Kvaser BlackBird v2 User's Guide

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https://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 BlackBird v2 users. This document contains a description of the hardware's properties and general instructions for connecting the device to a computer. The Kvaser Remote Device Configuration software is started from the Kvaser Device Guide program in the control panel.

For information about how to set up a WLAN connection to the Kvaser BlackBird v2, see the Kvaser BlackBird Getting Started Guide.

2 Introduction

This section will describe the functions and features of the Kvaser BlackBird v2.

2.1 Welcome to Kvaser BlackBird v2

Figure 1: Kvaser BlackBird v2

The Kvaser BlackBird v2 is a small, yet advanced, wireless CAN interface. Configured via USB, the Kvaser BlackBird v2 can be used as a wireless CAN interface or as a USB CAN interface.

This guide applies to Kvaser BlackBird v2 devices listed in Table 1.

Device	Product Number
Kvaser BlackBird v2	73-30130-00671-3

Table 1: Kvaser BlackBird v2 device and its Product numbers

2.2 Major features of Kvaser BlackBird v2

- Wireless/USB CAN interface with Kvaser *t* programmability.
- Easy one click configuration using Kvaser Wi-Fi Pairing tool.
- Supports Kvaser REST API.
- Can be either public or private.
- Supports high data throughput and prevents bottlenecks with quick reaction times and precise time stamping.
- Supports both 11-bit (CAN 2.0A) and 29-bit (CAN 2.0B Active) identifiers.
- Large on-board RAM buffer for CAN messages.
- Supports silent mode for analysis tools – listen to the bus without interfering.
- 100 % compatible with applications written using Kvaser CANlib targeting other Kvaser CAN hardware.
- High-speed CAN connection (compliant with ISO 11898-2), up to 1 Mbit/s.
- Fully compatible with J1939, CANopen, NMEA 2000 and DeviceNet.
- One USB 2.0 Hi-Speed connection with data rates up to 480 Mbit/s while being compatible with USB 1.x and USB 3.0.
- Rugged aluminum housing.
- Supports 802.11b/g/n.

2.3 Interface

Kvaser BlackBird v2 provides a CAN bus interface through a standard USB interface or remotely over Wi-Fi.

2.4 The t programming language

The Kvaser t programming language is event oriented and modelled after C. It can be used to customize the behavior of the Kvaser BlackBird v2 and other Kvaser t capable devices.

A t program is invoked via hooks, which are entry points that are executed at the occurrence of certain events. These events can be, for example, the arrival of specific CAN messages or a timer expiration.

Like any Kvaser CAN interface, the Kvaser BlackBird v2 can be used via CANlib on a host computer. The addition of t programs running directly on the Kvaser BlackBird v2 makes it possible to react much quicker to CAN bus events (for example to speed up file transfer protocols or to simulate missing hardware).

For more information, see the Kvaser t Programming Language guide that can be downloaded at www.kvaser.com/download.

2.5 Restrictions in t functionality

The Kvaser BlackBird v2 is a dedicated CAN interface, and as such does not contain real-time clock (RTC), logger or SD card functionality, neither does the Kvaser BlackBird v2 include dedicated I/O pins. This means that the t functionality listed in Table 2 on Page 7 is not available on Kvaser BlackBird v2 (the table shows version 3.10 of the t language compiler).

Group	Function name
Hooks	`on IoEvent`
Predefined I/O Functions	`kvIoGetNumberOfPins`
	`kvIoPinGetInfo`
	`kvIoPinSetInfo`
	`kvIoConfirmConfig`
	`kvIoPinSetDigital`
	`kvIoPinGetDigital`
	`kvIoPinGetOutputDigital`
	`kvIoPinSetRelay`
	`kvIoPinGetOutputRelay`
	`kvIoPinSetAnalog`
	`kvIoPinGetAnalog`
	`kvIoPinGetOutputAnalog`
Predefined File I/O Functions	`fileOpen`
	`fileClose`
	`fileGets`
	`fileReadBlock`
	`filePuts`
	`fileWriteBlock`
	`fileSeek`
	`fileDelete`
Predefined XML Functions	`xmlOpen`
	`xmlClose`
	`xmlGet`
Predefined t Program Related Functions	`scriptLoad`
Predefined Logger Related Functions	`filterDropMessage`
	`loggerStatus`
	`loggerStart`
	`loggerStop`
Other Predefined Functions	`timeGetDate`

Table 2: Functionality in the t language (v3.10) that is not supported by Kvaser BlackBird v2.

2.6 Additional software and documentation

The Kvaser CANlib SDK includes everything you need in order to develop software applications interacting with Kvaser CAN and LIN hardware. The SDK contains full documentation and many sample programs, written in C, C++, C#, Delphi, Python and Visual Basic. Kvaser CAN and LIN 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 BlackBird v2 hardware

In this section you can read more about the installation, hardware, power supply and LED indicators.

3.1 Hardware installation

For the Kvaser BlackBird v2 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 BlackBird v2.

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 BlackBird v2 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 5.5, Updating the firmware, on Page 19.

3.2 USB connector

The Kvaser BlackBird v2 has a standard USB type "A" connector.

3.3 CAN connector

The Kvaser BlackBird v2 has a 9-pin D-SUB CAN connector (see Figure 2). See Section 5.3, CAN connectors, on Page 18 for pinout information.

Figure 2: CAN connector on Kvaser BlackBird v2

3.4 Power supply

The Kvaser BlackBird v2 can be powered from the CAN side or from the USB side. The device automatically switches between the CAN (primary) and the USB (secondary) power supply, reducing the power drain on host laptop's battery.

To operate the Kvaser BlackBird v2 as a wireless CAN interface, you must supply power on the CAN side. To use the device as a USB CAN interface or to configure the device, power on the USB side is sufficient.

3.5 LED indicators

Figure 3: LEDs on the Kvaser BlackBird v2

The LED indicators have somewhat different meaning depending on how your Kvaser BlackBird v2 is being used – as a CAN interface or a wireless interface. Table 3 describes the general purpose of each LED.

LED	General meaning
CAN (Yellow)	Status for CAN channel.
INFO (Orange)	General Information.
ERROR (Red)	Indicates temporary or permanent errors.
WLAN (Blue)	WLAN status.
POWER (Green)	Power and general status.

Table 3: LEDs on the Kvaser BlackBird v2

The ERROR LED indicator can give more information about the cause of failure.

ERROR LED Signal	Auxiliary Signal	General Meaning
Blink	CAN LED blinks	CAN channel is in error passive mode
Slower blink	CAN LED blinks	CAN channel is bus off
Short flash	-	Error frame detected

Table 4: ERROR LED Indicator Signals

A steady light on ERROR LED is used to indicate a variety of situations. Check the other LED signals to identify the issue.

LED	Signal bursts	General Meaning
INFO	1 short blink	CAN overrun
INFO	5 short blinks	Major error
INFO	6 short blinks	WLAN failure
POWER	continuous fast blink	Software problems: configuration, parameters, firmware

Table 5: LED interpretation when ERROR LED gives a steady light.

4 How to use the Kvaser BlackBird v2

4.1 Initial network setup

The easiest way to get started is to use the Kvaser Wi-Fi Pairing Tool to pair your Kvaser BlackBird v2 with a host host computer that supports Wi-Fi Direct. [1]

Connect the Kvaser BlackBird v2 to a free USB port on your host computer or externally powered USB hub and start the Kvaser Device Guide, which was installed together with the drivers and can be found in the Windows Control Panel.

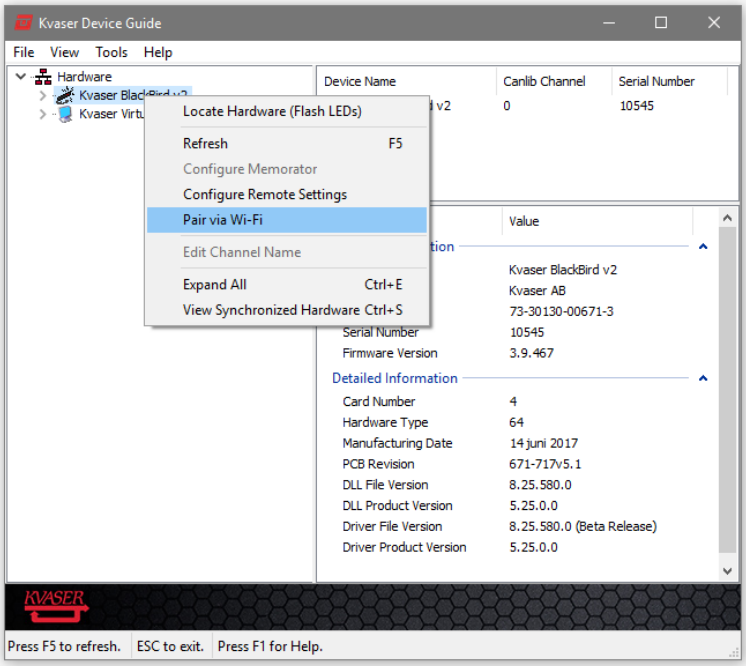

Figure 4: Right click on the Kvaser BlackBird v2 in Kvaser Device Guide and select "Pair via Wi-Fi" to start Kvaser Wi-Fi Pairing Tool.

There are some basic configurations that you can change while configuring the Kvaser BlackBird v2, these are available on the configuration tab in the Kvaser Wi-Fi Pairing Tool (see Figure 5 on Page 13) and include setting the Geographical Region.

Start the pairing process by clicking the "Pair Device and PC" button under the Status tab in the Kvaser Wi-Fi Pairing Tool. The complete configuration process may take 40 seconds to complete, and during that time both the host host computer and Kvaser BlackBird v2 will be configured, and the connection will also be tested.

[1] For more information about how to set up a WLAN connection to the Kvaser BlackBird v2, see the Kvaser BlackBird Getting Started Guide.

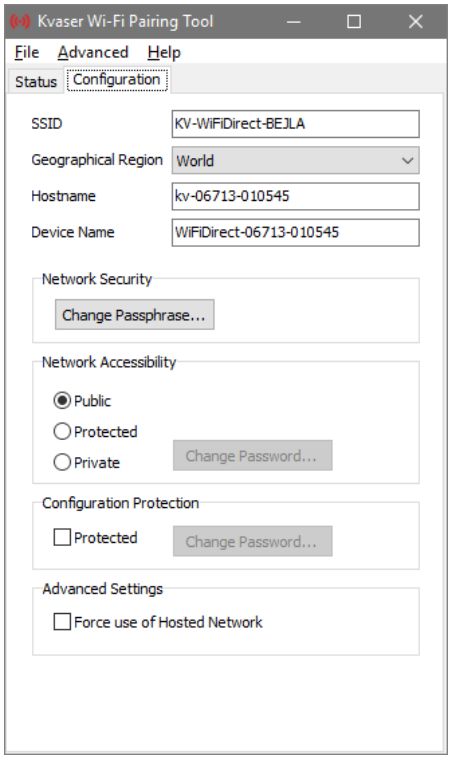

Figure 5: Some configurations are available under the Configuration tab in the Kvaser Wi-Fi Pairing Tool.

Note that some host computer firewalls may interfere with the automatic detection of the newly configured Kvaser BlackBird v2 and needs to be turned off to complete the last step, "Waiting for device to respond via Wi-Fi".

Now that the Kvaser BlackBird v2 has been successfully paired with the host host computer, you should remove the Kvaser BlackBird v2 from the USB port and apply power to the CAN connector instead. The device will now turn up as a "Remote" device inside the Kvaser Device Guide, see Figure 8 on Page 15.

For information about how to set up a WLAN connection to the Kvaser BlackBird v2, see the Kvaser BlackBird Getting Started Guide.

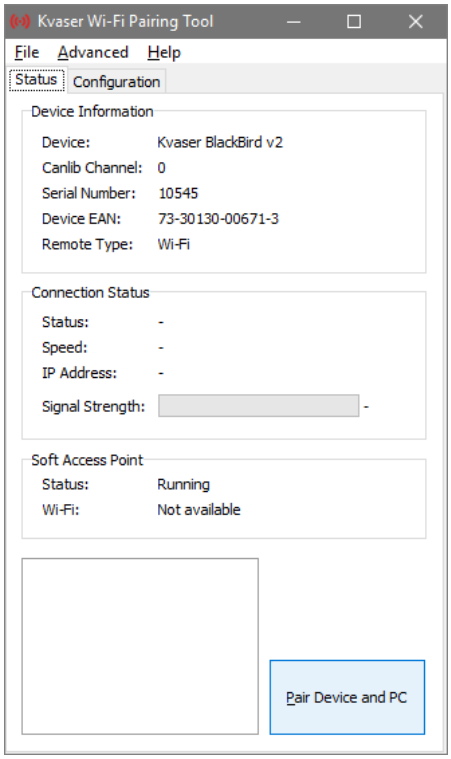

Figure 6: In the Kvaser Wi-Fi Pairing Tool, click "Pair Device and PC" to start the pairing sequence.

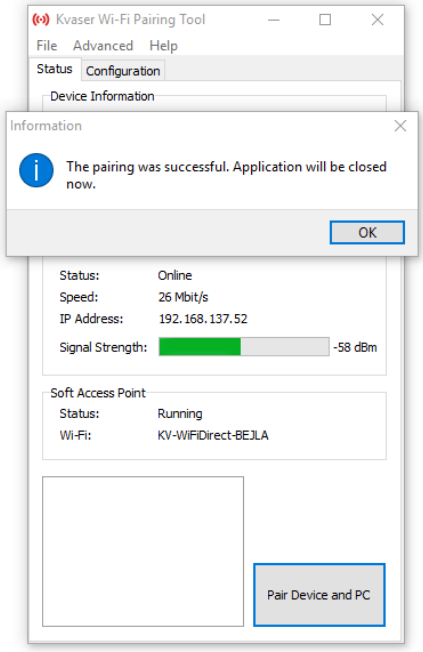

Figure 7: The Kvaser Wi-Fi Pairing Tool have successfully configured our Kvaser BlackBird v2.

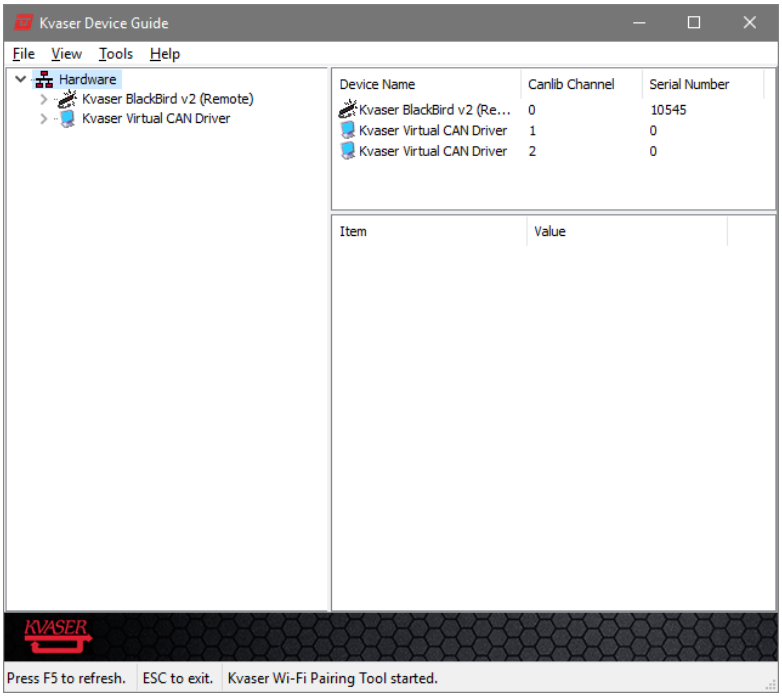

Figure 8: The Kvaser BlackBird v2 is marked as (Remote) to denote that it is now connected via Wi-Fi.

4.2 Use as a USB CAN interface

To use the Kvaser BlackBird v2 as a USB CAN interface; connect the unit to a free USB port on your host computer or USB hub.

When used as a USB CAN interface, the POWER LED will be illuminated and the CAN LED will emit short flashes when CAN messages are transmitted and received.

4.3 Use as a Wireless CAN Interface

To use the Kvaser BlackBird v2 as a Wireless CAN interface, supply power through the CAN connector and disconnect the USB connector. For more information about how to set up a WLAN connection to the Kvaser BlackBird v2, see the Kvaser BlackBird Getting Started Guide.

When used as a Wireless CAN interface, the POWER LED will be illuminated and the CAN LED will emit short flashes when CAN messages are transmitted and received. When the WLAN LED is constantly illuminated, the BlackBird is connected as a CAN interface and the wireless communication is stable.

4.4 Troubleshooting

Use "Kvaser Device Guide" in the Control Panel to verify that the computer can communicate with the Kvaser BlackBird v2. 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.

4.4.1 Check your firewall

The default port number used by the Kvaser BlackBird v2 is 11416. This port is used for both UDP and TCP and should be open for both incoming and outgoing traffic (both TCP and UDP) on your firewall. The Kvaser Network Device Selector tool might also need authorization from you. Consult your firewall software documentation for how to do this.

For further troubleshooting, see the trouble shooting section in the Kvaser BlackBird Getting Started Guide.

5 Appendices

In this section you will find technical information about the Kvaser BlackBird v2 and its connectors.

5.1 Start and stop of t programs

All events that a t program will react to are specified using various event hooks. In effect, these are functions which are called when the specific events occur. Among other events, the program can react to starting and stopping itself which this section describes. Read the Kvaser t Programming Language guide that can be downloaded at www.kvaser.com/download for more information.

The "on start" event will be triggered in the Kvaser BlackBird v2 when any of the following occurs:

- When a t program is started using the CANlib API (`kvScriptStart()`).
- When a t program is started from another t program.

The "on stop" event will be triggered for running t programs during the corresponding cases:

- When a t program is stopped using the CANlib API (`kvScriptStop()`).
- When a t program is stopped from another t program.

5.2 Technical data

In Table 6 on Page 18 you will find the technical specifications of Kvaser BlackBird v2.

CAN Channels	1 (CAN 2.0A and 2.0B Active)
CAN Transceivers	TJA1051T (Compliant with ISO 11898-2)
CAN Controller	Built into the processor
Galvanic isolation	Yes
CAN Bit Rate	40 kbit/s to 1 Mbit/s
Time stamp resolution	25 µs
Error Frame Detection	Yes
Error Frame Generation	Yes
Kvaser t programming	Yes
Host interface	Supports USB 2.0 Hi-Speed at 480 Mbit/s. Compatible with USB 1.1 at 12 Mbit/s and with USB 3.0 at 480 Mbit/s.
Host OS	Windows (7 or later) [1].
Wireless communication	WLAN 802.11b/g/n, 2.4 GHz, (infrastructure and ad hoc-mode)
Wireless security	WPA2 / WPA / WEP128 / WEP64
External power	Allowed operating voltage 9–40 V DC. Maximum input voltage 48 V DC.
Power consumption	Typical values are: 370 mA if powered from the USB (~5 V). 4.2 W for single channel powered from the CAN bus.
Hardware configuration	Done by software (Plug & Play).
Dimensions	30 x 190 x 20 mm
Weight	165 g including cables and connectors.
Operating temperature	–40 °C to +70 °C
Storage temperature	–55 °C to +90 °C
Relative Humidity	0 % to 85 % (non-condensing.)

Table 6: Technical Specifications.

5.3 CAN connectors

Kvaser BlackBird v2 devices that use the 9-pin D-SUB connector (see Figure 9 on Page 19) have the pinning described in Table 7 on Page 19.

[1] For other operating systems, contact Kvaser support.

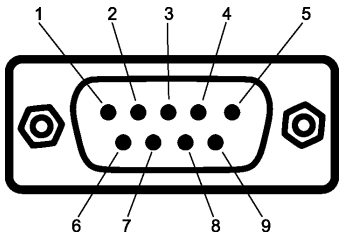

Figure 9: The D-SUB 9 connector pin numbers

D-SUB pin number	Function
1	Not connected
2	CAN_L
3	GND
4	Not connected
5	Shield
6	Not connected
7	CAN_H
8	Not connected
9	Power supply to the device

Table 7: Configuration of the 9-pin D-SUB

5.4 CAN bus termination

Every CAN bus must be terminated with a 120 Ohm resistor at each end of the bus. The Kvaser BlackBird v2 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.

5.5 Updating the firmware

For the Kvaser BlackBird v2 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. Read the Release Notes carefully.

6 Safety Instructions

6.1 Intended Use

Kvaser interfaces are used to connect computer systems to CAN buses. The Kvaser BlackBird v2 is intended for connection to a computer via the USB port or WiFi.

6.2 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.

7 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:
https://www.kvaser.com/en/kvaser/recycling-policy.html

8 Legal acknowledgements

8.1 EU Regulatory Compliance

KVASER **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 BlackBird v2

Object of the declaration (identification of apparatus allowing traceability):
Product: Kvaser BlackBird v2
Type: 73-30130-00671-3

The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:
Radio Equipment Directive (RED) 2014/53/EU (Art. 3.1a, 3.1b and 3.2)

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 300 328 (2016-11 (2.1.1))
EN 301 489-1 (2016-11 (2.1.1))
EN 301 489-17 (2016 (3.1.1))
EN 62 311 (2008)
EN 62 368-1 (2014 + AC:2015)
EN 50581 (2012)

Signed for and on behalf of:

Mölndal	2022-04-19	
Place of issue	Date of issue	Claes Haglund, Supply Chain and Quality Director

8.2 FCC Regulatory Compliance

KVASER

Federal Communications Commission (FCC) Compliance Information Statement

IDENTIFICATION OBJECT:
Product: Kvaser BlackBird v2
Type: 73-30130-00671-3

APPLICABLE COMPLIANCE STATEMENTS:
CFR Title 47 Part 15 §15.107, §15.109
This device complies with part 15 of the FCC Rules.
Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) this device must accept any interference received,
including interference that may cause undesired operation.

RESPONSIBLE PARTY (IN USA) NAME:
Kvaser Inc.
23881 Via Fabricante, Suite 503
Mission Viejo, CA 92691

Internet contact: support@kvaser.com

8.3 Patents, copyrights and trademarks

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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.

The products described in this document are protected by U.S. patent 5,696,911 and 7,100,042.

9 Document Revision History

Version history for document UG_98105_blackbird_v2:

Revision	Date	Changes
4.0	2014-01-31	First public release.
4.1	2014-03-08	Restructuring chapters.
4.2	2014-04-15	Renumbered pages.
4.3	2015-01-08	Minor update.
4.4	2015-08-11	Minor textual changes.
4.5	2016-02-04	Minor textual changes.
4.6	2017-01-09	Added link to patents.
4.7	2018-01-29	"Kvaser Device Guide" has replaced "Kvaser Hardware".
4.8	2018-05-07	Minor textual changes.
5.0	2018-09-11	Added chapter Initial network setup, updated device table, textual changes.
6.0	2018-10-15	Updated EU Regulatory Compliance.
7.0	2019-01-17	New t functionality added with FW v3.14, cleaned up connector variants, minor textual changes.
7.1	2019-08-09	Url protocol updated.
7.2	2020-01-27	Added DoC and sdoc.
7.3	2020-08-19	Windows 7 or later supported.
7.4	2022-04-20	Minor textual changes, added galvanic isolation info to Technical data table, updated DoC.
7.5	2023-02-13	Added more information about Kvaser t programming. Added section about intended use.
7.6	2024-04-25	Updated Kvaser logo and the section for troubleshooting.