PLIN-USB

LIN Interface for USB

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User Manual



Document version 1.1.0 (2019-03-14)



Relevant products

Product Name	Model	Part number
PLIN-USB		IPEH-004052

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1 Introduction

The PLIN-USB enables the connection of a Windows computer to a LIN network via USB. The adapter supports the LIN protocol according to the standard ISO 17987 and complies with all LIN specifications up to version 2.2. The interface can be operated as a master or a slave.

The monitor software PLIN-View Pro and the PLIN programming interface for the development of applications with LIN connection are included in the scope of supply.

1.1 Properties at a Glance

- Adapter for High-Speed-USB 2.0 (compatible with USB 1.1 and USB 3.0)
- LIN connection (ISO 17987)
- Compliant with all LIN specifications (up to version 2.2)
- Bit rates from 1 kbit/s up to 20 kbit/s
- 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
- LIN bus connection via D-Sub, 9-pin
- LIN connection short-circuit-proof against transceiver supply and ground
- TJA1028T LIN transceiver
- Galvanic isolation on the LIN connection up to 500 V



- Indicator LED for interface status
- Voltage supply via USB
- Adapter supply 5 V DC via USB port
- Transceiver supply 6 28 V DC via D-Sub, pin 9
- Extended operating temperature range from -40 to 85 °C (-40 to 185 °F)

1.2 Operation Requirements

- Vacant USB port on the computer (compatible to USB 1.1, 2.0, and 3.0)
- Note: Do <u>not</u> use a USB extension cable for connecting the PLIN-USB to a computer. The use of an extension cable does not conform to the USB specification and may cause malfunction of the PLIN-USB.
- Operating system Windows 10, 8.1, 7 (32/64-bit)
- Additional DC voltage source 6 to 28 V to supply the LIN transceiver



1.3 Scope of Supply

- PLIN-USB in plastic casing (with 60 cm USB cable)
- LIN interface drivers for Windows 10, 8.1, 7 (32/64 bit)
- LIN monitor PLIN-View Pro for Windows
- Programming interface PLIN-API for developing applications with LIN connection
- Manual in PDF format

Optionally available accessories:

LIN Connection Cable for PC LIN interfaces (IPEK-003013)



2 Installing Software and Hardware

This chapter covers the software setup for the PLIN-USB 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 PLIN-USB 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 device driver:

1. Start the Intro.exe software from the supplied Product DVD.

The navigation program appears.

- 2. In the main menu, select **Drivers** and then click on **Install now**.
- 3. Confirm the message from the User Account Control related to "Installer database of PEAK-Drivers".

The driver setup starts.

4. Follow the program's instructions. When selecting components, select the **LIN device driver** (other components as needed).

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

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🖟 PEAK-Drivers 4.1.3 Setup	×							
Custom Setup Select the way you want features to be installed.	PEAK							
Click on the icons in the tree below to change the w	ay features will be installed.							
CAN device drivers Virtual PCAN-Gateway UN device driver Virtual PCAN driver Virtual PCAN-Basic	For PCAN-USB Pro and PCAN-USB Pro FD. PLIN-View Pro tool This feature requires 0KB on your hard drive.							
C:\Program Files\PEAK-System\PEAK-Drivers 4\								
Reset Disk Usage < B	ack Next > Cancel							

PE/

Figure 1: LIN device driver in PEAK-Drivers Setup

2.2 Connecting the PLIN-USB

LIN (D-Sub)



Figure 2: Assignment of the D-Sub connector on the PLIN-USB, auxiliary supply required for LIN transceiver

In addition to the connection to the LIN bus, the PLIN-USB requires an external DC power for operation in the range of 6 to 28 Volts. Apply it to pin 9.



To facilitate the connection, use the optional supply cable with D-Sub connectors (IPEK-003013).

USB

Connect the PLIN-USB with its USB plug (type A) to a USB port of a computer or of a USB hub. It does not matter whether the USB port complies electronically with the standard 1.1, 2.0, or 3.0.

Windows detects the new hardware and initializes the previously installed device driver. After the successful initialization, the status LED on the PLIN-USB is lit green (see also section 3.1 *Status* LED on page 10).



3 Operation

3.1 Status LED

For indication of operating conditions the PLIN-USB has an LED on its top.

LED status	Meaning
Green on	There's a connection to a driver of the operating system.
Green slow blinking	The LIN interface is initialized with a valid bitrate. A software application is connected to the LIN interface.
Green quick blinking	Data is transmitted via the connected LIN bus.

3.2 Unplugging the USB Connection

Under Windows the icon for removing hardware safely is not used with the PLIN-USB. You can unplug the PLIN-USB from the computer without any preparation.

3.3 Distinguishing Several PLIN-USB

You can operate several PLIN-USB on a single computer at the same time. To distinguish the interfaces in a software environment, you need to assign a hardware ID to each interface that is permanently saved in the interface. The hardware ID is independent of the LIN communication.

Do the following to set the hardware ID in the PLIN-USB:

1. Make sure that the PLIN-USB is connected to the PC and is initialized (status LED is lit green).



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

The Properties of PEAK Hardware window opens.

3. Change to the **LIN Hardware** tab and select the PLIN-USB interface from the list.

Properties of	f PEAK Hardwa	ire						×
CAN Hardware	LIN Hardware	Drivers	APIs	About				
	Device Man	ager Vers	ion: 2.6	5.0.100				
The following LI	IN hardware is ir	nstalled o	n this cor	nputer:				
Hardware		Info				Fin	mware	
E PLIN-USB		ID 0h, 0	Device 1,	Channel 1		1.	1.0	
Identify						Set Hardwa	are ID	
		OK		Cancel	A	pply	Help	

Figure 3: LIN hardware tab in the PEAKCPL software

- 4. Click on the Set Hardware ID button.
- 5. 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 PLIN-USB, e.g. with a sticker, in order to quickly distinguish similar interfaces.



4 Software

4.1 LIN Monitor PLIN-View Pro for Windows

PLIN-View Pro for Windows is a display and monitoring program for LIN messages in connection with PC LIN interfaces from PEAK-System. The program is part of the device driver installation.

<u>,</u>	Receive /	fransmit	Trace										PCAN_USB_PRO: Table						
sceive	ID 01h Status	xxx_LIN	Length 8	Deta C1 18 PC FF 3F FF HighSideFault = HighSideFault = Din_0 Din_1 Din_2 Din_3 Din_3 Din_4 Nodetror Ain_0 Ain_1 Ain_2	30.88 00h 00h 0 - 0FF 0 - 0FF 0 - 0FF 0 - 0FF 0 - 0FF 0 - 0FF 255 - max 4,0 Volt	Peri: 75	d Count 1091	Direction Subscriber	CST Enhanced	Checksu 6Ch	0 k.	•	Schedule Table "main_si ID Control_soc_LIN Error_Status_soc_LIN Status_soc_LIN	Delay 25 25 25 25	(Running) Slot Type Uncon Uncon Uncon	v Resolve Scher chlone> chlone> chlone>			
Rc	05h Contro	Loodan	2	E010 Dout_0 = 1 - 00 Dout_1 = 1 - 00 Dout_2 = 1 - 00 Dout_3 = 1 - 00 Dout1_0 = 0 - 00 Dout1_1 = 0 - 00 Dout1_1 = 0 - 00 Dout1_3 = 0 - 00	F F	75	7416	Publisher	Enhanced	ash	0 <i>k</i> .								
PLII re: -USB Pro LIP -USB Pro LIP	N-N 10 4 16h 4 Féh	/iev	v Pr	O Province Internet Mode None None	×	75 Count 0	729 Direction Subscriber Publisher	Subscriber CST Enhanced Enhanced	Enhanced Erro Edit Dout Dout Dout Dout Dout	41h Control, coc, L Nr L, D L, J L, J L, J H, O	O.k. Naignala N 1 1	 alue ON ON ON OFF ON 				Type Logical	Bange 0.1 0.1	5	
Made: S Bitrate: 15 a detection	200			~	Master	0 1162 6607 Bur: Active	Publisher Subscriber Publisher Overruns: 0	Enhanced Enhanced Enhanced	Dout Dout Dout Dout	HJ HJ HJ L2 call 0-10FF call: 1-10N	0 0 0	- OFF - OFF - OFF			_	Legical Legical Legical			
imeout: 40	on sunnir	g	• ma 0)	Detect K Cancel					-	t: Press F2 to	ıdk a Signal	value, j	mess ESC to cancel adding		0				
															-	-	1		

Figure 4: PLIN-View Pro for Windows

- Do the following to start and initialize PLIN-View Pro:
 - 1. From the Windows Start menu, select **PLIN-View Pro**.



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

lardware:					
Туре		ID	Device	Channel	Mode
PLIN-USB		0h	1	1	Slave
Mode:	Master				~
Bit rate:	19200				~
Bit rate detecti	on				
T .	4000		• mr	Dete	ct

Figure 5: Connection with the PLIN-USB in PLIN-View Pro

- 2. From the **Hardware** list, select the LIN connection to be used.
- 3. Determine the operation **Mode** to be used for the LIN connection.
- 4. From the **Bit rate** list, select the bit rate that is used by all nodes on the LIN bus.
- 5. Finally confirm the settings in the dialog box with **OK**.

The main window of PLIN-View Pro appears.



4.1.1 Receive/Transmit Tab

酱																
Fil	LIN Transmit	Nodes	Schedules Trace To	ols Help												
	🔁 - 🗔 🔗 A	2.• €	ta ta 🤤 🛑 💵		0											
а,	29 28 20 28	2918														
	Receive / Transmit	Trace										PLIN_USB: Tables				
	ID	L	anoth Data			Period	Count	Direction	CST	Checksum	Errors	Global Frame Table				\sim
	05h	2	□ 00 00			5	32	Publisher	Enhanced	7Ah	0.k.	ID	Protected ID	Direction	Lenc	th ^
	Control_xxx_LIN		DoutL_0 = 0 -	OFF								00h	80h	Disabled	2	
			DoutL_2 = 0 -	OFF								Status_xxx_LIN	C1h	Subscriber	8	
			DoutL_3 = 0 - DoutH_0 = 0 -	OFF								Error_Status_xxx_LIN	42h	Subscriber	2	
			DoutH_1 = 0 -	OFF								Status_xxx_LIN_Event	03h	Subscriber	8	
			DoutH_2 = 0 -	OFF								04h	C4h	Disabled	2	
												Control_xxx_LIN	85h	Publisher	2	
e	02h Error Status xxx	- IIN 2	EencomFron =	0 - OK		5	32	Subscriber	Enhanced	BDh	0.k.	06h	06h	Disabled	2	
.≥			ThermalError -	0 - OK								07h	47h	Disabled	2	
e e			CommError = 0	о - ок								08h	OSh	Disabled	2	
e a	01h	8	00 00 00 00 00 00	00 00 00		15	31	Subscriber	Enhanced	3Eh	0.k.	09h	49h	Disabled	2	
	Status_xxx_LIN		LowSideFault = HighSideFault1	00h								QAh	CAh	Disabled	2	
			HighSideFault2	- 00h								OBh	88h	Disabled	2	~
			Din_0 = 0 - 0F Din 1 = 0 - 0F	Ŧ								<				>
			Din_2 = 0 - 0F	F								Properties				
			Din_3 = 0 - 0F	Ŧ								Frame Definition "00h"				~
			NodeError = 0 Ain 0 = 0 - mit	- OK								21 21				
			Ain_1 = 0 - mi	'n								× Changeable				
			Ain_2 = 0 - mi	n								Checksum Type	Enh	anced		_
					1							Direction	Dis	bled		
	ID	Length	Data	Count	Direction	CST	Err	rors	Trigger	Commen	e .	Event Frame	No			
	Control xxx LIN	2	⊟ 72 19 DoutL 0 = 1 - 0N	0	Publisher	Enhanc	ed		Manual			Length	2			
.±			DoutL_1 = 1 - ON									Unconditional ID	00h			
E			DoutL_2 = 0 - 0FF DoutL_3 = 1 - 0N									ReadOnly				
ns			DoutH_0 = 1 - ON									D	00h			
La			DoutH_1 = 0 - OFF DoutH 2 = 0 - OFF									Protected ID	80h			
			DoutH_3 = 1 - ON													
	05h	2	⊞ FD 04	0	Publisher	Enhanc	ed		Manual			Checksum Type				
												Defines the type for th	e checksum ca	culation of the	UN-Fram	ie .
	L											dennition and can be	classic, Enhand	ed or Automati	с.	
00	onnected to PLIN-US	8 (19200)	Channel: 1 Mode: Master	Bus: Sleep	Overruns: 0											

Figure 6: 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 LIN messages and one for to be transmitted ones. In Master mode, Receive/Transmit appears and LIN messages can be transmitted onto the bus. In Slave mode, Receive/Publisher appears. In this case it is not possible to transmit messages.

If a Master requests data from a Slave, the Slave can publish the data within the LIN frame. The Global Frame Table contains all entries for defined LIN frames that can be used by the LIN interface. In order to transmit a LIN frame, the basic frame definition in the properties must be adapted.

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

- 1. From the **Global Frame Table**, select a frame.
- 2. Change the **Checksum Type** property to **Enhanced** or **Classic**.



- 3. Change the **Direction** property to Publisher.
- 4. Select the menu command **Transmit** > **New Frame**.

The New frame dialog box appears.

New frame	×
ID (Hex):	
Control_xxx_LIN	~
Data (18):	
Comment:	
Frame Definition	
ID:	05h
PID:	85h
Checksum Type:	Enhanced
Direction:	Publisher
Length:	2
	OK Cancel

Figure 7: New frame dialog box

- 5. From the ID list, select the frame to be transmitted.
- 6. Enter the **Data** of the LIN frame in the corresponding field.
- 7. Confirm the entries with **OK**.
- Transmit the selected frame with the menu command Transmit > Send (alternatively Space bar).
- Note: You can also manage and activate schedule tables. Furthermore, you can open LDF files and use their information for managing schedule tables, displaying data in symbolic form, or validate and edit data.

Tip: In order to facilitate the work with the Global Frame table, the Transmit and Publisher lists and the schedule tables as well with LDF files, you can put those into a PLIN project file with the menu item **File** > **Save** and reload later on.

DF/

4.1.2 Trace Tab

🦉 • 6	- <i>01 0</i> % •	€ ⊠0	19	- = 🖾 💞 🛛	0										
5 5	2222														
Receive /	Transmit 🚥 Tr	ace						PLIN_USB: Tables							
Recording., 107,7723 s 4312 Frames C1/Users/Screenshots en-US/Documents/PLIN-Slave with PLIN-USB 2.1./trc									Global Frame Table						
	Direction	10	Length	Deta.	Checknum	CET	Error A	ID	Protected ID	Direction	Le				
C 0030	Coherriber		Congoi	00.00	on one of the second se	Coherend	Entra	00h	806	Disabled	2				
0,09/2	Subscriber	02	-	00 00	00	Cabaaaad		Status xxx LIN	C1h	Subscriber	8				
0,0222	Dublishes	01	2	00 00 00 00 00 00 00 00	30	Cabaaaad		Free Status you LIN	426	Subscriber	2				
0,0472	Publisher	00	5	00.00	20	Cabaaaad		Status on UN Econt	021	Subscribes					
0,0722	Subscriber	02	-	00.00	35	Enhanced		An	C.III	Disabled					
107/2	ouuscriber	01		00 00 00 00 00 00 00 00	30	cristanced		own	Can	unacred	2				
7472	rounsher	00	-	00.00		ennanced		Control_xx_LIN	850	Publisher	2				
	auuscriber	02	1	00.00	10	unishced		OSh	06h	Disabled	2				
7972	Dublisher	05	2	00.00	74	Enhanced		07h	47h	Disabled	2				
8333	Publishes		÷	00.00		Enhanced		08h	08h	Disabled	2				
8472	Subscriber	01	8	00.00.00.00.00.00.00.00	36	Enhanced		09h	49h	Disabled	2				
8722	Publisher	05	2	00.00	74	Enhanced		0Ah	CAh	Disabled	2				
8972	Subscriber	02	2	00.00	BD	Enhanced		OBh	86h	Disabled	2				
9222	Subscriber	01	8	00 00 00 00 00 00 00 00	36	Enhanced		000	4Ch	Disabled	2				
9472	Publisher	05	2	00.00	74	Enhanced		000	005	Dirabled	-				
9723	Subscriber	02	2	00.00	8D	Enhanced		001	art	Disabled					
9973	Subscriber	01	8	00 00 00 00 00 00 00 00	36	Enhanced		<							
0223	Publisher	05	2	00.00	74	Enhanced									
0473	Subscriber	02	2	00.00	BD.	Enhanced		Properties							
0723	Subscriber	01		00 00 00 00 00 00 00 00	38	Enhanced		Frame Definition "00h"							
.0973	Publisher	05	2	00.00	78	Enhanced		8n 61 101							
1223	Subscriber	02	2	00 00	BD	Enhanced		BC Z =			_				
,1473	Subscriber	01	8	00 00 00 00 00 00 00 00	36	Enhanced		Changeable							
,1723	Publisher	05	2	00 00	7A	Enhanced		Checksum Type	Enha	nced					
1973	Subscriber	02	2	00 00	BD	Enhanced		Direction	Disat	iled					
2223	Subscriber	01	8	00 00 00 00 00 00 00 00	3E	Enhanced		Event Frame	No						
2473	Publisher	05	2	00.00	7A	Enhanced		Length	2						
2723	Subscriber	02	2	00.00	BD	Enhanced		Unconditional ID	006						
,2973	Subscriber	01	8	00 00 00 00 00 00 00 00	3E	Enhanced		ReadOnly							
,3223	Publisher	05	2	00.00	7A	Enhanced		D.	005		-				
,3473	Subscriber	02	2	00.00	BD	Enhanced		Postacted ID	805						
3723	Subscriber	01	8	00 00 00 00 00 00 00 00	36	Enhanced		Transferred to	001						
3973	Publisher	05	2	00.00	7A	Enhanced									
4223	Subscriber	02	2	00.00	BD	Enhanced									
4473	Subscriber	01	8	00 00 00 00 00 00 00 00	36	Enhanced									
,4723	Publisher	05	2	00.00	7A	Enhanced		0.1.7							
,4973	Subscriber	02	2	00.00	BD	Enhanced		Checksum lype							
,5223	Subscriber	01	8	00 00 00 00 00 00 00 00	3E	Enhanced		Defines the type for th	e checksum ca	iculation of the	LIN-FI				

Figure 8: Trace tab

On the **Trace** tab, the tracer (data logger) of PLIN-View Pro is used to record and display the communication on a LIN bus.

On startup of the tracer, the **Save as** dialog box appears. Enter a file name for saving the recording. The recording is continued until the LIN tracer is stopped or until the free space on the selected medium isn't enough anymore.

The upper area of the tab has a bar with information to the tracer status: the current status of the LIN tracer, the total run time, the number of recorded LIN frames, and the name of the current trace file for recording.



4.1.3 Status Bar

Connected to PLIN-USB (19200) Channel: 1 Mode: Master Bus: Active Overruns: 0

Figure 9: Status bar

The status bar shows information about the current LIN hardware, the connected LIN channel, the mode of operation, the LIN bus status (Active/Sleep), and a counter for the unsent or unread 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 with the F1 key.



4.2 PLIN-API for the Connection of Selfcreated Programs





On the provided DVD in the directory branch <code>Develop/PC</code> 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.

PEA

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 the use of this software, consult the software provider.



5 Technical Specifications

Power supply	
Supply voltage	 5 V DC via USB port for PLIN-USB (without transceiver) 6 - 28 V DC via pin 9 D-Sub for transceiver (required)
Current consumption	USB: 30 mA Auxiliary supply: max. 20 mA at 12 V

USB	
USB mode	USB 2.0 Full-speed
USB port	Plug type A
Cable length	about 60 cm

LIN

LIN standard	2.2, downward-compatible
LIN connection	D-Sub, 9-pin, LIN signal on pin 4, galvanic isolation up to 500 V
Transceiver	TJA1028T/3V3/20
Bitrates	1 - 20 kbit/s
Scheduler	Initialized by software, processed by hardware 8 schedule tables with 256 slots in all configurable

Measures

Size	86 x 43 x 21 mm See also dimension drawing Appendix B on page 23
Length USB connection cable	about 60 cm
Weight	about 80 g (incl. cable)

- - -



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

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





Appendix B Dimension Drawing



Figure 11: Dimension Drawing of the PLIN-USB

The figure does not show the original size.