Quick Implementation of TFmini-I-CAN and Computer Communication Operation Instructions

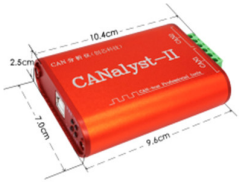
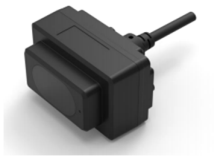
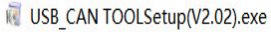
1. Overview

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 slave address.

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

2. Test Preparation

2.1. Necessary Tools

Tools				
Name	CANalyst[1]	TFmini-I-CAN LiDAR	DC power supply	Software

2.2. Pin Description

TFmini-I-CAN supports wide supply voltage range, with power supply options between 7 and 30V.

Note: If you are testing other hardware versions, please consult the corresponding product manual for pin description and confirmation of interface.

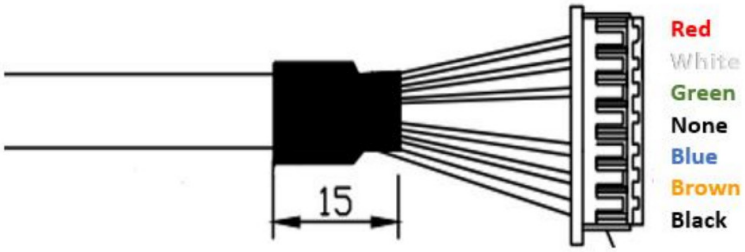


Fig.1 Pinout

Table 1 Line Sequence Description

Number	Colour	Function	Explanation
1	Red	VCC	7-30V
2	White	CAN_L	CAN bus
3	Green	CAN_H	CAN bus

[1] https://item.taobao.com/item.htm?spm=a230r.1.14.1.49345de5rwJHiq&id=18286496283&ns=1&abbucket=12#detail.

4	Black	GND	GND

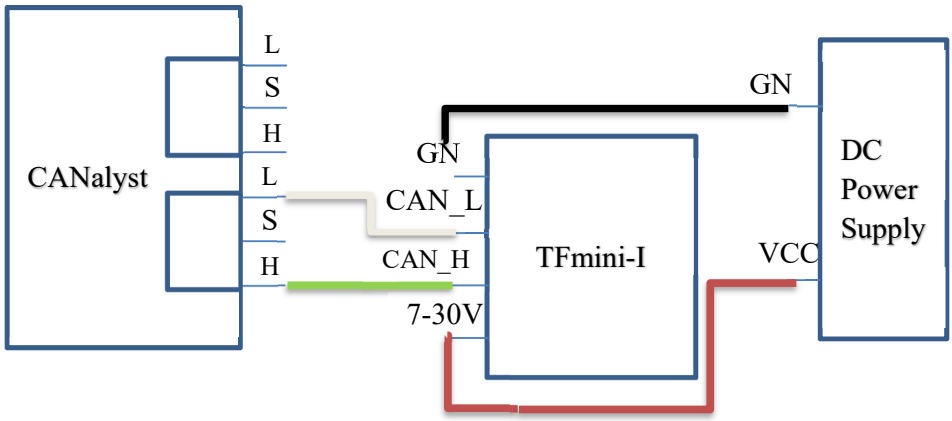


Fig.2 CANalyst connecting TFmini-I-CAN to PC

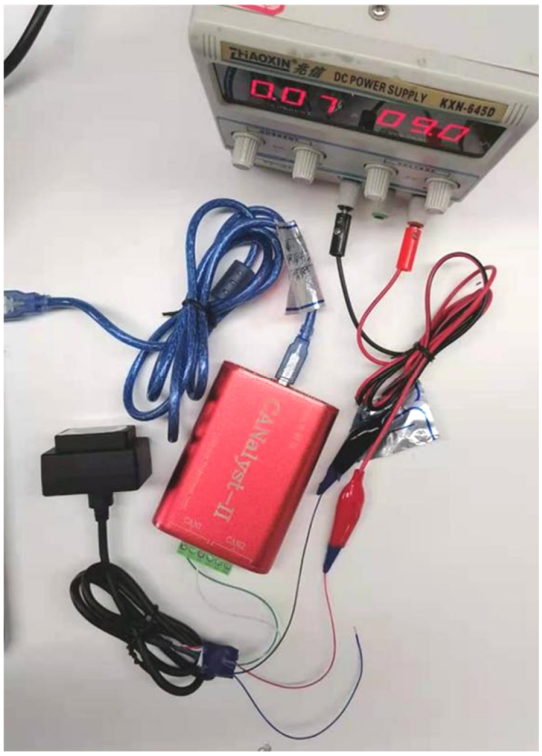


Fig.3 CANalyst connecting TFmini-I-CAN to PC

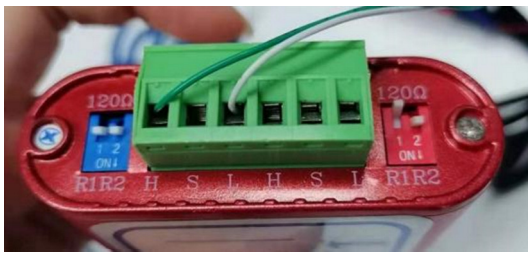


Fig.4 CANalyst and TFmini-I-CAN connection method

3. Test Steps

3.1. Establishing Connection with PC

After CANalyst, LiDAR and PC are connected, faint red light can be seen from the LiDAR lens.

Fig.5 Lidar output red light

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. Modify the Baud Rate

After the driver update, open the USB_CAN TOOL and set the parameters. TFmini-I-CAN baud rate defaults to 250kbps, the frame format defaults to standard frame, transmit and receive IDs defaults to 0x00000003.

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 00 03".

Fig.6 Parameter setting

Find "Device Operation" in the dropdown menu and click on "Start Device". Select the baud rate as "250k bps". Click on "OK" and the device will start.

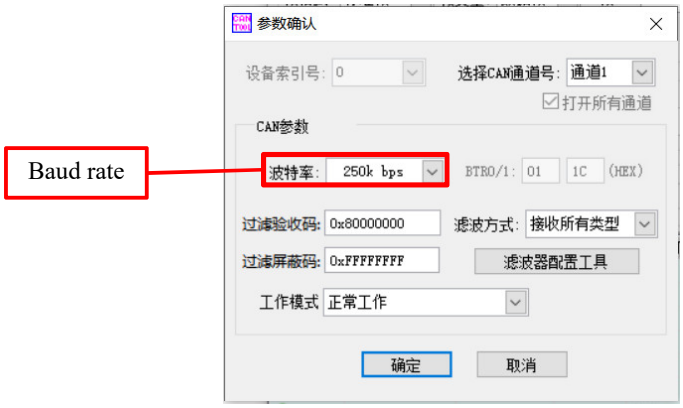


Fig.7 Selecting the baud rate

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
02425	13:39:17.704	0x22FB4C5	ch1	接收	0x0003	数据帧	标准帧	0x08	x| DD 00 6B 12 26 6D 00 00
02426	13:39:17.704	0x22FB529	ch1	接收	0x0003	数据帧	标准帧	0x08	x| DD 00 6C 12 30 6D 00 00
02427	13:39:17.733	0x22FB58D	ch1	接收	0x0003	数据帧	标准帧	0x08	x| DD 00 6E 12 3A 6D 00 00
02428	13:39:17.733	0x22FB5F1	ch1	接收	0x0003	数据帧	标准帧	0x08	x| DD 00 69 12 44 6D 00 00
02429	13:39:17.733	0x22FB655	ch1	接收	0x0003	数据帧	标准帧	0x08	x| DE 00 6A 12 4E 6D 00 00

Fig.8 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. The output data are all hexadecimal numbers, byte0-1 are the lower and higher bytes of the distance value; byte2-3 are the lower and higher bytes of the signal strength; and byte6-7 are reserved. For example, if the output data frame is: DD 00 6B 12 26 6D 00 00, then the measured distance value is 000000DD, which is 221 in decimal; and the signal strength is 0000126B, which is 4715 in decimal. In summary, the measured distance value is 221cm and the signal strength is 4715.

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

TFmini-I-CAN needs to use the "Send File" method to modify the baud rate. The format of the send file is a text file with **one frame per line containing 4 elements**: ID, data, frame format, frame type. The elements are separated by **Tab characters** and the lines are separated by **carriage returns** and the format is described as follows.

Table 2 Elements contained in each data frame

ID	DATA	Frame Format	Frame Type
CAN ID (HEX)	Parameter configuration command(HEX) Separated by spaces	Standard or extended frames Value = "std" for standard frames Value="ext" for extended frames Not case-sensitive	Data frames or remote frames Value="data" for data frames Value="rmt" for remote frames Not case-sensitive

Table 3 Parameter configuration command format

Byte	0	1	2	3	4	5-8	9-12	13
Description	0x5A	0x0E	0x51	Type	Baudrate	Recv_id	Send_id	Check_sum
Default Value				0	8	0x00000003	0x00000003	

Where Type indicates the frame format: Type=0 (standard frame), Type=1 (extended frame); Recv_id indicates the LiDAR receive ID, Send_id indicates the LiDAR send ID, both are entered in little-endian format. Then according to the configuration command Recv_id is: 03 00 00 00; Send_id is: 03 00 00 00 00. Correspondence between the value of byte4 and the baud rate as follows.

Table 4 Correspondence between the value of byte4 and the baud rate

Byte4	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Baud rate	1000	900	800	666	600	500	400	300	250	225	200	160	150	144	125	120	100

Create a new ".txt" text file and copy the following gray backgrounded contents into the text file and save it. Just select it when sending the file (the frame IDs are separated from the commands by TAB and the bytes of the commands are separated by spaces).

```
00000003    5A 0E 51 00 05 03 00 00   std    data
00000003    00 03 00 00 00 C4     std    data
00000003    5A 04 11 6F    std  data
```

Set "Send total frames" to 1 and "Send period" to 10 ms. Click "Send file" and select the file you just created. Then set "Total frames sent" to 2 and 3, and repeat what you just did (click "Show" in the menu bar, and select "Merge same ID data" to see more clearly).

Fig.9 Set "Send total frames" to 1

Fig.10 Set "Send total frames" to 2

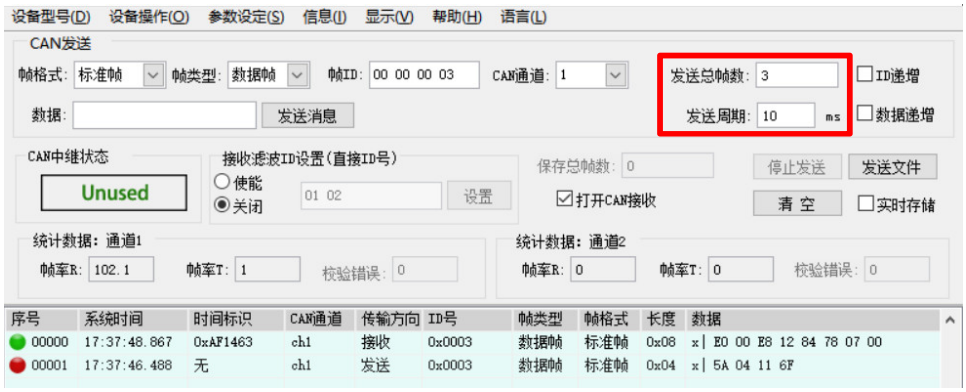


Fig.11 Set "Send total frames" to 3

After completing the above operation, click on "Shutdown Device" in "Device Operation". Power off and restart after a few moments. After reboot, select 500k baud rate. If the distance value can be correctly obtained, it indicates that the baud rate modification is successful.

For more details, please refer to the *SJ-PM-TFmini-i A02 manual* or any latest manual of TFmini-I-CAN and *USB-CAN Tool debugging software installation and operation manual*.