EBYTE

Chengdu Ebyte Electronic Technology Co.,Ltd

Wireless Modem

User Manual

ECAN-W01S

CONTENT

1. Product introduction

1.1. Product introduction

ECAN-W01S is a high-performance industrial WIFI and CAN bus data conversion equipment developed by EBT. It integrates two CAN bus interfaces, one EtherNet interface and one WiFi interface internally, which can easily complete the interworking of CAN bus network and WiFi network.

ECAN-W01S has a built-in 120 ohm resistor, which can be enabled by dialing; Support the operation within the temperature range of – 40 ℃~85 ℃. It has a 10M Ethernet interface. Customers can use the network cable to connect the PC end and enter the configuration software to configure the device parameters; The device WiFi network has two modes: AP and STA, which can quickly establish or access the WiFi network; 2-channel CAN port communication supports fixed common CAN baud rate and user-defined CAN baud rate, with the highest baud rate of 1Mbps; At the same time, the device has multiple working modes such as TCP Server, TCP Client, UDP, etc.
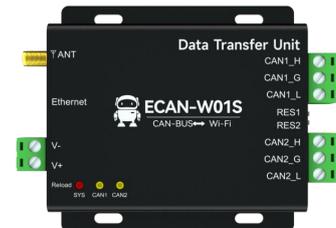
1.2. Functional features

● Integrated 2-way CAN bus interface, using plug-in terminal wiring mode;
● Support CAN2.0A and CAN2.0B frame formats and conform to ISO/DIS 11898 specification;
● CAN bus communication baud rate between 5Kbps and 1Mbps can be programmed arbitrarily;
● Dual CAN transceiver supports dual server, and each channel supports up to 4 links;
● Integrated 2.4G WiFi interface, conforming to IEEE802.11a/b/g standard;
● Support WiFi AP/STA mode, and access up to 5 STA devices in AP mode;
● Maximum transmission data flow: 8000 frames/second; Maximum received data flow: 14000 frames/second;
● Support registration package and heartbeat package;
● Support DHCP and DNS;
● Support offline restart/timeout restart;
● Support upper computer configuration;
● Support online modification of baud rate;
● Including 120 ohm resistance;
● Built in watchdog;
● Network interface upgrading function;
● Working temperature range: – 40 ℃~+85 ℃.

2. Quick Get Start

You need quasi ECAN-W01S * 1, power adapter * 1, network cable * 1, 2.4GWiFi antenna * 1, CAN analyzer * 1;

1、The factory default of the device is AP mode, the SSID is ECAN-W01S-XX, and the password is 12345678. After the device is powered on, search the device WiFi through the PC, as shown in the following figure:

Click Connect to connect to the device's WiFi

2、Open the network debugging assistant of the computer, set it as TCP Client, set the remote host IP to 192.168.4.101, and set the remote host port number to 8881.
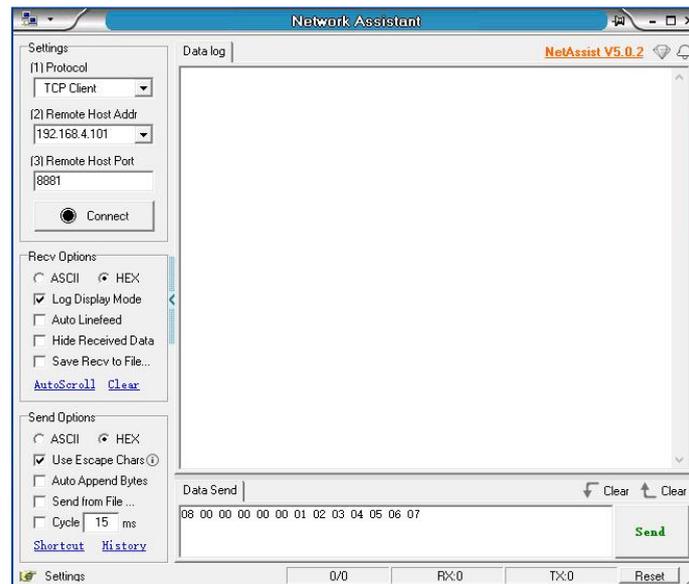
3、Connect CAN1 of ECAN-W01S to CAN resolver. When ECAN-W01S is connected to CAN bus, just connect CAN_ H connected to CAN_ H，CAN_ L connected to CAN_ L is enough. (Note that the default CAN baud rate is 100K)

4、The network assistant can be used to realize the communication between devices and peripherals.
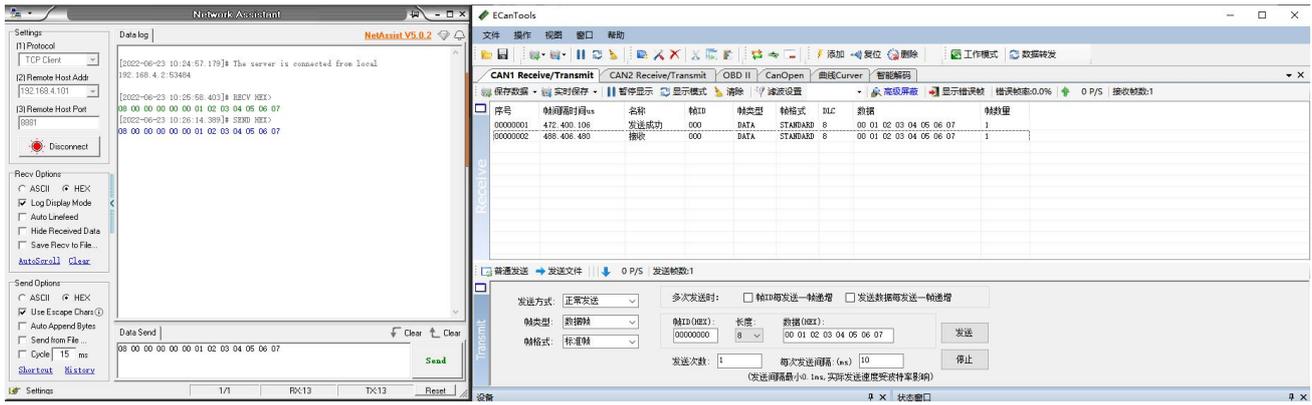
3. Technical Indicators

3.1. General specifications

Serial No	Project	Specifications
1	supply voltage	8V~28VDC, over 28V may burn out, 12V or 24V power supply is recommended
2	Mesh port specification	Standard RJ45, supporting 10Mbps
3	WiFi specifications	IEEE802.11a/b/g standard
4	Network Protocol	IP、 TCP/UDP、WiFi
5	Simple transparent transmission mode	TCP Server、TCP Client、UDP Server、UDP Client
6	TCP Server Connection	A maximum of four TCP connections are supported in a single channel
7	IP acquisition method	Static IP, DHCP
8	Domain name resolution	support
9	User Configuration	Upper computer configuration
10	Working temperature	-40~+85 ℃, industrial grade
11	Operating humidity	10%~90%, relative humidity, non condensing
12	Size	See dimension drawing
13	Average weight	120g
14	Storage temperature	-40~+85 ℃, industrial grade

3.2. Mechanical dimension drawing and pin definition
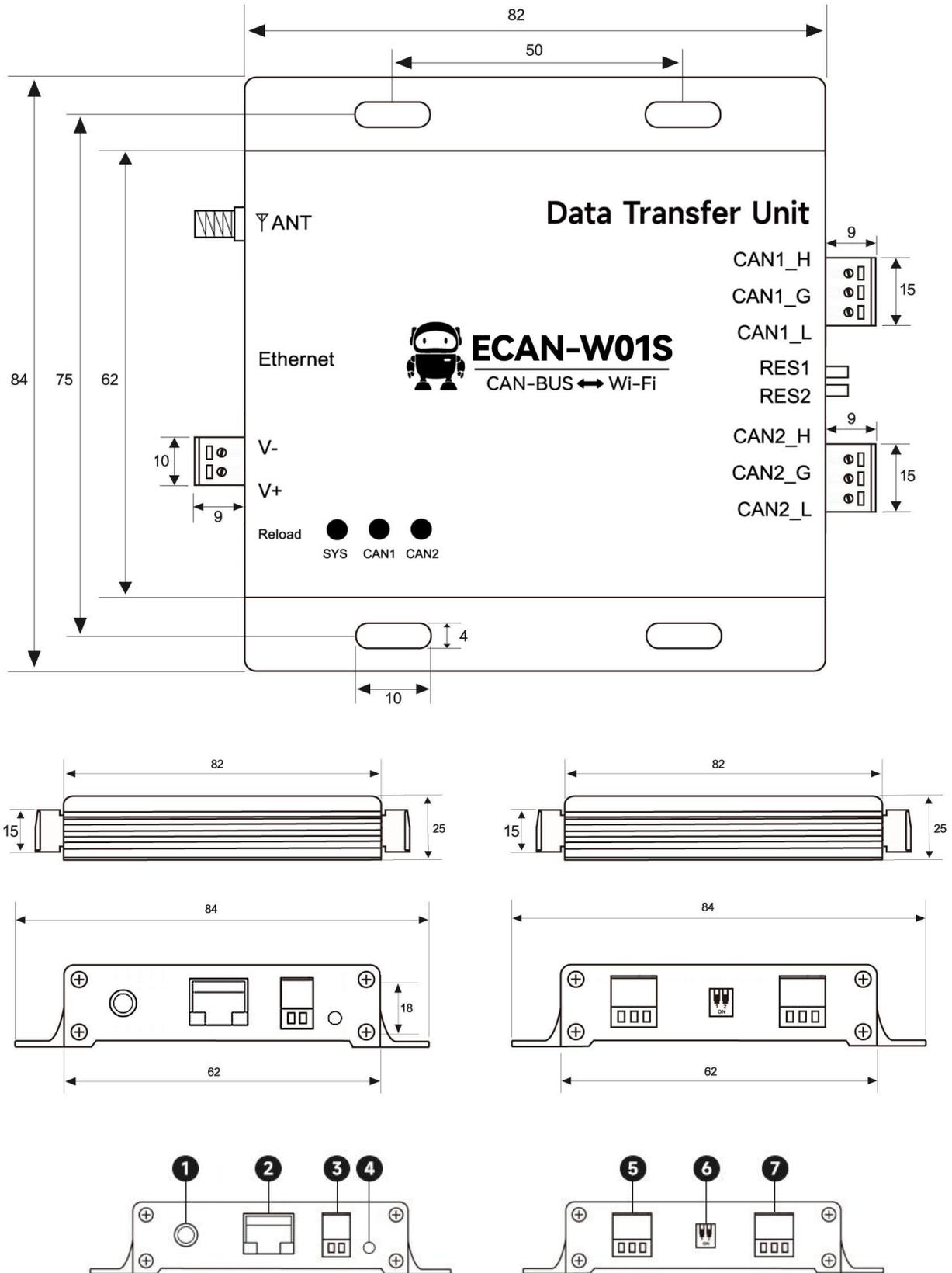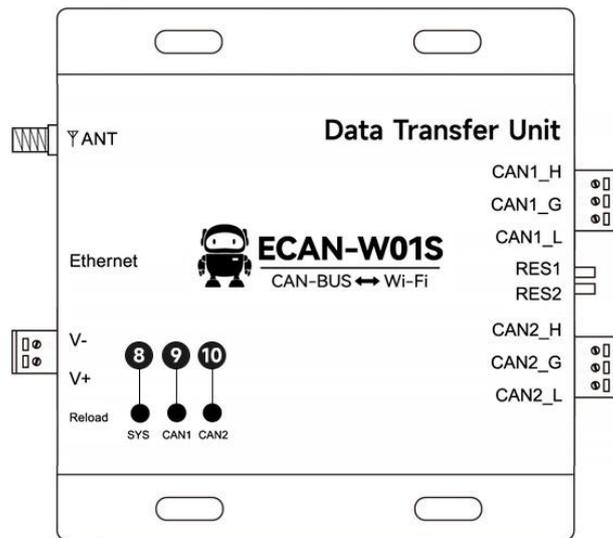
Serial No	Identification name	Function description
1	ANT	WiFi antenna SMA interface
2	ETHERNET	Ethernet interface, standard RJ45 interface, connected to PC
3	V+	Power positive interface, 5.08 phoenix head, (default 8-28V), 12V/24V recommended
	V-	Power supply cathode interface 5.08 Phoenix head
4	Reload	Reload button, press and hold for more than 5s to restore the factory
5	CAN2_ H	CAN2 channel bus high, 5.08 phoenix head
	CAN2_ G	CAN2 channel bus ground, 5.08 phoenix head
	CAN2_ L	CAN2 channel bus low, 5.08 phoenix head
6	Dial RES1	CAN1 channel 120 ohm resistance dial switch
	Dial RES2	CAN2 channel 120 ohm resistance dial switch
7	CAN1_ H	CAN1 channel bus high, 5.08 phoenix head
	CAN1_ G	CAN1 channel bus ground, 5.08 Phoenix head
	CAN1_ L	CAN1 channel bus low, 5.08 phoenix head
8	SYS	Power indicator (red), network access (red flashing)
9	CAN1/ERR	CAN1 data light (green), data error light (red)
10	CAN2/ERR	CAN2 data light (green), data error light (red)

4. Product Function Introduction

4.1. WiFi function

4.1.1. AP mode

Access Point is referred to as AP mode for short. It is similar to a router, allowing wireless devices to connect and establishing TCP/IP based server, client, and UDP communications. In this mode, four stations can be connected, and each TCP server supports up to four TCP sockets. By default, the device is in AP mode. The SSID is ECAN-W01S-XX-XX-XX-XX (followed by the device MAC address). The default secret key is 12345678.

4.1.2. STA mode

Station mode is called STA for short. The device in this role does not provide connection, but can only connect to Access Points or routers. The device in the Station role supports TCP server, TCP client, and UDP; Under the TCP server, each channel supports a maximum of four sockets. When the device switches from other working roles to STA mode, the device can enable DHCP to obtain IP addresses, and automatically configure the gateway, subnet mask, and DNS domain name server. It can also set a static IP address for networking.

4.2. Basic function

→ **Ethernet part**

4.2.1. SOCKET Function

ECAN-W01S can establish two sockets, namely Socket A1 and Socket B1. Both of them support TCP Client, TCP Server, UDP Client and UDP Server.

Two sockets run simultaneously. It can be connected to different networks at the same time for data transmission.

When the device SOCKET is a TCP Server, each SOCKET can access up to four links at the same time, and two SOCKET can have up to eight links.

4.2.2. TCP Client Function

(1) TCP Client provides client connection for TCP network service. Initiate a connection request to the server and establish a connection to realize the interaction between CAN data and server data. According to the relevant provisions of the TCP protocol, the TCP client has the difference between connection and disconnection to ensure reliable data exchange. Usually used for data interaction between devices and servers, it is the most commonly used networking

communication mode.

(2) When ECAN-WO1S attempts to connect to the server in TCP Client mode and the local port is 0, it initiates a connection with a random port each time.

(3) In the same LAN, if ECAN-WO1S is set as a static IP, please keep the IP and gateway of ECAN-WO1S in the same network segment, and set the gateway IP correctly, otherwise normal communication will not be possible.

4.2.3. TCP Server Functions

(1) TCP Server is the TCP server. In TCP Server mode, ECAN-WO1S listens to the local port, accepts and establishes a connection for data communication when a connection request is sent, and sends the data to all client devices that establish a connection with ECAN-WO1S at the same time after receiving the data.

(2) It is usually used for communication with TCP clients in the LAN. It is suitable for scenarios where there is no server in the LAN and multiple computers or mobile phones request data from the server. Like TCP Client, it has the difference between connection and disconnection to ensure reliable data exchange.

(3) When ECAN-WO1S is used as a TCP server, up to 8 clients can be supported in a dual socket, and up to 4 clients can be supported in a single socket. The local port number is a fixed value and cannot be set to 0.

4.2.4. UDP Client Functions

(1) UDP Client is a connectionless transmission protocol that provides simple and unreliable transaction oriented information transmission services. Without connection establishment and disconnection, you only need to specify an IP and port to send data to the other party. It is usually used in data transmission scenarios where there is no requirement for packet loss rate, the data packet is small, the transmission frequency is fast, and the data is to be transmitted to the specified IP.

(2) In UDP Client mode, ECAN-WO1S will only communicate with the target port of the target IP. If the data does not come from this channel, the data will not be received by ECAN-WO1S.

(3) In UDP Client mode, if the target address is set to 255.255.255.255, the effect of UDP full network segment broadcast can be achieved, and broadcast data can also be received. ECAN-WO1S module supports broadcast within the network segment, such as the broadcast mode of xxx. xxx. xxx. 255.

4.2.5. UDP Server Features

(1) UDP Server does not verify the source IP address on the basis of ordinary UDP. After receiving a UDP packet, it changes the target IP address to the data source IP address and port number. When sending data, it sends the IP address and port number of the latest communication.

(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 high speed and frequency.

Note: UDP Server cannot actively send data. Only after receiving the data can it send the data to the IP and port that has recently conducted data interaction.

→ CAN part

4.2.6. CAN function

category	name	default	explain
CAN configuration	CAN baud rate	100K	There are 10 options from 5K to 1000K. You can also fill in any baud rate value
	CAN operating mode	normal	Normal: CAN port can normally respond to received CAN frame;
	Number of subcontracting frames	50	The value that can be filled in is 1~50. When the CAN port continuously receives data (the interval is less than the packet time interval), and the number of received CAN frames reaches the "number of packet frames", the received data will be packaged into an Ethernet packet and sent to the network port. The number of frames in the packet refers to the maximum number of frames in the packet. If the number of frames in the packet is not reached during the receiving process, but the frame interval exceeds the packet time interval, the received data will also be packaged into an Ethernet packet for transmission. If the number of sub packet frames is set to 1, it means that there is no sub packet, and each CAN frame is sent as an Ethernet packet separately. At this time, the real-time performance is the strongest, but

	Subcontracting interval（ms）	1	The value that can be filled in is 1~255. When the CAN port does not receive new data frames within the time defined by the "packet time interval" (unit: ms) and the number of packet frames has not been reached, all data frames that have been received and have not been sent before will be packaged into an Ethernet packet and sent to the network port.

category	name	default	explain
CAN configuration	Standard frame upper limit	7FF（HEX）	The upper limit and lower limit of the received standard frame ID set by the user jointly determine the standard frame ID range to be received.
	Lower limit of standard frame	000（HEX）	
	Extended frame upper limit	1FFFFFFF（HEX）	The upper limit and lower limit of the received extended frame ID set by the user jointly determine the range of extended frame IDs to be received.
	Lower limit of extended frame	000000000（HEX）	

	CAN transmit buffer Number (1024 frames)	Not configurable	Because the speed of Ethernet is much higher than that of CAN transmission, if the amount of data received by Ethernet is too large, CAN needs to buffer transmission, which can ensure no frame loss, but such a large buffer may lead to poor real-time performance, that is, the data currently sent by Ethernet can only be sent from the CAN interface after a certain time. In this case, the customer needs to control the sending speed of Ethernet to match the sending speed of CAN port.

4.2.7. CAN protocol conversion format

Multiple data of CAN-Bus is in one Ethernet data.

Definition of Ethernet & CAN-Bus data flow:

One frame data contains 13 bytes.

Frame information include length & type, 1 byte in length.

BIT7							BIT0
FF	RTR	Reserved	Reserved	B3	B2	B1	B0
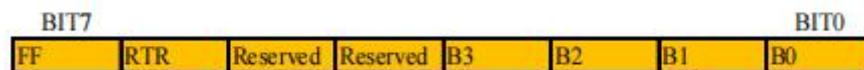
FF: Standard frame & Extended frame identification bit, 1=Extended frame,
0=Standard frame.

RTR: Remote frame & data frame identification bit, 1=Remote frame, 0=data frame.

B3~B0: data length, the length of CAN frame.

Frame ID: 4 byte in length, standard frame has 11 bits, Extended frame
has 29 bits.

High byte			Low byte		High byte			Low byte
12h	34h	56h	78h		00h	00h	01h	23h

Extended frame ID: Extended frame ID:
    0X12345678   0X123

Frame data: 8 byte in length, the valid length decide by frame
information B3~B0

DATA1							DATA8
11h	22h	33h	44h	55h	66h	77h	88h

As above is the valid data of 8 bytes.

DATA1							DATA8
11h	22h	33h	44h	55h	66h	77h	88h
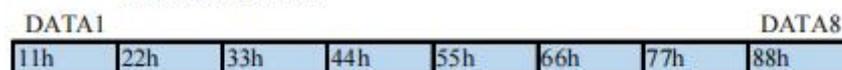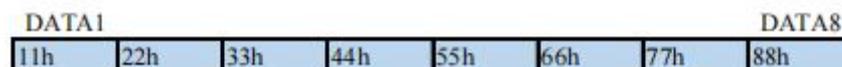
As above is the valid data of 5 bytes.

For example:

A extend frame data: 8 byte in length, frame ID 0×12345678, valid data of 8
bytes(11h,22h,33h,44h,55h,66h,77h,88h).

88h	12h	34h	56h	78h	11h	22h	33h	44h	55h	66h	77h	88h

**Note: Every frame must be 13 bytes, must complement 0 if don't have enough 13
bytes in both case: frame ID is less than 4 bytes or frame data is less than 8 bytes.**

4.3. Features

4.3.1. CAN filtering

CAN filtering is divided into software filtering and hardware filtering.

4.3.1.1. Software filtering

The upper limit value and lower limit value of received extended frame ID set jointly determine the range of extended frame ID to be received; A total of three sets of ID filtering can be set.

4.3.1.2. Hardware filtering

There are as many as 28 filter groups (14 for each channel) in the module. By setting filter groups, each CAN node can receive messages that conform to the filter rules. Messages that do not conform to the filter rules are discarded by hardware without software intervention. Each filter bank consists of two 32-bit registers CAN_ FxR0 and CAN_ FxR1 composition. The bit width of the filter group can be configured as one 32-bit filter or two 16 bit filters. Each filter group can be configured as masked bit or identifier list mode, and each filter group can be enabled or disabled.

In the masked bit mode, the two registers are respectively the identifier register and the masked register, which need to be used together. Each bit of the identifier register indicates that the expected value of the corresponding bit is explicit or implicit, and each bit of the masked register indicates whether the expected value of the corresponding identifier register bit needs to be consistent.

32-bit shielded bit mode

Identifier register	CAN_ FxR1[31:24]	CAN_ FxR1[23:16]	CAN_ FxR1[15:8]	CAN_ FxR1[7:0]			
Masked bit register	CAN_ FxR2[31:24]	CAN_ FxR2[23:16]	CAN_ FxR2[15:8]	CAN_ FxR2[7:0]			
mapping	STID[10:3]	STID[2:0]	EXID[17:13]	EXID[12:5]	EXID[4:0]	IDE	RTR	0

In identifier list mode, both registers are used as identifier registers, and each bit of the received message identifier must be consistent with one of the registers to pass the filtering.

32 bit identifier list

Identifier register	CAN_ FxR1[31:24]	CAN_ FxR1[23:16]	CAN_ FxR1[15:8]	CAN_ FxR1[7:0]			
Masked bit register	CAN_ FxR2[31:24]	CAN_ FxR2[23:16]	CAN_ FxR2[15:8]	CAN_ FxR2[7:0]			
mapping	STID[10:3]	STID[2:0]	EXID[17:13]	EXID[12:5]	EXID[4:0]	IDE	RTR	0

In the 16 bit mode, the register group is divided into four registers. The mask bit mode of each

filter group in the mask bit mode can have two filters. Each filter contains a 16 bit identifier register and a 16 bit mask register; In identifier list mode, all four registers are used as identifier registers.

16 bit shielded bit mode

Identifier register n	CAN_ FxR1[15:8]	CAN_ FxR1[7:0]			
Mask bit register n	CAN_ FxR1[31:24]	CAN_ FxR1[23:16]			
Identifier register n+1	CAN_ FxR2[15:8]	CAN_ FxR2[7:0]			
Mask bit register n+1	CAN_ FxR2[31:24]	CAN_ FxR2[23:16]			
mapping	STID[10:3]	STID[2:0]	RTR	IDE	EXID[17:15]

16 bit identifier list mode

Identifier register n	CAN_ FxR1[15:8]	CAN_ FxR1[7:0]			
Mask bit register n	CAN_ FxR1[31:24]	CAN_ FxR1[23:16]			
Identifier register n+1	CAN_ FxR2[15:8]	CAN_ FxR2[7:0]			
Mask bit register n+1	CAN_ FxR2[31:24]	CAN_ FxR2[23:16]			
mapping	STID[10:3]	STID[2:0]	RTR	IDE	EXID[17:15]

When a message can be filtered by multiple filters, the filter number stored in the receiving mailbox determines which filter number to store according to the filter priority rules. The filter priority rules are as follows:

● All 32-bit filters have higher priority than 16 bit filters

● For filters of the same width, the filter priority of identifier list is higher than that of shielded bit mode

● Filters with the same width and mode have higher priority if they are numbered smaller

4.3.2. Custom baud rate

The user can set the user-defined baud rate through the upper computer, select time period 1, time period 2, and pre division coefficient, and calculate the baud rate according to the calculation table provided.

1.BRP should be as small as possible to ensure that Tq is as small as possible and reduce errors;

2.SJW defaults: 1;

3.Recommended range of sampling points: 75-87.5%;

When the baud rate > 800kbps, the recommended sampling point is 75%;

When the baud rate > 500kbps, the recommended sampling point is 80%;

When the baud rate<=500kbps,the recommended sampling point is 87.5%;

4.The sampling points of all nodes on the bus should be consistent as much as possible, and the CANFD arbitration domain and data domain sampling points are not required to be consistent;

$$Baud = \frac{72000000}{brp(1 + 1 + tbs1 + 1 + tbs2)}$$

tbs1,tbs2: CAN_BS1/2_Ntq = N-1, example: CAN_BS1_13tq, so tbs1 = 12; CAN_BS2_3tq, so tbs2 = 2

$$sampling\ point = \frac{2 + tbs1}{1 + 1 + tbs1 + 1 + tbs2}$$

4.3.3. Modify baud rate online

The device supports online adjustment of the baud rate through the Ethernet port in the TCP Server mode without entering the configuration software.

The command format is as follows

instructions	CAN baud rate
3F 00 FF 00 00 00 00 FF 00 00 00 00 FF	1000K
3F 01 FF 00 00 00 00 FF 00 00 00 00 FF	800K
3F 02 FF 00 00 00 00 FF 00 00 00 00 FF	500K
3F 03 FF 00 00 00 00 FF 00 00 00 00 FF	250K
3F 04 FF 00 00 00 00 FF 00 00 00 00 FF	125K
3F 05 FF 00 00 00 00 FF 00 00 00 00 FF	100K
3F 06 FF 00 00 00 00 FF 00 00 00 00 FF	50K
3F 07 FF 00 00 00 00 FF 00 00 00 00 FF	20K

| 3F 08 FF 00 00 00 00 FF 00 00 00 00 FF | 10K |
| 3F 09 FF 00 00 00 00 FF 00 00 00 00 FF | 5K |

4.3.4. Heartbeat function

In the network transparent transmission mode, users can choose to let ECAN-W01S send heartbeat packets. The heartbeat packet can be sent to the network server. The main purpose of sending to the network side is to maintain the connection with the server. It only takes effect in TCP Client and UDP Client modes. ECAN-W01S module supports customized heartbeat packet with a maximum length of 128 bytes. Support custom heartbeat package.
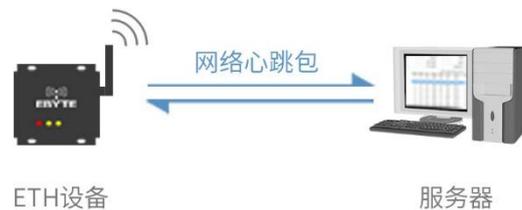
4.3.5. Registration package function

In the network transparent transmission mode, the user can choose to let the DTU send the registration package to the server. The registration package is used to enable the server to identify the data source device, or as a password to obtain server function authorization. The registration packet can be sent when the DTU establishes a connection with the server, or a packet of registration packet data can be sent before each packet. The data of the registration package can be MAC address or user-defined registration data, of which the longest setting content of the user-defined registration package is 128 bytes. Support user-defined registration package;

Establishing a connection and sending a registration package is mainly used to connect the server to be registered.

The registration charter system is only applicable to TCP Client and UDP Client, and is invalid under TCP Server and UDP Server.
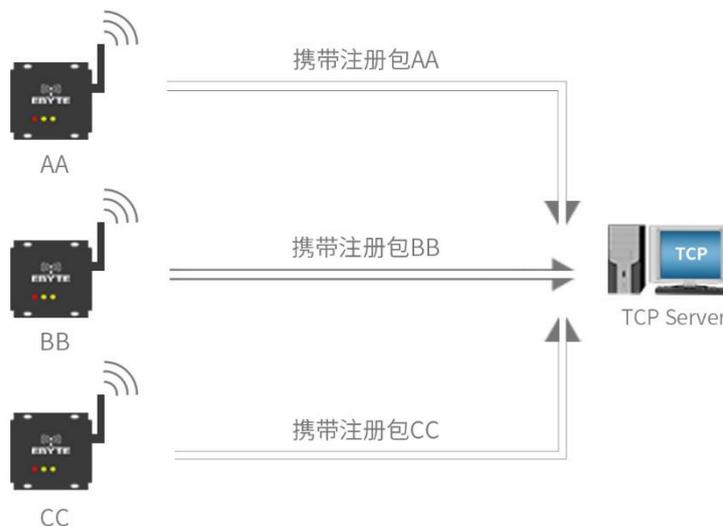
4.3.6. Timeout restart function

The timeout restart (no data restart) function is mainly used to ensure the long-term stable operation of ECAN-W01S. When the link has not received and sent data for a long time, ECAN-W01S will restart after exceeding the set time, so as to avoid the impact of abnormal conditions on communication. The timeout restart time can be set through the upper computer. The normal working time of this function is set as 60~65535S, and the default value is 300S. 0 is off.

4.4. Support DHCP and domain name resolution

4.4.1. DHCP

The device can automatically obtain the IP address through the router, and automatically configure the gateway, subnet mask and DNS server. It does not support modifying the subnet mask and DNS server.

4.4.2. DNS (Domain Name Resolution)

When the user enters the domain name, it will automatically query the DNS server, and the DNS server retrieves the database to obtain the corresponding IP address. In the static IP mode, the user can customize the server for domain name resolution, which is used to resolve private domain name server data. In the dynamic IP mode, the device automatically follows the domain name resolution server configured by the routing device. The user only needs to modify the DNS server of the routing device, and does not need to configure this device.

4.5. Disconnection reconnection

Disconnection reconnection: the device requests connection periodically after disconnection to ensure that the connection can be restored in case of accidental disconnection (note that the device is not restarted);

4.6. Network interface upgrade

Firmware can be upgraded and maintained through the serial port upgrade tool provided by our company.

Step 1: Open the software, open the configuration host computer, and click the menu bar
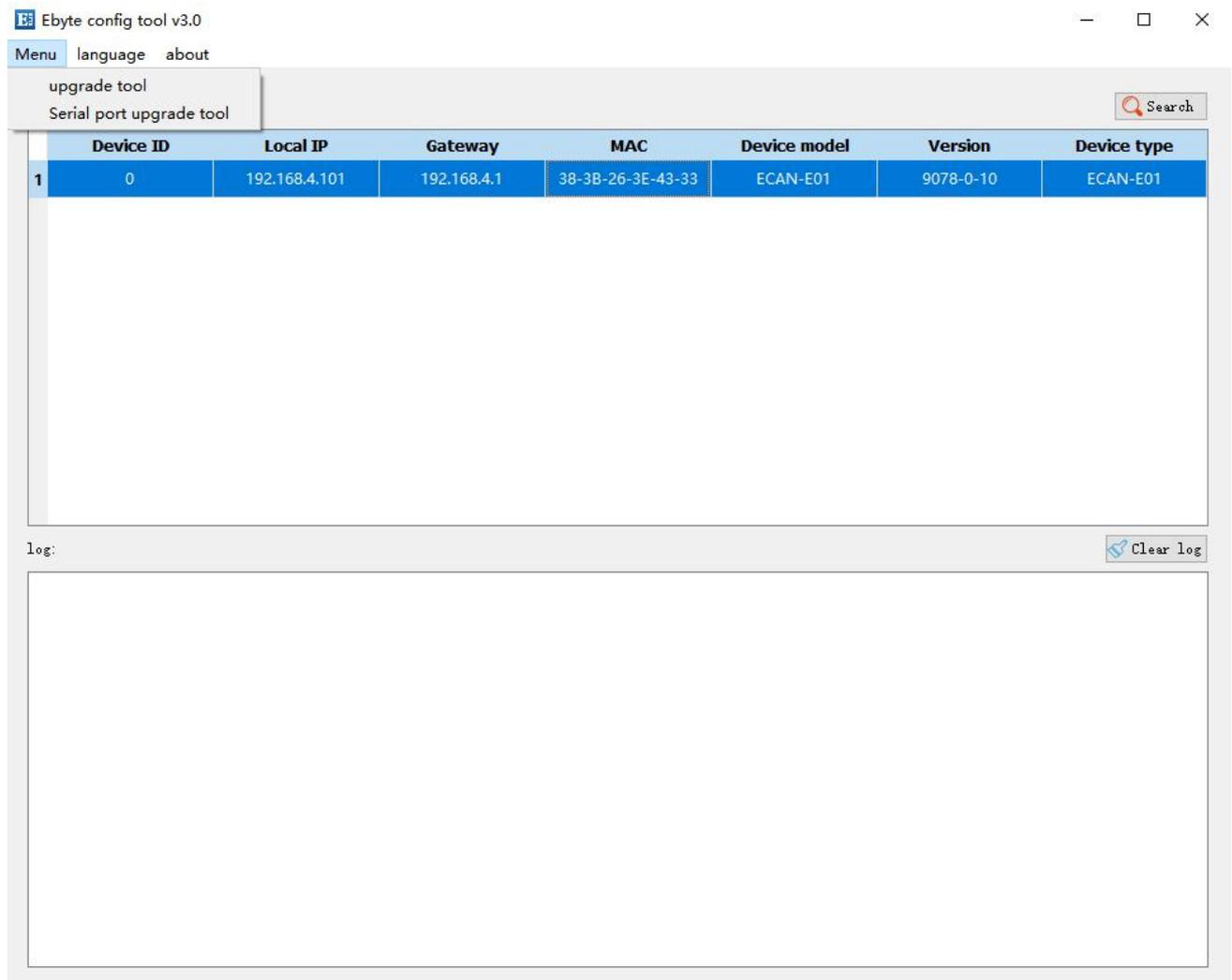
Step 2: Select Device Upgrade Assistant and click Search Device
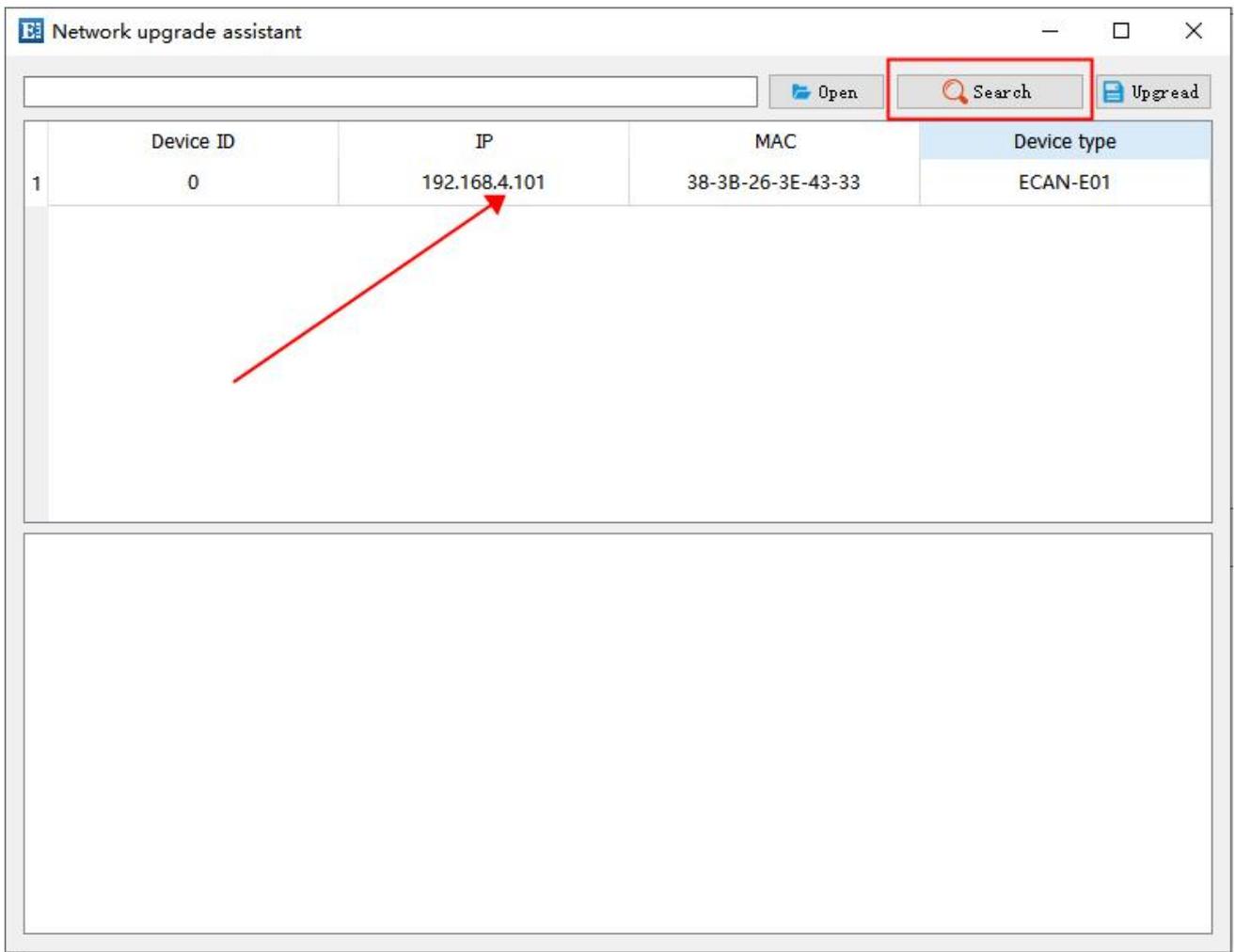
Step 3: After selecting the firmware, click Upgrade to upgrade
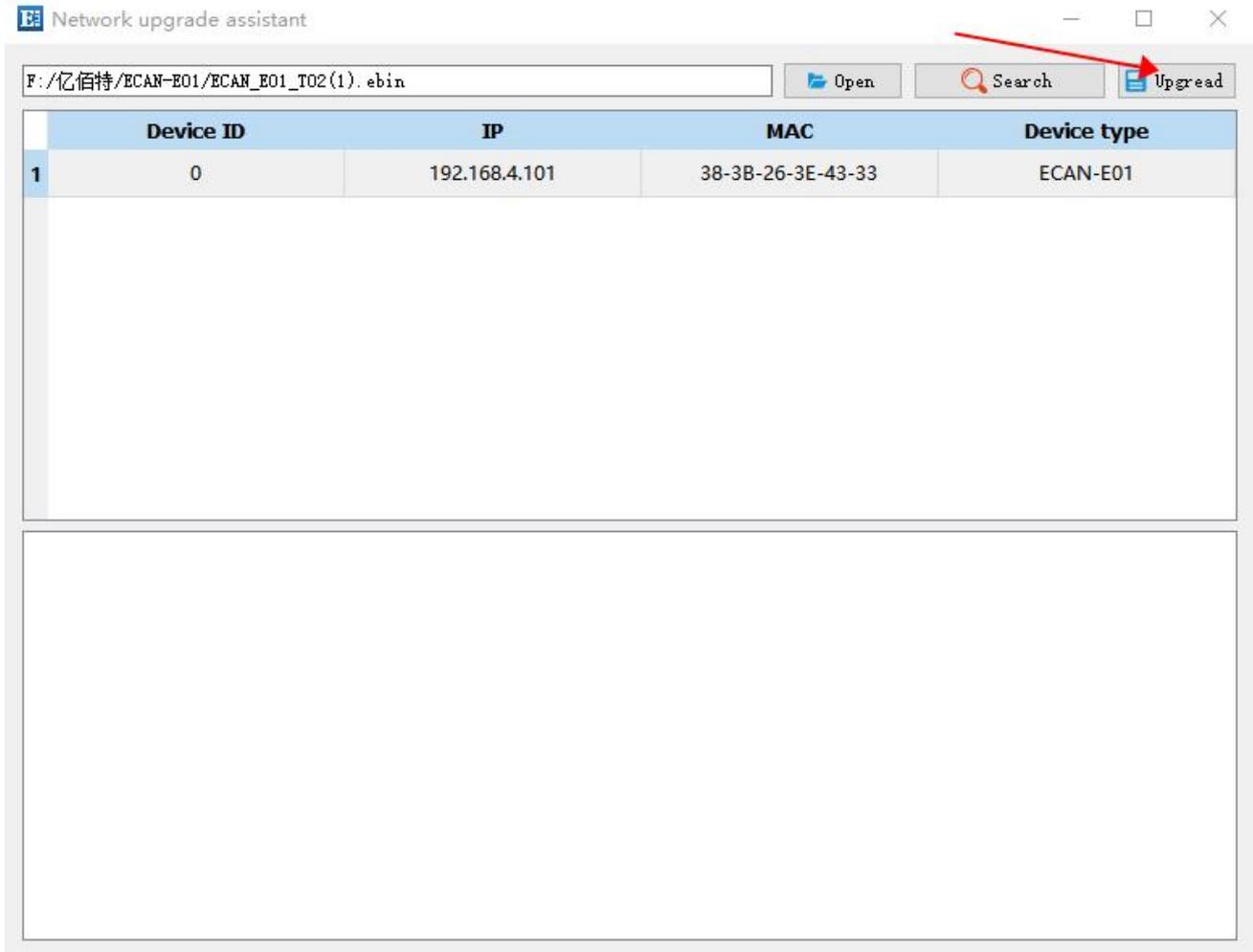
4.7. Restore factory settings

The device has the function of pressing the key to restore the factory settings. To restore the factory settings of the hardware, long press the reload key for more than 5s.

5. Important statements

1. EBT reserves the right of final interpretation and modification of all contents in this manual.
2. Due to the continuous improvement of the hardware and software of the product, this manual may be changed without further notice, and the latest version of the manual shall prevail.
3. Everyone is responsible for protecting the environment: In order to reduce the use of paper, this manual is only printed in Chinese, and the English manual is only provided with electronic documents. If necessary, please download it from our official website; In addition, if not specifically required by the user, we will only provide product specifications according to a certain proportion of the order quantity when the user orders in bulk, and not every data

transmission station will be equipped with one by one. Please understand.

6. Revision History

edition	Revision Date	Revision description	Maintainer
1.0	2022-06-10	First edition	LM

7. About us

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