

# PCAN-Dongle

Parallel Port to CAN Interface

## User Manual



Document version 2.1.0 (2017-02-09)

**PEAK**  
System

## Relevant products

Product name	Model	Part number
PCAN-Dongle	PS/2	IPEH-002019
PCAN-Dongle opto-decoupled	PS/2	IPEH-002020

The cover picture shows the PCAN-Dongle opto-decoupled. The other models have a case with silver-colored coating.

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# 1 Introduction

This parallel connection to CAN converter is a sensible alternative to using a PCAN-USB adapter for connecting to a CAN network, especially for older PCs and laptops. Depending on the parallel interface present, it can be operated in "Multiplex" or "Enhanced Parallel Port" mode. Power is supplied to the PCAN-Dongle through a special adapter connected to the PC's keyboard output.

The opto-decoupled version also guarantees galvanic isolation of up to 500 Volts between the PC and the CAN sides.

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.

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



**Note:** This manual refers to both the PCAN-Dongle standard model as well as the one with galvanic isolation. Differences at use and at the technical specifications are mentioned accordingly in this manual.



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

## 1.1 Properties at a Glance

- Logic control by means of integrated CPLD
- Supplied in space-saving port adapter casing D-Sub 25-pin (LPT) to D-Sub 9-pin (CAN)

- └ Software-driven switching from “Multiplex” to “EPP (Enhanced Parallel Port)” mode
- └ The voltage supply is through the PS/2 keyboard connection
- └ High-Speed CAN connection (ISO 11898-2)
- └ Bit rates from 5 kbit/s up to 1 Mbit/s
- └ Compliant with CAN specifications 2.0A (11-bit ID) and 2.0B (29-bit ID)
- └ CAN bus connection via D-Sub, 9-pin (in accordance with CiA® 303-1)
- └ NXP SJA1000 CAN controller, 16 MHz clock frequency
- └ NXP PCA82C251 CAN transceiver
- └ 5-Volt supply to the CAN connection can be connected through a solder jumper, e.g. for external bus converter
- └ Galvanic isolation on the CAN connection up to 500 V (only opto-decoupled model)
- └ Operating temperature range from 0 to 60 °C (32 to 140 °F)



**Note:** This manual describes the use of the PCAN-Dongle with Windows. You can find device drivers for Linux and the corresponding information on PEAK-System's website under [www.peak-system.com/linux](http://www.peak-system.com/linux).

## 1.2 System Requirements

- └ A free parallel port (D-Sub, 25 pins) at the computer, capable of interrupts
- └ Operating system Windows 10, 8.1, 7 (32-bit) or Linux (32/64-bit)

## 1.3 Scope of supply

- └ PCAN-Dongle in plastic casing
- └ Device drivers for Windows 10, 8.1, 7 (32-bit) and Linux (32/64-bit)
- └ CAN monitor PCAN-View for Windows
- └ CAN monitor PCAN-View for DOS
- └ Programming interface PCAN-Basic for developing applications with CAN connection
- └ Programming interfaces for standardized protocols from the automotive sector
- └ Manual in PDF format

## 2 software and Hardware Installation

This chapter covers the software setup for the PCAN-Dongle under Windows.

Install the driver before you install the adapter.

▶ Do the following to install the driver:

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 program instructions until the **Costum Setup** is displayed.

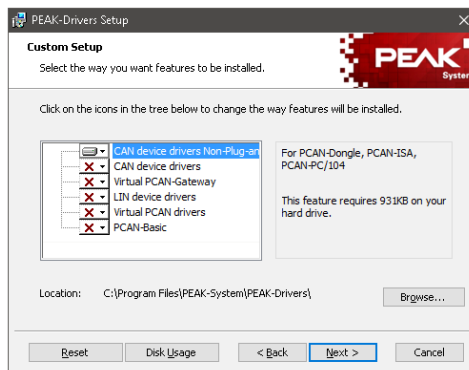


Figure 1: Driver selection in the PEAK-Drivers Setup

5. Deselect the **CAN device drivers** and select **CAN device drivers Non-Plug-and-Play**.



**Note:** The **CAN device drivers Non-Plug-and-Play** is only available under 32-bit Windows. PCAN-Dongle does not work under 64-bit Windows.

6. Follow the further instructions.



Do the following to install the adapter:


1. Turn off the computer.
2. Connect the PCAN-Dongle with the wider port (25 pins) to the free parallel port at the computer.
3. Pull the keyboard connector from the corresponding port at the computer.
4. Connect the T-piece at the cable of the PCAN-Dongle to the keyboard port.
5. Reconnect the keyboard to the free end of the T-piece.

A configuration of the hardware is not needed. However, you should check the settings for the parallel interface in the computer's **BIOS setup**.

If the computer has a parallel interface with EPP as well as ECP properties, the corresponding setting in the BIOS set-up should be **ECP** (not **EPP** and not **EPP+ECP**). Although the extended properties of the PCAN-Dongle usually will work with the last-mentioned setting, some systems may have problems with it. Therefore the setting for the “pure” ECP mode should be preferred.

Further information about the different operating modes of the PCAN-Dongle can be found in section 4.3.



 Do the following to install the adapter:

After turning on the computer, the LED at the PCAN-Dongle must light red. This indicates that the power supply for the PCAN-Dongle is correct.



**Attention!** Don't remove PCAN-Dongle from the computer while powered on (red LED on PCAN-Dongle is lit). Electronic parts of the PCAN-Dongle or the computer's parallel interface may be harmed.

## 3 Connecting a CAN Bus

### 3.1 Connection over D-Sub connector

A High-speed CAN bus (ISO 11898-2) is connected to the 9-pin D-Sub connector. The pin assignment corresponds to the specification CiA® 303-1.

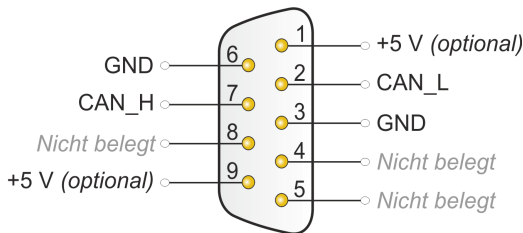


Figure 2: Pin assignment High-Speed CAN  
(view onto connector of the PCAN-Dongle)

Low power devices (e.g. bus converters) can be supplied directly with 5 volts over pin 1 and/or pin 9 of the CAN connector. Pin 1 and/or pin 9 are not in use at the delivery state. For more information see the next section 3.2.




**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 Voltage Supply for External Devices

External devices with low power consumption (e.g. bus converters) can be directly supplied via the CAN connector. With a solder bridge on the PCAN-Dongle board (casing opened), a 5-Volt supply can optionally be routed to pin 1 and/or pin 9 of the D-Sub connector (PCAN-Dongle opto-decoupled: pin 1 only).

The opto-decoupled model of the Dongle contains an interconnected DC/DC converter. Therefore, the current output is limited to about 50 mA.

 Do the following to activate the voltage supply:



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



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

1. Open the case of the PCAN-Dongle by cautiously levering the latches on both sides, e.g. with a flat tip screwdriver.
2. Remove the board.
3. Set the solder bridge(s) on the PCAN-Dongle board according to the desired settings.

Figure 3 shows the position of the solder bridge JP9.

Figure 4 shows the position of the solder bridges R11.

The tables below contain the possible settings.

4. For reassembly, place the board overhead onto the top part of the case.

Make sure that the cable is lying in the side cut-out with the strain relief inside the case, and that the LED is placed in the corresponding hole of the top part of the case.

5. Push the bottom part of the case onto the top part until the latches click in.

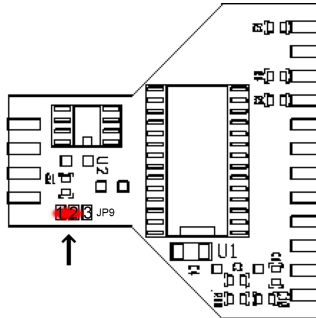


Figure 3: PCAN-Dongle (bottom view)

D-Sub connector	Solder field	5-Volt supply			
		Without (Standard)	Pin 1	Pin 9	Pin 1 and pin 9
CAN 1	JP9				

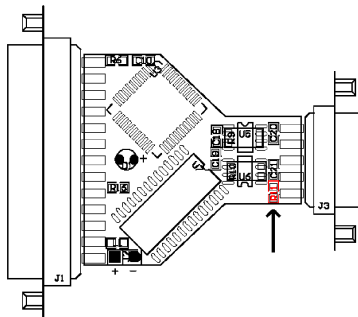


Figure 4: PCAN-Dongle opto-decoupled (top view)

D-Sub connector	Solder field	5-Volt supply	
		Without (Standard)	Pin 1
CAN 1	R11		

## 3.3 Cabling

### 3.3.1 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 transceivers of the connected CAN nodes (CAN interfaces, control devices).

The PCAN-Dongle adapter does not have an internal termination. Use the adapter on a terminated bus.

### 3.3.2 Example of a Connection

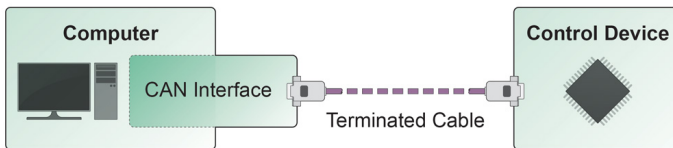


Figure 5: Simple CAN connection

This example shows a connection between the PCAN-Dongle adapter and a control unit. The connection cable is terminated with 120 ohms at both ends.

### 3.3.3 Maximum Bus Length

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

The following table shows different maximum possible CAN bus length with 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
20 kbit/s	3.3 km
10 kbit/s	6.6 km
5 kbit/s	13.0 km

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

## 4 operation

### 4.1 Prerequisites for the Operation

Under Windows you must explicitly determine the use of an interrupt for the parallel interface. This is done in the Windows Device Manager.

▶ Do the following to assign an interrupt to the parallel interface under Windows:

1. Open the Windows Device Manager.
2. Under **Ports (COM & LPT)** in the tree view of the Device Manager double click on the entry **Printer Port (LPTx)** or **ECP Printer Port (LPTx)**.

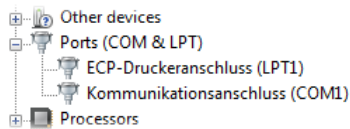


Figure 6: Entry in the Device Manager for the printer port

3. Select the tab **Port Settings**.
4. Activate the option **Use any interrupt assigned to the port**.

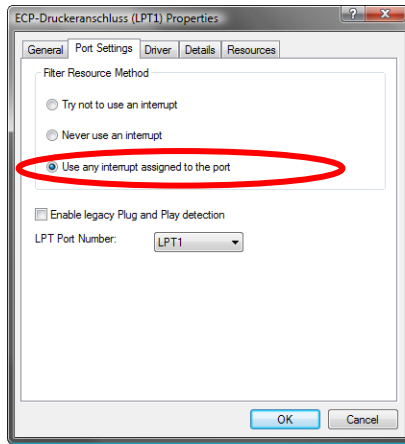


Figure 7: Indicating the use of an interrupt

## 4.2 Interface Information

For the initialization of the PCAN-Dongle during the start of an application you need information about the used interrupt and port address of the parallel interface.

▶ Do the following to find out the interrupt and the I/O range used by the parallel interface:

1. Open the Windows Device Manager.
2. Under **Ports (COM & LPT)** in the tree view of the Device Manager double click on the entry **Printer Port (LPTx)** or **ECP Printer Port (LPTx)**.

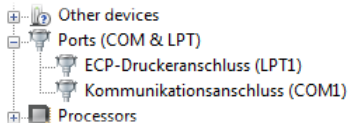


Figure 8: Entry in the Device Manager for the printer port



3. Select the tab **Resources**.
4. From the entries **I/O Range** (first value = port address) and **Interrupt** or **IRQ** in the list you can see the needed information. Write down this information for later use.

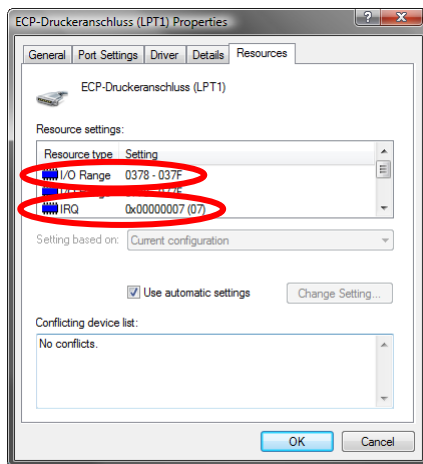


Figure 9: Resource information about the parallel interface

## 4.3 Operating Modes

The PCAN-Dongle can be used in one of four possible operating modes:

Name of operating mode	Alternative identifier	Description
Multiplex Mode	PEAK Dongle-CAN	Standard Parallel Port (SPP)
EPP Mode	PEAK Dongle-CAN EPP	Extended Capability Port (ECP)
Multiplex PeliCAN Mode	PEAK Dongle-CAN SJA	Standard Parallel Port (SPP), extended CAN functionality (CAN 2.0B incl. 29-bit IDs)
EPP PeliCAN Mode	PEAK Dongle-CAN SJA EPP	Extended Capability Port (ECP), extended CAN functionality (CAN 2.0B incl. 29-bit IDs)

The EPP PeliCAN Mode is recommended to gain the full CAN functionality at lowest possible computer system load. If this mode doesn't work correctly, you can fall back to one of the other operating modes. The Multiplex Mode should work on any system.



**Tip:** You can find further information about the PeliCAN Mode in the data sheet for the CAN controller SJA1000 by NXP obtainable at the according website, for example.


You can find information about activating an operating mode in the following section.

## 5 software and API

This chapter covers the provided software PCAN-View and the programming interface PCAN-Basic.

### 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 adapter.

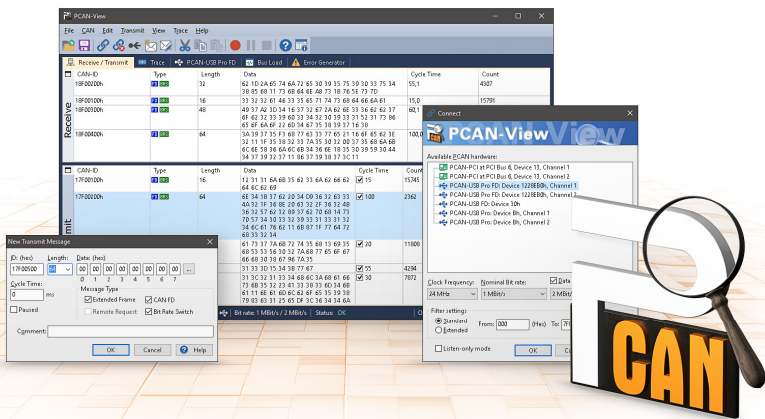


Figure 10: PCAN-View for Windows

▶ Do the following to start and initialize PCAN-View:

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

The **Connect** dialog box appears.

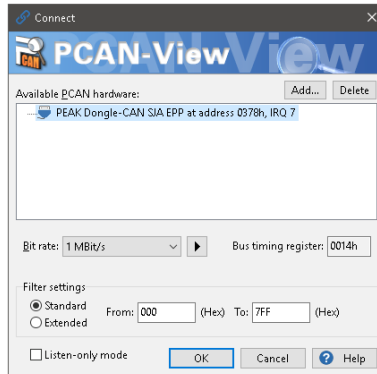


Figure 11: Selection of the hardware and parameters

2. Select an interface from the list and continue with step 6.
3. If no entry is in the list, press the button **Add**. The dialog box **Add CAN hardware** appears.

If the mode of the parallel interface is set to ECP in the computer's BIOS setup, you can register the PCAN-Dongle as **PEAK Dongle-CAN SJA EPP**.

4. Enter the port address and the interrupt of the used parallel interface established before (see section 4).

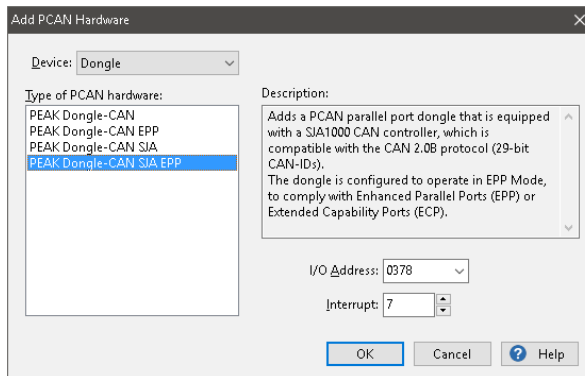


Figure 12: Selection of a hardware type

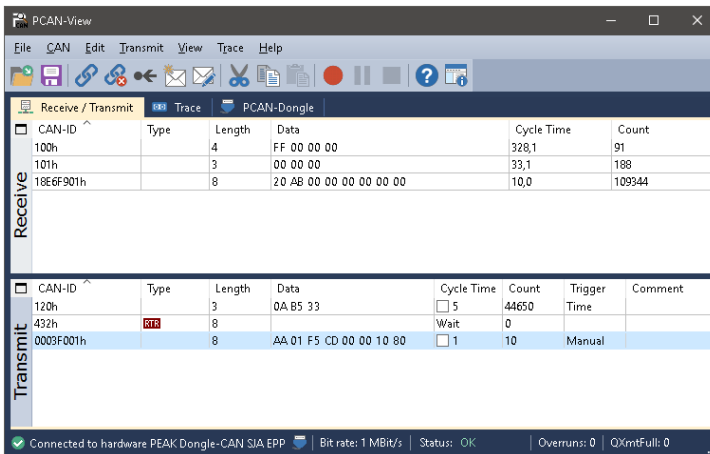
5. Confirm your input with **OK**.
6. From the drop-down list, select the **Bit rate** that is used by all nodes on the CAN bus.



**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 participate 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 13).

### 5.1.1 Receive/Transmit Tab



Receive / Transmit						
CAN-ID	Type	Length	Data	Cycle Time	Count	
100h		4	FF 00 00 00	328,1	91	
101h		3	00 00 00	33,1	188	
18E6F901h		8	20 AB 00 00 00 00 00	10,0	109344	


CAN-ID	Type	Length	Data	Cycle Time	Count	Trigger Time	Comment
120h		3	0A B5 33	<input type="checkbox"/> 5	44650		
432h	<b>RTB</b>	8		Wait	0		
0003F001h		8	AA 01 F5 CD 00 00 10 80	<input type="checkbox"/> 1	10	Manual	

Connected to hardware PEAK Dongle-CAN SJA EPP | Bit rate: 1 MBit/s | Status: OK | Overruns: 0 | QXmtFull: 0

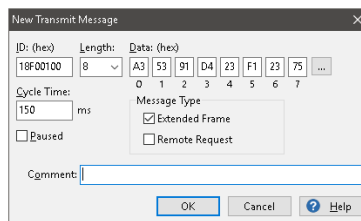
Figure 13: Receive/Transmit Tab

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 message with PCAN-View:

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

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



New Transmit Message

ID: (hex) Length: Data: (hex)

18F00100 8 A3 53 91 D4 23 F1 23 75

Cycle Time: 150 ms

☐ Paused

Message Type

☒ Extended Frame

☐ Remote Request

Comment:

OK Cancel ? Help

Figure 14: Dialog box new transmit message

2. Enter the **ID**, the data **Length**, and the CAN message **Data**.



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

3. 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.
4. Confirm the entries with OK.

The created transmit message appears on the **Receive/Transmit** tab.

5. 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

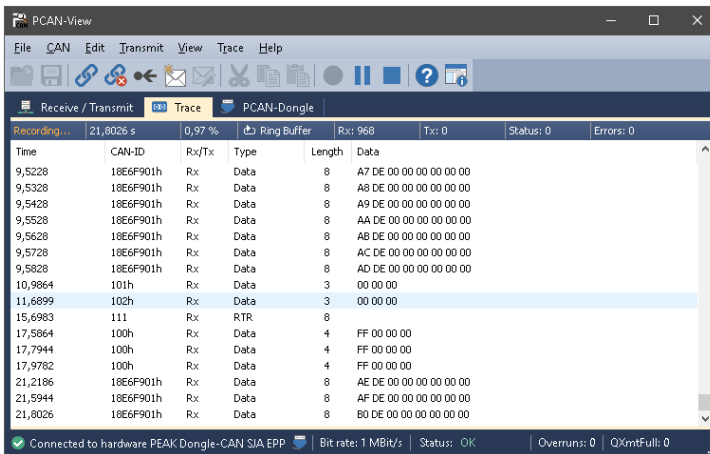


Figure 15: Trace Tab

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-Dongle

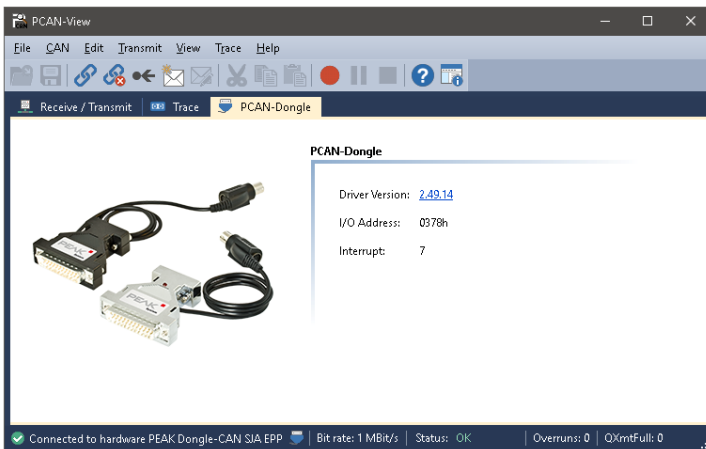


Figure 16: PCAN-Dongle

The **PCAN-Dongle** tab contains some detailed information about the hardware and driver.

### 5.1.4 Status Bar



Figure 17: 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 Linking Own Programs with PCAN-Basic

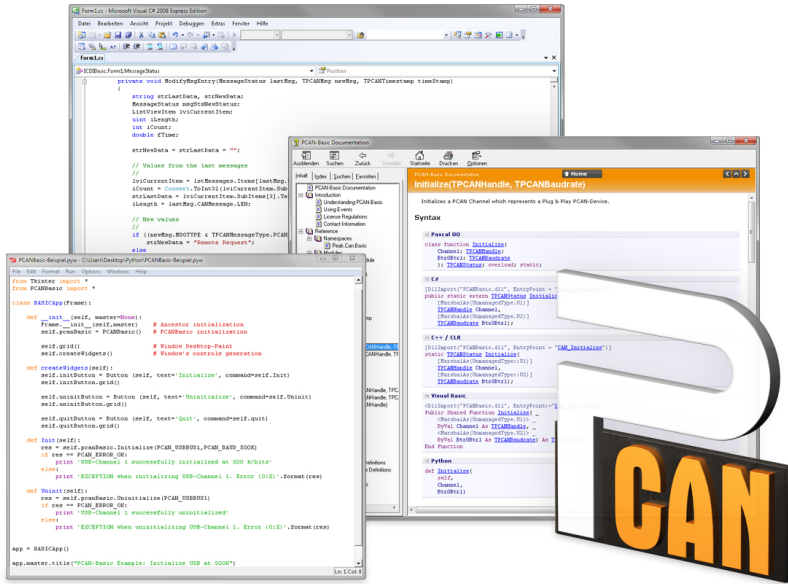


Figure 18: PCAN-Basic

On the provided DVD, you can find files of the PCAN-Basic programming interface 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 be 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.

### 5.2.1 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  $\mu$ s (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



**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`).

### 5.2.2 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 to confine to specific CAN IDs or setting the CAN controller to listen-only mode.

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.

### 5.2.3 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.

## 6 Frequently Asked Questions (FAQ)

Question	Answer
In the computer's BIOS setup the parallel port setting shows <b>ECP</b> but the PCAN-Dongle works with the <b>EPP</b> mode. Is this correct?	Yes, it is. The naming of the operating mode EPP of the PCAN-Dongle has historical causes. The parallel interface at the computer went through various developments in the nineties. Only the EPP extension existed during the time, when the PCAN-Dongle arose. With version 1.9 the EPP extension already had similarities to the ECP extension, which is usually used in computers today. The name of the operating mode EPP was kept for the PCAN-Dongle.
Can a <b>printer</b> still be connected to the PCAN-Dongle?	No. The PCAN-Dongle doesn't offer any possibility to connect through the parallel interface for the printer.
Is it possible to <b>supply</b> the PCAN-Dongle PS/2 also via the computer's <b>mouse connector</b> ?	Yes.

## 7 Technical specifications

### Connectors

Supply	Cable to the keyboard jack of the computer, length about 50 cm/20 inches
Computer	D-Sub (m), 25 pins (to standard parallel port)
CAN	D-Sub (m), 9 pins Pin assignment according to CiA® 303-1

### CAN

Specification	ISO 11898-2, High-speed CAN 2.0A (standard format) and 2.0B (extended format)
Bit rates	5 kbit/s - 1 Mbit/s
Controller	NXP SJA1000
Transceiver	NXP PCA82C251
Galvanic isolation	up to 500 V (only for IPEH-002020)
Supplying external devices	PCAN-Dongle: D-Sub pin1/9; 5 V, max. 100mA PCAN-Dongle opto: D-Sub pin 1; 5 V, max. 50mA via solder bridge(s), not assigned at delivery

### Supply

Supply voltage	+5 V DC
Current consumption	PCAN-Dongle: max. 80 mA PCAN-Dongle opto-decoupled: max. 140 mA

### Measures

Size	56 x 18 x 62 mm (2 3/16 x 11/16 x 2 7/16 Inches)
Weight	PCAN-Dongle (PS/2): 51 g (1.80 oz.) PCAN-Dongle opto-decoupled: 52 g (1.83 oz.)

### Environment

Operating temperature	0 – 60 °C (32 – 140 °F)
Storage temperature	-20 – +80 °C (-4 – 176 °F)
Relative humidity	15 – 90 %, not condensing

**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-Dongle  
Item number(s): IPEH-002019/20  
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

A handwritten signature in black ink, appearing to read "Uwe Wilhelm".

Uwe Wilhelm, Managing Director

## Appendix B Quick Reference

### Hardware Installation

Install the driver from the supplied DVD, before you connect the PCAN-Dongle to the computer's parallel port. Insert the T-piece at the cable's end between the keyboard port at the computer and the keyboard connector (for power supply). The LED must light red.

### Software setup and startup under windows

Run the CAN monitor PCAN-View for Windows from the Start menu as a sample application for accessing the PCAN-Dongle. Get the parameters of the parallel interface (I/O address, interrupt) needed for initialization of the PCAN-Dongle from Windows Device Manager.

### High-Speed CAN connector (D-Sub, 9 pins)

