TOSUN

TC1038 Pro Product Manual

Version：V1.0 | English

tosunai.com

Copyright Information

Shanghai TOSUN Technology Ltd

No. 9 Building, 1288 Jiasong North Road, Jiading District, Shanghai (Headquarters)

Buildings 14-17, Lane 4849 Cao'an Highway (Shanghai Research Institute)

In the principle of providing better services to users, Shanghai TOSUN Technology Ltd (hereinafter referred to as "TOSUN Technology") will present as much detailed and accurate product information as possible in this manual. However, due to the timeliness of the content in this manual, TOSUN Technology cannot fully guarantee the timeliness and applicability of this document at any time.

If there are any changes to the information and data in this manual, no separate notice will be given. To obtain the latest version of the information, please visit the official website of TOSUN Technology or contact the staff of TOSUN Technology. Thank you for your understanding and support!

@ Copyright 2024-2025, Shanghai TOSUN Technology Ltd. All rights reserved.

What Are the Advantages of TC1038 Pro?

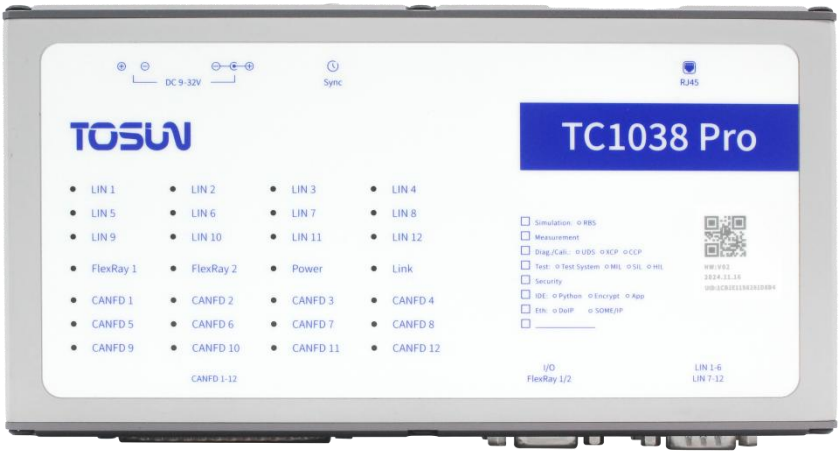
- **Multi-Bus Technology:** TC1038 Pro supports CAN/CAN FD, LIN, and FlexRay bus technologies simultaneously. In complex bus network environments, a single TC1038 Pro device can communicate with multiple ECU nodes across different bus technologies.

- **Multi-Channel:** Equipped with a rich set of bus channels, TC1038 Pro can handle 12 CAN/CAN FD, 12 LIN, and 2 FlexRay buses simultaneously. It can easily meet the demand for multiple channels under various application scenarios.

- **High Performance:** Built with high-performance hardware, TC1038 Pro ensures robust data processing in complex networks. Its Ethernet connection to the PC guarantees fast and stable data interaction。

- **Cost Efficiency:** By integrating multiple bus technologies, TC1038 Pro reduces the need for separate communication modules in bus networks, lowering hardware costs and simplifying wiring complexity.

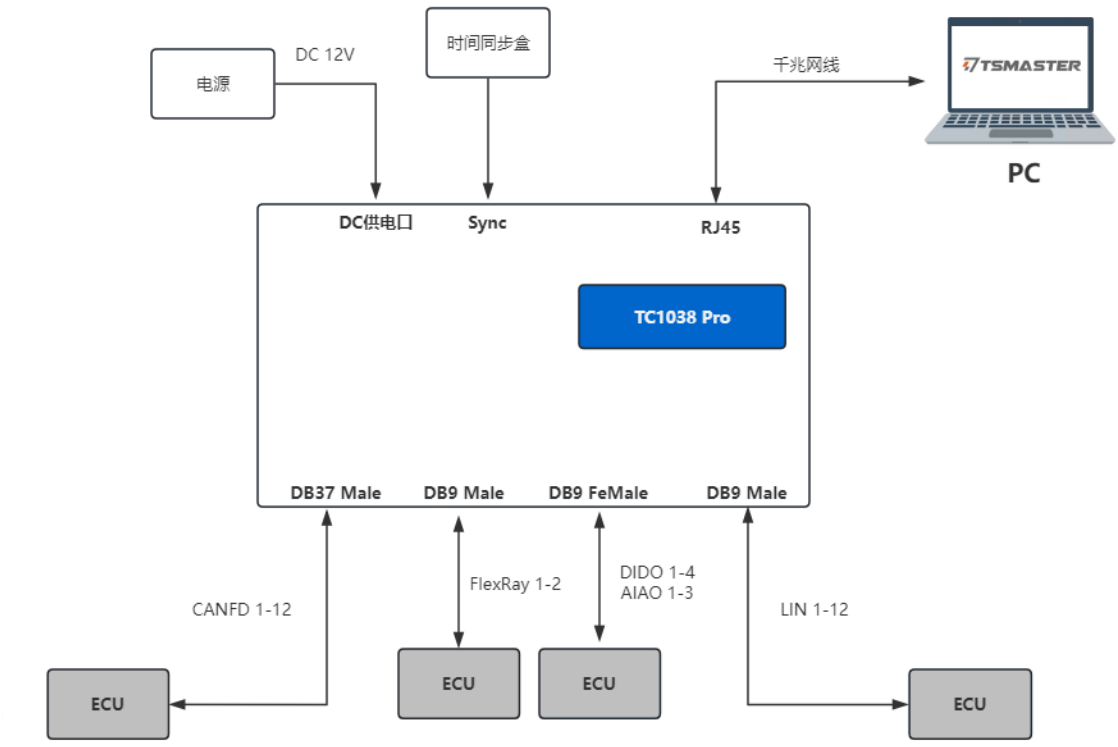
- **Seamless Software Integration:** Fully compatible with TOSUN's TSMaster software, TC1038 Pro allows users to monitor, analyze, and simulate various bus data with ease. It also supports functions such as UDS diagnostics, ECU flashing, and CCP/XCP calibration.



What Can It Do?

- CAN/CAN FD bus data monitoring, collection, and analysis
- LIN bus data monitoring, collection, and analysis
- FlexRay data monitoring, collection, and analysis
- DIDO (Digital Input/Output), AIAO (Analog Input/Output)
- ECU flashing
- ECU-level and system-level automated testing
- ...

How to Use the TC1038 Pro Device?



Contents

1. About this User Manual

1.1 Warranty

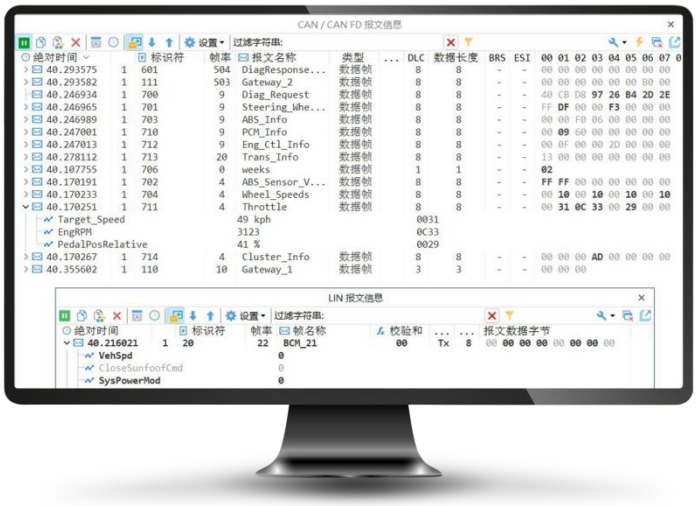
This document is provided for reference only and does not constitute any form of guarantee or commitment from TOSUN. TOSUN Technology reserves the right to modify the content and data of the document without further notice. TOSUN Technology assumes no responsibility for the accuracy of the document or for any damages arising from the use of the document. TOSUN Technology greatly appreciates for pointing out errors or making suggestions for improvement, so that we can provide more efficient products in the future.

1.2 Copyright

TOSUN Technology retains all rights to this document and its contents. Without the explicit written permission of TOSUN Technology, it is prohibited to copy, distribute, transmit, disseminate, republish, or use any part of this document in any manner.

2. General Information

2.1 Bus Data Collection and Analysis



With the TSMaster software, functions such as message sending/monitoring/replay, bus statistics/logging, digital data/graphic form display and analysis, and so on can be achieved.

- Bus Statistics

  Bus statistics include: bus load rate, peak load rate, data frame rate, data frame count, error frame rate, error frame count, controller status, and send error count.

- Database

  Supports loading databases in formats such as DBC, LDF, XML, ARXML, and can display database structure views, signal communication matrix views, and message communication matrix views.

- Message Replay

  Supports offline and online replay of recorded files in formats such as BLF and ASC.

- Message Transmission

Supports manual sending, hotkey sending, and periodic sending. It also supports signal generators and allows for the creation of customized messages and database-based messages.

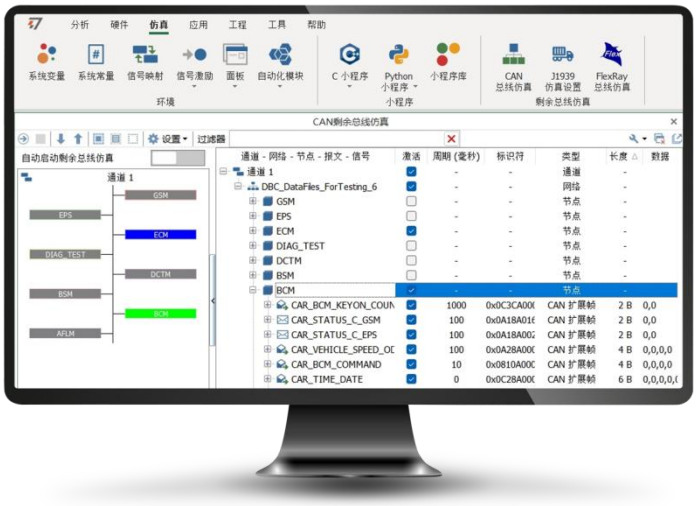
- Message Monitoring

Supports multiple display modes, DBC parsing to view signal values, and channel filtering/ID filtering configuration.

- Graphical Value Display

The signal's Y-axis is flexible and configurable, supporting multi-axis mode and separated display mode, with the option to precisely display data points, which facilitates data analysis for users.

2.2 Bus Simulation

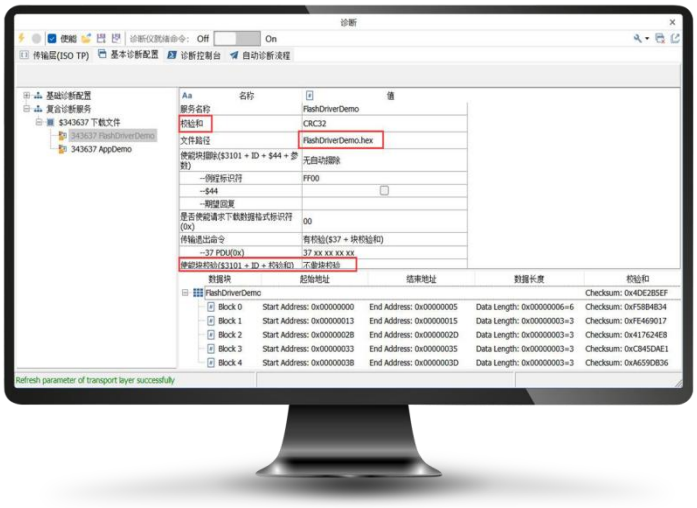


With the TSMaster software, it is possible to achieve multiple buses simulation such as CAN, LIN, and FlexRay. ECU code simulation can also be achieved through soft HIL. The Panel feature built into TSMaster allows bus signals association in the panel to achieve graphical display.

- Supports CAN bus simulation
- Supports LIN bus simulation
- Supports J1939 bus simulation

- Supports FlexRay bus simulation

2.3 Diagnostic



Diagnostic is an important function of automotive ECUs. When the vehicle is in operation, sensors distributed throughout the vehicle can track various potential faults that may occur at any time in the vehicle's electrical or electronic systems. The TOSUN toolchain assists users in conveniently developing and verifying fault diagnosis-related functions, and performing flashing based on the UDS protocol.

- Diagnostic Parameter Configuration

The configuration includes timeout parameter configuration, TesterPresent configuration, and SeedKey DLL configuration. With a built-in SeedKey algorithm editor, users can implement SeedKey algorithms directly without the need for external development tools.

- Basic Diagnostic Configuration

Users can edit the diagnostic database by themselves, including: the settings for various services, the parameters related to requests and responses and so on.

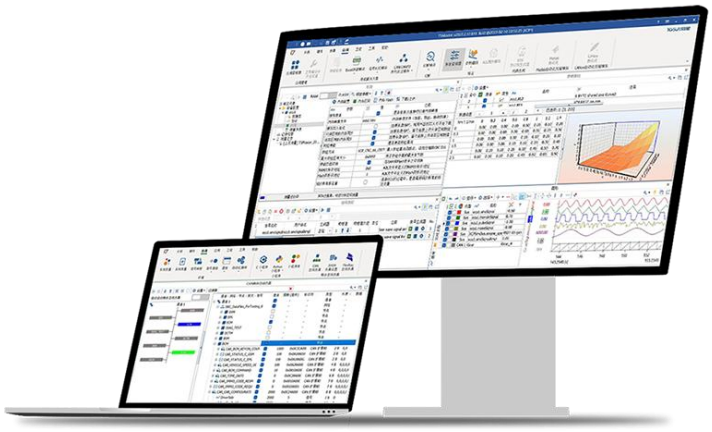
- Diagnostic Console

Execute the configured diagnostic services, and user can set up automatic comparison to check if the response results are correct.

- Automated Diagnostic Process

Customize diagnostic processes and diagnostic services to facilitate the creation of various Flash Bootloader flashing processes.

2.4 Calibration

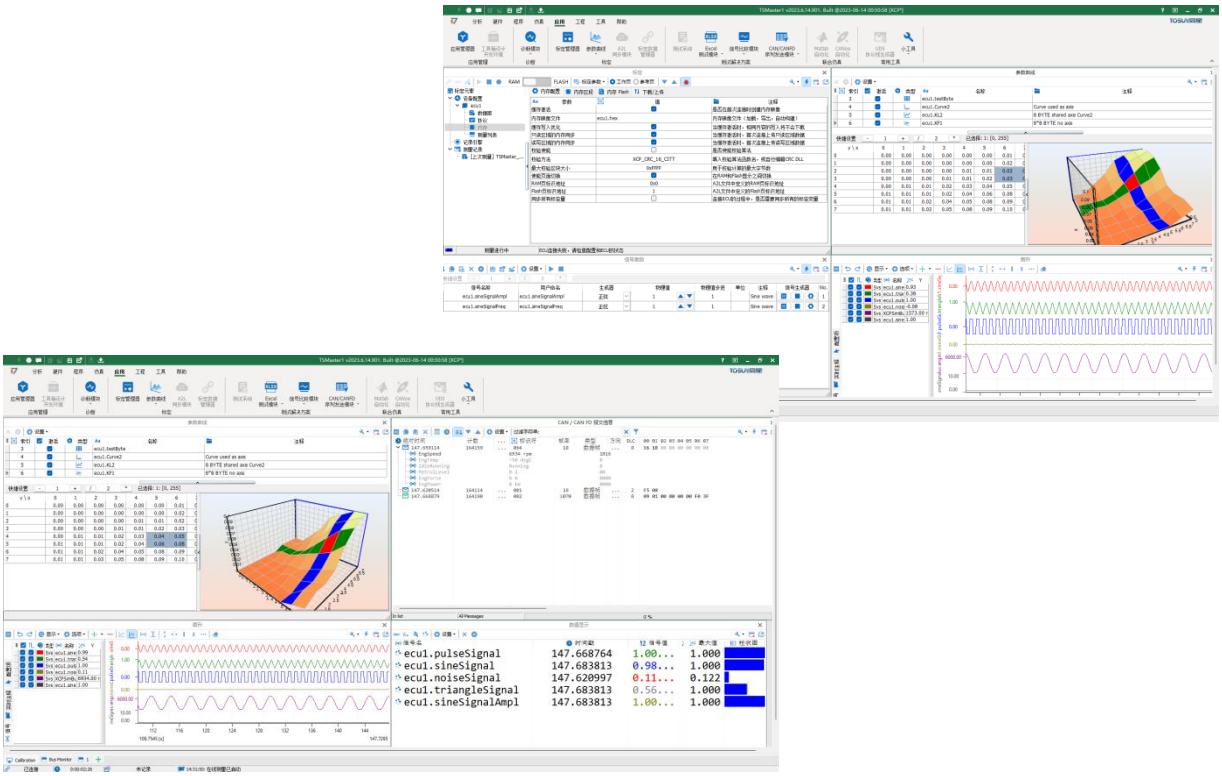


CCP: It is a communication protocol based on CAN (Controller Area Network), mainly used for the calibration and parameter settings of ECUs. It provides the ability to read and write ECU, allowing engineers to read the current parameter values, set new parameter values, and perform real-time testing and adjustments.

XCP: It is a universal measurement and calibration protocol applicable to various communication interfaces such as CAN and Ethernet. It offers higher transmission rates and more robust capabilities, allowing engineers to quickly read and write large volumes of data in a short period and perform advanced diagnostics and debugging operations.

Automotive calibration is a technique used in the development and diagnostics of automotive ECUs, which involves adjusting the parameters and calibration values of the ECU to optimize the vehicle's performance and functionality. CCP and XCP are common communication protocols used for communication with the ECU, and reading and modifying parameters. These technologies and tools enable vehicle manufacturers and engineers to better perform vehicle tuning and calibration work.

- Supports importing A2L files
- Supports DAQ/Polling measurement
- Memory settings, capable of loading images and configuring verification methods, etc.
- Supports characteristic parameter curves, MAP diagrams, etc.
- Supports MDF/MF4 file storage and playback
- Supports graphical display of variable curves
- Supports calibration parameter management in par or hex format
- Built-in message information analysis, diagnostics, calibration, and system variable data are integrated into one, which facilitates a streamlined process of data analysis
- Automated calibration functions can also be achieved by calling system variables
- Supports single and multiple file downloads



3.TC1038 Pro

3.1 Overview

The TC1038 Pro is a multi-bus simulation and testing tool developed by TOSUN, supporting CAN/CAN FD, LIN, and FlexRay buses. It features 12 CAN/CAN FD channels with adjustable baud rates from 125Kbps to 1Mbps for CAN and up to 8Mbps for CAN FD. The 12 LIN channels can be configured as master or slave nodes via software, supporting baud rates from 0 to 20Kbps. Additionally, the two FlexRay channels utilize dual-wire redundancy for data transmission, offering extremely low latency and a flexible bandwidth allocation mechanism, supporting various data types and diverse topologies.

TC1038 Pro connects to a PC via Ethernet, ensuring high data transmission speed and preventing communication bottlenecks when handling large volumes of bus data. It features a driverless design for Windows, offering excellent system compatibility.

With the powerful TSMaster software, it supports loading DBC, LDF, XML, ARXML, etc. database files, making it very convenient to monitor, analyze, and simulate various types of bus data, and it also supports functions such as UDS diagnostics, ECU flashing, CCP/XCP calibration, etc.

3.2 Features

- ✓ us (microsecond) level hardware message timestamps to meet advanced requirements
- ✓ Driverless design for Windows system
- ✓ 12 CAN/CAN FD channels, 12 LIN channels, 2 FlexRay channels
- ✓ Supports DIDO *4 and AIAO *3
- ✓ CAN channel baud rate adjustable from 125Kbps-1Mbps, and CAN FD supports a maximum of 8Mbps
- ✓ LIN bus master/slave mode configurable via software
- ✓ Built-in 120-ohm terminal resistor for CAN, with the resistance value configurable through software
- ✓ CAN supports Self-ACK self-acknowledgment configuration
- ✓ Built-in 100-ohm terminal resistor for FlexRay, with the resistance value configurable through software
- ✓ Auxiliary communication controller, eliminating the need to add extra nodes during cold starts
- ✓ Supports blf and asc format data recording and offline/online playback
- ✓ Supports hardware time synchronization across multiple device
- ✓ Provides API-based sample projects for easy secondary development

3.3 Technical Data

Channel	12* CAN FD 12* LIN 2* FlexRay 4* DIDO 3* AIAO
PC Interface	RJ45 Ethernet
CAN Interface	DB37 male
LIN Interface	DB9 male
FlexRay Interface	DB9 male
I/O Interface	DB9 female
Driver	Driverless design for Windows system
Cache	Hardware cache to ensure no frame loss
CAN	Supports CAN 2.0 A and B protocols, compliant with the ISO 11898-1 standard, with baud rates from 125Kbps to 1Mbps
CAN FD	Supports CAN FD that complies with both ISO and non-ISO standards, with baud rates from 125Kbps to 8Mbps
LIN	Supports LIN 1.3 and LIN 2.x, with baud rates from 0 to 20Kbps
FlexRay	FlexRay channel (A and B)
Cold Start	Supported
Timestamp Accuracy	1 us, hardware message timestamp, can meet advanced requirements
CAN Terminal Resistor	Built-in 120-ohm terminal resistor, with the resistance value configurable through software
FlexRay Terminal Resistor	Built-in 100-ohm terminal resistor, with the resistance value configurable through software
Galvanic Isolation	CAN/FlexRay channel DC2500V isolation
DIDO	DI: 0-40V Vref: 0-3.3V, Threshold range: VAH=(330+499*Vref)/1098; Val=0.455*Vref DO: Low level 0V, high level 5V/12V (use with load unsupported)
AIAO	AI: 0-39V AO: 0-30V
Power Supply	DC power supply
Power Consumption	10W
Case Material	Metal
Dimension	Approx. 210*118*47mm
Weight	Approx. 878g (without packaging)/ Approx. 2110g (with packaging)
Operating Temperature	-40℃~80℃

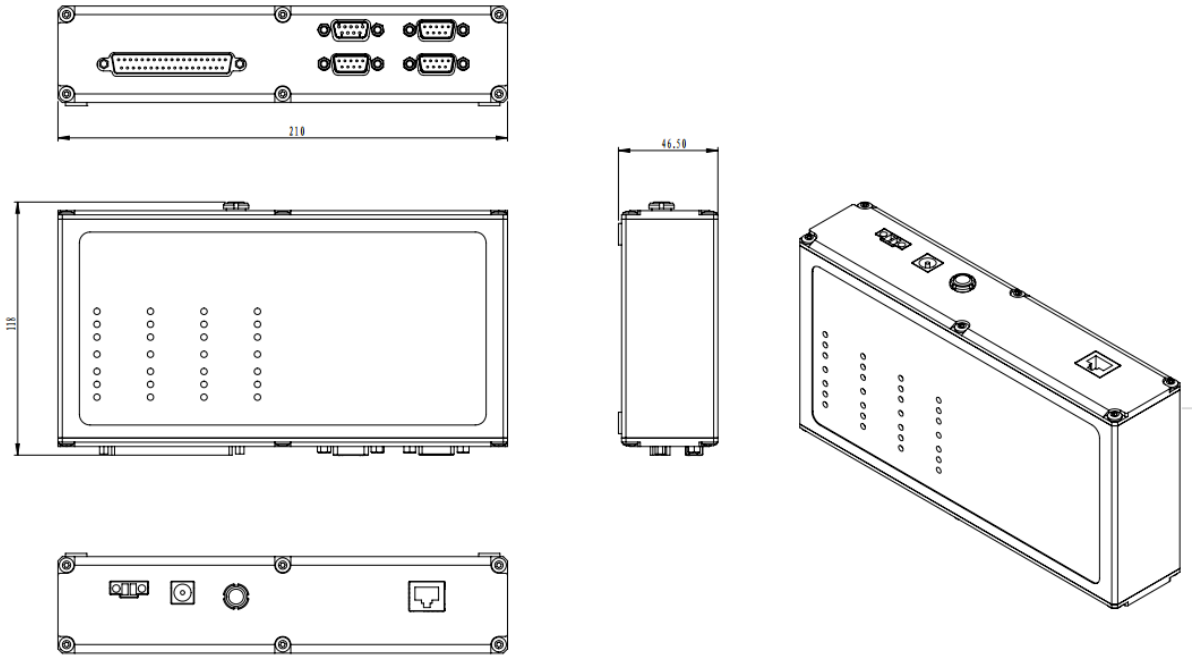
Operating Humidity	10% ～ 90% (non-condensing)
Operating Environment	Keep away from corrosive gases

3.4 Electrical Data

Parameter		Test Condition	Minimum Value	Typical Value	Maximum Value	Unit
Operating Voltage	DC power supply	CAN transmission, ETH transmission	9	12	28	V
Operating Current	DC power supply	CAN transmission, ETH transmission	--	0.42	--	A
Power Consumption	DC power supply	CAN transmission, ETH transmission	--	5.0	--	W
CAN Interface	Bus pin voltage resistance	CANH、CAHL	-58	--	58	V
	Terminal resistor	Terminal resistor enabled	--	120	--	Ω
	Isolation withstand voltage	Leakage current less than 1mA	2500	--	--	VDC
LIN Interface	Bus pin voltage resistance	LIN1, LIN2	-40	--	40	V
FlexRay Interface	Bus pin voltage resistance	FlexRay_BM、FlexRay_BP	-60	--	60	V
	Terminal resistor	Terminal resistor enabled	--	100	--	Ω
	Isolation withstand voltage	Leakage current less than 1mA	2500	--	--	VDC

EMC Compatibility	EFT	IEC61000-4-4 standard	2	--	--	kV

3.5 Mechanical Data



3.6 Scope of Delivery

✓ Main device: TC1038 Pro

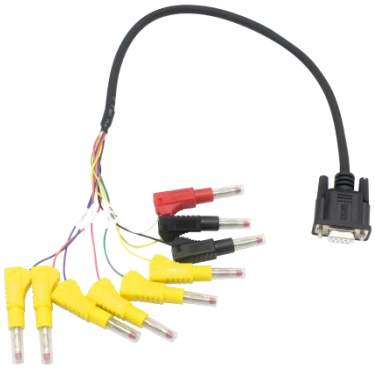
✓ 12V2A power adapter

✓ Cat 6 Gigabit Ethernet cable

✓ DB37 female to 12-way DB9 signal cable

✓ DB9 female to two male signal cable (FlexRay)

✓ DB9 to nine banana LIN cable*2



✓ DB9 male*1

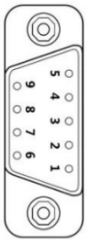
3.7 Hardware Interface

- 1000Base-T interface (RJ45)
- Time synchronization interface
- Power interface (round adapter port)
- Power interface (phoenix terminal)
- DB37 male (CAN/CAN FD)

PIN Number	Definition	PIN Number	Definition
PIN20	CAN FD1_HIGH	PIN1	CAN FD1_LOW
PIN21	CAN FD_SHIELD	PIN2	CAN FD_GND
PIN22	CAN FD2_HIGH	PIN3	CAN FD2_LOW
PIN23	CAN FD3_HIGH	PIN4	CAN FD3_LOW
PIN24	CAN FD_SHIELD	PIN5	CAN FD_GND
PIN25	CAN FD4_HIGH	PIN6	CAN FD4_LOW
PIN26	CAN	PIN7	CAN

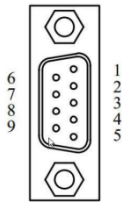
	FD5_HIGH		FD5_LOW
PIN27	CAN FD_SHIELD	PIN8	CAN FD_GND
PIN28	CAN FD6_HIGH	PIN9	CAN FD6_LOW
PIN29	CAN FD7_HIGH	PIN10	CAN FD7_LOW
PIN30	CAN FD_SHIELD	PIN11	CAN FD_GND
PIN31	CAN FD8_HIGH	PIN12	CAN FD8_LOW
PIN32	CAN FD9_HIGH	PIN13	CAN FD9_LOW
PIN33	CAN FD_SHIELD	PIN14	CAN FD_GND
PIN34	CAN FD10_HIGH	PIN15	CAN FD10_LOW
PIN35	CAN FD11_HIGH	PIN16	CAN FD11_LOW
PIN36	CAN FD_SHIELD	PIN17	CAN FD_GND
PIN37	CAN FD12_HIGH	PIN18	CAN FD12_LOW
		PIN19	CAN FD_GND

- DB9 Female (I/O):

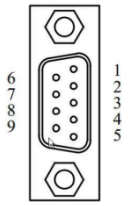
DB9 Pin	Channel	PIN Number	Definition
	I/O	PIN1	DIDO1
		PIN2	DIDO3
		PIN3	DGND
		PIN4	AIAO1
		PIN5	AIAO3
		PIN6	DIDO2
		PIN7	DIDO4

		PIN8	AGND
		PIN9	AIAO2

- DB9 male interface (FlexRay):

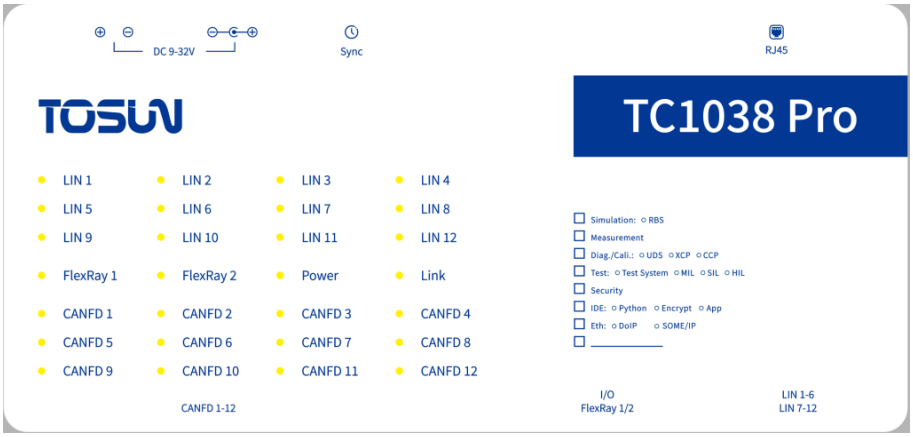
DB9 Pin	Channel	PIN Number	Definition
	Flexray 1/2	PIN1	Flexray_BM2
		PIN2	Flexray_BM1
		PIN3	Flexray_GND
		PIN4	Flexray_BM3
		PIN5	Flexray_BM4
		PIN6	Flexray_BP2
		PIN7	Flexray_BP1
		PIN8	Flexray_BP3
		PIN9	Flexray_BP4

- DB9 male interface (LIN):

DB9 Pin	Channel	PIN Number	Definition	Channel	PIN Number	Definition
	LIN 1-6	PIN1	LIN1	LIN 7-12	PIN1	LIN7
		PIN2	V_Bat		PIN2	V_Bat
		PIN3	LIN2		PIN3	LIN8
		PIN4	GND		PIN4	GND
		PIN5	LIN3		PIN5	LIN9
		PIN6	LIN4		PIN6	LIN10
		PIN7	LIN5		PIN7	LIN11
		PIN8	GND		PIN8	GND
		PIN9	LIN6		PIN9	LIN12

3.8 LED

Diagram of LED indicator:



Description of indicator:

Indicator	**Definition**
Power	Indicator for power
Link	Indicator for connection
CAN FD 1-12	Indicator for CAN FD channel 1-12
LIN 1-12	Indicator for LIN channel 1-12
FlexRay 1-2	Indicator for FlexRay channel 1-2

Description of LED color/status:

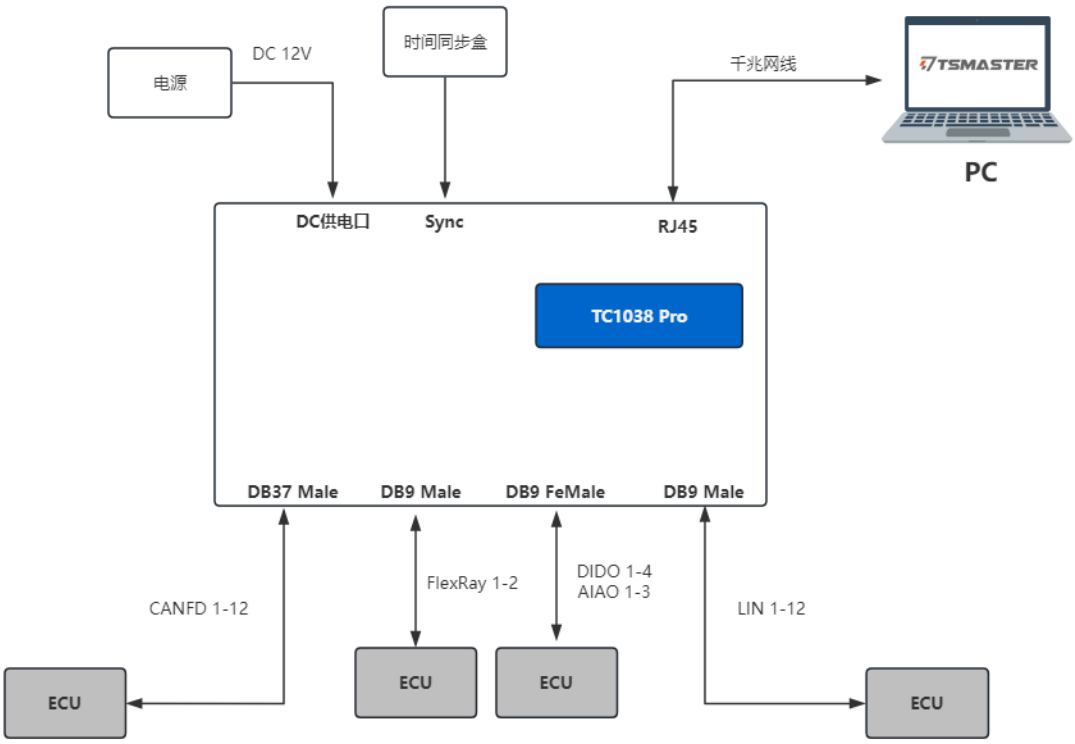
Color/Status	**Description**
Power Green	Device is powered on normally
Link Green	ETH connection is normal
CAN FD Green Blinking	CAN FD channel data frame is sent or received correctly
CAN FD Red Blinking	CAN FD channel sends or receives error frames, indicating a configuration, protocol, or wiring error
LIN Green Blinking	LIN channel data frame is sent or received correctly
LIN Red Blinking	LIN channel sends or receives error frames, indicating a configuration, protocol, or wiring error
FlexRay Green Blinking	FlexRay channel data frame is sent or received correctly
FlexRay Red Blinking	FlexRay channel sends or receives error frames, indicating a configuration, protocol, or wiring error

3.9 Optional Accessories

1. Mounting bracket

4. Quick Start

4.1 System Connection



Power the TC1038 Pro via the power adapter interface or Phoenix terminal interface with DC 12V, and connect the device's RJ45 Ethernet port to the PC. Based on users' requirements, connect the corresponding CAN/CAN FD, LIN, FlexRay, DIDO, and AIAO interfaces to the ECU. The TC1038 Pro can then be controlled via the TSMaster software on the PC to communicate with the ECU.

4.2 Driver Installation

Driverless design for Windows, offering excellent system compatibility.

4.3 Software Overview

TSMaster is a powerful and comprehensive tool that can connect, configure, and control all TOSUN hardware tools and devices, enabling functions such as automotive bus embedded code generation, monitoring, simulation, development, UDS diagnostics, CCP/XCP calibration, ECU flashing, I/O control, test measurement, and so on.

TSMaster supports Matlab Simulink co-simulation and CarSim dynamic model ECU algorithm simulation testing (soft real-time HIL). It provides users with a series of convenient functions and editors, allowing them to directly execute ECU code within TSMaster and supports C script and Python script editing. At the same time, TSMaster also offers a mini-program function, enabling users to customize the simulation test panel, test process, test logic, and even the entire test system, and automatically generate reports. The code written by users based on TSMaster is hardware-independent, and can be easily shared, referenced, and used on different hardware platforms.

TSMaster supports multiple commonly used bus tool brands, including Vector, Kvaser, PEAK, IXXAT, as well as mainstream instruments in the market (such as oscilloscopes, waveform generators, and digital multimeters) and boards (such as AI, DI, DO, etc.). Its design concept is to perfectly integrate with the test system to achieve joint simulation and testing of multiple hardware and multiple channels. This enables TSMaster to meet the PV/DV test verification needs for various automotive electronic components and assemblies, as well as the inspection requirements for the production line.

4.4 Software Installation

TSMaster software download link:

https://www.tosunai.com/downloads/

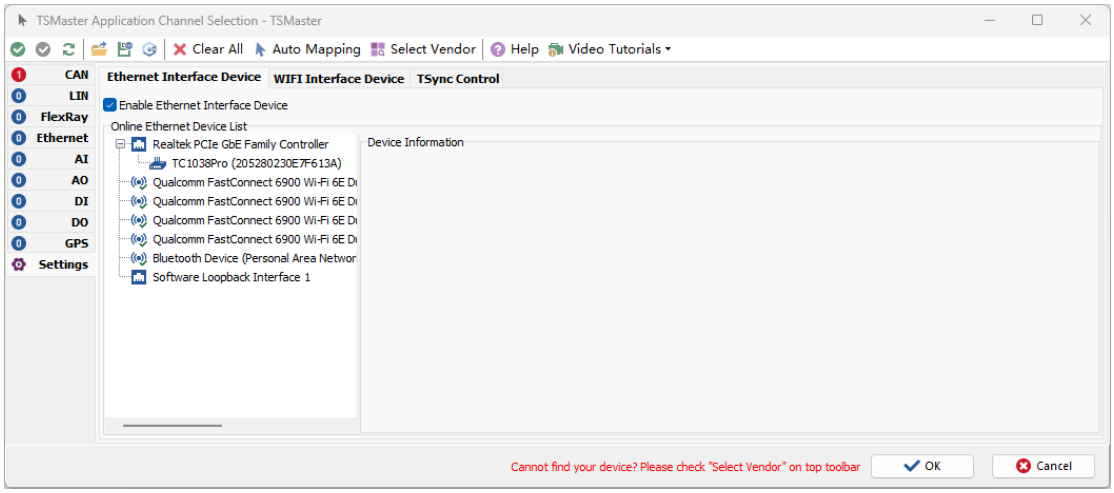
If the link is not accessible, you can contact the corresponding sales personnel or visit the official TOSUN website to obtain the software. Meanwhile, you can scan the QR code to follow the TOSUN official account to get the download link.

After the installation, you can see the following software on the PC.

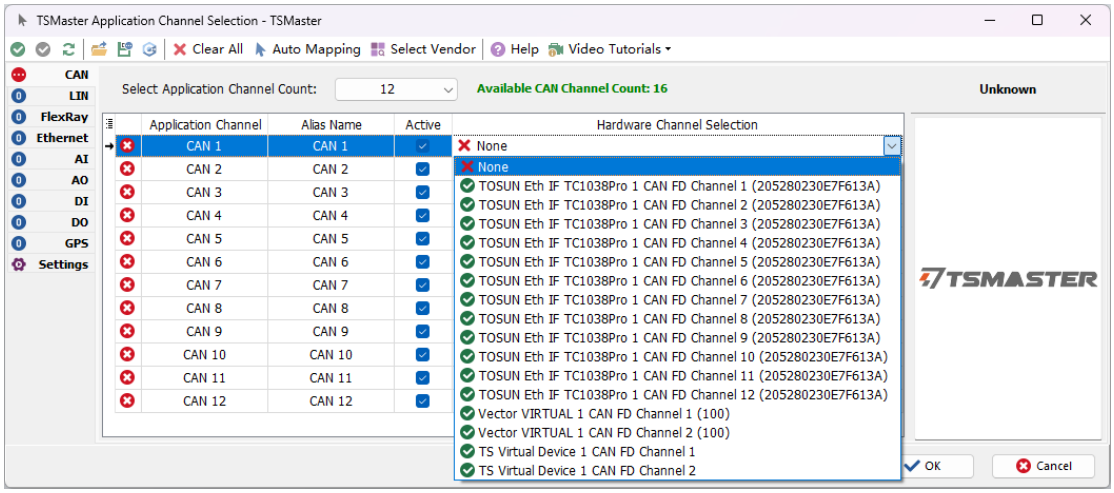
4.5 Use TSMaster with the Hardware

Set the PC's Ethernet IP address to 192.168.1.x (to ensure it is on the same subnet as the TC1038 Pro).

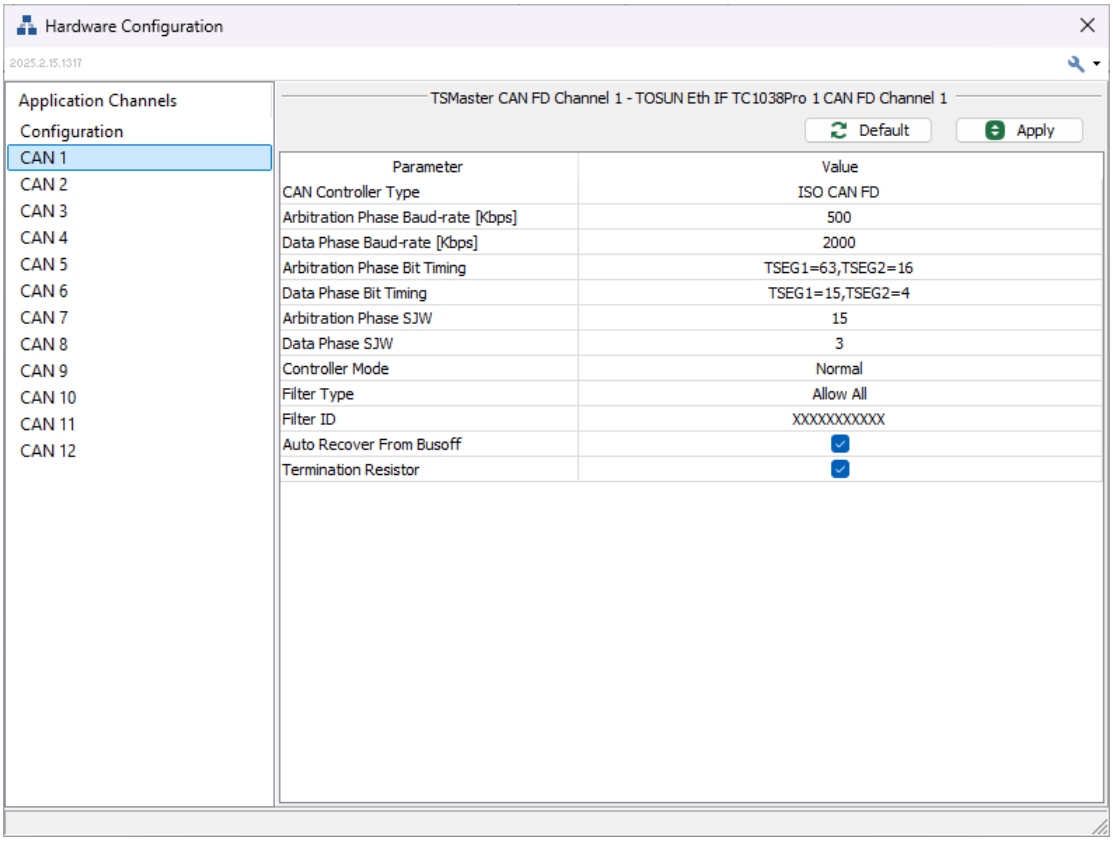
In TSMaster, click Hardware->Channel Selection, in the channel selection GUI, click Settings on the left sidebar, and check “Enable Ethernet Interface Device”, then the TC1038 Pro device will be shown.



In the "Channel Selection" interface, select the type of bus technology in the left sidebar and configure the application channel count.



In Network Hardware, a series of controller parameters can be configured, such as protocol, baud rate, controller mode, and whether to enable the terminal resistor.



After the configuration, click Analysis->Start and connect the hardware to efficiently carry out works such as bus development, testing, ECU production line, etc. with the powerful TSMaster software. For more detailed instructions on using the TSMaster software, please refer to the TSMaster software manual and the quick start guide.

5. Inspection and Maintenance

The main electrical components of the TC1038 Pro device are semiconductor components. Although the equipment has a long service life, they may also accelerate aging and significantly reduce their service life under an incorrect environment. Therefore, during the use of the equipment, periodic inspection should be carried out to ensure that the use environment maintains the required conditions.

It is recommended to conduct inspections at least once every 6 months to 1 year. Under improper environmental, more frequent inspections should be conducted. As shown in the table

below, if you encounter problems during maintenance, please read the following content to find the possible causes of the problem. If the problem still cannot be solved, please contact Shanghai TOSUN Technology Ltd.

Item	Inspection	Standard	Action
Power Supply	Inspect for voltage fluctuations at the power supply end	Power supply port +12V DC	Use a voltage meter to check the power input end. Take necessary actions to keep the voltage fluctuations within the acceptable range.
Surrounding Environment	Check the ambient temperature of the surrounding environment. (Including the internal temperature of enclosed environments)	-40℃~+80℃	Use a thermometer to check the temperature and ensure that the ambient temperature within in the acceptable range.
	Check the ambient humidity. (Including the internal humidity of enclosed environments)	The relative humidity must be within the range of 10% to 90%	Use a hygrometer to check the humidity and ensure that the ambient humidity within the acceptable range.
	Check for the accumulation of dust, powder, salt, and metal shavings	No accumulation	Clean and protect the equipment.
	Check for any contact with water, oil, or chemical sprays on the equipment	No contact	Clean and protect the equipment if necessary.
	Check for the presence of corrosive or flammable gases in the equipment area	No presence	Inspect by the smell, or using a sensor.
	Check for levels of vibration and shock	Vibration and shock are within the acceptable	Install padding or other shock-absorbing devices if necessary.

		range	
	Check for noise sources near the equipment	No significant noise source	Isolate the equipment from noise sources or protect the equipment.
Wiring Installation	Check the crimped connectors in the external wiring	Ensure enough space between the connectors	Visually inspect and adjust if necessary.
	Check for damage in the external wiring	No damage	Visually inspect and replace the wiring if necessary.

6. Appendix

（1）Thanks to the advantages of the Ethernet interface, the TC1038 Pro supports remote access. For details, please refer to the technical document：

Remote Access User Guide V1.0

（2）The TC1038 Pro provides cross-platform secondary development interface support for customers. For more information, please visit the Gitee repository:

https://gitee.com/xujinpeng120/libTSDevBase

TOSUN

Engineer Everything !

Software

Support CAN(FD)/LIN/FlexRay/SOME/IP and DoIP

UDS diagnostics/ECU flashing/CCP/XCP calibration

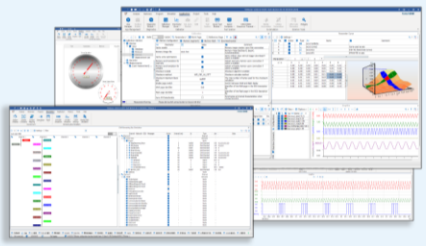
Embedded code generation/Application builder

Encrypted release/Logging and bus replay

Graphical programming/Residual bus simulation

C and Python scripting

Bus monitoring/Transmiting/Automated testing



TSMASTER

Hardware

1/2/4/8/12-channel CAN FD/CAN to USB/PCIe device

1/2/6-channel LIN to USB/PCIe device

Multi channel FlexRay/CAN FD to USB/PCIe device

Multi channel automotive Ethernet/CAN FD to USB/PCIe device

Automotive Ethernet media conversion device (T1 to Tx)

Multi-channel CAN FD/Ethernet/LIN datalogger

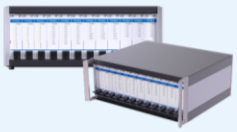
TTS test systems

-CAN FD/CAN/FlexRay/LIN communication boards

-Relay and fault injection boards

-Resistors for sensor simulation

-Digital I/O, Analog I/O boards available



CAN CAN FD LIN FlexRay OPEN ALLIANCE

Solutions

- Bus Conformance
- Network Automation Testing System
- Charging Testing System
- EMB Calibration Testing Equipment
- Information Security Solutions
- Steer-by-Wire Chassis Testing Solutions
- EOL Testing Equipment
- Motor Performance
- Durability Testing Solutions
- FCT

About TOSUN

The core product, TSMaster, is a comprehensive tool for automotive R&D, testing, production, and after-sales. It integrates essential functions with hardware support to streamline processes and ensure precision, making it ideal for automotive professionals.

International Organization

ASAM CiA

Quality Assurance

ISO9001:2015

CE Certification

CE

Contact Us :

+86 21-5956 0506

sales@tosunai.com

website :

www.tosunai.com

Beijing/Shanghai/Guangzhou/Chengdu/Changzhou/Taipei/Stuttgart/Seoul