PCAN-USB FD

User Manual

Relevant Products

Product name		Part number
PCAN-USB FD	with USB-A port	IPEH-004022
PCAN-USB FD	with USB-C port	IPEH-004023

Imprint

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Contents

1 Introduction

The CAN FD interface PCAN-USB FD allows the connection of CAN CC and CAN FD networks to a computer, depending on the version via a USB-A or USB-C port. The simple handling and its compact plastic casing make the interface suitable for mobile applications. A galvanic isolation of up to 500 Volts decouples the PC from the CAN bus.

The CAN FD standard (CAN with Flexible Data rate) is primarily characterized by higher bandwidth for data transfer. The maximum of 64 data bytes per CAN FD frame (instead of 8 so far) can be transmitted with bit rates up to 12 Mbit/s. CAN FD is downward-compatible to the CAN 2.0 A/B standard, thus CAN FD nodes can be used in existing CAN networks. However, in this case the CAN FD extensions are not applicable.

The monitor software PCAN-View and the programming interface PCAN-Basic for the development of applications with CAN connection are included in the scope of supply and support the standard CAN FD.

Device drivers exist for different operating systems, so programs can easily access a connected CAN bus.

This manual describes the use of the CAN interface with **Windows**. Device drivers and application information for **Linux**: www.peak-system.com/quick/DL-Driver-E

At the end of this manual you can find a Quick Reference with brief information about the installation and operation of the PCAN-USB FD interface.

1.1 Properties at a Glance

- CAN interface for High-speed USB 2.0 (compatible to USB 1.1 and USB 3.0; available with USB-A or USB-C connector)
- High-speed CAN connection (ISO 11898-2)
- Complies with CAN specifications ISO 11898-1 for CAN and CAN FD
- CAN FD support for ISO and Non ISO standard switchable
- CAN FD bit rates for the data field (64 bytes max.) from 25 kbit/s up to 12 Mbit/s
- CAN bit rates from 25 kbit/s up to 1 Mbit/s
- CAN bus connection via D-Sub, 9-pin (in accordance with CiA® 106)
- Time stamp resolution 1 µs
- FPGA implementation of the CAN FD controller
- NXP CAN transceiver TJA1044GT
- Galvanic isolation on the CAN connection up to 500 V
- CAN termination can be activated through a solder jumper
- Measurement of bus load including error frames and overload frames on the physical bus
- Induced error generation for incoming and outgoing CAN messages
- 5-Volt supply to the CAN connection can be connected through a solder jumper, e.g. for external bus converter
- Voltage supply via USB
- Extended operating temperature range from -40 to +85 °C (-40 to +185 °F)

1.2 Scope of Supply

- PCAN-USB FD in plastic casing
- Device drivers for Windows 11 (x64/ARM64), 10 (x64), and Linux
- CAN monitor PCAN-View for Windows
- Programming interface PCAN-Basic for developing applications with CAN connection
- Programming interfaces for standardized protocols from the automotive sector
- Manual in PDF format

1.3 System Requirements

Computer with

- operating system Windows 11 (x64/ARM64), 10 (x64), or Linux
- a vacant USB port (USB 1.1–3.0; USB-A/USB-C) or
  a vacant USB port on the connected active USB hub

2 Settings

The following describes the settings for the power supply of external devices and the internal termination. If you do not need any of these settings, skip this chapter.

2.1 Voltage Supply of External Devices

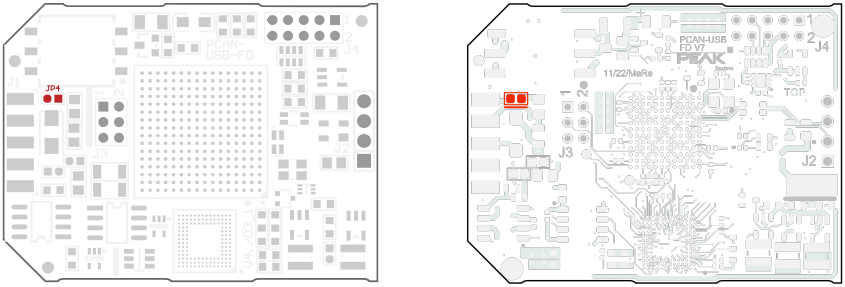
Optionally, an external power supply can be connected via the D-Sub connector using solder bridges at pin 1 and/or pin 9 on the D-Sub connector. This allows external devices to be supplied with a voltage of 5 V DC, such as the PCAN-TJA1054 bus converter for Low-speed CAN. Pin 1 is not assigned at delivery. The current output is limited to 50 mA.

2.1.1 Activate Power Supply

Risk of short circuit! Soldering on the CAN interface may only be performed by qualified electrical engineering personnel.

Attention! Electrostatic discharge (ESD) can damage or destroy components on the card. Take precautions to avoid ESD.

1. Open the CAN interface casing. Push the latches on both sides cautiously with a slotted screwdriver.
2. Remove the circuit board.
3. Set the corresponding solder bridges on the circuit board.



Circuit boards of the published hardware versions

4. For assembly, place the circuit board on the upper half of the housing. The strain relief and the LED must be in the corresponding recesses.
5. Press the lower half of the housing onto the upper half of the housing until the latches engage.

Attention! The voltage supply for external devices is not protected separately. Therefore, turn off the computer before you connect and disconnect CAN cables or peripheral systems. Consider that some computers still supply the USB ports with power even when they are turned off (standby operation).

2.2 Internal Termination

The internal termination can be activated by solder jumpers on the circuit board to terminate one end of the CAN bus. At delivery the termination is not activated.

Tip: We recommend to do termination at the CAN cabling, for example with the terminating resistors PCAN-Term (IPEK-003002) or PCAN-MiniTerm (IPEK-003002-Mini). Thus, CAN nodes can be flexibly connected to the bus.

2.2.1 Activate Internal Termination

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Attention! Electrostatic discharge (ESD) can damage or destroy components on the card. Take precautions to avoid ESD.

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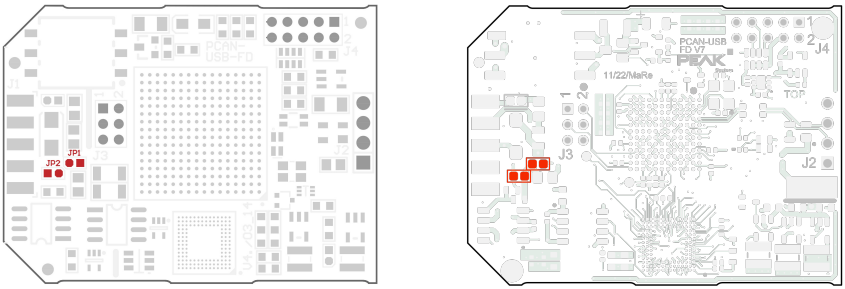


Circuit boards of the published hardware versions

4. For assembly, place the circuit board on the upper half of the housing. The strain relief and the LED must be in the corresponding recesses.
5. Press the lower half of the housing onto the upper half of the housing until the latches engage.

3 Installation

This chapter covers the software setup for the PCAN-USB FD interface under Windows and the connection of the CAN interface to the computer.

> **Note:** For installation under Linux, see Appendix D *Linux*.

Install the driver before you connect the CAN interface.

3.1 Install Device Driver Setup

1. Download the device driver setup from our website: www.peak-system.com/quick/DL-Driver-E
2. Unpack the file `PEAK-System_Driver-Setup.zip`
3. Double-click the file `PeakOemDrv.exe`
   The driver setup starts.
4. Follow the program instructions.

3.2 Connecting the CAN Interface

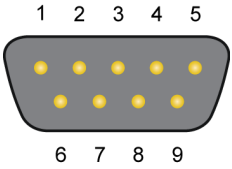
Attention! Do not use a USB extension cable to connect the CAN interface to the computer. Extension cables do not comply with the USB specification.

1. Connect the CAN interface to a USB port of the computer or of a connected USB hub. The computer can remain powered on.
   Windows detects the new hardware and completes the driver installation.
2. Check the LED on the CAN interface. If the LED is green, then the driver was initialized successfully.

4 Connecting the CAN Bus

4.1 Connection over D-Sub Connector

After the CAN interface is connected, a CAN bus can be connected to the D-Sub connector. The pin assignment for CAN corresponds to the specification CiA® 106:

Pin	Assignment	D-Sub plug
1	CAN_V+ (optional)	
2	CAN_Low	
3	CAN_GND	
4	Not connected	
5	Not connected	
6	CAN_GND	
7	CAN_High	
8	Not connected	
9	Not connected	

Low power devices can be supplied directly with 5 Volts over pin 1 of the CAN connector, for example bus converters. Pin 1 is not in use at the delivery state. For more information see section 2.1 *Voltage Supply of External Devices*.

Tip: Connect a CAN bus with a different transmission standard via a bus converter. PEAK-System offers different bus converter modules like the PCAN-TJA1054 for a Low-speed CAN bus according to ISO 11898-3.

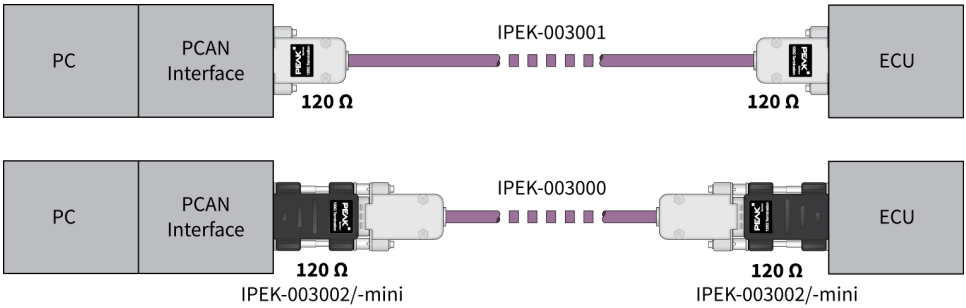
4.2 Cabling

4.2.1 Termination

The High-speed CAN bus (ISO 11898-2) must be terminated with 120 Ω on both ends. The termination prevents interfering signal reflections and ensures the proper operation of the transceivers of the connected CAN nodes (CAN interfaces, control devices).

The PCAN-USB FD has an optional internal termination with 120 Ω. For more information see chapter 2.2 *Internal Termination*.

4.2.2 Example of a Connection



This example shows a connection between the PCAN Interface and a control unit (ECU). The upper example shows a connection with a cable which is terminated with 120 Ω at both ends. At the lower example the connection is made with termination adapters.

4.2.3 Maximum Bus Length

The maximum bus length depends on the nominal bit rate:

Nominal bit rate	Buslength
1 Mbit/s	40 m
500 kbit/s	110 m
250 kbit/s	240 m
125 kbit/s	500 m
50 kbit/s	1.3 km
25 kbit/s	2.5 km

The listed values have been calculated on the basis of an idealized system and can differ from reality.

Note: For CAN FD, the same maximum bus lengths applys as for CAN, despite the higher data bit rate of CAN FD. The dependency is based on the bit rate during the arbitration, called nominal bit rate.

5 Operation

5.1 Status LED

The LED can be in the following states:

Status	Meaning
Green on	There's a connection to a driver of the operating system.
Green slow blinking	A software application is connected to the interface.
Green quick blinking	Data is transmitted via the connected CAN bus.
Red blinking	An error is occurring during the transmission of CAN data.
Orange quick blinking	Identification of an interface when multiple interfaces are plugged.

5.2 Unplugging the USB Connection

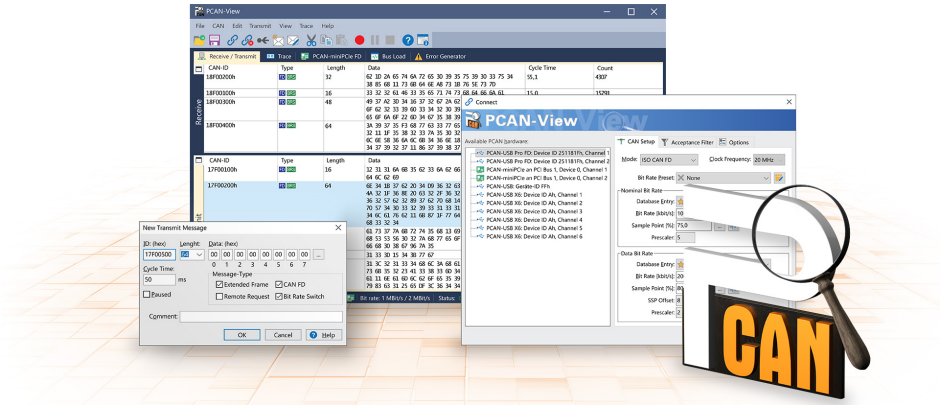
The PCAN-USB FD interface can be disconnected from the computer without further actions. In Windows, the interface is not listed under "Safely Remove Hardware".

5.3 Distinguishing several PCAN-USB FD Interfaces

You can operate several PCAN-USB FD interfaces on a single computer at the same time. The supplied program PEAK-Settings allows the assignment of device IDs in order to distinguish the CAN interfaces in a software environment.

PEAK-Settings is part of the device driver setup and can be started by entering PEAK-Settings in the Windows search bar. More information, see *Distinguishing between multiple CAN interfaces* on page 31

6 CAN Monitor PCAN-View



The CAN monitor PCAN-View is a Windows software for viewing, sending, and recording CAN and CAN FD messages. The software is installed with the installation of the device driver package under Windows.

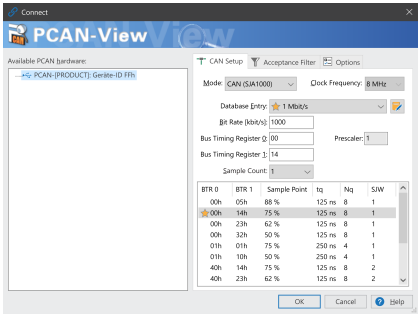
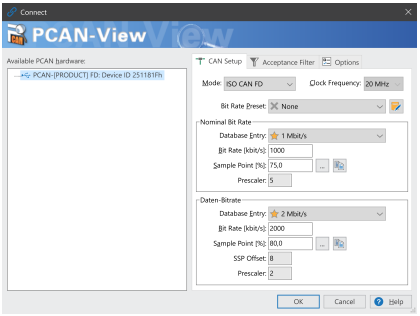
In the following the initialization of a CAN interface is described as an example.

Detailed information about using PCAN-View can be found in the program window under the menu item *Help*.

6.1 Initialize CAN interface

1. Open the program *PCAN-View* via the Windows Start menu.

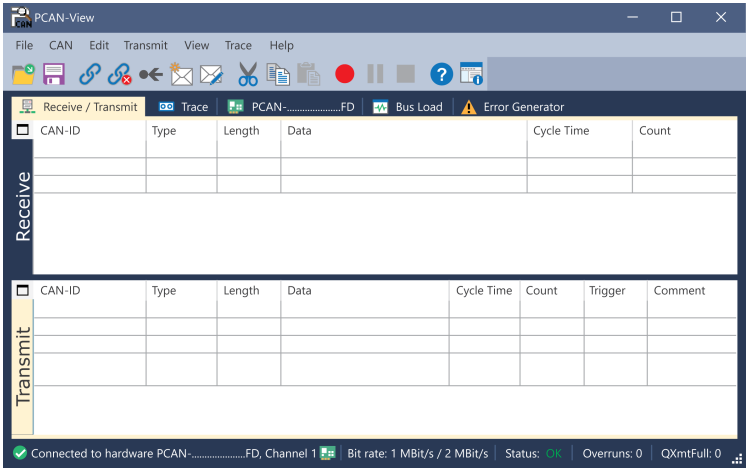
   Depending on the CAN interface the *Connect* dialog is displayed with or without settings for CAN FD.

CAN	CAN FD
	

CAN interface	List entry in *Available Hardware*
USB Interface, 1-channel	see example above
USB Interface, 2-channel	PCAN-USB Pro FD: Device ID 251181Fh, Channel 1 PCAN-USB Pro FD: Device ID 251181Fh, Channel 2
PCIe Interface, 2-channel	PCAN-PCI Express at PCI Bus 1, Device 0, Channel 1 PCAN-PCI Express at PCI Bus 1, Device 0, Channel 2

2. If there are several CAN interfaces, select the desired interface. For multiple channels, select the desired channel from the list.
3. Enter the *bit rate(s)* and other settings according to the connected CAN bus.

4. Confirm the entries with *OK*. The main window appears and displays the *Receive / Transmit* tab.

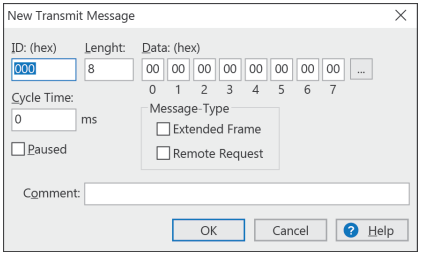
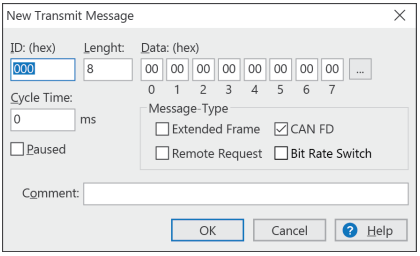


5. For initializing another channel or CAN interface, open another instance of *PCAN-View*.

6.2 Transmit CAN message

1. Select the menu command *Transmit / New Message*.

   Depending on the CAN interface, the dialog box *New Transmit Message* is displayed with or without settings for CAN FD.

CAN	CAN FD
	

1. Enter the *ID*, *Length* and *Data* of the message. Other settings can be made according to the connected CAN bus.
2. Enter a value into the *Cycle Time* field to choose manually or periodically message transmission.

   To transmit periodically enter a value greater than 0.

   To transmit only manually enter the value 0.
3. Confirm the entries with *OK*.

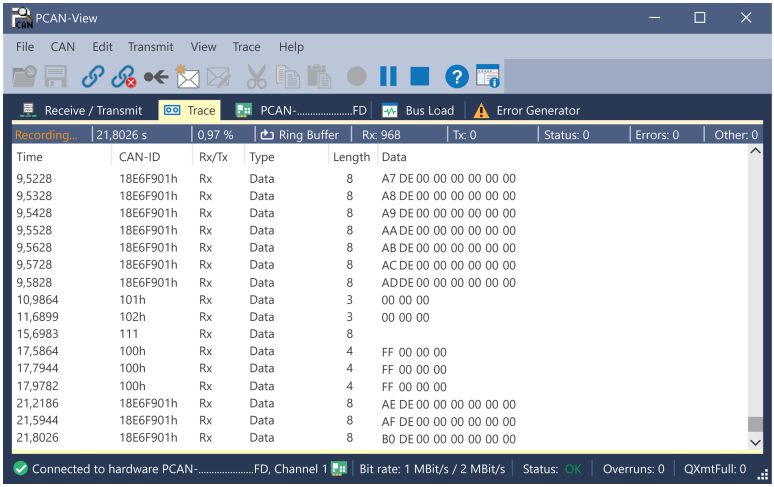
   The created transmit message appears on the *Receive / Transmit* tab.
4. To send the message manually, select the menu command *Transmit* > *Send* or press the space bar.

   The manual transmission process is performed additionally for periodically transmitted CAN messages.

6.3 Additional Tabs

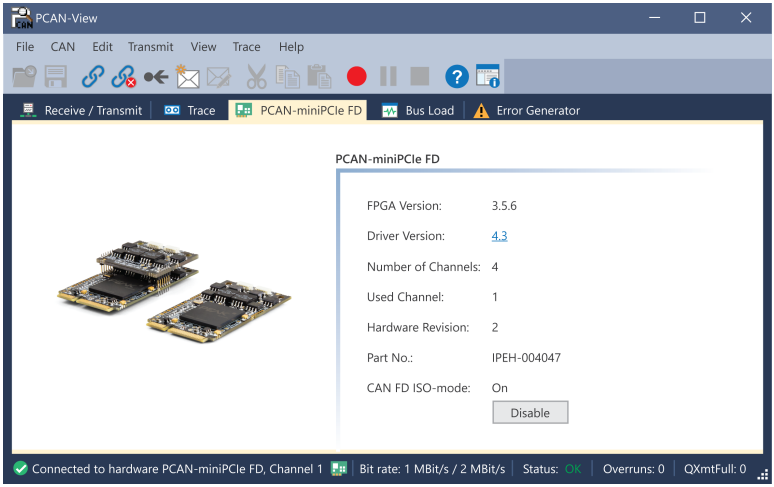
Depending on the CAN interface, additional tabs are available.

6.3.1 Trace Tab



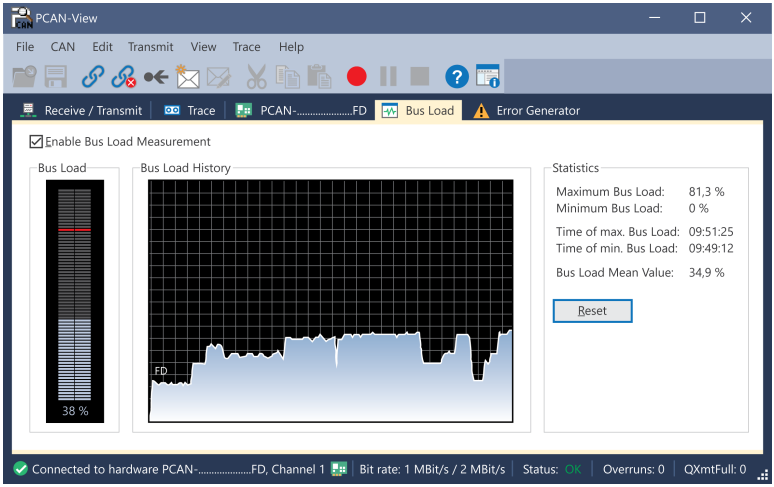
The tracer (data logger) records the communication of the CAN bus in linear or ring buffer mode. The trace data can be saved to a file.

6.3.2 CAN Interface Tab



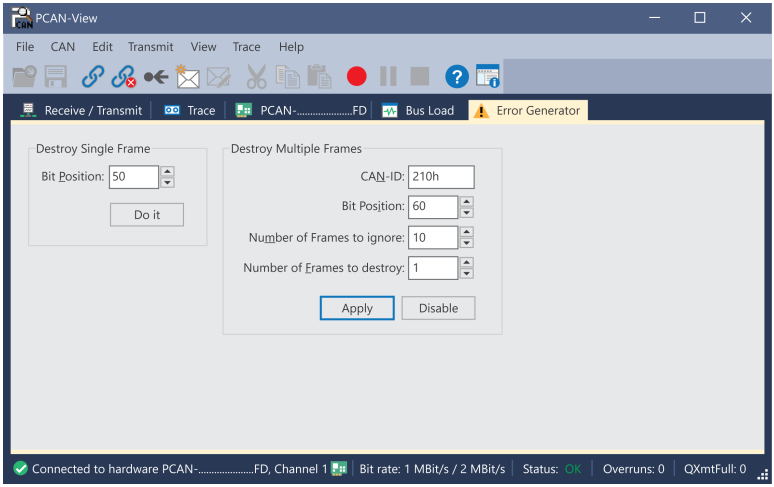
The *CAN interface* tab shows information about the hardware and the used Windows device driver. In this case exemplary for the PCAN-miniPCIe FD. Depending on the CAN interface, a hardware ID can be determined to distinguish several interfaces of the same type.

6.3.3 Bus Load Tab



The *Bus Load* tab displays the current bus load, its time history and statistical information of the connected CAN channel.

6.3.4 Error Generator Tab



Via the *Error Generator* tab the communication on the CAN bus in test environments or during the development of CAN buses can be disturbed in a controlled way by 6 consecutive dominant bits. This is a violation of the CAN protocol on the CAN bus which must be recognized as an error by the connected CAN nodes.

> **Note:** The Error Generator should only be used by experienced users and in the development environment. For further information, please contact our customer support: support@peak-system.com

You can destroy CAN frames with the error generator by one of two methods:

- once after activation
- repeatedly at specific intervals related to a CAN ID

Destroy Single CAN Frame

The *Destroy Single Frame* area refers to the next CAN frame that is recognized after activation.

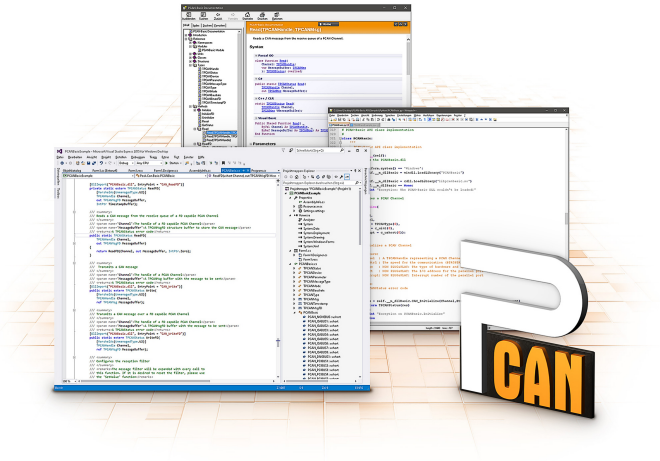
1. Enter the *Bit Position* where in the CAN frame the error is to be generated. The bit position must start after the identifier. The count includes the stuff bits.
2. Execute the destroy action with *Do it*.

   The next received or transmitted CAN frame will be destroyed at the selected bit position.

Destroy Multiple CAN Frames

1. Enter the *CAN ID* of the CAN frame that is intended to be destroyed multiple times. The following specifications refer to this ID.
2. Enter the *Bit Position* where in the CAN frame the error is to be generated. The bit position must start after the identifier. The count includes the stuff bits.
3. If CAN messages are to be sent unharmed before being destroyed, specify the *Number of Frames to ignore*.
4. Determine the *Number of Frames to destroy*.
5. Confirm the entries with *Apply* to activate the error generator.
6. Stop destroying further CAN frames with *Disable*.

7 API PCAN-Basic



The intended use of PCAN-Basic requires compliance with the license rights. Read the license agreement for end users at: https://www.peak-system.com/quick/eula

The programming interface (API) PCAN-Basic provides basic functions for the connection of own programs to CAN CC, CAN FD, and CAN XL buses using Interfaces from PEAK-System. PCAN-Basic is the interface between the program and the device driver. In Windows operating systems, these are DLL files (Dynamic Link Library) and in Linux operating systems an SO (Dynamic Shared Object). PCAN-Basic is designed to be cross-operating system compatible. Software projects can be ported between supported systems with little effort.

With the installation of the device driver package under Windows the DLL files of the API PCAN-Basic are placed in the system folder. Examples for all common programming languages as well as libraries and help files are available as a download package at: www.peak-system.com/quick/DL-Develop-E

For Linux, a download of the API is available under this link. For a use of PCAN-Basic another driver package with a chardev driver is needed, because an access under SocketCAN is not possible. The "Driver Package for Proprietary Purposes", the user manual, and further information about the implementation can be found at https://linux.peak-system.com

7.1 Features of PCAN-Basic

- API for developing applications with CAN CC, CAN FD, and CAN XL connections
- Support for CAN specifications CAN CC (classic CAN 2.0), CAN FD, and CAN XL (ISO 11898-1 2024)
- Application development for the platforms Windows 11 (x64/ARM64), 10 (x86/x64), and Linux
- Multiple PEAK-System applications and your own can be operated on a physical channel at the same time
- Use of up to 16 channels for each hardware type
- Simple switching between channels of a PEAK CAN interface
- Access to the CAN channels of a PCAN-Gateway via the PCAN-LAN hardware type
- Driver-internal buffering of up to 32,768 CAN messages per CAN channel
- Precision of time stamps on received messages up to 1 µs (depending on the PEAK CAN interface used)
- Supports PEAK-System‘s trace formats
  - Version 1.1 for CAN CC recordings
  - Version 2.0 for CAN FD recordings
  - Version 3.0 for CAN XL recordings
- Access to specific hardware parameters, such as listen-only mode
- Notification of the application through Windows® events when a message is received
- Support of CAN error frames
- Confirmation of physical transmission by CAN echo frames
- Extended system for debugging operations
- Multilingual debugging output
- Output language depends on operating system

- Debugging information can be defined individually
- Thread-safe API

7.2 Principle Description of the API

The sequence of accessing the CAN interface is divided into three phases:

Initialization

A CAN channel must be initialized before using it. This is done by the simple call of the function `CAN_Initialize` for CAN CC, `CAN_InitializeFD` for CAN FD, and `CAN_InitializeXL` for CAN XL. Up to 16 CAN channels can be opened at the same time. After a successful initialization the CAN channel is ready. No further configuration steps are required.

Interaction

For receiving and transmitting messages the functions `CAN_Read` and `CAN_Write`, `CAN_ReadFD` and `CAN_WriteFD` , as well as `CAN_ReadXL` and `CAN_WriteXL` are available depending on the initialization mode. Additional settings can be done, such as setting up message filters to confine to specific CAN IDs or setting the CAN controller to Listen-only mode.

With the corresponding parameter activated, events are used to automatically notify an application (client) when CAN messages are received. This offers the following advantages:

- The application no longer needs to check for received messages periodically (no polling).
- The response time at reception is reduced.

Completion

To end the communication the function `CAN_Uninitialize` is called in order to release the reserved resources for the CAN channel, among others. In addition the CAN channel is marked as "Free" and is available to other applications.

8 Hardware Management with PEAK-Settings

PEAK-Settings is a software that can be used to display, manage, and configure all available devices, installed drivers, and APIs of PEAK-System.

8.1 Installation

PEAK-Settings is installed together with the device driver setup of PEAK-System.

8.2 Working with PEAK-Settings

After installation, the software can be started. To do this, enter PEAK-Settings in the search field.

When you run PEAK-Settings, the start page is displayed. From here you can navigate to the individual categories.

Distinguishing between multiple CAN interfaces

All connected **CAN interfaces** are listed in the CAN hardware area. Information about the device ID, the GUID, the firmware version and the number of channels can be called up here.

You can operate several interfaces of the same type on one computer. The device ID and GUID make it possible to identify the hardware in a software environment. The GUID is an unchangeable, unique string. The device ID, on the other hand, can be configured with PEAK settings as follows.

1. Click on CAN Hardware to display the connected hardware.
2. Enter a hexadecimal number ending in “h” as the new hardware ID.
3. Confirm the entry with Set.

9 Technical Specifications

Connectors	
CAN	D-Sub (m), 9 pins, pin assignment according to CiA® 106
USB	High-speed USB 2.0, compatible with USB 1.1 and USB 3.0, available with USB-A or USB-C connector

CAN		
Protocols on OSI layer 2	CAN FD ISO 11898-1:2015, CAN FD non-ISO, CAN 2.0	
Physical transmission, OSI layer 1	ISO 11898-2 (High-speed CAN)	
CAN bit rates	Nominal:	25 kbit/s to 1 Mbit/s
CAN FD bit rates	Nominal: Data:	25 kbit/s to 1 Mbit/s 25 kbit/s to 12 Mbit/s
Controller	FPGA implementation	
Transceiver	NXP TJA1044GT	
Galvanic isolation	up to 500 V	
Supplying external devices	D-Sub pin 1; 5 V, max. 50 mA, not activated at delivery	
Internal termination	via solder bridges 120 Ohm between CAN-High and CAN-Low, not activated at delivery	
Time stamp resolution	1 µs	

Power supply	
Supply voltage	+5 V DC (via USB port)
Power consumption	max. 170 mA

Measures	
Size (w/o cable)	75 x 43 x 22 mm
Length (connection cable)	approx. 0.75 m
Weight (with cable)	max. 68 g

Environment	
Operating temperature	-40 to +85 °C / -40 to +185 °F
Temperature for storage and transport	-40 to 100 °C / -40 to +212 °F
Relative humidity	15 to 90 %, not condensing
Ingress protection (IEC 60529)	IP20

Conformity	
RoHS	EU Directive 2011/65/EU (RoHS 2) + 2015/863/EU DIN EN IEC 63000:2019-05
EMC	EU Directive 2014/30/EU DIN EN 55032:2022-08 DIN EN 55035:2018-04

Appendix A CE Certificate

EU Declaration of Conformity

This declaration applies to the following product:

Product name:	**PCAN-USB FD**
Item number(s):	**IPEH-004022, IPEH-004023**
Manufacturer:	PEAK-System Technik GmbH Leydheckerstraße 10 64293 Darmstadt Germany

CE We declare under our sole responsibility that the mentioned product is in conformity with the following directives and the affiliated harmonized standards:

EU Directive 2011/65/EU (RoHS 2) + 2015/863/EU (amended list of restricted substances)

DIN EN IEC 63000:2019-05
Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances (IEC 63000:2016);
German version of EN IEC 63000:2018

EU Directive 2014/30/EU (Electromagnetic Compatibility)

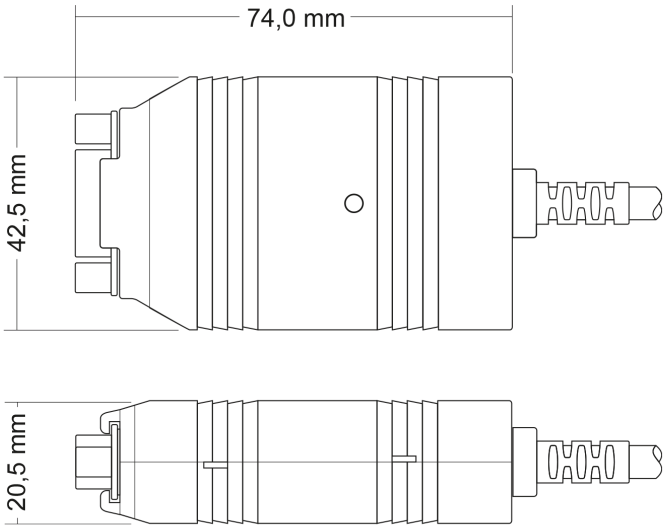
DIN EN 55032:2022-08
Electromagnetic compatibility of multimedia equipment - Emission requirements (CISPR 32:2015);
German version of EN 55032:2015 + AC:2016 + A11:2020 + A1:2020

DIN EN 55035:2018-04
Electromagnetic compatibility of multimedia equipment - Immunity requirements (CISPR 35:2016, modified);
German version of EN 55035:2017

Darmstadt, 10 December 2025

Andreas Staat, Engineering Manager Hardware

Appendix B Dimension Drawings



Appendix C Quick Reference

Software/Hardware Installation under Windows

Download the device drivers installation package from our website www.peak-system.com/quick/DL-Driver-E. Install the driver before you install the CAN interface.

After driver installation connect the CAN interface to a USB port of the computer or of a connected USB hub. The new hardware is recognized by Windows and the driver is initialized. The LED on the interface then lights up green.

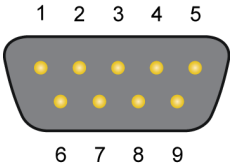
Check the operational readiness. Open the Windows Start menu. Type `Peak Settings` and press Enter. The window *PEAK Settings* appears. The connected USB interface is displayed under *CAN Hardware*.

Getting Started under Windows

Run the CAN monitor PCAN-View from the Windows Start menu as a sample application for accessing the CAN interface. For initialization of the CAN interface select the desired CAN channel and CAN bit rate.

Status	Meaning
Green on	There's a connection to a driver of the operating system.
Green slow blinking	A software application is connected to the interface.
Green quick blinking	Data is transmitted via the connected CAN bus.
Red blinking	An error is occurring during the transmission of CAN data.
Orange quick blinking	Identification of an interface when multiple interfaces are plugged

High-speed CAN connector (D-Sub, 9 pins)

Pin	Assignment	D-Sub plug
1	CAN_V+ (optional)	
2	CAN_Low	
3	CAN_GND	
4	Not connected	
5	Not connected	
6	CAN_GND	
7	CAN_High	
8	Not connected	
9	Not connected	

Appendix D Linux

Depending on the Kernel version, device drivers for the CAN interfaces from PEAK-System are already included in the operating system. The PCAN interfaces are handled as network devices (SocketCAN, netdev). You can find the documentation for SocketCAN under:
https://www.kernel.org/doc/Documentation/networking/can.txt

The following command lists the available drivers:

```
grep PEAK_ /boot/config-`uname -r`
```

Whether the required driver for the PCAN interface is present and loaded can be checked with the following command:

```
lsmod | grep ^peak check
```

If the initialization was successful, the response line starts with `peak_usb`.

You can find a recent list of which PCAN interface is supported from which kernel version onwards on our Linux website.

> **Attention:** Since the end of 2022 there is PCAN-USB FD with a different hardware version, which is only supported with kernel 6.x and higher or with the peak-linux-driver-8.15.

If the required drivers are not listed, install the "Driver Package for Proprietary Purposes". The download and documentation for the driver can also be found on:
https://linux.peak-system.com

This driver package is also needed to use the APIs based on the chardev driver, for example PCAN-Basic, libpcan, or libpcanfd.

Appendix E Disposal and Recycling

You must dispose of this product properly according to local laws and regulations. Because this product contains electronic components, it must be disposed of separately from household waste. When this product reaches its end of life, contact local authorities to learn about disposal and recycling options, or simply drop it off at your local HMS office or return it to HMS.

For more information, see www.hms-networks.com.