

USBCAN-modul 16

Industrial USB to CAN converter

User Manual



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Contents

1. Introduction.....	4
1.1 Overview.....	4
1.2 Properties at a glance.....	4
1.3 Typical application.....	4
2. Installation.....	6
2.1 Driver and software installation.....	6
2.2 Connect to PC.....	6
2.3 Connect to CAN-Bus.....	6
3. Connection and use.....	8
3.1 Connect to USB.....	8
3.2 Connect to CAN.....	8
3.3 CAN-Bus terminal resistance.....	9
3.4 System LED.....	9
4. ECAN Tools introduction.....	11
4.1 Start.....	11
4.2 Transmit/Receive data.....	11
4.3 CAN-Bus diagnosis function.....	12
4.4 Relay & Offline.....	13
4.5 Other functions.....	14
5. Secondary development.....	15
6. Technical Specifications.....	13
Appendix: CAN2.0B frame format.....	14
Sales and service.....	16

1 Introduction

1.1 Overview

USBCAN-model 16 adapter is a debug or analysis tool with 16 CAN-Bus channels. Using this adapter, PC can quickly connect to CAN-Bus network through USB interface, and become a intelligent node of CAN-Bus to transmit/receive CAN-Bus data. Adapter comes with isolation. Device driver, software and programming interfaces (VC, VB, Net, Delphi, Labview, C++Builder) exist for different Windows systems.

1.2 Properties at a glance

- Adapter for USB connection (USB 2.0, compatible with USB 1.1 and USB 3.0);
- Integrated 16-way CAN-Bus interface, the use of DB9 wiring;
- Support CAN2.0A and CAN2.0B frame format, accord ISO/DIS 11898 specification;
- CAN-Bus communication baud rate between 5Kbps~1Mbps arbitrary programmable;
- Use DC + 24V power supply;
- Galvanic isolation on the CAN connection up to 1500 V;
- Bit rates up to 1 Mbit/s Time stamp resolution 1 μ s;
- Max received data traffic: 14000 fps;
- Device driver and software support Windows XP/7/8/10;
- Support ECAN Tools software;
- Extended operating temperature range from -40 to 85 ° C;
- Dimensions: (L)482mm * (W)119mm * (H)44mm.

1.3 Typical application

- Test CAN-Bus network or device;
- Automotive electronics development;

- Electrical system communication test.
- Industrial control network.
- Listen all CAN-Bus communication.

2 Installation

This chapter describes how to connect the USB-CAN adapter with a computer and the precautions when connecting the USB-CAN adapter with a computer for the first time.

2.1 Driver and software installation

Note: Before install the driver or software, please ensure that the user login an administrator account of Windows, or the user account has permissions to install the driver and software, otherwise it may lead to the installation failed.

2.1.1 Install driver and software

ECAN Tools has been integrated with hardware driver installation program, users can directly install ECAN Tools.

If you only need to install the driver, please enter the “driver” folder, select the installation file that corresponds to the system type. (“DriverSetup.exe” for 32-bit. “DriverSetup64.exe” for 64-bit)

2.1.2 Uninstall driver and software

Users can run the DriverSetup.exe/ DriverSetup64.exe and click "Uninstall" button to uninstall the installed device driver.

2.2 Connect to PC

USBCAN-modul 16 using DC +24V DC power supply, DC +24V and with USB access.

2.3 Connect to CAN-Bus

USBCAN-modul 16 interface card integrated 16-channel CAN channels, 16 DB9 (CiA) interfaces, the terminal pin is defined as shown in Table 2.1.

Pin	Port	Name	Function
1	CAN/DB9	NC/+5V	+5V
2		CAN_L	CAN_L Signal line

3		GND	CAN_GND
4		NC	No definition
5		NC	No definition
6		GND	CAN_GND
7		CAN_H	CAN_H Signal line
8		NC	No definition
9		SHIELD	Shielded wire (FG)

Table2.1 USBCAN-modul 16 CAN-Bus signal distribution

Normally communication requires CAN_H with bus CAN_H, CAN_L with bus CAN_L.

3 Connection and use

3.1 Connect to USB

USBCAN-modul 16 interface card's USB interface conforms to the USB2.0 full speed protocol specification. It can be connected with PC machine interface with USB1.1 standard, USB2.0 standard, USB3.0 standard PC connection communication.

When driver and software have been installed, connect the adapter to the USB interface, a new USBCAN device named "GC - Tech USBCAN Device" can be found in the PC Device manager. If there is no “!” or “?” mark that the device run fine.

3.2 Connect to CAN

USBCAN-modul 16 adapter connect to CAN-Bus as chapter 2.3, CAN_H to CAN_H, CAN_L to CAN_L.

The CAN bus network adopts topological structure, only the two furthest terminal need to connect $120\ \Omega$ terminal resistance between CAN_H and CAN_L. For branch connection, its length should not be more than 3m. CAN-bus nodes connection as shown in figure 3.1.

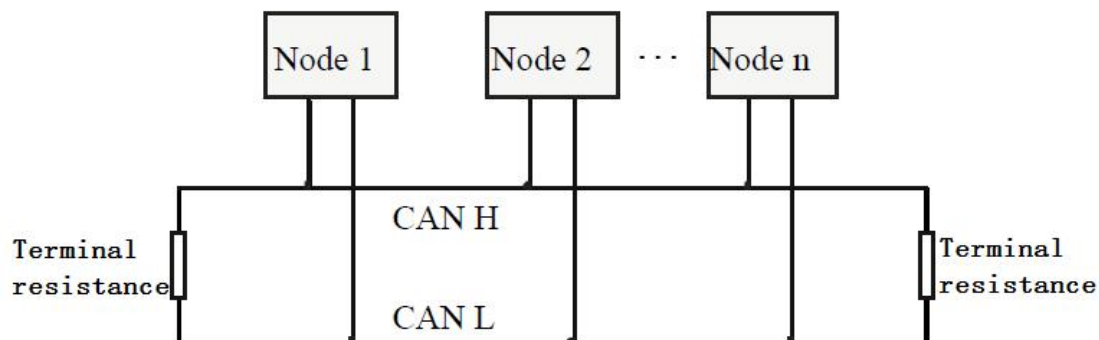


Figure 3.1 CAN-bus network

Note: the CAN-bus cable can use ordinary twisted-pair cable, shielded twisted-pair cable. Theory of the maximum communication distance depends on the bus baud rate, Their relationship are shown in the Table 3.1.

Baud rate	Distance
1 Mbit/s	40m

500 kbit/s	110m
250 kbit/s	240m
125 kbit/s	500m
50 kbit/s	1.3km
20 kbit/s	3.3km
10 kbit/s	6.6km
5 kbit/s	13km

Table 3.1 Relationship of baud rate and distance

3.3 CAN-Bus terminal resistance

In order to improving the communication reliability and eliminating CAN-bus terminal reflection, the two furthest terminal need to connect terminal resistance between CAN_H and CAN_L as shown in figure 3.2. Terminal resistance values determined by the characteristic impedance of the cables. Such as, the characteristic impedance is $120\ \Omega$.

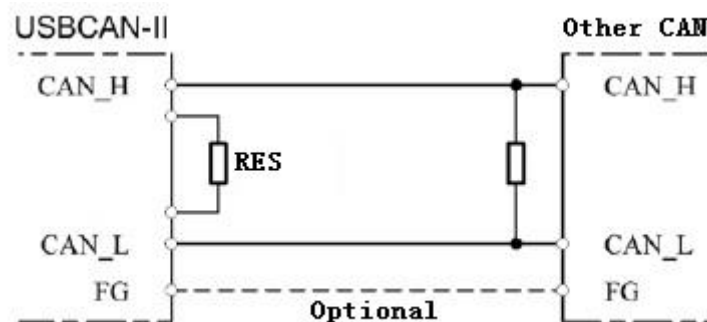


Figure 3.2 USBCAN-modul 16 connect to other CAN devices

Note: USBCAN-modul 16 adapter has integrated $120\ \Omega$ terminal resistance. Users can choose whether enable. R1 for CAN1 and R2 for CAN2, press it to ON to enabled.

3.4 System LED

USBCAN-modul 16 adapter with 4 PWR indicators, 16 ERR indicators, 16 RUN indicators to indicate the adapter status. More functions are shown in table 3.2 and 3.3.

Indicator	Colour	State
PWR	Red+Green	Power indicator
RUN	Green	System indicator
ERROR	Red	Error light

Table 3.2 USBCAN-modul 16 adapter indicator LED

USB interface connection is normal, PWR indicator will be light; when the CAN side of the data transmission when the corresponding channel RUN will be light; when there is a data error ERROR will be light.

Indicator	State	Meaning
PWR	Red ON	USB Power supply normal
	Green ON	System Power supply normal
	OFF	System Power supply error
RUN	Blinking	CAN-Bus data transmission
	OFF	No data
ERROR	ON	Error
	OFF	Normal

Table 3.3

4 ECAN Tools introduction

Users can use ECAN Tools software to receive and transmit CAN data. Flexible use of functions can help to more with less.

4.1 Start

1.If ECAN Tools has been installed, users can directly run it on the desktop.



2.Choose the device type and click "open device", one adapter will shown in the below.

3.Choose work mode. Software provides three kinds of work mode: normal, listen, loopback.

Normal: use this mode to transmit or receive data.

Listen: use this mode to receive data only, and don't send response or clock.

loopback: use this mode to test if the adapter is working well.

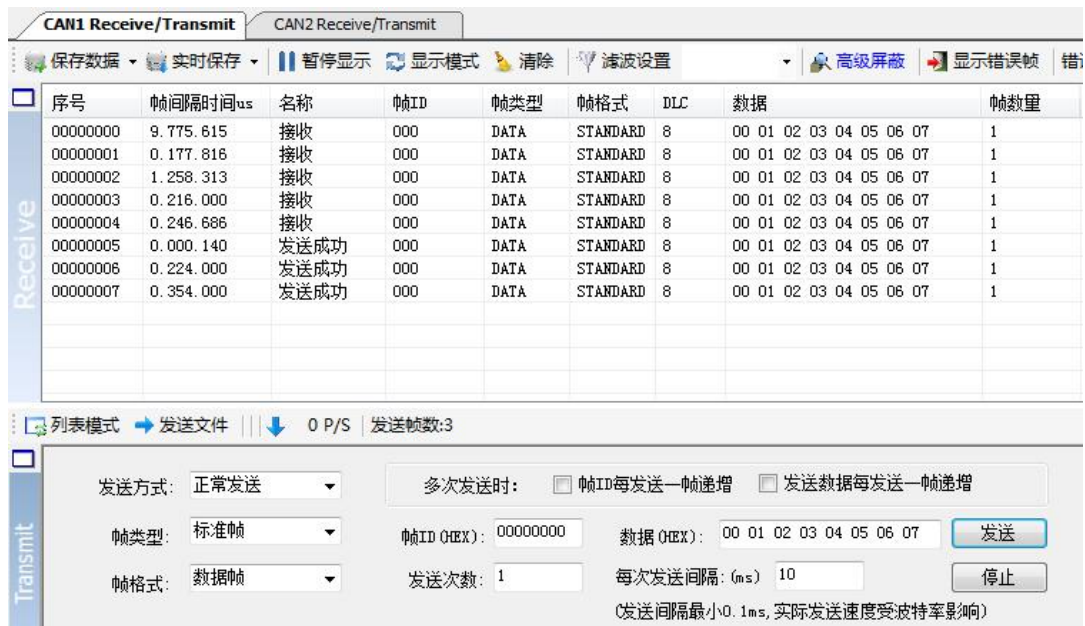
4.Choose baud rate according to the CAN-bus, don't match will lead to communication failed.

If you don't know the baud rate, you can use "automatic identification of baud rate" function to adapt.

4.2 Transmit/Receive data

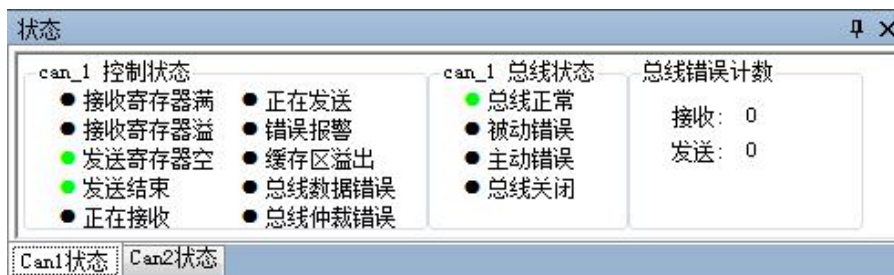
Transmitting and receiving is the basic function of ECAN Tools, in this interface, users can directly see the received CAN data, and send the data to CAN-bus.

[Product data sheet](#)



4.3 CAN-Bus diagnosis function

CAN-Bus diagnosis function can detect the bus error frames and bus arbitration lost.



CAN bus status display: indicate the CAN bus status include: bus normal, passive error, active error、bus off.

The CAN controller FIFO overflow: message within a certain period of time is too dense, lead to data loss.

The CAN controller error alarm: when many of errors on the bus, error counter exceeds the alarm threshold, and display the error count.

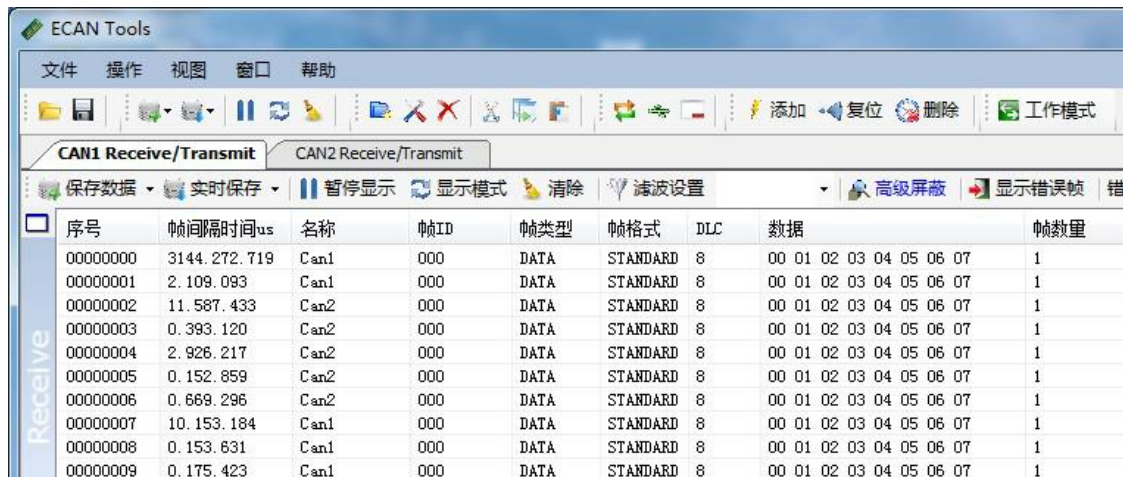
The CAN controller negative error: when many of send or receive errors, lead to the CAN controller into the negative state, and display the error count.

CAN bus controller error: when nodes send or receive errors, error counter value will be accumulate, and can catch the wrong information, such as ACK, CRC error and so on.

4.4 Relay & Offline

4.4.1 Relay mode

CAN relay function can connect two CAN-Bus together whether they have the same baud rate, the data flow can be seen in computer. This function can be used to see the two nodes of data flow, which data is from which node, it can be used to crack communication protocol between two nodes.



The screenshot shows the ECAN Tools software interface. The main window displays two tabs: 'CAN1 Receive/Transmit' and 'CAN2 Receive/Transmit'. The 'CAN1 Receive/Transmit' tab is active, showing a table of received data. The table has columns for '序号' (Serial Number), '帧间隔时间us' (Frame Interval Time in us), '名称' (Name), '帧ID' (Frame ID), '帧类型' (Frame Type), '帧格式' (Frame Format), 'DLC' (Data Length Code), '数据' (Data), and '帧数里' (Frame Count). The data shows a sequence of 9 frames received on the Can1 channel, all with ID 000 and data 00 01 02 03 04 05 06 07.

序号	帧间隔时间us	名称	帧ID	帧类型	帧格式	DLC	数据	帧数里
00000000	3144.272.719	Can1	000	DATA	STANDARD	8	00 01 02 03 04 05 06 07	1
00000001	2.109.093	Can1	000	DATA	STANDARD	8	00 01 02 03 04 05 06 07	1
00000002	11.587.433	Can2	000	DATA	STANDARD	8	00 01 02 03 04 05 06 07	1
00000003	0.393.120	Can2	000	DATA	STANDARD	8	00 01 02 03 04 05 06 07	1
00000004	2.926.217	Can2	000	DATA	STANDARD	8	00 01 02 03 04 05 06 07	1
00000005	0.152.859	Can2	000	DATA	STANDARD	8	00 01 02 03 04 05 06 07	1
00000006	0.669.296	Can2	000	DATA	STANDARD	8	00 01 02 03 04 05 06 07	1
00000007	10.153.184	Can1	000	DATA	STANDARD	8	00 01 02 03 04 05 06 07	1
00000008	0.153.631	Can1	000	DATA	STANDARD	8	00 01 02 03 04 05 06 07	1
00000009	0.175.423	Can1	000	DATA	STANDARD	8	00 01 02 03 04 05 06 07	1

4.4.2 Offline mode

Users can create an instructions in notepad (.txt) and download it to the adapter, after that the adapter can into offline mode and do as the instructions each time the adapter power up. Instructions such as: transmit, delay, triggering, receiving modified send and so on. This function can easily achieve automatic control and can be used in the production line test, crack communication protocol and so on, even though users can not secondary development.

Example:

```
10,1,40000000,0000,144,0,8,01 02 03 04 05 06 07 08,100,500
```

Means:

power up wait 10ms,

initialize the CAN1 channel to transmit and receive data,

don't set the trigger,

don't replace ID and data,

transmit CAN ID 0x144,
standard,
data length eight,
data 01 02 03 04 05 06 07 08,
send times 100 times,
time interval 500ms.

4.5 Other functions



Save data: save the receiving list, save format: txt, can, csv and binary.

Display mode: scroll mode and list mode, list mode can classified data together according to the rules.

Filter settings: users can set multi-stage filtering by editing the filter ID.

Data mask: masked ID is not displayed.

Error frames: error frames on the bus can be displayed / hidden.

If you want to know more about the software specific function and usage, please see the “ECAN Tools software instructions” document.

5 Secondary development

We will provide interface, example and library for secondary development customers. Dll and library named: “ECANVCL.h”, “ECANVCL.lib”, “ECANVCL.dll”. These libraries standards compliant, users can use these in VC, VB and some other programming environment, to use these libraries, please see “ECAN dynamic library manual” and Figure 5.1.

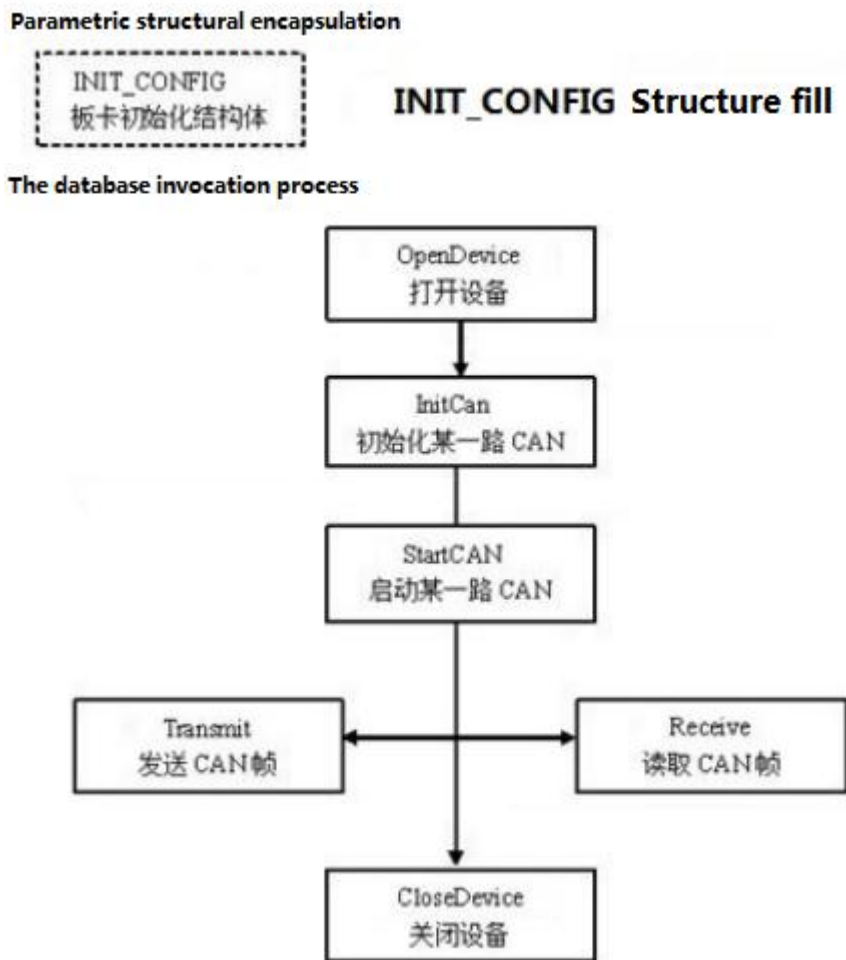


Figure 5.1 Secondary development function call process

6 Technical Specifications

Connection	
PC	USB, type A
CAN	DB9
Interface	
USB	USB2.0 full speed, USB 1.1,USB3.0
CAN	ISO 11898 standard, support CAN2.0A/B
CAN baud rate	5Kbit/s~1Mbit/s
Isolation	1500V, DC-DC
CAN terminal resister	Integrated, code switch to enable
Power	
Voltage	+24V DC
Current	200mA (Max)
Environment	
Temperature	-40℃~+85℃
Humidness	15%~90%RH, without condensation
EMC test	EN 55024:2011-09 EN 55022:2011-12
IP grade	IP 20
Basic	
Dimension	482mm *119mm *44mm
Weight	630g

Appendix: CAN2.0B frame format

CAN2.0B standard frame

CAN standard frame format is 11 bytes, including two parts: information and data. The first 3 bytes for information.

Bit Byte	7	6	5	4	3	2	1	0
1	FF	RTR	×	×	DLC			
2	(Message identifier)				ID.10—ID.3			
3	ID.2—ID.0			×	×	×	×	×
4	data 1							
5	data 2							
6	data 3							
7	data 4							
8	data 5							
9	data 6							
10	data 7							
11	data 8							

Byte 1 for the frame information. Seventh (FF) means the frame format, in the standard frame, FF = 0; Sixth (RTR) means the type of frame, RTR = 0 means for the data frame, RTR = 1 for remote frame; DLC means the length of the data.

Byte 2, 3 for the message identifier.

Bytes 4~11 for the data of the data frame, remote frame is invalid.

CAN2.0B extended frame

CAN extended frame format is 13 bytes, including two parts: information and data. The first 5 bytes for information.

Bit Byte	7	6	5	4	3	2	1	0
1	FF	RTR	×	×	DLC			
2	(Message identifier)				ID.28—ID.21			
3	ID.20—ID.13							
2	ID.12—ID.5							
3	ID.4—ID.0				×	×	×	
4	data 1							
5	data 2							
6	data 3							
7	data 4							
8	data 5							
9	data 6							
10	data 7							
11	data 8							

Byte 1 for the frame information. Seventh (FF) means the frame format, in the standard frame, FF = 0; Sixth (RTR) means the type of frame, RTR = 0 means for the data frame, RTR = 1 for remote frame; DLC means the length of the data.

Byte 2~5 for the message identifier.

Bytes 4~11 for the data of the data frame, remote frame is invalid.

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