



# Korlan USB2CAN User Guide

High quality isolated USB to CAN interface

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# 1. Introduction

Korlan USB2CAN provides a convenient computer (USB) to CAN 2.0 network interface. You can send and receive CAN messages. Write your program for communicating with industrial, medical, and automotive devices equipped with CAN interface. Korlan USB2CAN comes in two different versions: DB9 or OBD2. The Korlan CANBUS USB adapter connects a CAN bus to the USB port of any device running the Linux or Windows operating system, which also supplies the power to the adapter (no power supply is required). In the downloads section, you can find all the related drivers, software applications, and programming examples for Windows 10/11 and Linux operating systems.

# 1.1 Usage warning

Use your device with caution and a complete understanding of the risks. This warning informs 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 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 or OBD2, 16 pins. Standard inter assignment.					
CAN					
Specification	ISO 11898-2 High-speed CAN 2.0A (standard format) and 2.0B (extended format)				
Bit rates	50, 50, 100, 125, 250, 500, 800, 1000 Kbit/s or user definable				
Controller	ARM 32bit Cortex-M0 (STM32F072)				
Transceiver	TI ISO1050				
Galvanic isolation	Up to 2.5kV, separate for each CAN channel				
Termination	None				
MEASURES					
Size	110 x 36.7 x 16.2 mm (L x W x H), no cable				
Weight	DB9 version: 100g with cable, OBD2 version: 140g with cable				
ENVIRONMENT					
Operating temperature	From -35°C to +55°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 ptotocol support	Driver for VSCP protocol				

CONNECTORS							
	Open source CANAL API DLL for Windows						
	Linux SocketCAN compatible						

# 2. Korlan USB2CAN converter

### 2.1 CAN connector pinout

#### FIGURE 2-1. DB9 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 $\Omega$ /0.1uF
6	CAN GND	CAN Ground
7	CANH	CANH bus line (dominant high)
8	-	No connection
9	-	No connection

#### FIGURE 2-2. ODB2 CONNECTOR



PIN	DESCRIPTION
4	GND
5	GND
6	CAN Bus High
14	CAN Bus LOW

Note: All other pins on OBD2 are not used and not connected.

# 2.2 LED indication

Korlan USB2CAN has three LEDs (Power, Error, Info) for device status indication. Device status Indication modes are listed in the table below.



LED	STATUS DESCRIPTION
PWR LED on	Device is powered on.
INFO LED on, STAT LED off	CAN interface enabled, device is ready to receive or send data.
STAT LED on, INFO LED off	CAN interface is not enabled on a host device.
INFO LED on, STAT LED blinking	CAN interface sending data.
INFO LED blinking fast	CAN bus passive error.
INFO LED blinking slow	CAN bus warning.
STAT LED blinking slow	CAN bus-off error.

# 2.3 CAN bus termination

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



#### Standard termination example.

The  $120-\Omega$  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.

### 2.4 Testing modes

Korlan USB2CAN supports three testing modes:

- Loopback mode is used to test if the device is applicable when only one device is available. If Korlan USB2CAN is in loopback mode, everything sent through the CAN interface is sent back to the device. The CAN interface TX pins are connected to its RX pins.
- Silent in this mode, the interface only listens CAN bus. No data or ACK frames are sent.
- **Silent loopback** is a self-test mode that can be used in a working CAN system without interfering with other devices connected to the CAN bus.

# 3. Work on Linux

#### 3.1 Driver and configuration

Mainline Linux has supported the Korlan USB2CAN converter since version 3.9. It works with Linux distributions like Ubuntu and Debian with no additional driver installation. For Raspbian, the driver must be built manually. Instruction on building CAN driver for Raspbian can be found on 8devices WIKI pages. <u>https://www.8devices.com/wiki/korlan:compile-raspberry</u>

#### **Recommended Linux distributions:**

- Ubuntu 18.04 or later
- Debian 8 (Jessie) or later
- Raspbian Bullseye

You can verify if Korlan USB2CAN device is recognized by the system and drivers loaded correctly using the usb-devices command. In the output, you will see your device:

```
usb-devices
T: Bus=03 Lev=02 Prnt=02 Port=02 Cnt=03 Dev#= 7 Spd=12 MxCh= 0
D: Ver= 2.00 Cls=ff(vend.) Sub=ff Prot=00 MxPS=64 #Cfgs= 1
P: Vendor=0483 ProdID=1234 Rev=01.00
S: Manufacturer=8Devices
S: Product=USB2CAN converter
S: SerialNumber=9508BBCC
```

- C: #Ifs= 1 Cfg#= 1 Atr=80 MxPwr=100mA
- I: If#=0x0 Alt= 0 #EPs= 4 Cls=ff(vend.) Sub=ff Prot=ff Driver=usb\_8dev

If you use several Korlan USB2CAN devices, you will see all of them in USB-devices output with different SeriaNumber values. The first device in the output will correspond to the can0 socketcan interface, the second - can1, etc.

If the driver is loaded correctly, the CAN interface should be seen by issuing the command: ip link show

4: can0: <NOARP,ECHO> mtu 16 qdisc noop state DOWN mode DEFAULT group default qlen 10 link/can

Set canO interface speed to 125 Kbps: sudo ip link set canO up type can bitrate 125000 sample-point 0.875

Bring the can0 interface to UP state (INFO LED lights on, STAT LED lights off): sudo ip link set can0 up

To bring down the interface (STAT LED lights up, INFO LED lights off): sudo ip link set can0 down

You can set different options when configuring can interface.For example:

To configure can0 interface to work in loopback mode: sudo ip link set can0 up type can bitrate 125000 loopback on

To configure can0 interface to work in silent mode: sudo ip link set can0 up type can bitrate 125000 listen-only on To disable auto retry on can0 interface and ensure that if an error occurs, Korlan does not try to resend a TX frame:

sudo ip link set can0 up type can bitrate 125000 one-shot on

If you want 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 you to get CAN communications instantly using two commands, cansend, and candump.

```
Command to install the tool:
sudo apt-get install can-utils
```

```
Send byte of information (1122334455667788) to can device with id = "1f334455": cansend can0 1f334455#1122334455667788
```

Receive everything on the can1 interface: candump can1

#### 3.3 Python programming examples for Linux

Python programming examples rely on the python-can module and socket can drivers. Before running code examples, you shall bring the CAN interface to the UP state using the command: sudo ip link set can0 up type can bitrate 125000 sample-point 0.875

```
Example receive_all.py - receives and prints all messages on the screen until Ctr-C is pressed.
```

```
with can.interface.Bus(channel='can0', interface='socketcan', bitrate=1000000) as bus:
    try:
        while True:
            msg = bus.recv(1)
            if msg is not None:
                print(msg)
except KeyboardInterrupt:
        pass # exit normally
```

Example send.py - sends 10 CAN messages to the bus.

```
bus = can.Bus(channel='can0', interface='socketcan', bitrate=1000000)
for i in range(10):
    msg = can.Message(arbitration_id=0xc0ffee, data=[i,2,3,4,5,6,7,8],
    is_extended_id=True)
    bus.send(msg)
```

import can

্যন jonas@NUC-20: ~/w	ork/linux_can_examples 🔍 😑 🗕		
jonas@NUC-20:-\$ cd work/linux_can_exa jonas@NUC-20:-/work/linux_can_example jonas@NUC-20:-/work/linux_can_example:	nples/ \$ python3 send.py :\$ ∐		
	jonas@NUC-20: ~/work/li	linux_can_examples Q = _ 0	8
ionas@NUC-28:-/work/linux.cc Timestang: 1640840091.11350 Timestang: 1640840091.11360 Timestang: 1640840091.11360 Timestang: 1640840091.11307 Timestang: 1640840091.11307 Timestang: 1640840091.11307 Timestang: 1640840091.11402 Timestang: 1640840091.11402	<pre>m_example:S python3 receive_all.py 1 D: 00c0ffee X Tx 1 D: 00c0ffee X Tx</pre>	DL:       8       00       02       03       04       05       06       07       08       Channel:       c         DL:       8       01       02       03       04       05       06       07       08       Channel:       c         DL:       8       02       02       03       04       95       06       07       08       Channel:       c         DL:       8       03       02       03       04       95       06       07       08       Channel:       c         DL:       8       04       02       03       04       95       06       07       08       Channel:       c         DL:       8       05       02       03       04       95       06       07       08       Channel:       c         DL:       8       06       02       03       04       95       06       07       08       Channel:       c         DL:       8       06       02       03       04       95       06       07       08       Channel:       c         DL:       8       08       02       03       04 <td>an0 an0 an0 an0 an0 an0 an0 an0 an0</td>	an0 an0 an0 an0 an0 an0 an0 an0 an0

# 3.4 Firmware upgrade

Install dfu-util tool sudo apt-get install dfu-util

Switch to the internal bootloader using the set\_dfu utility provided with the firmware: sudo <code>./set\_dfu</code>

Flash new firmware as root: sudo dfu-util -a 0 -s 0x8008000 -D USB2CAN-v2.0.bin

# 4. Work on Windows

## 4.1 Installing Windows 10/11 WinUSB driver

Download the Korlan USB2CAN driver from

https://www.8devices.com/media/products/usb2can\_korlan/downloads/usb2can\_winusb.msi.

Install it following the procedure.



🕼 8Devices USB2CAN WinUSB Driver	-		×
Installation Complete			
8Devices USB2CAN WinUSB Driver has been successfully installe	d.		
Click "Close" to exit.			
Please use Windows Update to check for any critical updates to the	.NET I	Framewo	ork.
<back close<="" td=""><td></td><td>Cano</td><td>el</td></back>		Cano	el

Check if the device is functioning correctly using Windows Device Manager





#### 4.3 Python programing examples for Windows

You will require a CANAL DLL library from the 8devices WEB site. It's been provided for 64 and 32-bit environments

https://www.8devices.com/media/products/usb2can\_korlan/downloads/korlan\_python-can\_examples.zip

Examples are based on python-can library programming examples and are slightly modified, adding Korlan USB2CAN specific information and providing an explicit path to the usb2can.dll library. You will need to install a python-can library using your favorite Python package installer.

send\_one\_korlan.py - sends a single CAN bus message.

import can

```
with can.interface.Bus(bustype="usb2can", channel="9508bbcc", bitrate=1000000, dll='./
usb2can.dll') as bus:
    msg = can.Message(arbitration_id=0xC0FFEE, data=[0, 25, 0, 1, 3, 1, 4, 1],
    is_extended_id=True)
    try:
        bus.send(msg)
        print(f"Message sent on {bus.channel_info}")
    except can.CanError:
        print("Message NOT sent")
```

receve\_all\_korlan.py - receiving and printing CAN bus messages in the loop until Ctrl-C is pressed.

```
import can
with can.interface.Bus(bustype="usb2can", channel="d3365afb", bitrate=1000000, dll='./
usb2can.dll') as bus:
    try:
        while True:
            msg = bus.recv(1)
            if msg is not None:
                print(msg)
except KeyboardInterrupt:
            pass # exit normally
```

💶 Select Command Prompt							_	$\times$	
essage sent on USB2CAN device 9508bbcc								~	
∷\Users\jonas\work\korlan-ui>python send_one_korlan.p lessage sent on USB2CAN device 9508bbcc	ру								
:\Users\jonas\work\korlan-ui>python send_one_korlan.p essage sent on USB2CAN device 9508bbcc	ру								
:\Users\jonas\work\korlan-ui>python send_one_korlan.p lessage sent on USB2CAN device 9508bbcc	ру								
:\Users\jonas\work\korlan-ui>python	ру								
::\Users\jonas\work\korlan-ui>python	у								
:\Users\ionas\work\korlan-ui>								~	
Comment with a marker illing and									
Command Prompt - python receive_an_konan.py								· · ·	^
C:\Users\jonas\work\korlan-ui>									^
C:\Users\jonas\work\korlan-ui>python_receive_al	l korlan.pv								
Timestamp: 125971.000000 ID: 00c0ffee X	DLC:	8	00 19 00	01 03	01 O	4 01			
Timestamp: 128195.000000 ID: 00c0ffee X	DLC:	8	00 19 00	01 03	01 0	4 01			
Timestamp: 129556.000000 ID: 00c0ffee X	DLC:	8	00 19 00	01 03	01 0	4 01			
Timestamp: 130914.000000 ID: 00c0ffee X	DLC:	8	00 19 00	01 03	01 0	4 01			
Timestamp: 132262.000000 ID: 00c0ffee X	DLC:	8	00 19 00	01 03	01 0	4 01			
Timestamp: 133617.000000 ID: 00c0ffee X	DLC:	8	00 19 00	01 03	01 0	4 01			
Timestamp: 134969.000000 ID: 00c0ffee X	DLC:	8	00 19 00	01 03	01 0	4 01			
Timestamp: 137093.000000 ID: 00c0ffee X	DLC:	8	00 19 00	01 03	01 0	4 01			
									~

# 4.4 Firmware upgrade

Firmware upgrade to version 2.3 is straightforward on Windows operating system. Follow the instructions below.

1. Connect your Korlan USB2CAN adapter to the USB port of your computer.

2. Download Korlan USB2CAN Firmware Upgrade Tool v2.3 from our website:

https://www.8devices.com/media/products/usb2can\_korlan/downloads/USB2CAN\_v23.exe

3. Run the USB2CAN\_v23.exe file to start the firmware upgrade.

4. Follow instructions and wait until the firmware upgrade is finished before disconnecting Korlan USB2CAN device.

8Devices USB2CAN Firmwa	re v2.3 Setup — 🗆 🗙	👩 8Devices US82CAN Firmware v2.3 Setup — 🗆 🗙	8 Bevices USB2CAN Firmware v2.3 Setup     − □ ×
	Korlan USB2CAN firmware v2.3	Installing Please wait while 8Devices US82CAN Firmware v2.3 is being installed.	Installation Complete Setup was completed successfully.
	Click Install to run USB2CAN firmware installation.	Extract: USB2CAN_DFU_legacy.exe 100%	Completed
Ŀ		Output fisider: C1;User1;Vseru/JappOtata;Kooll(TempLuSB2CAN_installer Extract: dfu-util.exe., 100% Extract: Usb2:an-dfu-tiler-setup.exe., 100% Extract: Usb2:an-dfu-tiler-setup.exe., 100% Extract: USB2CAN_DPL.exe., 100% Extract: USB2CAN_DPL.exe., 100% Extract: USB2CAN_DPL.exe., 100% Installing Driver.,	Extract: usb2can_v23.bin Automatic Section Science Copyright 2005-2009 Weston Schmidt Harvald Welte and OperMoko Inc. Copyright 2005-2009 Weston Schmidt, Harvald Welte and OperMoko Inc. Weston Weston Schmidt, Harvald Welte and Schmidt, Harvald Welte and OperMoko Inc. Copyright 2005-2009 Weston Schmidt, Harvald Welte and OperMoko Inc. Copyright 2005-2009 Weston Schmidt, Harvald Welte and OperMoko Inc. Copyright 2005-2009 Weston
	Install Cancel	Nulla Close Cancel	Nulsoft Install System v3.04

# 5. Korlan USB2CAN test application - kcan

### 5.1 About the application

This application is designed for Korlan USB2CAN device testing. It is written in python and relies on a versatile python-can library. The application is supported on Linux and Windows operating systems. 8devices provide the source code of kcan application under a very friendly license for your reference and experiments. The code with installation instructions is available on github: <u>https://github.com/8devices/korlan-usb2can-test-application</u>.

If you are using Windows operating system and you do not need the source code, you can also use this application simply by installing and running kcan.exe file on your computer, which you can find here: <u>https://wiki.8devices.com/korlan</u>.

#### Notes:

- Make sure to select the proper device ID and set the correct bit rates when using this program. Bit rates between two communicating devices must have the same value.
- You can run multiple instances of kcan application on your computer to control multiple Korlan USB2CAN devices.
- If you use Linux operating system, you have to run the application with sudo for it to work properly.

### 5.2 Instructions for using the program

Connect Korlan device to your computer and run the Korlan test application. You should see configuration tab displayed in the program's window.

Select desired Korlan USB2CAN device id from dropdown menu if you have connected multiple Korlan devices on your computer.

Select the desired bit rate from the dropdown menu.

Select wanted options for Korlan's interface:

- Loopback.
- Silent.
- Disable auto retry.

Loopback, silent and silent loopback testing modes are explained on page 7 of this document. Disable auto retry ensures that if an error occurs, Korlan does not try to resend a TX frame.

Set filters if you want to receive only certain RX messages with specific can ids. Enter desired CAN ID and CAN MASK.

The filter mask is used to determine which bits in the ID of the received frame are compared with the filter:

- If a mask bit is set to a zero, the corresponding ID bit of a received frame will automatically be accepted, regardless of the value of the filter bit.
- If a mask bit is set to a one, the corresponding ID bit of a received frame will be compared with the value of the filter bit; if they match it is accepted otherwise the frame is rejected.

If you want every bit to match the filter, set can mask to 1FFFFFF.

Click on the Configure button. You will observe device details and Korlan connection status on the status bar at the bottom of the window.

Korlan TX/RX OBD2 OBD2 diagrams	
Configure	
Device ID: CDE7E976 - RX filtering: CAN ID (hex): CAN MASK (hex): Extended ID:	
CAN bus bit rate:	
Silent OBD2	
Firmware version: 2.4 Hardware version: 2.0 Canal version: 2.0.0 DLL version: 2.0.0 Device vendor. 8devices.com	
Kadas ID CD57675 is connected to CAN but at hit rate 1000 kit/s	orr 0

Now you can proceed to the TX/RX tab and observe received and transmitted messages on a scrollable messages pane. You shall set desired CAN ID and DATA for transmitting messages, then click on the button Send.

If you want, you can reset bus statistics by clicking Clear stats button or clear message pane by clicking Clear messages button.

Also, you can stop RX message display for more attentive inspection by clicking on the Pause RX button.

	-law LICE	AL CAN									
CO KO	rian - USB	to CAN	adapter tes	t							=
Korlan	TX/RX	OBD2	OBD2 dia	agrams							
C	ounter		Time (s)	Flags	CAN ID	DLC	Data (hex)	CAN ID (hex):		DATA (hex):	
	1	т	0.000	Х	1FFFFFFF	8	00 01 02 03 04 05 06 07	1FF		0001020304050607	🔽 Extended Frame
	2		654.873	Х.,	1FFFFFFF	8	00 01 02 03 04 05 06 07				
	3	Т	0.000	Х.,	1FFFFFFF	8	00 01 02 03 04 05 06 07				
	4	r	655.129	Х.,	1FFFFFFF	8	00 01 02 03 04 05 06 07				Send
	5	Т	0.000	Х	1FFFFFFF	8	00 01 02 03 04 05 06 07				
	6		655.401	Х	1FFFFFFF	8	00 01 02 03 04 05 06 07				
	7	Т	0.000	Х.,	1FFFFFFF	8	00 01 02 03 04 05 06 07				
	8		655.689	Х	1FFFFFFF	8	00 01 02 03 04 05 06 07				
	9	Т	0.000	Х	1FFFFFFF	8	00 01 02 03 04 05 06 07				
	10		656.001		1FFFFFFF	8	00 01 02 03 04 05 06 07	RX frames:		TX frames:	40
								RX bytes:	40	TX bytes:	40
								Bus overruns:		False	
								Bus OFF's:	0	Ok	
											Class state
											Cledi stats
										Deves DV	
										Pause KA	Clear messages
Korlan	ID CDE7	E976: is c	onnected t	o CAN bus	at bit rate 100	0 kbit/s					RX err: 0 TX err: 0

In OBD2 tab you can select up to 6 parameters and press Show data button to get human-readable data about your vehicle. You will have to connect Korlan to your vehicle's OBD2 connector which is near the steering wheel. Note that some of the suggested parameters won't be available on your vehicle, because parameters ids depend on the car brand.

🕝 Korlan - USB to CAN adapter test				×
Korlan TX/RX OBD2 OBD2 diagrams				
	Temperature (°C)	Engine speed (rpm)	Vehicle speed (km/h)	
Select parameters to display (max 6):				
<ul> <li>Engine Coolant temperature</li> <li>Engine speed</li> <li>Vehicle speed</li> <li>Mass air flow rate</li> <li>O2 voltage</li> <li>Throttle position</li> </ul>	67	6912	1	
Evap. system vapor pressure     Engine oil temperature     Accelerator pedal position	Mass air flow rate (g/s)	O2 voltage	Throttle position (%)	
Show data	284	0.215	1	
WARNING: Available parameters depend on the car brand.				
Korlan ID D3365AFB: is connected to CAN bus a	t bit rate 1000 kbit/s		RX err: 0 TX	err: 0

In OBD2 diagrams tab you can see OBD2 data displayed in the real time diagrams. You can choose up to 4 parameters to be displayed.

