User Manual

USBCAN-E/2E-U

Industrial high performance CAN interface card

Item	Content
Keywords	USBCAN card, high performance CAN interface card
Abstract	USBCAN-E/2E-U product performance description and user guide

Revision History

Version	Rev. Date	Modifications
V1.00	2010/09/02	Created the document.
V1.01	2011/03/26	Modified the document, and the product type of USBCAN-E is changed to USBCAN-E-U.
V1.02	2012/02/24	Modified the document, and added USBCAN-2E-U.
V1.03	2012/07/05	Modified the second point of the frequently asked questions.
V1.04	2014/11/11	Integrated with data sheet and user manual, did not use the data sheet and updated some figures.

Contents

Chapter 1: Introduction

1.1 Overview

USBCAN-E/2E-U high-performance CAN interface card is compatible with the USB2.0 bus full-speed specification and integrated with 1-channel/2-channel CAN interface. With the USBCAN-E/2E-U high-performance CAN interface card, PC can be connected to CAN-bus network through USB bus, which constructs the CAN-bus network control node with data processing and data acquisition in the field bus laboratory, industrial control, high-performance community, automotive electronic network and other CAN-bus network fields.

USBCAN-E/2E-U high performance CAN interface card is a powerful tool for CAN-bus product development and CAN-bus data analysis. Furthermore, due to its small size and plug-and-play, the USBCAN-E/2E-U interface card is the best choice for portable system users.

It is equipped with an electrical isolation module, which prevents damage from ground circulation and improves its usage reliability in severe environments.

USBCAN-E/2E-U high performance CAN interface card supports Win2000/XP, Linux2.6 and other operating systems. The USBCAN-E/2E-U also provides the unified application programming interface and complete application demonstration code (including VC, VB, Delphi, C++Builder and other demonstration code examples) for users to develop their application programs.

USBCAN-E/2E-U interface card also supports the CANTest general testing software, so that the CAN-bus message transmitting, receiving and monitoring can be implemented.

Figure 1-1: Product appearance

1.2 Features

- PC interface is compliance with USB2.0 full speed specification.
- It supports CAN2.0A and CAN2.0B protocols and conforms to ISO/DIS11898 specification.
- It is integrated with 1-channel/2-channel CAN-bus interface.
- Programmable CAN-bus communication Baud rate in the range of 5Kbps～1 Mbps.
- The power supply can be provided via the USB Bus or external power supply (DC+9V~+25V，200mA).
- The CAN-bus interface is provided with electrical isolation; and the isolation voltage is 2500VDC.
- Maximum receiving data frame traffic: 14000 fps (extended frame).
- It supports Win2000, WinXP, Win7, Win8, Linux2.4, Linux 2.6 and other operating systems.
- It supports CANtest test software.
- It is small and supports plug-and-play.
- Size：(Length)115mm * (Width)76mm * (Height)30mm.

1.3 Application

- CAN-bus diagnosis and test.
- Automotive electronic application.
- Electric power communication network.
- Industrial control device.
- High-speed, large amount of data communication.

Chapter 2: Device Installation

2.1 Power Supply Mode

USBCAN-E/2E-U high-performance CAN interface card is featured with small size and plug-and-play. Users can power for the USBCAN-E/2E-U interface card via the PC's USB port or use an external power supply.

2.1.1 External Power Supply Mode

External power supply mode is suitable for PCs using USB bus hubs, or connected to multiple USB terminal devices, resulting in USB ports cannot provide enough current to USBCAN-E/2E-U interface card.
Use an external power supply (DC+9~+25V, 200mA) to connect to the POWER socket of the USBCAN-E/2E-U interface card. At this time, the indicator SYS is red. Then connect the PC to the USBCAN-E/2E-U interface card with the USB cable, the USBCAN-E/2E-U interface card can work normally.

2.1.2 USB Bus Power Supply Mode

The USB bus power supply mode is suitable for most applications, for example, when the USBCAN-E/2E-U interface card is the only device that the USB port is connected.
The USBCAN-E/2E-U interface card is connected to PC directly via the USB cable, and thus provided +5V for the USBCAN-E/2E-U interface card. At this time, the indicator SYS is lit and turns red. It indicates the device is powered up. After that the indicator flashes for several times, and then turns green. It means that the interface card can communicate with PC.

2.2 CAN-bus Connector

The USBCAN-E/2E-U interface card is integrated with 1~2 CAN-bus channels, which connect with the CAN-bus network or CAN-bus interface. A 10-pin AWG 14-22 plug-and-play wiring terminal is the output of the CAN-bus channel. The pin definition of the wiring terminal is shown in Table 2-1.

Table 2-1: CAN-bus signal assignment of USBCAN-E-U interface card

Pin	CAN port	Name	Function
1	CAN0	CAN_L	CAN_L signal line
2		R-	Terminal resistance (connected to CAN_L internally)
3		SHIELD	Shielded line (FG)
4		R+	Terminal resistance (connected to CAN_H internally)
5		CAN_H	CAN_H signal line
6	NC	NC	-
7		NC	-
8		NC	-
9		NC	-
10		NC	-

Table 2-2: CAN-bus signal assignment of USBCAN-2E-U interface card

Pin	CAN port	Name	Function
1	CAN0	CAN_L	CAN_L signal line
2		R-	Terminal resistance (connected to CAN_L internally)
3		SHIELD	Shielded line (FG)
4		R+	Terminal resistance (connected to CAN_H internally)
5		CAN_H	CAN_H signal line
6	CAN1	CAN_L	CAN_L signal line
7		R-	Terminal resistance (connected to CAN_L internally)
8		SHIELD	Shielded line (FG)
9		R+	Terminal resistance (connected to CAN_H internally)
10		CAN_H	CAN_H signal line

2.3 Signal Indicator

2.3.1 USBCAN-E-U Signal Indicator

The USBCAN-E-U interface card contains one dual-color SYS indicator, one green RUN indicator, and one red ERR indicator to indicate the operating status of device. Table 2-3 shows the specific functions of these three indictors. The CAN bus status of these three indicators are described in Table 2-4.

Table 2-3: Indicator status on the USBCAN-E-U interface card

Indicators	Status	Indicator status
SYS	Red	Indicates the device initialization status
	Green	Indicates USB interface signal.
RUN	Green	CAN interface operating normally
ERR	Red	CAN interface has errors

- When the USBCAN-E-U interface card is powered on, the system initialization status indicator SYS is red to indicate that the device is powered on and the system is being initialized. Otherwise, it indicates that there is system power supply fault or serious system error.
- After the USB interface is connected properly, the USB signal indicator SYS (green) lights, and the system initialization status indicator SYS (red) extinguishes. When the USB interface has data transmission, the USB signal indicator SYS (green) flashes.
- When the RUN indicator lights, it indicates the CAN controller has finished initialization and enters into normal operating status.
- When the CAN controller has transmission errors, the ERR indicator lights; When the CAN controller has no error, the ERR indicator extinguishes.

Table 2-4: Indicator status on the USBCAN-E-U interface card

CAN Indicator status	CAN bus status
RUN and ERR extinguish	CAN controller and bus are disconnected
RUN flashes, ERR flashes	CAN controller has not started, which prompts users to start CAN controller
RUN lights	CAN bus operating normally
RUN lights, ERR flashes	CAN-bus has errors or data overflow, and it may lose frames

2.3.2 USBCAN-2E-U Signal Indicator

The USBCAN-2E-U interface card contains one dual-color SYS indicator, one dual-color CAN0 indicator, one dual-color CAN1 indicator to indicate the operating status of device. Table 2-5 shows the specific functions of these three indictors. The CAN bus status of these three indicators are described in Table 2-6.

Table 2-5: Indicator status on the USBCAN-2E-U interface card

Indicators	Status	Indicator status
SYS	Red	Indicates the device initialization status
	Green	Indicates USB interface signal.
CAN0	Green	CAN interface operating normally
	Red	CAN interface has errors
CAN1	Green	CAN interface operating normally
	Red	CAN interface has errors

- When the USBCAN-2E-U interface card is powered on, the system initialization status indicator SYS is red to indicate that the device is powered on and the system is being initialized. Otherwise, it indicates that there is system power supply fault or serious system error.
- After the USB interface is connected properly, the USB signal indicator SYS (green) lights, and the system initialization status indicator SYS (red) extinguishes. When the USB interface has data transmission, the USB signal indicator SYS (green) flashes.
- CAN0 and CAN1 indicator are lit to indicate the CAN controller has finished initialization and enter into normal operating status.
- When the CAN controller has transmission errors, the red indicators of CAN0 and CAN1 are lit; When the CAN controller has no error, the red indicators extinguish.

Table 2- 6: Indicator status on the USBCAN-2E-U interface card

CAN Indicator status	CAN bus status
CAN0 and CAN1 extinguish	CAN controller and bus are disconnected
CAN0 and CAN1 flash with red and green	CAN controller has not started, which prompts users to start CAN controller
Green indicators of CAN0 and CAN1 are lighting	CAN bus operating normally
CAN0, CAN1 Green indicator is lighting Red indicator is flashing	CAN-bus has errors or data overflow, and it may lose frames

2.4 System Connection

2.4.1 CAN-bus Connection

When the USBCAN-E/2E-U interface card is connected to CAN-bus Bus, users only need to connect CAN_L with CAN_L signal, CAN_H with CAN_H signal.

The CAN-bus network uses linear topology, and the two terminals of bus should be connected with a 120Ω terminal resistance; if the number of nodes is greater than 2, the intermediate node does not need to connect with a 120Ω terminal resistance. For branch connections, the connection distance should not exceed 3m. The CAN-bus connection is shown in Figure 2- 1.

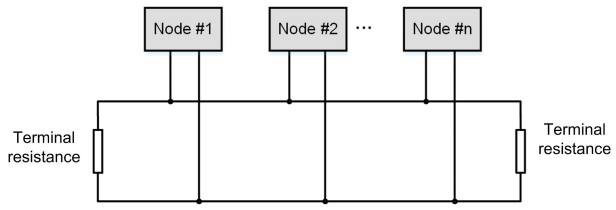

Figure 2- 1: CAN-bus network topology

Notes: *The CAN-bus can use common twisted pair or shielded twisted pair. If the communication distance exceeds 1Km, the section area of cable should be greater than Φ1.0mm², which depends on the specific distance. Generally, the longer the communication distance is, the greater the section area of cable is.*

2.4.2 Bus Terminal Resistance

In general, the two terminals of CAN-bus network should be added a terminal matching resistance to improve communication reliability. The value of terminal matching resistance is determined by the characteristic impedance of transmission cable. For example, if the characteristic impedance of twisted pair is 120Ω, two terminals of CAN-bus should be connected with a 120Ω terminal resistance. In addition, the USBCAN-E/2E-U interface card uses CTM8251KT transceiver; therefore, if the other nodes on the network use different transceivers, the terminal resistance must be calculated separately.

The terminal resistance (120Ω) is not connected between the internal CANH and CANL. If the user needs to connect the terminal resistance at the node of the interface card, it is necessary to connect the 120Ω terminal resistance to the terminal R+ and R-, as shown in Figure 2- 2.

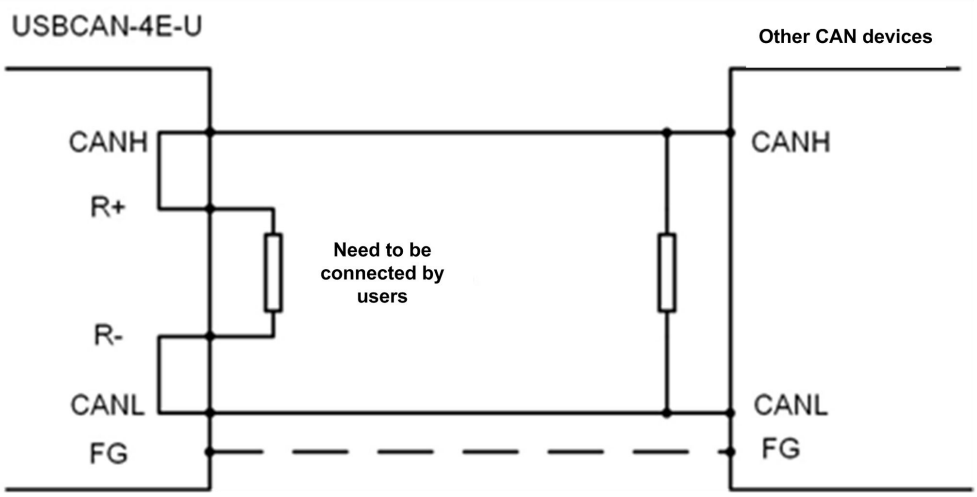

Figure 2- 2: Connection between USBCAN-E/2E-U and other CAN devices

As shown in the figure, the CAN_H and R+ as well as the CAN_L and R- are connected directly in the device.

2.4.3 USB Bus Connection

The USB port on the USBCAN-E/2E-U interface card is compliance with USB2.0 full speed protocol specification, and can be connected to a PC with USB1.1 or USB2.0 standard.

There are two ways for connecting the USBCAN-E/2E-U interface card to the PC:

- The attached USB cable is connected to the PC's USB port directly; at this time, it uses bus power supply mode to provide +5V voltage for the USBCAN-E/2E-U

interface card via the USB port.

- The USBCAN-E/2E-U interface card is connected to the PC via an external USB bus hub. If a USB hub powered by the bus is used, the USBCAN-E/2E-U interface card must use an external power supply (DC +9 ~ +25V, 200mA) and use the external power supply mode.

Chapter 3: Driver Installation

The following takes a PC with WinXP operating system for an example, introduces how to correctly install the USBCAN-E/2E-U industrial high-performance CAN interface card device.

3.1 Driver Installation

Windows XP can automatically detect a new device (as shown in Figure 3-1) and activate the “Find new hardware” wizard to install the plug-and-play device driver (as shown in Figure 3-2). If the system does not prompt to find a new device at this time, please check whether the hardware is installed correctly or not.

Figure 3-1: Windows XP find a new device

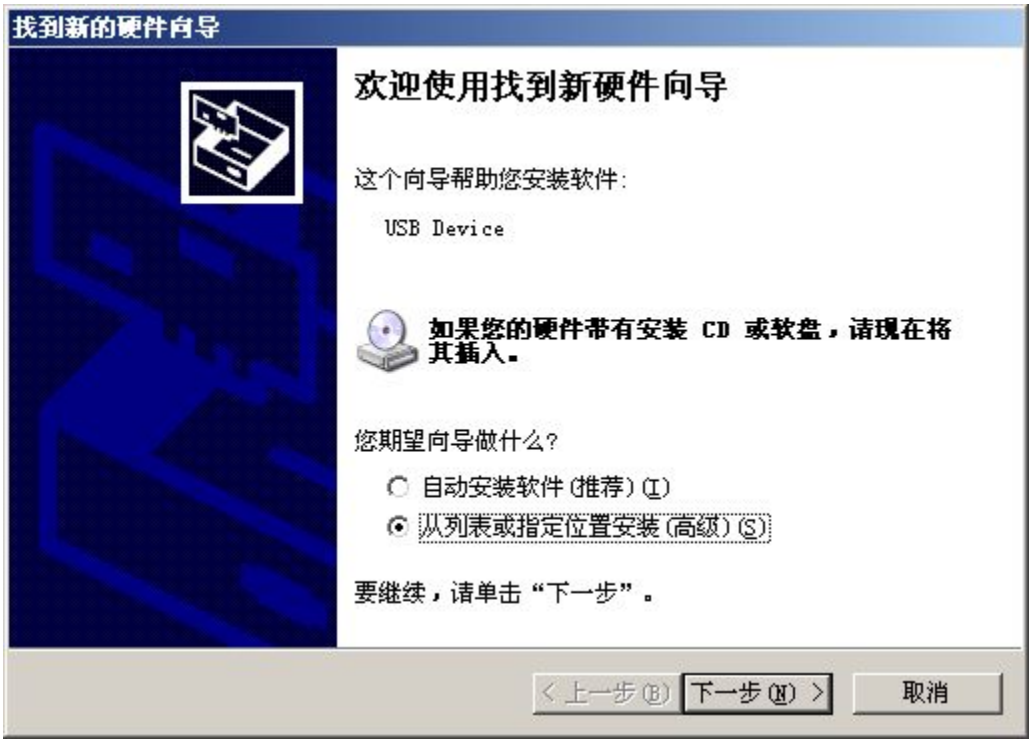

Figure 3-2: New hardware driver installation

Select “Install from the list or specific location” and click “Next” to continue.

Figure 3-3: Obtain driver installation file content

Mark “Include this location in search” and click the "Browse" button. In the pop-up folder browsing dialog box, specify the location of the driver installation file (The location of the driver in the disk is USBCAN-E/2E-U V1.0\drivers\XP driver). Click “Next” to continue.

Figure 3-4: Driver installation

Wait for the installation wizard to install the driver. The next window shows the installed device, prompts “Find new hardware wizard” and has completed the

installation of the driver. Click “Finish” button to complete the installation.

Figure 3-5: Complete driver installation

Check the installation of the device via “Start → Control Panel → System”. Select the tab of “Hardware”, and then click the “Device Manager” button.

Figure 3-6: Hardware wizard

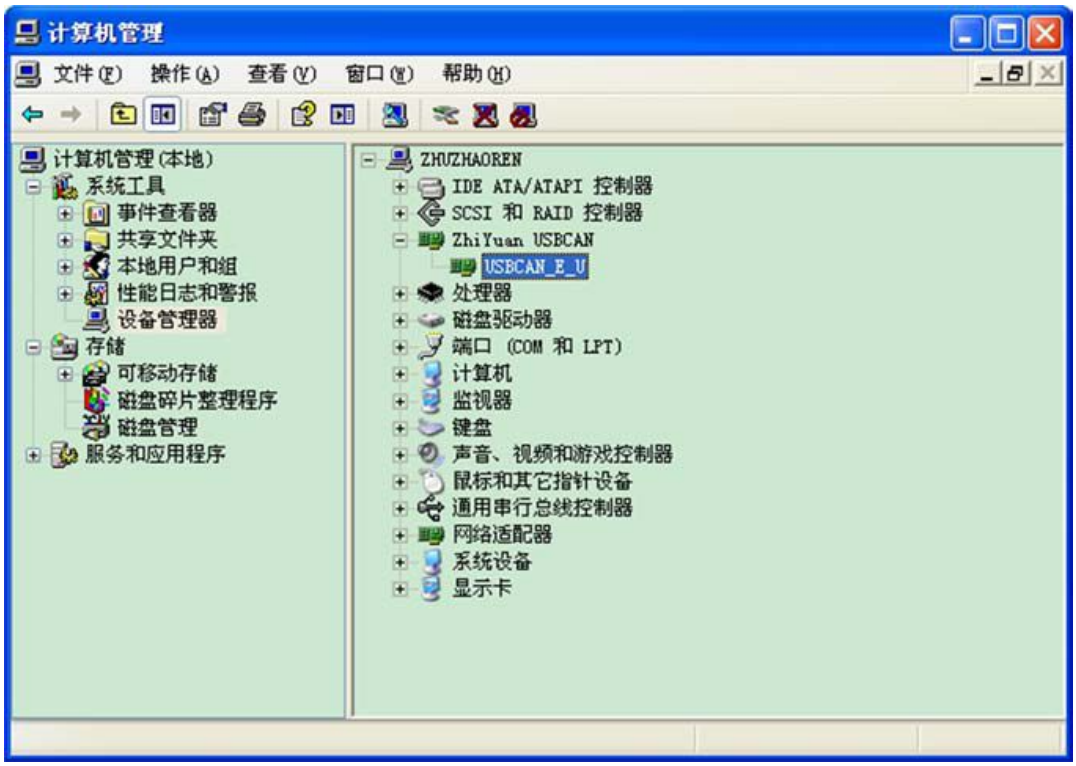

Figure 3-7: Check the status of driver installation

3.2 Unload the Driver

You can unload the device driver via “Start → Control Panel → System”. Select the tab of “Hardware”, and then click the “Device Manager” button.

Figure 3-8: Hardware wizard

Move the mouse onto the USBCAN-E/2E-U, single-click the right key of the mouse, and select the “Delete” button on the pop-up menu.

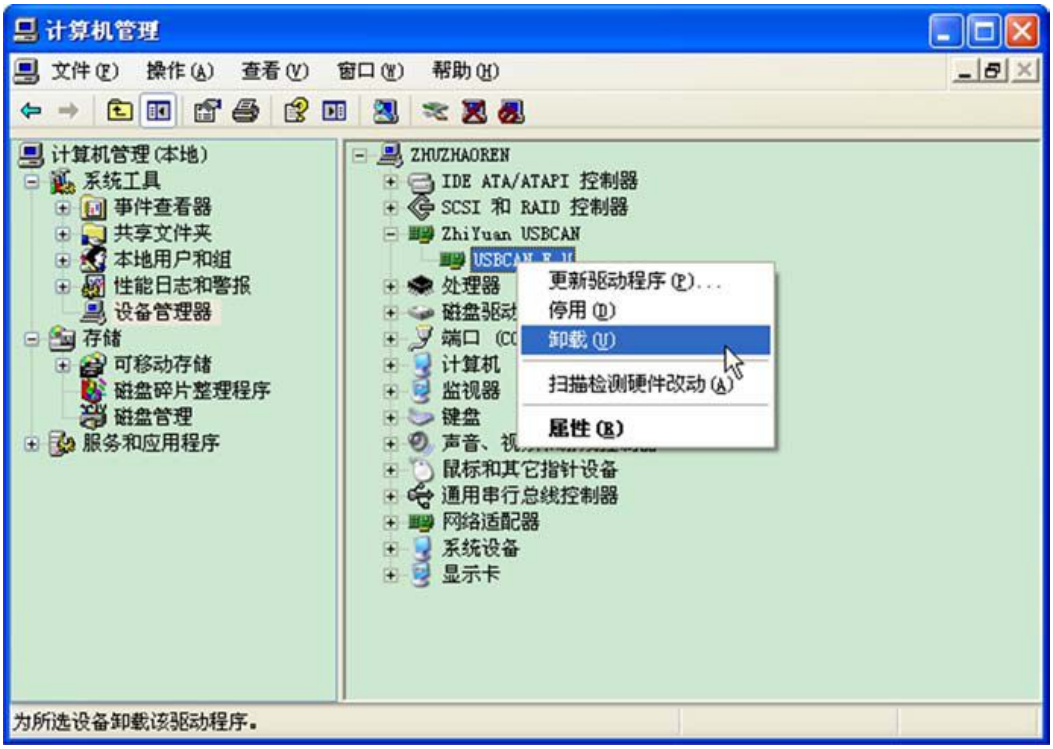

Figure 3-9: Device driver deleted

Click the “OK” button in the “Device Unload Confirmation” dialog box. The driver of USBCAN-E/2E-U will be deleted. The “Device Manager” will automatically refresh and show that the device has been removed.

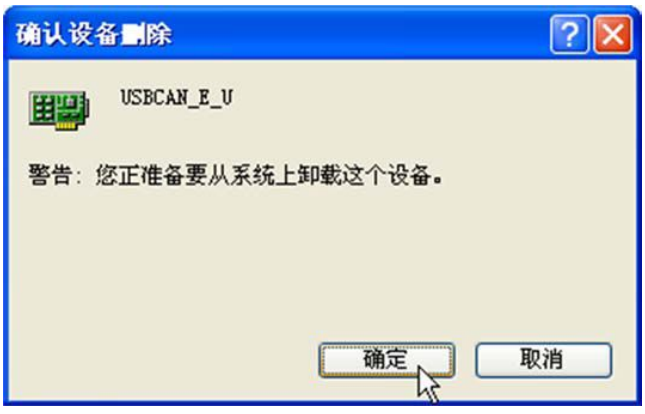

Figure 3-10: Driver unload confirmation

Chapter 4: Frequently Asked Questions

1. In the ZLGCANTEST test software, why show “Fail to start the device”?
The reason for this type of failure is that the USBCAN-E/2E-U device driver is not installed properly. Check the USBCAN-E/2E-U device properties in the “System” of the PC control panel to see if there is a “!” Or “?” in front of the USBCAN-E/2E-U device; if so, check the hardware/software confliction, and reinstall the USBCAN device driver.

2. Do you need to use a 120Ω terminal resistance?
It is recommended that the 120Ω terminal resistance is used to absorb endpoint reflections and provide a stable physical link. When the self-transmittng and self-receiving of a single node is implemented, the 120Ω terminal resistance must be connected to constitute a loop, otherwise the self-transmitting and self- receiving test can not be implemented. The USBCAN-E/2E-U high-performance CAN interface card does not have a built-in 120Ω terminal resistance.

3. Can multiple USBCAN-E/2E-U interface cards be installed in a computer?
The interface with old version does not support multi-card operation at the same time, but the current USBCAN-E/2E-U interface card supports the simultaneous operation with up to eight PC-CAN interface cards of the same model.

4. What is the maximum data conversion rate for the USBCAN-E/2E-U interface card?
The single CAN channel of the USBCAN-E/2E-U interface card supports the CAN bus data conversion rate of up to 7000 fps. The frame here refers to the data frame of the extended frame, which may be faster if it is a standard frame or a remote frame. In addition, the maximum data traffic will be limited by PC performance.

5. Why does the CAN state indicator turn off?
Because all operations of the USBCAN-E/2E-U interface card are controlled by the PC, the CAN state indicator will be meaningful only if the PC has sent a command to start CAN communication.

6. Why system operation is illegal when calling interface functions?
First of all, read the function description carefully when using interface functions, ensure that the input parameters are proper, pay special attention to the pointer (address) delivery, or refer to the provided examples. If the problem is still unable to solve, you can contact our technical support.

7. How to set the communication baud rate of the PC-CAN interface card?

Provide a set of commonly used baud rate settings. If users want to use other baud rates, please refer to “CAN-bus Universal Test Software and Interface Library User Manual” to calculate. Note that the CAN controller of the USBCAN-E/2E-U interface card uses a 36MHz clock. When users define the Baud rate, they should calculate according to this clock frequency.

8. Whether the system entering into standby or sleep mode affects reception?

It will affect reception. All processing will be stopped at this time, and it probably lead to hardware receiving buffer overflow error. If a program is started, the device will try to prevent the system entering into the standby or sleep mode, thus ensuring the system to work properly. When using the USBCAN-E/2E-U interface card, please disable the standby and sleep function of the system.

9. How to deal with errors in the application?

Errors are mainly divided into function call error and CAN-bus communication error.

Function call error is generally caused by parameter errors. For example, the device number is out of range or type number has error. The error number returned by Win32 function GetLastError is 87. And operating for the disable device is actually an illegal handle operation. Since the call of specific function has provided a corresponding Win32 standard error code, users can use GetLastError for error analysis. This part of debugging work should be completed in design generally.

CAN-bus communication error is generally caused by the CAN network. Also, it may be caused by improper user settings, for example, inconsistent baud rate settings, or calling the transmit function without starting the CAN controller, etc. Most of the errors have been handled simply in the device driver, and if you want a deeper level of error analysis and processing, you can call the VCI_ReadCANStatus function.

Also note that the data overflow interrupt error may be caused by these conditions: (1) software receiving buffer overflow. This means that the application can not process the received data timely, and users should optimize the application or change the communication policy. (2) hardware receiving buffer overflow. This error is caused by PC interrupt delay at the receiving terminal. It just can resolve by upgrading the computer performance or coordinating the remaining nodes to reduce the transmitting speed.

10. What matters should be considered for turning on/off the device?

The USBCAN-E/2E-U interface card provides two CAN ports, allowing users to operate different ports in the same program. The USBCAN-E/2E-U interface card is not allowed to share the way to open the device, and the same device can not be opened by different program through calling the VCI_OpenDevice function for several times. The VCI_OpenDevice and VCI_CloseDevice functions can only be called once when the application is initialized and exited.

If the current port is no longer used when the device is turned off, users should call the VCI_ResetCAN function to make the current port separated from the CAN bus.

The device driver will call the VCI_ResetCAN automatically to exit the CAN bus connection only when the last device handle is closed.

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

The USBCAN-E/2E-U interface card does not provide an interface for direct operation interruption because the interruption has been processed by driver. Most of the reasons for operation interruption in the application are that programs do not know when data arriving at the device, thus the triggering of a receiving message is needed to read data from the buffer. The general method to solve this problem is to use multiple threads (or multiple tasks). That is, start a new thread and call the VCI_Receive function to query the receiving buffer in the thread. The blocking mechanism has been implemented in the VCI_Receive. If there is no data in the buffer, the thread will be suspended. At this time, it will not take up the CPU time, and the application can still handle other transactions.

12. How to use VCI_Transmit function?

The driver of the USBCAN-E/2E-U interface card provides about 128 frames of transmitting buffer FIFO. Each time the call of VCI_Transmit can transmit up to about 128 frames of data. The transmission speed of the transmitting device is determined by the hardware and software performance of the current computer. Generally, the transmission speed is about 2000 fps (the standard data frame is 11Bytes, 1Mbps). If the transmission speed is too fast, it will cause data overflow of the remote receiving device without response. Users can add delay in the application programming appropriately to reduce the transmission speed.

Each frame has a time-out limit in the transmission process. The timeout period is about 2 seconds when the single frame is sent. When transmitting multiple frames at a time, the timeout period for the last frame transmission is 2 seconds and for the remaining frames are 1 second. The sending timeout is usually due to CAN bus busy and the lower priority of the current node, but not a function call or communication error. Users can program to achieve re-transmission (usually, the timeout event rarely occurs in the low-speed network). Therefore, ensure that the CAN bus occupancy should not exceed 60-70% of the bus capacity in system design.

13. How to use the VCI_Receive function better?

The device driver provides the software receiving buffer with 130000 frames, which provides sufficient response time for application programmers. When the software receiving buffer data overflows, the device driver will call VCI_ResetCAN to reset the CAN bus and set the CAN status data overflow interrupt flag. Note that both the software buffer overflow and the CAN controller hardware buffer overflow use this flag.

The receive function provides the Wait parameter for multi-thread programming, encapsulated inside is a blocking function. The meaning of the Wait parameter is similar to the dwMilliseconds parameter of Win32 WaitForSingleObject (refer to the description of Win32API). It specifies a timeout return time for VCI_Receive in

milliseconds.

When Wait is 0, the number of frames that were successfully read currently will be returned immediately in function call. If the receive buffer is empty, then it returns 0. When Wait is not 0, if there is data in the receive buffer in function call, then it immediately returns the number of frames successfully read. If the receive buffer is empty at this time, the function will wait for a specified timeout of arriving or receiving data before returning the number of frames successfully received. When the value of Wait is 0xFFFFFFFF for infinite waiting until data receiving, it is recommended that this value should not be set too large, and the value of infinite waiting should be paid attention.

When the value of nFrames is 0, the function actually returns a notification message. It does not need to read the receiving buffer, and it is a special tricky usage. Note: If you call the VCI_Receive function in the main thread and Wait is not 0, it may cause the application to temporarily lose response. If you receive by querying, the value of Wait should be set to 0.

Chapter 5: Inspection and Maintenance

The main electrical components of USBCAN-E/2E-U interface card are semiconductor parts. Although these parts have long life time, they may age quickly if used in improper environment. Therefore, the device should be inspected regularly to guarantee it is used in the allowable condition. The device is recommended to be inspected at least once per 6 months to 1 year, and it should be inspected more frequently if used in the improper environment.

If there is problem occurred during the device maintenance, please read the following table to find the cause, as shown in Figure 5-1. If the problem cannot be solved yet, please contact ZLG ZHIYUAN Electronics.

Table 5-1: Inspection and Maintenance

Content	Inspection	Criterion	Operation
Power supply	Check the voltage fluctuation of power supply input	+9V ~ +25VDC or +5V DC USB port power supply	Use a voltmeter to measure the USB port voltage on the power supply input terminal. Take measures to make the voltage fluctuation within the range
Ambient environment	Check ambient temperature (including internal temperature in the closed environment)	-40℃~+85℃	Use a thermometer to measure temperature and ensure the ambient temperature remains within the allowable range.
	Check ambient humidity (including internal humidity in the closed environment)	The relative humidity should be 10%~90% without air-conditioning.	Use a hygrometer to measure humidity and ensure the ambient humidity remains within the allowable range.
	Check the accumulation of dust, powder, salt, metal shavings	No accumulation	Clean and protect the device.
	Check whether water, oil, or chemical spray touches the device	No spray touches the device.	If necessary, please clean and protect the device.
	Check whether there is corrosive or flammable gases around the device	No corrosive or flammable gas	Smell or use a sensor to check whether there is corrosive or flammable gas.
	Check vibration and shock	Vibration and shock within the specified limits	If necessary, please install a gasket or other shock absorber.
	Check the noise source near the device	No important noise signal source	Isolate the device from noise source or protect the device

Content	Inspection	Criterion	Operation
Installation and wiring	Check the connection of each unit and whether each unit has been securely locked with next unit.	No loosening	Fully press the connectors together and lock them with the slider
	Check whether the cable connector is inserted and locked completely.	No loosening	Correct any error connection installation.
	Check whether there is loose screw in the external wiring.	No loosening	Tighten the screw with a screwdriver.
	Check the crimp connector in the external wiring	There is enough space between connectors.	Check it visually, and adjust it if necessary
	Check whether there is any damage in the external cable.	No damage	Check it visually, and replace the cable if necessary

Chapter 6: Appendix: CAN2.0B Protocol Frame Format

CAN2.0B Standard Frame

The messages of CAN standard frame are 11 bytes, including messages and data. The first three bytes are messages.

	7	6	5	4	3	2	1	0
Byte 1	FF	RTR	X	X	DLC (data length)			
Byte2	Message identification code ID.10-ID.3							
Byte3	ID.2-ID.0			X	X	X	X	X
Byte4	Data 1							
Byte5	Data2							
Byte6	Data3							
Byte7	Data4							
Byte8	Data5							
Byte9	Data6							
Byte10	Data7							
Byte11	Data8							

Byte 1 is the frame message. The seven bit (FF) means the frame format. In the standard frame, FF=0. The six bit (RTR) means the type of frame. RTR=0 means data frame, RTR=1 means remote frame. DLC means the actual data length in data frame.

Byte 2 and Byte 3 indicate message identification codes. The 11 bits are significant.

Byte 4~Byte 11 are actual data in data frame, and the remote frame is invalid.

CAN2.0B Extended Frame

The messages of CAN extended frame are 13 bytes, including messages and data. The first five bytes are messages.

	7	6	5	4	3	2	1	0
Byte 1	FF	RTR	X	X	DLC (data length)			
Byte2	Message identification code ID.28-ID.21							
Byte3	ID.20-ID.13							
Byte4	ID.12-ID.5							
Byte5	ID.4-ID.0					X	X	X
Byte6	Data1							
Byte7	Data2							
Byte8	Data3							
Byte9	Data4							
Byte10	Data5							
Byte11	Data6							
Byte12	Data7							
Byte13	Data8							

Byte 1 is the frame message. The seven bit (FF) means the frame format. In the extended frame, FF=1. The six bit (RTR) means the type of frame. RTR=0 means data frame, RTR=1 means remote frame. DLC means the actual data length in data frame.

Byte 2~Byte 5 indicate message identification codes. The 29 bits in the high bytes are significant.

Byte 6~Byte 13 are actual data in data frame, and the remote frame is invalid.

Chapter 7: Rights & Statements

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