

TSCANmini – 汽车级便携式 CAN 总线接口

用户手册 V2020.3



CAN(FD)/LIN/FastLIN 总线

- 汽车级 CAN、CANFD、LIN、FastLIN 总线设备
- 支持图形化编程的产线接口模块
- Flash BootLoader 嵌入式代码 /PC 软件

诊断/标定

- UDS 诊断嵌入式代码/PC 软件
- CCP/XCP 标定嵌入式代码/PC 软件

快速原型

- MBD 快速 ECU 开发
- 汽车级量产快速原型控制器可直接装车应用

非标设备/EOL 设备

- 汽车天窗试验解决方案
- 汽车雨刮试验解决方案
- 汽车“四门两盖”试验解决方案
- 电机性能/耐久试验解决方案
- 汽车零部件 EOL 设备

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一、 简介

1.1 概述

TSCANmini 是同星智能推出的便携式、易安装的高速 CAN 总线接口模块，最高速率 1M bps，产品采用高速 USB2.0 接口与 PC 连接，Windows 系统免驱设计使得设备具备极佳的系统兼容性。

支持支持 dbc 文件、a2l 文件、blf 文件、asc 文件，满足汽车级 CAN 总线开发、测试、标定、诊断需求。

支持 Windows、Linux 系统的二次程序开发 API 接口使得设备能够方便的集成到其他设备或软件系统中。可适用于研发人员、ECU 产线、试验工程师、售后人员使用。

1.2 特性

- us（微秒）级硬件报文时间戳，满足高阶需求；
- 便携式设计，独特设计的安装孔，便于集成到各种设备中或仪表面板上；
- 高速 USB2.0 接口，Windows 系统免驱设计，具备极佳的系统兼容性；
- CAN 通道 DC2500V 隔离；
- 汽车级设计，支持 dbc 文件、a2l 文件、blf 文件、asc 文件；
- 支持 blf、asc 格式数据记录和离线/在线回放；
- 内置脚本编辑，支持虚拟仿真、半实物仿真；（仅 TSCANpro 软件）
- 可支持 UDS 诊断及 CCP 标定；
- 支持同星 CAN Flash BootLoader 系列软件；
- 支持 Windows、Linux 系统二次开发接口；
- 内置 120 欧终端电阻可软件配置。

1.3 典型应用

- CAN 总线测试
- CAN 总线仿真/标定/诊断
- 汽车 ECU 检测设备
- 下线检测设备
- 工业控制设备
- 其他需要高速/可靠 CAN 总线通信的场合

1.4 其他增值服务

- PC 端软件定制
- 设备通讯接口集成
- BootLoader 定制
- CCP 刷写协议定制
- 诊断协议定制
- 功能定制
- 产线集成

二、 设备安装

2.1 产品外形



图 1 TSCANmini 设备外形

2.2 易集成型安装孔

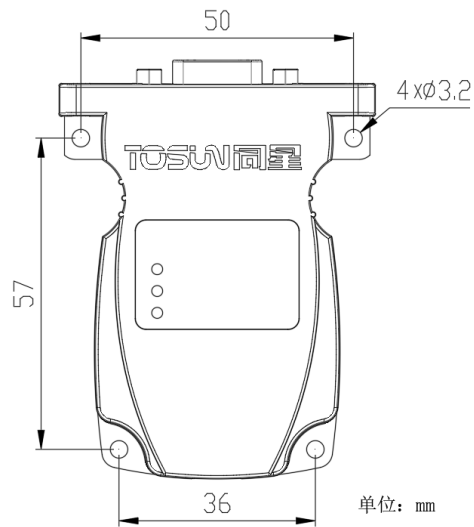
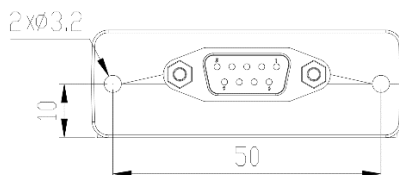


图 2 TSCANmini 集成安装图 1



单位: mm

图3 TSCANmini 集成安装图2

2.3 CAN 总线接口

DB 9 Male 插座	引脚	信号	描述
	1	NC	未使用
	2	CAN_Low	CAN Low 信号线
	3	CAN_GND	CAN 参考地
	4	NC	未使用
	5	CAN_Shield	CAN 屏蔽地
	6	NC	未使用
	7	CAN_High	CAN High 信号线
	8	NC	未使用
	9	NC	未使用

2.4 信号指示灯

指示灯	状态	描述
LINK	红色	USB 已连接电脑但未连接 TSMaster 软件
	灯灭	USB 连接故障
	绿色	USB 正常通讯
CAN	红色闪烁	CAN 总线有错误帧, 红灯闪烁频率与错误帧频率正相关
	绿色闪烁	CAN 总线正常通讯, 绿灯闪烁频率与报文收发频率正相关

2.5 终端电阻

TSCANmini 设备内置了 120Ω终端电阻, 可通过 PC 软件 TSMaster 直接配置终端电阻是否接入。

三、 TSMaster 软件概述

TSMaster 是同星智能推出的虚拟仪器软件平台，可连接、配置并控制所有的同星硬件工具、设备，实现汽车总线监控、仿真、诊断、标定、BootLoader、I/O 控制、测量测试、EOL 等多种场合的功能需求。

同时，TSMaster 支持 Vector 总线系列产品硬件。

可适用于研发人员、ECU 产线、试验工程师、售后人员使用。

3.1 特性

- CAN、LIN、CAN FD 总线监控、仿真、测试；
- 报文信息，显示总线报文数据、帧率；
- 报文发送，可配置周期发送且连续变化的总线信号；
- 图形窗口，显示总线信号的变化曲线；
- 数据库管理，加载并解析 DBC 文件和 LDF 文件；
- 脚本功能，支持任意用户逻辑模拟节点的行为。
- 支持外部程序调用 API 接口；
- 支持 Vector 的 VN 系列各类硬件；
- 通道映射，支持用户自定义应用程序的逻辑通道进行联合仿真；
- 报文记录和回放功能，支持 BLF 格式的 CAN/LIN/CAN FD 报文记录和回放，记录文件大小没有限制；
- 支持基于 UDS 的 CAN BootLoader、LIN BootLoader 刷写；
- 支持 CCP 刷写；

3.2 免费索取

TSMaster 软件可免费使用，请直接向同星索取：

电话：021-5956 0506

邮箱：Sales@tosunai.cn

网址：www.tosunai.cn

QQ 群：



群名称：总线技术交流
群 号：1085941880

四、 TSMaster User Manual

1.1 User Interface

TSMaster is an open environment for monitoring, simulation of automotive network communications. The main interface of TSMaster is shown as below.

Main Interface

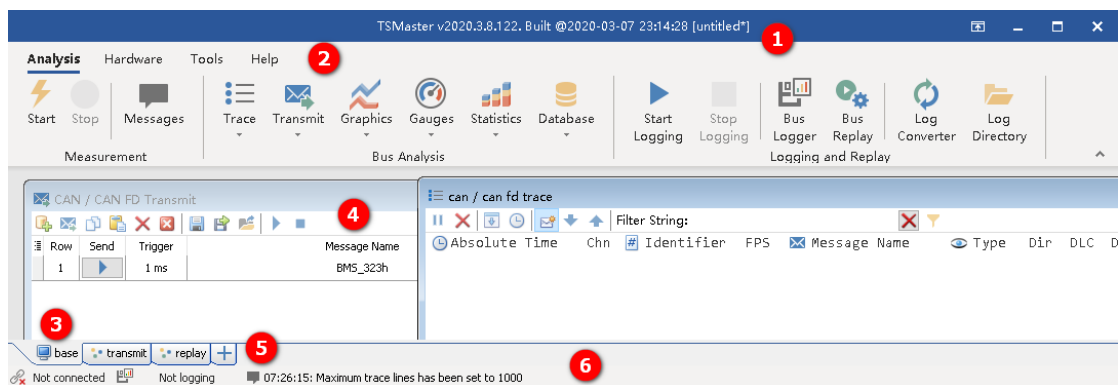


Fig 1 TSMaster main interface

1. Application title bar. The application name, build time and loaded configuration is shown in this title bar.
2. Ribbon toolbar. The main functions are accessed from this ribbon toolbar.
3. Page tabs. Each tab contains a set of windows for measurement and simulation. User can add or delete window inside the current tab.
4. Application forms. Each window is a function performing specific tasks.
5. Add page button. User can add new page by clicking this button. If user want to delete a page, just right-click on the current page and select “delete tab” command.
6. Status bar. The connection status of application, logging information and write information are shown in the status bar.

1.1.1 Ribbon Functions

There are four tabs in ribbon: Analysis, Hardware, Tools and Help.

1.1.1.1 Analysis Tab

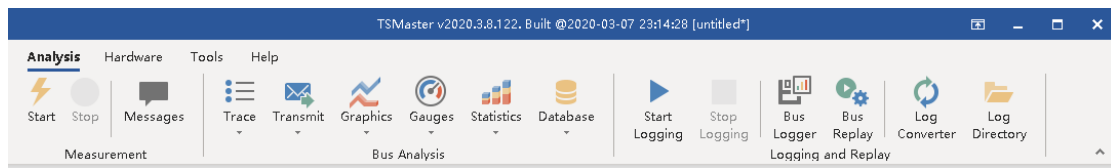


Fig 2 Analysis tab in Ribbon

Start: Start application. This operation will connect all the logical channels with hardware channels, the data from hardware will be shown in the application interface.

After application is started, the following functions are not available:

- Bus Replay. Bus replay is only allowed when application is disconnected.
- Channel Selection. Channel selection is only available before application connection.
- Channel Mapping. Channel mapping information is required before application is connectd.
- Network Hardware. Hardware parameters are only allowed to configure before application is started.

Stop: Stop application. This operation will disconnect all the logical channels with hardware channels. The logging operation is also stopped if already running.

After application is stopped, the following functions are now available:

- Bus Replay. User can load logged files and analyze them in the application forms.
- Channel Selection. User can map channels freely when application is not connected.
- Channel Mapping. User can manage application and channels in the channel mapping form.

- Network Hardware. User can alter hardware configuration when application is not connected.

Messages: Show message window.

Trace: This is a drop-down button as shown below:

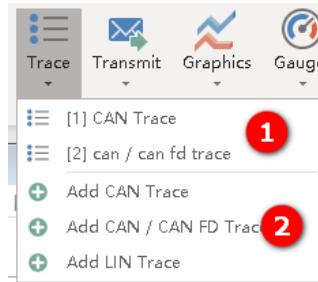


Fig 3 Trace drop-down button

1. Trace windows that already exist in the system, click to show one of them.
2. Add new trace window in the system. The default location is the current tab.

Transmit: Show or add transmit windows for bus message transmission.

Graphics: Show or add graphics windows for signal curve display.

Gauges: Show or add gauge windows for signal value display.

Statistics: Show bus statistics window.

Database: Show bus database window, CAN (*.dbc) and LIN (*.ldf) files are supported.

Start Logging: Start logging of bus events.

Stop Logging: Stop logging of bus events.

Bus Logger: Show bus logging configuration window.

Bus Replay: Show bus replay window.

Log Converter: Show log file converter application which converts blf file format to asc file format and vice versa.

Log Directory: Show the current log file directory in Windows explorer.

1.1.1.2 Hardware Tab

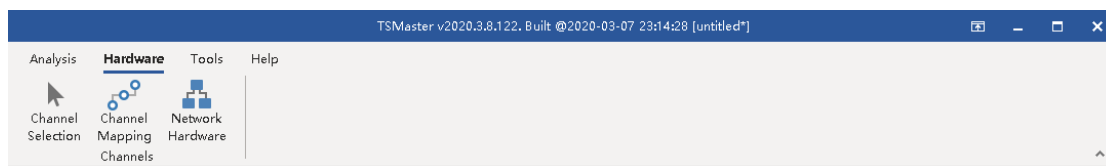


Fig 4 Hardware tab in ribbon

Channel Selection: Open channel selection window for logical channel mapping with hardware channels.

Channel Mapping: Open channel mapping configuration window to manage application logical channels and mapping.

Network Hardware: Open hardware configuration window to configure individual hardware channel parameters.

1.1.1.3 Project Tab

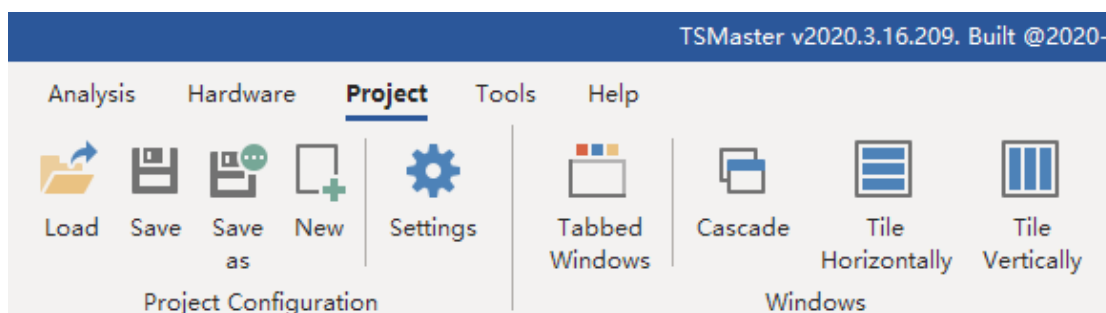


Fig 5 TSMaster Project Tab

Load: Load TSMaster configuration file, this operation will overwrite all the current settings.

Save: Save TSMaster configuration file to a location. If the destination configuration is specified, the following save command will update the destination configuration file.

The first time when the button is clicked, a save as dialog will be prompt for user to select a destination configuration file:

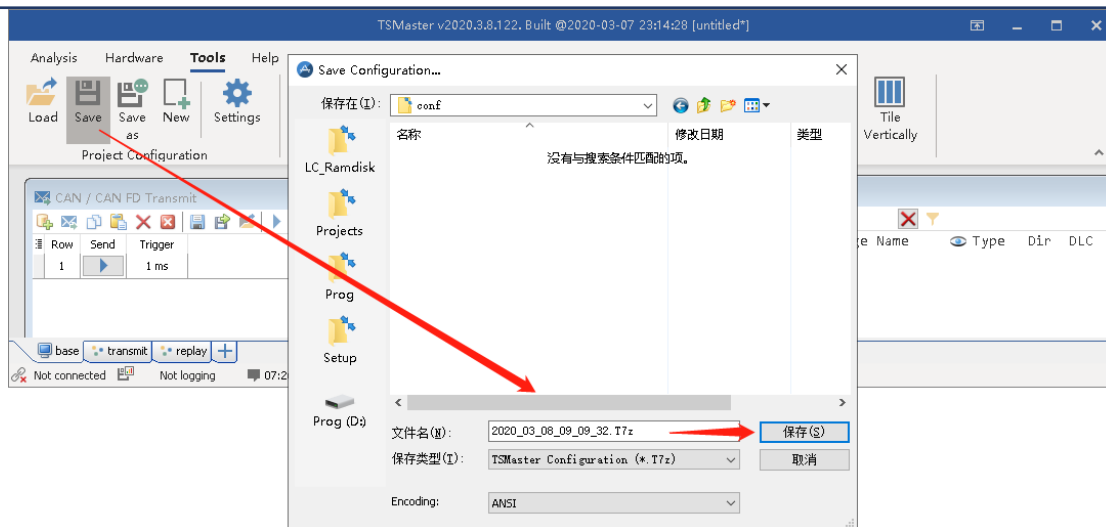


Fig 6 Save configuration for the first time

Just specify a location and file name for the configuration file, and click “Save” button. The application title will display the destination configuration file name after the configuration file is saved:

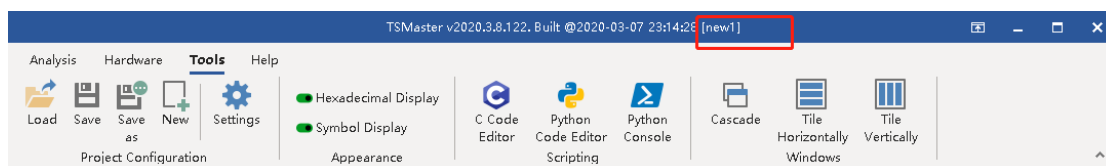


Fig 7 Configuration file name shown in the title bar

After the configuration file is saved, each successive save command will update this file continuously.

Save as: This command will popup a save as dialog for the user to change the configuration file to another location.

New: This command will erase all the current configuration and create a new environment for analysis. Note: please save all your work into a configuration file before applying this command.

Settings: Opens a software configuration window showing all the opened windows. User can show/hide/delete the application forms in this window. The title of each

application form can also be modified here.

Tabbed Windows: This checkbox displays all windows in tabs or vice versa:

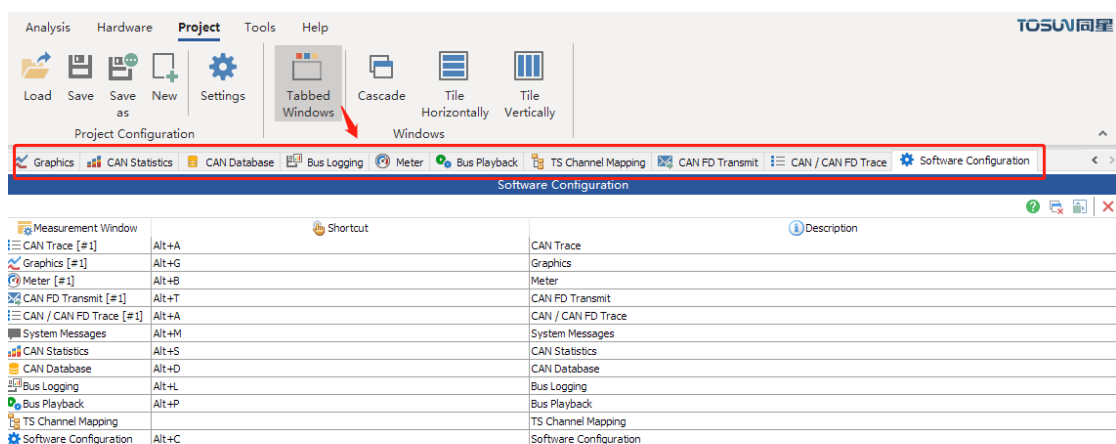


Fig 8 Tabbed Windows

Note: When this checkbox is checked, the lower tab group disappears because all the sub forms are displayed in the above tabs.

If this checkbox is unchecked, the lower tab group will be visible again and each tab group controls a series of sub mdi forms.

Cascade: Cascade application forms in the current tab group.

Tile Horizontally: Tile all the application forms in the current tab horizontally.

Tile Vertically: Tile all the application forms in the current tab vertically.

Note: This above features “Cascade, Tile Horizontally and Tile Vertically” are only available when “Tabbed Windows” feature is unchecked.

1.1.1.4 Tools Tab

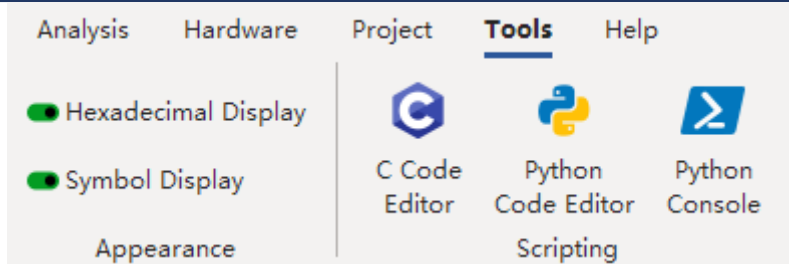


Fig9 Tools tab in ribbon

Hexadecimal Display: This command toggles display between hexadecimal and decimal.

Symbol Display: This command toggles display between symbol description and value of a signal in database.

C Code Editor: This command opens TSMaster C Code Editor for editing C scripts.

Python Code Editor: This command opens TSMaster Python Code Editor for editing Python scripts.

Python Console: This will open python console window for interacting with internal python engine shipped with TSMaster.

1.1.2 Help Tab

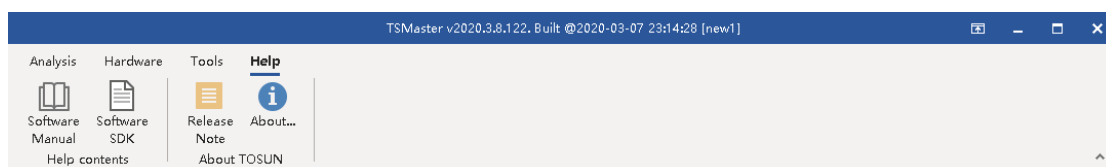


Fig 10 Help tab in ribbon

Software Manual: This software manual will be shown.

Software SDK: TSMaster API description manual will be shown.

Release Note: This will open release note for the current version of TSMaster.

About...: This will show about dialog of TOSUN company.

1.2 Channel Selection

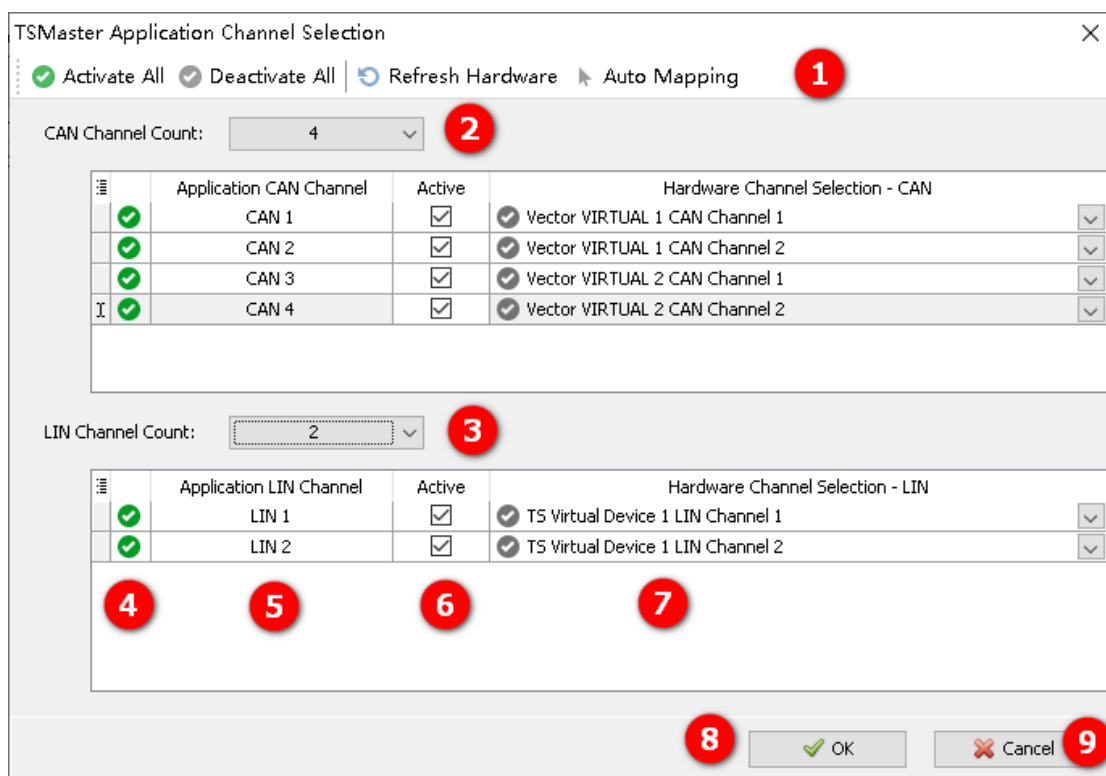


Fig 11 Channel Selection dialog

Channel selection dialog is used to quick configure application channel mapping before application is running.

1. Toolbar buttons described below:

Activate All: Activate all the application channels




Deactivate All: Deactivate all the application channels

Refresh Hardware: Refresh hardware channel list after USB devices are plugged in or out

Auto Mapping: Automatically search hardware channels and map each application channel with available hardware channel in the order of discovery.

2. **Application CAN channel count:** Displays the current CAN channel count of TSMaster, the user can change it using drop-down button, the modification takes

effect immediately.

3. **Application LIN channel count:** Displays the current LIN channel count of TSMaster, the user can change it using drop-down button, the modification takes effect immediately.
4. **Availability:** Indicates the availability of the current application channel. The color of the icon has the following meaning:
 -  This application channel mapping is valid. The corresponding application is fully functional during measurement.
 -  This application channel is disabled. The corresponding application channel is not available during measurement.
 -  This application channel is invalid, the user must resolve the mapping problem, otherwise the application cannot start.
5. **Application channel:** Application logical channel specified by user. Each application channel number has an ascending order starting from 1. The available application channels are from 1 to CAN channel count.
6. **Active Selection:** This checkbox controls the availability of the current application channel. Default selection is checked. If user wants to disable the current application channel, the selection can be unchecked. After that, the mapping of this application channel will not be available during measurement.
7. **Hardware channel selection drop-down box:** This drop-down box lists all the available hardware channels that can be mapped with the current application channel. The color of each item listed has the following meaning:

- ✔ This hardware channel is not mapped with other application channels, it is free for user to select.
- ✔ This hardware channel is already mapped with one application channel. Multiple application channels mapping to the same hardware channel is not allowed.
- ✘ This application channel is not mapped with any hardware channel, the user must ensure the mapping of the application channel before measurement starts.

Note: If TSMaster is opened for the first time, when user tries to connect application without opening this dialog, a default configuration is automatically applied, which performs the following operations:

- [1] search for available CAN and LIN hardware channels excluding TS virtual channels
- [2] set application CAN and LIN channels according to the first found hardware channels
- [3] start application for the measurement

1.3 System Messages Window

System messages window displays all the software related messages, the message color has the following meaning:

- Default: Normal message
- Verbose: Message of minor importance
- Hint: Message that should to come into notice
- OK: Message that indicates the current operation is successful

■ Error: The current operation encounters an error

The description of system message window is shown below:

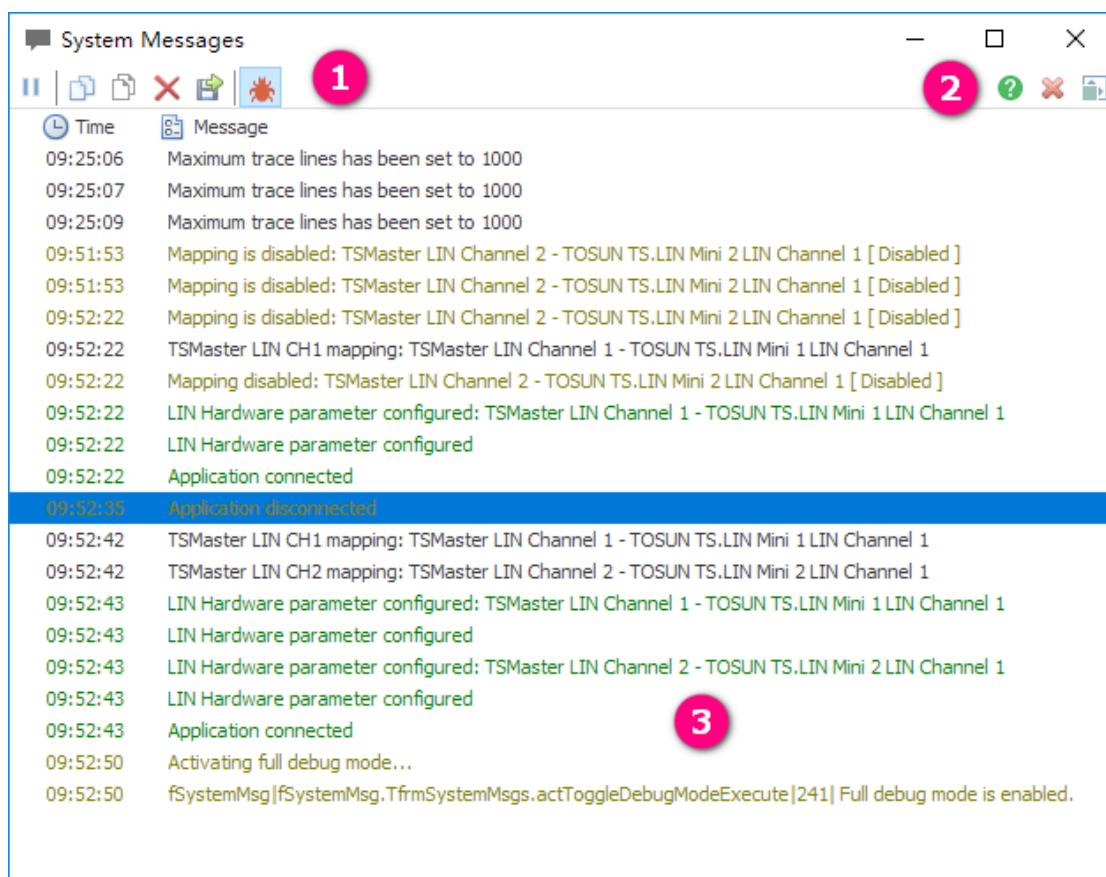


Fig 12 System Message Window


1. Toolbar buttons

- || Pause checkbox, check to suppress the display of incoming messages
- 📄 Copy the selected logs into clipboard
- 📄 Copy all the logs into clipboard
- ✖ Clear the display of the current window, this will delete all the logs
- 💾 Save the log to a file on the disk
- 🔥 Debugging mode switch, check to open debug mode, each log message will then

contain stack trace info.

2. Common window buttons

 Opens help document for the current window

 Delete or hide the current window, if the user selects “Delete” , the window will be destroyed and will not appear in any of the application tabs; if the user selects “Hide” , the window will be hidden in the current tab, but may be displayed in other tabs. Note: the default operation of closing a window by clicking on the right-top red button of a window

 is to hide it.

3. **Logging area:** The time and description of events are displayed here.

1.4 CAN / CAN FD Trace

CAN / CAN FD Trace window display events from CAN / CAN FD networks.

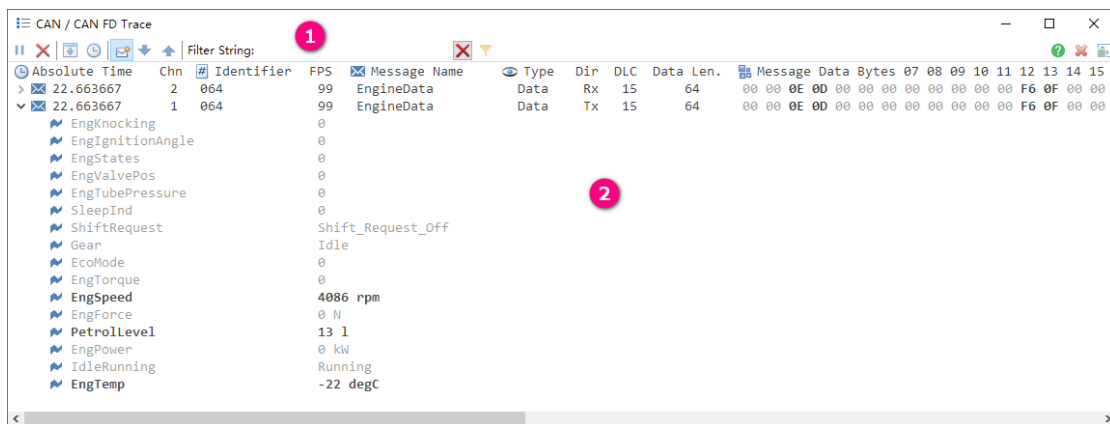




Fig 13 CAN / CAN FD Trace Window

1.4.1 Trace toolbar

 Pause display button, when checked, the “Pause” button will switch to “Continue”  and incoming events will not be refreshed on the screen. The incoming events will be visible again when the “Continue” button is clicked.

Clear the display of the current trace window.

This checkbox sets trace window in chronological view mode. In this mode every incoming new message will be display as one trace line.

This checkbox sets trace window in relative time mode.

This checkbox ensures the trace list always scroll to the latest message.

Expand all message nodes to view their signal values.

Collapse all message nodes so signals are hidden.

Filter String: Filter trace list with specified string, the filter string can be the following types:

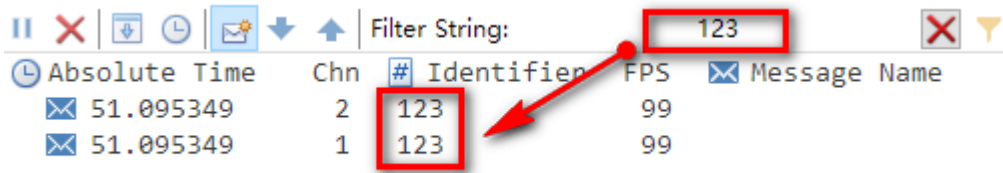


Fig 14 Filter by identifier

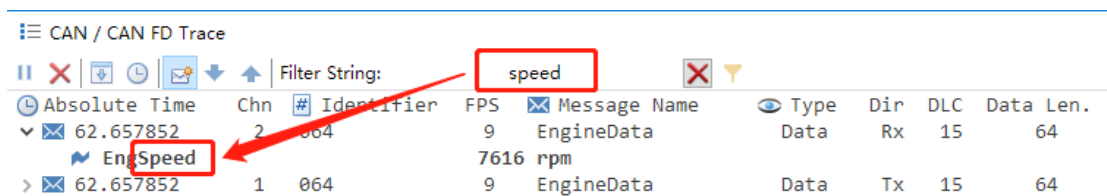


Fig 15 Filter by signal name

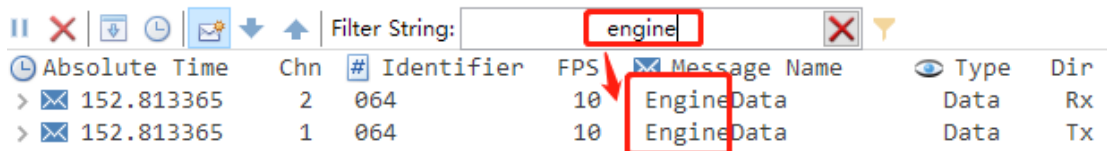


Fig 16 Filter by message name

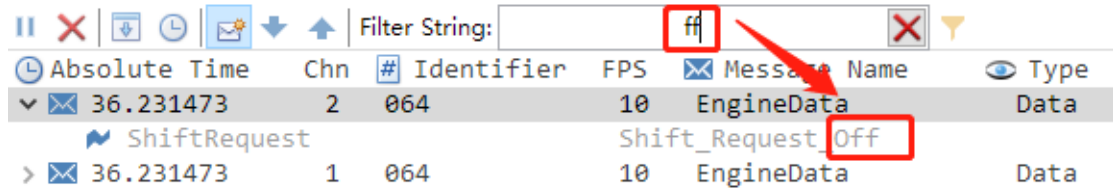


Fig 17 Filter by signal symbol value

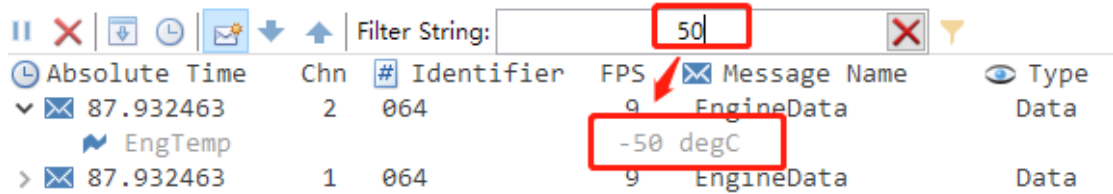


Fig 18 Filter by signal numeric value

Clear filter value, the trace list will then display all the trace lines.

Message filter tool, which allows specific message identifiers to display in the trace, and meanwhile blocks other message identifiers. User can use this message filter to hide some irrelevant messages, or just monitor certain messages.

1.4.2 Trace message identifier filter

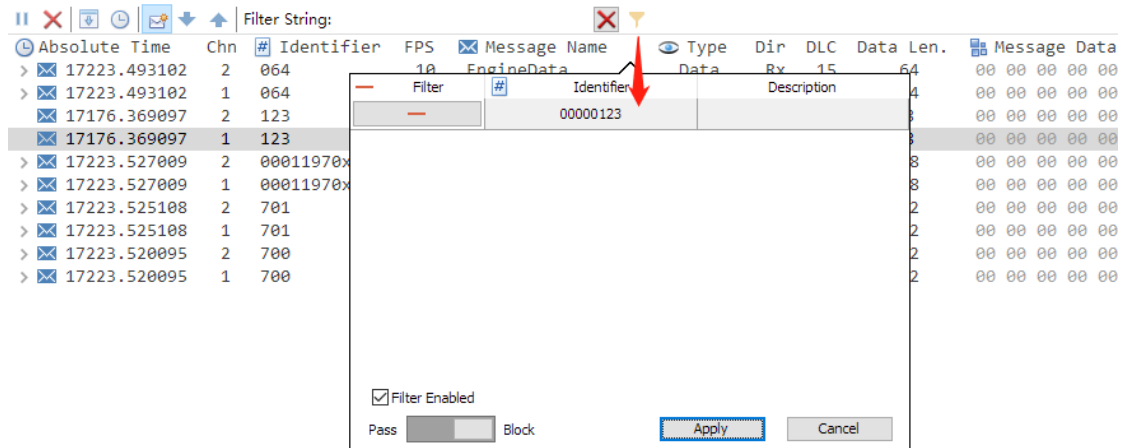


Fig 19 Trace message identifier filter

The trace message identifier filter works under either of the two conditions:

- Block mode Pass Block

The message identifier in the list will be blocked, and other message will pass the filter.

In the above picture, only 0x123 will be blocked, while other message identifiers will be displayed in the trace window.

2. Pass mode Pass Block

The message identifier in the list will be passed, and other message will be blocked. In the following picture, only 0x123 will be refreshed in the trace list:

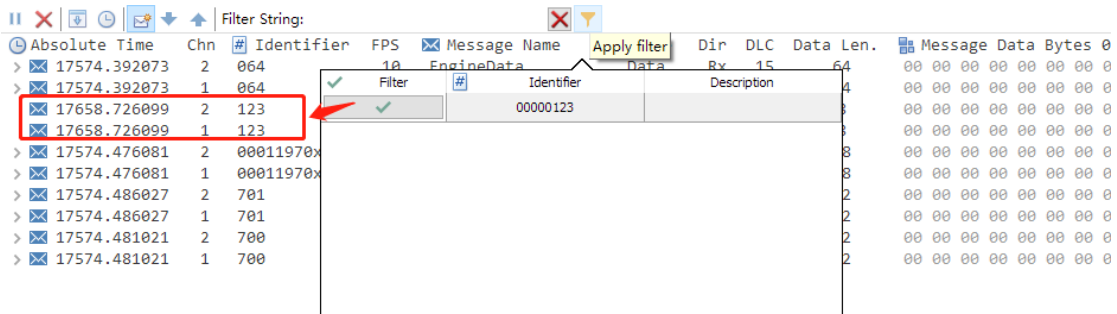


Fig 20 Message identifier filter working in pass mode

To add or delete message identifiers in the list, just right-click on the empty area of the list, you will see the following popup menu items:

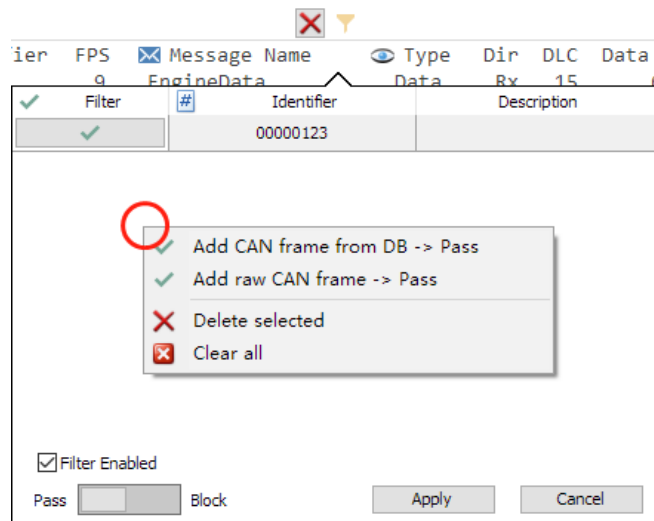
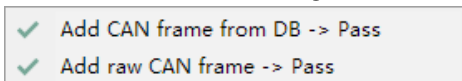


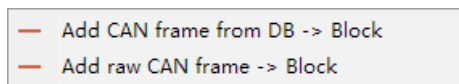
Fig 21 Add or delete message identifiers in the list



Add CAN frame identifiers from database or on the

fly. These added message identifiers will be passed to the trace list. These menu items will

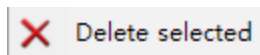
be shown when the filter is in pass mode.



Add CAN frame identifiers from database or on the fly.

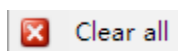
These added message identifiers will be blocked and will not be displayed in the trace list.

These menu items will be shown when the filter is in block mode.

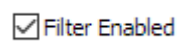


This operation will remove the selected message identifier from the

filter list.



This operation clears all the message identifier items from the filter list.



This checkbox controls whether the message identifier filter is enabled or

not.

1.4.3 Trace list columns

Absolute Time: Absolute measurement time in seconds, this is the default time display format. The absolute time or message will be displayed in this column.

Relative Time: The relative time indicates the time in relation to the preceding message. In chronological mode this is the message received directly before the current message, whereas in fixed position mode the relative time is displayed in relation to the previous message of the same type.

Chn: The channel number of the message.

Identifier: CAN message identifier, extended identifier format will add a “x” symbol to the identifier value.

FPS: Frames per second, this column displays the frame rate of specific identifier.

Message Name: The name of the message defined in the database.

Type: CAN message type will be displayed here including the following:

- Data: Classical CAN data frame
- Remote: Classical CAN remote frame
- FD: CAN FD frame

Dir: Direction of the CAN message, can be Tx (transmit) or Rx (receive)

DLC: Data length code from CAN messages, in CAN FD frame the DLC has the following relationships with the length of data bytes:

DLC	Data length
0~8	Same as DLC
9	12
10	16
11	20
12	24
13	32
14	48
15	64

Data Len: The length of data bytes.

Message Data Bytes: Each data byte of the message. In CAN FD frame, the data byte can be larger than 8 bytes, each data byte with index starting from 0 is shown:

```

Message Data Bytes 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
01 02 03 04 05 06 07 08 05 37 FF FF FF 80 76 09 00 46 57 FF FF FF FF 23 00 00 00

```

Fig 22 Message data bytes with index starting from 0

1.4.4 Trace Signals Display

Trace signals can be expanded if a message is defined in the loaded CAN database:

Absolute Time	Chn	# Identifier	FPS	Message Name	Type	Dir	DLC	Data Len.	Message Data
869.881944	2	064	9	EngineData	FD	Rx	15	64	01 02 03 04 05
				EngKnocking					0
				EngIgnitionAngle					0
				EngStates					0
				EngValvePos					0
				EngTubePressure					0
				SleepInd					0
				ShiftRequest					Shift_Request_Off
				Gear					Idle
				EcoMode					1
				EngTorque					7 50407338535435E18
				EngSpeed					2376 rpm
				EngForce					5 N
				PetrolLevel					4 l
				EngPower					20.55 kW
				IdleRunning					Running
				EngTemp					-44 degC
869.881944	1	064	9	EngineData	FD	Tx	15	64	01 02 03 04 05

Fig 23 Signals with updated values highlighted

1.4.5 Popup Menus

Most of trace popup menu items can be found in trace toolbar except “Copy” and “Block selected message” :

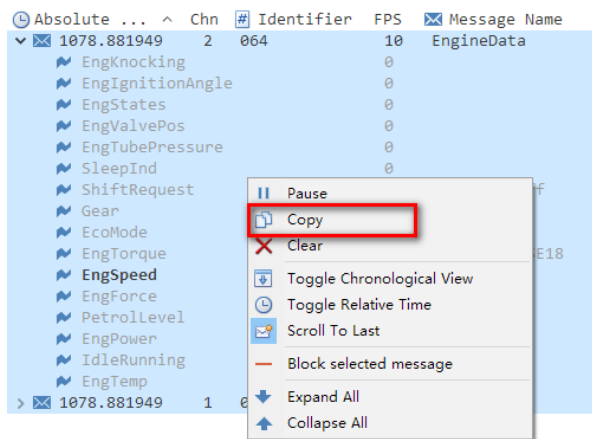


Fig 24 Trace popup menu

To copy the trace lines, the user has to select certain trace lines and then click the “Copy” item. The selected text has the same layout as trace display:

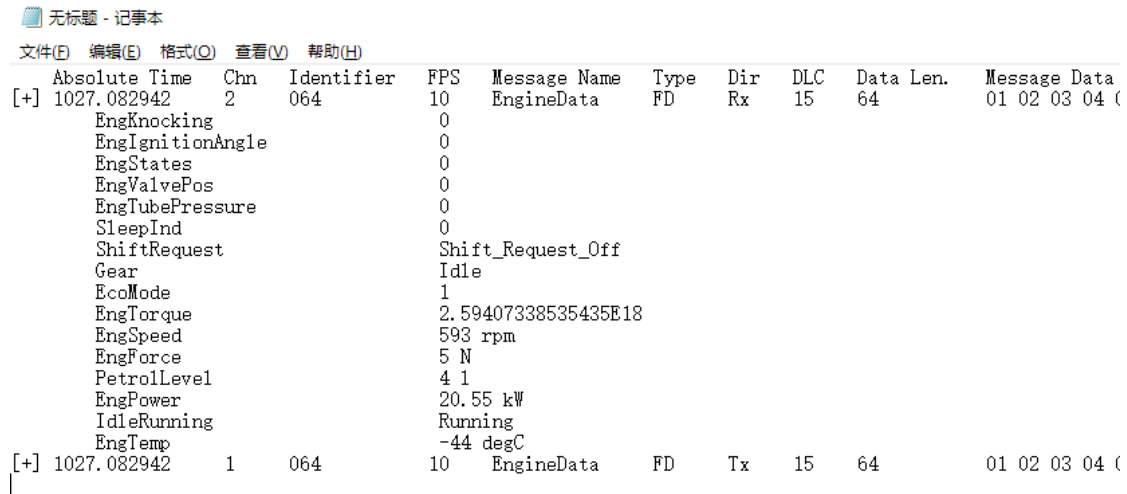


Fig 25 Selected trace lines in text

1.5 CAN / CAN FD Transmit Window

CAN / CAN FD frames can be transmitted manually or periodically by CAN / CAN FD transmit window:

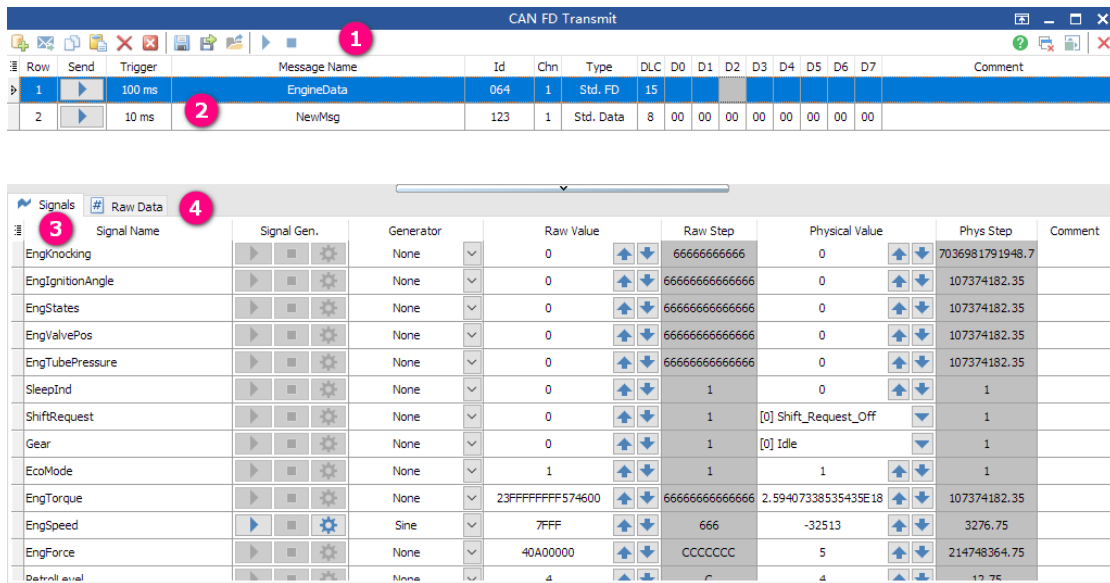



Fig 26 CAN / CAN FD Transmit Window

1.5.1 Transmit toolbar


- Add a CAN message from database.
- Add a raw CAN message directly into transmit list, which can be freely modified.

 Copy selected CAN messages into clipboard, which can be pasted into current transmit list.


 Paste the copied CAN message from clipboard into the current transmit list.


 Delete the selected CAN messages from current list


 Remove all the CAN messages from current list.

 Save the current transmit list to an external file. For the first time a save dialog box appears for the user to specify destination file. The following save operations will overwrite this file.

 Export the current transmit list to an external file.

 Load transmit list from external file, this operation will overwrite all the existing transmit list.

 Start the transmission of the current transmit list. Note: this operation will send all the frames inside the transmit list, for manual transmit messages, only one frame is sent per message; for cyclic transmit messages, all of them are scheduled to be sent periodically.


 Stop all the periodically transmitted messages. Note: this operation will be executed everytime when application disconnects.

1.5.2 Transmit list

The transmit list contains messages to be edited, each message has the following properties:

Row: The number of each transmit message in ascending order, this field is read-only and cannot be edited.

Send: This is a button controlling the current message transmission. The style of this button depends on the trigger type of the current message:

- Manal transmit message: Each click on this button will trigger one CAN message transmission.
- Periodic transmit message: The first click on this button will start the cyclic transmission of this message. The transmit button will then switch to a “Stop” button:  The next click on this stop button will stop the cyclic transmission of the current message.

Trigger: Message transmission type:

- Manual: One click on the “Send” button will trigger one CAN message transmission
- Periodic: Periodic transmission type has the following properties:

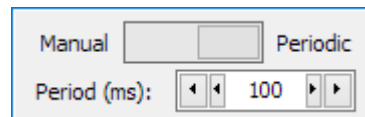


Fig 27 Periodic transmission type configuration

The period can be within range from 1ms to 1000000000ms.

Message Name: The name of the message, if this message is added from CAN database, then the message name is defined by CAN database and cannot be modified by user; if this message is added manually, then the name of the message can be freely altered by user.

Id: Identifier of CAN message.

Chn: The channel number of CAN message.

Type: CAN frame type, can be the one of the following 6 types:

- Std. Data: Classical CAN data frame with standard identifier
- Std. Remote: Classical CAN remote frame with standard identifier
- Std. FD: FD frame with standard identifier
- Ext. Data: Classical CAN data frame with extended identifier
- Ext. Remote: Classical CAN remote frame with extended identifier
- Ext. FD: FD frame with extended identifier

DLC: Data length code of the CAN message, which can be within range 0~15.

D0~D7: Classical CAN data frame data byte editors. Note: In FD CAN frame, these editors are unavailable and replaced by “Raw Data” editors located on the bottom panel.

1.5.3 Signals list

Signals list displays editors for modifying signal properties of the selected CAN message defined in CAN database. The raw CAN messages do not have signals list editors.

Signal Name	Signal Gen.	Generator	Raw Value	Raw Step	Physical Value	Phys Step	Comment
EngTubePressure		None	0	6666666666666666	0	107374182.35	
SleepInd		None	0	1	0	1	
ShifRequest		None	0	1	[0] Shift_Request_Off	1	
Gear		None	0	1	[0] Idle	1	
EcoMode		None	1	1	1	1	
EngTorque		None	23FFFFFFF574600	6666666666666666	2.59407338535435E18	107374182.35	
EngSpeed		Sine	7FFF	666	-32513	3276.75	
EngForce		None	40A00000	CCCCCCC	5	214748364.75	
PetrolLevel		None	4	C	4	12.75	
EngPower		None	807	CCC	20.55	7.5	
IdleRunning		None	0	1	[0] Running	1	
EngTemp		None	3	6	-44	10	

Fig 28 Signals list of the selected CAN message




1.5.3.1 Signal Name

The signal name defined in the CAN database.

1.5.3.2 Signal Gen.

The signal value generator feature, which has three buttons for sending and

configuring the value changing behavior of each CAN signal:

-  Start generating of the current signal. Once this button is clicked, the button changes to “Pause” button shown below.
-  Pause button, once this button is clicked, the current CAN signal generator pauses, the button then changes back to “Send” button shown above.
-  Stop button, a click on this button stop the operation of the current CAN signal generator.

1.5.3.3 Generator

This combobox specifies the generator type of the current CAN signal, which has the following choices:

- None: No CAN signal generator is available, the signal value in the sent CAN message depends on the physical value set on the “Physical Value” on the right side.
- Ramps and Pulses:

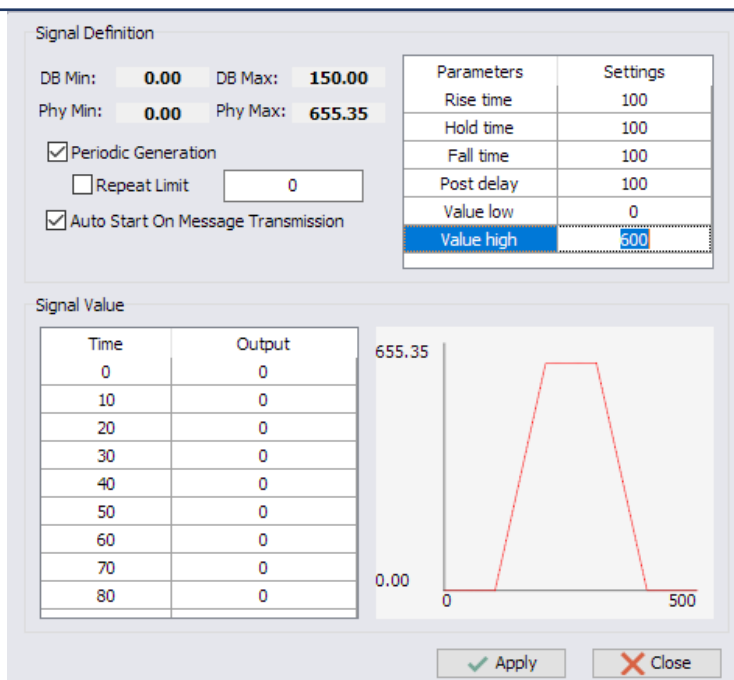


Fig 29 Ramps and Pulses signal generator

The selected CAN signal will be generated in the time series of Rise-Hold-Fall-Delay.

The high value, low value and each time segment can be modified.

- DB Min and Max: The minimum and maximum value defined in the database.
- Phy Min and Max: The physical minimum and maximum value that the signal can reach.
- Periodic Generation: The signal generator can restart itself when a period of value has been generated.
- Repeat Limit: The restart count of periodic generation, if not specified, the restart count of periodic generation is unlimited. This limit number depends on the activation status of “Periodic Generation” .
- Auto Start On Message Transmission: The signal generator will automatically start when the parent message is scheduled to be transmitted periodically.
- Signal Value table: The signal value table defines each signal physical value against

time in milliseconds. The table is read-only except custom signal generator.

- Parameter list: The signal waveform depends the parameters defined in this table.
 - Signal waveform preview: The signal value being generated by this generator can be previewed in a time-value view here.
- Value Range

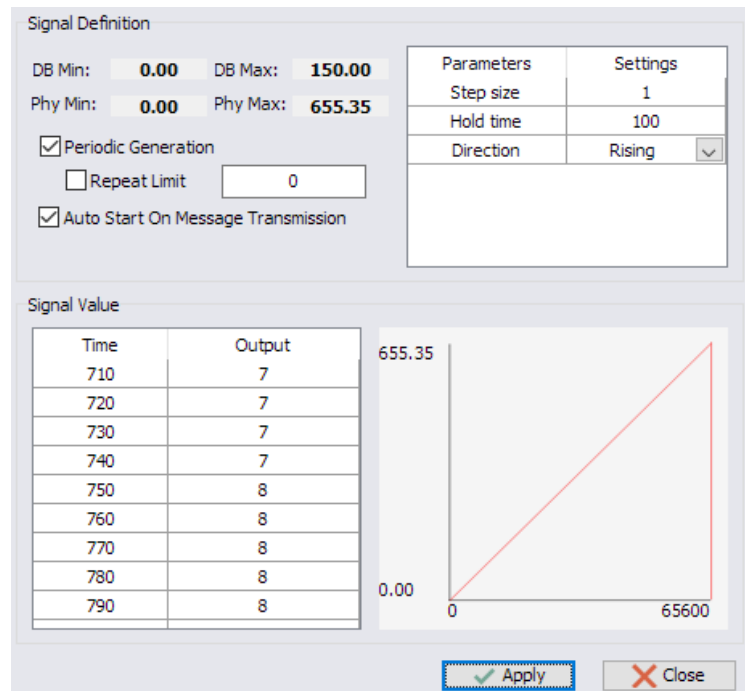


Fig 30 Value range signal generator

The value range generator traverses the signal value in “Rising”, “Falling” and “Alternate” methods.

- Toggle

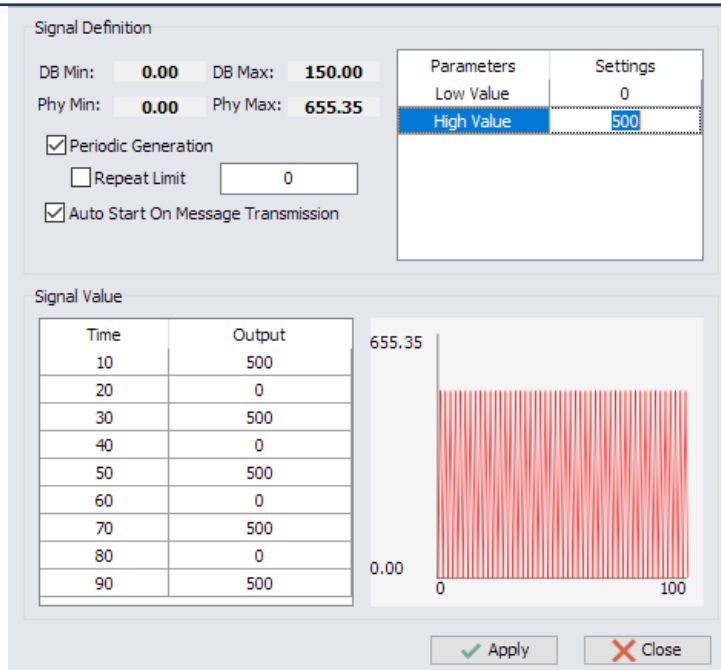


Fig 31 Toggle signal generator

The toggle signal generator changes the signal value between low and high. The low and high value can be specified by the user.

■ Random

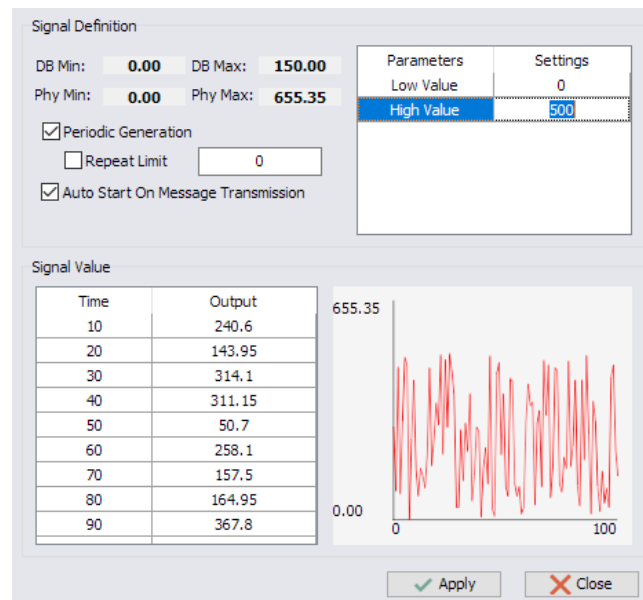


Fig 32 Random signal generator

The random signal generator outputs random signal values. The low value and high value of the random range can be specified.

■ User Defined

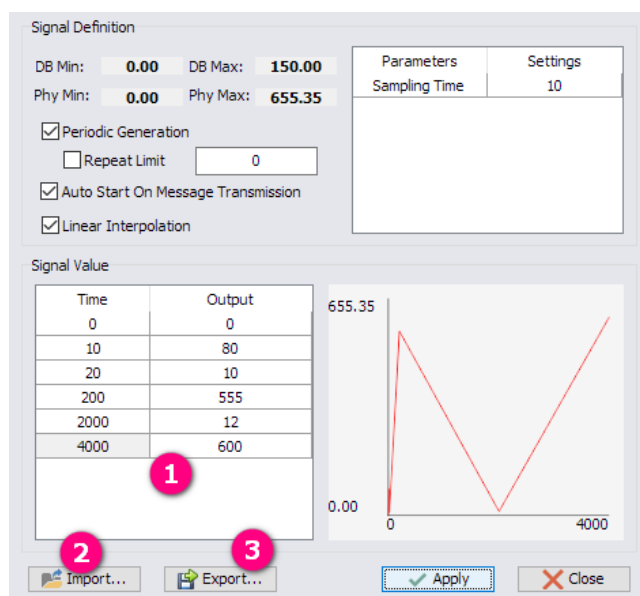


Fig 33 User defined signal generator

User defined signal generator provides an interface for the user to interact with the signal values. The user can make the waveform from external software such as excel, and then import the waveform data into the transmission value table.

1. **Signal Value table:** To append a new value into the table, press “Down” key. To insert a new value before the selected value in the table, press “Insert” key. Note: the time series in the table must be in ascending order, otherwise the generator will stop on the incorrect time.
2. **Import button:** The user can import signal waveform defined externally. The waveform data file should have the extension of “*.sig” and should have the following format:

```

1 Interpolation;Linear
2 Sample rate [ms];10
3 Delay [ms];0
4 Time [ms];EngPower
5 0;0
6 10;80
7 20;10
8 200;555
9 2000;12
10 4000;600
11

```

Fig 34 User defined signal generator import file format

Line 1: Interpolation method, only Linear is supported currently.

Line 2: Sample rate in milliseconds. Note: the character “;” is the separator between the key and value in the “key - value” pair.

Line 3: Delay time in milliseconds.

Line 4: Table description of the following “key - value” pair.

Line 5 and the following: Table data defined in “key - value” pair which are separated by “;” character.

3. **Export button:** The export feature of the signal generator, which will export the current table value into a “*.sig” file.

1.5.3.4 Raw Value

Raw value editor of the current selected signal. To modify a signal’s raw value without touching its physical value, use this editor.




Increment and decrement button of the raw value. Clicking on the corresponding button increments or decrements the raw value by the step defined on the “Raw Step” field.

1.5.3.5 Raw Step

The increment or decrement step of the “Raw Value” field.

1.5.3.6 Physical Value

Physical value editor of the current selected signal. To modify a signal’ s physical value without touching its raw value, use this editor.

 Increment and decrement button of the physical value. Clicking on the corresponding button increments or decrements the physical value by the step defined on the “Phys Step” field.

1.5.3.7 Phys Step

The increment or decrement step of the “Physical Value” field.

1.5.3.8 Comment

User comment on the specified signal.

1.6 CAN Statistics

1.6.1 CAN Statistics list

Statistics	Channel 1	Channel 2
BusLoad [%]	2.52	2.52
PeakLoad [%]	2.52	2.52
Std. Data [fr/s]	211	211
Std. Data [total]	9238	9238
Ext. Data [fr/s]	0	0
Ext. Data [total]	0	0
Std. Remote [fr/s]	0	0
Std. Remote [total]	0	0
Ext. Remote [fr/s]	0	0
Ext. Remote [total]	0	0
Error Frames [fr/s]	0	0
Error Frames [total]	0	0

Fig 35 CAN Statistics

CAN Statistics window displays bus load and frame rate of each CAN channel. The following value can be monitored:

Bus Load: CAN bus load in percentage.

Peak Load: CAN bus peak load from the start of measurement in percentage.

Std. Data [fr / s]: Standard classical CAN data frame rate per second.

Std. Data [total]: Total number of classical standard CAN data frame.

Ext. Data [fr / s]: Extended classical CAN data frame rate per second.

Ext. Data [total]: Total number of classical extended CAN data frame.

Std. Remote [fr / s]: Standard classical CAN remote frame rate per second.

Std. Remote [total]: Total number of remote classical CAN remote frame.

Ext. Remote [fr / s]: Extended classical CAN remote frame rate per second.

Ext. Remote [total]: Total number of extended classical CAN remote frame.

Error frames [fr / s]: CAN error frame rate per second.

Error frames [total]: Total number of CAN error frames.

1.6.2 CAN statistics popup menu

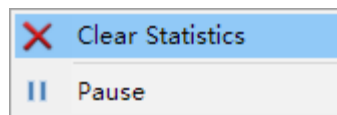


Fig 36 CAN statistics popup menu

Clear Statistics: Clear all the statistics data immediately.

Pause: Pause the display of current CAN statistics data.

1.7 Graphics

Graphics window displays signals from CAN, CAN FD and LIN messages.

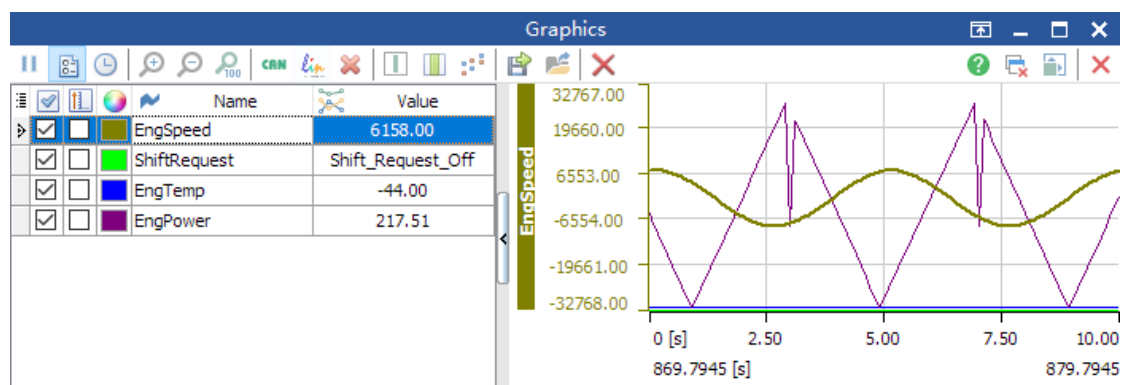




Fig 37 Graphics

1.7.1 Graphics toolbar

 Pause the display of graphics, the next click on this button will resume the display of graphics.

 This checkbox controls the display of left signal list panel.

 Absolute time and relative time switch box, when enabled, the time axis in the graphics will switch to a formatted date time display:

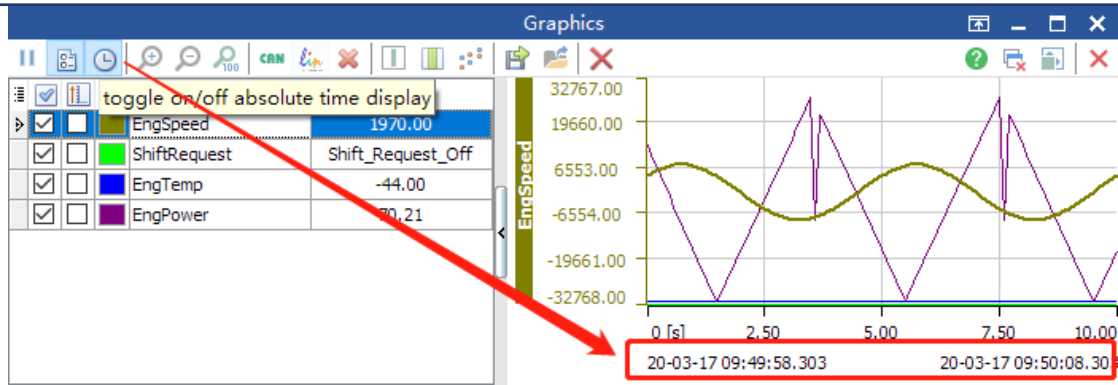









Fig 38 Formatted date time display of time axis

When disabled, the time axis will display relative time relative to the beginning of measurement.

-  Zoom in button, click to zoom in the graphic display in time.
-  Zoom out button, click to zoom out the graphic display in time.
-  Zoom reset button, click to set the graphics display to original zoom factor.
-  Add a CAN signal from database.
-  Add a LIN signal from database.
-  Delete the selected signal in the list.

 This checkbox displays or hides the measurement cursor. When this checkbox is checked, a measurement cursor will be displayed on the graphics window, which displays the selected signal value according to the measurement time. Move the cursor across the graphic area, you will see the value displayed in the measurement cursor being continuously updated. Uncheck this checkbox hides the measurement cursor.

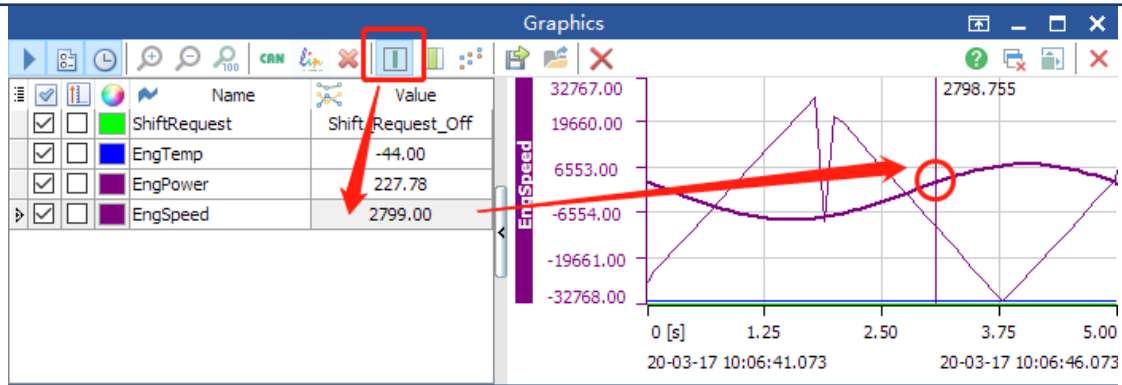



Fig 39 Graphics measurement cursor

 Time measurement cursor checkbox. This checkbox shows or hides the time measurement cursor pair.

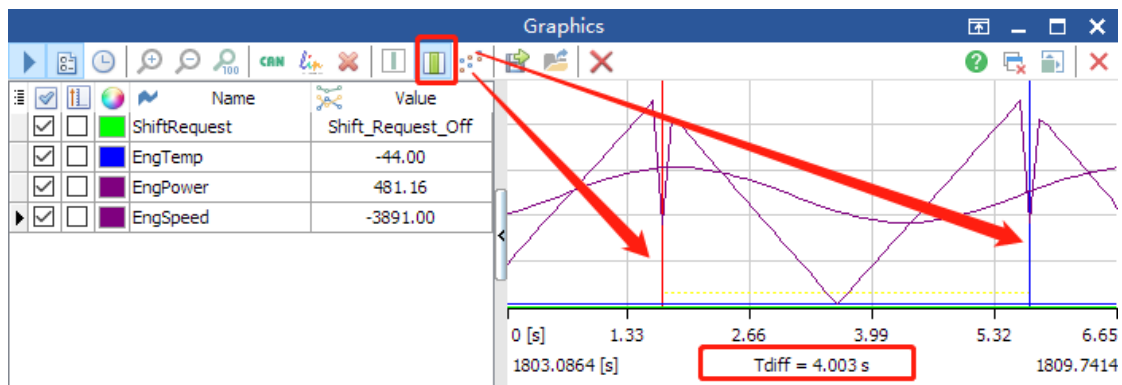



Fig 40 Time measurement cursor checkbox

When the time measurement cursor is enabled, the user can define a time range between blue cursor and red cursor. “Left click” on the graphics window drops a blue cursor to the location of the click point, and “Right click” on the graphics window drops a red cursor to the location of the click point. The delta time between blue cursor and red cursor will then be displayed on the bottom area of time axis in the graphics window.

 Sample point display. When this checkbox is checked, each sample point will be displayed in the graphics window, it is easy for the user to detect frame loss situation with the help of the sample point display.

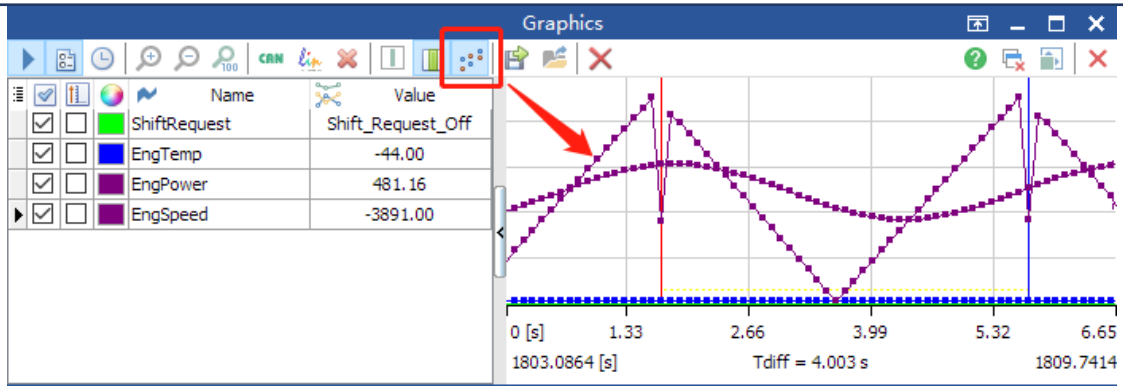


Fig 41 Sample point display

Export graphics data to an external location. Note: this button is only enabled when application disconnects.

Import graphics data from an external location. Note: this button is only enabled when application disconnects.

Clears all the data in the graphics.

1.7.2 Graphics signal list

			Name	Value
<input checked="" type="checkbox"/>	<input type="checkbox"/>		ShiftRequest	hift_Request_Of
<input checked="" type="checkbox"/>	<input type="checkbox"/>		EngTemp	-44.00
<input checked="" type="checkbox"/>	<input type="checkbox"/>		EngPower	102.50
<input checked="" type="checkbox"/>	<input type="checkbox"/>		EngSpeed	6755.00

Fig 42 Graphics signal list

Signal visibility checkbox, the signal will be set to hidden when this checkbox is unchecked.

Always show value axis checkbox, if the checkbox is checked, the value axis of the specified signal will be displayed in the graphics window permanently.

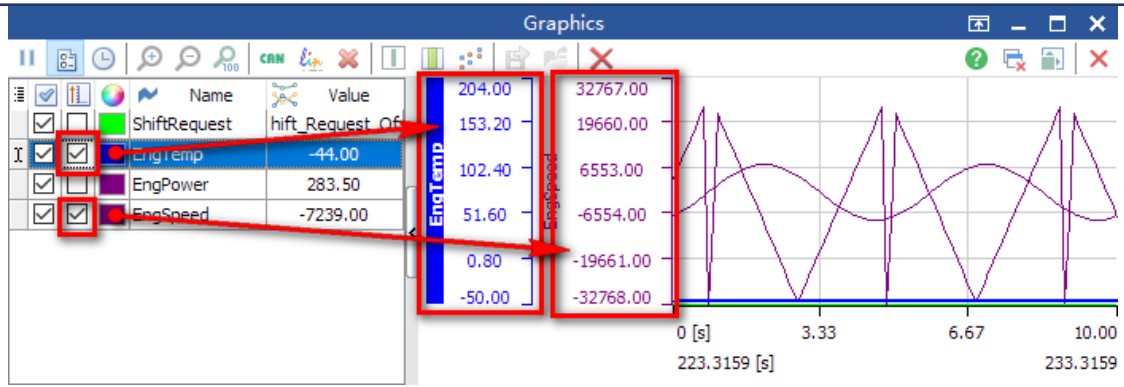


Fig 43 Signal axis display

Color picker. Clicking on this button will popup a dialogbox for the user to pick a color for the specified signal:

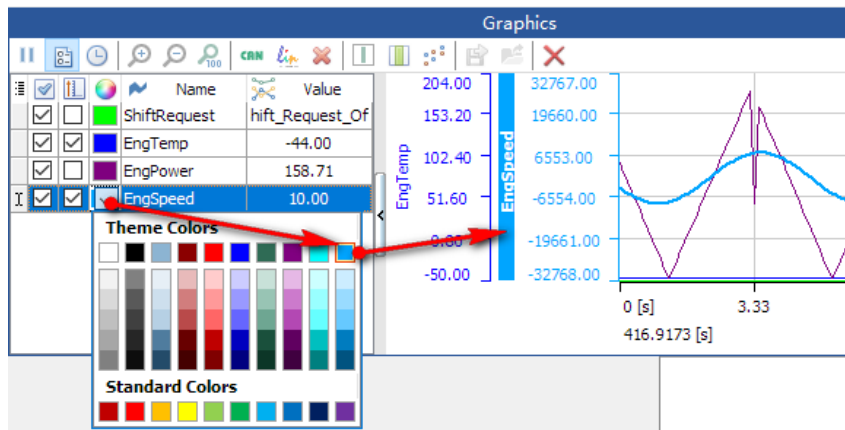


Fig 44 Color picker of graphic signals

Signal name field, this field displays signal name according to the database definition.

Signal value field, this field display real-time signal physical value.

1.7.3 Signal property inspector

Signal property inspector will be popued when the signal in the list is double-clicked, or the “Edit Signal...” menu item is clicked. Take “CAN signal property inspector” as an example:

CAN Signal Parameter	Value
Name	EngTemp
Length	7
Byte Order	Intel
Value Type	Unsigned
Minimum	-50
Maximum	204
Unit	degC
Factor	2
Offset	-50
Init. Value	0
Comment	
Start Bit	16
Message ID	64

Fig 45 Signal properties inspector

The following properties can be displayed or modified by user freely:

Name: the signal name

Length: the bit count of the signal

Byte Order: Intel or Motorola byte order switch of the signal

Value Type: the value type can be Unsigned, Signed, 32-bit float or 64-bit float

Minimum: the minimum physical value of the signal, this value also adjusts the lower range of graphics display

Maximum: the maximum physical value of the signal, this value also adjusts the higher range of graphics display

Unit: the unit of the signal

Factor: enlarge factor of the signal

Offset: offset value of the signal

Init. Value: initialize value of the signal

Comment: the user can add comments on the specified signal

Start Bit: the signal start bit in the message which contains it

Message ID: the identifier of the message which contains it

Channel Number: the CAN channel number of the signal

1.7.4 Signal Popup menu

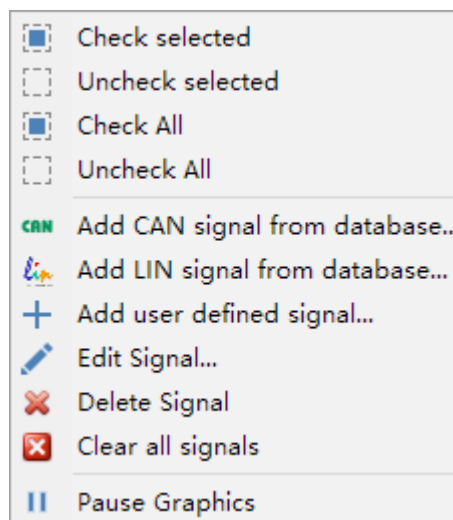


Fig 46 Graphics signal popup menu

Check selected: Make all the selected signals visible in the graphics.

Uncheck selected: Make all the selected signals invisible in the graphics.

Check All: Make all the signals visible in the graphics.

Uncheck All: Make all the signals invisible in the graphics.

Add CAN signal from database...: This button popup a CAN database signal selector for the user to select CAN signals to monitor.

Add LIN signal from database...: This button popup a LIN database signal selector for the user to select LIN signals to monitor.

Add user defined signal...: This button adds a custom signal in the list, which can be modified later.

Edit Signal...: Pops up the “Signal property inspector” as described above.

Delete Signal: This button deletes all the selected signals from the list.

Clear All Signals: This button deletes all the signals from the list.

Pause Graphics: This button pauses the display of the current graphics window, a click on this button again will resume the display of the current graphics window.

1.8 CAN Database

CAN database viewer can be used to load/unload CAN database, select CAN messages or CAN signals in the TSMaster application.

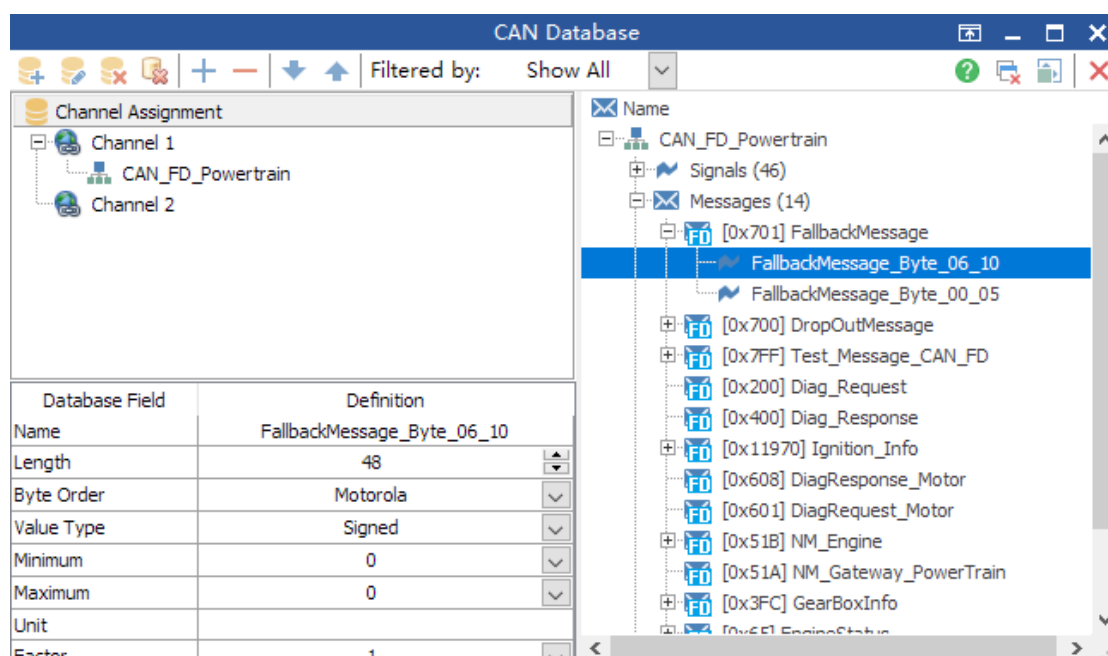








Fig 47 CAN Database

1.8.1 CAN database toolbar

 Add a CAN database from external *.dbc file

 Edit the current selected database (*.dbc file) using default editor on this computer

 Delete the current selected database from the database list

-  Delete all the database links from the database list
-  Increase a channel resource for database file mapping
-  Decrease a channel resource for database file mapping
-  Expand all nodes in the database treeview
-  Collapse all nodes in the database treeview

Filter by: database element filter, can be the following for user to select in database element selector mode:

- Show All: all the database elements will be displayed in the treeview
- CAN Signal: Only CAN signals are displayed
- CAN Message: Only CAN messages are displayed
- CAN Node: Only CAN nodes are displayed
- Environment Variable: Only environment variables are displayed

1.8.2 CAN database channel assignment

CAN database channel assignment enables the user to associate the selected database with specific CAN channels. A CAN database can support only one CAN channel, or multiple channels.

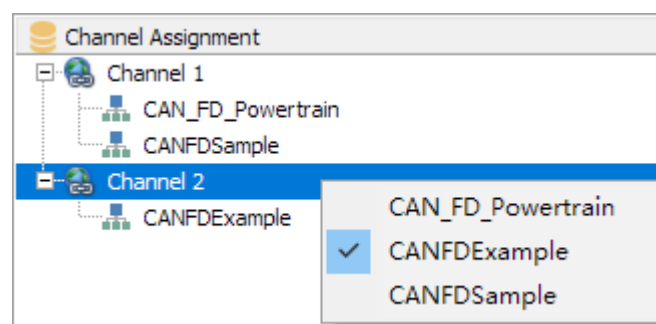


Fig 48 Channel assignment

When there are multiple database files loaded, the user may right-click on the specific

CAN channel, which pops up a list of available CAN databases. The user can associate / deassociate the database with the currently selected CAN channel by clicking on the database item in the popup menu.

1.8.3 CAN Database field viewer

Database Field	Definition	
Value Type	Signed	▼
Minimum	0	▼
Maximum	0	▼
Unit		
Factor	1	▼
Offset	0	▼
Init. Value	0	▼

Fig 49 CAN database field viewer

The CAN database field viewer is used to display properties of the selected element, which can be CAN signal, CAN message, CAN node, environment variable or CAN network.

Note: the CAN database field viewer currently not supports editing of CAN elements.

1.8.4 CAN element treeview

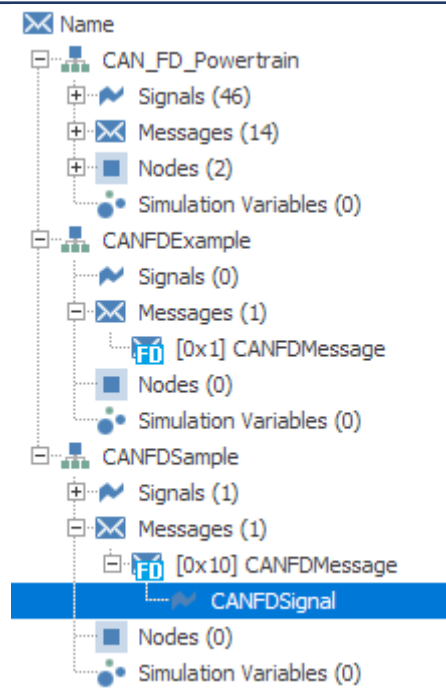


Fig 50 CAN element treeview

The CAN element treeview displays all the loaded CAN database information including CAN network, CAN signals, CAN messages, CAN nodes and Environment variables.

1.9 Hardware Configuration

The hardware configuration window is used to set hardware parameters before measurement starts.

1.9.1 Configuration Page

The configuration page contains all the application channels specified by user. There is a button which opens channel selection dialog mentioned above.

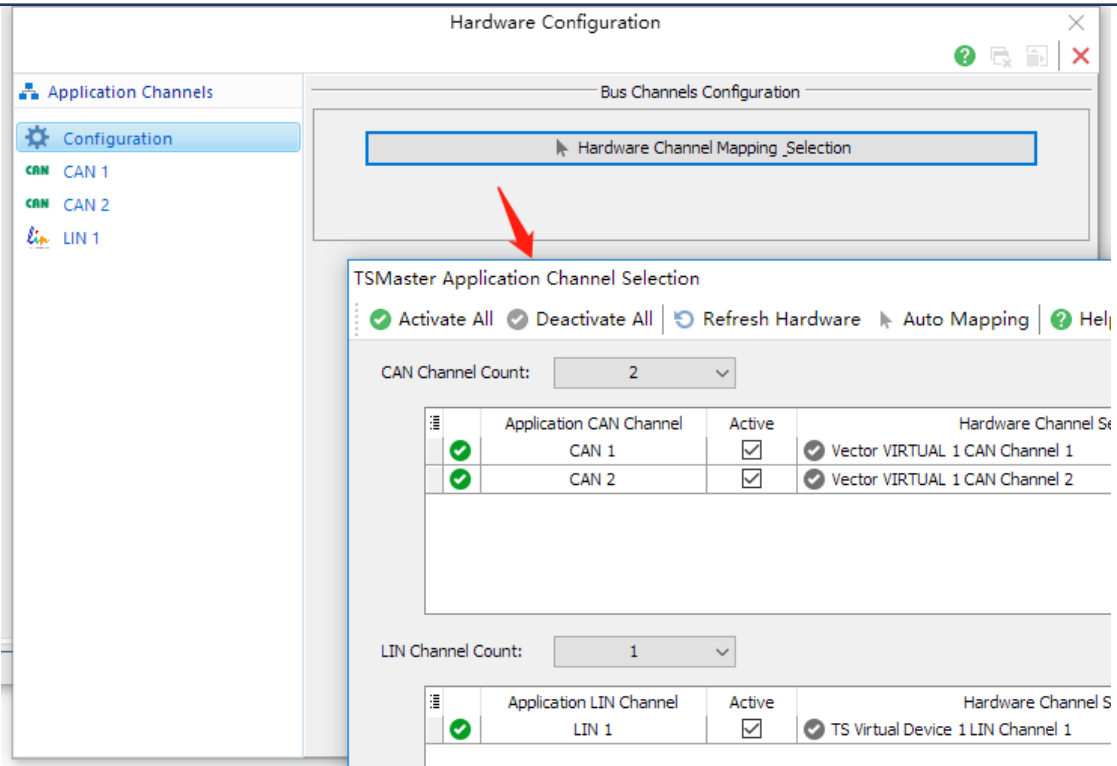


Fig 51 Hardware Configuration page

1.9.2 Channel configuration page

The channel configuration page differs when different application channel is selected. The user must check the hardware settings in each channel before starting the measurement.

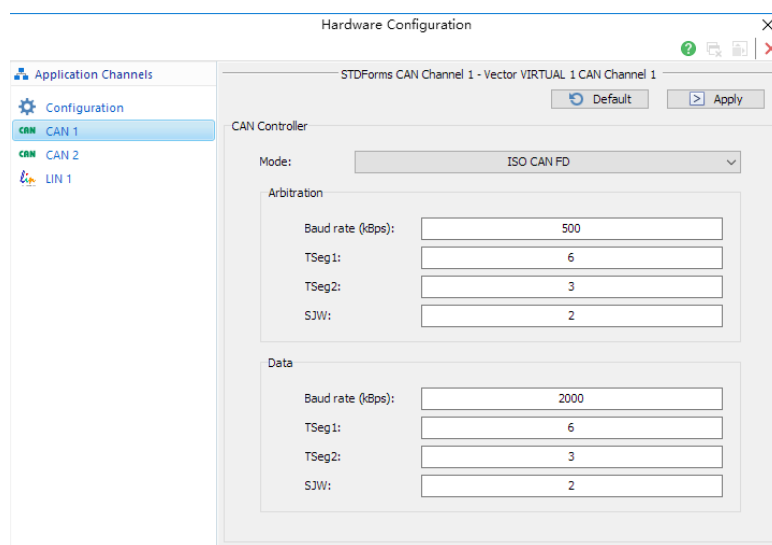


Fig 52 Hardware channel settings

1.10 Bus Logging

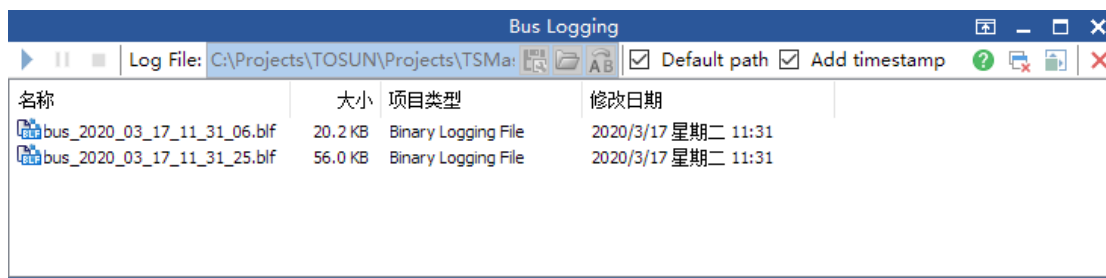





Fig 53 Bus logging

1.10.1 Bus logging toolbar

- ▶ Start logging, this button is disabled when logging engine is working.
- || Pause logging, this button is enabled when logging engine is working.
- Stop logging, this button is enabled when logging engine is working.

Log File: C:\Projects\TOSUN\Projects\TSMa:    Log file destination editor.

 Select log file location.

 Opens folder of log file destination.

 Starts TS log file converter to convert log files to another format.

Default path Default path checkbox, if this checkbox is checked, the log file destination folder will be set to relative folder to TSMaster configuration file.

Add timestamp Auto add timestamp to every log file name.

1.10.2 Bus logging popup menu

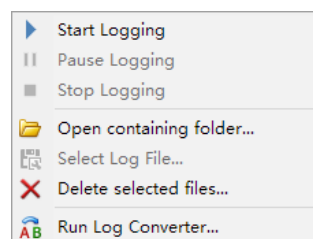


Fig 54 Bus logging popup menu

The popup menu will popups when user right-click on the log file list. All the menu items are described in the above chapter.

1.11 Bus Playback

Bus playback window replays CAN, CAN FD and LIN messages from external log files when the application is not connected.

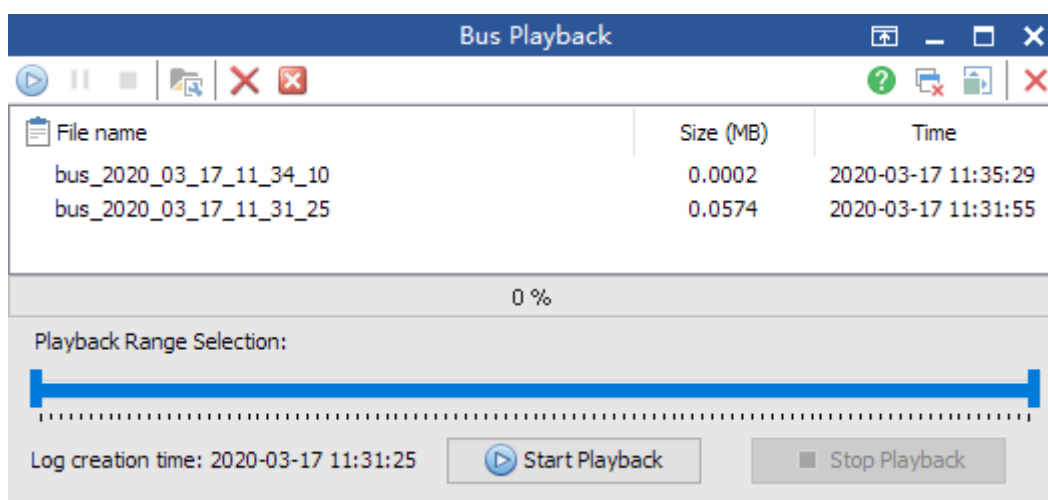








Fig 55 Bus playback

1.11.1 Bus playback toolbar

-  Starts playback. This button is not enabled when application is connected.
-  Pause playback. This button is enabled when playback starts.
-  Stop playback. This button is enabled when playback starts.
-  Add playback files to the log file list.
-  Remove the selected log files from the list.
-  Remove all the log files from the list.

1.11.2 Bus playback popup menu

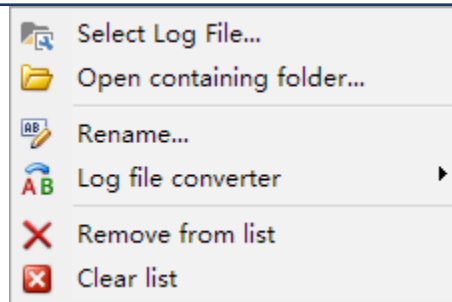


Fig 56 Bus playback popup menu

The menu items are described in the above chapter except:

Open containing folder...: Open the folder which contains the selected log file.

Rename...: Pops up a rename dialog box for the user to rename the selected log file.

1.11.3 Playback control

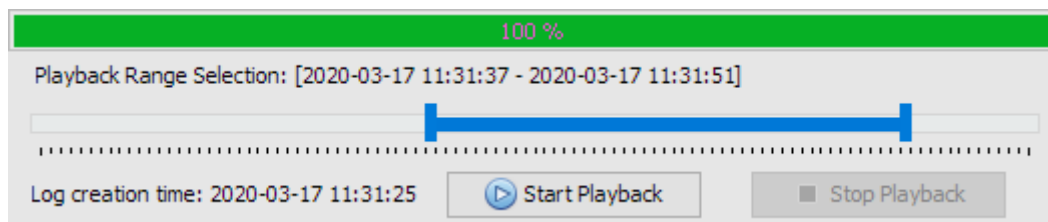


Fig 57 Bus playback control

 Playback progress indication.

 Playback range selection.

1.12 Meter

Meter displays CAN or LIN signals defined in CAN or LIN databases.

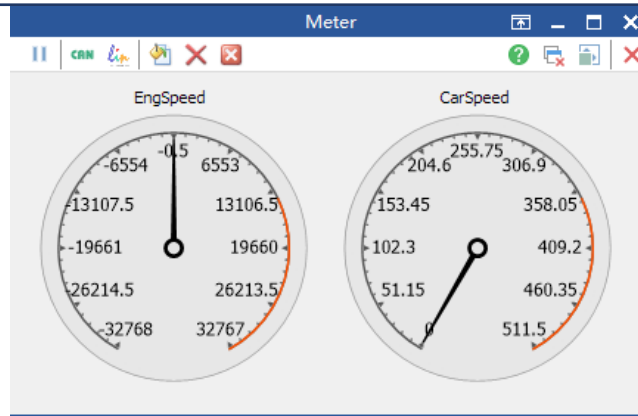


Fig 58 Meter

1.12.1 Meter toolbar

Pause display of meter signals, when checked, all the meter signals refresh tasks

are paused.

- Add a CAN signal from database.
- Add a LIN signal from database.
- Select meter display style.
- Delete the selected meter signals.
- Delete all the signals in meter window.

1.12.2 Meter signal editor

CAN Signal Parameter	Value
Name	CarSpeed
Length	8
Byte Order	Intel
Value Type	Unsigned
Minimum	0
Maximum	511.5
Unit	mph
Factor	0.5
Offset	0
UI Size:	200
	200
Switch Type:	Circular
<input type="button" value="Delete"/> <input checked="" type="button" value="Apply"/> <input type="button" value="Cancel"/>	

Fig 59 Meter signal editor

Name: the name of the signal to be displayed.

Length: signal bit count.

Byte Order: can be Intel or Motorola.

Value Type: can be Unsigned, Signed, 32-bit float or 64-bit float.

Minimum: the minimum physical value of the signal, this setting also affects the graphical minimum range.

Maximum: the maximum physical value of the signal, this setting also affects the graphical maximum range.

Unit: the unit of signal physical value.

Factor: the enlarge factor of the physical value of signal.

Offset: the offset value of the physical value of the signal.

UI Size in width and height: user can adjust the size of the meter by modifying these parameters.

Switch Type: the following types are supported:

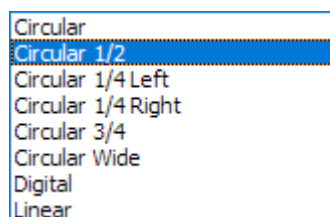



Fig 60 The type of meter display


1.13 LIN Trace

1.13.1 Trace toolbar

|| Pause display button, when checked, the “Pause” button will switch to

“Continue”  and incoming events will not be refreshed on the screen. The incoming events will be visible again when the “Continue” button is clicked.


 Clear the display of the current trace window.

 This checkbox sets trace window in chronological view mode. In this mode every incoming new message will be display as one trace line.

 This checkbox sets trace window in relative time mode.

 This checkbox ensures the trace list always scroll to the latest message.

 Expand all message nodes to view their signal values.

 Collapse all message nodes so signals are hidden.

Filter String:  Filter trace list with specified string, the

filter string can be the following types:

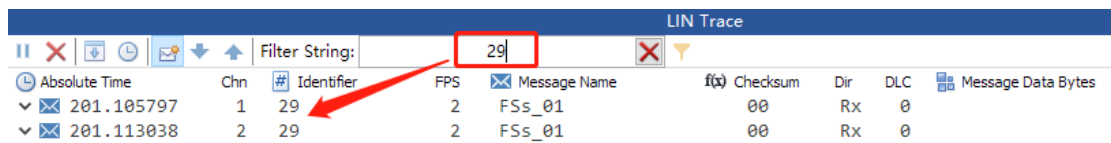


Fig 61 Filter by identifier

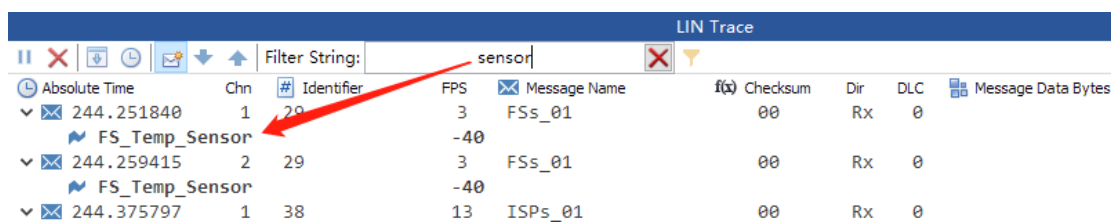


Fig 62 Filter by signal name

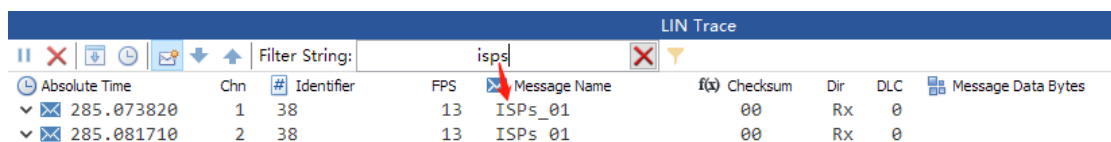


Fig 63 Filter by message name

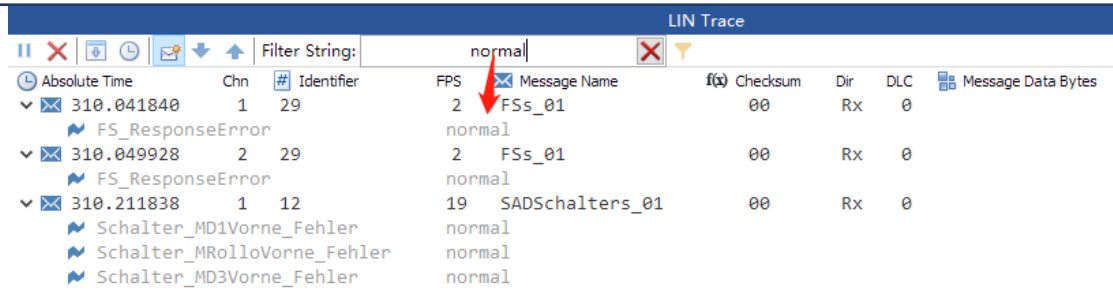


Fig 64 Filter by signal symbol value

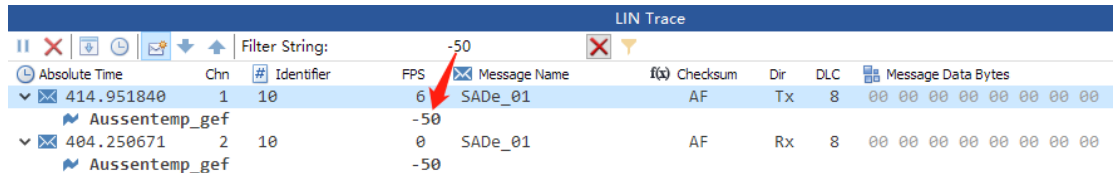


Fig 65 Filter by signal numeric value

Clear filter value, the trace list will then display all the trace lines.

Message filter tool, which allows specific message identifiers to display in the trace, and meanwhile blocks other message identifiers. User can use this message filter to hide some irrelevant messages, or just monitor certain messages.

1.13.2 Trace message identifier filter

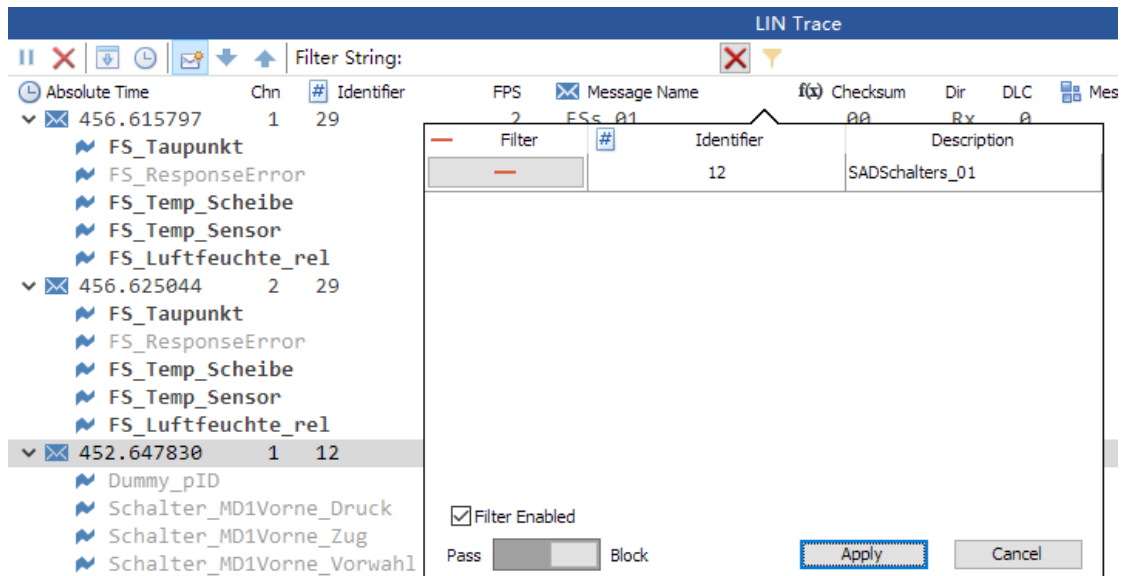


Fig 66 Trace message identifier filter

The trace message identifier filter works under either of the two conditions:

3. Block mode Pass Block

The message identifier in the list will be blocked, and other message will pass the filter. In the above picture, only 0x12 will be blocked, while other message identifiers will be displayed in the trace window.

4. Pass mode Pass Block

The message identifier in the list will be passed, and other message will be blocked. In the following picture, only 0x12 will be refreshed in the trace list:

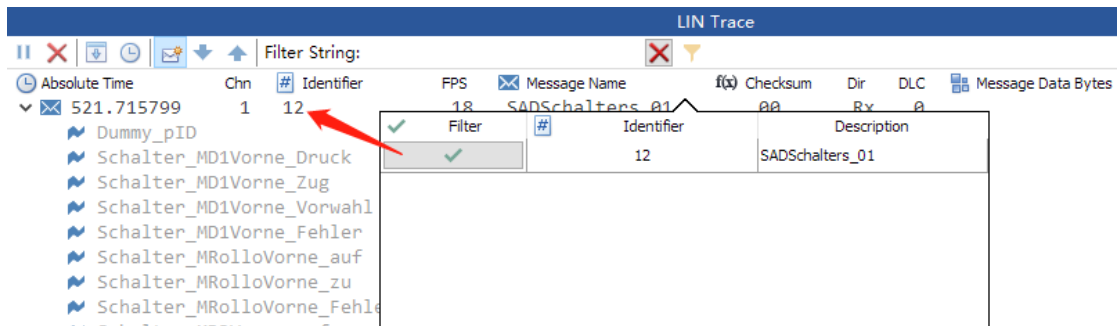


Fig 67 Message identifier filter working in pass mode

To add or delete message identifiers in the list, just right-click on the empty area of the list, you will see the following popup menu items:

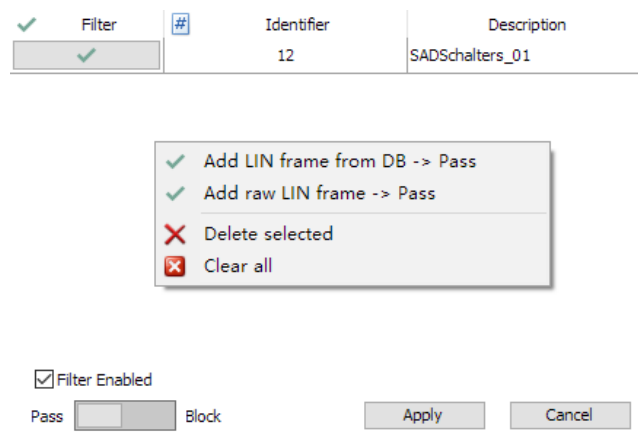
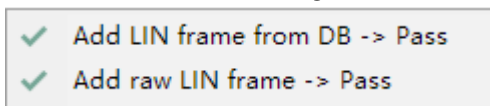


Fig 68 Add or delete message identifiers in the list



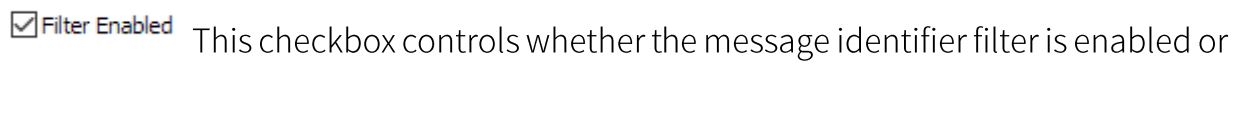
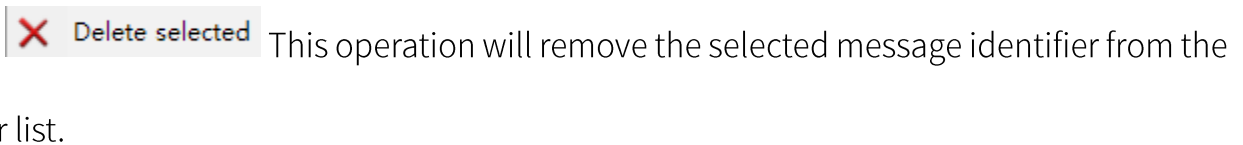
Add LIN frame identifiers from database or on the

fly. These added message identifiers will be passed to the trace list. These menu items will be shown when the filter is in pass mode.



These added message identifiers will be blocked and will not be displayed in the trace list.

These menu items will be shown when the filter is in block mode.



1.13.3 Trace list columns

Absolute Time: Absolute measurement time in seconds, this is the default time display format. The absolute time or message will be displayed in this column.

Relative Time: The relative time indicates the time in relation to the preceding message. In chronological mode this is the message received directly before the current message, whereas in fixed position mode the relative time is displayed in relation to the previous message of the same type.

Chn: The channel number of the message.

Identifier: LIN message identifier.

FPS: Frames per second, this column displays the frame rate of specific identifier.

Message Name: The name of the message defined in the database.

Checksum: LIN frame checksum value read by tool.

Dir: Direction of the LIN message, can be Tx (transmit) or Rx (receive)

DLC: Data length code from LIN messages.

Message Data Bytes: Each data byte of the message.



Fig 69 Message data bytes with index starting from 0

1.13.4 Trace Signals Display

Trace signals can be expanded if a message is defined in the loaded LIN database:

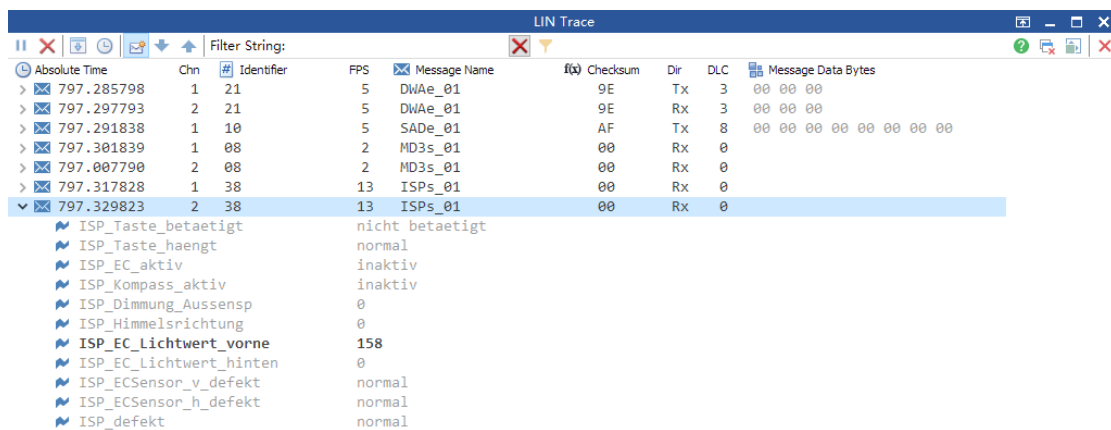


Fig 70 Signals with updated values highlighted

1.13.5 Popup Menus

Most of trace popup menu items can be found in trace toolbar except “Copy” and “Block selected message” :

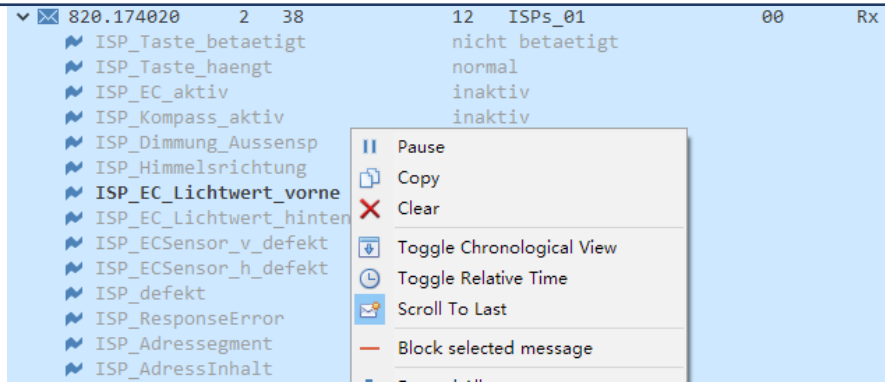


Fig 71 Trace popup menu

To copy the trace lines, the user has to select certain trace lines and then click the “Copy” item. The selected text has the same layout as trace display:

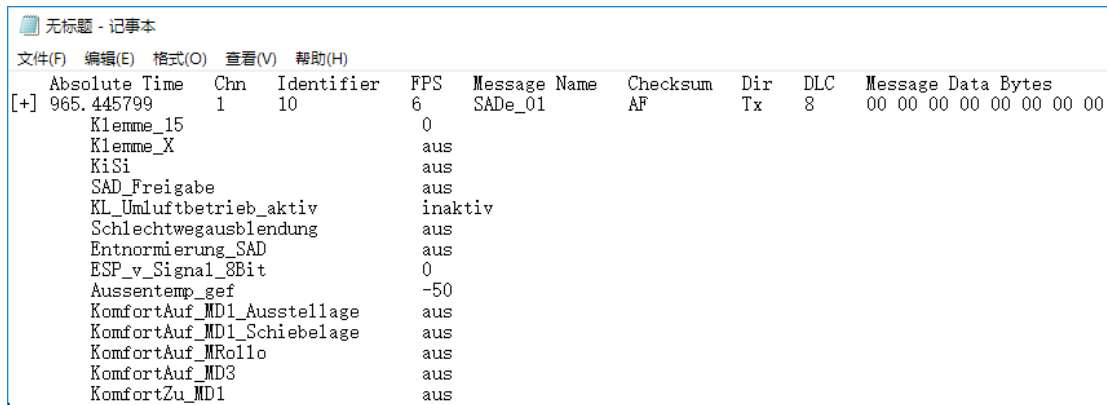


Fig 72 Selected trace lines in text

1.14 LIN Transmit

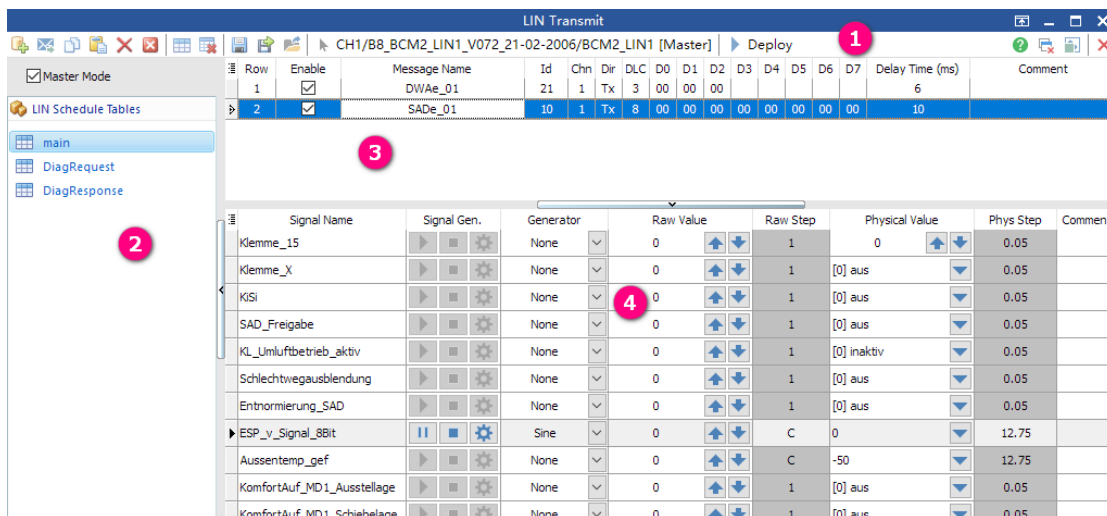


Fig 73 LIN Transmit

1.14.1 Transmit toolbar

 Add a LIN message from database.

 Add a raw LIN message directly into transmit list, which can be freely modified.

 Copy selected LIN messages into clipboard, which can be pasted into current transmit list.


 Paste the copied LIN message from clipboard into the current transmit list.

 Delete the selected LIN messages from current list


 Remove all the LIN messages from current list.


 Add a new schedule table.


 Delete the selected schedule table including its messages and signals.

 Save the current transmit list to an external file. For the first time a save dialog box appears for the user to specify destination file. The following save operations will overwrite this file.

 Export the current transmit list to an external file.

 Load transmit list from external file, this operation will overwrite all the existing transmit list.

 Select LIN node, this will popup a LIN database window for the user to choose LIN node. After a LIN node is selected, the message list and schedule tables are associated with this node for simulation.

 Deploy the schedule table into the hardware. The LIN hardware will automatically perform LIN message transmission.

- Undeploy all LIN messages. When this button is clicked, the scheduled LIN frames in the hardware are stopped.

1.14.2 LIN schedule table list

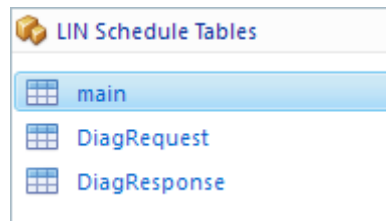


Fig 74 LIN schedule tables

The LIN schedule table list displays all the schedule tables of the current master node. If the current LIN node is not LIN master, this page is automatically hidden. Select one item in the list will display all the frame list on the message list.

1.14.3 Transmit list

The transmit list contains messages to be edited, each message has the following properties:

Row: The number of each transmit message in ascending order, this field is read-only and cannot be edited.

Enable: Activate or deactivate the current LIN frame.

Message Name: The name of the message, if this message is added from LIN database, then the message name is defined by LIN database and cannot be modified by user; if this message is added manually, then the name of the message can be freely altered by user.

Id: Identifier of LIN message.

Chn: The channel number of LIN message.

DLC: Data length code of the LIN message, which can be within range 0~8.

D0~D7: LIN data frame data byte editors.

Delay Time (ms): LIN frame transmit delay time in milliseconds.

Comment: User can edit the comment of each LIN frame.

1.14.4 Signals list

Signals list displays editors for modifying signal properties of the selected LIN message defined in LIN database. The raw LIN messages do not have signals list editors.


































Signal Name	Signal Gen.	Generator	Raw Value	Raw Step	Physical Value	Phys Step	Comment
Klemme_15	  	None	0	1	0	0.05	
Klemme_X	  	None	0	1	[0] aus	0.05	
KSi	  	None	0	1	[0] aus	0.05	
SAD_Freigabe	  	None	0	1	[0] aus	0.05	
KL_Umluftbetrieb_aktiv	  	None	0	1	[0] inaktiv	0.05	
Schlechtwegausblendung	  	None	0	1	[0] aus	0.05	
Entnormierung_SAD	  	None	0	1	[0] aus	0.05	
ESP_v_Signal_8Bit	  	Sine	0	C	0	12.75	
Aussentemp_gef	  	None	0	C	-50	12.75	
KomfortAuf_MD1_Ausstellage	  	None	0	1	[0] aus	0.05	
KomfortAuf MD1 Schiebelage	  	None	0	1	[0] aus	0.05	



Fig 75 Signals list of the selected LIN message

1.14.4.1 Signal Name

The signal name defined in the LIN database.

1.14.4.2 Signal Gen.

The signal value generator feature, which has three buttons for sending and configuring the value changing behavior of each LIN signal:

-  Start generating of the current signal. Once this button is clicked, the button changes to “Pause” button shown below.
-  Pause button, once this button is clicked, the current LIN signal generator pauses, the button then changes back to “Send” button shown above.


-  Stop button, a click on this button stop the operation of the current LIN signal generator.

1.14.4.3 Generator

This combobox specifies the generator type of the current LIN signal, which is described in “CAN Transmit Window” .

1.14.4.4 Raw Value

Raw value editor of the current selected signal. To modify a signal’ s raw value without touching its physical value, use this editor.


 Increment and decrement button of the raw value. Clicking on the corresponding button increments or decrements the raw value by the step defined on the “Raw Step” field.

1.14.4.5 Raw Step

The increment or decrement step of the “Raw Value” field.

1.14.4.6 Physical Value

Physical value editor of the current selected signal. To modify a signal’ s physical value without touching its raw value, use this editor.

 Increment and decrement button of the physical value. Clicking on the corresponding button increments or decrements the physical value by the step defined on the “Phys Step” field.

1.14.4.7 Phys Step

The increment or decrement step of the “Physical Value” field.

1.14.4.8 Comment

User comment on the specified signal.

1.15 LIN Database

LIN database viewer can be used to load/unload LIN database, select LIN messages or LIN signals in the TSMaster application.

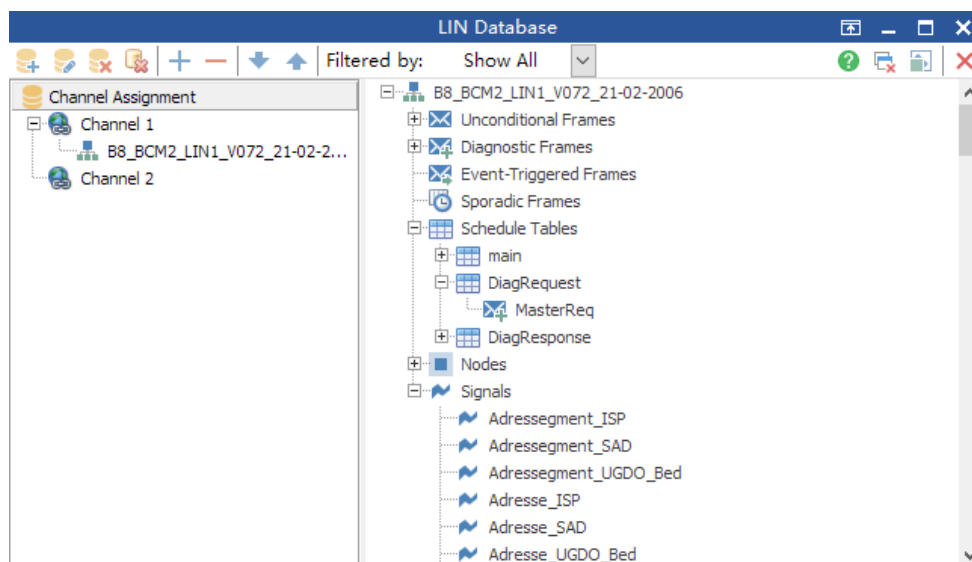







Fig 76 LIN Database

1.15.1 LIN database toolbar

-  Add a LIN database from external *.ldf file
-  Edit the current selected database (*.ldf file) using default editor on this computer
-  Delete the current selected database from the database list
-  Delete all the database links from the database list
-  Increase a channel resource for database file mapping

- Decrease a channel resource for database file mapping
- ↓ Expand all nodes in the database treeview
- ↑ Collapse all nodes in the database treeview

Filter by: database element filter, can be the following for user to select in database element selector mode:

- Show All: all the database elements will be displayed in the treeview
- LIN Signal: Only LIN signals are displayed
- LIN Message: Only LIN messages are displayed
- LIN Node: Only LIN nodes are displayed
- Environment Variable: Only environment variables are displayed

1.15.2 LIN database channel assignment

LIN database channel assignment enables the user to associate the selected database with specific LIN channels. A LIN database can support only one LIN channel, or multiple channels.

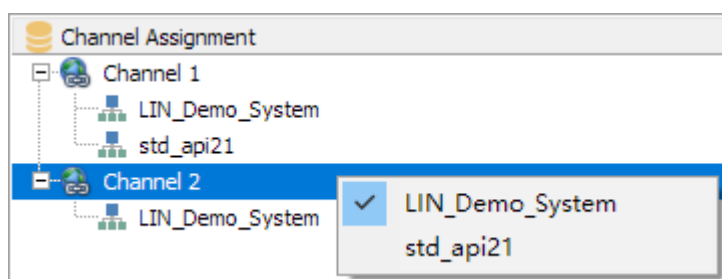


Fig 77 Channel assignment

When there are multiple database files loaded, the user may right-click on the specific LIN channel, which pops up a list of available LIN databases. The user can associate / deassociate the database with the currently selected LIN channel by clicking on the

database item in the popup menu.

1.15.3 LIN element treeview

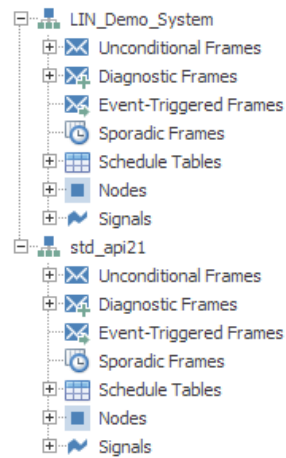


Fig 78 LIN element treeview

The LIN element treeview displays all the loaded LIN database information including LIN network, LIN signals, LIN messages, LIN nodes, LIN schedule tables and Environment variables.

1.16 TS Channel Mapping

TS channel mapping window is a tool for the management of hardware and logical channel mappings.

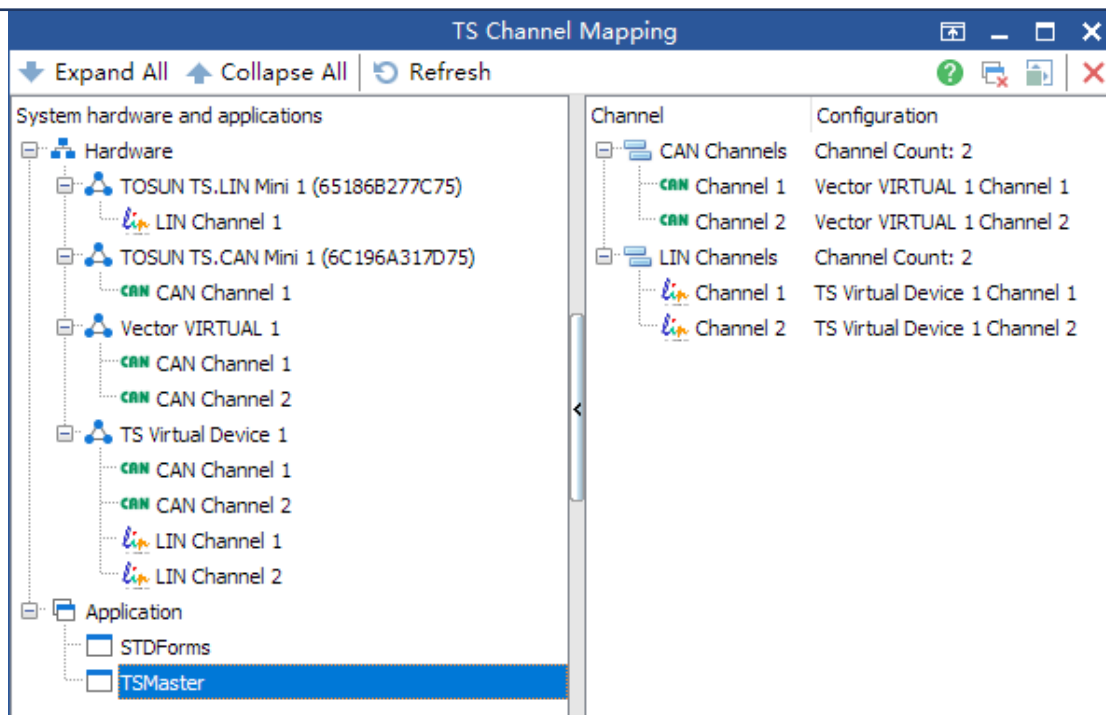


Fig 79 TS Channel Mapping

1.16.1 TS Channel Mapping toolbar

- Expand all the tree nodes of hardware list.
- ⬆ Collapse all the tree nodes of hardware list.
- 🔄 Refresh hardware channel and logical channel lists.

1.16.2 Hardware channel and application list

The list has two main groups: hardware channels and applications:

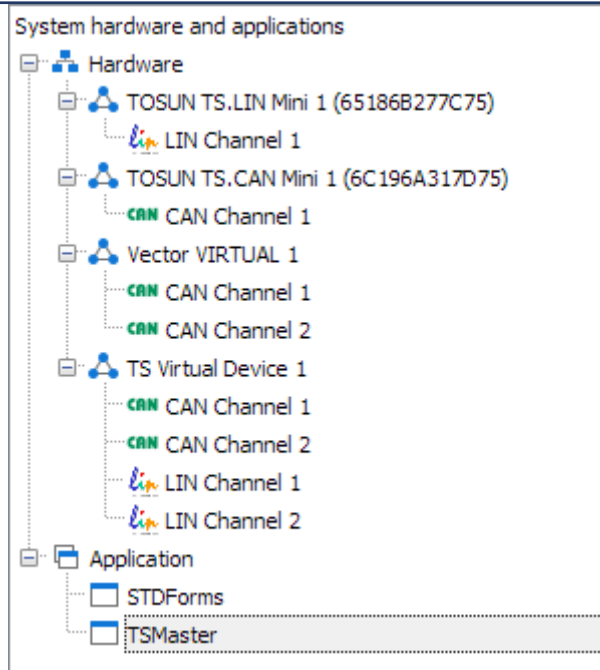


Fig 80 Hardware channels and applications

The hardware list displays each hardware devices and available channels inside the device.

The application list displays all the applications that requires mapping.

1.16.3 Map a hardware channel with a logical application channel

There are several ways for a user to map.

- Right click on the hardware channel

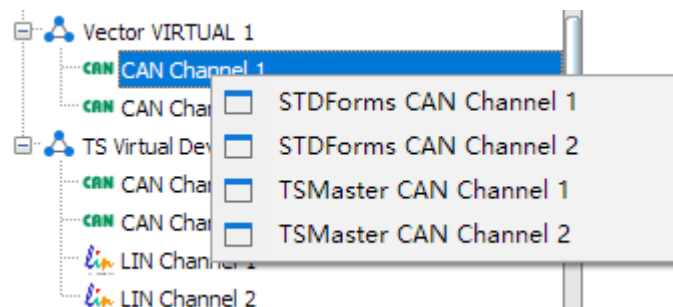


Fig 81 Right click on the hardware channel

- Right click on the application logical channel

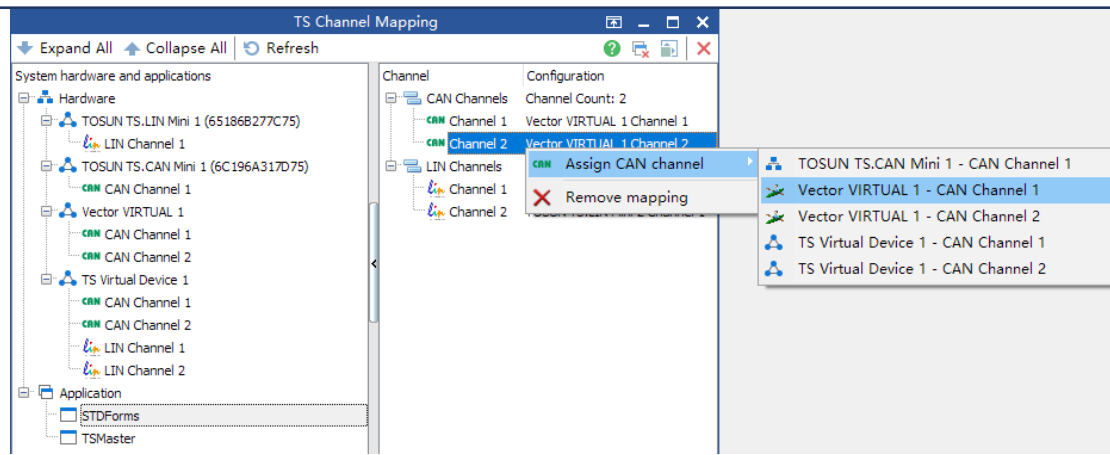


Fig 82 Right click on the logical channel

1.16.4 Add or delete an application

To add a new application, right-click on the “Application” group and select “Add application...” menu item.

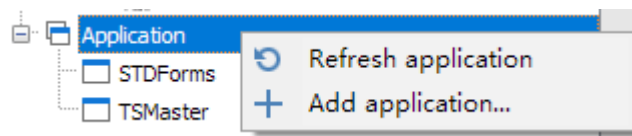


Fig 83 Add a new application

To delete an existing application, right-click on the specified application, and select “Delete application...” menu item.

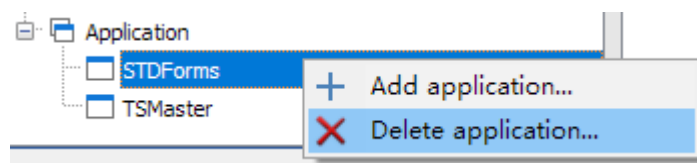


Fig 84 Delete application

1.16.5 Set channel count of a bus type

To set the channel count of a bus type such as LIN bus, right-click on the “LIN channels” group and select “Set channel count” menu item:

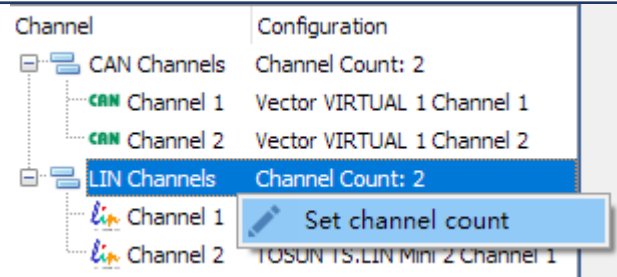


Fig 85 Set application channel count

1.17 Software Configuration

The software configuration controls each application form's status:

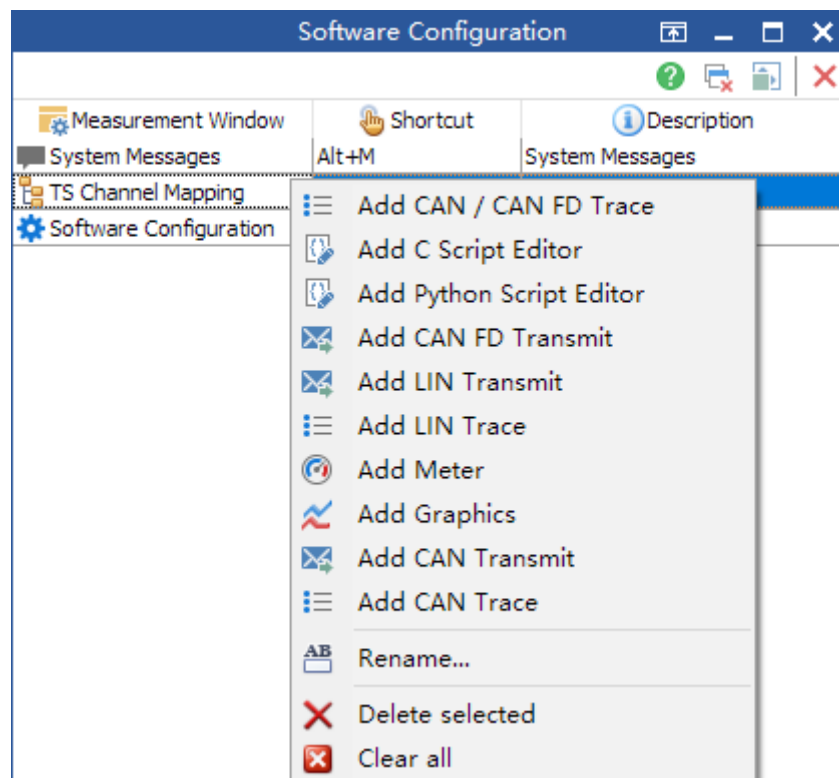


Fig 86 Software configuration

The list contains all the opened application windows. With the help of its pop-up menu, the user can delete the selected window, rename the selected window and also create new window to perform specific tasks.

