SLSS CANAnalyser Pro Software

Users Manual

Based on software version 1.1.0.54L

1. Getting started

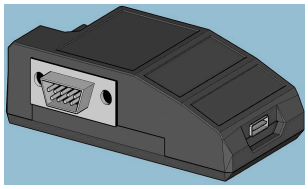
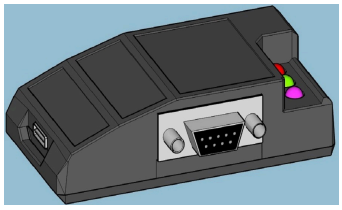
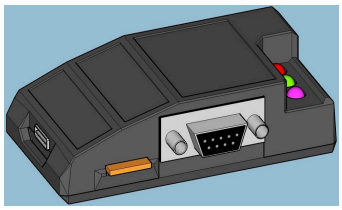
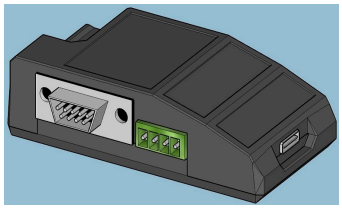
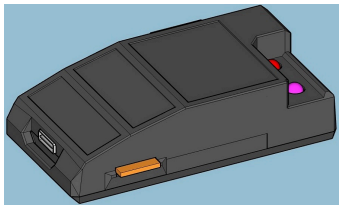
You must use a USB2.0 compatible cable with the CANAnalyser dongles, not a charge-only USB cable.

1.1. Hardware

For compatibility to the Pro version of SLSS CANAnalyser, please purchase one of our hardware variants.

The latest list of variants can be found online here: https://serosys-tech.com/product-lineup/

Table 1. Supported Hardware Options

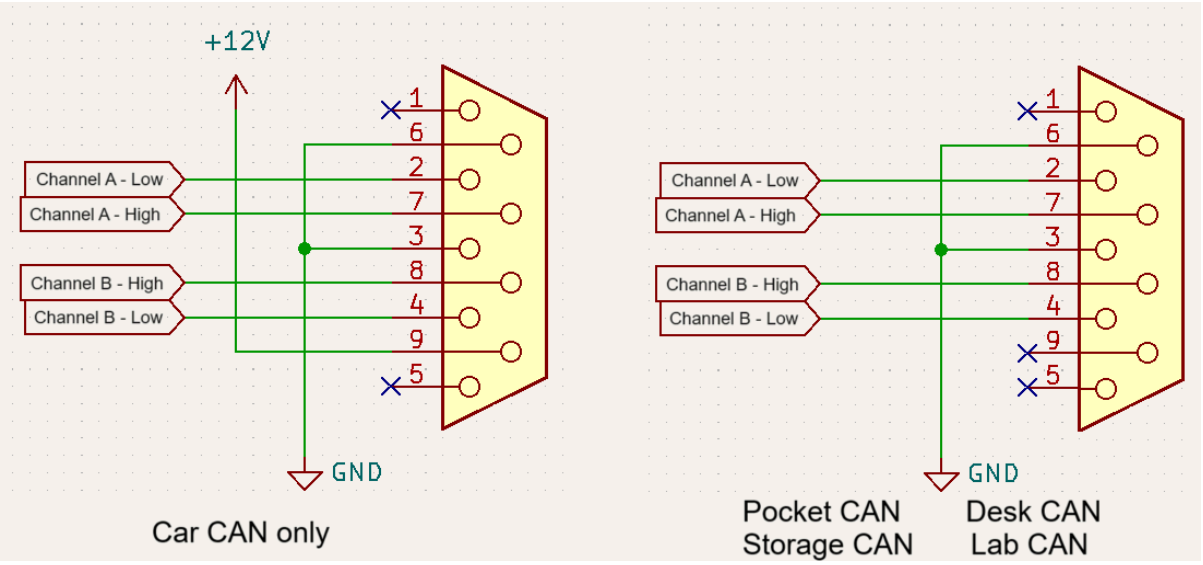
Hardware Model	Basic Feature Information
Pocket CAN 	**Our basic CAN hardware module with many great features at an entry point** Send and Receive messages and export data with limitations on maximum bus messages plus selectable dual CAN bus monitoring and support for CAN DBC import along with graphical analyser and TCP interface and reverse engineering tools
Desk CAN / Desk CAN FD 	**The starting point professional CAN hardware module with more features and power** Upgraded micro offering higher CAN bus traffic support and full dual CAN bus monitoring plus male and female DB9 ports for CAN traffic pass-through bus tapping, CAN message event triggering, macro message sending and API interface. Optional variant with CAN FD
Storage CAN / Storage CAN FD 	**Advanced Features and data storage hardware module for a customized experience** Desk CAN plus a micro-SD reader for recording extended or standalone CAN traffic and the ability to configure the hardware as a CAN gateway. Optional variant with CAN FD
Lab CAN 	**Tailored for a more integrated hardware programmable lab environment including CAN FD** Desk CAN with upgraded support for dual CAN FD and programmable GPIO interface and the ability to configure the hardware as a CAN gateway and comes with an industry standard rack mount bracket
Car CAN 	**A true standalone data logger that can be wired into a vehicle or other test device** Dedicated standalone hardware module with micro-SD card and GPIO intended to interface to a vehicle. It can be programmed to send / receive messages and interface and trigger on GPIO hardware events and comes with a mounting bracket

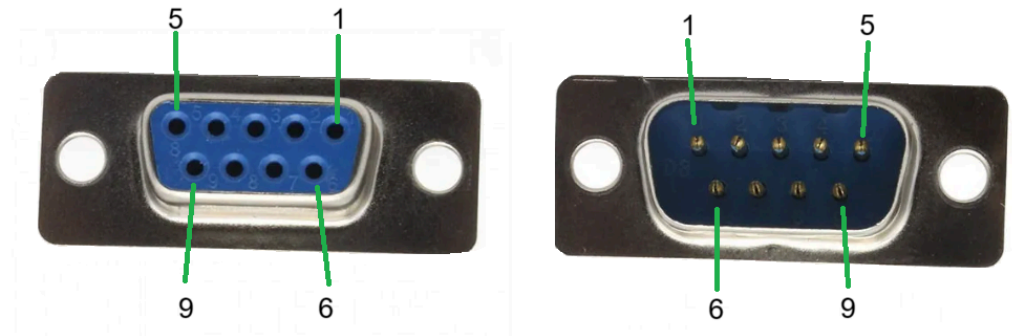
1.2. Connector Pinouts

1.2.1. DB9 (D-sub9) Connector

For Hardware modules with 2 of the 9-pin connectors, the pinout is the same for both Male and Female connectors. They are internally connected pin to pin and will pass through bus traffic even if unpowered.

Pin #	Function
1	No Connection
2	CAN bus CH-A Low
3	Ground
4	CAN bus CH-B Low
5	No Connection
6	Ground
7	CAN bus CH-A High
8	CAN bus CH-B High
9	12V B+ (only on Car CAN. All other variants this is N/C)





Power

- Only available on Car CAN
- Input power voltage supply range: +7 V to +28 VDC (nominal ~= 12 VDC)
- Reverse voltage and transient voltage protection

Ground

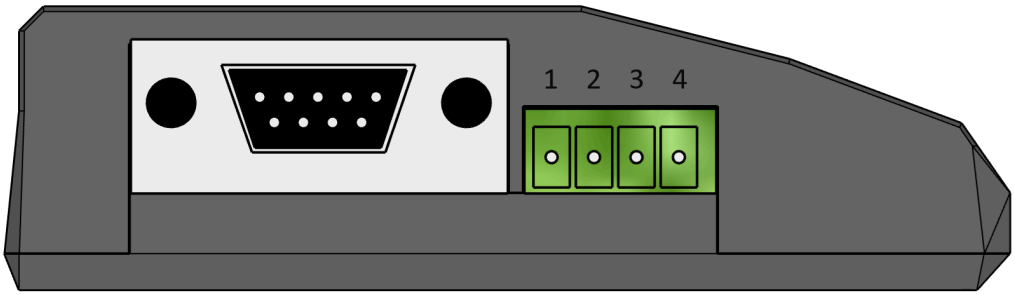
- Ground pins are all connected internally

CAN Bus High / Low

- Even though the differential CAN Bus high and low pins do not require a ground reference, it is recommended that ground is carried with these pins for common-mode voltage rejection to avoid potential damage to the transceivers

1.2.2. GPIO Connector

Applicable to Lab CAN and Car CAN dongles only



GPIO pins 1 and 2 are inputs

GPIO pins 3 and 4 are outputs

Electrical Parameters

- Automotive grade I/O
- Short Circuit Protection on all 4 pins
- At overtemperature the regulator is automatically turned off by the integrated thermal protection circuit
- Inputs from -43VDC to 45VDC
- Outputs provide up to 100mA steady state at CMOS logic levels (0V / 5V)
- Output supports 60V blocking voltage protection
- Outputs support input overvoltage protection to 28VDC

Mating Connector

Pluggable System Terminal Block. There are many suppliers of this style of connector. This is one example:

Phoenix Contact	1840382
LCSC Part #	C480547
Package	Pitch=3.5mm

https://www.phoenixcontact.com/en-us/products/pcb-plug-mc-15-4-st-35-1840382

MC 1,5/ 4-ST-3,5 - PCB connector

1840382

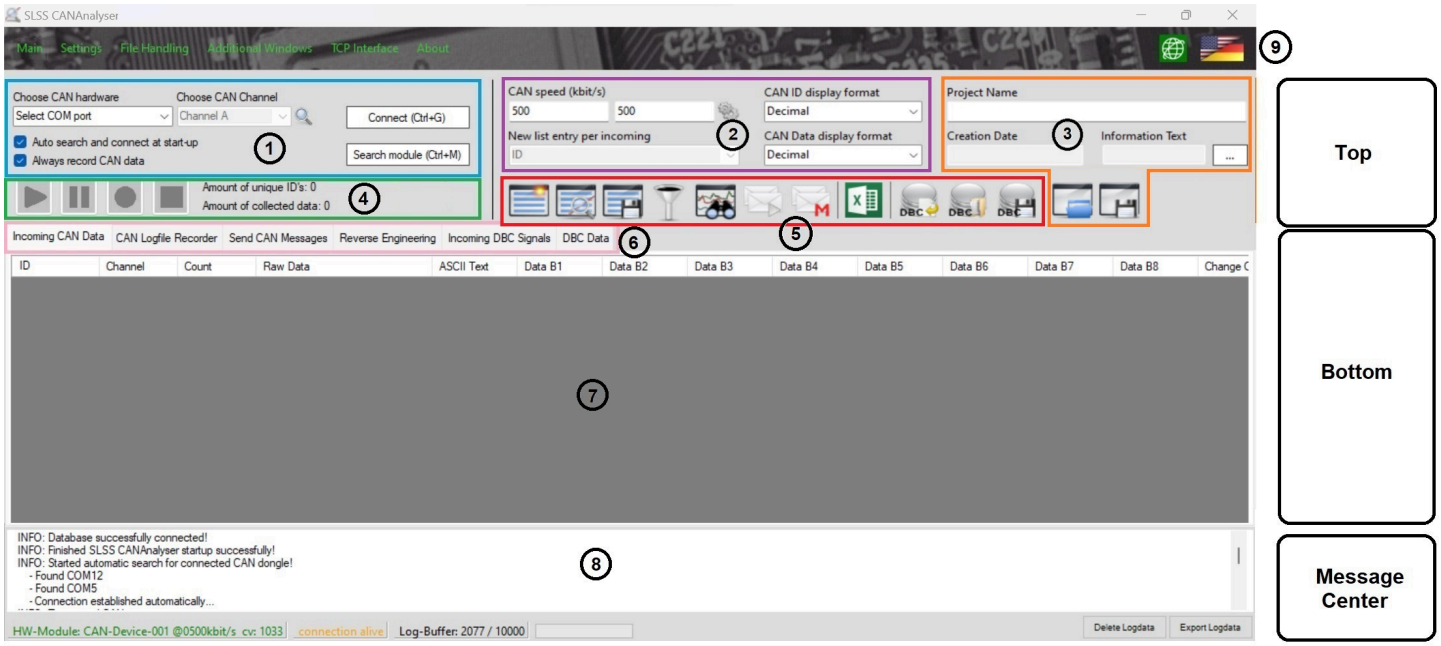
PCB connector, nominal cross section: 1.5 mm^2, color: green, nominal current: 8 A, rated voltage (III/2): 160 V, contact surface: Tin, contact connection type: Socket, number of potentials: 4, number of rows: 1, number of positions: 4, number of connections: 4, product range: MC 1,5/..-ST, pitch: 3.5 mm, connection method: Screw connection with tension sleeve, screw head form: L Slotted, conductor/PCB connection direction: 0 °, plug-in system: COMBICON MC 1,5, locking: without, mounting: without, type of packaging: packed in cardboard

2. SLSS CANAnalyser Software

If desired to use more than 1 dongle on the same PC, please note that multiple instances of the CANAnalyser software may be run at once! So if you want to connect 2 dongles, you can run the SW twice.

To ensure all buttons are accessible and all information is visible, a minimum resolution of 1366 x 768 at 100% scale is required.

2.1. The Main Screen Layout



The screen is broken into 3 main vertical regions: Top, Bottom and Message Center.

The Top area contains all the common functions that transpose into the bottom feature tabs and will be context adjusting based on which feature tab is open in the bottom. You will always have all the required controls within reach that are agnostic of which feature tab is open.

The Bottom area shows the CAN traffic or gives you access to the various functions within each feature tab.

The Message Center area shows general log information and other important information.

Here is a description of each of the numbered zones on the main screen:

1. This is the area where all the module hardware physical connection options are made
2. This area controls the CAN connection speed and channel modes and lets you choose the format you want to see and record all data
3. The place to record information about your project that you desire to save notes and give titles and information for future reference. By default, a directory will be created and used under **Documents\SLSS CANAnalyser Projectspace**
4. Allows the user quick button access for recording / playing / pausing CAN data in the logger and shows the amount of traffic

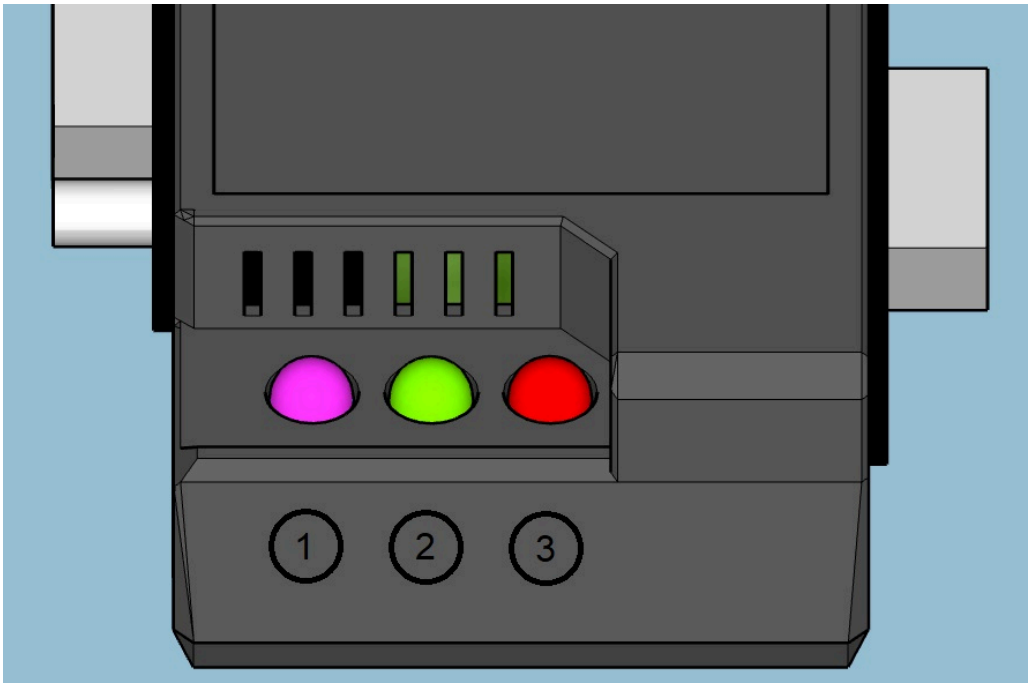
5. These buttons are unique and context specific in most cases to the currently selected feature tab plus fixed buttons for the CAN DBC file input as well as access to the visual graphical analyser and message filters and offers global access to send / stop sending CAN messages from any mode as well as entering Macro sending mode
6. This is where to select the desired feature tab
7. This is the Bottom area where all relevant information is displayed related to the respectively selected feature tab
8. This is the Message Center area which shows information such as the connection status, hardware module information and connection speed and message buffer usage.
9. The software should install and start in English by default, however if a user desires to change the operating language to German, simply left-click on the flags to alternate between English and German language.

> If the connection status (Connection Alive message in the bottom of the screen) is red then your PC has low resources. Please close other applications for improved performance.

2.2. Understanding the LEDs on the CAN Dongles

All hardware modules except for Car CAN have 3 dual colored LEDs.

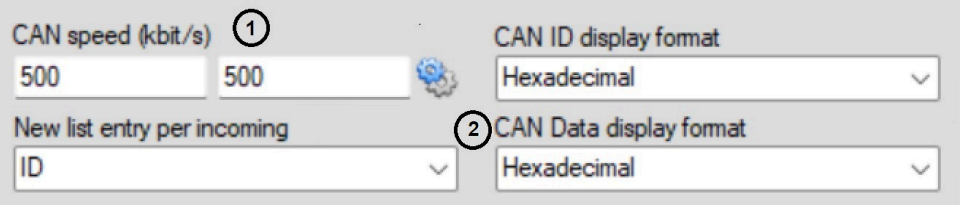
> Car CAN has only 2 LEDS as Car CAN only supports a single CAN bus node.



1. LED 1 - Power and Connection - **Solid Red** - Hardware module is powered up. - **Blinking purple** - Hardware module has an active live connection to the software.
2. LED 2 - CAN bus CH-B - **Green** - Incoming CAN traffic received. - **Red** - Outgoing CAN traffic is being sent. - **Amber** - Incoming and Outgoing traffic
3. LED 3 - CAN bus CH-A - **Green** - Incoming CAN traffic received. - **Red** - Outgoing CAN traffic is being sent. - **Amber** - Incoming and Outgoing traffic

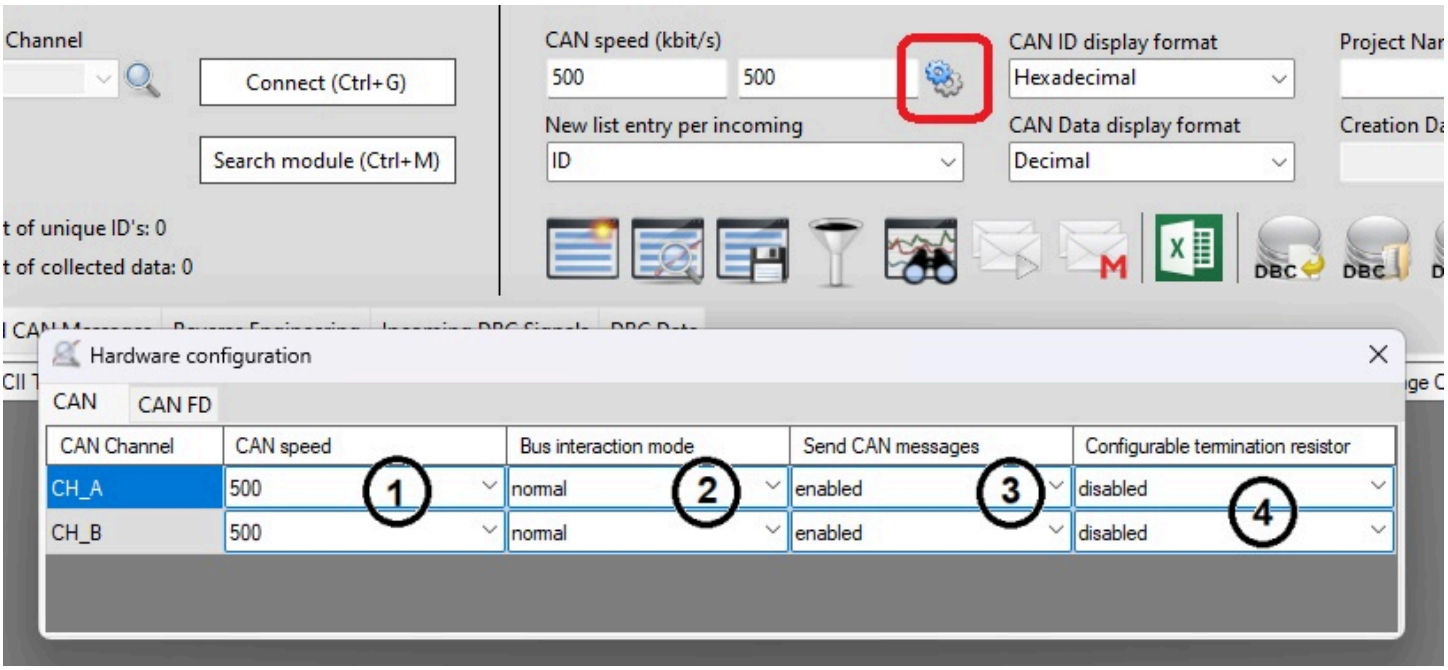
2.3. Establishing the Connection Between Software and CAN Dongle

2.3.1. Connection Speed, Connection Mode and List Entry Style



1. Shows the Connection Speed for each channel. The speed and mode can be changed from here
2. Select the option from drop-down menu to view Incoming Messages either by unique ID's or by pure scrolling messages
   - ID - Only 1 unique ID row is shown in all the data available in the Incoming CAN data tab and just the data changes
   - Data - Every message received is shown in a unique row similar to the logged data so the same ID may be seen multiple times.

2.3.2. Set the Connection Speed and Connection Mode for each Independent Channel



Press the image of the gears to open the Hardware Configuration window. The Connection Speed and Connection Mode for each channel can be adjusted here.

Settings menu is only accesible when the dongle is disconnected. Make the desired changes and then reconnect.

1. The drop-down menu lets you choose from available CAN speeds that are able to be independently set for each channel.

500 kbit/s is the default standard used in most automotive applications (HS-CAN).

2. The drop-down menu lets you choose between normal mode (*Allows full send and recieve interaction on the bus*), Listen Only mode (*Only able to receive bus messages but not able to send*), or Off (*Channel is completely shut off, no receiving or sending possible*).

> In Listen Only mode, if the dongle is connected to a bus that has a single node only, the Incoming data will show a very fast message count. This is because it is not an active multi-node bus. Once there are at least 2 nodes on the bus plus the dongle, it will operate normally. Also, the SW will allow the Sending tab to appear as if it is sending messages, however they will not be sent to the actual bus

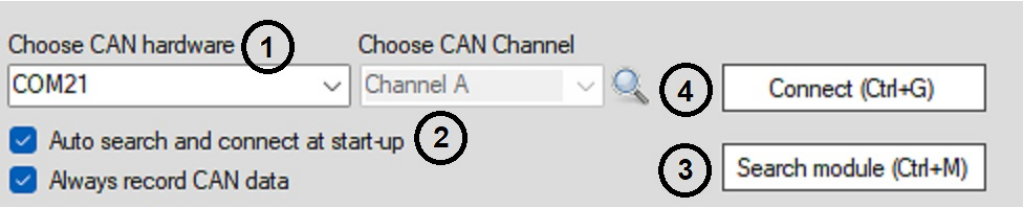
3. The drop-down menu allows the user to lock out or enable each CAN channel from being able to send messages or not. If these are disabled, the Send CAN Messages Tab will not be functional
4. The drop-down menu allows a SW configurable option for enabling or disabling the 120 ohm bus terminating resistor (independently per channel)

> If your hardware dongle has a letter A or B in the serial number, this menu option is non-functional and those hardware units are permanently enabled for 120 ohm termination resistance

2.3.3. Connecting to the Dongle Hardware

There are a few ways of connecting the hardware module to the software.

Please make sure you are using a USB 2.0 data cable and that the **Solid Red** color LED is lit up before trying to connect.



Manually selecting a COM port and then connecting

1. Select the COM port for your hardware dongle in the drop-down box and then

4. select the Connect button

This will tell the software to look for the hardware dongle on that port. If if finds the hardware and connects to it, the hardware connection LED will begin blinking purple. If it does not find it, please select a different port and ensure the proper USB driver has been installed.

Automatically searching for your hardware dongle after the program has already been loaded

3. Select the Search Module button and let the software automatically search through the available COM ports to find your hardware dongle. If if finds the hardware and connects to it, the hardware connection LED will begin blinking purple. If it does not find it, ensure the proper USB driver has been installed.

> Automatically searching for the dongle may take up to 10 seconds

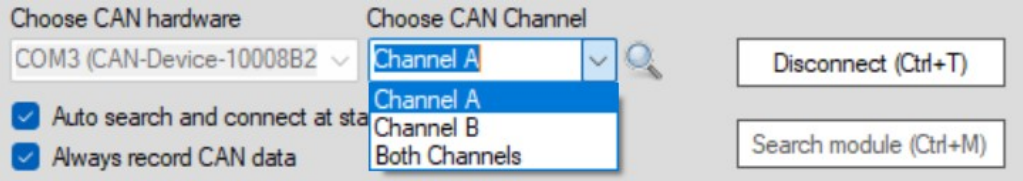
Automatically searching for your hardware dongle upon loading the software

2. If desired, the check-box next to "Auto search and connect at start-up" may be selected. Once selected, the next time the software is loaded, it will automatically search for the hardware dongle upon start-up. If if finds the hardware and connects to it, the hardware connection LED will begin blinking purple. If it does not find it, ensure the proper USB driver has been installed.

> Automatically searching for the dongle may take up to 10 seconds

2.4. Selecting Your Desired CAN Bus to Monitor

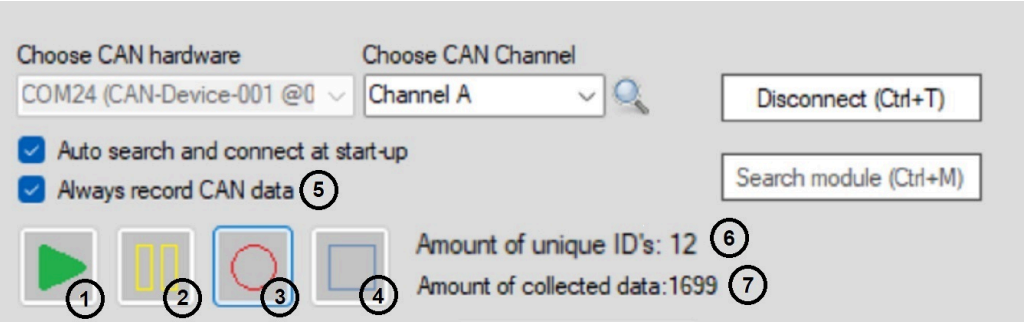
To change between CAN bus monitoring and sending between the CAN channels supported by your hardware.



1. Select the drop-down to choose your CAN channel. Once selected, the software will showing incoming traffic and send outgoing traffic on the specified channel.

2.5. Controlling Recording / Displaying of CAN Traffic

The buttons allow control over the data recording and display as well as the showing of high level data recording quantities



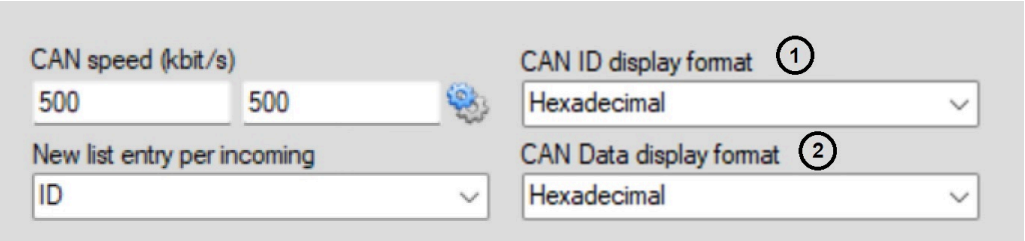
1. The **Play** button is activated by default to show all incoming CAN message data
2. The **Pause** button is used to pause the display and recording of CAN message data
3. The **Record** button is used to record the CAN message data in the buffer
4. The **Stop** button is used to stop the display and recording of CAN message data

> If a DBC file is loaded, a context box will ask if the user desires to enhance the log files. This will take some time to post-process and add all of the DBC human readable signal data to the logfile and will be available in the exports. See the section **Incoming DBC Signals Feature Tab** for more details.

5. If desired, the check-box next to "Always record CAN data" may be selected. Once selected, the next time the software is loaded, it will automatically begin recording available CAN data into the buffer
6. This displays the number of unique CAN arbitration ID’s seen on the incoming data bus
7. This displays the total quantity of messages received

2.6. Selecting the Global Data format to view CAN ID and CAN Data

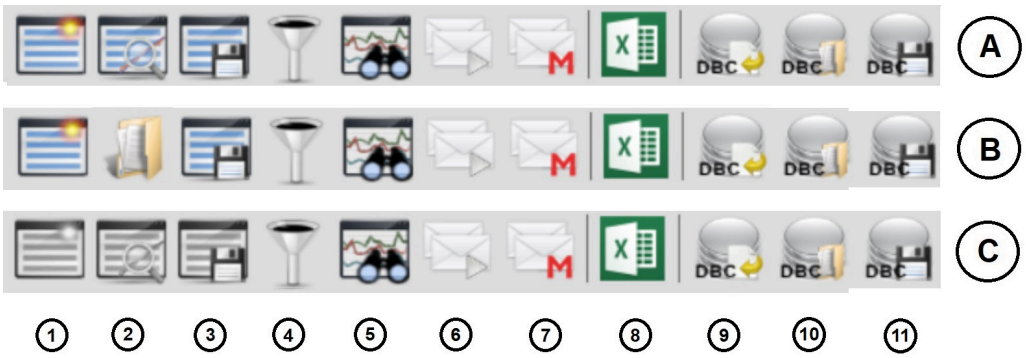
These 2 drop-down menus allow the user to select their prefered data format used throughout all feature tabs and data exports.



1. For Arbitration ID (CAN ID), choose between Hexadecimal, Decimal or Binary format
2. For CAN data, choose between Hexadecimal, Decimal or Binary format

2.7. Contextual Buttons and Features

These 9 buttons offer some dynamic functionality. Depending on the selected analysis tab, some buttons dynamically change to fulfill the associated application purpose while others maintain functionality specific to the current analysis tab



Row A. These buttons are available in the following Feature tabs: "Incoming CAN Data" and "CAN Logfile Recorder"

Row B. These buttons are available in the following Feature tabs: "Send CAN Messages" and "Reverse Engineering"

Row C. These buttons are available in the following Feature tabs: "Incoming DBC Signals" and "DBC Data"

Within each row, this is what each button does:

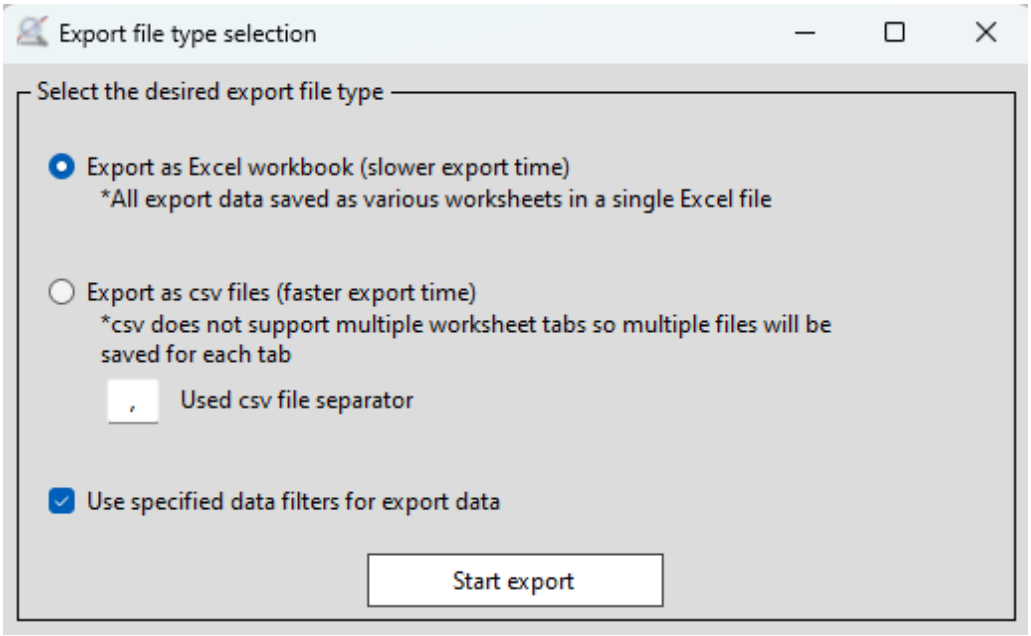
#	**Row A**	**Row B**	**Row C**
1.	Clears the current message list of all data and begins a fresh data view	Clears the current list of messages to be sent	This button is not available
2.	Loads a previously saved list of CAN data and opens it in a separate CAN data viewer window	Loads a list of previously saved data such as CAN messages or reverse engineering data	This button is not available
3.	Saves all currently displayed CAN data	Saves all currently displayed data / configuration	This button is not available
4.	Opens the message filtering setup in a separate window	Opens the message filtering setup in a separate window	This button is not available
5.	Opens the Graphical Analyser Viewer in a separate window	Opens the Graphical Analyser Viewer in a separate window	Opens the Graphical Analyser Viewer in a separate window
6.	Starts or Stops messages in the active Send list from any mode	Starts or Stops messages in the active Send list from any mode	Starts or Stops messages in the active Send list from any mode
7.	Enters Macro sending mode on the bottom of the screen (replacing the message center) **This can be toggled on / off at any time**	Enters Macro sending mode on the bottom of the screen (replacing the message center) **This can be toggled on / off at any time**	Enters Macro sending mode on the bottom of the screen (replacing the message center) **This can be toggled on / off at any time**

#	Row A	Row B	Row C
8.	Exports all data to a choice of CSV format (multiple CSV files) or Excel format (in multiple worksheet tabs)	Exports all data to a choice of CSV format (multiple CSV files) or Excel format (in multiple worksheet tabs)	Exports all data to a choice of CSV format (multiple CSV files) or Excel format (in multiple worksheet tabs)
9.	Opens a separate window to create and manage DBC message entries	Opens a separate window to create and manage DBC message entries	Opens a separate window to create and manage DBC message entries
10.	Loads in a fully created DBC file and applies it to the current messages	Loads in a fully created DBC file and applies it to the current messages	Loads in a fully created DBC file and applies it to the current messages
11.	Saves the current DBC data into a DBC file	Saves the current DBC data into a DBC file	Saves the current DBC data into a DBC file

2.7.1. Exporting Data

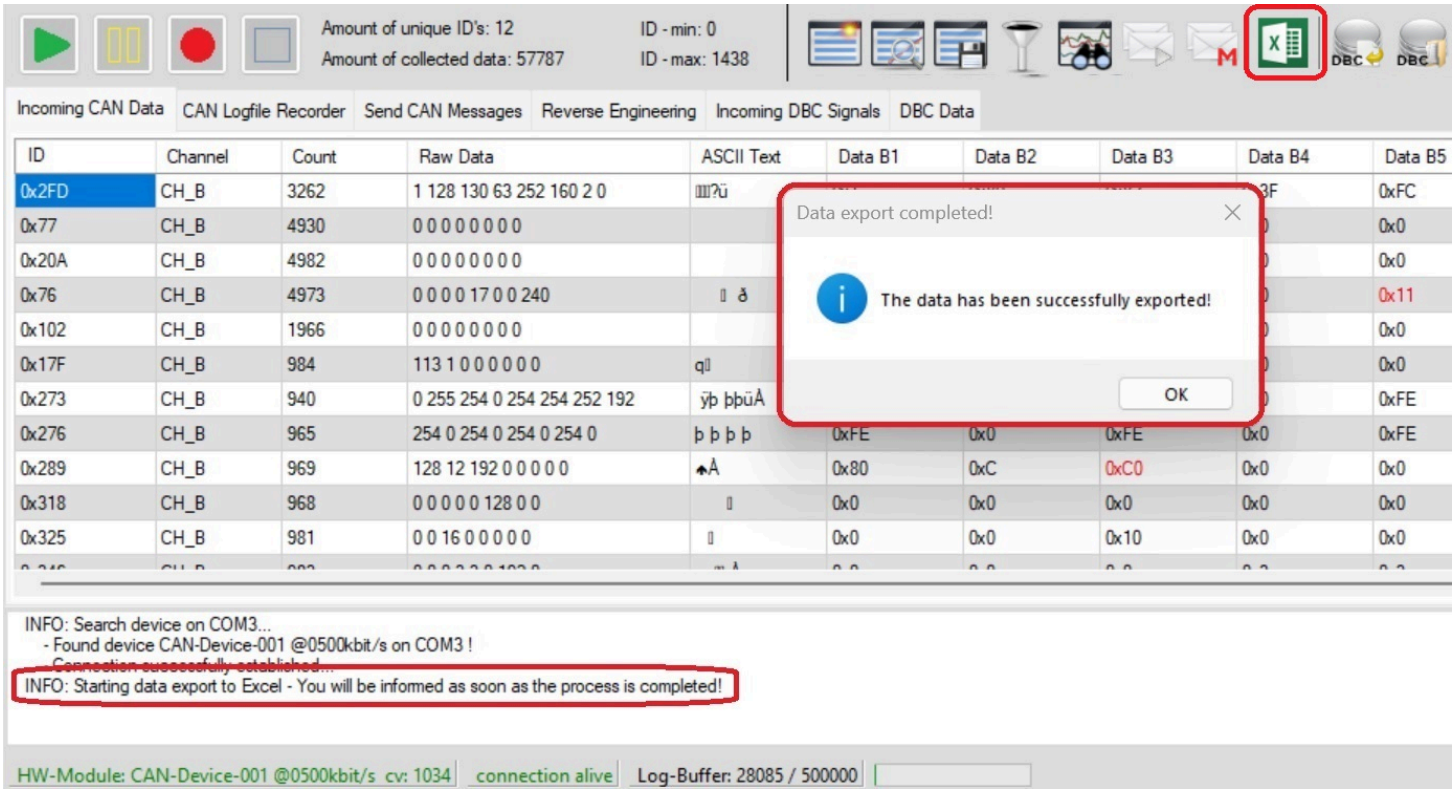
If you have a large amount of buffer data, the export may take a long time. Pressing the export button, if Excel export is chosen, the message center at the lower part of the screen informs the user that the export process has begun. The CANAnalyser software will continue normal operation until the export is completed and then a pop-up message will inform the user when the Export is complete. Avoid pressing the export button again before this process is completed to prevent it restarting the Export request. The CSV export is much faster!

Upon pressing the Export button, there are 2 options presented for Export as Excel or Export as CSV.



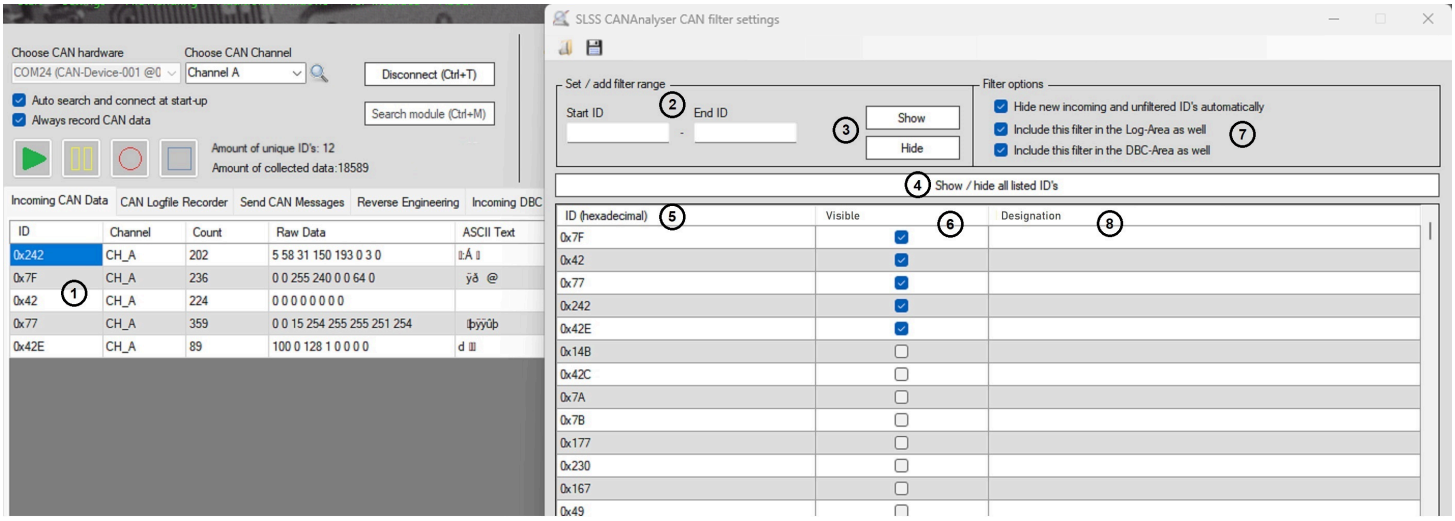
Since CAN data may contain ASCII characters that may conflict with a comma (standard default CSV delimiter), there is an option to choose another delimiting character if desired.

Once the export is completed, this message will be displayed

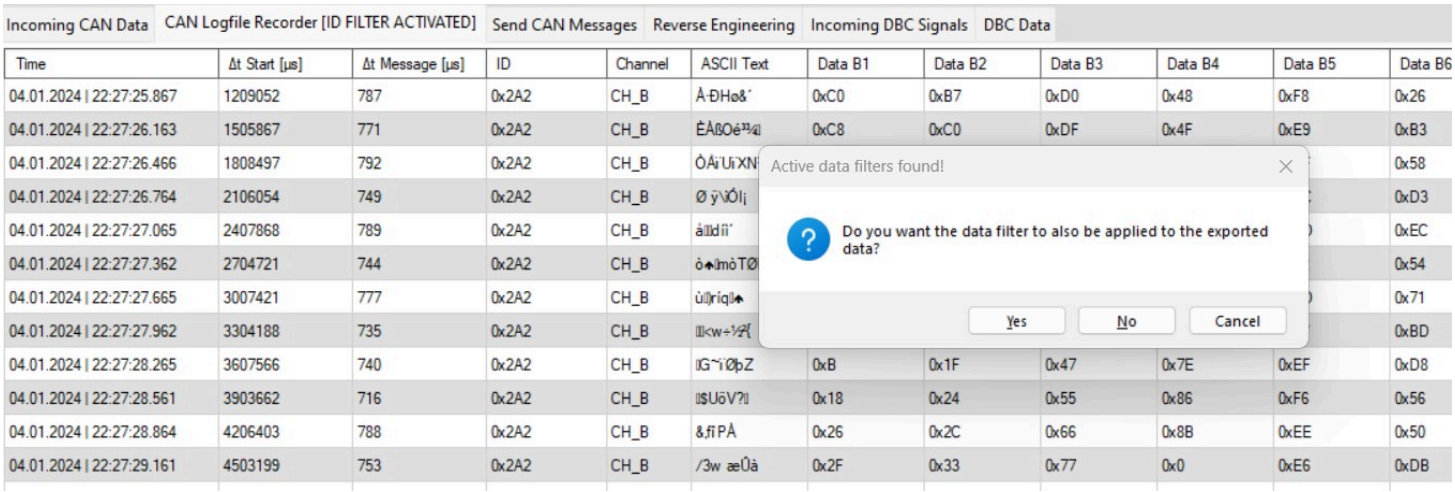


2.7.2. Message Filtering Button

This is a separate window that opens to be able to move to a separate screen or show as a separate window to be able to view the impact of adjusting filter settings on the fly in different feature tabs



1. This is the Incoming CAN Data Feature tab to see the immediate impact of the filters being applied
2. Enter in a single CAN ID or a range (Start ID to End ID) to use as your filter criteria
3. After selecting your CAN ID or CAN ID range, select either **Show** or **Hide** to affect the checkboxes in the table below for visibility of the selected IDs
4. This button can be toggled to **Show** or **Hide** ALL visible ID's (checkboxes) in the table below
5. Lists all current received message ID's on the active bus
6. List of checkboxes to show which ID's will be shown or hidden
7. Checkbox options of where to apply the impact of the filter settings
8. If a CAN DBC file is currently loaded, the human readable designations of the ID's will be shown here for reference

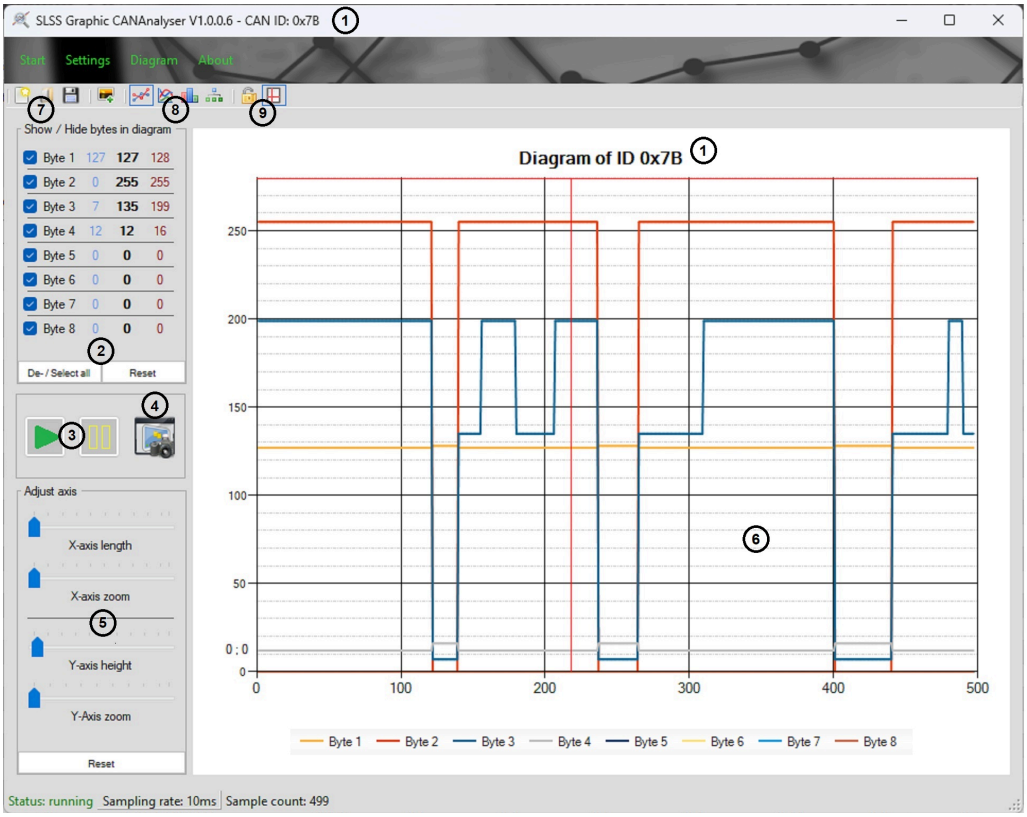


If a filter setting is active at the time that an Export of the log file is requesting, a dialog box will ask if the user only wants to export the filtered data or the entire dataset or to cancel out.

2.7.3. Graphical Analyser Viewer

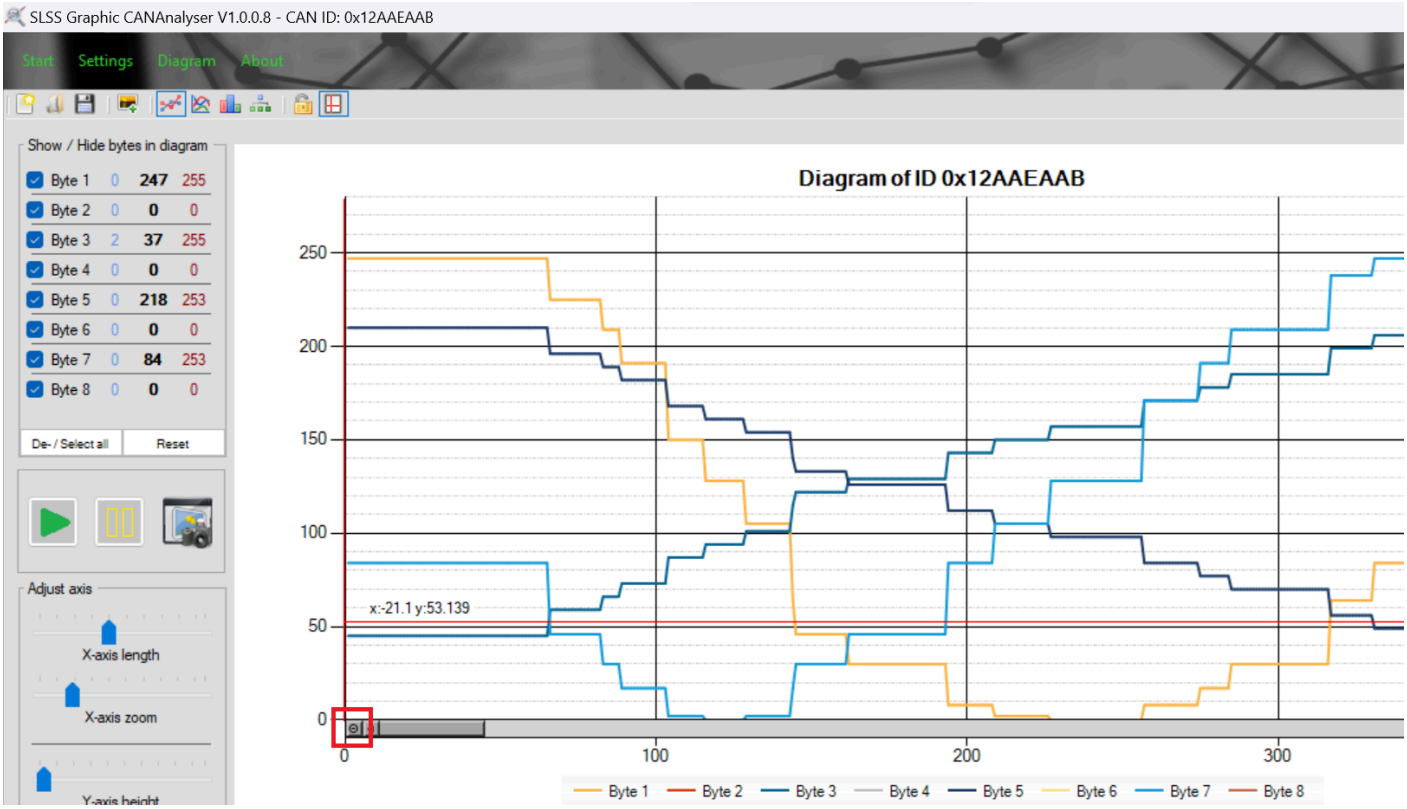
Often it is easier to visually represent data to make it user friendly for simpler data analysis. This simple and adjustable graphical interface allows analysis of data bytes independently and the User can save the graph image / data for future use.

Multiple windows may be opened to view more than one graph. Right-click on a message in the Incoming CAN Data tab will allow a CAN ID to be directly brought up in the graph as well as clicking the contextual button in the top part of the main screen.

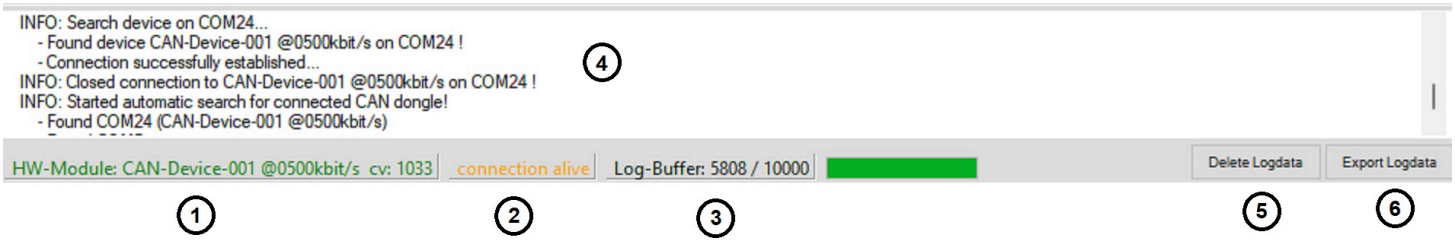


1. This shows the CAN ID identifier.
2. Individual bytes may be enabled / disabled on the graphical viewer as well as buttons to turn them all on / off and reset them.
3. The **Play** and **Pause** buttons are included in the viewer for easy access to pause the Incoming data whenever necessary and then play it again.
4. Pressing this button will export a screenshot of the graph in .PNG image file format.
5. These are adjustment sliders to control the X and Y graph parameters to optimize the view of the data. Please see note below on reseting the zoom level
6. This is the main graphical viewing area. Moving the mouse in this area will also show the X and Y coordinates of the precise position.
7. These buttons allow clearing the graph (new graph data) and loading and saving the data as well as exporting the image file.
8. These buttons allow for different graph formats (standard / spline / area / point).
9. These button allow for hiding the cursor or locking its position.

After changing the X-axis zoom or the Y-axis zoom, to reset the view again, please click the small circle button next to the slider (red box below)

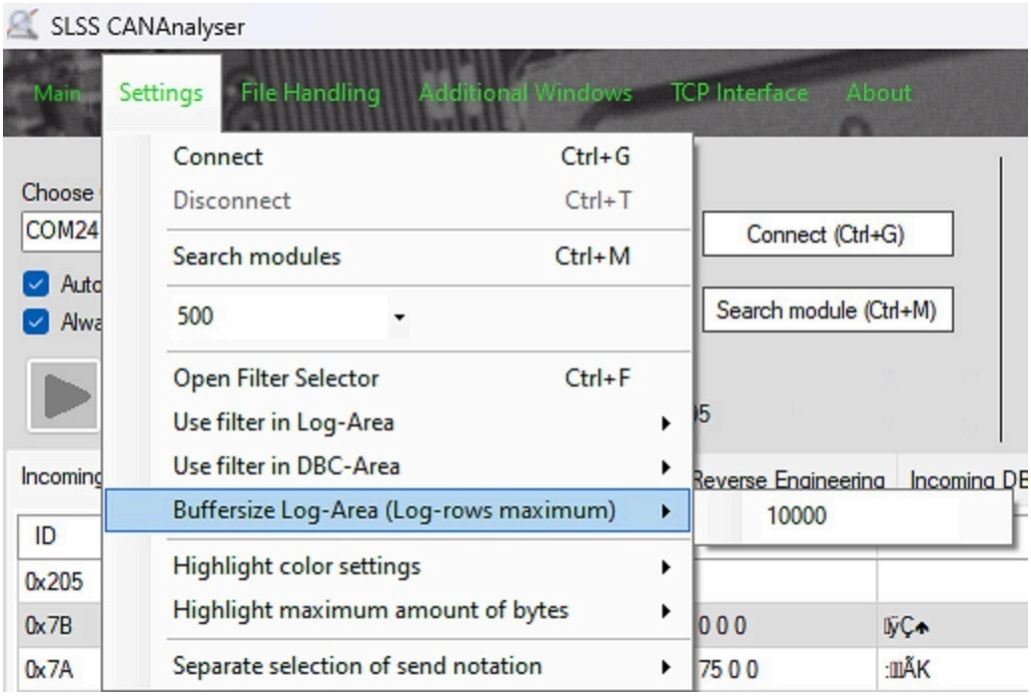


2.8. Message Center Details



1. Hardware module connection information (once connected properly). Otherwise it states that there is no module connected.
2. Displays connection quality (if connected). (Green color / Yellow color / Red color) If Yellow and Red colors are blinking then consider closing other programs to free up system resources.
3. Shows the current log buffer size used and the maximum size. To increase the log buffer size, see next section.
4. Logged Data from the SLSS CANAnalyser. This may be scrolled through (scoll-bar on the right) to view important chronologically listed SW log data
5. Button to clear out the SLSS CANAnalyser log data
6. Button to export the SLSS CANAnalyser log data

2.9. Increase Log Buffer Maximum Size



Going into this menu allows you to increase the maximum recording log buffer size. Note that the larger the log buffer, the longer it takes to save the exported data

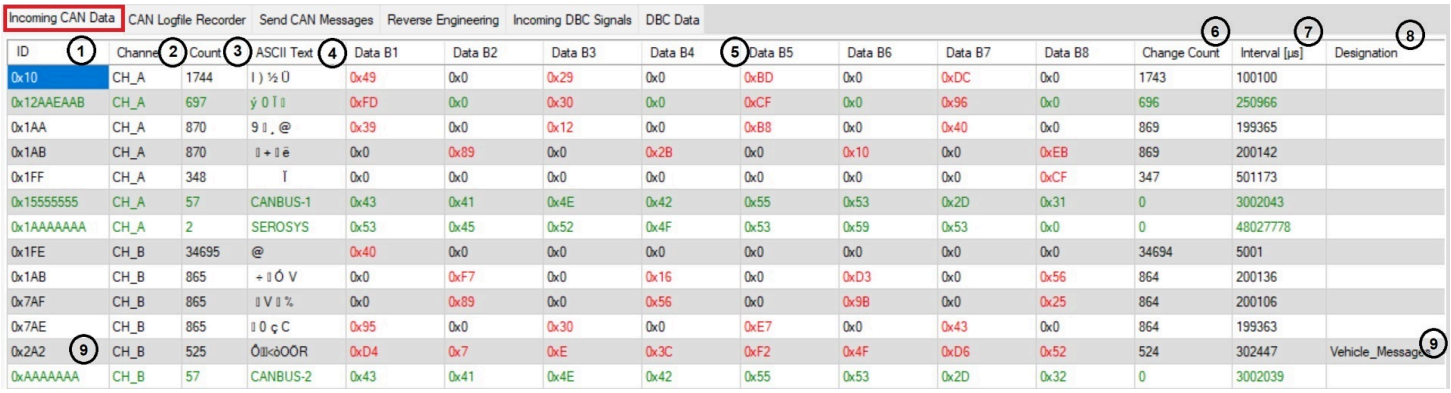
3. Feature Tabs

3.1. Incoming CAN Data Feature Tab

This is the default tab and the most important tab that gives an overview of all current incoming CAN data.

As a general comment on formatting columns, each column may be shrunk or widened to suit individual preferences.

Clicking on the header of each column will also sort the table order based on the column (low to high or high to low)



1. **ID** column - Displays the Arbitration ID of each unique CAN message received or sent (*Note that Pocket CAN does not show sent messages in this chart*)

Extended ID's display the entire row in green color

Standard ID's display the entire row in black color

2. **Channel** - Displays the source of the CAN data for each row:

Channel	Data Source
CH_A	Data received from the bus into the hardware module on CAN bus CH-A
CH_B	Data received from the bus into the hardware module on CAN bus CH-B
SEND_A	Data from the hardware module on CAN bus CH-A
SEND_B	Data from the hardware module on CAN bus CH-B

Pocket CAN limitations: It will only show CH_A or CH_B but not both. It also will not show SEND_A or SEND_B data on the incoming tab. Sent data may only be viewed in the Send Can Message tab.

SEND_A and SEND_B entries will only be shown if the hardware dongle receives an acknowledgement on an active bus. Therefore if the dongle is not connected to a bus where the send function receives verification that the message was sent, these entries will not be shown on this view.

3. **Count** - The count of how many times the CAN ID was sent or received, regardless if there was any change in Byte data.
4. **ASCII Text** - Displays the concatenated ASCII converted data of the current 8 data bytes for the CAN ID.
   Note that to display certain ASCII special items, this is the nomenclature to represent these special characters:

[CR] = carriage return
[LF] = line feed
[SC] = semicolon

5. **Data B(x)** - 8 columns showing the current 8 data bytes for the CAN ID. (*Note the red colored entries. This is the changing byte highlighting. This will be described in more detail in the next sub-section*)
6. **Change Count** - The count of how many times the data changed for this CAN ID
7. **Interval (us)** - The time delta in microseconds between the last 2 times this CAN ID was received or sent
8. **Designation** - Human readable message name of the CAN ID. *This only populates if a valid CAN DBC has been loaded*
9. If a valid CAN DBC is loaded and the Designation is shown, clicking on the CAN ID will expand that Designation box to show the human readable CAN signals for that row. Note only one row shows at a time. (see image here)

ID	Channel	Count	ASCII Text	Data B1	Data B2	Data B3	Data B4	Data B5	Data B6	Data B7	Data B8	Change Count	Interval [µs]	Designation
0x1AB	CH_A	8255	6 ¡ 8 ¢	0x0	0x36	0x0	0xA1	0x0	0x38	0x0	0xA2	8254	199896	
0x10	CH_A	16510	˚ ▯ ▯ >	0xB0	0x0	0x8D	0x0	0x15	0x0	0x3E	0x0	16509	99939	
0x1AA	CH_A	8255	Ó ▯ t Ý	0xD2	0x0	0x1B	0x0	0x74	0x0	0xDD	0x0	8254	199882	
0x12AAEAAB	CH_A	6603	▯ Ê 6	0x96	0x0	0xC9	0x0	0x36	0x0	0x2	0x0	6602	249391	
0x1FF	CH_A	3301	▯	0x0	0x0	0x0	0x0	0x0	0x0	0x0	0x98	3300	498720	
0x1FE	CH_B	329987	X	0x58	0x0	0x0	0x0	0x0	0x0	0x0	0x0	329986	4993	
0x1AB	CH_B	8249	¯ ▯ ¬ O	0x0	0xA8	0x0	0x83	0x0	0xAC	0x0	0x4F	8248	199890	
0x7AF	CH_B	8249	▯ ▯ V ö	0x0	0x9C	0x0	0x3	0x0	0x56	0x0	0xF6	8248	199894	
0x7AE	CH_B	8249	y ▯ ¬ ▯	0x79	0x0	0x97	0x0	0xAC	0x0	0x15	0x0	8248	200491	
0x2A2	CH_B	5188	¡ÇÁßèÎNÚ	0xA1	0xC7	0xC1	0x26	0xE8	0xCF	0x4E	0xDA	5187	300631	Vehicle_Messages * KPH: 511.050 * RPM: 2,480.250 * BAT_VOLTS: 13.920 * TRANS: Drive
0x15555555	CH_A	550	CANBUS-1	0x43	0x41	0x4E	0x42	0x55	0x53	0x2D	0x31	0	2999949	
0xAAAAAAA	CH_B	310	CANBUS-2	0x43	0x41	0x4E	0x42	0x55	0x53	0x2D	0x32	0	6465653	

Byte Highlighting

This feature allows a visual aid to more easily detect the changing of data bytes. There are 2 styles used in this software.

Color changing of the data

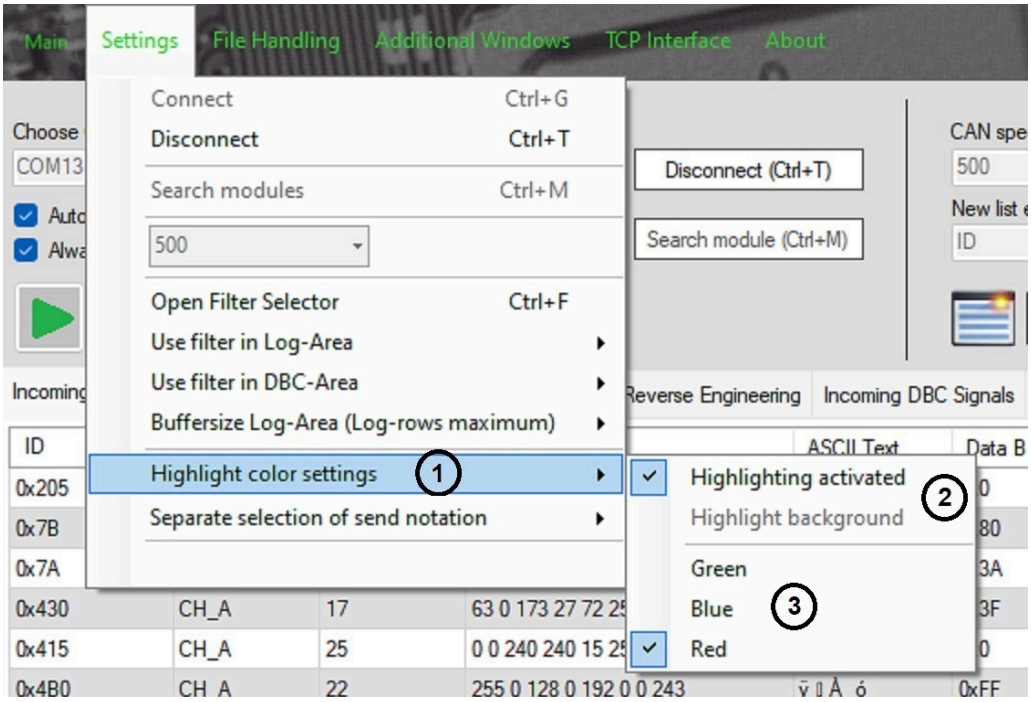
Data B1	Data B2	Data B3	Data B4	Data B5	Data B6	Data B7	Data B8
0x3A	0x98	0x1	0xC4	0x81	0x4B	0x0	0x0
0x0	0x0	0x0	0x0	0x0	0x0	0x0	0x0
0x80	0x0	0x7	0x10	0x0	0x0	0x0	0x0
0x6	0x0	0xAD	0x1B	0xFE	0x1	0x37	0x91

Color changing of the data cell

Data B1	Data B2	Data B3	Data B4	Data B5	Data B6	Data B7	Data B8
0x0	0x0	0x0	0x0	0x0	0x0	0x0	0x0
0x7F	0xFF	0xC7	0xC	0x0	0x0	0x0	0x0
0x6	0x0	0xAD	0x1B	0xFE	0x1	0x37	0x91
0x3A	0x97	0x1	0xC3	0x81	0x4B	0x0	0x0

These methods are mutually exclusive and selectable in the setting menu. To change between these modes, you must disconnect first and then change the selection in the settings menu and then reconnect.

Settings Menu Options



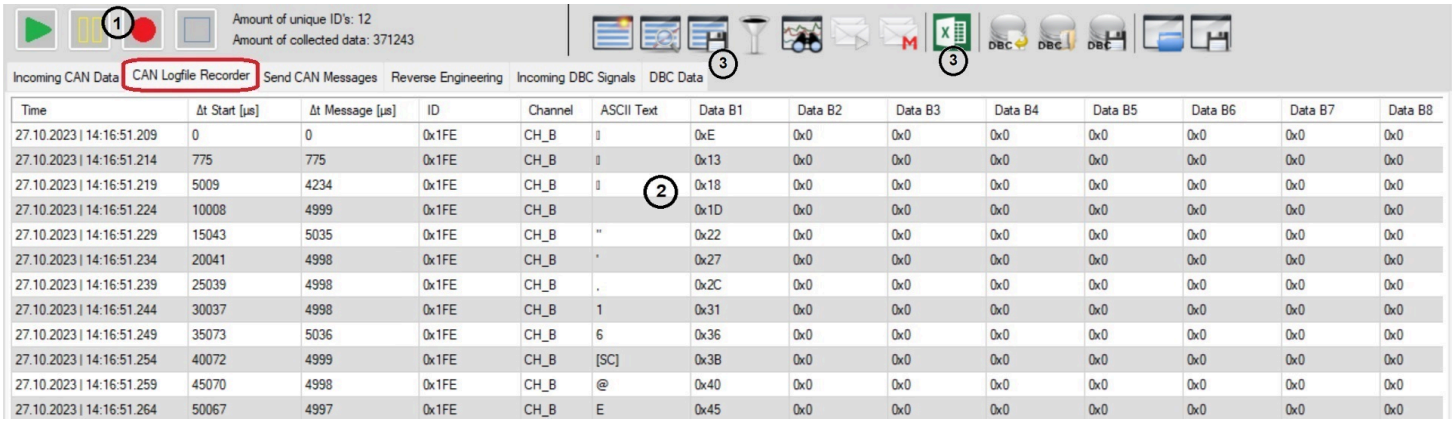
1. Enter this sub-menu to access the options of the byte highlighting behavior
2. Activate byte highlighting or disable it (It is on by default) or change modes to highlight the background or not
3. Select the color you prefer. Red is the default

Right-Click Menu

Using the mouse Right-click function on the Incoming Data provides a menu of quick access tasks to access that are convenient from this location. It is good to left-click select a cell in a row first to ensure the right-click context menu reacts to the data in the selected row as applicable

3.2. CAN Logfile Recorder Feature Tab

This feature tab is used to display and store a running log of all data received sequentially. This data bay be saved or exported for further analysis.

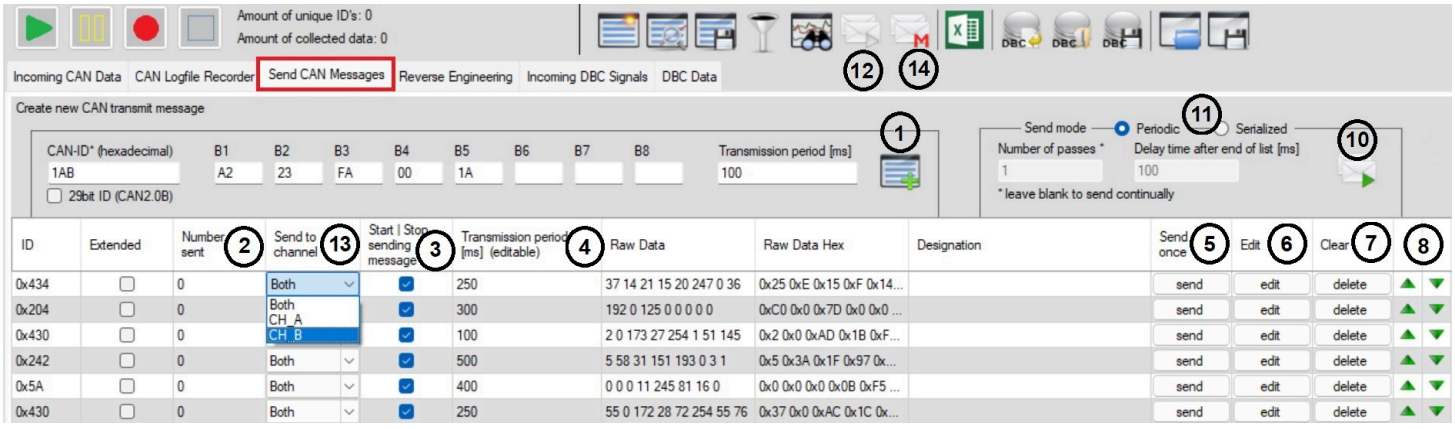


Time	Δt Start [µs]	Δt Message [µs]	ID	Channel	ASCII Text	Data B1	Data B2	Data B3	Data B4	Data B5	Data B6	Data B7	Data B8
27.10.2023 | 14:16:51.209	0	0	0x1FE	CH_B		0xE	0x0	0x0	0x0	0x0	0x0	0x0	0x0
27.10.2023 | 14:16:51.214	775	775	0x1FE	CH_B		0x13	0x0	0x0	0x0	0x0	0x0	0x0	0x0
27.10.2023 | 14:16:51.219	5009	4234	0x1FE	CH_B		0x18	0x0	0x0	0x0	0x0	0x0	0x0	0x0
27.10.2023 | 14:16:51.224	10008	4999	0x1FE	CH_B		0x1D	0x0	0x0	0x0	0x0	0x0	0x0	0x0
27.10.2023 | 14:16:51.229	15043	5035	0x1FE	CH_B	"	0x22	0x0	0x0	0x0	0x0	0x0	0x0	0x0
27.10.2023 | 14:16:51.234	20041	4998	0x1FE	CH_B	'	0x27	0x0	0x0	0x0	0x0	0x0	0x0	0x0
27.10.2023 | 14:16:51.239	25039	4998	0x1FE	CH_B	.	0x2C	0x0	0x0	0x0	0x0	0x0	0x0	0x0
27.10.2023 | 14:16:51.244	30037	4998	0x1FE	CH_B	1	0x31	0x0	0x0	0x0	0x0	0x0	0x0	0x0
27.10.2023 | 14:16:51.249	35073	5036	0x1FE	CH_B	6	0x36	0x0	0x0	0x0	0x0	0x0	0x0	0x0
27.10.2023 | 14:16:51.254	40072	4999	0x1FE	CH_B	[SC]	0x3B	0x0	0x0	0x0	0x0	0x0	0x0	0x0
27.10.2023 | 14:16:51.259	45070	4998	0x1FE	CH_B	@	0x40	0x0	0x0	0x0	0x0	0x0	0x0	0x0
27.10.2023 | 14:16:51.264	50067	4997	0x1FE	CH_B	E	0x45	0x0	0x0	0x0	0x0	0x0	0x0	0x0

1. As described in earlier sections, the play / pause / record / stop buttons have a direct impact on the data logger.
2. The data will scroll down vertically with new data appearing in the top row and pushing older data down and off the screen.
3. All recorded data may be exported either in the export format of the CANAnalyser SW (to be able to be loaded again) or as an export for external data analysis in either Excel or CSV formats.

3.3. Send CAN Messages Feature Tab

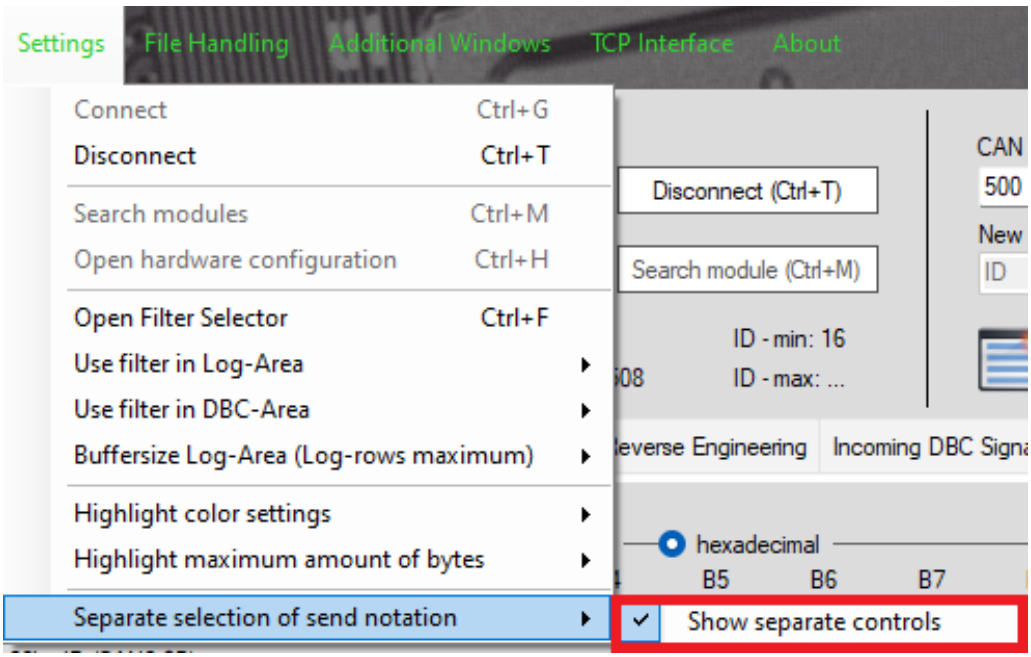
This feature tab is used to allow the user to create and send single or multiple CAN messages onto the bus. By default, data will be sent in the Periodic mode. More details will be listed below.



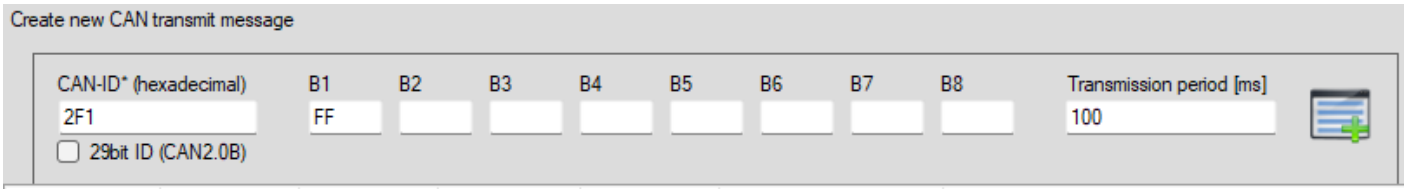
1. In this area, the user can type in a CAN ID followed by the 8 Byte values desired and then specify the Transmission period in ms and then hit the **Create broadcast message** button to create an entry in the table below to be sent on the bus when activated. The 29 bit ID box may be checked to add as an extended ID. This process may be done multiple times. Each time the button is pressed, the active data entered will become another entry in the table.

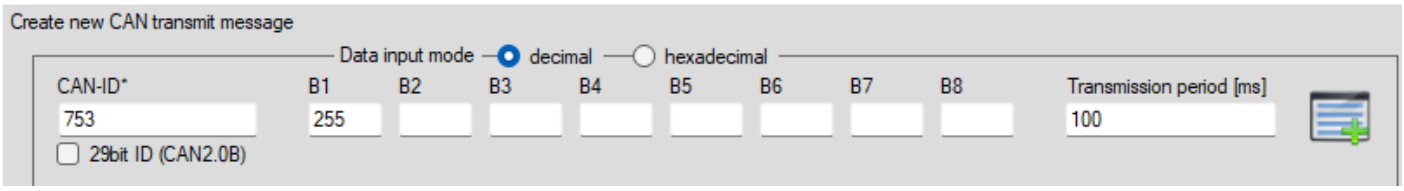
2. When viewing this window while messages are being sent, this column shows a count of how many times each message was sent.
3. When viewing this window while messages are being sent, the checkboxes may be checked or unchecked dynamically to turn on and off sending of individual messages on the list if desired.
4. The transmission / delay period may be changed dynamically by double-clicking in the cells on this column if desired as a fast way to edit the transmission speed.
5. At any time, the user may press the **Send** button to manually send any message once (regardless of whether the messages are automatically sending or not).
6. To edit an existing message entry in the table, select **Edit** to open a window of parameters to change and then **Save changes**.
7. Select **Clear** to delete a message entry from the table.
8. The up and down arrows may be used to move a message up or down the list order. Note that this is not useful in Periodic mode but it is useful on the Serialized mode.
9. The load and save icons are used to load a previously saved list of messages to send or to save the current list. Note that a saved file can be also opened as a macro (see next sub-section)
10. Pressing this button toggles between sending / stopping the list of messages to be sent to the bus.
11. Select the box to move between Periodic or Serialized messages to be sent. When Periodic is selected, the 2 boxes under it are grayed out and not required, however, when Serialized is selected, the user may specify a set number of passes that the list should be sent and if a delay time is desired at the end of the list before starting the next pass.
12. The global Start and Stop sending button works in all tabs. Note that the green arrow in the icon means that there are messages that can be sent and pressing it turns the arrow red to show that it is sending. If that arrow is red, pressing it will stop sending and then turn the arrow green. If the arrow is grey, that means there are no messages ready to be sent yet and messages will need to be added first
13. The drop-down box allows the message to be selected to send to either Channel A, Channel B or both channels
14. This will enter the Macro sending options mode (see next sub-section)

3.3.1. Separate Selection of Send Notation



This menu item only impacts the Send Messages area. This allows the user to specify if they want to use separate send notations from the mean CAN ID dispaly format. Note that using the separate send notification allows the user to specify either Decimal or Hexadecimal in the Send message formatting.

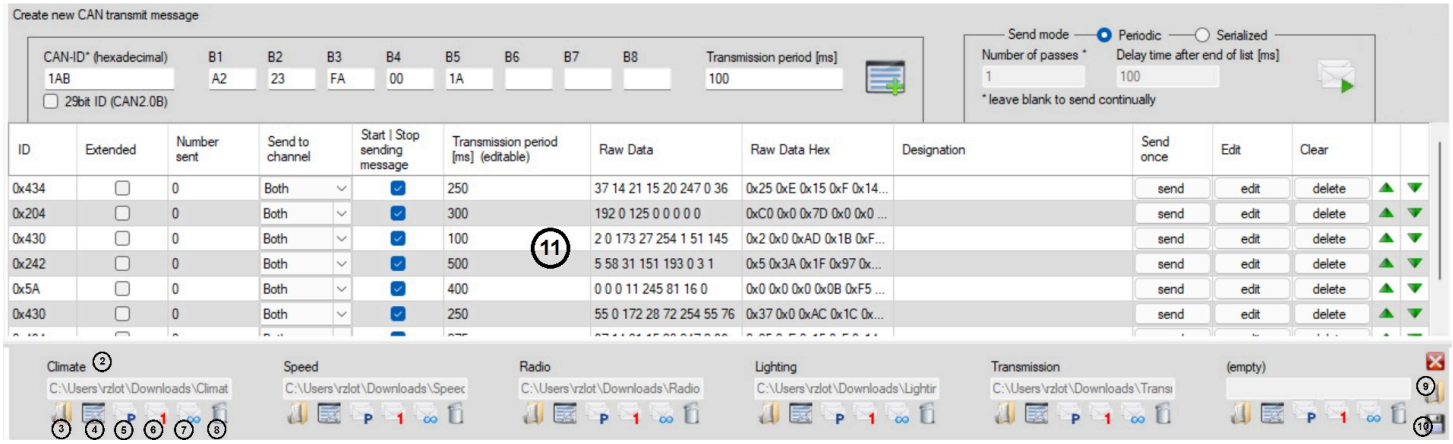




3.3.2. Send Macro Messages

This sub-section will describe how to make use of the macros feature. There are 6 macro slots that may be used.

There can only be one visible send list so the active list of messages is still tied to the regular send button.

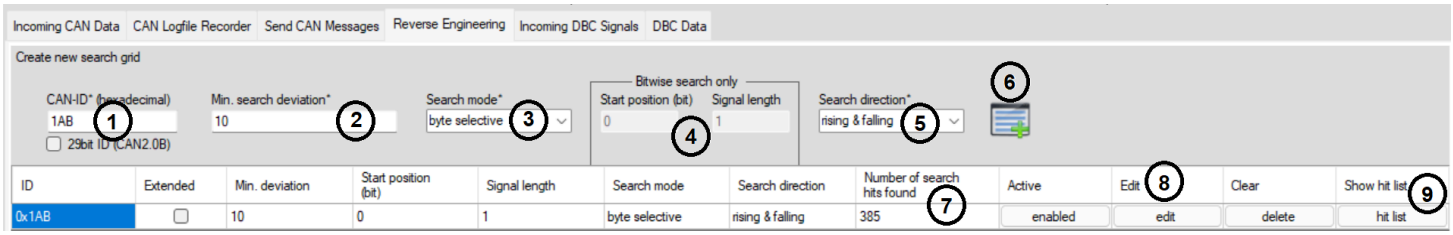


1. The red M button toggles the macros at the bottom of the active send list. **Note that the Macro button is on the main buttons at the top of the screen.** If the macros are toggled off, macros cannot be used
2. This is the name of the file of the loaded macro in each slot. If a file is not loaded in one of the slots, it will say (empty)
3. The open button allows a previously saved list of sent messages to be loaded as a macro
4. If it is desired to view / edit the messages from the macro, pressing this button will replace the active send list data with the data from the macro. **If the current visible send list has different data than the macro, a context box will ask if you want to save the current active send list before overwriting it**
5. Toggles the send mode between periodic and serialized
6. Sends the macro once
7. Sends the macro infinitely until stopped
8. Removes the macro from the list
9. Opens a master list of macros that prefills all 6 slots
10. Saves the current list of 6 macros into a single reloadable file to repopulate the macros
11. This is the active send list.

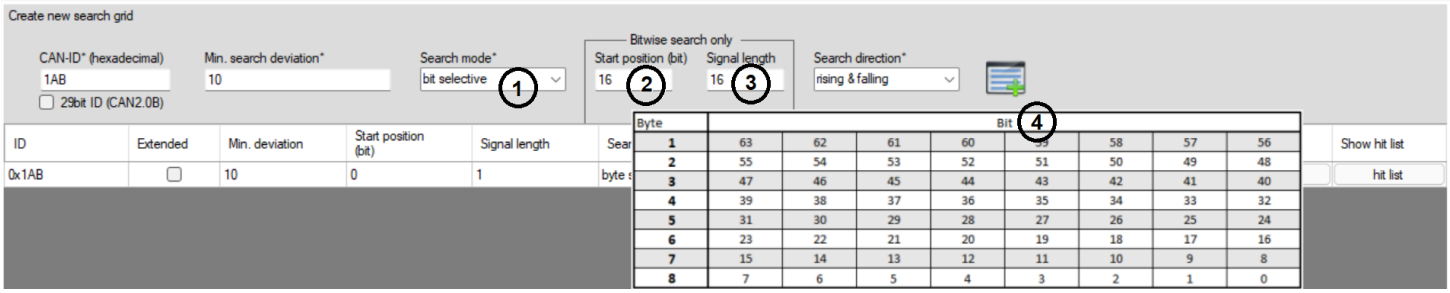
3.4. Reverse Engineering Feature Tab

As of V53, the bitwise search mode is disabled. This will be reenabled in a future release.

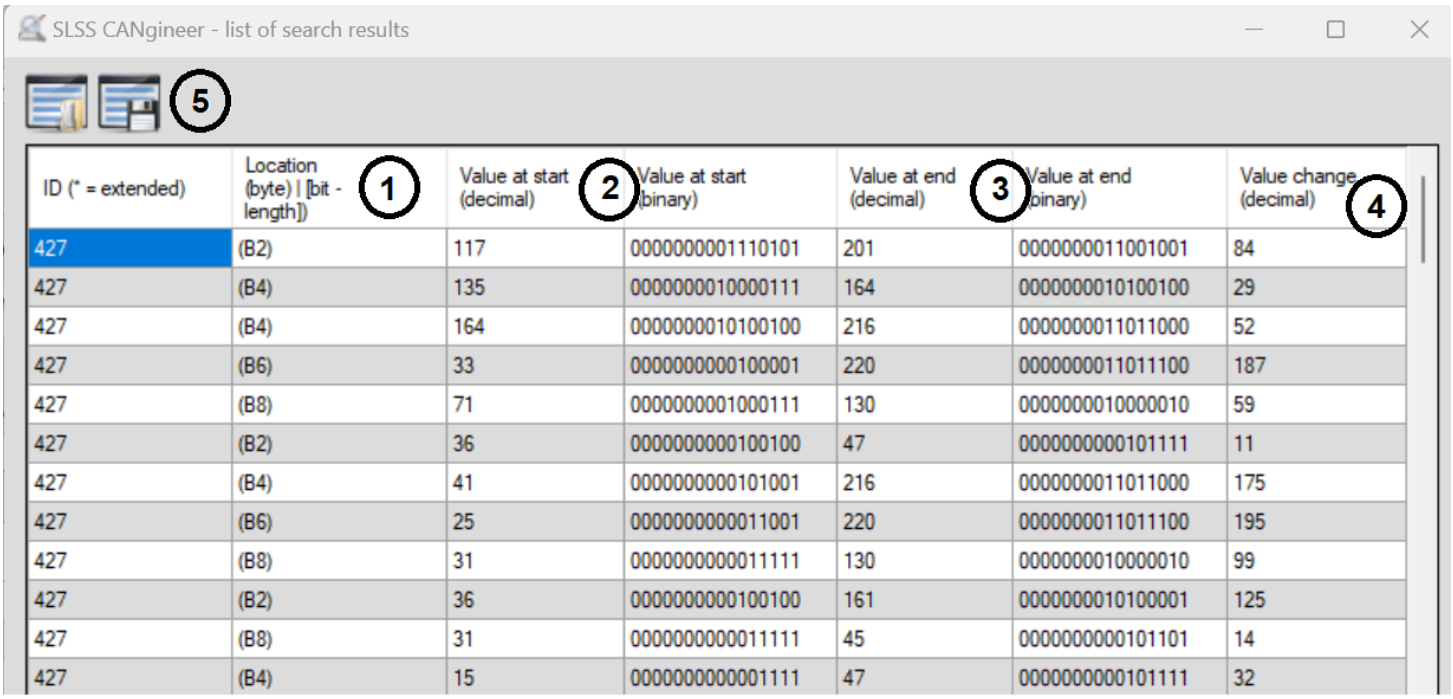
This feature allows the user to locate the specific target bytes or bits that are changing in a specific Arbitration ID based on a set of criteria. This is useful if the user knows the ID of an action on the bus, however the user needs to find out the specific data that is changing within that ID. The data may be search by bytes or bits as a criteria.



1. Specify the target Arbitration ID
2. Specify the deviation limit of data change (in decimal value) of what is being searched for in the data changes
3. This is the drop-down to select if the search should be done with the bytes structure or a bits structure
4. This is only accesible when the user selects a bit selective search mode (more detail below the next image)
5. To narrow down the deviation, the user may select a matching hit if the data deviation is either rising or rising and falling from the nominal value specified in the Min. search deviation
6. Pressing this button adds the search criteria to the list and the search begins immediately based on the current traffic on the bus
7. As the search criteria matches a hit on the bus, this number will increase to let the user know there is a match to the search criteria
8. There are 3 buttons here to interact with rows in the existing search items. The first button allows the search row to be enabled or disabled. The second button lets you edit the search criteria. The third button will delete that search criteria row
9. To view the matching hits, pressing this button opens the hit list window. (details below)



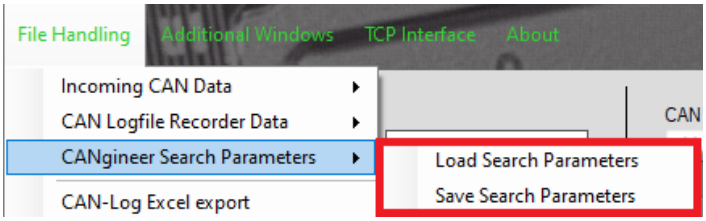
1. Search mode is changed to a bit selective search. With a bit selective search, these next items open up.
2. Choose the starting bit position for the search criteria. Note that bits go from 0 to 63 on the bus data
3. Choose the number of bits in length. For example, if the starting bit position is 16 and the length is 16 bits then the search will be from bit position 16 to end at 32.
4. Selecting either of the start or length position boxes opens up a visual aid chart showing the 64 bit positions and where they align to the 8 bytes in a CAN 2.0 package



1. This column shows which byte contains the target location of the matching hit in the specified arbitration ID (showing in Decimal)
2. These columns show the decimal and binary value of the start of the change
3. These columns show the decimal and binary value of the end of the change
4. This column shows the delta of the value change to match the hit criteria
5. The table may be saved and also a previously saved table may be loaded for reviewing again.

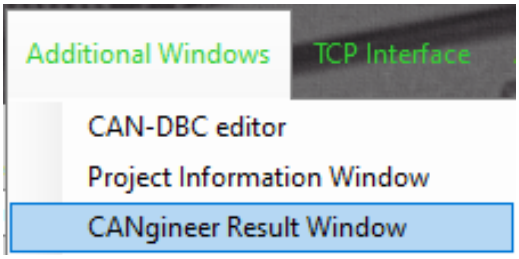
3.4.1. Reverse Engineering CANgineer Search Parameters

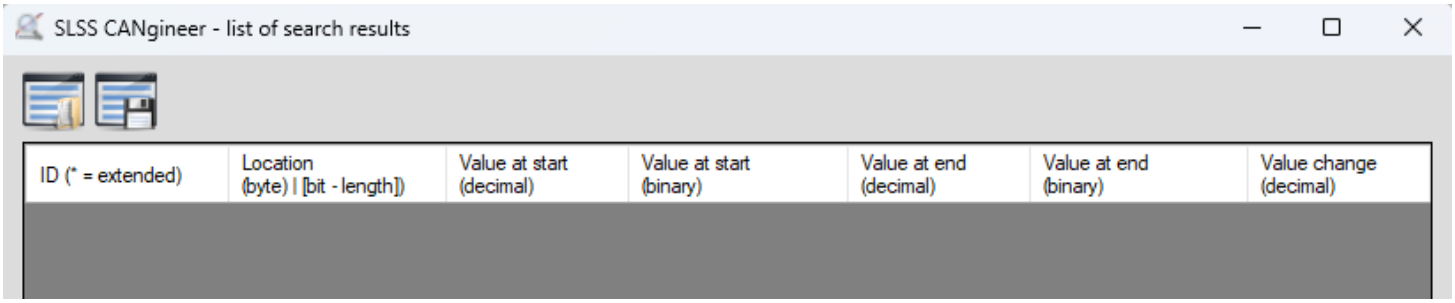
Load and save search parameters from Reverse Engineering Tab



3.4.2. Reverse Engineering CANgineer Result Window

View the data results from the Reverse Engineering feature.

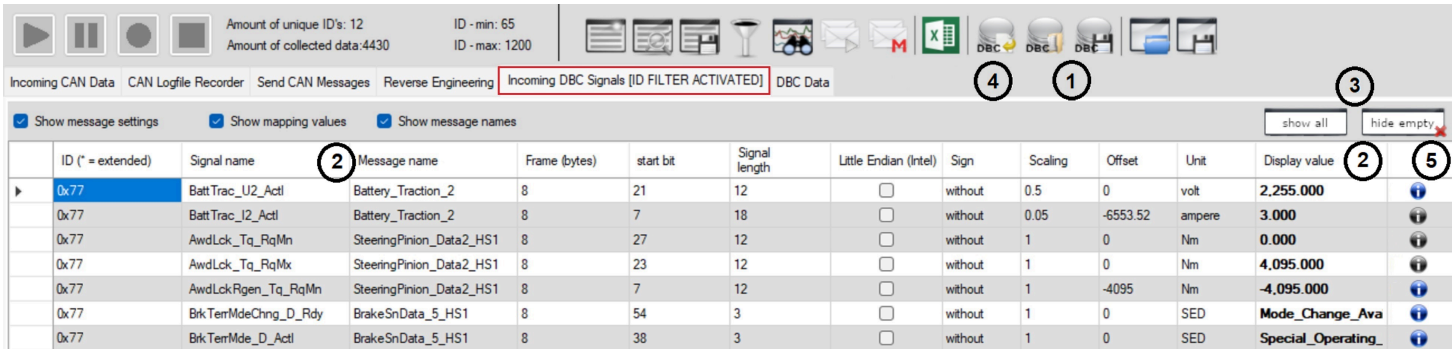




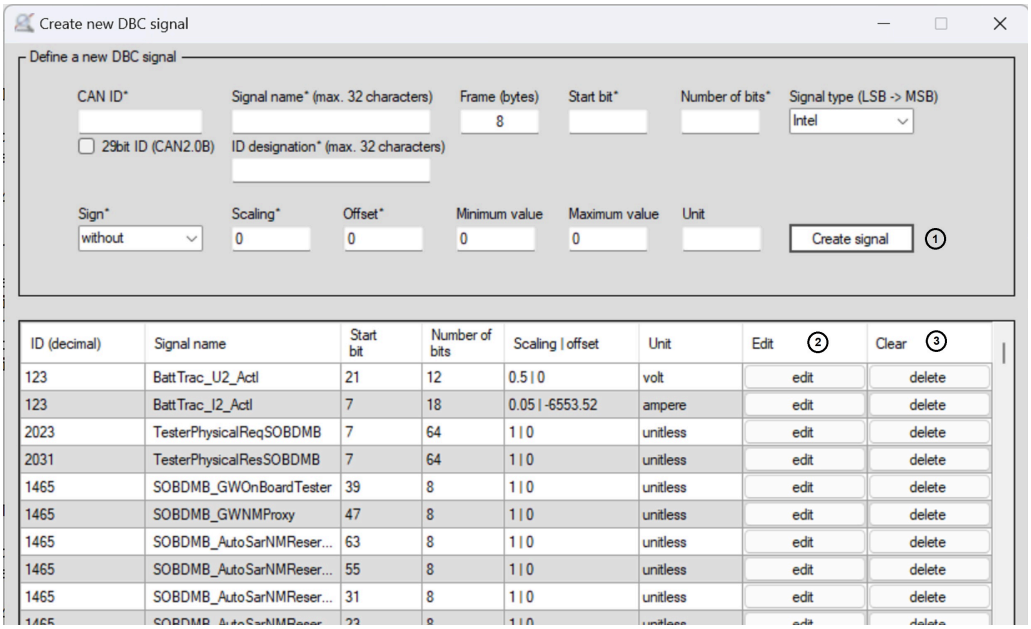
There is the ability to Load and save the data from the Result Window.

3.5. Incoming DBC Signals Feature Tab

This feature tab is used to see the human readable information to match the CAN ID to the specific messages and signal names. This tab also shows other non-human readable contextual data about the construct of the signals.



1. Load / Save CAN DBC buttons. Use the Load button to load the DBC file that populates the respective human readable data in this tab as well as the Incoming CAN Data tab / CAN Logfile Recorder tab and the data export.
2. The key human readable signal name, message name and display values are shown here.
3. By default, the DBC will load and populate the view for ALL CAN ID's that match to the DBC file. If it is desired to monitor live CAN bus traffic data in real time to see only the actual data messages on the bus then pressing the **hide empty** button will hide all rows that do not match live CAN data on the bus to make it easier to view. Pressing the **show all** button will revert back to show the entire list again.
4. This button opens a window to create new DBC signals or edit ones that already exist if a DBC file was loaded.
5. The "i" button will be lit up blue if there is detailed additional information about that particular signal. Click on the blue "i" button for additional information.

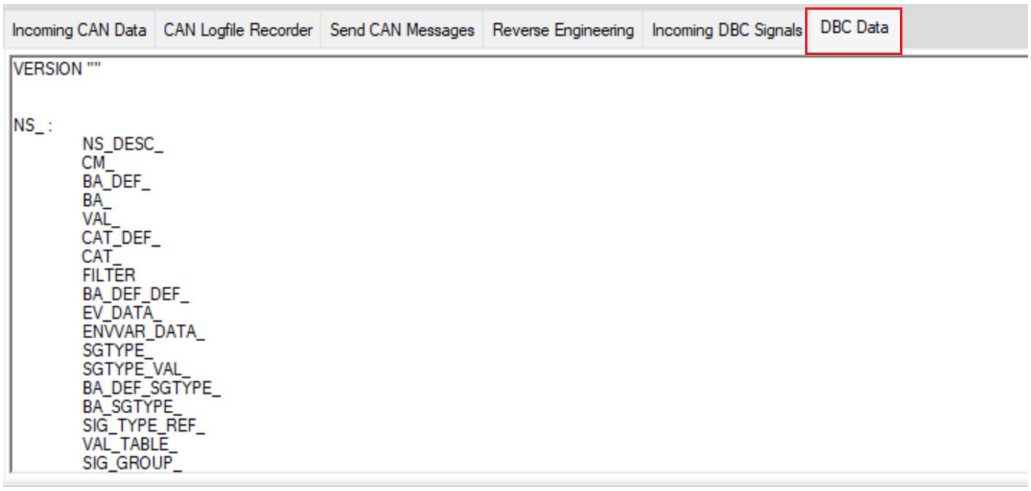


1. In this top box, all data to create a new signal may be input and then press the **Create signal** button to add it as an entry to the list (appending or a new list).

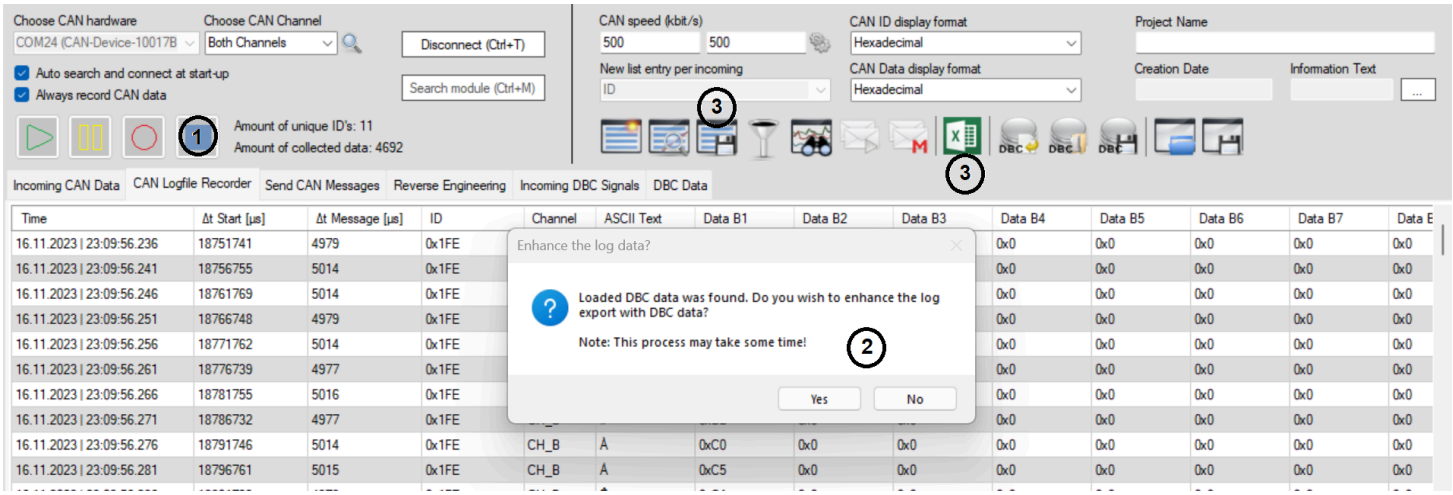
2. Pressing the **Edit** button will allow an existing signal to be edited.
3. Pressing the **delete** button will allow an existing signal to be deleted.

3.6. DBC Data Feature Tab

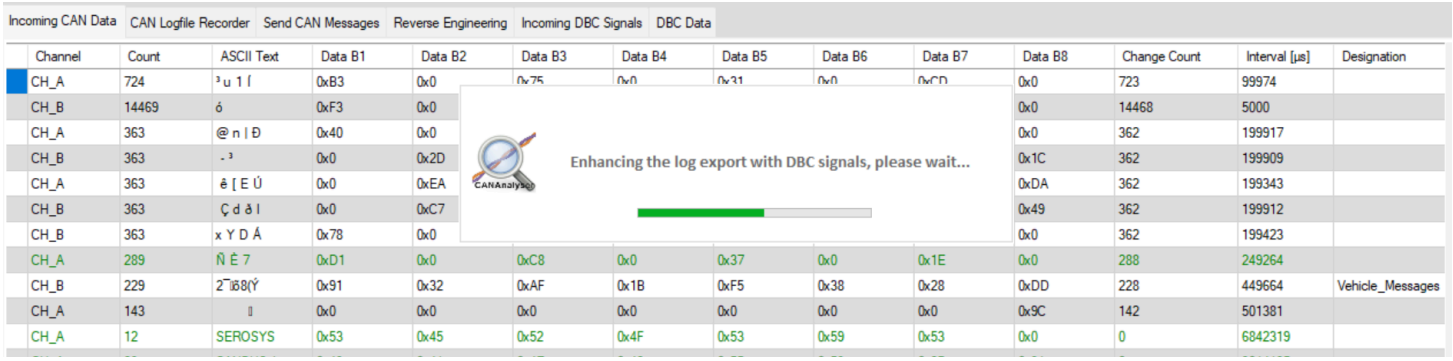
This feature tab is used to view / create the raw DBC data file contents and can be loaded / saved.



3.7. Enhancing Logdata with Human Readable Signal Data

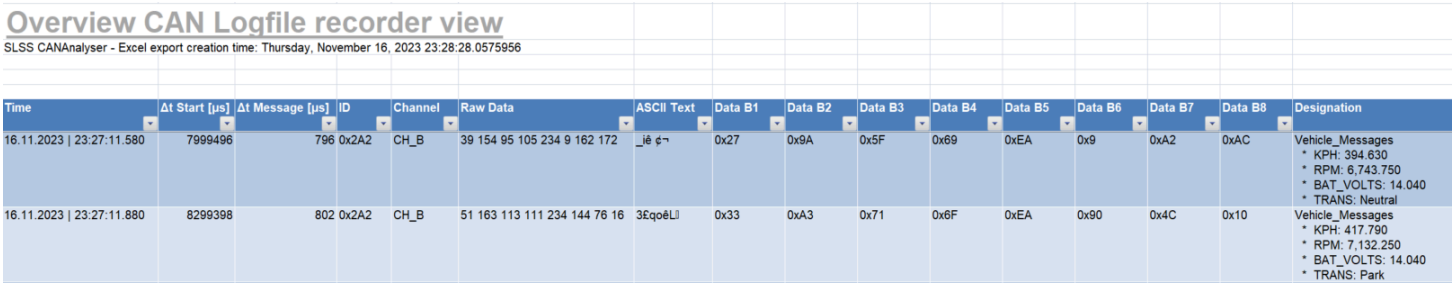


1. If a DBC file is loaded and the user presses the STOP button, a context box will ask if the user desires to enhance the log files. This will take some time to post-process and add all of the DBC human readable signal data to the logfile and will be available in the exports.
2. If the user chooses to enhance the log data, a pop-up window will inform the user of the short progress bar to enhance the logs and then the box will close when it is completed (see image below)
3. Upon the completion of the log enhancement process, any saving of the data or the export (CSV or Excel) will include an enhanced data logging file that includes the Designation as well as the list of all human readable signals for each Arbitration ID for each data change.



Channel	Count	ASCII Text	Data B1	Data B2	Data B3	Data B4	Data B5	Data B6	Data B7	Data B8	Change Count	Interval [µs]	Designation
CH_A	724	³ u 1 Í	0xB3	0x0	0x75	0x0	0x31	0x0	0xCD	0x0	723	99974	
CH_B	14469	ó	0xF3	0x0						0x0	14468	5000	
CH_A	363	@ n ¦ Ð	0x40	0x0						0x0	362	199917	
CH_B	363	· ³	0x0	0x2D						0x1C	362	199909	
CH_A	363	ê [E Ú	0x0	0xEA						0xDA	362	199343	
CH_B	363	Ç d ð I	0x0	0xC7						0x49	362	199912	
CH_B	363	x Y D Á	0x78	0x0						0x0	362	199423	
CH_A	289	Ñ Ê 7	0xD1	0x0	0xC8	0x0	0x37	0x0	0x1E	0x0	288	249264	
CH_B	229	2¯ï68(Ý	0x91	0x32	0xAF	0x1B	0xF5	0x38	0x28	0xDD	228	449664	Vehicle_Messages
CH_A	143	▯	0x0	0x0	0x0	0x0	0x0	0x0	0x0	0x9C	142	501381	
CH_A	12	SEROSYS	0x53	0x45	0x52	0x4F	0x53	0x59	0x53	0x0	0	6842319	

Example from an Excel export:



Overview CAN Logfile recorder view

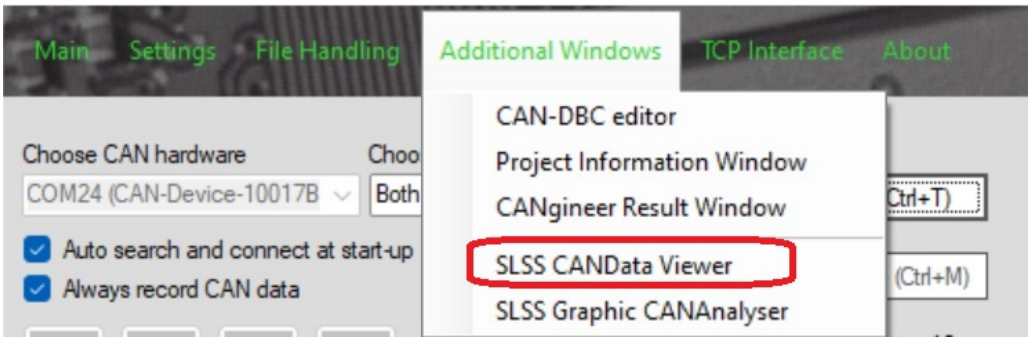
SLSS CANAnalyser - Excel export creation time: Thursday, November 16, 2023 23:28:28.0575956

Time	Δt Start [µs]	Δt Message [µs]	ID	Channel	Raw Data	ASCII Text	Data B1	Data B2	Data B3	Data B4	Data B5	Data B6	Data B7	Data B8	Designation
16.11.2023 | 23:27:11.580	7999496	796	0x2A2	CH_B	39 154 95 105 234 9 162 172	_iê ¢¬	0x27	0x9A	0x5F	0x69	0xEA	0x9	0xA2	0xAC	Vehicle_Messages * KPH: 394.630 * RPM: 6,743.750 * BAT_VOLTS: 14.040 * TRANS: Neutral
16.11.2023 | 23:27:11.880	8299398	802	0x2A2	CH_B	51 163 113 111 234 144 76 16	3£qoêLï	0x33	0xA3	0x71	0x6F	0xEA	0x90	0x4C	0x10	Vehicle_Messages * KPH: 417.790 * RPM: 7,132.250 * BAT_VOLTS: 14.040 * TRANS: Park

4. Other Menu Items

4.1. Accessing the SLSS CANData Viewer

This menu option feature is used to be able to load in a previously saved data session and view the data inside the software



Alternatively, the 3 file extenstions (.scdf, .scdv & .rcdf) may be double-clicked and opened directly from a Windows Explorer folder. Doing this will directly open an instance of the Data Viewer program.

File extensions

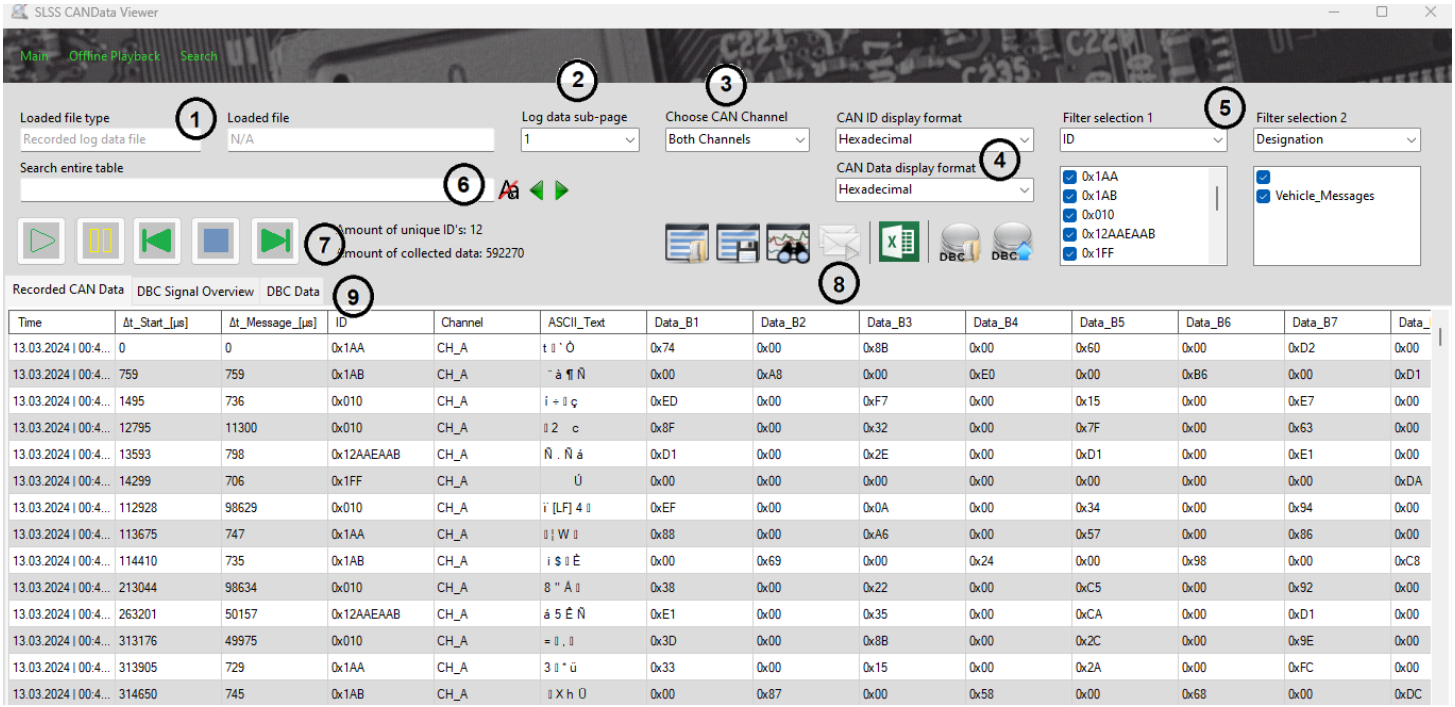
scdf - SLSS CAN Data file - Saved current data from the Incoming CAN Data tab (snapshot of the current messages - 1 per ID)

scdv - SLSS CANData Viewer file - Saved table content of the SLSS CANData Viewer (can be saved as a sub-set to remove filtered items)

rcdf - SLSS recorded CAN Data file - Saved current data from the CAN Logfile Recorder tab (full log export data)

4.2. SLSS CANData Viewer Main Program

All of SLSS CANAnalyser saved file formats are supported.



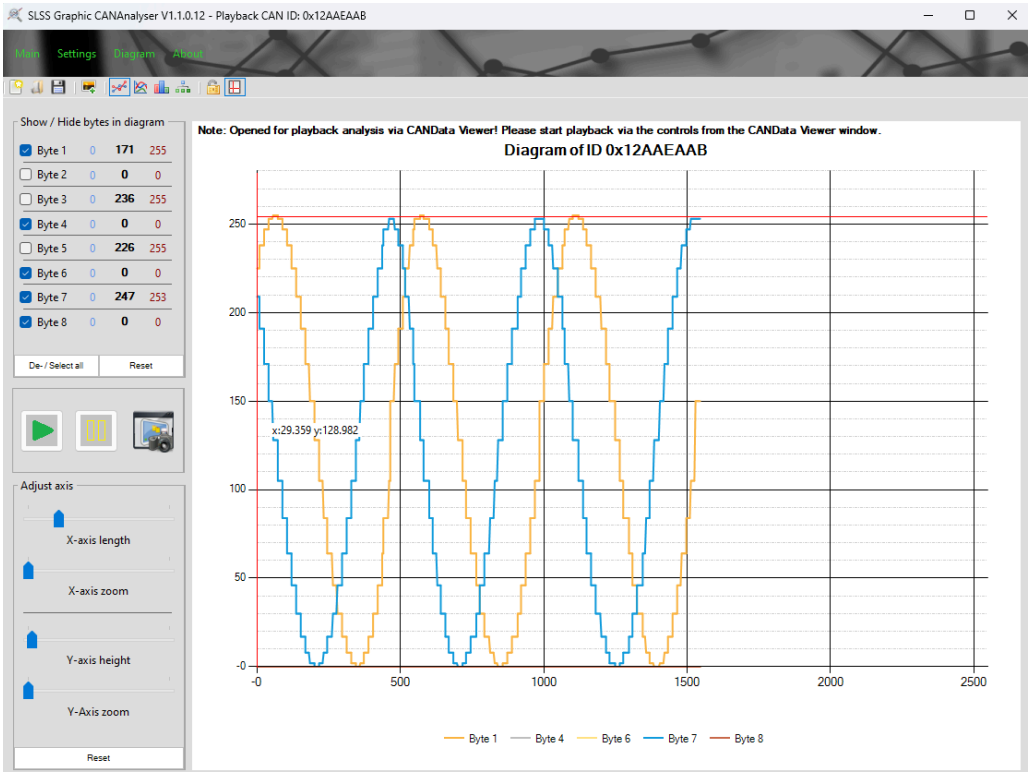
Time	Δt_Start_[µs]	Δt_Message_[µs]	ID	Channel	ASCII_Text	Data_B1	Data_B2	Data_B3	Data_B4	Data_B5	Data_B6	Data_B7	Data_
13.03.2024 | 00:4...	0	0	0x1AA	CH_A	t ▯ ` Ò	0x74	0x00	0x8B	0x00	0x60	0x00	0xD2	0x00
13.03.2024 | 00:4...	759	759	0x1AB	CH_A	¯ à ¶ Ñ	0x00	0xA8	0x00	0xE0	0x00	0xB6	0x00	0xD1
13.03.2024 | 00:4...	1495	736	0x010	CH_A	í ÷ ▯ ç	0xED	0x00	0xF7	0x00	0x15	0x00	0xE7	0x00
13.03.2024 | 00:4...	12795	11300	0x010	CH_A	▯ 2 c	0x8F	0x00	0x32	0x00	0x7F	0x00	0x63	0x00
13.03.2024 | 00:4...	13593	798	0x12AAEAAB	CH_A	Ñ . Ñ á	0xD1	0x00	0x2E	0x00	0xD1	0x00	0xE1	0x00
13.03.2024 | 00:4...	14299	706	0x1FF	CH_A	Ú	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0xDA
13.03.2024 | 00:4...	112928	98629	0x010	CH_A	ï [LF] 4 ▯	0xEF	0x00	0x0A	0x00	0x34	0x00	0x94	0x00
13.03.2024 | 00:4...	113675	747	0x1AA	CH_A	▯ ¦ W ▯	0x88	0x00	0xA6	0x00	0x57	0x00	0x86	0x00
13.03.2024 | 00:4...	114410	735	0x1AB	CH_A	i $ ▯ È	0x00	0x69	0x00	0x24	0x00	0x98	0x00	0xC8
13.03.2024 | 00:4...	213044	98634	0x010	CH_A	8 " Á ▯	0x38	0x00	0x22	0x00	0xC5	0x00	0x92	0x00
13.03.2024 | 00:4...	263201	50157	0x12AAEAAB	CH_A	á 5 Ê Ñ	0xE1	0x00	0x35	0x00	0xCA	0x00	0xD1	0x00
13.03.2024 | 00:4...	313176	49975	0x010	CH_A	= ▯ . ▯	0x3D	0x00	0x8B	0x00	0x2C	0x00	0x9E	0x00
13.03.2024 | 00:4...	313905	729	0x1AA	CH_A	3 ▯ " ü	0x33	0x00	0x15	0x00	0x2A	0x00	0xFC	0x00
13.03.2024 | 00:4...	314650	745	0x1AB	CH_A	▯ X h Ü	0x00	0x87	0x00	0x58	0x00	0x68	0x00	0xDC

1. Information displayed based on the file loaded. It states the type of file and the file name that was loaded
2. In the case of loading a file that has more than 200,000 rows, to conserve PC memory resources, the data will be broken into sub-pages of up to 200,000 lines per sub-page. This drop-down allows the user to select a different sub-page of data to access
3. This allows the view of only CH_A or CH_B or both channels from the loaded data
4. These drop-downs are used to change the format of either the ID or Byte data (HEX, DEC, BINARY)
5. Filter 1 and Filter 2 may be set to provide 2 layers of filtering of ID or bytes or designation to find the data that is desired
6. This is a data search field. Any text entered here will highlight a cell in blue color for matching criteria. Beside it is an icon to enable or disable case matching. The green arrows beside that will move to the next or previous matched cell
7. These are the data control buttons. From left to right is Play, Pause, Step backwards, Stop, Step forwards. Note, to play back the data, press the play button. The play button must be enabled for the graphical viewer to show the graph
8. These are the feature control buttons. From left to right is the Load data button (loads scdf, scdv, rcdf files), the save button to save a copy of your current filtered data, the graphical analyzer button (operates identical to this button in the main software), the playback CAN button (future application to play back recorded data back onto the live bus), Export data button (choose from Excel or CSV), load DBC file button and then the last button will go through the loaded data rows and enhance it with the loaded DBC file data.
9. There are 3 tabs in the main viewing window. These operate identically to the way these 3 tabs operate in the main SLSS CANAnalyser software. The Recorded CAN Data tab shows the logged data rows (that can be played back). The DBC Signal Overview tab shows you all the decoded human readable DBC signal data that can also be played back to see dynamic data as it changes. The DBC Data tab allows the direct viewing of the DBC file itself.

The drop-down menus to change selections will be greyed-out (unavailable) if the Data Viewer is in PLAY or PAUSE mode. Press STOP to make adjustments and then resume playing back.

4.3. Playback Graphical Analyser from the Data Viewer

The selected ID will be displayed in the graphic viewer. Note that this operates identically to how the primary graphical analyzer works from the main software. Refer to the other chapter for the details instructions.



For this graphical analyser to play back the data, the PLAY button must be pressed in the SLSS CANData Viewer or else the graph will not display.

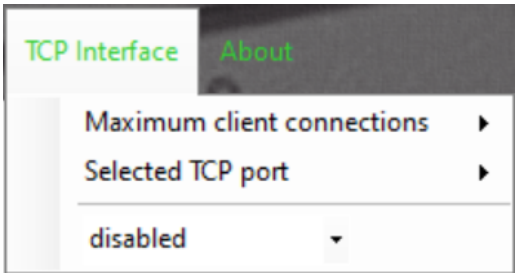
4.4. TCP/IP Communication Interface for Third-party applications

Using the TCP Interface, data can be passed to a third party application via TCP/IP network connection allowing CANAnalyser to be used as a server that can support multiple connected clients.

This makes it possible to create your own proprietary interface in scripting languages widely used in development, such as Python, Groovy or Lua, and to interface with the SLSS CANAnalyser software to control various functions and analyze the CAN data using a custom remote interface.

Here is a list of currently supported functions via TCP/IP interface to the SLSS CANAnalyser software:

```
 1 - Send CAN message to bus channel A
 2 - Send CAN message to bus channel B
 3 - Send CAN message to both bus channels
 4 - Mute the transmission of received CAN messages
 5 - Start / stop logfile recording and save the logfile to a specific folder
 6 - Start the hardware module search
 7 - Connect to a specific CAN module by a known COM port
 8 - Change CAN speed for bus A or bus B
 9 - Toggle bus interaction mode for both transceivers between normal and listen-only
10 - Change the selected CAN channel
11 - Change arbitration ID notation between HEX, DEC and BINARY
12 - Change CAN data notation between HEX, DEC and BINARY
13 - Load a stored project file by the given file path
14 - Restart the software with or without active TCP/IP interface
15 - Close the software via TCP/IP command
16 - Get connection status information from the SLSS CANAnalyser
17 - Get run state information from the SLSS CANAnalyser
```



TCP/IP can support multiple connections so the user may specify the maximum number of connections are allowed to be accepted to the software. If the number is increased, the server opens the given number of network ports, starting from the port that gets defined. It is possible to open and stay connected simultaneously on different ports.

The user must then specify the TCP port to be forwarded on the router to open up for the IP address.

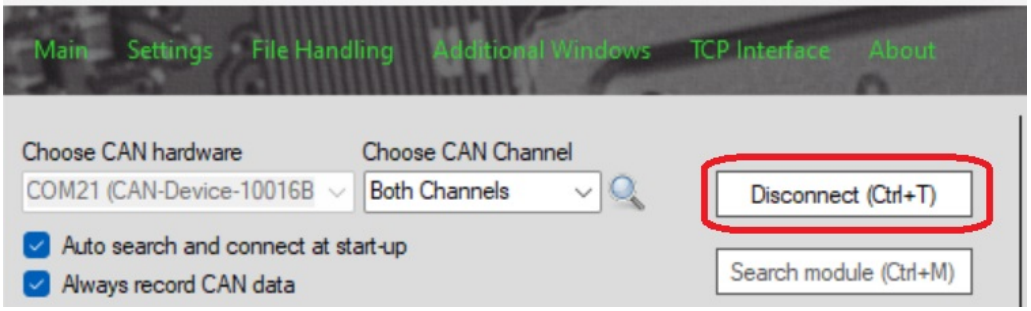
This interface may be enabled or disabled.

If the hardware dongle is disconnected during a TCP request, the CANAnalyser software will report a connection error

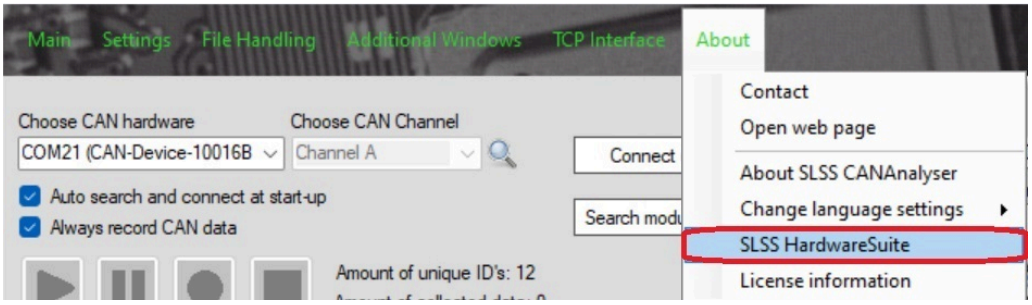
4.5. Hardware Dongle Firmware Updater

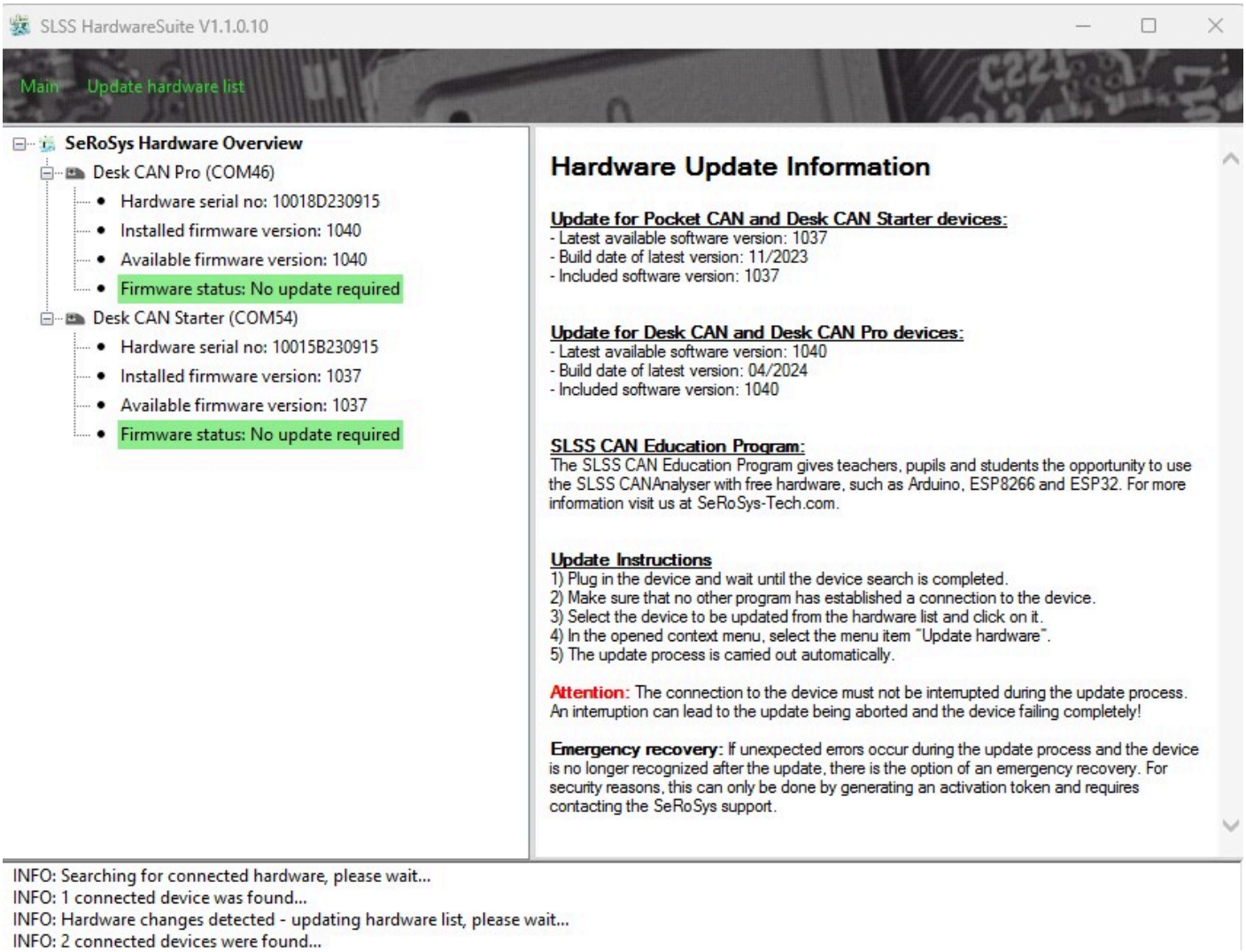
This menu option feature is used to update the firmware on your hardware dongle if required. To check to see if there is a required firmware update, follow this process.

Please press the "Disconnect" button before loading the SLSS HardwareSuite



Select "SLSS HardwareSuite" from the "About" menu.





When the HardwareSuite loads, after a few seconds, the Hardware Overview will show you the dongle that is plugged in and it will show you the firmware status. If the firmware status is green then no update is required and the HardwareSuite may be exited. If the firware status is yellow, that means there is an update required. Click on the yellow firmware status and follow the instructions.

Please read all the Hardware Update Information on the right side of the screen and follow the directions carefully. If there is a hardware technical issue or the dongle is disconnected during the update process and becomes unresponsive then contact SeRoSys technical support for assistance.