GCAN-208 Series

CAN fiber optic repeater
User Manual

contents

1. Function introduction

1.1 Overview

Shenyang Vhandy Technology Co., Ltd. GCAN-208 series module is an industrial integrated 1 (or 2) standard optical fiber interface (single-mode, multi-mode, SC, ST optional), 2 (or 1) standard CAN bus interface Level CAN bus to fiber optic converter.

GCAN-208 series modules can convert CAN bus data into optical signals for transmission through optical fibers. By using GCAN-208 series modules in pairs, users can easily extend the CAN bus communication distance, effectively eliminate long-distance communication interference, and prevent the bus from being damaged by electromagnetic interference, ground ring interference, lightning strikes and other damage to the bus and equipment.

GCAN-208 series modules can convert CAN bus data transparently and losslessly into optical signals, and then parse the optical signals into CAN bus data transparently and losslessly. Vhandy Technology uses unique bus signal conversion technology, which can achieve the conversion time between CAN data and optical signal in microseconds, so as to ensure the real-time communication, so GCAN-208 can support any CAN bus communication protocol Such as: CANopen, SAE J1939, DeviceNet, NMEA2000, etc.

The unique dual-channel device of the GCAN-208-1 module can extend the communication distance of two CAN buses at the same time. The GCAN-208-2 module has two sets of optical fiber interfaces, which can be used for cascading. This series of modules is a key tool for industrial bus transformation, long-distance communication, and isolation of bus interference. The CAN bus interface of the module has integrated an isolation protection module to prevent damage to the module due to instantaneous overvoltage and over current. At the same time, the module With the characteristics of small size, plug and play, etc., it is also the best choice for existing system integration.

1.2 Performance characteristics

1.2.1 Hardware features

● High-speed 32-bit industrial-grade processor;

● Built-in hardware watchdog timer;

● Use external power supply (DC +9~24V ±20%);

● Electrostatic discharge immunity level: contact discharge ±2KV, air discharge ±15KV;

● Immunity level of electrical fast transient pulse group: ±1KV;

● Surge immunity level: ±1KV;

● Working temperature range: -40℃~+85℃;

● Working humidity range: 5%~95% RH without condensation;

1.2.2 CAN Properties

● Integrate 2 channels (or 1 channel) CAN bus interface, using terminal wiring mode;

● CAN bus signals include: CAN_H, CAN_L, EARTH;

● The CAN bus has its own 120Ω terminal resistance, which can be selected through the DIP switch;

● CAN bus supports CAN2.0A and CAN2.0B frame formats, in line with ISO/DIS 11898 specifications;

● The baud rate of CAN bus communication is between 5Kbps and 1Mbps, which can be configured through the DIP switch;

● The CAN bus interface adopts electrical isolation, and the isolation voltage of the isolation module: DC 3000V;

● Maximum throughput per channel: 8000 fps/sec;

1.2.3 Fiber Properties

● The optical fiber interface SC, ST, FC are optional;

● The optical fiber transmission mode is single-mode and multi-mode optional;

● The number of optical fibers is single-core and dual-core optional.

1.3 Selection guide

	GCAN-208-1	GCAN-208-2	GCAN-208-2 F
Number of optical fiber	1	2	2
Total number of CAN lines	2	1	1
Number of fiber interfaces per channel	Single-core and dual-core optional (specify when ordering)		
Fiber type	Single-mode, multi-mode optional (specify when ordering)		
Optical fiber interface	ST, SC, FC are optional (specify when ordering)		
Typical usage	It can only be used in pairs, and the two CAN buses can be independently relayed through optical fiber lines at the same time.	Using several GCAN-208-2 between a pair of GCAN-208-1 can realize CAN bus cascade.	Several GCAN-208-2 F can form a fiber-optic ring network, and if a node is dropped, it will not affect the normal communication of other nodes.

1.4 Typical application

● CAN bus communication transformation;

● CAN bus cross-sea long-distance communication;

● The anti-interference reconstruction of CAN bus in areas with strong interference such as wind turbines;

● Long-distance communication between the main control room and the building;

● Networking of fire alarm system;

● Long-distance distributed communication system.

1.5 Typical application diagram
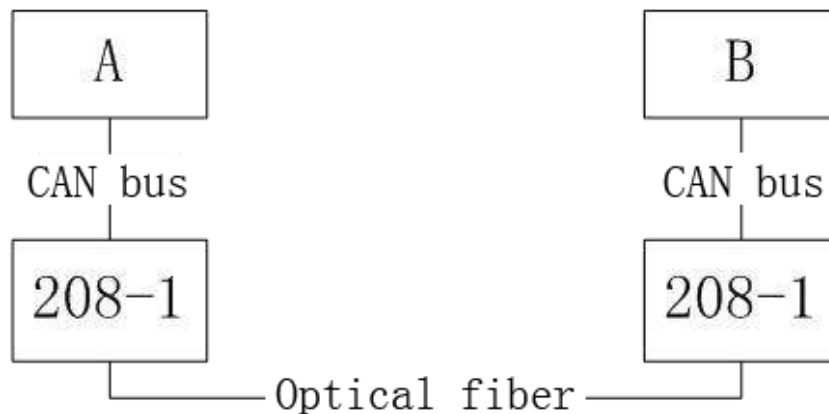
GCAN-208-1 typical application-paired use
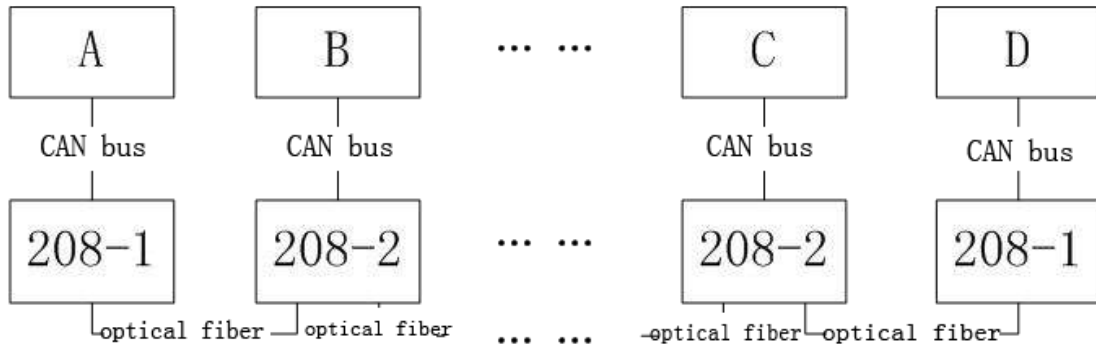
GCAN-208-2 typical application-hand in hand cascade

GCAN-208-2 F typical application-ring network

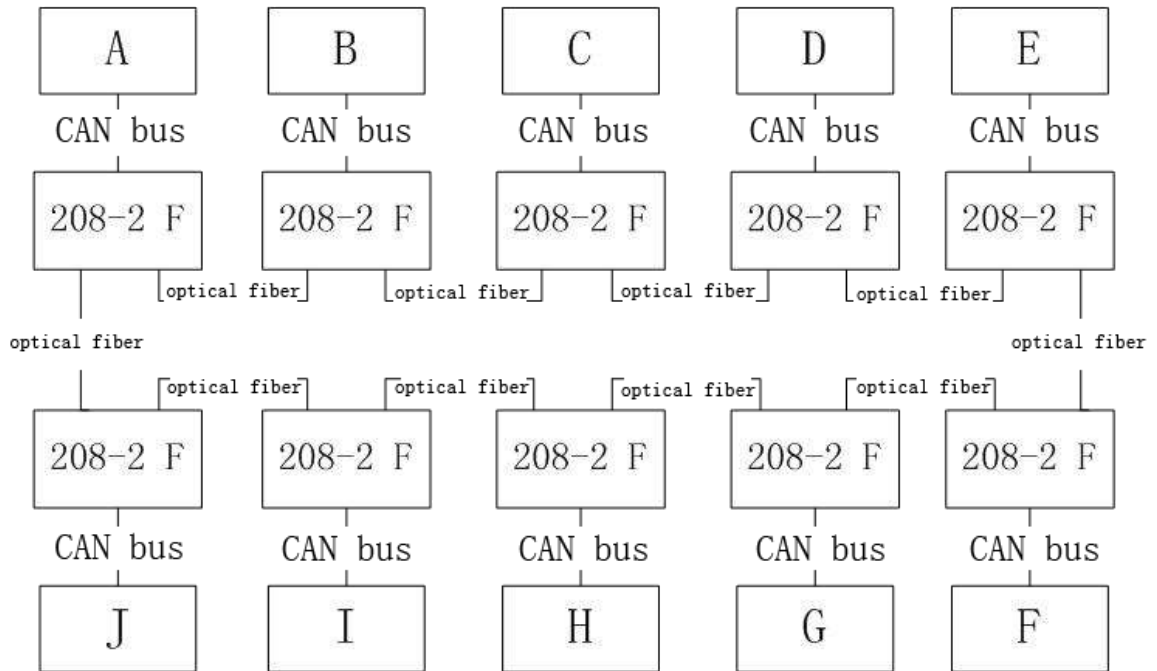# 2. Installation

2.1 Equipment size

Equipment dimensions: (length, including terminal) 118mm * (width) 93mm * (height) 22mm, the schematic diagram is shown in Figure 2.1.
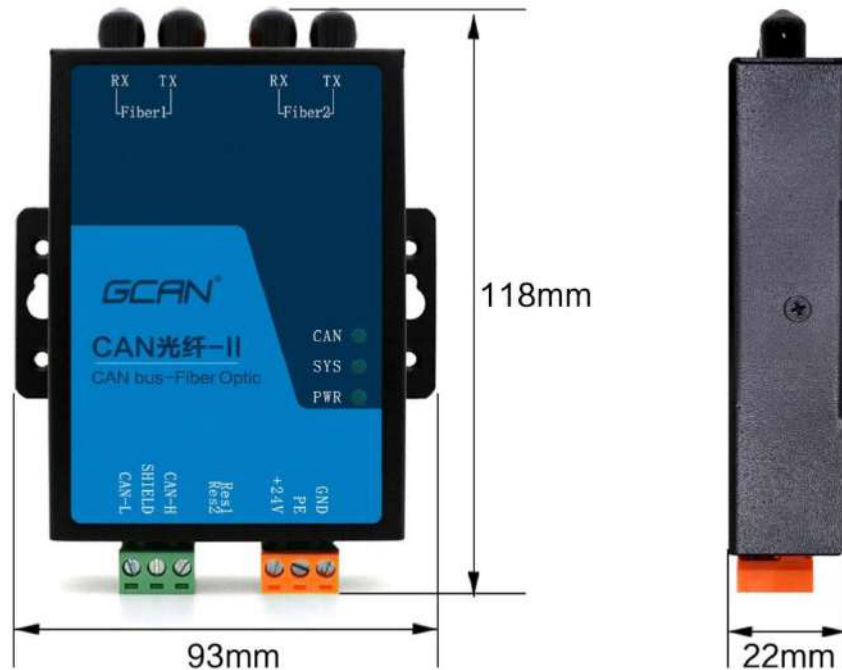
Figure 2.1 Dimensions of GCAN-208

2.2 Equipment fixed

The mechanical dimensions of GCAN-208 series modules are shown in Figure 2.2. You can use wall-mounted installation to fix the module inside the chassis or add DIN rail accessories to fix the module on the DIN rail.

GCAN-208 series module PE is connected with the shell. If the cabinet or rail where the module is installed is fixed to a grounded metal component board, the module will be grounded automatically, and no external grounding wire is required. If the cabinet or rail where the module is installed is fixed to an ungrounded base, the cabinet or rail must be connected to the nearest ground terminal.
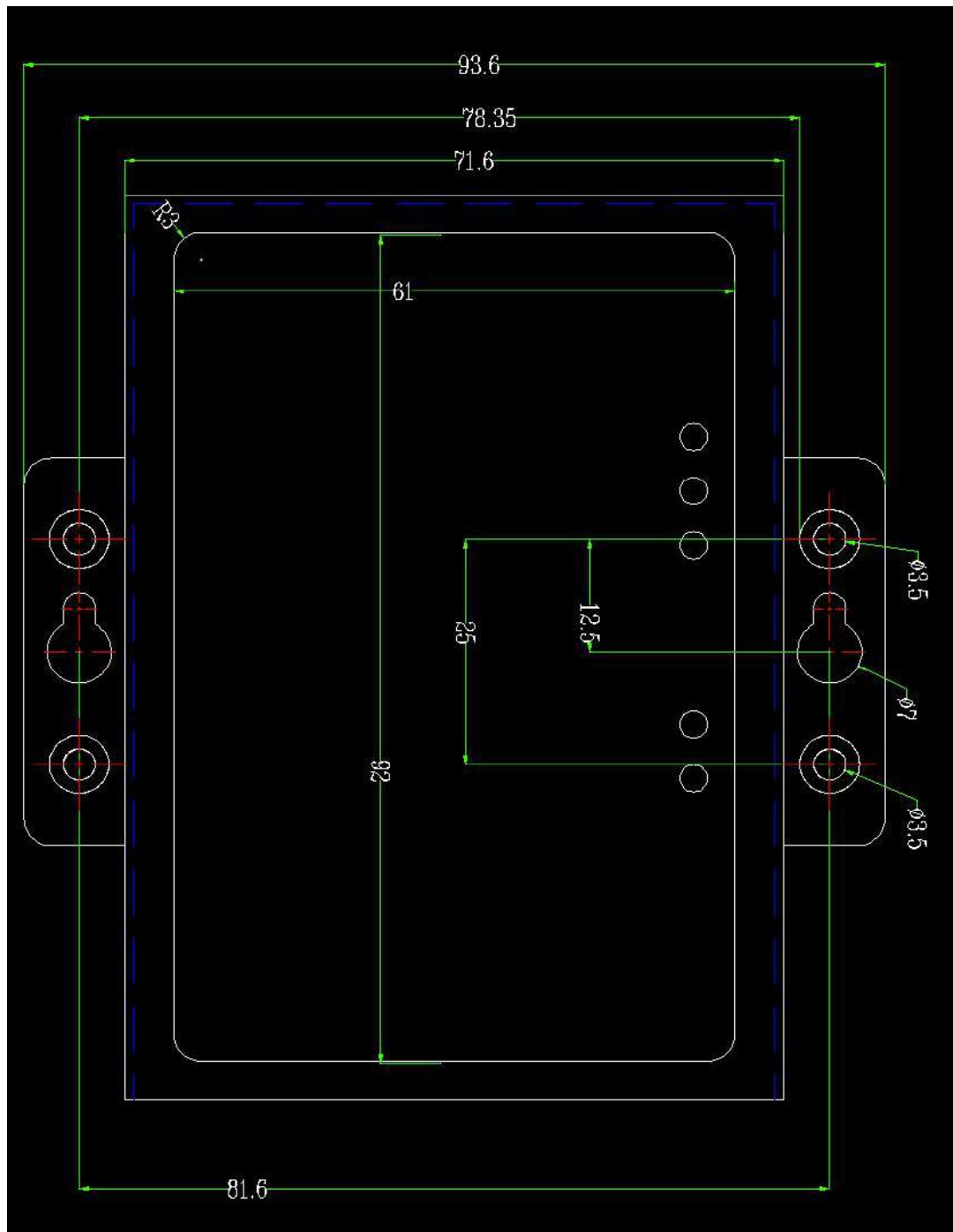
Figure 2.2 Schematic diagram of the mechanical dimensions of GCAN-208 series modules

2.3 Interface definition and function

2.3.1 GCAN-208-1 module

The GCAN-208-1 module integrates one DC 9-24V power interface, two standard CAN bus interfaces and one standard optical fiber interface (single-mode, multi-mode, SC, ST, single-core, dual-core optional).

The power interface of the GCAN-208-1 module is led out by a 3 PIN plug-in terminal (orange). The position of the power supply and optical fiber interface and

interface definition are shown in Figure 2.3, Table 2.1, and Table 2.2.

Figure 2.3 GCAN-208-1 power supply and optical fiber interface location

Pin (from left to right)	Iterface	Name	Function
1		9-24V	9-24V DC power input positive
2	power supply	EARTH	Shield, connect to earth
3		GND	9-24V DC power input negative

Table 2.1 GCAN-208-1 power interface definition

Pin (from left to right)	Iterface	Name	Function
1	Optical fiber interface	TX	Optical fiber transmission interface
2		RX	Optical fiber transmission interface

Table 2.2 GCAN-208-1 fiber interface definition

The CAN bus interface of GCAN-208-1 module is led out by two 3 PIN plug-in terminal blocks (green), which can be used to connect 2 CAN bus networks or devices with CAN bus interface. The interface position and interface definition are shown in Figure 2.4. As shown in Table 2.3.

Figure 2.4 CAN bus interface of GCAN-208-1 module

Pin (from left to right)	Iterface	Name	Function
1	CAN2	CAN2-L	CAN2_L signal line (CAN low)
2		EARTH	Shield, connect to earth
3		CAN2-H	CAN2_H signal line (CAN high)
4	CAN1	CAN1-L	CAN1_L signal line (CAN low)
5		EARTH	Shield, connect to earth
6		CAN1-H	CAN1_H signal line (CAN high)

Table 2.3 CAN bus signal distribution of GCAN-208-1 module

2.3.2 GCAN-208-2 module

The GCAN-208-2 module integrates one DC 9-24V power interface, one standard CAN bus interface and two standard optical fiber interfaces (single-mode, multi-mode, SC, ST optional).

The CAN bus interface of GCAN-208-2 module is led out by 1 (green) 3 PIN plug-in terminal, which can be used to connect 1 CAN bus network or CAN bus interface equipment; the power interface consists of 1 (orange) 3PIN plug Pull-out terminal blocks lead out. The position and definition of the CAN bus interface and power interface are shown in Figure 2.5, Table 2.4, and Table 2.5.

Figure 2.5 GCAN-208-2 CAN bus interface and power interface location

Pin (from left to right)	Iterface	Name	Function
1	CAN	CAN-L	CAN_L signal line (CAN low)
2		EARTH	Shield, connect to earth
3		CAN-H	CAN_H signal line (CAN high)

Table 2.4 CAN bus signal distribution of GCAN-208-2 module

Pin (from left to right)	Iterface	Name	Function
1	power supply	9-24V	9-24V DC power input positive
2		EARTH	Connect PE interface to earth
3		GND	9-24V DC power input negative

Table 2.5 GCAN-208-2 power interface definition

The position and definition of the optical fiber interface of GCAN-208-2 module are shown in Figure 2.6 and Table 2.6.

Figure 2.6 GCAN-208-2 fiber interface position

Pin (from left to right)	Iterface	Name	Function
1	Fiber interface 2	TX	Optical fiber transmission interface
2		RX	Optical fiber transmission interface
3	Optical fiber interface 1	TX	Optical fiber transmission interface
4		RX	Optical fiber transmission interface

Table 2.6 GCAN-208-2 optical fiber interface definition

3. Equipment use

3.1 CAN bus configuration

GCAN-208 series modules generally require users to configure CAN bus communication parameters or entrust our company to factory configuration before use.

3.1.1 Configure the CAN bus baud rate through the DIP switch

When the user uses the GCAN-208 module for the first time, if you already know the CAN bus baud rate, you can first open the device shell (unscrew the black screws on both sides) and directly use the DIP switch inside the device to adjust the corresponding CAN bus Baud rate. The dial switch is shown in Figure 3.1.
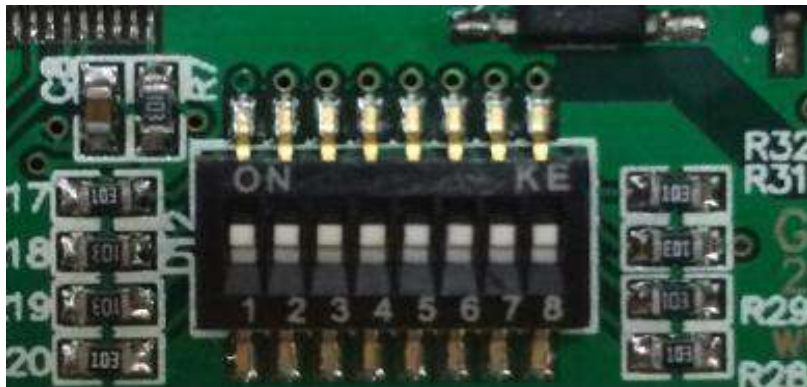

Figure 3.1 DIP switch

The method of setting the baud rate of the DIP switch: Do not power on the system first, open the device shell with a screwdriver, and find the DIP switch shown in the figure above. The number "1, 2, 3, 4" of the DIP switch can be used for CAN1 Configure the baud rate, "5, 6, 7, 8" can configure the CAN2 baud rate. (For devices with only one CAN, only the first four DIP switches are valid.) The specific configuration method is CAN1 as an example. See Table 3.1 for details. The ON direction is 0, and the digital direction is 1.

Note: The ring network equipment does not have a baud rate of 1000K.

Icon	Definition	Baud rate	Icon	Definition	Baud rate
	0000	1000k		0001	800k
	0010	666k		0011	500k
	0100	400k		0101	250k
	0110	200k		0111	125k
	1000	100k		1001	80k
	1010	50k		1011	40k
	1100	20k		1111	13.33k
	1101	10k		1110	5k

Table 3.1 GCAN-208 series module baud rate configuration diagram

3.1.2 Automatically recognize the baud rate

When the user does not know the baud rate of the CAN bus or the module cannot work normally after setting the baud rate through the DIP switch, the automatic baud rate recognition function can be used to identify the actual baud rate of the bus. The specific usage method is as follows:

1. Turn all the baud rate dial switches of the GCAN-208 module to the digital side.

2. Correctly connect the GCAN-208 module to the CAN bus (ensure that the wiring is correct and the terminal resistance is correctly added).

3. Power on the GCAN-208 module, wait until the PWR is always on and the SYS light is flashing, use the tool to press and hold the button in the left hole of the CAN channel as shown in the figure below, as shown in figure 3.2.

按键

Figure 3.2 Schematic diagram of key position

4. Keep pressing the button in the hole for 3s, and release it when the CAN light turns red and starts to flash quickly. At this time, the module is identifying the bus baud rate.

5. The recognition process will continue for a period of time. When the CAN light turns from red to green and is always on, it means that the baud rate has been

recognized, and the recognized baud rate can be enabled when the module is powered on again. If the red light is always on after the strobe, it means that the recognition is not successful. The physical layer needs to be checked at this time.

Note: After the device automatically recognizes the baud rate, the DIP switch will become invalid.

3.1.3 View the baud rate of the current device

When you need to know the value of the baud rate used by the current device, first open the device shell (unscrew the black screws on both sides) and then connect the USB port of the device to the computer with a USB cable. The USB port is a USB-MINI port. As shown in Figure 3.3.
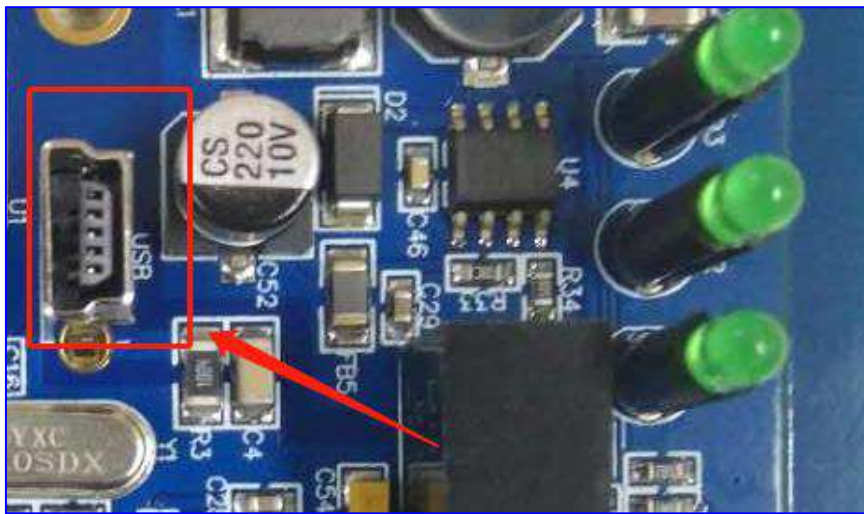

Figure 3.3 Schematic diagram of USB port

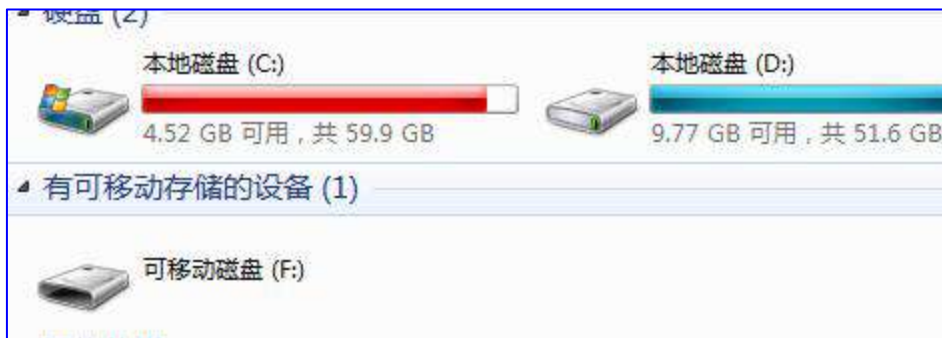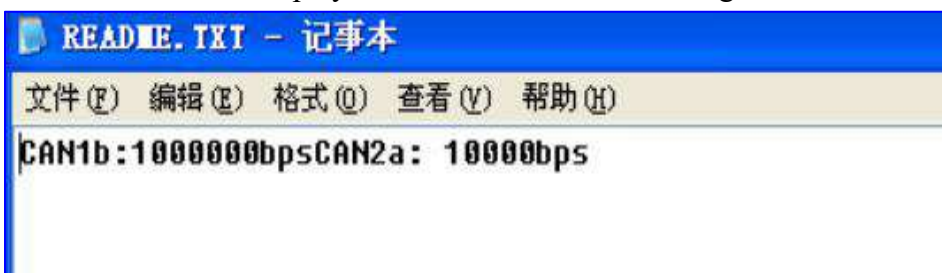At this time, a removable disk will appear on the computer, as shown in Figure 3.4

Figure 3.4 Schematic diagram of removable disk

Open the disk, a notepad file will appear in it, and the value of the current CAN channel baud rate will be displayed in the file. As shown in Figure 3.5:

Figure 3.5 Baud rate value

Among them, CAN1 in "CAN1b" represents the CAN1 channel, and b represents the baud rate configured by the device through automatic identification. In "CAN2a", CAN2 represents the CAN2 channel, and a represents the baud rate configured by the device by configuring the DIP switch.

Notice:

1. The notepad file in the removable disk is a read-only file and can only be viewed. The value in this file cannot be manually modified to change the baud rate of the device.

2. GCAN-208-1 has two independent CAN buses. During automatic identification, it will start with CAN1 first, and then CAN2 will be identified after CAN1 has been identified. If the CAN light is always red and does not flash, it means that the recognition is not successful. At this time, you need to check whether the wiring and terminal resistance are correct. After the recognition fails, the module will automatically adopt the value of the baud rate of the DIP switch when it is powered on again.

Restore factory settings (clear the automatic identification record of the device): Turn all the 8P dial switches to the digital side, then power on the device, and then press and hold the reset button until the CAN light is red and flashes to make the device no-load identification. After all CAN channels fail to be identified, power on again to restore the factory settings.

3.1.4 Modify the device baud rate

When you need to modify the baud rate of the current device, you can do as shown in the following flowchart 3.6.
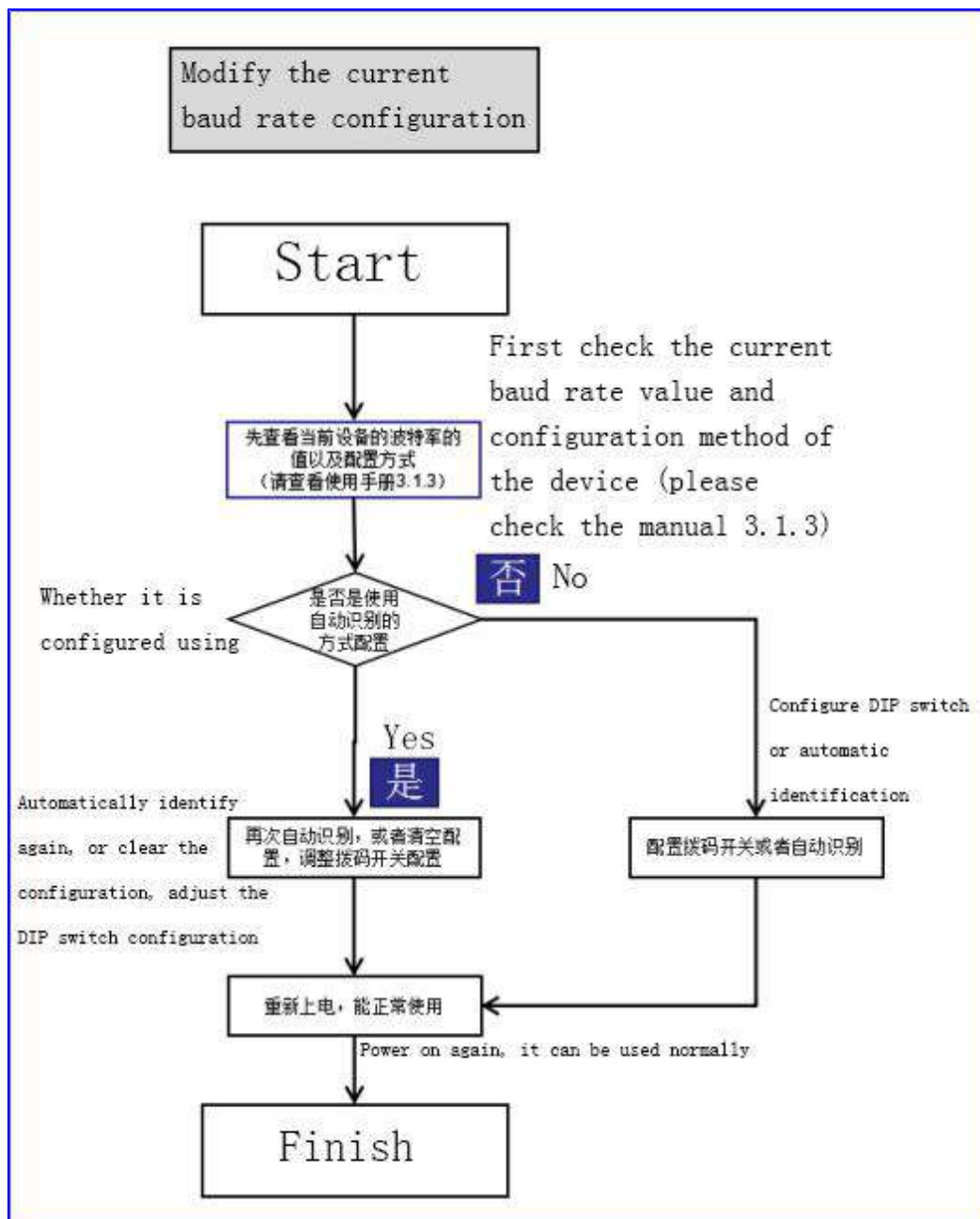
Figure 3.6 Flow chart for modifying current baud rate

3.1.5 Configure CAN bus terminal resistance

The two CAN channels of the GCAN-208 series modules have integrated standard 120Ω terminal resistances, which can be selected through the DIP switch between the two CAN bus wiring terminals.

3.2 Connect with optical fiber

The optical fiber interface type of GCAN-208 series module can choose SC and ST interface, and the transmission mode can choose single-mode and multi-mode. In actual use, users only need to select the corresponding optical fiber cable to plug and play.

Please note: Connect RX to TX and TX to RX when connecting dual-core optical

fiber.

Single-core optical fiber connection requires pairing of A and B devices.

3.3 Connect with CAN bus

GCAN-208 series modules are connected to CAN bus by connecting CAN_H to CAN_H and CAN_L to CAN_L to establish communication.

The CAN bus network adopts a linear topology, and the two farthest terminals of the bus need to be installed with 120Ω terminal resistors; if the number of nodes is greater than 2, the intermediate nodes do not need to install 120Ω terminal resistors. For branch connections, the length should not exceed 3 meters. The connection of CAN bus is shown in Figure 3.7.
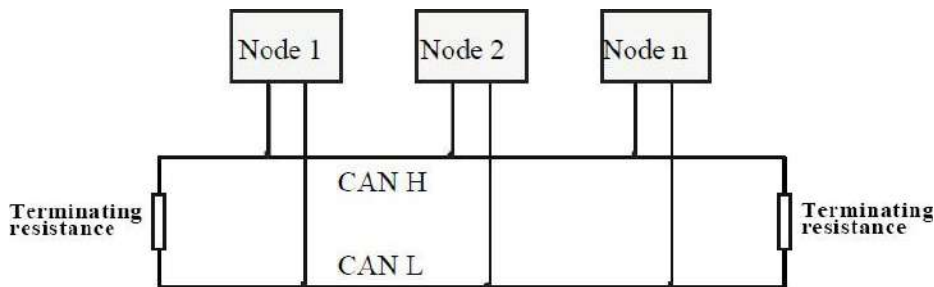

Figure 3.7 Topological structure of CAN bus network

Please note: CAN bus cable can use ordinary twisted pair and shielded twisted pair. The theoretical maximum communication distance mainly depends on the bus baud rate. The relationship between the maximum bus length and the baud rate is shown in Table 3.2. If the communication distance exceeds 1Km, ensure that the cross-sectional area of the line is greater than Φ1.0mm2. The specific specifications should be determined according to the distance. The general rule is to increase the distance as the distance increases.

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

Table 3.2 Reference table of baud rate and maximum bus length

3.4 CAN bus terminal resistance

In order to enhance the reliability of CAN communication and eliminate the

interference of CAN bus terminal signal reflection, the two farthest endpoints of the CAN bus network usually need to add terminal matching resistors, as shown in Figure 3.2. The value of the terminal matching resistance is determined by the characteristic impedance of the transmission cable. For example, the characteristic impedance of the twisted pair is 120Ω, and the two end points on the bus should also be integrated with 120Ω terminal resistance. GCAN-206 module interface card uses 82C251 transceiver. If other nodes on the network use different transceivers, the terminal resistance must be calculated separately.
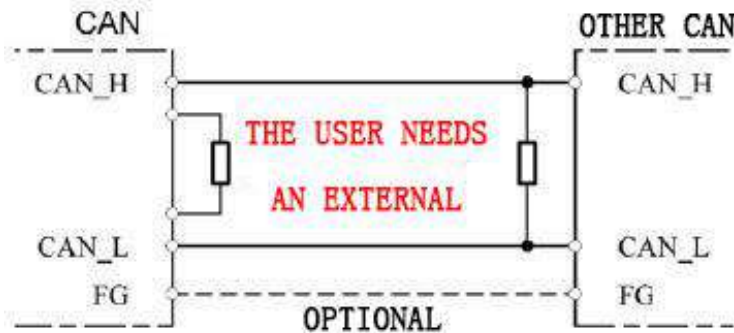

Figure 3.2 Connection of GCAN-208 module with other CAN node devices

3.5 System status indicator

GCAN-208 series modules have 1 POWER indicator light to indicate the power supply of the system, 1 SYS indicator light to indicate the operating status of the device, 1 Fiber indicator light to indicate optical fiber data transmission, 2 (or 1)) CAN indicator light is used to indicate CAN bus data transmission. The specific indication functions of these 5 indicators are shown in Table 3.3, and the meanings of these 5 indicators in various states are shown in Table 3.4.

Indicator light	colour	Indicating status
POWER	green	System power supply indication
SYS	green	System operation instructions
Fiber	green	Optical fiber communication instructions
CAN1	Red/green	CAN1 communication status indication
CAN2	Red/green	CAN2 communication status indication

Table 3.3 GCAN-208 series module indicators

After the GCAN-208 series modules are powered on, the system power supply lamp POWER and the initialization status indicator SYS are on, indicating that the device has been powered and the system is being initialized; otherwise, it indicates that the system has a power failure or a serious error has occurred.

After the optical fiber and CAN are connected normally, when data is transmitted between CAN and optical fiber, the corresponding Fiber and CAN indicator lights

will flash.

Indicator light	state	Indicating status
POWER	Chang Liang	Equipment power supply is normal
	not bright	The power supply of the device is not normal
SYS	not bright	system error
	Chang Liang	System initialization failed
	Flashing	System initialization is normal
Fiber	Not bright or always bright	Optical fiber to send data or no data transmission
	Flashing	Optical fiber receives data
CAN1/CAN2	not bright	No data transmission on CAN bus
	Flashing green	CAN bus has data transmission
	Red	CAN bus error

Table 3.4 GCAN-208 series module indicator status

4.Technical specifications

Connection method	
Optical fiber	SC, ST, FC, single-mode, multi-mode, single-core, dual-core optional
CAN	OPEN3 terminal block
Interface characteristics	
Optical fiber transmission method	Single-mode, multi-mode optional
CAN protocol	Follow ISO 11898 standard, support CAN2.0A/B
CAN baud rate	5Kbit/s~1Mbit/s, configured by dial switch
Electrical isolation	DC-2500V
CAN terminal resistance	Has been integrated, through the dial switch to choose whether to connect
Power supply	
Supply voltage	+9~24V DC ±20%
Supply current	50mA max
Environmental test	
Operating temperature	-40°C~+85°C
Working humidity	15%~90%RH, no condensation
EMC test	EN 55024:2011-09 EN 55022:2011-12
Protection level	IP 20
Basic Information	
Dimensions	118mm *93mm *22mm
weight	230g

5. Frequently Asked Questions

1. Is it necessary to use a 120Ω terminal matching resistor?

It is recommended that the 120Ω terminal matching resistor be used to absorb end-point reflections and provide a stable physical link. When performing a single-node self-transmitting and self-receiving test, the 120 Ω terminal resistance must be connected to form a loop, otherwise the self-transmitting and self-receiving test cannot be performed. The GCAN-208 series module integrates a 120 Ω terminal resistance, which can be connected through the DIP switch.

2. Can multiple GCAN-208 series modules be installed on one CAN bus?

Due to the structural characteristics of the CAN bus, multiple CAN nodes can be connected to one bus. Therefore, one CAN bus allows the installation of multiple CAN-to-optical modules without affecting the bus. The actual number is related to the maximum number of CAN bus nodes.

3. What is the highest data conversion rate of GCAN-208 series modules?

The single CAN channel of the GCAN-208 series module supports CAN bus data conversion at a maximum of 8000 fps. The frame mentioned here refers to a data frame with 8 data in the standard frame. If it is less than 8 bytes of data or a remote frame, it may be faster.

4. Why are the Fiber and CAN indicator lights off?

Only when there is data transmission on the optical fiber or CAN end and the module is in data conversion, the Fiber and CAN indicator lights will light up.

5. How to set the communication baud rate of GCAN-208 series modules?

A group of commonly used baud rate values can be set through the DIP switch inside the module. If you want to use other baud rates, please contact the relevant personnel of Vhandy Technology Co., Ltd.

6. Does the system enter the standby or sleep state affect the reception?

Will have an impact. At this time, all processing will stop, which may cause the hardware receiving buffer overflow error at most. If there is a program to open the device, it will try to prevent the system from entering the standby or sleep state, so as to ensure the normal operation of the system. When using GCAN-208 series modules, please disable the standby and sleep functions of the system.

6.Disclaimer

Thank you for purchasing the GCAN series of software and hardware products from Vhandy Technology. GCAN is a registered trademark of Shenyang Vhandy Technology Co., Ltd. This product and manual are copyrighted by Vhandy Technology. Without permission, it is not allowed to reproduce in any form. Before using, please read this statement carefully. Once used, it is deemed to be an endorsement and acceptance of the entire content of this statement. Please strictly abide by the manual, product description and related laws, regulations, policies and guidelines to install and use the product. In the process of using the product, the user promises to be responsible for his actions and all consequences arising therefrom. Vhandy Technology will not be liable for any losses caused by improper use, installation, or modification by users.

The final interpretation right of the disclaimer belongs to Vhandy Technology.

Appendix : CAN2.0 protocol frame format

CAN2.0A standard frame

CAN standard frame information is 11 bytes, including two parts: information and data. The first 3 bytes are the information part.

	7	6	5	4	3	2	1	0
Bytes 1	FF	RTR	×	×	DLC (Data length)			
Bytes 2	(Message ID)				ID.10—ID.3			
Bytes 3	ID.2—ID.0			×	×	×	×	×
Bytes 4	Data 1							
Bytes 5	Data 2							
Bytes 6	Data 3							
Bytes 7	Data 4							
Bytes 8	Data 5							
Bytes 9	Data 6							
Bytes 10	Data 7							
Bytes 11	Data 8							

Byte 1 is frame information. The 7th bit (FF) represents the frame format, in the standard frame, FF=0; the 6th bit (RTR) represents the frame type, RTR=0 represents the data frame, RTR=1 represents the remote frame; DLC represents the transmission The actual data length in the data frame.

Bytes 2 and 3 are message identification codes, 11 bits are valid.

Bytes 4 to 11 are the actual data of the data frame, which is invalid in the remote frame.

CAN2.0B extended frame

The CAN extended frame information is 13 bytes, including two parts, information and data. The first 5 bytes are the information part.

	7	6	5	4	3	2	1	0
Bytes 1	FF	RTR	×	×	DLC (Data length)			
Bytes 2	(Message ID) ID.28—ID.21							
Bytes 3	ID.20—ID.13							
Bytes 4	ID.12—ID.5							
Bytes 5	ID.4—ID.0					×	×	×
Bytes 6	Data 1							
Bytes 7	Data 2							
Bytes 8	Data 3							
Bytes 9	Data 4							
Bytes 10	Data 5							
Bytes 11	Data 6							
Bytes 12	Data 7							
Bytes 13	Data 8							

Byte 1 is frame information. The 7th bit (FF) indicates the frame format, in the extended frame, FF=1; the 6th bit (RTR) indicates the frame type, RTR=0 indicates the data frame, RTR=1 indicates the remote frame; DLC indicates the transmission The actual data length in the data frame.

Bytes 2 to 5 are message identification codes, and the upper 29 bits are valid.

Bytes 6 to 13 are the actual data of the data frame, which is invalid in the remote frame.

Sales and Service

Shenyang Vhandy Technology Co., Ltd.

Address: No.135-21, Changqing Street, Hunnan, Shenyang, Liaoning, China.

E-mail: sygckj@gmail.com

Tel/ Whatsapp: +86 13644001762

Skype： live:sygckj

WeChat: gckj777

Website: www.gcanbus.com