USB-to-CAN ^{V2}

compact
embedded
automotive
professional

USB CAN Interface

IXXAT

IXXAT Automation GmbH
Leibnizstr. 15
88250 Weingarten
Germany

Tel.: +49 751 56146-0
Fax: +49 751 56146-29
Internet: www.ixxat.com
E-Mail: info@ixxat.com

Support

In case of unsolvable problems with this product or other IXXAT products please contact IXXAT in written form:

Fax: +49 751 56146-29
E-Mail: support@ixxat.de

Further international support contacts can be found on our webpage www.ixxat.com

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Document number: 4.01.0280.20000
Version: 1.0

1   Introduction

By purchasing the IXXAT USB-to-CAN**V2** interface, you decided for a high-quality electronic component developed and manufactured according to the latest technological standards.

This manual describes the USB-to-CAN**V2** compact, USB-to-CAN**V2** embedded, USB-to-CAN**V2** professional as well as the USB-to-CAN**V2** automotive CAN interface.

In the further description these interfaces are referred as CAN-interface.

The properties of the CAN interfaces are:

USB-to-CAN**V2** compact / embedded

- USB 2.0 Hi-Speed (480MBit/s)
- one CAN-High-Speed channel according ISO11898-2
- optional galvanic CAN bus isolation
- fieldbus connection:
    - o   compact: Sub-D9M or RJ45
    - o   embedded: Sub-D9M

USB-to-CAN **V2** professional

- USB 2.0 Hi-Speed (480MBit/s)
- two CAN-High-Speed channels according ISO11898-2
- galvanic CAN bus isolation (both CAN channels are on the same potential)
- fieldbus connection: 2 x RJ45
- equipped with two cable adapter RJ45 to Sub-D9M

USB-to-CAN **V2** automotive

- USB 2.0 Hi-Speed (480MBit/s)
- two CAN-High-Speed channels according ISO11898-2, CAN1 can be switched between high- and low-speed (ISO 11898-3) via software.
- one LIN-Interface V1.3, Master/Slave-Mode switchable via software.
  Please refer to the instructions in chapter 4.2
- galvanic fieldbus isolation (all field bus channels are on the same potential)
- fieldbus connection: 2 x RJ45
- equipped with two cable adapter RJ45 to Sub-D9M

2 Installation

2.1 Software installation

To operate the interface a driver has to be installed first. For Windows this driver is part of the VCI (Virtual CAN Interface) V3, which can be downloaded for free on the IXXAT webpage http://www.ixxat.com.

For installation of the VCI V3 driver on Windows comuters, please refer to the VCI installation manual.

IXXAT also offers the ECI driver for Linux and real-time operating systems for many CAN interfaces. Information on supported operating systems and interfaces is available on the IXXAT webpage http://www.ixxat.com.

2.2 Hardware installation

Before connecting the CAN interface to the USB socket on your PC, you should install the software driver first(see previous section).

2.2.1 USB-to-CAN^{V2} compact / professional / automotive

The CAN-Interface can be connected on the fly (hot plug support).

2.2.2 USB-to-CAN^{V2} embedded

For all work on the PC and interface, you must be statically discharged. Work must be carried out on an earthed, anti-static work mat.

Take the following steps in sequence:

(1) Switch off the PC and unplug the power cord.

(2) Open the PC according to the instructions of the PC manufacturer
and find a suitable slot. The cable for the internal USB connection is designed according to standard USB plugs (see chapter 4.3). Please note the polarity and the occupancy of the pin connector in your PC. Do not use force when plugging in.

(3) Make sure that the interface sits tightly in the PC.

(4) Close the PC; the hardware installation is now complete.

3 Connectors and displays

3.1 USB connector

The shield of the USB cable is connected to ground using a 100nF capacitor and therefore also connected to ground of the USB plug.

It is recommended, that the interface is directly connected to PC USB ports or to self powered USB hubs to ensure sufficient power supply.

USB-to-CAN^{V2} compact / professional / automotive

- The USB-cable has a plug type "A". The assignment corresponds to the USB 2.0 standard.

USB-to-CAN^{V2} embedded

- The USB-cable has a 5-pin female connector. The assignment corresponds to PC standard for internal USB devices (see chapter 4.3).

3.2 Fieldbus connector

The assignment of the fieldbus connectors (Sub-D9 and RJ45) is in accordance to CiA 303-1.

The shield of the CAN connector is connected to CAN ground via a 1 MΩ resistor and a 10 nF capacitor. The shields of the CAN connectors of the variants *USB-to-CAN^{V2} professional* and *USB-to-CAN^{V2} automotive* are connected directly together.

For non galvanic decoupled CAN interfaces, fieldbus ground and PC ground are at the same potential.

For best noise immunity, the shields of the CAN cables must directly connected to ground.

The pin assignment of the connectors CAN interfaces are shown below.

3.2.1 USB-to-CAN^{V2} compact

Signal	Pin No.	
	Sub-D9	RJ45
CAN-High	7	1
CAN-Low	2	2
GND	3,6	3, 7

3.2.2 USB-to-CAN^{V2} professional

	RJ45, Pin No.		Adapter cable 1.01.0074.01000
Signal	CAN 1	CAN 2	Sub-D9M, Pin No.
CAN-High	1	1	7
CAN-Low	2	2	2
GND	3,7	3, 7	3, 6

Two RJ45 to Sub-D9M adapter cable will be delivered with the *USB-to-CAN^{V2} professional*. The cable can be ordered separately too using order number 1.04.0074.0100.

3.2.3 USB-to-CAN^{V2} automotive

	RJ45, Pin No.		Adapter cable 1.01.0074.01000
Signal	CAN 1	CAN 2	Sub-D9M, Pin No.
CAN-High	1	1	7
CAN-Low	2	2	2
GND	3,7	3, 7	3, 6
CAN-High LS	4	-	4
CAN-Low LS	5	-	1
LIN	-	6	5
$VBAT_{LIN}$[1]	-	8	9

Two RJ45 to Sub-D9M adapter cable will be delivered with the *USB-to-CAN^{V2} automotive*. The cable can be ordered separately too using order number 1.04.0074.0100.
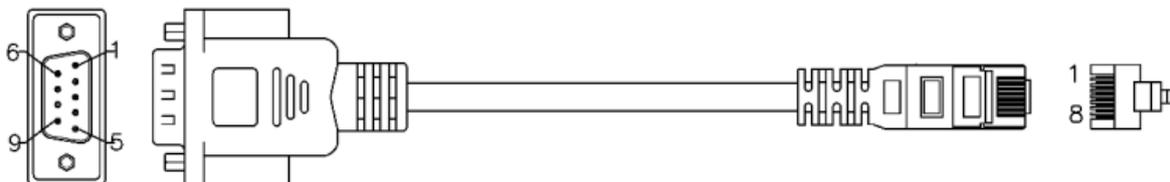
Picture 3-1: adapter cable RJ45 / Sub-D9M 1.04.0074.01000

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[1] see chapter 4.2

3.3   Displays

The CAN-Interfaces have LED´s that shows the current communication status of USB and fieldbus activities and are labeled with the appropriate name.

3.3.1   USB LED

Light pattern	Description	Causes / Hints
off	No communication via USB	• Device not properly initialized, maybe the USB port can´t provide enough power. • Device not connected to USB port
green	USB communication possible	• Device ready for action
red flash	State change power saving ⇔ active	• Change power state

3.3.2   CAN LED

Light pattern	Description	Causes / Hints
off	No CAN communication	• No CAN communication. • Device not connected to CAN
green/ green flash	CAN communication	• With each CAN message the LED is triggered
red blinking	CAN communication, CAN controller in error state	• The CAN controller is in "Error Warning" of "Error passive" state. CAN communication is further possible.
red	Bus Off	• The CAN controller is in "Bus Off" state. No CAN communication possible

3.3.3 CAN1 LS LED

CAN-Low Speed functionality according to ISO11898-3 is only available on USB-to-CAN^{V2} automotive.

Light pattern	Description	Causes / Hints
off	CAN High-Speed transceiver active	• CAN high speed interface is activated
orange	CAN low speed (fault tolerant) transceiver active	• CAN low speed interface activated

The communication status is shown on CAN1-LED (see chapter 3.3.2)

3.3.4 LIN LED

LIN functionality is only available on USB-to-CAN^{V2} automotive.

Light pattern	Description	Causes / Hints
off	No LIN communication	• No LIN communication on the LIN bus • Device not connected LIN bus
green/green flash	LIN communication	• With each LIN message the LED is triggered
red/red flash	LIN communication with errors	• On transmission or reception of a LIN message an error was detected

4 Notes

4.1 CAN bus termination

There is no bus termination resistor for the CAN bus in the CAN interface integrated. IXXAT offers a bus termination resistor as a feed through connector as accessory (order number 1.04.0075.03000)

Picture 4-1: CAN bus termination resistor 1.04.0075.03000

4.2 LIN interface

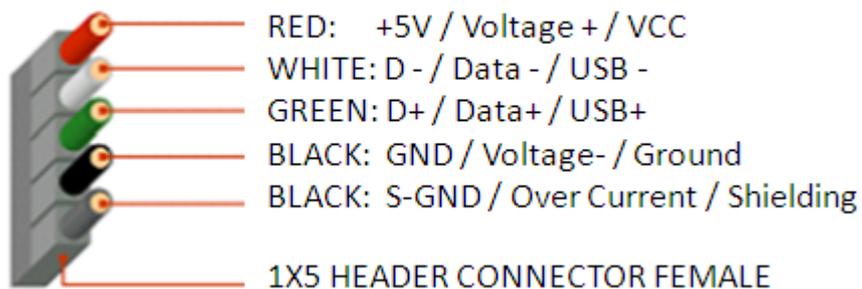*A LIN interface is only available on the USB-to-CAN^{V2} automotive.*

The LIN interface can be configured as LIN Master according to LIN specification V1.3.

If the CAN interface is used as a LIN-Master, a voltage of 12 V DC (voltage range 8 - 18 V DC) has to be connected to pin VBAT$_{LIN}$, see chapter 3.2.3

Power consumption is limited by a 1 kΩ resistor.

4.3 USB-to-CAN^{V2} embedded cable wire assignment

Standard Wire Assignments

RED: +5V / Voltage + / VCC
WHITE: D - / Data - / USB -
GREEN: D+ / Data+ / USB+
BLACK: GND / Voltage- / Ground
BLACK: S-GND / Over Current / Shielding

1X5 HEADER CONNECTOR FEMALE

5   Appendix

5.1   Technical data

USB-Interface	USB 2.0, Hi-Speed (480 MBit/s)
Microcontroller / RAM / Flash:	32 Bit / 192 kByte / 512 kByte
CAN High Speed , ISO 11898-2	
CAN bitrates:	10 kbit/s - 1 Mbit/s
CAN transceiver:	TI SN65HVD251
CAN bus termination:	none
CAN Low Speed , ISO 11898-3	
CAN bitrates:	10 kbit/s – 125 kbit/s
CAN transceiver:	NXP TJA1054
CAN bus termination	low speed, RTH=RTL=4,7kΩ
LIN transceiver:	NXP TJA1020
LIN bitrate:	max. 20 kbit/s
LIN VBAT$_{LIN}$:	8 - 18V DC, 12 V DC typical
Galvanic field bus isolation:	800 V DC / 500 V AC for 1 min.
Power supply:	via USB, 5 V DC / 300 mA
Enclosure material:	ABS plastic
Dimension:	80 x 50 x 22 mm
Weight:	approx. 100 g
Operating temperature range:	-20°C - +70°C
Storage temperature range:	-40°C - +85°C
Relative humidity:	10 - 95%, non condensing
Protection class:	IP40

5.2 Support

For more information on our products, FAQ lists and installation tips, please refer to the support area on our homepage (http://www.ixxat.com). There you will also find information on current product versions and available updates.

5.3 Returning hardware

If it is necessary to return hardware to us, please download the relevant RMA form from our homepage and follow the instructions on this form.

5.4 FCC Compliance

Declaration of conformity

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

▪ This device may not cause harmful interference, and
▪ this device must accept any interference received, including interference that may cause undesired operation

Class A digital device – Instructions

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 own expense.

5.5 Disposing of old equipment

This product is covered by ElektroG (WEEE) and has to be disposed according to ElektroG (WEEE) separately. Products of IXXAT, which are covered by ElektroG, are exclusively for commercial use and marked with the symbol of the crossed-out garbage can.

According to the B2B regulations, the disposal in accordance with § 10 para. 2 clause 3 Electrical and Electronic Equipment act in the version of 16.03.2005 is regulated separately in the General Terms and Conditions and its supplements of IXXAT. The terms and conditions, its supplements and other information on disposal of old equipment can be downloaded at www.ixxat.com.

5.6 Information on EMC

The product is a class A device. If the product is used in office or home environment radio interference can occur under certain conditions. To ensure faultless operation of the device, the following instructions must be followed due to technical requirements of EMC:

- use only the included accessories
- the shield of the interfaces must be connected with the device plug and with the plug on the other side

5.7 EC Declaration of Conformity

EMC compliance testing has been conducted to the Electromagnetic Compatibility Directive 2004/108/EC. For more information please consult the EMC compliance document on the support pages on IXXAT website.