GCAN-211

Industrial WiFi-CAN Converter

User Manual



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English Translation and Editorial Work by Shenzhen MoCAN Electric Co., Ltd.

Revision History

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1. Function Introduction

1.1 Overview

The GCAN-211 from Guangcheng Technology is a high-performance CAN-bus communication interface card integrating two CAN interfaces, one Ethernet interface and one WiFi interface. With the GCAN-211, users can easily interconnect a CAN-bus network and a WiFi network, further extending the range of the CAN-bus network.

The GCAN-211 is a powerful tool for CAN-bus product development and CAN-bus data analysis. PCs, mobile phones and tablets can quickly connect to a CAN-bus network over WiFi, forming CAN-bus control nodes for data processing and data acquisition in fieldbus laboratories, industrial control, intelligent communities, automotive electronic networks and other CAN-bus applications. Compact and plug-and-play, it is also an excellent choice for portable systems.

The GCAN-211 integrates an electrical isolation protection module on the CAN interface to prevent damage from transient overcurrent or overvoltage and improve system reliability in harsh environments.

The GCAN-211 supports secondary development. Guangcheng Technology provides example connection code for VB and C#, allowing users to develop their own test software or integrate the device into existing software systems.

1.2 Features

1.2.1 Hardware Features

• High-speed 32-bit industrial-grade processor
• Embedded hardware watchdog timer
• Internal FLASH memory for parameter storage
• External power supply (9-24 V DC); 12 V or 24 V recommended
• Supply current: 80 mA at 24 V DC
• ESD immunity: contact discharge +/-2 kV, air discharge +/-15 kV
• Electrical fast transient burst immunity: +/-1 kV
• Surge immunity: +/-1 kV
• Operating temperature range: -40°C to +85°C
• Operating humidity range: 5% - 95% RH, non-condensing
• Screw-fixed mounting, designed for industrial use

1.2.2 CAN Characteristics

• Integrates two CAN-bus interfaces using pluggable terminal blocks
• CAN-bus signals: CAN_H, CAN_L and CAN_GND
• Supports CAN 2.0A and CAN 2.0B frame formats, compliant with ISO/DIS 11898
• CAN-bus baud rate freely programmable from 5 kbps to 1 Mbps
• CAN-bus interface electrically isolated; isolation withstand voltage 2500 V DC
• 32 hardware FIFO receive buffers; maximum receive data flow 8000 frames/s
• Receive-message timestamp accuracy on the CAN side down to 1 us

1.2.3 Ethernet Characteristics

• PC interface: standard RJ45 Ethernet, 10/100 M auto-negotiation

• Timeout-disconnect function supported

• Working port, target IP address and target port are all configurable

• Automatically restores connection resources after a network outage and reliably re-establishes TCP connections

• TCP supports up to 255 connections, allowing six user groups to manage one CAN port simultaneously

• In UDP mode, each CAN port supports six target IP groups, allowing multiple users to manage one CAN device simultaneously

• Supported protocols: ETHERNET, ARP, IP, ICMP, UDP, DHCP, DNS and TCP

• Compatible with SOCKET operation (TCP Server, TCP Client, UDP, etc.); host communication software follows standard SOCKET rules

1.2.4 WiFi Characteristics

• Integrated 2.4 GHz WLAN interface, compliant with IEEE 802.11a/b/g

• Supports AP and Station modes

1.3 Typical Applications

• CAN-bus network diagnosis and testing

• Industrial WiFi connection to a CAN network

• Power communication networks

• Industrial control equipment

• High-speed, high-volume communication

2. Device Installation

2.1 Device Dimensions

The outline dimensions of the device are (length, including terminal block) 118 mm x (width) 93 mm x (height) 22 mm, excluding the antenna, as shown in Figure 2.1.

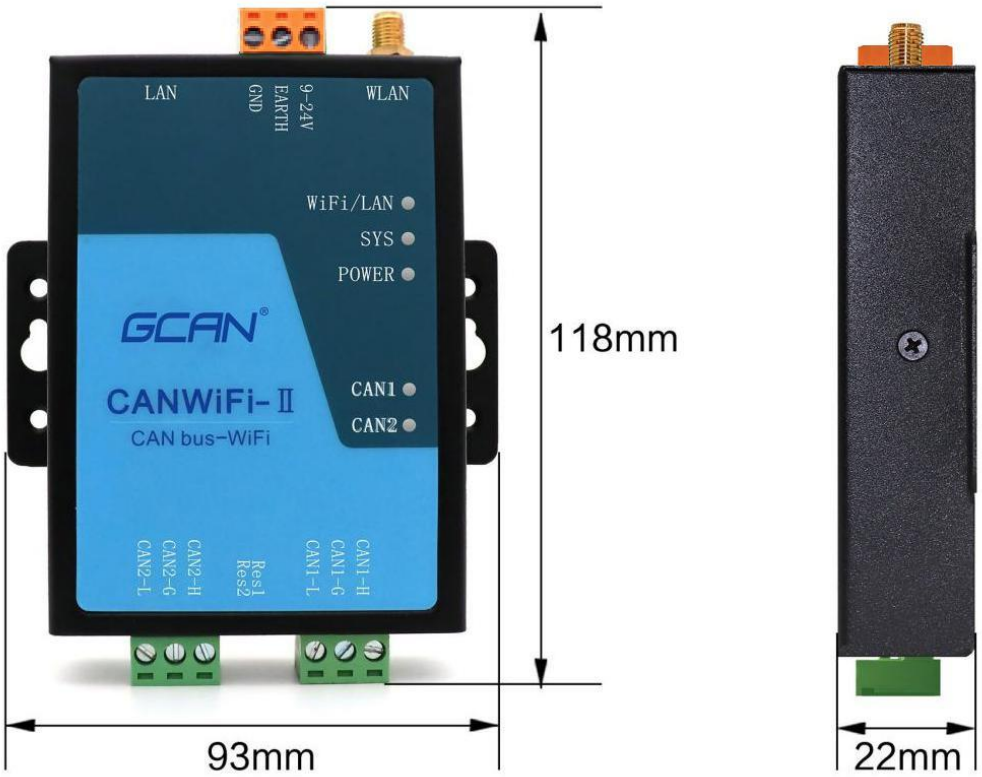

Figure 2.1 Outline dimensions of the GCAN-211

2.2 Device Mounting

The outline dimensions of the GCAN-211 interface card are shown in Figure 2.2. These dimensions can be used to design the mounting holes for the device.

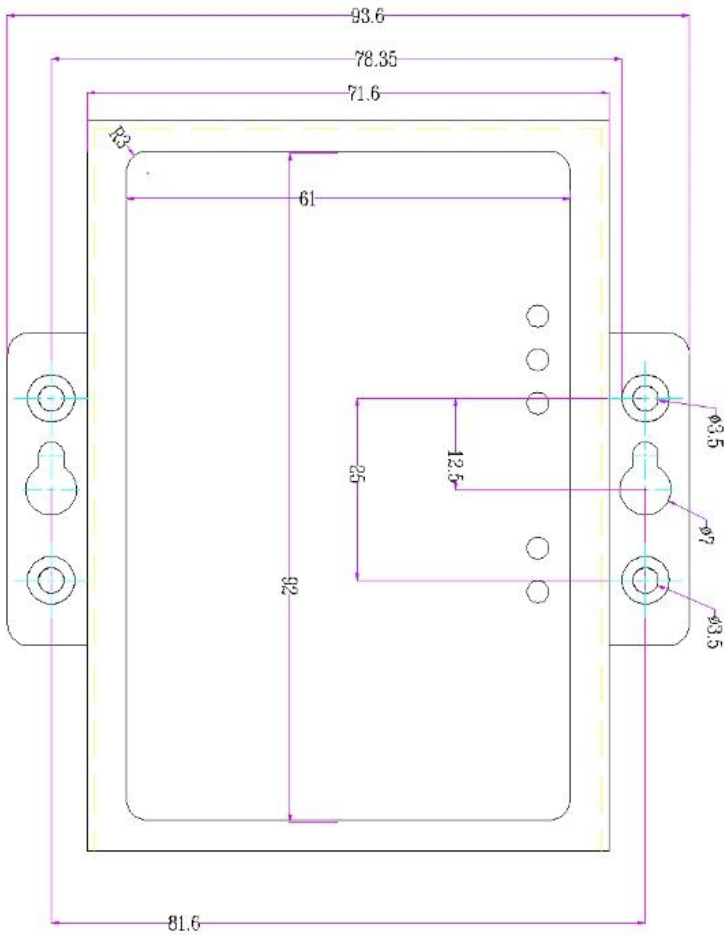

Figure 2.2 Mechanical dimensions of the GCAN-211

2.3 Interface Definition and Functions

The GCAN-211 integrates one 9-24 V DC power interface, two standard CAN-bus interfaces, one Ethernet interface and one WiFi interface.

The power interface of the GCAN-211 is brought out through a 3-pin pluggable terminal block. The positions of the WiFi, power and Ethernet interfaces and the power interface definition are shown in Figure 2.3 and Table 2.1.

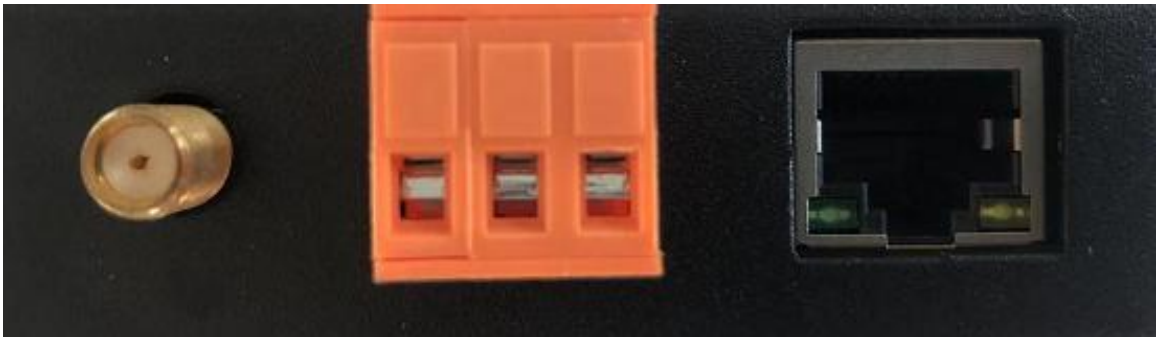

Figure 2.3 WiFi, power and Ethernet interface positions

Pin (left to right)	Port	Name	Function
1	Power	9-24 V	Positive input of the 9-24 V DC supply
2	EARTH	PE	PE terminal; connect to earth
3	GND	GND	Negative input of the 9-24 V DC supply

Table 2.1 Power interface definition of the GCAN-211

The CAN-bus interfaces of the GCAN-211 are brought out through two 3-pin terminal blocks and can be used to connect two CAN-bus networks or CAN-bus devices. The interface positions and definitions are shown in Figure 2.4 and Table 2.2.



Figure 2.4 CAN-bus interfaces of the GCAN-211

Pin (left to right)	Port	Name	Function
1	CAN2	CAN2-L	CAN2_L signal line (CAN low)
2	CAN2	CAN2-G	CAN2_GND ground
3	CAN2	CAN2-H	CAN2_H signal line (CAN high)
4	CAN1	CAN1-L	CAN1_L signal line (CAN low)
5	CAN1	CAN1-G	CAN1_GND ground
6	CAN1	CAN1-H	CAN1_H signal line (CAN high)

Table 2.2 CAN-bus signal assignment of the GCAN-211

3. Device Usage

3.1 Connection and Configuration with a PC

The GCAN-211 is plug-and-play, so the user can connect directly to the device over WiFi to establish communication.

The GCAN-211 is powered by 9-24 V DC. Once the device is powered, the CANet-Wifi-Config configuration software on a PC can be used to configure its operating mode and basic parameters (see Chapter 4).

3.1.1 Restoring Factory Settings

The default WiFi IP address of the GCAN-211 is 192.168.1.11. If the IP address has been changed and forgotten, the parameters can be reset with the reset button shown in Figure 3.1.



Figure 3.1 Reset button position

After the GCAN-211 is powered on, press and hold the reset button for about 5 seconds. When the SYS and WIFI LEDs flash alternately, the system parameters have been reset. Release the button and power-cycle the GCAN-211 to restore the factory settings.

3.1.2 Changing the PC IP Address

Before communicating with the GCAN-211, make sure that the PC has an Ethernet adapter and that the PC and the GCAN-211 are on the same subnet.

The GCAN-211 is assigned a default IP address (192.168.1.11) and gateway (255.255.255.0) at the factory. Use the flowchart in Figure 3.2 to check whether the device and the PC are on the same subnet.

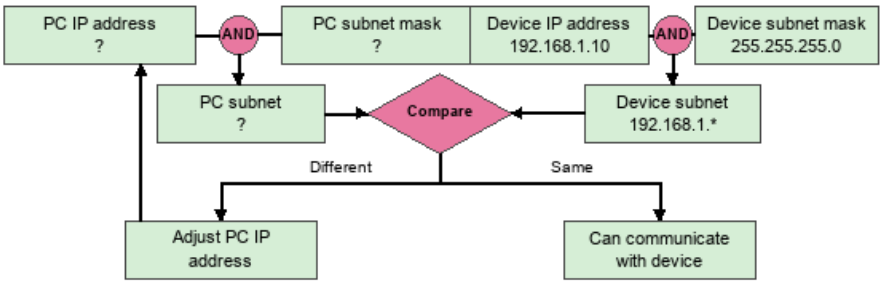

Figure 3.2 Same-subnet detection flowchart for the PC and GCAN-211

Note: The GCAN-211 can be configured only when the PC is on the same subnet. If the subnets differ, configure the PC as described below.

3.1.3 Windows XP/7 Network Settings

For Windows XP/7, the PC IP address and subnet can be set by adding a second IP address or modifying the existing IP address. If the PC uses a fixed IP, either method can be used. If the PC obtains an IP address automatically, only the modification method can be used.

Open Control Panel, then Network Connections (Windows XP) or Network and Sharing Center (Windows 7), then Local Area Connection Properties, then Internet Protocol (TCP/IP) (Windows XP) or Internet Protocol Version 4 (TCP/IP) (Windows 7). The dialog shown in Figure 3.3 appears.

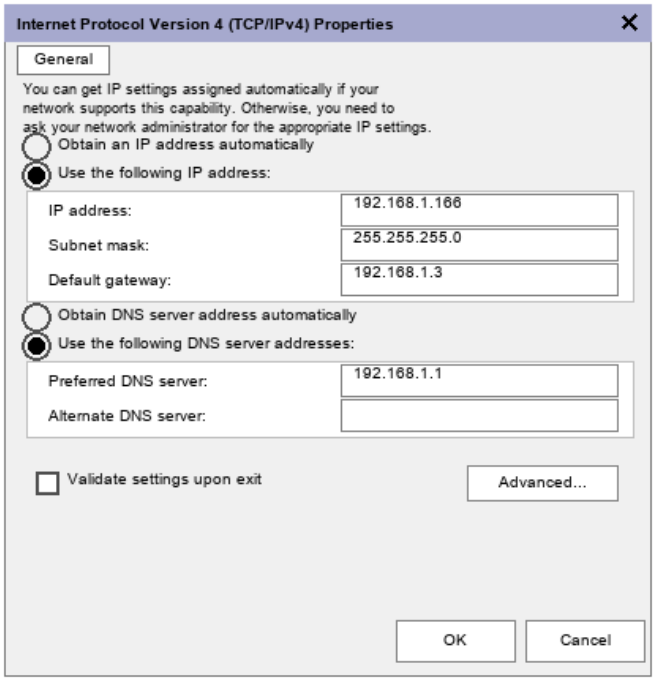

Figure 3.3 TCP/IP Properties - General tab

Click Advanced to open the Advanced TCP/IP Settings dialog shown in Figure 3.4, where a PC IP address can be added.

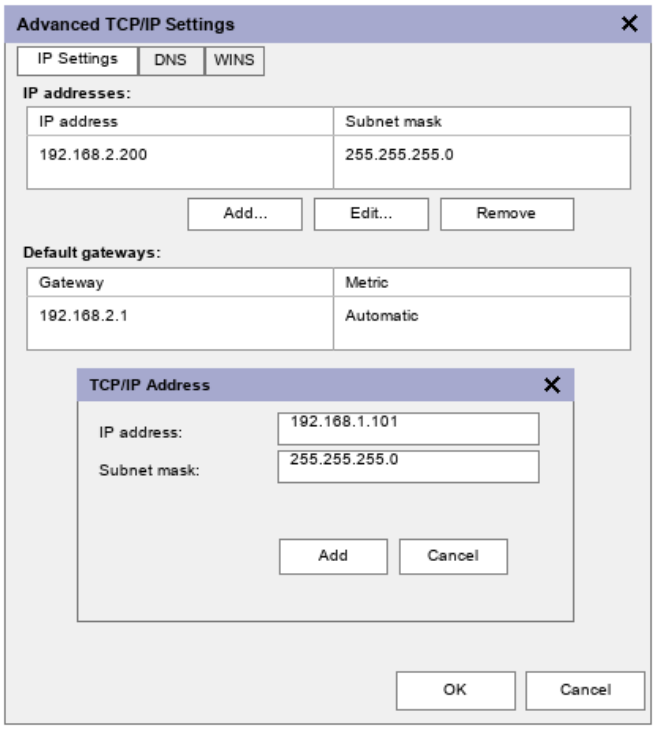

Figure 3.4 Advanced TCP/IP Settings - adding a PC IP address

In the IP Addresses area, click Add and enter an IP address on the same subnet as the GCAN-211. The PC can then communicate with and configure the GCAN-211.

Note: When communicating over WiFi, make sure that the wireless adapter IP address and the device IP address are on the same subnet. The modification method is the same.

If the PC obtains an IP address automatically, select "Use the following IP address" at the step shown in the same-subnet flowchart and enter an IP address on the same subnet as the GCAN-211. Do not use the same IP address.

3.2 Ethernet Connection

The GCAN-211 supports three operating modes: TCP Server, TCP Client and UDP.

3.2.1 TCP Server Mode

In TCP Server mode, the GCAN-211 does not initiate connections. It waits for a TCP Client to connect. After the TCP connection is established, bidirectional data communication is possible.

3.2.2 TCP Client Mode

In TCP Client mode, the GCAN-211 actively connects to a preconfigured TCP server. If the connection fails, the client keeps trying according to the configured connection conditions. After the TCP connection is established, bidirectional data communication is possible.

3.2.3 UDP Mode

UDP mode uses the UDP protocol for data communication. UDP is connectionless and cannot guarantee that packets sent to the target host are received correctly, so applications with high reliability requirements need an upper-layer protocol to ensure data integrity. However, UDP is simple, adds little overhead and can provide higher communication speed and better real-time performance than TCP. In a simple network with moderate load, UDP is not prone to errors. All devices in this mode have equal status; there is no server or client.

3.3 CAN-Bus Connection

To connect the GCAN-211 to a CAN bus, connect CAN_H to CAN_H and CAN_L to CAN_L to establish communication.

The CAN-bus network uses a linear topology. The two most distant ends of the bus require 120 ohm terminating resistors; if there are more than two nodes, intermediate nodes do not require 120 ohm terminating resistors. Branch connections must not exceed 3 m. The connection is shown in Figure 3.5.

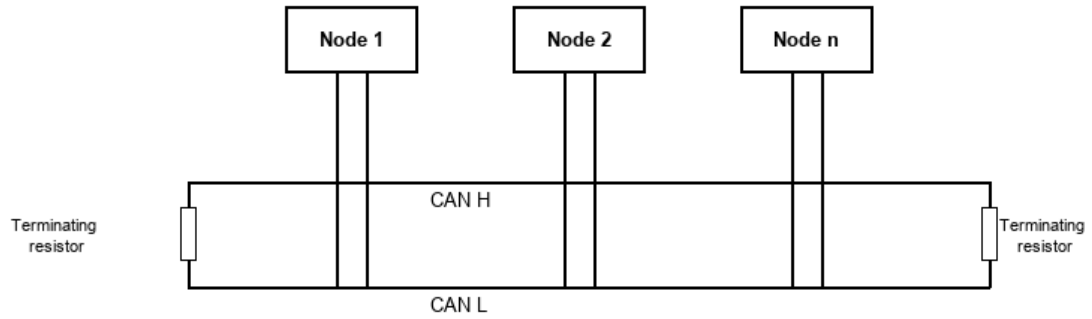

Figure 3.5 CAN-bus network topology

CAN-bus cable can be ordinary twisted pair or shielded twisted pair. The theoretical maximum communication distance depends mainly on the bus baud rate; see Table 3.1. If the distance exceeds 1 km, make sure that the conductor cross-section is larger than 1.0 mm2; the exact specification depends on the distance and is generally increased as the distance becomes longer.

Baud rate	Bus length
1 Mbit/s	25 m
500 kbit/s	100 m
250 kbit/s	250 m
125 kbit/s	500 m
50 kbit/s	1.0 km
20 kbit/s	2.5 km
10 kbit/s	5.0 km
5 kbit/s	13 km

Table 3.1 Baud rate and maximum bus length

3.4 CAN-Bus Terminating Resistor

To improve CAN communication reliability and eliminate signal-reflection interference at the bus ends, terminating resistors are generally installed at the two most distant endpoints of the CAN network, as shown in Figure 3.6. The resistor value is determined by the characteristic impedance of the transmission cable. For example, if the characteristic impedance of the twisted pair is 120 ohms, a 120 ohm terminating resistor should be integrated at both endpoints. The GCAN-211 uses an 82C251 transceiver; if other nodes use different transceivers, the terminating resistor must be recalculated.

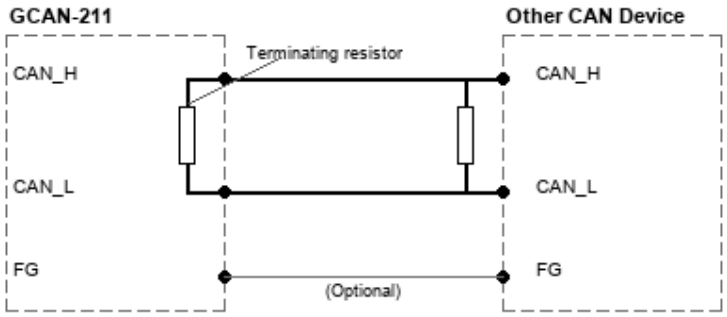

Figure 3.6 GCAN-211 connected to another CAN node

Note: The GCAN-211 has an internal 120 ohm terminating resistor that can be connected by DIP switch. The switch is located between the two 3-pin terminal blocks; the right switch controls CAN1 and the left switch controls CAN2. Set the switch to ON to enable the resistor.

3.5 System Status LEDs

The GCAN-211 has one PWR LED and one SYS LED to indicate device status, plus one WiFi/LAN LED, one CAN1 LED and one CAN2 LED to indicate bus status. The functions and status meanings of these LEDs are listed in Tables 3.2 and 3.3.

LED	Color	Indication
PWR	Green	Power supply status
SYS	Green	System status
WiFi/LAN	Green	Data indication
CAN1	Red / Green	CAN1 data indication
CAN2	Red / Green	CAN2 data indication

Table 3.2 LEDs of the GCAN-211 interface card

When the device is powered on, PWR and SYS illuminate, indicating that the device is powered and the system is initializing; otherwise, a power fault or serious system error has occurred.

When the Ethernet or WiFi interface is connected correctly, the WiFi/LAN LED flashes while data is being transmitted over Ethernet or WiFi.

When CAN-bus data is being transmitted or received, the corresponding CAN1 or CAN2 green LED flashes. If a communication fault occurs, the red LED illuminates.

LED	Status	Indication
PWR	On	Power supply normal
	Off	Power supply fault
SYS	Off	Device initialization failed
	Flashing	Initialization successful, standby state
	Steady on	Device fault
CAN1 / CAN2	Steady red	CAN-bus communication fault
	Green flashing	Data transmission on the corresponding CAN bus

Table 3.3 LED status of the GCAN-211 interface card

4. CANet-Wifi-Config Software

The GCAN-211 WiFi-to-CAN module can be configured with the CANet-Wifi-Config software, including operating mode, working port, module IP, CAN operating mode, CAN baud rate and WiFi settings.

Note: Configuration must be performed over an Ethernet cable.

4.1 Factory Reset

The factory Ethernet IP address is 192.168.1.10 and the default WiFi IP address is 192.168.1.11. If the WiFi IP address has been changed and forgotten, the reset button can be used to restore the parameters.

Note: The Ethernet IP address cannot be changed. The default CAN-bus baud rate is 250 kbps. See section 3.1.1 for factory reset.

4.2 Connecting the GCAN-211

The device can be configured only through the Ethernet port. Connect only the Ethernet cable during configuration. When connecting with the software, select the device type and enter the Ethernet IP address: 192.168.1.10. Select GCAN-211 (CANWiFi) as the device type.

Click Connect. After a successful connection, the main software window appears.

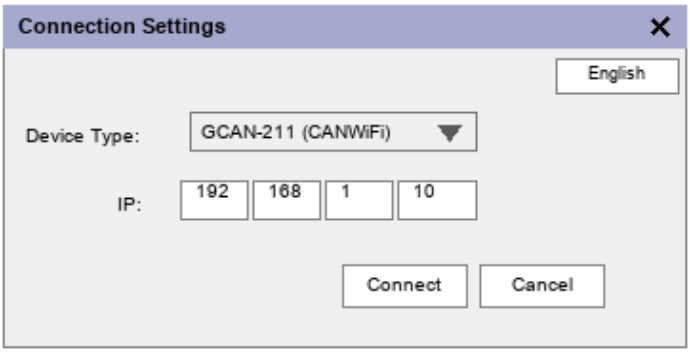

Figure 4.1 Connection settings dialog

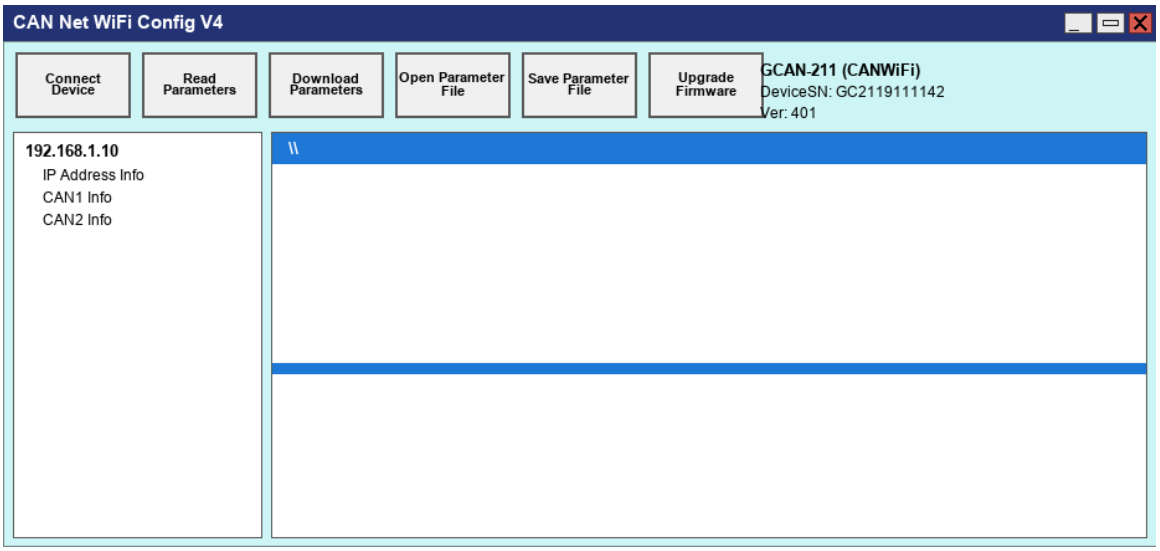

Figure 4.2 CANet-Wifi-Config main window

There are six tool buttons at the top of the software:

- Connect Device - connect to the device
- Read Parameters - read the configuration information from the device
- Download Parameters - download the configuration to the device FLASH
- Open Parameter File - open a configuration file stored on the PC
- Save Parameter File - save the current configuration to the PC
- Upgrade Firmware - update the GCAN-211 firmware kernel (use only under guidance)

4.3 Configuring Basic Communication Information

After connecting successfully, click Read Parameters to upload the device parameters to the PC (a confirmation message appears when reading succeeds). "IP Address Info" contains WiFi-side parameters; "CAN1/CAN2 Info" contains CAN-bus parameters.

Click Read Parameters to display the read-completion message shown in Figure 4.3.

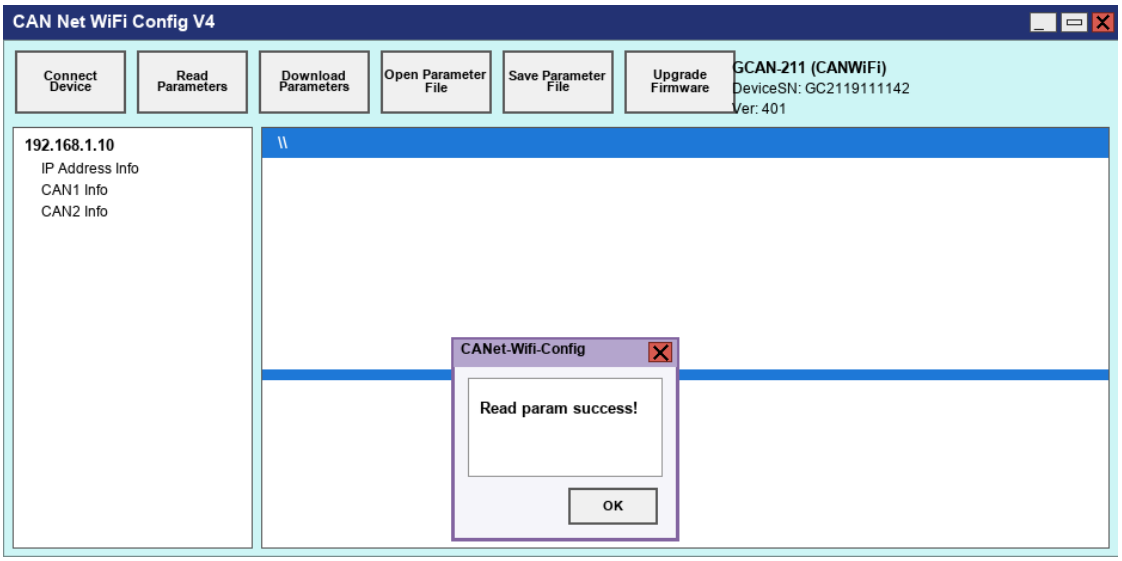

Figure 4.3 Read parameters complete

Click "IP Address Info" to open the WiFi parameter view shown in Figure 4.4.

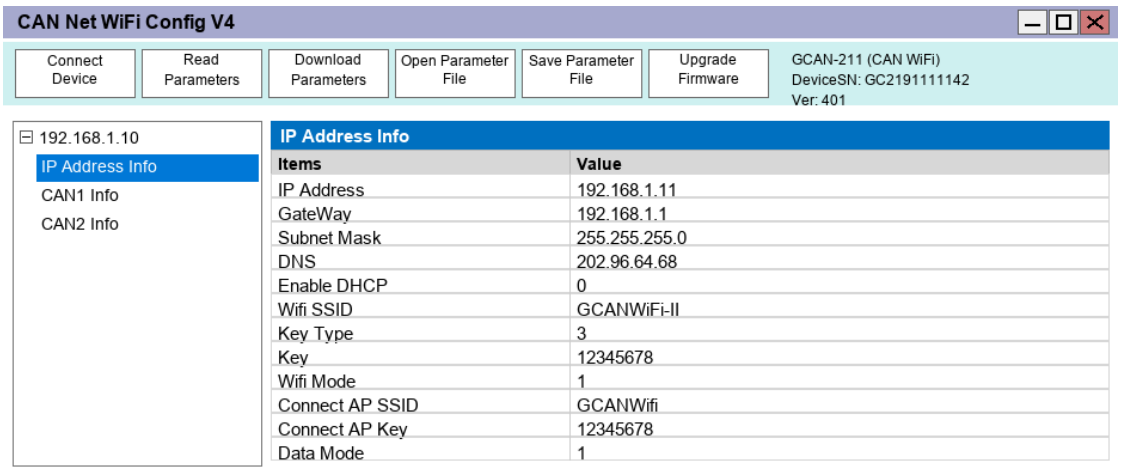

Figure 4.4 WiFi parameter information

The WiFi parameters are described below. The CAN2 Info tab is shown in Figure 4.5.

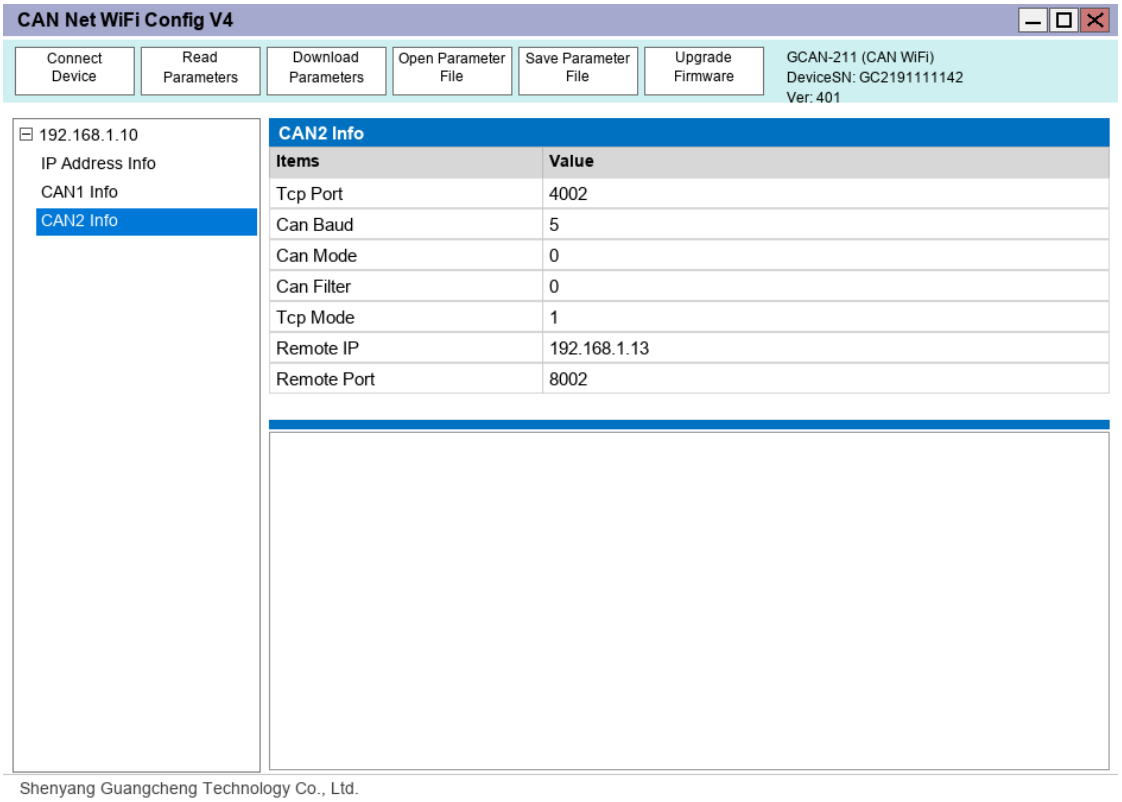

Figure 4.5 CAN2 parameter information

Parameter	Description
IP Address	Sets the WiFi IP address
GateWay	Sets the WiFi gateway
Subnet Mask	Sets the WiFi subnet mask
DNS	Sets the DNS address
Enable DHCP	Enables DHCP (automatic IP acquisition)
Wifi SSID	Sets the WiFi network name
Key Type	Sets the encryption mode
Key	Sets the WiFi password
Wifi Mode	Sets the WiFi operating mode
Connect AP SSID	Sets the AP name to connect to in Client mode
Connect AP Key	Sets the AP password to use in Client mode
Data Mode	Sets the data transmission format: normal or compatible

Note: Make sure that the wireless adapter IP and the device IP are on the same subnet. Key Type must match the WiFi device being used; WPA2 is recommended and is the most common setting.

4.3.1 CAN-Bus Parameter Settings

Click "CAN1/CAN2 Info" to open the CAN-bus parameter view shown in Figure 4.6.

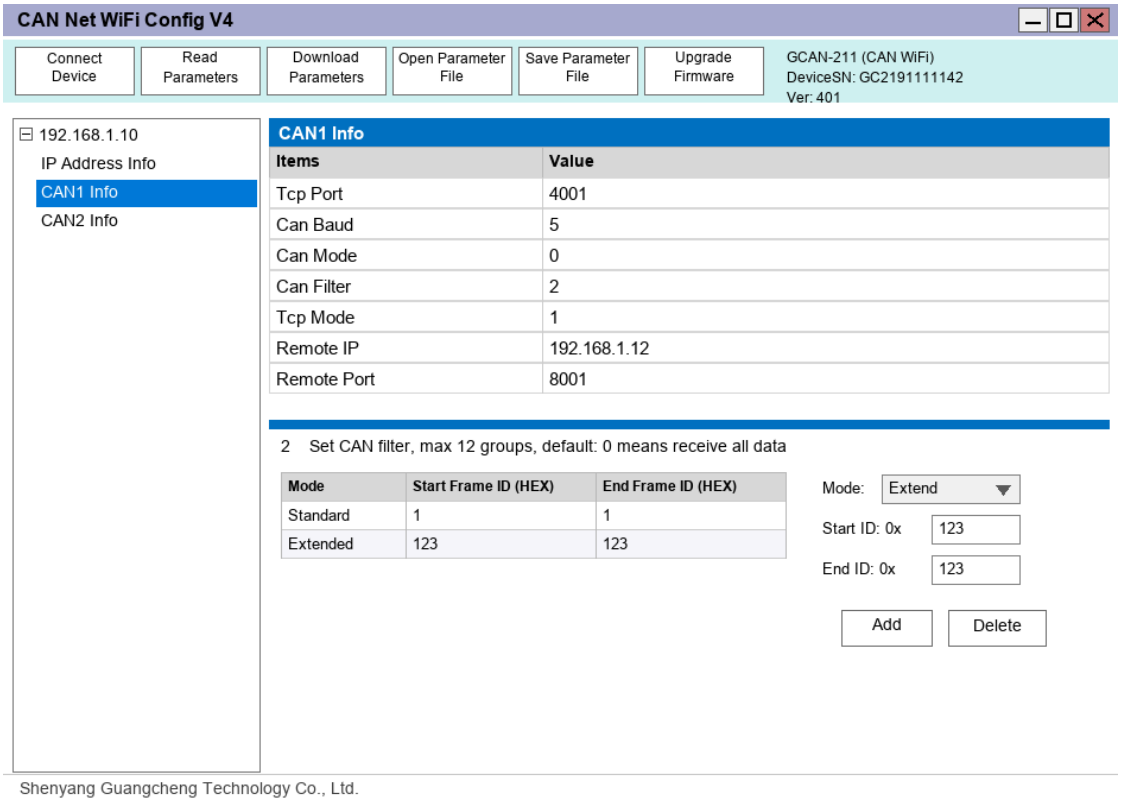

Figure 4.6 CAN1/CAN2 parameter information

The CAN-bus parameter settings are shown in Figure 4.7.

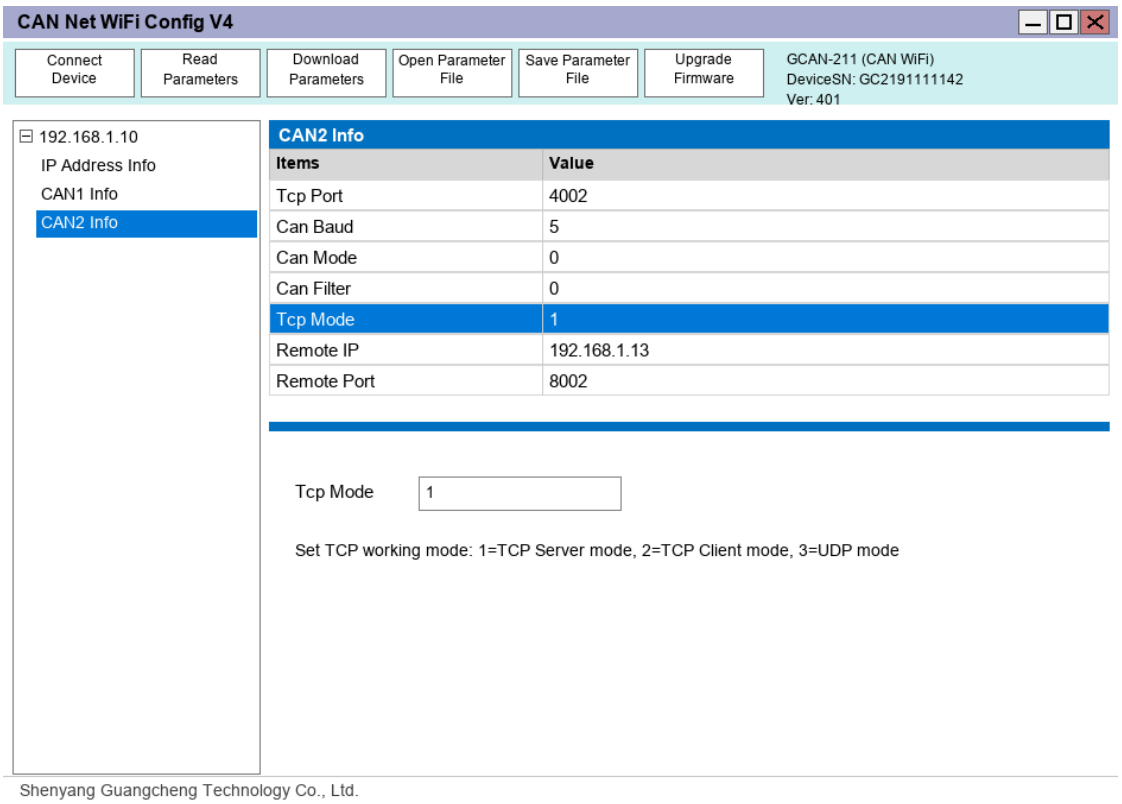

Figure 4.7 CAN-bus parameter settings

• TCP Port - sets the CAN-bus communication port; effective only in TCP Server mode

• CAN Baud - sets the CAN-bus baud rate (see Table 4.1)

• CAN Mode - sets the CAN-bus operating mode; the default value 0 is recommended

• CAN Filter - sets the CAN-bus filters; up to 12 standard and extended frame filters can be configured

• TCP Mode - sets the TCP operating mode: 1 = TCP Server, 2 = TCP Client, 3 = UDP

• Remote IP - sets the target host IP address; effective in TCP Client or UDP mode

• Remote Port - sets the target host port number; effective in TCP Client or UDP mode

4.4 Completing Configuration

After a parameter is modified, that section turns red in the software. Click Download Parameters to write the configuration to the GCAN-211 FLASH.

A completion message is displayed when downloading succeeds.

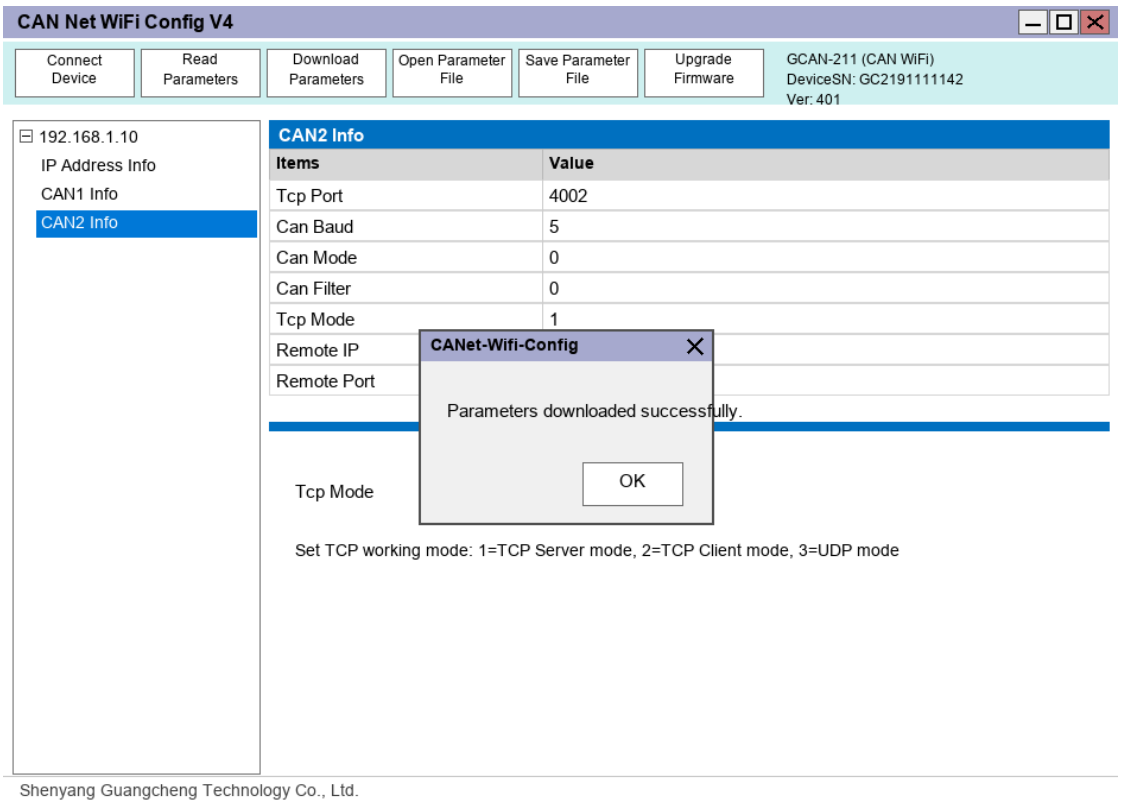

Figure 4.8 Download parameters complete

Note: Power-cycle the device after downloading so that the new configuration takes effect.

4.5 Saving and Loading Configuration Files

Configuration parameters downloaded from the device or entered manually can be saved to a local file with Save Parameter File. Opening that file with Open Parameter File loads the configuration in one step.

4.6 Updating the GCAN-211 Firmware (Use Under Technical Guidance)

Disconnect the module power, press and hold the reset button, then apply power. When the Power LED illuminates and the LAN LED flashes rapidly, release the button. The system enters kernel upgrade mode.

Insert an Ethernet cable, open CANet-Wifi-Config, select the GCAN-211 device and enter IP address 192.168.1.10 (fixed and cannot be changed).

After connecting successfully, the Upgrade Firmware button becomes available. Click "UpData App".

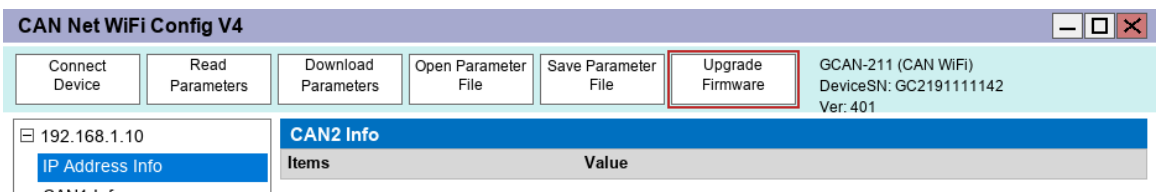

Figure 4.9 Firmware upgrade button state

Click "Open File" to select the firmware file, then start the upgrade.

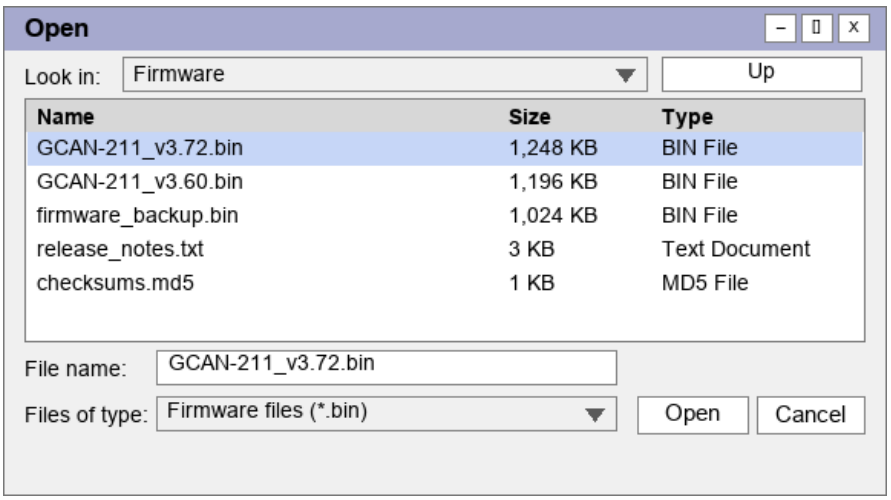

Figure 4.10 Open firmware file dialog



Figure 4.11 Firmware upgrade in progress

Note: Do not disconnect the network or power during the upgrade, otherwise the upgrade will fail. If it fails, restart the device and reopen the software.

After the upgrade is complete, power-cycle the module before use.

5. WiFi Wireless Connection

To configure the wireless connection mode, use an Ethernet connection: connect the 9-24 V DC supply and connect the device LAN port to a PC Ethernet port with a network cable.

5.1 AP Mode

In AP mode, the GCAN-211 acts as a hotspot that accepts connections from other WiFi devices, like a wireless router. Configure this mode with CANet-Wifi-Config: set Wifi Mode to 1 for AP mode, set Wifi SSID to the hotspot name and set Key to the hotspot password.

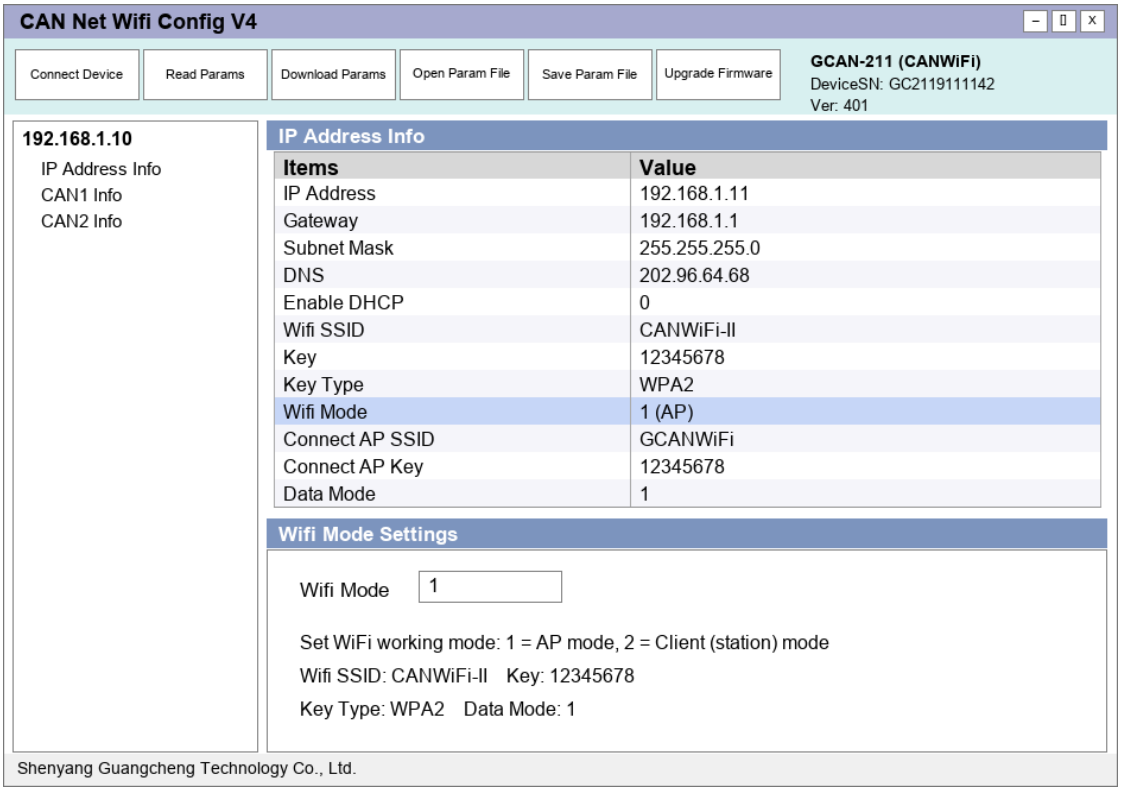

Figure 5.1 AP mode settings

5.2 Station Mode

In Station mode, the GCAN-211 acts as a client connecting to an AP hotspot, providing wireless network access. To use this function, the wireless network name (SSID), channel, encryption mode and key must be known. In CANet-Wifi-Config, set Wifi Mode to 2 for Client (Station) mode, set Connect AP SSID to the AP name and set Connect AP Key to the AP password.

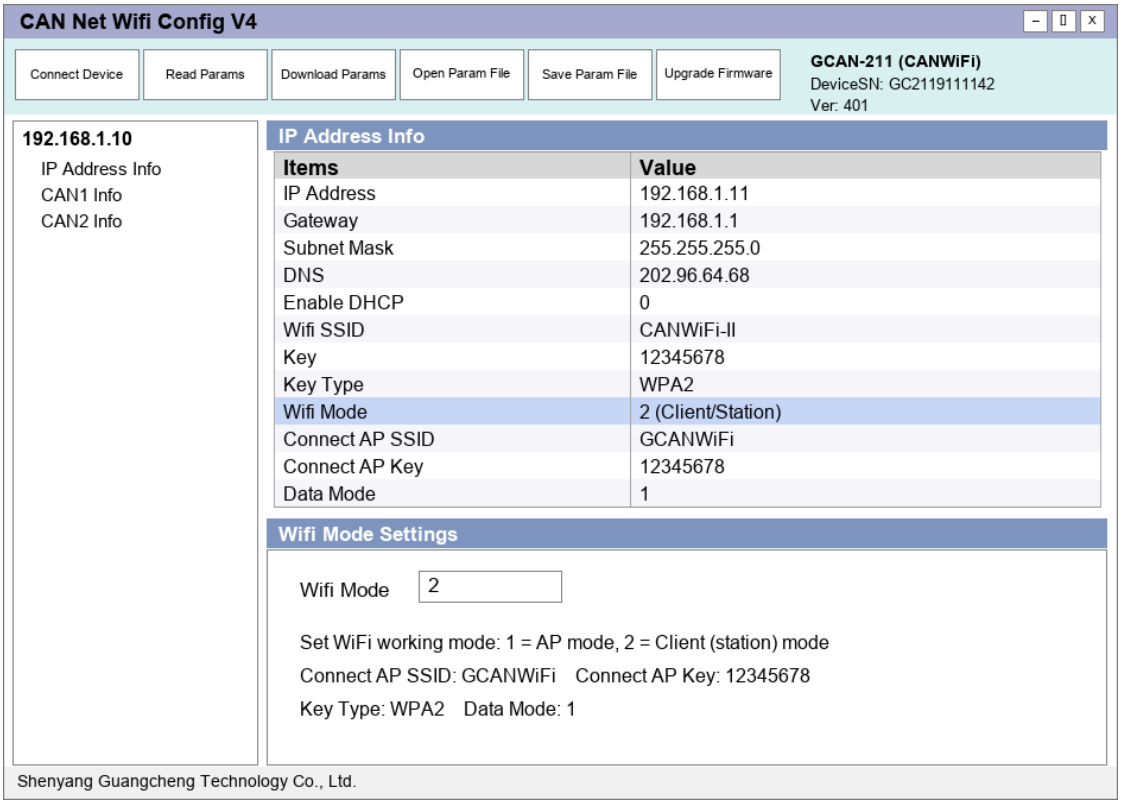

Figure 5.2 Station mode settings

6. Network Debug Assistant

Guangcheng Technology provides the Net Assist network debug assistant, which can be used to test the TCP Server, TCP Client and UDP transmit/receive functions of the GCAN-211 in AP mode and Client (Station) mode.

6.1 Preparations

Before testing, make sure that CAN_H and CAN_L of the GCAN-211 are connected to the CAN interface of the target device and that the GCAN-211 has been configured correctly.

If a PC is used to connect to the GCAN-211, open the Windows command prompt (Start > Run > cmd > OK) after powering on the device, then enter "arp -d" and "ping 192.168.1.11" (or the configured IP address) to verify the connection. A normal connection is shown in Figure 6.1.

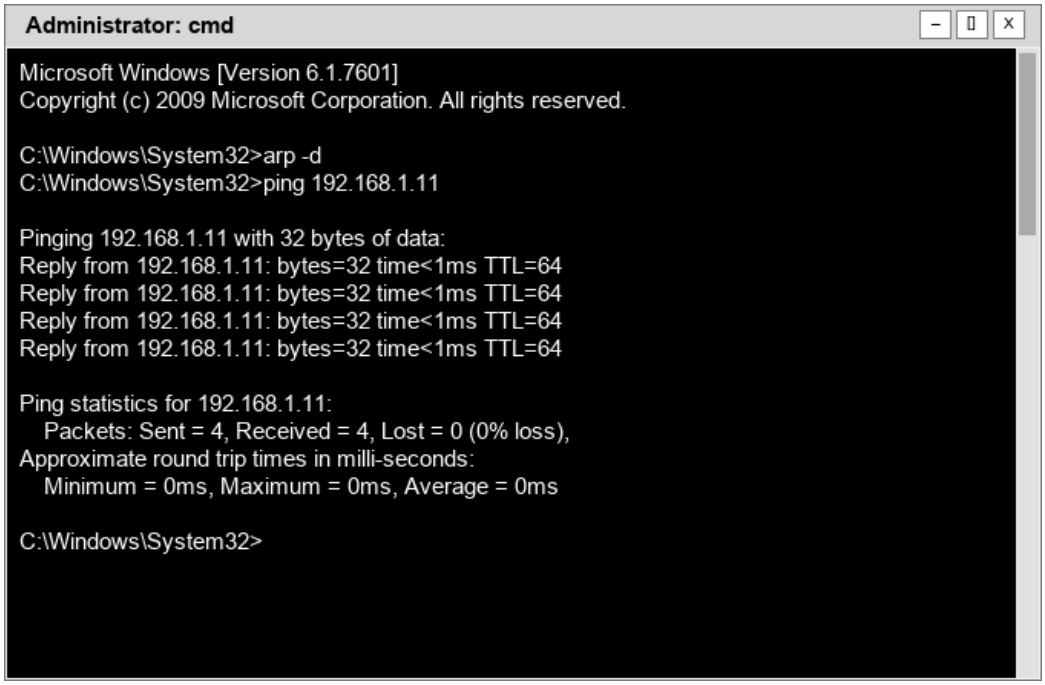

Figure 6.1 Command prompt connectivity check

Note: For this test the operating mode is AP mode. Disconnect the Ethernet cable; the PC and GCAN-211 must communicate over WiFi.

After confirming the connection, connect the CAN interface of the GCAN-211 to another CAN device. Make sure that 120 ohm terminating resistors are installed at both ends of the CAN bus. In this manual, a Guangcheng Technology USBCAN-II Pro is used as the CAN interface device, and the default CAN baud rate is 250 kbps.

6.2 TCP Server Mode Communication Test

In the configuration software, set the TCP Mode of CAN1 to 1 so that the GCAN-211 operates as a TCP Server, and set CAN Baud to 5 (250 kbps). In Net Assist, select TCP Client as the protocol type. Set the local host address to the PC IP address and the remote host address to the GCAN-211 IP address and port number (the CAN1 factory default is 192.168.1.11:4001).

After configuration, power-cycle the GCAN-211. In Net Assist, select Hex Display and Hex Send.

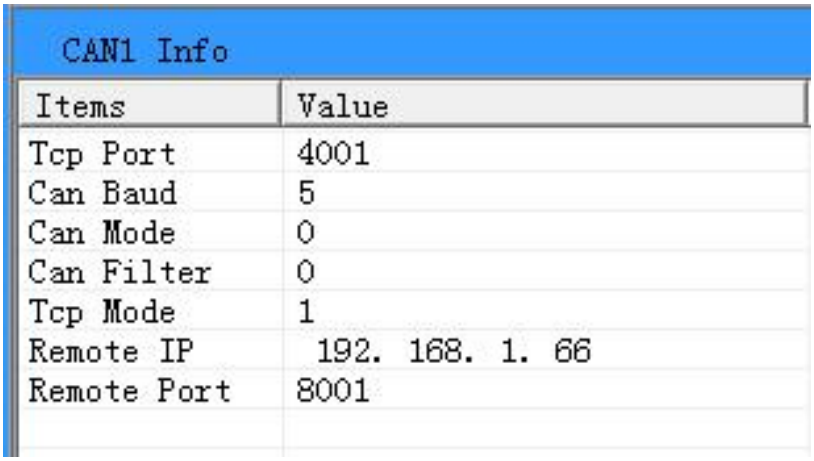

Figure 6.2 CAN1 configuration - TCP Server mode

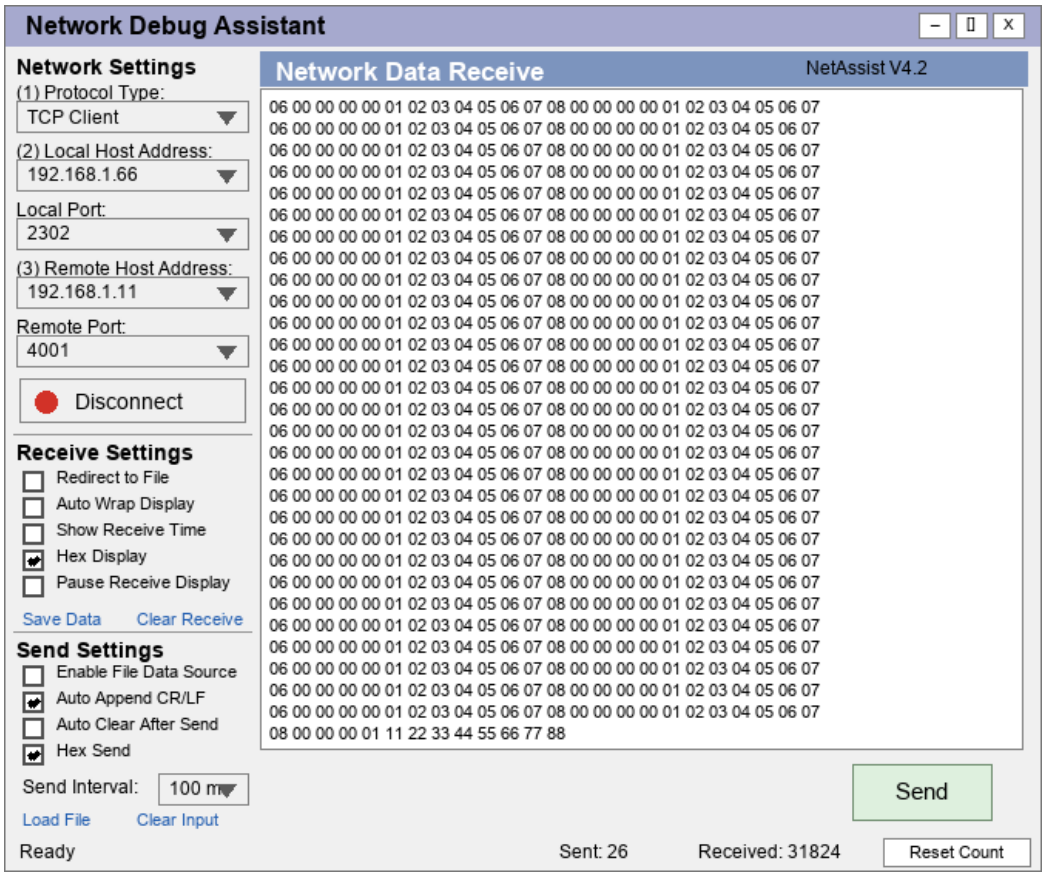

Figure 6.3 NetAssist TCP Client settings

6.3 TCP Client Mode Communication Test

In the configuration software, set the TCP Mode of CAN1 to 2 so that the GCAN-211 operates as a TCP Client. Set Remote IP to the PC IP address and Remote Port to the port number for that IP (default 8001). In Net Assist, select TCP Server as the protocol type. Set the local host address to the PC IP address and the local host port to the remote port configured in the software.

Note: After configuration, power-cycle the GCAN-211 and select Hex Display and Hex Send in Net Assist.

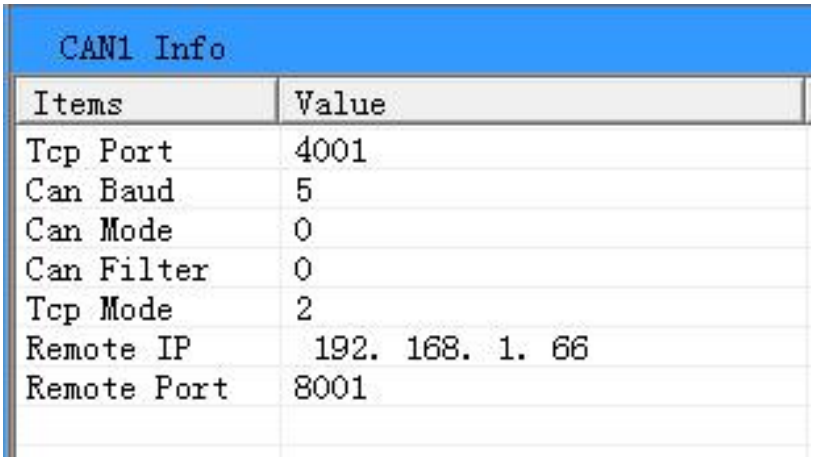

Figure 6.4 CAN1 configuration - TCP Client mode

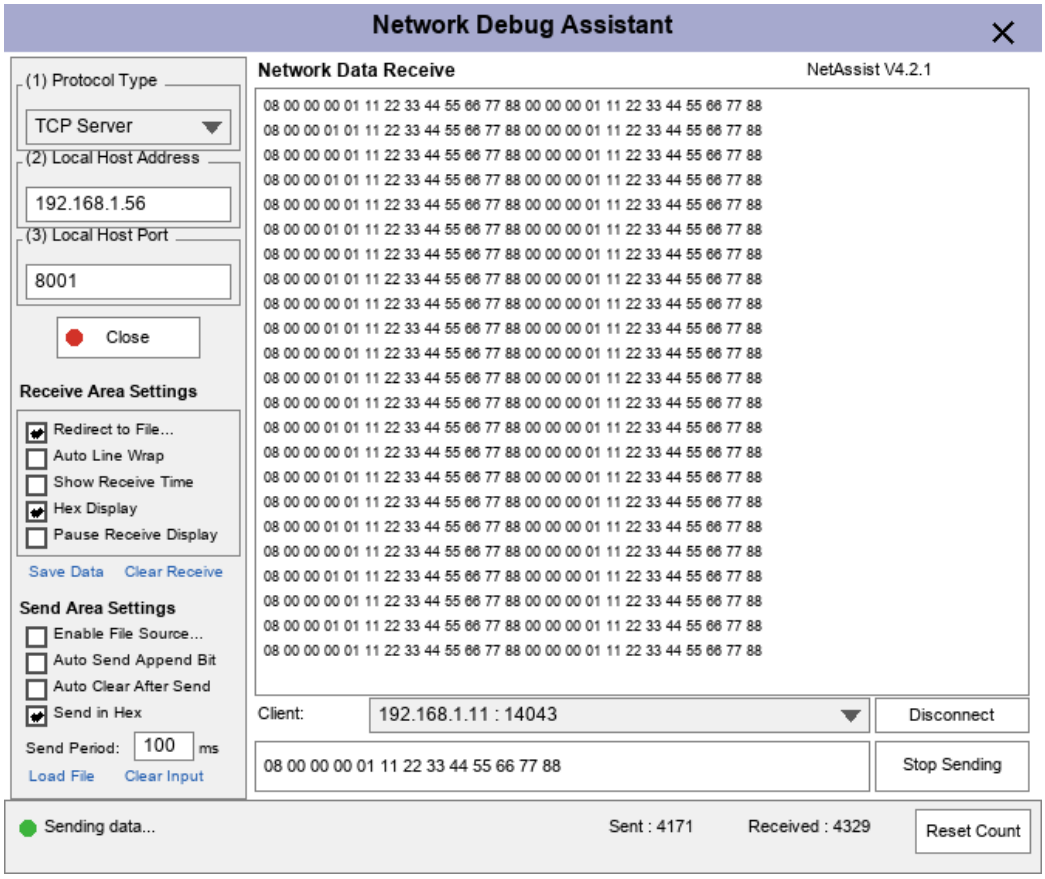

Figure 6.5 NetAssist TCP Server settings

6.4 UDP Mode Communication Test

In the configuration software, set the TCP Mode of CAN1 to 3 so that the GCAN-211 operates in UDP mode. Set Remote IP to the PC IP address and Remote Port to the port number for that IP (default 8001). In Net Assist, select UDP as the protocol type. Set the local host address to the PC IP address and the local host port to the remote port configured in the software.

Note: After configuration, power-cycle the GCAN-211 and select Hex Display and Hex Send in Net Assist.

CAN1 Info

Items	Value
Tcp Port	4001
Can Baud	5
Can Mode	0
Can Filter	0
Tcp Mode	3
Remote IP	192. 168. 1. 66
Remote Port	8001

Figure 6.6 CAN1 configuration - UDP mode

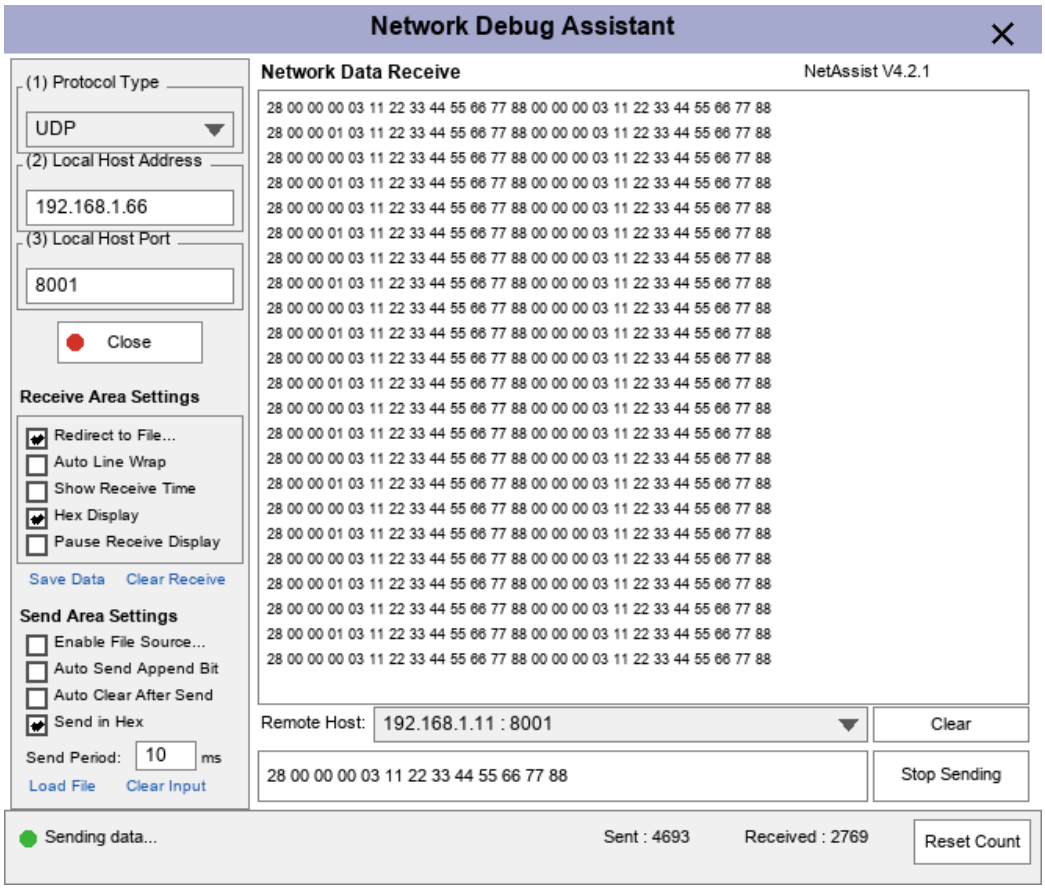

Figure 6.7 NetAssist UDP settings

7. Online Baud-Rate Modification

7.1 Function Description

The GCAN-211 supports online adjustment of the baud rate over Ethernet in TCP Server mode, without using the configuration software. By adding the baud-rate modification

command to the host computer used for secondary development, users can conveniently change among multiple baud rates, greatly simplifying the workflow and improving usability.

7.2 Command Format

Send commands over Ethernet according to the format below. All bytes are fixed except Data 1, Data 2, Data 3 and Data 5.

• Data 1 and Data 2: 02 01 = set baud rate; 0B 03 = apply immediately

• Data 3: 01 = CAN1 channel; 02 = CAN2 channel

• Data 5: 00=1000k, 01=800k, 02=666k, 03=500k, 04=400k, 05=250k, 06=200k, 07=125k, 08=100k, 09=80k, 10=50k, 11=40k, 12=20k, 13=10k, 14=5k

Note: All three groups of data must be sent in sequence to modify the baud rate online. If the apply-immediately message is not sent, the new baud rate takes effect after the next power cycle.

Frame info	Frame ID	Frame ID	Frame ID	Frame ID	Data 1	Data 2	Data 3	Data 4	Data 5	Data 6	Data 7	Data 8
10	00	00	08	01	Set rate / apply	Set	CAN channel	00	Set baud rate	00	00	00

Table 7.1 Online baud-rate modification command format

7.3 Transmission Examples

Example: set CAN1 to 250 kbps.

Ethernet send: 1000 00 08 0102 01 01 00 05 00 00 00

Ethernet reply: 10 00 00 08 01 02 01 01 00 05 00 00 00 (modified; takes effect after power cycle)

Example: set CAN2 to 1000 kbps.

Ethernet send: 1000 00 08 0102 01 02 00 00 00 00 00

Ethernet reply: 10 00 00 08 01 02 01 02 00 00 00 00 00 (modified; takes effect after power cycle)

Example: apply the CAN1 and CAN2 baud-rate settings immediately.

Ethernet send: 1000 00 08 010B 03 00 00 00 00 00 00

Ethernet reply: 10 00 00 08 01 0B 03 00 00 00 01 00 00 (previous modifications applied immediately)

8. Secondary Development

Guangcheng Technology also provides example source code for a simple GCAN-211 test program. Users can develop their own host debugging and analysis software based on this code, or integrate the function into an existing software system.

Secondary development of the GCAN-211 does not require a dynamic-link library. All host software and examples support Socket communication; a Socket connection can be established directly. Guangcheng Technology also provides a network debug assistant to help users test Ethernet Socket communication.

9. Technical Specifications

Category	Item	Specification
Connection	PC side	Ethernet interface, RJ45
	CAN side	**OPEN3 pluggable terminal block**
Interface features	Ethernet interface	10/100 M auto-negotiation
	CAN interface	Compliant with ISO 11898; supports CAN 2.0A/B
	CAN baud rate	5 kbit/s - 1 Mbit/s
	Electrical isolation	1500 V DC
	CAN terminating resistor	Integrated; enabled by DIP switch
Power supply	**Supply voltage**	**+9 to +24 V DC**
	Supply current	80 mA at 24 V DC
	Recommended voltage	12 V or 24 V
Environmental test	**Operating temperature**	**-40°C to +85°C**
	Operating humidity	15% - 90% RH, non-condensing
EMC test	**EMC standard**	**EN 55024:2011-09; EN 55022:2011-12**
Protection	**Ingress protection**	**IP 20**
General	**Outline dimensions**	**118 mm x 93 mm x 22 mm, excluding antenna**
	Weight	220 g

10. Frequently Asked Questions

1. The software reports a connection failure/error when connecting to the GCAN-211.

Check whether the IP address used by the software is on the same subnet as the GCAN-211, or whether the computer IP is set to a static address on the same subnet as the GCAN-211.

2. Is a 120 ohm terminating resistor always required on the CAN bus?

A 120 ohm terminating resistor absorbs endpoint reflections and provides a stable physical link. For a single-node self-transmit/self-receive test, the 120 ohm resistor must be connected to form a loop; otherwise the test cannot be performed. The GCAN-211 has an internal 120 ohm terminating resistor.

3. Can multiple GCAN-211 modules be installed on one computer?

A computer can connect to multiple GCAN-211 modules through an Ethernet switch or hub.

4. What is the maximum data conversion rate of the GCAN-211 interface card?

A single CAN channel of the GCAN-211 supports a maximum conversion rate of 8000 CAN frames/s. The frames referred to are standard 8-byte data frames; shorter frames or remote frames may be faster. The maximum data flow is also limited by PC performance.

5. The CAN status LED is off.

The CAN status LED is meaningful only when CAN data is being transmitted through the CAN interface.

6. How is the communication baud rate of the GCAN-211 set?

The software provides a set of commonly used baud rates. For other special baud rates, please contact Guangcheng Technology technical support.

7. How many lower-level devices can be connected to the GCAN-211?

The maximum number of CAN nodes complies with the CAN standard. The actual number of connected devices depends on the operating environment and baud rate.

8. Does the system entering standby or sleep mode affect reception?

Yes. All processing stops in that state, which may at worst cause a hardware receive-buffer overflow error. If a program keeps the device open, the system will attempt to prevent standby or sleep mode in order to maintain normal operation. When using the GCAN-211 interface card, disable the standby and sleep functions of the system.

9. WiFi protocol overview

WiFi is a wireless access service protocol with two operating modes: AP (Access Point) and Station (STA). It is essentially a connection method that replaces a cable; data communication is carried on a wireless channel.

AP mode provides wireless access services and allows other wireless devices to connect and access data; typical wireless routers and bridges work in this mode. APs can connect to each other. The wireless network name, encryption mode and password must be configured.

Station mode is similar to a wireless terminal. An STA does not accept wireless connections itself; it connects to an AP. A typical wireless network adapter works in this mode.

TCP Protocol Introduction

TCP supports three operating modes: TCP Server, TCP Client and UDP.

TCP Server: the server acts as a central point. Other devices are configured with an IP address and an open port (port range 0-65535). TCP Client devices can then connect to the host using that IP address and port, enabling bidirectional communication.

TCP Client: configure the local IP address and the target TCP Server IP address and port. On a LAN, the client and the TCP Server must be on the same subnet. The two devices can then communicate bidirectionally.

In one communication session there can be only one TCP Server. When two or more devices need to interconnect, set one device to TCP Server mode and all others to TCP Client mode. A GCAN-211 in TCP Client mode can connect to a TCP Server together with other TCP Client devices. In TCP Server mode, the GCAN-211 supports only one TCP Client connection, i.e. one socket.

UDP: UDP mode can be simply understood as two TCP Client devices connecting to a TCP Server. For example, devices A and B are both set to UDP mode. To interconnect, A must be

configured with its own IP address and port and the target IP address and port of B; B must be configured with its own IP address and port and the target IP address and port of A.

Note: UDP is faster than TCP, but frame loss may occur.

11. Disclaimer

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The standard frame layout is shown in Table A.1.

	7	6	5	4	3	2	1	0
Byte 1	FF	RTR	×	×	DLC (Data Length)			
Byte 2	(Message Identifier) **ID.10-ID.3**							
Byte 3	ID.2-ID.0			×	×	×	×	×
Byte 4	Data 1							
Byte 5	Data 2							
Byte 6	Data 3							
Byte 7	Data 4							
Byte 8	Data 5							
Byte 9	Data 6							
Byte 10	Data 7							
Byte 11	Data 8							

Table A.1 CAN 2.0A standard frame format

A.2 CAN 2.0B Extended Frame

A CAN extended frame contains 13 bytes in two parts: information and data. The first five bytes are the information part.

Byte 1 is the frame information. Bit 7 (FF) indicates the frame format; FF = 1 for an extended frame. Bit 6 (RTR) indicates the frame type; RTR = 0 for a data frame and RTR = 1 for a remote frame. DLC indicates the actual data length when the CAN frame is a data frame.

Bytes 2 to 5 contain the message identifier; the upper 29 bits are valid.

Bytes 6 to 13 contain the actual data of a data frame and are invalid for a remote frame.

The extended frame layout is shown in Table A.2.

	7	6	5	4	3	2	1	0
Byte 1	FF	RTR	X	X	DLC (Data Length)			
Byte 2	(Message Identifier) **ID.28-ID.21**							
Byte 3	ID.20-ID.13							
Byte 4	ID.12-ID.5							
Byte 5	ID.4-ID.0					X	X	X
Byte 6	Data 1							
Byte 7	Data 2							
Byte 8	Data 3							
Byte 9	Data 4							
Byte 10	Data 5							
Byte 11	Data 6							
Byte 12	Data 7							
Byte 13	Data 8							

Table A.2 CAN 2.0B extended frame format

Appendix B: GCAN-211 Data Flow Definition

One Ethernet data block can contain multiple CAN-bus data frames.

B.1 Ethernet-to-CAN Bus Data Flow Definition

One CAN frame contains 13 bytes.

Frame information, 1 byte, identifies information such as the frame type and length. Bit 7 (FF) indicates standard or extended frame: 1 = extended, 0 = standard. Bit 6 (RTR) indicates remote or data frame: 1 = remote, 0 = data. Reserved bits are fixed at 0 and must not be written as 1. B3-B0 indicate the data length.

Frame ID, 4 bytes, with 11 valid bits for a standard frame and 29 valid bits for an extended frame. The high byte and low byte arrangements for extended ID 0x12345678 and standard ID 0x123 are shown in the source examples.

Frame data, 8 bytes; the valid length is determined by B3-B0 in the frame information. For an 8-byte data frame, the data bytes are 11h, 22h, 33h, 44h, 55h, 66h, 77h and 88h.

Example: an extended data frame with ID 0x12345678 and eight data bytes (11h, 22h, 33h, 44h, 55h, 66h, 77h, 88h) is represented with frame information FF/RTR/reserved/DLC = 12h 34h 56h 78h 00h 00h 01h 23h, followed by the eight data bytes.

Note: During conversion between CAN-bus data and Ethernet data, a CAN frame always occupies 13 bytes in the Ethernet data stream. If the frame ID or data is shorter than 4 or 8 bytes respectively, the module pads the missing bytes with 0.

Appendix C: GCAN-211 Data Flow Definition - Compatible Mode

One WiFi data block can contain multiple CAN-bus data frames.

C.1 Ethernet-to-CAN Bus Data Flow Definition in Compatible Mode

One CAN frame contains 20 bytes.

Frame header, 2 bytes, marks the start of a CAN frame and is fixed at 0xFE 0xFD. Send mode, 1 byte: 0x00 = normal transmission, 0x01 = self-transmit/self-receive.

Frame information, 1 byte, identifies information such as the frame type and length. Bit 7 (FF) indicates standard or extended frame: 1 = extended, 0 = standard. Bit 6 (RTR) indicates remote or data frame: 1 = remote, 0 = data. Reserved bits are fixed at 0. B3-B0 indicate the data length.

Frame ID, 4 bytes, with 11 valid bits for a standard frame and 29 valid bits for an extended frame. Frame data, 8 bytes; the valid length is determined by B3-B0 in the frame information.

Frame receive timestamp, 3 bytes in milliseconds, counted from power-on and wrapping to 0 after overflow.

Checksum, 1 byte, is the XOR of all bytes from the frame header to the reserved field: byte0 ^ byte1 ^ ... ^ byte18.

Example: an extended data frame with ID 0x12345678 and eight data bytes is represented as fe fd 00 88 12 34 56 78 11 22 33 44 55 66 77 88 e8 a2 ee af.

Note: When a PC sends CAN frames, do not exceed the maximum CAN transmission rate. For example, at 1000 kbps the CAN side can transmit about 10000 standard data frames per second. Even with large internal buffers, sending too quickly from the PC can cause overflow. CAN-to-WiFi conversion is also limited by WiFi capability; it is recommended that each CAN channel send no more than 5800 frames per second.