Kvaser Hybrid 2xCAN/LIN User's Guide

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http://www.kvaser.com

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We believe that the information contained herein was accurate in all respects at the time of printing. Kvaser AB cannot, however, assume any responsibility for errors or omissions in this text. Also note that the information in this document is subject to change without notice and should not be construed as a commitment by Kvaser AB.

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1 About this manual

This manual is intended for Kvaser Hybrid 2xCAN/LIN users. This document contains a description of the hardware's properties and general instructions for connecting the device to a computer.

2 Introduction

This section will describe the functions and features of the Kvaser Hybrid 2xCAN/LIN.

2.1 Welcome to Kvaser Hybrid 2xCAN/LIN

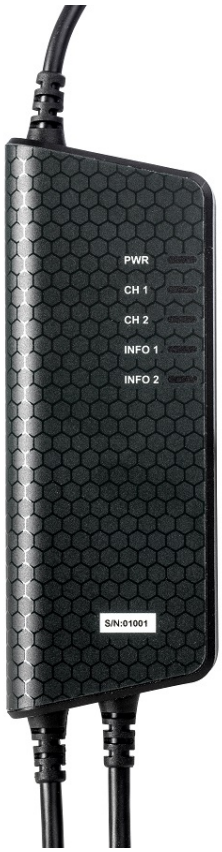

Figure 1: Kvaser Hybrid 2xCAN/LIN

Kvaser Hybrid 2xCAN/LIN is a two-channel interface where each channel can be opened independently either as CAN or LIN. The Kvaser Hybrid 2xCAN/LIN is compatible with applications that use Kvaser's CANlib and LINlib.

This guide applies to Kvaser Hybrid 2xCAN/LIN devices listed in Table 1.

Device	Product Number
Kvaser Hybrid 2xCAN/LIN	73-30130-00965-3

Table 1: Kvaser Hybrid 2xCAN/LIN devices and their EAN numbers.

2.2 Major features

- Hybrid USB CAN/LIN interface.
- Supports CAN FD, up to 5 Mbit/s (with correct physical layer implementation).
- Quick and easy plug-and-play installation.
- Supports both 11-bit (CAN 2.0A) and 29-bit (CAN 2.0B active) identifiers.
- Power is taken from the USB bus.
- 100% compatible with applications written for other Kvaser CAN hardware with Kvaser CANlib and Kvaser LINlib.
- High-speed CAN connection (compliant with ISO 11898-2), up to 1 Mbit/s.
- Fully compatible with J1939, CANopen, NMEA 2000® and DeviceNet.
- Supports LIN 1.3 to 2.2
- LIN reference voltage detection

2.3 Interface

Kvaser Hybrid 2xCAN/LIN provides a CAN/LIN bus interface through a standard USB interface.

2.4 Additional software and documentation

The Kvaser CANlib SDK includes everything you need in order to develop software applications interacting with Kvaser CAN hardware. The SDK contains full documentation and many sample programs, written in C, C++, C#, Delphi, Python and Visual Basic. Kvaser CAN hardware is built around the same common software API. Applications developed using one device type will run without modification on other device types.

The latest versions of documentation, software and drivers can be downloaded for free at www.kvaser.com/download.

3 Kvaser Hybrid 2xCAN/LIN hardware

In this section you can read more about the CAN/LIN channels, power supply and LED indicators.

3.1 Hardware installation

For the Kvaser Hybrid 2xCAN/LIN to communicate with the host computer, a compatible version of the Kvaser driver and firmware must be installed.

After the driver has been installed on the host computer, the firmware may then be downloaded and installed on the Kvaser Hybrid 2xCAN/LIN.

The latest version of the driver and firmware can be downloaded from www.kvaser.com/download.

The driver is installed by running the file `kvaser_drivers_setup.exe`.

The Kvaser Hybrid 2xCAN/LIN may be inserted in any free USB socket on the host computer. You do not need to switch the power off before inserting or removing the device.

For information on how to upgrade the firmware, see Section 4.5, Updating the firmware, on Page 15.

3.2 USB connector

The Kvaser Hybrid 2xCAN/LIN has a standard USB type "A" connector.

Figure 2: A standard USB type "A" connector.

Connect the device to your computer using any high quality USB 2.0 certified cable. The maximum USB cable length is 5 m (∼ 16 ft). If you need a longer cable,

you can use USB hubs or USB extension cables with a built-in hub. By chaining up to 5 hubs, you can achieve an effective cable length of up to 25 m (∼ 82 ft).

> As USB cables become longer they are more sensitive to EMI, because they make a longer antenna that can pick up more noise. These issues can be mitigated by using higher quality cables with better shielding. Thicker cables tend to be better than thin ones, and braided shielding tends to be more reliable than only foil. Furthermore, longer cables may introduce signal degradation and timing issues that, if necessary, can be mitigated using shorter cable segments combined with hubs that amplify the signal and handle delays on a per-cable basis.

3.3 CAN/LIN channels

The Kvaser Hybrid 2xCAN/LIN has two LIN/CAN Hi-Speed channels in two seperate 9-pin D-SUB CAN connectors (see Figure 3). See Section 4.3, CAN/LIN connector, on Page 13 for pinout information.

Figure 3: CAN/LIN connector on Kvaser Hybrid 2xCAN/LIN

3.4 Power supply

The Kvaser Hybrid 2xCAN/LIN is powered from the USB port. You also need to apply a reference voltage to the LIN reference power pin when running the channel in LIN mode. See Section 4.3, CAN/LIN connector, on Page 13 for pinout information.

3.5 LED Indicators

The Kvaser Hybrid 2xCAN/LIN has a single power LED as well as one traffic LED and one Informational LED for each CAN/LIN channel as shown in Figure 4 on Page 9. Their functions are described in Section 4.1, Definitions of LED states and colors, on Page 10.

Figure 4: LEDs on the Kvaser Hybrid 2xCAN/LIN.

3.6 Troubleshooting

Use "Kvaser Device Guide" in the Control Panel to verify that the computer can communicate with the Kvaser Hybrid 2xCAN/LIN. If the firmware version shown is all zeros, there are communication problems. If the LEDs are not flashing or do not light up at all, check the power supply.

3.7 Limitations in LINlib functionality

The following limitations apply to the Kvaser Hybrid 2xCAN/LIN:

- The API call `linSetupIllegalMessage()` is not supported.
- The fields `synchEdgeTime` and `byteTime` in the `struct LinMessageInfo` is not used.

4 Appendices

In this section you will find technical information about the Kvaser Hybrid 2xCAN/LIN and its connectors.

4.1 Definitions of LED states and colors

The Kvaser Hybrid 2xCAN/LIN has three types of LEDs; Power, Traffic and Info. These are dual colored as shown in Table 2. A device with multiple channels has one Traffic LED for each channel. When the device has more than one channel a space and digit is added on the label, CH 1, CH 2 etc. The red Traffic LEDs are also used to indicate errors by using all red Traffic LEDs simultaneously.

LED	Label	Color
Power	PWR	Green/Yellow
Traffic	CH	Yellow/Red
Info	INFO	Green/Yellow

Table 2: The different type of LEDs.

The following definitions is used to describe the state of an LED:

Off The LED is off and no light is emitted.

Flash The LED is lit up for a very short time. A single flash may be hard to see and a continuous set of flashes will look the same as On.

Slow Blink The LED is repeatedly turned On and Off. The On and Off phase is equal in time.

Fast Blink The LED is repeatedly turned On and Off but with a higher frequency than Slow Blink. The On and Off time is still equal.

On The LED is constantly emitting light.

Slow Waver This is a variant of Slow Blink but instead of being Off, a second color is On. This is only possible with a dual colored LED.

Fast Waver The LED is alternating between two colors as in Slow Waver but using a higher frequency.

Running This means that all LEDs are lit, one at the time, in sequence with every color available i.e. "Power green->Power yellow->Traffic 1 yellow->Traffic 1 red->Traffic 2 yellow->Traffic 2 red->. . . "

As an example, "Slow Waver (Green/Yellow)" means that the LED is slowly blinking by alternating between green and yellow.

The Kvaser Hybrid 2xCAN/LIN has five LEDs as shown in Figure 4 on Page 9. Their functions are shown in Table 3 on Page 11.

LED	Function	Description
PWR (Green)	Power	Steady light when unit is powered and working.
CH 1 (Yellow)	CAN RxTx	Status for CAN/LIN channel 1
CH 2 (Yellow)	CAN RxTx	Status for CAN/LIN channel 2
INFO 1 (Green)	LIN Mode	CH 1 in use as LIN
INFO 1 (Yellow)	LIN Mode	LIN reference voltage is available
INFO 2 (Green)	LIN Mode	CH 2 in use as LIN
INFO 2 (Yellow)	LIN Mode	LIN reference voltage is available

Table 3: LEDs on the Kvaser Hybrid 2xCAN/LIN.

4.1.1 Interface mode

The device is in Interface mode when connected to the PC via USB. If the Power LED is showing a steady green light, the device is in Interface mode and working correctly. When connected to the computer for the first time, the Power LED will blink slowly in yellow until the driver is installed and the device has received a USB configuration.

When in Interface mode, if the Power LED is yellow for an extended period, something is wrong. Please see Table 4.

The power should never be removed when firmware update is in progress.

Power LED	Traffic LED	Description
Slow Blink (Yellow)	All off (-)	Waiting for USB configuration
Slow Waver (Green/Yellow)	Slow Waver (Yellow/Red)	Firmware configuration error[1]
Slow Waver (Green/Yellow)	All Slow Blink (Yellow)	Power problem[2]

Table 4: Yellow Power LED shows problems in Interface mode.

4.1.2 CAN and LIN usage

Kvaser Hybrid 2xCAN/LIN is ready to be operated as either a CAN or LIN interface when connected to the PC without further configuration. You can use the same CANlib and LINlib API calls as with other Kvaser interfaces, use CANlib for CAN and LINlib for LIN related usage. Both libraries are included in the Kvaser CANlib SDK, see Section 2.4, Additional software and documentation, on Page 6.

[1] This should not normally happen. If it does, please contact Kvaser support.
[2] This indicates low power supply, such as using an unpowered USB hub.

4.1.3 CAN interface mode

When Kvaser Hybrid 2xCAN/LIN is used as a CAN interface, the traffic LED is used as described in Table 5 on Page 12.

Traffic LED	Description
Off (-)	Idle, no CAN traffic
Flash (Yellow)	CAN message received or sent
Flash (Red)	Error frame received
All Fast Blink (Yellow)	Firmware update is in progress
Fast Blink (Red)	CAN channel is error passive
On (Red)[3]	CAN overrun

Table 5: Traffic LED shows CAN bus status in CAN Interface mode.

4.1.4 LIN interface mode

When Kvaser Hybrid 2xCAN/LIN is used as a LIN interface, the traffic LED is used as described in Table 6.

Traffic LED	Description
Off (-)	Idle, no CAN traffic
Flash (Yellow)	Internal activity or LIN message received or sent
All Fast Blink (Yellow)	Firmware update is in progress

Table 6: Traffic LED shows LIN bus status in LIN Interface mode.

4.2 Technical data

In Table 7 on Page 13 you will find the Kvaser Hybrid 2xCAN/LIN's technical specifications.

[3]The red Traffic LED indicating overrun will stay on until the device goes bus off.

CAN/LIN Channels	2 (Individually configurable as CAN or LIN)
CAN Transceivers	TJA1051T/E (Compliant with ISO 11898-2)
CAN Bit Rate	50 kbit/s to 1 Mbit/s
CAN FD Bit Rate	Up to 5 Mbit/s (with correct physical layer implementation)
CAN/LIN Controller	Kvaser CAN/LIN IP in FPGA
LIN Transceivers	TJA1021T/20
LIN Bit Rate	1 - 20 kbit/s
Time stamp resolution	50 µs
CAN Max message rate	20000 msg/s per channel
Error Frame Detection	Yes
Error Frame Generation	No
Silent mode	No
Kvaser MagiSync	No
PC interface	USB 2.0
Power consumption	max 280 mA
Hardware configuration	Done by software (Plug & Play).
Software requirements	Windows 7 or later. (For other operating systems, contact Kvaser support.)
Dimensions	50 x 170 x 20 mm for body incl. strain relief
Weight	170 g
Operating temperature	−40 °C to +85 °C
Storage temperature	−40 °C to +85 °C
Relative humidity	0 % to 85 % (non-condensing.)

Table 7: Technical Specifications.

4.3 CAN/LIN connector

Kvaser Hybrid 2xCAN/LIN devices that use the 9-pin D-SUB connector (see Figure 5) have the pinning described in Table 8 on Page 14.

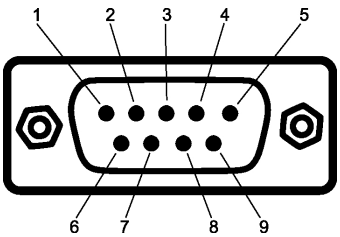

Figure 5: The D-SUB 9 connector pin numbers

D-SUB 9	CAN Function	LIN Function
1	Not connected	Not connected
2	CAN_L channel	Not connected
3	GND	GND both
4	Not connected	Not connected
5	Shield	Shield
6	Not connected	Not connected
7	CAN_H channel	LIN_BUS channel
8	Not connected	Not connected
9	Not connected	Reference Voltage

Table 8: Pin configuration of the 9-pin D-SUB connector.

4.4 CAN bus termination

Every CAN bus must be terminated with a 120 Ohm resistor at each end of the bus. The Kvaser Hybrid 2xCAN/LIN does not contain any CAN bus termination, because their inclusion could cause severe disturbance in a system which is already correctly terminated.

For laboratory or testing use, the exact value of the termination resistors is not always critical. Sometimes a single terminator is sufficient. For production, proper termination is essential. If you see error frames on the bus, you should check the termination.

To save yourself a lot of trouble, always terminate the CAN bus properly.

4.5 Updating the firmware

For the Kvaser Hybrid 2xCAN/LIN to communicate with the host computer, compatible versions of the Kvaser CANlib (including driver) and firmware must be installed.

The latest versions of firmware and drivers can be downloaded for free at www.kvaser.com/download.

Connect the Kvaser Hybrid 2xCAN/LIN to your PC with the USB cable and start the update.exe application. A window opens showing the Firmware Update Instructions, read and follow those carefully.

To check the current firmware version, open "Kvaser Device Guide" which can be found in the Control Panel. Select "Kvaser Hybrid 2xCAN/LIN" in the tree view to the left, and click on the channel. The firmware revision information now appears in the right half of the window.

5 Disposal and Recycling Information

When this product reaches its end of life, please dispose of it according to your local environmental laws and guidelines.

For information about Kvaser's recycling programs, visit:
http://www.kvaser.com/en/kvaser/recycling-policy.html

6 Legal acknowledgements

6.1 Usage warning

WARNING FOR ALL USERS

WARNING! - YOUR USE OF THIS DEVICE MUST BE DONE WITH CAUTION AND A FULL UNDERSTANDING OF THE RISKS!

THIS WARNING IS PRESENTED TO INFORM YOU THAT THE OPERATION OF THIS DEVICE MAY BE DANGEROUS. YOUR ACTIONS CAN INFLUENCE THE BEHAVIOR OF A CAN-BASED DISTRIBUTED EMBEDDED SYSTEM, AND DEPENDING ON THE APPLICATION, THE CONSEQUENCES OF YOUR IMPROPER ACTIONS COULD CAUSE SERIOUS OPERATIONAL MALFUNCTION, LOSS OF INFORMATION, DAMAGE TO EQUIPMENT, AND PHYSICAL INJURY TO YOURSELF AND OTHERS. A POTENTIALLY HAZARDOUS OPERATING CONDITION IS PRESENT WHEN THE FOLLOWING TWO CONDITIONS ARE CONCURRENTLY TRUE: THE PRODUCT IS PHYSICALLY INTERCONNECTED TO A REAL DISTRIBUTED EMBEDDED SYSTEM; AND THE FUNCTIONS AND OPERATIONS OF THE REAL DISTRIBUTED EMBEDDED SYSTEM ARE CONTROLLABLE OR INFLUENCED BY THE USE OF THE CAN NETWORK. A POTENTIALLY HAZARDOUS OPERATING CONDITION MAY RESULT FROM THE ACTIVITY OR NON-ACTIVITY OF SOME DISTRIBUTED EMBEDDED SYSTEM FUNCTIONS AND OPERATIONS, WHICH MAY RESULT IN SERIOUS PHYSICAL HARM OR DEATH OR CAUSE DAMAGE TO EQUIPMENT, DEVICES, OR THE SURROUNDING ENVIRONMENT.

WITH THIS DEVICE, YOU MAY POTENTIALLY:

- CAUSE A CHANGE IN THE OPERATION OF THE SYSTEM, MODULE, DEVICE, CIRCUIT, OR OUTPUT.
- TURN ON OR ACTIVATE A MODULE, DEVICE, CIRCUIT, OUTPUT, OR FUNCTION.
- TURN OFF OR DEACTIVATE A MODULE, DEVICE, CIRCUIT, OUTPUT, OR FUNCTION.
- INHIBIT, TURN OFF, OR DEACTIVATE NORMAL OPERATION.
- MODIFY THE BEHAVIOR OF A DISTRIBUTED PRODUCT.
- ACTIVATE AN UNINTENDED OPERATION.
- PLACE THE SYSTEM, MODULE, DEVICE, CIRCUIT, OR OUTPUT INTO AN UNINTENDED MODE.

ONLY THOSE PERSONS WHO:

(A) ARE PROPERLY TRAINED AND QUALIFIED WITH RESPECT TO THE USE OF THE DEVICE,

(B) UNDERSTAND THE WARNINGS ABOVE, AND

(C) UNDERSTAND HOW THIS DEVICE INTERACTS WITH AND IMPACTS THE FUNCTION AND SAFETY OF OTHER PRODUCTS IN A DISTRIBUTED SYSTEM AND THE APPLICATION FOR WHICH THIS DEVICE WILL BE APPLIED, MAY USE THE DEVICE.

PLEASE NOTE THAT YOU CAN INTEGRATE THIS PRODUCT AS A SUBSYSTEM INTO HIGHER-LEVEL SYSTEMS. IN CASE YOU DO SO, KVASER AB HEREBY DECLARES THAT KVASER AB'S WARRANTY SHALL BE LIMITED TO THE CORRECTION OF DEFECTS, AND KVASER AB HEREBY EXPRESSLY DISCLAIMS ANY LIABILITY OVER AND ABOVE THE REFUNDING OF THE PRICE PAID FOR THIS DEVICE, SINCE KVASER AB DOES NOT HAVE ANY INFLUENCE ON THE IMPLEMENTATIONS OF THE HIGHER-LEVEL SYSTEM, WHICH MAY BE DEFECTIVE.

6.2 EU Regulatory Compliance

Advanced CAN Solutions

EU Declaration of Conformity (DoC)

We

Company Name:	Kvaser AB	City:	Mölndal
Postal address:	Aminogatan 25	Telephone number:	+46 31 886344
Postcode:	431 53	E-mail address:	sales@kvaser.com

declare that the DoC is issued under our sole responsibility and belongs to the following product:

Product: Kvaser Hybrid 2xCAN/LIN

Object of the declaration (identification of apparatus allowing traceability):
Product: Kvaser Hybrid 2xCAN/LIN
Type: 73-30130-00965-3

The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:
Electromagnetic Compatibility (EMC) Directive 2014/30/EU (Art. 6)

RoHS recast Directive 2011/65/EU (Art. 4.1)

The following harmonised standards and technical specifications have been applied
(title, date of standard/specification):

EN 55024 (2010)	EN 55032 (2012)
EN 61000-6-3 (2007 + A1:2011)	EN 50581 (2012)

Signed for and on behalf of:

Mölndal	2018-10-04	
Place of issue	Date of issue	Claes Haglund, Supply Chain and Quality director

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense.

6.3 Patents, Copyrights and Trademarks

All trademarks are the property of their respective owner. Windows is a registered trademark of Microsoft Corporation in the United States and other countries.

Adobe, the Adobe logo, and Reader are either registered trademarks or trademarks of Adobe Systems Incorporated in the United States and/or other countries.

DeviceNet is a trademark of Open DeviceNet Vendor Association, Inc.

NMEA 2000 is the registered trademark of the National Marine Electronics Association, Inc.

For information about Kvaser related CAN patents, see www.kvaser.com/patent.

7 Document Revision History

Version history for document UG_98198_hybrid_2xcan_lin:

Revision	Date	Changes
1.0	2017-09-05	Initial version
1.1	2017-11-21	Stated USB 2.0, "Kvaser Device Guide" has replaced "Kvaser Hardware", Minor textual changes
1.2	2018-01-28	Minor textual changes
1.3	2018-05-07	Minor textual changes
1.4	2018-08-28	Minor textual changes
2.0	2018-11-19	Updated EU Regulatory Compliance, added LINlib limitation chapter
2.1	2019-02-11	Minor textual changes