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1. Product Introduction

1.1 Product Overview

CANFDNET-400U is a high-performance industrial Ethernet and CAN(FD)-bus data conversion device developed by Guangzhou ZLG Electronics Co., Ltd. It integrates four CAN(FD)-bus interfaces, one Ethernet interface, one vehicle dual-wire Ethernet interface, and provides a stable TCP/IP protocol stack. It allows users to easily interconnect the CAN(FD)-bus network and Ethernet and further expand the scope of CAN(FD)-bus network.

CANFDNET-400U is an industrial-grade product working in the temperature range of -40°C to 85°C. It has one 100M/1000M adaptive Ethernet interface, one 10M/100M on-board dual-wire Ethernet interface, and four CAN (FD) ports with a maximum baud rate of 5 Mbps. It has TCP Server, TCP Client, UDP and other work modes. Users can flexibly set configuration parameters by using the configuration software.

1.2 Product Features

1.2.1 Powerful Hardware

- High-speed dual-core A9+FPGA processor;
- 100M/1000M self-applicable Ethernet interface, 2 kV electromagnetic isolation;
- Car dual-wire Ethernet, meeting 100Base-T1 specification
- Four CAN (FD) ports, 2.5 kVDC withstand voltage isolation;
- Rated power supply voltage range 9V-48V DC;
- Operating temperature: -40°C to +85°C;
- Humidity: 5%-95% RH, no condensation;
- Rugged metal housing, SECC metal (1.1 mm);
- Designed specifically for industrial environments.

1.2.2 Perfect Functions

- CAN(FD) interface functions supported:
 - Support baud rate 40K-5Mbps, baud rate can be set arbitrarily;
 - Support various controller types: CAN, CANFD ISO or CANFD Non-ISO;
 - Support the software terminal resistance switch;
 - Support message filtering;
 - Support millisecond-level message timing sending;
 - Support bus utilization reporting;
 - The message sending buffer can be set, and the user can choose the most suitable balance between real-time and large-capacity buffering;
- Multiple work modes supported:
 - Work modes: TCP Server, TCP Client, UDP;
 - Supports a maximum of four TCP servers, each of each supports a maximum of 16 connections; or supports a maximum of 16 TCP Client or UDP connections;

- In each mode, you can choose to upload the CAN (FD) channel message and error message, which can be flexibly used in various scenarios;
- The TCP Server/Client mode connection has a built-in TCP keep-alive mechanism to ensure reliable TCP connections;
- In TCP Client mode, the network will automatically reconnect after disconnection, and the TCP connection will be established reliably;
- In UDP mode, support multicast, IP segment and other operations to support multiple users to control multiple CAN (FD) channels at the same time;
- Supported TCP/IP protocols include IP, ARP, ICMP, UDP, DHCP, DNS, TCP;
- Flexible CAN (FD) packet settings meet various packet requirements of users;
- The communication protocol is open, and the secondary development interface function library is provided (Windows and Linux platforms supported);
- You can configure the working parameters by using the configuration tool, and provide the secondary development interface function library (Windows, Linux platforms supported);
- Support TCP/UDP data conversion between vehicle Ethernet and Ethernet;
- Support local system firmware upgrade.

1.2.3 Typical Applications

- High-speed train operation fault detection and troubleshooting
- Subway train operation fault detection and troubleshooting
- Train control system operation fault detection and troubleshooting
- Wind turbine CANFD communication fault detection
- Multi-channel CANFD communication records and fault analysis for traditional vehicles and new energy vehicles
- Ship CANFD communication fault detection and troubleshooting
- Coal mine CANFD communication fault analysis
- Elevator operation fault detection and troubleshooting
- Construction machinery operation fault detection and troubleshooting
- Aerospace vehicles and ancillary equipment operation detection and troubleshooting

2. Product Specifications

2.1 Electrical Specifications

Table 2.1 Electrical specifications

Parameter Name	Conditions	Rating			Unit
		Minimum	Typical Value	Maximum	
Operating voltage	DC	9	12	48	V
Power consumption		4.2	5.1	8.6	W

2.2 Operating Temperature

Table 2.2 Working temperature

Parameter Name	Rating			Unit
	Minimum	Typical Value	Maximum	
Operating temperature	-40	-	85	°C
Storage Temperature	-40	-	85	°C

2.3 Protection Level

Table 2.3 Protection level-electrostatic discharge immunity test (IEC61000-4-2)

Interface	Test Level	Test Voltage (kV)	Test Result	Remarks
Power supply	Level 4	6	Class A	Contact discharge
CANFD bus	Level 4	6	Class A	Contact discharge
Ethernet	Level 4	6	Class A	Contact discharge
Buttons, Indicators	Level 4	15	Class A	Air discharge

Table 2.4 Protection level-electrical fast transient pulse group immunity test (IEC61000-4-4)

Interface	Test Level	Test Voltage (kV)	Test Result	Remarks
Power supply	Level 3	2	Class A	Capacitive coupling
CANFD bus	Level 3	1	Class B	Capacitive coupling
Ethernet	Level 3	2	Class A	Capacitive coupling

Table 2.5 Protection level-surge (impact) test (IEC61000-4-5)

Interface	Test Level	Test voltage (kV)	Test Result	Remarks
Power supply	Level 3	1	Class A	Line-line
	Level 3	2	Class A	Line-ground
CANFD bus	Level 3	1	Class B	Line-line
	Level 3	2	Class B	Line-ground
Ethernet	Level 3	1	Class A	Line-line
	Level 3	2	Class A	Line-ground

3. Mechanical Dimensions

The mechanical dimensions are shown in the following figure (unit: mm)

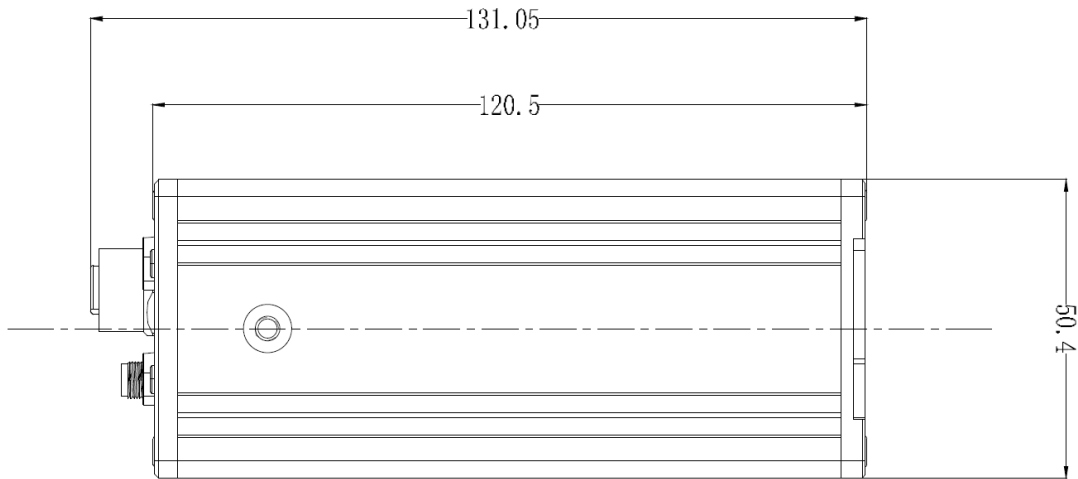


Figure 3.1 Host dimensions diagram 1

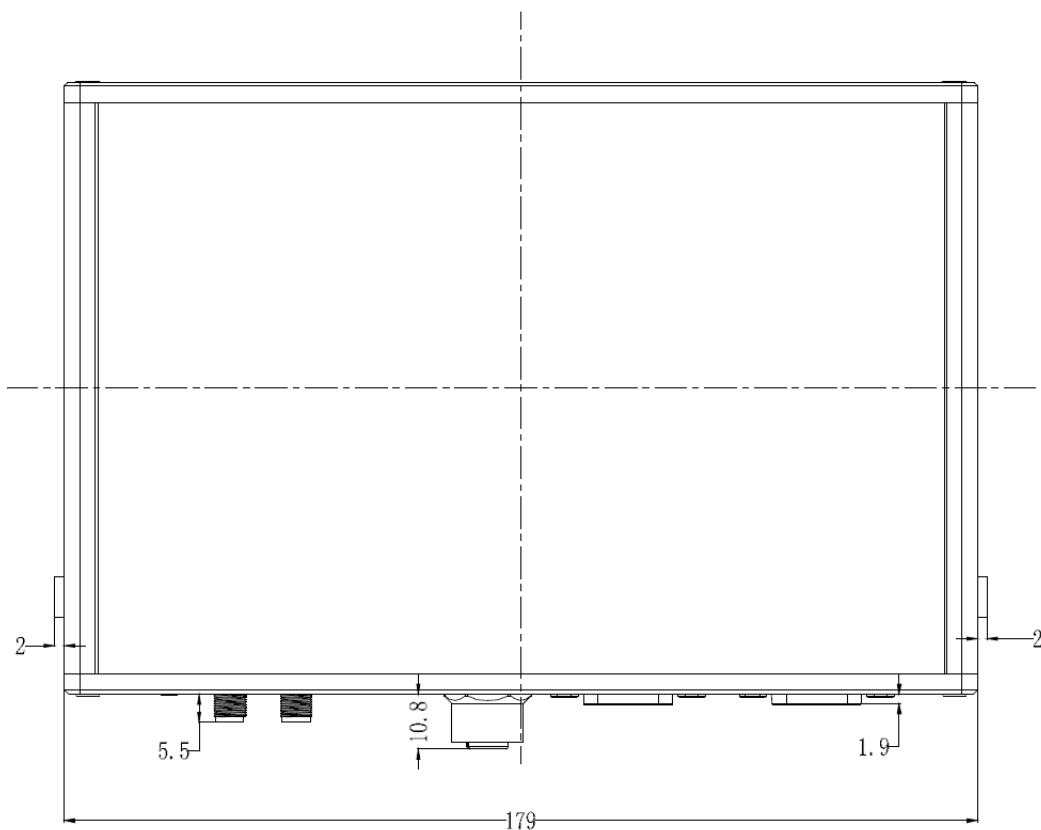


Figure 3.2 Host dimensions diagram 2

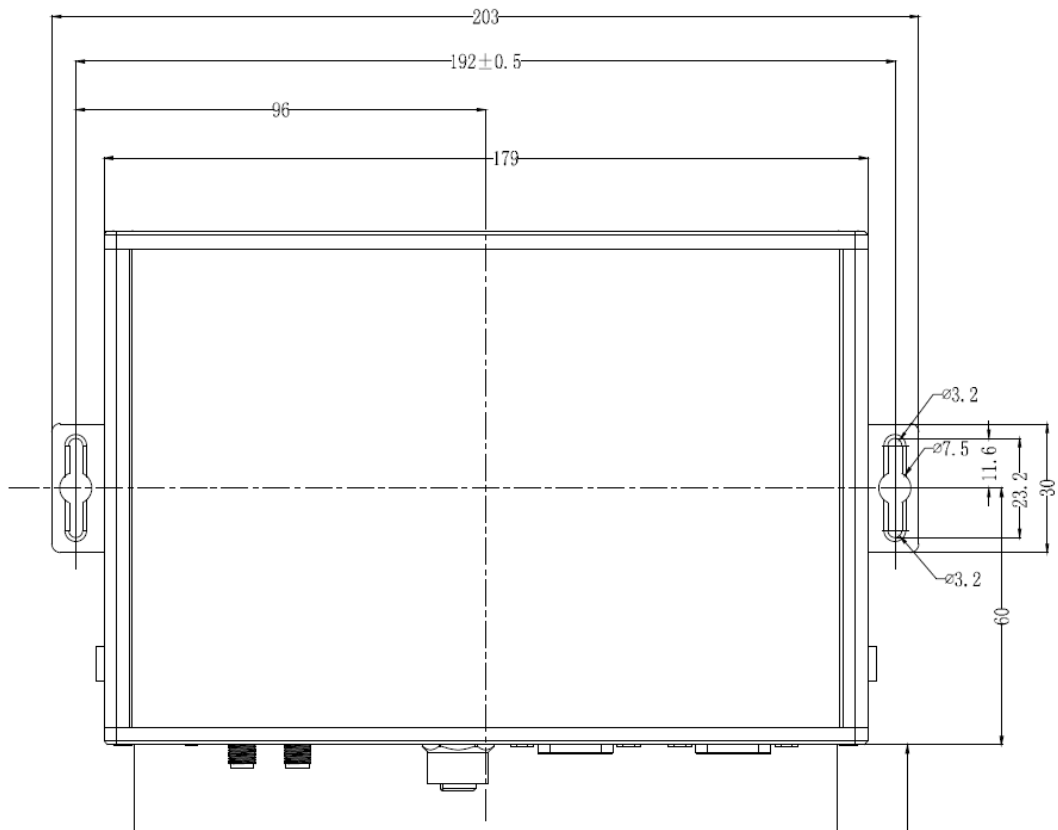


Figure 3.3 Installation method

4. Hardware Interfaces

This section describes the hardware interfaces of CANFDDTU-400 series devices.

4.1 Panel layout

Figure 4.1 shows the device panel layout.

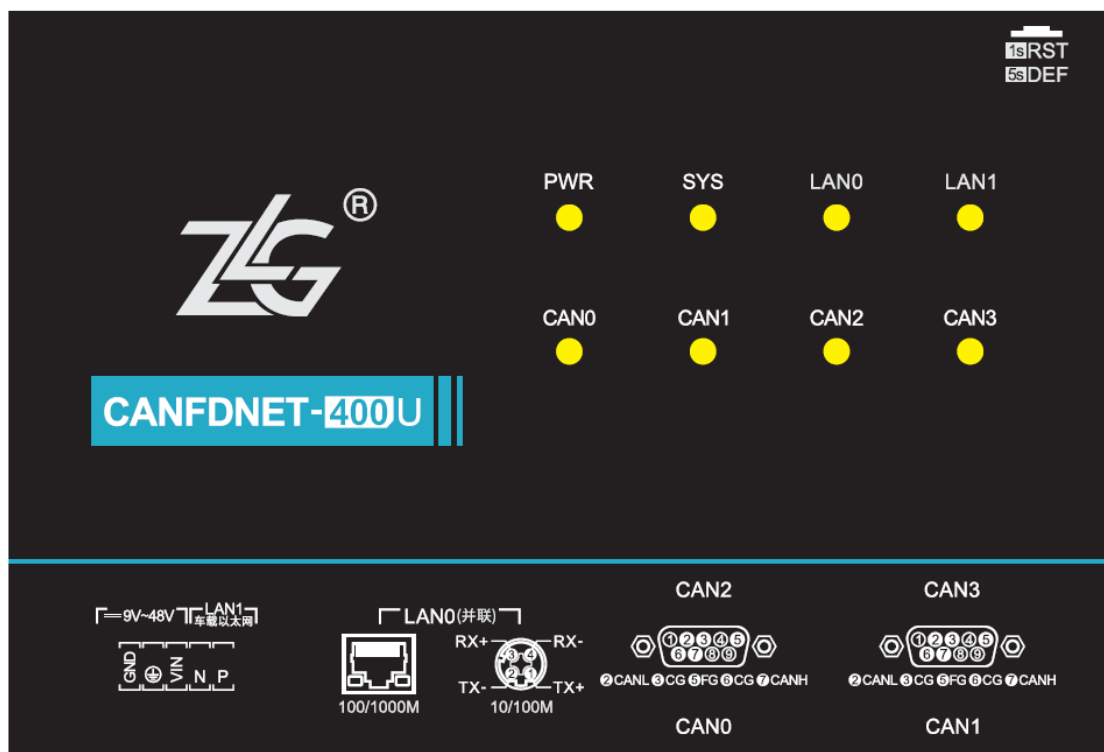


Figure 4.1 Panel layout

4.2 Indicators

Table 4.1 LED indicators

Identification	Function	Status	Status Description	Flash description
PWR	Power indicator	Light off	The device is not powered on	-
		Red	The device is powered on properly	-
SYS	System indicator	Green flashing light	System running	100 ms cycle, after ON twice, wait for 500 ms
		Always red	Device reset and restart	-
LAN0	Ethernet indicator	Light off	Ethernet no connected	-
		Green normally on	Ethernet connected	-
		Green flashing	The application has data transmission and reception	Flash at an interval of 200 ms
		Flash in red	Received data parsing error	Flash at an interval of 200 ms
LAN1	Vehicle Ethernet	Light off	Ethernet no connected	-

	Indicator	Green normally on	Ethernet connected	-
		Green flashing	The app has data transfer	200 ms periodic blink -
CAN0~ CAN3	CAN channel indicator	Light off	Channel not open	-
		Green normally on	Channel open	-
		Green flashing	The CAN channel sends and receives data properly	Flash at an interval of 200 ms
		Flash in red	CAN bus error	Flash at an interval of 200 ms

4.3 Button

The device provides a button as RST to reset the device and restore factory settings.

Table 4.2 Reset button function

Identification	Function
RST/DEF	Resets the device (press)
	Restore factory settings (5s)

4.4 Power Interface

The rated voltage of the power input of the equipment is DC 9-48 V, and the shell is marked as "DC 9-48V". The physical form of the interface is a 5.08 terminal. Table 4.3, Table 4.4 and Table 4.5 list the interface diagram, signal definition, and interface specifications.

Table 4 Power interface

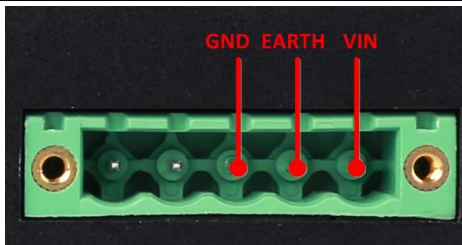
Type	Schematic Diagram
5.08 terminal	

Table 4.4 5.08 terminal signal definition

Function interface	Signal definition	Signal description	Interface Type
			5.08 interface
Power supply	V+	Positive electrode of power	√
	V-	Negative electrode of power	√

Table 4.5 Power interface specifications

Parameter Name	Conditions	Rating			Unit
		Minimum	Typical Value	Maximum	
Operating voltage	DC	9	12	48	V
Power consumption			5.1		W

4.5 CANFD-bus Interfaces

The device provides four isolated CANFD-Bus interfaces. The shell identification is "CAN0", "CAN1", "CAN2", and "CAN3". The physical form of the interface is a DB9 terminal. Table 4.6, Table 4.7 and Table 4.8 list the interface diagram, signal definition, and interface specifications.

Table 4.6 Pin definitions

Type	Schematic Diagram
Pin definitions	

Table 4.7 Signal definition

Function Interface	Signal Definition	Signal Description	Pin Number
CANFD0~CANFD3	CANFD_L	CANFD data transceiver differential inverted signal	2
	CANFD_GND	CANFD isolation ground	3, 6
	CANFD_H	CANFD data transceiver differential positive phase signal	7
	CANFD_FG	Shielding ground	5
	NC	Not connected	1, 4, 8, 9

Table 4.8 CANFD-Bus interface specifications

Parameter		Minimum	Typical Value	Maximum	Unit
Communication baud rate		5k		1M	bps
Number of nodes				110	pcs
Dominant level (logic 0)	CANFDH	2.75	3.5	4.5	V
	CANFDL	0.5	1.5	2	
Recessive level (logic 1)	CANFDH	2	2.5	3	
	CANFDL	2	2.5	3	
Differential level	Dominant (logic 0)	1.2	2	3.1	
	Recessive (logic 1)	-0.5	0	0.05	
Maximum withstand voltage of the bus pin		-18		18	
Instantaneous voltage of the bus		-100		+100	
Isolation voltage (DC)		3500			V

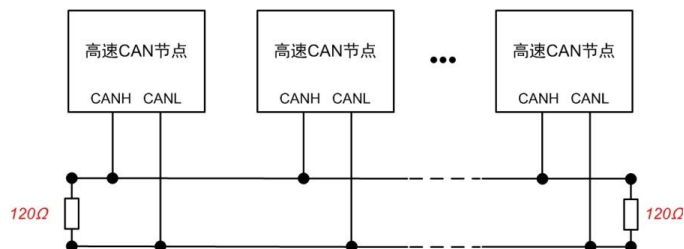


Figure 4.2 Typical high-speed CANFD network connection

Balanced transmission is adopted for the CANFD bus. According to ISO11898-2: In the high-speed CANFD, a 120 ohm terminal resistor needs to be connected to the network terminal node to eliminate signal reflection on the bus and avoid signal distortion. Figure 4.2 shows the high-speed CANFD network topology.

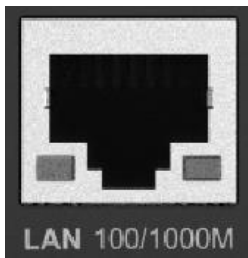
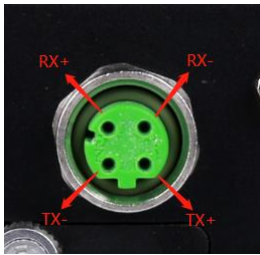
The device has a built-in 120 ohm terminal resistance, which can be connected or disconnected through the network configuration tool in ZCANPRO. For operation details, see chapter 5.5.2.

Note: The bus communication distance and communication rate are related to the field application and can be designed according to the actual application and related standards. CANFD-Bus cable can be ordinary twisted pair, shielded twisted pair or standard bus communication cable. In long-distance communication, the terminal resistance value needs to be selected according to the communication distance, cable impedance and number of nodes.

4.6 Ethernet Interface

The device provides one Ethernet interface. The physical form of the interface is RJ45 or M12 terminal (parallel connection, PHY is one channel), which realizes the communication between the device and the PC. The interface is 100/1000M specification. Table 4.9 lists the interface diagram and signal definition.

Table 4.9 Ethernet interface

Type	Schematic Diagram
RJ45 terminal	 A photograph of a black RJ45 terminal connector with a white plastic insert. The text "LAN 100/1000M" is printed on the bottom of the connector.
M12 terminal	 A photograph of a green M12 terminal connector. Red arrows point to the four pins, labeled RX+, RX-, TX-, and TX+.

4.7 Vehicle Ethernet Interface

The device provides one vehicle Ethernet interface, which meets the OPEN Alliance BroadR-Reach specification. The physical form of the interface is the OPEN terminal, which realizes vehicle Ethernet communication. This interface meets the 10/100M specification. Table 4.10, Table 4.11, and Figure 4.3 show the interface diagram and signal definition.

Table 4.10 Vehicle Ethernet interface

Type	Schematic Diagram
------	-------------------

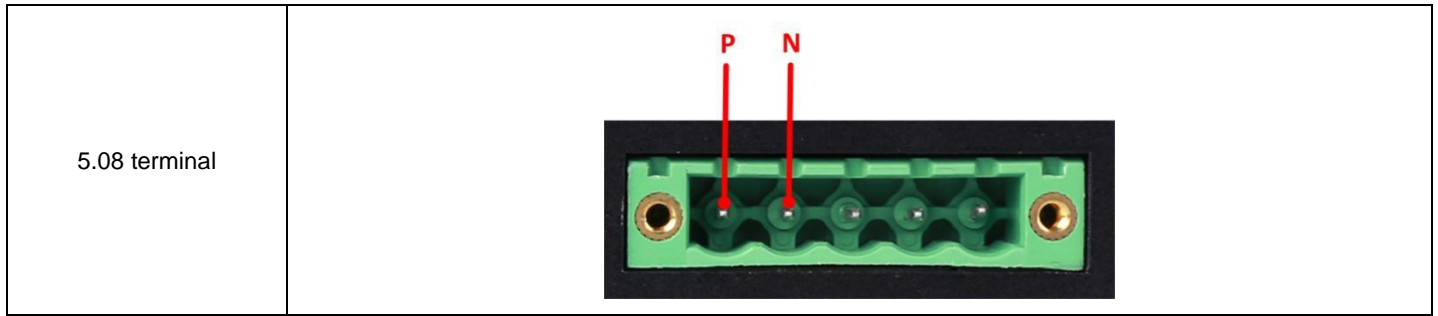


Table 4.11 Signal definition

Function Interface	Signal Definition	Signal Description	Pin Number
LAN1	P	LAN1 data transceiver differential positive phase signal	1
	N	LAN1 data transceiver differential inverted signal	2

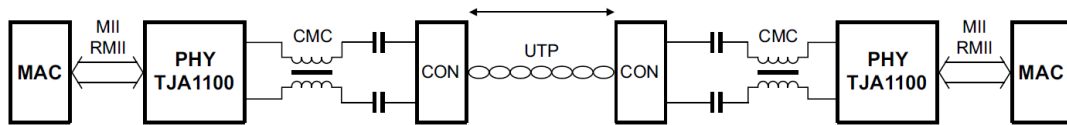


Figure 4.3 Typical network connection of vehicle Ethernet

5. Quick Guide

5.1 Device Connection

Connect the hardware by referring to the interface instructions in the "Product Hardware Interface Instructions" chapter, and power on the device.

5.2 Software Installation

Double-click the "ZCANPRO_Setup_Vxx.xx.xx.exe" ZCANPRO installation package. Follow the installation instructions to install the software. After the installation is complete, run the "ZCANPRO" software.

5.3 Running the Device Configuration Tool

After starting ZCANPRO, the "Device Management" interface appears, as shown in Figure 5.1. Click the Close button ("x") in the upper right corner to close "Device Management".



Figure 5.1 Device management interface

Click the "Tools" option in the toolbar in the upper part of ZCANPRO. Click "Network Device Configuration Tool" in the pop-up list, as shown in Figure 5.2. "Network Device Configuration Tool" is displayed, as shown in Figure 5.3.



Figure 5.2 Running the network device configuration tool

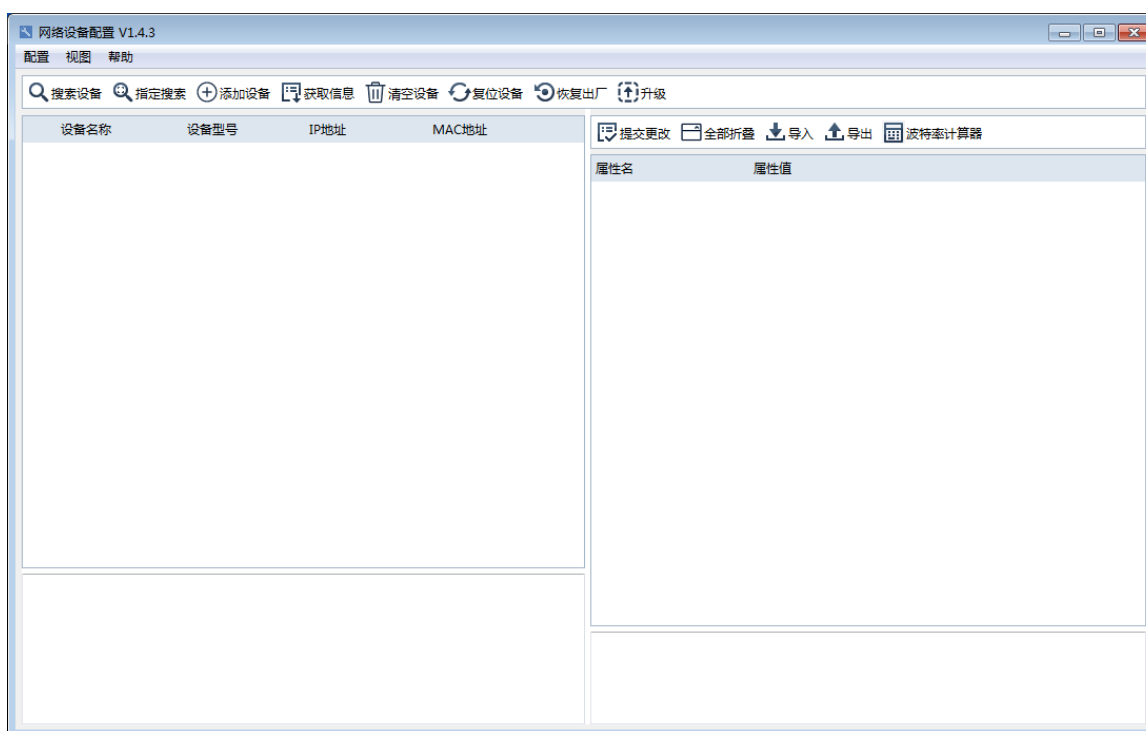


Figure 5.3 Network device configuration tool

5.4 Device Search

Click the "Search Device" option in the upper left corner of the "Network Device Configuration" tool to search for CANFDNET devices in the network. After the search is over, the devices connected to the network are displayed in the device list. Click a device to view or modify its configurations on the right side of the configuration tool.

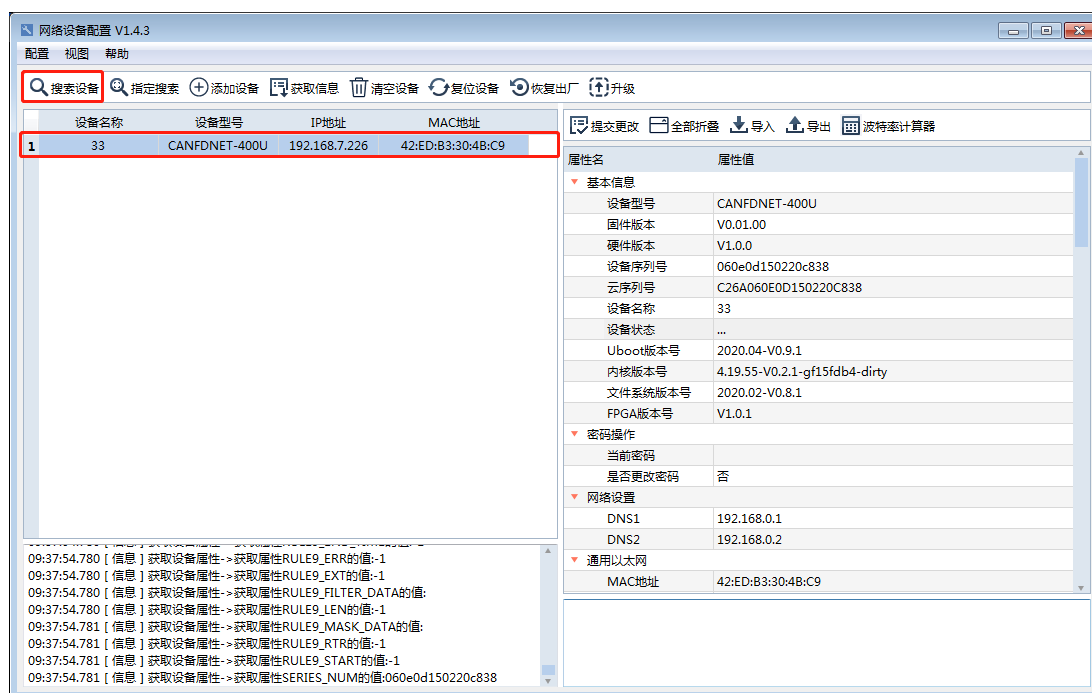


Figure 5.4 Network device configuration tool interface

5.5 Basic Device Configurations

When the device is used for the first time, configure the channel parameters, network parameters and CAN(FD)-to-Ethernet parameters as required.

5.5.1 Configuring Network Parameters

When the CANFDNET device uses the "forwarding Ethernet" function, the device and the PC must be on the same network segment, which ensures normal TCP/UDP connections. Modify the "Universal Ethernet" configuration items as needed.

通用以太网	
MAC地址	42:ED:B3:30:4B:C9
DHCP使能	否
IP	192.168.7.226
子网掩码	255.255.255.0
网关	192.168.7.254

Figure 5.5 "Universal Ethernet" configuration item

1. DHCP enabling: Determine whether to enable DHCP to automatically obtain an IP address as required. After enabling DHCP to obtain an IP address automatically, only a DHCP server device on the network can successfully obtain an IP address and other related information.
2. IP: Configure the IP address of the device.
3. Subnet mask: Specify the subnet for the device IP address.
4. Gateway: gateway address of the device.

5.5.2 Configuring CAN (FD) Channel Parameters

The CANFDNET device has four CAN (FD) channels, each of which needs to be configured independently. Modify the "CANx Configuration" configuration item as needed.

CAN0配置	
控制器类型	ISO CANFD
工作模式	正常模式
控制器时钟	40
自定义波特率使能	否
仲裁域波特率	1Mbps 80%
数据域波特率	5Mbps 75%
终端电阻	打开
定时发送	...
报文发送间隔(ms)	0
发送缓冲区	4096
发送缓冲策略	满时丢弃新数据
总线利用率使能	是
总线利用率采集...	1000

Figure 5.6 CAN channel configuration interface

1. Select the controller type: protocol standard for the channel device channel to access the bus.
2. Select work mode: normal mode and listen-only mode; when the channel is working in listen-only mode, the controller will not send data (including the answer bit) to the bus.
3. Select the baud rate: when the channel works in CAN mode, you only need to configure the "arbitration domain baud rate", and select the baud rate as needed; when the channel works in CANFD mode, the "data domain baud rate" needs to be configured separately; when none of the options in the baud rate list meets the requirements, you can use a custom baud rate. After calculating the baud rate parameters in the baud rate calculator, copy the result to the "custom baud rate" configuration item.
4. Select terminal resistance enable: Determine whether to enable terminal resistance based on the impedance matching on the bus. After the terminal resistance is enabled, a 120 ohm resistor will be connected in parallel on the bus; **after the terminal resistance is connected, the impedance on the bus will be changed. If you do not know whether access is required, you are advised not to enable it.**

5.5.3 Configuring CAN(FD)-to-Ethernet Parameters

The CANFDNET device supports 16-channel Ethernet forwarding configuration. Click the "CAN(FD) to Ethernet" option. The "CAN(FD) to Ethernet" configuration interface appears.

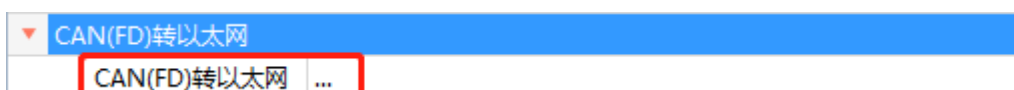


Figure 5.7 "CAN(FD)-to-Ethernet" option

	<input type="checkbox"/>	工作模式	本地端口	目标地址	目标端口
1	<input checked="" type="checkbox"/>	TCP服务器	8000	--	--
2	<input type="checkbox"/>	TCP服务器	0	--	--
3	<input type="checkbox"/>	TCP客户端	0		1
4	<input type="checkbox"/>	TCP客户端	0		1
5	<input type="checkbox"/>	TCP客户端	0		1
6	<input type="checkbox"/>	TCP客户端	0		1
7	<input type="checkbox"/>	TCP客户端	0		1
8	<input type="checkbox"/>	TCP客户端	0		1
9	<input type="checkbox"/>	TCP客户端	0		1
10	<input type="checkbox"/>	TCP客户端	0		1
11	<input type="checkbox"/>	TCP客户端	0		1
12	<input type="checkbox"/>	TCP客户端	0		1
13	<input type="checkbox"/>	TCP客户端	0		1
14	<input type="checkbox"/>	TCP客户端	0		1
15	<input type="checkbox"/>	TCP客户端	0		1
16	<input type="checkbox"/>	TCP客户端	0		1

查看高级配置项

取消 确定

Figure 5.8 "CAN(FD)-to-Ethernet" configuration interface

1. Work mode: Set the work mode of the device, "TCP server", "TCP client", or "UDP".
2. Local port: Set the local port of the device. When it is set to 0, it will be assigned by the system by default.
3. Destination address: In TCP server mode, you do not need to configure the destination address; in other modes, the destination address is the address of the remote TCP server or UDP.
4. Destination port: In TCP server mode, you do not need to configure the destination port; in other modes, the destination address is the port number of the remote TCP server or UDP monitoring.
5. Enable forwarding configuration: After configuring the parameters, select the leftmost check box of the current configuration item.

5.5.4 Downloading Configurations

After modifying the configuration parameters, enter the password (default: 88888) in the "Current Password" option box of the configuration item "Password Operation", as shown in Figure 5.9. Click the "Submit Changes" button at the top of the configuration parameter interface to download the configuration to the device. After the configuration is modified successfully, the "Modified successfully" message appears, as shown in Figure 5.10.

▼ 密码操作	
当前密码	88888 
是否更改密码	否

Figure 5 Entering the device password



Figure 5.10 Successful modification

5.6 Connecting ZCANPRO

After exiting the "Network Device Configuration Tool", return to the ZCANPRO software. Click "Device Management" in the upper option bar to display the "Device Management" interface, and select "CANFDNET-400U-XXX" in the "Type" drop-down list. The specific device needs to match the work mode configured in 5.5.3 Configuring CAN(FD) to Ethernet Parameters. Click "Start Device".

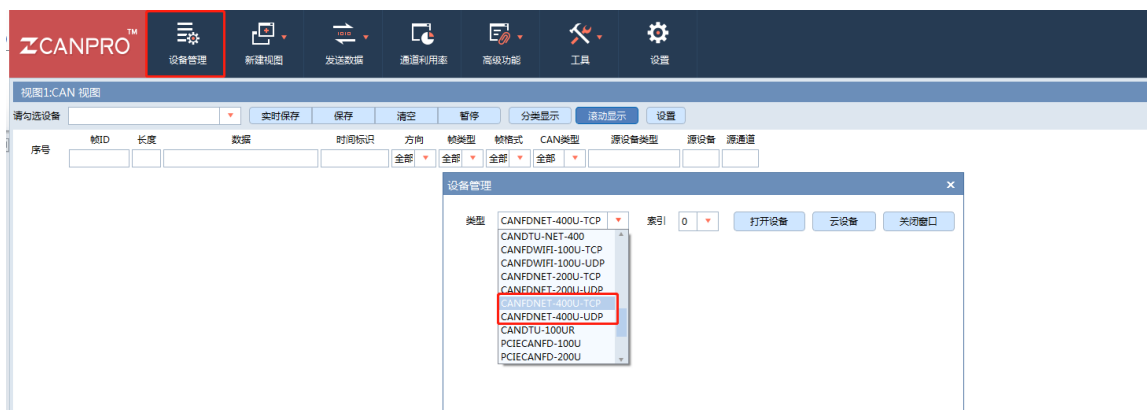


Figure 5.11 Starting the device in ZCANPRO

After starting the device, click "Start". On the startup interface, configure the parameters by referring to Section 5.5.3 Configuring CAN(FD) to Ethernet Parameters, and click "OK". The CAN(FD) data can be sent and received by using the usage method of ZCANPRO.



Figure 5.12 Starting the device

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!

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