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PCAN-USB Pro FD

CAN FD and LIN Interface for High-Speed USB 2.0

User Manual



Document version 1.4.1 (2020-01-08)

PEAK System

Relevant products

Product name	Model	Part number
PCAN-USB Pro FD		IPEH-004061

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1 Introduction

The PCAN-USB Pro FD adapter enables the connection of CAN FD and LIN networks to a computer via USB. Two field buses can be connected at the same time, up to four with appropriate adapter cables (2 x CAN FD, 2 x LIN). Each CAN FD channel is separately isolated against USB and LIN with a maximum of 500 Volts. Its robust aluminum casing makes the PCAN-USB Pro FD adapter suitable for mobile applications.

The new 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 new standard CAN FD.

The monitor application PLIN-View Pro as well as the PLIN programming interface are included in the scope of supply.

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



Tip: At the end of this manual (Appendix C) you can find a **Quick Reference** with brief information about the installation and operation of the PCAN-USB Pro FD adapter.

1.1 Properties at a Glance

- Adapter for High-speed USB 2.0
  (compatible to USB 1.1 and USB 3.0)
- Transmitting and receiving of CAN FD and LIN messages using 2 D-Sub connections (both with pin assignment for CAN FD and LIN bus)
- Time stamp resolution 1 µs
- 5-Volt supply at the D-Sub connector can be activated through a solder jumper, e.g. for external bus converter
- Voltage supply via USB
- Extended operating temperature range -40 - 85 °C (-40 - 185 °F)

CAN operation properties

- Complies with CAN specifications 2.0A/B and 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
- FPGA implementation of the CAN FD controller
- NXP TJA1044GT CAN transceiver
- Each CAN FD channel is separately opto-decoupled against USB and LIN up to 500 V
- CAN termination can be activated through a solder jumper, separately for each CAN channel
- Measurements of bus load including error frames and overload frames on the physical bus
- Induced error generation for incoming and outgoing CAN messages

LIN operation properties

- Bit rates from 1 up to 20 kbit/s
- TJA1021/20 LIN transceiver
- Compliant with all LIN specifications (up to version 2.2)
- Both LIN channels (common ground) are opto-decoupled against USB and CAN FD
- Can be used as a LIN master or slave (1 ms master task resolution)
- Automatic bit rate, frame length, and checksum type recognition
- Autonomous scheduler with support for unconditional, event, and sporadic frames
- Hardware can work through a schedule table (up to 8 tables can be configured with a total of 256 slots)

Note: This manual describes the use of the PCAN-USB Pro FD with **Windows**. You can find CAN drivers for **Linux** and the corresponding application information on the provided DVD in the directory branch `Develop` and on our website under www.peak-system.com/linux.

1.2 System Requirements

- Operating system Windows 10, 8.1, 7 (32/64-bit) or Linux (32/64-bit)
- A vacant USB port (USB 1.1, USB 2.0 or USB 3.0) at the computer or at a USB hub connected to the computer
- For LIN operation: supply voltage 8 to 18 V for the LIN transceiver (e.g. car battery)

Note: Do not use a USB extension cable to connect the PCAN-USB Pro FD adapter to the computer. The use of an extension cable does not comply with the USB specification and can lead to malfunction of the adapter.

1.3 Scope of Supply

- PCAN-USB Pro FD in aluminum casing
- CAN FD interface drivers for Windows 10, 8.1, 7 and Linux (32/64-bit)
- LIN interface drivers for Windows 10, 8.1, 7 (32/64-bit)
- CAN monitor PCAN-View for Windows
- LIN monitor PLIN-View Pro for Windows
- Programming interface PCAN-Basic for developing applications with CAN connection
- Programming interface PLIN-API for developing applications with LIN connection
- Programming interfaces for standardized protocols from the automotive sector
- Manual in PDF format

Note: Since the application possibilities of the PCAN-USB Pro FD adapter are various, special cable adapters for connecting the CAN and LIN buses are not provided. Therefore you need a 9-pin D-Sub female connector for your appliances to be connected individually.

2 Installing the Software and the Adapter

This chapter covers the software setup for the PCAN-USB Pro FD adapter under Windows and the connection of the adapter to a computer.

Install the driver before you connect the adapter to the computer.

2.1 Installing the Device Driver and PLIN-View Pro

In order to operate the PCAN-USB Pro FD on a Windows PC, you must install the suitable device driver. This is available on the provided Product DVD. During the installation process, the LIN monitoring software PLIN-View Pro is installed automatically.

Do the following to install the drivers:

1. Start `Intro.exe` from the supplied DVD.

   The navigation program starts.

2. Select in the main menu **Drivers** and click on **Install now**.

3. Confirm the message of the User Account Control related to "Installer database of PEAK Drivers".

   The driver setup starts.

4. Follow the instructions of the program. When getting to the components selection, add the **LIN Driver** (other components as needed).

   The LIN monitoring software PLIN-View Pro is installed automatically.

2.2 Connecting the PCAN-USB Pro FD

Do the following to connect the adapter:

Note: Do not use a USB extension cable to connect the PCAN-USB Pro FD adapter to the computer. The use of an extension cable does not comply with the USB specification and can lead to malfunction of the adapter.

1. Connect the adapter to a USB port at the computer. The computer can remain powered on.

   Windows detects the new hardware and completes the driver installation.

2. Check the LEDs on the adapter. If the LEDs are green, then the driver was initialized successfully.

3 Connecting the CAN and LIN Bus

Both D-Sub connectors on the PCAN-USB Pro FD adapter are each used for connecting one CAN and one LIN bus. The pin assignment is identical for both D-Sub connectors.

Note: Since the application possibilities of the PCAN-USB Pro FD adapter are various, special cable adapters for connecting the CAN and LIN buses are not provided. Therefore you need a 9-pin D-Sub female connector for your appliances to be connected individually.

3.1 CAN Connection over D-Sub Connector

Two High-speed CAN buses (ISO 11898-2) can be connected, one to each D-Sub connector. The pin assignment for CAN corresponds to the specification CiA® 303-1.

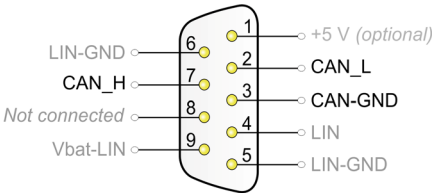


Figure 1: CAN pin assignment of the D-Sub connector

With the pin 1 devices with low power consumption (e.g. bus converters) can be directly supplied via the CAN connector. At delivery these pin are not assigned. You can find a detailed description about the activation in the following section 3.3.

Each CAN connection separately has a **galvanic isolation** up to 500 V against USB and LIN.

Tip: You can connect a CAN bus with a different transmission standard via a bus converter. PEAK-System offers different bus converter modules (e.g. PCAN-TJA1054 for a Low-speed CAN bus according to ISO 11898-3).

3.2 LIN Connection over D-Sub Connector

Two LIN buses can be connected, one to each D-Sub connector.

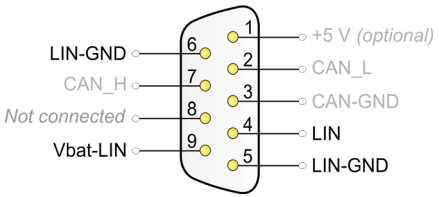


Figure 2: LIN pin assignment of the D-Sub connector

For the LIN operation an additional supply voltage must be applied to pin **Vbat-LIN** (8 - 18 V DC, e.g. car battery). Both LIN connections need their own supply.

Both LIN connections have a common **galvanic isolation** up to 500 V against USB and CAN. The LIN connections are not galvanically isolated against each other.

3.3 Voltage Supply of External Devices

External devices with low power consumption (e.g. bus converters) can be directly supplied via the CAN connector. With a solder bridge per CAN channel on the PCAN-USB Pro FD board (casing opened), a 5-Volt supply can optionally be routed to pin 1 of the D-Sub connector. The current output is limited to 50 mA.

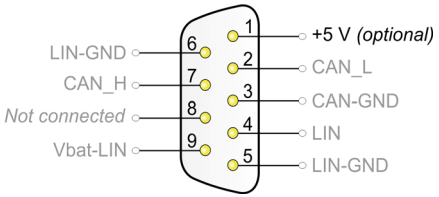


Figure 3: External 5-Volt supply at the D-Sub connectors

Tip: On request we deliver the device configured with this option.

Do the following to activate the voltage supply:

Risk of short circuit! Solder with great care to avoid unwanted short circuits on the card.

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

1. Remove the three screws at the back of the casing.

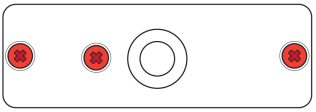


Figure 4: Attachment points at the back side of the casing

2. Remove the two outer screws next to the D-Sub connectors at the front of the casing.

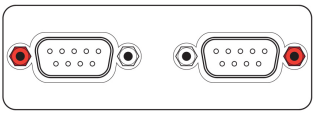


Figure 5: Attachment points of the D-Sub connectors at the front side of the casing

3. Remove the casing cover.
4. Lift the back of the case and slide the circuit board in direction of the front over the lower part of the casing. The bottom of the circuit board is accessible now.
5. Set the solder bridges on the circuit board of the adapter to activate the termination.

   Figure 6 shows the positions of the solder fields for the termination.
6. Reassemble the device. Slide the circuit board back into the lower part of the casing.
7. Close the casing cover.
8. Screw the front and back side (Figure 4 and Figure 5).

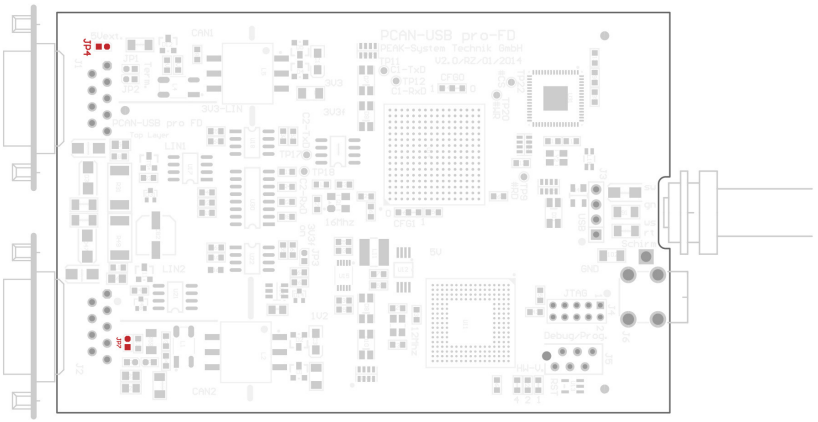


Figure 6: Top view **PCAN-USB Pro FD** board,
solder fields JP4/JP7

D-Sub connector	Solder field	5-Volt supply	
		Without (standard)	With (Pin 1)
CAN1	JP4		
CAN2	JP7		

Risk of short circuit! The 5-Volt supply 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).

3.4 Activating the Internal CAN Termination

The termination can be activated by solder jumpers for each channel on the board. At delivery the termination is not activated. A High-speed CAN bus (ISO 11898-2) must be terminated on both ends with 120 Ohms. Otherwise disturbances may arise. If a CAN bus is not terminated correctly, activate the internal termination.

Do the following to activate the internal termination:

Risk of short circuit! Solder with great care to avoid unwanted short circuits on the card.

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

1. Remove the three screws at the back of the casing.

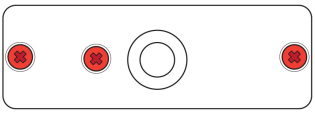


Figure 7: Attachment points at the back side of the casing

2. Remove the two outer screws next to the D-Sub connectors at the front of the casing.

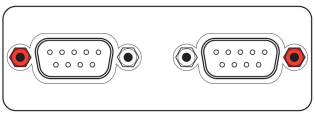


Figure 8: Attachment points of the D-Sub connectors at the front side of the casing

3. Remove the casing cover.

4. Lift the back of the case and slide the circuit board in direction of the front over the lower part of the casing. The bottom of the circuit board is accessible now.
5. Set the solder bridges on the circuit board of the adapter to activate the internal termination.

   Figure 9 shows the positions of the solder fields for the termination.
6. Reassemble the device. Slide the circuit board back into the lower part of the casing.
7. Close the casing cover.
8. Screw the front and back side (Figure 7and Figure 8).

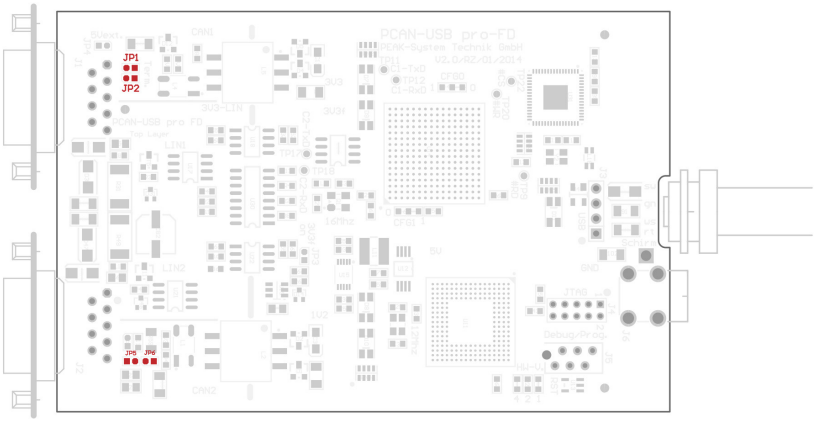


Figure 9: Top view **PCAN-USB Pro FD** board,
solder fields JP1/JP2 and JP5/JP6

D-Sub connector	Solder fields	Internal termination	
		Without (standard)	Active
CAN1	JP2 and JP3		
CAN2	JP5 and JP6		

3.5 Cabling

3.5.1 Termination

The High-speed CAN bus (ISO 11898-2) must be terminated with 120 ohms at both ends. The termination prevents interfering signal reflections and ensures the proper operation of the transceiver of the connected CAN nodes (CAN interface, control device).

The PCAN-USB Pro FD adapter has an internal termination. For more information, see chapter 3.4.

3.5.2 Example of a Connection

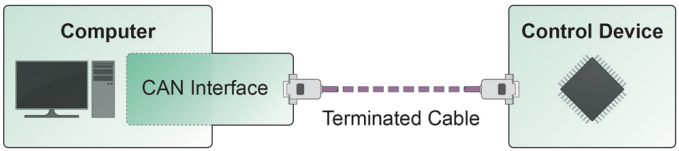


Figure 10: Simple CAN connection

In this example, the PCAN-USB Pro FD adapter is connected with a control unit by a cable that is terminated with 120 ohms at both ends.

3.5.3 Maximum Bus Length

High-Speed-CAN networks may have bit rates of up to 1 Mbit/s. The maximum bus length depends primarily on the bit rate.

The following table shows the maximum possible CAN bus length at different bit rates:

Bit rate	Bus length
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 apply 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. The nominal bite rate at CAN FD can be up to 1 Mbit/s.

4 Operation

4.1 Status LEDs

For indication of operating conditions the PCAN-USB Pro FD adapter has several LEDs.



Figure 11: Layout of the LEDs on the casing

LED	Status	Meaning
USB	Green on	A High-speed USB connection (USB 2.0) with a computer is established.
	Green blinking	Communication is occurring on the High-speed USB connection (USB 2.0).
	Orange on	A Full-speed USB connection (USB 1.1) with a computer is established.
		The PCAN-USB Pro FD adapter is in suspend mode (only voltage supply via USB cable, e.g. during computer standby).
	Orange blinking	Communication is occurring on the Full-speed USB connection (USB 1.1).

LED	Status	Meaning
CAN1/2	Green on	The CAN interface is initialized. There's a connection to a driver of the operating system.
	Green slow blinking	A software application is connected to the CAN interface.
	Green quick blinking	Data is transmitted via the connected CAN bus.
	Red quick blinking	An error is occurring during the transmission of CAN data, e.g. OVERRUN or BUSHEAVY.
LIN1/2	Green on	There's a connection to a driver of the operating system.
	Green slow blinking	The LIN interface is initialized with a valid bit rate. A software application is connected to the LIN interface.
	Green quick blinking	Data is transmitted via the connected LIN bus.

4.2 Unplugging the USB Connection

On Windows, the icon for removing hardware safely is not used with the PCAN-USB Pro FD adapter. You may unplug the adapter from the computer without any preparation.

4.3 Distinguishing Several PCAN-USB Pro FD Adapters

You can operate several PCAN-USB Pro FD adapters on a single computer at the same time. To be able to distinguish the interfaces in a software environment, assign a **Device number** for CAN and a **Hardware ID** for LIN, which is permanently stored in the interface, to each interface.

Do the following to set the device number (CAN) and the hardware ID (LIN) for the PCAN-USB Pro FD:

1. Make sure that the PCAN-USB Pro FD is connected to the PC and is initialized.

9. Open the Windows Start menu, type `peakcpl`, and press the Enter key.

   The **PEAK Hardware Properties** window and the **CAN Hardware** tab are displayed.

2. Click on **Set Device Number** on the **CAN Hardware** tab.

3. Enter a number (either decimal or hexadecimal with extension "h") as the new device number and confirm with **OK**.

4. Now switch to the **LIN Hardware** tab and select **PCAN-USB Pro FD** from the list.

5. Click on the **Set Hardware ID** button.

6. Enter a number (either decimal or hexadecimal with suffix “h”) as the new hardware ID and confirm with **OK**.



Tip: Add the assigned hardware ID to the casing of the PCAN-USB Pro FD, e.g. with a sticker, in order to quickly distinguish similar interfaces.

5 Software and API

This chapter covers the provided software PCAN-View and PLIN-View Pro and the programming interfaces PCAN-Basic and the PLIN-API.

5.1 Monitor Software PCAN-View

PCAN-View is simple Windows software for viewing, transmitting, and logging CAN and CAN FD messages.

Note: This chapter describes the use of PCAN-View with a CAN FD adapter.

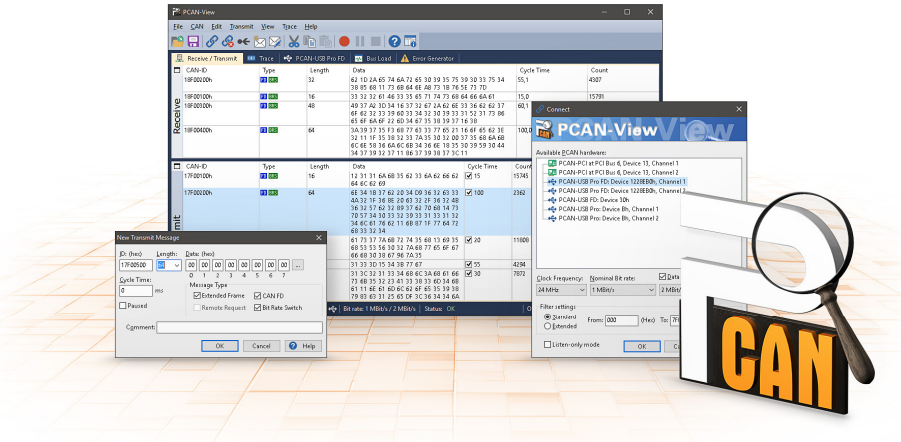


Figure 12: PCAN-View for Windows

Do the following to start and initialize PCAN-View:

1. Open the Windows Start menu and select **PCAN-View**.

   The **Connect** dialog box appears.

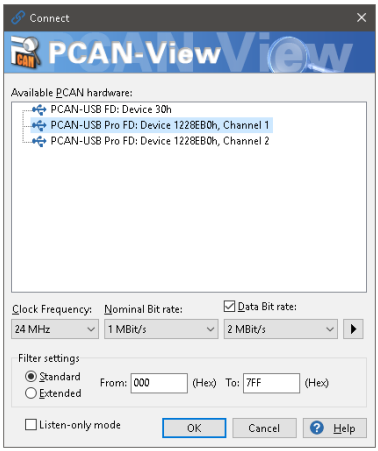


Figure 13: Selection of the specific hardware and parameters

2. Select an interface from the list.
3. From the drop-down menu, choose a **Clock Frequency**. The selectable bit rates in the following are based on this setting.
4. From the drop-down list, select a **Nominal Bit rate**, which is used for the arbitration phase (max. 1Mbit/s).
5. Enable the **Data Bit rate** checkbox.
6. From the drop-down menu, choose an additional **Data Bit rate** for the CAN FD bus. The bit rate selected here is used to transfer the data fields of a CAN FD frame with a higher bit rate.

Note: Both transmission rates must match those which are used by all nodes on the CAN bus.

Tip: You can create custom bit rates by using the button (▸).

7. Under **Filter settings** you can limit the range of CAN IDs to be received, either for standard frames (11-bit IDs) or for extended frames (29-bit IDs).
8. Activate the **Listen-only mode** if you do not actively take part in the CAN traffic and just want to observe. This also avoids an unintended disruption of an unknown CAN environment (e.g. due to different bit rates).
9. Confirm the settings in the dialog box with **OK**. The main window of PCAN-View appears (see Figure 14).

5.1.1 Receive/Transmit Tab

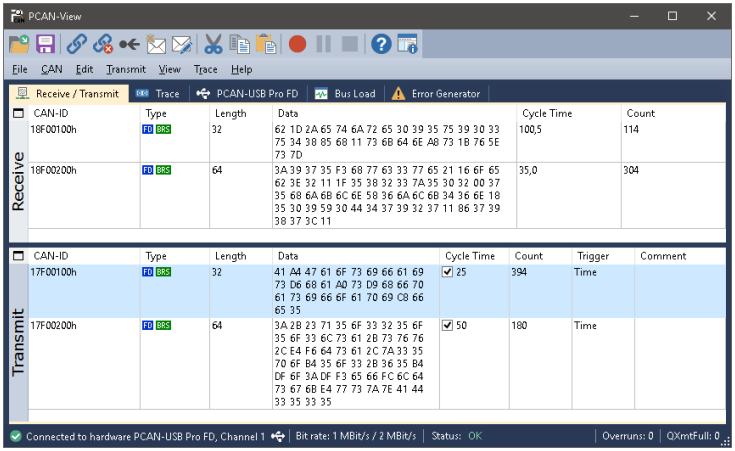


Figure 14: Receive/Transmit tab

The **Receive/Transmit** tab is the main element of PCAN-View. It contains two lists, one for received messages and one for the transmit messages. The CAN data format is hexadecimal by default.

Do the following to transmit a CAN FD message:

1. Select the menu command **Transmit** > **New Message** (alternatively or Ins).

   The dialog box **New Transmit Message** appears.

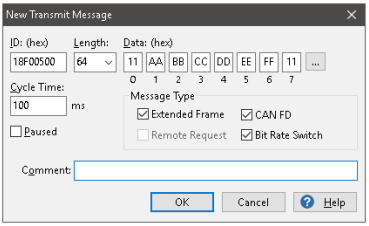


Figure 15: Dialog box new transmit message

2. Enable the **CAN FD** checkbox to define a CAN FD message with a maximum **Length** of 64 data bytes.
3. Enter the **ID**, the data **Length**, and the CAN message **Data**. With a length of more than 8 bytes, click on [...] and enter the data bytes into the editor.

Note: With the program version 4 of PCAN-View, the DLC field was renamed to **Length**. Latter reflects the actual data length.

4. Enter a value into the **Cycle Time** field to choose manually or periodically message transmission. Enter a value greater than 0 to transmit periodically. Enter the value 0 to transmit only manually.
5. Enable the **Bit Rate Switch** checkbox, that the data of a CAN FD message is transmitted with the selected **Data Bit rate**.
6. Confirm the entries with **OK**.

   The created transmit message appears on the **Receive/Transmit** tab.
7. Trigger selected transmit messages manually with the menu command **Transmit** > **Send** (alternatively [Space] bar). The manual transmission for CAN messages being transmitted periodically is carried out additionally.

Tip: Under the menu command **File > Save,** you can save the current transmit messages into a transmit list. Saved transmit lists are available for reuse.

5.1.2 Trace Tab

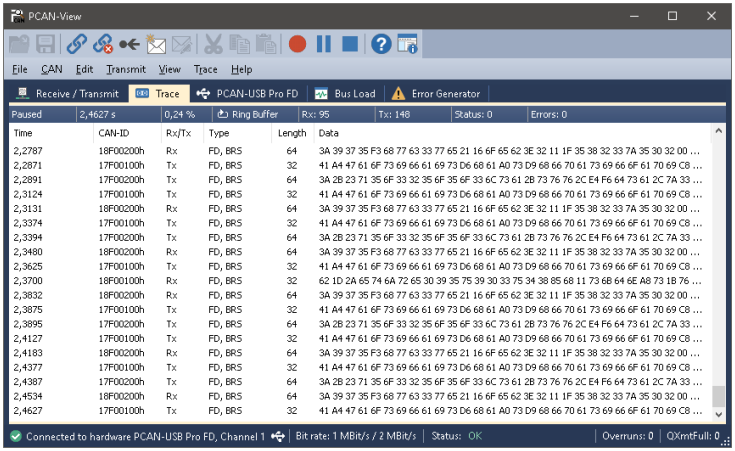


Figure 16: Trace tab

On the **Trace** tab, the data tracer (data logger) of PCAN-View is used for logging the communication on a CAN bus. During this process the messages are cached in the working memory of the PC. Afterwards they can be saved to a file.

The Tracer runs either in linear or in ring buffer mode. The linear buffer mode stops the Tracer as soon as the buffer is full. The ring buffer mode overwrites the oldest messages by new ones as soon as the buffer is full.

5.1.3 PCAN-USB Pro FD Tab

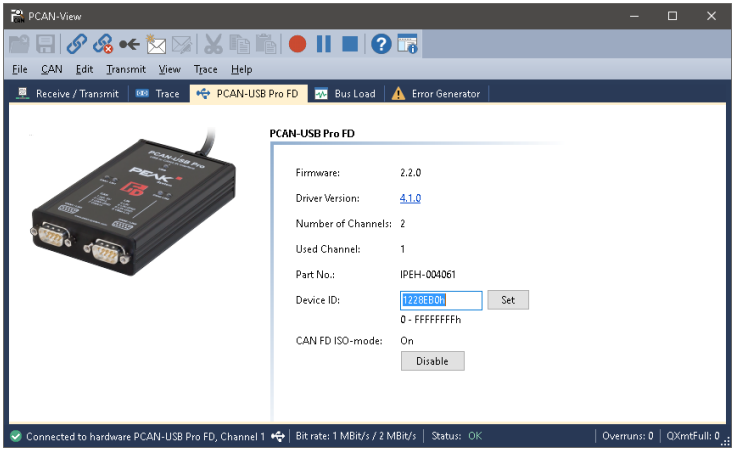


Figure 17: PCAN-USB Pro FD tab

The **PCAN-USB FD Pro** tab contains some detailed information about the hardware and driver. In addition, you can assign a **Device ID** to the adapter. Thus, it can be uniquely identified while operating several PCAN-USB Pro FD adapters on a computer at the same time.

To identify a PCAN-USB Pro FD adapter, you first go to the dialog box for selecting the hardware of PCAN-View (Figure 13 on page 25). In the list “Available PCAN hardware and PCAN-nets”, you can perform a right-click on every USB adapter and execute the command "identify". Thereby, the LED of the corresponding adapter flashes shortly.

CAN FD ISO-mode

The defined in the ISO 11898-standard is not compatible with the original protocol. PEAK-System takes this into account by supporting both protocol versions with their CAN FD interfaces.

If required, the user can switch to the CAN FD protocol used in the environment with the **Enable** / **Disable** button („Non-ISO“ and „ISO“).

5.1.4 Bus Load Tab

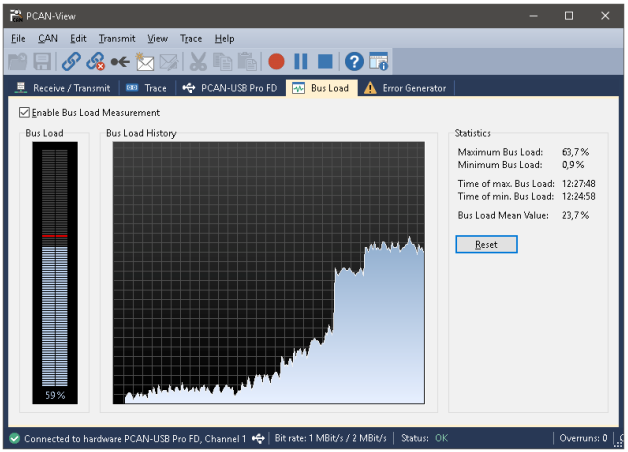


Figure 18: Bus Load tab

On the **Bus Load** tab, the current bus load, time course, and statistical information of the CAN channel are displayed. The CAN bus load reflects the utilization of transmission capacity.

5.1.5 Error Generator Tab

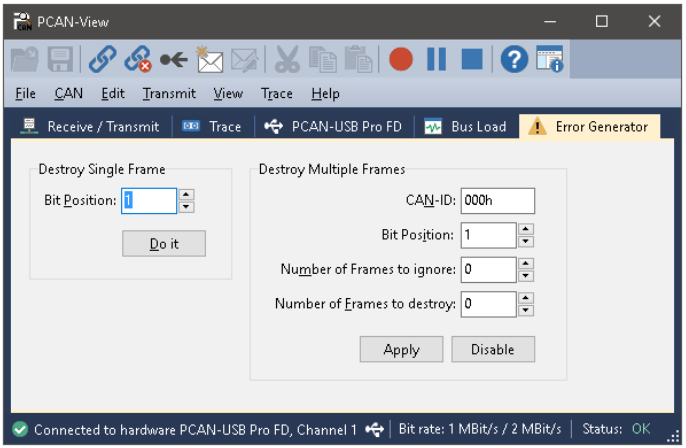


Figure 19: Error Generator tab

Via the **Error Generator** tab, the communication on the CAN bus can be disturbed for testing purpose 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.

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

The **Destroy Single Frame** area refers to the next CAN frame that is recognized by the PCAN-USB Pro FD adapter after activation.

Do the following to destroy a single CAN frame:

1. Enter the **Bit-Position** where in the CAN frame the error is to be generated. 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.

The **Destroy Multiple Frames** area refers to a CAN ID whose frames are to be destroyed in specific intervals.

Do the following to destroy multiple CAN frames:

1. Enter the **CAN ID** of the frame to be destroyed.
2. Enter the **Bit-Position** where in the CAN frame the error is to be generated. The count includes the stuff bits.
3. The **Number of Frames to ignore** field specifies the number of CAN frames with the given ID that are ignored before a frame is destroyed.
4. The **Number of Frames to destroy** field specifies the number of CAN frames with the given ID that are destroyed consecutively.
5. Confirm the entries with **Apply** to activate the error generator.
6. Stop destroying further CAN frames with **Disable**.

5.1.6 Status Bar



Figure 20: Display of the status bar

The status bar shows information about the current CAN connection, about error counters (Overruns, QXmtFull) and shows error messages.

You can find further information about the use of PCAN-View in the help which you can invoke in the program via the **Help** menu or with the F1 key.

5.2 LIN Monitor PLIN-View Pro for Windows

PLIN-View for Windows is a simple LIN monitor for receiving and transmitting LIN messages.

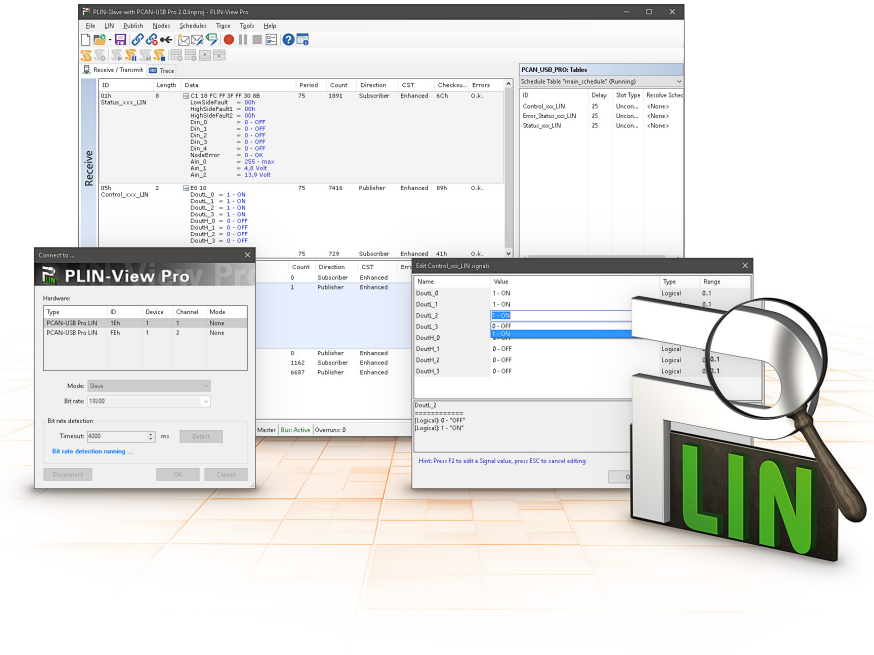


Figure 21: PLIN-View Pro for Windows

- Do the following to start and initialize PLIN-View Pro:

  1. Start the program PLIN-View Pro from the Windows Start Menu **All Programs** > **PEAK-Drivers** and then **PLIN-View Pro**.

     The dialog box for selecting the LIN hardware and for setting the LIN parameters appears.



Figure 22: Selection of the LIN specific hardware and parameters

2. From the **Hardware** list, select the LIN channel to be used.
3. From the dropdown list **Mode**, select the operation mode Master or Slave to be used for the LIN channel.
4. Select the bit rate that is used by all nodes on the LIN bus from the dropdown list **Bit rate**.
5. If you do not know the bit rate for the connected LIN bus, you can automatically detect the used bit rate with the function **Bit rate detection**. In the field **Timeout** you can set the time, to wait for a response from the hardware until the timeout occurs. Confirm with **Detect**.

Note: The LIN channel where the **Bit rate detection** is to be executed must not be initialized (no connection to a software).

   If a bit rate was determined successfully, it automatically appears in the dropdown list **Bit rate**.

6. Confirm the settings in the dialog box with **OK**. The main window of PLIN-View Pro appears (see Figure 23).

5.2.1 Receive/Transmit or Receive/Publisher Tab

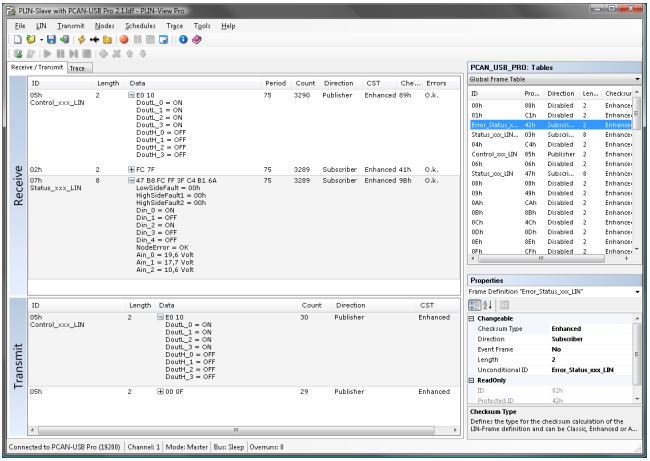


Figure 23: Receive/Transmit tab

The **Receive/Transmit** or **Receive/Publisher** tab is the main element of PLIN-View Pro. It contains two lists, one for received and one for transmitted LIN frames.

If you are logged in as LIN-Master, the Receive/Transmit tab appears. In Master mode you can transmit frames on the LIN bus.

If you are logged in as LIN-Slave, the Receive/Publisher tab appears. In Slave mode you cannot transmit frames. If the Master requests data from a Slave, he can publish it in the LIN frame.

In the **Global Frame Table** all defined LIN frame entries are stored that can be set with the PCAN-USB Pro FD. To transmit a LIN frame you have to adjust the underlying frame definition in the properties.

Do the following to transmit a LIN frame with PLIN-View Pro:

1. Select a frame from the **Global Frame Table**.
2. Change the property **Checksum Type** to Enhanced or Classic.
3. Change the property **Direction** in Publisher.
4. Select the menu command **Transmit > New Frame** (alternatively).

   The dialog box **New frame** appears.

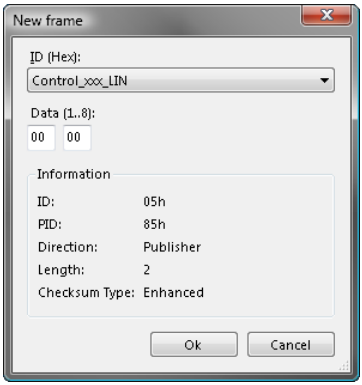


Figure 24: Dialog box New frame

5. Select the frame that should be transmitted from the dropdown list **ID**.
6. Enter in the field **Data** the data for the LIN frame.
7. Confirm the entries with **OK**.
8. Send the selected frame with the menu command **Transmit > Send** (alternatively Space bar).

Note: You can also manage and perform Schedule Tables. Furthermore you can open LDF files and manage Schedule Tables with their information. The Schedule Tables are used to validate or edit data and to present it symbolically.

Tip: You can use PLIN projects to simplify the work with the Global Frame Table, the Transmit or Publisher list, the Schedule tables, and the LDF files. With the menu command **File > Save** all files and configurations are saved in such a project for later use.

5.2.2 Trace Tab

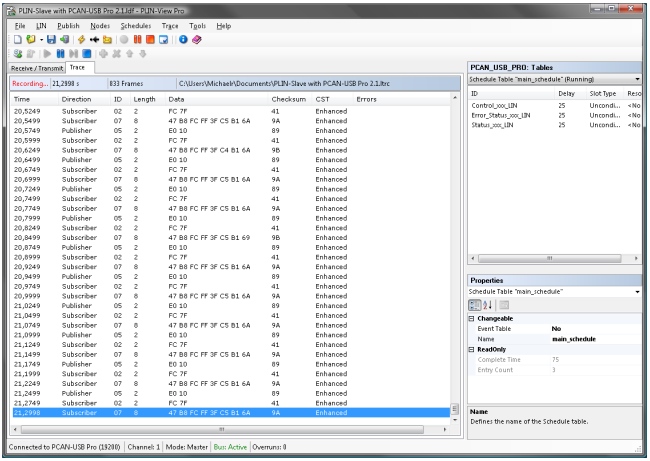


Figure 25: Trace tab

On the **Trace** tab the data tracer of PLIN-View Pro is used for logging and presenting the communication of a LIN bus.

At the start of the tracer the dialog box **Save** is shown. Enter a filename under which the recording should be stored. The storage

of data is done continuously until the tracer is stopped or the storage space on the selected medium is no longer sufficient.

On the upper part of the tracer is a line that issues various information about the tracer status: the current status of the LIN tracer, the complete duration that the tracer is running and recording, the number of recorded LIN frames, and the file name under which the recording will be saved.

5.2.3 Status Bar

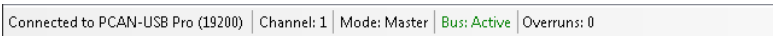


Figure 26: Display of the Status bar

The status bar shows information about the current LIN hardware, the connected LIN channel, the used operation mode, the status of the LIN bus (Active/Sleep), and a counter of not transmitted or received LIN frames (Overruns).

You can find further information about the use of PLIN-View Pro in the help which you can invoke in the program via the **Help** menu or the F1 key.

5.3 Linking Own Programs with PCAN-Basic Version 4 or Higher

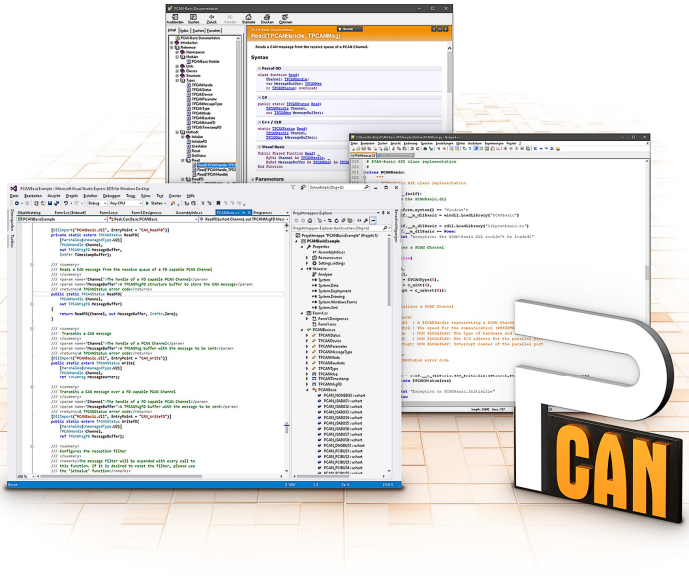


Figure 27: PCAN-Basic

On the provided DVD, you can find files of the programming interface PCAN-Basic in the directory branch `Develop`. This API provides basic functions for linking own programs to CAN and CAN FD interfaces by PEAK-System and can be used for the following operating systems:

- Windows 10, 8.1, 7(32/64-bit)
- Windows CE 6.x (x86/ARMv4)
- Linux (32/64-bit)

The API is designed for cross-platform use. Therefore software projects can easily ported between platforms with low efforts. For all common programming languages examples are available.

Beginning with version 4, PCAN-Basic supports the new CAN FD standard (CAN with Flexible Data Rate) which is primarily characterized by higher bandwidth for data transfer.

5.3.1 Features of PCAN-Basic

- API for developing applications with CAN and CAN FD connection
- Access to the CAN channels of a PCAN-Gateway via the new PCAN-LAN device type
- Supports the operating systems Windows 10, 8.1, 7 (32/64-bit), Windows CE 6.x, and Linux (32/64-bit)
- Multiple PEAK-System applications and your own can be operated on a physical channel at the same time
- Use of a single DLL for all supported hardware types
- Use of up to 16 channels for each hardware unit (depending on the PEAK CAN interface used)
- Simple switching between the channels of a PEAK CAN interface
- Driver-internal buffer for 32,768 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 and 2.0 (for CAN FD applications)
- Access to specific hardware parameters, such as listen-only mode
- Notification of the application through Windows events when a message is received

- Extended system for debugging operations
- Multilingual debugging output
- Output language depends on operating systems
- Debugging information can be defined individually
- Thread-safe API



Tip: An overview of the API functions is located in the header files. You can find detailed information about the PCAN-Basic API on the provided DVD in the text and help files (file name extensions `.txt` and `.chm`).

5.3.2 Principle Description of the API

The PCAN-Basic API is the interface between the user application and device driver. In Windows operating systems this is a DLL (Dynamic Link Library).

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

1. Initialization
2. Interaction
3. Completion

Initialization

A channel must be initialized before using it. This is done by the simple call of the function `CAN_Initialize` for CAN and `CAN_InitializeFD` for CAN FD. Depending on the type of the CAN hardware, 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` as well as `CAN_ReadFD` and `CAN_WriteFD` are available. Additional settings can be made, e.g. setting up message filters for specific CAN IDs or the listen-only mode for the CAN controller.

When receiving CAN messages, events are used for an automatic notification of an application (client). 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.

5.3.3 Notes about the License

Device drivers, the interface DLL, and further files needed for linking are property of the PEAK-System Technik GmbH and may be used only in connection with a hardware component purchased from PEAK-System or one of its partners. If a CAN hardware component of third-party suppliers should be compatible to one of PEAK-System, then you are not allowed to use or to pass on the driver software of PEAK-System.

If a third-party supplier develops software based on the PCAN-Basic and problems occur during the use of this software, consult the software provider.

5.4 Linking Own Programs with the PLIN-API

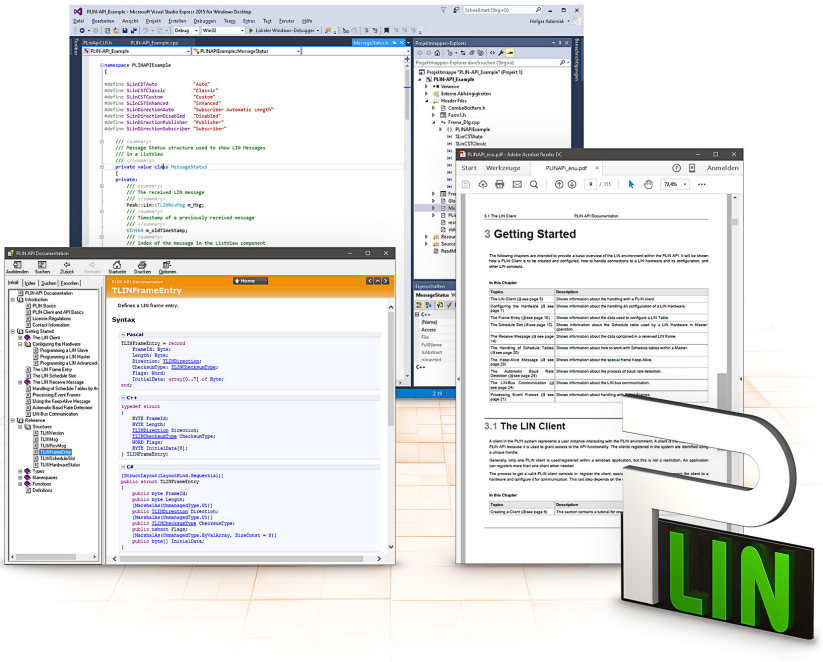


Figure 28: PLIN-API

On the provided DVD in the directory branch `Develop/PC interfaces/Windows/PLIN-API` are files of the PLIN-API. This provides basic functions for connecting your own programs to PC LIN interfaces from PEAK-System and can be used for the following operating systems:

- Windows 10, 8.1, 7 (32/64-Bit)

Furthermore, header files and programming examples (PLIN-View) are available for creating own applications in conjunction with the

PLIN API for PC-LIN interfaces from PEAK-System. Read the detailed documentation of the interface (API) in each header file.

Note: You can find further information in the text and help files (file name extensions `.txt` and `.chm`).

Notes about the License

Device drivers, the PLIN interface DLL, and further files needed for linking are property of the PEAK-System Technik GmbH and may be used only in connection with a hardware component purchased from PEAK-System or one of its partners. If a LIN hardware component of third-party suppliers should be compatible to one of PEAK-System, then you are not allowed to use or to pass on the driver software of PEAK-System.

If a third-party supplier develops software based on the PLIN-API and problems occur during use of this software, consult the software provider.

6 Technical Specifications

Connectors	
USB	USB plug type A
CAN/LIN	D-Sub (m), 9 pins Pin assignment according to specification CiA® 303-1

USB	
Type	High-speed USB 2.0 (compatible with USB 1.1 and USB 3.0)

CAN	
Protocols	CAN FD ISO 11898-1:2015, CAN FD non-ISO, CAN 2.0 A/B
Physical transmission	ISO 11898-2 (High-speed CAN)
CAN bit rates	25 kbit/s - 1 Mbit/s
CAN FD bit rates	25 kbit/s - 12 Mbit/s
Controller	FPGA implementation
Timestamp resolution	1 µs
Transceiver	TJA1044GT
Internal termination	Not activated, switchable by solder jumper
Galvanic isolation	Up to 500 V The CAN connections are isolated separately.
Supplying external devices	D-Sub Pin 1; 5 V, max. 50 mA Not assigned at delivery

LIN	
Bit rates	1 kbit/s - 20 kbit/s
Specification	LIN specification 2.2, downward-compatible
Timestamp resolution	1 µs
Transceiver	TJA1021/20
Galvanic isolation	Up to 500 V The LIN connections have a common ground.

Power supply	
Supply voltage	5 V DC via USB port LIN operation: 8 - 18 V DC via D-Sub connector
Power consumption	max. 200 mA at 5 V via USB

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

Measures	
Size	71.5 x 24 x 114 mm (W x H x D) (without connection cable) See also dimension drawings in Appendix B on page 49
Cable length	ca. 1.5 m
Weight	220 g (with USB cable)

Conformity	
EMV	Directive 2014/30/EU DIN EN 55024:2016-05 DIN EN 55032:2016-02
RoHS 2	Directive 2011/65/EU DIN EN 50581 VDE 0042-12:2013-02

Appendix A CE Certificate

EU Declaration of Conformity

This declaration applies to the following product:

Product name: PCAN-USB Pro FD

Item number(s): IPEH-004061

Manufacturer: PEAK-System Technik GmbH
Otto-Roehm-Strasse 69
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)

DIN EN 50581 VDE 0042-12:2013-02
Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances;
German version EN 50581:2012

EU Directive 2014/30/EU (Electromagnetic Compatibility)

DIN EN 55024:2016-05
Information technology equipment – Immunity characteristics – Limits and methods of measurement (CISPR 24:2010 + Cor.:2011 + A1:2015);
German version EN 55024:2010 + A1:2015

DIN EN 55032:2016-02
Electromagnetic compatibility of multimedia equipment - Emission Requirements (CISPR 32:2015);
German version EN 55032:2015

Darmstadt, 22 February 2019

Uwe Wilhelm, Managing Director

Appendix B Dimension Drawing

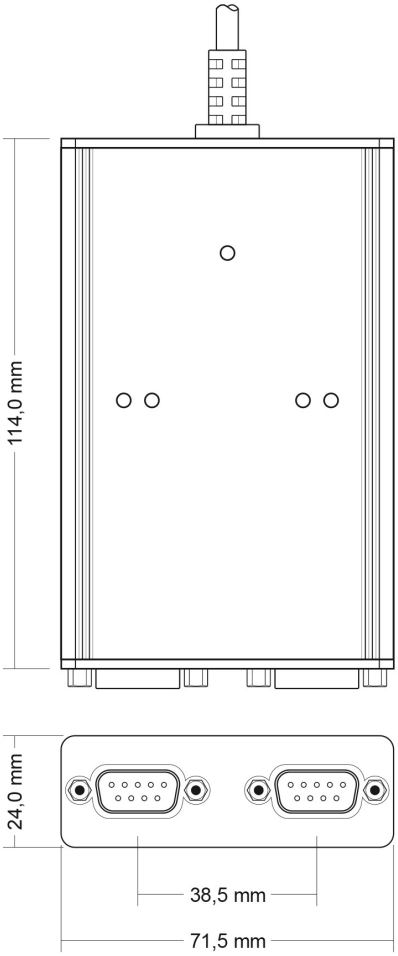


Figure 29: Top view of housing
The figure doesn't show the actual size of the product.

Appendix C Quick Reference

Software/Hardware Installation under Windows

Install the driver from the supplied DVD, before you connect the PCAN-USB Pro FD to the computer. After that, you connect the adapter to a USB port of the computer or of a connected USB hub. The computer can remain powered on. The LEDs must light green.

Note: Do not use a USB extension cable to connect the PCAN-USB Pro FD to the computer.

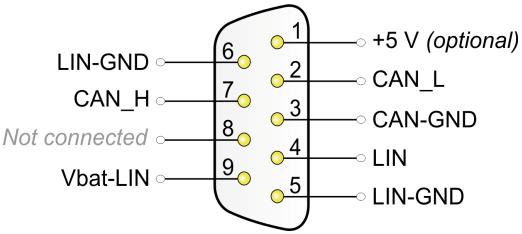
Getting Started under Windows

Run the CAN monitor PCAN-View or the LIN monitor PLIN-View Pro from the Windows Start menu as sample applications for accessing the PCAN-USB Pro FD adapter. For initialization of the CAN interface select the CAN channel and the bit rate. For initialization of the LIN interface select the LIN channel, the operation mode (Master or Slave), and the bit rate.

LED	Status	Meaning
USB	Green on	A High-speed USB connection (USB 2.0) with a computer is established.
	Green blinking	Communication is occurring on the High-speed USB connection (USB 2.0).
	Orange on	A Full-speed USB connection (USB 1.1) with a computer is established.
		The PCAN-USB Pro FD adapter is in suspend mode (only voltage supply via USB cable, e.g. during computer standby).
	Orange blinking	Communication is occurring on the Full-speed USB connection (USB 1.1).

LED	Status	Meaning
CAN1/2	Green on	The CAN interface is initialized. There's a connection to a driver of the operating system.
	Green slow blinking	A software application is connected to the CAN interface.
	Green quick blinking	Data is transmitted via the connected CAN bus.
	Red quick blinking	An error is occurring during the transmission of CAN data, e.g. OVERRUN or BUSHEAVY.
LIN1/2	Green on	There's a connection to a driver of the operating system.
	Green slow blinking	The LIN interface is initialized with a valid bit rate. A software application is connected to the LIN interface.
	Green quick blinking	Data is transmitted via the connected LIN bus.

D-Sub connector (9 pins) for CAN/LIN



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