TOSUN同星

Hardware IFU—TC1034

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tosunai.com

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1. Product profile

1.1 Product Overview

TC1034 is a 2 FlexRay, 2 CAN FD bus to USB interface equipment; can be easily competent for FlexRay network development, simulation, testing and other work.

TC1034 By TSMaster, software operation, can achieve multiple TC1034 parallel applications, or work with other same star FlexRay products. When cooperating with CAN, LIN and automotive Ethernet connection tools, TC1034 can make a single PC with high performance multi-bus analysis and simulation capabilities. Suitable for R & D personnel, test personnel, ECU production line and test engineer.

1.2 Typical applications

- FlexRay Flexible bus analysis;
- Accurate time analysis of the bus communication data;
- ECU test analysis and gateway application;

1.3 Functions and parameters

1.3.1 Functional characteristics

- Windows, Linux system free drive free design, with excellent system compatibility
- Internal support 700 KB send buffer space, can concurrently store 240 send configuration
- 2 channel FlexRay channels (both channels contain A and B)
- A 2-way CAN FD channel
- CAN channel port rate 125 Kbps—1Mbps tunable
- With auxiliary communication controller, no need to add additional nodes when cold start
- Based on the TSMaster perfect adaptation of FlexRay, CAN / CAN FD bus application
- Support for Windows, Linux system secondary development interface
- CAN terminal built-in 120 euro terminal resistance software configuration
- FlexRay Built-in 100 euro terminal resistance software configuration

1.3.2 Flexray Main functions

- The communication controller cache can be flexibly configured
- Detects the empty frames
- Composite communication mode can be composed of multiple cycles (Cycle multiplexing)
- Support for a maximum frame load of 254 bytes
- support PDUs
- There is a startup monitoring function
- Support for FlexRay, message recording and playback
- 2 FlexRay, the channel can be used as two FlexRay nodes in parallel

1.3.3 Technical parameters

channel	2 *FlexRay / 2 *CAN FD
PC end	USB 2.0
drive	Windows System drive-free design, with excellent system compatibility
FlexRay	FlexRay channel (A and B)
cold boot	support
CAN	Support CAN2.0A / B protocol, comply with ISO11898-1 specification, port rate 125 Kbps- -1Mbps
CAN FD	Support for ISO and non-ISO standard CAN FD, port rate 125 Kbps- -8Mbps
time stamp	1us, the hardware message timestamp, to meet the high-order requirements
insulate	FlexRay / CAN channel DC2500V isolation, electrostatic grade contact discharge ± 8KV
CAN terminal resistance	Built-in 120 euro software configuration
FlexRay Terminal resistance	Built-in 100 euro software configuration
supply electricity	USB
Case material	aluminium product
working temperature	-40℃～75℃
Working humidity	10% ~ 90% (no condensation)
work environment	Stay away from the corrosive gases

1.3.4 Electrical parameters

Parameter		test condition	least value	representative value	crest value	unit
working voltage	USB supply electricity	Two flexray messages	5.06	5.07	5.08	V
	USB supply electricity	Two CAN delivery channels	5.06	5.07	5.08	V
working current	USB supply electricity	Two flexray messages	0.44	0.45	0.46	A
	USB supply electricity	Two CAN delivery channels	0.42	0.43	0.44	A
power	USB supply electricity	Two flexray messages	2.23	2.28	2.34	W
	USB supply electricity	Two CAN delivery channels	2.13	2.18	2.24	W
CAN joggle	Bus pin pressure resistance	CANH、CAHL	-42	--	42	V
	terminal resistance	Enable terminal resistance	--	120	--	Ω
	Isolation and pressure resistance	The leakage current is less than 1 mA	2500	--	--	VDC
Flexray Interface	Bus pin pressure resistance	Flexray-BP、BM	0	--	24	V
	terminal resistance	Enable terminal resistance	--	100	--	Ω
	Isolation and pressure resistance	The leakage current is less than 1 mA	2500	--	--	VDC

1.4 Supply list

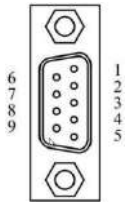
- ✓ TC1034 Host machine
- ✓ USB cable
- ✓ DB9 female one cent two male CAN wire harness
- ✓ DB9 female one cent two male Flexray wire harness

2. Hardware instructions

2.1 Description of hardware appearance and interface

- ✓ The USB high-speed 2.0 interface
- ✓ DB9 interface

DB9 pin definition:

DB9 pin	channel	pin	definition	channel	pin	definition
	Flexray 1/2	PIN1	Flexray_BM2	CANFD 1/2	PIN2	CANFD1_Low
		PIN2	Flexray_BM1		PIN3	CANFD_GND
		PIN3	Flexray_GND		PIN4	CANFD2_Low
		PIN4	Flexray_BM3		PIN5	CANFD_Shield
		PIN5	Flexray_BM4		PIN7	CANFD1_High
		PIN6	Flexray_BP2		PIN8	CANFD2_High
		PIN7	Flexray_BP1			
		PIN8	Flexray_BP3			
		PIN9	Flexray_BP4			

Note: Pin PIN 2 is low CAN, and pin PIN 7 is high CAN, which is consistent with the international standard.

2.2 LED indicator light instructions

Physical picture of the indicator light:

Instructions for indicator light:

pilot lamp	definition
CANFD 1	The CANFD channel 1 indicator lamp
CANFD 2	The CANFD channel 2 indicator lamp
Flexray1	Flexray Channel 1 indicator light
Flexray2	Flexray Channel 2 indicator light
LINK	Hardware connection indicator light

Description of the color of the indicator light:

pigment	description
LINK green light	The device hardware is connected
FlexRay：green light	FlexRay Channel data frames are sent or received correctly
FlexRay：red light	FlexRay The channel sends or receives incorrect frames, configuration, protocol, or wiring errors
CAN FD green light	CAN FD Channel data frames are sent or received correctly
CAN FD red light	CAN FD The channel sends or receives incorrect frames, configuration, protocol, or wiring errors

Note: The flicker frequency depends on the bus load.

3.Quick use

3.1 Download and install the TSMaster host computer

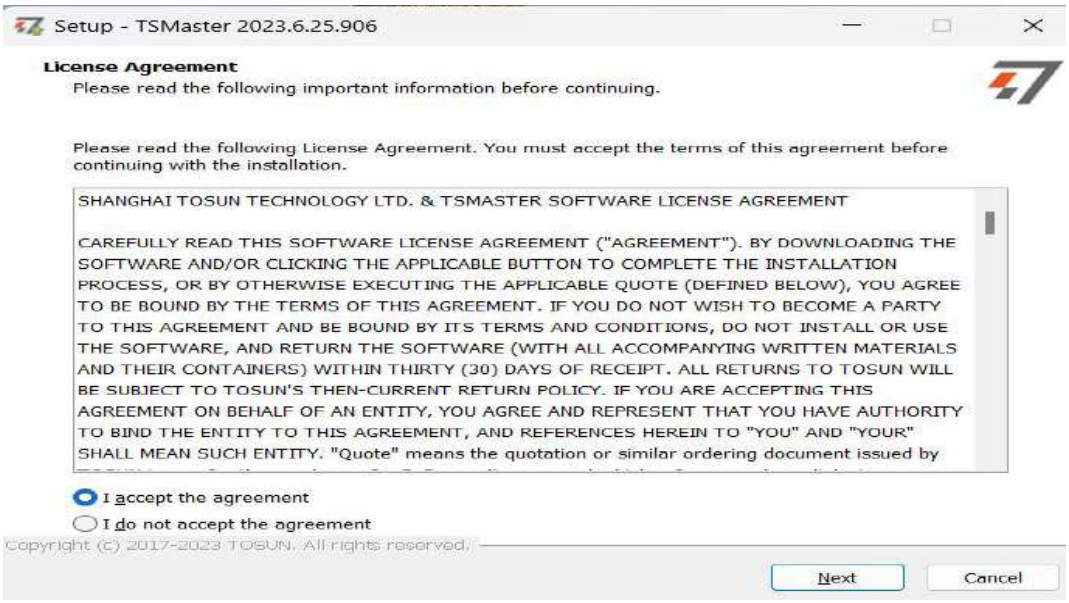
TSMaster Software download link：

http://www.tosun.tech/TOSUNSoftware/TSMaster_Setup_beta.exe

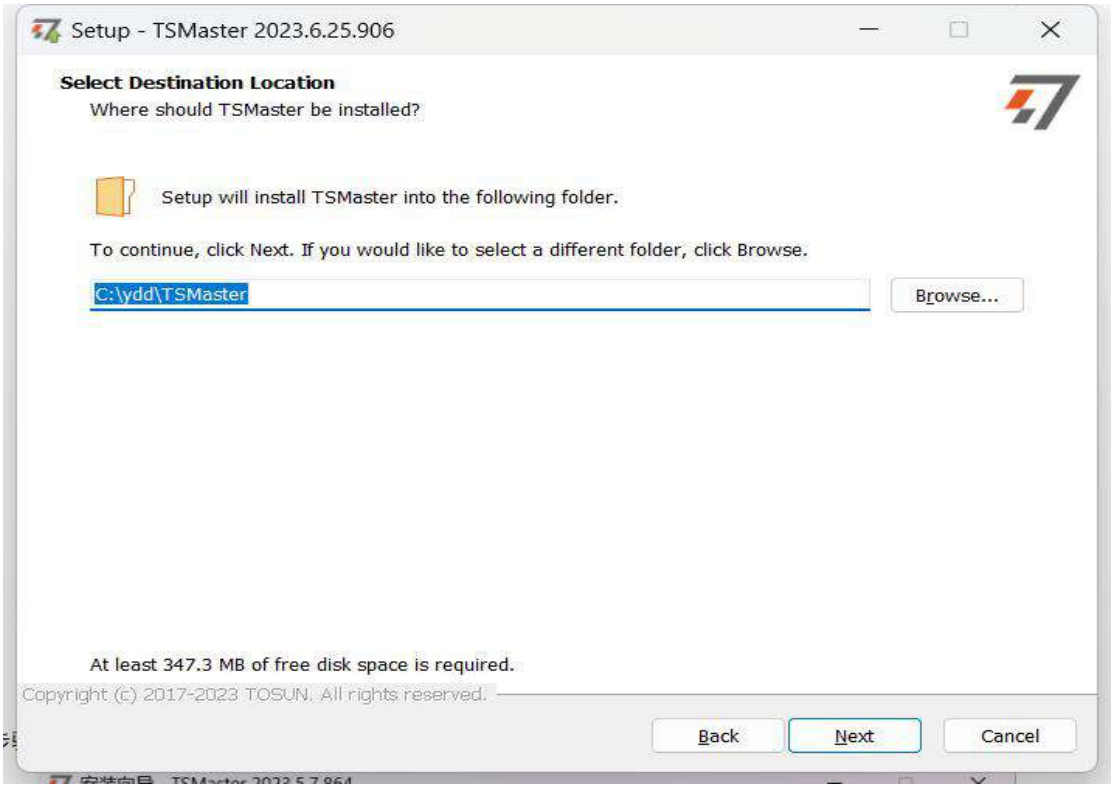
If not accessible, you can contact the corresponding sales staff or log in to the official website of the same star to get the upper machine, and you can also scan the code to follow the public account to get the download link.

Step 1:

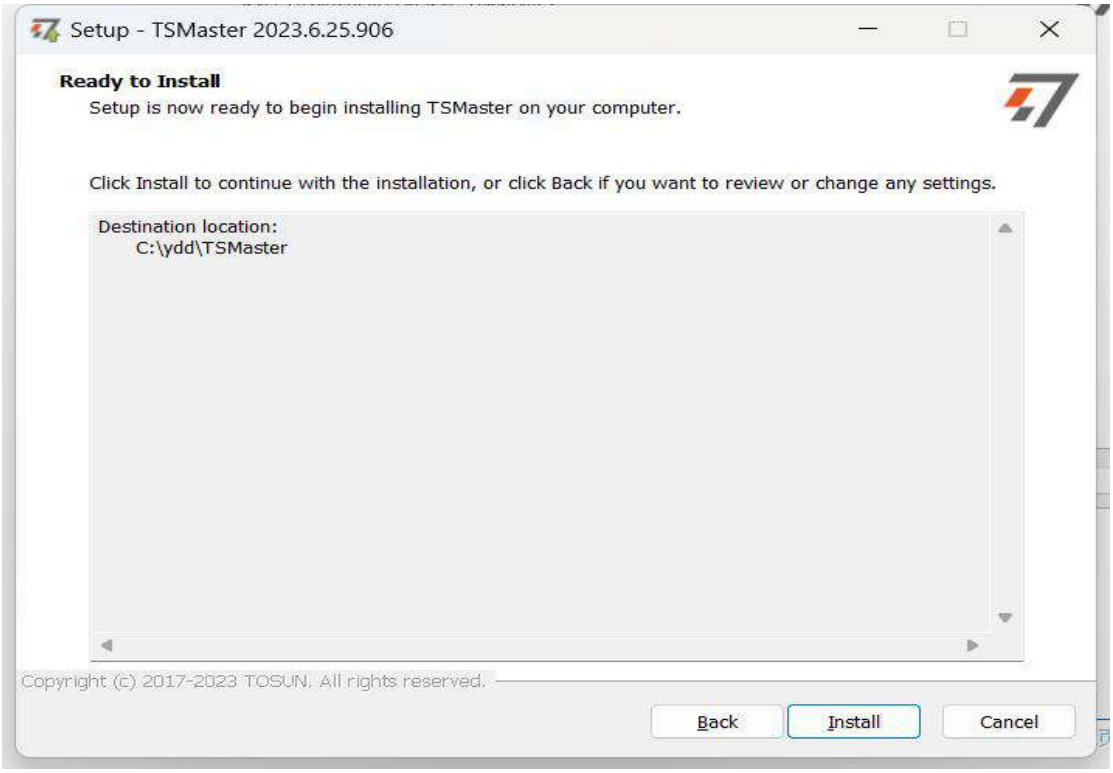
Step 2:



Step 3:


Setup - TSMaster 2023.6.25.906
Select Destination Location
Where should TSMaster be installed?
Setup will install TSMaster into the following folder.
To continue, click Next. If you would like to select a different folder, click Browse.
C:\ydd\TSMaster
Browse...
At least 347.3 MB of free disk space is required.
Copyright (C) 2017-2023 TOSUN. All rights reserved.
Back
Next
Cancel

Step 4:


Setup - TSMaster 2023.6.25.906
Ready to Install
Setup is now ready to begin installing TSMaster on your computer.
Click Install to continue with the installation, or click Back if you want to review or change any settings.
Destination location:
C:\ydd\TSMaster
Copyright (C) 2017-2023 TOSUN. All rights reserved.
Back
Install
Cancel

Complete installation:

3.2 Hardware configuration

FlexRay Channel connection

TC1034 There are two FlexRay, and each FlexRay has channels A and B. And channels A and B can simulate the ECU node (NODE), and the pin connection is as follows:

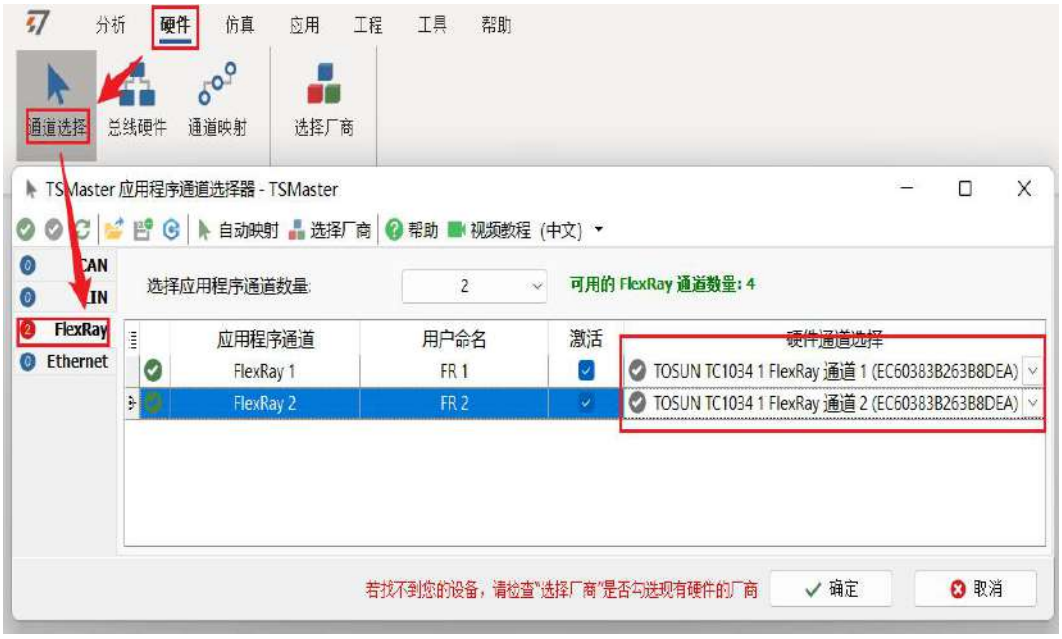
BP1 and BM1 are the corresponding NODE1 CHA

BP2 and BM2 are the corresponding NODE1 CHB

BP3 and BM3 are the corresponding NODE2 CHA

BP4 and BM4 are the corresponding NODE2 CHB

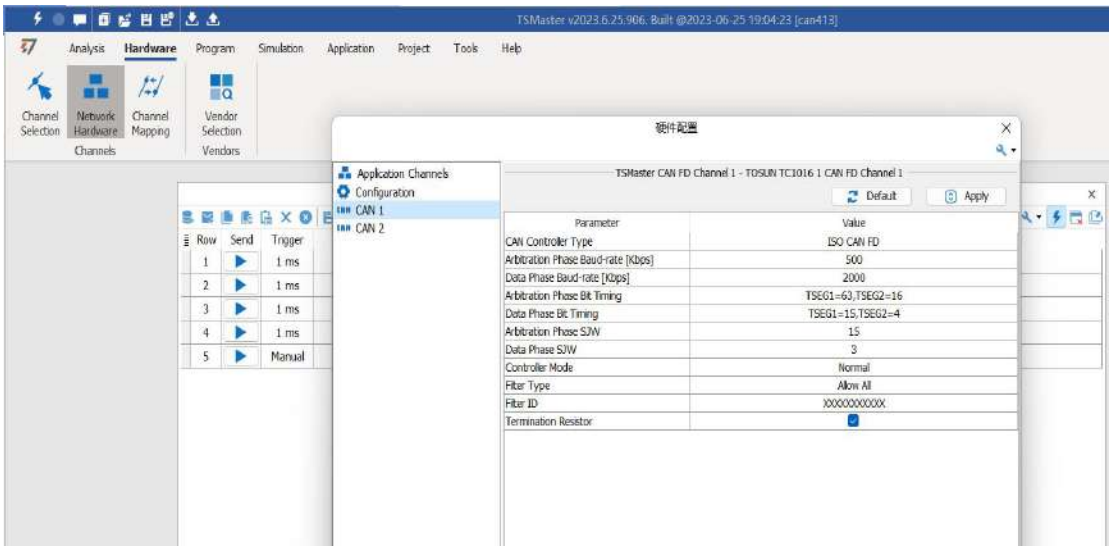
Example: If the tested ECU has only CHA, simply connect the PIN 2: FlexRay_BM1, PIN 7: FlexRay_BP1, and PIN 3: FlexRay _ GND to the ECU.



The CAN channel connection

The connection of CAN of TC1034, usually only needs to connect CANH and CANL to the CANH and CANL of the corresponding CAN ECU device.

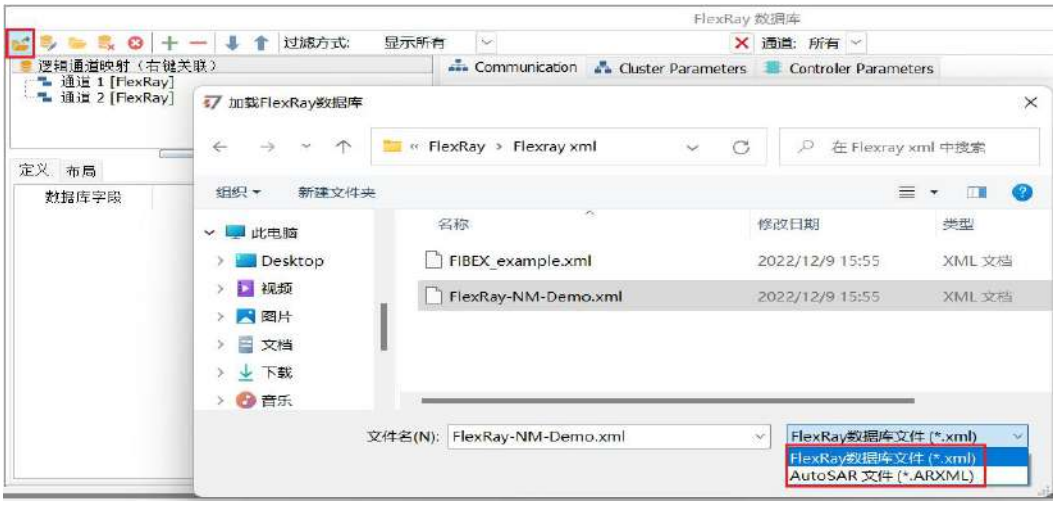
CAN channel, hardware configuration can switch the CAN / CAN CFD protocol, adjust the port rate and switch terminal resistance, click the application after the configuration.



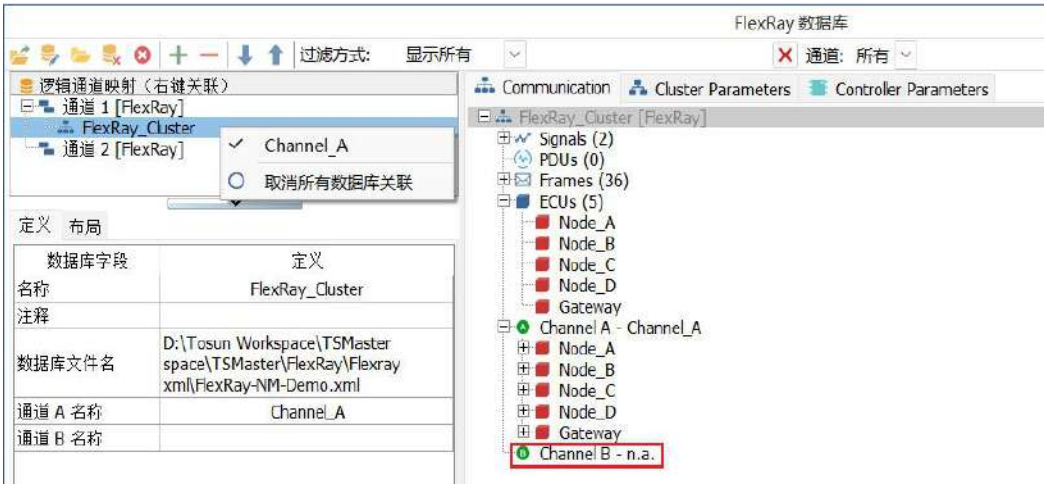
3.3 Flexray database loading

Before configuring the FlexRay channel, the corresponding FlexRay database file is usually loaded, supporting xml and arxml formats. The path is as follows:

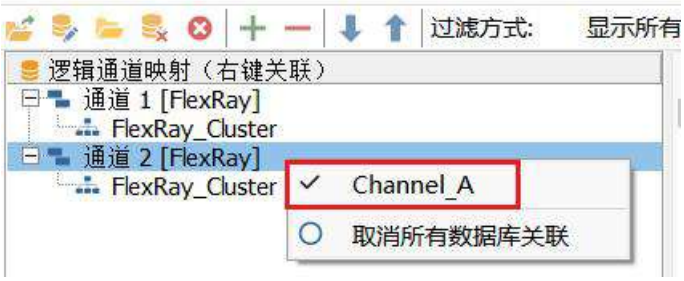
There are two loading methods: the first can drag the xml file directly onto the TSMaster software, and the second can open the database file with the following path.



After loading xml, you can view the signal, the packet frame, the node of the ECU, Channel A and Channel B, where Channel B-n.a. Represents that Channel B was not used.



To load the same database for FlexRay channel 2, right-select "Channel A" on channel 2.

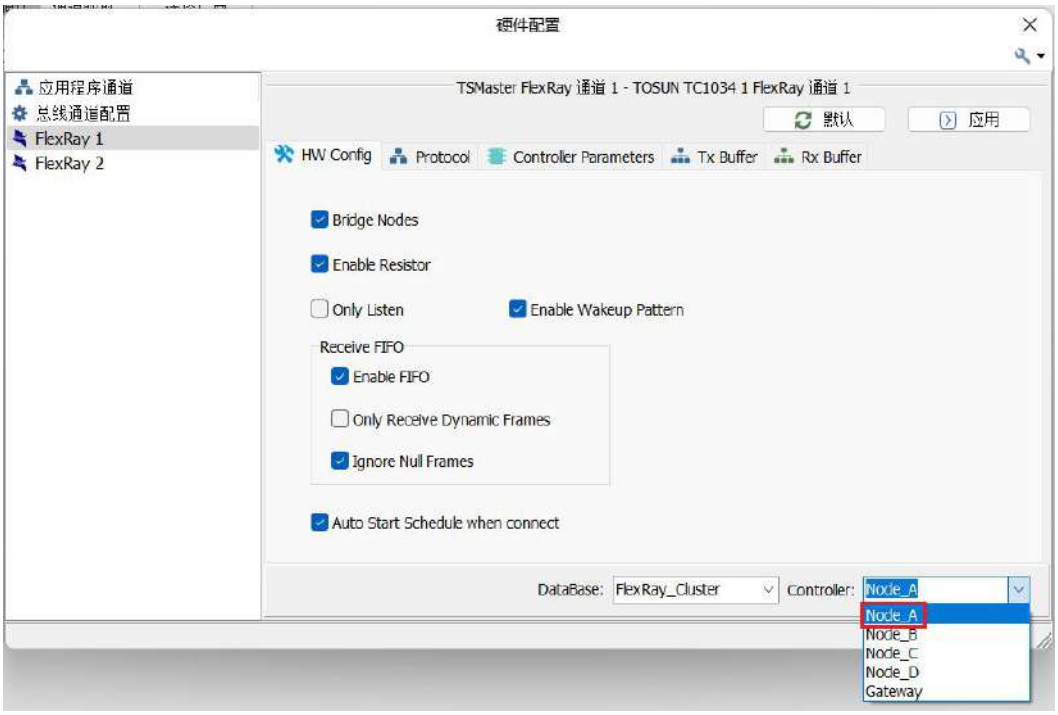


3.4 Flexray hardware configuration

Path: Hardware bus hardware FlexRay1

FlexRay The hardware configuration is divided into HW Config, Protocol, Controller Parameters, Tx Buffer, and Rx Buffer.

3.4.1 HW Config Hardware configuration



Bridge Nodes: The FlexRay1 and FlexRay2 channels used for the internal bridging of the TC1034.

Enable Resistor: enabling internal terminal resistance 100 euro.

Only listen: Is it in the listening mode not.

Enable Wakeup Pattern: Enable wake mode, which will issue wake frame after the connection project.

Receive FIFO: Ability to receive FIFO, whether to receive only dynamic frames, whether to ignore empty frames.

Auto Start Schedule when connect: Automatically start the schedule table after the connection.

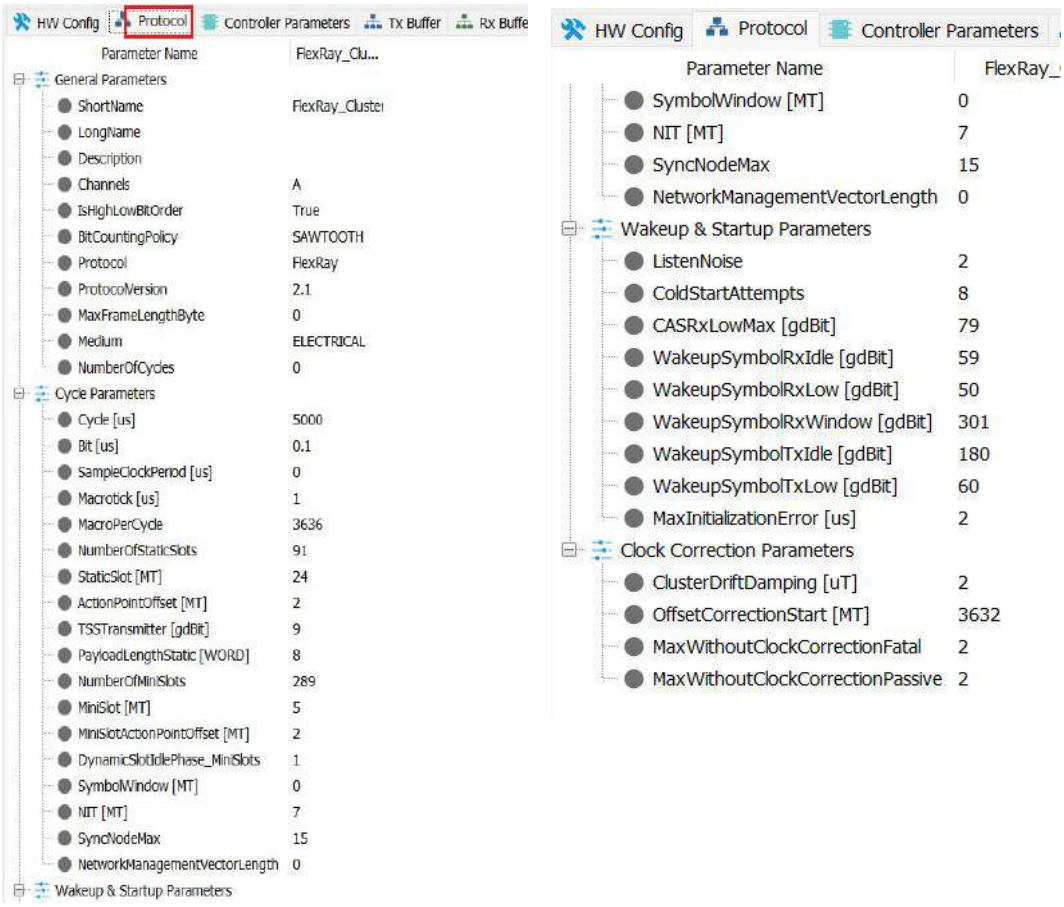
DataBase: The FlexRay Cluster for the current selection.

Controller: Select the controller node to select the channel, such as Node A.

3.4.2 Protocol protocol

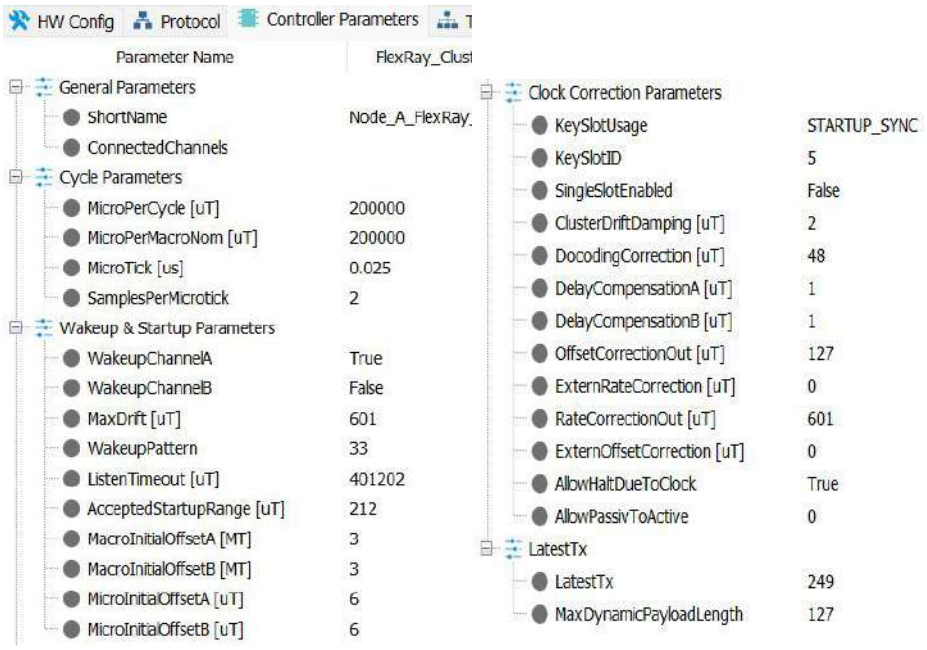
In the protocol, you can see: general parameters (General Parameters), Cycle parameters, wake up and start parameters, and clock correction parameters.

Usually, after the corresponding xml is loaded, all the parameters in the protocol are pre-set, and there is no special need to modify the parameters in the protocol.



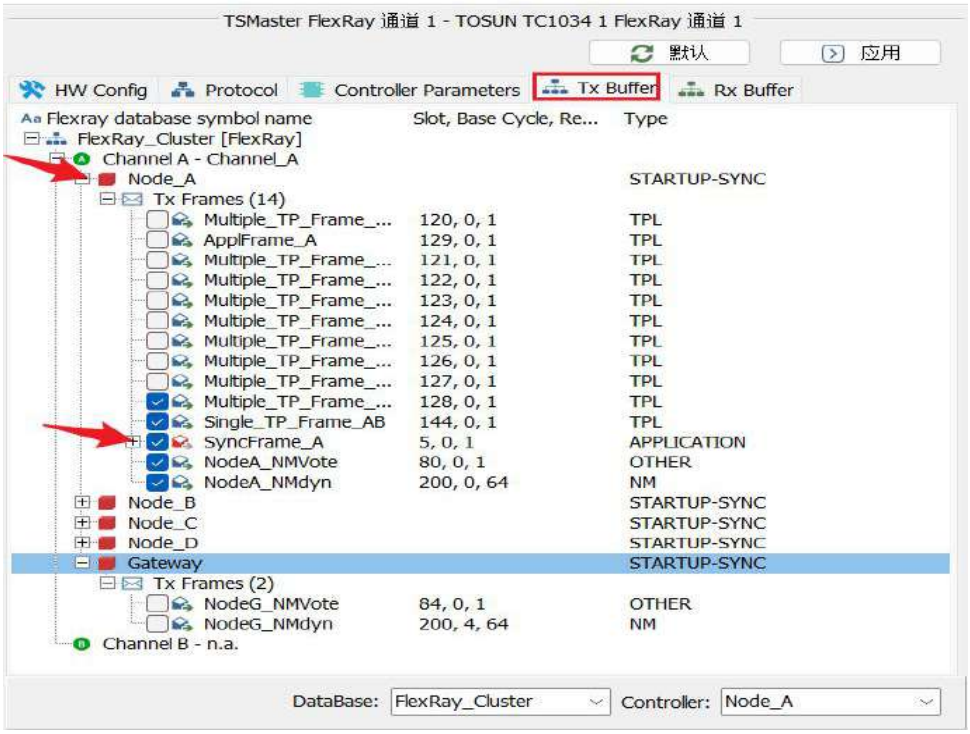
3.4.3 Controller Parameters Controller parameters

Controller parameters, can be viewed: general parameters (General Parameters), Cycle parameters, wake and start parameters, and clock correction parameters and Latest Tx.

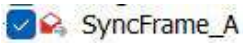


3.4.4 Tx Buffer (important configuration)

The ECU node such as Node _ A, where the red square before Node _ A, and the type STARTUP-SYNC, indicates that the ECU node has a cold start function.



Configure Tx Frames packet frame check: the selected message will be added to the scheduling table and run to send after starting the connection.

For the ECU node with cold start function, the red message logo should be checked for starting synchronization. For example, SyncFrame_A is the cold start message frame. 

Note 1: In the FlexRay network, at least two ECU nodes are required to have a cold start function.

If the connected ECU does not have the cold start function, and the FlexRay channel 1 of TC1034 only simulates one cold start ECU node, the FlexRay network of the ECU will not be allowed to start normally.

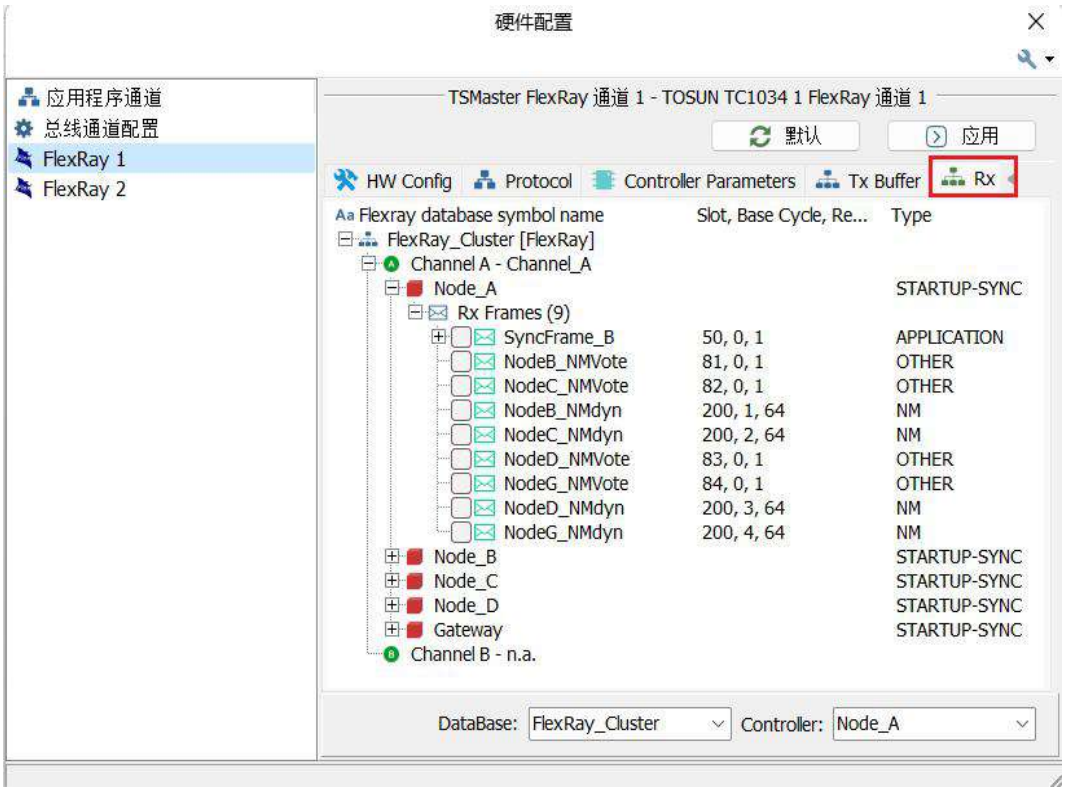
Note 2: For the number of Tx Buffer messages sent, one TC1034 device can simulate 248 messages sent at the same time.

TC1034 The device has two FlexRay channels, each channel supports 124 simulation messages.

3.4.5 Rx Buffer

Usually, after the Enable FIFO is enabled in the HW Config, all the messages are received by default. At this point we can not configure the Rx Buffer.

Because RX BUFF is only used in A / B redundant messages, in other cases, enabling FIFO does not need to check the corresponding RX BUFF.



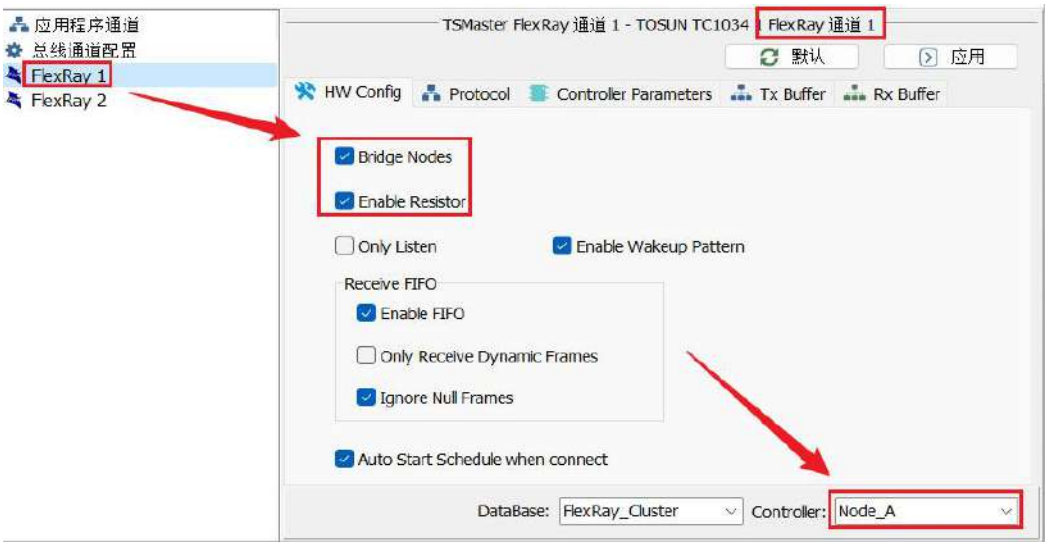
3.4.6 Operation Example-Simulation of two cold-start ECU node communication

The following shows that the two FlexRay channels 1 and 2 of TC1034 simulate the two ECU nodes A and node B with cold start respectively, and realize the network start.

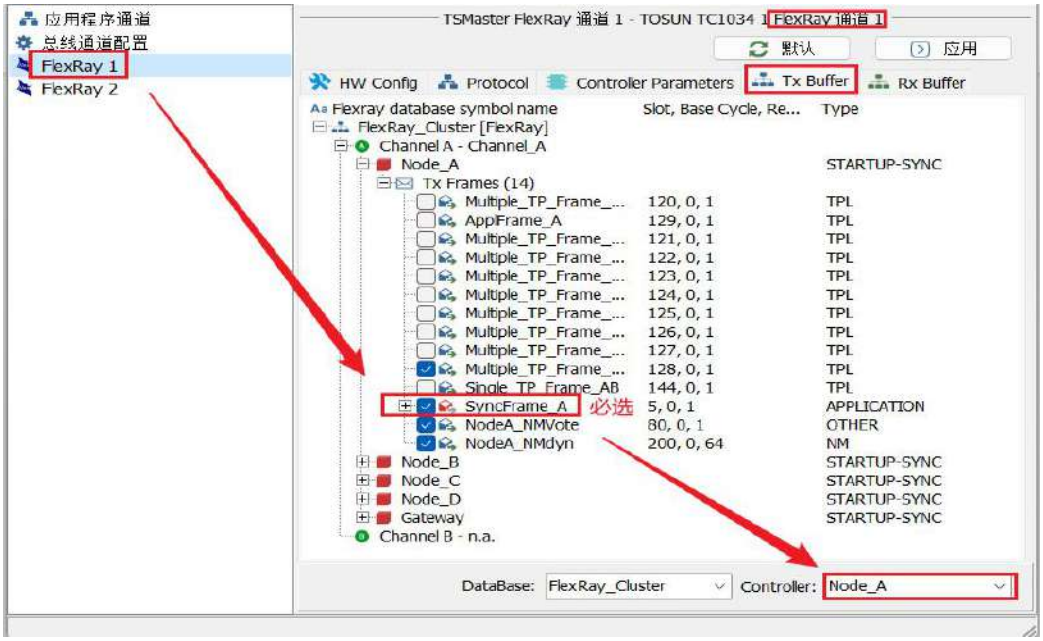
Step1: No physical connection of FlexRay1 and FlexRay2.

Step2: Bridge Nodes bridging of HW config with two FlexRay channels.

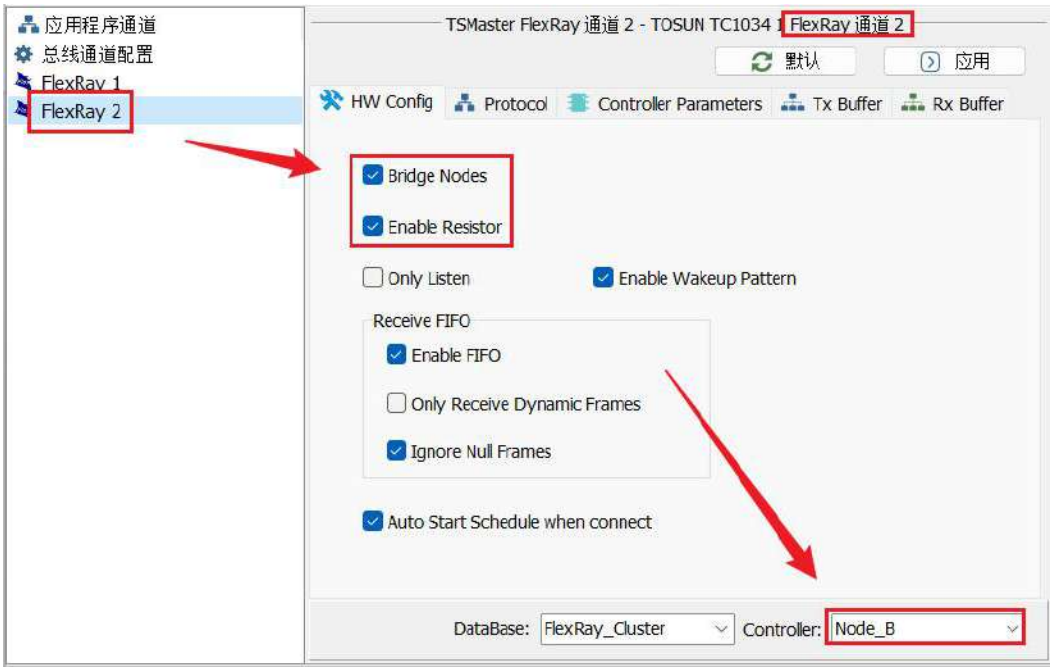
The Config configuration of FlexRay Channel 1 is as follows. Note the lower right controller selection of Node _ A.



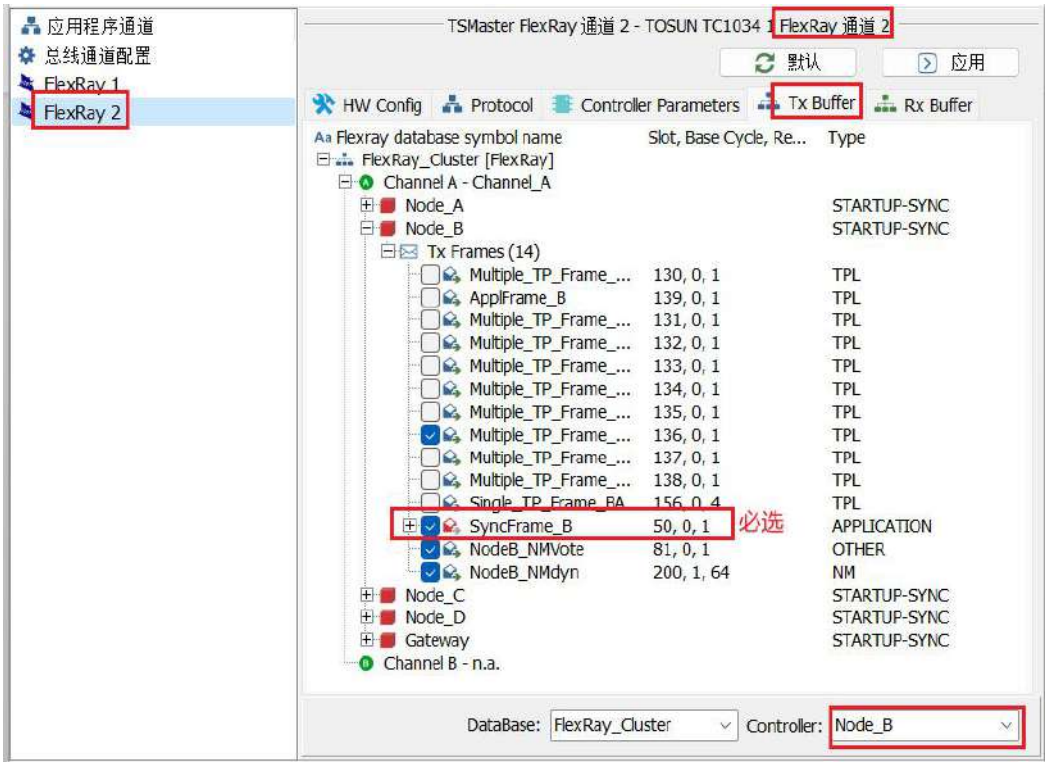
The Tx Buffer configuration of FlexRay channel 1 is as follows, where the red cold start message is required.



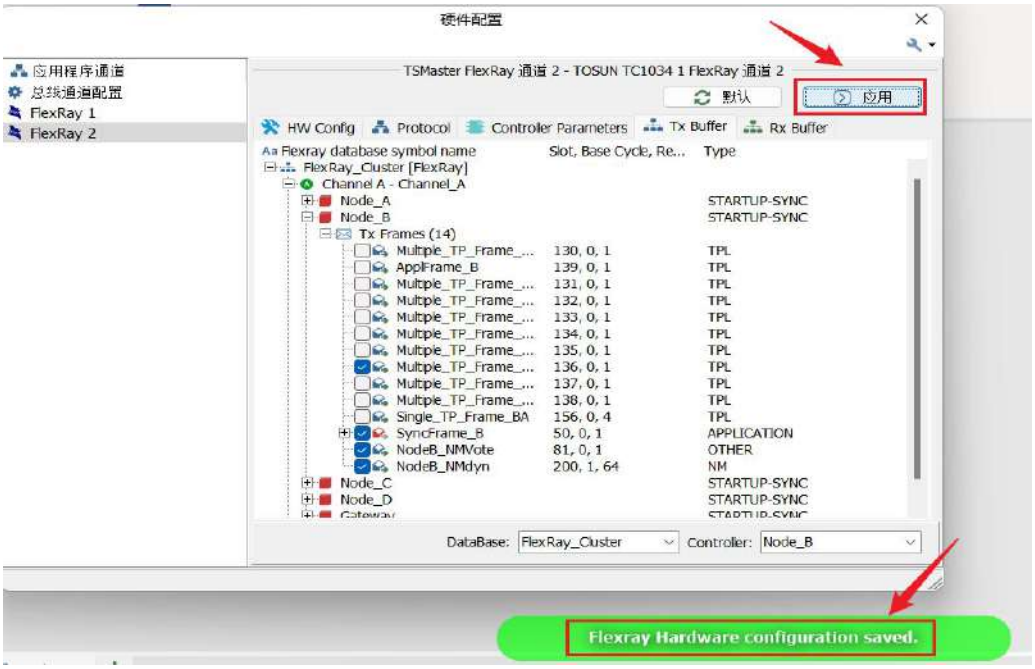
The Config configuration of FlexRay Channel 2 is as follows. Note that the lower right corner controller is selected as Node _ B.



The Tx Buffer configuration of FlexRay channel 2 is as follows, where the red cold start message is required.



Step3: Application configuration, the software indicates that the configuration has been saved.

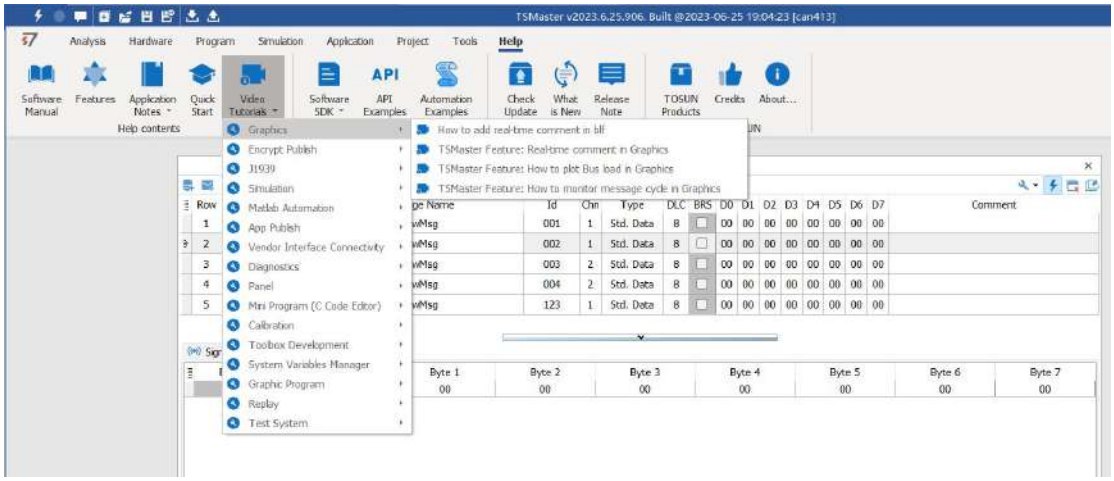


Step4: Create a FlexRay message message for message viewing.

Step5: Start the connection, start the FlexRay network, when you can hear the TC1034 relay sound. Channel FR 2A and 1A can be observed in the FlexRay message.

3.5 Help with documentation and video teaching

Various instructions and help manuals are provided in the TSMaster help bar.

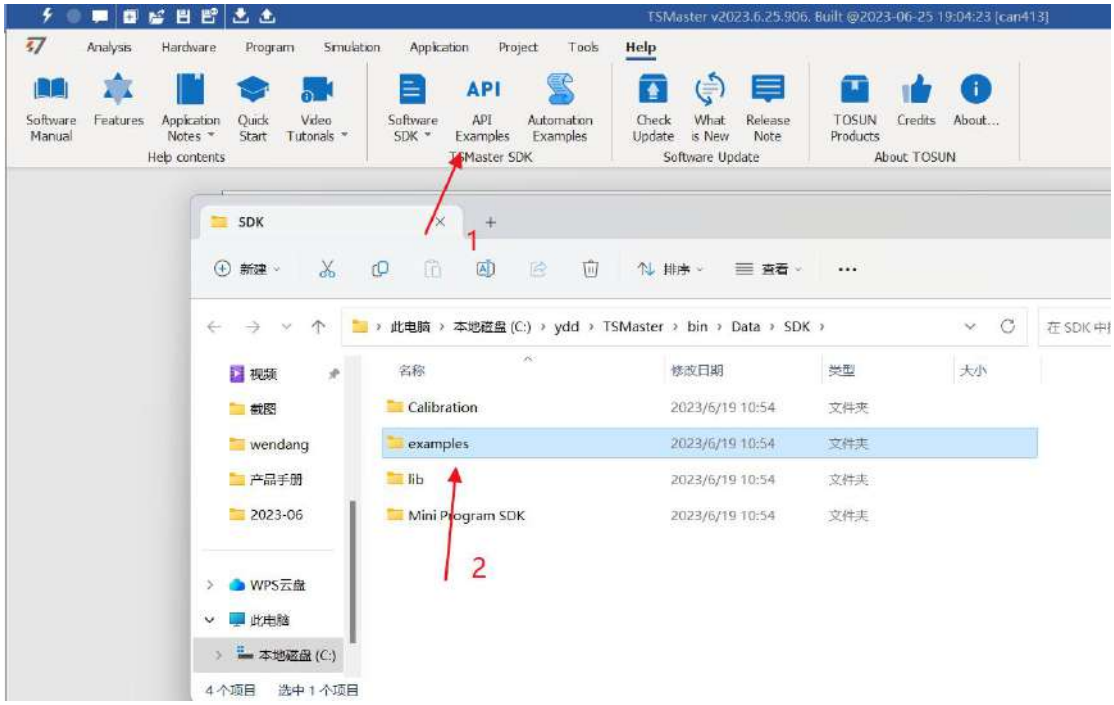


At the same time, a large number of teaching videos can enter B station

http s: / /space.bilibili.com / 2042371333, follow the tosun intelligent official number, watch all the teaching videos.

3.6 TSMaster API Secondary development

In the TSMaster help bar API routine, a variety of common language API is provided to facilitate users' secondary development. Efficient and easy-to-use secondary development functions that can support all kinds of development environments, such as C, Python, C #, Labview, etc.



3.6.1 Python Call to the dynamic library

Windows32-Position Python:

（1）pip install TSMasterAPI

(2) Using the TSMasterAPI form TSMasterAPI import * for

(3) Example synchronous upload github, address: https: / / github.com/sy950915/TSMasterAPI.git

Windows64 bit Python / Li nux:

（1）pip install libTSCANAPI

(2) Using the TSMasterAPI form libTSCANAPIimport * for

(3) Example synchronous upload github, address: https: / / github.com/sy950915/ libTSCANAPI.git

3.6.2 C calls the dynamic library

(1) Include TSMaster in a file with a path of TSMaster \ bin \ Data \ SDK \ lib \ x86.h header file.

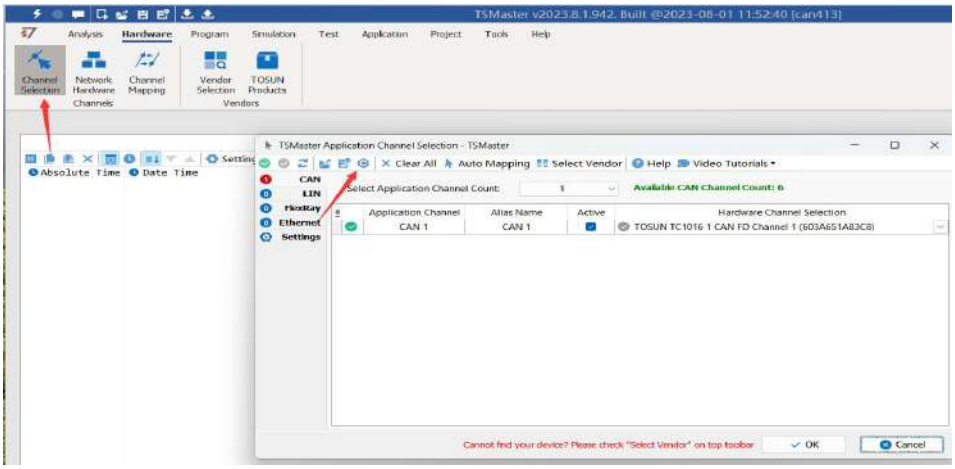
Such as: # include " TSMaster.h”

(2) Include TSMaster in a file with a path of TSMaster \ bin \ Data \ SDK \ lib \ x86. The lib file is connected to TSMaster.lib document.

In the C environment, add TSMaster to the Configuration Property connector input additional dependencies in the project property page.lib document.

3.6.3 Example of the calling of the interface

Windows, The Linux system provides the secondary development interface, easy to connect and use the equipment. The operation step are: select channel-generate C code-use C code / python code to call the interface. Take the code C, as an example:



C Script Fragments:

C脚本片段

```c
initialize_lib_tsmaster("TSMaster");
tsapp_set_can_channel_count(1);
tsapp_set_lin_channel_count(0);
tsapp_set_flexray_channel_count(0);
tsapp_set_ethernet_channel_count(0);

TLIBTSMapping m;

// TSMaster CAN FD 通道 1 - TOSUN TC1034 1 CAN FD 通道 1
m.init();
sprintf_s(m.FAppName, "%s", "TSMaster");
sprintf_s(m.FHWDeviceName, "%s", "TOSUN TC1034");
m.FAppChannelIndex = 0;
m.FAppChannelType = (TLIBApplicationChannelType)0;
m.FHWDeviceType = (TLIBBusToolDeviceType)3;
m.FHWDeviceSubType = 15;
m.FHWIndex = 0;
m.FHWChannelIndex = 0;
if (0 != tsapp_set_mapping(&m)) { /* handle error */ };

if (0 != tsapp_connect()){ /* handle error */ };

/* do your work here */

tsapp_disconnect();
finalize_lib_tsmaster();
```

C script call function description:

initialize _ lib _ tsmaster ("TSMaster"); / / TSMaster initialization function

Tsapp _ set _ can _ channel _ count (1); / / Set the number of can channels

The tsapp _ set _ lin _ channel _ count (0); / / Set the number of lin channels

The tsapp _ set _ flexray _ channel _ count (0); / / Set the number of flexray channels

The tsapp _ set _ ethernet _ channel _ count (0); / / Set the number of ethernet channels

TLIBTSMapping m; / / Initialize the construct

/ / Set the TSMaster CAN FD channel 1-TOSUN TC1034 1 CAN FD channel 1 channel mapping

m. The init (); / / initial construct m

sprintf_s(m. FAppName, "%s", "TSMaster"); / / Print the application name "TSMaster"

sprintf_s(m. FHWDeviceName, "%s", "TOSUN TC1034"); / / Print the hardware device name

m. FAppChannelIndex = 0; / / Application channel index

m. FAppChannelType = (TLIBApplicationChannelType) 0; / / Application channel type

m. FHWDeviceType = (TLIBBusToolDeviceType) 3; / / Hardware device type

m. FHWDeviceSubType = 15; / / corresponding parameters of hardware equipment *

m. FHWIndex = 0; / / Hardware index

m. FHWChannelIndex = 0; / / Hardware channel index

if (0 != Tsapp _ set _ mapping (& m)) {/ * handle error * /}; / / If the return value is not equal to the 0 mapping failure

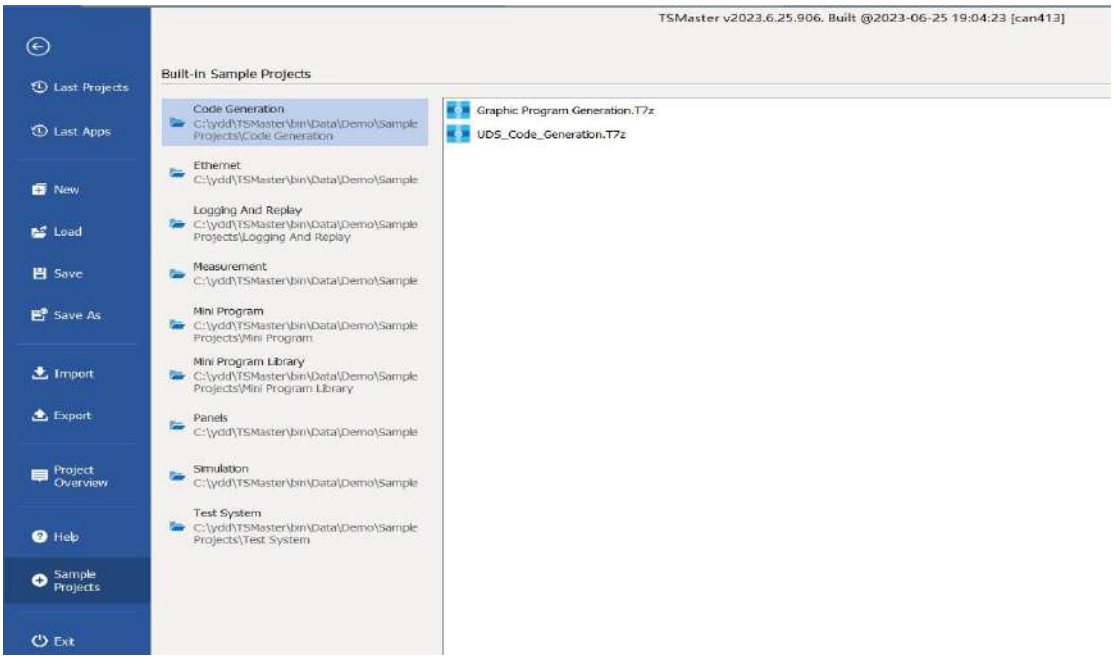
The tsapp _ disconnect(); / / Disconnect the device

finalize _ lib _ tsmaster(); / / Release the C script module

* Note: The corresponding parameters of the hardware equipment can be found in the TSMaster-Help-Software Development Package : TSMasterAPI_Hardware_Map.pdf

3.7 Sample Works

The example project provides a lot of Demo for user reference, greatly improving the user development efficiency.



4. Inspection and maintenance

TC1034 The main electrical component is the semiconductor component, although it has a long life, it may accelerate aging in the incorrect environment, greatly reducing the life. Therefore, regular inspections should be conducted during the use of the equipment to ensure that the use environment maintains the required conditions. It is recommended to check it up at least once every 6 months to a year. Under adverse environmental conditions, more frequent examinations should be performed. In the table below, if you encounter problems during maintenance, read below to find the possible cause of the problem. If the problem still cannot be solved, please contact Shanghai TOSUN Intelligent Technology Co., LTD.

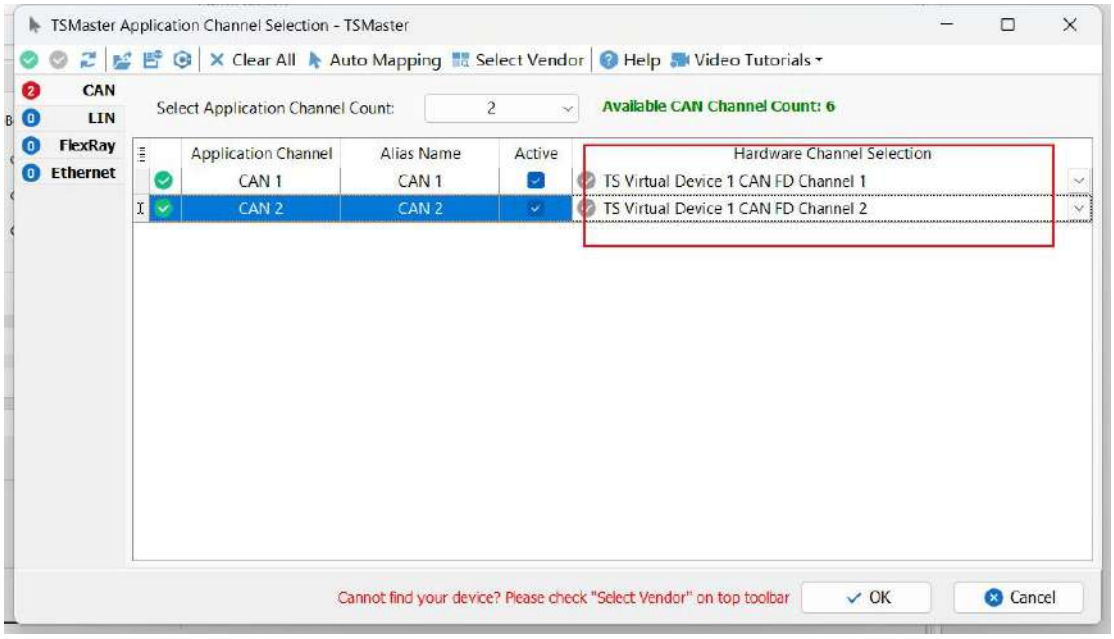
project	check up	standard	move about
power supply	Check the voltage fluctuation at the power supply side	7~18V DC	Use the voltmeter to check the source at the power supply input end. Take the necessary measures to make the voltage fluctuation within the range
surrounding environment	Check the ambient temperature (Including the internal temperature of the enclosed environment)	-40℃~+80℃	Use the thermometer to check the temperature and ensure that the ambient temperature remains within the allowable range
	Check ambient humidity (Including the internal humidity in the closed environment)	Without air conditioning, the relative humidity must be at 10%~90%	Use a humidity meter to check the humidity and ensure that the ambient humidity remains within the allowable range
	Check for the accumulation of dust, powder, salt, and metal debris	No accumulation	Clean and protect the equipment
	Check water, oil, or chemical spray collision into the device	No spray touched the equipment	If the cleaning and protection equipment is required
	Check for corrosive or	No easily	Check by smelling or using

	flammable gases in the equipment area	corrosive or flammable gases	a sensor
	Check the vibration and shock levels	The vibration and shock are within the specified limits	Install the liner or other shock absorber, if required
	Check the noise sources near the equipment	There are no significant noise signal source	Isolation equipment and noise sources or protection equipment
Install wiring	Check the compression connector in the external wiring	There is sufficient space between the connectors	Visual scopic inspection adjust if necessary
	Check for the damage to the external wiring	No damage	Visual inspection and replace wiring if necessary

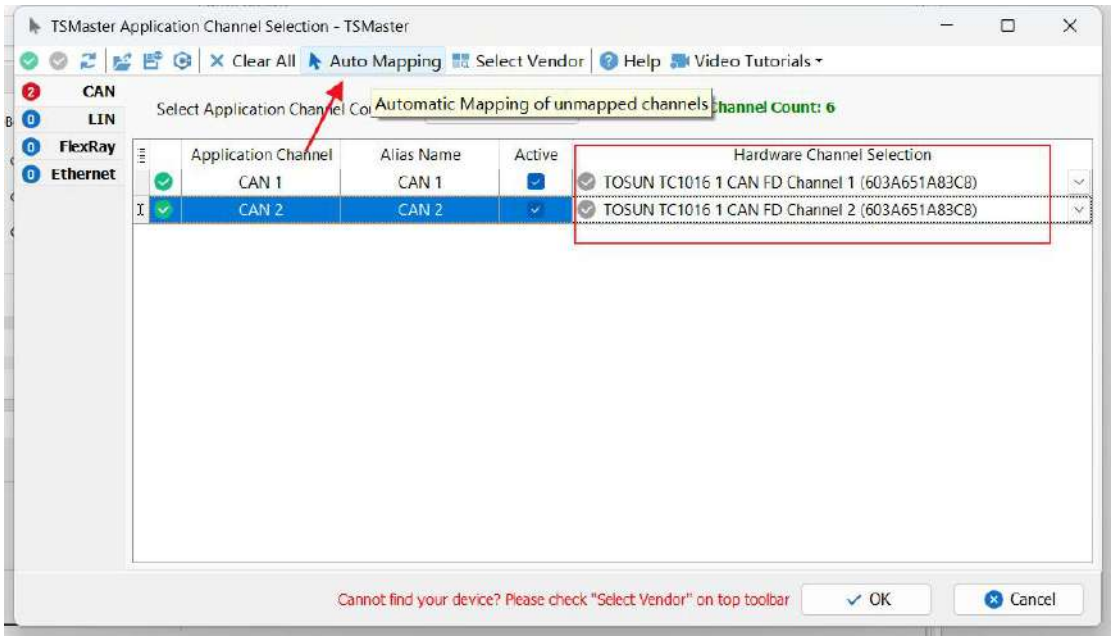
5.Common questions and answers

5.1 The line is connected correctly but cannot communicate properly:

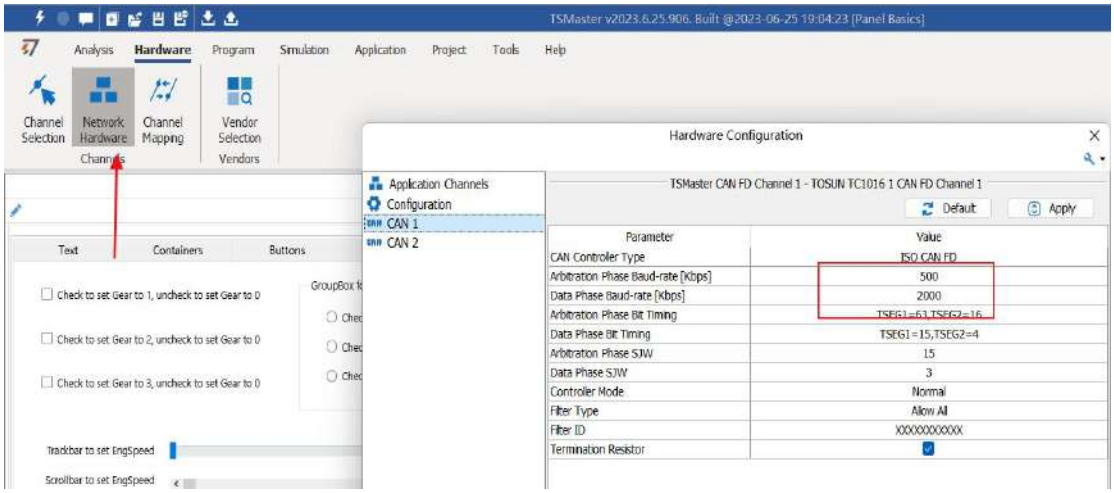
Solution: Check if the number of channels is set. If CAN Channel Count = 0, of course no online hardware cannot display. And the software is configured by default virtual channel, you need to select the hardware real channel.



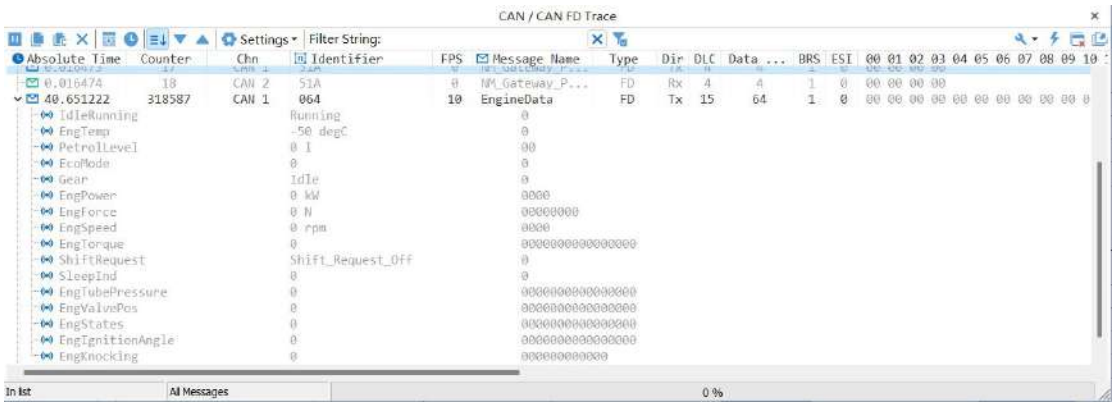
Automatically map or manually click to select the hardware real channel:



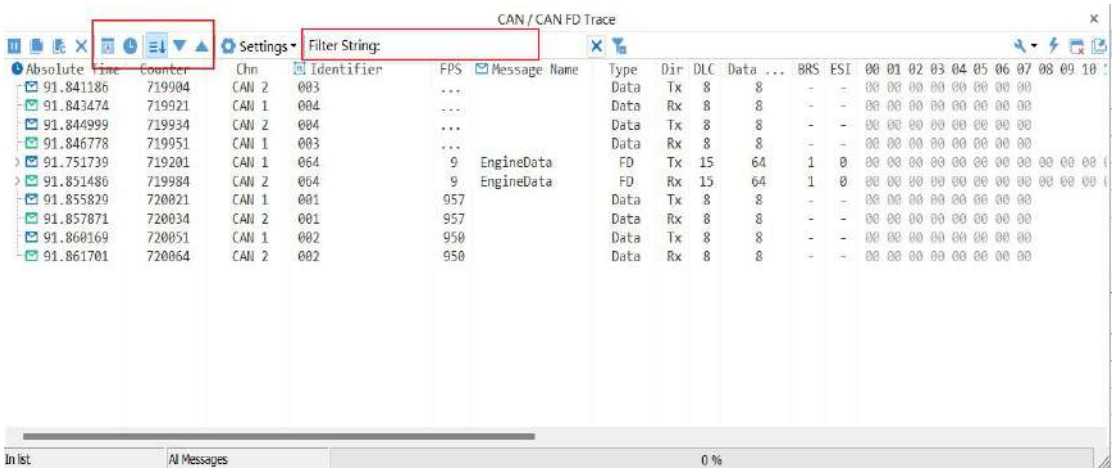
If the channel is selected correctly, it is necessary to ensure consistent port communication between the two channels, as shown in the figure below:



5.2 Inconvenient message observation and signal filtering:

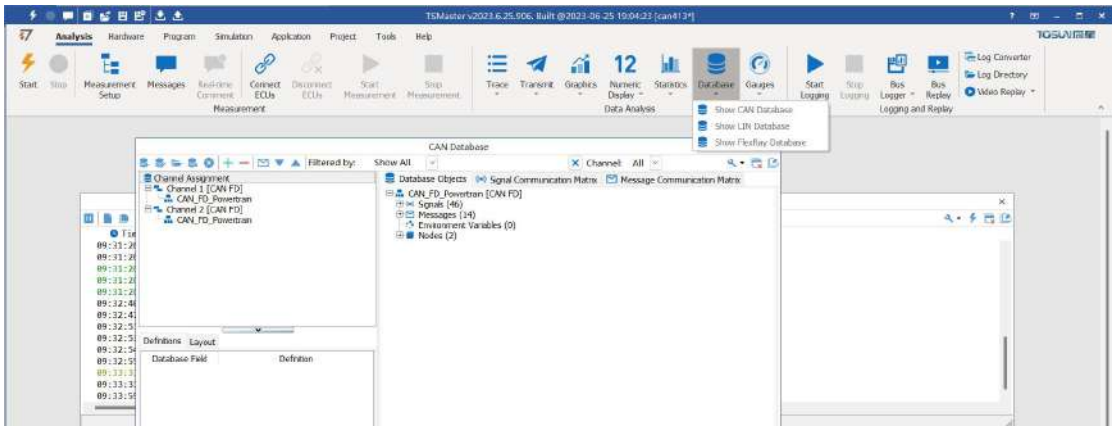


Solution: display in a fixed display or time order, expand or fold the signal display, and filter the string, click the following icon to operate:

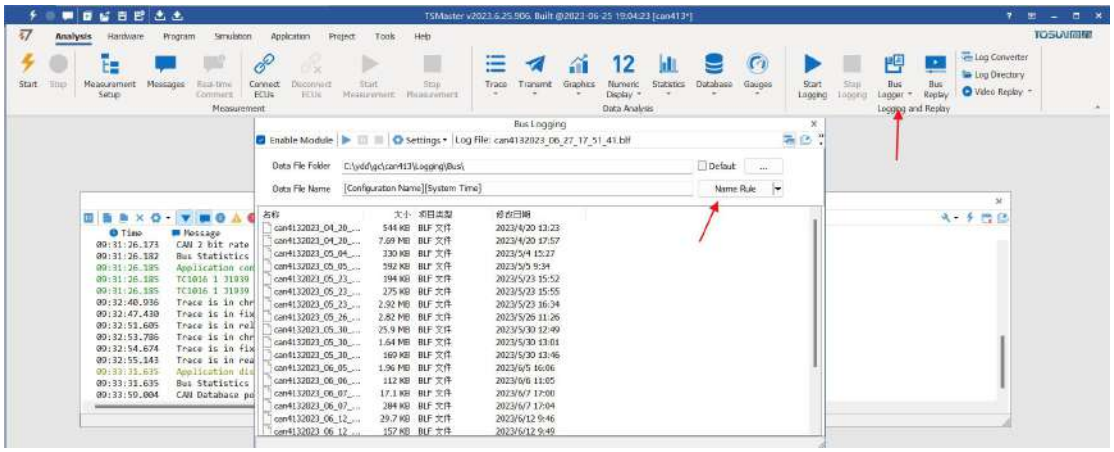


5.3 How to load the database:

Select the can / lin / flexray database, click the upper left corner icon to add the database file, or drag the file directly into this window to be automatically loaded, and then click the left channel to associate the database.



5.4 How to automatically record the message messages:



operating steps:

a. Analysis- -bus record

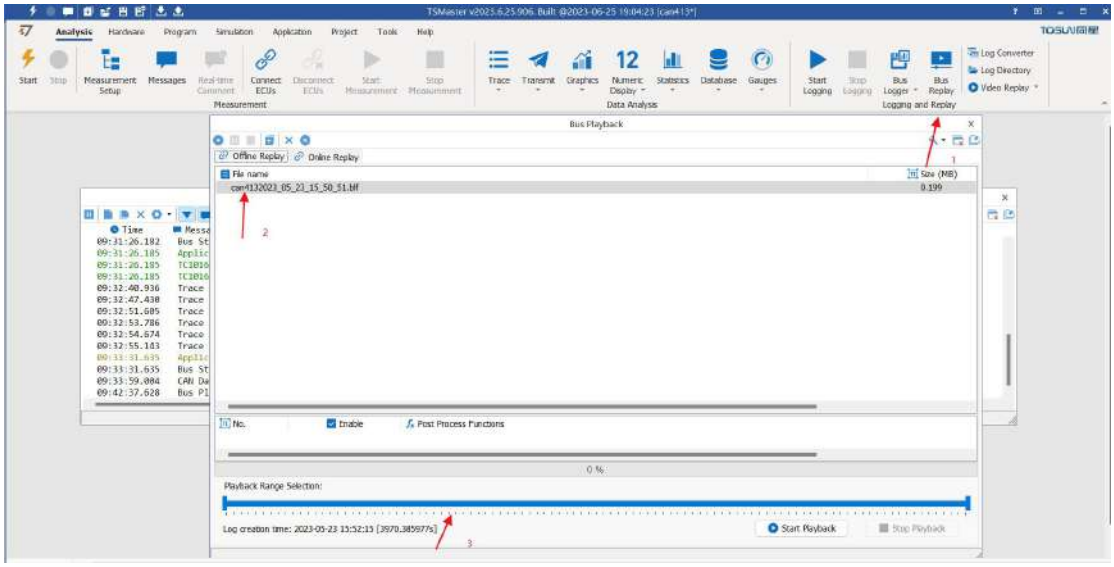
b. Add a name rule to distinguish between different save files

c. Add the self-start function

d. Start the record

5.5 How to replay messages (offline and online playback):

operating steps:



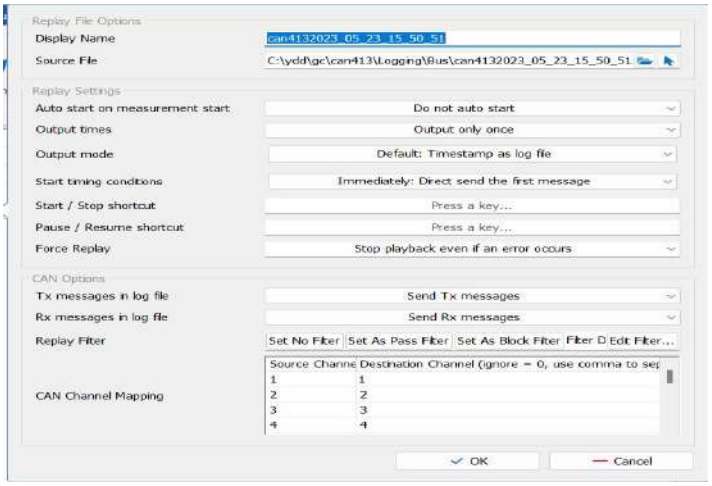
a. Bus playback

b. Offline playback, add the need to be played packets, can drag and drop file add directly

c. Select the range of message playback. Since the number of message display window is limited, you can choose the time period required for the message

d. Bus playback-online playback-add recording files

e. Online playback can playback the message according to the acquisition time stamp,and set the playback data



6.Appendix

6.1 CAN 2.0 Standard Frame:

The CAN standard frame information is 11 bytes, consisting of two parts: information and data parts. The first 3 bytes are for the information section.

	7	6	5	4	3	2	1	0
Bytes 1	FF	RTR	x	x	DLC (Data Length)			
Bytes 2	(Message identification code) ID.10-ID.3							
Bytes 3	ID.2-ID.0			x	x	x	x	x
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 the frame information. The 7th bit (FF) represents the frame format, in the standard frame, FF=0; the 6th bit (RTR) represents the type of frame, RTR = 0 is a data frame, RTR = 1 is a remote frame; the DLC represents the actual length of data at the data frame.

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

Bytes 4~11 is actual data of data frame, remote frame is invalid.

6.2 CAN 2.0 Expansion Frame:

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

	7	6	5	4	3	2	1	0
Bytes 1	FF	RTR	x	x	DLC (Data Length)			
Bytes 2	(Message identification code) ID.28-ID.21							
Bytes 3	ID.20-ID.13							
Bytes 4	ID.12-ID.5							
Bytes 5	ID.4-ID.0					x	x	x
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							

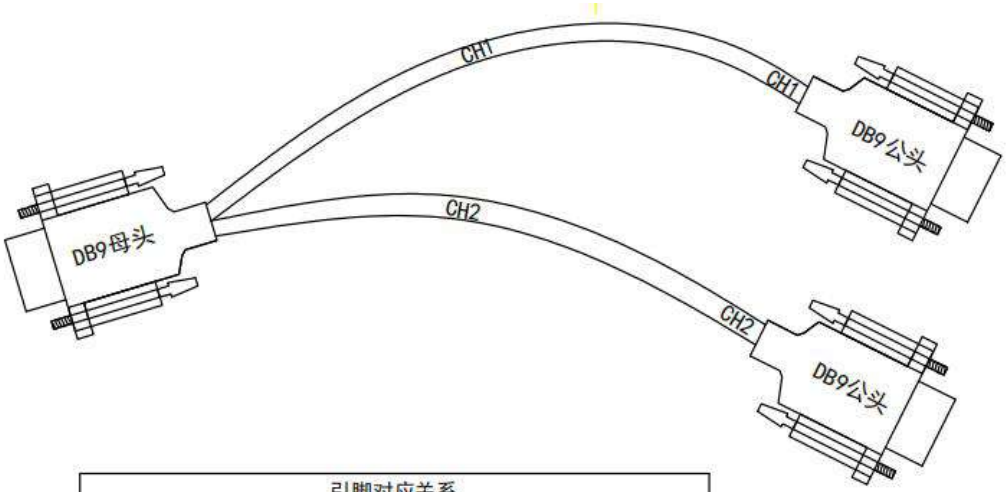
Byte 1 is the frame information. The 7th (FF) indicates the frame format, FF = 1; the 6th (RTR)

It represents the type of frame, RTR = 0 as a data frame and RTR = 1 as a remote frame; DLC represents the actual data length at the data frame.

Byte 2~5 is the message identification code, and its high 29 bits is valid.

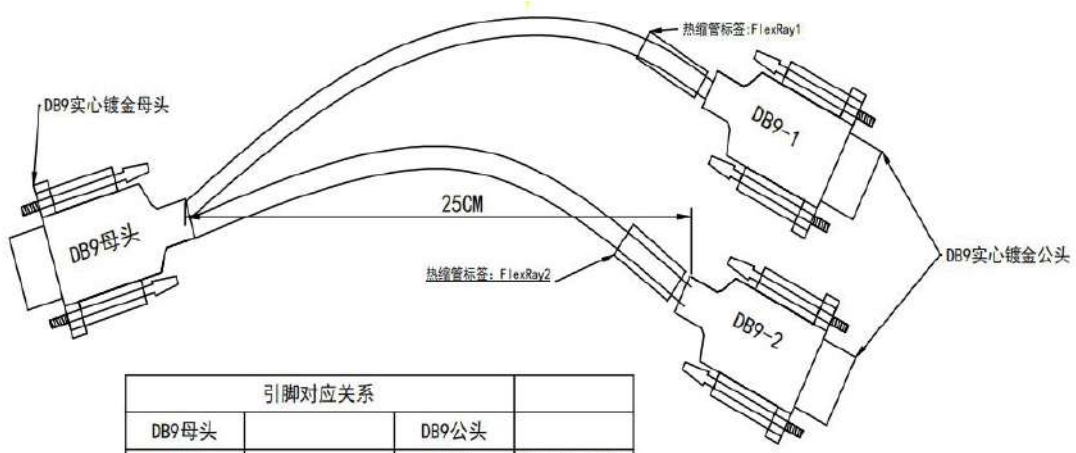
Bytes 6~13 is actual data of data frame, remote frame is invalid.

6.3 CAN DB9 One-in-two wire harness definition



引脚对应关系		
DB9母头		DB9公头
Pin2	CH1	Pin2
Pin7		Pin7
Pin3		Pin3
Pin3	CH2	Pin3
Pin4		Pin2
Pin8		Pin7

6.4 Flexray DB9 One-in-two wire harness definition



引脚对应关系			
DB9母头		DB9公头	
Pin2	FlexRay1(DB9-1)	Pin2	FlexRay_BM1
Pin7		Pin7	FlexRay_BP1
Pin3		Pin3	FlexRay_GND
Pin1		Pin4	FlexRay_BM2
Pin6		Pin8	FlexRay_BP2
Pin4	FlexRay2(DB9-2)	Pin2	FlexRay_BM3
Pin8		Pin7	FlexRay_BP3
Pin3		Pin3	FlexRay_GND
Pin5		Pin4	FlexRay_BM4
Pin9		Pin8	FlexRay_BP4

6.5 matters need attention

① Connect the lines to avoid short circuit.

② Before using the equipment, please carefully check the pin information in the product manual.

③ During the operation of the equipment, be sure to connect the power cord correctly and avoid plugging and unplugging.

④ Attention! Damage caused by electrostatic discharge (ESD).

7.Disclaimer

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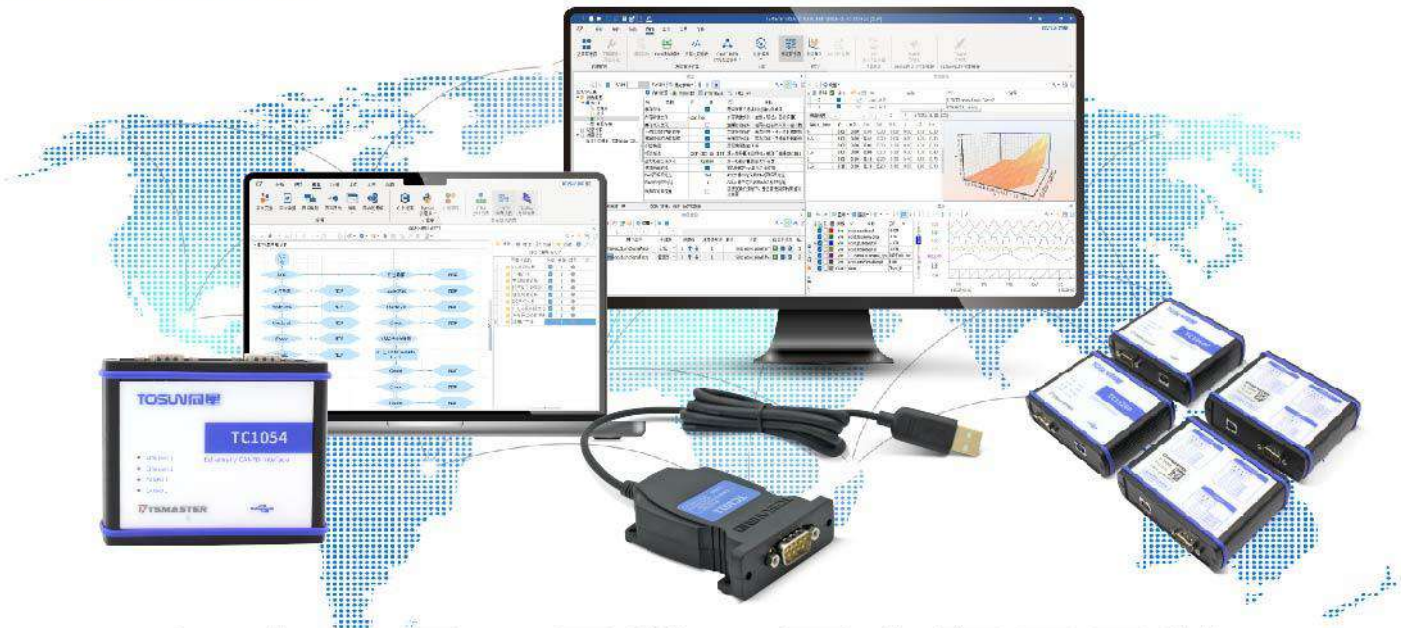

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- 1/2/6通道LIN转USB工具
- 10通道CAN FD/CAN转以太网工具
- 多通道Flexray/CAN FD转USB工具
- 多通道车载以太网/CAN FD转USB工具
- 车载以太网介质转换工具（T1转Tx）
- 多通道CAN FD/Ethernet/LIN记录仪

解决方案

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- FCT测试设备
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- 线控底盘测试解决方案
- 电机性能/耐久试验解决方案
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