



Devices



USB2CAN User Guide

High quality isolated USB to CAN interface

1.0v
2016-12-23

Table of Contents

1	Introduction	4
1.1	Usage warning	4
1.2	Technical specification	4
2	USB2CAN converter	5
2.1	Serial number	5
2.2	CAN connector pinout	5
2.3	Reset button	5
2.4	LED indication	6
2.5	CAN bus termination	6
2.6	Testing modes	7
3	Work on Linux	8
3.1	Driver and configuration	8
3.2	Tools-can-utils (send/receive CAN packets)	8
3.3	Tools-dfu-util (USB2CAN Firmware upgrade)	8
3.4	Test code example	8
3.5	Firmware upgrade	9
3.6	Change serial number	10
4	Work on Windows	11
4.1	Windows XP driver installation	11
4.2	Windows 7 driver installation	12
4.3	Windows 8 driver installation	14
4.4	USB2CAN test application bus speed configuration	16
4.5	Firmware upgrade	17

Changes history

Date	Change list
2016-12-23	Initial release

1. Introduction

This is one of the best and most cost effective CAN USB adapters on the market.

With CAN2USB you can monitor a CAN network, write a CAN program and communicate with industrial, medical, automotive or other CAN based device.

The CANBUS USB adapter connects a CAN bus to the USB port of a PC or notebook, which also supplies the power to the adapter (no power supply needed). In the downloads section now you can find all the related drivers and software applications and even Windows 7 64-bit kernel driver, which was added recently.

1.1 Usage 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 behaviour or a can-based distributed embedded system and depending on the application, the consequences of your improper actions could cause serious operation malfunction, loss of information, damage to equipment and physical injury to yourself or others.

1.2 Technical specification

Connectors

Computer	USB 2.0 Full speed, Type A connector
CAN	D-SUB, 9 pins. CAN-CIA standard interface pin assignment

CAN

Specification	ISO 11898-2 High-speed CAN 2.0A (standard format) and 2.0B (extended format)
Bit rates	10, 20, 50, 100, 125, 250, 500, 800, 1000 Kbit/s or user definable
Controller	ARM7 based STR750FV1T6
Transceiver	MCP2551
Galvanic isolation	Up to 500V, separate for each CAN channel
Termination	None

Measures

Size	73 x 42 x 24 mm (L x W x H), no cable
Weight	78g with cable

Environment

Operating temperature	From 0°C to +70°C
Relative humidity	15-90%, not condensing
Usage	Indoor only

Other

Available drivers	Windows 2000, Windows XP, Windows Vista, Windows 7, Windows 10, Linux
3rd party protocol support	Driver for VSCP protocol Open source CANAL API DLL for Windows Linux SocketCAN compatible

2. USB2CAN converter

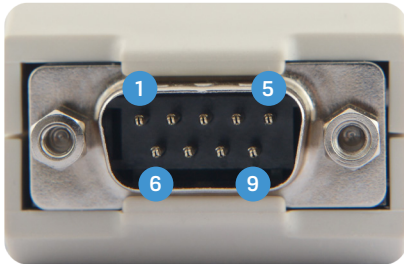
2.1 Serial number

USB2CAN converter has an 8 symbol serial number. Every device is manufactured with serial number, which is ED000200. To connect more than two devices to same PC, each device must contain a unique serial number.

EEPROM files with different ID's can be downloaded from 8devices WEB site.

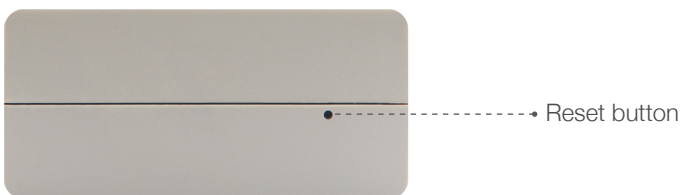
2.2 CAN connector pinout

USB2CAN uses 9-pin male DSUB connector.



Pin	Signal	Description
1	-	No connection
2	CANL	CANL bus line (dominant low)
3	CAN GND	CAN Ground
4	-	No connection
5	CAN_SHLD	Connected to CAN GND via 100 Ω /0.1 μ F
6	CAN GND	CAN Ground
7	CANH	CANH bus line (dominant high)
8	-	No connection
9	-	No connection

2.3 Reset button



USB2CAN has a reset button next to USB cable.

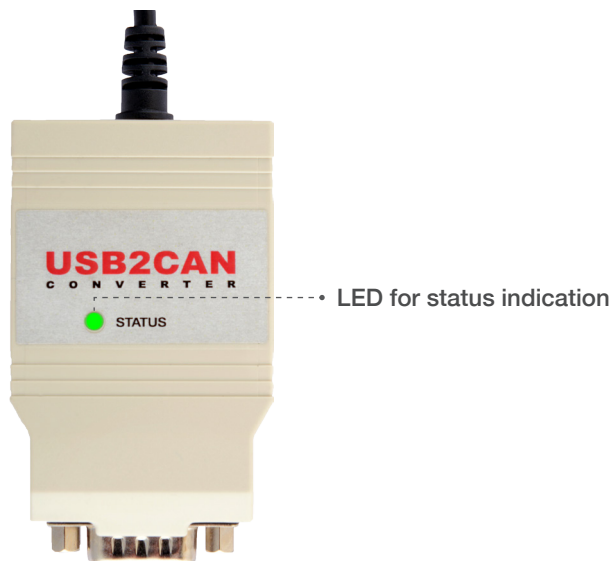
Reset button is used to enable bootloader mode for FW upgrade or to change a serial number.

To set device to the bootloader mode, reset button must be kept pressed when connecting converter to computer USB port.

2.4 LED indication

USB2CAN has a dual color LED for device status indication. The LED has two colors RED or GREEN.

Device status Indication modes are listed in the table below.

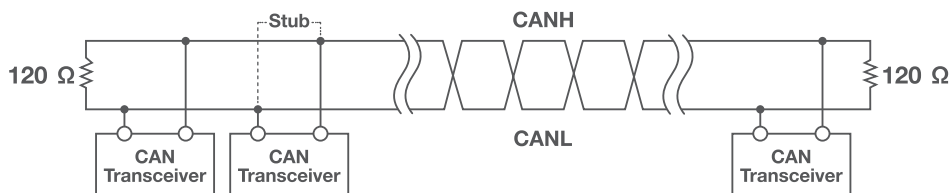


LED color	Status description
RED and GREEN steady	Bootloader mode.
RED/GREEN toggling	PC USB driver isn't installed.
RED steady	Device is powered on, computer drivers are initiated with no errors, CAN interface disabled.
GREEN steady	CAN interface enabled, device is ready to receive or send data.
GREEN blinking slow	CAN bus warning - one or both of the transmit/receive error counters exceed 96.
GREEN blinking fast	CAN bus error passive - error is greater than 127. The counter is incremented when an error occurs while sending or receiving data packet and decremented on every successful sent or received data packet.
RED blinking fast	CAN bus OFF error - transmit error counter of a CAN controller exceeds 255.

2.5 CAN bus termination

A High-speed CAN bus (ISO 11898-2) must be terminated on both ends with 120 Ohms.

Standard termination example.



The 120-Ω characteristic impedance twisted-pair cable must be terminated with an impedance of the same value to minimized reflected waves that occur from miss-matched impedances. Bad terminal may cause signal reflections and the transceivers of the connected CAN nodes (CAN- interface, control device) may not work.

The USB2CAN does not have an internal termination. Device must be used on a terminated CAN bus.

2.6 Testing modes

There are three testing modes supported by USB2CAN:

- Loopback
- Silent
- Silent loopback

1 Loopback mode

is used to test if the device is operational when only one device is available. If USB2CAN is in loopback mode, everything what is sent through the CAN interface is send back to device. It is like the CAN interface TX pins are connected to its RX pins.

2 Silent mode

means the interface only listens to the CAN bus. This means the unit does not even provide an ACK frame when a message is placed on the CAN bus correctly.

3 Silent loopback

is self test mode which can be used in a working CAN system without interfering with it.

3. Work on Linux

3.1 Driver and configuration

The “8 devices” USB2CAN converter is supported by mainline Linux since version 3.9. It works with Linux distributions like Ubuntu and Debian with no additional driver installation. For older version driver must be built manually.

Recommended Linux distributions:

- Ubuntu 14.04 or newer
- Debian 8 (Jessie) or newer

If the driver is correctly loaded, CAN interface should be seen when issuing the command `sudo ip link`.

Set can0 interface speed to 125 Kbps:

```
sudo ip link set can0 up type can bitrate 125000 sample-point 0.875
```

Set to can0 to “steady” state (steady green led):

```
sudo ip link set can0 up
```

To bring down interface (steady red led):

```
sudo ip link set can0 down
```

To get more information about configuration options type:

```
sudo ip link set can0 type can help
```

3.2 Tools- can-utils (send/receive CAN packets)

The programs allow to get CAN communications instantly using two commands “**cansend**” and “**candump**”.

Command to install tool:

```
sudo apt-get install can-utils
```

Send byte of information (0102030405060708) to can device with id = “01010101”:

```
cansend can0 01010101#0102030405060708
```

Receive everything on can0 interface:

```
candump can0
```

3.3 Tools- dfu-util (USB2CAN Firmware upgrade)

For dfu-util tool is recommended for USB2CAN firmware upgrade. The tool is used to upload firmware from PC to device over USB. The tool is available for download on 8devices WEB page.

IMPORTANT: it is highly recommended to use dfu-util from 8devices WEB page, which was modified from the original dfu-util to allow programming USB2CAN without any issues.

3.4 Test code example

Code example is available to download from a WEB (USB2CAN_TEST.py)

Two CAN bus interfaces need to be connected on same computer together (Ex.: connect two USB2CAN usb ports to a computer and connect can ports together). The code sends random from one interface to another and checks if the received data is valid.

To use the code go to terminal and launch command:

```
python USB2CAN_TEST [can interface 1] [can interface 2] [number of packets] [baudrate]
```

Example to send 100 random data packets from interface can0 to can1 at a 125 Kbps baudrate:

```
python USB2CAN_TEST.py can0 can1 100 125000
```

Testing was done using Ubuntu Linux distribution. Other distributions may require additional configuration.

3.5 Firmware upgrade

STEP 1 Check if USB2CAN device is functional

Plug in the device and type command **"dmesg"**. At the bottom you please check for the following information

```
[ 1519.152075] usb 4-1: USB disconnect, device number 5
[ 1521.636017] usb 4-1: new full-speed USB device number 6 using uhci_hcd
[ 1522.016040] usb 4-1: New USB device found, idVendor=0483, idProduct=1234
[ 1522.016046] usb 4-1: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[ 1522.016050] usb 4-1: Product: USB2CAN converter
[ 1522.016053] usb 4-1: Manufacturer: edevices
[ 1522.016056] usb 4-1: SerialNumber: ED000200
[ 1522.024045] usb_8dev 4-1:1.0 can0: firmware: 1.7, hardware: 1.0
```

<- Serial number
<- FM and HW version

Plug in the device and type command **"dmesg"**. At the bottom you please check for the following information

```
user_name@computer_name:~$ lsusb
Bus 001 Device 003: ID 058f:6362 Alcor Micro Corp. Flash Card Reader/Writer
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 005 Device 001: ID 1d6b:0001 Linux Foundation 1.1 root hub
Bus 004 Device 004: ID 0483:1234 STMicroelectronics
Bus 004 Device 001: ID 1d6b:0001 Linux Foundation 1.1 root hub
Bus 003 Device 001: ID 1d6b:0001 Linux Foundation 1.1 root hub
Bus 002 Device 001: ID 1d6b:0001 Linux Foundation 1.1 root hub
```

<-Command

<- USB2CAN device

STEP 2 Enable bootloader mode

Press the reset button near the cable of the device and then plug USB cable to PC.

To confirm bootloader initiation was a success type the command **"dmesg"**:

```
[ 2465.668017] usb 4-1: new full-speed USB device number 7 using uhci_hcd
[ 2465.835034] usb 4-1: New USB device found, idVendor=0483, idProduct=df11
[ 2465.835039] usb 4-1: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[ 2465.835043] usb 4-1: Product: STR75x-DFU
[ 2465.835047] usb 4-1: Manufacturer: STMicroelectronics
[ 2465.835049] usb 4-1: SerialNumber: 001
```

<- Bootloader mode
<- USB2CAN

Also, a bootloader mode, can be checked with **"lsusb"** command:

```
user_name@computer_name:~$ lsusb
Bus 001 Device 003: ID 058f:6362 Alcor Micro Corp. Flash Card Reader/Writer
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 005 Device 001: ID 1d6b:0001 Linux Foundation 1.1 root hub
Bus 004 Device 005: ID 0483:df11 STMicroelectronics STM Device in DFU Mode
Bus 004 Device 001: ID 1d6b:0001 Linux Foundation 1.1 root hub
Bus 003 Device 001: ID 1d6b:0001 Linux Foundation 1.1 root hub
Bus 002 Device 001: ID 1d6b:0001 Linux Foundation 1.1 root hub
```

<- Bootloader mode

STEP 3 Upgrade Firmware

IMPORTANT: Firmware upgrade is done using dfu-util program. it is highly recommended to use dfu-util from 8devices WEB page, which was modified from the original dfu-util to allow programming USB2CAN without any issues.

Change dfu-util program permission rights:

```
sudo chmod +x dfu-util
```

Download the DFU firmware upgrade image from 8devices WEB page.

The command to write DFU image is:

```
dfu-util -a 0 -R -D /Path/to/image/dfu_FW_file.dfu
```

The output should be similar to:

```
$ sudo dfu-util -a 0 -D Downloads/usb2can_1_6.dfu

Copyright 2005-2009 Weston Schmidt, Harald Welte and OpenMoko Inc.
Copyright 2010-2016 Tormod Volden and Stefan Schmidt
This program is Free Software and has ABSOLUTELY NO WARRANTY
Please report bugs to http://sourceforge.net/p/dfu-util/tickets/

Match vendor ID from file: 0483
Match product ID from file: 0000
Opening DFU capable USB device...
ID 0483:df11
Run-time device DFU version 011a
Claiming USB DFU Interface...
Setting Alternate Setting #0 ...
Determining device status: state = dfuIDLE, status = 0
dfuIDLE, continuing
DFU mode device DFU version 011a
Device returned transfer size 1024
DfuSe interface name: "Internal Flash 0"
file contains 1 DFU images
parsing DFU image 1
Target name: USB2CAN_firmware
image for alternate setting 0, (1 elements, total size = 106504)
parsing element 1, address = 0x20006000, size = 106496
Download      [=====] 100%    106496 bytes
Download done.
done parsing DfuSe file
```

Unplug and plug the device. Device will start in normal mode with new Firmware version.

3.6 Change serial number

IMPORTANT: serial number change is done using dfu-util program. it is highly recommended to use dfu-util from 8devices WEB page, which was modified from the original dfu-util to allow programming USB2CAN without any issues.

Change dfu-util program permission rights:

```
sudo chmod +x dfu-util
```

Download archive with EEPROM images with serial numbers ED000100-ED000226 from 8devices WEB page. The archive contains DFU images (e.g. file ED000204_1_0.dfu contains serial number ED000204).

Enable boot loader mode (see section "3.4 Firmware upgrade", Step 1 and Step 2). Then use dfu tool command:

```
dfu-util -a 1 -R -D /Path/to/image/ED000204_1_0.dfu
```

Unplug and plug the device. Device will start in normal mode with a new serial number.

4. Work on Windows

4.1 Windows XP driver installation

Download drivers files from 8devices WEB page:

- 32-bit - USB2CAN Windows 32-bit (XP, Vista, Win7, Win8) USB driver v1.0.2.1
- 64-bit - USB2CAN Windows 64-bit (XP, Vista, Win7, Win8) USB driver v1.0.2.1

Plug USB2CAN device to computer USB connection. RED/GREEN LED should be toggling

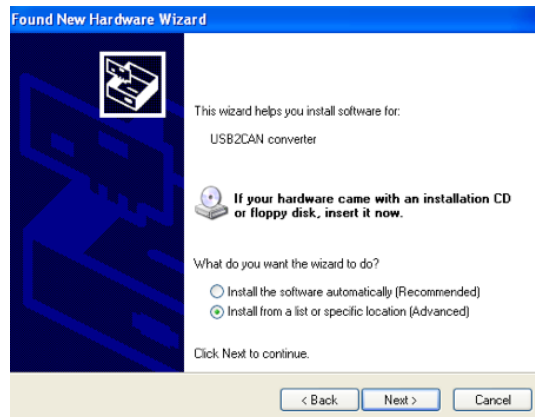
Use Hardware wizard, which will start after You plug device to PC.

It can be started manually by pressing: Start – Control Panel – Add Hardware.

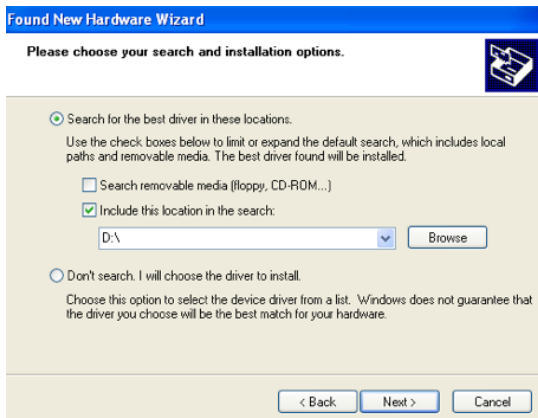
- 1 When Hardware wizard starts, choose “No, not this time” and press next:



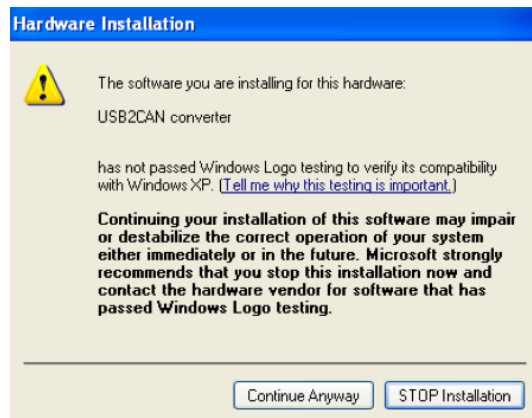
- 2 Then choose “Install from a list or specific location”:



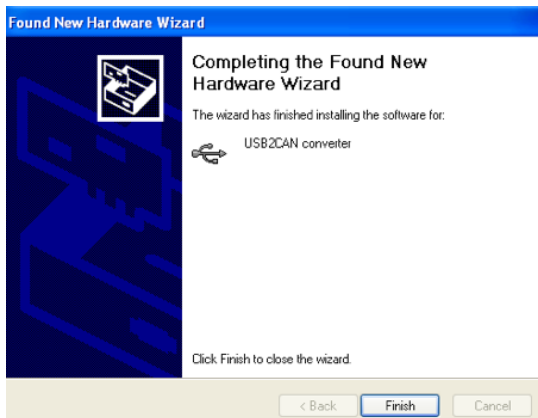
- 3 Choose “Search for the best driver in these locations”, browse for drivers location and press next:



- 4 You will receive warning from Windows. Choose “Continue Anyway”:

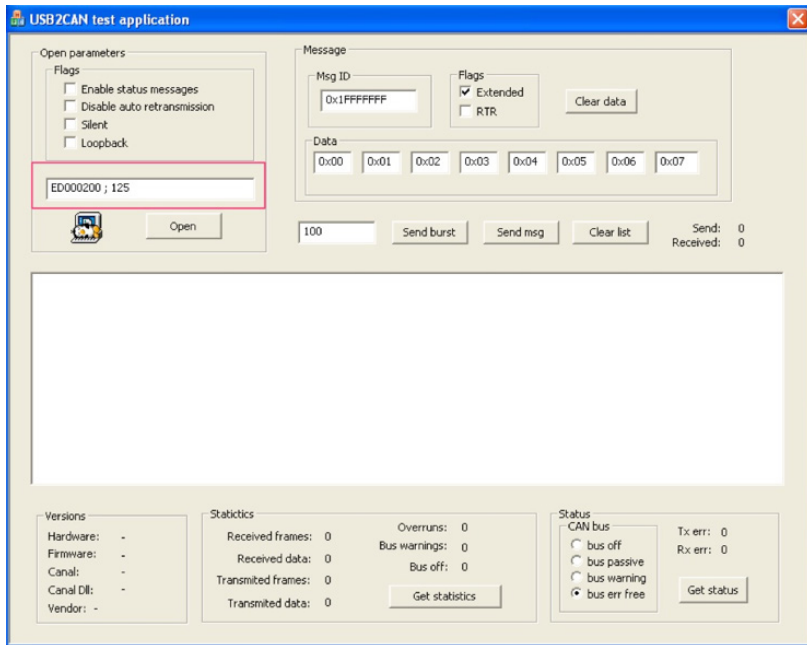


- 5 When installation completed press “Finish”:



If the driver installation was successful, USB2CAN LED will turn steady RED.

Run USB2CAN test application (can be downloaded from 8devices WEB page). Change device serial number to which is presented on device back side and press **“Open”**:



USB2CAN LED will turn steady GREEN.

4.2 Windows 7 driver installation

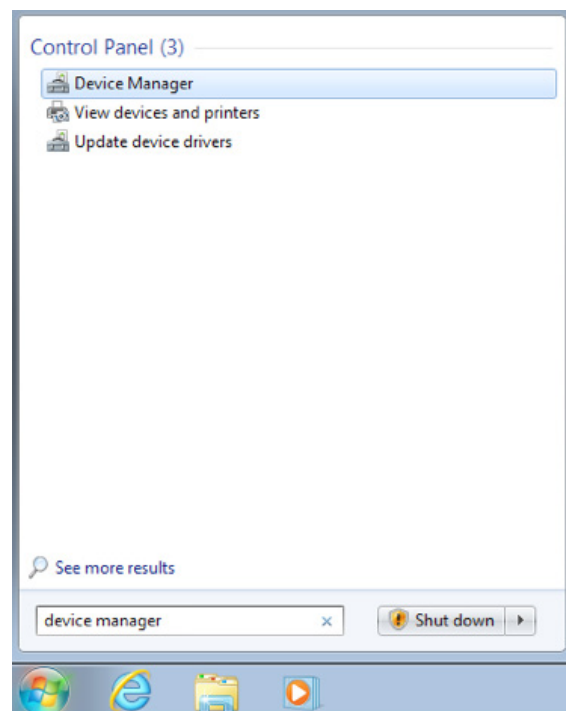
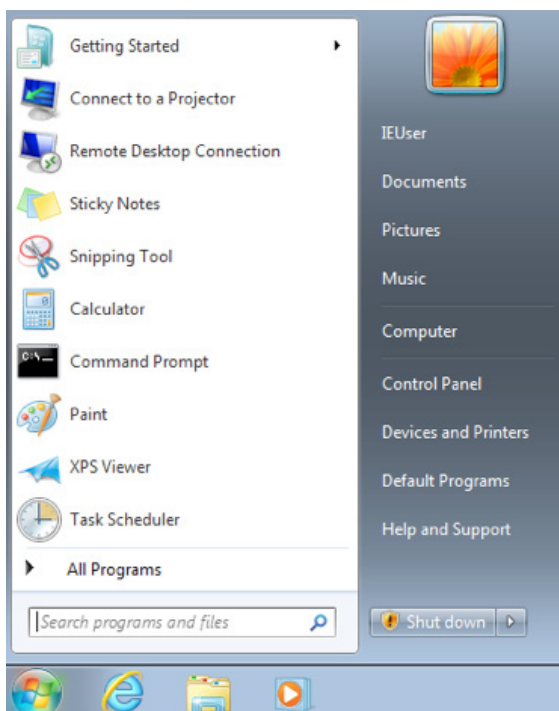
Download drivers files from 8devices WEB page:

- 32-bit - USB2CAN Windows 32-bit (XP, Vista, Win7, Win8) USB driver v1.0.2.1
- 64-bit - USB2CAN Windows 64-bit (XP, Vista, Win7, Win8) USB driver v1.0.2.1

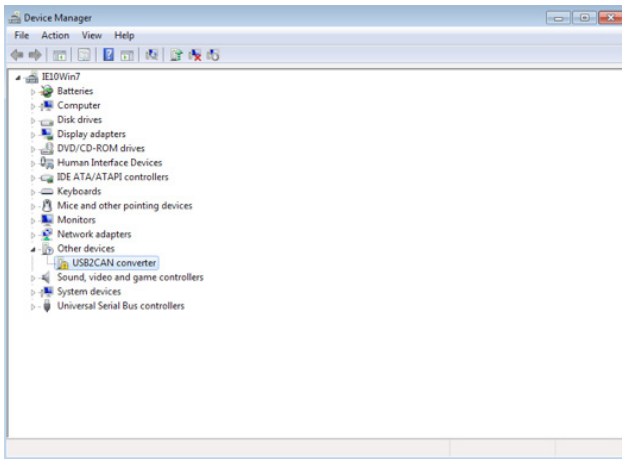
Plug USB2CAN device to computer USB connection. RED/GREEN LED should be toggling

Use Hardware wizard, which will start after You plug device to PC.

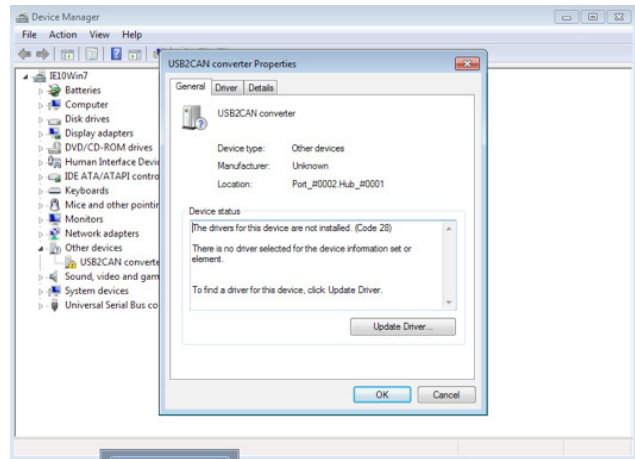
It can be started manually by pressing **“Start”** button and then run Device manager by writing **“Device manager”** in search field



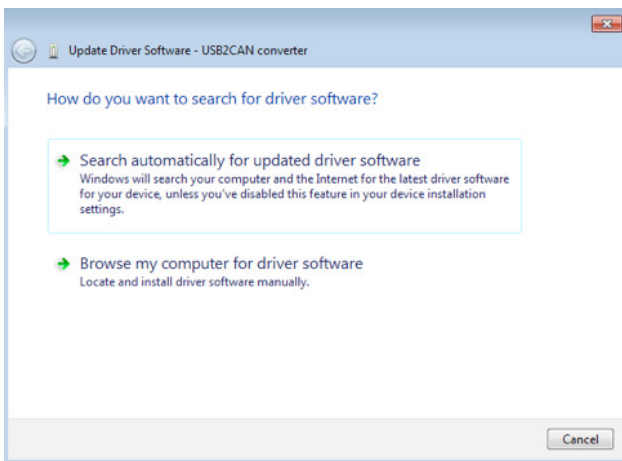
1 Choose sub2can device:



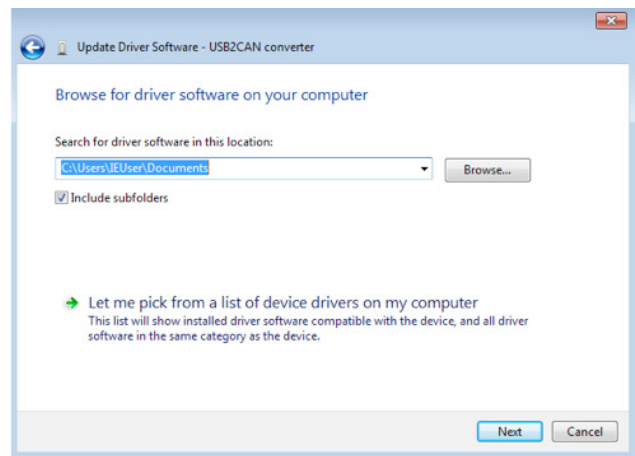
2 Press "Update Driver":



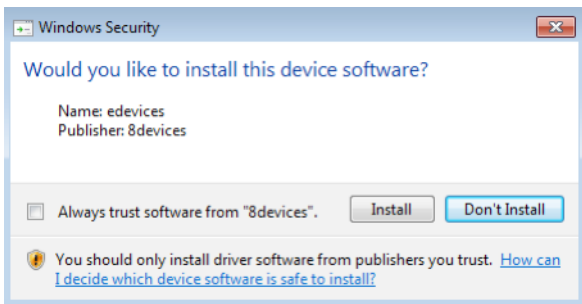
3 Choose "Browse my computer for driver software":



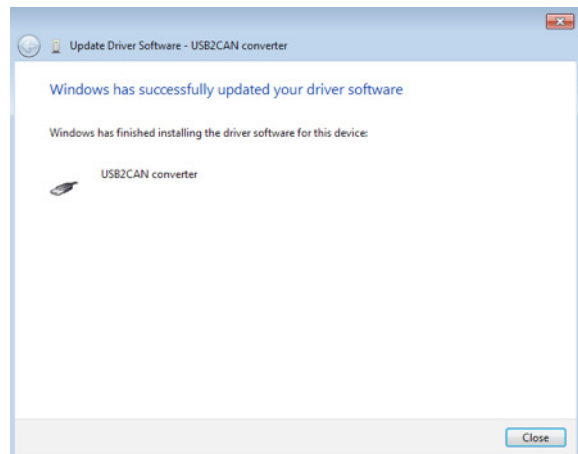
4 Browse for drivers location on Your computer:



5 Will pop-up Windows Security message. Press "Install":

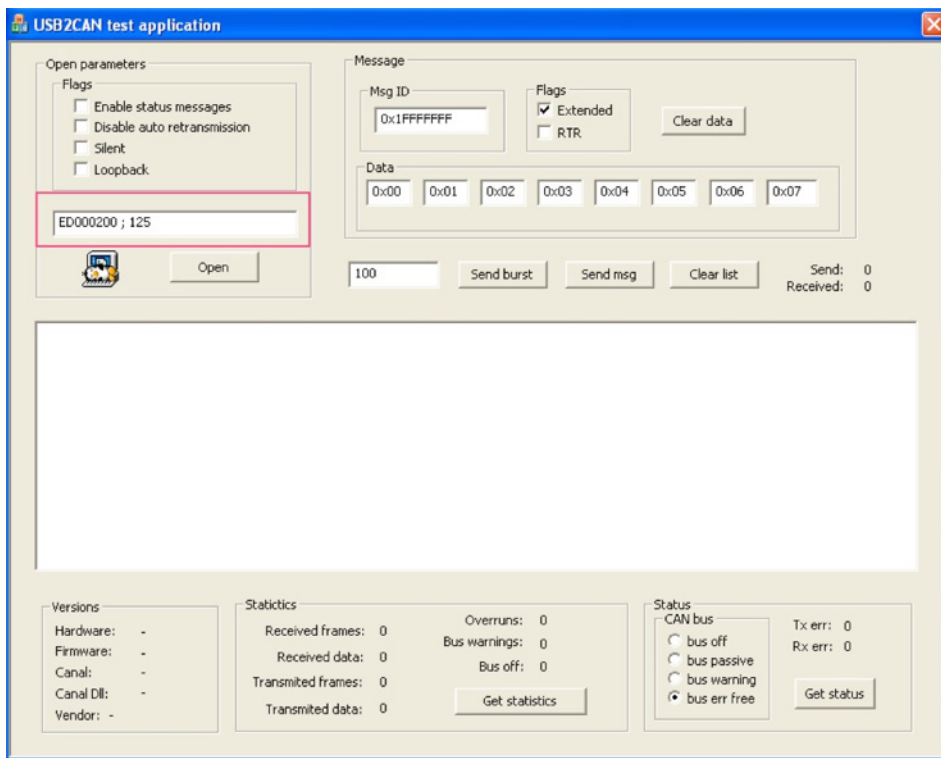


6 Finish installation:



If the driver installation was successful, USB2CAN LED will turn steady RED.

Run USB2CAN test application (can be downloaded from 8devices WEB page). Change device serial number to which is presented on device back side and press **“Open”**:



USB2CAN LED will turn steady GREEN.

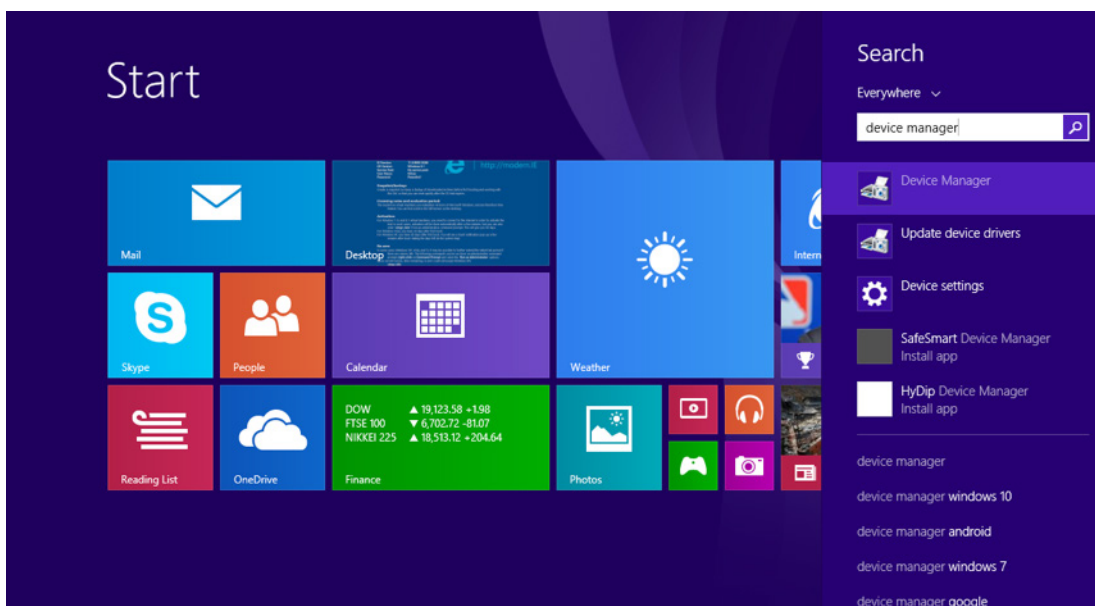
4.3 Windows 8 driver installation

Download drivers files from 8devices WEB page:

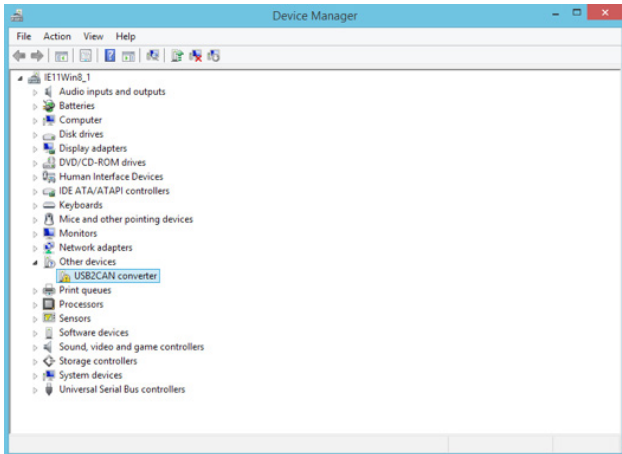
- 32-bit - USB2CAN Windows 32-bit (XP, Vista, Win7, Win8) USB driver v1.0.2.1
- 64-bit - USB2CAN Windows 64-bit (XP, Vista, Win7, Win8) USB driver v1.0.2.1

Plug USB2CAN device to computer USB connection. RED/GREEN LED should be toggling

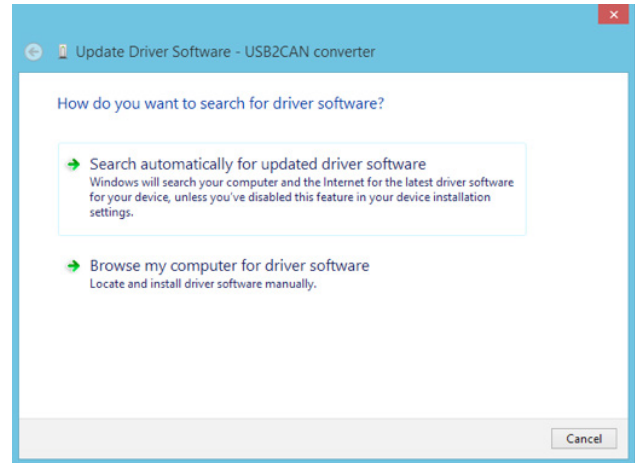
Run device manager.



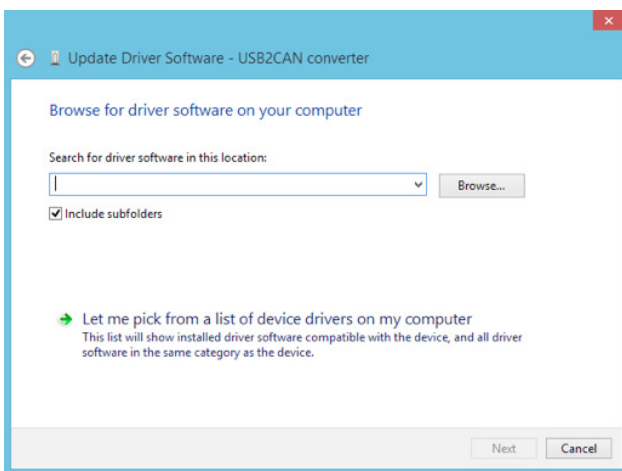
- 1 Then mark USB2CAN device and chose "Update driver software" from top menu:



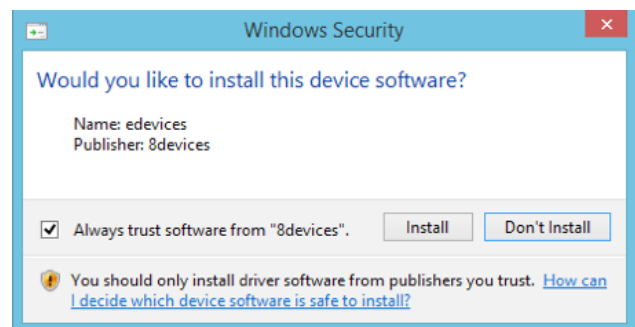
- 2 Choose "Browse my computer for driver software":



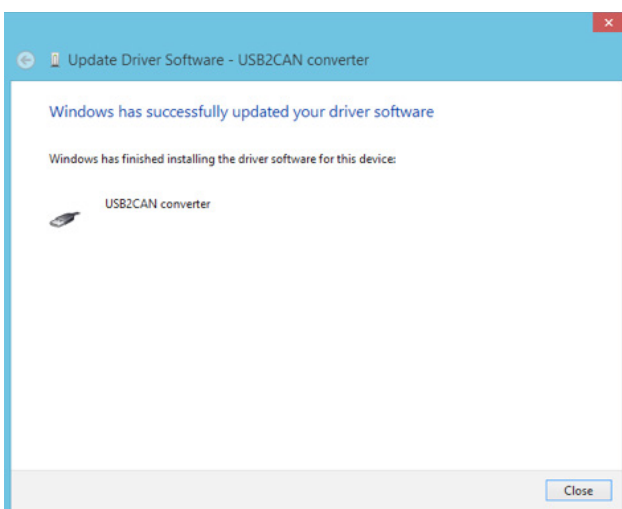
- 3 Browse for drivers and click next:



- 4 Will pup-up Windows Security message. Choose "Install":

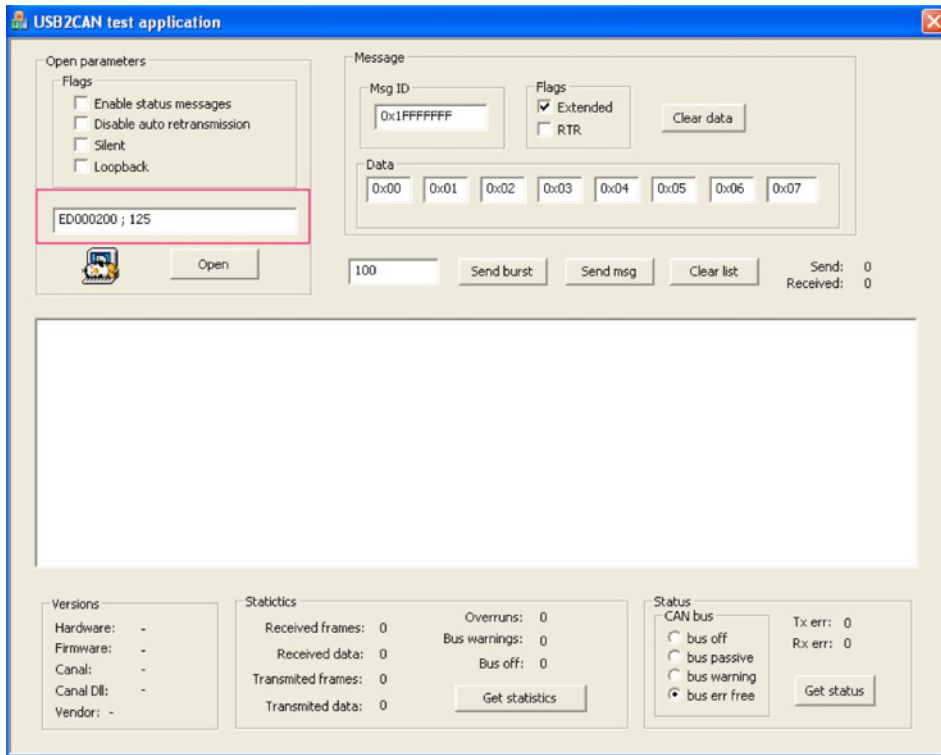


- 5 And press "Close":



If the driver installation was successful, USB2CAN LED will turn steady RED.

Run USB2CAN test application (can be downloaded from 8devices WEB page). Change device serial number to which is presented on device back side and press **“Open”**:



USB2CAN LED will turn steady GREEN.

4.4 USB2CAN test application bus speed configuration

For a proper operation a correct serial number and bus speed must be entered. Serial number is located on USB2CAN label. Important to note, that is several converters are connected to same PC, the serial number must be changed.

Standard CAN bus speed configuration

Input format is: “serial number;can bus speed”, allowed speed options 125, 250, 500,1000
Example: ED000200;125

Customized CAN bus speed configuration

For a customized speed, the bus speed setting must be set to “0” with additional configuration parameters. The additional parameters are written directly to internal microcontroller timing register.

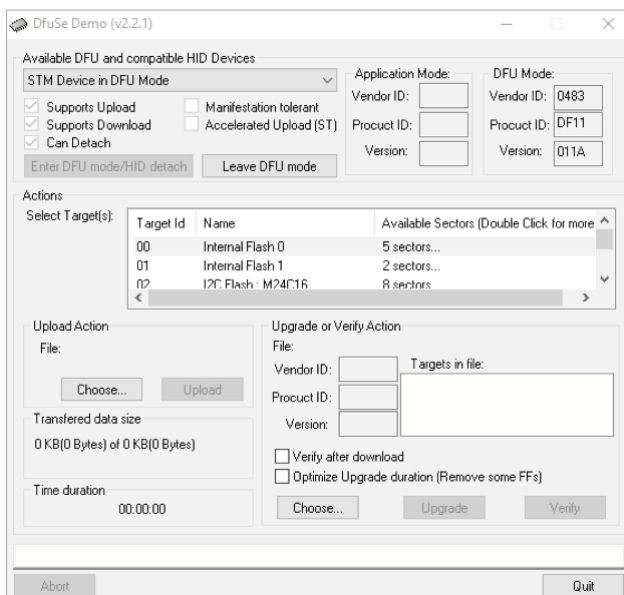
Input format is: “serial number;0;tseg1;tseg2;sjw;brp”
Example: ED000200;0;12;34;22;11

More details how to configure customized speed can be found at <http://www.bittiming.can-wiki.info>

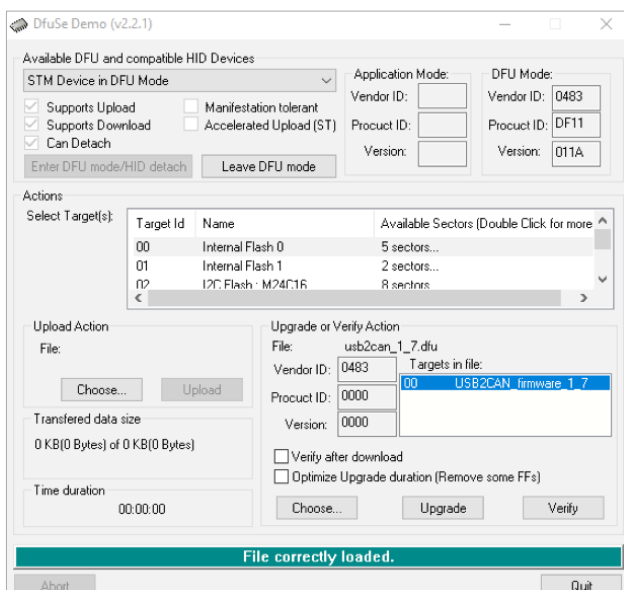
Note: on the WEB page drop down menu select “ST Microelectronics bxCAN” and “Clock Rate” = 32MHz

4.5 Firmware upgrade

- Step 1** Disconnect converter from PC
- Step 2** Enable **“bootloader”** mode by pressing the reset button near the USB cable and then plug USB cable to PC.
- Step 3** LED indicator must be RED and GREEN steady at the same time.
- Step 4** Install USB2CAN USB driver for bootloader mode (available to download from 8devices WEB page):
- 32-bit - USB2CAN Windows 32-bit (XP, Vista, Win7, Win8) USB driver v1.0.2.1
 - 64-bit - USB2CAN Windows 64-bit (XP, Vista, Win7, Win8) USB driver v1.0.2.1
- Step 5** Install USB2CAN USB DFU device drivers (USB2CAN CANAL DLL v1.0.6).
- Step 6** Download firmware image from 8devices WEB page.
- Step 7** Launch DfuSe Demonstrator program.

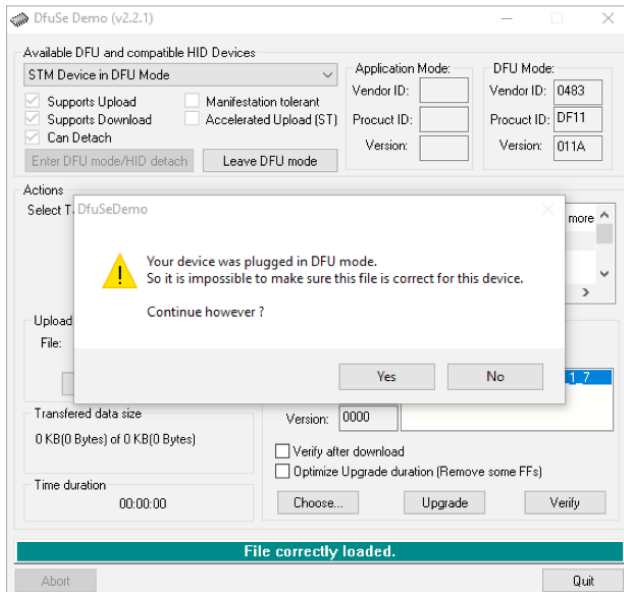


- Step 8** Choose **“STM Device in DFU Mode”** in **“Available DFU and compatible HID Devices”**
- Step 9** Select **“Target Id”** - Internal Flash 0.
- Step 10** „Choose“ firmware file location on Your PC:



Step 11 Choose “**Verify**”

Step 12 Will pop up message windows. Choose “**Yes**”



Step 13 After successful verification choose “**Upgrade**”

Step 14 Will pop up message windows. Choose “**Yes**”