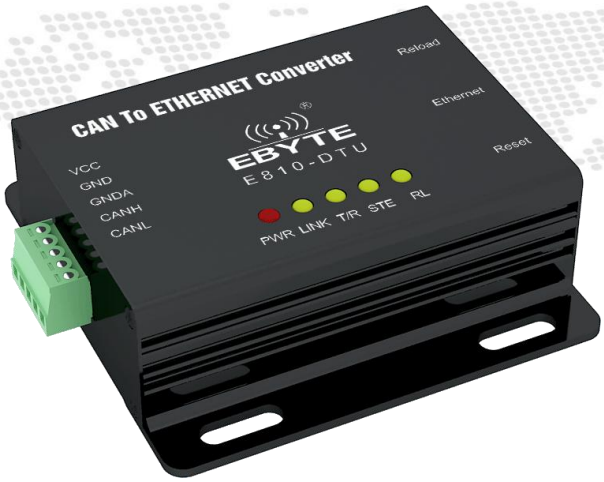
Chengdu Ebyte Electronic Technology Co.,Ltd

Wireless Modem

User Manual

E810-DTU(CAN-ETH) User Manual
Industrial CAN to Ethernet DTU



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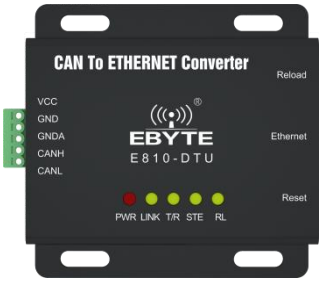
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1. Introduction

1.1. Product Introduction



The E810-DTU (CAN-ETH) is a high-performance CAN-Bus DTU that integrates one CAN interface and one Ethernet interface. With the high-performance E810-DTU (CAN-ETH), users can easily interconnect the CAN-bus network and the Ethernet network.

The E810-DTU (CAN-ETH) is a CAN to Ethernet device that supports the TCP/IP network protocol. The device supports adaptive network speed (up to 100M full duplex) and provides four working modes: TCP Server, TPC Client, UDP Server, and UDP Client, which can help users to efficiently perform two-way data transparent transmission between TCP/UDP and CAN.。The device supports two-way SOCKET working at the same time, and the WEB page can be used for parameter configuration.

E810-DTU (CAN-ETH) is easy to operate, and the data transmission is flexible, efficient, and highly reliable. It can help users quickly to establish a stable and reliable data transmission environment and easily realize data transmission.

1.2. Features

CAN Features

Integrated 1 channel CAN-bus interface；

CAN-bus signal includes：CAN_H、CAN_L

CAN-bus support CAN2.0A and CAN2.0B format, which satisfy ISO/DIS 11898 specification；

CAN-bus communication baud rate has 15 baud rates from 6Kbps to 1Mbps；

CAN-bus interface has electrical protection; common mode inductor for effective removal of common mode noise;

Ethernet Features

The standard Ethernet interface, RJ45, supports 10/100M self-adaptation;

Support heartbeat packages, registration packages, short connections, KeepAlive, cache clearance and timeout restart functions;

Support Modbus TCP to RTU function;

Supporting Transport Cloud(Ebyte Cloud)；

Support Web page settings；

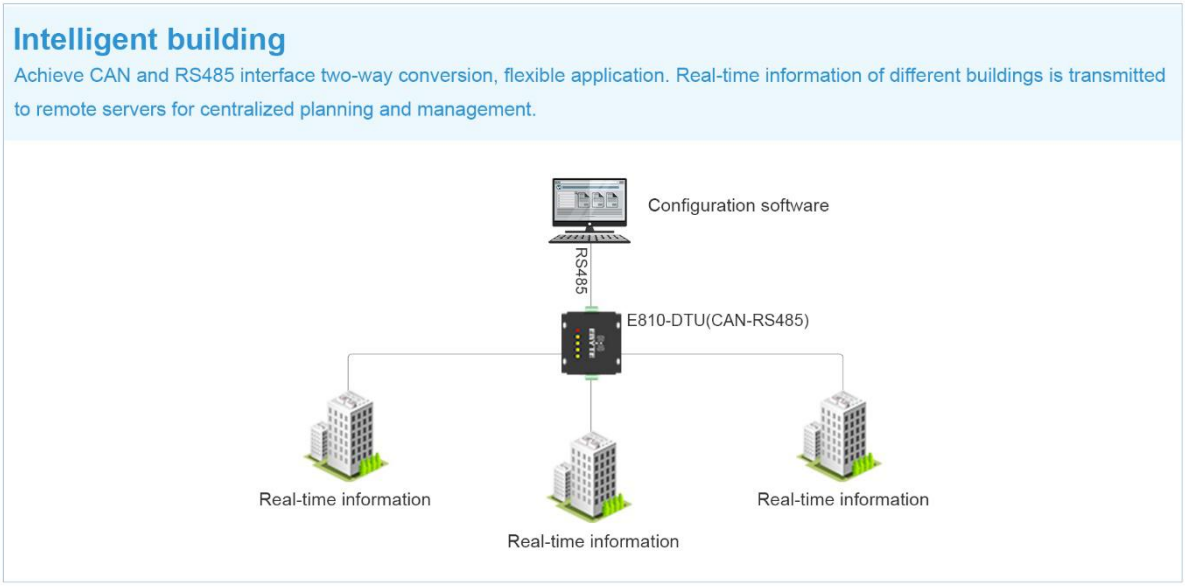
Working Port, Target IP and Target Port can be set；

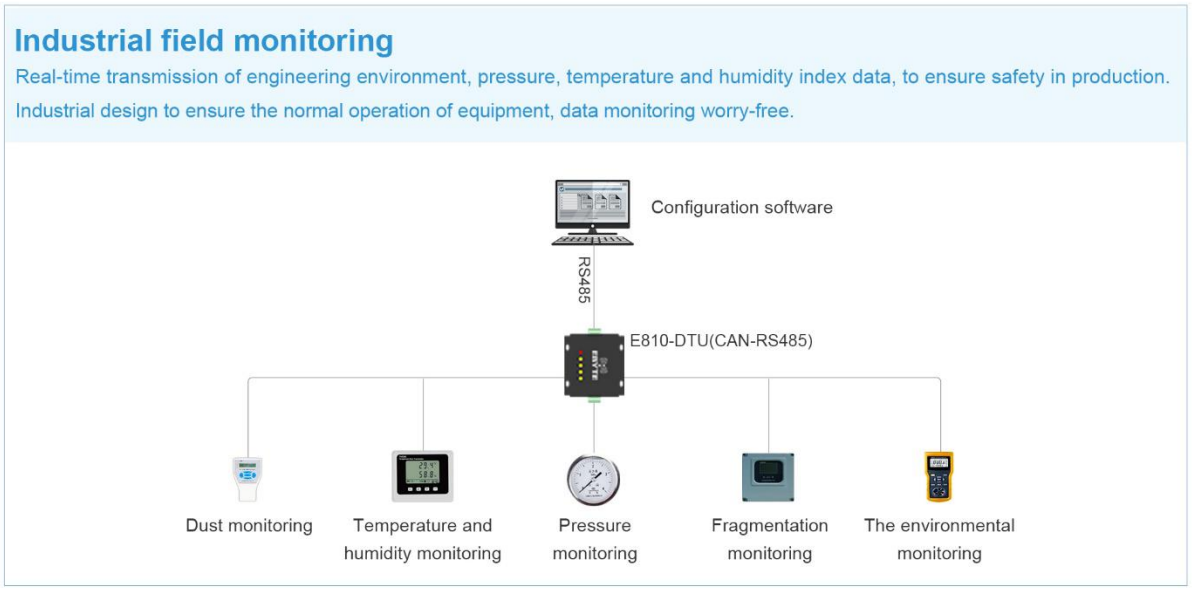
Support two SOCKET working simultaneously, four SOCKET working modes (TCP Server, TCP Client, UDP Server, UDP Client);

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1.3. Typical application

- CAN-bus network diagnosis and testing: real-time diagnosis of CAN-bus.
- Industrial Ethernet connection to CAN network: industrial field data remote transmission.
- Power communication network, industrial control equipment: long-distance communication, industrial field control.
- Building control: real-time information of buildings, transmitted to remote servers for coordination.
- Mine monitoring: real-time transmission of mine pressure, dust, temperature and humidity data.
- Charging pile: monitor the status of each charging pile in real time, and control the status of the project in time.





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2. Quick Use

2.1. Equipment use

E810-DTU (CAN-ETH) is powered by +8~28V DC (the +12V or +24V standard power supply is recommended). When the device is powered normally, Users can use WEB page to configure its working mode and basic operating parameters (See the WEB page configuration method in 4.9 WEB introduction and configuration).

2.2. Default parameters

IP Acquisition type	STATIC
IP address	192.168.4.101
Subnet mask	255.255.255.0
gateway	192.168.4.1
DNS	61.139.2.69
Spare NDS	192.168.4.1
CAN baud rate	100 kbps
Packing time	10 (ms)
Packing length	1000 (byte)
Filter frame type	Receive all frames
Socket A1 Basic parameters	TCPS,192.168.4.101,8886
Socket A1 Heart Packet Mode	NET
Socket A1 Heartbeat package content	0(s), Turn off the heartbeat package function
Socket A1 Registration package mode	heartbeat msg
Socket A1 Registration package time	Turn off
Socket A1 Registration package content	regist msg
Socket A1 Short connection time	0(s)，Turn off short connection
Socket A1 keepalive parameter	time/inteval/probes = 10(s)/5(s) /30(times)
Socket A1 Empty the cache function	OFF，Turn off
Socket B1 Basic parameters	TCPC,192.168.4.100,8887
Socket B1 Heartbeat packet mode	NET
Socket B1 Heartbeat packet time	0(s), Turn off the heartbeat package function
Socket B1 Heartbeat package content	heartbeat msg
Socket B1 Registration package mode	Turn off

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Socket B1 Registration package content	regist msg
Socket B1 Short connection time	0(s), Turn off short connection
Socket B1 keepalive parameters	time/inteval/probes = 10(s) /5(s) / 30(times)
Socket B1 Empty the cache function	OFF, Turn off
Cloud transparent switch	OFF, Turn off
Tcp server Max. Connection No.	6
Intranet discovery port	1901
Intranet discovery password	www.cdebyte.comwww.cdebyte.com
web port	80
Web Login username/password	admin/admin
Timeout restart time	3600(s)

2.3. WEB introduction and configuration

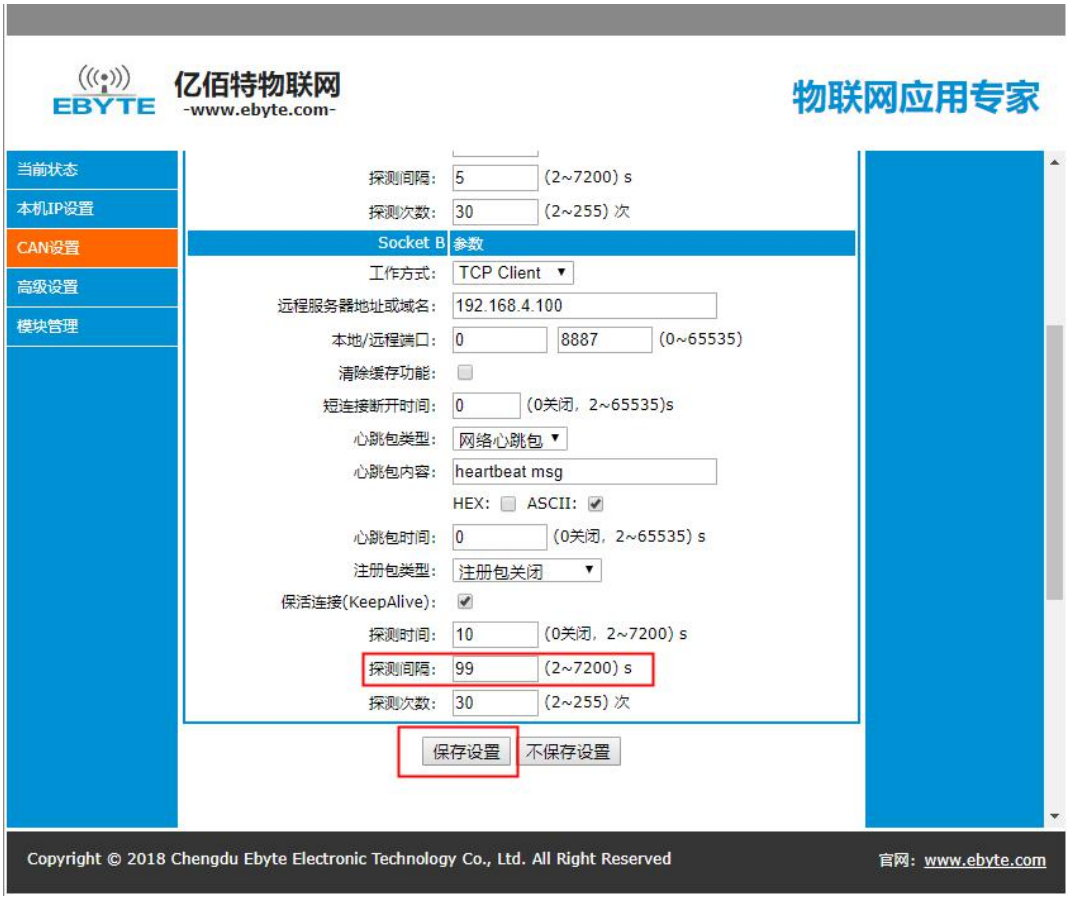
The module supports web page configuration. Users can input the IP address and port through any browser (the default IP address is 192.168.4.101. The browser default port is 80). After successful login, enter the web page (the default username and password are both admin).As shown in the figure:



Select a page for parameter browsing and configuration according to specific needs (taking CAN settings as an example).



After the parameters filled in correctly in this page, click Save Settings.



The page will automatically jump to the module management page. After clicking on the module to restart, the module will restart and the parameters set will take effect.



2.4. Communication instructions

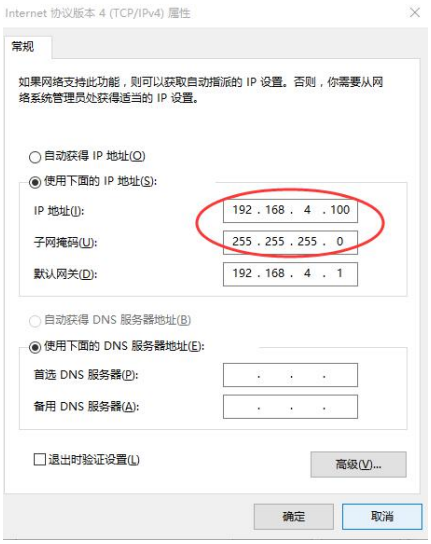
Preparation:

One E810-DTU(CAN-ETH), one CAN analyzer(This is used to analyze, send and receive data on CAN bus. One side of the CAN analyzer is CAN-Bus and another side is USB, which can connect to computer directly), E810-DTU(CAN-ETH) is connected to the CAN_H,CAN_L of CAN analyzer to form the communication network. In a same one PC, the mutual communication can be realized via the CAN analyzer and network debugging tool.

2.4.1. SOCKET instructions

1. Set the IP address of PC same as the E810-DTU(CAN-ETH) and same subnet mask. For example, the IP of PC is 192.168.4.100, the IP of module is 192.168.4.101;

PC configuration:



Module configuration:



2.4.2. TCP Client instructions

1. Open the network debugging assistant in PC, here We take “Savage Network Debugging Assistant” as example.Set the protocol type to TCP Server. The local IP address and port are set to 192.168.4.100 and 8886 respectively.



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2. Set the network type of SOCKET A1 to TCPC (TCP Client), target IP as 192.168.4.100. local port as 0(random port), target port 8886, click Save.



3. Open the CAN analyzer software, select the correct COM port and baud rate, and connect the device to TCP Server for communication test with "network debugging assistant"

The below picture shows a standard data frame sent by the network. The CAN sending ID is 0x00 0x00 0x00 0x00 0x01 and the data is 0X11 0x22 0x33 0x44 0x55. The data sent should conform to the data format (see the basic function of CAN-Data Protocol for details).



2.4.3. TCP Server instruction

1. Set the Network Debugging Assistant to TCP Client, set the remote host IP to 192.168.4.101, and set the remote host port number to 8886.

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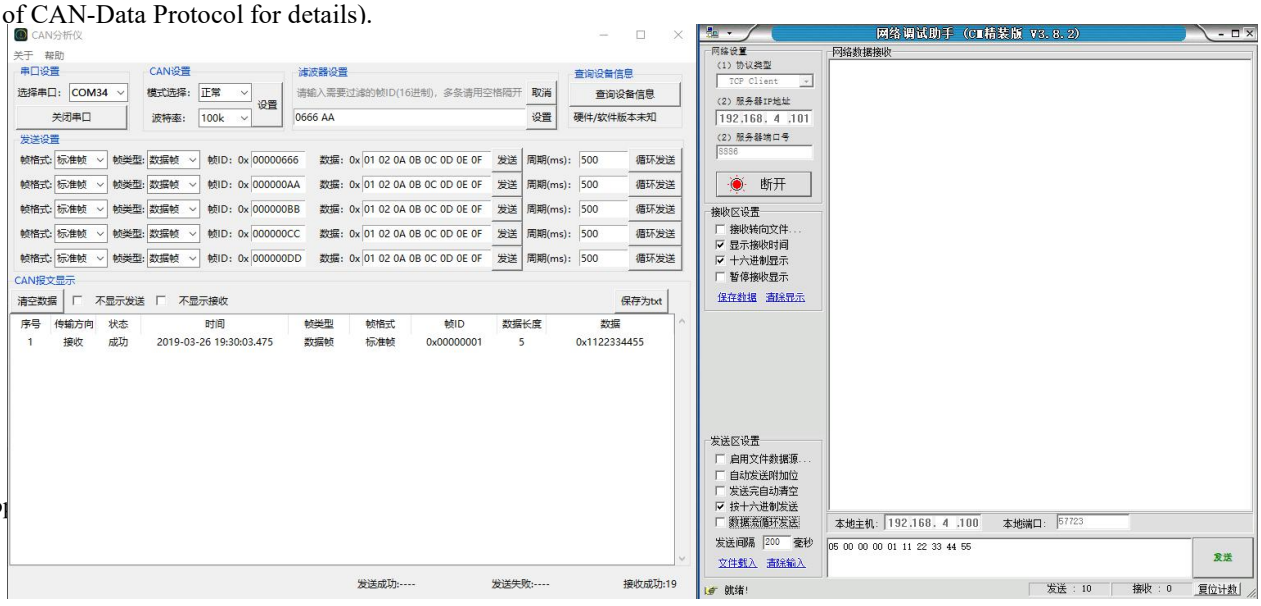


2.Set the network type of SOCKET A1 to TCPS (TCP Server) and local port 8886. Click Save to restart the module.



3.Open the CAN analyzer software, select the correct COM port and baud rate, and click the "Network Debugging Assistant" to connect the device for communication test.

The below picture shows a standard data frame sent by the network. The CAN sending ID is 0x00 0x00 0x00 0x00 0x01 and the data is 0X11 0x22 0x33 0x44 0x55. The data sent should conform to the data format (see the basic function of CAN-Data Protocol for details).

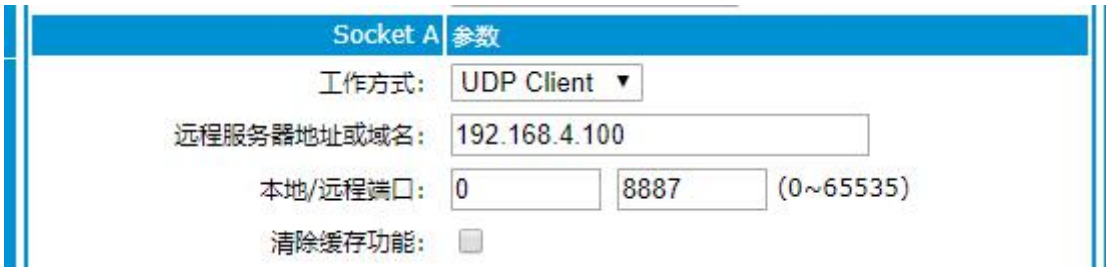


2.4.4.UDP Client instruction

1.Set "Network Debugging Assistant" to UDP (this host does not distinguish UDP Client from UDP Server), local host IP set to 192.168.4.100, and local host port number set to 8887.



2. Set the network type of SOCKET A1 network type to UDPC (UDP Client), the target IP address is 192.168.4.100, and the destination port is 8887. Click Save to restart the module.



3.Open the CAN analyzer software, select the correct COM port and baud rate, and click the "Network Debugging Assistant" to connect the device for communication test.

The below picture shows a standard data frame sent by the network. The ID is 0x00 0x00 0x06 0x66 and the data is 0x01 0x02 0x0A 0x0B 0x0C 0x0D 0x0E 0x0F. The data received by the network conforms to the data format. (see the basic function of CAN-Data Protocol for details).

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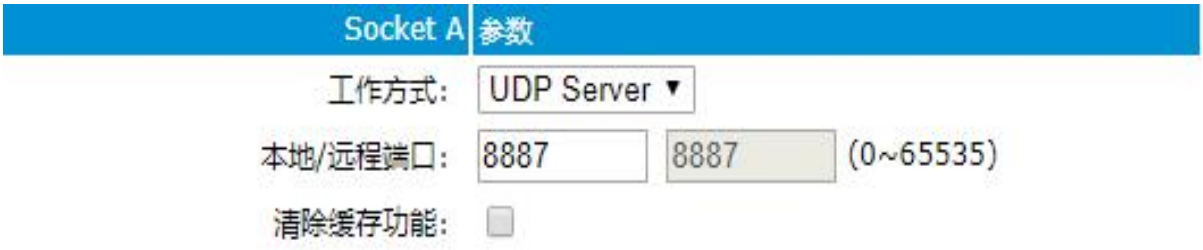
2.4.5.UDP Server instruction

1. Set the Network Debugging Assistant to UDP (this host does not distinguish between UDP Client and UDP Server), the local host IP is set to 192.168.4.101, the local host port number is set to 8886, and the remote host is set to 192.168.4.101:8887.



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2. Set the network type of SOCKET A1 to UDPS (UDP Server), the local IP address to 192.168.4.101, and the local port 8887. Click Save to restart the module.



3. Open the CAN analyzer software, select the correct COM port and baud rate, click the "Network Debugging Assistant" to connect the device for communication test.

The picture shows that the network sends a frame of standard data frame, the CAN transmission ID is 0x00 0x00 0x00 0x01, the data is 0x11 0x22 0x33 0x44 0x55, the transmitted data needs to conform to the data format (see CAN basic function-data protocol for details)



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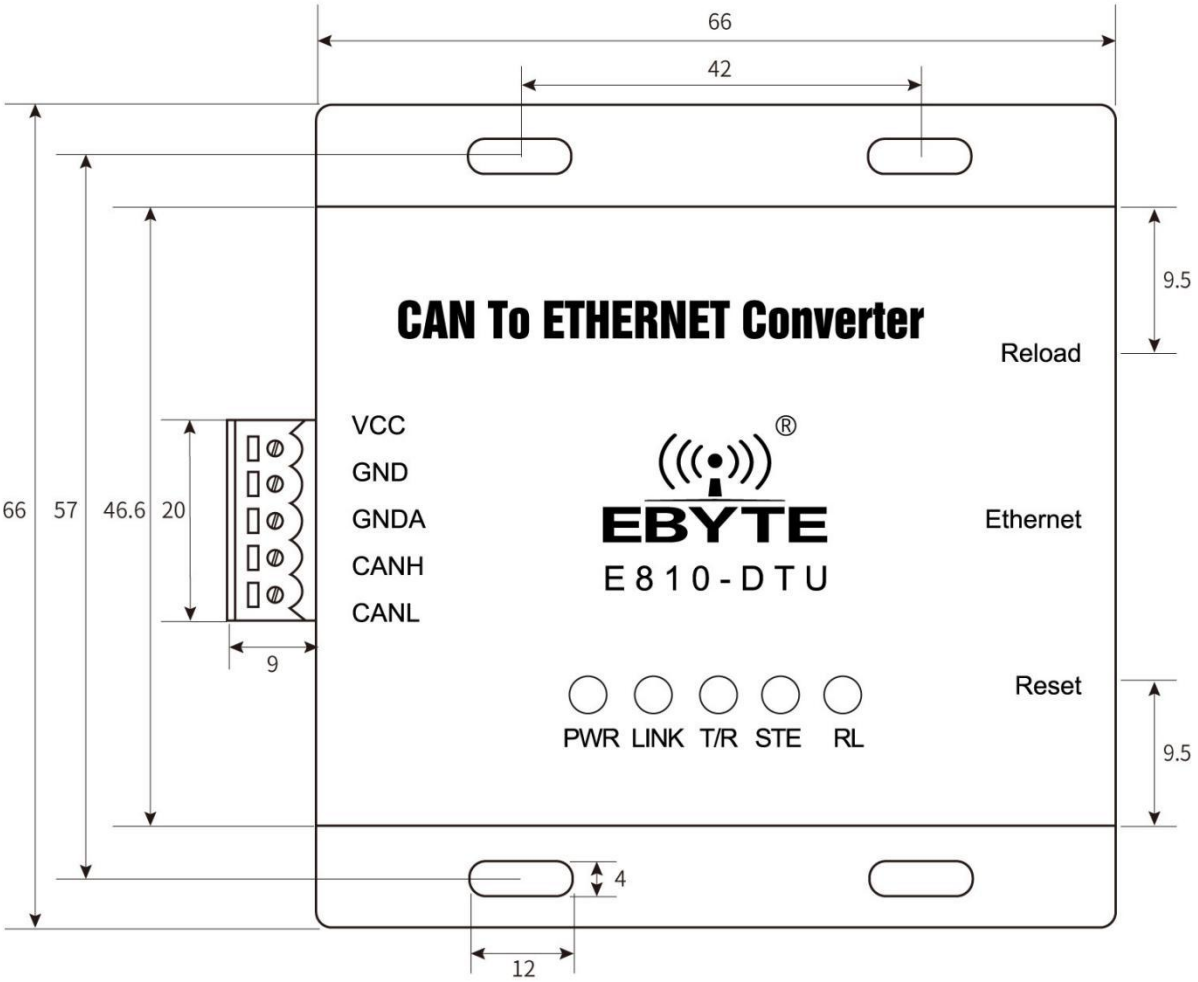
3. Hardware parameter introduction

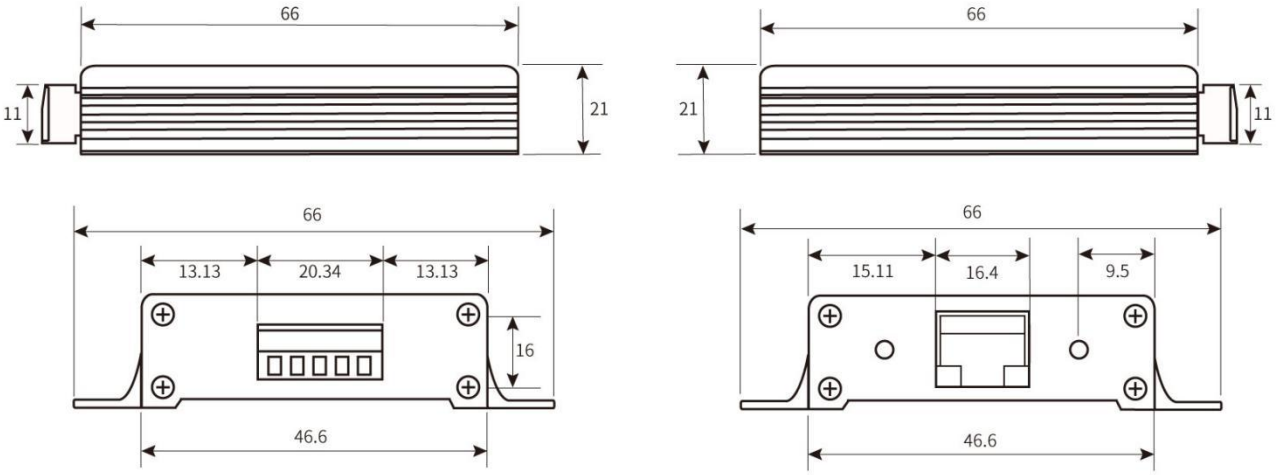
3.1 Main specification

SN	Parameters	Specification
1	Interface	Ethernet:RJ45, 10/100Mbps CAN:1*5*3.81, Screwing
2	Network protocol	IP、 TCP/UDP、 ARP、 ICMP、 IPV4
3	Simple transparent transmission	TCP Server、TCP Client、UDP Server、UDP Client、Cloud transparent transmission
4	Data Packing Mechanism	Byte packing and time packing
5	TCP Server connection	Supporting up to 6 TCP connections
6	IP access	Static IP、 DHCP
7	DNS	Support
8	CAN Transmit baud rate	A total of 15 baud rates from 6Kbps-1000Kbps
9	CAN filtering mode	Up to 8 filtration modes
10	CAN data layout	protocol format
11	Parameter configuration	Web page configuration
12	Working current	82mA@12V
13	Voltage	8V~28VDC，Over 28V may burn the product, It’s recommend to use 12V or 24V
14	Working temperature	-40 ~ +85℃, Industrial grade
15	Working humidity	10% ~ 90%, relative humidity, no condensation
16	Product size	66*66*21（mm）
17	Average weight	
18	PCB	2 laminate
19	Storage temperature	-40～+125℃, Industrial grade

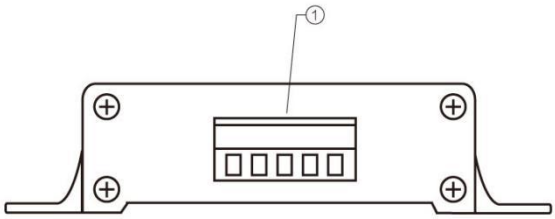
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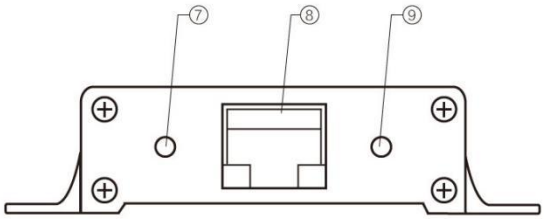
3.2. Mechanical Dimension Diagram and Pin Definition

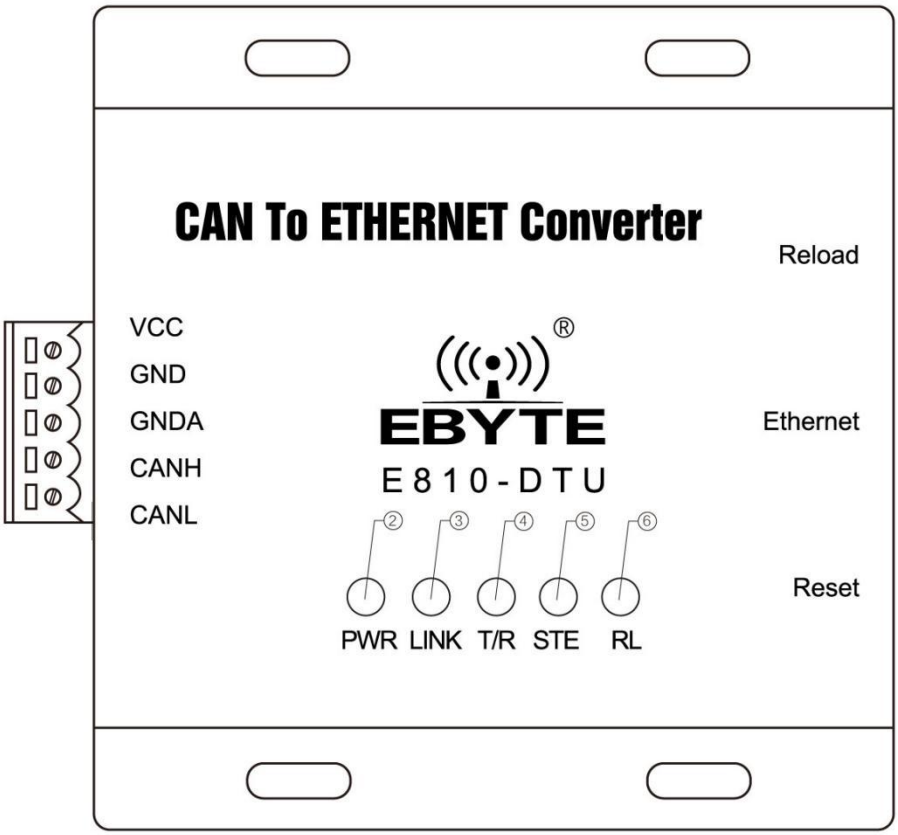




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SN	Name	Usage
1	VCC	Power, default 8-28V (customizable standard 5V version), recommended 12V/24V
2	GND	Power ground
3	GNDA	Signal reference ground
4	CANH	CAN communication interface, CAN bus H
5	CANL	CAN communication interface, CAN bus L
6	PWR	Power Indicator
7	WORK	TX and RX indicator
8	LINK	Connection indicator-

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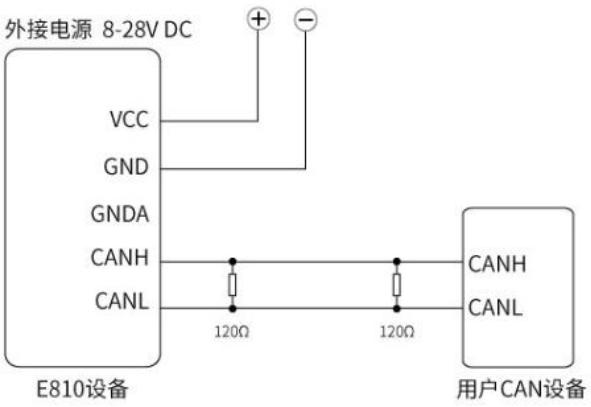
9	STE	Status Indicator
10	RL	Restore factory settings indicator
11	Reset	Reset setting button
12	Ethernet	RJ45 interface
13	Reload	Restore factory settings button, long press 5-10s to restore factory settings

3.3.Connection Method

3.3.1. Ethernet connection method



3.3.2. CAN connection method



Note: When the CAN bus high-frequency signal is transmitted, the signal wavelength is relatively short with respect to the transmission line, and the signal will form a reflected wave at the end of the transmission line, which interferes with the original signal. Therefore, it is necessary to add a terminating resistor at the end of the transmission line so that the signal does not reflect after reaching the end of the transmission line. The terminating resistor should be the same as the impedance of the communication cable, typically 120 ohms. Its function is to match the bus impedance, improve the anti-interference and reliable operation of data communication.

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4. Product function introduction

4.1.Network basic function

4.1.1. IP address introduction

IP address refers to the Internet Protocol address, indicating the identity of the module in the LAN.The IP address is unique in the LAN and therefore cannot be duplicated with other device addresses on the same LAN.E810-DTU (CAN-ETH) supports static IP and DHCP IP acquisition methods.

Static IP: Static IP is required to be manually set by the user. During the setting process, note that the IP, subnet mask and gateway are simultaneously written.Static IP is suitable for LAN communication without DHCP Server or fixed IP address.

DHCP: DHCP is mainly used to dynamically obtain IP address, Gateway address and NDS server address information from gateway host (with DHCP server). By DHCP, users can save the tedious steps of setting IP address manually, and avoid the conflict of IP address in LAN caused by setting IP address manually.

4.1.2. Subnet mask introduction

The subnet mask is a type used to indicate which network the host indicated by the IP address is in. The subnet mask cannot exist separately. It needs to be used together with the IP address. Its role is to divide an IP into two parts: the network address and the host address.

The subnet mask is a 32-bit address. For a class A address, the default subnet mask is 255.0.0.0, the default subnet mask for class B is 255.255.0.0, and the default subnet mask for class C is 255.255.255.0. For example, for our commonly used class C address, the capacity of IP in the subnet is $2^8 = 256$, but because all 0 and all 1 are special IP addresses in the IP address, the number of IP available in class C subnet mask is 254.

4.1.3.Gateway Introduction

Gateway, also known as Inter-Network Connector, realizes the interconnection between two networks.If the device is connected to a router, the gateway is the router IP address.Through the gateway,the device can access another network (or local area network) connected by the gateway.

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4.1.4. DNS introduction

DNS is called Domain Name System. The mutual mapping of domain names and IP addresses on the World Wide Web (www) is the database. After the device has the correct DNS server, it can interact with the external network (World Wide Web) server through the network domain name.

4.1.5. Data packing mechanism

Because the data of the network end is transmitted by data frame, it is necessary to send the frame data of CAN to the network end, so that the data can be transmitted more efficiently and quickly.

Serial port packing time: The default is 10ms, which can be set from 0 to 1000.

Serial port packing length: The default is 1000 bytes, which can be set from 0 to 1000.

Note:

When both of the parameters are not 0, C based on the rules which any of them are satisfied;

When one parameter is 0, the packing rule will be another non-zero value;

When both parameters are 0, the packing rule is the default parameter value: 10ms/1000 bytes.

4.1.6. SOCKET function

E810-DTU (CAN-ETH) can establish two Sockets, respectively Socket A1, Socket B1.

Socket A1 support TCP Client、TCP Server、UDP Client、UDP Server ect. All types. Socket B1 only support TCP Client、UDP Client、UDP Server.

Two Sockets can connect to different networks for data transmission at the same time.

4.1.7. TCP Client function

(1)TCP Client provides client connection for TCP network services. It proactively initiate a connection request to the server and establish a connection for interaction between serial data and server data.According to the relevant provisions of the TCP protocol, the TCP Client has the difference of connection and disconnection to ensure reliable exchange of data. It is commonly used for data interaction between devices and servers.

(2)When E810-DTU (CAN-ETH) attempts to connect to the server in TCP Client mode and the local port is 0, it initiates the connection with random ports each time.

(3)This mode supports short connection function.

(4)In the same LAN, if the E810-DTU (CAN-ETH) is set to static IP, please keep the IP of E810-DTU (CAN-ETH) and gateway in the same network segment, and set the gateway IP correctly, otherwise the normal communication will not be possible.

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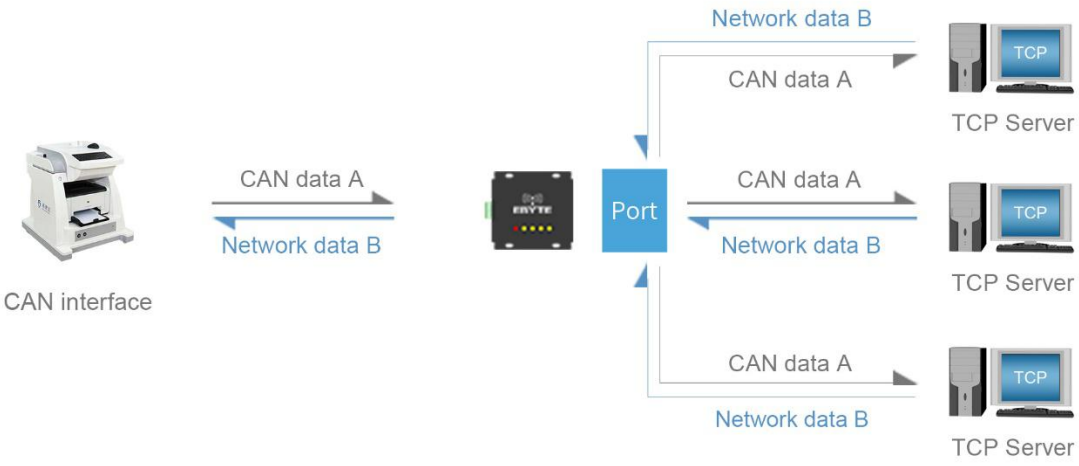
4.1.8. TCP Server function

(1)In TCP Server mode, E810-DTU (CAN-ETH) monitors the local port, accepts and establishes a connection for data communication when a connection request is sent.When the E810-DTU (CAN-ETH) serial port receives the data, it will send the data to all the client devices connected to the E810-DTU (CAN-ETH) at the same time.

(2)It usually used for communication with TCP client in LAN and suitable for scenarios where there are no servers in the LAN and there are multiple computers or mobile phones requesting data from the server. Like TCP Client, there are connections and disconnections to ensure reliable data exchange.

(3) When E810-DTU (CAN-ETH) is used as the TCP Server, it can accept up to 6 Client connections (the number of connections can be customized). The local port number is a fixed value and cannot be set to 0.

(4)TCP Server can set the maximum number of connections. When the maximum number of connections is reached, you can choose to kick off the old connection or disable the new connection function according to the instruction configuration.



4.1.9. UDP Client function

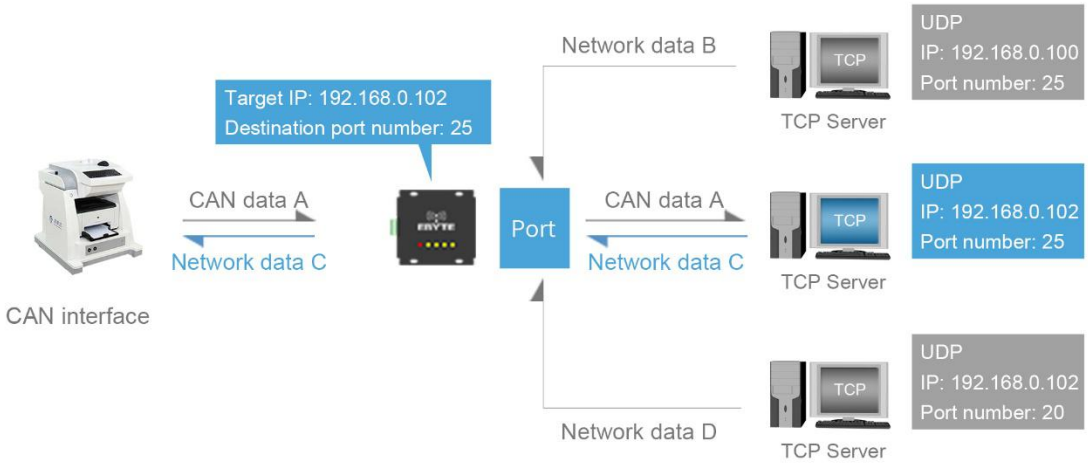
(1)UDP Client is a connectionless transmission protocol, which provides simple and unreliable transaction-oriented information transmission service. There is no connection establishment and disconnection. It only needs to establish IP and port to send data to each other.It is usually used for data transmission scenarios where the packet loss rate is not

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required, the data packet is small and the transmission frequency is fast, and the data is transmitted to the specified IP.

(2) In UDP Client mode, E810-DTU (CAN-ETH) will only communicate with the target port of the target IP. If the data is not from this channel, the data will not be received by E810-DTU (CAN-ETH).

(3) In UDP Client mode, the target address is set to 255.255.255.255, which can achieve the effect of UDP full network segment broadcasting, and also can receive broadcasting data. E810-DTU (CAN-ETH) supports broadcasting within network segment, such as xxx.xxxx.255 broadcasting mode.



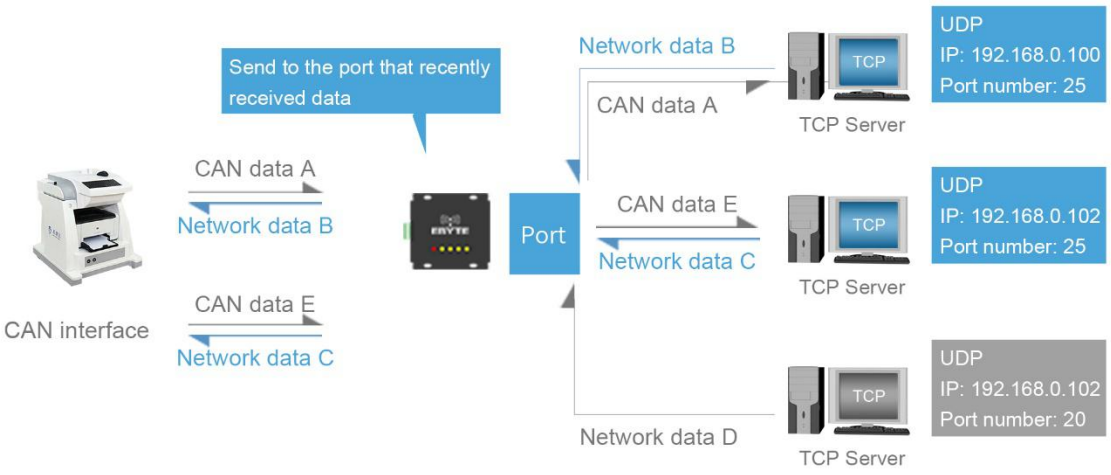
4.1.10. UDP Server function

(1) UDP Server means that the source IP address is not verified on the basis of ordinary UDP. After receiving a UDP packet, the target IP is changed to the data source IP and port number. The data is transmitted to the nearest communicated IP and port number.

(2) This mode is usually used in data transmission scenarios where multiple network devices need to communicate with modules and do not want to use TCP due to faster speeds.

Note: UDP Server cannot send data actively, and can only send data to the IP and port that has recently performed data interaction after receiving the data.

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4.2. CAN basic function

4.2.1. CAN introduction

CAN is an abbreviation of Controller Area Network,which is an ISO international standardized serial communication protocol.In the automotive industry, various electronic control systems have been developed for safety, comfort, convenience, low pollution, and low cost.Due to the different data types and reliability requirements for communication between these systems, there are many cases of multi-bus structure, and the number of wiring harnesses also increases.In order to adapt to the need to “reduce the number of wire harnesses” and “high-speed communication of large amounts of data through multiple LANs”, in 1986 German electrician Bosch developed a CAN communication protocol for automobiles. Since then, CAN has been standardized by ISO11898 and ISO11519. CAN is one of the most widely used fieldbuses in the world and is the standard protocol for automotive networks in Europe.

The high performance and reliability of CAN have been recognized and widely used in industrial automation, marine, medical equipment, industrial equipment, etc. Fieldbus is one of the hotspots in the development of technology in the field of automation today. It is known as the computer LAN in the field of automation.Its emergence provides powerful technical support for distributed control systems to achieve real-time and reliable data communication between nodes. CAN communication only has two signal lines, CAN_H and CAN_L. The CAN controller judges the bus level according to the potential difference between the two lines. Bus level is divided into dominant level and recessive level, which must be one of them. The sender sends the message to the receiver by changing the bus level.

CAN protocol characteristics：

- Multi master control.
- System softness.
- Fast communication speed and long communication distance.U p to 1Mbps (distance less than 40M), up to 10KM

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(rate less than 5Kbps).

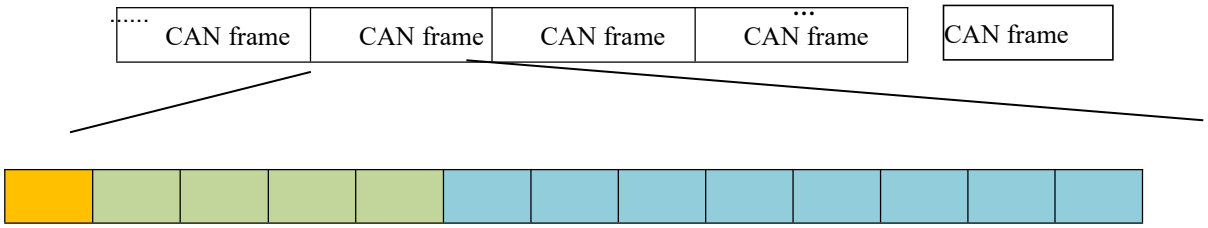
- With error detection, error notification, and error recovery.
- Failure closure function.
- Multiple Connection Nodes.

4.2.2. Data protocol

When the E810-DTU (CAN-ETH) network sends data to the CAN, the data must conform to the data protocol before it can be sent out from the CAN bus. Similarly, when the CAN end of E810-DTU (CAN-ETH) receives the data from the CAN bus, it will process the data into data conforming to the data protocol, and then send it to the network end.

One Ethernet data can contain several CAN bus data that conform to data protocol.

The E810-DTU (CAN-ETH) data protocol conversion format is as follows, each CAN frame contains up to 13 bytes, and the 13-byte content includes CAN frame information + frame ID + frame data.



Frame information: 1 byte in length, used to identify some information of the CAN frame, such as type, length, etc.

BIT7 BIT0

FF	RTR	Reserved	Reserved	D3	D2	D1	D0

FF: The identification bits of standard frame and extended frame, 1 for extended frame and 0 for standard frame.

RTR: Identification bit of remote frame and data frame, 1 for remote frame and 0 for data frame.

Reserved: The reserved value is 0 and cannot be written to 1.

D3～D0: Data Length Bit, which identifies the data length of the CAN frame.

Frame ID： 4 bytes in length, 11 bits in standard frame and 29 bits in extended frame.

High byte Low byte

12h	34h	56h	78h

The above is the extended frame ID number.

Representation of 0x12345678

High byte Low byte

00h	00h	01h	23h

The above is the standard frame ID number

Representation of 0x123

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Frame data: The length is 8 bytes, and the effective length is determined by the value of D3~D0 of the frame information.

DATA1 DATA8

11h	22h	33h	44h	55h	66h	77h	88h

The above is the representation of 8 bytes of valid data.

DATA1 DATA8

11h	22h	33h	44h	55h			

The above is a representation of 5 bytes of valid data.

For example:

The following example is an extended data frame with a frame ID of 0x11223344 and 8 bytes of valid data.

Representation of (11h,22h,33h,44h,55h,66h,77h,88h)

88h	11h	22h	33h	44h	11h	22h	33h	44h	55h	66h	77h	88h

The following example is a standard data frame with a frame ID of 0x789 and 5 bytes of valid data.

Representation of (12h, 34h, 56h, 78h, 90h)

05h	00h	00h	07h	89h	12h	34h	56h	78h	90h			

For example:

1.CAN bus receives the data and outputs it to the network.：

CAN data：

Frame format: extended frame

Frame type: data frame

ID ： 0x12345678

Data : AAh BBh CCh DDh EEh

Output to the network: 85 12 34 56 78 AA BB CC DD EE

0x85 indicates that the frame format is an extended frame, the frame type is a data frame, and the data length is 5

The last four digits indicate that the CAN ID is 12345678.

The last 8 bits are the data area, and the effective length is 5

As shown below:

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Network end
85
12
34
56
78
AA
BB
CC
DD
EE



CAN message	
Frame Info	Extended data frame
Frame ID	0x12345678
Data Field	AA
	BB
	CC
	DD
	EE

2. The network end sends data to CAN:

The network end send: 05 00 00 06 78 12 34 56 78 90

0x05 indicates that the frame format is standard frame, the frame type is data frame, and the data length is

5.

00 00 06 78 indicates ID (hexadecimal) is 0678

12 34 56 78 90 is the data area (hexadecimal), the effective length is 5

As shown below:

Network end
05
00
00
06
78
12
34
56
78
90



CAN message	
Frame Info	Standard data frame
Frame ID	0x00000678
Data Field	12
	34
	56
	78
	90

5. Revision History

Version	Date	Description	Issued by
1.0	2019-04-24	Original version	Lizhibing

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