Manual

USB-to-CAN II

Intelligent PC/CAN Interface

IXXAT
The expert for industrial and automotive communication

IXXAT

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1 Introduction

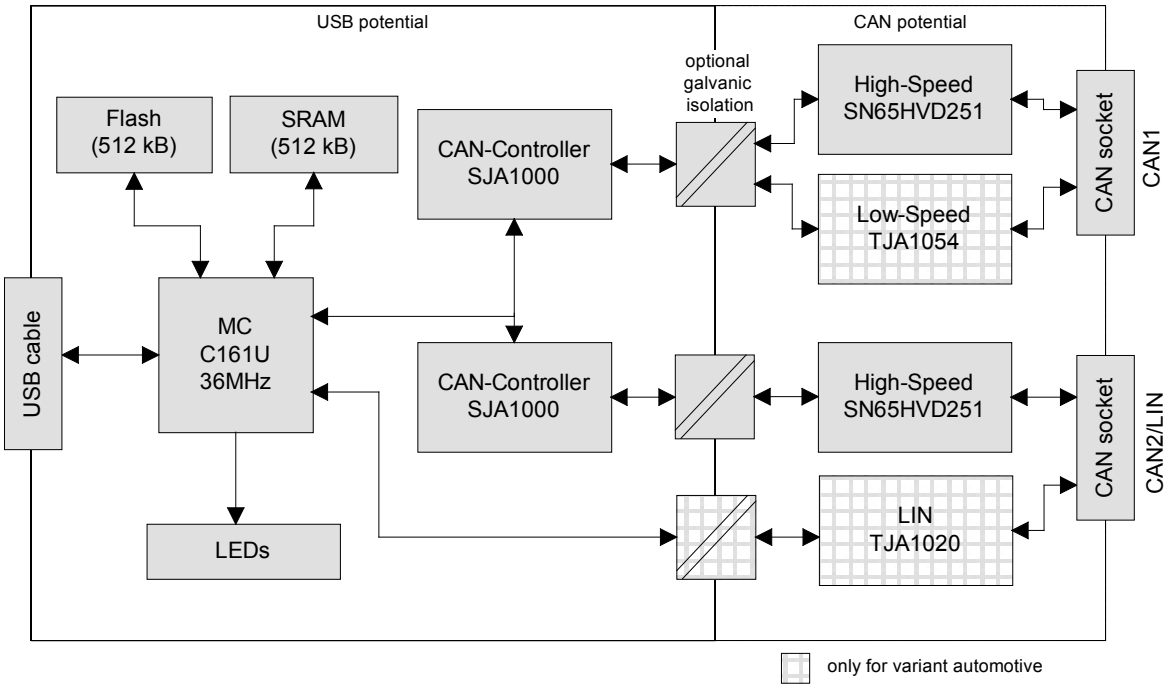
1.1 Overview

Congratulations on your purchase of the IXXAT PC/CAN interface USB-to-CAN II, a high-quality electronic component developed and manufactured according to the latest technological standards.

This manual is intended to familiarize you with your interface, also referred to in the following as USB-to-CAN II. Please read this manual before beginning with the installation.

1.2 Features

- According to USB specification version 2.0
- "Hot-plug" compatible (plug-in during operation of computer)
- Power supply via USB
- Infineon 16 bit microcontroller with 36MHz clock
- 512 kByte RAM
- 512 kByte Flash
- 2 CAN controller PHILIPS SJA1000 with 16 MHz clock
- variant industrial:
  CAN bus interface according to ISO 11898-2, as an option galvanically isolated (both CAN circuits have a common potential)
- variant automotive:
  CAN bus interface on CAN 1 can be choosen between high- (ISO 11898-2) and low-speed (ISO 11898-3), galvanically isolated (both CAN circuits have a common potential)
  CAN bus interface on CAN 2 according to ISO 11898-2, galvanically isolated
  LIN bus interface, galvanically isolated (common potential with the CAN bus interfaces)



Picture 1-1: Block diagram of the USB-to-CAN II

1.3 Support

For more information on our products, FAQ lists and installation tips, please refer to the support section of our website (http://www.ixxat.de), which also contains information on current product versions and available updates.

If you have any further questions after studying the information on our website and the manuals, please contact our support department. The support section on our website contains the relevant forms for your support request. In order to facilitate our support work and enable a fast response, please provide precise information on the individual points and describe your question or problem in detail.

If you would prefer to contact our support department by phone, please also send a support request via our website first, so that our support department has the relevant information available.

1.4 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. In the case of repairs, please also describe the problem or fault in detail on the RMA form. This will enable us to carry out the repair quickly.

2 Installation

2.1 Software installation

A driver is required to operate the interface. This driver is part of the VCI (Virtual CAN Interface), which could be downloaded for free in the internet (http://www.ixxat.de).

For installation of the CAN driver VCI under Windows, please refer to the VCI installation manual.

2.2 Hardware installation

The USB-to-CAN II can be plugged in and unplugged during operation of the PC (hot-plug compatible). It is recommended to install the VCI software before plugging in for the first time.

3 Connections and displays

3.1 Pin allocation

3.1.1 USB connector

The USB connector is designed as a type "A" connector. Pin allocation is according to the USB standard.

The shield of the USB cable is connected to the ground of the PCB via a 1MΩ resistor and a 1nF capacitor.

The USB-to-CAN II could only be connected to self-powered hubs (USB-hubs with own power supply) or directly to the PC

3.1.2 CAN bus connector for CAN 1

The USB-to-CAN II has a bus interface according to ISO 11898-2, optionally configurable as ISO 11898-3 (only variant automotive).

The signals of the bus interface are connected to the 8-pin RJ45 connector (see table 3-1). The bus interface can be galvanically isolated from the CAN bus as an option.

Pin No. X5	Signal
1	CAN high
2	CAN low
3	GND
4	CAN high (Fault Tolerant), (only variant automotive)
5	CAN low (Fault Tolerant), (only variant automotive)
6	Not connected
7	GND
8	Not connected

Table 3-1: Pin allocation of the CAN bus connector

The shield of the CAN connector is connected to the ground of the CAN bus interface via a 1MΩ resistor and a 1nF capacitor. The shields of both CAN connectors are directly connected together.

In case of a non galvanically decoupled device the CAN ground and the USB ground have a common potential.

For the best results of noise immunity the shields of the CAN cables should be grounded.

3.1.3 CAN bus connector for CAN 2

The USB-to-CAN II has a bus interface according to ISO 11898-2, optionally with LIN interface (only variant automotive).

The signals of the bus interface are connected to the 8-pin RJ45 connector (see table 3-2). The bus interface can be galvanically isolated from the CAN and LIN bus as an option.

Pin No. X6	Signal
1	CAN high
2	CAN low
3	GND
4	Not connected
5	Not connected
6	LIN (only variant automotive)
7	GND
8	V-LIN (12V DC, max. 200mA) (only variant automotive)

Table 3-2: Pin allocation of the CAN bus connector

The shield of the CAN connector is connected to the ground of the CAN bus interface via a 1MΩ resistor and a 1nF capacitor. The shields of both CAN connectors are directly connected together.

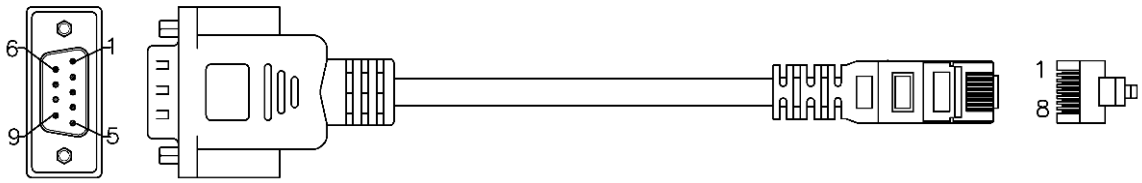
In case of a non galvanically decoupled device the CAN ground and the USB ground have a common potential.

For the best results of noise immunity the shields of the CAN cables should be grounded.

3.1.4 Cable adapter RJ45 to Sub-D9M

The connection of the cable adapter could be seen in table 3-3.

The cable could be ordered at IXXAT with the ordering number 1.04.0074.01000.



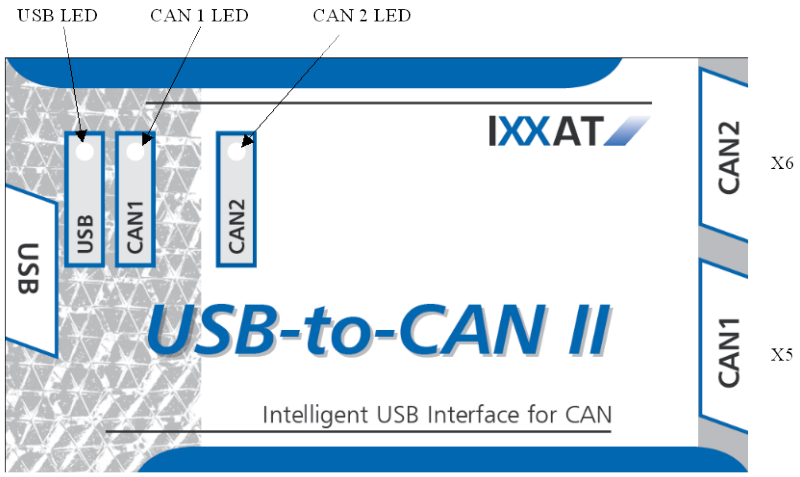
Picture 3-1: Cable adapter RJ45 to Sub-D9M

Pin No. Sub-D9M	Pin No. RJ45
7	1
2	2
3	3
4	4
1	5
5	6
6	7
9	8
8	Not connected
Shield	Shield

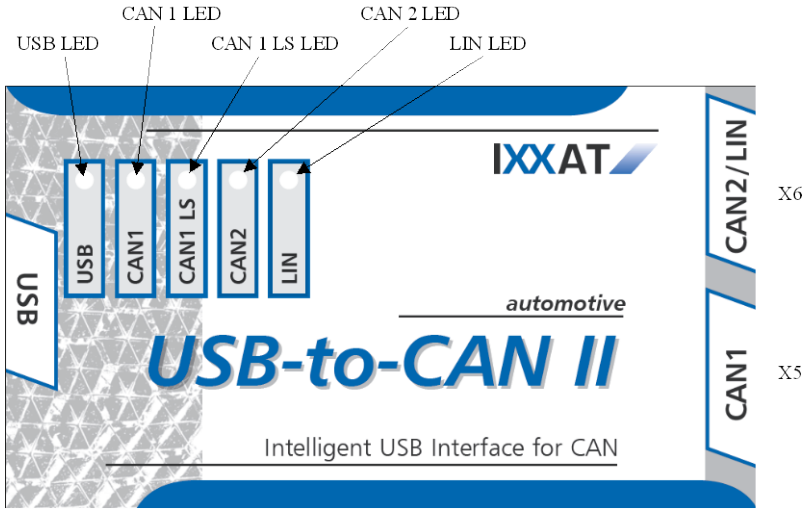
Table 3-3: Pin assignment of the cable adapter

3.2 Displays

The USB-to-CAN II has 3 LEDs in the variant industrial and 5 LEDs in the variant automotive. The LEDs show the communication status of the according interface.



Picture 3-2: Connectors and LEDs of the variant industrial



Picture 3-3 Connectors and LEDs of the variant automotive

3.2.1 USB LED

The USB LED signals the operating state of the device. If the LED is green, communication via USB is possible. If the LED is off, there's no communication possible.

In case of a green flashing USB LED, the level of the USB voltage may be too low for safety CAN communication. But this is only a hint of the interface, there's no limitation in use of the CANs.

Flashing mode	Description	Causes/Hints
off	No communication via USB possible	• Device not properly initialised, because the USB port can't provide enough power • Device not connected to USB
green	USB communication possible	• Device fully functional
green blinking	USB communication possible, may be the USB voltage is to low for a properly CAN communication CAN communication is still possible!	• The CAN components need a voltage of 5V DC ±5%, but the USB voltage is under the lower limit at the moment

Table 3-4: States of the USB LED

3.2.2 CAN LEDs (CAN1 and CAN2)

The two coloured (green and red) LEDs for CAN1 and CAN2 flash on each CAN message (transmitted or received) green, if there was no error detected.

If the CAN controller is in the „Error warning" or „Error passive" state, the LED flashes red on each message. In the „Bus off" state the LED is continously red.

Flashing mode	Description	Causes/Hints
off	No CAN communication	• No CAN communication • Device not connected to CAN
green / green blinking	CAN communication	• With each CAN message the LED is triggered
red blinking	CAN communication, CAN controller in error state	• The CAN controller is in the „Error Warning" or „Error passive" state, the reception/transmission of CAN messages is still possible
red	Bus Off	• The CAN controller is in the „Bus Off" state. No more CAN communication possible

Table 3-5: States of the CAN LEDs

3.2.3 CAN1 LS LED (only variant automotive)

The CAN1 LS LED is yellow. It shows the active bus interface for CAN 1. If the high speed transceiver is active, the LED is off. In case of the fault tolerant transceiver, the LED is on.

Flashing mode	Description	Causes/Hints
off	CAN high speed transceiver active	• The CAN high speed interface is activated
yellow	CAN low speed (fault tolerant) transceiver active	• The CAN low speed (fault tolerant) interface is activated

Table 3-6: States of the CAN1 LS LED

3.2.4 LIN LED (only variant automotive)

The two-coloured (green and red) LED for LIN flashes on each message, that was transmitted or received. In case of an error the LED is blinking red.

Flashing mode	Description	Causes/Hints
off	No LIN communication	• There is no LIN communication • Device not connected to LIN
green / green blinking	LIN communication	• With each LIN message the LED is triggered
red / red blinking	LIN communication with errors	• On the transmission or reception of a LIN message an error was detected

Table 3-7: States of the LIN LED

3.3 CAN bus termination

There is no bus termination resistor for the CAN bus assembled on the USB-to-CAN II. As an accessory a bus termination resistor is available as a feed through connector at IXXAT (ordering number 1.04.0075.03000).

3.4 LIN (only variant automotive)

The USB-to-CAN II can be configured as LIN Master according to LIN specification V1.3. A voltage of 12 V DC (voltage range 8-18V DC) has to connected to the CAN socket X6.

The power consumption is limited by a 1kΩ resistor.

4 Appendix

4.1 Technical specifications

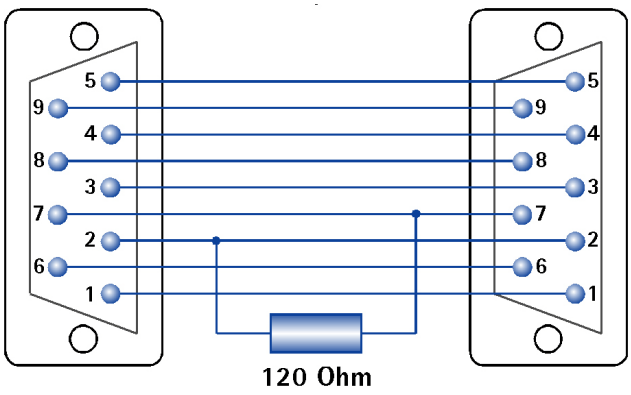
USB interface:	Version 2.0 (Full Speed)
Microcontroller:	Infineon C161U, 36 MHz
RAM / Flash:	512 kByte / 512 kByte
CAN controller:	2x Philips SJA1000
CAN transceiver (high speed):	Texas Instruments SN65HVD251
CAN transceiver (low speed):	Philips TJA1054
Max. number of CAN bus nodes:	120 (high speed), 32 (low speed)
CAN bus termination resistor:	none (high speed), RTH=RTL=4,7kΩ (low speed)
CAN propagation delay:	with galvanic isolation typically 32 ns
CAN baudrates:	10 kBaud – 1 MBaud (high speed), 10 kBaud - 125 kBaud (low speed)
Max. CAN message rate (with VCI, receive direction):	19900 messages/s (continuous) 21200 messages /s (burst)
Max. CAN- message rate (with VCI, transmit direction):	11300 messages /s (continuous)
LIN transceiver:	Philips TJA1020
LIN baudrates:	up to 20 kBaud
Max. LIN message rate:	2500 messages/s
LIN voltage range:	8 – 18V DC, 12 V DC typically
Power supply:	via USB (5V DC)
Power consumption (normal):	typically 210 mA maximum 400 mA
Power consumption (standby):	typically 4 mA maximum 21 mA
Housing material:	ABS plastics
Dimensions (L x B x H) in mm:	98 x 55 x 20
Weight:	approx. 200 g

Protection class:	IP40
Operating temperature range:	-20°C - +80°C
Storage temperature range:	-40°C - +85°C
Relative humidity:	10 - 95%, non-condensing
Galvanic isolation:	optional CAN and LIN Bus to USB 250 V AC for 1 min
Device security:	CSA/UL 60950-00 Class 3862 10, 3862 90

4.2 Accessories

4.2.1 CAN bus termination resistor

IXXAT offers a bus termination resistor as a feed through connector (ordering number 1.04.0075.03000).



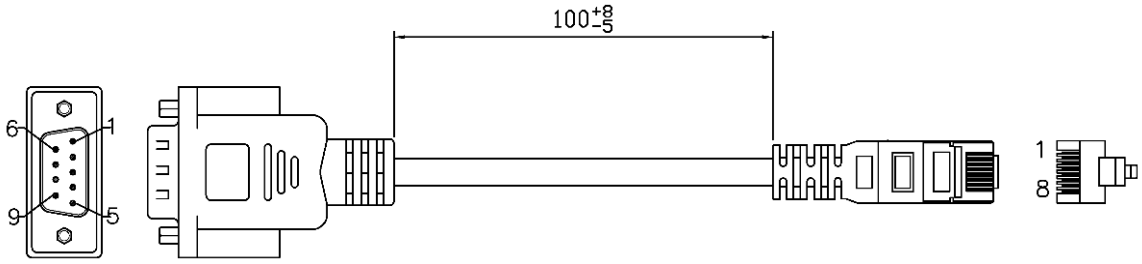
Picture 4-1: Connections of the CAN bus termination resistor

Picture 4-2: CAN bus termination resistor

4.2.2 Cable adapter RJ45 to Sub-D9M

The cable adapter offers the possibility of connecting the USB-to-CAN II via a Sub-D9M plug to the user. The length of the cable (without the plugs) is 100 mm.

The ordering number of the cable adapter is 1.04.0074.01000.



Picture 4-3: Cable adapter RJ45 to Sub-D9M

4.3 Notes on EMC

The PC/CAN-Interface USB-to-CAN II may only be used with a PC that has a CE-symbol. The CAN-bus connected to the interface must have a shielded lead. The shield braiding must be connected with low impedance to the connector housing.

Declaration of conformity

IXXAT Automation declares that the product: USB-to-CAN II

with the article number: 1.01.0062.11110
1.01.0062.11220
1.01.0066.11220

do comply with the EC directives 2004/108/EC.

Applied harmonized standards in particular:
EN 55022:2006 + A1:2007
EN 55024:1998 + A1:2001 + A2:2003

22.08.2011, Dipl.-Ing. Christian Schlegel , Managing Director

IXXAT Automation GmbH
Leibnizstrasse 15
88250 Weingarten

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.