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.

7

🖟 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 driver 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 o	of PEAK Hardwa	are					×
CAN Hardware	LIN Hardware	Drivers	APIs	About			
	Device Mar	lager Vers	ion: 2.	5.0.100			
The following L	.IN hardware is i	nstalled o	n this co	mputer:			
Hardware		Info				Firmware	
E PLIN-USE	3	ID 0h, I	Device 1	Channel 1		1.1.0	
Identify		ОК		Cancel	Set Har	rdware ID 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.

- AL -	Receive	/Trinsmit	ES Trace										PCAN_USB_PRO: Table							
	ID 01h Stati	e_xx_U	Length 8	C1 18 FC FF 3F FF 3 LowSideFoult = HighSideFoult1 = HighSideFoult2 = Din_0 = Din_1 =	ich Ich	Peris 75	d Count 1891	Direction Subscriber	CST Enhanced	Checksu. 6Ch	0 k.	^	Schedule Table "main_s ID Control_coc_LIN Error_Status_coc_LIN Status_coc_LIN	Delay 25 25 25	Slot Type Uncon Uncon					
Receive				Din_3 - Din_4 - Nodetrror - Ain_0 - Ain_1 - Ain_2 -	- OFF - OFF - OK 55 - max ,0 Valt 3,9 Volt															
	05h Cont	rol_xxx_L	DN ²	E0 10 Dist[_0 = 1 - 0M Dist[_1 = 1 - 0M Dist[_2 = 1 - 0M Dist[_2 = 1 - 0M Dist[_0 = 0 - 0P Dist[_0 = 0 - 0P Dist[_2 = 0 - 0P Dist[_2 = 0 - 0P Dist[_3 = 0 - 0P		75	7416	Publisher	Enhanced	89h	o.k.									
o					<	75	729	Subscriber	Enhanced		0.k.	v			_	-				
PLII	N-'	Vie	w Pr	ov Pr		Count 0	Direction Subscriber	CST Enhanced	Erre Edit U	iontrol_coc.Li		blue				Type	Range	×		
rei						1	Publisher	Enhanced	Dout			- ON				Logical				
re	6		Device 1	Channel Mode					Dout			ON					0.1	\langle		
-USB Pro LIP	N 1	h	1 :	1 None					Dout			ON OFF			_		1			
-USB Pro LIP	N F	h	1 3	2 None					Dout	H_0		ON			_					
						0 1162	Publisher Subscriber	Enhanced Enhanced	Dout			- OFF - OFF				Logical Logical	0.1			
						1162	Publisher	Enhanced	Dout			OFF			-	Logical	0.0.1	P		
Made: S	lina -			~													-			
Bitrate: 15	9200								Doutt	2									1	
a detection					-				II cair	al]: 0 - "OFF"						100	_	~		
imeout 40	00		🗧 ma	Detect	Marter	Bus: Active	Overruns: 0	/	read to a construction of the construction of	al): 1 - "ON"										
ale detecti	ion run	ing					/						ress ESC to cancel editing		_	- 18		-		
ormet			0	K Cancel						P 1613 P 2 10 1	iak s sgrai	carbe, j	INTERSC TO CARTER ROUTING		-					
		_	_		4						-	_				- 18				
																				1
															-	-				0

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				
Timeout:	4000		🜩 ms	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

	💁 🕢 🔜 · 😜				0 🐻										
1.2	22223														
Re	eceive / Transmit 📖 T	race										PLIN_USB: Tables			
1	ID	Length	Data			Period	Count	Direction	CST	Checksum	From	Global Frame Table			
	05h	2	E 00 00			75	32	Publisher		7Ah	0.k.	ID	Protected ID	Direction	Length
	Control_xxx_LIN		DoutL_0 = 0 - DoutL 1 = 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 - DoutH 3 = 0 -									04h	C4h	Disabled	2
				OFF								Control_xxx_LIN	85h	Publisher	2
	02h	2	00 00			75	32	Subscriber	Enhanced	BDh	0.k.	06h	06h	Disabled	2
	Error_Status_xxx_UN		EepromError = ThermalError =	0 - OK								07h	47h	Disabled	2
			CommError -	о - OK								08h	08h	Disabled	2
	01h	8		00 00 00		75	31	Subscriber	Enhanced	3Eh	0.k.	09h	49h	Disabled	2
	Status_xxx_LIN		LowSideFault =									QAh	CAh	Disabled	2
			HighSideFault1 HighSideFault2	= 00h								OBh	88h	Disabled	2
			Din_0 = 0 - 0F Din_1 = 0 - 0F									<			
			Din_2 = 0 - 0F	Ŧ								Properties			
			Din_3 = 0 - 0 Din_4 = 0 - 0									Frame Definition "00h"			
			NodeError = 0	- OK											
			Ain_0 = 0 - mi Ain_1 = 0 - mi									21 21			
			Ain_2 = 0 - mi									 Changeable 			
l												Checksum Type		inced	
	ID Let	noth Dat	a	Count	Direction	CST	Err	ors	Tripper	Commen		Direction	Disa	bled	
	05h 2		2 19	0	Publisher	Enhan	ned		Manual			Event Frame	No		
	Control_xxx_LIN	0	outL_0 = 1 - ON									Length	2		
			outL_1 = 1 - ON outL_2 = 0 - OFF									Unconditional ID	00h		
		D	outL_3 = 1 - ON									 ReadOnly 	00h		
			outH_0 = 1 - ON outH 1 = 0 - OFF									Protected ID	00h		
		0	outH_2 = 0 - OFF outH_3 = 1 - ON									Protected ID	sun		
	05h 2		D 04	0	Publisher	Enhan	red		Manual			Checksum Type			
	2			~	- outstier	Crition						Defines the type for th	e checksum cal	culation of the I	IN-Frame

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	
	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

				ace Tools Help	-										
				🔍 🔳 📰 🕜 🛽	0										
5.5	2222														
Receive / Transmit 🚥 Trace									PLIN_USB: Tables						
cordina.	rding., 107.7723 s 4312 Frames C/Users/Screenshots en-US/Docur				S\Documents\P	LIN-Slave with F	UN-USB 2.1.Itrc		Global Frame Table						
me	Direction	ID	Length	Data	Checksum	CST	Errors	^	ID	Protected ID	Direction	Len			
6.5972	Subscriber	02	2	00.00	BD	Enhanced			00h	80h	Disabled	2			
6,6222	Subscriber	01	8	00 00 00 00 00 00 00 00 00	36	Enhanced			Status xxx LIN	C1h	Subscriber	8			
16,6222	Publisher	01	2	00 00 00 00 00 00 00 00 00	3E 7A	Enhanced			Error Status xxx LIN	42h	Subscriber	2			
		05	2		A BD				Status xxx LIN Event	03h	Subscriber	8			
16,6722	Subscriber			00 00 00 00 00 00 00 00 00		Enhanced									
16,6972	Subscriber Publisher	01	8		3E 7A	Enhanced			04h	C4h	Disabled	2			
6,7222		05		00.00		Enhanced			Control.xxx_UN	85h	Publisher	2			
6,7472	Subscriber	02	2	00 00	8D	Enhanced			OSh	06h	Disabled	2			
6,7722	Subscriber	01	8	00 00 00 00 00 00 00 00	36	Enhanced			07h	47h	Disabled	2			
6,7972	Publisher	05	2	00 00	7A	Enhanced			03h	08h	Disabled	2			
6,8222	Subscriber	02	2	00.00	BD	Enhanced			09h	49h	Disabled	2			
6,8472	Subscriber	01	8	00 00 00 00 00 00 00 00	36	Enhanced			OAh	CAh	Disabled	2			
6,8722	Publisher	05	2	00 00	7A	Enhanced			OBh	SEN	Disabled	2			
6,8972	Subscriber	02	2	00.00	BD	Enhanced									
6,9222	Subscriber	01	8	00 00 00 00 00 00 00 00	3E	Enhanced			0Ch	4Ch	Disabled	2			
6,9472	Publisher	05	2	00 00	7A	Enhanced			00h	ODh	Disabled	2			
16,9723	Subscriber	02	2	00.00	BD	Enhanced			(C)	95h	Dissibled	,			
16,9973	Subscriber	01	8	00 00 00 00 00 00 00 00	36	Enhanced									
7,0223	Publisher	05	2	00 00	7A	Enhanced			Properties						
17,0473	Subscriber	02	2	00 00	8D	Enhanced			Freme Definition "00h"						
17,0723	Subscriber	01	8	00 00 00 00 00 00 00 00	36	Enhanced									
17,0973	Publisher	05	2	00 00	7A	Enhanced			20 24 III						
7,1223	Subscriber	02	2	00 00	BD	Enhanced			 Changeable 	_		_			
17,1473	Subscriber	01	8	00 00 00 00 00 00 00 00	36	Enhanced			 Changeable Checksum Type 	Enhar					
17,1723	Publisher	05	2	00 00	7A	Enhanced									
7,1973	Subscriber	02	2	00 00	BD	Enhanced			Direction	Disab	ed.				
7,2223	Subscriber	01	8	00 00 00 00 00 00 00 00 00	36	Enhanced			Event Frame	No					
7,2473	Publisher	05	2	00 00	7A	Enhanced			Length	2					
7,2723	Subscriber	02	2	00 00	BD	Enhanced			Unconditional ID	000					
7,2973	Subscriber	01	8	00 00 00 00 00 00 00 00	36	Enhanced			ReadOnly						
7,3223	Publisher	05	2	00 00	7A	Enhanced			D	00h		_			
7,3473	Subscriber	02	2	00 00	8D	Enhanced			Protected ID	805					
7,3723	Subscriber	01	8	00 00 00 00 00 00 00 00	36	Enhanced			Trouccied to	000					
7,3973	Publisher	05	2	00.00	7A	Enhanced									
7,4223	Subscriber	02	2	00 00	8D	Enhanced									
7,4473	Subscriber	01	8	00 00 00 00 00 00 00 00	38	Enhanced									
17,4723	Publisher	05	2	00 00	7A	Enhanced									
7,4973	Subscriber	02	2	00 00	BD	Enhanced			Checksum Type						
7,5223	Subscriber	01	8	00 00 00 00 00 00 00 00	36	Enhanced		×	Defines the type for the definition and can be to						

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.