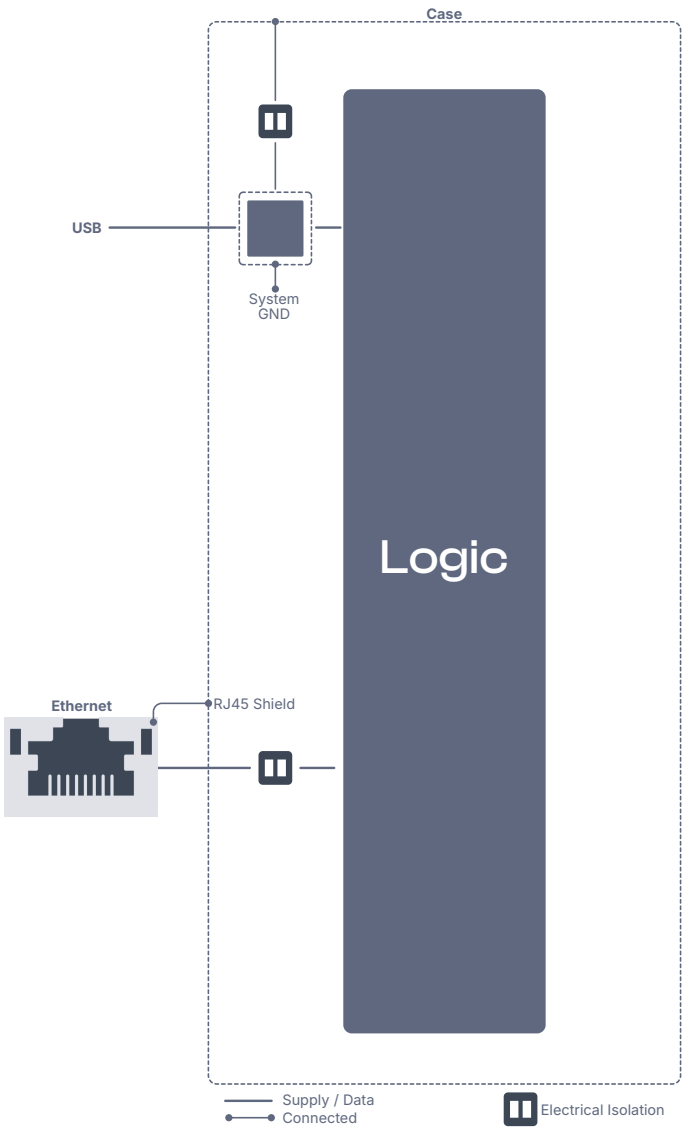
Detailed information on the listed accessories can be found in the separate accessories manual on our website.

Cables and connectors > Ethernet cables

4.6 Technical Data

Ethernet ports	> 1x RJ45 – 1x Infineon AQR115C – 2.5GBASE-T – 1000BASE-T – 100BASE-TX
Computer interface	USB 3.2 Gen 1, bus-powered, fixed cable (length 1 m, min. bend radius 45 mm) with Type-C connector
Input voltage	Nom. 5 V (USB bus-powered)
Power consumption	Max. 4.5 W (USB bus-powered)
Temperature range (ambient temp. of the device)	Operation: -25 °C ... +55 °C Storage: -40 °C ... +85 °C
Relative humidity of ambient air	15 %...95 %, non-condensing
Dimensions (LxWxH)	54 mm x 98 mm x 23 mm
Weight	175 g
Operating system requirements	Windows 10 (x64, 64 bit) Windows 11 (x64, 64 bit)

Electrical isolation of the connectors



5 VN5610A

In this chapter you find the following information:

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5.3 Standalone Mode **49**

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5.7.1 Overview 55

5.7.2 Electrical Isolation 57

5.7.3 Network Features 59

5.8 Accessories **61**

5.1 Scope of Delivery

Contents

The delivery includes:

- VN5610(A) Ethernet/CAN interface
- Vector Power Supply 12 V / 1.5 A (part number 05024)
- USB 2.0 cable (part number 05011)

5.2 Introduction

About the VN5610(A)

The VN5610(A) is a Vector network interface which supports the Ethernet physical layer 10BASE-T, 100BASE-T1 (OPEN Alliance BroadR-Reach), 100BASE-TX and 1000BASE-T. 100BASE-T1 is a physical layer especially used in automotive electronics.



Figure 15: VN5610 Ethernet/CAN Interface



Figure 16: VN5610A Ethernet/CAN Interface

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

Highlights

Common features of VN5610 and VN5610A:

- Support of two independent Ethernet ports, available as 2x RJ45 or 1x D-SUB9

- Support of standard Ethernet (10BASE-T/100BASE-TX/1000BASE-T)
- Support of two independent CAN/CAN FD channels, available as 1x D-SUB9
- High resolution time stamps for Ethernet frames
- High resolution time stamps for CAN/CAN FD frames
- Software, hardware and IEEE 1588 time synchronization of multiple Vector network interfaces
- Internal three-way-routing in/monitor/out
- Robustness, power supply and temperature ranges suitable for automotive and industrial applications

Differences

Differences between VN5610 and VN5610A:

- **VN5610**
  - Support of BroadR-Reach physical layer
- **VN5610A**
  - Support of 100BASE-T1 (OPEN Alliance BroadR-Reach)
  - Support of one digital input/output (e. g. for DoIP Activation Line)

5.3 Standalone Mode

This Vector device can also operate in standalone mode (i. e., without being connected to a computer). Typical standalone applications include:

- Standalone Media Converter
- Port Mirroring



Note

For standalone mode, the device must already be set up using the Vector Hardware Manager and the configuration must already be deployed. The configuration is persistent and independent of the connected computer, and the device is fully functional when powered externally.

If the device is already running in standalone mode (no connection to a computer), you can always re-connect your device to your computer via USB without interruption. This can be useful, for example, if you want to use CANoe for remaining bus simulation or measurement purposes after the standalone mode is already running. Connecting your application such as CANoe to the Vector device does not interfere with its operation, e. g. communication with your ECU.

5.4 Connectors Ethernet Side

Device connectors



Figure 17: Ethernet CH1, D-SUB9 (100BASE-T1), Ethernet CH2

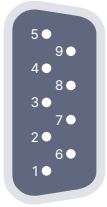
> **Ethernet CH1/CH2 (RJ45)**
Standard Ethernet connector for 10BASE-T, 100BASE-TX and 1000BASE-T.

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

> **LED SPEED**
- Off: 10 Mbit/s
- Orange: 100 Mbit/s
- Green: 1000 Mbit/s

> **Ethernet CH1/CH2 (D-SUB9)**
D-SUB9 connector for 100BASE-T1. Use the BRcable 2Y to access both ports on separate D-SUB9 connectors (see accessories manual, part number 05103).

Pin	Assignment
1	CH2 MDI+
2	CH2 MDI-
3	Not connected
4	CH1 MDI+
5	CH1 MDI-
6...9	Not connected



Note

The configuration is done in the Vector Hardware Manager.

5.5 Connectors USB Side

Device connectors

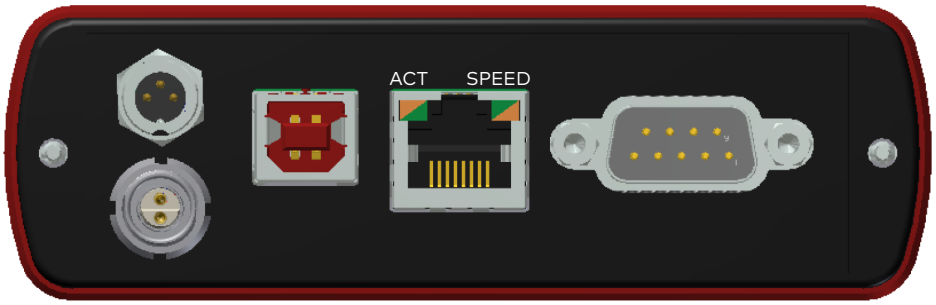


Figure 18: Connectors on the USB side

> **Power/sync (Binder connector)**

The VN5610A has one power/sync connector (Binder type 711) which can be used for time synchronization of different Vector devices (see section Time Synchronization on page 349) or for power.

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



> **IO CH5 (LEMO connector)**

The VN5610A has a LEMO connector (type 302) for dedicated digital input/output tasks (e. g. as DoIP Activation Line). Use the VX1362B adapter cable to access the pins (see accessories manual, part number 22258). The pin assignment is as follows:

Pin	Assignment
1	Digital input/output (see technical data)
2	Ground



Internal interconnection of digital in/out 0/1

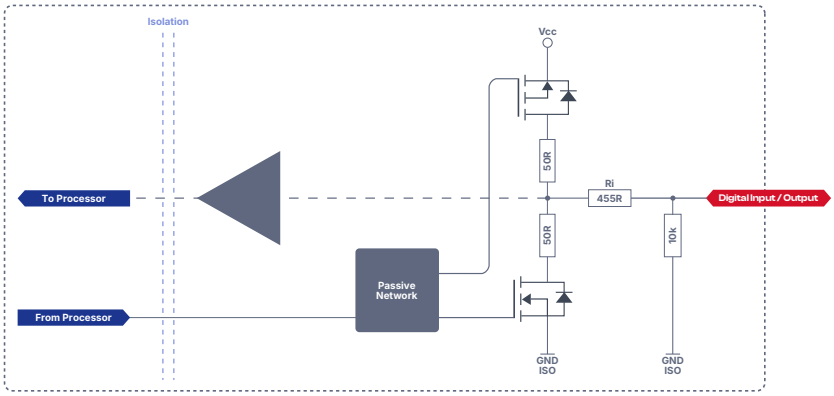


Figure 19: Digital input /output

Note

The VN5610A requires at least 8 V to power up. Afterwards the power supply can be reduced to 6 V for operation (typ. 12 V DC). The need of an external power supply depends on the Ethernet configuration (see table).

Ethernet Configuration	Port 1			
	Disabled	100BASE-T1	100BASE-TX	1000BASE-T
Port 2				
Disabled	O	O	O	O
100BASE-T1	O	O	✓	✓
100BASE-TX	O	✓	✓	✓
1000BASE-T	O	✓	✓	✓

O: bus-powered (also when both CAN channels in use),

✓: external power supply recommended.

Note: CAN itself requires no external power supply.

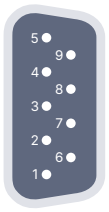
> **USB**

Connect your computer and the VN5610A over USB to install and to use the device with measurement applications (CANoe, CANalyzer). Use the USB 2.0 compliant cable found in the delivery (USB extension cables may generate faults between the computer and the device). Connect the device directly to a USB port at your computer or use a USB hub with its own power supply (self-powered). The device can also be powered via this connector.

> **Host (Ethernet)**
Alternative host connection over Ethernet (1000BASE-T). Further details and tips can be found in the Vector Hardware Manager help in section **Tips and Tutorials | Ethernet | Host Configuration**.

> **CAN CH3/4 (D-SUB9)**
D-SUB connector with two CAN channels. Use the CANcable 2Y to access both channels on separate D-SUB9 connectors (see accessories manual, part number 05075).

Pin	Assignment
1	CH4 CAN Low
2	CH3 CAN Low
3	CH3 GND
4	Reserved. Please do not use.
5	Not connected
6	CH4 GND
7	CH3 CAN High
8	CH4 CAN High
9	Not connected



5.6 LEDs

LEDs on top side

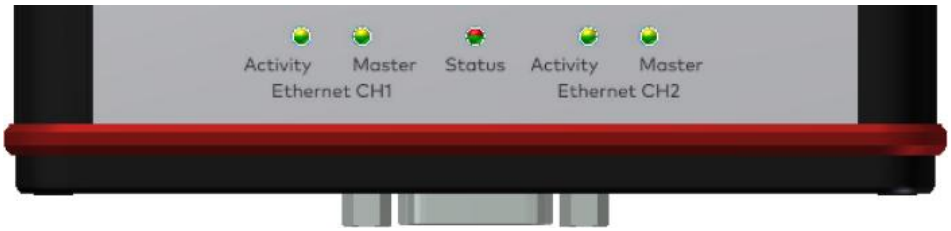


Figure 20: LEDs on VN5610(A)

> **Activity (Ethernet CH1/CH2)**
Same as LED ACT at RJ45 connectors. LED illuminates if there is an Ethernet link or blinks if there is Ethernet activity at CH1/CH2.

Color	Description
Green	Link to RJ45.
Yellow	Link to D-SUB9.

> **Master (Ethernet CH1/CH2)**
Illuminates if CH1/CH2 is configured as Master.

Color	Description
Green	PHY is configured as master on RJ45.
Yellow	PHY is configured as master on D-SUB9.

Note

When the LED is flashing, the device is in Master/Slave auto-detect mode. This indicates that a link has not yet been established. The device will attempt to establish a link by iterating through master/slave configurations and possible link speeds. See the Vector Hardware Manager Help for more details on the "Master/Slave Auto Detect" feature.

> **Status**
Multicolored LED indicating the device status.

Color	Description
Green	> Blinks 4x at power up and illuminates afterwards. > Blinks quicker during an update progress. Please wait for the automatic reboot of the device after the update has been finished. Do not disconnect the power supply while the LED is blinking.
Red	An error has occurred. Please disconnect the power supply as well as the USB cable. Re-connect the power supply and the USB cable and try again.

5.7 Technical Data

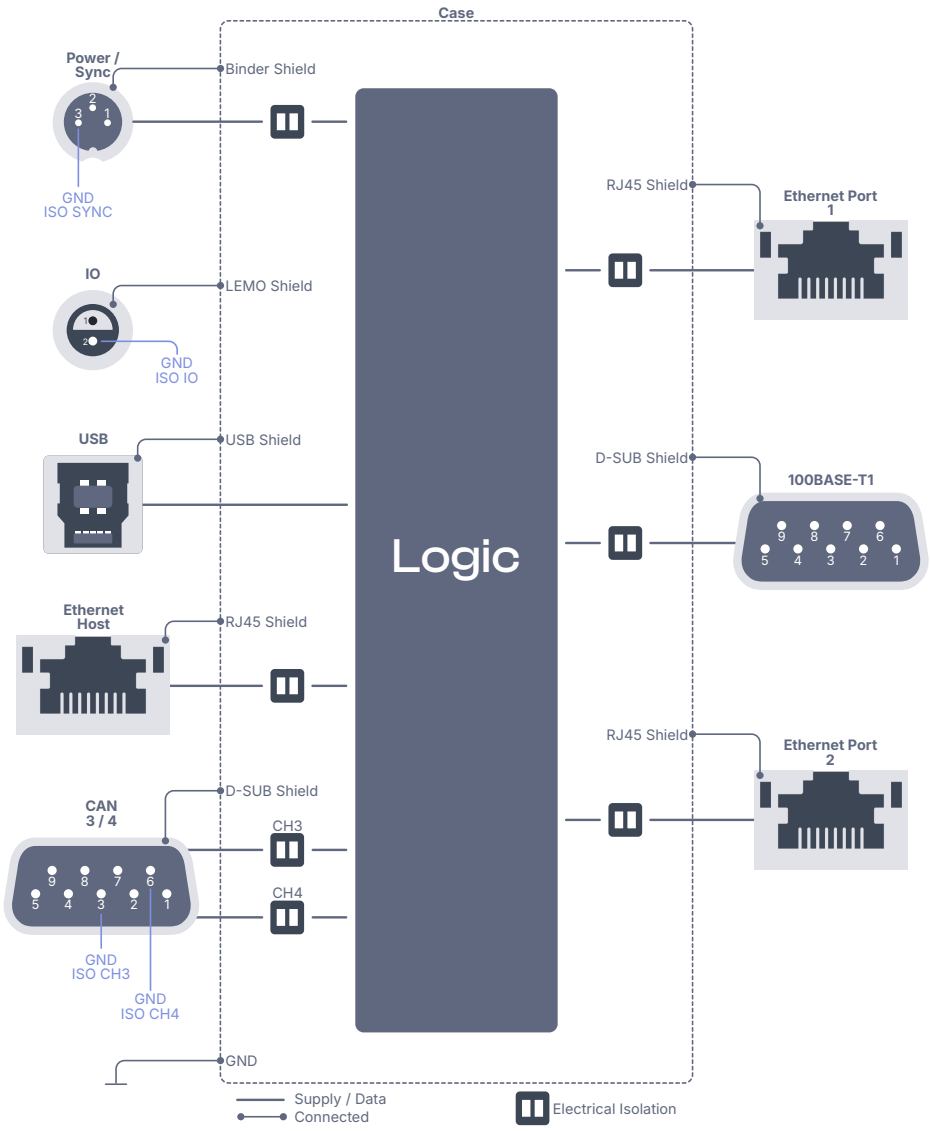
5.7.1 Overview

Ethernet ports	Max. 2, selectable from: > 2x RJ45 – on-board BCM54810 PHY – 1000BASE-T – 100BASE-TX – 10BASE-T > 1x D-SUB9 – on-board BCM89811 PHY – 100BASE-T1 – OPEN Alliance BroadR-Reach; dual port
CAN/CAN FD channels	Max. 2 (on-board TJA1051 transceivers) 1x D-SUB9 (dual channel) CAN2.0: 2 Mbit/s CAN FD: up to 8 Mbit/s
Digital input/output	1x LEMO Push/pull mode (e. g. DoIP Activation Line) or only Push mode (e. g. Wake-up Triggers) Output high (no load): 13 V Output high (load 346Ω): 5.3 V Output low: 0 V Input range: 0 V...16 V Input: Schmitt trigger high 3.4 V Input: Schmitt trigger low 2.5 V Rout: 503 Ω
Computer interface	USB 2.0 or Ethernet (1000BASE-T)
Power supply	Without external power supply: bus-powered at 100 Mbit operation mode With external power supply: 6...50 V DC, typ. 12 V DC, power-up: 8 V DC

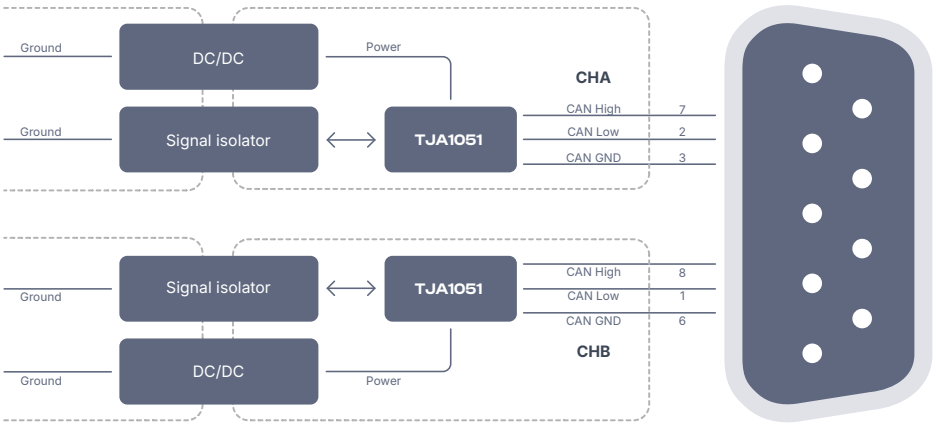
Power consumption	Approx. 2.5 W
Time stamps	Resolution: 8 ns Accuracy (in device): 1 µs Accuracy software sync: typ. 50 µs Accuracy hardware sync: typ. 1 µs Accuracy PTP sync (IEEE1588): typ. 1 µs
Latency link/switch segment	Link (stress access): approx. 7...12 µs Link (low latency): approx. 6...7 µs Switch: approx. 12 µs Please note that the exact latency depends on: > Link speed > Ethernet PHY > Ethernet packet length (switch segment only)
Temperature range	Operation: -40 °C ... +65 °C Storage: -40 °C ... +85 °C
Relative humidity of ambient air	15 %...95 %, non-condensing
Dimensions (LxWxH)	Approx. 125 mm x 106 mm x 32 mm
Operating system requirements	Windows 10 (x64, 64 bit) Windows 11 (x64, 64 bit)

5.7.2 Electrical Isolation

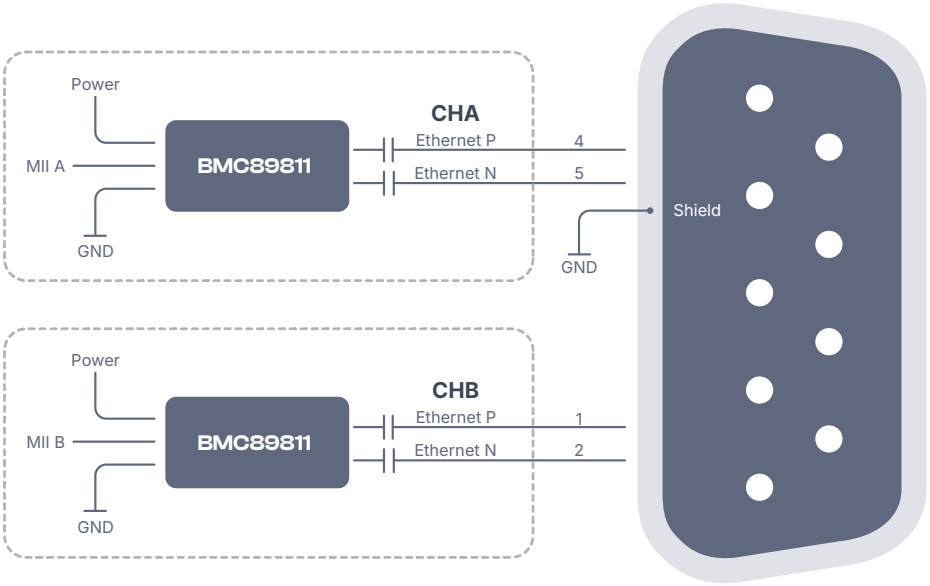
Electrical isolation of the connectors



Electrical isolation of CAN in detail



Electrical isolation of Ethernet in detail



5.7.3 Network Features

Ports/channels	Total number of Ethernet Ports	4
	10BASE-T1S	-
	100BASE-T1 / 1000BASE-T1	2 / -
	1000BASE-T1 Legacy Mode	-
	10/100/1000BASE-T(X)	2
	1G BASE-T	-
	2.5G BASE-T	-
	2.5GBASE-T1	-
	5G BASE-T	-
	10G BASE-T	-
	CAN FD	2
	DoIP Activation / Wake-up Line	✓
	Multiple digital / analog IO	-
Power supply	External	✓
	USB buspowered	✓
Infrastructure	Hardware synchronization	✓
	Software synchronization	✓
	PTP IEEE 1588 v2	✓
	Computer uplink	USB2.0
	Computer uplink Ethernet	1000BASE-T
	USB adapter to connect sub devices	-
	Infrastructure Switch to connect sub devices	-
Port interconnection	Layer 2 Switch	✓
	TAP	✓
	Multidrop segment	-
	Simultaneously interconnectable ports via switch/TAP	2
	Media conversion	1
	Link transparency	✓
	OPEN Alliance TC10 (Wake/Sleep) 10BASE-T1S	-
	OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	-
	OPEN Alliance TC10 (Wake/Sleep) 1000BASE-T1	-
	OPEN Alliance TC10 (Wake/Sleep) 2.5/5/10GBASE-T1	-
	Physical bypass relays	-

Measure	Mirroring port	-
	Uplink Frame filter	16 rules
	Reporting of invalid Ethernet packets	✓
	MACsec (IEEE 802.1AE)	-
	Reporting of PLCA events	-
Simulation	VLAN tagging / untagging / routing	-
	Virtual switch ports for Vector-Tools	16
	Time-triggered transmit interface (e. g. for precise AVB-Streams)	-
	MACsec (IEEE 802.1AE)	-
	gPTP (IEEE 802.1AS) support on user network (AVB and AUTOSAR clocks)	-
Test	On-board packet generator	✓
	Invalid Ethernet packet generation	✓
	OPEN Alliance TC10 (Wake/Sleep) 10BASE-T1S	-
	OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	-
	OPEN Alliance TC10 (Wake/Sleep) 1000BASE-T1	-
	OPEN Alliance TC10 (Wake/Sleep) 2.5/5/10GBASE-T1	-
	MACsec (IEEE 802.1AE)	-
	gPTP (IEEE 802.1AS) support on user network (AVB and AUTOSAR clocks)	-
Application area	Measurement / analysis	✓
	Simulation	✓
	Test	✓

1) Available in a later release.
2) Host computer must support USB-C with 3 A.
3) Supports one switch segment with a maximum of three measurement ports. Sending via measurement ports is not possible.
4) Only with compatible VNmodule60 (see section VNmodule60 on page 284).
5) Only 100/1000BASE-T1

5.8 Accessories



Note

Detailed information on the listed accessories can be found in the separate accessories manual on our website.

Cables and connectors

- BRcable 2Y
- VNcable D-SUB9 HSD Z
- CANcable1
- CANcableA
- CANcable TnT (D-SUB9 to Bunch Plugs)
- CANcable Y
- CANcable 2Y
- CANterm 120
- CANcable Set Pro
- Vector SYNCcableXL
- Vector SYNCcable50
- Multi SYNCbox external
- Multi SYNCbox internal
- Multi SYNCbox active
- Cable Binder 3pol Connector with Pigtail
- Cable LEMO/Banana Plugs
- USB Cable 2.0

Power supply

- Vector Power Supply 12V/1.5A
- Cable Banana Plug <> Binder 3-pin
- Car Power Supply Cable 12V with Binder

Miscellaneous

- Fix Kit 32mm Device

6 VN5611

In this chapter you find the following information:

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6.2 Introduction **63**

6.3 Connectors **64**

6.3.1 Front Side 64

6.3.2 Back Side 64

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6.6 Accessories **70**

6.1 Scope of Delivery

Contents

The delivery includes:

> 1x VN5611 Ethernet Interface

6.2 Introduction

About the VN5611

The VN5611 is a very compact and convenient network interface for Automotive Ethernet IEEE 100BASE-T1/1000BASE-T1. It is used for the analysis of Ethernet networks as well as for simulation and test tasks in the Ethernet environment. USB 3.0 is used as an interface to the computer. Thanks to the small and compact format, the device is ideally suited for portable use.



Figure 21: VN5611 Ethernet Interface

Highlights

Features of the VN5611:

> 2x IEEE 100BASE-T1/ 1000BASE-T1 user port
> Host connection USB 3.0
> On-board Ethernet TAPs to link between two Ethernet ports
> On-board Vector Ethernet Switch IP supporting free segmentation
> New hardware configuration concept for flexible configuration
> Software synchronization to other Vector interfaces (typ. 50 µs accuracy)
> Multi-application support (different tools can share an Ethernet port at the same time)
> High precision time stamped Ethernet frames (< 20 ns precision)
> Device is designed for mobile use
  - small, handy and lightweight housing
  - power-supply via USB

6.3 Connectors

6.3.1 Front Side

Device connectors

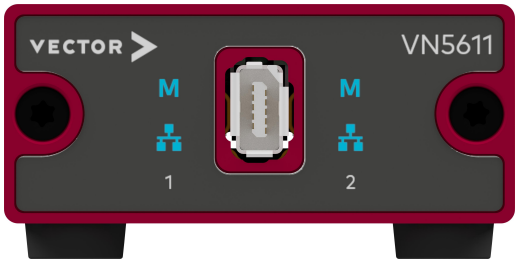
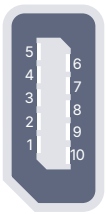


Figure 22: Connectors on the Ethernet side

> **Ethernet (ix Industrial)**
ix Industrial connectors for 100BASE-T1/1000BASE-T1 (e. g. Harting ix Industrial type 10A-1). Each connector has two Ethernet ports (A and B). Use cables of the Vector AEcable 2Y family to access both ports on separate connectors (different plug systems available).

Pin	Assignment
1	CH2 MDI+
2	CH2 MDI-
3...5	Not connected
6	CH1 MDI+
7	CH1 MDI-
8...10	Not connected



6.3.2 Back Side

Device connectors

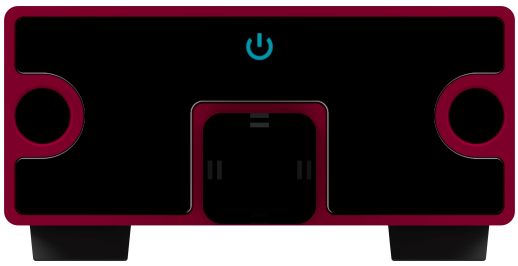


Figure 23: Connectors on the USB side

> **USB**
Connect your computer and the VN5611 over USB to install and to use the device with measurement applications (CANoe, CANalyzer). Connect the device directly to a USB Type-A port at your computer or use a USB hub with its own power supply (self-powered).

6.4 LEDs

> **Ethernet Port 1/2**

LED illuminates if there is an Ethernet link or blinks if there is Ethernet activity at the according port.

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

> **M Ethernet Port 1/2**

Illuminates if the according port is configured as master.

State	Description
On	PHY is configured as master.
Off	PHY is configured as slave.



Note

When the LED is flashing, the device is in Master/Slave auto-detect mode. This indicates that a link has not yet been established. The device will attempt to establish a link by iterating through master/slave configurations and possible link speeds. See the Vector Hardware Manager Help for more details on the "Master/Slave Auto Detect" feature.

> **Power**

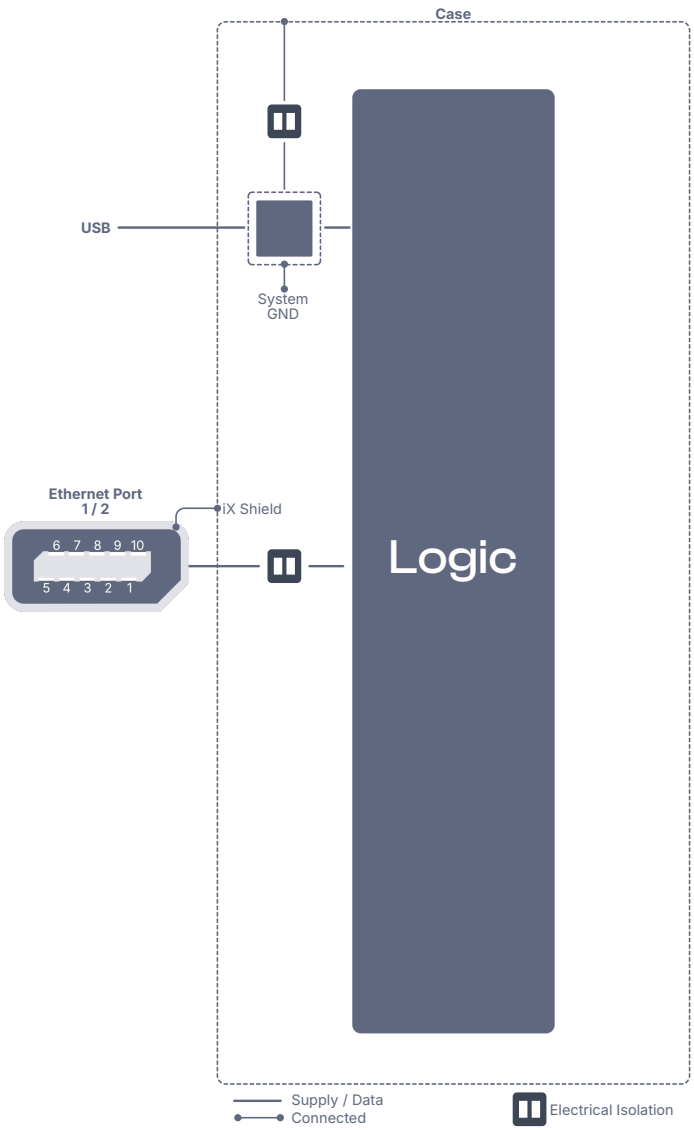
Multicolored LED indicating the device status.

Color	Description
Green	> Blinks 4x at power up and illuminates afterwards. > Blinks quicker during an update progress. Please wait for the automatic reboot of the device after the update has been finished. Do not disconnect the USB cable while the LED is blinking.
Red	An error has occurred. Please disconnect the USB cable. Reconnect the USB cable and try again.

6.5 Technical Data

Ethernet ports	> 1x ix Industrial – 2x Broadcom BCM89883 – 1000BASE-T1 – 100BASE-T1
Computer interface	USB 3.0, bus-powered, fixed cable (length 1 m, min. bend radius 45 mm) with type-A connector
Input voltage	Nom. 5 V (USB bus-powered)
Power consumption	Max. 4.5 W (USB bus-powered)
Latency link/switch segment	Link (stress access): approx. 7...12 µs Link (low latency): approx. 6...7 µs Switch: approx. 12 µs Please note that the exact latency depends on: > Link speed > Ethernet PHY > Ethernet packet length (switch segment only)
Temperature range (ambient temp. of the device)	Operation: 0 °C ... +55 °C Storage: -40 °C ... +85 °C
Relative humidity of ambient air	15 %...95 %, non-condensing
Dimensions (LxWxH)	Approx. 54 mm x 98 mm x 23 mm
Weight	174 g
Operating system requirements	Windows 10 (x64, 64 bit) Windows 11 (x64, 64 bit)

Electrical isolation of the connectors



Note

The usage of an AEcable 2Y is recommended because it separates the interface's shield potential from the ECU shield potential. This ensures that all compensating currents over the shields are avoided. A capacitive coupling of the shields is implemented in the AEcable 2Y.

6.5.1 Network Features

Ports/channels	Total number of Ethernet Ports	2
	10BASE-T1S	-
	100BASE-T1 / 1000BASE-T1	2
	1000BASE-T1 Legacy Mode	-
	10/100/1000BASE-T(X)	-
	1G BASE-T	-
	2.5G BASE-T	-
	2.5GBASE-T1	-
	5G BASE-T	-
	10G BASE-T	-
	CAN FD	-
	DoIP Activation / Wake-up Line	-
	Multiple digital / analog IO	-
Power supply	External	-
	USB buspowered	✓
Infrastructure	Hardware synchronization	-
	Software synchronization	✓
	PTP IEEE 1588 v2	-
	Computer uplink	USB3.0
	Computer uplink Ethernet	-
	USB adapter to connect sub devices	-
	Infrastructure Switch to connect sub devices	-
Port interconnection	Layer 2 Switch	✓
	TAP	✓
	Multidrop segment	-
	Simultaneously interconnectable ports via switch/TAP	2
	Media conversion	-
	Link transparency	✓
	OPEN Alliance TC10 (Wake/Sleep) 10BASE-T1S	-
	OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	✓
	OPEN Alliance TC10 (Wake/Sleep) 1000BASE-T1	-
	OPEN Alliance TC10 (Wake/Sleep) 2.5/5/10GBASE-T1	-
	Physical bypass relays	-

Measure	Mirroring port	-
	Uplink Frame filter	-
	Reporting of invalid Ethernet packets	✓
	MACsec (IEEE 802.1AE)	-
	Reporting of PLCA events	-
Simulation	VLAN tagging / untagging / routing	-
	Virtual switch ports for Vector-Tools	16
	Time-triggered transmit interface (e. g. for precise AVB-Streams)	-
	MACsec (IEEE 802.1AE)	-
	gPTP (IEEE 802.1AS) support on user network (AVB and AUTOSAR clocks)	-
Test	On-board packet generator	-
	Invalid Ethernet packet generation	✓
	OPEN Alliance TC10 (Wake/Sleep) 10BASE-T1S	-
	OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	✓
	OPEN Alliance TC10 (Wake/Sleep) 1000BASE-T1	-
	OPEN Alliance TC10 (Wake/Sleep) 2.5/5/10GBASE-T1	-
	MACsec (IEEE 802.1AE)	-
	gPTP (IEEE 802.1AS) support on user network (AVB and AUTOSAR clocks)	-
Application area	Measurement / analysis	✓
	Simulation	✓
	Test	✓

1) Available in a later release.
2) Host computer must support USB-C with 3 A.
3) Supports one switch segment with a maximum of three measurement ports. Sending via measurement ports is not possible.
4) Only with compatible VNmodule60 (see section VNmodule60 on page 284).
5) Only 100/1000BASE-T1

6.6 Accessories



Note

Detailed information on the listed accessories can be found in the separate accessories manual on our website.

Cables and connectors

- AEcable 2Y
- USBadapter 3.2 Gen 1 C-A SDSL (Single Screw Lock)

7 VN5612

In this chapter you find the following information:

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7.6 Accessories **79**

7.1 Scope of Delivery

Contents

The delivery includes:

> 1x VN5612 Ethernet Interface

7.2 Introduction

About the VN5612

The VN5612 is a very compact and convenient network interface for Standard Ethernet IEEE 100BASE-TX/1000BASE-T. It is used for the analysis of Ethernet networks as well as for simulation and test tasks in the Ethernet environment. USB 3.0 is used as an interface to the computer. Thanks to the small and compact format, the device is ideally suited for portable use.



Figure 24: VN5612 Ethernet Interface

Highlights

Features of the VN5612:

> 2x IEEE 100BASE-TX / 1000BASE-T user port
> Host connection USB 3.0
> On-board Ethernet TAPs to link between two Ethernet ports
> On-board Vector Ethernet Switch IP supporting free segmentation
> New hardware configuration concept for flexible configuration
> Software synchronization to other Vector interfaces (typ. 50 µs accuracy)
> Multi-application support (different tools can share an Ethernet port at the same time)
> High precision time stamped Ethernet frames (< 20 ns precision)
> Device is designed for mobile use
  - small, handy and lightweight housing
  - power-supply via USB

7.3 Connectors

7.3.1 Front Side

Device connectors

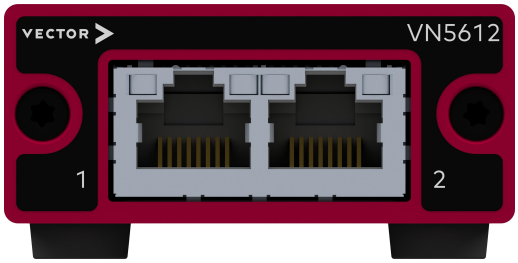


Figure 25: Connectors on the Ethernet side

> **Ethernet (RJ45 connectors)**
Standard Ethernet connectors for 10BASE-T, 100BASE-TX and 1000BASE-T.

7.3.2 Back Side

Device connectors

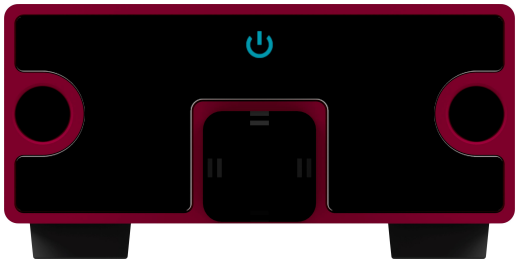


Figure 26: Connectors on the USB side

> **USB**
Connect your computer and the VN5612 over USB to install and to use the device with measurement applications (CANoe, CANalyzer). Connect the device directly to a USB Type-A port at your computer or use a USB hub with its own power supply (self-powered).

7.4 LEDs

> **RJ45**

LEDs illuminate if there is an Ethernet link or blink if there is Ethernet activity.

Color (Left)	Description
Green	Activity

Color (Right)	Description
Off	10 Mbit/s
Orange	100 Mbit/s
Green	1000 Mbit/s

> **Power**

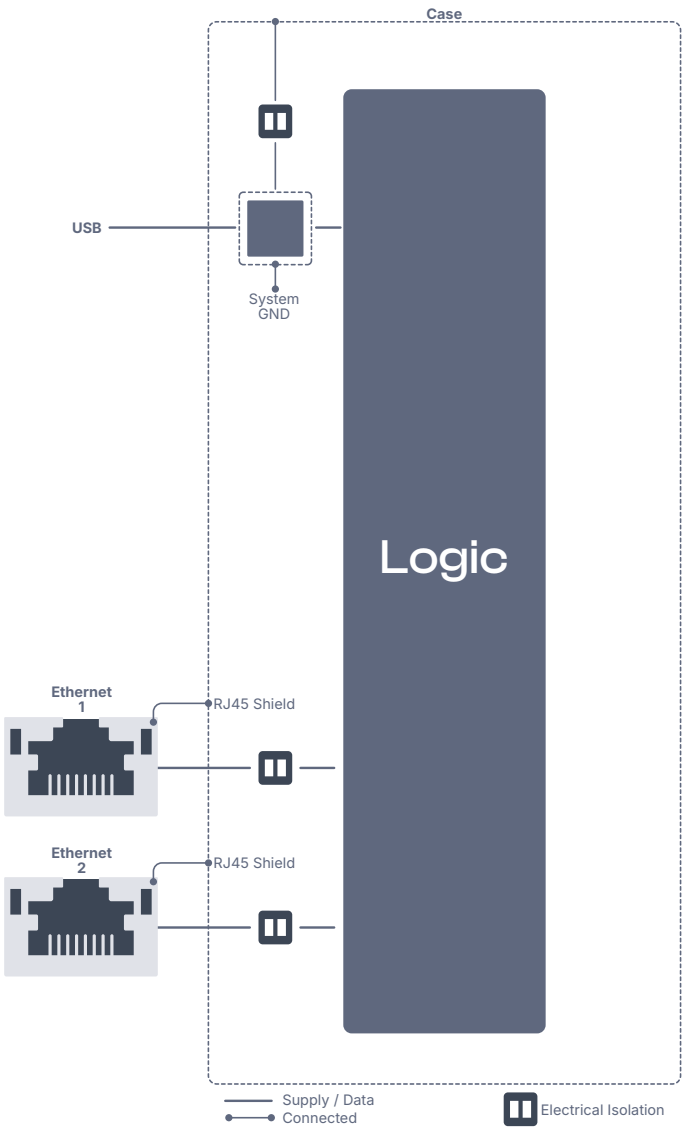
Multicolored LED indicating the device status.

Color	Description
Green	> Blinks 4x at power up and illuminates afterwards. > Blinks quicker during an update progress. Please wait for the automatic reboot of the device after the update has been finished. Do not disconnect the USB cable while the LED is blinking.
Red	An error has occurred. Please disconnect the USB cable. Reconnect the USB cable and try again.

7.5 Technical Data

Ethernet ports	> 2x RJ45 – 2x Broadcom BCM54210 – 1000BASE-T – 100BASE-TX – 10BASE-T
Computer interface	USB 3.0, bus-powered, fixed cable (length 1 m, min. bend radius 45 mm) with type-A connector
Input voltage	Nom. 5 V (USB bus-powered)
Power consumption	Max. 4.5 W (USB bus-powered)
Latency link/switch segment	Link (stress access): approx. 7...12 µs Link (low latency): approx. 6...7 µs Switch: approx. 12 µs Please note that the exact latency depends on: > Link speed > Ethernet PHY > Ethernet packet length (switch segment only)
Temperature range (ambient temp. of the device)	Operation: 0 °C ... +55 °C Storage: -40 °C ... +85 °C
Relative humidity of ambient air	15 %...95 %, non-condensing
Dimensions (LxWxH)	Approx. 54 mm x 98 mm x 23 mm
Weight	183 g
Operating system requirements	Windows 10 (x64, 64 bit) Windows 11 (x64, 64 bit)

Electrical isolation of the connectors



7.5.1 Network Features

Ports/channels	Total number of Ethernet Ports	2
	10BASE-T1S	-
	100BASE-T1 / 1000BASE-T1	-
	1000BASE-T1 Legacy Mode	-
	10/100/1000BASE-T(X)	2
	1G BASE-T	-
	2.5G BASE-T	-
	2.5GBASE-T1	-
	5G BASE-T	-
	10G BASE-T	-
	CAN FD	-
	DoIP Activation / Wake-up Line	-
	Multiple digital / analog IO	-
Power supply	External	-
	USB buspowered	✓
Infrastructure	Hardware synchronization	-
	Software synchronization	✓
	PTP IEEE 1588 v2	-
	Computer uplink	USB3.0
	Computer uplink Ethernet	-
	USB adapter to connect sub devices	-
	Infrastructure Switch to connect sub devices	-
Port interconnection	Layer 2 Switch	✓
	TAP	✓
	Multidrop segment	-
	Simultaneously interconnectable ports via switch/TAP	2
	Media conversion	-
	Link transparency	✓
	OPEN Alliance TC10 (Wake/Sleep) 10BASE-T1S	-
	OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	-
	OPEN Alliance TC10 (Wake/Sleep) 1000BASE-T1	-
	OPEN Alliance TC10 (Wake/Sleep) 2.5/5/10GBASE-T1	-
	Physical bypass relays	-

Measure	Mirroring port	-
	Uplink Frame filter	-
	Reporting of invalid Ethernet packets	✓
	MACsec (IEEE 802.1AE)	-
	Reporting of PLCA events	-
Simulation	VLAN tagging / untagging / routing	-
	Virtual switch ports for Vector-Tools	16
	Time-triggered transmit interface (e. g. for precise AVB-Streams)	-
	MACsec (IEEE 802.1AE)	-
	gPTP (IEEE 802.1AS) support on user network (AVB and AUTOSAR clocks)	-
Test	On-board packet generator	-
	Invalid Ethernet packet generation	✓
	OPEN Alliance TC10 (Wake/Sleep) 10BASE-T1S	-
	OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	-
	OPEN Alliance TC10 (Wake/Sleep) 1000BASE-T1	-
	OPEN Alliance TC10 (Wake/Sleep) 2.5/5/10GBASE-T1	-
	MACsec (IEEE 802.1AE)	-
	gPTP (IEEE 802.1AS) support on user network (AVB and AUTOSAR clocks)	-
Application area	Measurement / analysis	✓
	Simulation	✓
	Test	✓

1) Available in a later release.
2) Host computer must support USB-C with 3 A.
3) Supports one switch segment with a maximum of three measurement ports. Sending via measurement ports is not possible.
4) Only with compatible VNmodule60 (see section VNmodule60 on page 284).
5) Only 100/1000BASE-T1

7.6 Accessories



Note

Detailed information on the listed accessories can be found in the separate accessories manual on our website.

Cables and connectors

- USBadapter 3.2 Gen 1 C-A SDSL (Single Screw Lock)
- Ethernet cables

8 VN5614

In this chapter you find the following information:

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8.6 Accessories **90**

8.1 Scope of Delivery

Contents

The delivery includes:

> 1x VN5614 10BASE-T1S Interface

8.2 Introduction

About the VN5614

The VN5614 is a very compact and convenient network interface for Automotive Ethernet IEEE 10BASE-T1S. It is used for the analysis of Ethernet networks as well as for simulation and test tasks in the Ethernet environment. USB 3.0 is used as an interface to the computer. Thanks to the small and compact format, the device is ideally suited for portable use.



Figure 27: VN5614 Ethernet Interface

Highlights

Features of the VN5614:

> 2x 10BASE-T1S port
> Low-level error and physical layer collision avoidance (PLCA) events reporting
> Flexible multidrop configuration to connect multiple simulated Ethernet nodes to the bus
> Software synchronization to other Vector interfaces (typ. 50 µs accuracy)
> Multi-application support (different tools can share an Ethernet port at the same time)
> USB-C connection to computer
> High precision time stamped Ethernet frames (<20 ns precision)
> Device is designed for mobile use
  - small, handy and lightweight housing
  - power-supply via USB

8.3 Connectors

8.3.1 Front Side

Device connectors

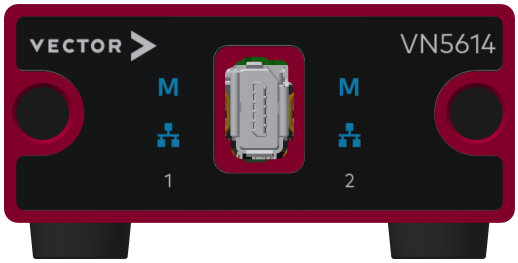
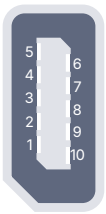


Figure 28: Connectors on the Ethernet side

> **Ethernet (ix Industrial)**
ix Industrial connector for 10BASE-T1S (e. g. Harting ix Industrial type 10A-1). The connector has two Ethernet ports (A and B). Use cables of the Vector AEcable 2Y DSUB9 10BASE-T1S (part number: 05246) to access both ports on separate connectors.

Pin	Assignment
1	CH1 MDI+ (connected to pin 4)
2	CH1 MDI- (connected to pin 5)
6	CH1 MDI+
7	CH1 MDI-
3	Not connected
4	CH2 MDI+ (connected to pin 1)
5	CH2 MDI- (connected to pin 2)
9	CH2 MDI+
10	CH2 MDI-
8	Not connected
Shield	Shield



Note

There is no internal differential end termination for 10BASE-T1S multidrop on the module. The multidrop busline must be terminated externally, e. g. by an already terminated ECU or by a resistor connected to the AEcable ix/DSUB9 10BASE-T1S (Vector part number 05219) via a 100 Ohm resistor between MDI+ and MDI-.

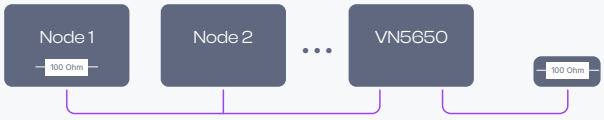


Figure 29: External termination

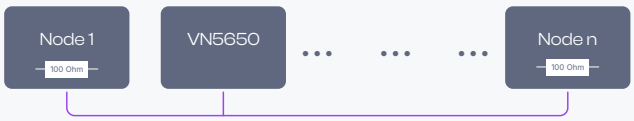


Figure 30: Node termination

A plug and play adapter to terminate the 10BASE-T1S network is available (10BASEterm - Vector part number 05224). It is suitable for AEcable ix/DSub9 10BASE-T1S. The 10BASEterm is not intended for use with AEcable 2Y DSUB9 male.

8.3.2 Back Side

Device connectors

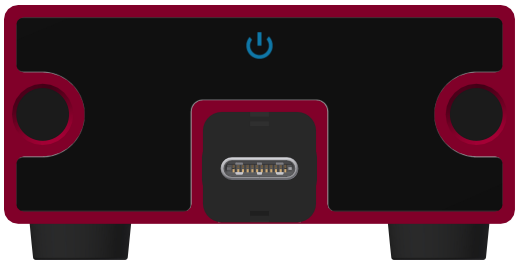


Figure 31: Connectors on the USB side

> **USB**
>
> Connect your computer and the VN5614 over USB 3.2 Gen 1 to install and to use the device. Connect the device directly to a USB Type-C port at your computer or use a USB hub with its own power supply (self-powered).

8.4 LEDs

> **Ethernet Port 1/2**

LED illuminates when BEACON symbols are regularly detected on the MDI or blinks if there is Ethernet activity.

Color	Description
Yellow	10 Mbit/s

> **M Ethernet Port 1/2**

Illuminates if the according port is configured as Coordinator.

State	Description
On	PHY is configured as a PLCA Coordinator.
Off	PHY is configured as a PLCA Follower.

> **Power**

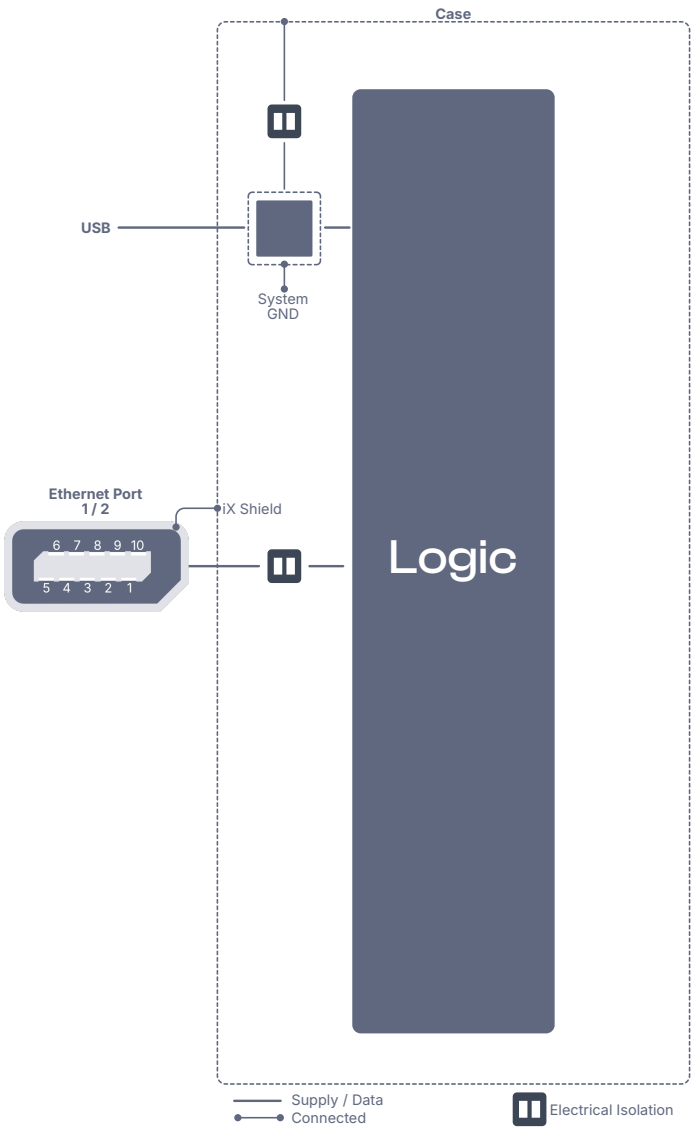
Multicolored LED indicating the device status.

Color	Description
Green	> Blinks 4x at power up and illuminates afterwards. > Blinks quicker during an update progress. Please wait for the automatic reboot of the device after the update has been finished. Do not disconnect the USB cable while the LED is blinking.
Red	An error has occurred. Please disconnect the USB cable. Re-connect the USB cable and try again.

8.5 Technical Data

Ethernet ports	2x Microchip LAN8670 (each with Analog Devices AD3306)
Computer interface	USB 3.2 Gen 1, bus-powered, fixed cable (length 1 m, min. bend radius 45 mm) with Type-C connector
Input voltage	Nom. 5 V (USB bus-powered)
Power consumption	Approx. 2 W
Temperature range (ambient temp. of the device)	Operation: 0 °C ... +50 °C Storage: -40 °C ... +85 °C
Relative humidity of ambient air	15 %...95 %, non-condensing
Dimensions (LxWxH)	54 mm x 98 mm x 23 mm
Weight	Approx. 180 g
Operating system requirements	Windows 10 (x64, 64 bit) Windows 11 (x64, 64 bit)

Electrical isolation of the connectors



8.5.1 Network Features

Ports/channels	Total number of Ethernet Ports	2
	10BASE-T1S	2
	100BASE-T1 / 1000BASE-T1	-
	1000BASE-T1 Legacy Mode	-
	10/100/1000BASE-T(X)	-
	1G BASE-T	-
	2.5G BASE-T	-
	2.5GBASE-T1	-
	5G BASE-T	-
	10G BASE-T	-
	CAN FD	-
	DoIP Activation / Wake-up Line	-
	Multiple digital / analog IO	-
Power supply	External	-
	USB buspowered	✓
Infrastructure	Hardware synchronization	-
	Software synchronization	✓
	PTP IEEE 1588 v2	-
	Computer uplink	USB3.0
	Computer uplink Ethernet	-
	USB adapter to connect sub devices	-
	Infrastructure Switch to connect sub devices	-
Port interconnection	Layer 2 Switch	-
	TAP	-
	Multidrop segment	✓
	Simultaneously interconnectable ports via switch/TAP	-
	Media conversion	-
	Link transparency	-
	OPEN Alliance TC10 (Wake/Sleep) 10BASE-T1S	✓
	OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	-
	OPEN Alliance TC10 (Wake/Sleep) 1000BASE-T1	-
	OPEN Alliance TC10 (Wake/Sleep) 2.5/5/10GBASE-T1	-
	Physical bypass relays	-

Measure	Mirroring port	-
	Uplink Frame filter	-
	Reporting of invalid Ethernet packets	✓
	MACsec (IEEE 802.1AE)	-
	Reporting of PLCA events	✓1)
Simulation	VLAN tagging / untagging / routing	-
	Virtual switch ports for Vector-Tools	8
	Time-triggered transmit interface (e. g. for precise AVB-Streams)	-
	MACsec (IEEE 802.1AE)	-
	gPTP (IEEE 802.1AS) support on user network (AVB and AUTOSAR clocks)	-
Test	On-board packet generator	-
	Invalid Ethernet packet generation	✓
	OPEN Alliance TC10 (Wake/Sleep) 10BASE-T1S	✓
	OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	-
	OPEN Alliance TC10 (Wake/Sleep) 1000BASE-T1	-
	OPEN Alliance TC10 (Wake/Sleep) 2.5/5/10GBASE-T1	-
	MACsec (IEEE 802.1AE)	-
	gPTP (IEEE 802.1AS) support on user network (AVB and AUTOSAR clocks)	-
Application area	Measurement / analysis	✓
	Simulation	✓
	Test	✓

1) Available in a later release.
2) Host computer must support USB-C with 3 A.
3) Supports one switch segment with a maximum of three measurement ports. Sending via measurement ports is not possible.
4) Only with compatible VNmodule60 (see section VNmodule60 on page 284).
5) Only 100/1000BASE-T1

8.6 Accessories



Note

Detailed information on the listed accessories can be found in the separate accessories manual on our website.

Cables and connectors	>	AEcable 2Y DSUB9 10BASE-T1S

9 VN5620

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9.1 Scope of Delivery

Contents

The delivery includes:

- 1x VN5620 Ethernet/CAN Interface
- 1x USB cable 3.1 (A-C, 1. 8m, with screws)
- 1x USB cable 3.1 (C-C, 1. 8m, with screws)
- 1x Vector power supply 12 V / 1.5 A (part number 05024)

9.2 Introduction

About the VN5620

The VN5620 is a compact and powerful interface for the analysis, simulation, test and validation of Ethernet networks. The VN5620 interface supports a wide range of possible applications. It is suitable for synchronous Ethernet monitoring with other bus systems, network participation (e. g. in simulations and generation of frames, loads and errors in tests). The user can use Ethernet (1000BASE-T) or USB 3.2 Gen 1 as interface to the computer.



Figure 32: VN5620 Ethernet/CAN Interface

Highlights

Features of the VN5620:

- 4x IEEE 100BASE-T1 / 1000BASE-T1 user port
- 2x CAN FD channel
- 1x digital IO (e. g. for DoIP ActivationLine)
- 2x infrastructure port, standard Ethernet (100BASE-TX / 1000BASE-T), usable as:
  - uplink to host computer
  - an alternative user port
    (e. g. to analyze traffic of a 100BASE-TX/1000BASE-T link)
  - USB adapter function to connect sub devices (e. g. VN5430, VX1135 or CSM modules, see page 25)
- Useable as a CMP sink for analysis in applications (see Vector Hardware Manager help for further details)
- Host connection via USB 3.2 Gen 1 or Ethernet
- On-board Ethernet TAPs to link between two Ethernet ports
- On-board Vector Ethernet Switch IP

- New hardware configuration concept
- Usable without host-connection to interconnect ECUs
  - Self-configuration after power-up
- Hardware filtering of Ethernet packets on protocol base
- Device synchronization to other Vector interfaces or 3rd party via
  - software synchronization (typ. 50 µs accuracy)
  - hardware synchronization (1 µs accuracy)
- IEEE 1588 (PTP)
- Multi-application support (different tools can share an Ethernet port at the same time)
- High precision time stamped Ethernet/CAN frames (< 20 ns precision)

9.3 Standalone Mode

This Vector device can also operate in standalone mode (i. e., without being connected to a computer). Typical standalone applications include:

- Standalone Media Converter
- Port Mirroring



Note

For standalone mode, the device must already be set up using the Vector Hardware Manager and the configuration must already be deployed. The configuration is persistent and independent of the connected computer, and the device is fully functional when powered externally.

If the device is already running in standalone mode (no connection to a computer), you can always re-connect your device to your computer via USB without interruption. This can be useful, for example, if you want to use CANoe for remaining bus simulation or measurement purposes after the standalone mode is already running. Connecting your application such as CANoe to the Vector device does not interfere with its operation, e. g. communication with your ECU.

9.4 Connectors

9.4.1 Front Side

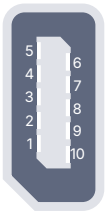
Device connectors



Figure 33: Connectors on the Ethernet side

> **Ethernet 1/2 and 3/4 (ix Industrial)**
ix Industrial connectors for 100BASE-T1/1000BASE-T1 (e. g. Harting ix Industrial type 10A-1). Each connector has two Ethernet ports (A and B). Use cables of the Vector AEcable 2Y family to access both ports on separate connectors (different plug systems available).

Pin	Assignment
1	CH2 MDI+
2	CH2 MDI-
3...5	Not connected
6	CH1 MDI+
7	CH1 MDI-
8...10	Not connected



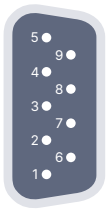
Note

We recommend the usage of an AEcable 2Y (see section Accessories on page 111), because it separates the VN5620 shield potential from the ECU shield potential. This ensures that all compensating currents over the shields are avoided. A capacitive coupling of the shields is implemented in the AEcable 2Y.

> **CAN 5/6 (D-SUB9)**

D-SUB9 connector for CAN. The connector has two channels. Use the CANcable 2Y to access both channels on separate D-SUB9 connectors (see accessories manual, part number 05075).

Pin	Assignment
1	CH6 CAN Low
2	CH5 CAN Low
3	CH5 GND
4	Reserved. Do not use.
5	Not connected
6	CH6 GND
7	CH5 CAN High
8	CH6 CAN High
9	Not connected



9.4.2 Back Side

Device connectors



Figure 34: Connectors on the USB side

> **Power (Binder)**
Use this connector to power the VN5620 as alternative to USB-C (see USB connector details).

Pin	Assignment
1	Power supply 10 V...32 V (typ. 12 V DC)
2	Not connected
3	Ground



> **Sync (Binder)**
The VN5620 has one sync connector (Binder type 711) which can be used for time synchronization of different Vector devices see section Time Synchronization on page 349.

Pin	Assignment
1	Not connected
2	Synchronization line
3	Ground



> **Reset**
If the device configuration is corrupted, start it with pushed reset button.

> **I/O (LEMO connector)**
LEMO connector (type 302) for bidirectional digital input/output.

Pin	Assignment
1	Digital IO (pulse-per-second signal output supported)
2	Ground



> **USB (Type-C)**
Connect your computer and the VN5620 via USB to install and to use the device with measurement applications (e. g. CANoe, CANalyzer). If the host computer provides a current of 3 A, the device can also be powered via this connector.

> **Host (RJ45 connector)**
This infrastructure port offers several configuration options:
  - Uplink: Connect your computer and the VN5620 via standard Ethernet instead of USB to use it with measurement applications (e. g. CANoe, CANalyzer) in a network setup.
  - Alternative analysis port



Note

The uplink port must be configured as an **Ethernet Host** in the Vector Hardware Manager.

> **Casc (RJ45 connector)**
This infrastructure port offers several configuration options:
  - Alternative analysis port
  - Mirroring port
  - Adapter to Ethernet based sub devices (e. g. VN5430) (see section USB Adapter/Connection of Sub Devices on page 25). The USB adapter function can also be used to obtain Capture Module Protocol (CMP) data streams.

> **Functional Earth (FE)**
Optional connection of housing ground to system ground.

> **Kensington Lock**
Mounting of Nano Kensington (NanoSaver).

9.5 LEDs

LEDs



Figure 35: Top LEDs on VN5620

> **Ethernet Port 1...4**

LED illuminates if there is an Ethernet link or blinks if there is Ethernet activity at the according port.

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

> **M Ethernet Port 1...4**

Illuminates if the according port is configured as master. The color of the Master LED depends on the link speed (see Ethernet port LED above).

State	Description
On	PHY is configured as master.
Off	PHY is configured as slave.

Note

When the LED is flashing, the device is in Master/Slave auto-detect mode. This indicates that a link has not yet been established. The device will attempt to establish a link by iterating through master/slave configurations and possible link speeds. See the Vector Hardware Manager Help for more details on the "Master/Slave Auto Detect" feature.

> **CAN (CH5/CH6)**

Multicolored channel LEDs, each indicating the bus activity for CAN.

Color	Description
Green	Data frames have been sent or received correctly. The flashing frequency varies according to the message rate.
Orange	Error frames have been sent or received. The flashing frequency varies according to the message rate.
Red	Bus off.

> **Sync**

LED illuminates if the device is synchronized.

Color	Sync State	Description
Off	Not configured.	No master or slave protocols are active for this device or no configuration has been loaded yet.
Orange	Configured, waiting for master.	A slave protocol is active, but no master could be found / assigned yet. The state is assumed when the PTP protocol **Slave** or **Best-Master** is activated in the firmware, i. e. when starting the PTP stack in the firmware or if one of the slave protocols was activated in the driver, i. e. when or after the configuration was applied by the Vector Timesync Service (vTSS).
Green (flashing)	Pending.	A slave protocol is active and a master was found or could be assigned. The SYNC condition / the steady state was not yet reached or was left again. > **PTP** Transition to the Slave-With-Master state, but the SYNC condition has not yet been reached. > **HW-SYNC** Pulse and master time present, but the SYNC accuracy has not yet been reached.

Color	Sync State	Description
		> **SW-SYNC** SYNC accuracy not yet reached.
Green	In-sync.	SYNC condition reached and is met or only master protocols active on the interface.
Red	Failure.	> **PTP** Master lost, SYNC accuracy not maintained. > **HW-SYNC** Missing pulse, missing time information of the master, SYNC accuracy not maintained. > **SW-SYNC** SYNC accuracy not maintained. If the SYNC accuracy is not maintained but the master is present, this state is only maintained for three seconds, then the state changes to **Pending**.

> **Power**

Multicolored LED indicating the device status.

Color	Description
Green	> Blinks 4x at power up and illuminates afterwards. > Blinks quicker during an update progress. Please wait for the automatic reboot of the device after the update has been finished. Do not disconnect the power supply while the LED is blinking.
Red	An error has occurred. Please disconnect the power supply as well as the USB cable. Re-connect the power supply and the USB cable and try again.

> **RJ45**

LEDs illuminate if there is an Ethernet link or blink if there is Ethernet activity.

Color (Left)	Description
Green	Activity

Color (Right)	Description
Off	10 Mbit/s
Orange	100 Mbit/s
Green	1000 Mbit/s

9.6 Technical Data

9.6.1 Overview

Ethernet ports	> 2x ix Industrial – 4x Infineon 88Q2112-A2 – 1000BASE-T1 – 100BASE-T1 > 2x RJ45 – 2x Broadcom BCM54210 – 1000BASE-T – 100BASE-TX – 10BASE-T
CAN/CAN FD channels	2x NXP TJA1057
Digital input/output	Output high (no load): 13 V Output high (load 346 Ohm): 5.3 V Output low: 0 V Input range: 0...16 V Input Schmitt trigger high: 3.4 V Input Schmitt trigger low: 2.5 V Rout: 503 Ohm Pulse-per-second signal (PPS) output: Supported via Vector Hardware Manager
Computer interface	USB 3.2 Gen 1 with Type-C connector/ IEEE 1000BASE-T
Input voltage	External powered 10...32 V (typ. 12 V DC) or USB-C powered (must support USB-C, 3 A)
Power consumption	Max. 15 W Typ. 10 W
Time stamps	Resolution: 12.5 ns Accuracy (in device): 1 µs Accuracy software sync: typ. 50 µs Accuracy hardware sync: typ. 1 µs
Latency link/switch segment	Link (stress access): approx. 7...12 µs Link (low latency): approx. 6...7 µs Switch: approx. 12 µs Please note that the exact latency depends on:

	> Link speed > Ethernet PHY > Ethernet packet length (switch segment only)
Temperature range (ambient temp. of the device)	Operation: -25 °C ... +60 °C Storage: -40 °C ... +85 °C
Relative humidity of ambient air	15 %...95 %, non-condensing
Dimensions (LxWxH)	143 mm x 153 mm x 37 mm
Weight	570 g
Operating system requirements	Windows 10 (x64, 64 bit) Windows 11 (x64, 64 bit)

9.6.2 Temperature Shutdown

Temperature limits

The devices are temperature monitored to prevent damage to the device. The devices switch off automatically when the upper limit temperature is exceeded. This limit value represents the theoretical maximum of the hardware. However, it is possible to leave this range slightly without damaging the hardware.

For this purpose the temperature shutdown can be switched off actively.

If the maximum temperature is exceeded, it is indicated by a red status LED on the device. Vector applications also display this (e. g. in the **Write** window of CANoe).

You can find the settings in the Vector Hardware Manager.

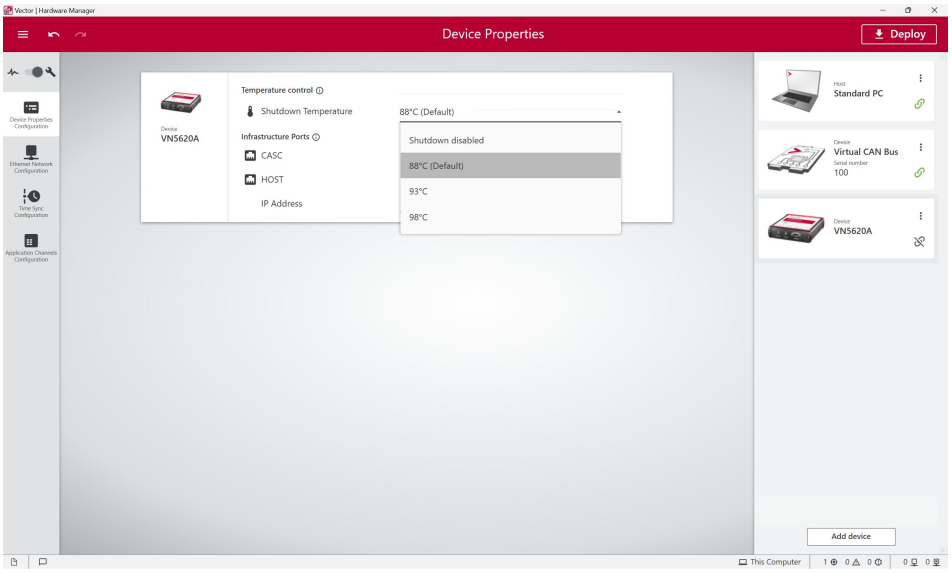
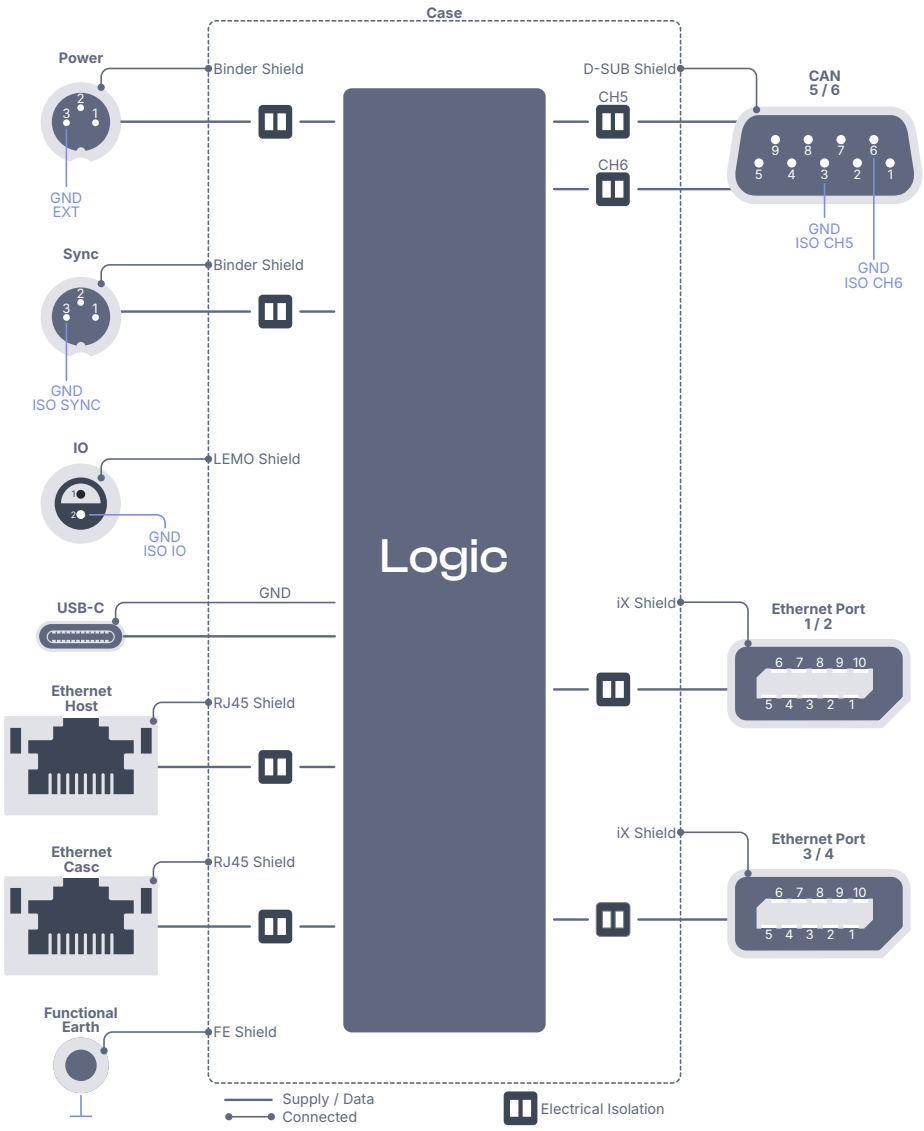


Figure 36: Device Properties Configuration in the Vector Hardware Manager

9.6.3 Electrical Isolation

Electrical isolation of the connectors



Note

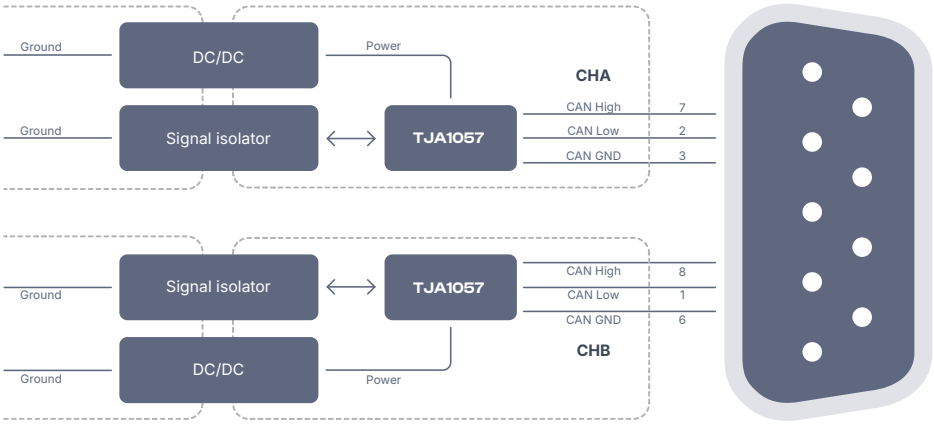
Please note that the shield of the USB-C connector has the same potential as the logic ground of the device and that this is isolated from the housing ground of the device. This is to avoid ground loops when used with a computer system without an electrically isolated power supply.

The FE socket of the device must be connected to the user-side system ground when the device is operated in the vehicle.

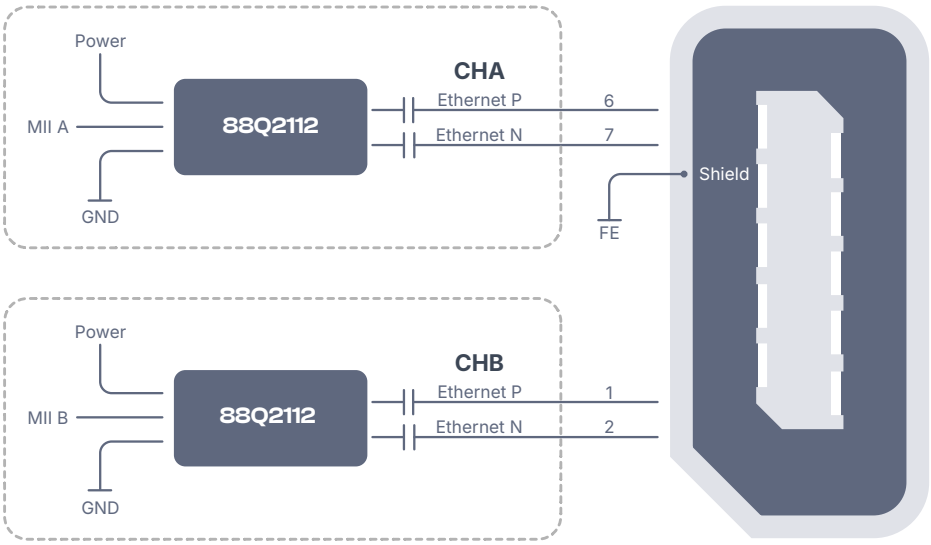
Note

The usage of an AEcable 2Y is recommended because it separates the interface's shield potential from the ECU shield potential. This ensures that all compensating currents over the shields are avoided. A capacitive coupling of the shields is implemented in the AEcable 2Y.

Electrical isolation of CAN in detail



Electrical isolation of Ethernet in detail



Note

The electrical isolation of the interfaces is a functional isolation that is used to avoid ground loops and interference between the networks. The voltage difference between the isolated areas must not exceed 60 VDC (isolation voltage). The isolation voltage usually exceeds the maximum permissible voltage at a port (operating voltage).

9.6.4 Network Features

Ports/channels	Total number of Ethernet Ports	6
	10BASE-T1S	-
	100BASE-T1 / 1000BASE-T1	4
	1000BASE-T1 Legacy Mode	✓
	10/100/1000BASE-T(X)	2
	1G BASE-T	-
	2.5G BASE-T	-
	2.5GBASE-T1	-
	5G BASE-T	-
	10G BASE-T	-
	CAN FD	2
	DoIP Activation / Wake-up Line	✓
	Multiple digital / analog IO	-
Power supply	External	✓
	USB buspowered	✓2)
Infrastructure	Hardware synchronization	✓
	Software synchronization	✓
	PTP IEEE 1588 v2	✓
	Computer uplink	USB 3.2 Gen 1
	Computer uplink Ethernet	1000BASE-T
	USB adapter to connect sub devices	✓
	Infrastructure Switch to connect sub devices	-
Port interconnection	Layer 2 Switch	✓
	TAP	✓
	Multidrop segment	-
	Simultaneously interconnectable ports via switch/TAP	4
	Media conversion	2
	Link transparency	✓
	OPEN Alliance TC10 (Wake/Sleep) 10BASE-T1S	-
	OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	-
	OPEN Alliance TC10 (Wake/Sleep) 1000BASE-T1	-
	OPEN Alliance TC10 (Wake/Sleep) 2.5/5/10GBASE-T1	-

	Physical bypass relays	-
Measure	Mirroring port	✓
	Uplink Frame filter	16 rules
	Reporting of invalid Ethernet packets	✓
	MACsec (IEEE 802.1AE)	-
	Reporting of PLCA events	-
Simulation	VLAN tagging / untagging / routing	✓
	Virtual switch ports for Vector-Tools	32
	Time-triggered transmit interface (e. g. for precise AVB-Streams)	-
	MACsec (IEEE 802.1AE)	-
	gPTP (IEEE 802.1AS) support on user network (AVB and AUTOSAR clocks)	-
Test	On-board packet generator	✓
	Invalid Ethernet packet generation	✓
	OPEN Alliance TC10 (Wake/Sleep) 10BASE-T1S	-
	OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	-
	OPEN Alliance TC10 (Wake/Sleep) 1000BASE-T1	-
	OPEN Alliance TC10 (Wake/Sleep) 2.5/5/10GBASE-T1	-
	MACsec (IEEE 802.1AE)	-
	gPTP (IEEE 802.1AS) support on user network (AVB and AUTOSAR clocks)	-
Application area	Measurement / analysis	✓
	Simulation	✓
	Test	✓

1) Available in a later release.
2) Host computer must support USB-C with 3 A.
3) Supports one switch segment with a maximum of three measurement ports. Sending via measurement ports is not possible.
4) Only with compatible VNmodule60 (see section VNmodule60 on page 284).
5) Only 100/1000BASE-T1

9.7 Troubleshooting

Issue	Remedy
The device is not recognized by the computer.	> Install the latest drivers from our website. > Perform a factory reset by pressing and holding the reset button on the back panel while powering up the device. Release the button when the Power LED starts flashing green.

9.8 Accessories



Note

Detailed information on the listed accessories can be found in the separate accessories manual on our website.

Cables and connectors

- AEcable 2Y
- CANcable1
- CANcableA
- CANcable TnT (D-SUB9 to Bunch Plugs)
- CANcable Y
- CANcable 2Y
- CANterm 120
- CANcable Set Pro
- Vector SYNCcableXL
- Vector SYNCcable50
- Multi SYNCbox external
- Multi SYNCbox internal
- Multi SYNCbox active
- Cable Binder 3pol Connector with Pigtail
- Cable LEMO/Banana Plugs
- USB Cable 3.1 Type A-C (Dual Screw Lock)
- USB Cable 3.1 Type C-C (Dual Screw Lock)
- Ethernet cables

Power supply

- Vector Power Supply 12V/1.5A
- Cable Banana Plug <> Binder 3-pin
- Car Power Supply Cable 12V with Binder

Miscellaneous

- Fix Kit 32mm Device

10 VN5620A

In this chapter you find the following information:

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10.8 Accessories **131**

10.1 Scope of Delivery

Contents

The delivery includes:

- 1x VN5620A Ethernet/CAN Interface
- 1x USB cable 3.1 (C-C, 1. 8m, with screws)
- 1x Vector power supply 12 V / 1.5 A (part number 05024)

10.2 Introduction

About the VN5620A

The VN5620A is a compact and powerful interface for the analysis, simulation, test and validation of Ethernet networks. The VN5620A interface supports a wide range of possible applications. It is suitable for synchronous Ethernet monitoring with other bus systems, network participation (e. g. in simulations and generation of frames, loads and errors in tests). The VN5620A also supports TC10 and MACsec at link speeds of 100/1000BASE-T1. The user can use Ethernet (1000BASE-T) or USB 3.2 Gen 1 as interface to the computer.



Figure 37: VN5620A Ethernet/CAN Interface

Highlights

Features of the VN5620A:

- 4x IEEE 100BASE-T1 / 1000BASE-T1 user port
- 2x CAN FD channel
- 1x digital IO (e. g. for DoIP ActivationLine)
- 2x infrastructure port, standard Ethernet (100BASE-TX / 1000BASE-T), usable as:
  - uplink to host computer
  - an alternative port for ther user network (e. g. to analyze traffic of a 100BASE-TX/1000BASE-T link)
  - USB adapter function to connect sub devices (e. g. VN5430, VX1135 or CSM modules, see page 25)
- Useable as a CMP sink for analysis in applications (see Vector Hardware Manager help for further details)
- Host connection via USB 3.2 Gen 1 or Ethernet
- On-board Ethernet TAPs to link between two Ethernet ports
- On-board Vector Ethernet Switch IP

- New hardware configuration concept
- Usable without host-connection to interconnect ECUs (see page 115)
  - Self-configuration after power-up
- Hardware filtering of Ethernet packets on protocol base
- Device synchronization to other Vector interfaces or 3rd party via
  - software synchronization (typ. 50 µs accuracy)
  - hardware synchronization (1 µs accuracy)
- IEEE 1588 (PTP)
- Multi-application support (different tools can share an Ethernet port at the same time)
- High precision time stamped Ethernet/CAN frames (< 20 ns precision)

10.3 Standalone Mode

This Vector device can also operate in standalone mode (i. e., without being connected to a computer). Typical standalone applications include:

- Standalone Media Converter
- Port Mirroring



Note

For standalone mode, the device must already be set up using the Vector Hardware Manager and the configuration must already be deployed. The configuration is persistent and independent of the connected computer, and the device is fully functional when powered externally.

If the device is already running in standalone mode (no connection to a computer), you can always re-connect your device to your computer via USB without interruption. This can be useful, for example, if you want to use CANoe for remaining bus simulation or measurement purposes after the standalone mode is already running. Connecting your application such as CANoe to the Vector device does not interfere with its operation, e. g. communication with your ECU.

10.4 Connectors

10.4.1 Front Side

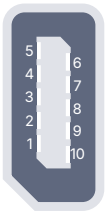
Device connectors



Figure 38: Connectors on the Ethernet side

> **Ethernet 1/2 and 3/4 (ix Industrial)**
ix Industrial connectors for 100BASE-T1/1000BASE-T1 (e. g. Harting ix Industrial type 10A-1). Each connector has two Ethernet ports (A and B). Use cables of the Vector AEcable 2Y family to access both ports on separate connectors (different plug systems available).

Pin	Assignment
1	CH2 MDI+
2	CH2 MDI-
3...5	Not connected
6	CH1 MDI+
7	CH1 MDI-
8...10	Not connected



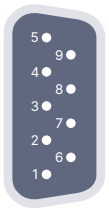
Note

We recommend the usage of an AEcable 2Y (see section Accessories on page 131), because it separates the VN5620A shield potential from the ECU shield potential. This ensures that all compensating currents over the shields are avoided. A capacitive coupling of the shields is implemented in the AEcable 2Y.

> **CAN 5/6 (D-SUB9)**

D-SUB9 connector for CAN. The connector has two channels. Use the CANcable 2Y to access both channels on separate D-SUB9 connectors (see accessories manual, part number 05075).

Pin	Assignment
1	CH6 CAN Low
2	CH5 CAN Low
3	CH5 GND
4	Reserved. Do not use.
5	Not connected
6	CH6 GND
7	CH5 CAN High
8	CH6 CAN High
9	Not connected



10.4.2 Back Side

Device connectors



Figure 39: Connectors on the USB side

> **Power (Binder)**
Use this connector to power the VN5620A as alternative to USB-C (see USB connector details).

Pin	Assignment
1	Power supply 10 V...32 V (typ. 12 V DC)
2	Not connected
3	Ground



> **Sync (Binder)**
The VN5620A has one sync connector (Binder type 711) which can be used for time synchronization of different Vector devices (see section Time Synchronization on page 349).

Pin	Assignment
1	Not connected
2	Synchronization line
3	Ground



> **Reset**
If the device configuration is corrupted, start it with pushed reset button.

> **I/O (LEMO connector)**
LEMO connector (type 302) for bidirectional digital input/output.

Pin	Assignment
1	Digital IO (pulse-per-second signal output supported)
2	Ground



> **USB (Type-C)**
Connect your computer and the VN5620A via USB to install and to use the device with measurement applications (e. g. CANoe, CANalyzer). If the host computer provides a current of 3 A, the device can also be powered via this connector.

> **Host (RJ45 connector)**
This infrastructure port offers several configuration options:
- Uplink: Connect your computer and the VN device via standard Ethernet instead of USB to use it with measurement applications (e. g. CANoe, CANalyzer) in a network setup.
- Alternative analysis port



Note

The uplink port must be configured as an **Ethernet Host** in the Vector Hardware Manager.

> **Casc (RJ45 connector)**
This infrastructure port offers several configuration options:
- Alternative analysis port
- Mirroring port
- Adapter to Ethernet based sub devices (e. g. VN5430) (see section USB Adapter/Connection of Sub Devices on page 25). The USB adapter function can also be used to obtain Capture Module Protocol (CMP) data streams.

> **Functional Earth (FE)**
Optional connection of housing ground to system ground.

> **Kensington Lock**
Mounting of Nano Kensington (NanoSaver).

10.5 LEDs

LEDs

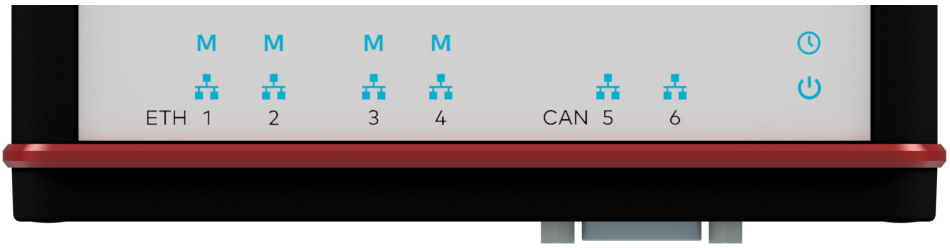


Figure 40: Top LEDs on VN5620A

> **Ethernet Port 1...4**

LED illuminates if there is an Ethernet link or blinks if there is Ethernet activity at the according port. When a port is in OPEN Alliance TC10 sleep mode, the LED flashes at a low frequency.

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

> **M Ethernet Port 1...4**

Illuminates if the according port is configured as master. The color of the Master LED depends on the link speed (see Ethernet port LED above).

State	Description
On	PHY is configured as master.
Off	PHY is configured as slave.

Note

When the LED is flashing, the device is in Master/Slave auto-detect mode. This indicates that a link has not yet been established. The device will attempt to establish a link by iterating through master/slave configurations and possible link speeds. See the Vector Hardware Manager Help for more details on the "Master/Slave Auto Detect" feature.

> **CAN (CH5/CH6)**

Multicolored channel LEDs, each indicating the bus activity for CAN.

Color	Description
Green	Data frames have been sent or received correctly. The flashing frequency varies according to the message rate.
Orange	Error frames have been sent or received. The flashing frequency varies according to the message rate.

Color	Description
Red	Bus off.

> **Sync**

LED illuminates if the device is synchronized.

Color	Sync State	Description
Off	Not configured.	No master or slave protocols are active for this device or no configuration has been loaded yet.
Orange	Configured, waiting for master.	A slave protocol is active, but no master could be found / assigned yet. The state is assumed when the PTP protocol **Slave** or **Best-Master** is activated in the firmware, i. e. when starting the PTP stack in the firmware or if one of the slave protocols was activated in the driver, i. e. when or after the configuration was applied by the Vector Timesync Service (vTSS).
Green (flashing)	Pending.	A slave protocol is active and a master was found or could be assigned. The SYNC condition / the steady state was not yet reached or was left again. > **PTP** Transition to the Slave-With-Master state, but the SYNC condition has not yet been reached. > **HW-SYNC** Pulse and master time present, but the SYNC accuracy has not yet been reached. > **SW-SYNC** SYNC accuracy not yet reached.
Green	In-sync.	SYNC condition reached and is met or only master protocols active on the interface.
Red	Failure.	> **PTP**

Color	Sync State	Description
		Master lost, SYNC accuracy not maintained. > **HW-SYNC** Missing pulse, missing time information of the master, SYNC accuracy not maintained. > **SW-SYNC** SYNC accuracy not maintained. If the SYNC accuracy is not maintained but the master is present, this state is only maintained for three seconds, then the state changes to **Pending**.

> **Power**

Multicolored LED indicating the device status.

Color	Description
Green	> Blinks 4x at power up and illuminates afterwards. > Blinks quicker during an update progress. Please wait for the automatic reboot of the device after the update has been finished. Do not disconnect the power supply while the LED is blinking.
Red	An error has occurred. Please disconnect the power supply as well as the USB cable. Re-connect the power supply and the USB cable and try again.

> **RJ45**

LEDs illuminate if there is an Ethernet link or blink if there is Ethernet activity.

Color (Left)	Description
Green	Activity

Color (Right)	Description
Off	10 Mbit/s
Orange	100 Mbit/s
Green	1000 Mbit/s

10.6 Technical Data

10.6.1 Overview

Ethernet ports	> 2x ix Industrial – Infineon 88Q2220M B2 – 1000BASE-T1 – 100BASE-T1 > 2x RJ45 – 2x Broadcom BCM54210 – 1000BASE-T – 100BASE-TX – 10BASE-T
CAN/CAN FD channels	2x NXP TJA1057
Digital input/output	Output high (no load): 13 V Output high (load 346 Ohm): 5.3 V Output low: 0 V Input range: 0...16 V Input Schmitt trigger high: 3.4 V Input Schmitt trigger low: 2.5 V Rout: 503 Ohm Pulse-per-second signal (PPS) output: Supported via Vector Hardware Manager
Computer interface	USB 3.2 Gen 1 with Type-C connector/ IEEE 1000BASE-T
Input voltage	External powered 10...32 V (typ. 12 V DC) or USB-C powered (must support USB-C, 3 A)
Power consumption	Max. 15 W Typ. 8 W
Time stamps	Resolution: 12.5 ns Accuracy (in device): 1 µs Accuracy software sync: typ. 50 µs Accuracy hardware sync: typ. 1 µs
Latency link/switch segment	Link (stress access): approx. 7...12 µs Link (low latency): approx. 6...7 µs Switch: approx. 12 µs Please note that the exact latency depends on:

	> Link speed > Ethernet PHY > Ethernet packet length (switch segment only)
Temperature range (ambient temp. of the device)	Operation: -25 °C ... +60 °C Storage: -40 °C ... +85 °C
Relative humidity of ambient air	15 %...95 %, non-condensing
Dimensions (LxWxH)	143 mm x 153 mm x 37 mm
Weight	570 g
Operating system requirements	Windows 11 (x64, 64 bit)

10.6.2 Temperature Shutdown

Temperature limits

The devices are temperature monitored to prevent damage to the device. The devices switch off automatically when the upper limit temperature is exceeded. This limit value represents the theoretical maximum of the hardware. However, it is possible to leave this range slightly without damaging the hardware.

For this purpose the temperature shutdown can be switched off actively.

If the maximum temperature is exceeded, it is indicated by a red status LED on the device. Vector applications also display this (e. g. in the **Write** window of CANoe).

You can find the settings in the Vector Hardware Manager.

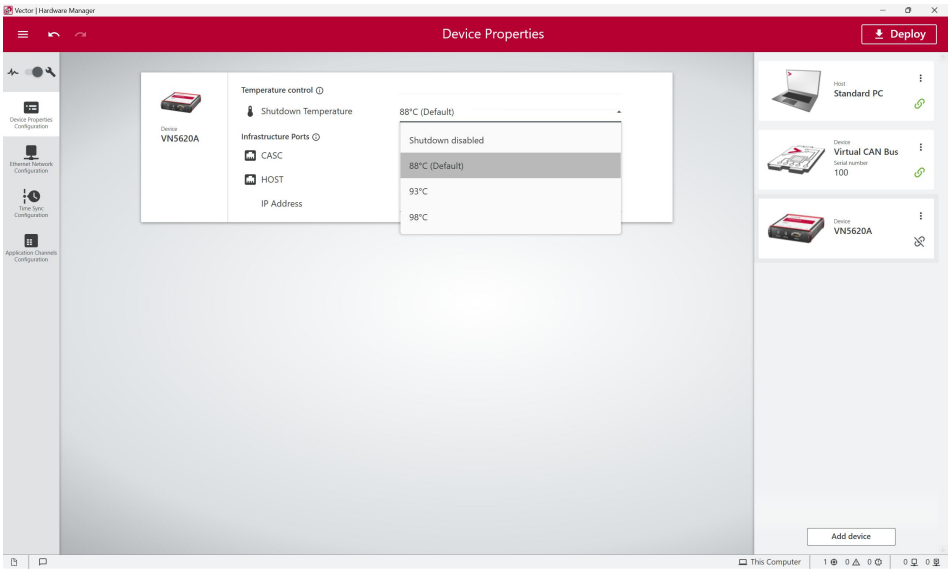
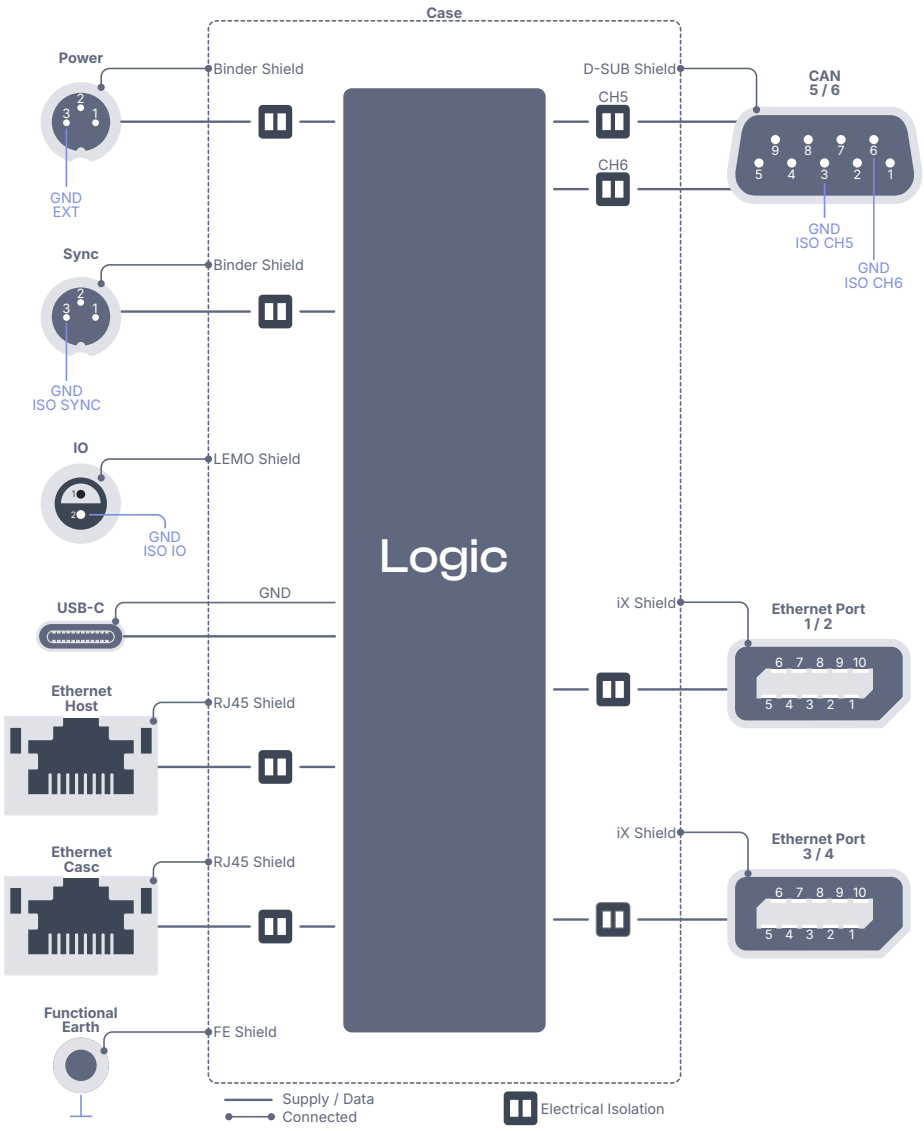


Figure 41: Device Properties Configuration in the Vector Hardware Manager

10.6.3 Electrical Isolation

Electrical isolation of the connectors



Note

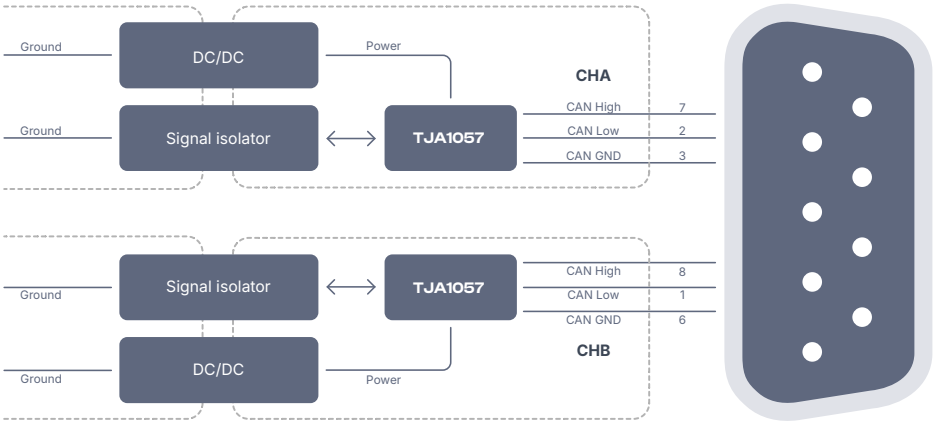
Please note that the shield of the USB-C connector has the same potential as the logic ground of the device and that this is isolated from the housing ground of the device. This is to avoid ground loops when used with a computer system without an electrically isolated power supply.

The FE socket of the device must be connected to the user-side system ground when the device is operated in the vehicle.

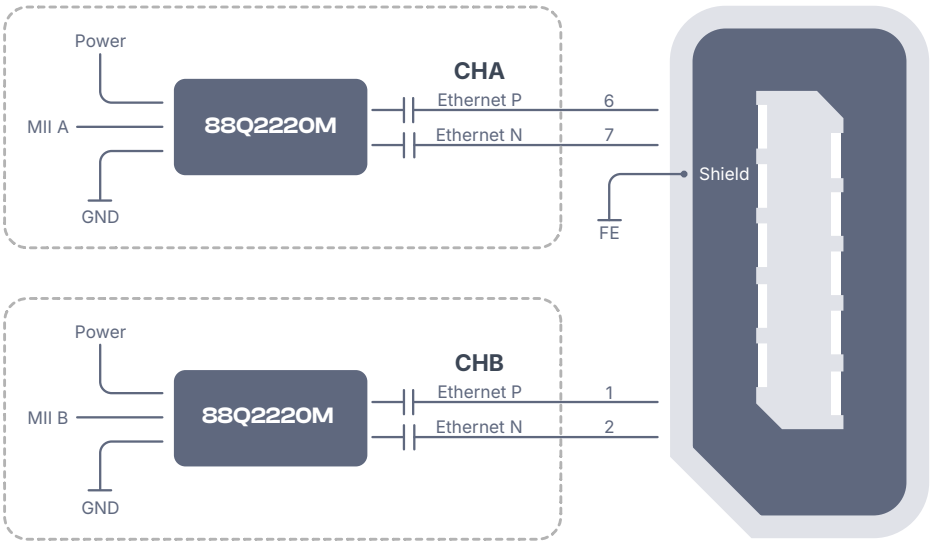
Note

The usage of an AEcable 2Y is recommended because it separates the interface's shield potential from the ECU shield potential. This ensures that all compensating currents over the shields are avoided. A capacitive coupling of the shields is implemented in the AEcable 2Y.

Electrical isolation of CAN in detail



Electrical isolation of Ethernet in detail



Note

The electrical isolation of the interfaces is a functional isolation that is used to avoid ground loops and interference between the networks. The voltage difference between the isolated areas must not exceed 60 VDC (isolation voltage). The isolation voltage usually exceeds the maximum permissible voltage at a port (operating voltage).

10.6.4 Network Features

Ports/channels	Total number of Ethernet Ports	6
	10BASE-T1S	-
	100BASE-T1 / 1000BASE-T1	4
	1000BASE-T1 Legacy Mode	-
	10/100/1000BASE-T(X)	2
	1G BASE-T	-
	2.5G BASE-T	-
	2.5GBASE-T1	-
	5G BASE-T	-
	10G BASE-T	-
	CAN FD	2
	DoIP Activation / Wake-up Line	✓
	Multiple digital / analog IO	-
Power supply	External	✓
	USB buspowered	✓2)
Infrastructure	Hardware synchronization	✓
	Software synchronization	✓
	PTP IEEE 1588 v2	✓
	Computer uplink	USB 3.2 Gen 1
	Computer uplink Ethernet	1000BASE-T
	USB adapter to connect sub devices	✓
	Infrastructure Switch to connect sub devices	-
Port interconnection	Layer 2 Switch	✓
	TAP	✓
	Multidrop segment	-
	Simultaneously interconnectable ports via switch/TAP	4
	Media conversion	2
	Link transparency	✓
	OPEN Alliance TC10 (Wake/Sleep) 10BASE-T1S	-
	OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	✓
	OPEN Alliance TC10 (Wake/Sleep) 1000BASE-T1	✓
	OPEN Alliance TC10 (Wake/Sleep) 2.5/5/10GBASE-T1	-

	Physical bypass relays	-
Measure	Mirroring port	✓
	Uplink Frame filter	16 rules
	Reporting of invalid Ethernet packets	✓
	MACsec (IEEE 802.1AE)	✓
	Reporting of PLCA events	-
Simulation	VLAN tagging / untagging / routing	✓
	Virtual switch ports for Vector-Tools	32
	Time-triggered transmit interface (e. g. for precise AVB-Streams)	-
	MACsec (IEEE 802.1AE)	✓
	gPTP (IEEE 802.1AS) support on user network (AVB and AUTOSAR clocks)	-
Test	On-board packet generator	✓
	Invalid Ethernet packet generation	✓
	OPEN Alliance TC10 (Wake/Sleep) 10BASE-T1S	-
	OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	✓
	OPEN Alliance TC10 (Wake/Sleep) 1000BASE-T1	✓
	OPEN Alliance TC10 (Wake/Sleep) 2.5/5/10GBASE-T1	-
	MACsec (IEEE 802.1AE)	✓
	gPTP (IEEE 802.1AS) support on user network (AVB and AUTOSAR clocks)	-
Application area	Measurement / analysis	✓
	Simulation	✓
	Test	✓

1) Available in a later release.
2) Host computer must support USB-C with 3 A.
3) Supports one switch segment with a maximum of three measurement ports. Sending via measurement ports is not possible.
4) Only with compatible VNmodule60 (see section VNmodule60 on page 284).
5) Only 100/1000BASE-T1

10.7 Troubleshooting

Issue	Remedy
The device is not recognized by the computer.	> Install the latest drivers from our website. > Perform a factory reset by pressing and holding the reset button on the back panel while powering up the device. Release the button when the Power LED starts flashing green.

10.8 Accessories



Note

Detailed information on the listed accessories can be found in the separate accessories manual on our website.

Cables and connectors

- AEcable 2Y
- CANcable1
- CANcableA
- CANcable TnT (D-SUB9 to Bunch Plugs)
- CANcable Y
- CANcable 2Y
- CANterm 120
- CANcable Set Pro
- Vector SYNCcableXL
- Vector SYNCcable50
- Multi SYNCbox external
- Multi SYNCbox internal
- Multi SYNCbox active
- Cable Binder 3pol Connector with Pigtail
- Cable LEMO/Banana Plugs
- USB Cable 3.1 Type A-C (Dual Screw Lock)
- USB Cable 3.1 Type C-C (Dual Screw Lock)
- Ethernet cables

Power supply

- Vector Power Supply 12V/1.5A
- Cable Banana Plug <> Binder 3-pin
- Car Power Supply Cable 12V with Binder

Miscellaneous

- Fix Kit 32mm Device

11 VN5631

In this chapter you find the following information:

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11.3 Standalone Mode 135

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11.1 Scope of Delivery

Contents

The delivery includes:

- 1x VN5631 10BASE-T1S Interface
- 1x USB cable 3.1 (C-C, 1. 8m, with screws)
- 1x Vector Power Supply ODU Mini-Snap

11.2 Introduction

About the VN5631

The VN5631 is a versatile, high-performance network interface designed for analyzing, simulating, testing, and validating Automotive Ethernet and CAN networks. Supporting 10BASE-T1S, 100BASE-T1, 1000BASE-T1, and up to 2.5GBASE-T, as well as CAN and CAN FD, the VN5631 is well-suited for mixed-technology setups and modern zonal architectures.

An uplink to the host computer via USB 3.2 Gen1 or 2.5GBASE-T Ethernet enables high data throughput and precise time synchronization using hardware, software, or PTP (IEEE 1588).



Figure 42: VN5631 Ethernet/CAN Interface

Highlights

Features of the VN5631:

- 2x IEEE 10BASE-T1S
- 2x IEEE 100BASE-T1/1000BASE-T1
- 2x CAN FD
- 1x digital IO (e. g. for DoIP Activation Line)
- 2x infrastructure port, standard Ethernet (up to 2.5GBASE-T), usable as:
  - uplink to host computer
  - an alternative port for the user network (e.g. to analyze Standard Ethernet traffic)
- Host connection via USB3.2 Gen1 or Ethernet
- Standalone, self-configuration after power-up

- Hardware filtering of Ethernet packets on protocol base
- Device synchronization to other Vector interfaces or 3rd party via
  - software synchronization (typ. 50 µs accuracy)
  - hardware synchronization (1 µs accuracy)
  - IEEE1588 v2 (PTP) (available in a later release)
- Multi-application support (different tools can share an Ethernet port at the same time)
- High precision timestamped Ethernet/CAN frames (< 20 ns precision)

11.3 Standalone Mode

This Vector device can also operate in standalone mode (i. e., without being connected to a computer). Typical standalone applications include:

- Standalone Media Converter
- Port Mirroring



Note

For standalone mode, the device must already be set up using the Vector Hardware Manager and the configuration must already be deployed. The configuration is persistent and independent of the connected computer, and the device is fully functional when powered externally.

If the device is already running in standalone mode (no connection to a computer), you can always re-connect your device to your computer via USB without interruption. This can be useful, for example, if you want to use CANoe for remaining bus simulation or measurement purposes after the standalone mode is already running. Connecting your application such as CANoe to the Vector device does not interfere with its operation, e. g. communication with your ECU.

11.4 Connectors

11.4.1 Front Side

Device connectors

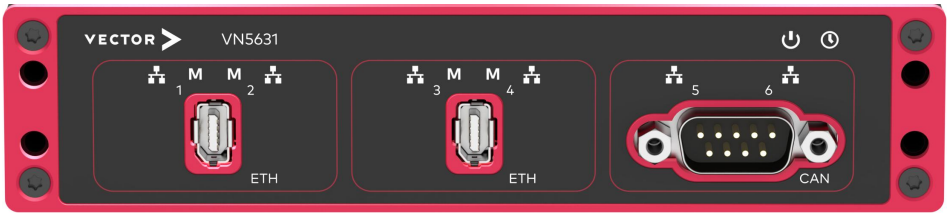
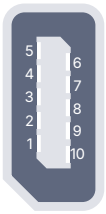


Figure 43: Connectors on the Ethernet side

> **Ethernet 1/2 (ix Industrial)**
ix Industrial connector for 10BASE-T1S (e. g. Harting ix Industrial type 10A-1). The connector has two Ethernet ports (A and B). Use cables of the Vector AEcable 2Y DSUB9 10BASE-T1S (part number: 05246) to access both ports on separate connectors.

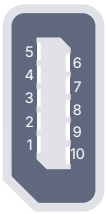
Pin	Assignment
1	CH1 MDI+ (connected to pin 6)
2	CH1 MDI- (connected to pin 7)
6	CH1 MDI+
7	CH1 MDI-
3	Not connected
4	CH2 MDI+ (connected to pin 9)
5	CH2 MDI- (connected to pin 10)
9	CH2 MDI+
10	CH2 MDI-
8	Not connected
Shield	Shield



> **Ethernet 3/4 (ix Industrial)**

ix Industrial connector for 100BASE-T1/1000BASE-T1 (e. g. Harting ix Industrial type 10A-1). The connector has two Ethernet ports (A and B). Use cables of the Vector AEcable 2Y family to access both ports on separate connectors (different plug systems available).

Pin	Assignment
1	CH2 MDI+
2	CH2 MDI-
3...5	Not connected
6	CH1 MDI+
7	CH1 MDI-
8...10	Not connected



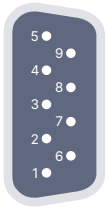
Note

We recommend the usage of an AEcable 2Y (see section Accessories on page 131), because it separates the VN5631 shield potential from the ECU shield potential. This ensures that all compensating currents over the shields are avoided. A capacitive coupling of the shields is implemented in the AEcable 2Y.

> **CAN 5/6 (D-SUB9)**

D-SUB9 connector for CAN. The connector has two channels. Use the CANcable 2Y to access both channels on separate D-SUB9 connectors (see accessories manual, part number 05075).

Pin	Assignment
1	CH6 CAN Low
2	CH5 CAN Low
3	CH5 GND
4	Reserved. Do not use.
5	Not connected
6	CH6 GND
7	CH5 CAN High
8	CH6 CAN High
9	Not connected



11.4.2 Back Side

Device connectors



Figure 44: Connectors on the USB side

> **Power (ODU)**

For power supply, the VN5631 has a two-pin ODU connector (MINI-SNAP size 1, type GF1L0C-P02RP00-0000). Attach the enclosed power cable to power up the unit (matching ODU connector type S11L0C-P02NPL0-6200).

Pin	Assignment
1	Power supply (10 V ... 32 V)
2	Ground



> **Sync (Binder)**

The VN5631 has one sync connector (Binder type 711) which can be used for time synchronization of different Vector devices (see section Time Synchronization on page 349).

Pin	Assignment
1	Not connected
2	Synchronization line
3	Ground



> **I/O (LEMO)**

LEMO connector (type 302) for bidirectional digital input/output.

Pin	Assignment
1	Digital IO (pulse-per-second signal output supported)
2	Ground



> **Reset**

If the device configuration is corrupted, start it with pushed reset button.

> **Kensington Lock**
Mounting of Nano Kensington (NanoSaver).

> **USB (Type-C)**
Connect your computer and the VN5631 via USB to install and to use the device with measurement applications (e. g. CANoe, CANalyzer). If the host computer provides a current of 3 A, the device can also be powered via this connector.

Note

When using RJ45 connectors, we recommend using the external power supply via the **Power** connector.

> **Functional Earth (FE)**
Optional connection of housing ground to system ground.

> **Ethernet 7/Host (RJ45 connector)**
This infrastructure port offers several configuration options:
- Uplink: Connect your computer and the VN device via standard Ethernet instead of USB to use it with measurement applications (e. g. CANoe, CANalyzer) in a network setup.
- Alternative analysis port

Note

The uplink port must be configured as an **Ethernet Host** in the Vector Hardware Manager.

> **Ethernet 8 (RJ45 connector)**
This infrastructure port offers several configuration options:
- Alternative analysis port
- Mirroring port

11.5 LEDs

LEDs

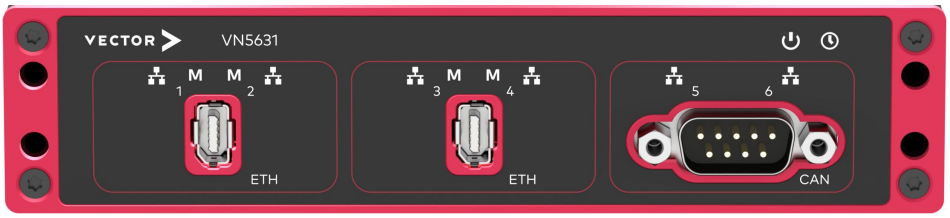


Figure 45: LEDs on VN5631

> **Ethernet Port 1/2**

LED illuminates when BEACON symbols are regularly detected on the MDI or blinks if there is Ethernet activity. When a port is in OPEN Alliance TC10 sleep mode, the LED flashes at a low frequency.

Color	Description
Yellow	10 Mbit/s

> **M Ethernet Port 1/2**

Illuminates if the according port is configured as PLCA Coordinator.

State	Description
On	PHY is configured as a PLCA Coordinator.
Off	PHY is configured as a PLCA Follower.

> **Ethernet Port 3/4**

LED illuminates if there is an Ethernet link or blinks if there is Ethernet activity at the according port. When a port is in OPEN Alliance TC10 sleep mode, the LED flashes at a low frequency.

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

> **M Ethernet Port 3/4**

Illuminates if the according port is configured as master. The color of the Master LED depends on the link speed (see Ethernet port LED above).

State	Description
On	PHY is configured as master.
Off	PHY is configured as slave.

Note

When the LED is flashing, the device is in Master/Slave auto-detect mode. This indicates that a link has not yet been established. The device will attempt to establish a link by iterating through master/slave configurations and possible link speeds. See the Vector Hardware Manager Help for more details on the "Master/Slave Auto Detect" feature.

> CAN (CH5/CH6)

Multicolored channel LEDs, each indicating the bus activity for CAN.

Color	Description
Green	Data frames have been sent or received correctly. The flashing frequency varies according to the message rate.
Orange	Error frames have been sent or received. The flashing frequency varies according to the message rate.
Red	Bus off.

> Sync

LED illuminates if the device is synchronized.

Color	Sync State	Description
Off	Not configured.	No master or slave protocols are active for this device or no configuration has been loaded yet.
Orange	Configured, waiting for master.	A slave protocol is active, but no master could be found / assigned yet. The state is assumed when the PTP protocol **Slave** or **Best-Master** is activated in the firmware, i. e. when starting the PTP stack in the firmware or if one of the slave protocols was activated in the driver, i. e. when or after the configuration was applied by the Vector Timesync Service (vTSS).
Green (flashing)	Pending.	A slave protocol is active and a master was found or could be assigned. The SYNC condition / the steady state was not yet reached or was left again. > **PTP**

Color	Sync State	Description
		Transition to the Slave-With-Master state, but the SYNC condition has not yet been reached. > **HW-SYNC** Pulse and master time present, but the SYNC accuracy has not yet been reached. > **SW-SYNC** SYNC accuracy not yet reached.
Green	In-sync.	SYNC condition reached and is met or only master protocols active on the interface.
Red	Failure.	> **PTP** Master lost, SYNC accuracy not maintained. > **HW-SYNC** Missing pulse, missing time information of the master, SYNC accuracy not maintained. > **SW-SYNC** SYNC accuracy not maintained. If the SYNC accuracy is not maintained but the master is present, this state is only maintained for three seconds, then the state changes to **Pending**.

> **Power**

Multicolored LED indicating the device status.

Color	Description
Green	Flashes 4x at power up and illuminates afterwards. Flashes quicker during an update progress. Please wait for the automatic reboot of the device after the update has been finished. Afterwards the LED is permanent on.
Red	An error has occurred. Please use the included USB cable and also make sure it is receiving sufficient power via USB. Please disconnect the USB cable. Reconnect the USB cable

Color	Description
	and try again. Flashes when the max. temperature has been reached.

> **RJ45**

LEDs illuminate if there is an Ethernet link or blink if there is Ethernet activity.

Color (Left)	Color (Right)	Description
Orange	-	100 Mbit/s
Green	-	1 Gbit/s
-	Orange	2.5 Gbit/s

11.6 Technical Data

11.6.1 Overview

Ethernet ports	> 2x ix Industrial – Microchip LAN8680 > 2x ix Industrial – Infineon 88Q2221M > 2x RJ45 – Maxlinear GPY215
CAN/CAN FD channels	2x NXP TJA1057
Digital input/output	1x Wake-up or DoIP Activation Line
Computer interface	USB 3.2 Gen 1 with Type-C connector/ IEEE 1000BASE-T/2.5GBASE-T
Input voltage	External powered 10...32 V (typ. 12 V DC) or USB-C powered (must support USB-C, 3 A)
Power consumption	Max: 16.5 W Typ: 14 W
Time stamps	Resolution: 8 ns Accuracy (in device): 1 µs Accuracy software sync: typ. 50 µs Accuracy hardware sync: typ. 1 µs
Latency link/switch segment	Link (stress access): approx. 7...12 µs Link (low latency): approx. 6...7 µs Switch: approx. 12 µs Please note that the exact latency depends on: > Link speed > Ethernet PHY > Ethernet packet length (switch segment only)
Temperature range (ambient temp. of the device)	Operation: -25 °C ... +55 °C Storage: -40 °C ... +85 °C
Relative humidity of ambient air	15 %...95 %, non-condensing
Dimensions (LxWxH)	173 mm x 144 mm x 32 mm
Weight	1.15 kg
Operating system requirements	Windows 11 (x64, 64 bit)

11.6.2 Temperature Shutdown

Temperature limits

The devices are temperature monitored to prevent damage to the device. The devices switch off automatically when the upper limit temperature is exceeded. This limit value represents the theoretical maximum of the hardware. However, it is possible to leave this range slightly without damaging the hardware.

For this purpose the temperature shutdown can be switched off actively.

If the maximum temperature is exceeded, it is indicated by a red status LED on the device. Vector applications also display this (e. g. in the **Write** window of CANoe).

You can find the settings in the Vector Hardware Manager.

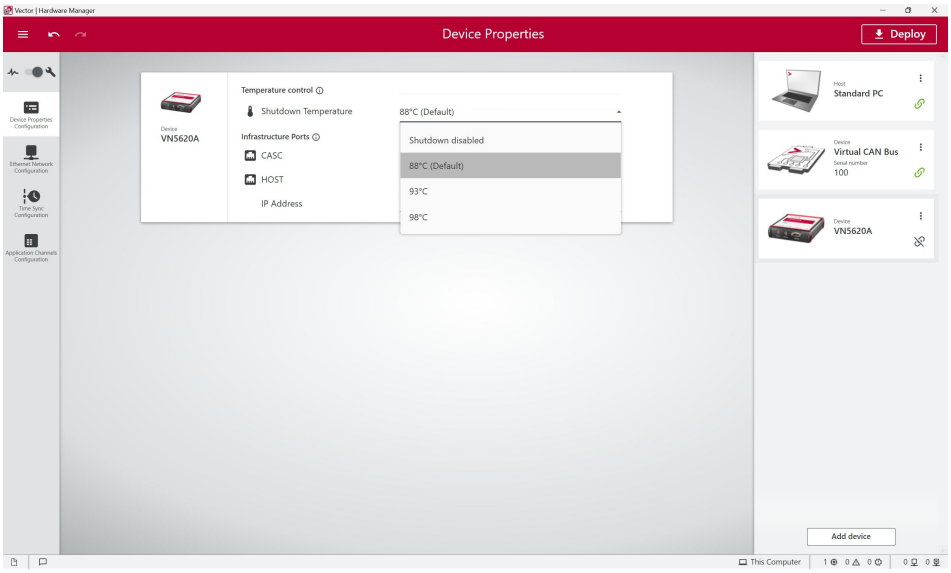
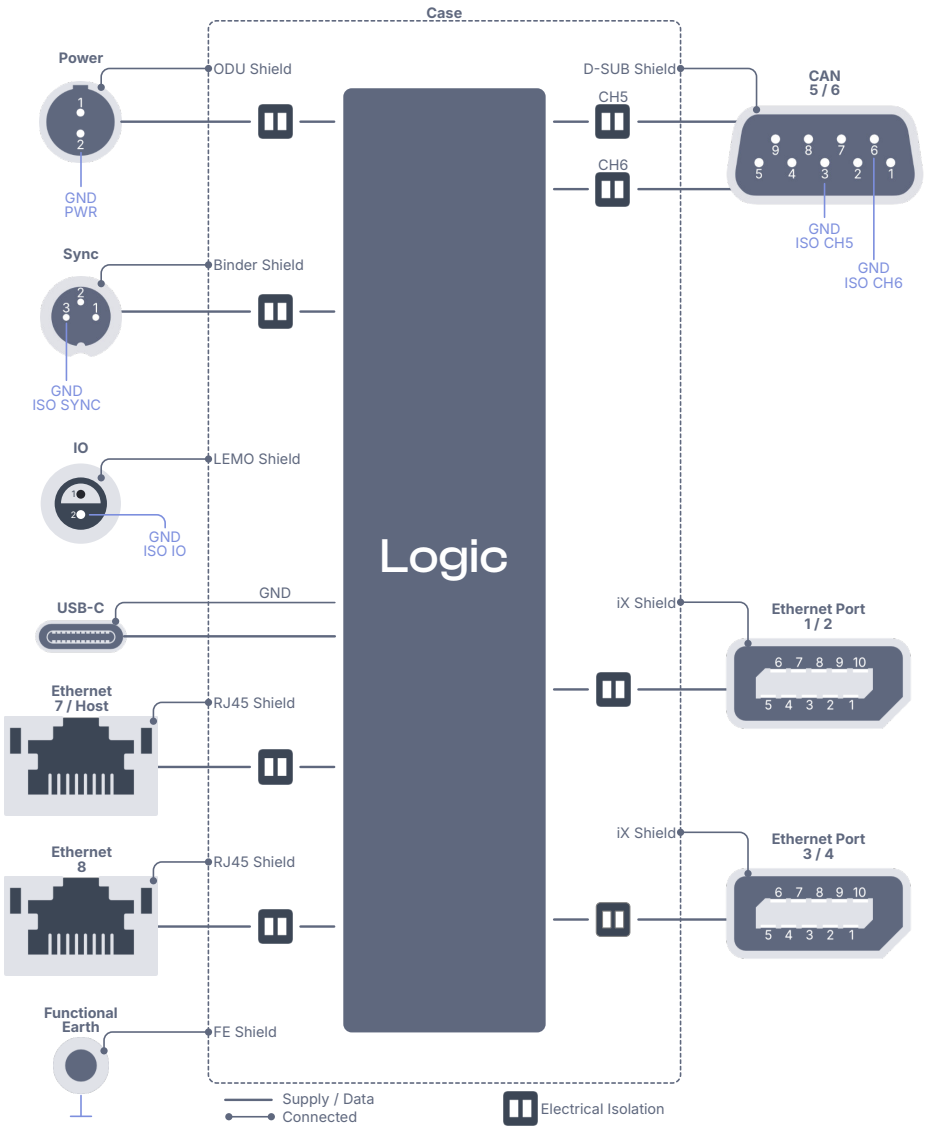


Figure 46: Device Properties Configuration in the Vector Hardware Manager

11.6.3 Electrical Isolation

Electrical isolation of the connectors



Note

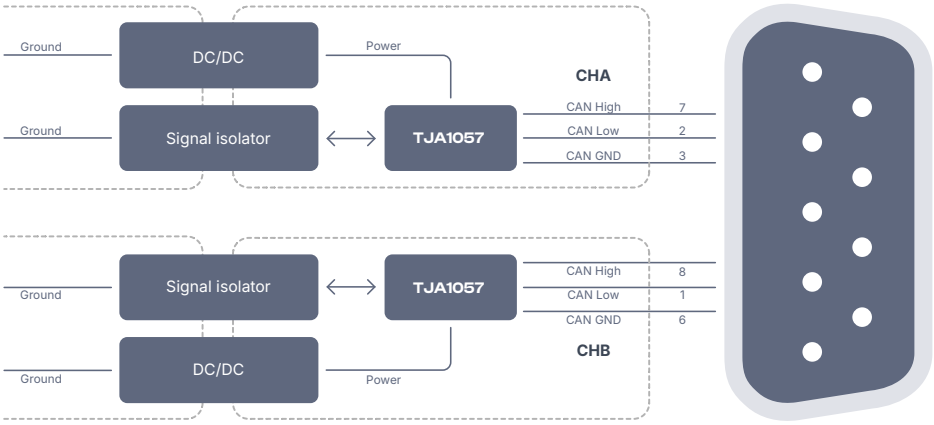
Please note that the shield of the USB-C connector has the same potential as the logic ground of the device and that this is isolated from the housing ground of the device. This is to avoid ground loops when used with a computer system without an electrically isolated power supply.

The FE socket of the device must be connected to the user-side system ground when the device is operated in the vehicle.

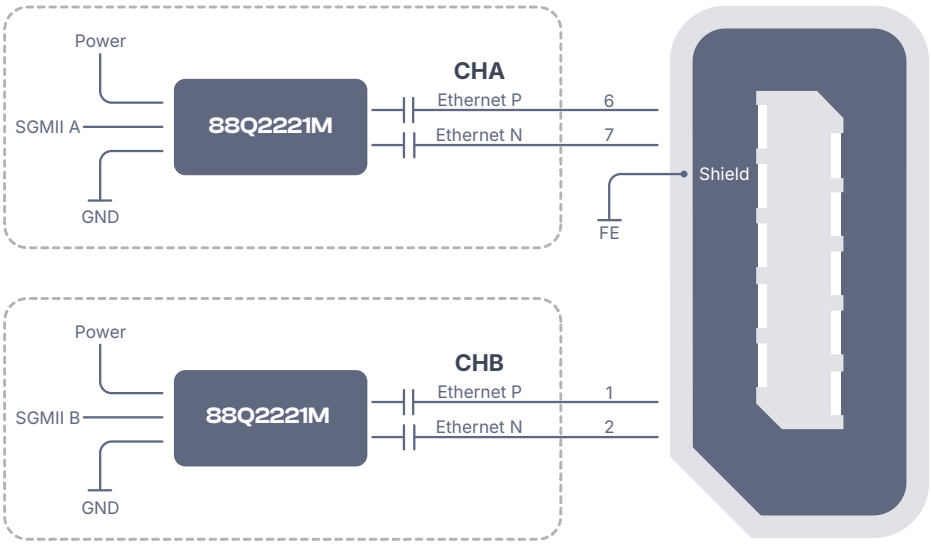
Note

The usage of an AEcable 2Y is recommended because it separates the interface's shield potential from the ECU shield potential. This ensures that all compensating currents over the shields are avoided. A capacitive coupling of the shields is implemented in the AEcable 2Y.

Electrical isolation of CAN in detail



Electrical isolation of Ethernet in detail



Note

The electrical isolation of the interfaces is a functional isolation that is used to avoid ground loops and interference between the networks. The voltage difference between the isolated areas must not exceed 60 VDC (isolation voltage). The isolation voltage usually exceeds the maximum permissible voltage at a port (operating voltage).

11.6.4 Network Features

Ports/channels	Total number of Ethernet Ports	6
	10BASE-T1S	2
	100BASE-T1 / 1000BASE-T1	2
	1000BASE-T1 Legacy Mode	-
	10/100/1000BASE-T(X)	2
	1G BASE-T	-
	2.5G BASE-T	2
	2.5GBASE-T1	-
	5G BASE-T	-
	10G BASE-T	-
	CAN FD	2
	DoIP Activation / Wake-up Line	✓
	Multiple digital / analog IO	-
Power supply	External	✓
	USB buspowered	✓2)
Infrastructure	Hardware synchronization	✓
	Software synchronization	✓
	PTP IEEE 1588 v2	✓1)
	Computer uplink	USB 3.2 Gen 1
	Computer uplink Ethernet	1000BASE-T/ 2.5GBASE-T
	USB adapter to connect sub devices	-
	Infrastructure Switch to connect sub devices	-
Port interconnection	Layer 2 Switch	✓
	TAP	✓
	Multidrop segment	✓
	Simultaneously interconnectable ports via switch/TAP	6
	Media conversion	2
	Link transparency	✓
	OPEN Alliance TC10 (Wake/Sleep) 10BASE-T1S	✓
	OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	✓
	OPEN Alliance TC10 (Wake/Sleep) 1000BASE-T1	✓

	OPEN Alliance TC10 (Wake/Sleep) 2.5/5/10GBASE-T1	-
	Physical bypass relays	-
Measure	Mirroring port	✓
	Uplink Frame filter	16 rules
	Reporting of invalid Ethernet packets	✓
	MACsec (IEEE 802.1AE)	✓5)
	Reporting of PLCA events	✓
Simulation	VLAN tagging / untagging / routing	✓
	Virtual switch ports for Vector-Tools	32
	Time-triggered transmit interface (e. g. for precise AVB-Streams)	✓
	MACsec (IEEE 802.1AE)	✓5)
	gPTP (IEEE 802.1AS) support on user network (AVB and AUTOSAR clocks)	-
Test	On-board packet generator	✓
	Invalid Ethernet packet generation	✓
	OPEN Alliance TC10 (Wake/Sleep) 10BASE-T1S	✓
	OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	✓
	OPEN Alliance TC10 (Wake/Sleep) 1000BASE-T1	✓
	OPEN Alliance TC10 (Wake/Sleep) 2.5/5/10GBASE-T1	-
	MACsec (IEEE 802.1AE)	✓5)
	gPTP (IEEE 802.1AS) support on user network (AVB and AUTOSAR clocks)	-
Application area	Measurement / analysis	✓
	Simulation	✓
	Test	✓

1) Available in a later release.
2) Host computer must support USB-C with 3 A.
3) Supports one switch segment with a maximum of three measurement ports. Sending via measurement ports is not possible.
4) Only with compatible VNmodule60 (see section VNmodule60 on page 284).
5) Only 100/1000BASE-T1

11.7 Troubleshooting

Issue	Remedy
The device is not recognized by the computer.	> Install the latest drivers from our website. > Perform a factory reset by pressing and holding the reset button on the back panel while powering up the device. Release the button when the Power LED starts flashing green.

11.8 Accessories



Note

Detailed information on the listed accessories can be found in the separate accessories manual on our website.

Cables and connectors

- AEcable 2Y
- AEcable 2Y DSUB9 10BASE-T1S
- CANcable1
- CANcableA
- CANcable TnT (D-SUB9 to Bunch Plugs)
- CANcable Y
- CANcable 2Y
- CANterm 120
- CANcable Set Pro
- Vector SYNCcableXL
- Vector SYNCcable50
- Multi SYNCbox external
- Multi SYNCbox internal
- Multi SYNCbox active
- Cable Binder 3pol Connector with Pigtail
- USB Cable 3.1 Type A-C (Dual Screw Lock)
- USB Cable 3.1 Type C-C (Dual Screw Lock)
- Ethernet cables

Power supply

- Vector Power Supply ODU Mini-Snap
- Cable Vehicle Input <> ODU Mini-Snap
- Cable Banana Plug <> ODU Mini-Snap

12 VN5632

In this chapter you find the following information:

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12.1 Scope of Delivery

Contents

The delivery includes:

- 1x VN5632 2.5GBASE-T1 Interface
- 1x USB cable 3.1 (C-C, 1. 8m, with screws)
- 1x Vector Power Supply ODU Mini-Snap

12.2 Introduction

About the VN5632

The VN5632 is a versatile, high-performance network interface designed for analyzing, simulating, testing, and validating Automotive Ethernet networks. It supports 100BASE-T1, 1000BASE-T1, up to 2.5GBASE-T1, and 2.5GBASE-T. Its multi-port, high-speed connectivity makes it ideal for bandwidth-intensive applications and modern zonal architectures.

A USB 3.2 Gen1 or 2.5GBASE-T Ethernet connection to the host computer enables high data throughput and precise time synchronization using hardware, software, or PTP (IEEE 1588).



Figure 47: VN5632 2.5GBASE-T1 Interface

Highlights

Features of the VN5632:

- 2x IEEE 2.5GBASE-T1
- 4x IEEE 100BASE-T1/1000BASE-T1
- 1x digital IO (e. g. for DoIP Activation Line)
- 2x infrastructure port, standard Ethernet (up to 2.5GBASE-T), usable as:
  - uplink to host computer
  - an alternative port for the user network (e.g. to analyze Standard Ethernet traffic)
- Host connection via USB3.2 Gen1 or Ethernet
- Standalone, self-configuration after power-up
- Hardware filtering of Ethernet packets on protocol base
- Device synchronization to other Vector interfaces or 3rd party via

  - software synchronization (typ. 50 µs accuracy)
  - hardware synchronization (1 µs accuracy)
  - IEEE1588 v2 (PTP) (available in a later release)
- Multi-application support (different tools can share an Ethernet port at the same time)
- High precision timestamped Ethernet frames (< 20 ns precision)

12.3 Standalone Mode

This Vector device can also operate in standalone mode (i. e., without being connected to a computer). Typical standalone applications include:

- Standalone Media Converter
- Port Mirroring



Note

For standalone mode, the device must already be set up using the Vector Hardware Manager and the configuration must already be deployed. The configuration is persistent and independent of the connected computer, and the device is fully functional when powered externally.

If the device is already running in standalone mode (no connection to a computer), you can always re-connect your device to your computer via USB without interruption. This can be useful, for example, if you want to use CANoe for remaining bus simulation or measurement purposes after the standalone mode is already running. Connecting your application such as CANoe to the Vector device does not interfere with its operation, e. g. communication with your ECU.

12.4 Connectors

12.4.1 Front Side

Device connectors



Figure 48: Connectors on the Ethernet side

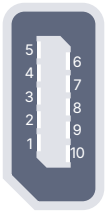
> **Ethernet 1/2 (Yamaichi Y-Circ)**
Yamaichi Y-Circ connectors for 2.5GBASE-T1 (e. g. Yamaichi YCP-BWI09ACX-S1FPCX-14799). Each connector has one Ethernet port. Use cables of the Vector AEcable MultiGig family to access the network:

Pin	Assignment
1	CHx MDI+
2	CHx MDI-



> **Ethernet 3...6 (ix Industrial)**
ix Industrial connector for 100BASE-T1/1000BASE-T1 (e. g. Harting ix Industrial type 10A-1). The connector has two Ethernet ports (A and B). Use cables of the Vector AEcable 2Y family to access both ports on separate connectors (different plug systems available).

Pin	Assignment
1	CH2 MDI+
2	CH2 MDI-
3...5	Not connected
6	CH1 MDI+
7	CH1 MDI-
8...10	Not connected



Note

We recommend the usage of an AEcable 2Y (see section Accessories on

page 131), because it separates the VN5632 shield potential from the ECU shield potential. This ensures that all compensating currents over the shields are avoided. A capacitive coupling of the shields is implemented in the AEcable 2Y.

12.4.2 Back Side

Device connectors



Figure 49: Connectors on the USB side

> **Power (ODU)**

For power supply, the VN5632 has a two-pin ODU connector (MINI-SNAP size 1, type GF1L0C-P02RP00-0000). Attach the enclosed power cable to power up the unit (matching ODU connector type S11L0C-P02NPL0-6200).

Pin	Assignment
1	Power supply (10 V ... 32 V)
2	Ground



> **Sync (Binder)**

The VN5632 has one sync connector (Binder type 711) which can be used for time synchronization of different Vector devices (see section Time Synchronization on page 349).

Pin	Assignment
1	Not connected
2	Synchronization line
3	Ground



> **I/O (LEMO)**

LEMO connector (type 302) for bidirectional digital input/output.

Pin	Assignment
1	Digital IO (pulse-per-second signal output supported)
2	Ground



> **Reset**
  If the device configuration is corrupted, start it with pushed reset button.

> **Kensington Lock**
  Mounting of Nano Kensington (NanoSaver).

> **USB (Type-C)**
  Connect your computer and the VN5632 via USB to install and to use the device with measurement applications (e. g. CANoe, CANalyzer). If the host computer provides a current of 3 A, the device can also be powered via this connector.

Note

When using RJ45 connectors, we recommend using the external power supply via the **Power** connector.

> **Functional Earth (FE)**
  Optional connection of housing ground to system ground.

> **Ethernet 7/Host (RJ45 connector)**
  This infrastructure port offers several configuration options:
  - Uplink: Connect your computer and the VN device via standard Ethernet instead of USB to use it with measurement applications (e. g. CANoe, CANalyzer) in a network setup.
  - Alternative analysis port

Note

The uplink port must be configured as an **Ethernet Host** in the Vector Hardware Manager.

> **Ethernet 8 (RJ45 connector)**
  This infrastructure port offers several configuration options:
  - Alternative analysis port
  - Mirroring port

12.5 LEDs

LEDs



Figure 50: LEDs on VN5632

> **Ethernet Port 1/2**

LED illuminates if there is an Ethernet link or blinks if there is Ethernet activity at the according port. When a port is in OPEN Alliance TC10 sleep mode, the LED flashes at a low frequency.

Color	Description
Cyan	2.5 Gbit/s

> **M Ethernet Port 1/2**

Illuminates if the according port is configured as master. The color of the Master LED depends on the link speed (see Ethernet port LED above).

State	Description
On	PHY is configured as master.
Off	PHY is configured as slave.

> **Ethernet Port 3...6**

LED illuminates if there is an Ethernet link or blinks if there is Ethernet activity at the according port. When a port is in OPEN Alliance TC10 sleep mode, the LED flashes at a low frequency.

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

> **M Ethernet Port 3...6**

Illuminates if the according port is configured as master. The color of the Master LED depends on the link speed (see Ethernet port LED above).

State	Description
On	PHY is configured as master.
Off	PHY is configured as slave.



Note

When the LED is flashing, the device is in Master/Slave auto-detect mode. This indicates that a link has not yet been established. The device will attempt to establish a link by iterating through master/slave configurations and possible link speeds. See the Vector Hardware Manager Help for more details on the "Master/Slave Auto Detect" feature.

> **Sync**

LED illuminates if the device is synchronized.

Color	Sync State	Description
Off	Not configured.	No master or slave protocols are active for this device or no configuration has been loaded yet.
Orange	Configured, waiting for master.	A slave protocol is active, but no master could be found / assigned yet. The state is assumed when the PTP protocol **Slave** or **Best-Master** is activated in the firmware, i. e. when starting the PTP stack in the firmware or if one of the slave protocols was activated in the driver, i. e. when or after the configuration was applied by the Vector Timesync Service (vTSS).
Green (flashing)	Pending.	A slave protocol is active and a master was found or could be assigned. The SYNC condition / the steady state was not yet reached or was left again. > **PTP** Transition to the Slave-With-Master state, but the SYNC condition has not yet been reached.

Color	Sync State	Description
		> **HW-SYNC** Pulse and master time present, but the SYNC accuracy has not yet been reached. > **SW-SYNC** SYNC accuracy not yet reached.
Green	In-sync.	SYNC condition reached and is met or only master protocols active on the interface.
Red	Failure.	> **PTP** Master lost, SYNC accuracy not maintained. > **HW-SYNC** Missing pulse, missing time information of the master, SYNC accuracy not maintained. > **SW-SYNC** SYNC accuracy not maintained. If the SYNC accuracy is not maintained but the master is present, this state is only maintained for three seconds, then the state changes to **Pending**.

> **Power**

Multicolored LED indicating the device status.

Color	Description
Green	Flashes 4x at power up and illuminates afterwards. Flashes quicker during an update progress. Please wait for the automatic reboot of the device after the update has been finished. Afterwards the LED is permanent on.
Red	An error has occurred. Please use the included USB cable and also make sure it is receiving sufficient power via USB. Please disconnect the USB cable. Reconnect the USB cable and try again. Flashes when the max. temperature has been reached.

> **RJ45**

LEDs illuminate if there is an Ethernet link or blink if there is Ethernet activity.

Color (Left)	Color (Right)	Description
Orange	-	100 Mbit/s
Green	-	1 Gbit/s
-	Orange	2.5 Gbit/s

12.6 Technical Data

12.6.1 Overview

Ethernet ports	> 2x 2.5GBASE-T1 – Broadcom BCM89892 > 4x 100BASE-T1/1000BASE-T1 – Infineon 88Q2221M > 2x 10/100/1000/2.5GBASE-T – Maxlinear GPY215
Digital input/output	1x Wake-up or DoIP Activation Line
Computer interface	USB 3.2 Gen 1 with Type-C connector/ IEEE 1000BASE-T/2.5GBASE-T
Input voltage	External powered 10...32 V (typ. 12 V DC) or USB-C powered (must support USB-C, 3 A)
Power consumption	Max: 18 W Typ: 15 W
Time stamps	Resolution: 8 ns Accuracy (in device): 1 µs Accuracy software sync: typ. 50 µs Accuracy hardware sync: typ. 1 µs
Latency link/switch segment	Link (stress access): approx. 7...12 µs Link (low latency): approx. 6...7 µs Switch: approx. 12 µs Please note that the exact latency depends on: > Link speed > Ethernet PHY > Ethernet packet length (switch segment only)
Temperature range (ambient temp. of the device)	Operation: -25 °C ... +55 °C Storage: -40 °C ... +85 °C
Relative humidity of ambient air	15 %...95 %, non-condensing
Dimensions (LxWxH)	173 mm x 144 mm x 32 mm
Weight	1.17 kg
Operating system requirements	Windows 11 (x64, 64 bit)

12.6.2 Temperature Shutdown

Temperature limits

The devices are temperature monitored to prevent damage to the device. The devices switch off automatically when the upper limit temperature is exceeded. This limit value represents the theoretical maximum of the hardware. However, it is possible to leave this range slightly without damaging the hardware.

For this purpose the temperature shutdown can be switched off actively.

If the maximum temperature is exceeded, it is indicated by a red status LED on the device. Vector applications also display this (e. g. in the **Write** window of CANoe).

You can find the settings in the Vector Hardware Manager.

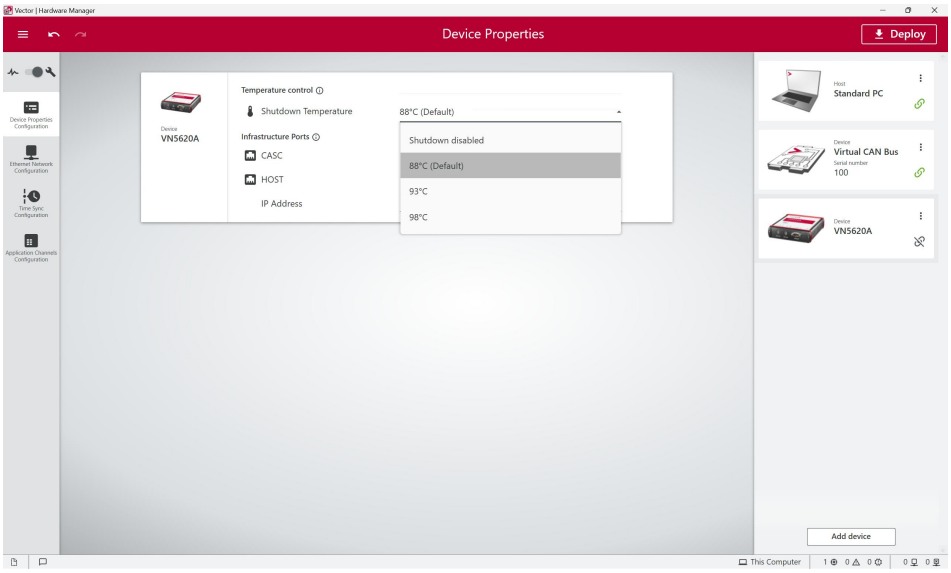
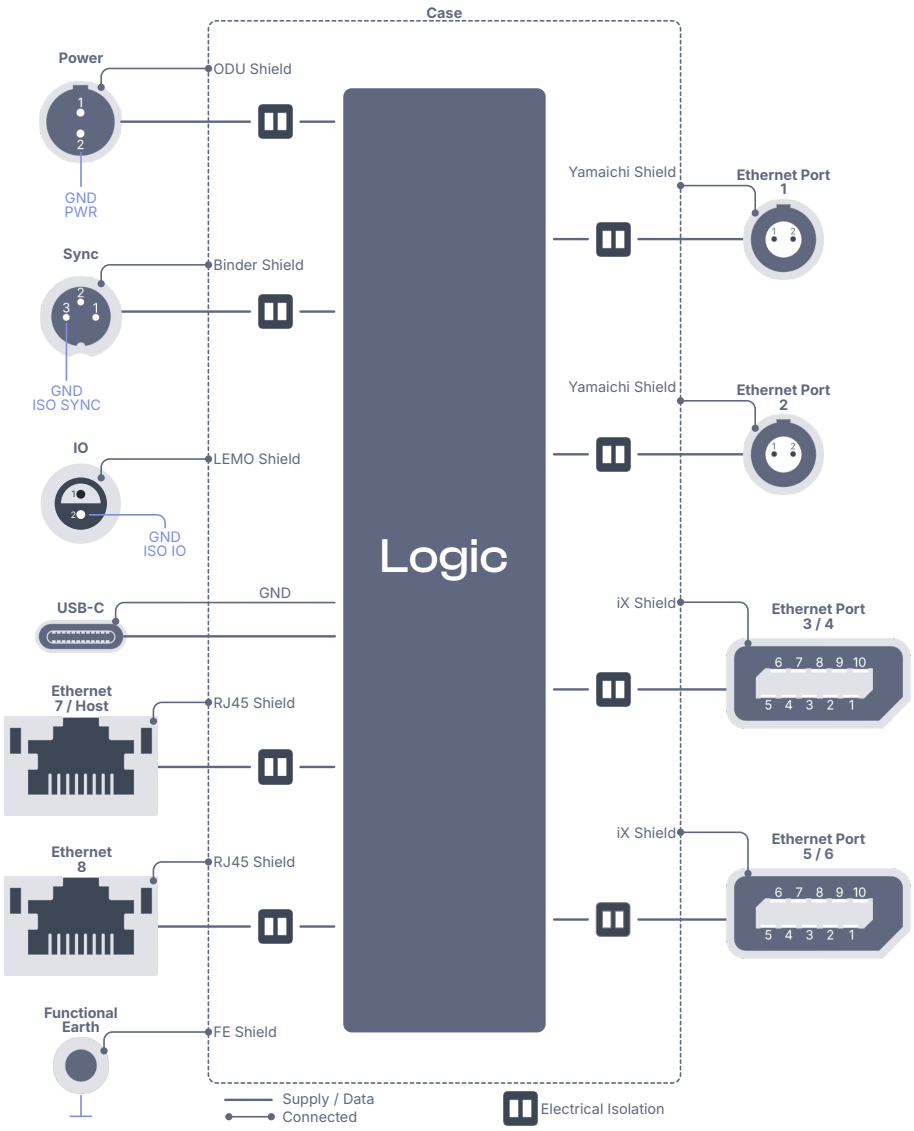


Figure 51: Device Properties Configuration in the Vector Hardware Manager

12.6.3 Electrical Isolation

Electrical isolation of the connectors



Note

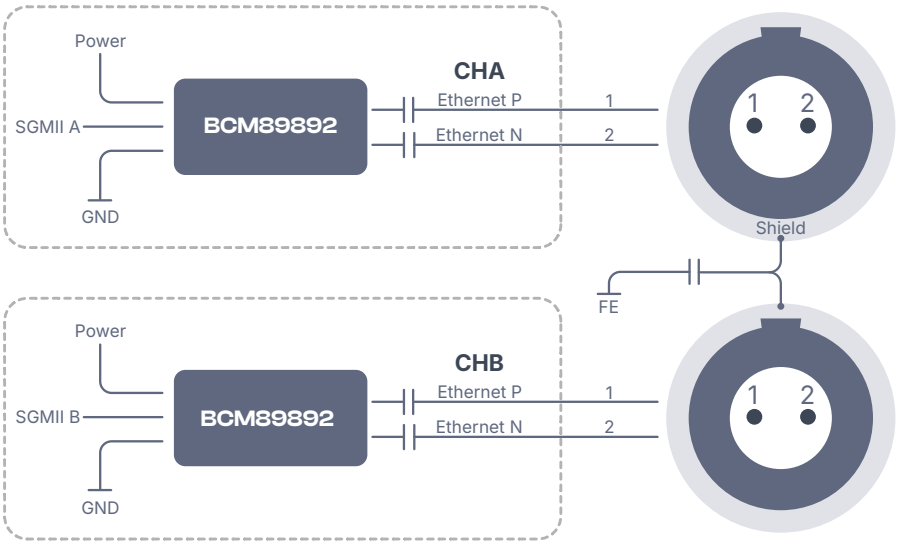
Please note that the shield of the USB-C connector has the same potential as the logic ground of the device and that this is isolated from the housing ground of the device. This is to avoid ground loops when used with a computer system without an electrically isolated power supply.

The FE socket of the device must be connected to the user-side system ground when the device is operated in the vehicle.

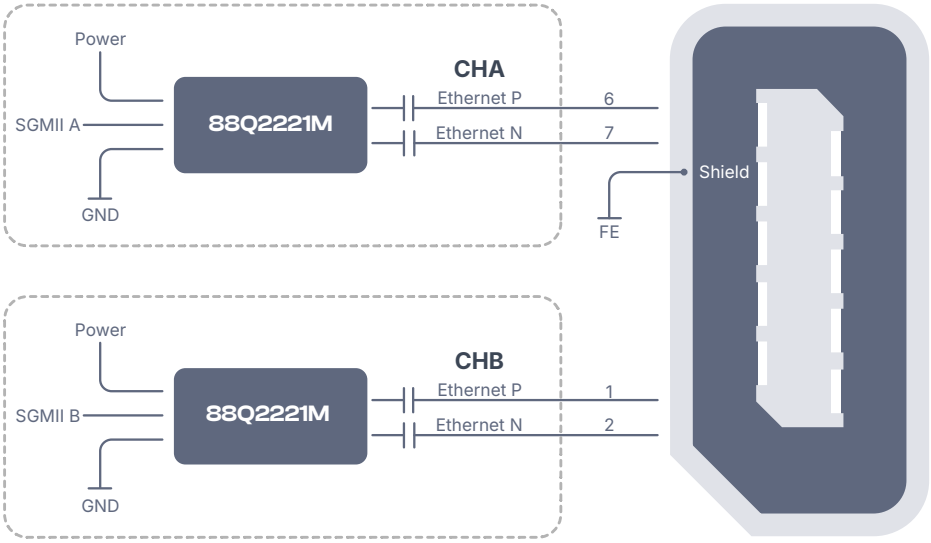
Note

The usage of an AEcable 2Y is recommended because it separates the interface's shield potential from the ECU shield potential. This ensures that all compensating currents over the shields are avoided. A capacitive coupling of the shields is implemented in the AEcable 2Y.

Electrical isolation of Ethernet in detail



Electrical isolation of Ethernet in detail



Note

The electrical isolation of the interfaces is a functional isolation that is used to avoid ground loops and interference between the networks. The voltage difference between the isolated areas must not exceed 60 VDC (isolation voltage). The isolation voltage usually exceeds the maximum permissible voltage at a port (operating voltage).

12.6.4 Network Features

Ports/channels	Total number of Ethernet Ports	6
	10BASE-T1S	-
	100BASE-T1 / 1000BASE-T1	4
	1000BASE-T1 Legacy Mode	-
	10/100/1000BASE-T(X)	2
	1G BASE-T	-
	2.5G BASE-T	2
	2.5GBASE-T1	2
	5G BASE-T	-
	10G BASE-T	-
	CAN FD	-
	DoIP Activation / Wake-up Line	✓
	Multiple digital / analog IO	-
Power supply	External	✓
	USB buspowered	✓2)
Infrastructure	Hardware synchronization	✓
	Software synchronization	✓
	PTP IEEE 1588 v2	✓1)
	Computer uplink	USB 3.2 Gen 1
	Computer uplink Ethernet	1000BASE-T/ 2.5GBASE-T
	USB adapter to connect sub devices	-
	Infrastructure Switch to connect sub devices	-
Port interconnection	Layer 2 Switch	✓
	TAP	✓
	Multidrop segment	-
	Simultaneously interconnectable ports via switch/TAP	6
	Media conversion	2
	Link transparency	✓
	OPEN Alliance TC10 (Wake/Sleep) 10BASE-T1S	-
	OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	✓
	OPEN Alliance TC10 (Wake/Sleep) 1000BASE-T1	✓
	OPEN Alliance TC10 (Wake/Sleep) 2.5/5/10GBASE-T1	✓1)

	Physical bypass relays	-
Measure	Mirroring port	✓
	Uplink Frame filter	16 rules
	Reporting of invalid Ethernet packets	✓
	MACsec (IEEE 802.1AE)	✓
	Reporting of PLCA events	-
Simulation	VLAN tagging / untagging / routing	✓
	Virtual switch ports for Vector-Tools	32
	Time-triggered transmit interface (e. g. for precise AVB-Streams)	✓
	MACsec (IEEE 802.1AE)	✓
	gPTP (IEEE 802.1AS) support on user network (AVB and AUTOSAR clocks)	-
Test	On-board packet generator	✓
	Invalid Ethernet packet generation	✓
	OPEN Alliance TC10 (Wake/Sleep) 10BASE-T1S	-
	OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	✓
	OPEN Alliance TC10 (Wake/Sleep) 1000BASE-T1	✓
	OPEN Alliance TC10 (Wake/Sleep) 2.5/5/10GBASE-T1	✓[1)]
	MACsec (IEEE 802.1AE)	✓
	gPTP (IEEE 802.1AS) support on user network (AVB and AUTOSAR clocks)	-
Application area	Measurement / analysis	✓
	Simulation	✓
	Test	✓

1) Available in a later release.
2) Host computer must support USB-C with 3 A.
3) Supports one switch segment with a maximum of three measurement ports. Sending via measurement ports is not possible.
4) Only with compatible VNmodule60 (see section VNmodule60 on page 284).
5) Only 100/1000BASE-T1

12.7 Troubleshooting

Issue	Remedy
The device is not recognized by the computer.	> Install the latest drivers from our website. > Perform a factory reset by pressing and holding the reset button on the back panel while powering up the device. Release the button when the Power LED starts flashing green.

12.8 Accessories



Note

Detailed information on the listed accessories can be found in the separate accessories manual on our website.

Cables and connectors

- AEcable 2Y
- AEcable MultiGig Family
- Vector SYNCcableXL
- Vector SYNCcable50
- Multi SYNCbox external
- Multi SYNCbox internal
- Multi SYNCbox active
- Cable Binder 3pol Connector with Pigtail
- USB Cable 3.1 Type A-C (Dual Screw Lock)
- USB Cable 3.1 Type C-C (Dual Screw Lock)
- Ethernet cables

Power supply

- Vector Power Supply ODU Mini-Snap
- Cable Vehicle Input <> ODU Mini-Snap
- Cable Banana Plug <> ODU Mini-Snap

13 VN5430

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13.1 Scope of Delivery

Contents

The delivery includes:

- 1x VN5430 Ethernet Interface
- 1x Ethernet cable CAT6A (2 m)
- 1x Vector power supply 12 V / 1.5 A (part number 05024)

13.2 Introduction

About the VN5430

The VN5430 is a compact interface for analysis, simulation and test tasks for Ethernet. The user benefits from the VN5430's versatile configuration options. A wide range of simulation and test scenarios can be implemented and the network topology can be maintained at the same time. The device can also be used as a stand-alone switch. Ethernet (1000BASE-T) is used as the interface to the computer.



Figure 52: VN5430 Ethernet Interface

Highlights

Features of the VN5430:

- 6x IEEE 100BASE-T1 / 1000BASE-T1 user port
- 2x infrastructure port, standard Ethernet (100BASE-TX / 1000BASE-T)
  - Host port can be used to connect to the computer for the measurement application (e. g. CANoe)
  - Casc port can be used as an alternative user port (e. g. for connecting a system under test)
- Host connection via Ethernet
- On-board Ethernet TAPs to link between two Ethernet ports
- On-board Vector Ethernet Switch IP
- New hardware configuration concept
- Usable without host-connection to interconnect ECUs
  - Self-configuration after power-up
- Hardware filtering of Ethernet packets on protocol base
- Device synchronization to other Vector interfaces or 3rd party via
  - hardware synchronization (1 µs accuracy)
  - IEEE 1588 (PTP)

- Multi-application support (different tools can share an Ethernet port at the same time)
- High precision time stamped Ethernet frames (< 20 ns precision)

13.3 Standalone Mode

This Vector device can also operate in standalone mode (i. e., without being connected to a computer). Typical standalone applications include:

- Standalone Media Converter
- Port Mirroring



Note

For standalone mode, the device must already be set up using the Vector Hardware Manager and the configuration must already be deployed. The configuration is persistent and independent of the connected computer, and the device is fully functional when powered externally.

If the device is already running in standalone mode (no connection to a computer), you can always re-connect your device to your computer via USB without interruption. This can be useful, for example, if you want to use CANoe for remaining bus simulation or measurement purposes after the standalone mode is already running. Connecting your application such as CANoe to the Vector device does not interfere with its operation, e. g. communication with your ECU.

13.4 Connectors

13.4.1 Front Side

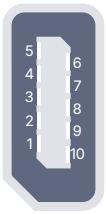
Device connectors



Figure 53: Connectors on the Ethernet side

> **Ethernet 1...6 (ix Industrial)**
ix Industrial connectors for 100BASE-T1/ 1000BASE-T1 (e. g. Harting ix Industrial type 10A-1). Each connector has two Ethernet ports (A and B). Use cables of the Vector AEcable 2Y family to access both ports on separate connectors (different plug systems available).

Pin	Assignment
1	CH2 MDI+
2	CH2 MDI-
3...5	Not connected
6	CH1 MDI+
7	CH1 MDI-
8...10	Not connected



Note

We recommend the usage of an AEcable 2Y (see section Accessories on page 189) because it separates the VN5430 shield potential from the ECU shield potential. This ensures that all compensating currents over the shields are avoided. A capacitive coupling of the shields is implemented in the AEcable 2Y.

Note

The configuration is done in the Vector Hardware Manager.

13.4.2 Back Side

Device connectors



Figure 54: Connectors on the back side

> **Functional Earth (FE)**
Optional connection of housing ground to system ground.

> **Power (Binder)**
Use this connector to power the VN5430.

Pin	Assignment
1	Power supply 10 V...18 V (typ. 12 V DC)
2	Not connected
3	Ground



> **Sync (Binder)**
The VN5430 has one sync connector (Binder type 711) which can be used for time synchronization of different Vector devices (see section Time Synchronization on page 349).

Pin	Assignment
1	Not connected
2	Synchronization line
3	Ground



> **Reset**
If the device configuration is corrupted, start it with pushed reset button.

> **Host (RJ45 connector)**
Connect your computer and the VN5430 via RJ45 (100BASE-TX/1000BASE-T) to use the device with measurement applications (e. g. CANoe, CANalyzer) in a network setup.

> **Casc (RJ45 connector)**
Infrastructure port with different possible configurations:
- Mirroring port
- Alternative analysis port

> **Kensington Lock**
Mounting of Nano Kensington (NanoSaver).

13.5 LEDs

LEDs



Figure 55: Top LEDs on VN5430

> **Ethernet Port 1...6**

LED illuminates if there is an Ethernet link or blinks if there is Ethernet activity at the according port.

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

> **M Ethernet Port 1...6**

Illuminates if the according port is configured as master. The color of the Master LED depends on the link speed (see Ethernet port LED above).

State	Description
On	PHY is configured as master.
Off	PHY is configured as slave.

Note

When the LED is flashing, the device is in Master/Slave auto-detect mode. This indicates that a link has not yet been established. The device will attempt to establish a link by iterating through master/slave configurations and possible link speeds. See the Vector Hardware Manager Help for more details on the "Master/Slave Auto Detect" feature.

> **Sync**

LED illuminates if the device is synchronized.

Color	Sync State	Description
Off	Not configured.	No master or slave protocols are active for this device or no configuration has been loaded yet.

Color	Sync State	Description
Orange	Configured, waiting for master.	A slave protocol is active, but no master could be found / assigned yet. The state is assumed when the PTP protocol **Slave** or **Best-Master** is activated in the firmware, i. e. when starting the PTP stack in the firmware or if one of the slave protocols was activated in the driver, i. e. when or after the configuration was applied by the Vector Timesync Service (vTSS).
Green (flashing)	Pending.	A slave protocol is active and a master was found or could be assigned. The SYNC condition / the steady state was not yet reached or was left again. > **PTP** Transition to the Slave-With-Master state, but the SYNC condition has not yet been reached. > **HW-SYNC** Pulse and master time present, but the SYNC accuracy has not yet been reached. > **SW-SYNC** SYNC accuracy not yet reached.
Green	In-sync.	SYNC condition reached and is met or only master protocols active on the interface.
Red	Failure.	> **PTP** Master lost, SYNC accuracy not maintained. > **HW-SYNC** Missing pulse, missing time information of the master, SYNC accuracy not maintained. > **SW-SYNC** SYNC accuracy not maintained.

Color	Sync State	Description
		If the SYNC accuracy is not maintained but the master is present, this state is only maintained for three seconds, then the state changes to **Pending**.

> **Power**

Multicolored LED indicating the device status.

Color	Description
Green	> Blinks 4x at power up and illuminates afterwards. > Blinks quicker during an update progress. Please wait for the automatic reboot of the device after the update has been finished. Do not disconnect the power supply while the LED is blinking.
Red	An error has occurred. Please disconnect the power supply as well as the USB cable. Re-connect the power supply and the USB cable and try again.

> **RJ45**

LEDs illuminate if there is an Ethernet link or blink if there is Ethernet activity.

Color (Left)	Description
Green	Activity

Color (Right)	Description
Off	10 Mbit/s
Orange	100 Mbit/s
Green	1000 Mbit/s

13.6 Technical Data

13.6.1 Overview

Ethernet ports	> 3x ix Industrial – 6x Infineon 88Q2112-A2 – 1000BASE-T1 – 100BASE-T1 > 2x RJ45 – 2x Broadcom BCM54210 – 1000BASE-T – 100BASE-TX – 10BASE-T
Computer interface	IEEE 1000BASE-T
Input voltage	External powered: 10 ...18 V (typ. 12 V DC)
Power consumption	Max. 15 W Typ. 11 W
Time stamps	Resolution: 12.5 ns Accuracy (in device): 1 µs Accuracy software sync: typ. 50 µs Accuracy hardware sync: typ. 1 µs
Latency link/switch segment	Link (stress access): approx. 7...12 µs Link (low latency): approx. 6...7 µs Switch: approx. 12 µs Please note that the exact latency depends on: > Link speed > Ethernet PHY > Ethernet packet length (switch segment only)
Temperature range (ambient temp. of the device)	Operation: -25 °C ... +60 °C Storage: -40 °C ... +85 °C
Relative humidity of ambient air	15 %...95 %, non-condensing
Dimensions (LxWxH)	143 mm x 149 mm x 37 mm
Weight	554 g
Operating system requirements	Windows 10 (x64, 64 bit) Windows 11 (x64, 64 bit)

13.6.2 Temperature Shutdown

Temperature limits

The devices are temperature monitored to prevent damage to the device. The devices switch off automatically when the upper limit temperature is exceeded. This limit value represents the theoretical maximum of the hardware. However, it is possible to leave this range slightly without damaging the hardware.

For this purpose the temperature shutdown can be switched off actively.

If the maximum temperature is exceeded, it is indicated by a red status LED on the device. Vector applications also display this (e. g. in the **Write** window of CANoe).

You can find the settings in the Vector Hardware Manager.

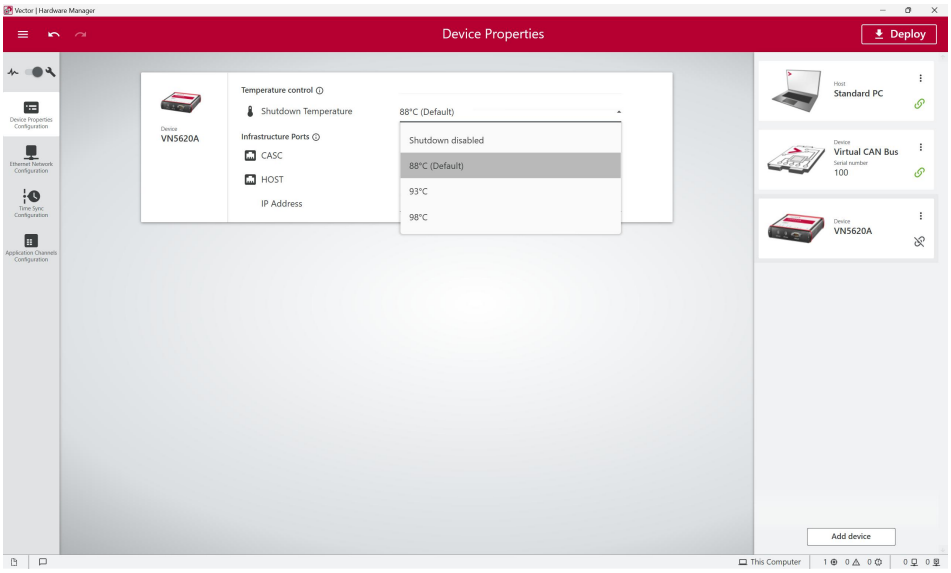
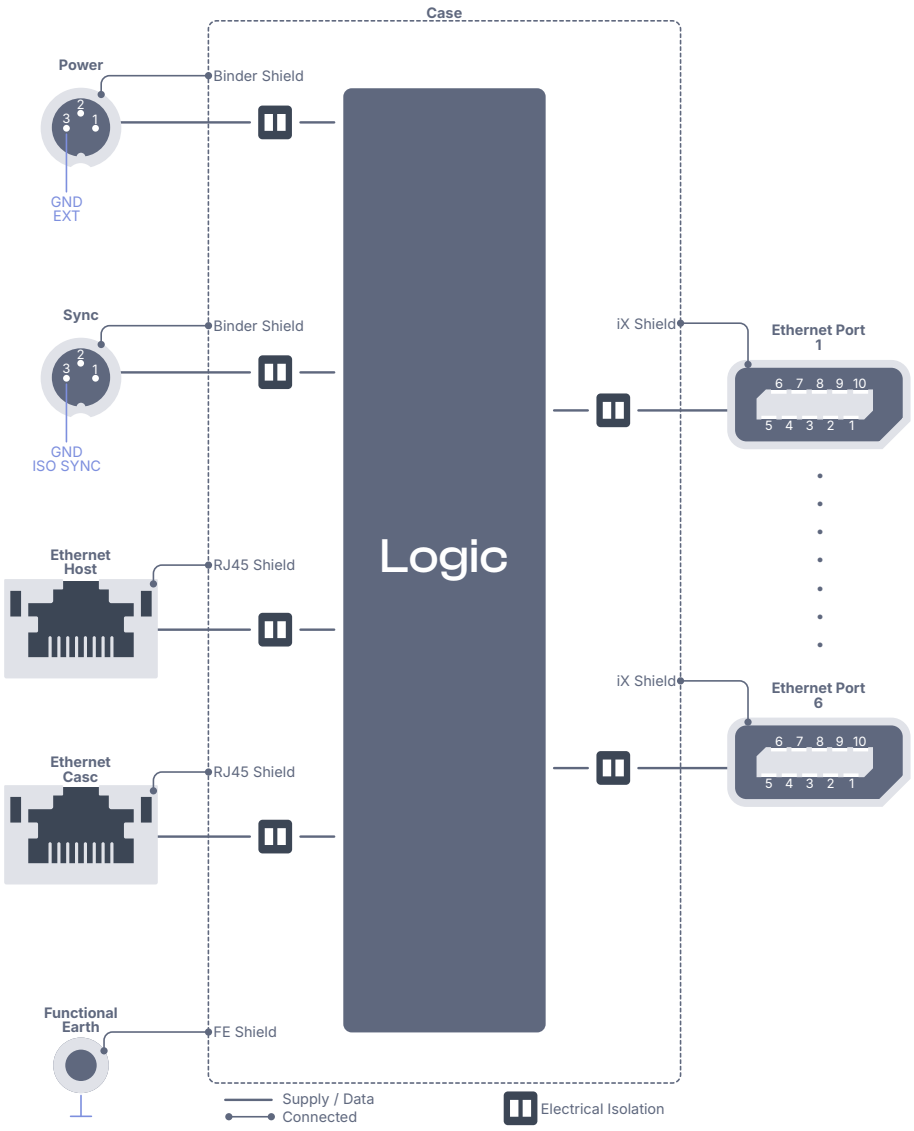


Figure 56: Device Properties Configuration in the Vector Hardware Manager

13.6.3 Electrical Isolation

Electrical isolation of the connectors



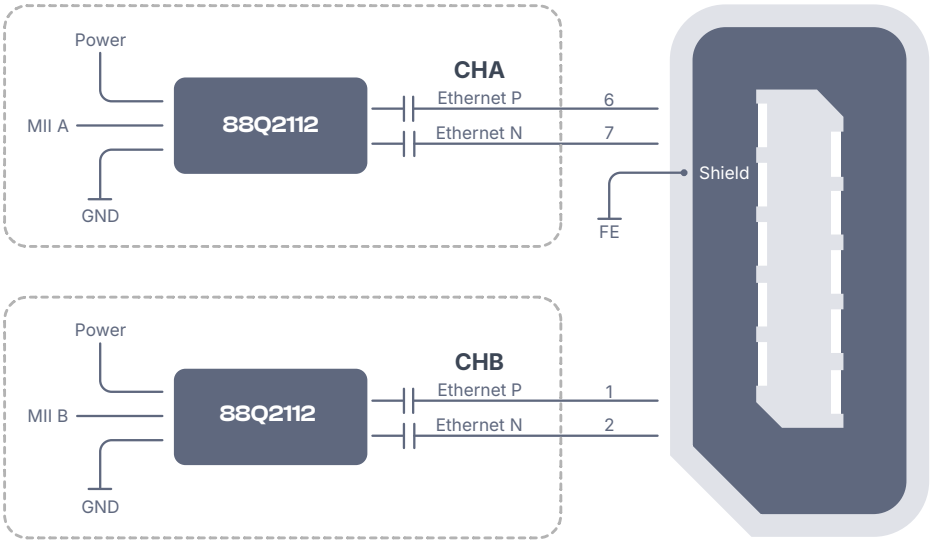
Note

The FE plug must be connected to the chassis ground if the network interface is used in a vehicle with shielded cables.

Note

The usage of an AEcable 2Y is recommended because it separates the interface's shield potential from the ECU shield potential. This ensures that all compensating currents over the shields are avoided. A capacitive coupling of the shields is implemented in the AEcable 2Y.

Electrical isolation of Ethernet in detail



Note

The electrical isolation of the interfaces is a functional isolation that is used to avoid ground loops and interference between the networks. The voltage difference between the isolated areas must not exceed 60 VDC (isolation voltage). The isolation voltage usually exceeds the maximum permissible voltage at a port (operating voltage).

13.6.4 Network Features

Ports/channels	Total number of Ethernet Ports	7
	10BASE-T1S	-
	100BASE-T1 / 1000BASE-T1	6
	1000BASE-T1 Legacy Mode	✓
	10/100/1000BASE-T(X)	1
	1G BASE-T	-
	2.5G BASE-T	-
	2.5GBASE-T1	-
	5G BASE-T	-
	10G BASE-T	-
	CAN FD	-
	DoIP Activation / Wake-up Line	-
	Multiple digital / analog IO	-
Power supply	External	✓
	USB buspowered	-
Infrastructure	Hardware synchronization	✓
	Software synchronization	-
	PTP IEEE 1588 v2	✓
	Computer uplink	-
	Computer uplink Ethernet	1000BASE-T
	USB adapter to connect sub devices	-
	Infrastructure Switch to connect sub devices	-
Port interconnection	Layer 2 Switch	✓
	TAP	✓
	Multidrop segment	-
	Simultaneously interconnectable ports via switch/TAP	6
	Media conversion	1
	Link transparency	✓
	OPEN Alliance TC10 (Wake/Sleep) 10BASE-T1S	-
	OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	-
	OPEN Alliance TC10 (Wake/Sleep) 1000BASE-T1	-
	OPEN Alliance TC10 (Wake/Sleep) 2.5/5/10GBASE-T1	-
	Physical bypass relays	-

Measure	Mirroring port	✓
	Uplink Frame filter	16 rules
	Reporting of invalid Ethernet packets	✓
	MACsec (IEEE 802.1AE)	-
	Reporting of PLCA events	-
Simulation	VLAN tagging / untagging / routing	✓
	Virtual switch ports for Vector-Tools	32
	Time-triggered transmit interface (e. g. for precise AVB-Streams)	-
	MACsec (IEEE 802.1AE)	-
	gPTP (IEEE 802.1AS) support on user network (AVB and AUTOSAR clocks)	-
Test	On-board packet generator	✓
	Invalid Ethernet packet generation	✓
	OPEN Alliance TC10 (Wake/Sleep) 10BASE-T1S	-
	OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	-
	OPEN Alliance TC10 (Wake/Sleep) 1000BASE-T1	-
	OPEN Alliance TC10 (Wake/Sleep) 2.5/5/10GBASE-T1	-
	MACsec (IEEE 802.1AE)	-
	gPTP (IEEE 802.1AS) support on user network (AVB and AUTOSAR clocks)	-
Application area	Measurement / analysis	✓
	Simulation	✓
	Test	✓

1) Available in a later release.
2) Host computer must support USB-C with 3 A.
3) Supports one switch segment with a maximum of three measurement ports. Sending via measurement ports is not possible.
4) Only with compatible VNmodule60 (see section VNmodule60 on page 284).
5) Only 100/1000BASE-T1

13.7 Troubleshooting

Issue	Remedy
The device is not recognized by the computer.	> Install the latest drivers from our website. > Perform a factory reset by pressing and holding the reset button on the back panel while powering up the device. Release the button when the Power LED starts flashing green.

13.8 Accessories



Note

Detailed information on the listed accessories can be found in the separate accessories manual on our website.

Cables and connectors	> AEcable 2Y > Vector SYNCcableXL > Vector SYNCcable50 > Multi SYNCbox external > Multi SYNCbox internal > Multi SYNCbox active > Cable Binder 3pol Connector with Pigtail > Ethernet cables
Power supply	> Vector Power Supply 12V/1.5A > Cable Banana Plug <> Binder 3-pin > Car Power Supply Cable 12V with Binder
Miscellaneous	> Fix Kit 32mm Device

14 VN5640

In this chapter you find the following information:

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14.1 Scope of Delivery

Contents

The delivery includes:

VN5640 Ethernet/CAN interface

- > Vector Power Supply ODU Mini-Snap (part number 05068)
- > USB cable 3.0 (A-B, 1.8m) (part number 05092)

14.2 Introduction

About the VN5640

The VN5640 is a Vector network interface which supports the Ethernet physical layer 10BASE-T, 100BASE-T1 (OPEN Alliance BroadR-Reach), 100BASE-TX and 1000BASE-T. 100BASE-T1 is a physical layer especially used in automotive electronics.In addition, the alternative Interface Option 1000BASE-T1 supports 1000BASE-T1.



Figure 57: VN5640 Ethernet/CAN Interface

The VN5640 enables the transparent monitoring and logging of Ethernet data streams and CAN events with minimal latency times and high resolution time stamps.With this, the VN5640 enables a variety of applications such as simple bus analyses, complex remaining bus simulations as well as diagnostic and calibration (e. g. with CANalyzer.Ethernet/CANoe.Ethernet).

Highlights

Features of the VN5640:

- > Support of 12 independent Ethernet ports
- > Support of 100BASE-T1 (OPEN Alliance BroadR-Reach)
- > Support of standard Ethernet (10BASE-T/100BASE-TX/1000BASE-T)
- > Support of 1000BASE-T1 (Interface Option 1000BASE-T1 only)
- > Support of two independent CAN/CAN FD channels, available as 1x D-SUB9
- > Support of an IO interface for setting or sampling of analog/digital values
- > Host connection via USB 3.0 or Ethernet (1000BASE-T)
- > High resolution time stamps for Ethernet frames
- > High resolution time stamps for CAN/CAN FD frames

- Device synchronization to other Vector interfaces or 3rd party via
  - software synchronization (typ. 50 µs accuracy)
  - hardware synchronization (1 µs accuracy)
  - IEEE 1588 (PTP)
- Internal three-way-routing in/monitor/out
- Hardware filtering of Ethernet and CAN data
- Integrated Layer 2 switch for optimized remaining bus simulation with several ports
- Hardware load generators for low jitter and full bandwidth
- Stand-alone mode capability ensures uninterrupted operation
- Robustness, power supply and temperature ranges suitable for automotive and industrial applications

14.3 Standalone Mode

This Vector device can also operate in standalone mode (i. e., without being connected to a computer). Typical standalone applications include:

- Standalone Media Converter
- Port Mirroring



Note

For standalone mode, the device must already be set up using the Vector Hardware Manager and the configuration must already be deployed. The configuration is persistent and independent of the connected computer, and the device is fully functional when powered externally.

If the device is already running in standalone mode (no connection to a computer), you can always re-connect your device to your computer via USB without interruption. This can be useful, for example, if you want to use CANoe for remaining bus simulation or measurement purposes after the standalone mode is already running. Connecting your application such as CANoe to the Vector device does not interfere with its operation, e. g. communication with your ECU.

14.4 Main Connectors

Device connectors

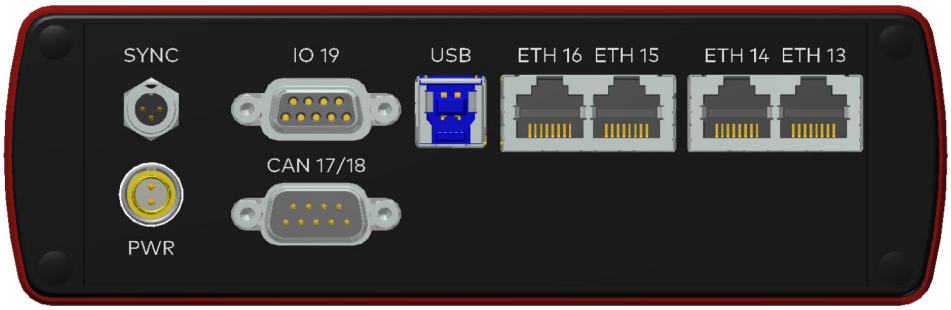


Figure 58: Connectors on the USB side

> **Sync (Binder)**

The VN5640 has one sync connector (Binder type 711) which can be used for time synchronization of different Vector devices (see section Time Synchronization on page 349).

Pin	Assignment
1	Not connected
2	Synchronization line
3	Ground



> **Power (ODU)**

For power supply, the VN5640 has a two-pin ODU connector (MINI-SNAP size 1, type GG1L0C-P02RP00-0000). Attach the enclosed power cable to power up the unit (matching ODU connector type S11L0C-P02NPL0-6200).

Pin	Assignment
1	Power supply (8 V ... 50 V)
2	Ground



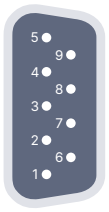
Note

The VN5640 requires at least 5 V to power up. For continuous operation, use 8 V or higher (typ. 12 V DC, max. 50 V). Temporary voltage drops (< 1 min) down to 5 V are allowed.

> IO 19 (D-SUB)

The VN5640 has a D-SUB9 connector (CH19) for dedicated digital input/output tasks. The pin assignment is as follows:

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



Internal interconnection of digital in/out 0/1

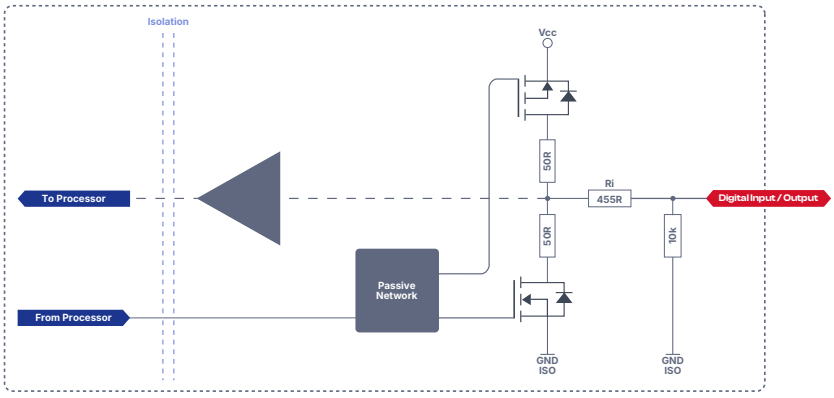


Figure 59: Digital input /output

Internal interconnection of digital input 0/1

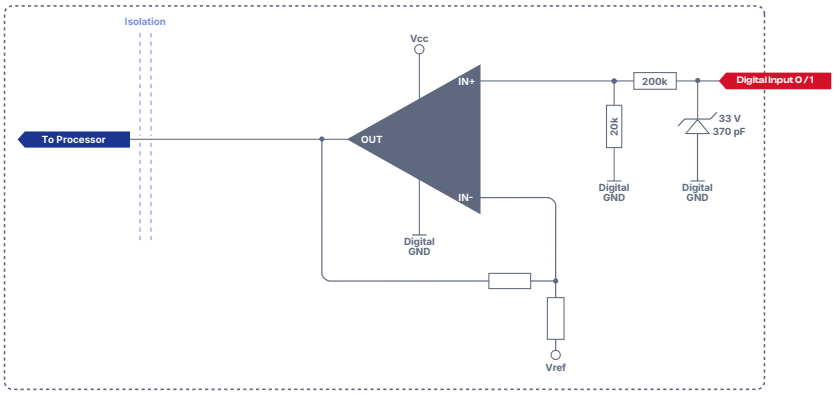


Figure 60: Digital input 0/1

Internal interconnection of digital output

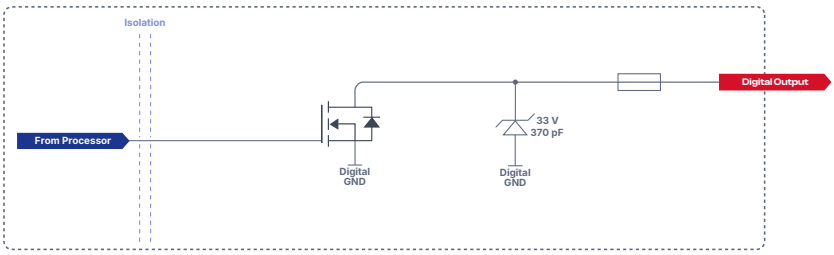


Figure 61: Digital output

Internal interconnection of analog input

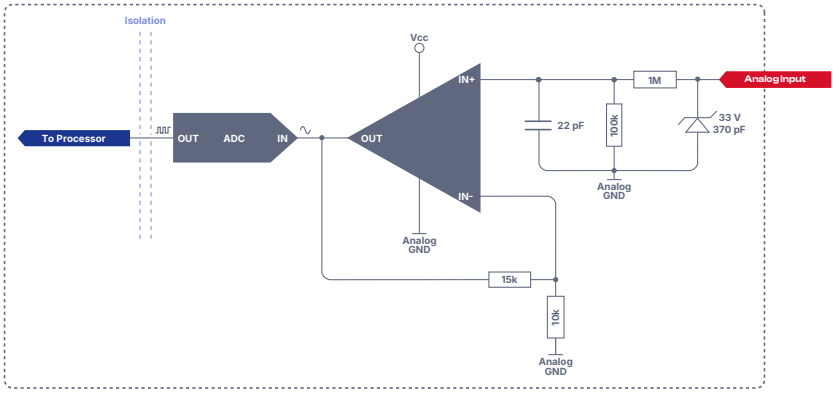


Figure 62: Analog input

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 maximum input voltage U_{input} to be measured 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:

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

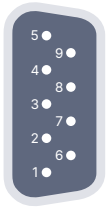
Examples

	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

> **CAN CH17/18 (D-SUB)**

D-SUB connector with two CAN channels. Use the CANcable 2Y to access both channels on separate D-SUB9 connectors (see accessories manual, part number 05075).

Pin	Assignment
1	CH18 CAN Low
2	CH17 CAN Low
3	CH17 GND
4	Reserved. Please do not use.
5	Not connected
6	CH18 GND
7	CH17 CAN High
8	CH18 CAN High
9	Not connected



> **USB**

Connect your computer and the VN5640 over USB to install and to use the device with measurement applications (CANoe, CANalyzer). Use the USB 3.0 compliant cable found in the delivery (USB extension cables may generate faults between the computer and the device). Connect the device directly to a USB port at your computer or use a USB hub with its own power supply (self-powered).

> **Ethernet 13...16 (Ethernet)**

Standard Ethernet connector for 10BASE-T, 100BASE-TX and 1000BASE-T. The Vector Hardware Manager allows you to configure these ports for use as infrastructure ports with different configuration options:

- Alternative analysis port for applications such as CANoe
- (Advanced) mirroring port
- Uplink (ETH16 only): Connect your computer and the VN5640 via standard Ethernet instead of USB to use it with measurement applications (e. g. CANoe, CANalyzer) in a network setup.

Note

The uplink port must be configured as an **Ethernet Host** in the Vector Hardware Manager.

14.5 LEDs

Top LEDs

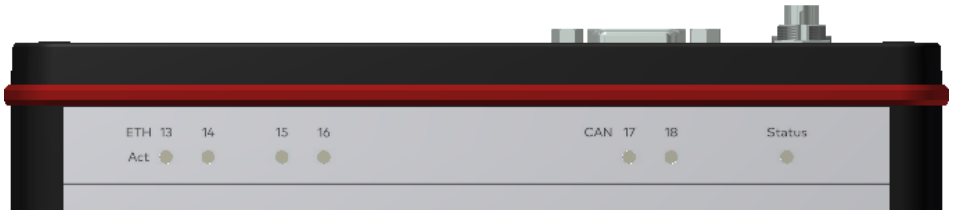


Figure 63: Top LEDs on VN5640

> **Act (Ethernet Port 13...16)**
> LED illuminates if there is an Ethernet link or blinks if there is Ethernet activity at the according port.

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

> **CAN (CH17/CH18)**
> Multicolored channel LEDs, each indicating the bus activity for CAN.

Color	Description
Green	Data frames have been sent or received correctly. The flashing frequency varies according to the message rate.
Orange	Error frames have been sent or received. The flashing frequency varies according to the message rate.
Red	Bus off.

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

Color	Description
Green	Blinks 4x at power up and illuminates afterwards. Blinks quicker during an update progress. Please wait for the automatic reboot of the device (approx. 60 seconds) after the update has been finished.
Red	An error has occurred. Please disconnect the power supply as well as the USB cable. Re-connect the power supply and the USB cable and try again.

Bottom LEDs

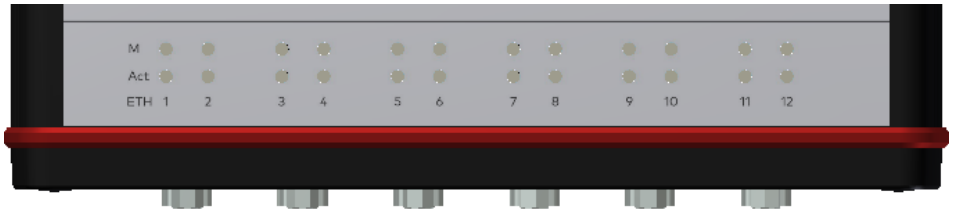


Figure 64: Bottom LEDs on VN5640

> **M (Ethernet Port 1...12)**
> Illuminates if the according port is configured as master.

Color	Description
Green	PHY is configured as master.
Off	PHY is configured as slave.

Note

When the LED is flashing, the device is in Master/Slave auto-detect mode. This indicates that a link has not yet been established. The device will attempt to establish a link by iterating through master/slave configurations and possible link speeds. See the Vector Hardware Manager Help for more details on the "Master/Slave Auto Detect" feature.

> **Act (Ethernet Port 1...12)**
> LED illuminates if there is an Ethernet link or blinks if there is Ethernet activity at the according port.

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

Note

During a firmware update process, the LEDs of port 1...12 turns into a progress bar.

14.6 Interface Option 100BASE-T1

14.6.1 Connectors

Device connectors

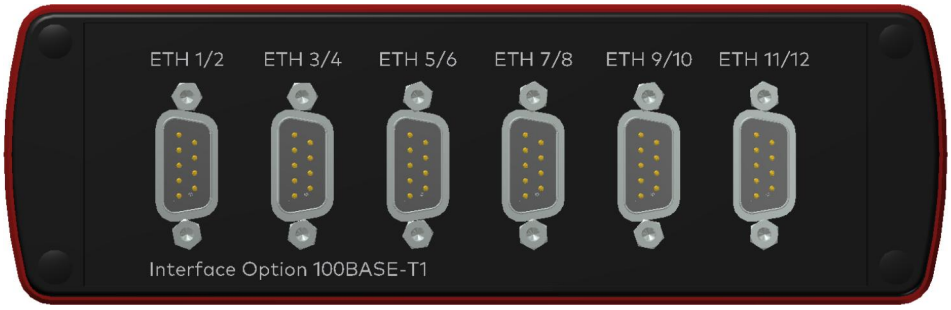
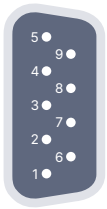


Figure 65: Ethernet CH1...CH12

> **Ethernet Port 1...12 (D-SUB9)**
> D-SUB9 connector for 100BASE-T1. Use the BRcable 2Y to access both ports on separate D-SUB9 connectors (see accessories manual, part number 05103).

Pin	Assignment
1	CH2 MDI+
2	CH2 MDI-
3	Not connected
4	CH1 MDI+
5	CH1 MDI-
6...9	Not connected



Note

The Ethernet configuration can be done in the Vector Hardware Manager.

14.6.2 Technical Data

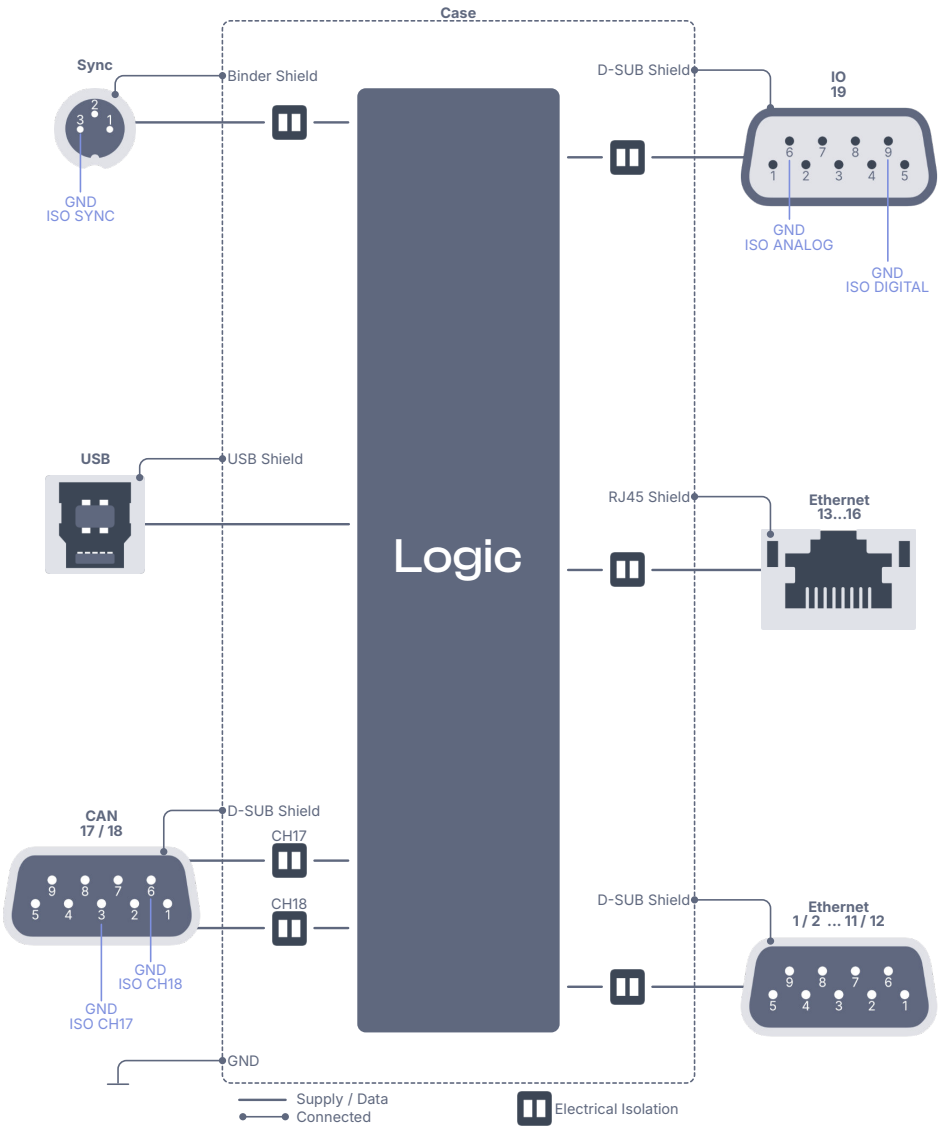
14.6.2.1 Overview

Ethernet ports	> 12x NXP TJA1101A – (IEEE 100BASE-T1) > 4x Atheros AR8031 – (IEEE 100BASE-TX/1000BASE-T)
CAN/CAN FD channels	2x NXP TJA1051
Analog input	10 bit Input 0 V...18 V (Ri = 1.1 MΩ) Voltage tolerance up to 30 V Details on the extended measuring range see on page 195.
Digital input	Range 0 V...32 V Schmitt trigger high 2.8 V, low 2.3 V Input frequencies up to 1 kHz
Digital output	Open Drain External supply up to 32 V Output frequency up to 1 kHz Current max. 500 mA Short circuit / over voltage protected
Digital input/output	Push/Pull mode (e.g. DoIP Activation Line) or only Push-Mode (e.g. Wake-up Triggers) Output high (no load): 13 V Output high (load 346 Ω): 5.3 V Output low: 0 V Input range: 0 V...16 V Input Schmitt trigger high: 3.4 V Input Schmitt trigger low: 2.5 V Rout: approx. 500 Ω
Time stamps	Resolution: 15.625 ns Accuracy (in device): 1 µs Accuracy software sync: typ. 50 µs Accuracy hardware sync: typ. 1 µs
Latency link/switch segment	Link (stress access): approx. 7...12 µs Link (low latency): approx. 6...7 µs Switch: approx. 12 µs

	Please note that the exact latency depends on: > Link speed > Ethernet PHY > Ethernet packet length (switch segment only)
Computer interface	USB 3.0 with Type-B connector/ Ethernet (1000BASE-T)
Input voltage	Power-up: min. 5 V Continuous operation: 8 V ... 50 V (typ. 12 V) Temporary voltage drop down (< 1 min) to 5 V
Power consumption	Max. 15 W
Temperature range (ambient temp. of the device)	Operation: -40 °C ... +60 °C Storage: -40 °C ... +85 °C
Relative humidity of ambient air	15 %...95 %, non-condensing
Dimensions (LxWxH)	186 mm x 172 mm x 55 mm
Weight	1300 g
Operating system requirements	Windows 10 (x64, 64 bit) Windows 11 (x64, 64 bit)

14.6.2.2 Electrical Isolation

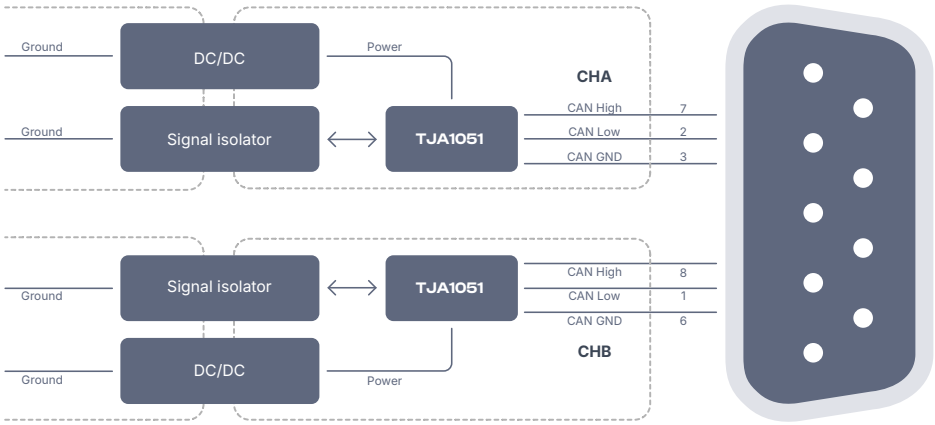
Electrical isolation of the connectors



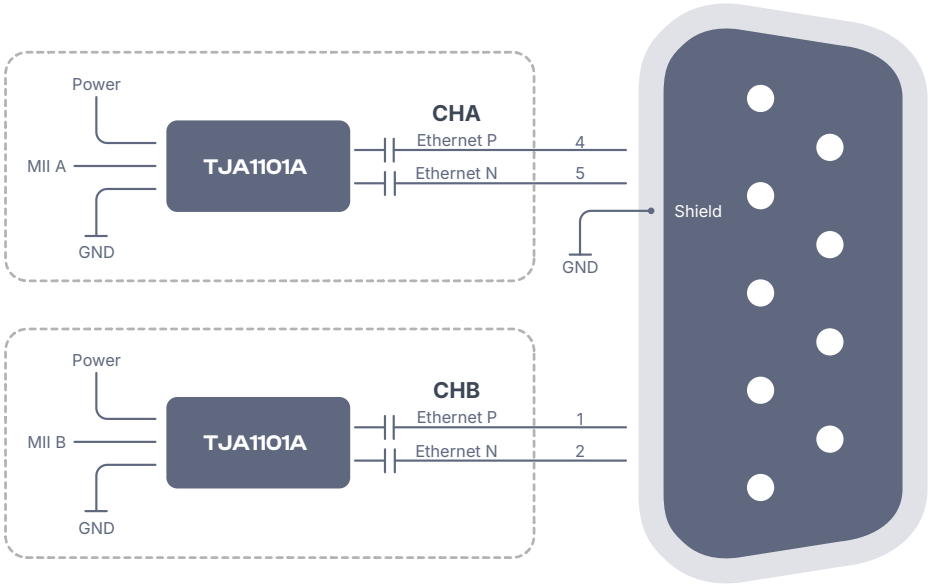
Note

Please note that shielded cables and the USB connector on the device share the same potential (see picture above) while the host shield is connected to GND. This can lead to ground loops and to damages on the host because of currents when using a 12 V notebook power supply without electrical isolation. Please always use an electrical isolated power supply for the host.

Electrical isolation of CAN in detail



Electrical isolation of Ethernet in detail



14.6.3 Network Features

Ports/channels	Total number of Ethernet Ports	16
	10BASE-T1S	-
	100BASE-T1 / 1000BASE-T1	12 / -
	1000BASE-T1 Legacy Mode	-
	10/100/1000BASE-T(X)	4
	1G BASE-T	-
	2.5G BASE-T	-
	2.5GBASE-T1	-
	5G BASE-T	-
	10G BASE-T	-
	CAN FD	2
	DoIP Activation / Wake-up Line	✓
	Multiple digital / analog IO	✓
Power supply	External	✓
	USB buspowered	✓
Infrastructure	Hardware synchronization	✓
	Software synchronization	✓
	PTP IEEE 1588 v2	✓
	Computer uplink	USB3.0
	Computer uplink Ethernet	1000BASE-T
	USB adapter to connect sub devices	-
	Infrastructure Switch to connect sub devices	-
Port interconnection	Layer 2 Switch	✓
	TAP	✓
	Multidrop segment	-
	Simultaneously interconnectable ports via switch/TAP	12
	Media conversion	4
	Link transparency	✓
	OPEN Alliance TC10 (Wake/Sleep) 10BASE-T1S	-
	OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	✓
	OPEN Alliance TC10 (Wake/Sleep) 1000BASE-T1	-
	OPEN Alliance TC10 (Wake/Sleep) 2.5/5/10GBASE-T1	-
	Physical bypass relays	-

Measure	Mirroring port	✓
	Uplink Frame filter	16 rules
	Reporting of invalid Ethernet packets	✓
	MACsec (IEEE 802.1AE)	-
	Reporting of PLCA events	-
Simulation	VLAN tagging / untagging / routing	✓
	Virtual switch ports for Vector-Tools	32
	Time-triggered transmit interface (e. g. for precise AVB-Streams)	-
	MACsec (IEEE 802.1AE)	-
	gPTP (IEEE 802.1AS) support on user network (AVB and AUTOSAR clocks)	-
Test	On-board packet generator	✓
	Invalid Ethernet packet generation	✓
	OPEN Alliance TC10 (Wake/Sleep) 10BASE-T1S	-
	OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	✓
	OPEN Alliance TC10 (Wake/Sleep) 1000BASE-T1	-
	OPEN Alliance TC10 (Wake/Sleep) 2.5/5/10GBASE-T1	-
	MACsec (IEEE 802.1AE)	-
	gPTP (IEEE 802.1AS) support on user network (AVB and AUTOSAR clocks)	-
Application area	Measurement / analysis	✓
	Simulation	✓
	Test	✓

1) Available in a later release.
2) Host computer must support USB-C with 3 A.
3) Supports one switch segment with a maximum of three measurement ports. Sending via measurement ports is not possible.
4) Only with compatible VNmodule60 (see section VNmodule60 on page 284).
5) Only 100/1000BASE-T1

14.7 Interface Option 1000BASE-T1

14.7.1 Connectors

Device connectors

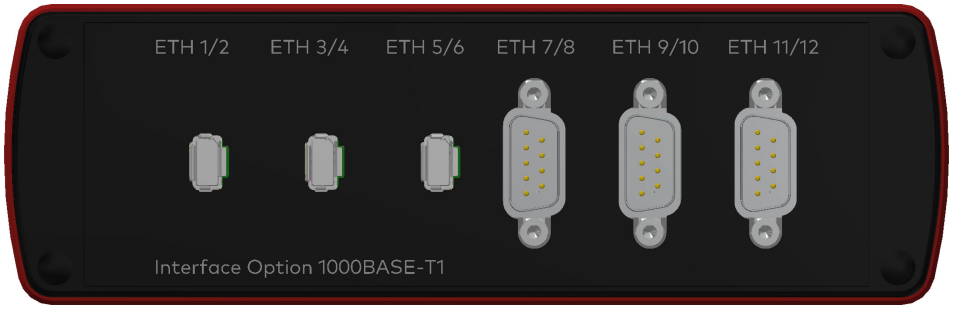
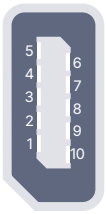


Figure 66: Ethernet CH1...CH12

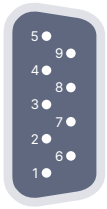
> **Ethernet Port 1...6 (ix Industrial)**
ix Industrial connectors for 100BASE-T1/1000BASE-T1 (e. g. Harting ix Industrial type 10A-1). Each connector has two Ethernet ports (A and B). Use cables of the Vector AEcable 2Y family to access both ports on separate connectors (different plug systems available).

Pin	Assignment
1	CH2 MDI+
2	CH2 MDI-
3...5	Not connected
6	CH1 MDI+
7	CH1 MDI-
8...10	Not connected



> **Ethernet Port 7...12 (D-SUB9)**
D-SUB9 connector for 100BASE-T1. Use the BRcable 2Y to access both ports on separate D-SUB9 connectors (see accessories manual, part number 05103).

Pin	Assignment
1	CH2 MDI+
2	CH2 MDI-
3	Not connected
4	CH1 MDI+
5	CH1 MDI-
6...9	Not connected





Note

The Ethernet configuration can be done in the Vector Hardware Manager.

14.7.2 Technical Data

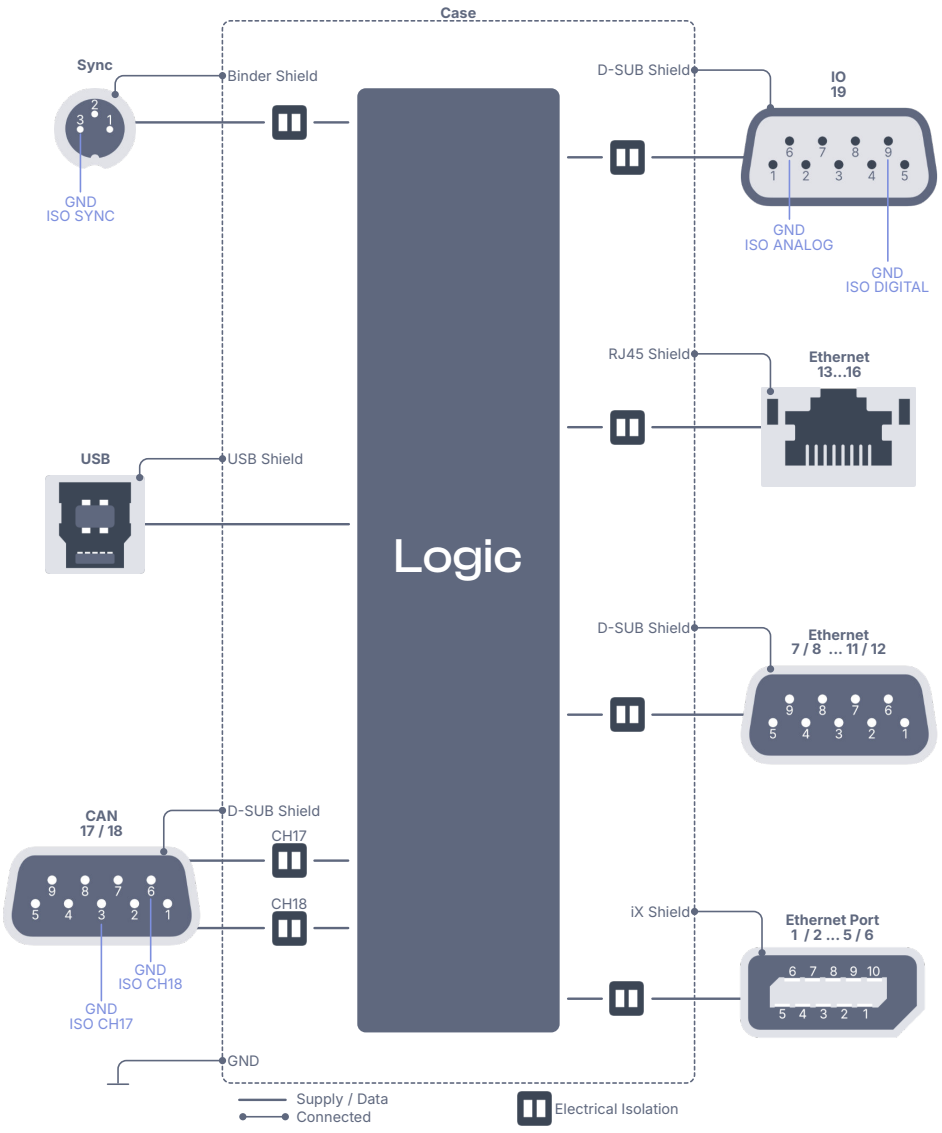
14.7.2.1 Overview

Ethernet ports	> 6x Infineon 88Q2112 Rev.A2 – (IEEE 100BASE-T1/1000BASE-T1) > 6x Broadcom BCM89811 – (IEEE 100BASE-T1) > 4x Atheros AR8031 – (IEEE 100BASE-TX/1000BASE-T)
CAN/CAN FD channels	2x NXP TJA1051
Analog input	10 bit Input 0 V...18 V (Ri = 1.1 MΩ) Voltage tolerance up to 30 V Details on the extended measuring range see on page 195.
Digital input	Range 0 V...32 V Schmitt trigger high 2.8 V, low 2.3 V Input frequencies up to 1 kHz
Digital output	Open Drain External supply up to 32 V Output frequency up to 1 kHz Current max. 500 mA Short circuit / over voltage protected
Digital input/output	Push/Pull mode (e.g. DoIP Activation Line) or only Push-Mode (e.g. Wake-up Triggers) Output high (no load): 13 V Output high (load 346 Ω): 5.3 V Output low: 0 V Input range: 0 V...16 V Input Schmitt trigger high: 3.4 V Input Schmitt trigger low: 2.5 V Rout: approx. 500 Ω
Time stamps	Resolution: 15.625 ns Accuracy (in device): 1 µs Accuracy software sync: typ. 50 µs Accuracy hardware sync: typ. 1 µs Accuracy PTP sync (IEEE1588): typ. 1µs

Latency link/switch segment	Link (stress access): approx. 7...12 µs Link (low latency): approx. 6...7 µs Switch: approx. 12 µs Please note that the exact latency depends on: > Link speed > Ethernet PHY > Ethernet packet length (switch segment only)
Computer interface	USB 3.0 with Type-B connector/ Ethernet (1000BASE-T)
Input voltage	Power-up: min. 5 V Continuous operation: 8 V ... 50 V (typ. 12 V) Temporary voltage drop down (< 1 min) to 5 V
Power consumption	Max. 15 W
Temperature range (ambient temp. of the device)	Operation: -40 °C ... +60 °C Storage: -40 °C ... +85 °C
Relative humidity of ambient air	15 %...95 %, non-condensing
Dimensions (LxWxH)	186 mm x 172 mm x 55 mm
Weight	1300 g
Operating system requirements	Windows 10 (x64, 64 bit) Windows 11 (x64, 64 bit)

14.7.2.2 Electrical Isolation

Electrical isolation of the connectors



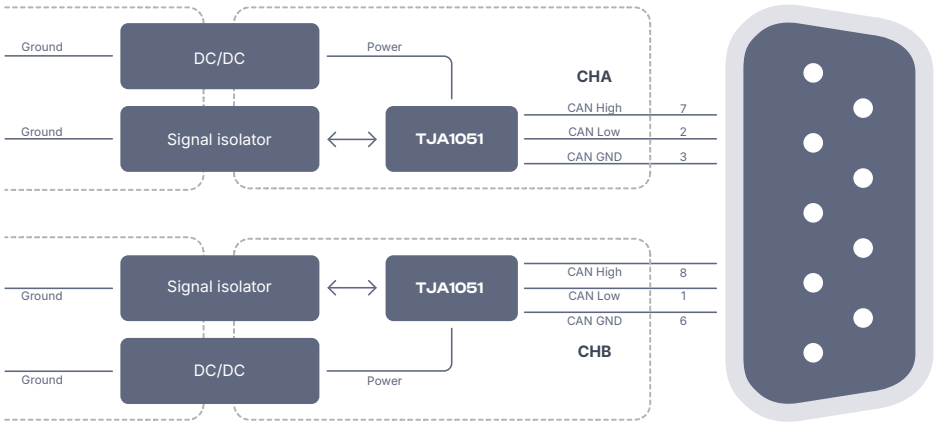
Note

Please note that shielded cables and the USB connector on the device share the same potential (see picture above) while the host shield is connected to GND. This can lead to ground loops and to damages on the host because of currents when using a 12 V notebook power supply without electrical isolation. Please always use an electrical isolated power supply for the host.

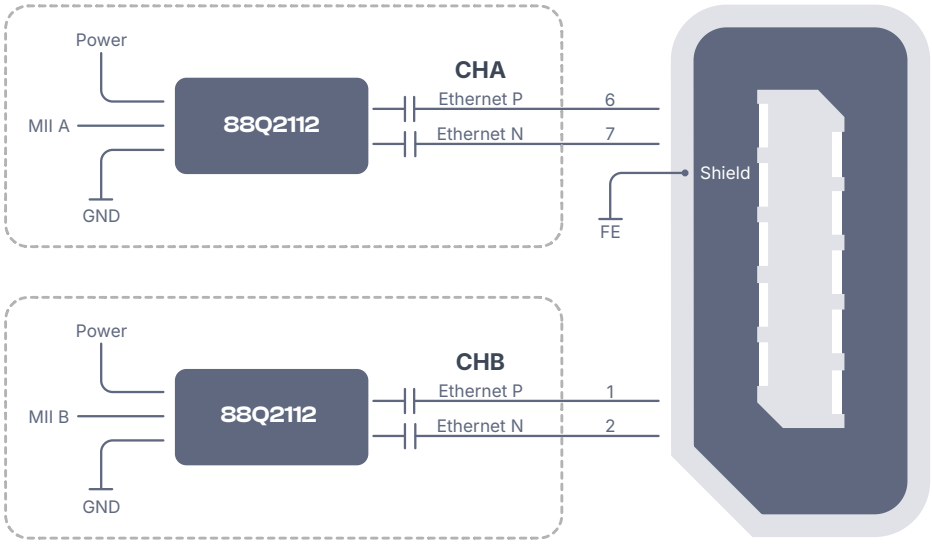
Note

The usage of an AEcable 2Y is recommended because it separates the interface's shield potential from the ECU shield potential. This ensures that all compensating currents over the shields are avoided. A capacitive coupling of the shields is implemented in the AEcable 2Y.

Electrical isolation of CAN in detail



Electrical isolation of Ethernet in detail



14.7.2.3 Network Features

Ports/channels	Total number of Ethernet Ports	16
	10BASE-T1S	-
	100BASE-T1 / 1000BASE-T1	12 / 6
	1000BASE-T1 Legacy Mode	✓
	10/100/1000BASE-T(X)	4
	1G BASE-T	-
	2.5G BASE-T	-
	2.5GBASE-T1	-
	5G BASE-T	-
	10G BASE-T	-
	CAN FD	2
	DoIP Activation / Wake-up Line	✓
	Multiple digital / analog IO	✓
Power supply	External	✓
	USB buspowered	✓
Infrastructure	Hardware synchronization	✓
	Software synchronization	✓
	PTP IEEE 1588 v2	✓
	Computer uplink	USB3.0
	Computer uplink Ethernet	1000BASE-T
	USB adapter to connect sub devices	-
	Infrastructure Switch to connect sub devices	-
Port interconnection	Layer 2 Switch	✓
	TAP	✓
	Multidrop segment	-
	Simultaneously interconnectable ports via switch/TAP	12
	Media conversion	4
	Link transparency	✓
	OPEN Alliance TC10 (Wake/Sleep) 10BASE-T1S	-
	OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	-
	OPEN Alliance TC10 (Wake/Sleep) 1000BASE-T1	-
	OPEN Alliance TC10 (Wake/Sleep) 2.5/5/10GBASE-T1	-
	Physical bypass relays	-

Measure	Mirroring port	✓
	Uplink Frame filter	16 rules
	Reporting of invalid Ethernet packets	✓
	MACsec (IEEE 802.1AE)	-
	Reporting of PLCA events	-
Simulation	VLAN tagging / untagging / routing	✓
	Virtual switch ports for Vector-Tools	32
	Time-triggered transmit interface (e. g. for precise AVB-Streams)	-
	MACsec (IEEE 802.1AE)	-
	gPTP (IEEE 802.1AS) support on user network (AVB and AUTOSAR clocks)	-
Test	On-board packet generator	✓
	Invalid Ethernet packet generation	✓
	OPEN Alliance TC10 (Wake/Sleep) 10BASE-T1S	-
	OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	-
	OPEN Alliance TC10 (Wake/Sleep) 1000BASE-T1	-
	OPEN Alliance TC10 (Wake/Sleep) 2.5/5/10GBASE-T1	-
	MACsec (IEEE 802.1AE)	-
	gPTP (IEEE 802.1AS) support on user network (AVB and AUTOSAR clocks)	-
Application area	Measurement / analysis	✓
	Simulation	✓
	Test	✓

1) Available in a later release.
2) Host computer must support USB-C with 3 A.
3) Supports one switch segment with a maximum of three measurement ports. Sending via measurement ports is not possible.
4) Only with compatible VNmodule60 (see section VNmodule60 on page 284).
5) Only 100/1000BASE-T1

14.8 Accessories



Note

Detailed information on the listed accessories can be found in the separate accessories manual on our website.

Cables and connectors

- AEcable 2Y
- BRcable 2Y
- VNcable D-SUB9 HSD Z
- CANcable1
- CANcableA
- CANcable TnT (D-SUB9 to Bunch Plugs)
- CANcable Y
- CANcable 2Y
- CANterm 120
- CANcable Set Pro
- Vector SYNCcableXL
- Vector SYNCcable50
- Multi SYNCbox external
- Multi SYNCbox internal
- Multi SYNCbox active
- Cable Binder 3pol Connector with Pigtail
- USB Cable 3.0
- Ethernet cables

Power supply

- Vector Power Supply ODU Mini-Snap
- Cable Vehicle Input <> ODU Mini-Snap
- Cable Banana Plug <> ODU Mini-Snap

Miscellaneous

- Fix Kit Large Device

15 VN5240

In this chapter you find the following information:

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15.1 Scope of Delivery

Contents

The delivery includes:

- 1x VN5240 Ethernet Measurement Interface
- 1x Cable Banana Plug <> ODU Mini-Snap (part number 05069)
- 1x Ethernet cable CAT6A (2 m)

15.2 Introduction

About the VN5240

The VN5240 is an interface that has been specially designed for monitoring and analysis of Ethernet networks. For recording Ethernet data in the vehicle, the VN5240 is ideal in combination with the VP6400 smart logging platform. The interface is connected to the computer via Ethernet (10GBASE-T). The tapped data-streams can also be accessed very flexible via up to three mirroring ports.

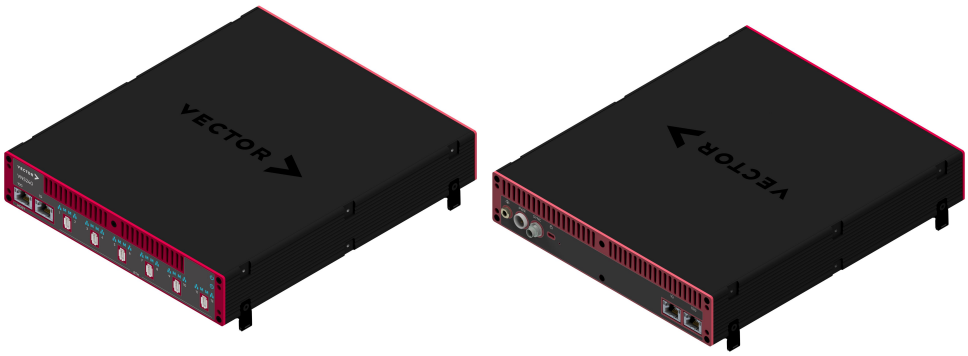


Figure 67: VN5240 Ethernet Interface

Highlights

Features of the VN5240:

- 3x Module slot for up to 12 Automotive Ethernet ports
- 2x 10/100/1000BASE-T(X) infrastructure port
- 2x 1G/2.5G/5G/10GBASE-T infrastructure port
  usable:
  - as uplink to host computer
  - as an alternative user port (e. g. to analyze traffic of a 100BASE-TX/1000BASE-T link)
- Usable as CMP capture module (see Vector Hardware Manager help for further details). Supports:
  - Ethernet
- Host connection Ethernet (10GBASE-T)
- On-board Ethernet TAPs to link between two Ethernet ports
- New hardware configuration concept for flexible configuration
- Usable without host-connection to interconnect ECUs
  - Self-configuration after power-up
- Hardware filtering of Ethernet packets on protocol base
- Device synchronization to other Vector interfaces or 3rd party via
  - hardware synchronization (1 µs accuracy)

  - IEEE 1588 (PTP)

> Multi-application support (different tools can share an Ethernet port at the same time)

> Provides high precision time stamped Ethernet frames (< 20 ns precision)

> Device is designed for in-vehicle applications:
  - Robust housing with various mounting possibilities
  - Form-factor fits perfect two times in a standard 19-inch rack system
  - Extended power supply range (8 V ... 32 V)
  - Extended temperature-range (-40 °C ... +65 °C)
  - Low-power soft off mode (only 2 mA power consumption)
  - On-board/configurable high frequency Ethernet bypass relays ensure a closed TAP connection between two ECUs while the VN5240 is not powered

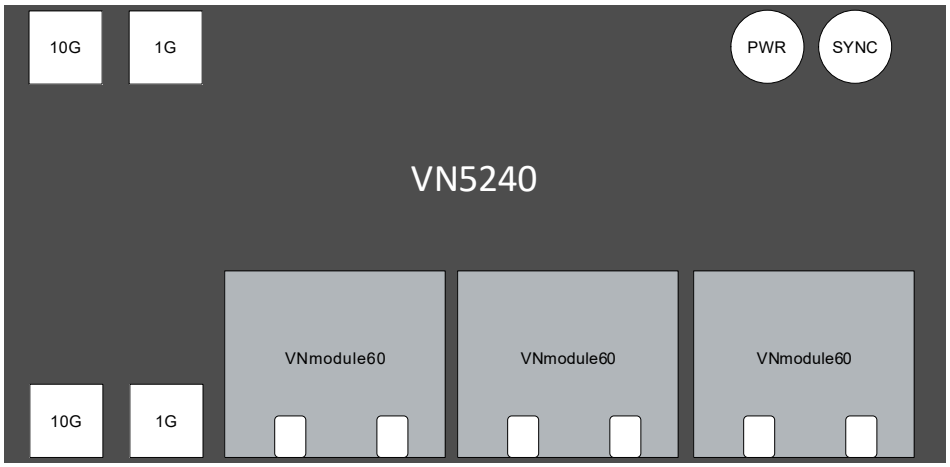


Figure 68: Ports overview

15.3 Physical Layer

VNmodule60

The physical layer of the VN5240 is provided by one or more VNmodule60 that can be inserted into the device.

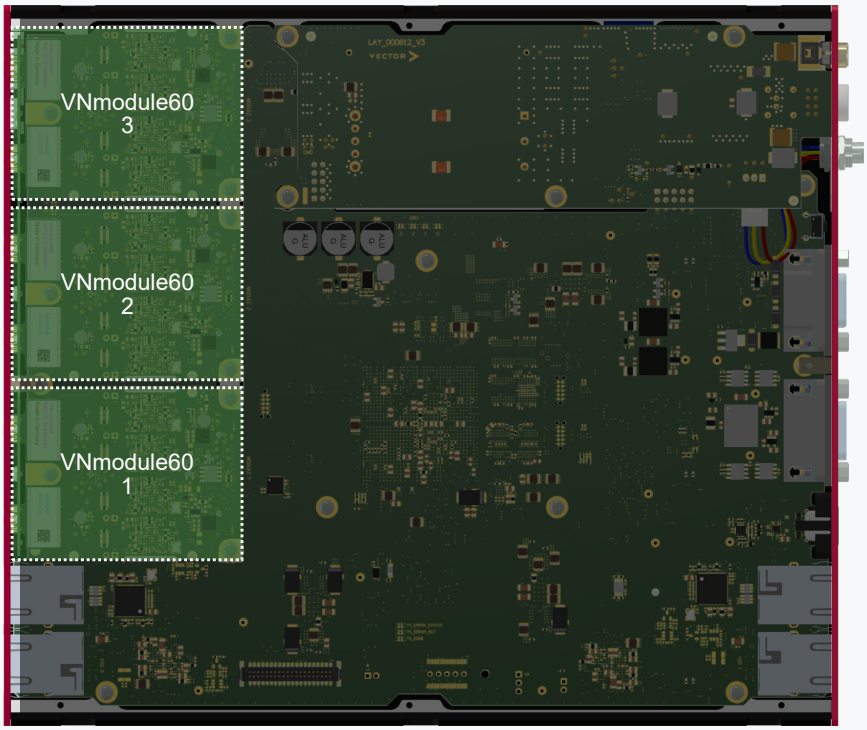
Depending on the module, a single VNmodule60 can provide up to four Ethernet ports. The VN5240 has three VNmodule60 slots, i. e. up to 12 ports can be used at the same time.

Note

This Vector device can be operated without a VNmodule60 mounted. For use with a VNmodule60, please refer to the following note.

Note

If you intend to use a single VNmodule60, insert it in slot 1 first. If you intend to use a second VNmodule60, insert the module in slot 2. The third VNmodule60 must be inserted in slot 3 accordingly.



Use case

Depending on your application, the VNmodule60 slots of the VN5240 can be equipped as follows:

VNmodule60 1	VNmodule60 2	VNmodule60 3
10BASE-T1S	-	-
10BASE-T1S	10BASE-T1S	-
10BASE-T1S	10BASE-T1S	10BASE-T1S
10BASE-T1S	100/1000BASE-T1	100/1000BASE-T1
10BASE-T1S	100/1000BASE-T1	-
100/1000BASE-T1	-	-
100/1000BASE-T1	100/1000BASE-T1	-
100/1000BASE-T1	100/1000BASE-T1	100/1000BASE-T1
2.5/5/10GBASE-T1	-	-
2.5/5/10GBASE-T1	2.5/5/10GBASE-T1	-
2.5/5/10GBASE-T1	2.5/5/10GBASE-T1	2.5/5/10GBASE-T1
2.5/5/10GBASE-T1	100/1000BASE-T1	100/1000BASE-T1
2.5/5/10GBASE-T1	100/1000BASE-T1	-
1/2.5/5/10GBASE-T	-	-
1/2.5/5/10GBASE-T	1/2.5/5/10GBASE-T	-
1/2.5/5/10GBASE-T	1/2.5/5/10GBASE-T	1/2.5/5/10GBASE-T

Note

The Vector device only supports the module combinations listed in the table. Other combinations are not supported by the driver.

Reference

The available modules can be found in the following sections:

> 10BASE-T1S Modules
> 100/1000BASE-T1 Modules
> 2.5/5/10GBASE-T1 Modules
> 1/2.5/5/10GBASE-T Modules

Instructions for replacing the module can be found in section Replacement on page 311.

15.4 Standalone Mode

This Vector device can also operate in standalone mode (i. e., without being connected to a computer). Typical standalone applications include:

- Standalone Media Converter
- Port Mirroring



Note

For standalone mode, the device must already be set up using the Vector Hardware Manager and the configuration must already be deployed. The configuration is persistent and independent of the connected computer, and the device is fully functional when powered externally.

If the device is already running in standalone mode (no connection to a computer), you can always re-connect your device to your computer via USB without interruption. This can be useful, for example, if you want to use CANoe for remaining bus simulation or measurement purposes after the standalone mode is already running. Connecting your application such as CANoe to the Vector device does not interfere with its operation, e. g. communication with your ECU.

15.5 Connectors

15.5.1 Front Side

Device connectors

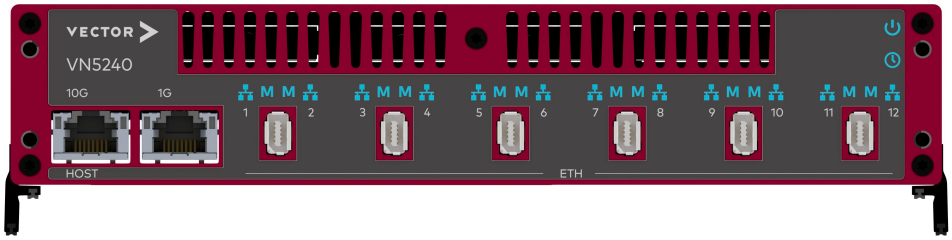


Figure 69: Connectors on the Ethernet side

> **Host 10G (RJ45)**
Uplink: Connect your computer and the VN5240 via RJ45 to use the device with measurement applications (e. g. CANoe, CANalyzer) in a network setup. Alternatively, you can configure the 1G connector for this purpose.

Note

The uplink port must be configured as an **Infrastructure Switch** in the Vector Hardware Manager.

Note

10 Gbps Ethernet connections show an increased sensitivity to EMI.

Data integrity is guaranteed by use of protocols which may reduce data throughput.

> **1G (RJ45)**
Infrastructure port with different possible configurations:
- Mirroring port
- Alternative analysis port
- Uplink: Connect your computer and the VN5240 via RJ45 to use the device with measurement applications (e. g. CANoe, CANalyzer) in a network setup.

Note

The uplink port must be configured as an **Infrastructure Switch** in the Vector Hardware Manager.

> **Ethernet 1...12 (ix Industrial)**
ix Industrial connectors for 100BASE-T1/1000BASE-T1 (e. g. Harting ix Industrial type 10A-1). The channel characteristics, number of available channels and the pin assignments depends on the inserted VNmodule60.

15.5.2 Back Side

Device connectors

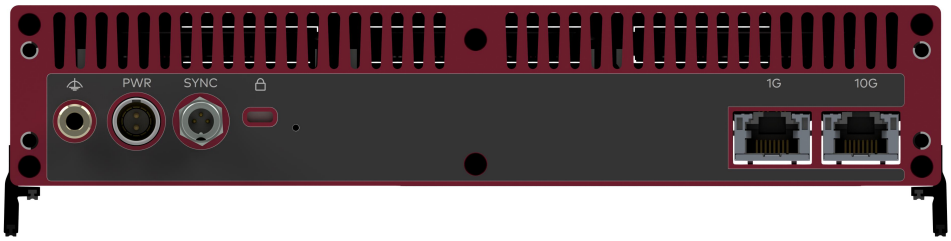


Figure 70: Connectors on the back side

> **Functional Earth (FE)**
Optional connection of housing ground to system ground.

> **Power (ODU)**
For power supply, the VN5240 has a two-pin ODU connector (MINI-SNAP size 1, type GF1L0C-P02RP00-0000). Attach the enclosed power cable to power up the unit (matching ODU connector type S11L0C-P02NPL0-6200).

Pin	Assignment
1	Power supply (8 V ... 32 V)
2	Ground



> **Sync (Binder)**
The VN5240 has a sync connector (Binder type 711) which can be used for time synchronization of different Vector devices (see section Time Synchronization on page 349). In addition, a pin is available for standby operation (see section Standby Operation on page 233).

Pin	Assignment
1	Terminal 15 (12 V ... 32 V) for standby operation
2	Synchronization line
3	Ground Sync



> **Kensington Lock**
Mounting of Nano Kensington (NanoSaver).

> **Reset**
If the device configuration is corrupted, start it with pushed reset button.

> **1G/10G (RJ45 connectors)**
Infrastructure port with different possible configurations:
- Mirroring port

- Alternative analysis port
- Uplink: Connect your computer and the VN5240 via RJ45 to use the device with measurement applications (e. g. CANoe, CANalyzer) in a network setup.



Note

The uplink port must be configured as an **Infrastructure Switch** in the Vector Hardware Manager.

15.6 LEDs

LEDs

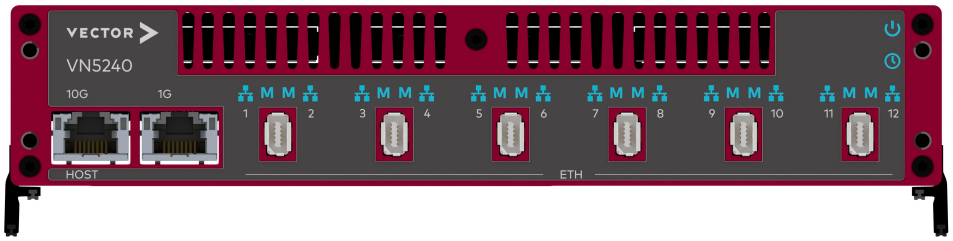


Figure 71: LEDs on VN5240

> **Power**

Multicolored LED indicating the device status.

Color	Description
Green	> Blinks 4x at power up and illuminates afterwards. > Blinks quicker during an update progress. Please wait for the automatic reboot of the device after the update has been finished. Do not disconnect the power supply while the LED is blinking.
Red	An error has occurred. Please disconnect the power supply as well as the USB cable. Re-connect the power supply and the USB cable and try again.

> **Sync**

LED illuminates if the device is synchronized.

Color	Sync State	Description
Off	Not configured.	No master or slave protocols are active for this device or no configuration has been loaded yet.
Orange	Configured, waiting for master.	A slave protocol is active, but no master could be found / assigned yet. The state is assumed when the PTP protocol **Slave** or **Best-Master** is activated in the firmware, i. e. when starting the PTP stack in the firmware or if one of the slave protocols was activated in the driver, i. e. when or after the configuration was applied by the Vector Timesync Service (vTSS).

Color	Sync State	Description
Green (flashing)	Pending.	A slave protocol is active and a master was found or could be assigned. The SYNC condition / the steady state was not yet reached or was left again. > **PTP** Transition to the Slave-With-Master state, but the SYNC condition has not yet been reached. > **HW-SYNC** Pulse and master time present, but the SYNC accuracy has not yet been reached. > **SW-SYNC** SYNC accuracy not yet reached.
Green	In-sync.	SYNC condition reached and is met or only master protocols active on the interface.
Red	Failure.	> **PTP** Master lost, SYNC accuracy not maintained. > **HW-SYNC** Missing pulse, missing time information of the master, SYNC accuracy not maintained. > **SW-SYNC** SYNC accuracy not maintained. If the SYNC accuracy is not maintained but the master is present, this state is only maintained for three seconds, then the state changes to **Pending**.

> **10G Port (RJ45)**
LEDs illuminate if there is an Ethernet link or blink if there is Ethernet activity.

Color (Left)	Color (Right)	Description
Orange	-	100 Mbit/s
Green	-	1 Gbit/s
-	Orange	2.5 Gbit/s
-	Green	5 Gbit/s
Orange	Orange	10 Gbit/s

> **1G Port (RJ45)**
LEDs illuminate if there is an Ethernet link or blink if there is Ethernet activity.

Color (Left)	Description
Green	Activity

Color (Right)	Description
Off	10 Mbit/s
Orange	100 Mbit/s
Green	1000 Mbit/s

> **Ethernet Port 1...12**
LED illuminates if there is an Ethernet link or blinks if there is Ethernet activity at the according port. When a port is in OPEN Alliance TC10 sleep mode, the LED flashes at a low frequency.

Color	Description
Violet	10 Gbit/s
Blue	5 Gbit/s
Cyan	2.5 Gbit/s
Green	1000 Mbit/s
Orange	100 Mbit/s
Yellow	10 Mbit/s
White	Bypass relays closed.

> **M Ethernet Port 1...12**
Illuminates if the according port is configured as master. The color of the Master LED depends on the link speed (see Ethernet port LED above).

State	Description
On	> 10BASE-T1S: PHY is configured as a PLCA Coordinator. > All other: PHY is configured as a master.
Off	> 10BASE-T1S: PHY is configured as a PLCA Follower. > All other: PHY is configured as a slave.



Note

When the LED is flashing, the device is in Master/Slave auto-detect mode. This indicates that a link has not yet been established. The device will attempt to establish a link by iterating through master/slave configurations and possible link speeds. See the Vector Hardware Manager Help for more details on the "Master/Slave Auto Detect" feature.

15.7 Device Stacking

This Vector device can be directly stacked or mounted side-by-side with other Vector devices that also have a Vector System Housing (VSH). This is supported by the side recesses on the housing.

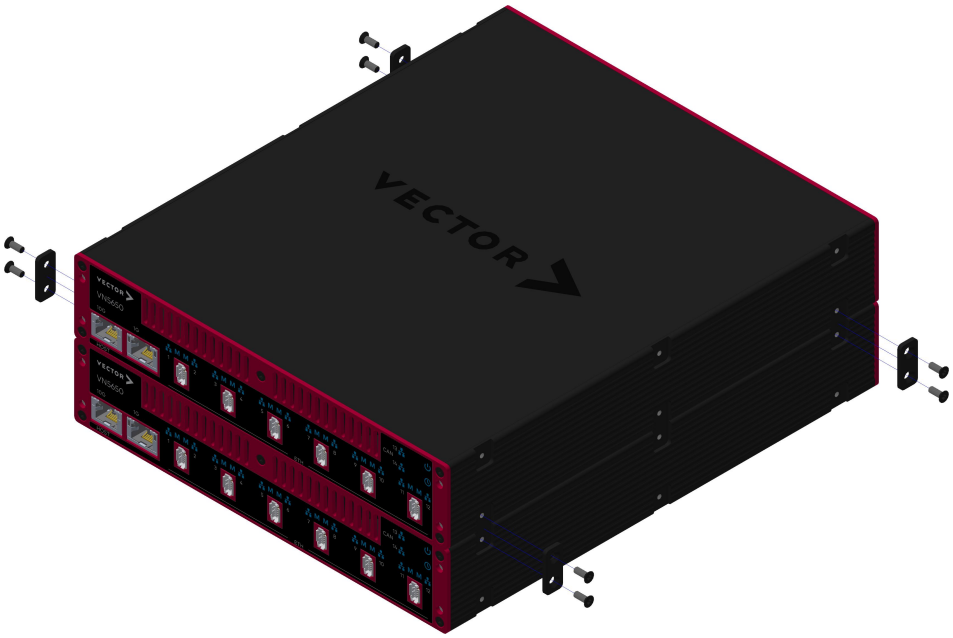


Figure 72: Stacked mounting (example with VN5650)

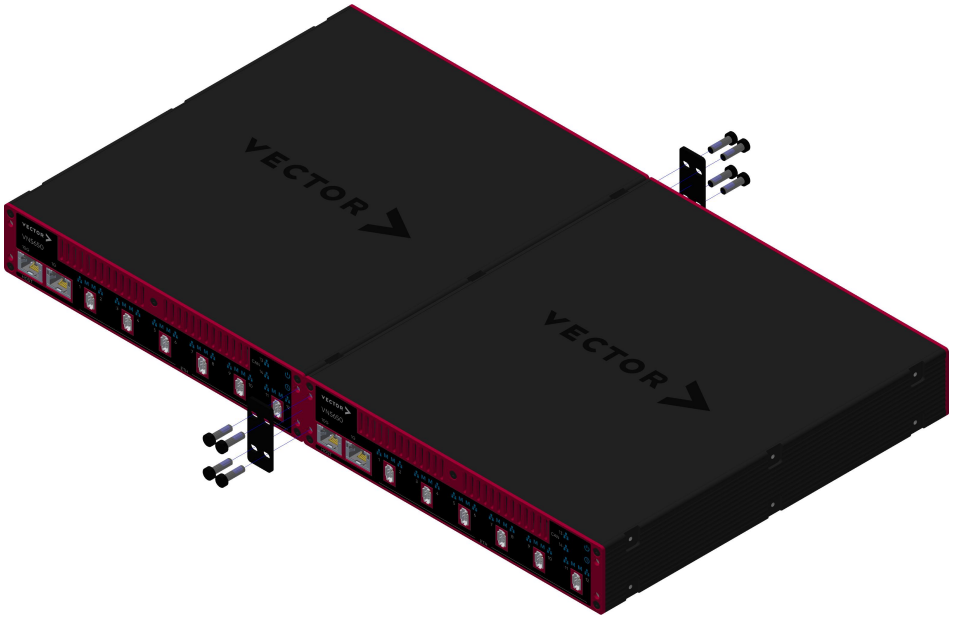


Figure 73: Side-by-side mounting (example with VN5650)

To further increase the mechanical stability of stacked devices, the mounted feet can be removed and replaced by the VSH Connecting Kit Vertical (see accessories manual, part number 05152).

15.8 Technical Data

15.8.1 Overview

Ethernet ports	Up to 12 ports via three plug-in modules. Port characteristics depend on the plugged module: > VNmodule60 4AE1G BCM89883 – 4x Broadcom BCM89883 – 100BASE-T1 – 1000BASE-T1 > VNmodule60 4AE1G 88Q2221M – 4x Infineon 88Q2221M – 100BASE-T1 – 1000BASE-T1 > VNmodule60 4AE1G 88Q2112 – 4x Infineon 88Q2112-A2 – 100BASE-T1 – 1000BASE-T1 > VNmodule60 4AE1G RTL9010AA – 4x Realtek RTL9010AA – 100BASE-T1 – 1000BASE-T1 > VNmodule60 1AE10M LAN8670 – 1x Microchip LAN8670 – 10BASE-T1S – 2x Broadcom BCM89883 – 100BASE-T1 – 1000BASE-T1 > VNmodule60 2AE10G BCM89890 – 2x Broadcom BCM89890 – 2.5GBASE-T1 – 5GBASE-T1 – 10GBASE-T1 > 2x RJ45 – 2x Broadcom BCM54210 – 1000BASE-T

	– 100BASE-TX – 10BASE-T > 2x RJ45 – 2x Broadcom BCM84891 – 10GBASE-T – 5GBASE-T – 2.5GBASE-T – 1GBASE-T – 100BASE-TX
Time stamps	Resolution: 8 ns Accuracy (in device): 1 µs Accuracy software sync: typ. 50 µs Accuracy hardware sync: typ. 1 µs Accuracy PTP sync (IEEE1588): typ. 1µs
Computer interface	Ethernet (1/2.5/5/10GBASE-T)
Power supply	External: 8 V...32 V (typ. 12 V DC)
Power consumption	Typ. 1.8 A @ 12 V Max. 3.1 A @ 12 V (65 °C) Standby: 2 mA @ 12 V For more information, see section Power Consumption on page 231.
Latency link/switch segment	Link (stress access): approx. 7...12 µs Link (low latency): approx. 6...7 µs Switch: approx. 12 µs Please note that the exact latency depends on: > Link speed > Ethernet PHY > Ethernet packet length (switch segment only)
Temperature range	Operation: -40 °C ... +65 °C Storage: -40 °C ... +85 °C
Relative humidity of ambient air	15 %...95 %, non-condensing
Dimensions (LxWxH)	250 mm x 216 mm x 42 mm
Weight	Approx. 2.5 kg
Operating system requirements	Windows 10 (x64, 64 bit) Windows 11 (x64, 64 bit)

15.8.2 Power Consumption

The power consumption depends primarily on the used device configuration and the ambient conditions under which the device is operated. The following example shows the power consumption in typical applications.



Example

Device configuration (3x BCM89883):

- 6x 100BASE-T1
- 6x 1000BASE-T1
- Uplink USB 3.2 Gen 1

Ambient temperature	25 °C	40 °C	65 °C
Voltage supply	12 V	12 V	12 V
Current consumption	1.7 A	1.7 A	2.0 A
Power consumption	20.4 W	20.4 W	24.0 W

When using 12 ports 1000BASE-T1 as an alternative configuration, an additional consumption of 1.4 W occurs.



Example

Device configuration (1x BCM89890, 2x 88Q2221M):

- 2x 2.5GBASE-T1
- 8x 1000BASE-T1

Ambient temperature	25 °C	40 °C	65 °C
Voltage supply	12 V	12 V	12 V
Current consumption	1.6 A	1.7 A	1.8 A
Power consumption	19.2 W	20.4 W	21.6 W

Example

Device configuration (1x BCM89890, 2x 88Q2221M):

> 2x 10GBASE-T1
> 8x 1000BASE-T1

Ambient temperature	25 °C	40 °C	65 °C
Voltage supply	12 V	12 V	12 V
Current consumption	1.8 A	1.8 A	2.0 A
Power consumption	21.6 W	21.6 W	24.0 W

Example

Device configuration (3x BCM89890):

> 6 x 2.5GBASE-T1

Ambient temperature	25 °C	40 °C	65 °C
Voltage supply	12 V	12 V	12 V
Current consumption	1.6 A	1.7 A	1.8 A
Power consumption	19.2 W	20.4 W	21.6 W

Example

Device configuration (3x BCM89890):

> 6x 10GBASE-T1

Ambient temperature	25 °C	40 °C	65 °C
Voltage supply	12 V	12 V	12 V
Current consumption	2.1 A	2.3 A	2.4 A
Power consumption	25.2 W	27.6 W	28.8 W

Note

The hardware is designed for a maximum power consumption of 3.1 A @ 12 V at maximum device temperature (+65 °C). Future device features may change the power consumption of the device.

15.8.3 Standby Operation

Activating the standby feature

The device supports a standby mode which can be activated via the **Vector Hardware Manager | Device Properties Configuration**.

The standby feature can be used by monitoring the following standby source:

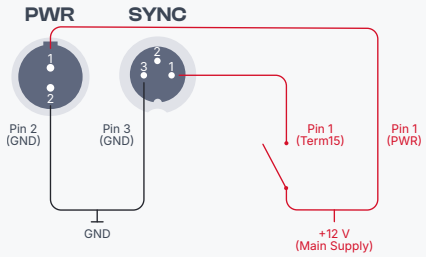
> Terminal 15 pin on the **Sync** connector

If terminal 15 is set (0 V), the interface is set to standby after a certain time. The timeout can be set in **Vector Hardware Manager | Device Properties Configuration**.

If terminal 15 is reset (rising edge to 12 V ... 32 V), the interface wakes up again.

Example

The following example shows how you can connect terminal 15 to the existing power supply for standby/wake-up. Please note that a voltage of at least 12 V is required at terminal 15 to wake up the device. The ground connection must be at the same potential as the power supply ground.



Note

During standby operation the Physical Bypass Relays can be set.

Note

During standby the device consumes approx. 2 mA @ 12 V.

15.8.4 Temperature Shutdown

Temperature limits

The devices are temperature monitored to prevent damage to the device. The devices switch off automatically when the upper limit temperature is exceeded. This limit value represents the theoretical maximum of the hardware. However, it is possible to leave this range slightly without damaging the hardware.

For this purpose the temperature shutdown can be switched off actively.

If the maximum temperature is exceeded, it is indicated by a red status LED on the device. Vector applications also display this (e. g. in the **Write** window of CANoe).

You can find the settings in the Vector Hardware Manager.

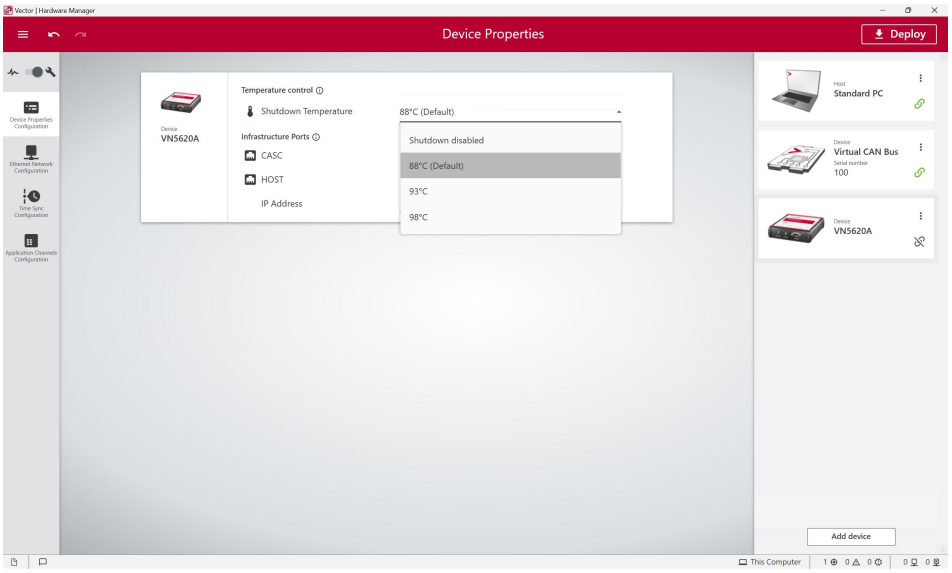
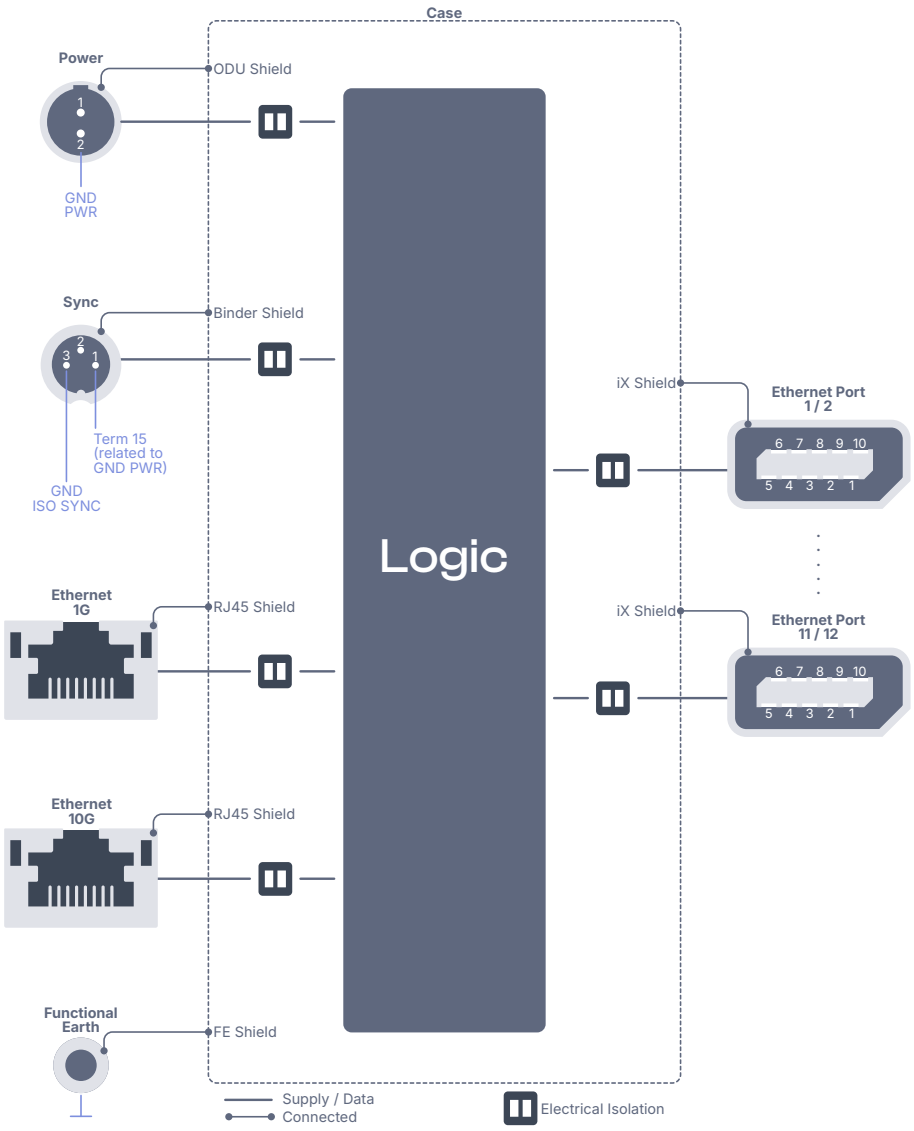


Figure 74: Device Properties Configuration in the Vector Hardware Manager

15.8.5 Electrical Isolation

Electrical isolation of the connectors



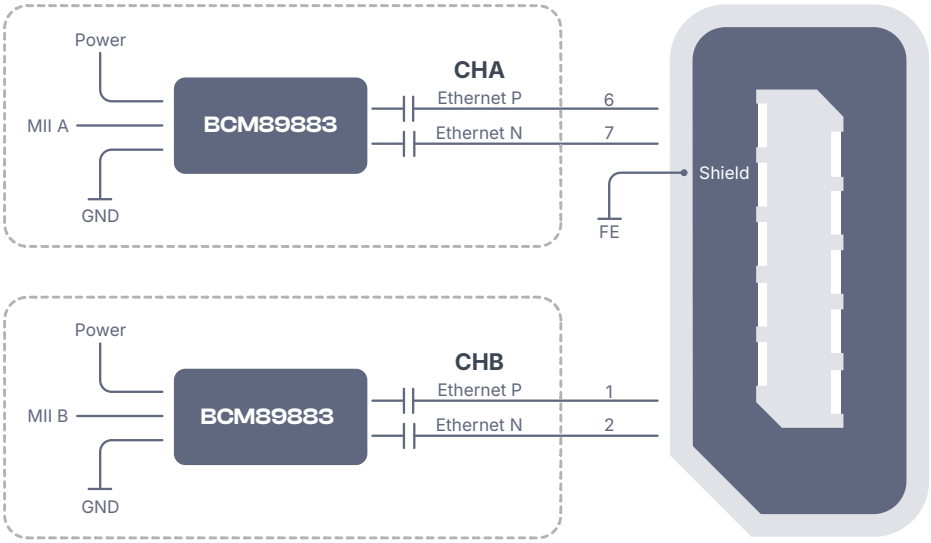
Note

The FE plug must be connected to the chassis ground if the network interface is used in a vehicle with shielded cables.

Note

The usage of an AEcable 2Y is recommended because it separates the interface's shield potential from the ECU shield potential. This ensures that all compensating currents over the shields are avoided. A capacitive coupling of the shields is implemented in the AEcable 2Y.

Electrical isolation of Ethernet in detail



Note

The electrical isolation of the interfaces is a functional isolation that is used to avoid ground loops and interference between the networks. The voltage difference between the isolated areas must not exceed 60 VDC (isolation voltage). The isolation voltage usually exceeds the maximum permissible voltage at a port (operating voltage).

15.8.6 Network Features

Ports/channels	Total number of Ethernet Ports	16
	10BASE-T1S	3[4)]
	100BASE-T1 / 1000BASE-T1	12
	1000BASE-T1 Legacy Mode	✓[4)]
	10/100/1000BASE-T(X)	2
	1G BASE-T	2
	2.5G BASE-T	2
	2.5GBASE-T1	-
	5G BASE-T	2
	10G BASE-T	2
	CAN FD	-
	DoIP Activation / Wake-up Line	-
	Multiple digital / analog IO	-
Power supply	External	✓
	USB buspowered	-
Infrastructure	Hardware synchronization	✓
	Software synchronization	-
	PTP IEEE 1588 v2	✓
	Computer uplink	-
	Computer uplink Ethernet	10GBASE-T
	USB adapter to connect sub devices	-
	Infrastructure Switch to connect sub devices	✓
Port interconnection	Layer 2 Switch	✓[3)]
	TAP	✓
	Multidrop segment	-
	Simultaneously interconnectable ports via switch/TAP	15
	Media conversion	3
	Link transparency	✓
	OPEN Alliance TC10 (Wake/Sleep) 10BASE-T1S	✓[4)]
	OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	✓[4)]
	OPEN Alliance TC10 (Wake/Sleep) 1000BASE-T1	✓[4)]
	OPEN Alliance TC10 (Wake/Sleep) 2.5/5/10GBASE-T1	✓[4)]
	Physical bypass relays	✓

Measure	Mirroring port	✓
	Uplink Frame filter	16 rules
	Reporting of invalid Ethernet packets	✓
	MACsec (IEEE 802.1AE)	-
	Reporting of PLCA events	✓1, 4)
Simulation	VLAN tagging / untagging / routing	-
	Virtual switch ports for Vector-Tools	8
	Time-triggered transmit interface (e. g. for precise AVB-Streams)	-
	MACsec (IEEE 802.1AE)	-
	gPTP (IEEE 802.1AS) support on user network (AVB and AUTOSAR clocks)	✓
Test	On-board packet generator	-
	Invalid Ethernet packet generation	-
	OPEN Alliance TC10 (Wake/Sleep) 10BASE-T1S	✓4)
	OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	-
	OPEN Alliance TC10 (Wake/Sleep) 1000BASE-T1	-
	OPEN Alliance TC10 (Wake/Sleep) 2.5/5/10GBASE-T1	-
	MACsec (IEEE 802.1AE)	-
	gPTP (IEEE 802.1AS) support on user network (AVB and AUTOSAR clocks)	✓
Application area	Measurement / analysis	✓
	Simulation	-
	Test	-

1) Available in a later release.
2) Host computer must support USB-C with 3 A.
3) Supports one switch segment with a maximum of three measurement ports. Sending via measurement ports is not possible.
4) Only with compatible VNmodule60 (see section VNmodule60 on page 284).
5) Only 100/1000BASE-T1

15.8.6.1 Physical Bypass Relay

General information

If a Vector Ethernet Network Interface is connected as TAP between two 100/1000BASE-T1 nodes, the communication of the two terminals is permanently interrupted when the interface is switched off, in standby mode or fails. By activating the physical bypass on the Vector Ethernet Network Interface, this communication can still be enabled.

The terms bypass closed or bypass open are explained in the following figures:

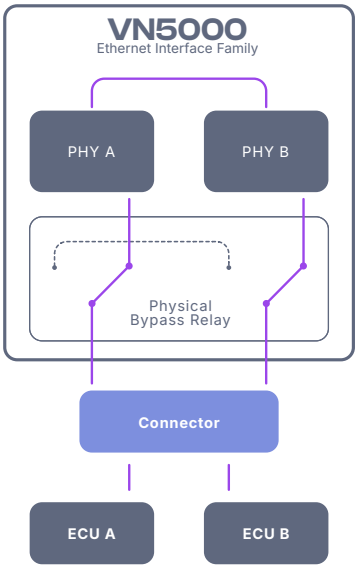


Figure 75: Bypass open, interface actively switches data between both ports

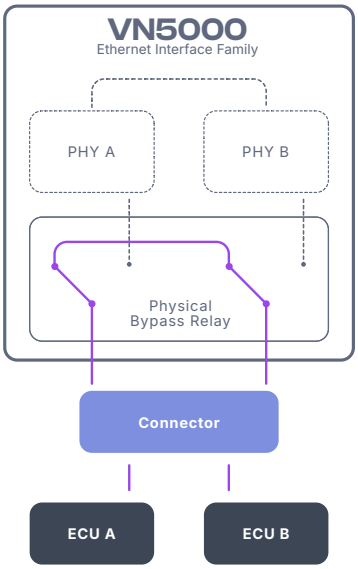


Figure 76: Bypass closed, interface is switched off

This physical bypass can be activated and deactivated via software, resulting in the following options or operation modes:

Operation Mode	Device powered	Device without power or in standby mode
2-channel mode	bypass open	bypass open
physical bypass mode	bypass open	bypass closed
passive mode	bypass closed	bypass closed

- **2-channel mode**
  The device operates without physical bypass relays. When it is turned off, ECU1 is disconnected from ECU2.
- **Physical bypass mode**
  Typical use of physical bypass relays: when the device is powered down or in standby mode, the relays close, maintaining the connection between ECU1 and ECU2.
- **Passive mode**
  The device behaves transparently as if it were not connected (physical bypass relays are always closed).



Note

If the physical bypass relays are closed, the device can neither read nor send data to the application. This means that device operations such as filtering or mirroring are not possible, and the application (such as CANoe or CANape) does not receive any data.



Note

When switching the relay, the link is briefly interrupted for 200 ms.



Note

If the physical bypass is active while power is supplied to the interface, the corresponding LED lights up white.

15.9 Troubleshooting

Issue	Remedy
The device is not recognized by the computer.	> Install the latest drivers from our website. > Perform a factory reset by pressing and holding the reset button on the back panel while powering up the device. Release the button when the Power LED starts flashing green.
Device turns off after some time.	> Check that the standby function is not activated. See the Standby section in this manual.

15.10 Accessories



Note

Detailed information on the listed accessories can be found in the separate accessories manual on our website.

Cables and connectors

- AEcable 2Y
- Vector SYNCcableXL
- Vector SYNCcable50
- Multi SYNCbox external
- Multi SYNCbox internal
- Multi SYNCbox active
- Cable Binder 3pol Connector with Pigtail
- Ethernet cables

Power supply

- Vector Power Supply ODU Mini-Snap
- Cable Banana Plug <> ODU Mini-Snap

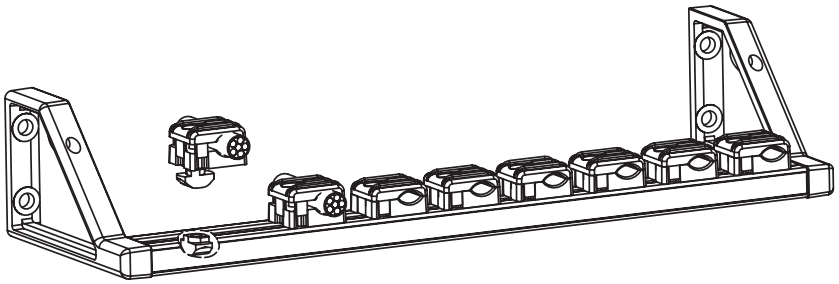
Miscellaneous

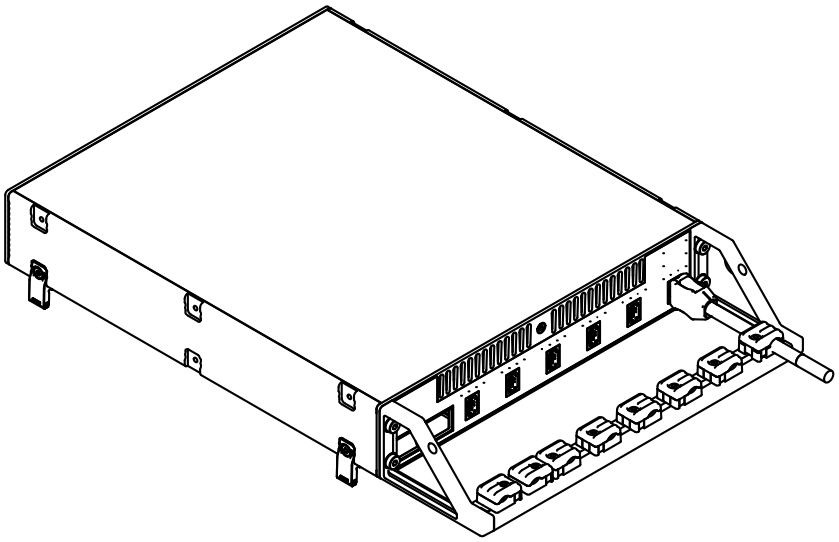
- VSH Cable Guard 216
- VSH Cable Guard 216 Clip
- VSH Connecting Kit 19"
- VSH Connecting Kit Horizontal
- VSH Connecting Kit Vertical
- VSH Equipment Foot Kit
- VSH Mounting Flange

15.10.1 VSH Cable Guard 216

Technical data

Description	Cable support system including eight clips for clamping single cables. For cable diameters (clamping range) from Ø 3.8 mm to Ø 6.8 mm.
Part number	05149





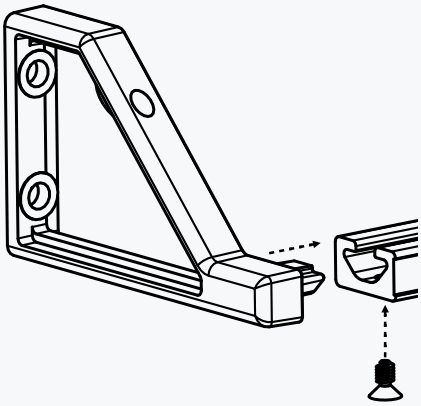
Note

The VSH Cable Guard 216 and the clips are not designed for use with VNcable 3Y.

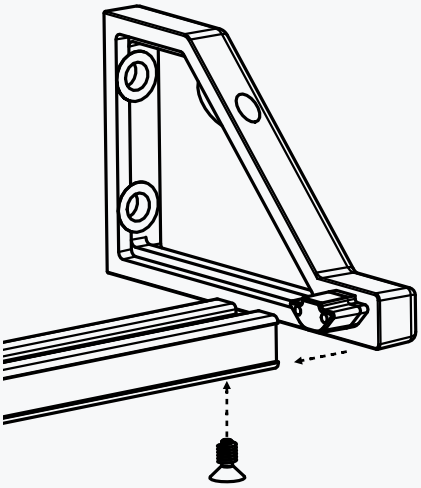
Example

The following steps describe the mounting of the VSH Cable Guard 216:

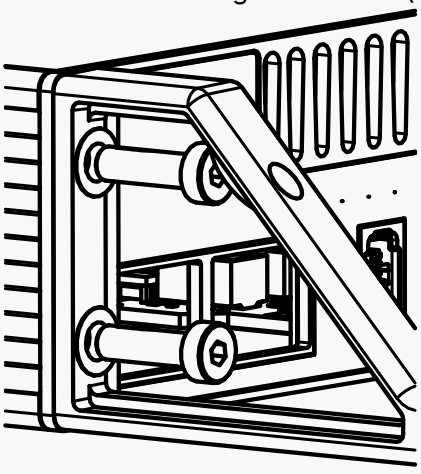
1. Insert the left frame into the cable rail and tighten the screw (Torx 8) with a torque of 1.4 Nm.



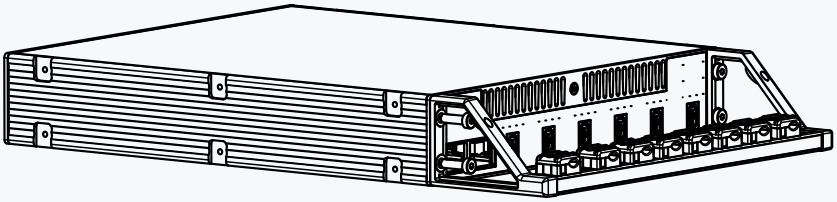
2. Repeat the steps above with the right frame.



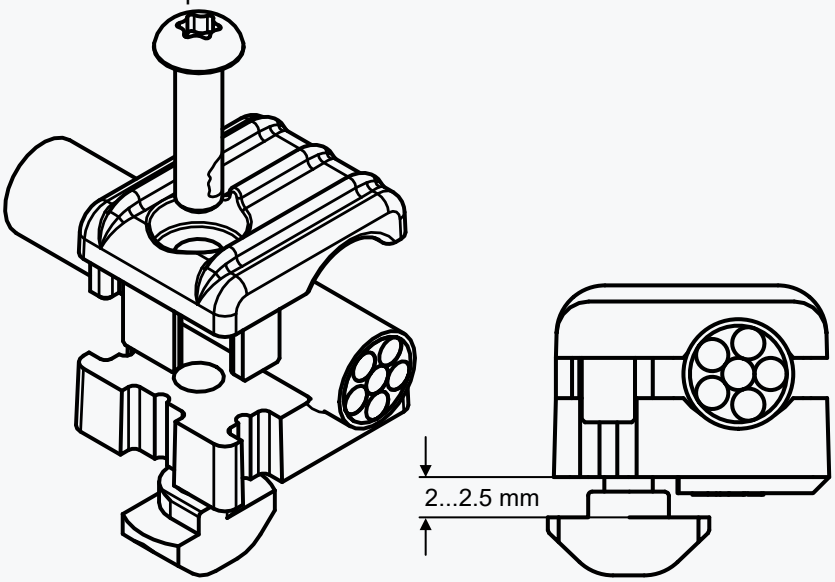
3. Attach the complete Cable Guard to the VN device and tighten it with the enclosed hexagonal screws (3 mm) and with a torque of 1.7 Nm.



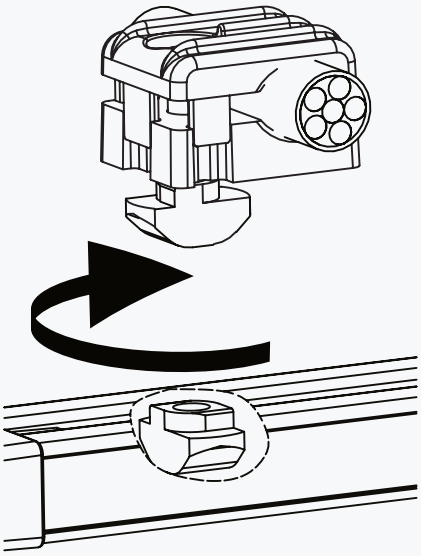
4. Repeat the steps on the other side.



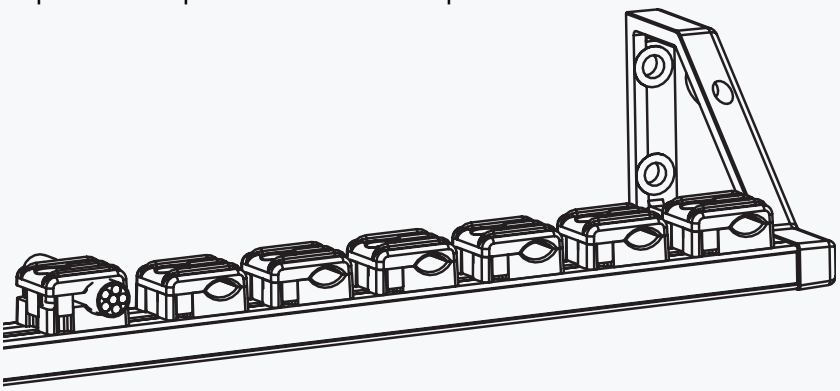
5. Lead the individual cables through the clamps and tighten the individual clamps depending on the cable (Torx 10). Tighten the screw only enough to leave a gap of 2 to 2.5 mm between the slot nut and the cable clamp.



6. Now insert the individual clamps into the Cable Guard and tighten the screw completely. The slot nut will rotate 90° inside the rail and thus fix the entire clamp.



7. Repeat the steps with all other clamps.



16 VN5650

In this chapter you find the following information:

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16.10.1 VSH Cable Guard 216 280

16.1 Scope of Delivery

Contents

The delivery includes:

- 1x VN5650 Ethernet/CAN Interface
- 1x Cable Banana Plug <> ODU Mini-Snap (part number 05069)
- 1x Ethernet cable CAT6A (2 m)
- 1x USB Cable 3.1 Type A-C (Dual Screw Lock)

16.2 Introduction

About the VN5650

The VN5650 is a powerful Ethernet interface that supports Automotive Ethernet on up to 12 ports. With the flexible physical layer modules, the standards 10BASE-T1S, 100BASE-T1, 1000BASE-T1, MultiGBASE-T1 and MultiGBASE-T are supported. It is suitable for synchronous monitoring of Ethernet networks with other bus systems. In addition, the VN5650 can provide optimal network access for remaining bus simulations and can be used for frame, load and fault generation during tests. Thanks to its robust housing and the various mounting and stacking capabilities, the device is ideally suited for use in vehicles. Ethernet (10GBASE-T) or USB 3.2 Gen 1 is used as the interface to the computer.

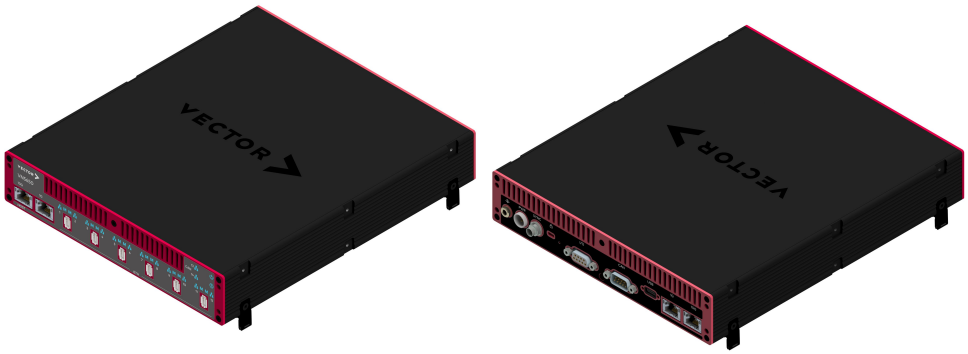


Figure 77: VN5650 Ethernet Interface

Highlights

Features of the VN5650:

- 3x Module slot for up to 12 Automotive Ethernet ports
- 2x 10/100/1000BASE-T(X) infrastructure port
- 2x 1G/2.5G/5G/10GBASE-T infrastructure port
  usable:
  - as uplink to host computer
  - as an alternative user port (e. g. to analyze traffic of a 100BASE-TX/1000BASE-T link)
  - mirroring port
- 2x CAN FD channel supporting up to 8 Mbit/s
- 1x Analog input
- 2x Digital input
- 1x Digital output (open collector)

- 2x Digital input/output, e. g. for DoIP Activation Line (ISO/DIS 13400-3)
- Usable as CMP capture module (see Vector Hardware Manager help for further details). Supports:
  - CAN
  - Ethernet
- Host connection USB 3.1 Gen 1 or Ethernet (10GBASE-T)
- On-board Ethernet TAPs to link between two Ethernet ports
- On-board Vector Ethernet Switch IP supporting free segmentation
- New hardware configuration concept for flexible configuration
- Usable without host-connection to interconnect ECUs
- Self-configuration after power-up
- Hardware filtering of Ethernet packets on protocol base
- Device synchronization to other Vector interfaces or 3rd party via
  - software synchronization (typ. 50 µs accuracy)
  - hardware synchronization (1 µs accuracy)
  - IEEE 1588 (PTP)
- Multi-application support (different tools can share an Ethernet port at the same time)
- Provides high precision time stamped Ethernet/CAN frames (< 20 ns precision)
- Device is designed for in-vehicle applications:
- Robust housing with various mounting possibilities
- Form-factor fits perfect two times in a standard 19-inch rack system
- Extended power supply range (8 V ... 32 V)
- Extended temperature-range (-40 °C ... +65 °C)
- Low-power stand-by mode (only 2 mA power consumption)
- On-board/configurable high frequency Ethernet bypass relays ensure a closed TAP connection between two ECUs while the VN5650 is not powered

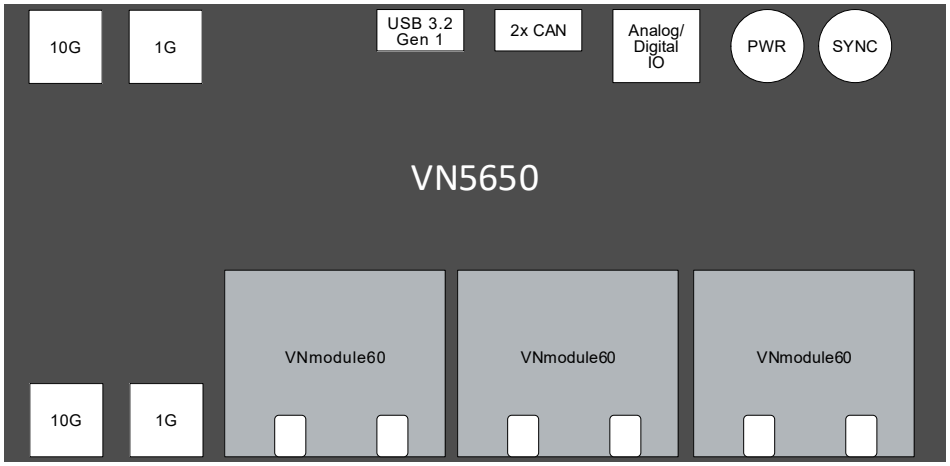


Figure 78: Ports overview

16.3 Physical Layer

VNmodule60

The physical layer of the VN5650 is provided by one or more VNmodule60 that can be inserted into the device.

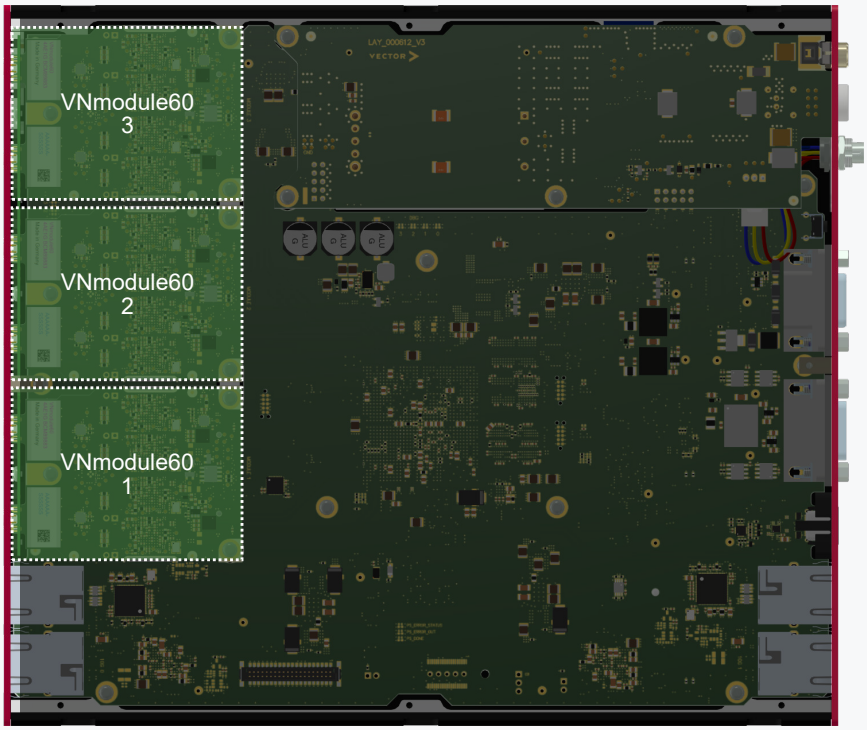
Depending on the module, a single VNmodule60 can provide up to four Ethernet ports. The VN5650 has three VNmodule60 slots, i. e. up to 12 ports can be used at the same time.

Note

This Vector device can be operated without a VNmodule60 mounted. For use with a VNmodule60, please refer to the following note.

Note

If you intend to use a single VNmodule60, insert it in slot 1 first. If you intend to use a second VNmodule60, insert the module in slot 2. The third VNmodule60 must be inserted in slot 3 accordingly.



Use case

Depending on your application, the VNmodule60 slots of the VN5650 can be equipped as follows:

VNmodule60 1	VNmodule60 2	VNmodule60 3
10BASE-T1S	1)	1)
10BASE-T1S	10BASE-T1S	1)
10BASE-T1S	10BASE-T1S	10BASE-T1S
2)	2)	2)

1) any of the following:

- 100/1000BASE-T1
- not equipped (empty)

2) any of the following:

- 100/1000BASE-T1
- 2.5/5/10GBASE-T1
- 1/2.5/5/10GBASE-T
- not equipped (empty)



Note

The Vector device only supports the module combinations listed in the table. Other combinations are not supported by the driver.



Reference

The available modules can be found in the following sections:

- 10BASE-T1S Modules
- 100/1000BASE-T1 Modules
- 2.5/5/10GBASE-T1 Modules
- 1/2.5/5/10GBASE-T Modules

Instructions for replacing the module can be found in section Replacement on page 311.

16.4 Standalone Mode

This Vector device can also operate in standalone mode (i. e., without being connected to a computer). Typical standalone applications include:

- Standalone Media Converter
- Port Mirroring



Note

For standalone mode, the device must already be set up using the Vector Hardware Manager and the configuration must already be deployed. The configuration is persistent and independent of the connected computer, and the device is fully functional when powered externally.

If the device is already running in standalone mode (no connection to a computer), you can always re-connect your device to your computer via USB without interruption. This can be useful, for example, if you want to use CANoe for remaining bus simulation or measurement purposes after the standalone mode is already running. Connecting your application such as CANoe to the Vector device does not interfere with its operation, e. g. communication with your ECU.

16.5 Connectors

16.5.1 Front Side

Device connectors

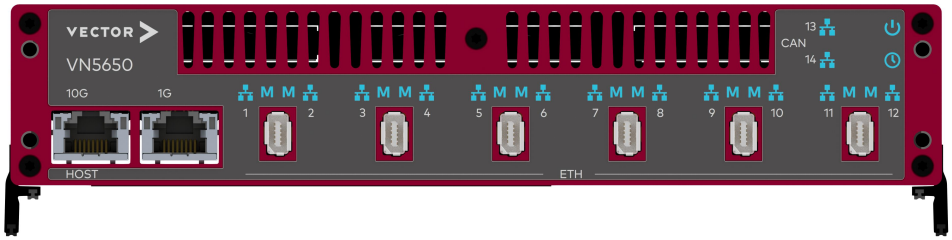


Figure 79: Connectors on the Ethernet side

> **Host 10G (RJ45)**
> Uplink: Connect your computer and the VN5650 via RJ45 to use the device with measurement applications (e. g. CANoe, CANalyzer) in a network setup. Alternatively, you can configure the 1G connector for this purpose.

Note

The uplink port must be configured as an **Infrastructure Switch** in the Vector Hardware Manager.

Note

10 Gbps Ethernet connections show an increased sensitivity to EMI.

Data integrity is guaranteed by use of protocols which may reduce data throughput.

> **1G (RJ45)**
> Infrastructure port with different possible configurations:
> - Mirroring port
> - Alternative analysis port
> - Uplink: Connect your computer and the VN5650 via RJ45 to use the device with measurement applications (e. g. CANoe, CANalyzer) in a network setup.

Note

The uplink port must be configured as an **Infrastructure Switch** in the Vector Hardware Manager.

> **Ethernet 1...12 (ix Industrial)**
ix Industrial connectors for 100BASE-T1/1000BASE-T1 (e. g. Harting ix Industrial type 10A-1). The channel characteristics, number of available channels and the pin assignments depends on the inserted VNmodule60.

16.5.2 Back Side

Device connectors

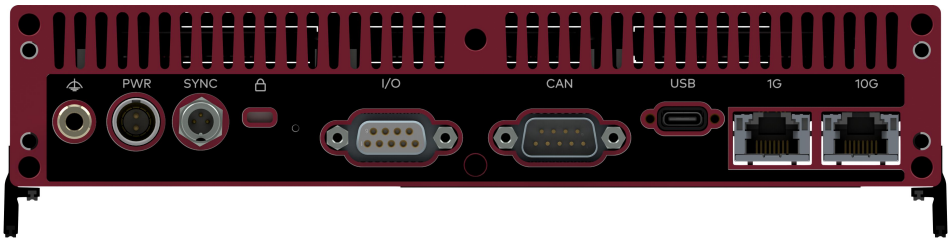


Figure 80: Connectors on the USB side

> **Functional Earth (FE)**
Optional connection of housing ground to system ground.

> **Power (ODU)**
For power supply, the VN5650 has a two-pin ODU connector (MINI-SNAP size 1, type GF1L0C-P02RP00-0000). Attach the enclosed power cable to power up the unit (matching ODU connector type S11L0C-P02NPL0-6200).

Pin	Assignment
1	Power supply (8 V ... 32 V)
2	Ground



> **Sync (Binder)**
The VN5650 has a sync connector (Binder type 711) which can be used for time synchronization of different Vector devices (see section Time Synchronization on page 349). In addition, a pin is available for standby operation (see section Standby Operation on page 270).

Pin	Assignment
1	Terminal 15 (12 V ... 32 V) for standby operation
2	Synchronization line
3	Ground Sync



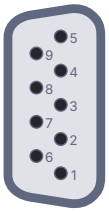
> **Kensington Lock**
Mounting of Nano Kensington (NanoSaver).

> **Reset**
If the device configuration is corrupted, start it with pushed reset button.

> IO (D-SUB)

The VN5650 has a D-SUB9 connector for dedicated digital input/output tasks. The pin assignment is as follows:

Pin	Assignment
1	Analog input
2	Digital input/output 0
3	Digital input/output 1
4	Digital input 0
5	Digital input 1
6	Analog GND
7	Not connected
8	Digital output, PPS signal (out)
9	Digital GND



Internal interconnection of digital in/out 0/1

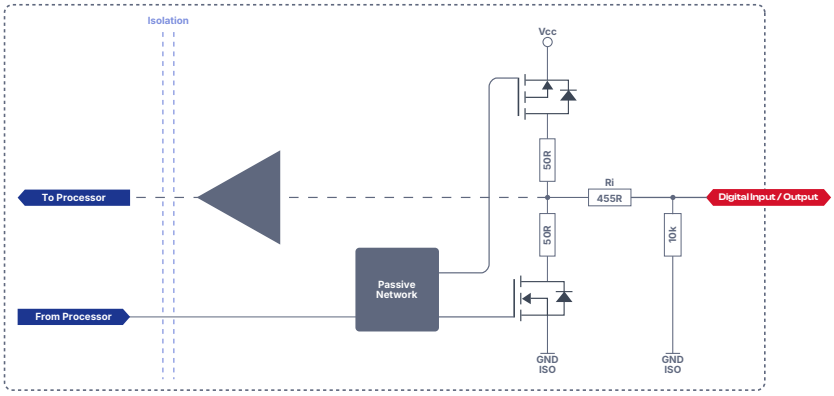


Figure 81: Digital input /output

Internal interconnection of digital input 0/1

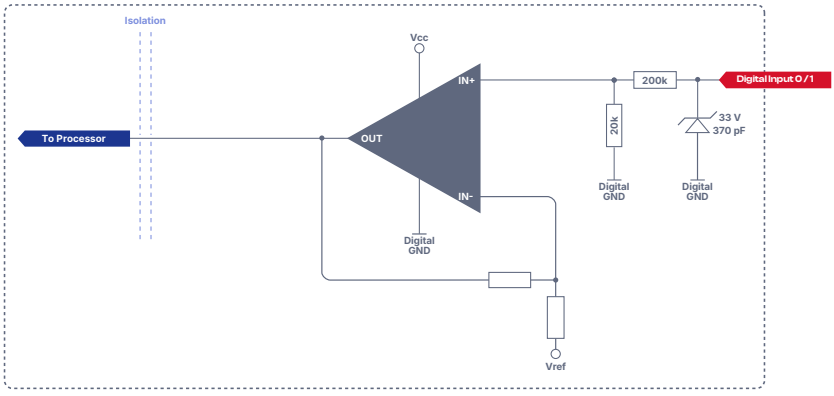


Figure 82: Digital input 0/1

Internal interconnection of digital output

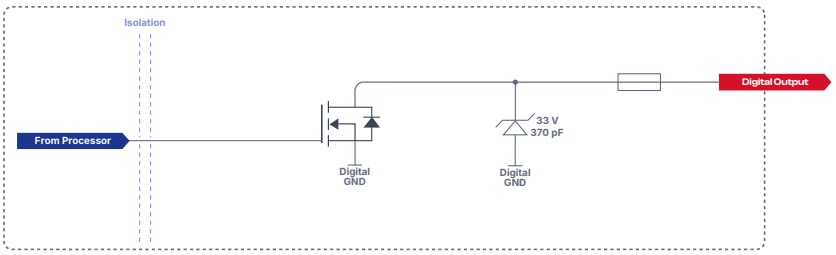


Figure 83: Digital output

Internal interconnection of analog input

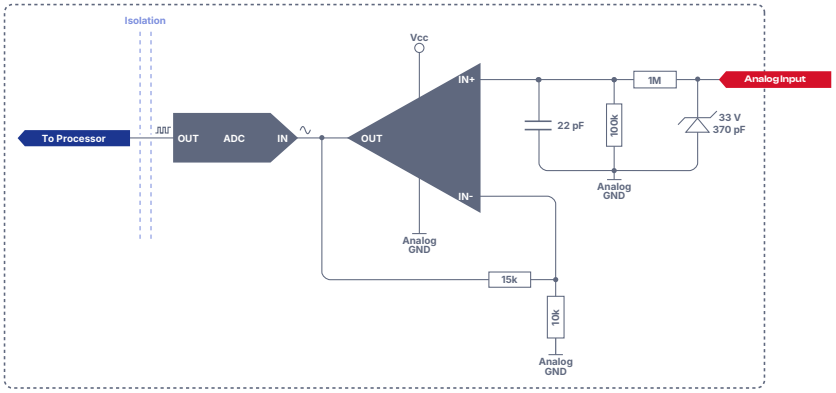


Figure 84: Analog input

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 maximum input voltage U_{input} to be measured 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:

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

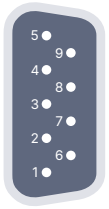
Examples

	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

> **CAN (D-SUB)**

D-SUB connector with two CAN channels. Use the CANcable 2Y to access both channels on separate D-SUB9 connectors (see accessories manual, part number 05075).

Pin	Assignment
1	CH14 CAN Low
2	CH13 CAN Low
3	CH13 GND
4	Reserved. Please do not use.
5	Not connected
6	CH14 GND
7	CH13 CAN High
8	CH14 CAN High
9	Not connected



> **USB (Type-C)**

Connect your computer and the VN5650 via USB to install and to use the device with measurement applications (e. g. CANoe, CANalyzer).

> **1G/10G (RJ45 connectors)**

Infrastructure port with different possible configurations:

- Mirroring port
- Alternative analysis port
- Uplink: Connect your computer and the VN5650 via RJ45 to use the device with measurement applications (e. g. CANoe, CANalyzer) in a network setup.

Note

The uplink port must be configured as an **Infrastructure Switch** in the Vector Hardware Manager.

16.6 LEDs

LEDs

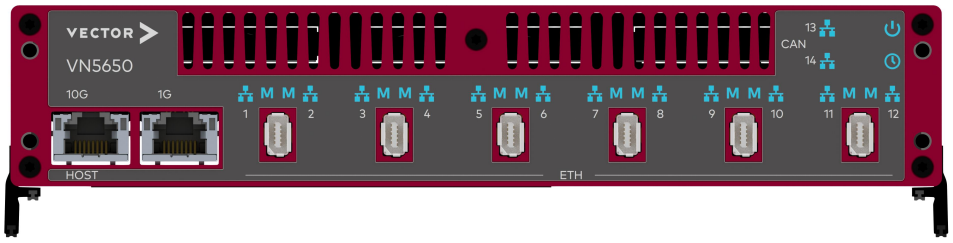


Figure 85: LEDs on VN5650

> **Power**

Multicolored LED indicating the device status.

Color	Description
Green	> Blinks 4x at power up and illuminates afterwards. > Blinks quicker during an update progress. Please wait for the automatic reboot of the device after the update has been finished. Do not disconnect the power supply while the LED is blinking.
Red	An error has occurred. Please disconnect the power supply as well as the USB cable. Re-connect the power supply and the USB cable and try again.

> **Sync**

LED illuminates if the device is synchronized.

Color	Sync State	Description
Off	Not configured.	No master or slave protocols are active for this device or no configuration has been loaded yet.
Orange	Configured, waiting for master.	A slave protocol is active, but no master could be found / assigned yet. The state is assumed when the PTP protocol **Slave** or **Best-Master** is activated in the firmware, i. e. when starting the PTP stack in the firmware or if one of the slave protocols was activated in the driver, i. e. when or after the configuration was applied by the Vector Timesync Service (vTSS).

Color	Sync State	Description
Green (flashing)	Pending.	A slave protocol is active and a master was found or could be assigned. The SYNC condition / the steady state was not yet reached or was left again. > **PTP** Transition to the Slave-With-Master state, but the SYNC condition has not yet been reached. > **HW-SYNC** Pulse and master time present, but the SYNC accuracy has not yet been reached. > **SW-SYNC** SYNC accuracy not yet reached.
Green	In-sync.	SYNC condition reached and is met or only master protocols active on the interface.
Red	Failure.	> **PTP** Master lost, SYNC accuracy not maintained. > **HW-SYNC** Missing pulse, missing time information of the master, SYNC accuracy not maintained. > **SW-SYNC** SYNC accuracy not maintained. If the SYNC accuracy is not maintained but the master is present, this state is only maintained for three seconds, then the state changes to **Pending**.

> **10G Port (RJ45)**

LEDs illuminate if there is an Ethernet link or blink if there is Ethernet activity.

Color (Left)	Color (Right)	Description
Orange	-	100 Mbit/s

Color (Left)	Color (Right)	Description
Green	-	1 Gbit/s
-	Orange	2.5 Gbit/s
-	Green	5 Gbit/s
Orange	Orange	10 Gbit/s

> **1G Port (RJ45)**

LEDs illuminate if there is an Ethernet link or blink if there is Ethernet activity.

Color (Left)	Description
Green	Activity

Color (Right)	Description
Off	10 Mbit/s
Orange	100 Mbit/s
Green	1000 Mbit/s

> **Ethernet Port 1...12**

LED illuminates if there is an Ethernet link or blinks if there is Ethernet activity at the according port. When a port is in OPEN Alliance TC10 sleep mode, the LED flashes at a low frequency.

Color	Description
Violet	10 Gbit/s
Blue	5 Gbit/s
Cyan	2.5 Gbit/s
Green	1000 Mbit/s
Orange	100 Mbit/s
Yellow	10 Mbit/s
White	Bypass relays closed.

> **M Ethernet Port 1...12**

Illuminates if the according port is configured as master. The color of the Master LED depends on the link speed (see Ethernet port LED above).

State	Description
On	> 10BASE-T1S: PHY is configured as a PLCA Coordinator. > All other: PHY is configured as a master.
Off	> 10BASE-T1S: PHY is configured as a PLCA Follower. > All other: PHY is configured as a slave.

Note

When the LED is flashing, the device is in Master/Slave auto-detect mode. This indicates that a link has not yet been established. The device will attempt to establish a link by iterating through master/slave configurations and possible link speeds. See the Vector Hardware Manager Help for more details on the "Master/Slave Auto Detect" feature.

> **(CAN 13/14)**

Multicolored channel LEDs, each indicating the bus activity for CAN.

Color	Description
Green	Data frames have been sent or received correctly. The flashing frequency varies according to the message rate.
Orange	Error frames have been sent or received. The flashing frequency varies according to the message rate.
Red	Bus off.

16.7 Device Stacking

This Vector device can be directly stacked or mounted side-by-side with other Vector devices that also have a Vector System Housing (VSH). This is supported by the side recesses on the housing.

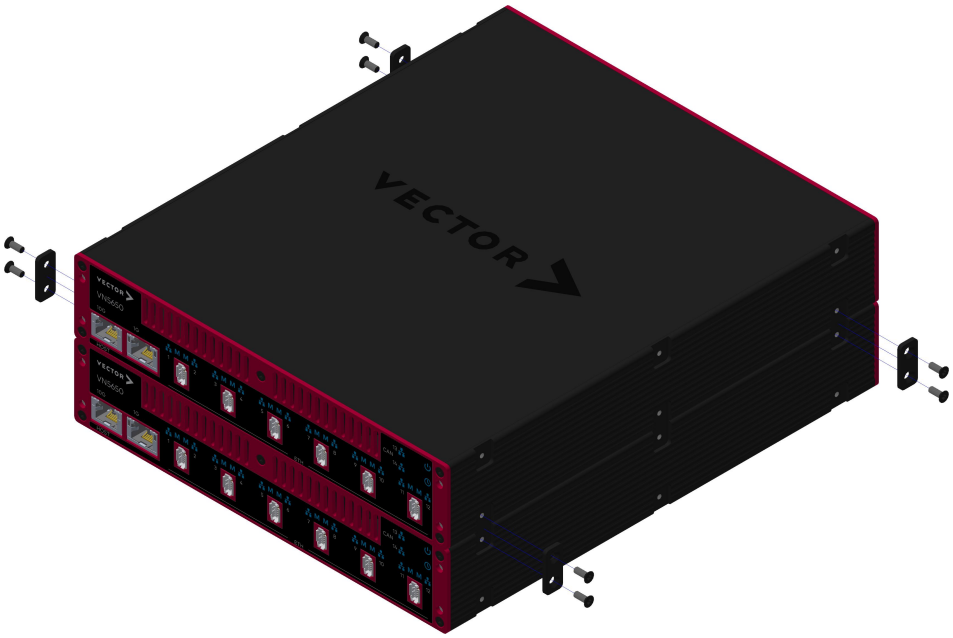


Figure 86: Stacked mounting (example with VN5650)

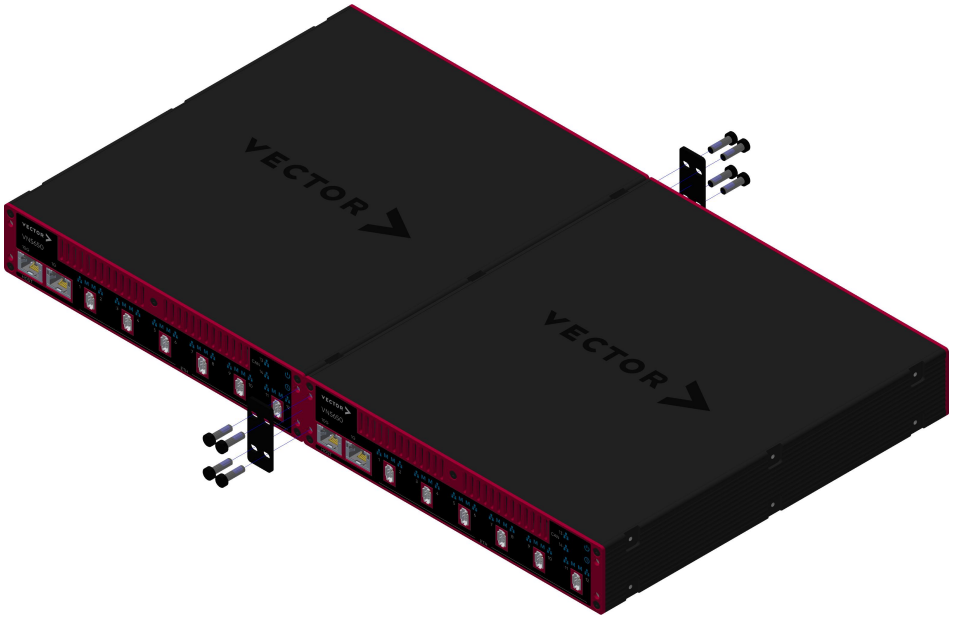


Figure 87: Side-by-side mounting (example with VN5650)

To further increase the mechanical stability of stacked devices, the mounted feet can be removed and replaced by the VSH Connecting Kit Vertical (see accessories manual, part number 05152).

16.8 Technical Data

16.8.1 Overview

Ethernet ports	Up to 12 ports via three plug-in modules. Port characteristics depend on the plugged module: > VNmodule60 4AE1G BCM89883 – 4x Broadcom BCM89883 – 100BASE-T1 – 1000BASE-T1 > VNmodule60 4AE1G 88Q2221M – 4x Infineon 88Q2221M – 100BASE-T1 – 1000BASE-T1 > VNmodule60 4AE1G 88Q2112 – 4x Infineon 88Q2112-A2 – 100BASE-T1 – 1000BASE-T1 > VNmodule60 4AE1G RTL9010AA – 4x Realtek RTL9010AA – 100BASE-T1 – 1000BASE-T1 > VNmodule60 1AE10M LAN8670 – 1x Microchip LAN8670 – 10BASE-T1S – 2x Broadcom BCM89883 – 100BASE-T1 – 1000BASE-T1 > VNmodule60 2AE10G BCM89890 – 2x Broadcom BCM89890 – 2.5GBASE-T1 – 5GBASE-T1 – 10GBASE-T1 > 2x RJ45

	– 2x Broadcom BCM54210 – 1000BASE-T – 100BASE-TX – 10BASE-T > 2x RJ45 – 2x Broadcom BCM84891 – 10GBASE-T – 5GBASE-T – 2.5GBASE-T – 1GBASE-T – 100BASE-TX
CAN/CAN FD channels	2x NXP TJA1057
Analog input	10 bit Input 0 V...18 V Voltage tolerance up to 50 V (with series resistor) Sampling rate up to 1 kS/s
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 Output frequency up to 1 kHz Current max. 500 mA Short circuit / over voltage protected Pulse-per-second signal (PPS) output: Supported via Vector Hardware Manager
Digital input/output	Output high (no load): 13 V Output high (load 346 Ω): 5.3 V Output low: 0 V Input range: 0 V...16 V Input Schmitt trigger high: 3.4 V Input Schmitt trigger low: 2.5 V Rout: 503 Ω
Time stamps	Resolution: 8 ns Accuracy (in device): 1 µs Accuracy software sync: typ. 50 µs Accuracy hardware sync: typ. 1 µs

	Accuracy PTP sync (IEEE1588): typ. 1µs
Latency link/switch segment	Link (stress access): approx. 7...12 µs Link (low latency): approx. 6...7 µs Switch: approx. 12 µs Please note that the exact latency depends on: > Link speed > Ethernet PHY > Ethernet packet length (switch segment only)
Computer interface	USB 3.2 Gen1 with Type-C connector/ IEEE (1/2.5/5/10GBASE-T)
Power supply	External: 8 V...32 V (typ. 12 V DC)
Power consumption	Typ. 1.9 A @ 12 V Max. 3.7 A @ 12 V (65 °C) Standby: 2 mA @ 12 V For more information, see section Power Consumption on page 267.
Temperature range	Operation: -40 °C ... +65 °C Storage: -40 °C ... +85 °C
Relative humidity of ambient air	15 %...95 %, non-condensing
Dimensions (LxWxH)	250 mm x 216 mm x 42 mm
Weight	2.6 kg
Operating system requirements	Windows 10 (x64, 64 bit) Windows 11 (x64, 64 bit) Ubuntu 22.04 LTS (64 bit) Ubuntu 24.04 LTS (64 bit)

16.8.2 Power Consumption

The power consumption depends primarily on the used device configuration/use case and the ambient conditions under which the device is operated. The following examples show the power consumption in typical applications.



Example

Device configuration (3x BCM89883):

> 6x 100BASE-T1
> 6x 1000BASE-T1
> Uplink USB 3.2 Gen 1

Ambient temperature	25 °C	40 °C	65 °C
Voltage supply	12 V	12 V	12 V
Current consumption	1.8 A	1.8 A	1.9 A
Power consumption	21.6 W	21.6 W	22.8 W

> Additional 10G uplink-port/ mirroring port

Ambient temperature	25 °C	40 °C	65 °C
Voltage supply	12 V	12 V	12 V
Current consumption	2.0 A	2.0 A	2.3 A
Power consumption	24.0 W	24.0 W	27.6 W

When using 12 ports 1000BASE-T1 as an alternative configuration, an additional consumption of 1.4 W occurs.



Example

Device configuration (1x BCM89890, 2x 88Q2221M):

> 2x 2.5GBASE-T1
> 8x 1000BASE-T1

Ambient temperature	25 °C	40 °C	65 °C
Voltage supply	12 V	12 V	12 V
Current consumption	1.7 A	1.8 A	2.0 A
Power consumption	20.4 W	21.6 W	24.0 W

> Additional 10G uplink-port/ mirroring port

Ambient temperature	25 °C	40 °C	65 °C
Voltage supply	12 V	12 V	12 V
Current consumption	1.9 A	2.0 A	2.3 A
Power consumption	22.8 W	24.0 W	27.6 W



Example

Device configuration (1x BCM89890, 2x 88Q2221M):

> 2x 10GBASE-T1
> 8x 1000BASE-T1

Ambient temperature	25 °C	40 °C	65 °C
Voltage supply	12 V	12 V	12 V
Current consumption	1.9 A	2.0 A	2.2 A
Power consumption	22.8 W	24.0 W	26.4 W



Example

Device configuration (3x BCM89890):

> 6x 2.5GBASE-T1
> Additional 10G uplink-port/ mirroring port

Ambient temperature	25 °C	40 °C	65 °C
Voltage supply	12 V	12 V	12 V
Current consumption	1.9 A	2.0 A	2.2 A
Power consumption	22.8 W	24.0 W	26.4 W



Example

Device configuration (3x BCM89890):

> 6x 10GBASE-T1
> Additional 10G uplink-port/ mirroring port

Ambient temperature	25 °C	40 °C	65 °C
Voltage supply	12 V	12 V	12 V
Current consumption	2.4 A	2.5 A	2.8 A
Power consumption	28.8 W	30.0 W	33.6 W

Example

Device configuration (3x LAN8670 V2):

- 3x 10BASE-T1S
- 6x 100BASE-T1
- Additional 10G uplink-port/ mirroring port

Ambient temperature	25 °C	40 °C	65 °C
Voltage supply	12 V	12 V	12 V
Current consumption	1.8 A	1.8 A	2.0 A
Power consumption	21.6 W	21.6 W	24 W

Note

The hardware is designed for a maximum power consumption of 3.7 A @ 12 V at maximum device temperature (+65 °C). Future device features may change the power consumption of the device.

16.8.3 Standby Operation

Activating the standby feature

The device supports a standby mode which can be activated via the **Vector Hardware Manager | Device Properties Configuration**.

The standby feature can be used by monitoring one of the following standby sources:

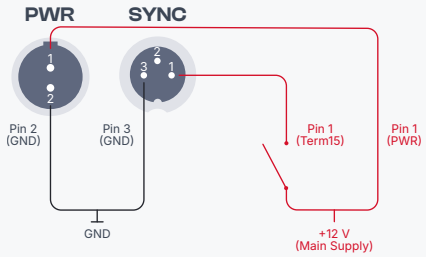
- USB (Type A) host interface (via USB Type A-C cable only)
- Terminal 15 pin on the **Sync** connector

If the USB connection is interrupted (e. g. cable disconnected) or terminal 15 is set (0 V), the interface is set to standby after a certain time. The timeout can be set in **Vector Hardware Manager | Device Properties Configuration**.

If the USB connection is active again or terminal 15 is reset (rising edge to 12 V ... 32 V), the interface wakes up again.

Example

The following example shows how you can connect terminal 15 to the existing power supply for standby/wake-up. Please note that a voltage of at least 12 V is required at terminal 15 to wake up the device. The ground connection must be at the same potential as the power supply ground.



Note

During standby operation the Physical Bypass Relays can be set.

Note

During standby the device consumes approx. 2 mA @ 12 V.

16.8.4 Temperature Shutdown

Temperature limits

The devices are temperature monitored to prevent damage to the device. The devices switch off automatically when the upper limit temperature is exceeded. This limit value represents the theoretical maximum of the hardware. However, it is possible to leave this range slightly without damaging the hardware.

For this purpose the temperature shutdown can be switched off actively.

If the maximum temperature is exceeded, it is indicated by a red status LED on the device. Vector applications also display this (e. g. in the **Write** window of CANoe).

You can find the settings in the Vector Hardware Manager.

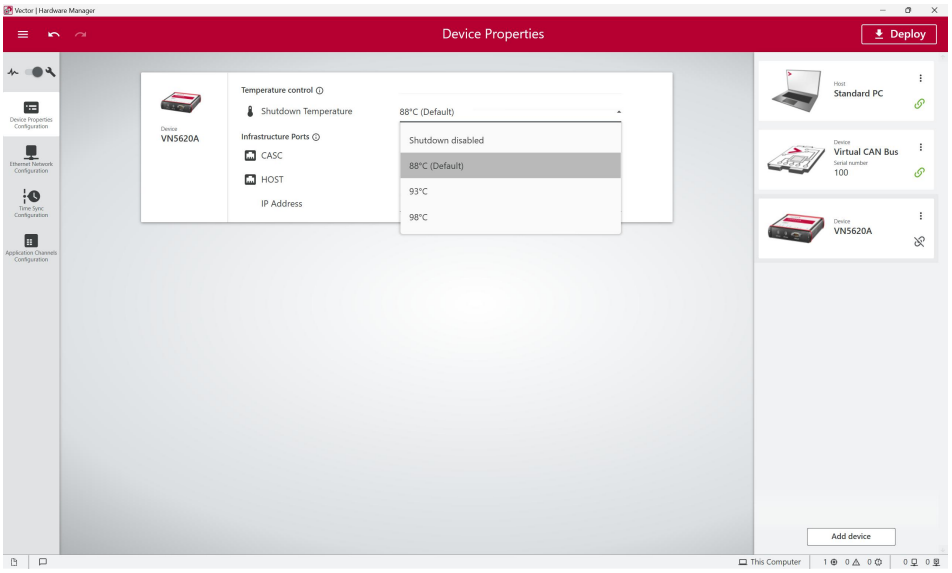
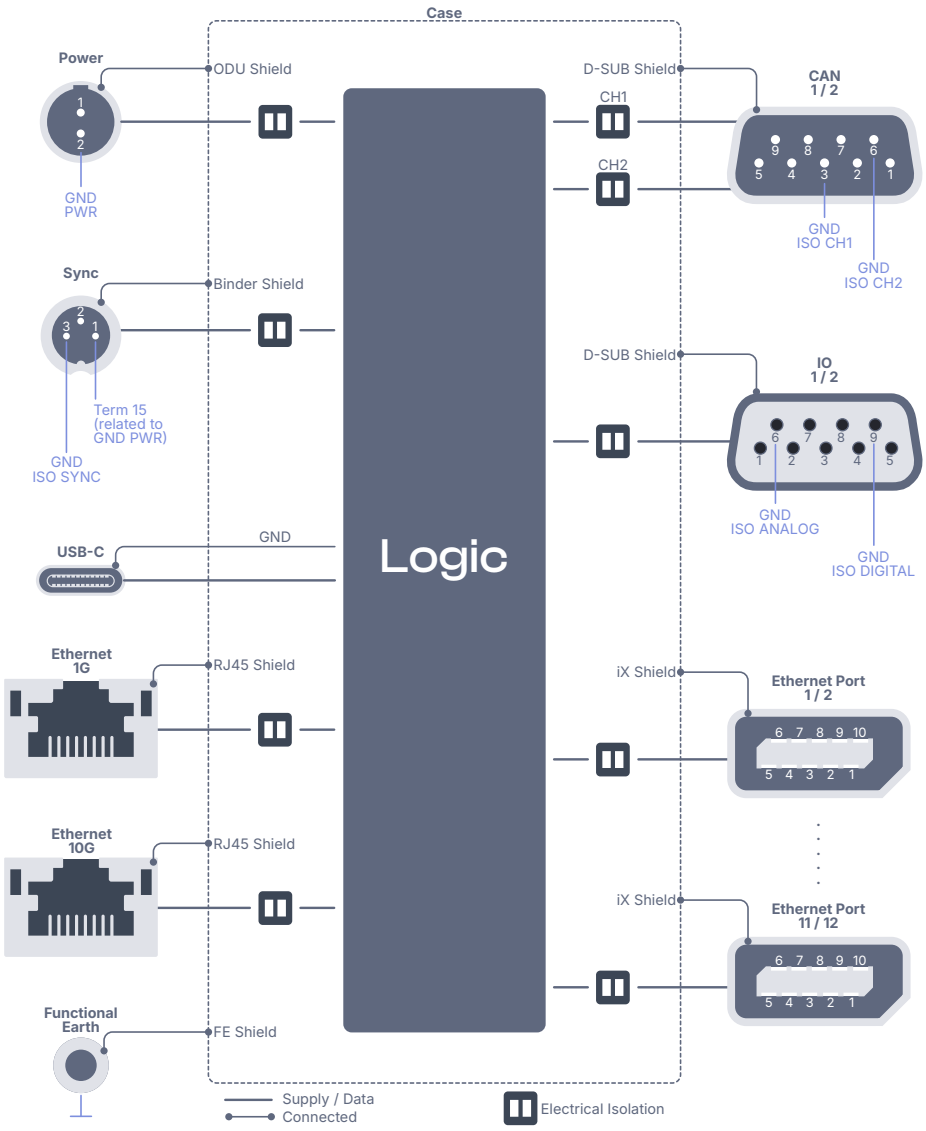


Figure 88: Device Properties Configuration in the Vector Hardware Manager

16.8.5 Electrical Isolation

Electrical isolation of the connectors



Note

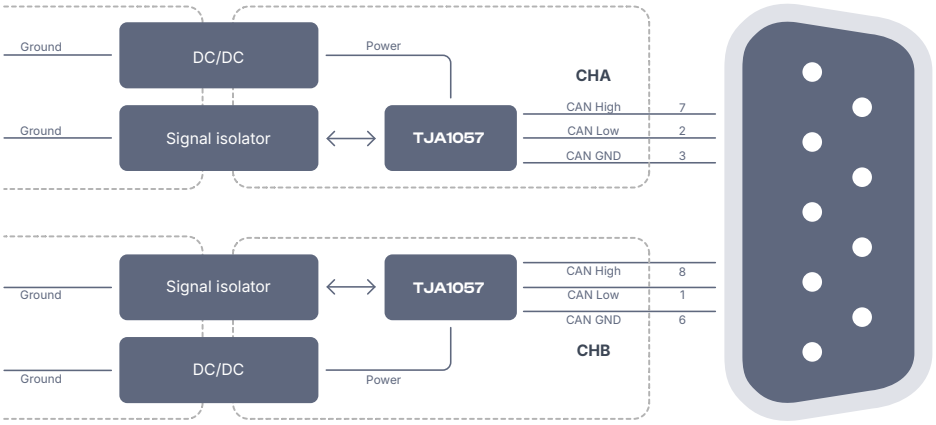
Please note that the shield of the USB-C connector has the same potential as the logic ground of the device and that this is isolated from the housing ground of the device. This is to avoid ground loops when used with a computer system without an electrically isolated power supply.

The FE socket of the device must be connected to the user-side system ground when the device is operated in the vehicle.

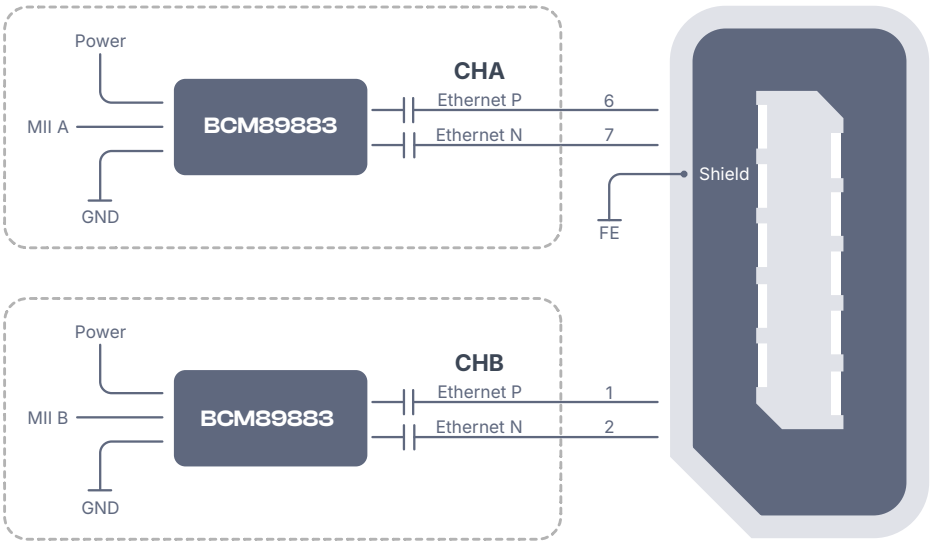
Note

The usage of an AEcable 2Y is recommended because it separates the interface's shield potential from the ECU shield potential. This ensures that all compensating currents over the shields are avoided. A capacitive coupling of the shields is implemented in the AEcable 2Y.

Electrical isolation of CAN in detail



Electrical isolation of Ethernet in detail



Note

The electrical isolation of the interfaces is a functional isolation that is used to avoid ground loops and interference between the networks. The voltage difference between the isolated areas must not exceed 60 VDC (isolation voltage). The isolation voltage usually exceeds the maximum permissible voltage at a port (operating voltage).

16.8.6 Network Features

Ports/channels	Total number of Ethernet Ports	16
	10BASE-T1S	3[4)]
	100BASE-T1 / 1000BASE-T1	12
	1000BASE-T1 Legacy Mode	✓[4)]
	10/100/1000BASE-T(X)	2
	1G BASE-T	2
	2.5G BASE-T	2
	2.5GBASE-T1	✓[4)]
	5G BASE-T	2
	10G BASE-T	2
	CAN FD	2
	DoIP Activation / Wake-up Line	✓
	Multiple digital / analog IO	✓
Power supply	External	✓
	USB buspowered	-
Infrastructure	Hardware synchronization	✓
	Software synchronization	✓
	PTP IEEE 1588 v2	✓
	Computer uplink	USB 3.2 Gen 1
	Computer uplink Ethernet	10GBASE-T
	USB adapter to connect sub devices	-
	Infrastructure Switch to connect sub devices	✓
Port interconnection	Layer 2 Switch	✓
	TAP	✓
	Multidrop segment	✓[4)]
	Simultaneously interconnectable ports via switch/TAP	16
	Media conversion	4
	Link transparency	✓
	OPEN Alliance TC10 (Wake/Sleep) 10BASE-T1S	✓[4)]
	OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	✓[4)]
	OPEN Alliance TC10 (Wake/Sleep) 1000BASE-T1	✓[4)]
	OPEN Alliance TC10 (Wake/Sleep) 2.5/5/10GBASE-T1	✓[4)]

	Physical bypass relays	✓
Measure	Mirroring port	✓
	Uplink Frame filter	16 rules
	Reporting of invalid Ethernet packets	✓
	MACsec (IEEE 802.1AE)	✓4)
	Reporting of PLCA events	✓1, 4)
Simulation	VLAN tagging / untagging / routing	✓
	Virtual switch ports for Vector-Tools	64
	Time-triggered transmit interface (e. g. for precise AVB-Streams)	✓
	MACsec (IEEE 802.1AE)	✓4)
	gPTP (IEEE 802.1AS) support on user network (AVB and AUTOSAR clocks)	✓
Test	On-board packet generator	✓
	Invalid Ethernet packet generation	✓
	OPEN Alliance TC10 (Wake/Sleep) 10BASE-T1S	✓4)
	OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	✓4)
	OPEN Alliance TC10 (Wake/Sleep) 1000BASE-T1	✓4)
	OPEN Alliance TC10 (Wake/Sleep) 2.5/5/10GBASE-T1	✓4)
	MACsec (IEEE 802.1AE)	✓4)
	gPTP (IEEE 802.1AS) support on user network (AVB and AUTOSAR clocks)	✓
Application area	Measurement / analysis	✓
	Simulation	✓
	Test	✓

1) Available in a later release.
2) Host computer must support USB-C with 3 A.
3) Supports one switch segment with a maximum of three measurement ports. Sending via measurement ports is not possible.
4) Only with compatible VNmodule60 (see section VNmodule60 on page 284).
5) Only 100/1000BASE-T1

16.8.6.1 Physical Bypass Relay

General information

If a Vector Ethernet Network Interface is connected as TAP between two 100/1000BASE-T1 nodes, the communication of the two terminals is permanently interrupted when the interface is switched off, in standby mode or fails. By activating the physical bypass on the Vector Ethernet Network Interface, this communication can still be enabled.

The terms bypass closed or bypass open are explained in the following figures:

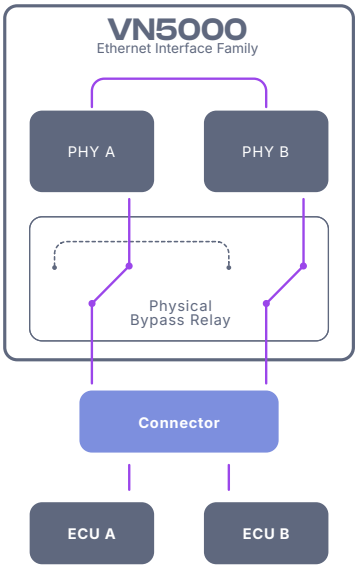


Figure 89: Bypass open, interface actively switches data between both ports

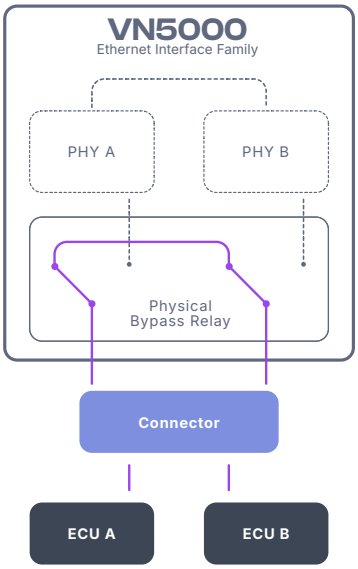


Figure 90: Bypass closed, interface is switched off

This physical bypass can be activated and deactivated via software, resulting in the following options or operation modes:

Operation Mode	Device powered	Device without power or in standby mode
2-channel mode	bypass open	bypass open
physical bypass mode	bypass open	bypass closed
passive mode	bypass closed	bypass closed

- **2-channel mode**
  The device operates without physical bypass relays. When it is turned off, ECU1 is disconnected from ECU2.
- **Physical bypass mode**
  Typical use of physical bypass relays: when the device is powered down or in standby mode, the relays close, maintaining the connection between ECU1 and ECU2.
- **Passive mode**
  The device behaves transparently as if it were not connected (physical bypass relays are always closed).



Note

If the physical bypass relays are closed, the device can neither read nor send data to the application. This means that device operations such as filtering or mirroring are not possible, and the application (such as CANoe or CANape) does not receive any data.



Note

When switching the relay, the link is briefly interrupted for 200 ms.



Note

If the physical bypass is active while power is supplied to the interface, the corresponding LED lights up white.

16.9 Troubleshooting

Issue	Remedy
The device is not recognized by the computer.	> Install the latest drivers from our website. > Perform a factory reset by pressing and holding the reset button on the back panel while powering up the device. Release the button when the Power LED starts flashing green.
Device turns off after some time.	> Check that the standby function is not activated. See the Standby section in this manual.

16.10 Accessories



Note

Detailed information on the listed accessories can be found in the separate accessories manual on our website.

Cables and connectors

- AEcable 2Y
- CANcable0
- CANcable1
- CANcableA
- CANcable Y
- CANcable 2Y
- CANterm 120
- CANcable Set Pro
- Vector SYNCcableXL
- Vector SYNCcable50
- Multi SYNCbox external
- Multi SYNCbox internal
- Multi SYNCbox active
- Cable Binder 3pol Connector with Pigtail
- USB Cable 3.1 Type A-C (Dual Screw Lock)
- USB Cable 3.1 Type C-C (Dual Screw Lock)
- Ethernet cables

Power supply

- Vector Power Supply ODU Mini-Snap
- Cable Banana Plug <> ODU Mini-Snap

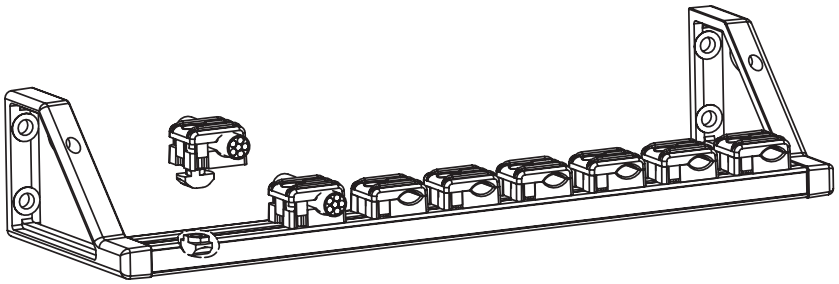
Miscellaneous

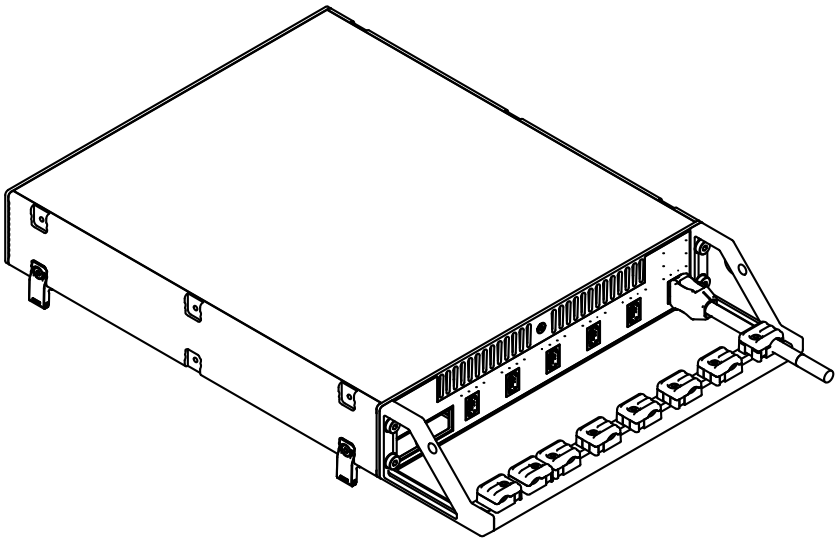
- VSH Cable Guard 216
- VSH Cable Guard 216 Clip
- VSH Connecting Kit 19"
- VSH Connecting Kit Horizontal
- VSH Connecting Kit Vertical
- VSH Equipment Foot Kit
- VSH Mounting Flange

16.10.1 VSH Cable Guard 216

Technical data

Description	Cable support system including eight clips for clamping single cables. For cable diameters (clamping range) from Ø 3.8 mm to Ø 6.8 mm.
Part number	05149





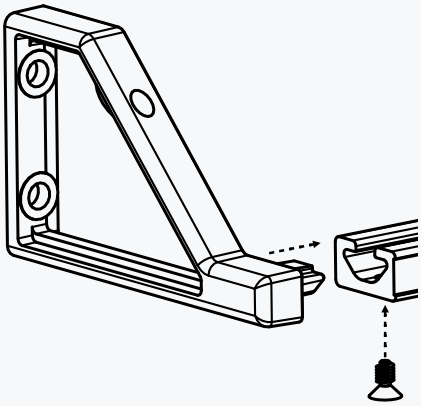
Note

The VSH Cable Guard 216 and the clips are not designed for use with VNcable 3Y.

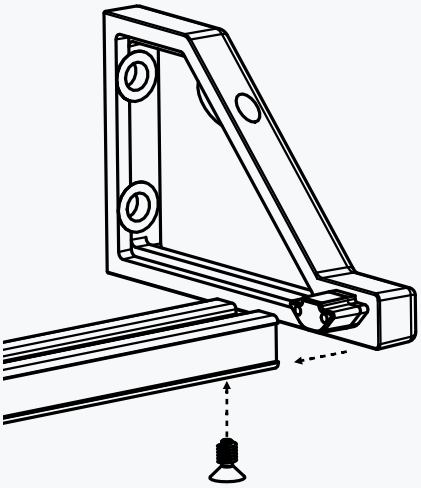
Example

The following steps describe the mounting of the VSH Cable Guard 216:

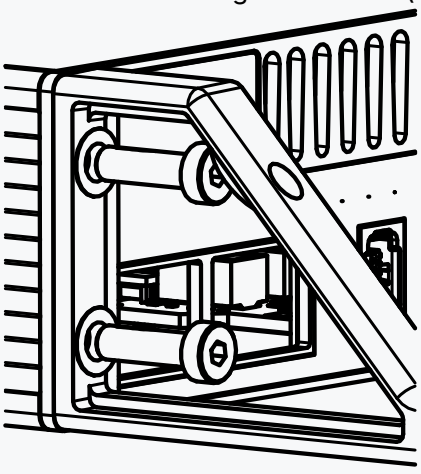
1. Insert the left frame into the cable rail and tighten the screw (Torx 8) with a torque of 1.4 Nm.



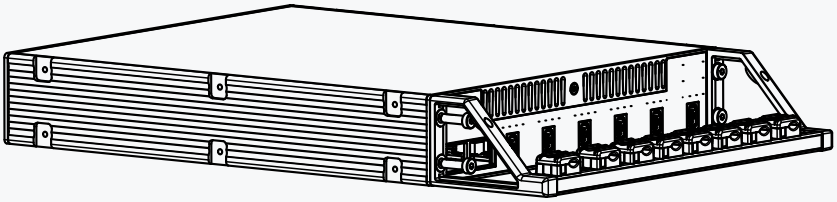
2. Repeat the steps above with the right frame.



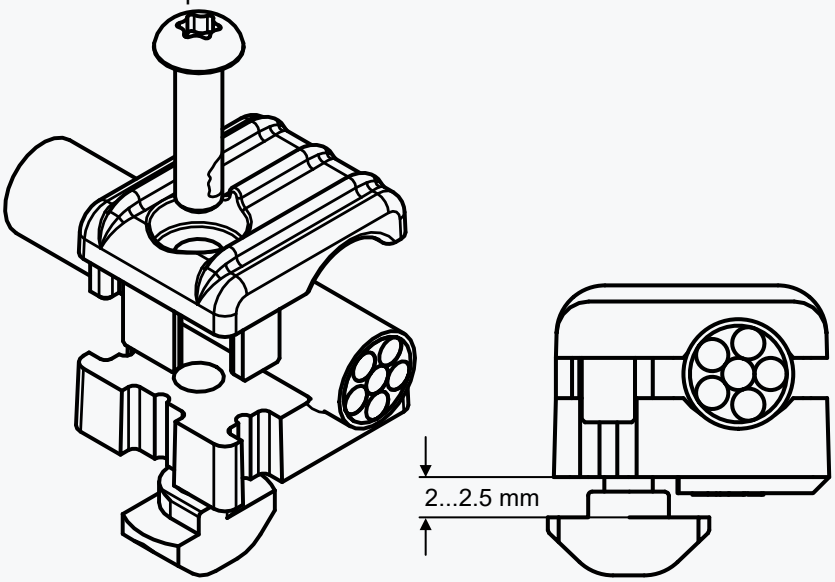
3. Attach the complete Cable Guard to the VN device and tighten it with the enclosed hexagonal screws (3 mm) and with a torque of 1.7 Nm.



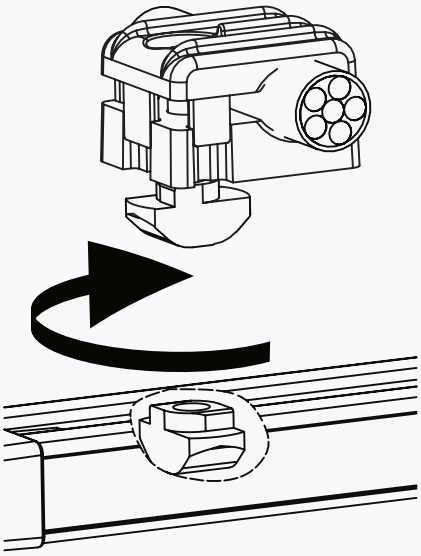
4. Repeat the steps on the other side.



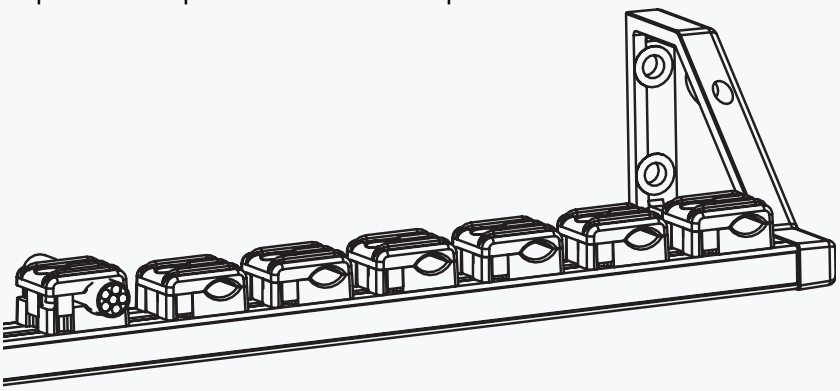
5. Lead the individual cables through the clamps and tighten the individual clamps depending on the cable (Torx 10). Tighten the screw only enough to leave a gap of 2 to 2.5 mm between the slot nut and the cable clamp.



6. Now insert the individual clamps into the Cable Guard and tighten the screw completely. The slot nut will rotate 90° inside the rail and thus fix the entire clamp.



7. Repeat the steps with all other clamps.



17 VNmodule60

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17.1 Introduction

Physical layer

A VNmodule60 provides the physical layer on the Vector Ethernet interface. Depending on the module used, up to four ports can be used simultaneously with a single VNmodule60.

Note

On the following pages you will find the available modules and their technical data. You will also find assembly instructions at the end (see section Replacement on page 311).

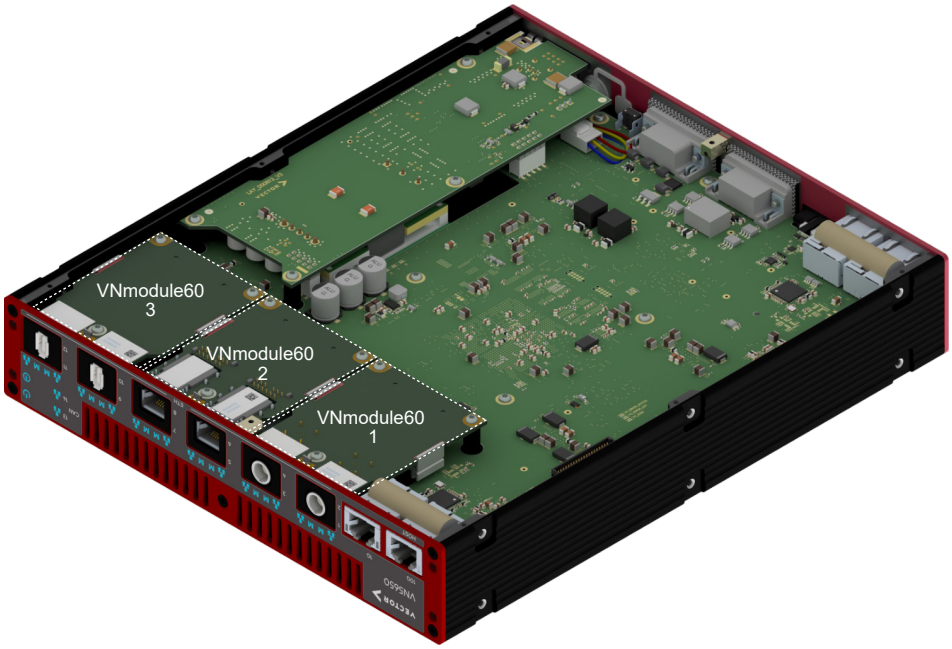


Figure 91: VNmodule60 slots with connectors

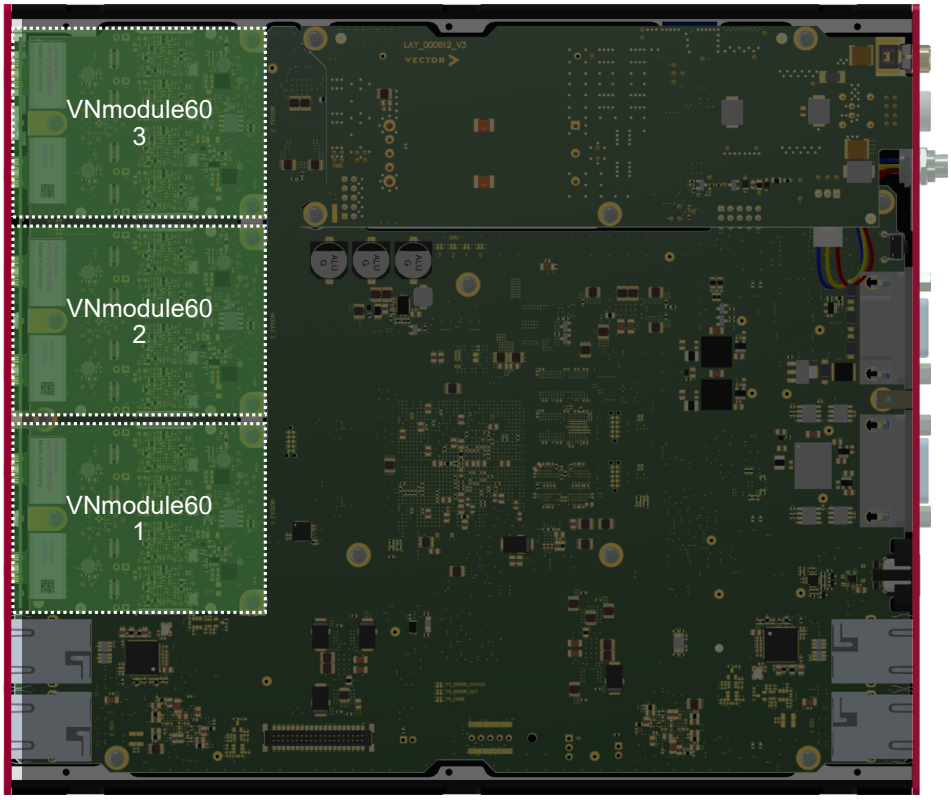


Figure 92: VNmodule60 slots top view

17.2 100/1000BASE-T1 Modules

17.2.1 VNmodule60 4AE1G BCM89883

17.2.1.1 General Information

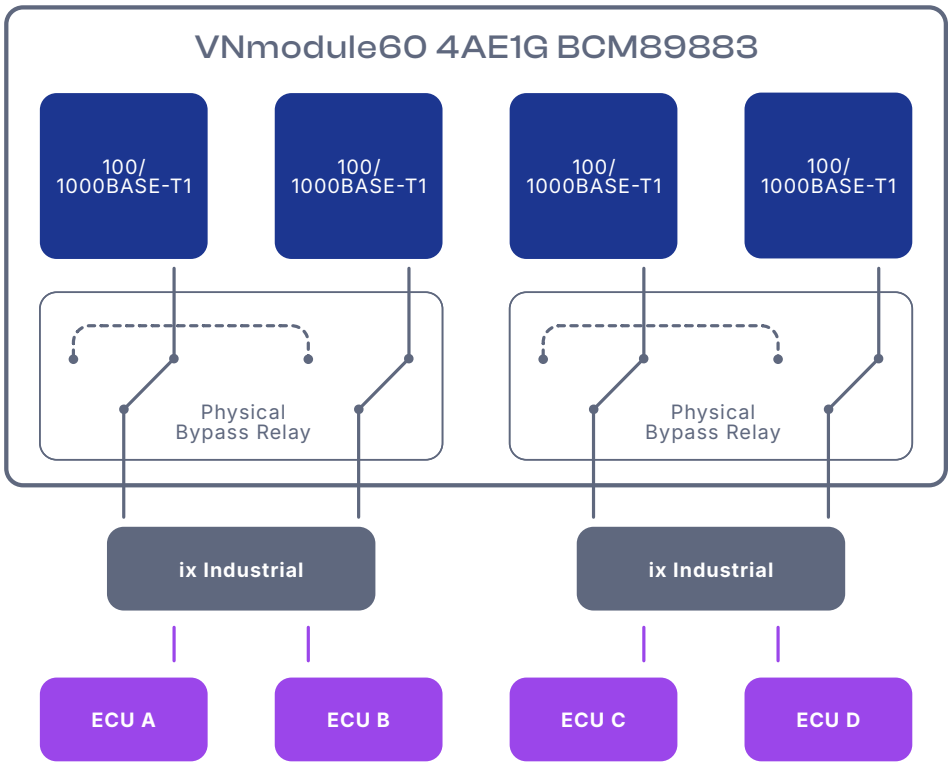
Physical layer

The VNmodule60 4AE1G BCM89883 offers four 100/1000BASE-T1 ports.

Used PHY:

> Broadcom BCM89883

Setup



Features

Supported Physical Layer Standards	4AE1G BCM89883
10BASE-T1S	-
100BASE-T1	✓
1000BASE-T1	✓
1000BASE-T1 Legacy Mode[1)]	-
OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	✓

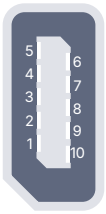
1) The 1000BASE-T1 Legacy Mode (non-compliant communication) is required to ensure compatibility with older Infineon PHY revisions such as Infineon 88Q2112 rev. A0.

17.2.1.2 Connectors

> **Ethernet 1...4 (ix Industrial)**

ix Industrial connectors for 100BASE-T1/1000BASE-T1 (e. g. Harting ix Industrial type 10A-1). Each connector has two Ethernet ports (A and B). Use cables of the Vector AEcable 2Y family to access both ports on separate connectors (different plug systems available).

Pin	Assignment
1	CH2 MDI+
2	CH2 MDI-
3...5	Not connected
6	CH1 MDI+
7	CH1 MDI-
8...10	Not connected



17.2.2 VNmodule60 4AE1G 88Q2221M

17.2.2.1 General Information

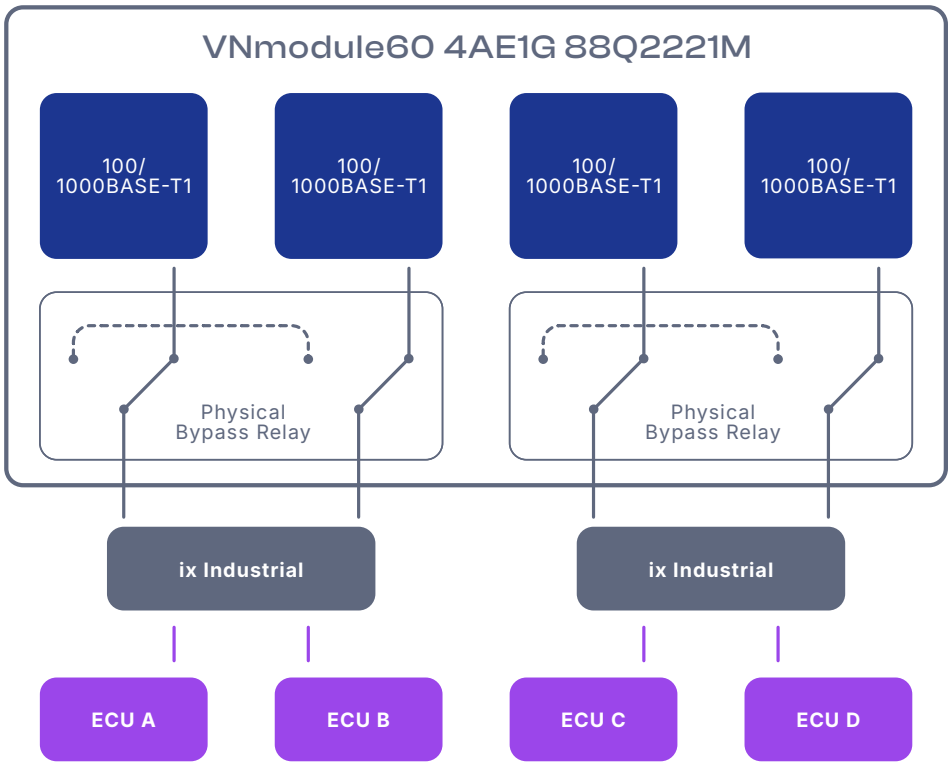
Physical layer

The VNmodule60 4AE1G 88Q2221M offers four 100/1000BASE-T1 ports.

Used PHY:

> Infineon 88Q2221M

Setup



Features

Supported Physical Layer Standards	4AE1G 88Q2221M
10BASE-T1S	-
100BASE-T1	✓
1000BASE-T1	✓
1000BASE-T1 Legacy Mode[1)]	-
OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	✓
OPEN Alliance TC10 (Wake/Sleep) 1000BASE-T1	✓
MACsec (IEEE 802.1AE)[2)]	✓

1) The 1000BASE-T1 Legacy Mode (non-compliant communication) is required to ensure compatibility with older Infineon PHY revisions such as Infineon 88Q2112 rev. A0.

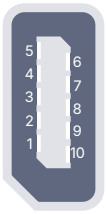
2) MACsec Key Agreement (MKA) is not processed on the hardware. Vector CANoe or Vector CANape is required.

17.2.2.2 Connectors

> **Ethernet 1...4 (ix Industrial)**

ix Industrial connectors for 100BASE-T1/1000BASE-T1 (e. g. Harting ix Industrial type 10A-1). Each connector has two Ethernet ports (A and B). Use cables of the Vector AEcable 2Y family to access both ports on separate connectors (different plug systems available).

Pin	Assignment
1	CH2 MDI+
2	CH2 MDI-
3...5	Not connected
6	CH1 MDI+
7	CH1 MDI-
8...10	Not connected



17.2.3 VNmodule60 4AE1G 88Q2112

17.2.3.1 General Information

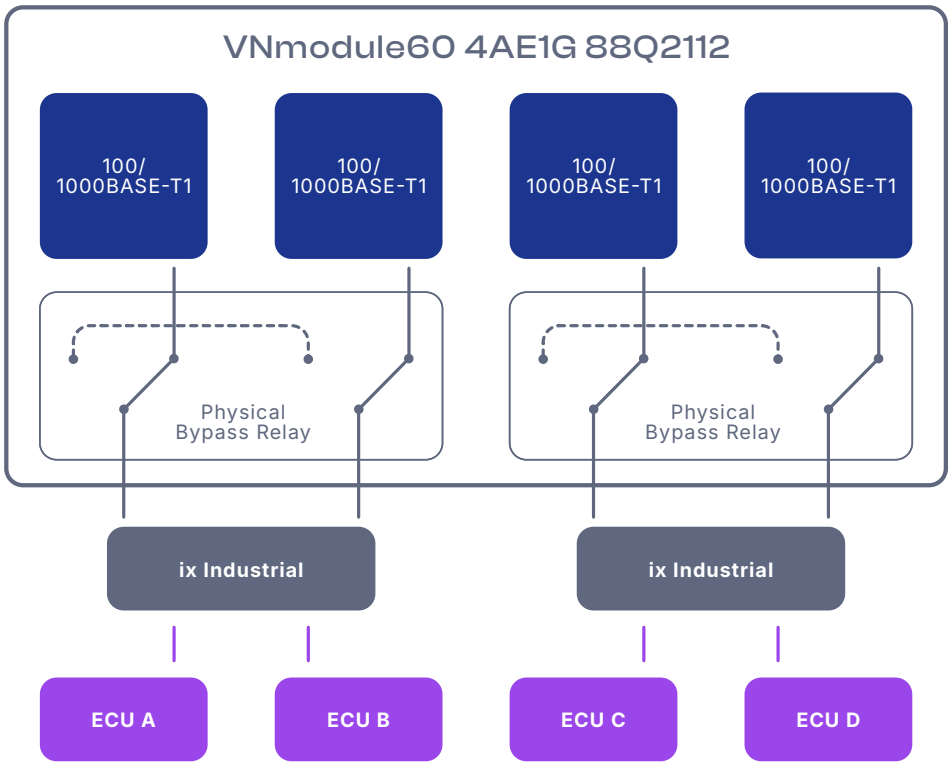
Physical layer

The VNmodule60 4AE1G 88Q2112 offers four 100/1000BASE-T1 ports.

Used PHY:

> Infineon 88Q2112-A2

Setup



Features

Supported Physical Layer Standards	4AE1G 88Q2112
10BASE-T1S	-
100BASE-T1	✓
1000BASE-T1	✓
1000BASE-T1 Legacy Mode[1)]	✓
OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	-

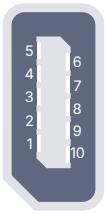
1) The 1000BASE-T1 Legacy Mode (non-compliant communication) is required to ensure compatibility with older Infineon PHY revisions such as Infineon 88Q2112 rev. A0.

17.2.3.2 Connectors

> **Ethernet 1...4 (ix Industrial)**

ix Industrial connectors for 100BASE-T1/1000BASE-T1 (e. g. Harting ix Industrial type 10A-1). Each connector has two Ethernet ports (A and B). Use cables of the Vector AEcable 2Y family to access both ports on separate connectors (different plug systems available).

Pin	Assignment
1	CH2 MDI+
2	CH2 MDI-
3...5	Not connected
6	CH1 MDI+
7	CH1 MDI-
8...10	Not connected



17.2.4 VNmodule60 4AE1G RTL9010AA

17.2.4.1 General Information

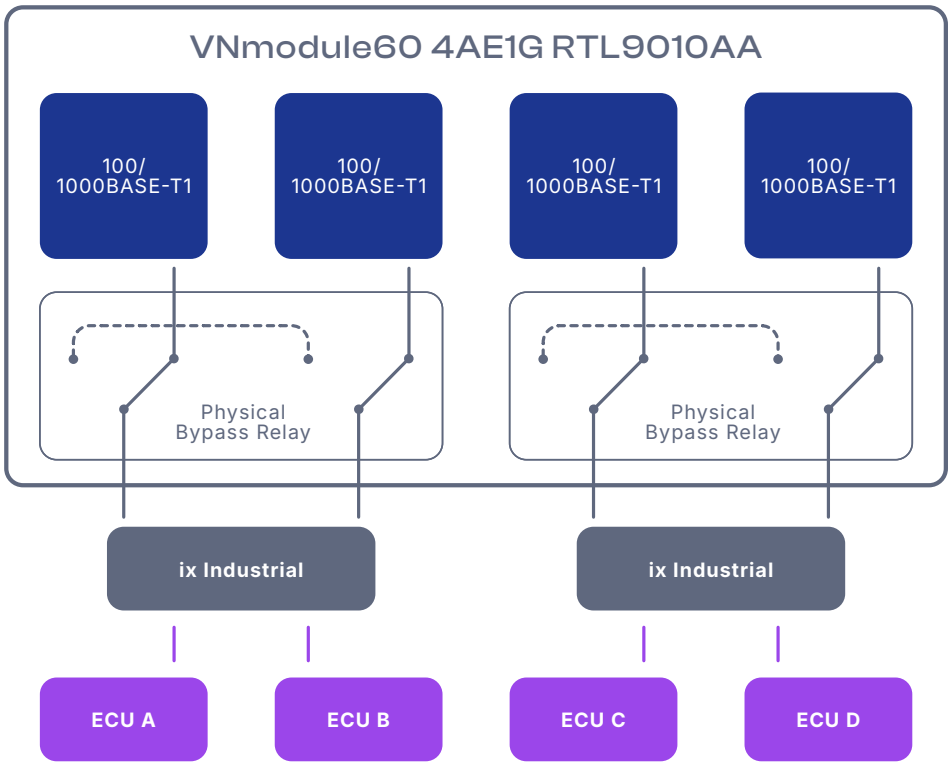
Physical layer

The VNmodule60 4AE1G RTL9010AA offers four 100/1000BASE-T1 ports.

Used PHY:

> Realtek RTL9010AA

Setup



Features

Supported Physical Layer Standards	4AE1G RTL9010AA
10BASE-T1S	-
100BASE-T1	✓
1000BASE-T1	✓
1000BASE-T1 Legacy Mode[1)]	-
OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	✓
OPEN Alliance TC10 (Wake/Sleep) 1000BASE-T1	✓

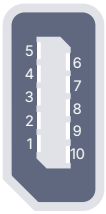
1) The 1000BASE-T1 Legacy Mode (non-compliant communication) is required to ensure compatibility with older Infineon PHY revisions such as Infineon 88Q2112 rev. A0.

17.2.4.2 Connectors

> **Ethernet 1...4 (ix Industrial)**

ix Industrial connectors for 100BASE-T1/1000BASE-T1 (e. g. Harting ix Industrial type 10A-1). Each connector has two Ethernet ports (A and B). Use cables of the Vector AEcable 2Y family to access both ports on separate connectors (different plug systems available).

Pin	Assignment
1	CH2 MDI+
2	CH2 MDI-
3...5	Not connected
6	CH1 MDI+
7	CH1 MDI-
8...10	Not connected



17.3 10BASE-T1S Modules

17.3.1 VNmodule60 1AE10M LAN8670

17.3.1.1 General Information

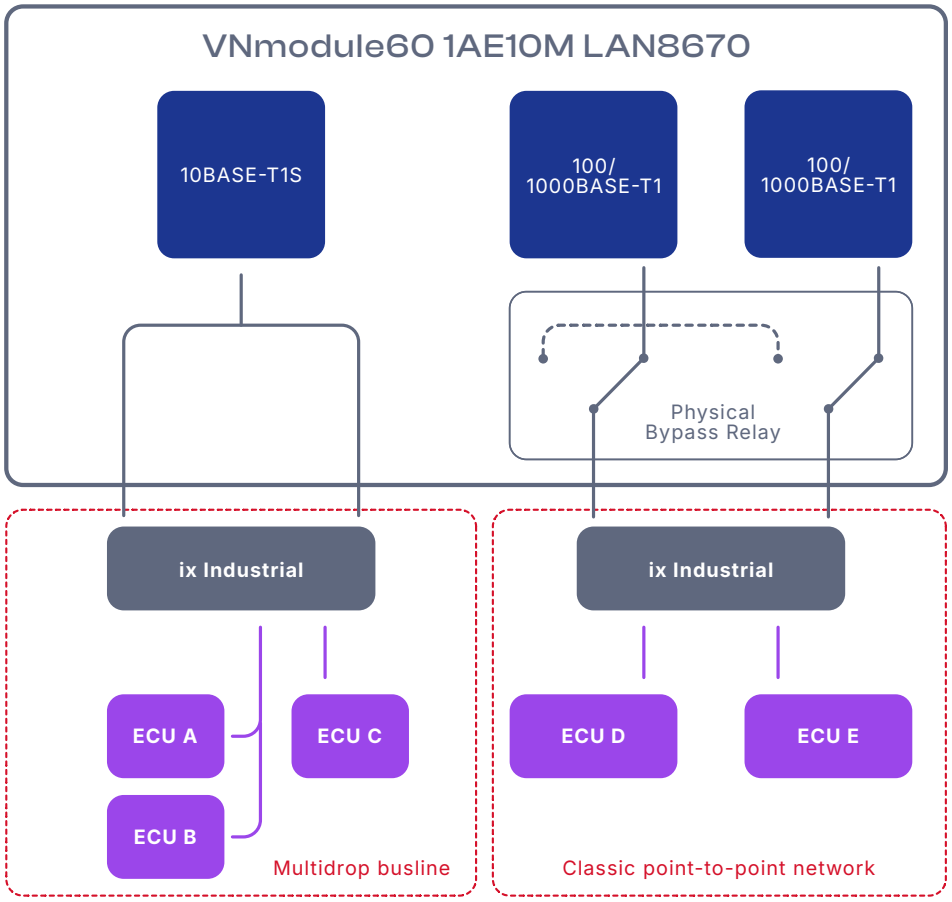
Physical layer

The VNmodule60 1AE10M LAN8670 offers one 10BASE-T1S port as well as two 100/1000BASE-T1 ports.

Used PHY:

- Microchip LAN8670 (10BASE-T1S)
- Broadcom BCM89883 (100/1000BASE-T1)

Setup



Features

Supported Physical Layer Standards	LAN8670	BCM89883
10BASE-T1S	✓	-
100BASE-T1	-	✓
1000BASE-T1	-	✓
1000BASE-T1 Legacy Mode[1)]	-	-
OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	-	✓

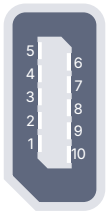
1) The 1000BASE-T1 Legacy Mode (non-compliant communication) is required to ensure compatibility with older Infineon PHY revisions such as Infineon 88Q2112 rev. A0.

17.3.1.2 Connectors

> **Ethernet 1 (ix Industrial)**

ix Industrial connectors for 10BASE-T1S. The 10BASE-T1S port is available through two pin-pairs (1/2 and 6/7). The signals of pin 1/6 and pin 2/7 are connected to allow daisy chain setups for 10BASE-T1S (see examples in section Termination on page 297).

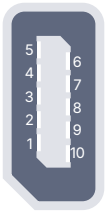
Pin	Assignment
1	CH1 MDI+ (connected to pin 6)
2	CH1 MDI- (connected to pin 7)
3...5	Not connected
6	CH1 MDI+ (connected to pin 1)
7	CH1 MDI- (connected to pin 2)
8...10	Not connected



> **Ethernet 2..3 (ix Industrial)**

ix Industrial connectors for 100/1000BASE-T1.

Pin	Assignment
1	CH3 MDI+
2	CH3 MDI-
3...5	Not connected
6	CH2 MDI+
7	CH2 MDI-
8...10	Not connected



17.3.1.3 Termination

Note

There is no internal differential end termination for 10BASE-T1S multidrop on the module. The multidrop busline must be terminated externally, e. g. by an already terminated ECU or by a resistor connected to the AEcable ix/DSUB9 10BASE-T1S (Vector part number 05219) via a 100 Ohm resistor between MDI+ and MDI-.

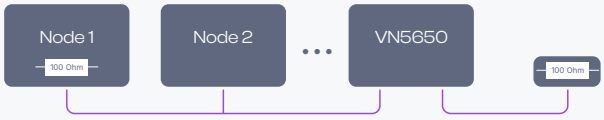


Figure 93: External termination

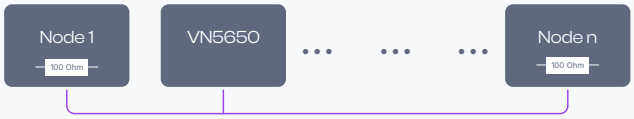
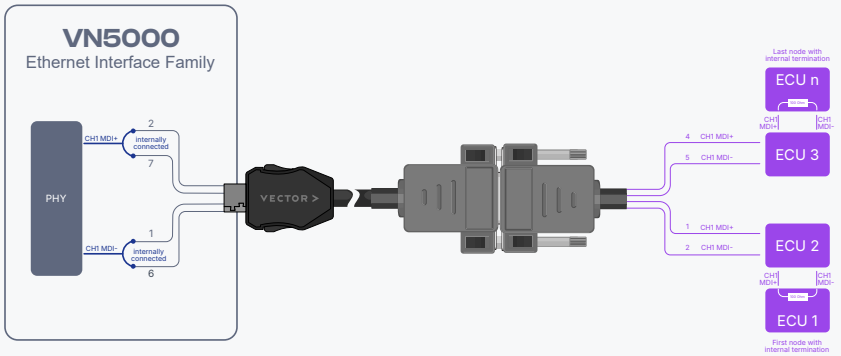


Figure 94: Node termination

Example

The following example shows a network consisting of several ECUs and a device of the VN5000 Ethernet interface family.

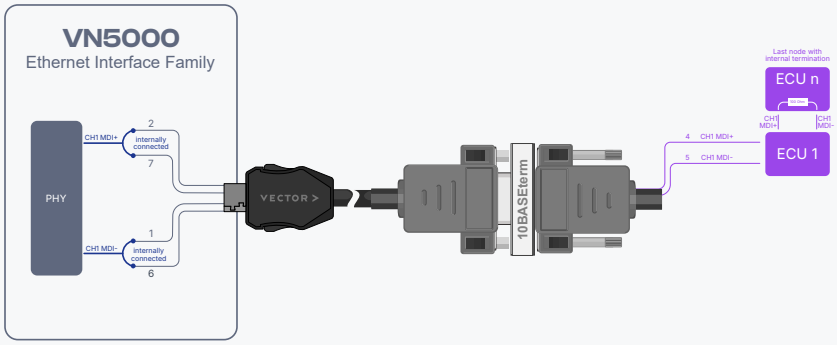


The two outer ECUs are terminated with 100 ohms. The Vector device is connected via the AEcable ix/DSUB9 10BASE-T1S cable (Vector part number 05219).

The pins of the adjacent ECUs (here ECU2 and ECU3) are connected to each other via an internal bridge (stub) in the Vector device. If the AEcable ix/DSUB9 10BASE-T1S is disconnected, ECU2 and ECU3 are disconnected from each other.

Example

The following example shows a network consisting of several ECUs and a device from the VN5000 Ethernet Interface family.



Since the Vector device is the first device in the chain, it must be terminated. For this purpose, the 10BASEterm plug (part number 05224) can be used, which connects pins 1 and 2 on the D-SUB9 via a 100-ohm resistor.

17.3.1.4 Bus Interface Network

Depending on the hardware revision, the following circuit is used on the VNmodule60.

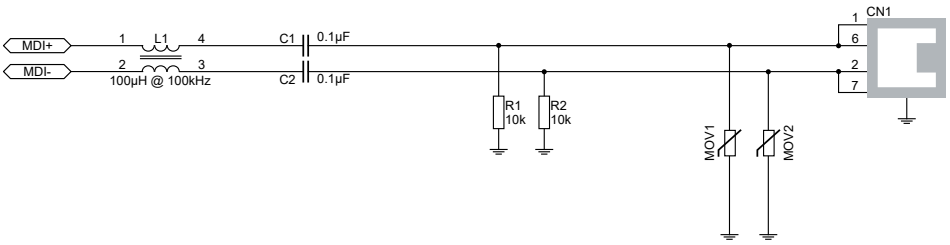


Figure 95: Circuit of hardware revision 2

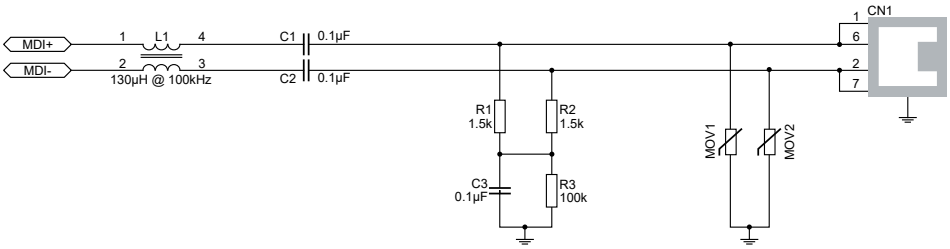


Figure 96: Circuit of hardware revision 3

Note

The revision can be determined using the Vector Hardware Manager.

Note

When using unshielded cables, the FE socket of the device should be connected to the user-side system ground.

17.3.2 VNmodule60 1AE10M LAN8670 V2

17.3.2.1 General Information

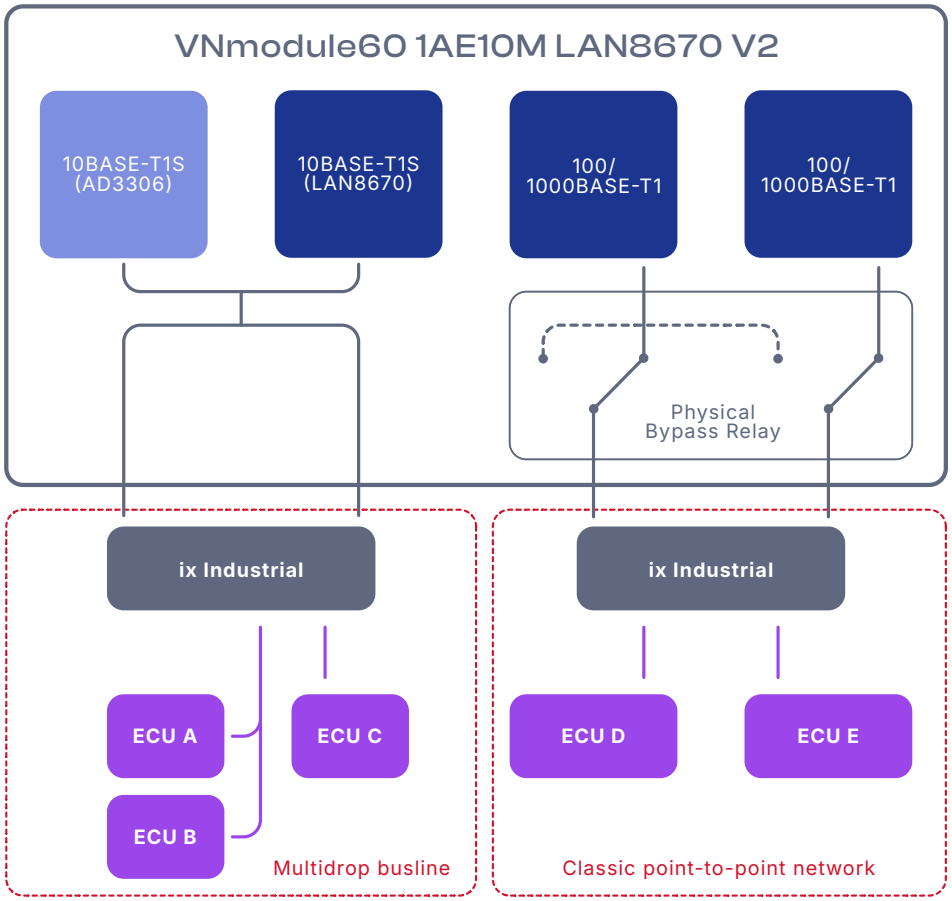
Physical layer

The VNmodule60 1AE10M LAN8670 V2 offers one 10BASE-T1S port as well as two 100/1000BASE-T1 ports.

Used PHY:

- Microchip LAN8670 (with Analog Devices AD3306) (10BASE-T1S)
- Broadcom BCM89883 (100/1000BASE-T1)

Setup



Features

Supported Physical Layer Standards	LAN8670	BCM89883
10BASE-T1S	✓	-
100BASE-T1	-	✓
1000BASE-T1	-	✓
1000BASE-T1 Legacy Mode[1)]	-	-
OPEN Alliance TC10 (Wake/Sleep) 10BASE-T1S[2)]	✓	-
OPEN Alliance TC10 (Wake/Sleep) 100BASE-T1	-	✓

1) The 1000BASE-T1 Legacy Mode (non-compliant communication) is required to ensure compatibility with older Infineon PHY revisions such as Infineon 88Q2112 rev. A0.

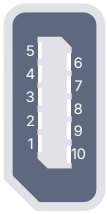
2) Performed by AD3306 on the same port.

17.3.2.2 Connectors

> **Ethernet 1 (ix Industrial)**

ix Industrial connectors for 10BASE-T1S. The 10BASE-T1S port is available through two pin-pairs (1/2 and 6/7). The signals of pin 1/6 and pin 2/7 are connected to allow daisy chain setups for 10BASE-T1S (see examples in section Termination on page 302).

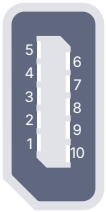
Pin	Assignment
1	CH1 MDI+ (connected to pin 6)
2	CH1 MDI- (connected to pin 7)
3...5	Not connected
6	CH1 MDI+ (connected to pin 1)
7	CH1 MDI- (connected to pin 2)
8...10	Not connected



> **Ethernet 2..3 (ix Industrial)**

ix Industrial connectors for 100/1000BASE-T1.

Pin	Assignment
1	CH3 MDI+
2	CH3 MDI-
3...5	Not connected
6	CH2 MDI+
7	CH2 MDI-
8...10	Not connected



17.3.2.3 Termination

Note

There is no internal differential end termination for 10BASE-T1S multidrop on the module. The multidrop busline must be terminated externally, e. g. by an already terminated ECU or by a resistor connected to the connection cable via a 100 Ohm resistor between MDI+ and MDI-.

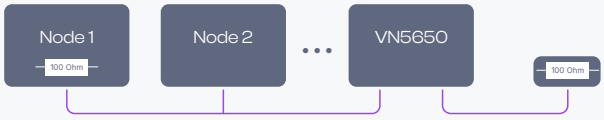


Figure 97: External termination

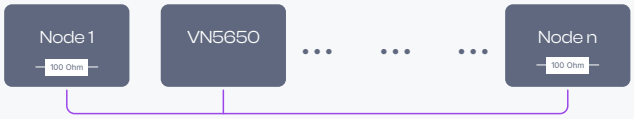
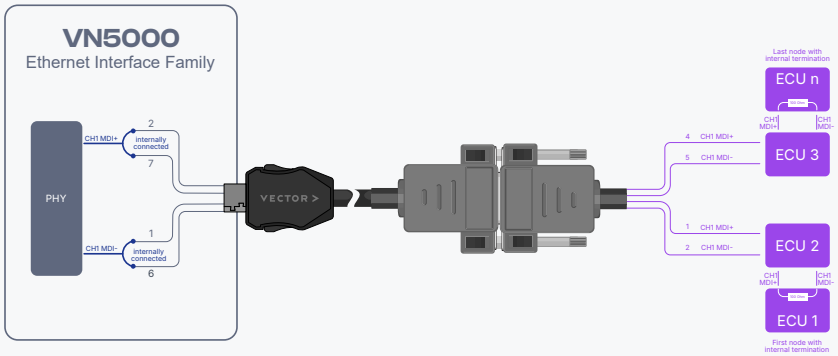


Figure 98: Node termination

Example

The following example shows a network consisting of several ECUs and a device of the VN5000 Ethernet interface family.

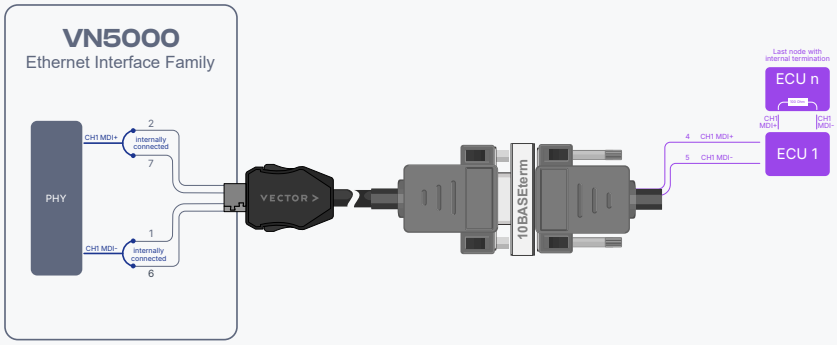


The two outer ECUs are terminated with 100 ohms. The Vector device is connected via the AEcable ix/DSUB9 10BASE-T1S cable (Vector part number 05219).

The pins of the adjacent ECUs (here ECU2 and ECU3) are connected to each other via an internal bridge (stub) in the Vector device. If the AEcable ix/DSUB9 10BASE-T1S is disconnected, ECU2 and ECU3 are disconnected from each other.

Example

The following example shows a network consisting of several ECUs and a device from the VN5000 Ethernet Interface family.



Since the Vector device is the first device in the chain, it must be terminated. For this purpose, the 10BASEterm plug (part number 05224) can be used, which connects pins 1 and 2 on the D-SUB9 via a 100-ohm resistor.

17.3.2.4 Bus Interface Network

The following circuit is used on the VNmodule60.

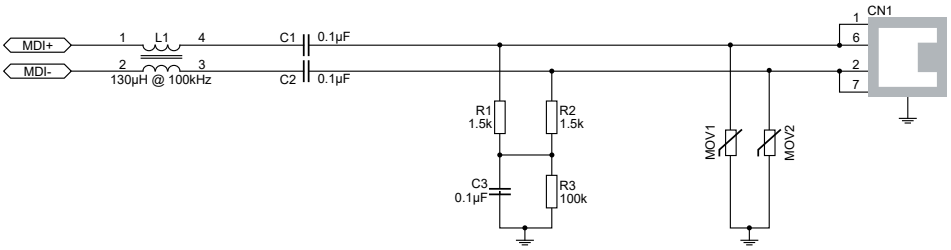


Figure 99: Circuit of hardware

Note

When using unshielded cables, the FE socket of the device should be connected to the user-side system ground.

17.4 2.5/5/10GBASE-T1 Modules

17.4.1 VNmodule60 2AE10G BCM89890

17.4.1.1 General Information

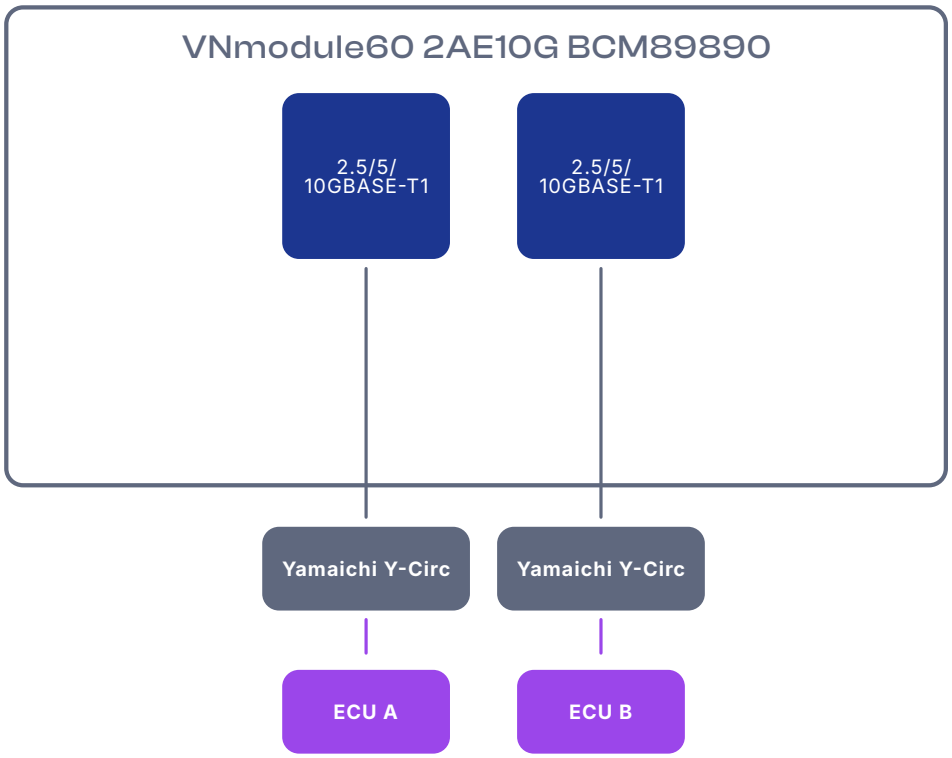
Physical layer

The VNmodule60 2AE10G BCM89890 offers two 2.5/5/10GBASE-T1 ports.

Used PHY:

> Broadcom BCM89890M Rev. B0 (2.5/5/10GBASE-T1)

Setup



Features

Supported Physical Layer Standards	2AE10G BCM89890
2.5GBASE-T1	✓
5GBASE-T1	✓
10GBASE-T1	✓
OPEN Alliance TC10 (Wake/Sleep) 2.5/5/10GBASE-T1	-
MACsec	✓

17.4.1.2 Connectors

> **Ethernet 1/2 (Yamaichi Y-Circ)**

Yamaichi Y-Circ connectors for 2.5/5/10GBASE-T1 (e. g. Yamaichi YCP-BWI09ACX-S1FPCX-14799). Each connector has one Ethernet port. Use cables of the Vector AEcable MultiGig family to access the network:

Pin	Assignment
1	CHx MDI+
2	CHx MDI-



17.4.2 VNmodule60 2AE10G MV-Q3244

17.4.2.1 General Information

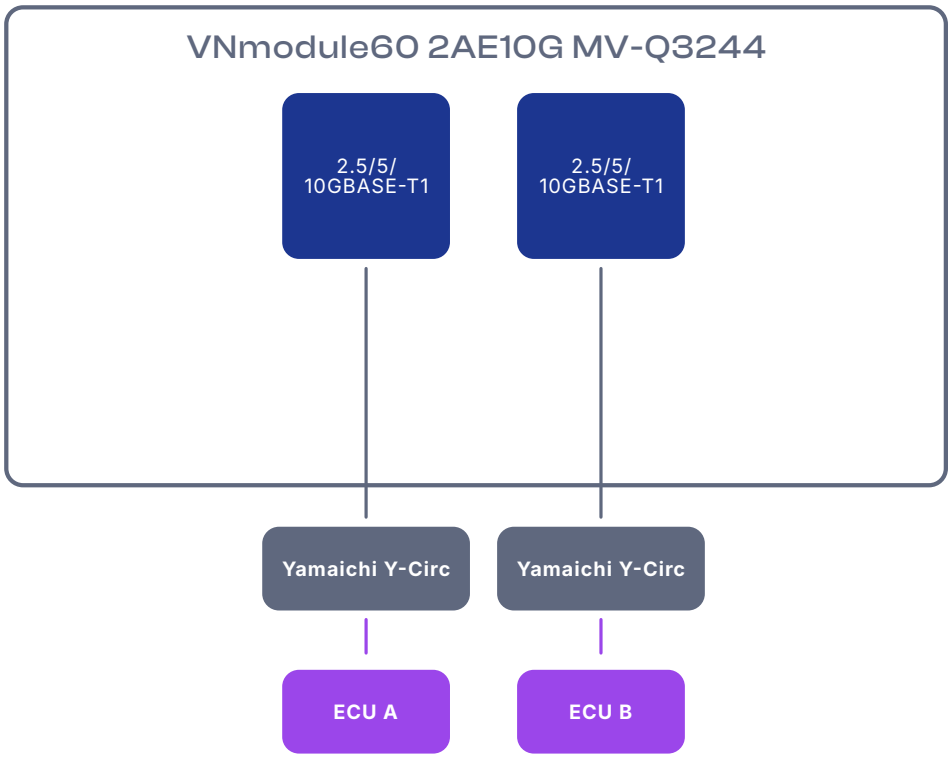
Physical layer

The VNmodule60 2AE10G MV-Q3244 offers two 2.5/5/10GBASE-T1 ports.

Used PHY:

> Infineon MV-Q3244 Revision A2 (2.5/5/10GBASE-T1)

Setup



Features

Supported Physical Layer Standards	2AE10G MV-Q3244
2.5GBASE-T1	✓
5GBASE-T1	✓
10GBASE-T1	✓
OPEN Alliance TC10 (Wake/Sleep) 2.5/5/10GBASE-T1	✓
MACsec	✓

17.4.2.2 Connectors

> **Ethernet 1/2 (Yamaichi Y-Circ)**

Yamaichi Y-Circ connectors for 2.5/5/10GBASE-T1 (e. g. Yamaichi YCP-BWI09ACX-S1FPCX-14799). Each connector has one Ethernet port. Use cables of the Vector AEcable MultiGig family to access the network:

Pin	Assignment
1	CHx MDI+
2	CHx MDI-



17.5 1/2.5/5/10GBASE-T Modules

17.5.1 VNmodule60 2ETH10G BCM84891

17.5.1.1 General Information

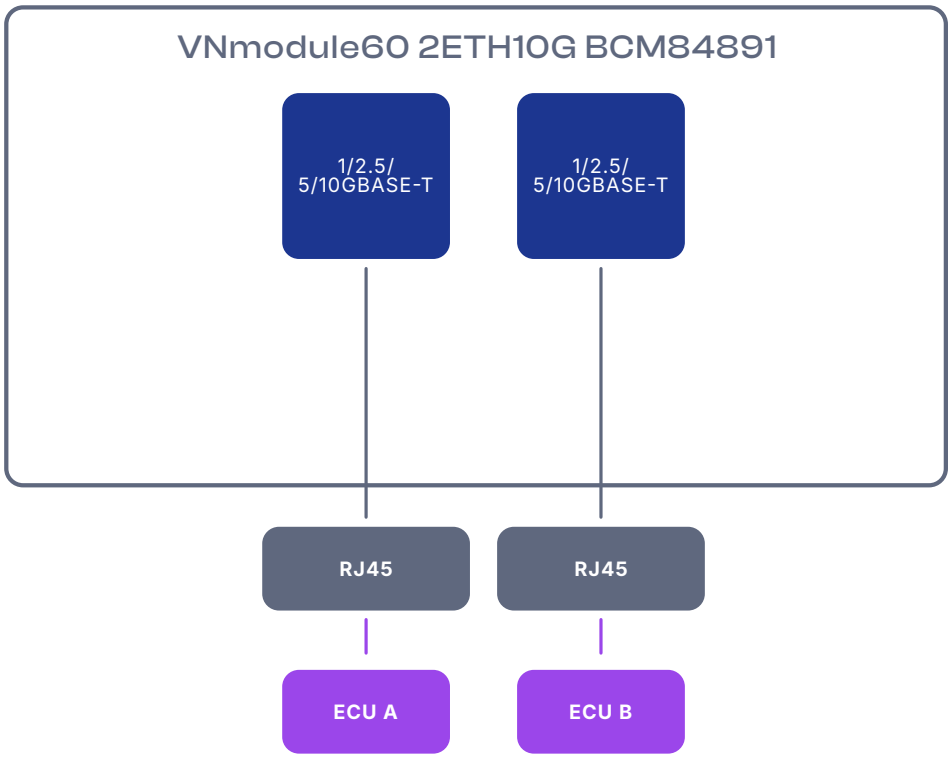
Physical layer

The VNmodule60 2ETH10G BCM84891 offers two 1/2.5/5/10GBASE-T ports.

Used PHY:

> Broadcom BCM84891

Setup



Features

Supported Physical Layer Standards	2ETH10G BCM84891
10BASE-T	-
100BASE-TX	✓
1000BASE-T	✓
2.5GBASE-T	✓
5GBASE-T	✓
10GBASE-T	✓

17.5.1.2 Connectors

> **Ethernet 1/2 (RJ45)**

RJ45 connectors for 1/2.5/5/10GBASE-T. Each connector has one Ethernet port.

Pin	Assignment
1	MDI DA+
2	MDI DA-
3	MDI DB+
4	MDI DC+
5	MDI DC–
6	MDI DB–
7	MDI DD+
8	MDI DD-



17.6 Replacement

WARNING!

Ensure an ESD safe working environment during disassembly and assembly. Avoid touching the top, bottom or connectors of the boards during this process to avoid ESD damage.

WARNING!

To avoid scratching the surface, make sure the work surface is clean and soft.

WARNING!

Take care when removing / reassembling the module to avoid damaging the connector.

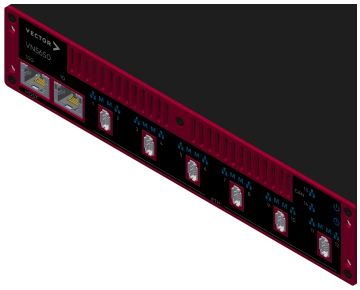
Note

Before replacing a VNmodule60, please download and install our latest drivers from our website.

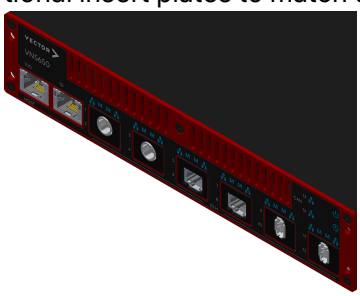
Version 1 and 2

Depending on the hardware revision, the front panel has different cutouts:

> The first revision has cutouts for ix Industrial connectors (V1).



> The second revision has generic rectangular cutouts (V2) and uses additional insert plates to match the various VNmodule60 connectors.



Please use the appropriate instructions provided in the following sections.



Reference

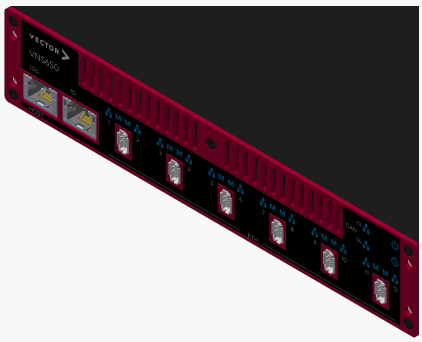
You can also find a video tutorial for V2 on YouTube:

https://www.youtube.com/watch?v=bmYe6Qa0oXE

17.6.1 Removing a VNmodule60 (V1)

Note

The following instructions apply to Vector devices with the fixed cutouts for the ix Industrial connectors.

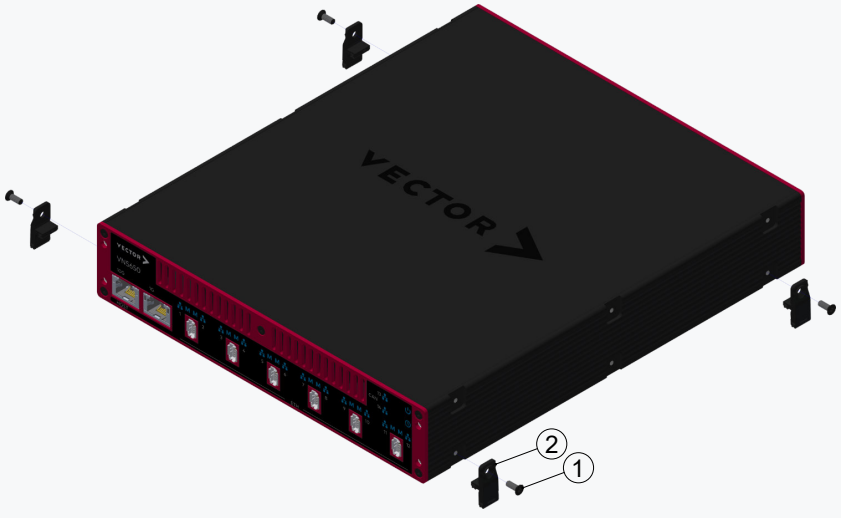


Step by Step Procedure

1. Save your current configuration using the Vector Hardware Manager (**Burger menu | Save As...**).

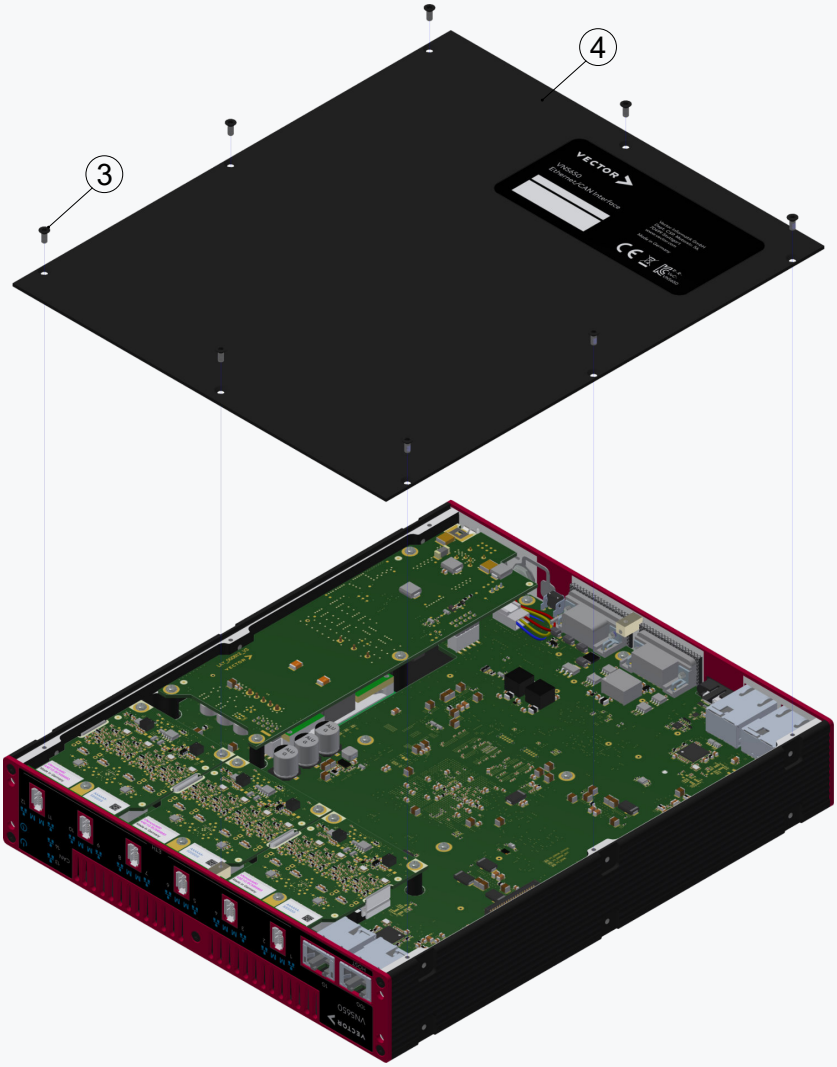
2. In the Vector Hardware Manager, open the **Ethernet Network Configuration** page and delete your current configuration. The configuration must be empty.

3. First unscrew all four screws (1) of the VSH Equipment Feet (2) using a Torx TX 10 screwdriver and set the screws and VSH Equipment Feet aside. The screws can be reused up to five times.

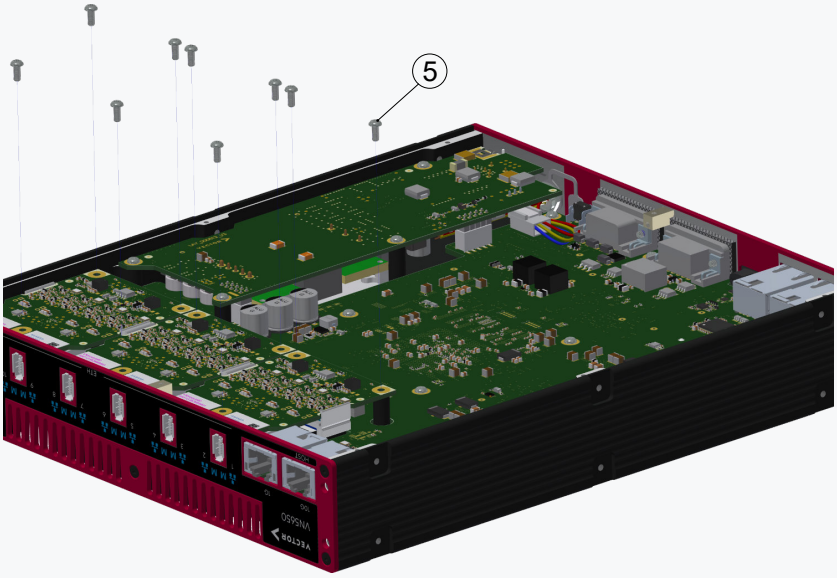


4. Turn the device upside down.

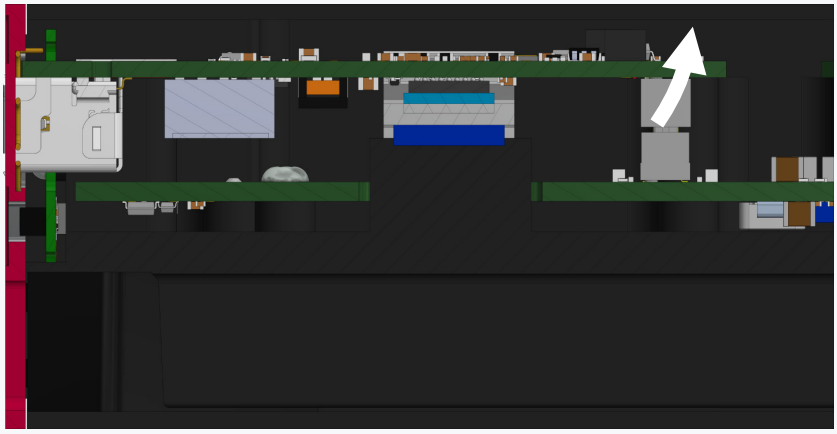
5. Unscrew all eight screws (3) of the device bottom cover (4) using a Torx TX 8 screwdriver. Put the screws and the bottom cover aside. These screws can also be reused up to five times.

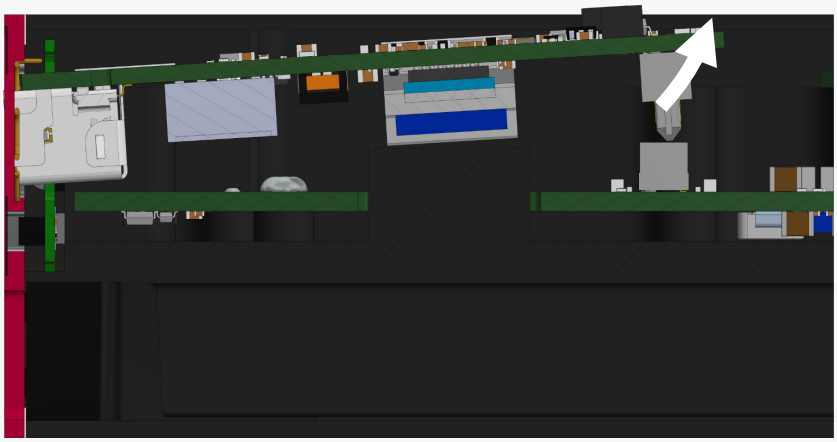


6. Unscrew all screws (5) on each module to be replaced using a Torx TX 8 screwdriver. Set the screws aside. These screws can be reused up to five times.



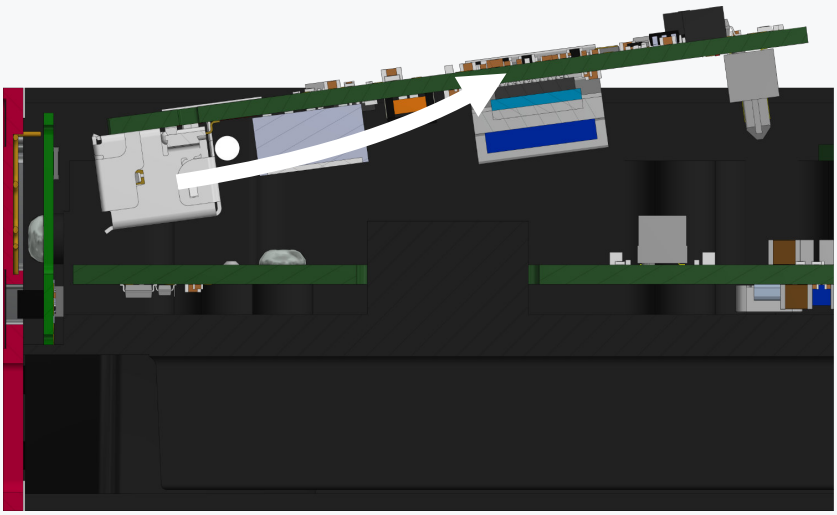
7. Lift up on the back of the module until it is disconnected from the connector on the main board.



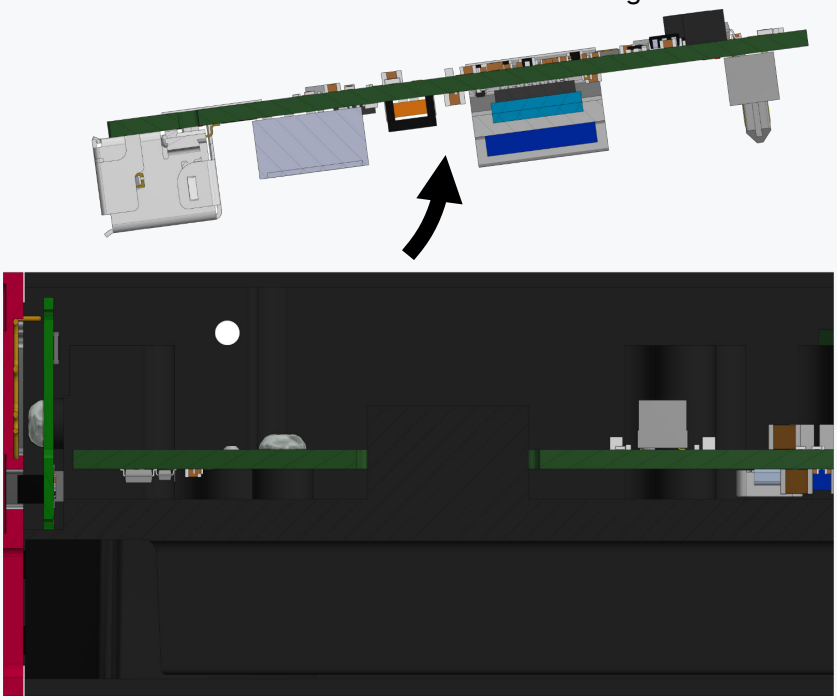


8. Pull the module inwards until the front connector of the module is completely pulled through the LED board.





9. The module can then be removed from the housing.

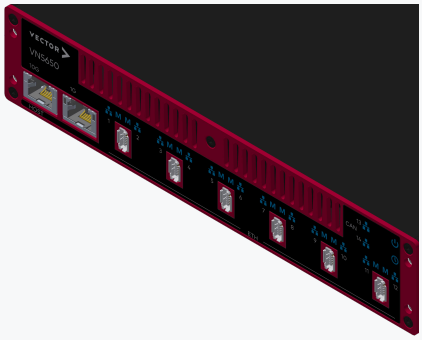


10. Place the module in ESD safe packaging.

17.6.2 Inserting a VNmodule60 (V1)

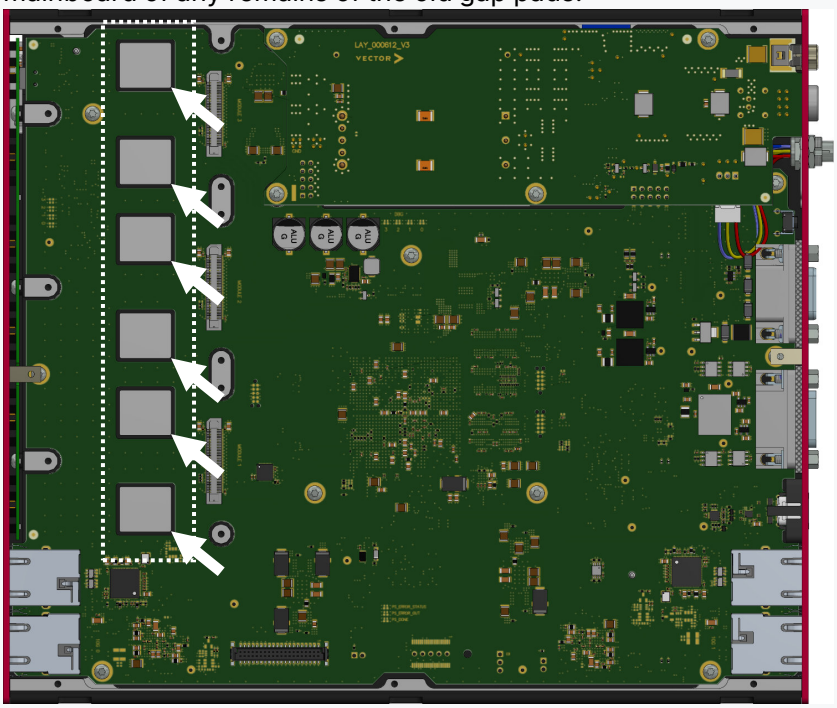
Note

The following instructions apply to Vector devices with the fixed cutouts for the ix Industrial connectors.

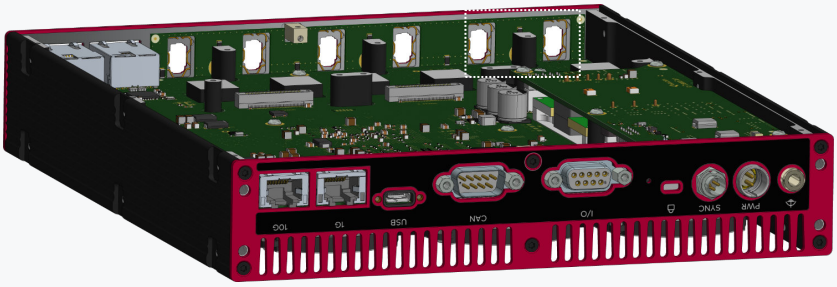


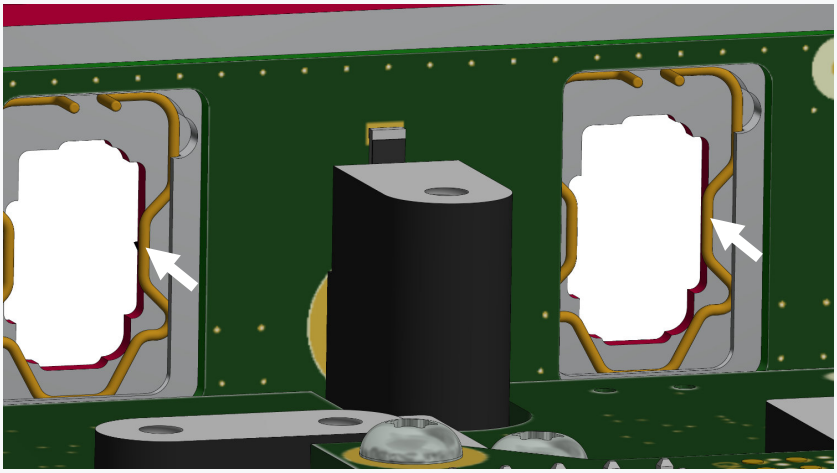
Step by Step Procedure

1. Before inserting the new modules, clean the six cooling domes on the mainboard of any remains of the old gap pads.

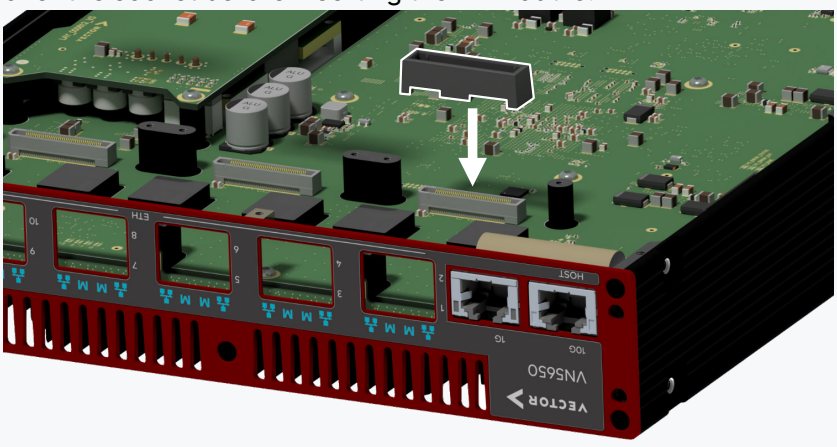


2. Check that the EMC spring is in the correct position.

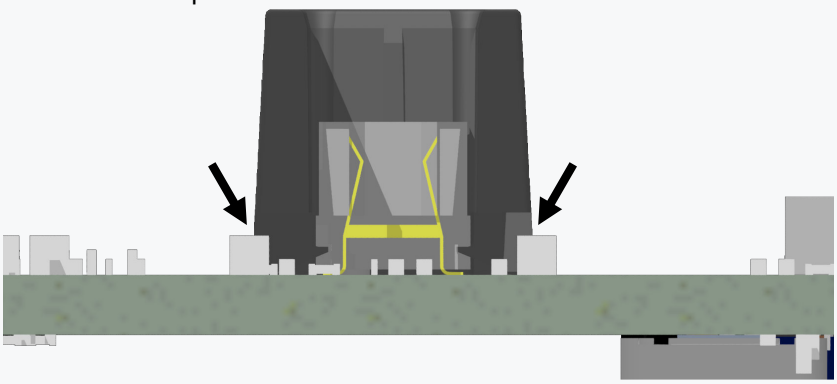




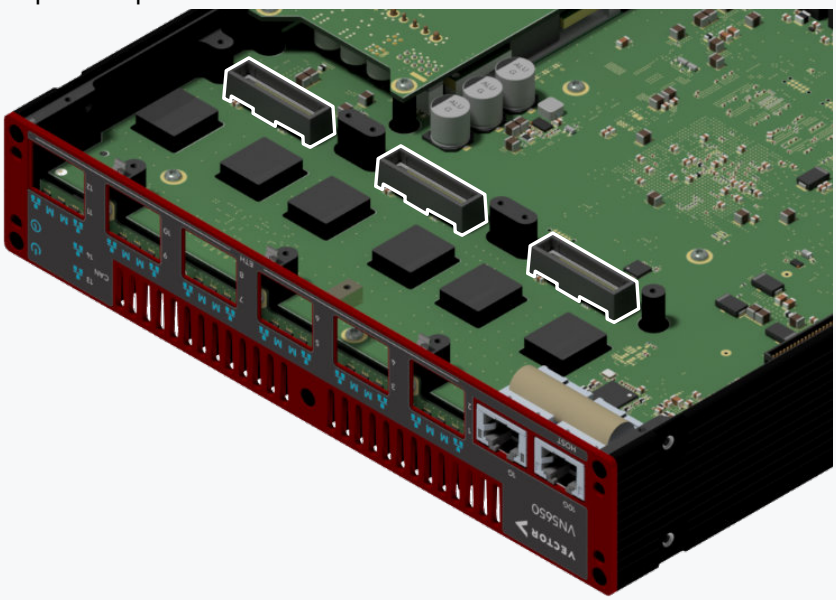
3. To avoid damage to the VNmodule jack, please insert the plug-in aid over the socket before inserting the VNmodule.



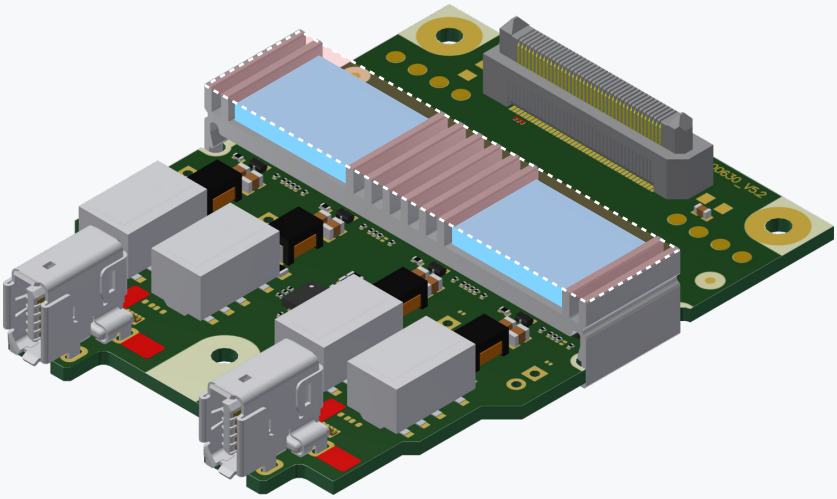
It will click into place:



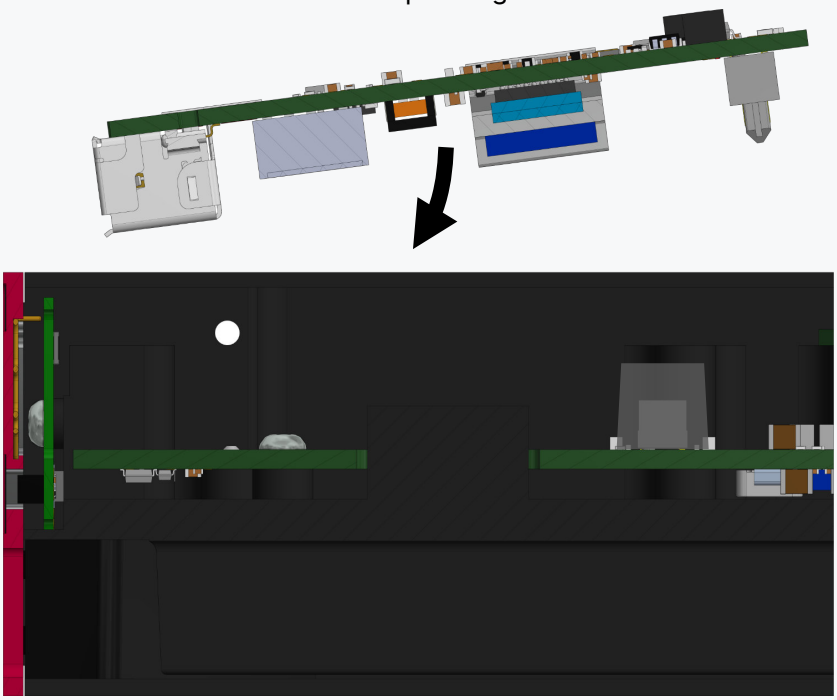
Repeat step 4 with the other sockets.



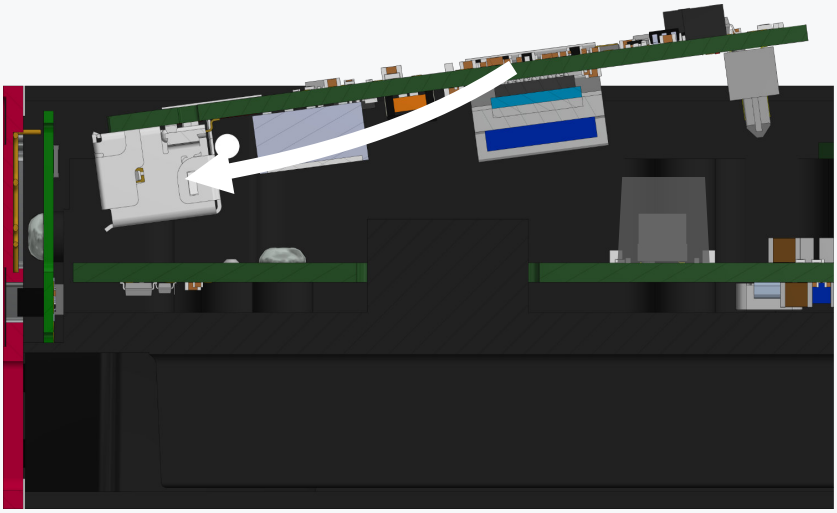
4. Unpack the replacement module. Remove the protective film from the gap pads. Do not remove the gap pads from the heat sink!



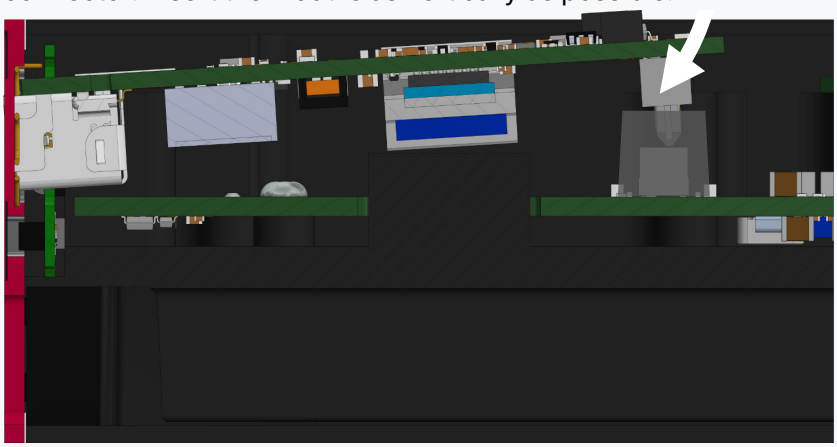
5. Hold the module over the corresponding slot on the main board.

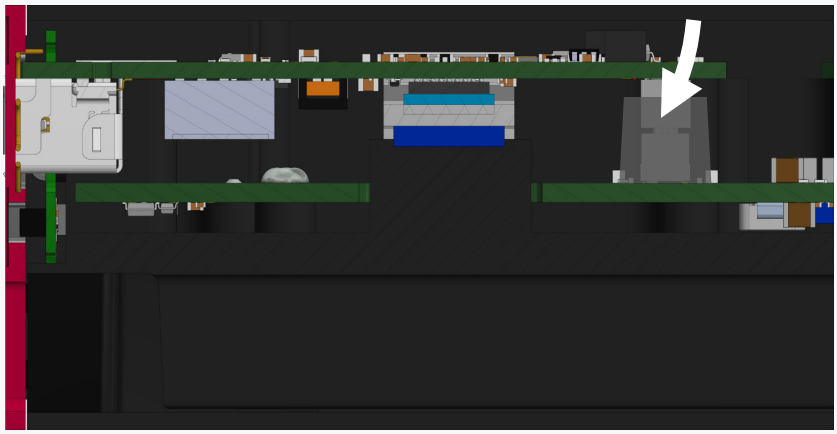


6. Slide the module towards the front panel and through its openings until the connectors are flush with the outside of the front panel.



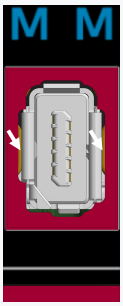
7. Carefully connect the rear connector of the module to the main board connector. Insert the module as vertically as possible.



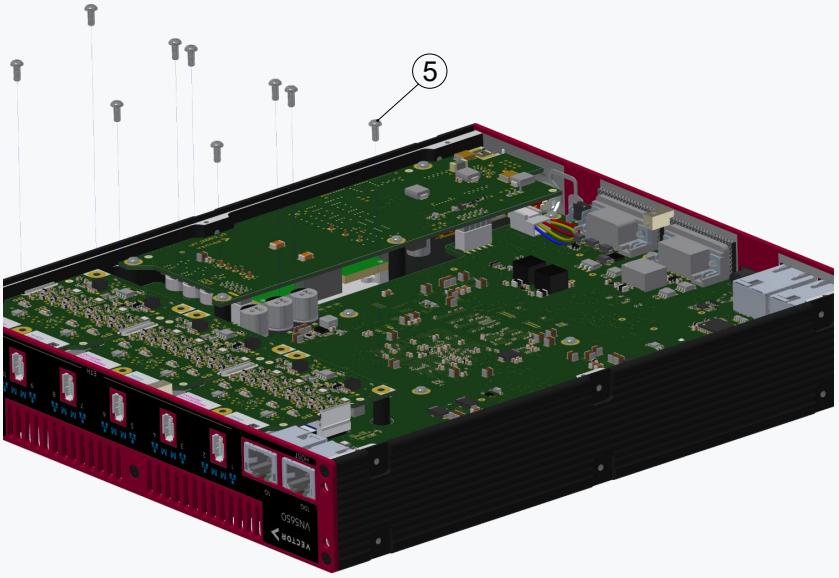


8. Check the correct position of the EMC spring after assembly.

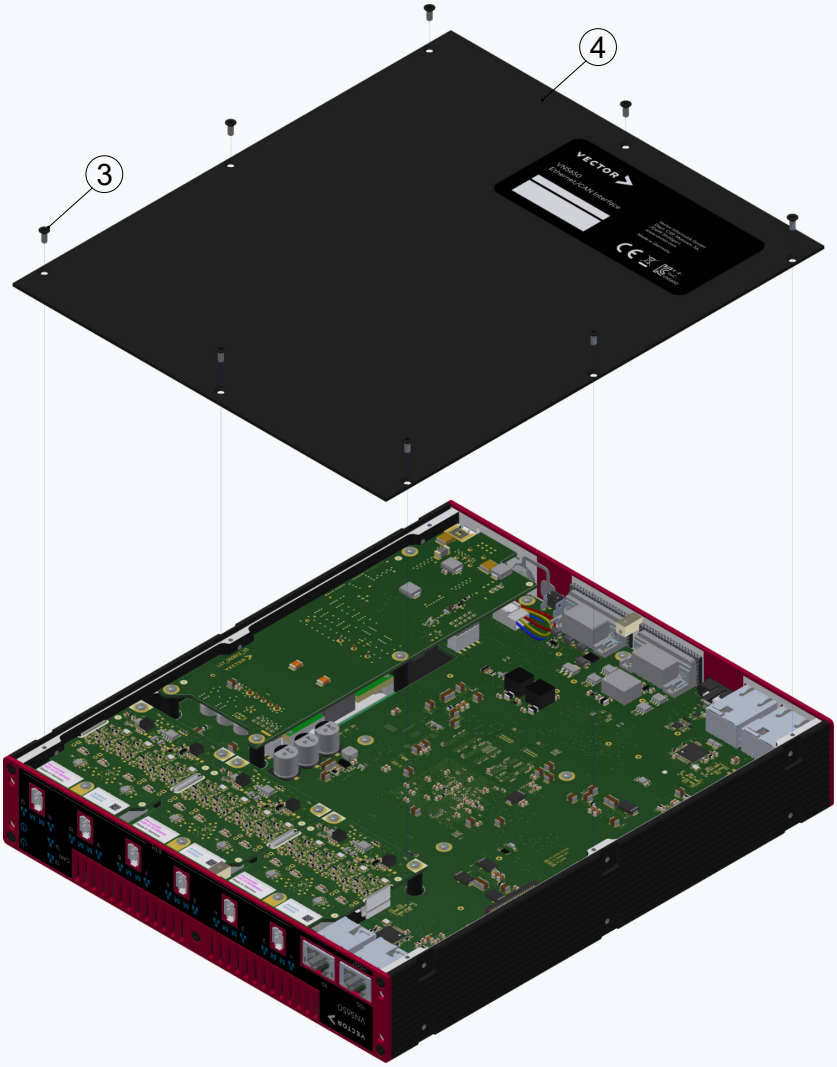




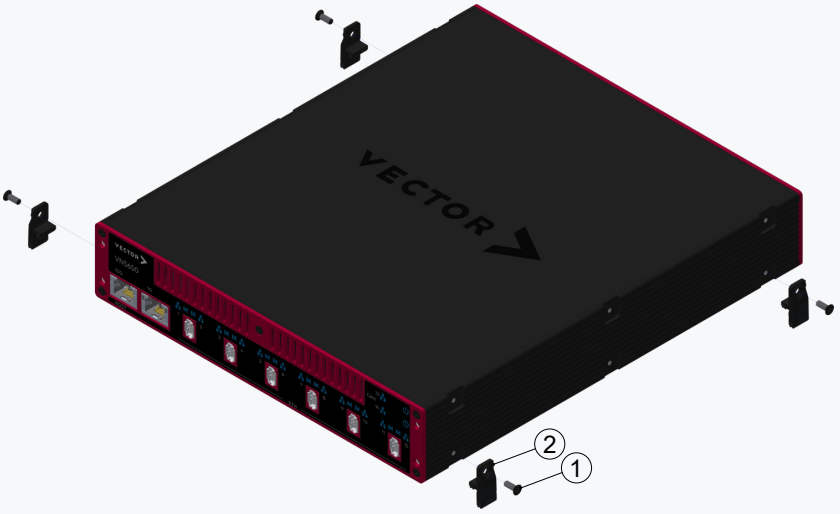
9. Tighten all screws (5) of each replaced module with a Torx TX 8 screwdriver to a torque of 0.5 Nm. Use the (new) screws supplied with your VNmodule60.



10. Tighten all eight screws (3) of the device bottom cover (4) using a Torx TX 8 screwdriver to a torque of 0.5 Nm.



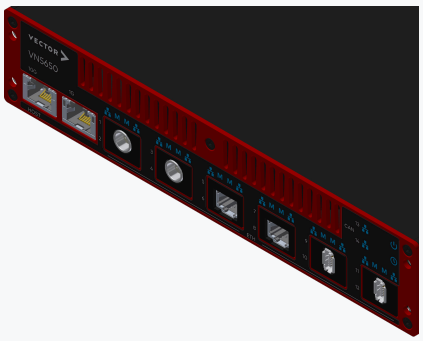
11. Tighten all four screws (1) of the VSH Equipment Feet (2) with a Torx TX 10 screwdriver to a torque of max. 0.9 Nm.



17.6.3 Removing a VNmodule60 (V2)

Note

The following instructions apply to Vector devices with the generic (rectangular) cutouts.



Step by Step Procedure

1. Save your current configuration using the Vector Hardware Manager (**Burger menu | Save As...**).

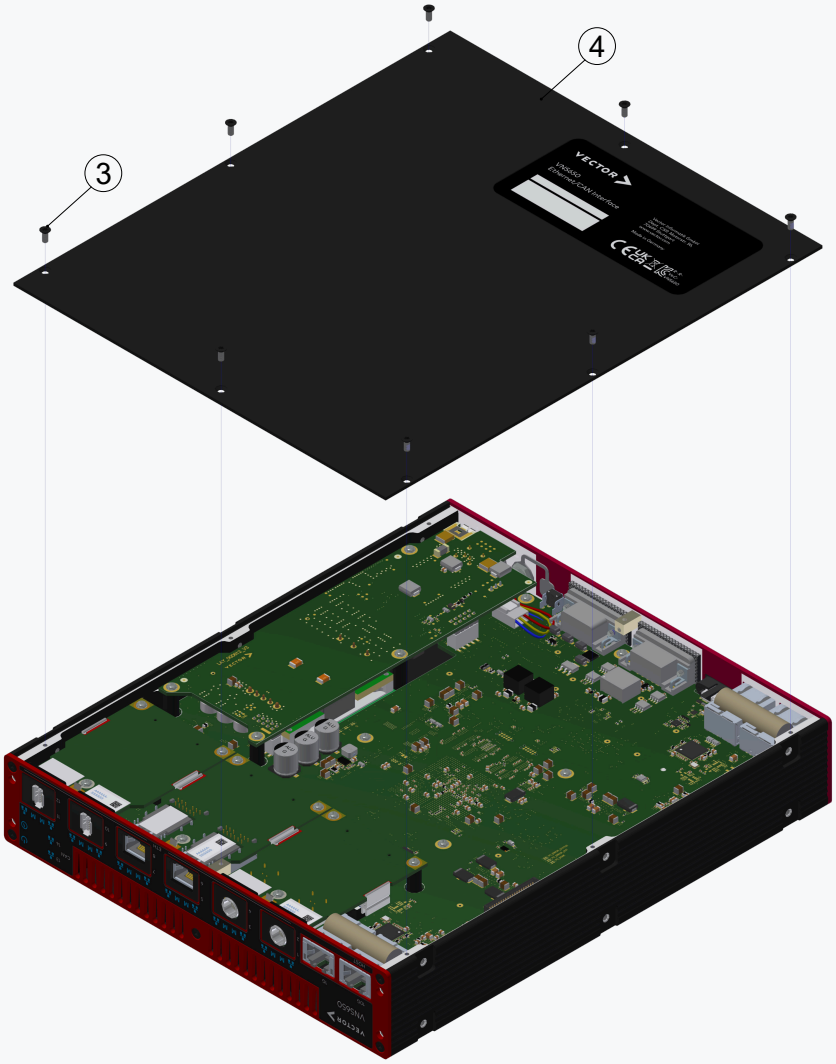
2. In the Vector Hardware Manager, open the **Ethernet Network Configuration** page and delete your current configuration. The configuration must be empty.

3. First unscrew all four screws (1) of the VSH Equipment Feet (2) using a Torx TX 10 screwdriver and set the screws and VSH Equipment Feet aside. The screws can be reused up to five times.

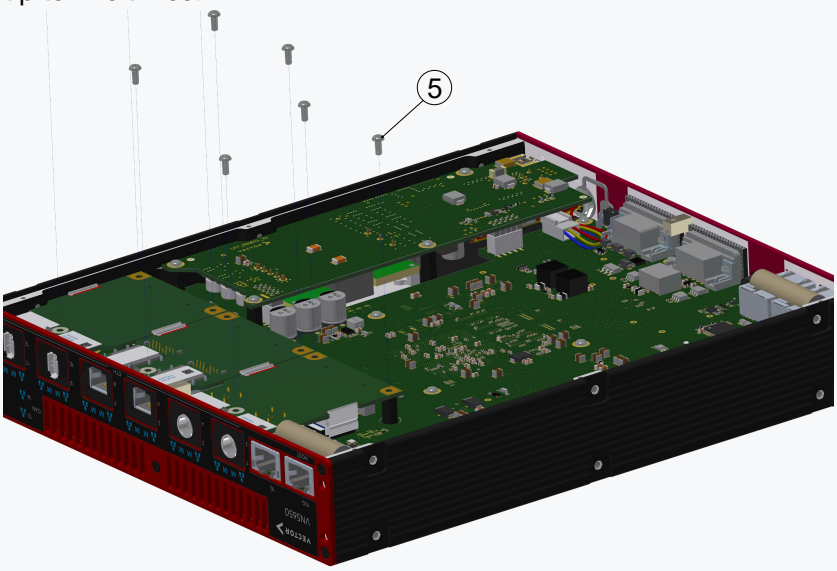


4. Turn the device upside down.

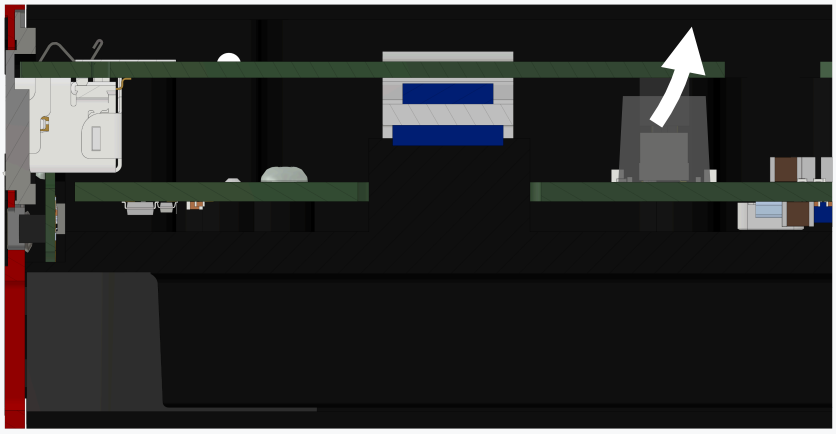
5. Unscrew all eight screws (3) of the device bottom cover (4) using a Torx TX 8 screwdriver. Put the screws and the bottom cover aside. These screws can also be reused up to five times.

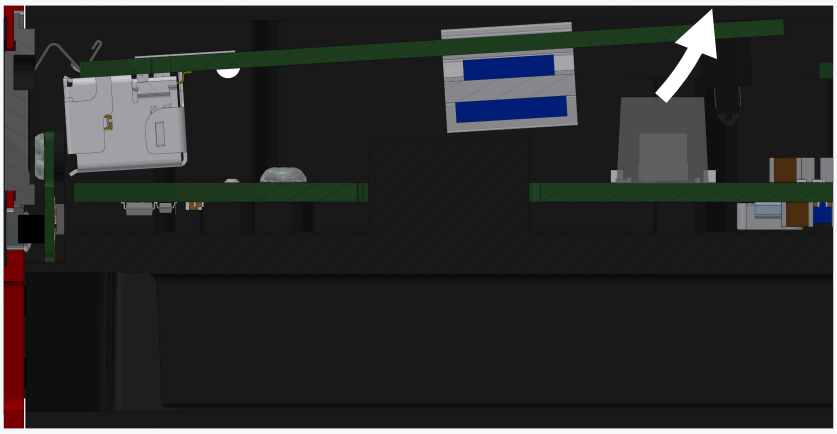


6. Unscrew all screws (5) on each module to be replaced using a Torx TX 8 screwdriver. Set the screws aside. These screws can be reused up to five times.

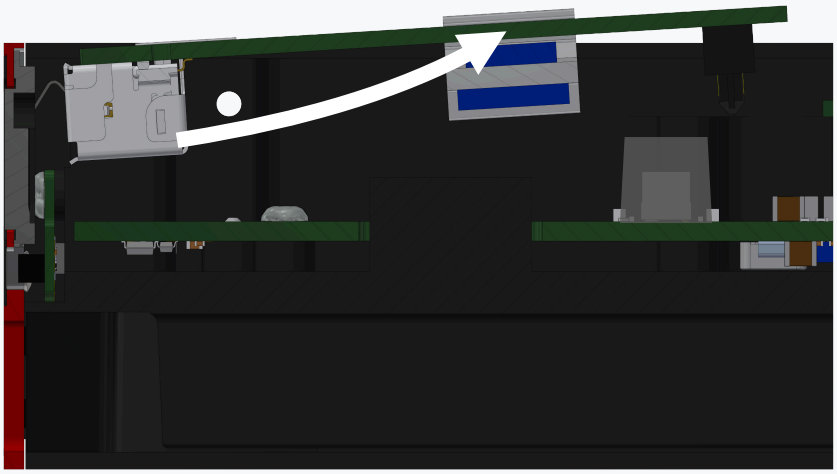


7. Lift up on the back of the module until it is disconnected from the connector on the main board.

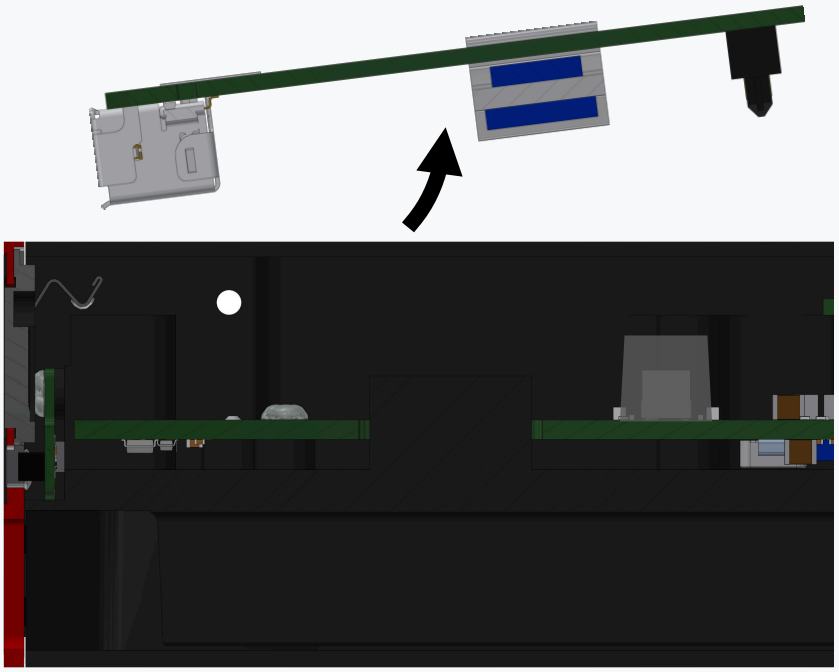




8. Pull the module inwards until the front connector of the module is completely pulled through the LED board.

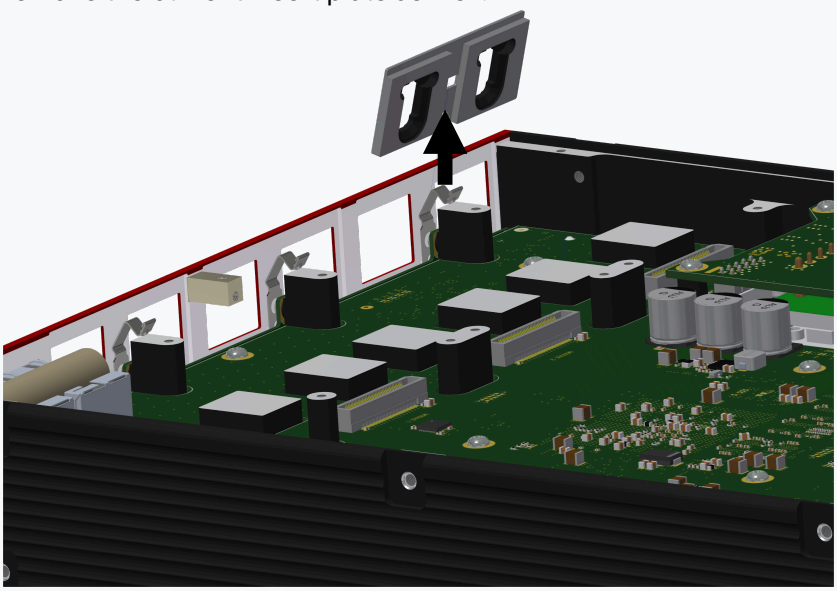


9. The module can then be removed from the housing.



10. Place the module in ESD safe packaging.

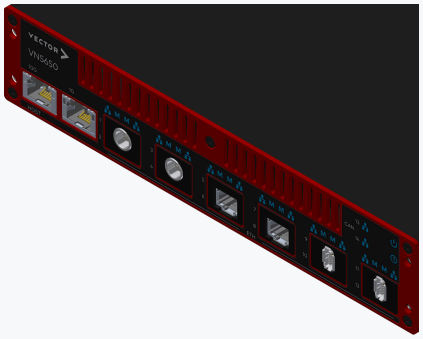
11. If you want to insert another VNmodule with different connectors, remove the current insert plate as well.



17.6.4 Inserting a VNmodule60 (V2)

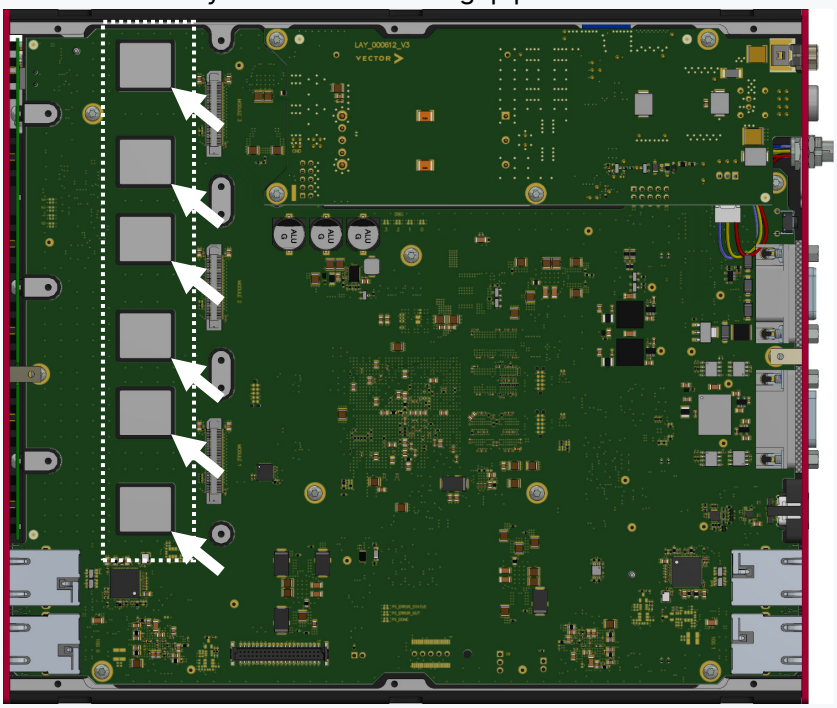
Note

The following instructions apply to Vector devices with the generic (rectangular) cutouts.

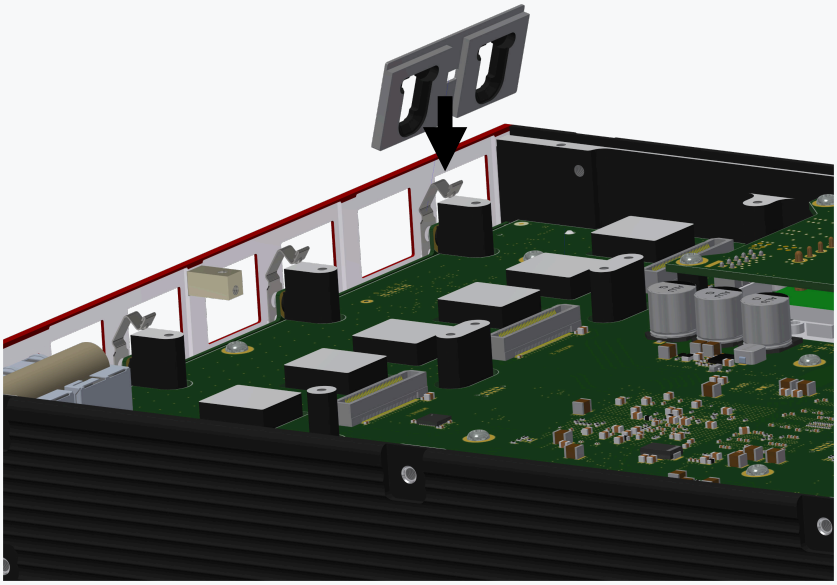


Step by Step Procedure

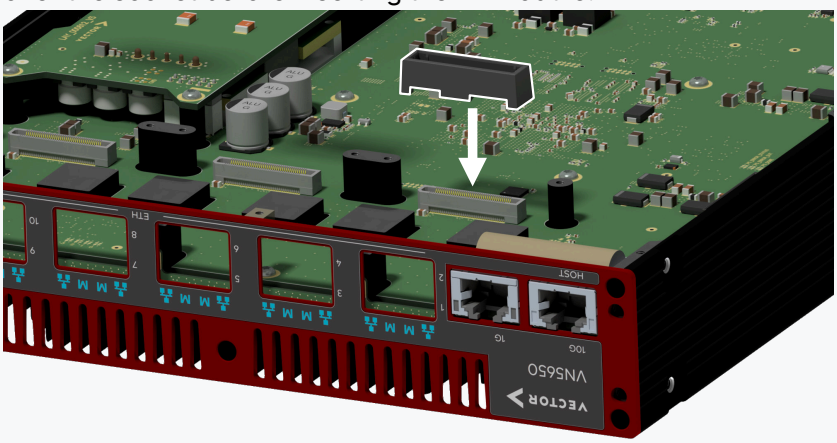
1. Before inserting the new modules, clean the six cooling domes on the mainboard of any remains of the old gap pads.



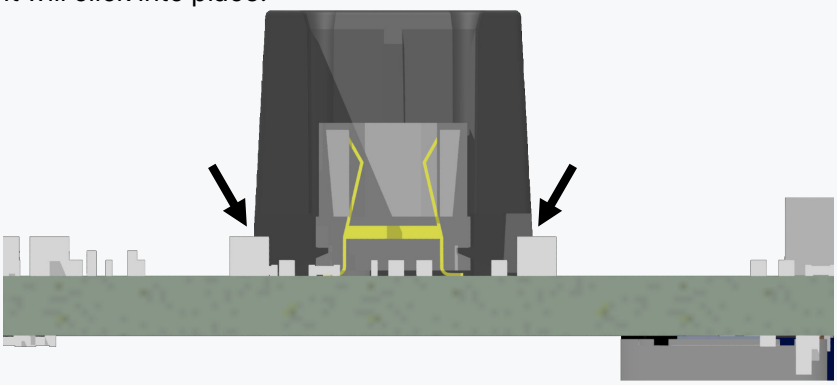
2. If you have not already done so, carefully insert the appropriate insert plate for your VNmodule into the spring on the front panel.



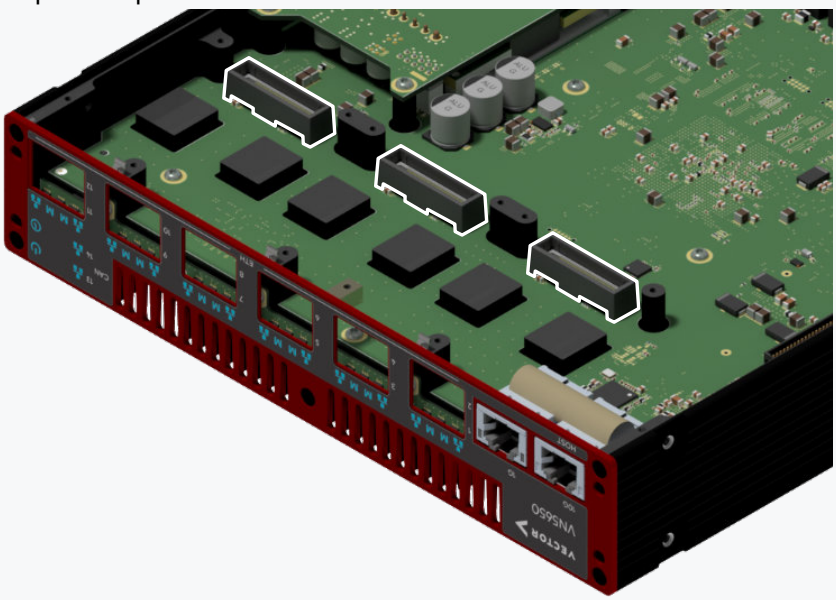
3. To avoid damage to the VNmodule jack, please insert the plug-in aid over the socket before inserting the VNmodule.



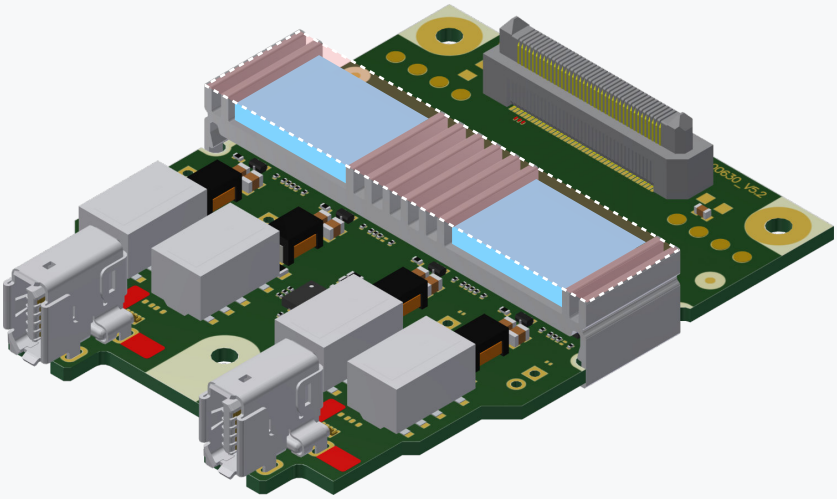
4. It will click into place:



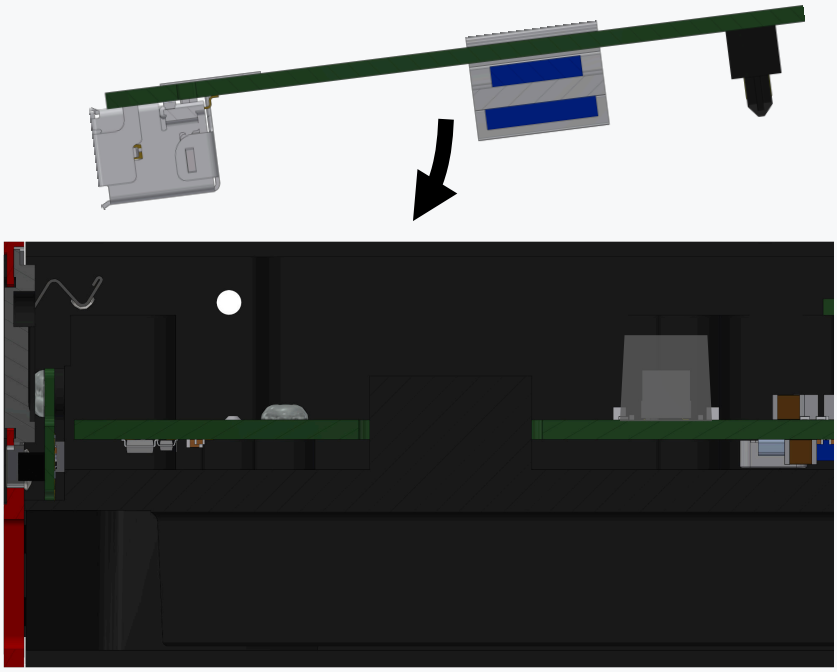
5. Repeat step 4 with the other sockets.



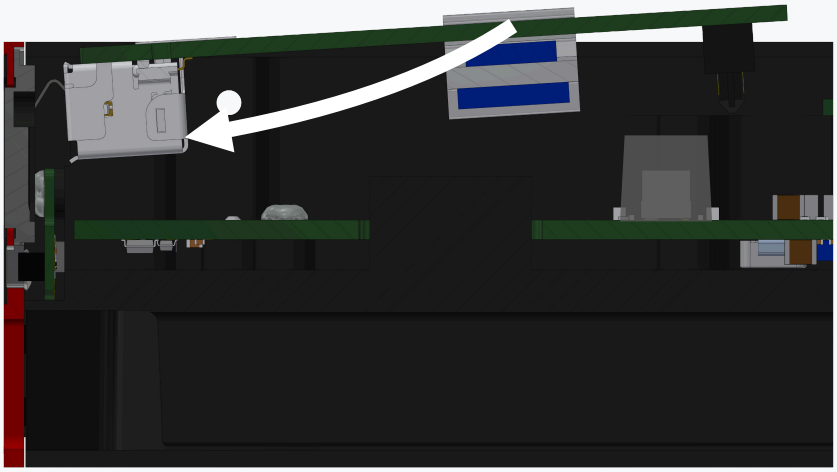
6. Unpack the replacement module. Remove the protective film from the gap pads. Do not remove the gap pads from the heat sink!



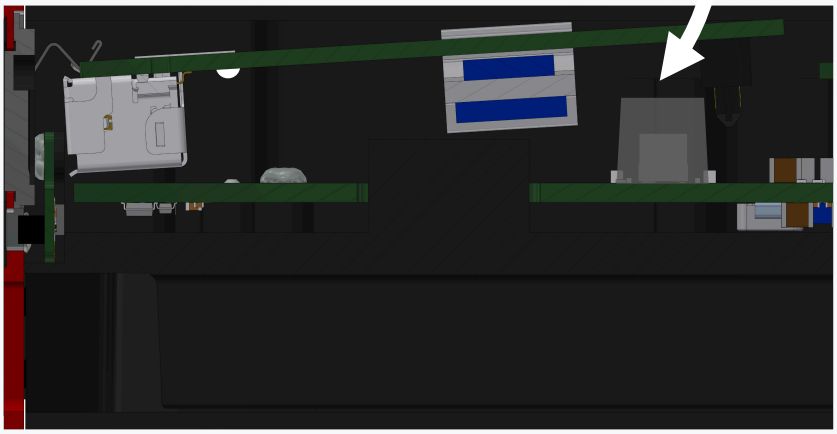
7. Hold the module over the corresponding slot on the main board.

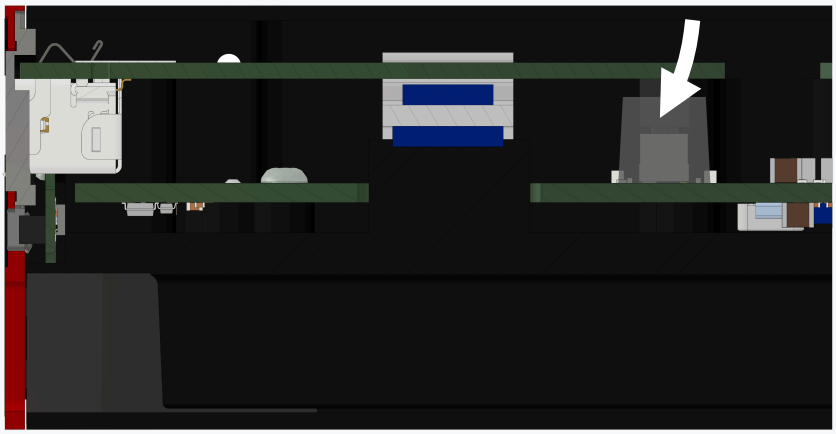


8. Slide the module towards the front panel and through its openings until the connectors are flush with the outside of the front panel.

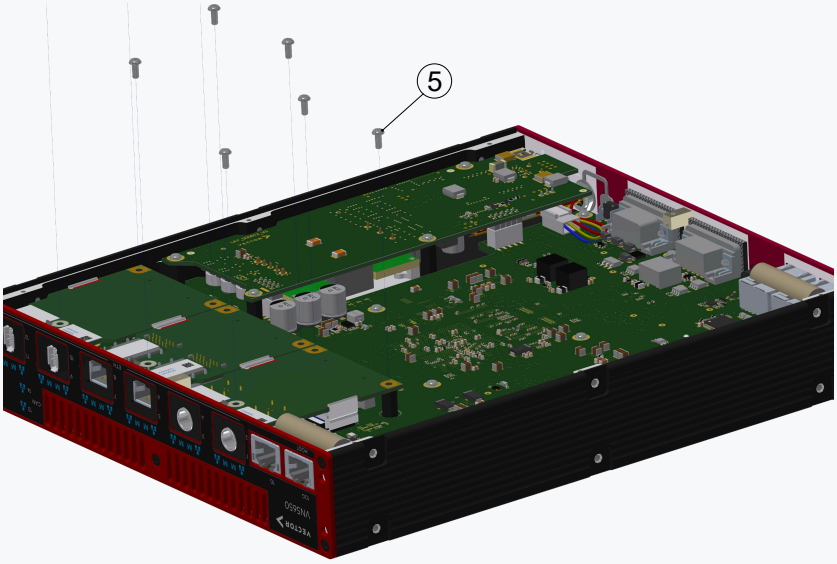


9. Carefully connect the rear connector of the module to the main board connector. Insert the module as vertically as possible.

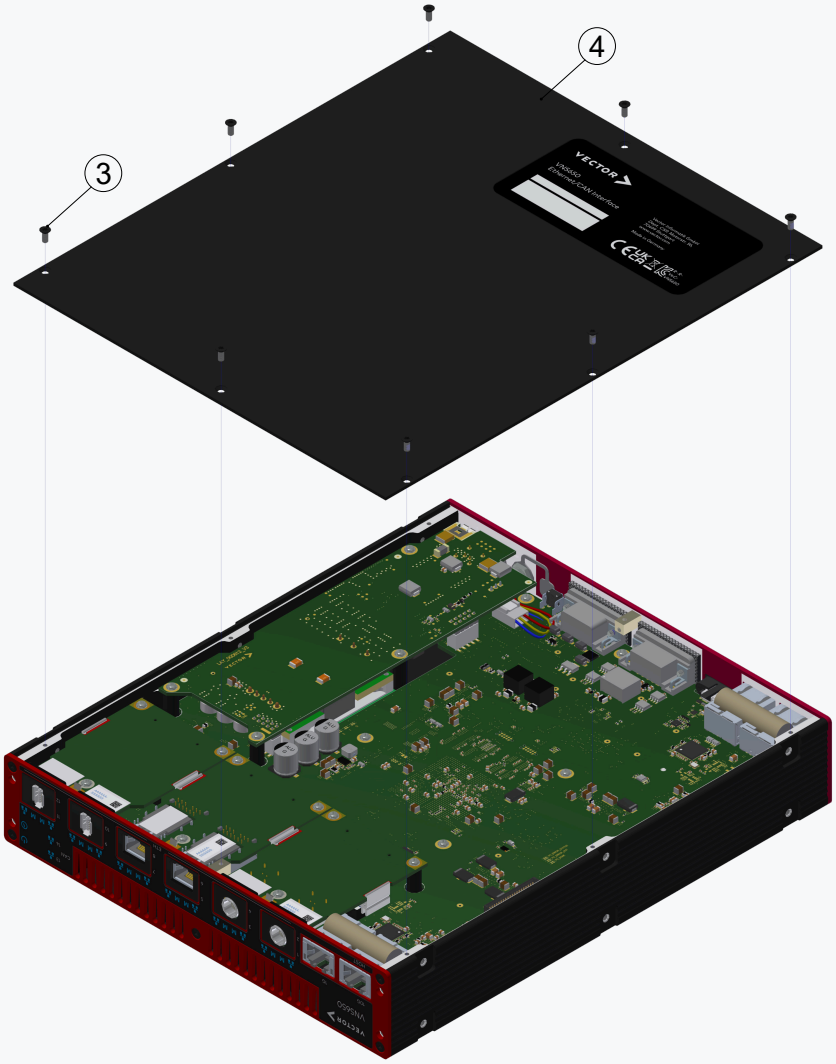




10. Tighten all screws (5) of each replaced module with a Torx TX 8 screwdriver to a torque of 0.5 Nm. Use the (new) screws supplied with your VNmodule60.



11. Tighten all eight screws (3) of the device bottom cover (4) using a Torx TX 8 screwdriver to a torque of 0.5 Nm.



12. Tighten all four screws (1) of the VSH Equipment Feet (2) with a Torx TX 10 screwdriver to a torque of max. 0.9 Nm.



Note

If a configuration (port setting, switch setting, ...) stored on the device does not match the module configuration (e. g. if it was not deleted beforehand), the device switches to a fallback configuration. In the worst case, the device may not start anymore. In this case, please start the device with the reset button pressed and then write a valid configuration to the device.

18 Getting Started

In this chapter you find the following information:

18.1 Driver Installation 338
18.1.1 General Information 338
18.1.2 Installation Instructions 338
18.1.3 Command Line 340
18.2 Vector Hardware Manager 346
18.2.1 Hardware Configuration 346
18.2.2 Tool Location and Help 346
18.3 Linux Driver 348

18.1 Driver Installation

18.1.1 General Information

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

Note

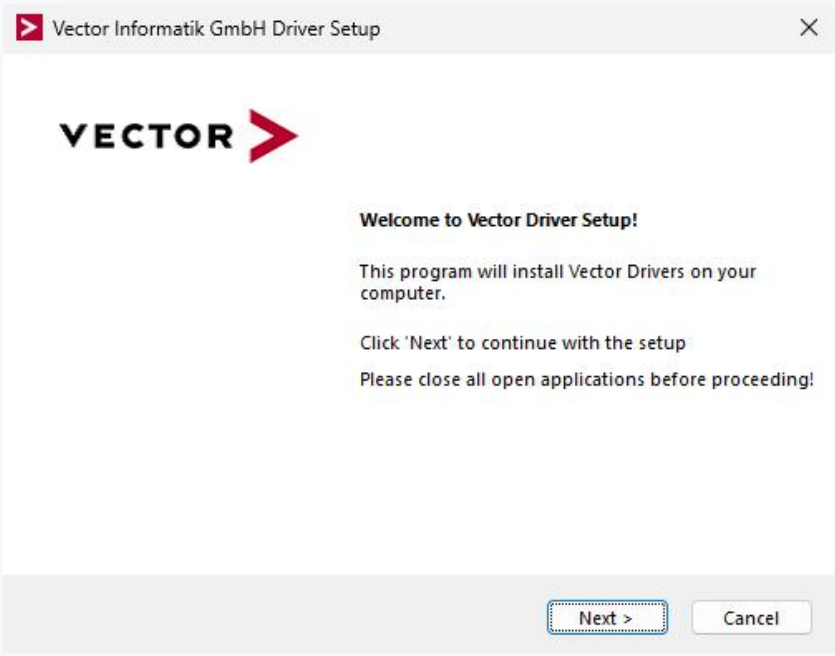
Please note that you will need **Administrator Rights** for the following steps

18.1.2 Installation Instructions

Step by Step Procedure

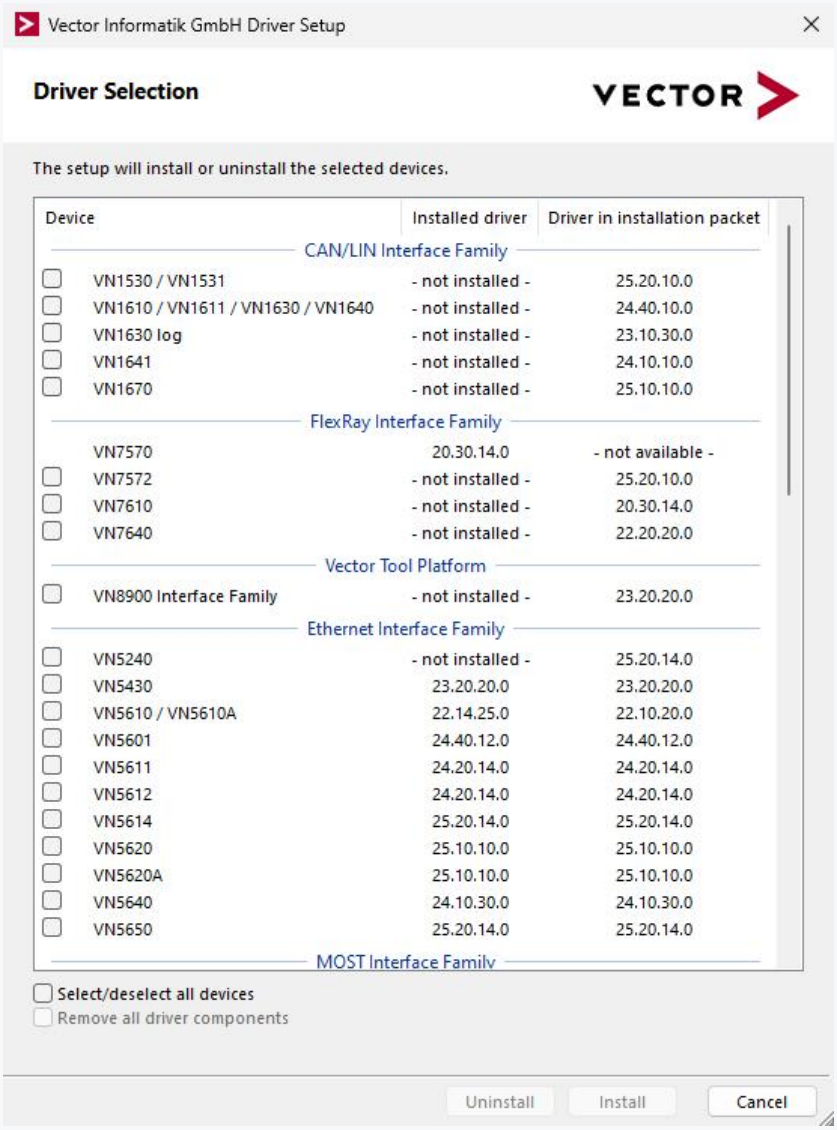
1. Execute the driver setup `\Drivers\Setup.exe` before the device is connected to the computer with the included USB cable.

   If you have already connected the device to the computer, 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 computer with the included USB cable.

18.1.3 Command Line

Command line installation is an important feature for administration purposes when new drivers need to be installed or updated in the background without user interaction.

This section describes how to use the command line for

> Vector drivers

18.1.3.1 Vector Driver

Prerequisites

Prerequisites

Administrative rights are required to use the `setup.exe` command line tool. If the device is not connected to the computer during installation, a pre-installation to the Windows Driver Store is performed. If the device is connected to the computer for the first time, the device driver installation must be completed. The requirements and actual behavior of this process varies between Windows operating systems (see section Remarks on page 345).

Options and Actions

The `setup.exe` can be found on the Vector Driver Disk and provides a command line interface as follows:

```
setup.exe [option] [action]
```

Options

Option	Command	Description
Silent mode	/s	Executes the driver setup in silent mode. No user interaction is required. This command cannot be used with uncertified Vector drivers. Use with the `/installCert` option under Windows 7/8 and above.
No virtual driver	/nv	Does not install any virtual driver (Virtual CAN Bus).
Update only	/uo	The setup is forced to install only a newer version of a driver located in the folder `\Drivers`.
Vector DLLs only	/dongleDLLsOnly	Use this option to install only the Vector Keyman API DLLs. The WIBU service of the dongle manufacturer will not be installed. Attention: This option is only valid if you actually install the Vector Keyman driver. This means using action: `/i keyman`.
Install certificate	/installCert	This option installs the Vector driver certificate in the local certificate store under trusted publishers. Use this option in conjunction with the `/s` option to silently install the Vector drivers under Windows 7/8 and above.
No CodeMeter runtime service	/ncmr	Does not install the WIBU service.

Actions

Action	Command	Description
Install	/i <driver name>	Installs the specified driver from the driver source path.The driver name is the name of the device (e. g. `vn1630`). Lower case and upper case will be ignored.
Install all	/i all	Installs all available interface drivers from the driver source path. Note: The following drivers are **not automatically** installed with the `all` option: Vector Keyman VN8900 Ethernet driver (vnIpClient). They must be installed explicitely.
Install all and Vector Keyman	/i all keyman	Installs all available interface drivers from the driver source path and the Vector Keyman.
Install all and Vector Keyman	/i all keyman	Installs all available interface drivers from the driver source path and the Vector Keyman.
Uninstall	/u <driver name>	Removes (uninstalls) the specified driver from the system. The driver name is the name of the device (e. g. `vn1630`). Lower case and upper case will be ignored.
Uninstall all	/u all	Removes (uninstalls) all interface drivers and driver components from the system. This action removes everything except for the Vector Keyman and the VN8900 Ethernet driver (vnIpClient).
Uninstall all and Vector Keyman	/u all keyman	Removes (uninstalls) all available interface drivers from the system including the Vector Keyman.
Info	/info <file name>	Creates a new file containing information about the drivers, which are available in this installation package (e. g. the version number).
Install Vector Keyman	/i keyman	Installs only the Vector Keyman.
Install virtual driver and driver components only	/i virtual	Installs the virtual driver and the driver components only.
Uninstall Vector Keyman	/u keyman	Uninstalls the Vector Keyman.
Uninstall the virtual driver and driver components	/u virtual	Uninstalls the virtual driver and the driver components only.
No automatic update	/noAutoUpdate <driver name>	Disables automatic updating of software running on the device when a driver is installed on the host system. The driver name is the name of the device (e. g. vx1161.41). Lower case and upper case will be ignored. If the specified driver does not support this feature, the action is silently ignored.
No automatic update all	/noAutoUpdate all	Disables automatic updating of soft-

Action	Command	Description
		ware running on the device when a driver is installed on the host system for all drivers that support this feature.

Return Values

When executing `setup.exe` in command line mode, the following values may be returned:

Return Value	Description
0	The operation was successful.
1	The installation was not successful.
2	The uninstallation was not successful.
3	Restart of the system is required.
4	Command `/info` could not be executed.
5	User attempted to install/uninstall an unknown driver or component.
6	The setup process was interrupted because the XLAPI DLL is still being used by another process.
7	The setup has been aborted because the driver package is missing mandatory components.

Examples

Command	Action
setup.exe /s /installCert /i all	Installs all interface drivers silently. Except for the Vector USB dongle, the Vector Keyman and the VN8900/VN8810 Ethernet drivers.
setup.exe /s /installCert /i all vnipclient vnipcl8800	Installs all interface drivers silently including the VN8900/VN8810 Ethernet drivers.
setup.exe /s /installCert /i all keyman	Installs all interface drivers silently including the Vector Keyman.
setup.exe /s /installCert /i vn1630	Installs the driver for VN1630(A) silently.
setup.exe /s /i keyman	Installs the driver for the Vector Keyman silently.
setup.exe /s /dongleDLLsOnly /i keyman	Installs only the Vector Keyman API-DLLs silently. The CodeMeter runtime is not installed.
setup.exe /s /dongleDLLsOnly /u keyman	Uninstalls only the Vector Keyman API-DLLs silently. The CodeMeter runtime is not uninstalled.
setup.exe /s /u vn1630	Uninstalls the VN1630 driver from the system silently.
setup.exe /info "Drivers.txt"	Example output of `Drivers.txt` [Common] version=0x703001e root=C:\Drivers\ file1=setup.exe file2=DIFxAPI.dll file3=.\CommonFiles

Command	Action
	[CANboardXL] version=0x7030012 path=.\CANboardXL

18.1.3.2 Remarks

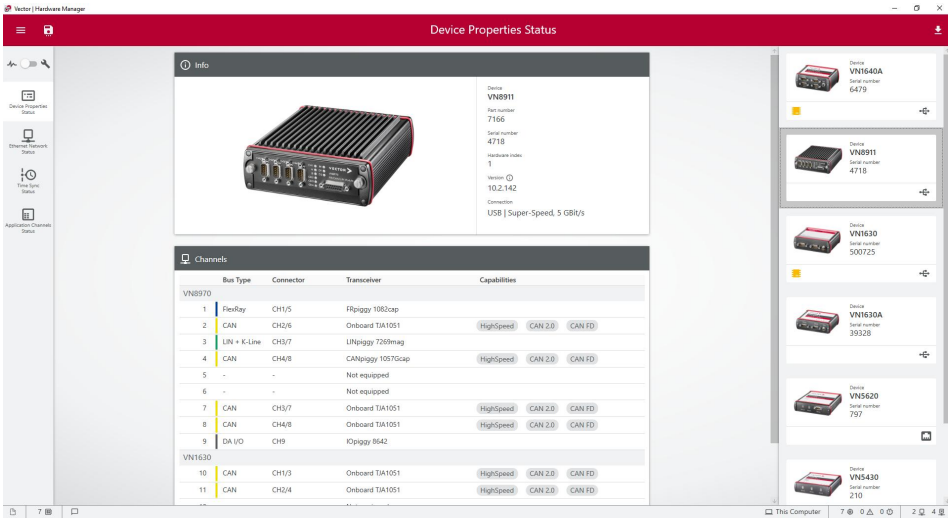
> **Windows 10 (64 bit) / Windows 11 (64 bit)**
  - Recommended installation command:
    `setup.exe /installCert /s /i all`
  - Recommended uninstallation command:
    `setup.exe /s /u all`
  - It is not possible to install the drivers from a network drive.
  - It is possible to pre-install the drivers, if the hardware is currently not connected. In this case, the installation of the driver automatically completes after connecting the device.
  - In order to use the silent mode (`/s`), the Vector certificate must be added to the trusted publishers. The Vector certificate can be added silently during the first installation by specifying the `/installCert` option. Any future installation of a Vector certified driver can be installed silently then.
  - The Vector certificate can also be added to the trusted publishers during the first installation by hitting the checkbox **Always trust content from this publisher**. This installs the Vector certificate locally. Any future installation of a Vector certified driver can be installed silently then.

18.2 Vector Hardware Manager

18.2.1 Hardware Configuration

General information

The **Vector Hardware Manager** is the successor of the Vector Hardware Config tool and a newly developed configuration and diagnostic tool for your installed Vector devices. It is strongly needed to set up your Vector devices for use with your Vector applications (e. g. CANoe, CANalyzer, CANape, ...).



18.2.2 Tool Location and Help

After successful driver installation (see page 338) of your Vector device, you will find the Vector Hardware Manager in the Windows Start menu or in the installation folder:

```
C:\Program Files (x86)\
Vector Hardware Manager\vHardwareManager.exe
```

Reference

Details, tips and instructions for the Vector Hardware Manager can be found in the supplied help.

- You can open the help by pressing **<F1>** in the Vector Hardware Manager or directly via:
- `C:\Program Files (x86)\Vector Hardware Manager-\Help01\HTML5\VectorHardwareManager.htm`
- The most recent version of the help is also available online: `https://help.vector.com/VectorHardwareManager/index.php`

For a brief introduction, we recommend reading the sections **Basic Concept** and **Quick Start Guide**. Furthermore, we have provided addi-

tional information for you in the section **Tips and Tutorials**.

18.3 Linux Driver



Reference

The VN5650 can also be used under Linux. You can find more information about the driver installation on our website.

19 Time Synchronization

In this chapter you find the following information:

19.1 General Information **350**

19.2 Software Sync **352**

19.2.1 General Information 352

19.2.2 Configuration 352

19.3 Hardware Sync **353**

19.3.1 General Information 353

19.3.2 Configuration 354

19.4 Precision Time Protocol Sync **355**

19.4.1 General Information 355

19.4.2 Supported Features 355

19.4.3 Network Topology 356

19.4.4 Configuration 356

19.1 General Information

Time stamps and events

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

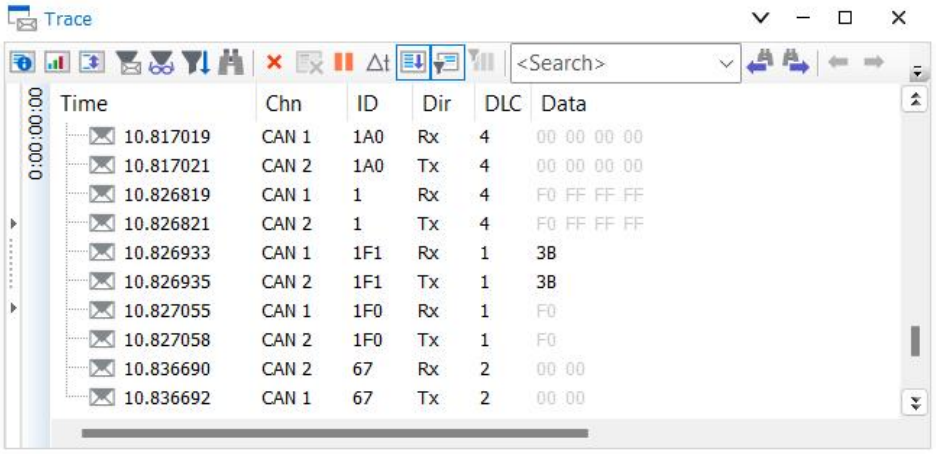


Figure 100: Time stamps of two CAN channels in CANoe

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.

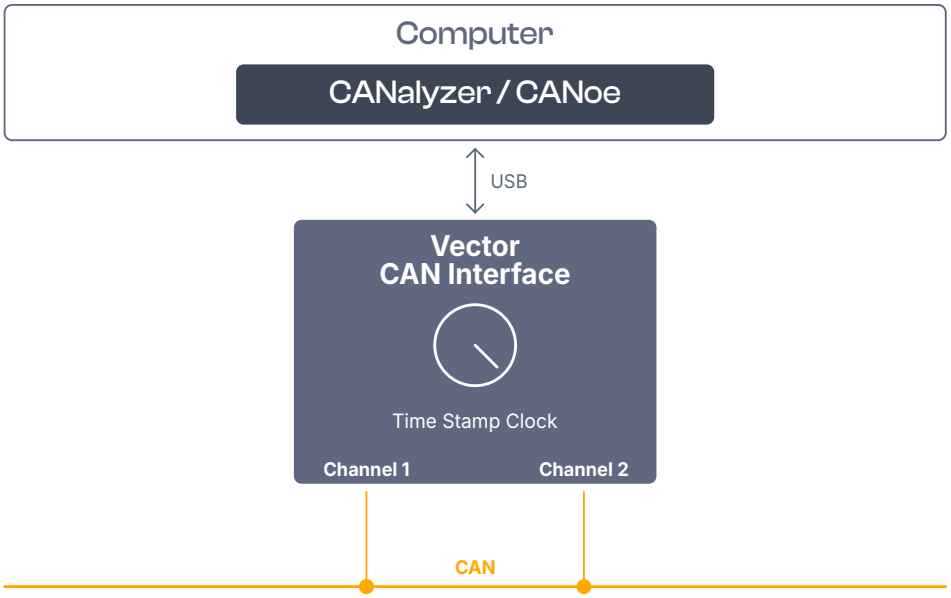


Figure 101: Common time stamp clock for each channel

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.

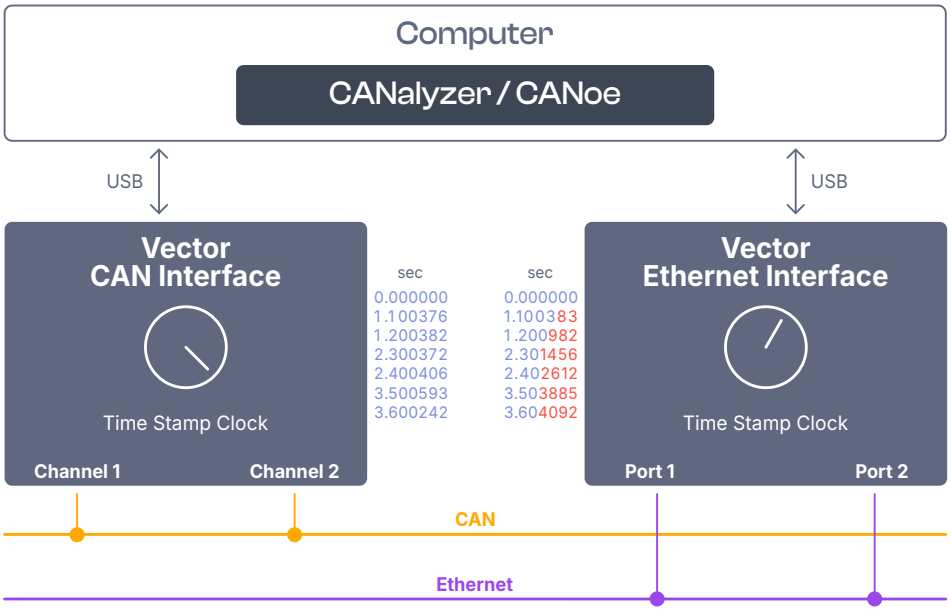


Figure 102: Example of unsynchronized network interfaces. Independent time stamps drift apart

To compensate for these time stamp deviations between the Vector network interfaces, the time stamps can be either synchronized by software, hardware, PTP or GNSS (capability depends on the Vector device).

Note

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

19.2 Software Sync

19.2.1 General Information

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 computer clock. For this purpose no further hardware setup is required.

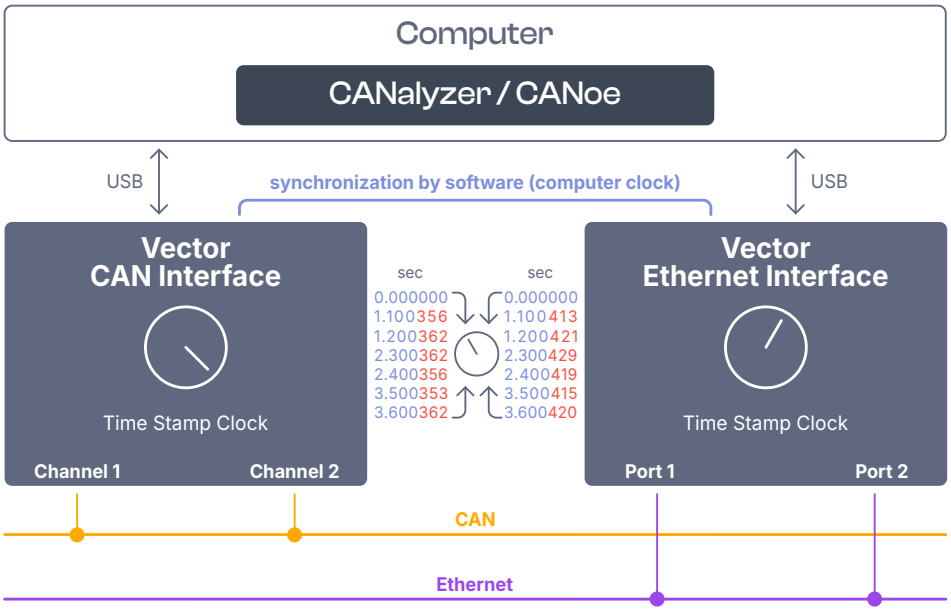


Figure 103: Time stamps of devices are synchronized to the computer clock

Note

Software time synchronization may lead to an increased latency for all connected Vector network interfaces. If a use case requires low latency, deactivate this option and use another synchronization mechanism.

19.2.2 Configuration

Vector Hardware Manager

Use the software synchronization if at least one device has no hardware sync connector. Also to synchronize the device clock to the computer time, use the software synchronization (legacy).

Reference

Further details and tips on the time sync configuration can be found in the Vector Hardware Manager help in section **User Interface | Navigation Rail | Time Sync**.

19.3 Hardware Sync

19.3.1 General Information

Synchronization by hardware

A more accurate time synchronization of multiple devices is provided by the hardware synchronization. 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).

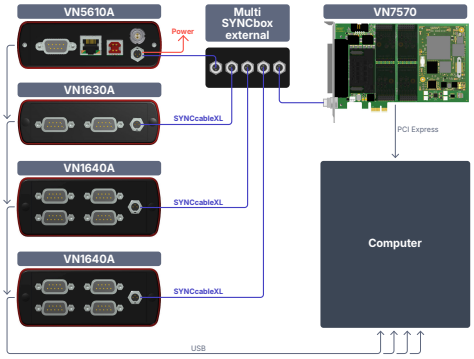


Figure 104: Example of a time synchronization with multiple devices

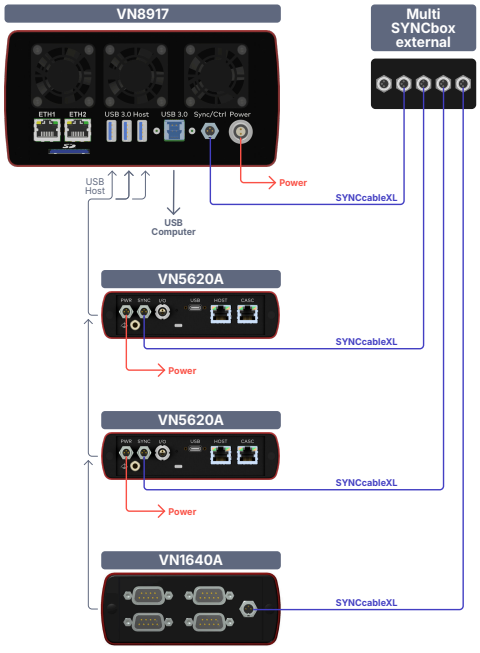


Figure 105: Example of a time synchronization with VN8917 and additional devices

At each falling edge on the sync line which is initiated by the driver, the Vector network interface generates a time stamp that is provided to the

driver. This allows the driver to calculate the deviations between the network interfaces and to synchronize the time stamps to a common time base (master clock) which can be defined by the user.

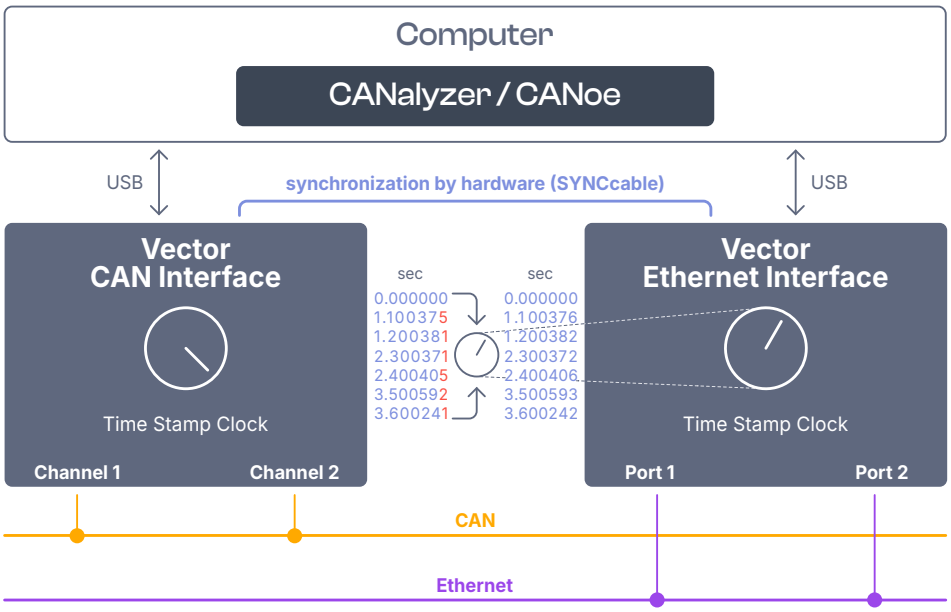


Figure 106: Time stamps are synchronized to the master clock

19.3.2 Configuration

Vector Hardware Manager

Use hardware synchronization if at least one device is connected with USB or PCIe to the PC and all devices are hardware sync capable. One device should be configured as master and all other devices as slaves. Therefore, all devices must be interconnected with SYNCcableXL and Multi SYNCbox external or SYNCbox active.

Reference

Further details and tips on the time sync configuration can be found in the Vector Hardware Manager help in section **User Interface | Navigation Rail | Time Sync**.

19.4 Precision Time Protocol Sync

19.4.1 General Information

Overview

The Precision Time Protocol (PTP) is a protocol used to synchronize clocks through a computer network. On a local area network, it achieves a synchronization accuracy in the sub-microsecond range, making it suitable for measurement and control systems.

Note

The PTP feature can only be used on the Ethernet host ports of these devices. Therefore, it can only be used, if the device is connected via Ethernet host port to the computer.

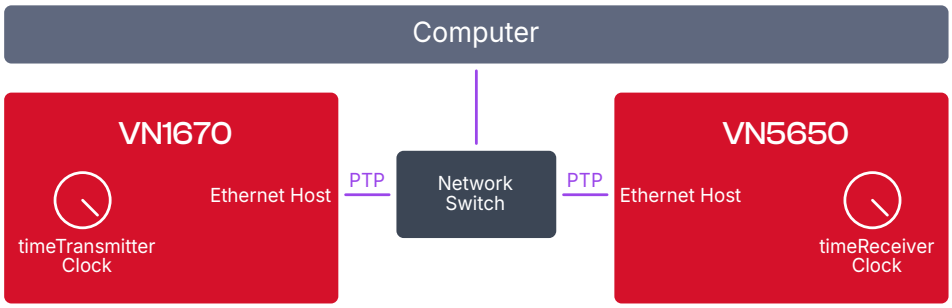


Figure 107: Setup example

19.4.2 Supported Features

Vector network interfaces support time synchronization with IEEE1588-2008 standard. The following IEEE1588 features are supported:

IEEE 1588 Features	VN Device Support
Clock Types	
Ordinary Clock timeTransmitter	✓
Ordinary Clock timeReceiver	✓
Synchronization	
2-step clock	✓
E2E	✓
Best TimeTransmitter Clock Algorithm (BTCA)	✓
Transport	
PTP over UDP with IPv4	✓
PTP over UDP with IPv6	-

IEEE 1588 Features	VN Device Support
Multicast timeTransmitter/timeReceiver	✓
Unicast timeTransmitter/timeReceiver	-
Synchronization accuracy	
1 µs	✓

19.4.3 Network Topology

Network switches

To achieve a maximum accuracy, PTP needs transparent clock support in network equipment. Therefore, a PTP transparent clock capable network switch is strongly suggested.

19.4.4 Configuration

Vector Hardware Manager

Use the PTP synchronization if all devices are connected via Ethernet host port to the PC and one device is configured as master and all other devices are configured as slaves.



Reference

Further details and tips on the time sync configuration can be found in the Vector Hardware Manager help in section **User Interface | Navigation Rail | Time Sync**.

20 Vehicle Electrics and GND/Earth

In this chapter you find the following information:

20.1 General Information **358**

20.2 Vehicle Battery Only (Closed System) **359**

20.3 External Power Supplies (Test Bench) **360**

20.1 General Information



WARNING!

When using Vector devices, ensure that the power supply and earthing are correct. Failure to do so may result in damage to the vehicle electronics or the Vector devices due to overvoltage. Two typical scenarios are described below.

20.2 Vehicle Battery Only (Closed System)

In this scenario, the individual Vector devices are powered directly from the vehicle battery. A third device is powered via USB (e. g. from a notebook in battery mode or from the vehicle battery) or via PCIe (card mounted in a computer and powered from the vehicle battery). The system is therefore closed.

The common reference ground is the chassis, which is connected to the negative terminal of the vehicle battery. Vector devices that have a functional earth connection (FE) must also be connected to the reference ground.

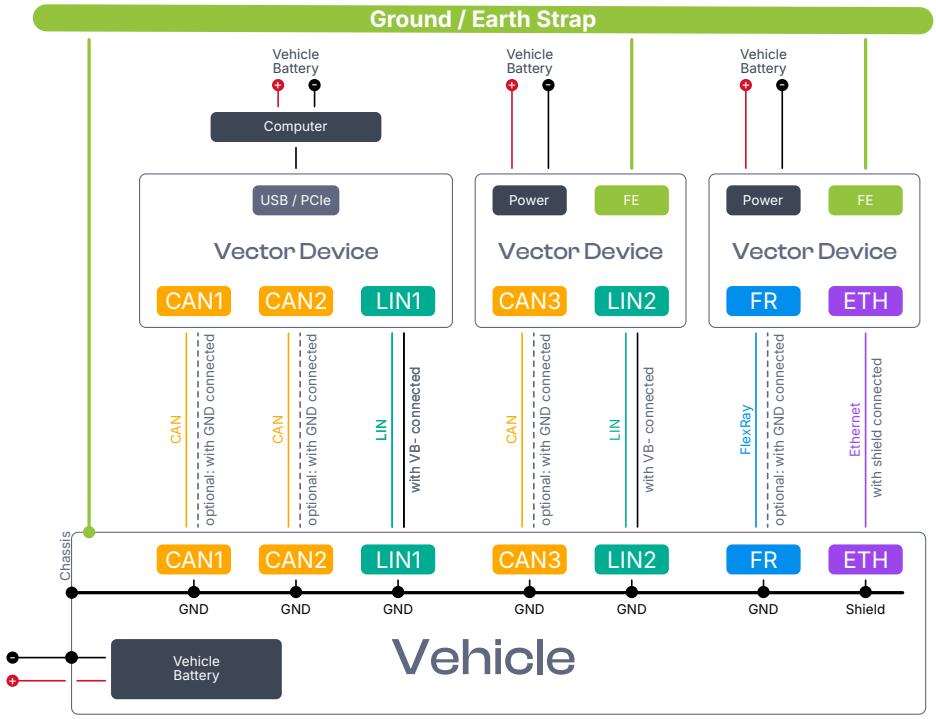


Figure 108: Vector devices powered by vehicle battery

The individual GNDs of the ECUs (in this example CAN, LIN, FlexRay) are connected to the chassis on the vehicle side. The shielding of the Ethernet connections is also connected to the chassis.

In this scenario, LIN VB- must be connected in the LIN signal path (LIN always requires VB- to be connected). For CAN and FlexRay it is recommended to connect all signal GNDs via their connectors (CAN GND, FlexRay GND) to have the same reference ground from the vehicle battery.

20.3 External Power Supplies (Test Bench)

In this scenario, the individual Vector devices are powered by individual power supplies. A third device is powered via USB or PCIe. This is a typical test bench scenario.

The common reference ground is earth, which is also connected to the chassis and to the negative terminal of the vehicle battery. Vector devices that have a functional earth connection (FE) must also be connected to the reference ground.

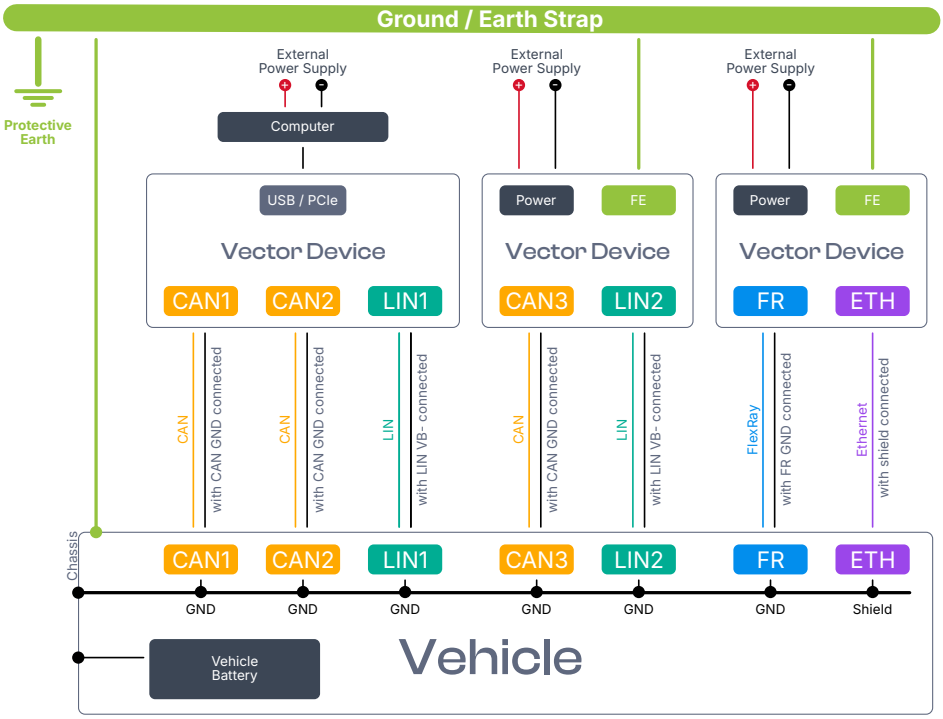


Figure 109: Test bench scenario

The individual GNDs of the ECUs (in this example CAN, LIN, FlexRay) are connected to the chassis on the vehicle side. The shielding of the Ethernet connections is also connected to the chassis.

In this scenario, all signal GNDs must be connected via their connectors (CAN GND, LIN VB-, FlexRay GND) to have the same reference ground.

21 Important Notes - Details

In this chapter you find the following information:

21.1 Safety Instructions and Hazard Warnings 362
21.1.1 Proper Use and Intended Purpose 362
21.1.2 Hazards 363
21.2 Disclaimer 364
21.3 Licenses 365
21.3.1 Google Protocol Buffer 365
21.3.2 Petteri Aimonen Nano Protocol Buffer 365
21.4 CRA Related Information 366
21.5 Disposal of Vector Hardware 367

21.1 Safety Instructions and Hazard Warnings



WARNING!

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.

21.1.1 Proper Use and Intended Purpose



WARNING!

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 work-shops 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.

21.1.2 Hazards



WARNING!

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.

21.2 Disclaimer



WARNING!

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.

21.3 Licenses

21.3.1 Google Protocol Buffer



Reference

This device uses the Google Protocol Buffer. The license information can be found in the separate text file on the Vector Driver Disk in `\Documentation\Licenses`.

21.3.2 Petteri Aimonen Nano Protocol Buffer



Reference

This device uses the Petteri Aimonen Nano Protocol Buffer. The license information can be found in the separate text file on the Vector Driver Disk in `\Documentation\Licenses`.

21.4 CRA Related Information

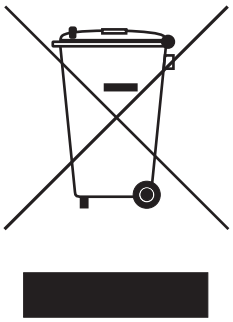
If you suspect a security vulnerability or want to report a security incident, please contact us at the address below or use the contact form on our website:

psirt@vector.com
www.vector.com

Vector Informatik GmbH
Ingersheimer Straße 24
70499 Stuttgart
GERMANY

21.5 Disposal of Vector Hardware

Please handle old devices responsibly and observe the environmental laws applicable in your country. Please dispose of the Vector hardware only at the designated places and not with the household waste.



Within the European Community, the Directive on Waste Electrical and Electronic Equipment (WEEE Directive) and the Directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS Directive) apply.

For Germany and other EU countries, we offer free take-back of old Vector hardware.

Please carefully check the Vector hardware to be disposed of before shipping. Please remove all items that are not part of the original scope of delivery, e.g. storage media. The Vector hardware must also be free of licenses and must no longer contain any personal data. Vector does not perform any checks in this regard. Once the hardware has been shipped, it cannot be returned to you. By shipping the hardware to us, you have relinquished your rights to the hardware.

Please register your old device via our website before shipping it.

22 Wichtige Hinweise

In diesem Kapitel finden Sie die folgenden Informationen:

22.1 Sicherheits- und Gefahrenhinweise 369
22.1.1 Sach- und bestimmungsgemäßer Gebrauch 369
22.1.2 Gefahren 370
22.2 Haftungsausschluss 371
22.3 Lizenzen 372
22.3.1 Google Protocol Buffer 372
22.3.2 Petteri Aimonen Nano Protocol Buffer 372
22.4 Informationen bezüglich CRA 373
22.5 Entsorgung von Vector Hardware 374

22.1 Sicherheits- und Gefahrenhinweise



WARNUNG!

Um Personen- und Sachschäden zu vermeiden, müssen Sie vor der Installation und dem Einsatz dieses Interfaces die nachfolgenden Sicherheits- und Gefahrenhinweise lesen und verstehen. Bewahren Sie diese Dokumentation (Handbuch) stets in der Nähe dieses Interfaces auf.

22.1.1 Sach- und bestimmungsgemäßer Gebrauch



WARNUNG!

Das Interface ist für die Analyse, die Steuerung sowie für die anderweitige Beeinflussung von Regelsystemen und Steuergeräten bestimmt. Das umfasst unter anderem die Bussysteme CAN, LIN, K-Line, MOST, FlexRay, Ethernet, BroadR-Reach oder ARINC 429.

Der Betrieb des Interfaces darf nur im geschlossen Zustand erfolgen. Insbesondere dürfen keine Leiterplatten sichtbar sein. Das Interface ist entsprechend den Anweisungen und Beschreibungen dieses Handbuchs einzusetzen. Dabei darf nur die dafür vorgesehene Stromversorgung, wie z. B. USB-powered, Netzteil, und das Originalzubehör von Vector bzw. das von Vector freigegebene Zubehör verwendet werden.

Das Interface ist ausschließlich für den Einsatz durch geeignetes Personal bestimmt, da der Gebrauch dieses Interfaces zu erheblichen Personen- und Sachschäden führen kann. Deshalb dürfen nur solche Personen dieses Interface einsetzen, welche die möglichen Konsequenzen der Aktionen mit diesem Interface verstanden haben, speziell für den Umgang mit diesem Interface, den Bussystemen und dem zu beeinflussenden System geschult worden sind und ausreichende Erfahrung im sicheren Umgang mit dem Interface erlangt haben.

Die notwendigen Kenntnisse zum Einsatz dieses Interfaces können bei Vector über interne oder externe Seminare und Workshops erworben werden. Darüber hinausgehende und Interface-spezifische Informationen wie z. B. „Known Issues“ sind auf der Vector Webseite unter www.vector.com in der „Vector KnowledgeBase“ verfügbar. Bitte informieren Sie sich dort vor dem Betrieb des Interfaces über aktualisierte Hinweise.

22.1.2 Gefahren



WARNUNG!

Das Interface kann das Verhalten von Regelsystemen und Steuergeräten steuern und in anderweitiger Weise beeinflussen. Insbesondere durch Eingriffe in sicherheitsrelevante Bereiche (z. B. durch Deaktivierung oder sonstige Manipulation der Motorsteuerung, des Lenk-, Airbag-, oder Bremssystems) und/oder der Einsatz des Interfaces in öffentlichen Räumen (z. B. Straßenverkehr, Luftraum) können erhebliche Gefahren für Leib, Leben und Eigentum entstehen. Stellen Sie daher in jedem Fall eine gefahrfreie Verwendung sicher. Hierzu gehört unter anderem auch, dass das System, in dem das Interface eingesetzt wird, jederzeit, insbesondere bei Auftreten von Fehlern oder Gefahren, in einen sicheren Zustand geführt werden kann (z. B. durch Not-Abschaltung).

Beachten Sie alle sicherheitstechnischen Richtlinien und öffentlich-rechtlichen Vorschriften, die für den Einsatz des Systems relevant sind. Zur Verminderung von Gefahren sollte das System vor dem Einsatz in öffentlichen Räumen auf einem nicht-öffentlich zugänglichen und für Testfahrten bestimmten Gelände erprobt werden.

22.2 Haftungsausschluss



WARNUNG!

Soweit das Interface nicht sach- oder bestimmungsgemäß eingesetzt wird, über-nimmt Vector keine Gewährleistung oder Haftung für dadurch verursachte Schäden oder Fehler. Das Gleiche gilt für Schäden oder Fehler, die auf einer mangelnden Schulung oder Erfahrung derjenigen Personen beruhen, die das Interface einsetzen.

22.3 Lizenzen

22.3.1 Google Protocol Buffer



Verweis

Dieses Gerät verwendet den Google Protocol Buffer. Die Lizenzinformation finden Sie als separate Textdatei auf der Vector Driver Disk unter `\Documentation\Licenses`.

22.3.2 Petteri Aimonen Nano Protocol Buffer



Verweis

Dieses Gerät verwendet den Aimonen Nano Protocol Buffer. Die Lizenzinformation finden Sie als separate Textdatei auf der Vector Driver Disk unter `\Documentation\Licenses`.

22.4 Informationen bezüglich CRA

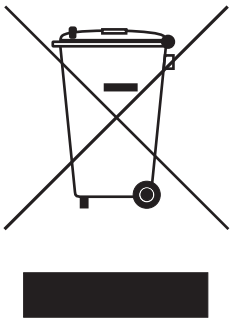
Wenn Sie eine Sicherheitslücke vermuten oder einen Sicherheitsvorfall melden möchten, kontaktieren Sie uns bitte über die unten angegebene Adresse oder über das Kontaktformular auf unserer Webseite:

psirt@vector.com
www.vector.com

Vector Informatik GmbH
Ingersheimer Straße 24
70499 Stuttgart
GERMANY

22.5 Entsorgung von Vector Hardware

Bitte gehen Sie verantwortungsvoll mit Altgeräten um und beachten Sie die in Ihrem Land geltenden Umweltgesetze. Entsorgen Sie die Vector Hardware bitte nur bei den dafür vorgesehenen Stellen und nicht über den Hausmüll.



Innerhalb der Europäischen Gemeinschaft gelten die Richtlinie über Elektro- und Elektronik-Altgeräte (WEEE-Richtlinie) und die Richtlinie zur Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten (RoHS-Richtlinie).

Für Deutschland und andere EU-Länder bieten wir Ihnen eine kostenlose Rücknahme der alten Vector Hardware an.

Bitte überprüfen Sie die zu entsorgende Vector Hardware vor dem Versand sorgfältig. Bitte entfernen Sie alle Gegenstände, die nicht zum ursprünglichen Lieferumfang gehören, z. B. Speichermedien. Die Vector Hardware muss außerdem frei von Lizenzen sein und darf keine personenbezogenen Daten mehr enthalten. Vector führt keine Kontrollen diesbezüglich durch. Sobald die Hardware versandt wurde, kann sie nicht mehr an Sie zurück geliefert werden. Mit dem Versand der Hardware an uns haben Sie Ihre Rechte an der Hardware abgetreten.

Bitte melden Sie vor dem Versand Ihr Altgerät über unsere Webseite an.

VECTOR >

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