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USB-2-X

Manual

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TRINAMIC
MOTION CONTROL

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1 Life support policy

TRINAMIC Motion Control GmbH & Co. KG does not authorize or warrant any of its products for use in life support systems, without the specific written consent of TRINAMIC Motion Control GmbH & Co. KG.

Life support systems are equipment intended to support or sustain life, and whose failure to perform, when properly used in accordance with instructions provided, can be reasonably expected to result in personal injury or death.

Information given in this data sheet is believed to be accurate and reliable. However neither responsibility is assumed for the consequences of its use nor for any infringement of patents or other rights of third parties, which may result from its use.

Specifications are subject to change without notice.

2 Features

The USB-2-X device is an interface converter which is equipped with a CAN interface, an IIC interface, a LIN interface, an SPI interface and an RS485 interface. It can be connected to the PC via the USB interface.

The USB-2-X device is mainly designed for use with some of the TRINAMIC evaluation kits, but it can also be used in any other purpose where a connection between a PC and a CAN interface, an IIC interface, a LIN interface, an SPI interface or an RS485 interface is needed.

Its frame is a compact, metalized standard housing (known as 25 pin Sub-D adapter housing) with the dimensions 53mm x 55mm x 16mm (length x width x height). Please notice that plugs and cables need further space.

The software supplied with this product can be used with every version of the Windows operating system that supports USB (Windows 98, Windows ME, Windows 2000, Windows XP and Windows Vista). Windows 95 and Windows NT4.0 do not support USB, so the USB-2-X device cannot be used with such systems.

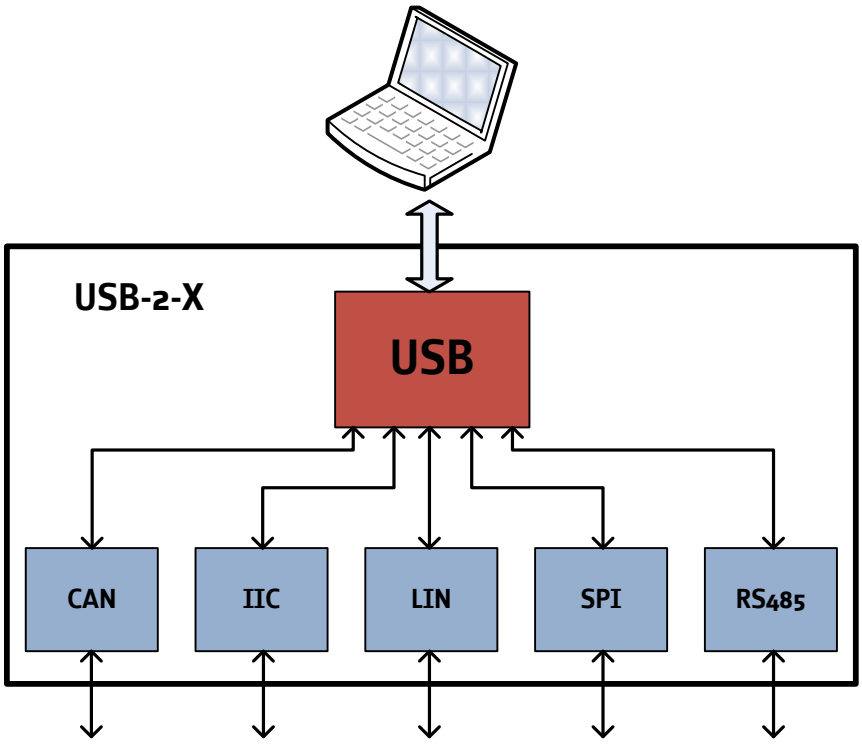


Figure 2.1: Block diagram of the USB-2-X

The following table shows all available interfaces of the USB-2-X with its characteristics:

Interface	Description
USB	- Connection to USB 1.1 or USB 2.0 hosts (cable supplied with the device) - USB full speed device (12MBit/s) - Bus powered (no extra power supply needed)
CAN	- CAN 2.0A and 2.0B compatible - Standard (11 bit) and extended (29 bit) identifier possible - Transceiver: compatible with ISO 11898 standard - Maximum bit rate: 1MBit/s - 120 ohms termination resistor can be activated with a jumper
LIN	- Compatible with LIN specification rev 1.3 - up to 20kBit/s - Industry standard physical interface transceiver
IIC	- Single master - Up to 400kBit/s - 7-bit addressing - Supports clock stretching (wait condition initiated by master)
SPI	- Four standard signals: SCK, MOSI, MISO, SS (slave select) - Additional 5th line SR: slave request signal input (falling edge active, internal pull-up) - Software selectable signal levels: 5V or 3.3V - Master mode operation - Silent slave mode (spy mode) possible when MISO is not connected to the target - Clock phase and polarity: all four modes software selectable - Setup and hold time of slave select signal as well as inter-byte delay time software selectable - Data rates: up to 3.75 MBit/s at 5V, up to 1.5 MBit/s at 3.3V
RS485	- Half duplex communication mode - Industry standard 75176 transceiver - 2400, 9600 and 19200 bps supported - Pull-up resistor, pull-down resistor and termination resistor possible (assembly option on request)

Table 2.1: Interfaces of the USB-2-X

3 Order codes

Order code	Description	Length of unit
USB-2-X V2.0	USB interface converter (with USB cable)	62.2 x 54.4 x 16.9 mm

Table 3.1: Order codes

4 Mechanical and electrical interfacing

4.1 Dimensions of the USB-2-X

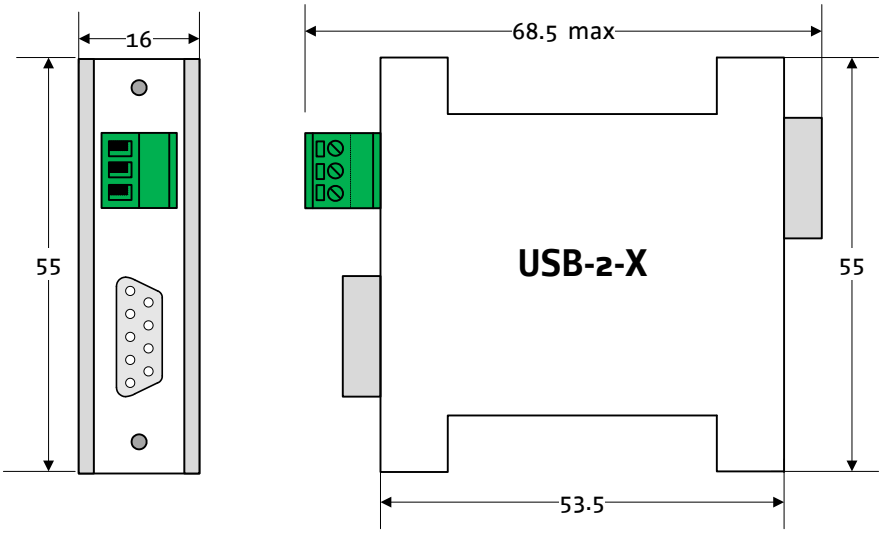


Figure 4.1: Dimensions of the USB-2-X

4.2 Connectors

First a little overview: Figure 5.1 shows where which interface is located and Figure 5.2 shows the PCB of the USB-2-X interface.

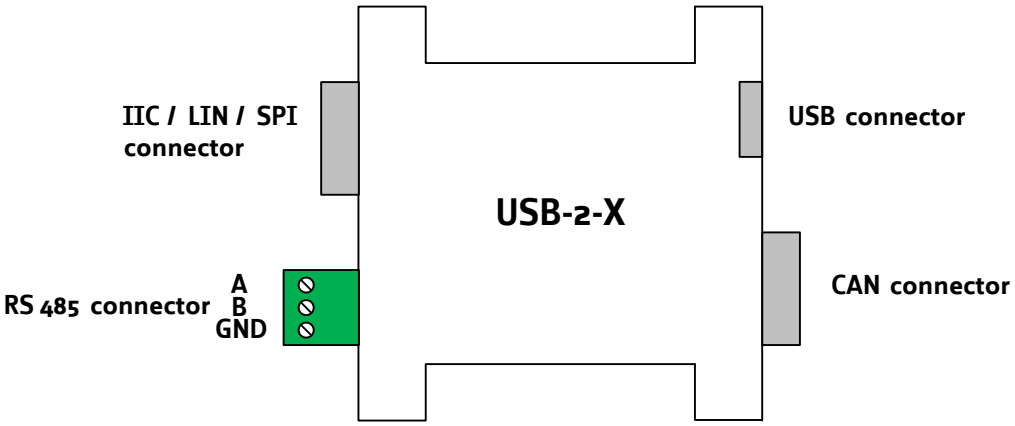


Figure 4.2: The USB-2-X device

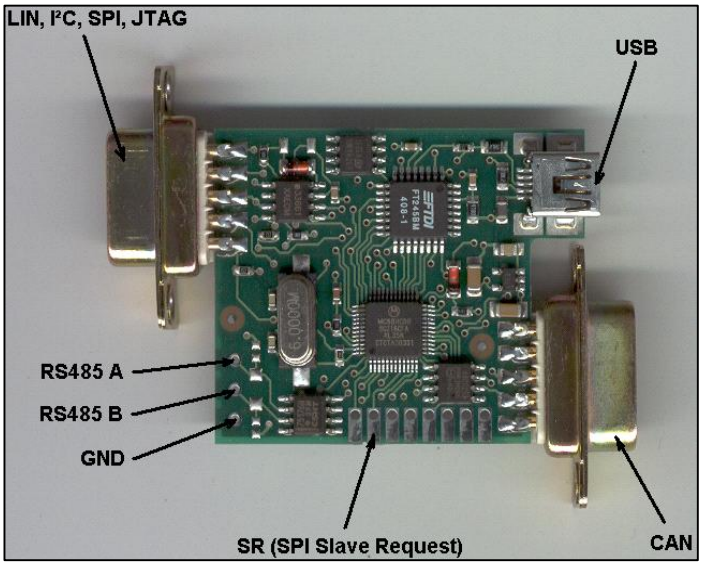
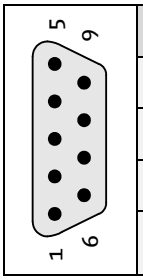


Figure 4.3: The PCB of the USB-2-X device

4.2.1 CAN connector

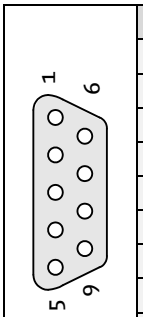


Pin	Signal
2	CAN_LOW
7	CAN_HI
3	GND
6	GND

Table 4.1: CAN connector

- A CAN termination resistor of 120 ohms can be activated shorting the two pin header placed below the USB connector using a jumper.

4.2.2 LIN, IIC, and SPI connectors



Pin	Signal (LIN)	Signal (IIC)	Signal (SPI)
1		SCL	
2			SCK
3	GND	GND	GND
4			SS
5			MOSI
6		SDA	
7	LIN (data)		
8			MISO
9	LIN supply voltage (+8..18VDC)		

Table 4.2: LIN, IIC, and SPI connectors

- When LIN is used, the LIN transceiver of the USB-2-X device has to be powered by the target via pin 9 of the connector.
- The pin assignment has been selected in order to allow direct connection to the TRINAMIC TMC211 evaluation board and the TRINAMIC TMC222 evaluation board.
- Please note that the additional *SR* (slave request) line of the SPI interface is not available on this connector but on a board edge solder pad (the second of eight solder pads counted starting from IC labeled *75176*).
- The IIC interface and the SPI interface cannot be used simultaneously.
- Also, the LIN interface and the RS485 interface cannot be used simultaneously.

4.2.3 RS485 connector

Pin	Signal
1	A (+)
2	B (-)
3	GND

Table 4.3: RS485 connector

5 Putting the USB-2-X into operation

5.1 Starting up

1) As USB devices are ***hot pluggable*** it is not necessary to turn off the PC when plugging in or removing the USB-2-X device. Just plug in the device when the PC is switched on and Windows is running.

2) When you plug in the USB-2-X device for the first time you will be prompted for a suitable device driver after a few seconds. You will have to be logged in as ***administrator*** to be able to install device drivers on Windows 2000 or Windows XP.

3) Insert the TMC TechLib CD that is supplied with this product and select the ***USB2X.INF*** file in the ***interfaces\USB2X*** directory on the TechLib CD.

4) The device driver will be installed. Now the USB-2-X device can be used.

5.2 Software

5.2.1 The USB-2-X with a TMC211 evaluation board

If you are using the USB-2-X device with a TMC211 evaluation board, use the software that is supplied with the evaluation board: ***Eval211USB.exe.*** This software is described in the manual of the TMC211 evaluation board.

5.2.2 The USB-2-X with a TMC222 evaluation board

If you are using the USB-2-X device with a TMC222 evaluation board, use the software that is supplied with the TMC222 evaluation board: ***Eval222USB.exe.*** It is described in the manual that comes with the TMC222 evaluation board.

5.2.3 The *USB-2-X.EXE* software for any other application

With this software you can send and receive any data using the interfaces of the USB-2-X device.

Start up as follows:

1) Start the program by double clicking the file ***USB2X.EXE*** which is supplied in the ***interfaces\USB2X*** directory of the TechLib CD.

2) The main window appears. Select your USB-2-X device in the interface section.

3) Click the ***Open*** button.

4) After the connection to the device has been successfully established, the firmware revision number of the device is shown.

5.2.4 Further information about the software

On the *IIC*, *LIN*, *CAN*, *SPI* and *RS485* tab pages you can find all functions to make use of the interfaces of the USB-2-X device. Please check TRINAMIC's web site from time to time and watch out for updates (of the PC software and the firmware).

Notes on using the USB-2-X device in your own PC software can be found in the documentation of the USB-2-X host interface protocol. There is also an example program, written in Delphi.

In the near future there will also be a DLL that will make integrating the USB-2-X device into your own devices very easy. Please check TRINAMIC's web site from time to time if it is already available.

Additional support tools for the USB-2-X are also available. Please check our website www.TRINAMIC.com to find the ***temperature logger*** to measure 8 temperatures via IIC with a LM75 chip or a chip programmer to read out and write via SPI, IIC or micro wire to EEPROMS and SPI chips like the TMC428.

6 Updating the firmware

The ***USB2X.EXE software*** also makes it possible to update the firmware of the USB-2-X device via its USB interface. Firmware files for the USB-2-X device can be downloaded on TRINAMIC's website (www.TRINAMIC.com).

For installing a new firmware file, please follow the instructions:

1) Download the file from TRINAMIC's web site. Firmware files for the USB-2-X device normally have the extension ***.s19***.

2) Start the USB-2-X PC software and click the ***Open*** button.

3) Click the ***Firmware update*** button. A new window appears.

4) Click the ***Load*** button and select your new firmware file.

5) Click the ***Start*** button and wait for the update process to complete.

6) Try if the USB-2-X device still works.
   If this should not be the case, quit the USB-2-X software, pull out the USB plug on the USB-2-X device, wait some seconds and plug it in again. Now restart the USB-2-X software and try again.
   If for some reason the USB-2-X device should still refuse to work, try to update the firmware again.

7 Revision history

7.1 Document revision

Version	Comment	Author	Description
1.00	2004-NOV-27	OK	Initial version
1.01	2004-OKT-01	OK	Minor error corrections
2.00	2005-JAN-24	OK	Describes USB-2-X Version 2
2.01	2005-NOV-23	OK	CAN connector pin assignments corrected
2.02	2007-SEP-19	HC	Clock stretching info for IIC, RS485 pin assignment in **Fehler! Verweisquelle konnte nicht gefunden werden.** corrected
2.03	2009-JUN-03	SD	Life support policy, order codes, and block diagram added. Minor changes.

Table 7.1: Document revision

7.2 Firmware revision

Version	Comment	Description
V2.10	2007-JUL-19	Supports clock stretching for IIC

Table 7.2: Firmware revision

8 References

[USB-2-X] USB interface converter (see http://www.trinamic.com)