Category	Contents
Keywords	PCI Express, CAN(FD) interface card
Abstract	PCIeCANFD-400U is a PCI Express x1 4-way CAN (FD) interface card. Backward compatibility with CAN 2.0 A/B standard enables PC/industrial computer to be connected to CAN/CAN(FD) network through the PCI-E interface, which constitutes a data acquisition and data processing system in CAN/CAN(FD) network applications such as laboratories, industrial control, and smart communities.

Revision History

Version	Date	Description
V1.0	March 18, 2021	Created

Contents

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1. Functions

1.1 Product Overview

CAN FD (CAN Flexible Data-rate) is the latest upgrade of the CAN bus, with a maximum of 64 bytes of data, and a flexible data field with a baud rate of up to 5 Mbps.

The PCIeCANFD-400U CAN(FD) interface card is a PCIe to 4-channel CAN(FD) communication interface card compatible with PCI Express r1.0a specification developed by Guangzhou ZLG Electronics. The PCIeCANFD-400U interface card provides PCI Express x1 multi-function device peripheral controller interface, which enables the computer to be easily connected to the CAN/CAN(FD) bus network to monitor multiple bus networks in real time. It is easy to install and simple to use.

The PCIeCANFD-400U CAN(FD) interface card provides four completely independent isolated CAN (FD) channels, conforming to CAN FD ISO 11898-1:2015 specification (compatible with CAN 2.0A/B standard). It supports a transmission rate of up to 5 Mbps, which enables flexible and convenient applications. To improve system reliability, the PCIeCANFD-400U interface card adopts 2,500 V DC electrically isolated CAN (FD) transceiver module, which protects the computer from the influence of ground circulation and enhances the system reliability in harsh environments.

The PCIeCANFD-400U interface card provides a unified application programming interface and complete and diverse application demonstration codes, including development routines such as VC, VB, Delphi and labview, which facilitates application development. PCIeCANFD-400U supports OPC interfaces and can be used in configuration software that supports OPC. In addition, we provide powerful ZCANPRO general-purpose CAN-BUS test software for CAN/CAN (FD) message sending and receiving and monitoring, which facilitates development and debugging.

Note: In the following, PCIeCANFD-400U is collectively referred to as PCIeCANFD interface card.
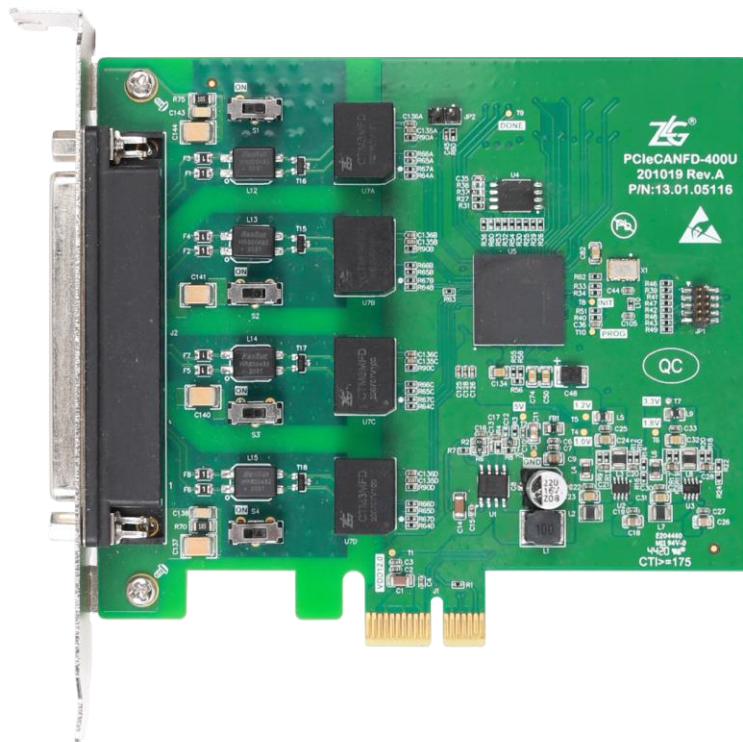
Figure 1.1 PCIeCANFD-400U appearance

1.2 Functions

- PC interface: high-speed PCIe interface, PCI Express x1 specification, compatible with x8, x16 and other PCI Express slots;

- Comply with CAN FD ISO 11898-1:2015 specification (compatible with CAN 2.0A/B standard);

- Number of channels: 4-channel isolated CAN interface, DB37 connector, (converted into 4-channel DB9 interface through a communication cable), in line with DeviceNet and CANopen standards.

- Compatible with high-speed CAN and CANFD;

- The CAN interface is electrically isolated from 2,500 VDC;

- The CAN communication baud rate can be arbitrarily programmable between 4 Kbps and 1 Mbps;

- The CANFD baud rate can be arbitrarily programmable between 1 Mbps and 5 Mbps;

- Maximum data flow for single channel transmission: 4,000 frames per second (remote frame, single frame transmission);

- The highest data flow rate received by a single channel: 10,000 frames per second (remote frame);

- Built-in 120 ohm terminal resistance, which can be connected and disconnected through the DIP switch;

- Support ZCANPRO test software (support Windows 7 and Windows 10);

- Operating temperature: -40°C to +85°C;

- Storage temperature: -40°C to +85°C;

- Length, width and height: 102.6 mm x 120.02 mm x 21.59 mm (including a metal baffle).

1.3 Product Specifications

1.3.1 Electrical Specifications

The PCIeCANFD interface card needs an electrical environment to work safely and stably. Table 1.1 lists the electrical parameters of the interface card. Exceeding the specifications listed in the table may cause the product to work unstable and fail, or even burn the board.

Table 1.1 Electrical specifications

Item		Test Conditions	Minimum	Typical Value	Maximum	Unit
Working voltage	PCIe interface power supply 12V	Four-channel transceiver	11	12	13	V
Operating current	External input DC power supply	Four-channel transceiver	--	150	--	mA
CAN interface	Bus pin withstand voltage	CANH, CAHL	-42	--	42	V
	Terminal resistance	Enable terminal resistance	--	120	--	Ω
	Isolation withstand voltage	Leakage current less than 1 mA	--	2500	--	VDC

1.3.2 Specifications

Table 1.2 Product specifications

Item	Specifications
	PCIeCANFD-400U PCI-9820I PCI-9840I PCI-9820
Number of CAN channels	4 cameras 2-way 4 cameras 2-way
Operating voltage	PCI-E standard 12V±8%
Power consumption	≤5W
Isolation voltage	2500VDC
Output terminal	DB37 connector to 4-channel DB9 interface
CAN baud rate	40Kbps - 1Mbps (CAN) 1Mbps - 5Mbps (CANFD acceleration)
Data receiving capability	10,000 frames/second/channel
Data sending capability	4,000 frames/sec/channel
Windows system driver	Support Support Support Support
Linux system driver	Support - - Support Support
VxWorks driver	— - Support Support
Dimensions (length x width)	PCB dimensions: 110 x 99.60 mm; Overall dimensions: 102.6 mm x 120.02 mm x 21.59 mm (including a metal baffle). 130 x 90 mm 130 x 90 mm 130 x 90 mm
Operating temperature	-40°C to +85°C
Ambient humidity	10%-90% (no condensation)
Environmental Requirements	Keep away from corrosive gas

1.3.3 Operating Temperature

The PCIeCANFD interface card can work in an industrial-grade environment. Its applicable operating temperature range: -40℃~+85℃. Using the interface card in too low or too high ambient temperature will make it work abnormally and shorten its service life.

1.4 Typical Applications

- CAN(FD)-Bus network diagnosis and test
- Electric power communication network
- Industrial control equipment
- Vehicle network debugging

2. Hardware Interfaces

2.1   CAN Communication Interface

The PCIeCANFD interface card uses a DB37 connector and a DB37 to 4xDB9 transfer cable. The signal definition of the DB9 interface pins meets the requirements of the CiA standard. Figure 2.3 shows the definition of the DB37 signal, and Table 2.1 lists the definition of the DB9 pin signal.

As shown in Figure 2.1, the cable labels "0, 1, 2, 3" correspond to "CAN0, CAN1, CAN2, CAN3" respectively, so that the DB9 interface is connected to the actual CAN-bus network.
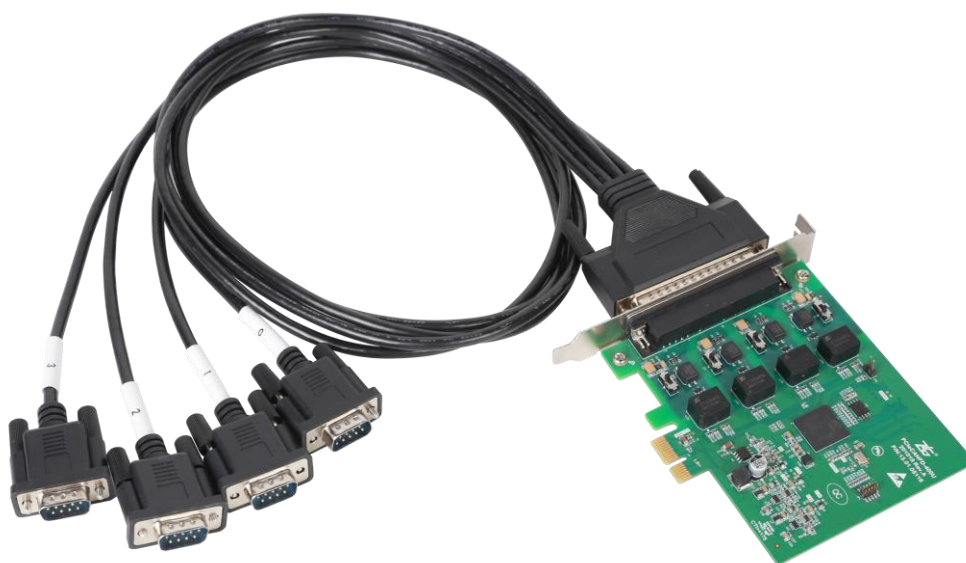

Figure 2.1 DB37 connector converted into a 4-channel DB9 interface through a communication cable

Figure 2.2 DB37 to 4xDB9 cable channel identification

2.2 DB-9 Connector Definition

Table 2.1 Pin definition of a DB-9 pin connector

Pin	Signal	Description	Interface diagram
1	NC	——	
2	CAN_L	CAN_L signal cable	
3	CAN_GND	Reference ground	
4	NC	——	
5	CAN_SHIELD	Shielded cable	
6	CAN_GND	Reference ground	
7	CAN_H	CAN_H signal cable	
8	NC	——	
9	NC	——	

The signal from the DB-9 connector can be transferred to the 5-pin OPEN5 connector through the optional DB9-OPEN5 converter.

Table 2.2 Pin definition of the OPEN5 socket

Pin	Signal	Description	Interface Diagram
1	V-	Network power supply negative	
2	CAN_L	CAN_L signal cable	
3	CAN_SHIELD	Shielded cable	
4	CAN_H	CAN_H signal cable	
5	V+	Network power supply positive	

2.3 DB-37 Connector
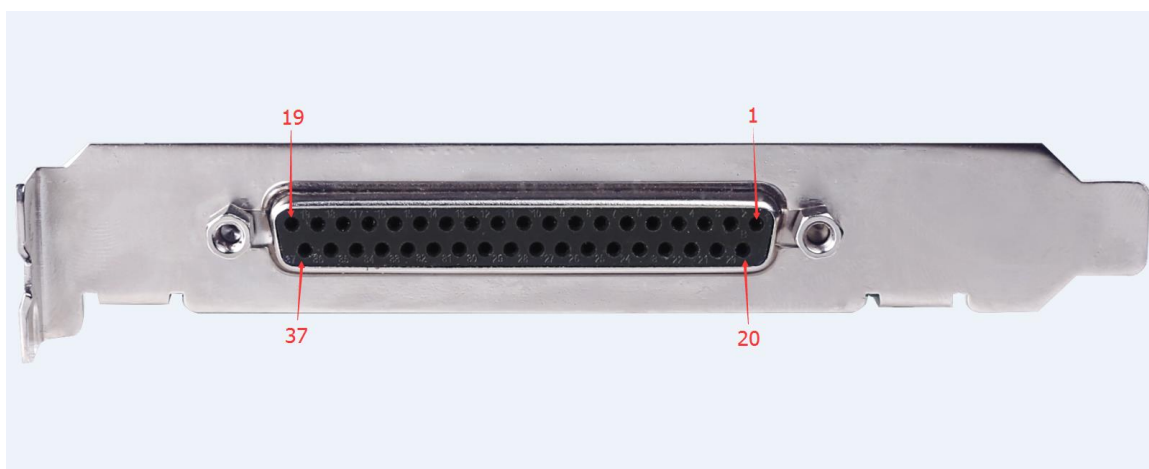
Figure 2.3 DB-37 connector

Table 2.3 DB-37 connector pin definition

CAN Channel	Pin	Signal	Description
CAN0	34	NC	——
	37	CAN_L	CAN_L signal cable
	19	CAN_GND	Reference ground
	16	NC	——
	35	CAN_SHIELD	Shielded wire
	17	CAN_GND	Reference ground
	18	CAN_H	CAN_H signal cable
	36	NC	——
	15	NC	——
CAN1	11	NC	——
	14	CAN_L	CAN_L signal cable
	33	CAN_GND	Reference ground
	30	NC	——
	12	CAN_SHIELD	Shielded cable
	31	CAN_GND	Reference ground
	32	CAN_H	CAN_H signal cable
	13	NC	——
	29	NC	——
CAN2	25	NC	——
	28	CAN_L	CAN_L signal cable
	10	CAN_GND	Reference ground
	7	NC	——
	26	CAN_SHIELD	Shielded cable
	8	CAN_GND	Reference ground
	9	CAN_H	CAN_H signal cable
	27	NC	——
	6	NC	——

CAN3	2	NC	——
	5	CAN_L	CAN_L signal cable
	24	CAN_GND	Reference ground
	21	NC	——
	3	CAN_SHIELD	Shielded cable
	22	CAN_GND	Reference ground
	23	CAN_H	CAN_H signal cable
	4	NC	——
	20	NC	——

2.4 Terminal Resistance

As shown in Figure 2.3, the CAN channel of the PCIeCANFD-400U interface card has a built-in 120Ω terminal resistance.The interface card uses the DIP switches S1_1, S1_2, S1_3, and S1_4 to select whether the terminal resistance of the corresponding CAN0, CAN1, CAN2, and CAN3 channels is connected to the bus network. As shown in Figure 2.4, set whether the CAN channel uses the 120 ohm terminal resistance. Before delivery, the DIP switch is set to "ON" by default, that is, the 120 ohm terminal resistance is connected to the corresponding bus network.

The interface card corresponds to the CAN channel at the endpoint of a CAN network. Set the DIP switch of the corresponding channel to "ON", or connect a 120 ohm terminal resistance between CAN_H and CAN_L of the corresponding CAN channel.

Figure 2.4 Terminal resistance selection switch

2.5　System Indicators

The PCIeCANFD-400U interface card has 1 system operation indicator, 1 dual-color CAN0 indicator, 1 dual-color CAN1 indicator, 1 dual-color CAN2 indicator, and 1 dual-color CAN3 indicator to indicate the device operating status. To facilitate the user's observation, the indicators are located at the rear of the board. Table 2.1 lists the indicator functions. When the indicators are in various states, the state of the CAN bus is shown in Table 2.2.

Figure 2.5 System indicators

Table 2.1 Indicator functions

Indicator	Status	Description
FPGA_RUN	Green	Device running properly
CANX_RUN	Green	CAN channel start
	Red	CAN channel error
	Light off	CAN channel not started

After the PCIeCANFD-400U interface card is powered on, the system status indicator FPGA_RUN is green, indicating that the device is powered on, and the system is operating properly; if the system status indicator FPGA_RUN is off, the system power supply fails or a critical fault occurs in the system.

When the CANX_RUN indicator is green, the CAN controller has been initialized and is working properly.

When the CAN controller has an error, the CANX_RUN indicator is red; when the error of the CAN controller is cleared, the CANX_RUN indicator is green.

2.6   Board Installation

2.6.1 Precautions

PCIeCANFD-400U series interface cards are electrostatic sensitive products and should be packed in a special anti-static protective bag before delivery. Therefore, when operating the interface card, take necessary protective measures to ensure that the interface card is not damaged by human contact with static electricity.

The PCIeCANFD-400U interface card should be installed when the PC/industrial computer has been **powered off**. Similarly, the interface card should also be disassembled when the PC/industrial computer is powered off.

PCIeCANFD-400U series interface cards do not have any switches and jumpers for assigning interrupts and I/O addresses, which are automatically assigned by the computer BIOS. Therefore, the board must be installed in the PCI-E slot before you install the driver. The installation procedure is as follows:

1.   Power off the computer and open the computer case cover;

2.   Insert the PCIeCANFD-400U series interface card into a free PCI-E slot, x1, x4, x8, or x16 slot;

3.   Tighten the screws to fix the board;

4.   Power on the computer. At this time, the BIOS automatically assigns interrupts and I/O addresses to the PCIeCANFD-400U interface card;
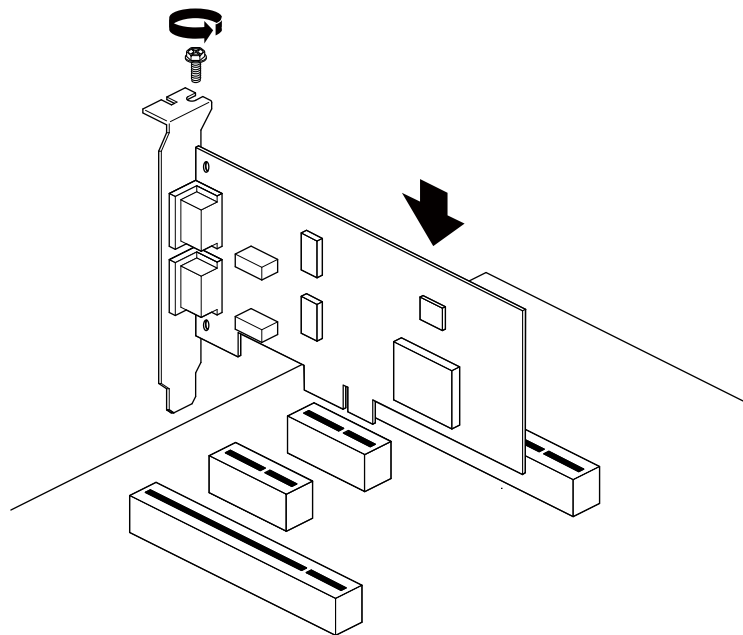
5.   Install the driver.

Figure 2.6 Removing and inserting the PCIeCANFD-400U series CAN interface card

Note: Do not remove or insert the PCI-E interface card with power on; do not touch the device with your hands during installation to prevent static electricity from damaging the device.

2.6.2 Product Dimensions

The physical dimensions of PCIeCANFD-400U are 117 mm x 120.02 mm (including metal baffle). Figure 2.6
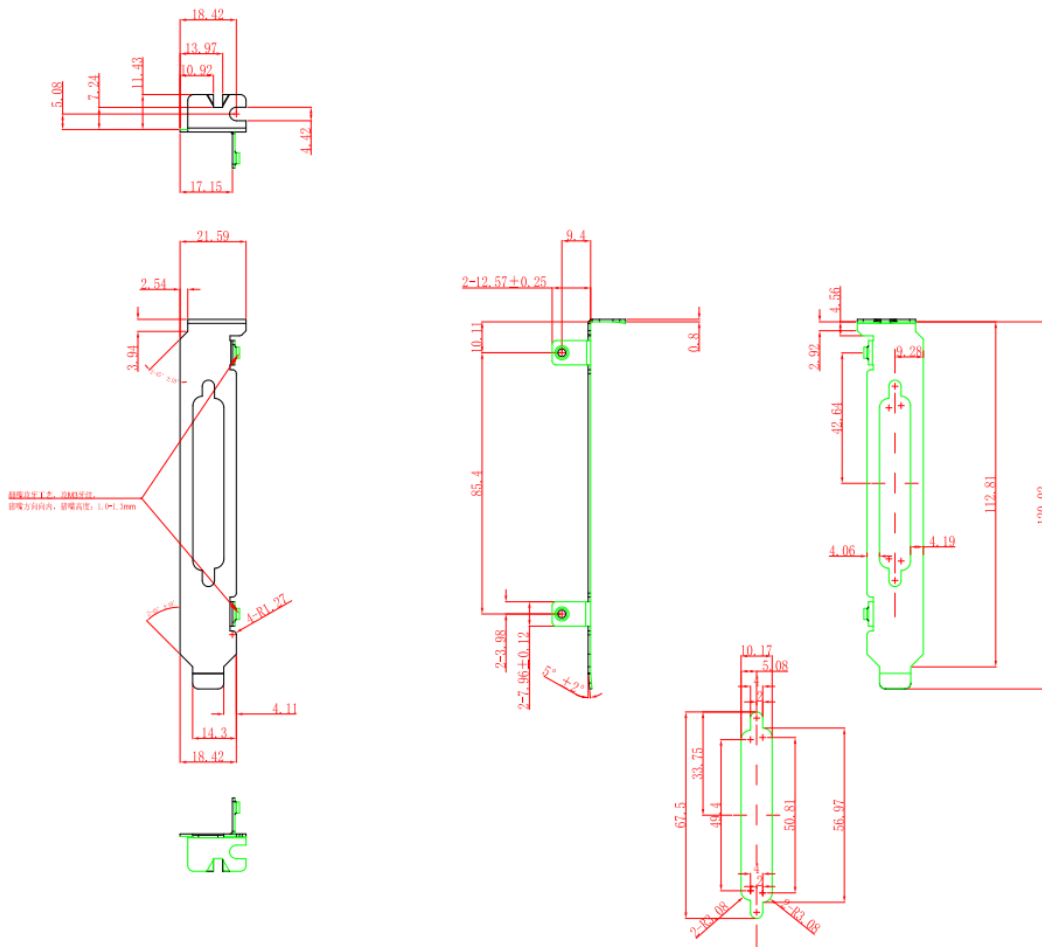
shows the baffle dimensions.

Figure 2.7 Baffle dimensions

2.7   System Connections

When the PCIeCANFD interface card is connected to the CAN-bus bus, it is only necessary to connect CAN_L to CAN_L and CAN_H to CAN_H signals. The CAN-bus network adopts a linear topology, and the two terminals of the bus need to be installed with 120 ohm terminal resistors; if the number of nodes is greater than 2, the intermediate nodes do not need to install 120 ohm terminal resistors. For branch connections, the length should not exceed 3 meters. Figure 2.2 shows the CAN-bus connection.
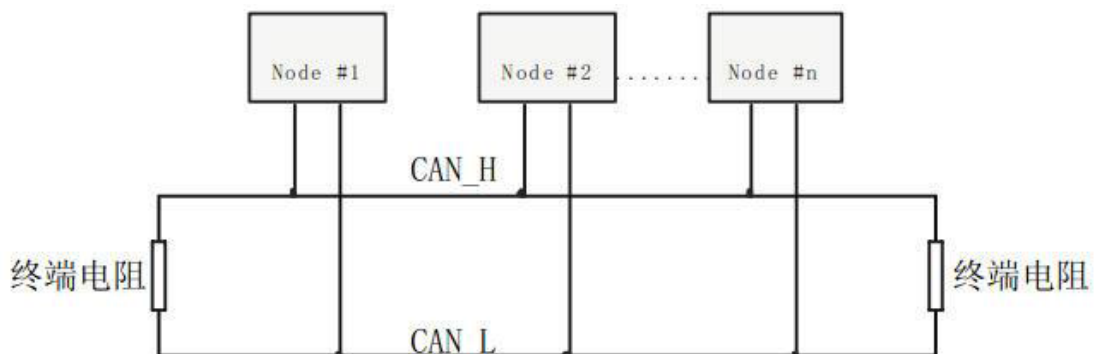
Figure 2.8 Linear topology of CAN-bus network

In the CAN-bus network, shielded wires are often used for interconnection, so as to enhance the anti-interference ability. However, there are many types of shielded wires and field wiring is complicated. Therefore, the wiring diagrams of different types of cables in application are shown below, including the connection diagrams of double-core single-layer shielded wire, double-core double-layer shielded wire, and three-core single-layer shielded wire (The "equipment iron shell" in the pictures refers to the outer shell of the device, which is grounded by default). Regardless of the type of cable, reasonable changes must be made according to the complexity of the field wiring. Ensure the reliable grounding of the single point of the shielded wire or ground wire at any time, and carry out on-site wiring in strict accordance with the wiring specifications to minimize communication errors and abnormalities, and improve the communication quality and service life of the bus.
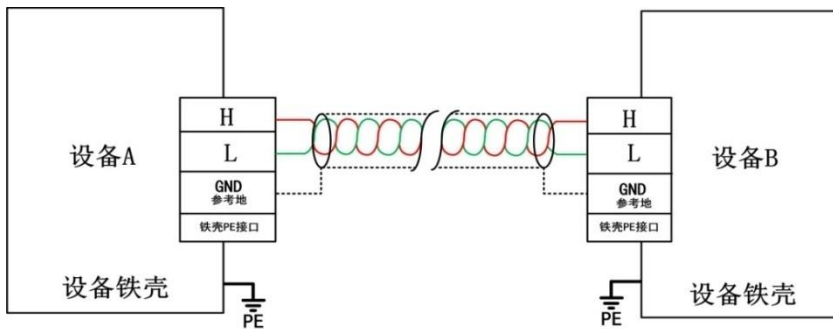

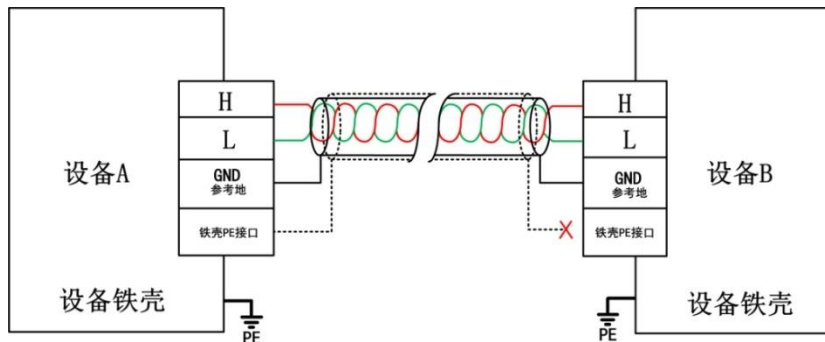Figure 2.9 Two-core single-layer shielded cable connection

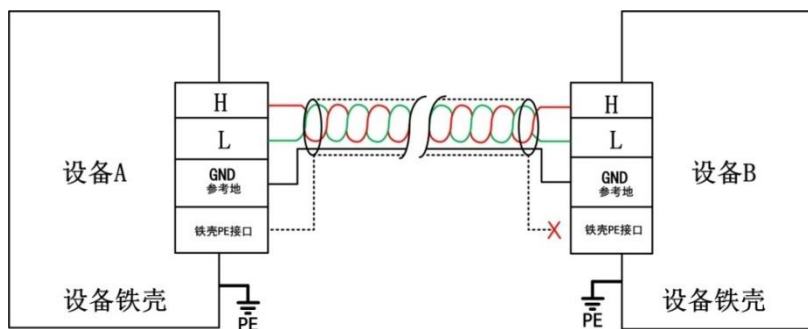Figure 2.10 Double-core double-shielded cable connection

Figure 2.11 Three-core single-layer shielded cable connection

3. Driver Installation

This document uses a PC running Windows 7 as an example to explain how to install the PCIeCANFD-200U (100U) driver.

3.1 Installing the Driver under Windows

When the computer is shut down, insert the PCIeCANFD interface card into the PCIe card slot of the computer, and start the computer.

Click the official driver installation application pcie-canfd-x00u-install.exe to display the driver software interface, as shown in Figure 3.1.
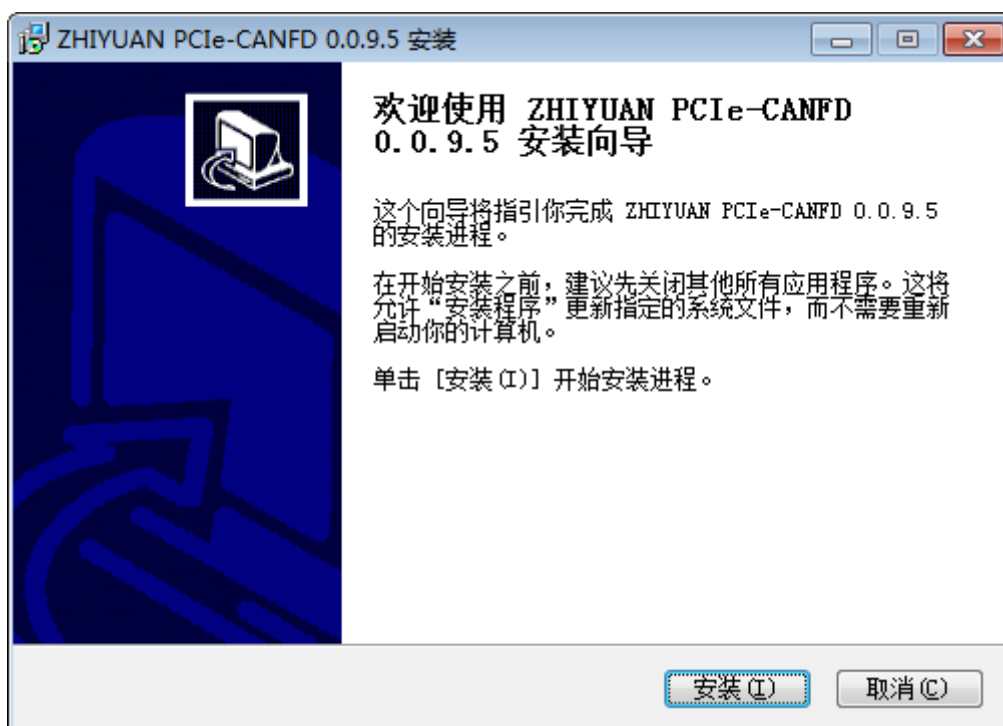

Figure 3.1 Driver software

As shown in Figure 3.2, click [Install] in the dialog box, and wait until the driver is installed.

Figure 3.2 Installing the driver

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After the installation is complete, the "Completing" dialog box appears. Click the [Finish] button to complete the installation, as shown in Figure 3.3.
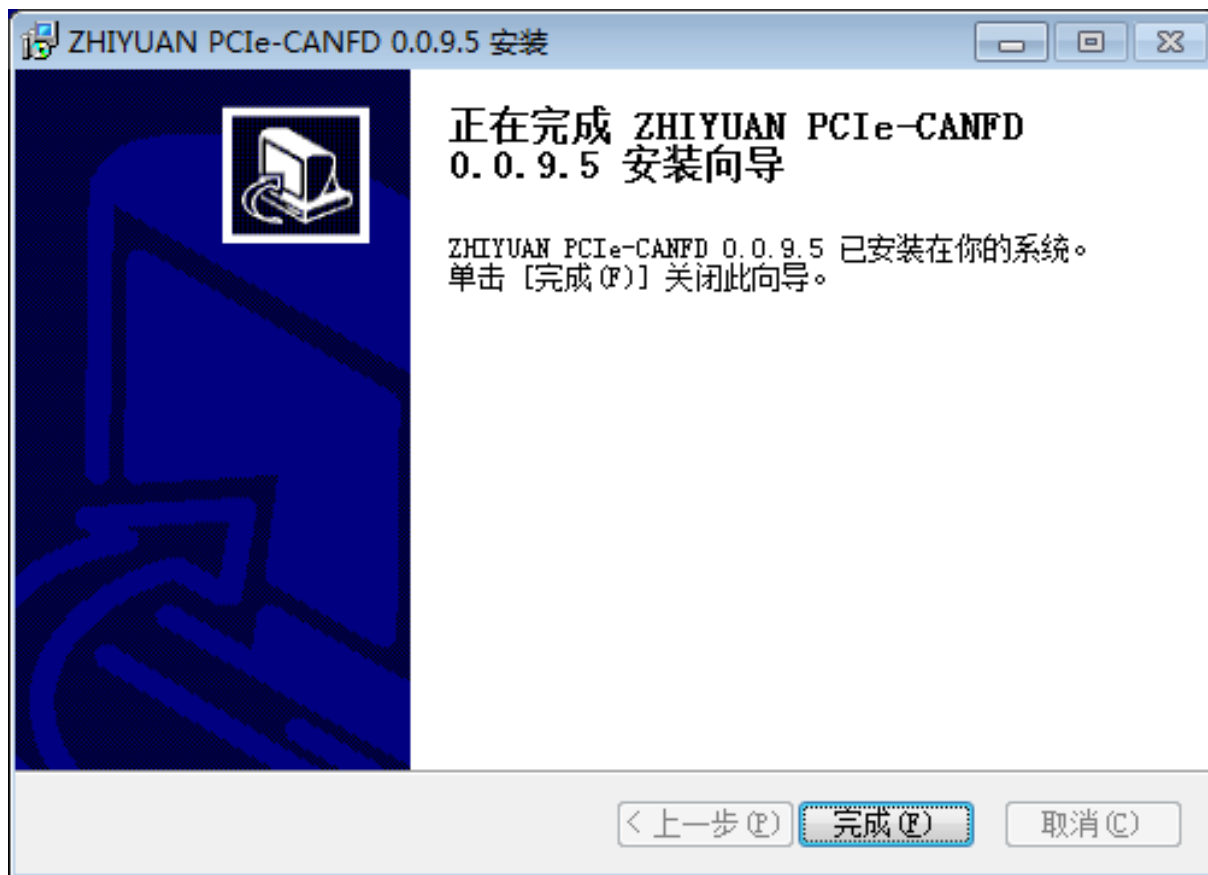

Figure 3.3 Driver installation complete

After the driver is installed, if the PCIeCANFD interface card is normal, ▷ ⬛ ZHIYUAN PCIE CAN-FD appears in the device manager, indicating that the driver is installed correctly and a PCIeCANFD interface card is inserted. At this time, the CANFD card has been connected to the PC, and the host computer software can be used to send and receive CAN (FD) messages. It is recommended to use the ZCANPRO software provided by ZLG Electronics as the host computer software. Users can also develop their own host computer software by using the provided secondary development function library.

4. Packing List

Table 5.1 PCIeCANFD-400U Packing List V1.00

No.	Name	Quantity	Unit	Remarks
1	PCIeCANFD-400U interface card	1	Piece	
2	DB-37 to 4xDB-9 cable	1	Nr.	
3	After-sales Service Guide	1	Pcs	
4	Certificate of Conformity	1	Piece	

5. Quick Guide

5.1   Introduction to ZCANPRO Software

ZCANPRO is the supporting software for CAN/CANFD series products produced by Guangzhou ZLG Electronics Co., Ltd., which can perform operations such as raw data transmission and reception, data playback, and high-level protocol analysis. The software is easy to operate and powerful, and it is a good helper for CAN bus testing, monitoring, diagnosis, and development.

ZCANPRO software can be downloaded from the ZLG Electronics official website http://www.zlg.cn.

5.2   Using PCIeCANFD on ZCANPRO

After the device driver and ZCANPRO are installed, PCIeCANFD can be used on the ZCANPRO software.

To view the procedure for using PCIeCANFD on ZCANPRO, click ⬇ in the upper right corner of the software main interface, and select [Quick User Guide] in the drop-down box (as shown in Figure 4.1). For detailed instructions for the ZCANPRO software, see [User Manual].
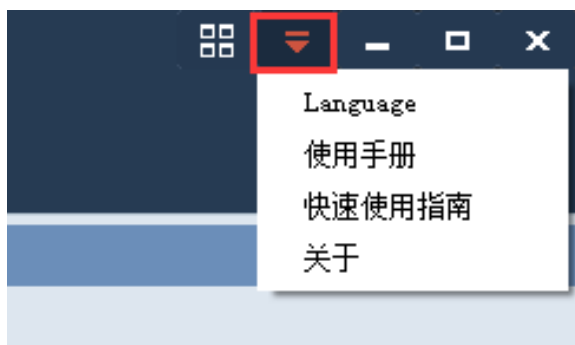

Figure 5.1 Opening the Quick Guide

6. Disclaimer

Based on the principle of providing better service for users, Guangzhou ZLG Electronics Co., Ltd. ("ZLG Electronics") will try to present detailed and accurate product information to users in this manual. However, due to the effectiveness of this manual within a particular period of time, ZLG Electronics does not guarantee the applicability of this document at any time. ZLG Electronics shall reserve the right to update this manual without prior notice. To get the latest version, please visit the official website of ZLG Electronics regularly or contact ZLG Electronics. Thank you!

Right to modify the document

Guangzhou ZLG Electronics Co., Ltd. shall reserve the right to modify related documents of PCIeCANFD interface card series products at any time without prior declaration.

ESD protection

The PCIeCANFD interface card series products have electrostatic protection capabilities to ensure the stable operation of the products. When using PCIeCANFD interface card series products, first discharge the static electricity on the body. For example, wear a reliable grounding static ring, or touch a water pipe connected to the earth.

Stay Truthful for Win-win Results, Continuous Learning, Customer Oriented, Professional and Concentrated, Always be the No. 1

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