Category	Contents
Keywords	M.2, CAN(FD) interface card
Description	The M.2CANFD is a dual-channel CAN(FD) interface card with M.2 2280 B-M-Key specification. Backward compatibility with CAN 2.0 A/B standard enables industrial notebook computers/portable industrial computers/single board computers (SBC) to be connected to CAN/CAN(FD) networks through M.2 NGFF

Revision History

Version	Date	Description
V1.0	March 18, 2021	Created

Contents

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.

M.2CANFD CAN(FD) interface card is a M.2 NGFF to dual-channel CAN(FD) communication interface card compatible with PCI Express r1.0a developed by Guangzhou ZLG Electronics. The M.2CANFD interface card provides the M.2 B+M Key interface, which enables the computer equipped with a M.2 B-key or M-Key slot to be easily connected to the CAN/CAN(FD) bus network and monitor multiple bus networks in real time. It is compact and can be easily embedded in single board computers (SBC), portable industrial control hosts, and industrial notebooks. It is easy to install and simple to use.

Note: Before installation, make sure that the M.2 B-key or M-Key slot provided by the host supports PCIe.

The M.2CANFD provides two completely independent isolated CAN (FD) channels, in line with 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, M.2CANFD interface card adopts 2,500 V DC electrically isolated CAN (FD) transceiver circuit, which protects the computer from the influence of ground circulation and enhances the reliability of the system in harsh environments. To facilitate expansion, the second function pin of CAN signals can be switched to the reserved PIN of the M.2 golden finger through jumper welding, which allows users to design CAN transceiver circuits on the baseboard by themselves.

M.2CANFD 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. M.2CANFD supports OPC interfaces and can be used in configuration software that supports OPC. In addition, we provide a powerful ZCANPRO general-purpose CAN-BUS test software for CAN/CAN (FD) message sending and receiving and monitoring, which facilitates development and debugging.

Note: M.2CANFD is collectively referred to as M.2CANFD interface card below.
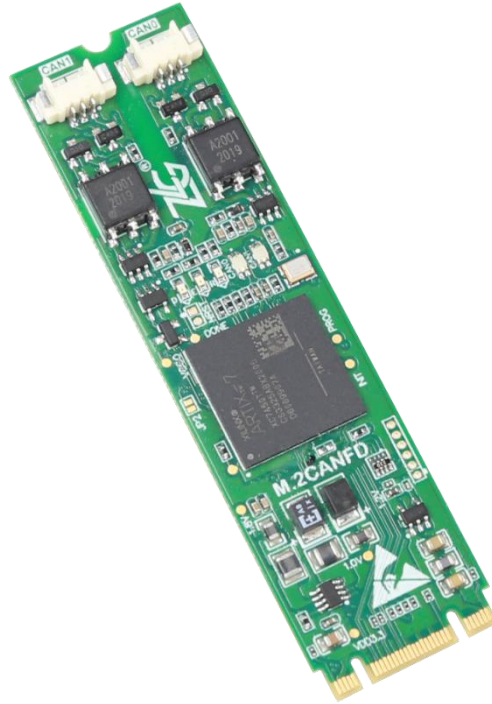
Figure 1.1 M.2CANFD product appearance

1.2   Features

- PC interface: standard M.2 B+M Key interface, 2,280 specification, compatible with M-Key and B-Key slots;

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

- Number of channels: dual-channel isolated CAN interface, standard DB-9 connector provided through the interface board;

- The CAN controller transceiver signal can be switched to M.2 gold finger reserved pins, which helps users design the CAN transceiver circuit by themselves;

- 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;

- CANFD accelerated 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);

- The interface board has a built-in 120 ohm terminal resistance, which can be connected and disconnected by using 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: 80 mm * 22 mm * 5.6 mm (thickness).

1.3 Specifications

1.3.1 Electrical Parameters

The safe and stable operation of the M.2CANFD interface card requires a certain electrical environment. Table 1.1 lists the electrical parameters of the interface card. Exceeding the parameter values listed in the table may cause the product to work unstable and inoperative, or even burn the board.

Table 1.1 M.2CANFD interface card electrical parameters

Parameter		Test Conditions	Minimum	Typical Value	Maximum	Unit
Working voltage	M.2 slot	Dual channel transceiver	3.2	3.3	3.4	V
Operating current	External input DC power supply	Dual channel transceiver	--	350	--	mA
CAN interface	Bus pin withstand voltage	CANH、CAHL	-42	--	42	V
	Terminal resistance	Enable terminal resistance	--	120	--	Ω
	Isolation withstand voltage (between channels)	Leakage current less than 1 mA	--	2500	--	VDC
	Isolation withstand voltage (channel to system ground)	Leakage current less than 1 mA	--	2500	--	VDC

1.3.2 Specifications

Table 1.2 Product specifications

Item	Specification
	M.2CANFD
Number of CAN	2. circuits
Working voltage	3.3V±5%
Power	≤3W
Isolation voltage	2500VDC
Output terminal	2x1.25-3P connector, converted into 2xDB9 through the interface board
CAN baud rate	40Kbps - 1Mbps (CAN) 1Mbps - 5Mbps (CANFD acceleration)
Data receiving	10,000 frames/second/channel (remote frame, single frame transmission)
Data sending	4,000 frames/second/channel (remote frame)
Windows system	Support
Linux system	Support
VxWorks driver	—
Dimensions (length×width)	PCB dimensions (WLH): 22.0 x 80.0 mm x 5.6 mm; PACK board size (WLH): 31.9 mm x 36.3 mm x 14.1 mm (the length does not
Operating	-40°C ~ +85°C
Ambient humidity	10%-90% (no condensation)
Environmental	Keep away from corrosive gas

1.3.3 Operating Temperature

The M.2CANFD interface card can work in an industrial-grade environment. Its applicable operating temperature range: -40°C to +85°C. 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;
- Automotive electronics applications;

2. Hardware Interfaces

2.1 CAN Communication Interface

M.2CANFD uses a 1.25-3P connector. The signal definitions converted to DB9 interface pins through the attached PACK interface board meet the requirements of the CiA standard. Table 2.1 lists the signal definitions.

2.2 DB-9 Connector Definition

Table 2.1 Pin definition of 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 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 Terminal Resistance

As shown in Figure 2.3, the PACK interface board attached to the M.2CANFD interface card has a built-in 120-ohm terminal resistance. Use the DIP switch S1 to select whether the CAN channel terminal resistance is connected to the bus network. As shown in Figure 2.4, set whether the CAN channel uses the 120 ohm terminal resistance. Before delivey, 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.
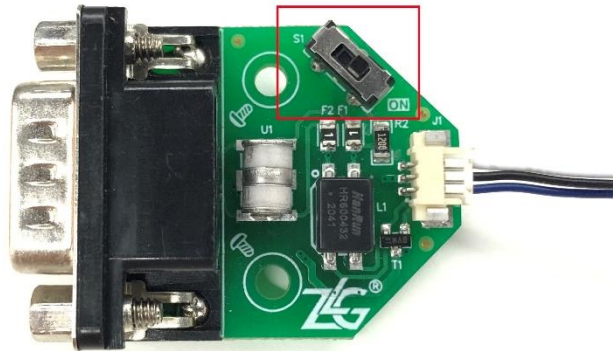

拨码开关拨到"ON"，接通终端电阻

Figure 2.1 Terminal resistance selection switch

2.4 CAN Second Function Pin Switch

When you need to design the CAN transceiver circuit or improve the protection level of the CAN signal line, you can consider connecting the second function pin of the CAN signal to the backplane through the M.2 reserved pin. Designing the CAN transceiver circuit yourself improves the system flexibility.

The CAN signal secondary function pin is switched through the pad jumper JP2 (as shown in Figure 2.2). JP2 is disconnected by default, and the system uses the default on-board CAN transceiver. When JP2 is short-circuited with solder, the second function pin of CAN signal is automatically enabled when the system is powered on. Table 2.3 lists the pin definitions.

Figure 2.2 CAN-TTL switch jumper

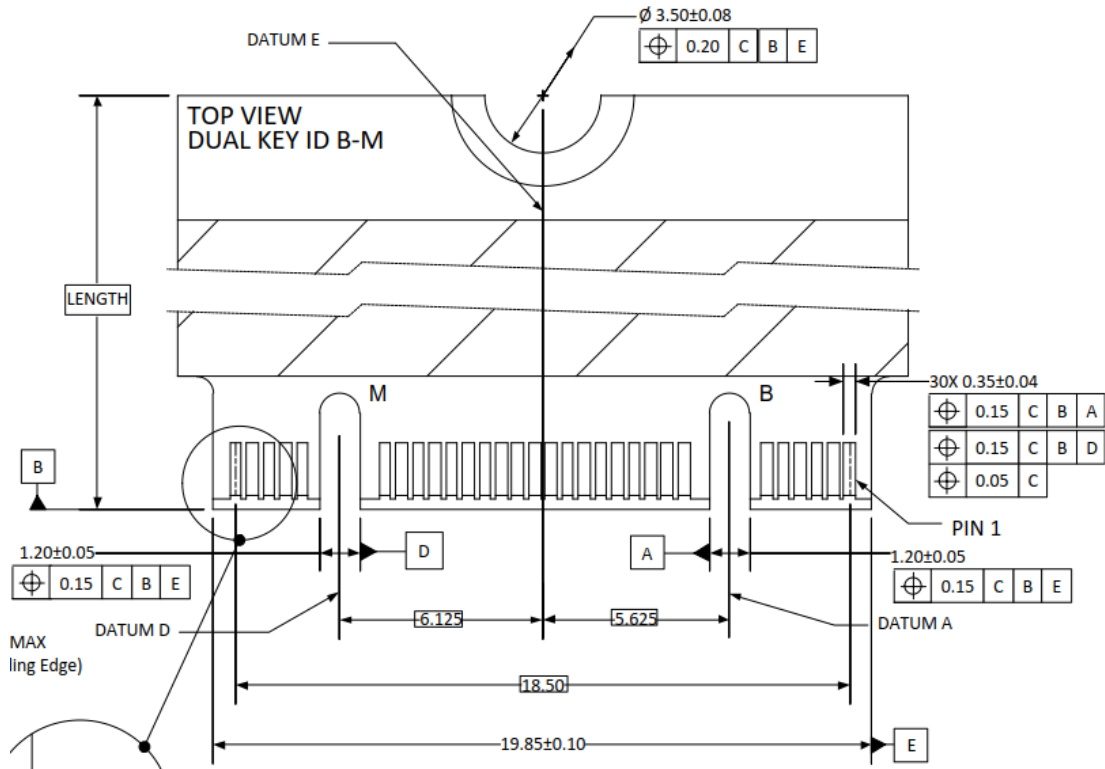## 2.5 M.2 Goldfinger Definition

Figure 2.3 M.2 goldfinger

The definition of M.2 interface is shown in Table 2.3. The 30th, 32nd, 34th, and 36th pins are the second function pins of the CAN.

Table 2.3 M.2 interface definition

Signal Name	Pin No.	Description
nWAKE	54	nWAKE signal/default pull-up
nRESET	50	nRESET signal/not used
TD0_REV	30	CAN0 TXD second function IO
RD0_REV	32	CAN0 RXD second function IO
TD1_REV	34	CAN1 TXD second function IO
RD1_REV	36	CAN1 RXD second function IO
REFCLK_N/P	53,55	PCIE reference clock pair
PCIE_TX_N/P	41,43	PCIE send pair
PCIE_RX_N/P	47,49	PCIE receiving pair
3.3V	2,4,70,72,74	Power supply
GND	3,27,33,39,45,51,57,71,73	Ground

2.6 Signal Indicators

The M.2CANFD interface card has 1 dual-color SYS indicator, 1 dual-color CAN0 indicator, and 1 dual-color CAN1 indicator, which indicate the running status of the device.

Table 2.1 lists the functions of the indicators. When the indicators are in various states, the status of the CAN bus is shown in Table 2.2.

Table 2.5 Indicator functions

Indicator	STATUS	Indication status
R（RUN）	Green	System operation instructions
CAN0	Green	The CAN interface is working properly
	Red	The CAN interface is faulty
CAN1	Green	The CAN interface is working properly
	Red	The CAN interface is faulty

After the M.2CANFD interface card is powered on, the system status indicator RUN is green, indicating that the device is powered on, and the system is operating properly; if the system status indicator RUN is off, the system power supply fails or a serious error occurs in the system.

When the CAN0 and CAN1 indicators are green, the CAN controller has been initialized and is working properly.

When the CAN controller has an error, the CAN0 and CAN1 indicators are red; when the error of the CAN controller is cleared, the CAN0 and CAN1 indicators are green.

Table 2.6 CAN bus status

CAN indicator status	CAN bus status
CAN0 and CAN1 indicators are all off	The CAN controller is disconnected from the bus
CAN0 and CAN1 indicators blink in red and green alternately	The CAN controller is not started, and the user is prompted to start the CAN controller
CAN0 and CAN1 green indicators are always on	The CAN bus is operating properly
CAN0 and CAN1 red indicators blink	The CAN-bus bus has an error or data overflow, and it may lose frames

2.7   Board Installation

2.7.1 Precautions

M.2CANFD 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 M.2CANFD interface card should be installed when the PC/industrial computer is **powered off**. Similarly, the interface card should also be disassembled when the PC/industrial computer is powered off.

Note: Before installation, make sure that the host provides an M.2 B-key or M-Key slot and supports PCIe.

M.2CANFD 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 M.2 slot before you install the driver. Figure 2.3 shows the installation procedure:

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

2.   Insert the end of the M.2CANFD series interface card diagonally upward into the free M.2 slot, and then gently press it down;

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 M.2CANFD interface card;

5.   Install the driver.
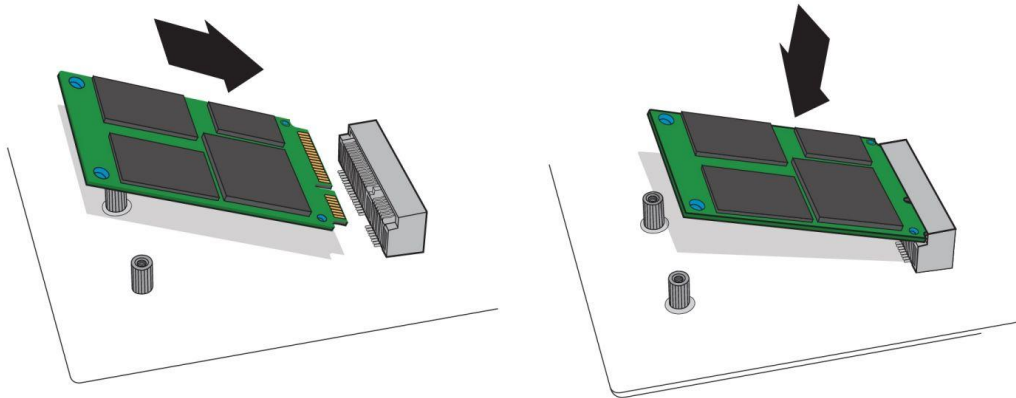
Figure 2.4 M.2CANFD installation diagram (similar to MiniPCIeCANFD)
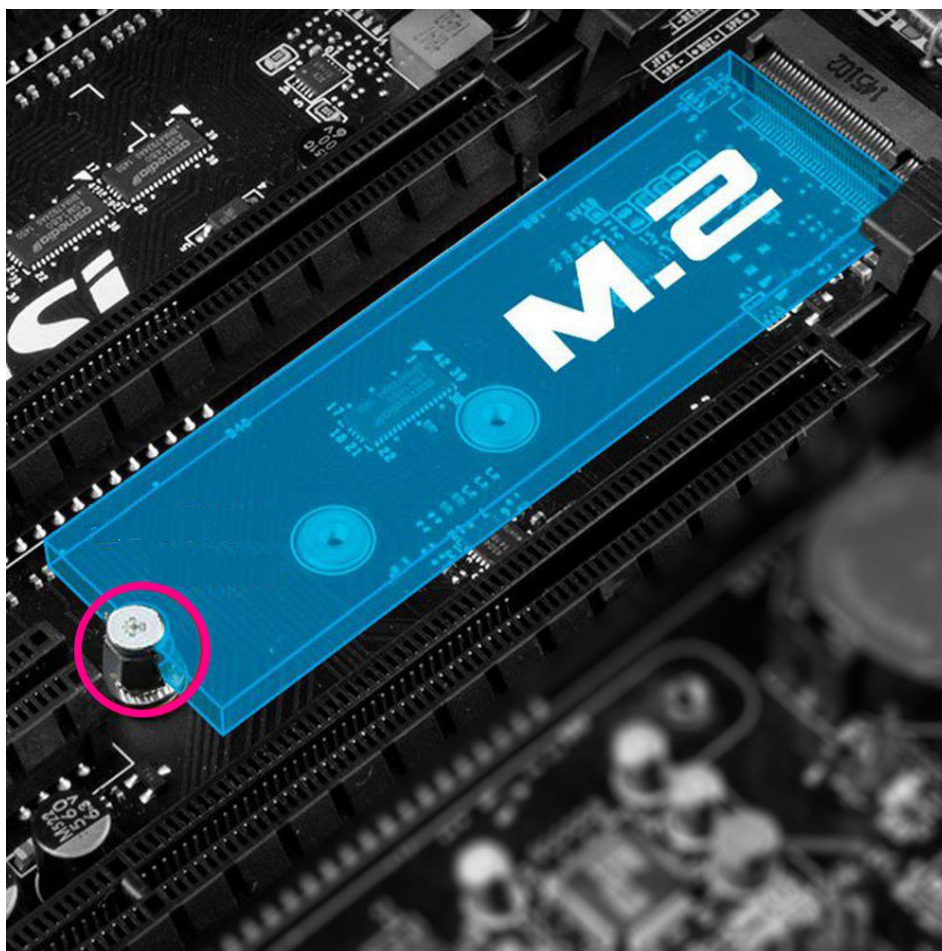
Figure 2.5 M.2CANFD installation diagram 2

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

2.7.2 Product Dimensions

M.2CANFD complies with the M.2 2280 standard. The width is 22 mm and the length is 80 mm. The height of the highest component on the TOP surface is 3.5 mm, and the height of the highest component on the BOTTOM surface is 1.75 mm.
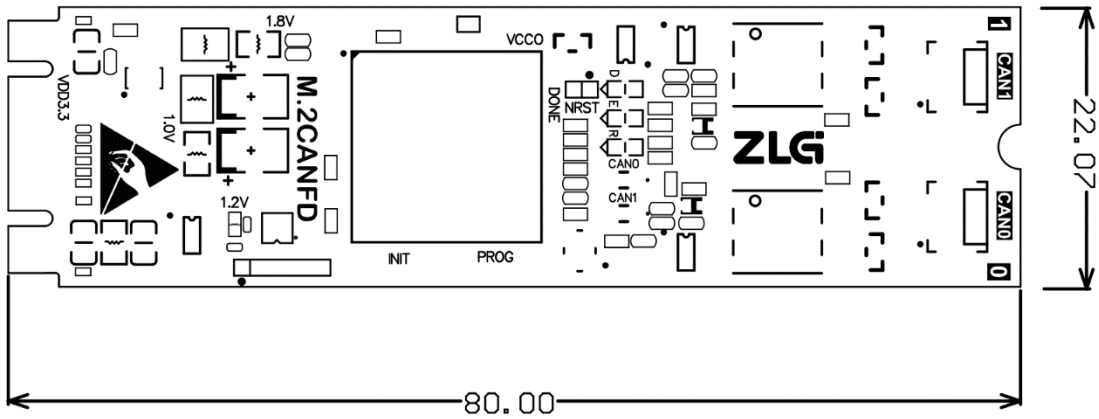
Figure 2.6 Product dimensions

2.8 System Connections

When the M.2CANFD 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.
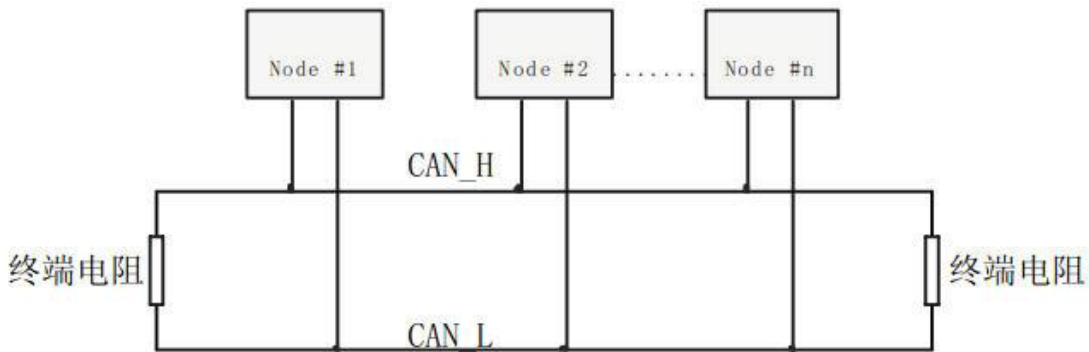
Figure 2.7 Linear topology of CAN-bus network

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.
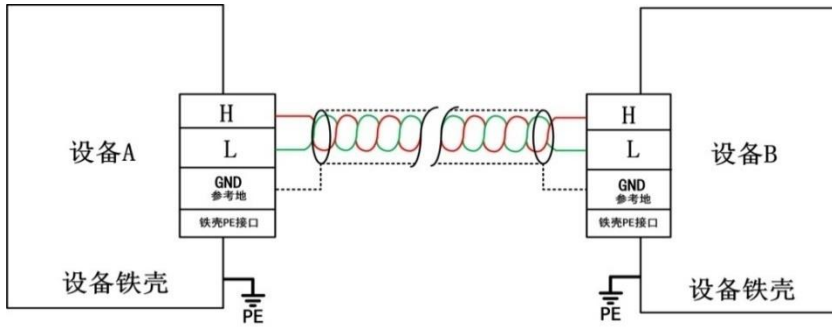
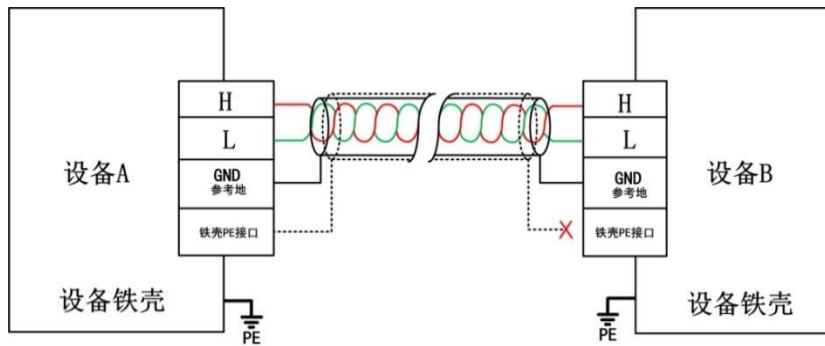Figure 2.8 Double-core single-layer shielded cable connection

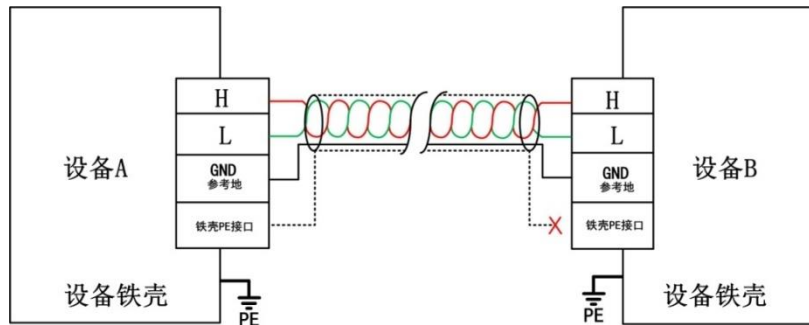Figure 2.9 Double-core double-shielded cable connection

Figure 2.10 Three-core single-layer shielded cable connection

3. Driver Installation

This document uses a PC running Windows as an example to describe how to install the M.2CANFD driver.

3.1 Installing the Driver on Windows

First, insert the M.2CANFD interface card into the M.2 card slot of the computer while power off, 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.
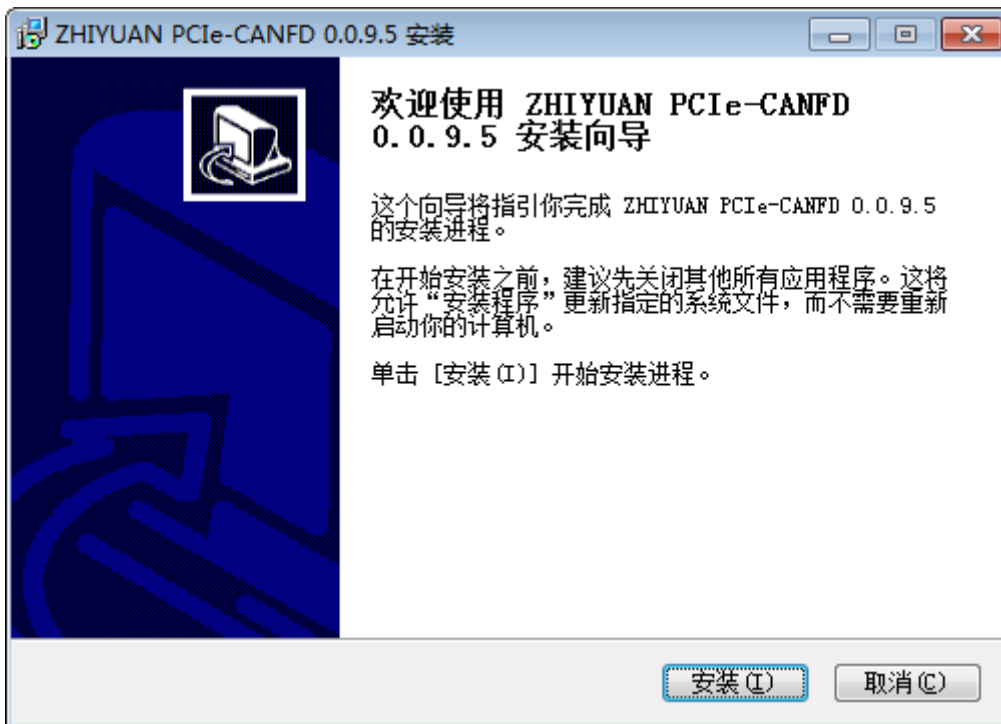

Figure 3.1 Driver software

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

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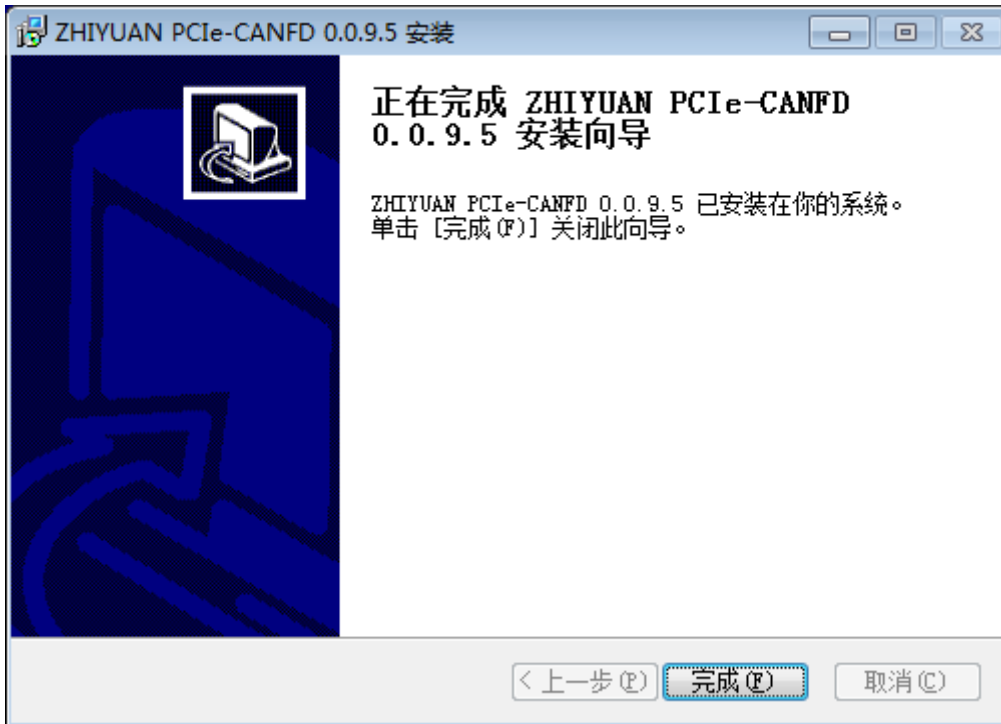

Figure 3.3 Driver installation complete

After the driver is installed, if the M.2CANFD interface card is normal, appears in the device manager, indicating that the driver is installed correctly and a M.2CANFD 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 4.1 M.2CANFD Packing List V1.00

No.	Name	Quantity	Unit	Remarks
1	M.2CANFD card	1	Piece	
2	mPCIeCANFD-PACK interface board	2	Piece	
3	1.25-3P double-headed cable	2	Piece	Used to connect the board and the interface board
4	DB-9 nut	4	Piece	Used to fix the interface board
5	After-sales Service Guide	1	Pcs	
6	Certificate of Conformity	1	Piece	

5. Quick Instructions

5.1　Introduction to the 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 you to carry out CAN bus testing, monitoring, diagnosis, and development.

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

5.2　M.2CANFD User Guide on ZCANPRO

After the device driver and ZCANPRO are installed, M.2CANFD can be used on the ZCANPRO software.

For details about how to use M.2CANFD on ZCANPRO, click [image] 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].
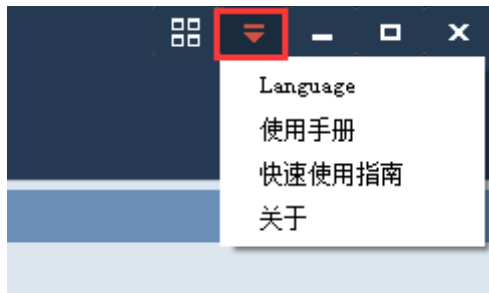

Figure 5.1 Opening the Quick Guide

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 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 M.2CANFD interface card series products at any time without prior declaration.

ESD protection

The M.2CANFD interface card series products have electrostatic protection capabilities to ensure the stable operation of the products. When using M.2CANFD 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.

Dreams come true with professionalism and dedication.

Guangzhou ZLG

Electronics Co., Ltd.

For more details, please visit

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