Quick Implementation of TF03-CAN and Computer Communication Operation Instructions

1. Overview

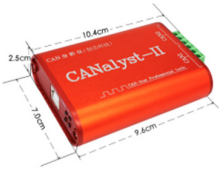
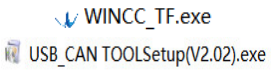
This document enables first-time users to quickly understand the tools and methods for conducting CAN communication tests, connect the LiDAR to the PC by consulting the corresponding instruction manual, and complete product testing under the CAN communication protocol by sending commands to obtain distance values and modify the baud rate.

This document applies to the product model: TF03-CAN (verify the product hardware version before testing).

2. Test Preparation

2.1. Necessary Tools

Table 1 Necessary Tools

Tools			
Name	CANalyst[1]	TF03-CAN	DC power supply
Tools			
Name	Adapter for TF series (Benewake)[2]	Connecting tools	Softwares

2.2. Communication Protocol Switching

TF03 supports both TTL serial communication and CAN communication, and factory default setting is TTL. To use CAN communication, please switch via TTL communication adapter (see chapter 3, section 1 for details).

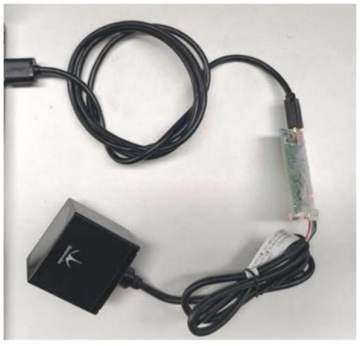


Fig.1 Connect LiDAR & PC

[1] https://item.taobao.com/item.htm?spm=a230r.1.14.1.49345de5rwJHiq&id=18286496283&ns=1&abbucket=12#detail.
[2] https://item.taobao.com/item.htm?spm=a1z10.5-c-s.w4002-23157226331.19.89f91ab6Pc2K1o&id=591144256044.

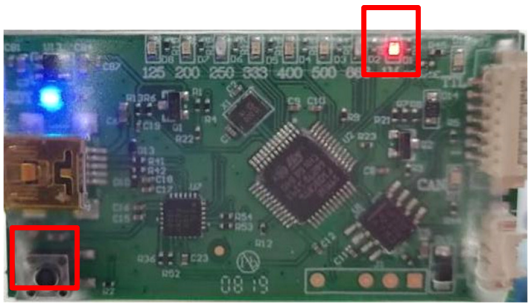


Fig.2 Set baud rate to 1M

After USB-TTL adapter, LiDAR and PC are connected, faint red light can be seen from the LiDAR lens.

Fig.3 LiDAR output red light

Open the software "WINCC_TF" to switch communication protocol:

1) Find "product" in the "Setting" and select TF03;
2) Choose the right "COM" port (The port number can be found in PC Settings->Devices->Bluetooth and other devices. If the adapter is not recognized, the drivers may not be installed, please install the driver[3]);
3) Set baud rate to 115200 (TF03 default baud rate is 115200). Then click on "Connect" below and the software displays a graph of the measured distance data.

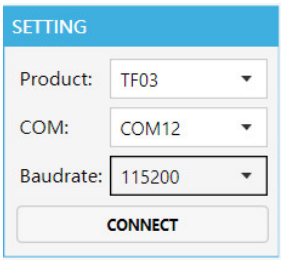


Fig.4 Parameter settings

[3] https://drive.google.com/drive/folders/1aWltEhSFPEp-iFsVmaRzotptOLwmhoA5?usp=sharing

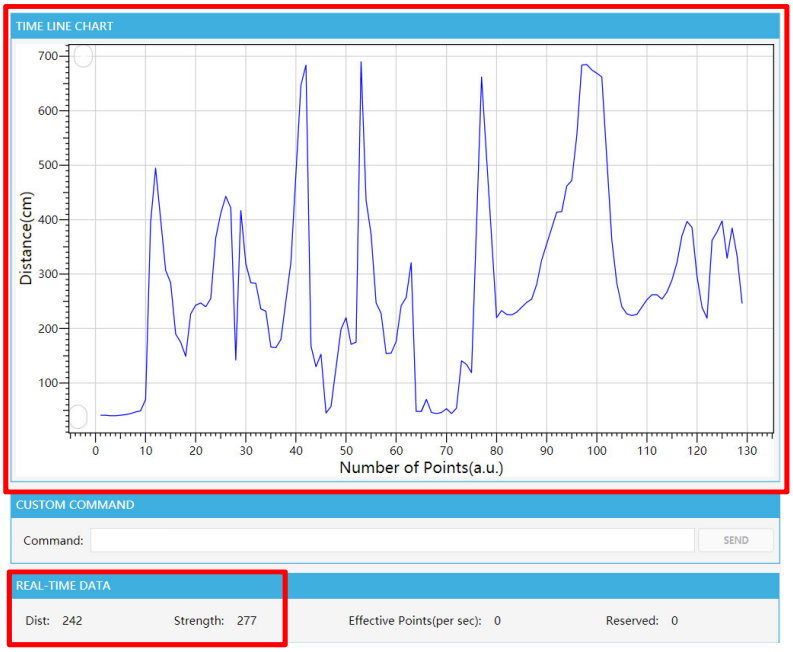


Fig.5 Distance values graph

4) Find "Command" in the "CUSTOM COMMAND" and enter protocol switching command: 5A 05 45 02 A6. Send the command, then enter the save configuration command: 5A 04 11 6F and send it.

Fig. 6 Switching to CAN communication

Fig.7 Save configuration

As can be seen, now the LiDAR has stopped outputting data, indicating that the communication protocol has been switched to CAN successfully.

3. CAN Communication Test

3.1. Pin Description & Connection Method

TF03-CAN allows a wide voltage supply, with power supply options between 5 and 24V.

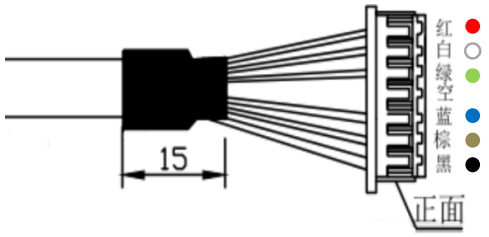


Fig.8 Pinout

Table 2 Line Sequence Description

Number	Colour	Function	Explanation
1	Red	VCC	5-24V
2	White	CAN_L	CAN bus
3	Green	CAN_H	CAN bus
4	N/A	N/A	N/A

5	Blue	TTL_RXD	Serial port receive
6	Brown	TTL_TXD	Serial port send
7	Black	GND	GND

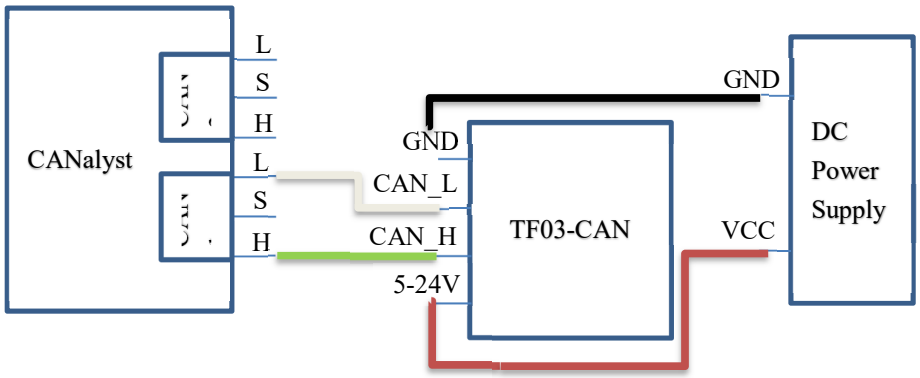


Fig.9 CANalyst connecting TF03-CAN to PC

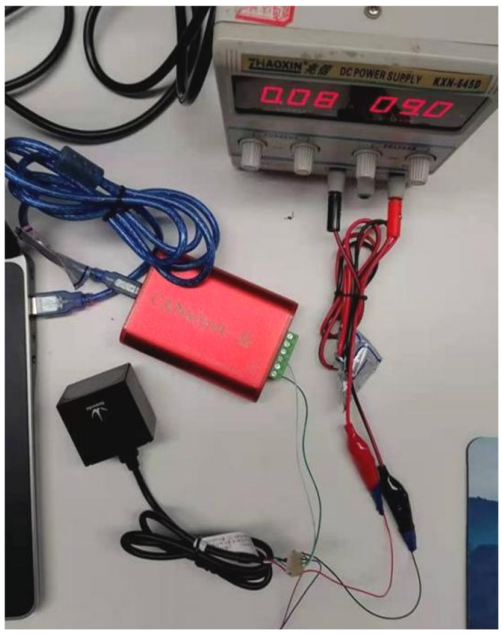


Fig.10 CANalyst connecting TF03-CAN to PC

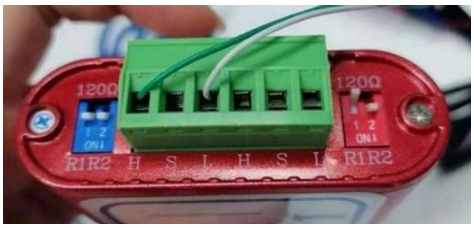


Fig.11 CANalyst and TF03-CAN connection method

3.2. Test Steps

3.2.1. TF03-CAN Establishes Connection with PC

Install USB_CAN TOOL according to the "*USB_CAN TOOL Debugging Software Installation and User Manual*". If you are using another CAN Analyzer, please install the drivers for that particular board. Open PC Settings->Devices->Bluetooth and Other Devices, find Microchip WinUSB Example Device and check if the USB is working properly. If "No driver" is displayed,

you need to install the driver before you can run USB_CAN TOOL.

Driver Installation: Find "This PC" on the desktop, right-click and select "Manage". Under the "Computer Management" column, find "Device Manager" and select the appropriate device. Right-click and select "Update Drivers", click on "Find and install drivers manually" and select Browse for drivers on your computer. Under the folder where the USB_CAN TOOL is installed, find the following path: driver\usb_drivers\Windows\win7 win8 win10 driver\inf, select the path and click "Next", then the computer will automatically install the driver.

3.2.2. Modify the Baud Rate

Open the USB_CAN TOOL to modify the baud rate. TF03-CAN baud rate defaults to 250kbps, the frame format defaults to standard frame. The sending and receiving IDs default to 0x00003003 & 0x00000003 respectively.

On the main page, find the "CAN Send" field, select "Frame Format" as "Standard Frame" (you can select "Standard Frame" or "Extended Frame" as the frame format, in practice "Standard Frame" is usually used), and select "Frame Type" as " Data frame" and set the "Frame ID" to "00 00 30 03".

Fig.12 Parameter setting

Find "Device Operation" in the upper menu bar and click on "Start Device". Select the baud rate as "250kbps". Click on "OK" and the device will start.

Fig.13 Starting-up device

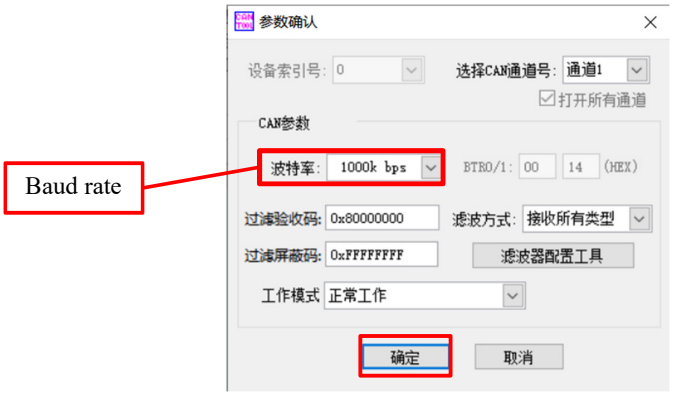
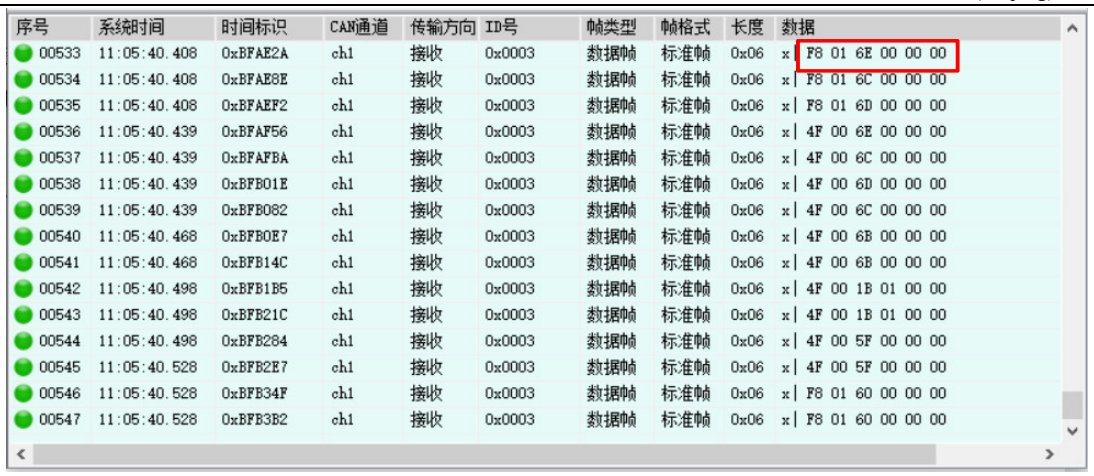


Fig.14 Selecting the baud rate



序号	系统时间	时间标识	CAN通道	传输方向	ID号	帧类型	帧格式	长度	数据
00533	11:05:40.408	0xBFAE2A	ch1	接收	0x0003	数据帧	标准帧	0x06	x| F8 01 6E 00 00 00
00534	11:05:40.408	0xBFAE8E	ch1	接收	0x0003	数据帧	标准帧	0x06	x| F8 01 6C 00 00 00
00535	11:05:40.408	0xBFAEF2	ch1	接收	0x0003	数据帧	标准帧	0x06	x| F8 01 6D 00 00 00
00536	11:05:40.439	0xBFAF56	ch1	接收	0x0003	数据帧	标准帧	0x06	x| 4F 00 6E 00 00 00
00537	11:05:40.439	0xBFAFBA	ch1	接收	0x0003	数据帧	标准帧	0x06	x| 4F 00 6C 00 00 00
00538	11:05:40.439	0xBFB01E	ch1	接收	0x0003	数据帧	标准帧	0x06	x| 4F 00 6D 00 00 00
00539	11:05:40.439	0xBFB082	ch1	接收	0x0003	数据帧	标准帧	0x06	x| 4F 00 6C 00 00 00
00540	11:05:40.468	0xBFB0E7	ch1	接收	0x0003	数据帧	标准帧	0x06	x| 4F 00 6B 00 00 00
00541	11:05:40.468	0xBFB14C	ch1	接收	0x0003	数据帧	标准帧	0x06	x| 4F 00 6B 00 00 00
00542	11:05:40.498	0xBFB1B5	ch1	接收	0x0003	数据帧	标准帧	0x06	x| 4F 00 1B 01 00 00
00543	11:05:40.498	0xBFB21C	ch1	接收	0x0003	数据帧	标准帧	0x06	x| 4F 00 1B 01 00 00
00544	11:05:40.498	0xBFB284	ch1	接收	0x0003	数据帧	标准帧	0x06	x| 4F 00 5F 00 00 00
00545	11:05:40.528	0xBFB2E7	ch1	接收	0x0003	数据帧	标准帧	0x06	x| 4F 00 5F 00 00 00
00546	11:05:40.528	0xBFB34F	ch1	接收	0x0003	数据帧	标准帧	0x06	x| F8 01 60 00 00 00
00547	11:05:40.528	0xBFB3B2	ch1	接收	0x0003	数据帧	标准帧	0x06	x| F8 01 60 00 00 00

Fig.15 Output data after successful start-up of the device

After the device has been successfully started, the measured distance information and signal strength can be read in the output data field on the right. Byte0-1 are the lower and higher bytes of the distance value (HEX); byte2-3 are the lower and higher bytes of the signal strength (HEX); and byte6-7 are reserved.

For example, if the output data frame is: F8 01 6E 00 00 00, then the measured distance value is 000001F8, which is 504 (DEC); and the signal strength is 0000006E, which is 110 (DEC). In summary, the measured distance value is 504 cm and the signal strength is 110.

The following is an example of setting a baud rate of 500K to explain the modification of the baud rate under the CAN protocol.

The command format for configuring the baud rate is shown below. In the command, H1 H2 H3 H4 indicates the baud rate (HEX), arranged from low to high, i.e. in Little-Endian order. SU is the checksum (Checksum = 5A + 08 + 52 + H1 + H2 + H3 + H4, and take the lower 8 bits).

Table 3 Modify baud rate

Function	Command	Return Value	Factory Configuration
Modify Baud Rate	5A 08 52 H1 H2 H3 H4 SU	Success: 5A 05 52 00 B1	1000000
		Fail: Timeout 1s no response	

Baud rate 500000 (DEC) = 0x0007A120 (HEX), then the command is: 5A 08 52 20 A1 07 00 7C. Enter the command in the "Data" field and click on Send.

Then enter "save configuration" command: 5A 04 11 6F. Send the command, the device will stop outputting data.

Fig.16 Send "Modify baud rate" command

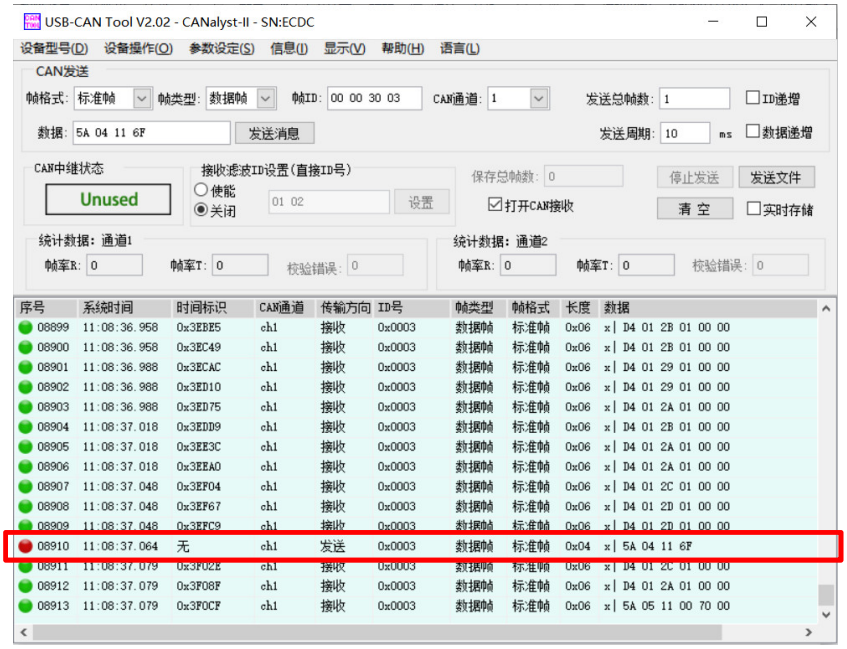


Fig.17 Send "save configuration" command

Click on "Shutdown Device" in "Device Operation" and then reboot. Select "500Kbps" for the baud rate, the device will start up successfully.

For more details, please refer to the *manual* of the particular device and *USB-CAN Tool debugging software installation and operation manual*.