PCAN-ExpressCard 34

CAN Interface for the ExpressCard/34 Slot

User Manual





Document version 1.3.0 (2019-06-03)



Relevant products

Product name	Model	Part number
PCAN-ExpressCard 34	One CAN channel	IPEH-003004

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1 Introduction

The CAN adapter PCAN-ExpressCard 34 allows the connection of a CAN bus to embedded PCs and laptops with ExpressCard slots. A galvanic isolation of up to 300 Volts decouples the PC from the CAN bus.

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.

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-ExpressCard 34.

1.1 Properties at a Glance

- Card for ExpressCard slot
- Type ExpressCard/34 (compatible with ExpressCard/54 slots)
- 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 to CiA® 303-1)
- FPGA implementation of the CAN controller (SJA1000 compatible)



- NXP PCA82C251 CAN transceiver
- └── Galvanic isolation on the CAN connection up to 300 V
- Extended operating temperature range from -40 to 85 °C (-40 to 185 °F)
- Note: This manual describes the use of the PCAN-ExpressCard 34 with Windows. You can find device 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 Prerequisites for Operation

- ExpressCard slot in the computer, type ExpressCard/34
- Operating system Windows 10, 8.1, 7 (32/64-bit) or Linux (32/64-bit)

1.3 Scope of Supply

- PCAN-ExpressCard 34 CAN interface
- Device drivers for Windows 10, 8.1, 7 and Linux (32/64-bit)
- 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



2 Installing the Software and the Card

This chapter covers the software setup for the PCAN-ExpressCard 34 under Windows and the installation in the computer.

Install the driver before you install the adapter.

Do the following to install the driver:

- Start Intro.exe from the root directory of the 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 "Installer database of PEAK Drivers".

The driver setup starts.

4. Follow the program instructions.

Do the following to install the adapter:

1. Insert the PCAN-ExpressCard into an ExpressCard slot of your computer. The computer can remain powered on.

Windows notifies that new hardware has been detected. The drivers are found and installed by Windows automatically.

2. Check the LED on the adapter. If the LED is <u>red</u>, then the driver was initialized successfully.



3 Connecting the 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 1: Pin assignment High-speed CAN

3.2 Cabling

3.2.1 Termination

A High-speed CAN bus (ISO 11898-2) must be terminated on both ends with 120 Ohms. Otherwise, there are interfering signal reflections and the transceivers of the connected CAN nodes (CAN interface, control device) will not work.

The PCAN-ExpressCard 34 does not have an internal termination. Use the adapter on a terminated CAN bus.



3.2.2 Example of a Connection



Figure 2: Simple CAN connection

This example shows a connection between the PCAN-ExpressCard 34 and a control unit. The connection cable is terminated with 120 ohms at both ends.

3.2.3 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
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 Status LED

The PCAN-ExpressCard 34 has a status LED which may be in one of the following conditions:

Status LED	Meaning
On	There's a connection to a driver of the operating system.
Slow blinking	A software application is connected to the CAN channel.
Quick blinking	Data is transmitted via the connected CAN bus.

4.2 Removing the Adapter

Under Windows the icon for removing hardware safely is not used with the PCAN-ExpressCard 34. You may remove the card from the computer without any preparation under Windows.



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.

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		CANED	3.00	Locath	Dute	Oute	Time Count	
		18F00200h	01) (E18)	32	62 1D 2A 65 74 6A 72 65 30 39 35 75 39 30 33 75 34 38 85 68 11 73 68 64 6E A8 73 18 76 5E 73 7D	55,1	4307	
		18F00100h	523 (525	16	33 32 32 61 46 33 35 65 71 74 73 68 64 66 6A 61	15,0	15791	
	ceive	18F00300h	11 (118	48	49 37 A2 3D 34 16 37 32 67 2A 62 65 33 36 62 62 37 6F 62 32 33 39 60 33 34 32 30 39 33 31 52 31 73 86 65 6F 6A 6F 22 6D 34 67 35 38 39 17 16 38	60,1	8 Cornect	×
	å	18F00400h	(*1 085)	64	3A 39 37 35 F3 60 77 63 33 77 65 21 16 6F 65 62 1E 32 11 1F 15 38 32 33 7A 35 30 32 00 37 35 68 6A 68 6C 6E 58 36 6A 6C 6B 34 36 6E 18 35 30 39 59 30 44 34 37 39 12 37 11 66 37 39 38 77 5C 11	100,0	PCAN-View	
		CANUD	Time	Langth	Data Ducia Tima	Court	PCAN-PCI at PCI Bus 6, Device 13, Channel 1	
		17F001006	0.000 0.000	16	12 31 31 6A 68 35 62 33 6A 62 66 62 V 15 64 6C 62 69	15745	- PCAN-PCI at PCI Bus 6, Device 13, Channel 2 - +++ PCAN-USB Pro FD: Device 1226EB0h, Channel 1	
New Transmit Mess	mit	17F002006		64 X	66 34 18 77 62 20 35 37 67 100 44 32 17 66 12 26 12 26 12 48 16 12 76 12 26 16 12 76 12 12 12 12 12 12 12 12 12 12 12<	2362		0
12500500	_				31 33 30 15 34 38 77 67	4294	-	
Cycle Time:		0 1 2 3 4 Message Type Detended Frame	CAN FD		31 3C 32 31 33 34 68 6C 3A 68 61 66 3 30 73 68 35 32 33 41 33 38 33 6D 34 68 61 11 66 61 6D 6C 62 67 65 35 39 38 79 83 63 12 56 50 67 3C 36 34 44 6A	7872	Glock Frequencys Nominal Bit rate: ☑ Data 24 MHz → 1 MBit/s → 2 MBit/	
Paused		Remote Request	Bit Rate Switz	h 📭	Bit rate: 1 MBit/s / 2 MBit/s Status: OK	0	Filter settings	
Camment							Optended From: 000 (Hec) Tec /H	
		ОК	Cancel 🕜	Help			Listen-only mode OK Ci	
	/	/ ,		<u> </u>				Uinn

Figure 3: 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 4: Selection of the specific hardware and parameters

- 2. Select an interface from the list.
- 3. From the dropdown list, select the **Bit rate** that is used by all nodes on the CAN bus.



- 4. 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).
- 5. 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).
- 6. Confirm the settings in the dialog box with **OK**. The main window of PCAN-View appears (see Figure 5).



5.1.1 Receive/Transmit Tab

ř٩	PCAN-View						-	_		×
<u>E</u> ile	<u>C</u> AN <u>E</u> dit <u>T</u> rar	ismit <u>V</u> iew	T <u>r</u> ace <u>H</u>	jelp						
~ *	88	🗲 📐 🛛	2 🖌 🛛	È 🐴 🛑 II 🔳 🛛	2 🖬					
line in the second seco	Receive / Transmit	🚥 Trace	🔶 PCA	N-USB						
	CAN-ID	Туре	Length	Data		Cycle Ti	me	Cou	int	
	170F2000h		8	85 B4 23 76 53 8A 42 2D		50,0		20		
	180F1000h		8	87 63 7A 56 3D 53 53 67		40,0		125		
Q	180F2000h		8	11 43 53 6A 53 8A 59 2C		200,1		24		
i S	180F3000h		2	11 22		349,7		13		
ğ	180F4000h		1	B5		650,3		7		
2	180F5000h		7	15 67 A5 42 54 24 A1		100,1		37		
	CAN-ID	Туре	Length	Data	Cycle Time	Count	Trigger	C	omment	
	170F1000h		8	A1 34 62 36 D6 74 37 43	✓ 75	139	Time			
	170F2000h		8	85 B4 23 76 53 8A 42 2D	✔ 50	179	Time			
	170F3000h		2	61 23	✓ 350	23	Time			
Ξ	170F4000h		1	A1	✓ 400	19	Time			
E	170F5000h		7	84 70 67 38 86 3A 54	230	32	Time			
2										
<u>e</u>										
⊢										
0	Connected to hardwa	re PCAN-USE	🕂 🕂 Bit ra	te: 1 MBit/s Status: OK	Overrur	s: 0 QXm	ntFull: 0			

Figure 5: 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:

 Select the menu command Transmit > New Message (alternatively [™] or Ins).

The New Transmit Message dialog box appears.

New Transmit Message		×
ID: (hex) Length: 18F00100 8 ~ Cycle Time: 150 ms Paused	Data: (hex) A3 53 91 D4 23 F1 23 0 1 2 3 4 5 6 Message Type ☑ Extended Frame □ Remote Request	75 7
C <u>o</u> mment:		
	OK Cancel	🕜 <u>H</u> elp

Figure 6: 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. The field **Cycle Time** indicates if the message shall be transmitted manually or periodically. If you want to transmit the message periodically, you must enter a value greater than 0. For a manual-only transmission enter 0.
- 4. Confirm the entries with **OK**.

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

 You 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: Using the menu command **File** > **Save** the current transmit messages can be saved to a list and loaded for reuse later on.



5.1.2 Trace Tab

📸 PCAN-	view							-		×
<u>F</u> ile <u>C</u> AN	<u>E</u> dit <u>T</u> ransmit	<u>V</u> iew T	<u>i</u> ace <u>H</u> elp							
n9 🗐	8 8 •€ \$	< ⊠∣	X 🖬			2 🖬				
👼 Recei	ve / Transmit 📖	Trace	🖶 PCAN-III	SR						
Paused	1.7752 s	0.16 %	e Rina E	luffer Rx	: 80	Tx: 77	Status: 0	Errors: 1)	
Time	CAN-ID	Rx/Tx	Type	Length	Data		1	1		^
1 5601	170550006	Ter	Data	7	94 70 67 26	06.04.54				
1,5681	170F5000h	TX Du	Data		07 69 74 54	00 3A 59				
1,5094	170520006	RA Tu	Data		07 03 7A 30	E2 84 42 20				
1,5701	170520000	Tu	Data		03 04 23 70	DE 74 27 42				
1,5950	180E1000h	DV DV	Data	8	87 63 70 56	30 53 53 67				
1,6160	180F5000h	PV PV	Data	7	15 67 05 40	54 24 61				
1.6251	170E2000b	TY	Data	, a	85 B4 23 76	53 86 42 20				
1.6285	180E2000b	P _V	Data	8	11 43 53 64	53 84 59 2C				
1 6495	180E1000b	P.v.	Data	8	87 63 74 56	30 53 53 67				
1.6561	170E3000b	Tx	Data	2	61.23					
1.6682	170E4000b	Tx	Data	1	A1					
1.6691	170E1000b	Tx	Data	8	A1 34 62 36	5 D6 74 37 43				
1.6751	170E2000b	Tx	Data	8	85 B4 23 76	53 8A 42 2D				
1.6895	180F1000h	Rx	Data	8	87 63 7A 56	3D 53 53 67				
1.7165	180F5000h	Rx	Data	7	15 67 A5 42	2 54 24 A1				
1,7252	170F2000h	Tx	Data	8	85 B4 23 76	53 8A 42 2D				
1,7296	180F1000h	R×	Data	8	87 63 7A 56	5 3D 53 53 67				
1,7442	170F1000h	T×	Data	8	A1 34 62 36	5 D6 74 37 43				- 18
1,7696	180F1000h	Rx	Data	8	87 63 7A 56	5 3D 53 53 67				- 18
1,7752	170F2000h	Tx	Data	8	85 B4 23 76	53 8A 42 2D				
										~
🥩 Connec	ted to hardware PCA	N-USB 🥰	Bit rate: 1	MBit/s Sta	atus: OK	Ove	erruns: 0 QXmtFull:	0		

Figure 7: 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-ExpressCard 34 Tab



Figure 8: PCAN-PCI tab (example)

The **PCAN-ExpressCard 34** tab contains some detailed information about the hardware and driver.

5.1.4 Status Bar



Figure 9: Example 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 10: 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 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 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 system
- 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 listenonly 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 <code>CAN_Uninitialize</code> 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 Technical Specifications

Connectors	
Computer	ExpressCard slot, type ExpressCard/34
CAN	D-Sub (m), 9 pins
	Pin assignment according to specification 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	FPGA implementation (SJA1000 compatible)
Transceiver	NXP PCA82C251
Galvanic isolation	Up to 300 V
Internal termination	none

Supply

Supply voltage	1.5 V und 3.3 V
Current consumption	1.5 V: max. 180 mA 3.3 V: max. 330 mA

Measures

Size	108 x 37 x 20 mm (L x W x D) See also dimension drawing in Appendix B on page 24
Weight	32 g

Environment

-40 - 85 °C (-40 - 185 °F)
-40 - 85 °C (-40 - 185 °F)
15 - 90 %, not condensing
IP30



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 Decla	ration of Conformity	PEAK
This declaration	applies to the following product:	
Product name:	PCAN-ExpressCard 34	
tem number(s):	IPEH-003004	
Manufacturer:	PEAK-System Technik GmbH Otto-Roehm-Strasse 69	
	64293 Darmstadt	
	Germany	
CE We decl the follo	are under our sole responsibility that the ment wing directives and the affiliated harmonized s	ioned product is in conformity with standards:
EU Directive 20	11/65/EU (RoHS 2)	
DIN EN 50581 VD	E 0042-12:2013-02	
Technical docum the restriction of	nentation for the assessment of electrical and e hazardous substances:	lectronic products with respect to
German version	EN 50581:2012	
U Directive 20	14/30/FU (Electromagnetic Compatibility)
DIN EN 55024:20	16-05	
nformation tech	nology equipment – Immunity characteristics	- Limits and methods of
measurement (C Serman version	ISPR 24:2010 + Cor.:2011 + A1:2015); EN 55024:2010 + A1:2015	
DIN EN 55032:20	16-02	
Electromagnetic German version I	compatibility of multimedia equipment - Emis EN 55032:2015	sion Requirements (CISPR 32:2015);
Darmstadt, 22 Fe	bruary 2019	
11	/	
The	NIM	
Jwe Wilhelm, Ma	anaging Director	



Appendix B Dimension Drawing



Figure 11: Side view and top view of the PCAN-ExpressCard 34

The figure does not show the actual size of the product.



Appendix C Quick Reference

Software/Hardware Installation under Windows

Install the driver from the supplied DVD, <u>before</u> you insert the PCAN-ExpressCard into a vacant ExpressCard slot. The card is recognized by Windows and the driver is initialized. The LED must light <u>red</u>.

Getting Started under Windows

Run the CAN monitor PCAN-View from the Windows Start menu as a sample application for accessing the PCAN-ExpressCard 34. For initialization of the card select the CAN connection and the CAN bit rate.

Status LED	Meaning
On	There's a connection to a driver of the operating system.
Slow blinking	A software application is connected to the CAN channel.
Quick blinking	Data is transmitted via the connected CAN bus.

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

