USBCAN-II FD

Industrial grade USB-CAN converter

User's manual

Documents version 1.10（2020/04/30）

Catalogue

1.Functional introduction

1.1 Function overview

USBCAN-II FD is a high performance bus communication interface card which integrates two CANFD interfaces. This model of CAN card conforms to the USB2.0 bus high-speed specification, has two independent CAN/CAN FD channels, and the signals are isolated from each other. PC can be quickly connected to CAN (FD)-bus network through USB interface to form CAN (FD)-bus network control nodes for data processing and data acquisition in CAN (FD)-bus network, such as field bus laboratory, industrial control, automotive electronic network and so on.

USBCAN-II FD high-performance CAN interface card is a powerful tool for CAN (FD)-bus product development and CAN (FD)-bus data analysis. At the same time, it has the characteristics of compact size, plug and play and so on. It is also the best choice for portable system users. The USBCAN-II FD interface card has its own USB interface and integrates the CAN interface electrical isolation protection module to avoid damage to the equipment due to instantaneous overcurrent / overvoltage and enhance the reliability of the system in bad environment.

USBCAN-II FD high-performance CAN interface card supports 32-bit / 64-bit Windows operating systems such as Windows XP, 7, 8, 10, etc. Our company provides users with a unified application programming interface and complete application demonstration code, and there is a demonstration of development routines, which is convenient for users to develop application programs.The USBCAN-II FD interface card can use the ECANTools general test software developed by our company, which can perform the functions of sending and receiving and monitoring CAN (FD)-bus messages.

1.2 Performance characteristics

- The PC interface conforms to the USB 2.0 full speed specification and is compatible with USB 1.1 and USB 3.0；
- Integrated 2-way CANFD interface, using plug-and-pull terminal connection ;
- CAN2.0 A/B protocol is supported and conforms to ISO 11898-1 specification；
- Communication baud rate is arbitrarily programmable between 1Mbps~5Mbps；
- Use USB bus power supply, or use external power supply (DC+5V,130mA);
- Bus interface is electrically isolated, the module insulation voltage is DC 2500V
- The maximum received data flow is 14000 fps;
- The accuracy of message timestamp received by the receiver CAN can reach 1us;
- Supported Windows XP, 7, 8, 10 and other Windows operating systems;
- Support ECANTools testing software;Support secondary development;

1.3 Typical application

- Automotive Electronics in CAN (FD)-bus Network diagnosis and testing.
- Electric power communication network.
- Industrial control equipment.
- Communication with high speed and large amount of data

2. Equipment installation

2.1Equipment dimensions

External dimensions: (long, including terminals) 103mm * (wide) 63mm * (high) 24mm, its schematic diagram is shown in figure 2.1.

Figure 2.1

2.2 Interface definition and function

The USBCAN-II FD interface card integrates 1 USB interface, 1 DC9-24V auxiliary power interface and 2 standard CAN (FD)-bus interfaces. The CAN (FD)-bus interface is led by a 6-Pin plug terminal and can be used to connect devices with 2 CAN (FD)-bus networks or CAN (FD)-bus interfaces.

The locations and definitions of USBCAN-II FD interfaces are shown in figures 2.2, 2.3 and tables 2.1 and 2.2.

Figure 2.2 USB and auxiliary power interface location

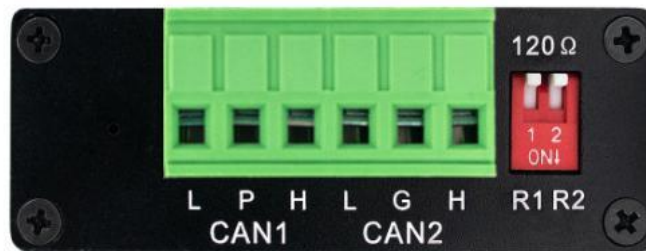| Pin (from left to right)	Port	Function
1	DC9-24V	USBCAN auxiliary power supply, usually don't need to connected
2	USB	USBCAN power supply, connected with computer

Table 2.1 USB and auxiliary power interface

Figure 2.3 CAN(FD)-bus interface position

Pin (from left to right)	Port	Name	Function
1	CAN1	L	CAN1_L Signal line （CAN Low）
2		P	Shielding
3		H	CAN1_H Signal line （CAN High）
4	CAN2	L	CAN1_L Signal line （CAN Low）
5		G	CAN-GND
6		H	CAN1_H Signal line （CAN High）

Table 2.2 USBCAN-II FD interface card's CAN(FD)-bus signal distribution

2.3 Driver and software installation

Before installing the driver and software, please make sure that you are the administrator of the Windows accounts, or if you have the right to install the driver and software, otherwise the installation may fail. The method to confirm the permissions of Windows account: control panel-user account.

2.3.1 Driver and software installation

Users need to install the driver manually, please go to the "3-driver driver" folder in the CD and install it manually.
After the driver and software are installed, plugged the device into the USB interface of PC, and a new USBCAN device can be found in the PC device manager. The driver name is "GC-Tech USBCANFD-I Device". If there is no yellow exclamation mark or question mark it means device driver is normal, and the USBCAN device is connected to the PC.

2.3.2 Driver and software unloading

The user can find the device driver in the device manager of the computer to delete.
Users can find the ECANTools software to uninstall it through the "add / remove programs" in the computer's control panel.

3. Equipment use mode

3.1Connected with PC

The USB interface of the USBCAN-II FD interface card conforms to the USB2.0 full-speed protocol specification and can communicate with PCs with USB1.1 standard, USB2.0 standard and USB3.0 standard.

3.1.1 USB bus power supply mode

The USB bus power mode is suitable for most applications, for example, when the USBCAN-II FD interface card is the only device connected to the USB port.
Make the PC directly connected to the USBCAN-II FD interface card through the USB cable(shipped with the machine), and the USB cable provides + 5V power to the USBCAN-II FD interface card. At this time, the lights PWR and SYS are lit, indicating that the equipment is working normally and is in the state of waiting to be connected.

3.1.2 External power supply mode

The external power supply mode is suitable for situations where the PC machine uses the USB bus hub (HUB), or has connected multiple USB terminal devices, resulting in the USB port can not provide enough current to the USBCAN-II FD interface card. Use an external power supply (DC+5V,200mA) to connect to the DC5V power outlet of the USBCAN-II FD interface card, and the lights PWR and SYS are lit; then connect the PC to the USBCAN-II FD interface card through the USB cable, and the USBCAN-II FD interface card will work properly.

3.2 Connected to CAN (FD)-bus

When USBCAN-II FD is connected to CAN bus, only need to connecting CAN_ H with CAN _ H, connecting CAN _ L with CAN _ L.
The CAN (FD)-bus network adopts a linear topology, and the farthest two terminals from the bus need to install 120 Ω terminal resistors, and if the number of nodes is bigger than 2, the intermediate nodes do not need to install 120 Ω terminal resistors. For branch connections, the length should not exceed 3 meters. The connection of the CAN (FD)-bus bus is shown in figure 3.1.
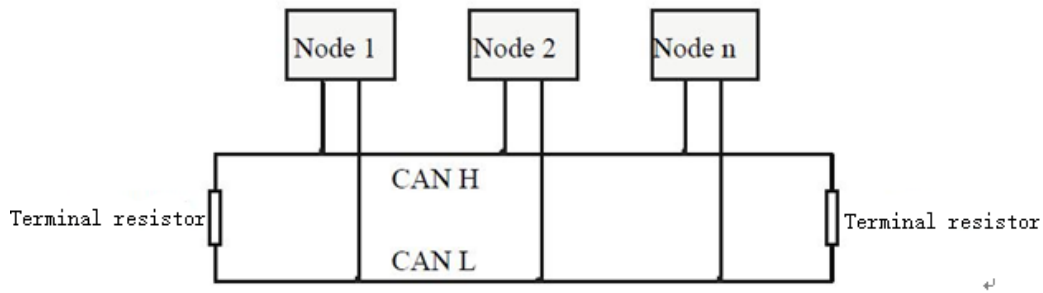
Figure 3.1 CAN(FD)-bus topology of the network.

3.3 CAN bus terminal resister

In order to enhance the reliability of CAN communication and eliminate the signal reflection interference of CAN bus terminals, The two farthest ends of the CAN bus network usually add the terminal resistors, as shown in figure 3.2. The quantity of the terminal matching resistance is determined by the characteristic impedance of the transmission cable. For example, if the characteristic impedance of the twisted pair is 120 Ω, the two ends of the bus should also integrate 120 Ω terminal resistors.
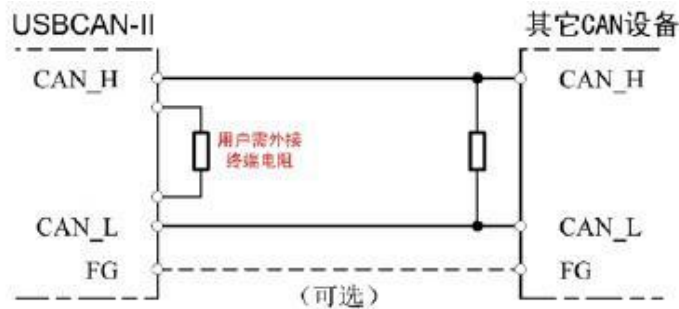

Figure 3.2 USBCAN- II FD connected with other CAN node equipment

Note： The 120 Ω terminal resistor has been integrated inside the USBCAN-II FD. You can choose whether to connect the resistor to the bus through the dialing switch. The dialing switch is next to the 6pin terminal. R1 and R2 correspond to the terminal resistors of CAN1 and CAN2, respectively. The resistors can be enabled by dialing to the position of ON.

3.4 System status indicator

The USBCAN-II FD interface card has 1 PWR indicator, 1 SYS indicator, 1 CAN1 indicator, and 1 CAN2 indicator to indicate the operating status of the device.
The specific indication functions of these four indicators are shown in Table 3.2.
When these four indicators are in various states, the status of the CAN bus is shown in Table 3.3.

Indicator	Color	Status
PWR	Green	Power indication
SYS	Green	System indication
CAN1	Green	CAN1 Signal indication
CAN2	Green	CAN2 Signal indication

Table 3.2 USBCAN-II FD interface card indication led

After the USBCAN-II FD interface card is powered on, the four lights are lit at the same time, and then the PWR is always on, the SYS is flashing slowly, but the CAN1 and CAN2 lights are not on, indicating that the equipment has been powered up and the system is initialized; otherwise, it indicates that there is a system power failure or other failure, you need to contact us.After the USB interface is connected normally, when the host computer software on the PC side invokes the USBCAN device, the USB signal indicator light SYS will flicker. At this time, when CAN1 or CAN2 has data transceiver, the corresponding CAN1 and CAN2 lights will flash. If the SYS flashes but the CAN1 or CAN2 indicator is not lit, it means that the CAN channel has no data, please check whether the wiring, communication baud rate, matching resistance and so on are correct.

Indicator LED	Status	Indicator status
PWR	Bright	The power supply normal.
	Not bright	The power supply abnormal.
SYS	Not bright	Device initialization failed
	Flicker	Device initialization success
CAN1、CAN2	Not bright	No data transmission in CAN channel
	Flicker	There is data transmission in the corresponding CAN channel.

Table 3.3 USBCAN- II FD interface card indication led status

4 Software use

4.1 Software startup

After installing the Windows driver, connect the hardware of the CAN analyzer, and the opening software will have the setting interface shown in the following figure.

1. "Select device type": select the corresponding hardware version, USBCAN-FD.

2. "Open device" button: click this button to access the USBCAN device.

If "USB device Open error!" is displayed. Please check that the device selected in 1 is correct and the driver in device Manager is installed correctly.

3. device display window: this window can display the hardware number and SN number of the device.

4. Channel selection interface: Can switch the setting window of CAN channel here.

5. working mode: you can choose normal mode, listening-only mode and self-receiving mode here. Usually choose the default normal mode.

6. baud rate selection: you can choose the baud rate here.

The baud rate is very important for the communication of the CAN bus, and you need to determine the baud rate of the target device or target bus before communicating.

After selecting the equipment, you can set some specific working modes and baud rate below. If you purchase a dual-channel device, you can set CAN1 and CAN2 separately through the tabs. Setting baud rate is particularly important. Setting baud rate here cannot be entered manually, but needs to be selected through the drop-down menu. Our products support the standard baud rate as shown in the figure:

If you are using a special baud rate, please click the customize button. At this time, you are required to enter a hexadecimal code. Some of the special baud rate values are listed in the table below. If you need other baud rates, please contact us. We will help you calculate the register setting value.

7. OK button: after selecting the baud rate, you can click OK, and then enter the software. At this time, if the hardware starts correctly, the SYS indicator will change from normal light to blinking state (flickering 2 times in a row). After a successful connection, the interface is displayed as follows:

4.2 Data reception related functions

After the device parameters are set, the software will enter the working state. If there is data on the bus, the data will be displayed in the receiving data window.The receive window is shown in the following figure:

The CANFD option in the red box is checked to enable the CANFD, frame type will become FD,. If you uncheck it, you cannot accept CANFD data, you can only accept CAN2.0 data. Bit Rate Switch option, checked to enable variable baud rate.
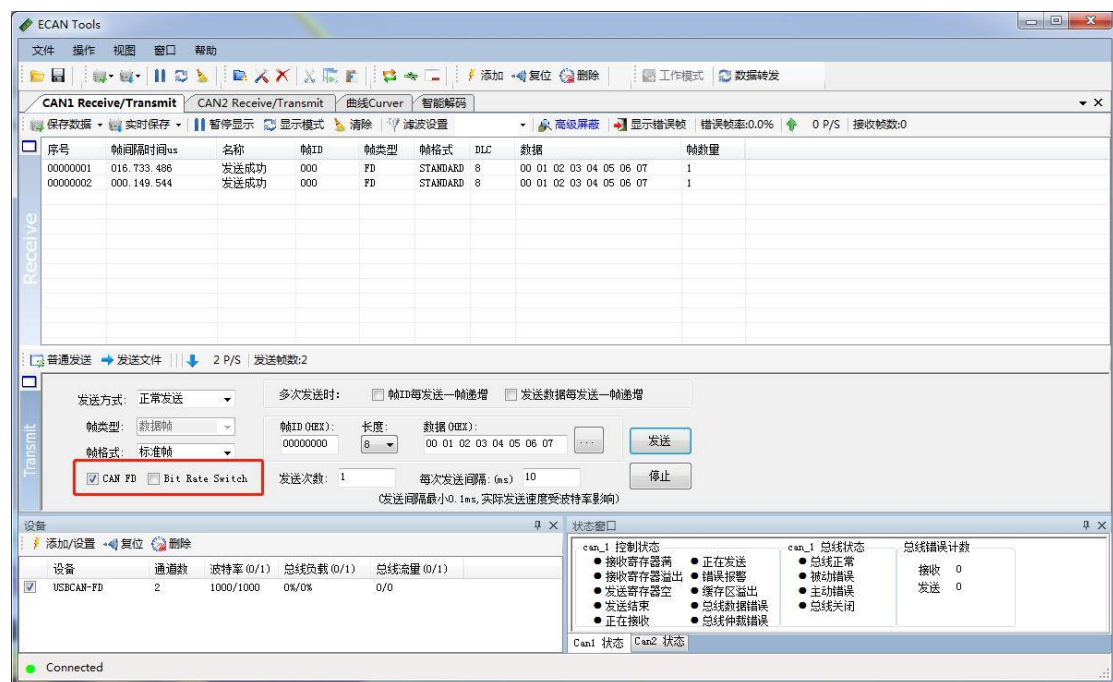
4.2.1 Saving data function and real-time saving function
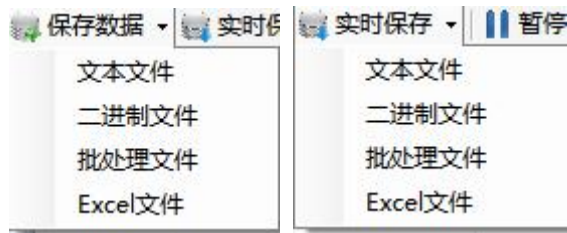
Users can save all the data in the current send / receive list locally, as detailed in the following table:

File Typ	File format	Editor
Text file	.txt	Notepad
Binary file	.dat	Notepad
Batch file	.can	Notepad
Excel file	.csv	WPS Excel

The text file is convenient for data preservation and post-analysis, and the batch file can be modified by notepad software and re-sent back to the bus. For a detailed description of the batch file format, see 3.4.3.

Click "Real-time Save" on the toolbar, set the real-time saved text type and file name, and you can start the real-time data saving function (that is, setting the save node A), to click again (that is, setting the save node B), series to stop saving and writing all the data from the start (A) to the end (B) to the save file.

Note: the system does not write data in real time. That means in the process of real-time saving, there is no data in the saved file.

4.2.2 Pause display function

You can click pause to pause the current scrolling data window. Devices and software can still receive data normally during the pause, but the data window will not be refreshed. Click continue to display to resume scrolling.

4.2.3 Display mode

Display modes include scrolling mode and statistical mode:

Scrolling display means that the received data keeps scrolling down in the receive list, and the current window sees the latest data; the statistical list is classified and displayed according to the set rules. For example, the numbers of the same ID can be displayed together according to the packet display, followed by the number of statistical packets. The statistical mode makes it convenient for engineers to grab the newly generated or changed data on the bus.

序号	帧间隔时间us	名称	帧ID	帧类型	帧格式	DLC	数据	帧数量
00000000	000.010.097	接收	000	FD	STANDARD	8	00 01 02 03 04 05 06 07	3519

4.2.4 Clearing function

Can empty the data in the receive / send window, as well as the data in the cache.

4.2.5 Filter settin

Receive filter settings can be set filter ID or ID segment, if set filter, the software will only display the set filter ID (segment), ID that is not in the filter range will be filtered out. Click "Edit filter", pop-up filter settings window, you can set the filter range:

Click "add filter" to start editing, enter the ID or ID segment you want to filter display,and then click "Save Settings" to add the filter content to the left

Multiple pieces of data can be added to the filter list on the left, and check the corresponding filter band to choose whether or not to enable it. This software can

enable multiple filters at the same time. Please note that you need to check "set enable filter" for the filter to take effect. The filter file can be saved and loaded by "Open filter file".

4.3 Data transmission related functions

4.3.1 normal mode data transmission function

Ordinary mode can be very intuitive to edit the frame data to be sent, and special functions such as cyclic transmission can be set.

Normal mode is relatively simple, editing frame information is very intuitive, please note that when entering data, you need to enter a space between each byte, otherwise "data format error will pop up!"

4.3.2 The function of sending data in list mode

After clicking on the list mode, the original position will be switched to normal mode. Click New frame to edit the data frame you want to send..

In the editing data interface, you can set frame ID, frame type, frame format, frame length and other data; in advanced options, you can set loop transmission mode, cycle transmission interval time, cycle transmission times, ID increment and so on.

发送	序号	名称	帧ID	帧类型	帧格式	DLC	数据	总帧数量	已发送帧数	间隔时间
send	00000000		000	FD	STANDARD	8	01 02 03 04 05 06 07 08	-1	233	10
send	00000001		000	FD	STANDARD	8	01 02 03 04 05 06 07 08	-1	0	10

When set ok, the CAN message can be added to the sending queue: click the box on the left of the send with the mouse to control whether it is sent or stopped; when the transmission is over, the check box automatically replies, and the number of packets sent successfully can be seen in the "frames sent".

5. Secondary development

Our company provides standard interface function libraries for secondary development users, including: ECanFDVci.h, ECANFDVCI.dll. The interface function library is in standard format, and users can declare and call these interface functions in the programming environment of VC, VB, Labview and so on. For more information on how to use them, please see "ECANFDVCI dynamic Library user Manual". Figure 6.1 shows the common structure name and the function library call process.
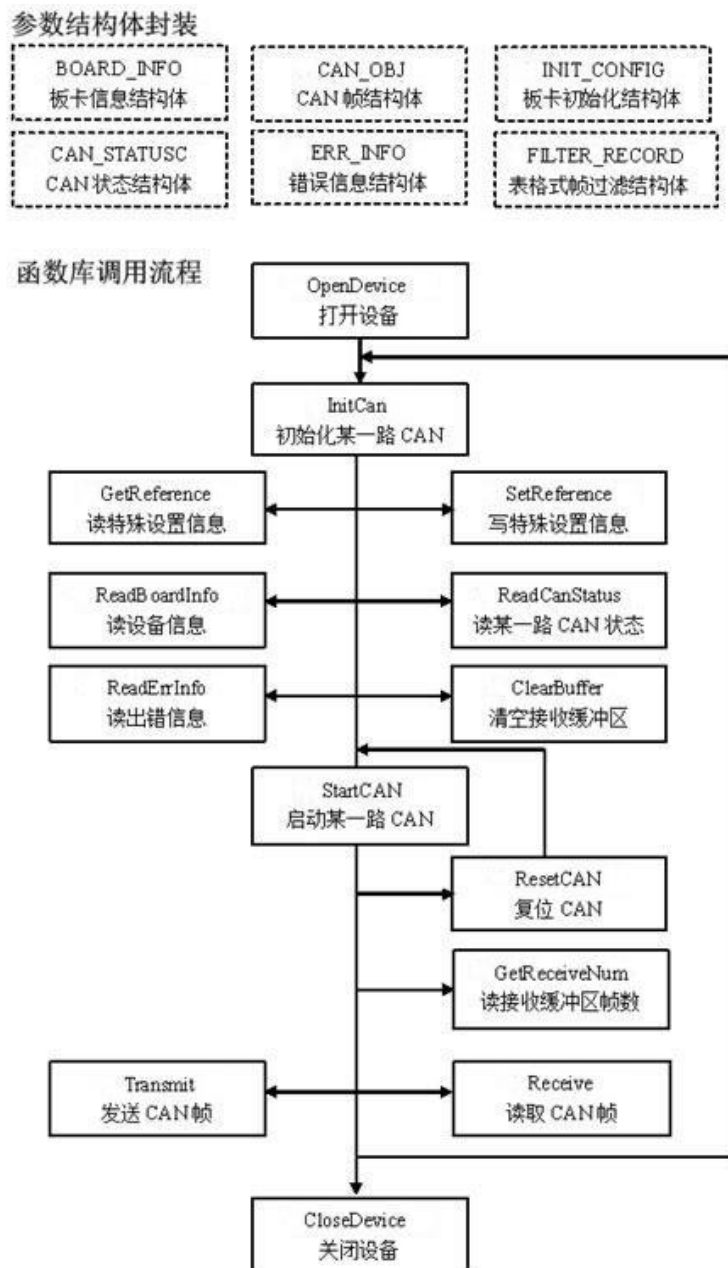

Figure 6.1 Secondary development Function call

6. Technical specification

Connection mode	
PC end	USB interface,A type
CAN end	OPEN6 plug-in type terminal
Interface feature	
USB interface	USB2.0 full-speed interface, compatible with USB1.1,USB3.0
CAN interface	Complies with ISO 11898 standard, supports CAN2.0A/B
CAN baudrate	5Kbit/s~1Mbit/s
Electrical isolation	2500V，DC-DC
CAN terminal resistance	Integrated,through the dial switch select on/off
Power supply	
Power supply voltage	+5V DC 　　（USB interface）
Power supply current	Max 130 mA
Environmental test	
Operating temperature	-40°C~+85°C
Working humidity	15%~90%RH，No condensation
EMC test	EN 55024:2011-09 EN 55022:2011-12
Protection grade	IP 20
Basic information	
Size	103mm *64mm *23mm (including terminals)
Weight	120g

7. Common problem

1. Why does the "open device error" display in the ECANTools test software?
This type of failure may occur because the device type is not selected correctly or the USBCAN device driver is not installed properly. Check the USBCAN device properties in the device manager of PC to see if there is a "!" Or "?" In front of the USBCAN device; if any, check for hardware / software conflicts and reinstall the USBCAN device driver.

2. Is it necessary to use 120 Ω terminal matching resistors?
It is recommended that the 120 Ω terminal matching resistor be used to absorb the end reflection and provide a stable physical link. When carrying out the spontaneous self-receiving test of a single node, the terminal resistance of 120 Ω must be connected to form a loop, otherwise the spontaneous self-receiving test can not be carried out. USBCAN high-performance CAN interface card has been connected with 120 Ω terminal resistance.

3. Can multiple USBCAN interface cards be installed on one computer?
The old version of the interface does not support multi-card operation at the same time, but the current USBCAN interface card supports up to 8 USBCAN interface cards of the same model to operate at the same time.

4. Why is the CAN status indicator not lit?
Because all the operations of the USBCAN interface card are controlled by the PC, the CAN status indicator will be meaningful only after the PC sends a command to start the CAN communication.

5. Why does the system operate illegally when calling interface functions?
First of all, when using the interface function, please read the function description carefully to ensure that the input parameters are legal, pay special attention to the transfer of the pointer (address), or refer to the example program provided. If the problem is still unsolved, please contact our technical support.

6. How to set the communication baud rate of USBCAN interface card?
The equipment provides a set of commonly used baud rate settings. To use other baud rates, please contact Guangcheng Technology customer service for calculation.
It should be noted that the CAN controller of the USBCAN interface card uses the 24MHz clock, which is calculated according to the baud rate customized by the user.

7. Does the standby or sleep state of the system affect reception?
It will make a difference. At this time, all processing will stop, which is most likely to cause the hardware receive buffer overflow error. If a program opens the device, it will try to prevent the system from entering standby or sleep state, so as to ensure that the system works properly. When using the USBCAN interface card, disable the standby and sleep functions of the system.

8. How to deal with errors in the application?

Errors are mainly divided into two types: function call errors and CAN (FD)-bus communication errors. Function call errors are usually caused by parameter errors.

9. What should I pay attention to when turning on or off the device?

The USBCAN-II FD interface card provides two CAN ports, and users can operate different ports in the same program. The USBCAN-II FD interface card does not allow devices to be opened by sharing, and the same device cannot be opened multiple times by different processes by calling the OpenDevice function. The OpenDevice and CloseDevice functions are generally called only once when the application sequence initializes and exits. When shutting down the device, if the current port is no longer in use, the ResetCAN function should be called first to make the current port detach from the CAN bus, and the device driver will automatically call ResetCAN to exit the connection of the CAN bus only when the last setting handle is closed.

10. How to use the interrupt mode to operate the communication card?

The USBCAN interface card does not provide an interface for direct operation of interrupts because interrupts are already handled in the driver. Most of the reasons why the operation needs to be interrupted in the application is that the program does not know when the data will reach the setting and needs to be triggered by a received message to read the data from the buffer. The general hand segment to solve this problem is to use multithreading (or multitasking). That is, start a new thread and loop through the thread to call the Receive function to query the receive buffer. Blocking has been implemented internally in Receive, where the calling thread is suspended when there is no data in the buffer, which does not take up CPU time, and the application can still handle other transactions.

11. How to better use Transmit to send functions?

The driver of the USBCAN interface card provides about 128frame sending buffer FIFO, sends up to 128frames of data per Transmit call. The sending speed of the sending equipment is determined by the software and hardware performance of the current computer. Generally, the continuous sending speed is about 2000 fps (standard data frame 11Bytesless 1Mbps). If the sending speed is too fast, it will make the data of the remote receiving equipment overflow and lose response, so the user can add delay appropriately in the application programming to reduce the sending speed. In the process of sending, there is a timeout limit for each frame, the timeout for a single frame is about 2 seconds, when sending multiple frames at a time, the timeout for the last frame is 2 seconds, and the rest is 1 second. Transmission timeout usually occurs when the CAN bus is busy and when the priority of the previous node is low, and it is not a function call or communication error. Users can program to retransmit (generally, transmission timeout events rarely occur in medium-and low-speed networks). Therefore, care should be taken in system design to ensure that the CAN bus should not take up more than 60-70% of the bus capacity.

8. Contact us