CAN Shift Light

USER MANUAL

Contents

General description

The RRR CAN Shift Light (CSL) is a fully configurable RPM based shift light indicator device equipped with a CAN communication protocol. Nine high-brightness RGB LED diodes are fully user defined for engine speed thresholds, brightness and colour. RPM threshold is adjustable for each LED separately. Also special flashing mode is inherent. The CSL device provides additional modes such as gear dependent shift light (up to nine gears), pitlane and alarm modes. Current RPM data is taken from a specific CAN frame, which broadcasts any type of ECU. There are pre-defined sets of CAN frames settings for most common ECUs. Moreover OBD-II can be used as well. Additional hardwired input can be used as a night-mode, pitlane or alarm switch. The device supports multiplexed / compound CAN streams. All the configuration procedure is provided using a dedicated application. Data transfer to and from CSL takes place via USB type C connector at the back of the device, which also allows the update procedure of internal software when new features come in future. High quality aluminium Xylan covered enclosure is handy and meets the standards of IP68 thanks to internal sealing. Two M3 bottom oriented threads provide the possibility of mounting to the car dash or cockpit. The final user decides on the connection method and type of connector - 1 metre of a cable is assured.

Features summary

- **CAN based communication protocol with multiplexed streams support**
- **Nine high-brightness RGB diodes**
- **Fully configurable LEDs, including brightness, colour and activate thresholds for each**
- **Flashing mode with frequency control**
- **Gear depend mode (up to nine gears)**
- **Dimming control mode**
- **Pitlane mode**
- **Alarm mode**
- **Pre-defined sets of CAN frames settings for most common ECUs**
- **OBD-II mode**
- **Hardwired user selectable input**
- **Dedicated application for setup**
- **USB type C data link**
- **Xylan covered high durability aluminium enclosure - meets IP68**
- **Hardware compatible future software updates provided**
- **Compact 78.5 mm x 21.9 mm x 14.5 mm dimensions**
- **Bottom mounting threads**

Characteristics table

Parameter	Min.	Typ.	Max.	Unit
Supply voltage	6	12	24	V
Standby supply current	-	20	-	mA
Supply current at LEDs full brightness	-	350	-	mA
Operating temperature	- 40	-	80	°C

Connection cable colour chart

Wire	Function
BLACK	Ground
BROWN	Supply
WHITE	CAN High
BLUE	CAN Low
GREY	Hardwired input

Software installation

The CSL is configured using a special dedicated application that works on all PCs under the Windows OS [1]. The software comes as a ZIP compressed archive that contains all necessary files.

After un-zip the archive software is ready to launch.

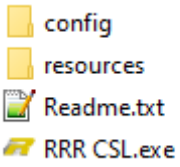

Fig.1 Un-zipped archive contents

[1] .NET Framework is necessary to run RRR CSL executable (version ≥ 4.5.2)

First launch

Run the "RRR CSL.exe" file. After that, the following window appear:

Fig.2 Welcome screen

Click the “USB INTERFACE” sub-menu button on the left part of the app screen. Connect the CLS device using the attached USB cable. Then click “Install” on the “Device drivers” tab.

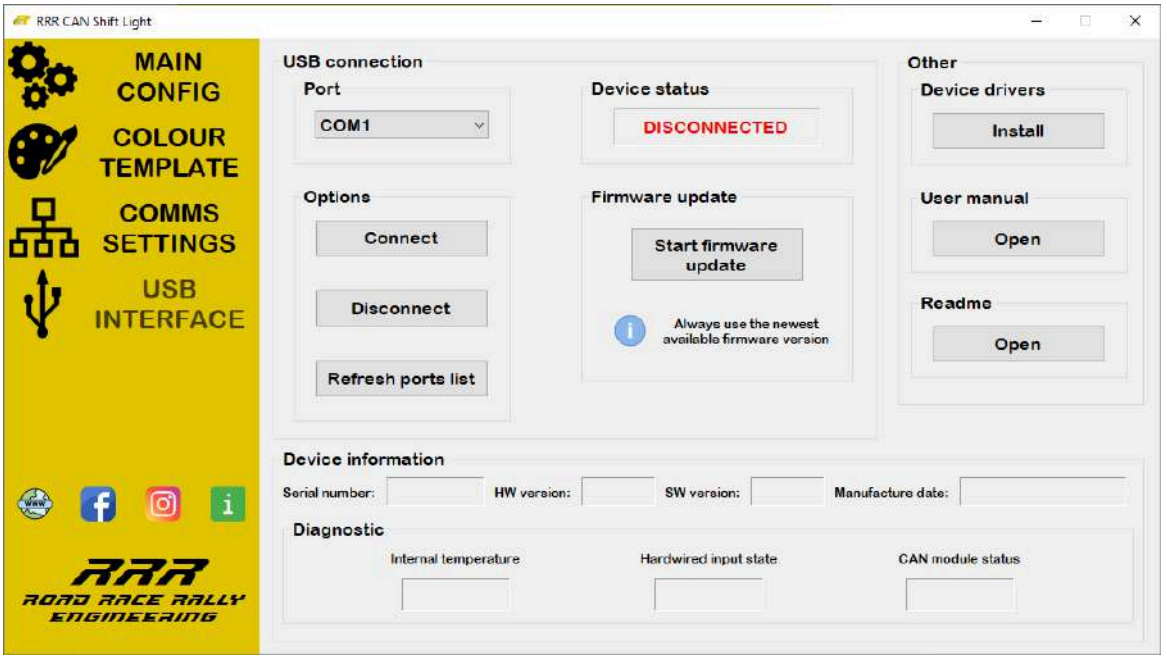

Fig.3 Drivers installation button

Driver wizard will automatically guide you through the installation process. After successful attempt following message will appear:

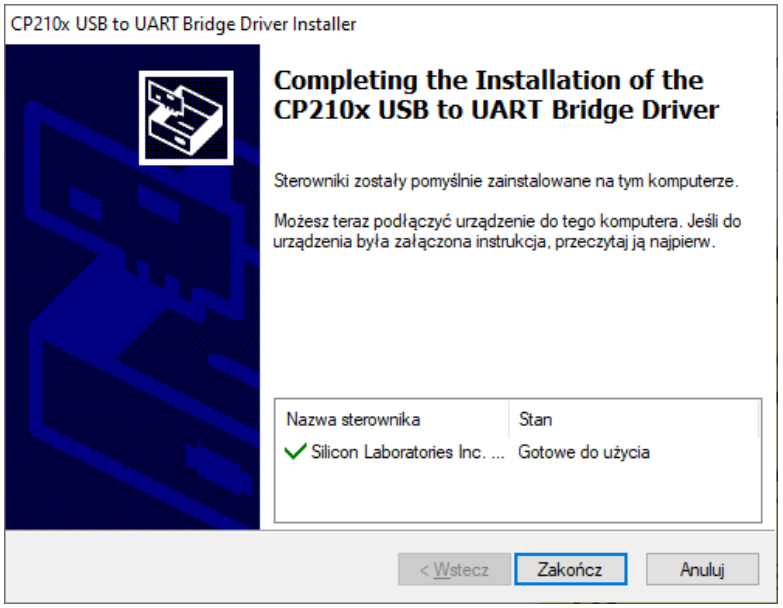

Fig.4 Successful driver installation screen

After that your CSL device is ready to use. Click “Refresh ports list”. Successively drop the port list tab and pick one which device is connected to (can be checked in Windows Device Manager). Click “Connect”. Successful connection will result in LEDs wave sequence on the CSL and pop-up on the screen:

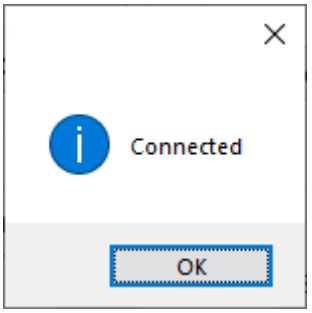

Fig.5 Successful connection to CSL

Otherwise:

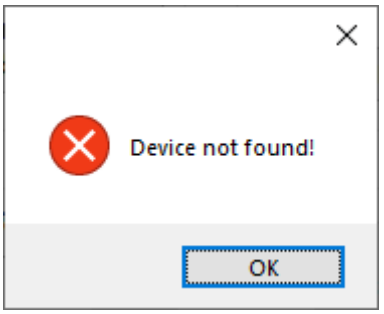

Fig.6 Unable to connect to CSL

In case of that check USB connection, driver installation and port. If that doesn't help, contact RRR support.

After terminating the fortunate connection, the following screen can be seen. Individual CSL information and self-diagnose parameters should be readable.

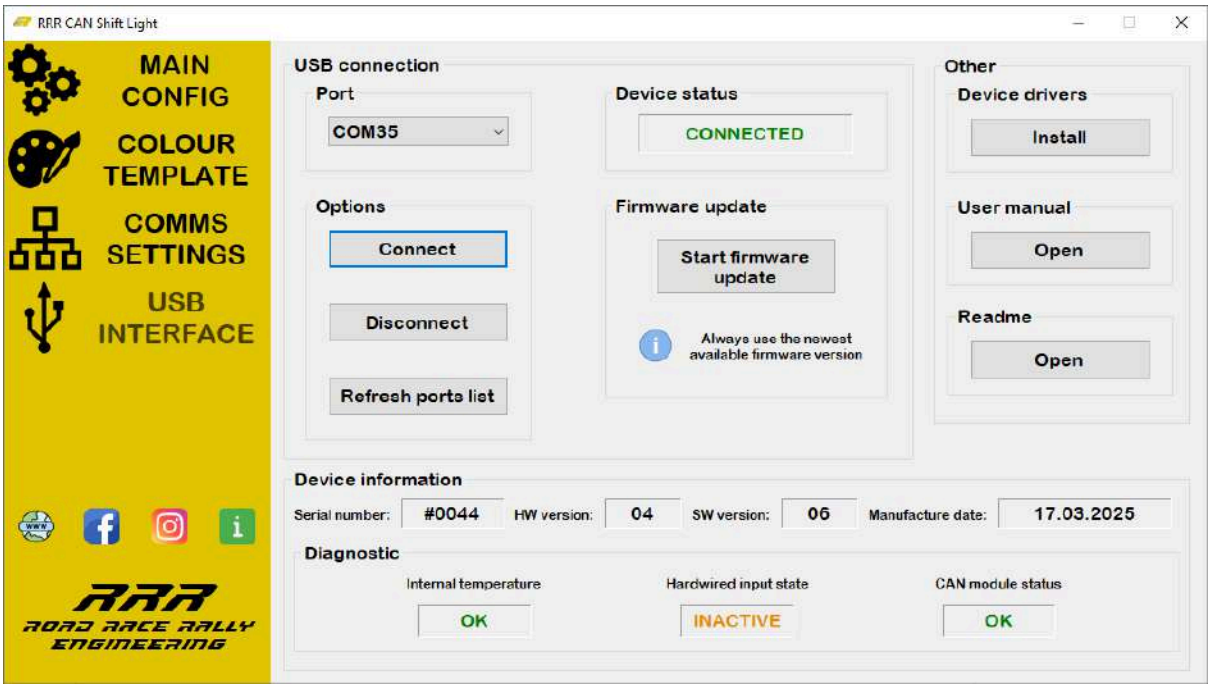

Fig.7 USB INTERFACE sub-menu screen when connected

"Disconnect" button should be pressed at the end of every config session. Never disconnect the USB cable in the "CONNECTED" state to end the session!

Firmware update

After first startup, you should check if device firmware is up to date. The current SW of the device can be read from the "Device information" tab [Fig.7] as a two digit number. The latest firmware version can be found in the Readme.txt file in the main installation folder.

```
-----------------------------------------------
Firmware        05F070824           09.08.2024

*Added device diagnostic support
*Changes in dimming control
-----------------------------------------------
```

Fig.8 Example of firmware notes in Readme.txt. First two digits indicate the exact version

When the current firmware version does not match the latest release, you should perform firmware update procedure to achieve new features.

Click the “Start firmware update” button to perform the procedure. Press “OK” to continue or cancel the operation.

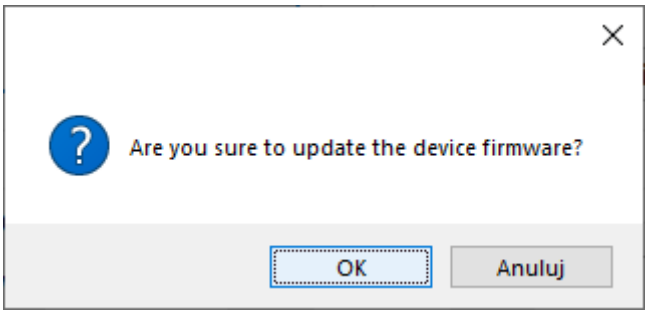

Fig.9 Update confirmation window

Pick the latest version of the binary file.

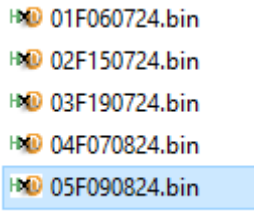

Fig.10 Firmware files list

Confirm all pop-ups. Then the CSL should enter the “Bootmode” which allows it to change its internal software.

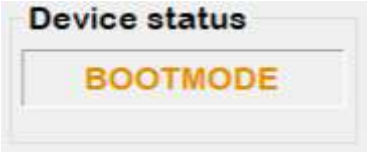

Fig.11 Device status in bootloader mode

After a while the following pop-up should show.

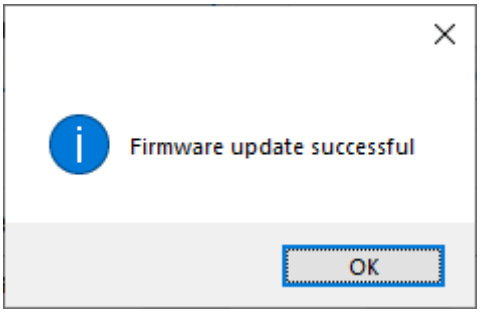

Fig.12 Firmware has been updated successfully

Main config sub-menu

The main operating settings of the CSL are located in the “MAIN CONFIG” sub-menu. There are: LEDs behaviour in function of RPM, colour setting, brightness control, configuration visual test on the device, data transfer from/to CSL and also restoring and saving the configuration to file. There is another bottom menu for flashing mode, which is activated above the set threshold. If gear depend mode is used, a submenu for each gear is available.

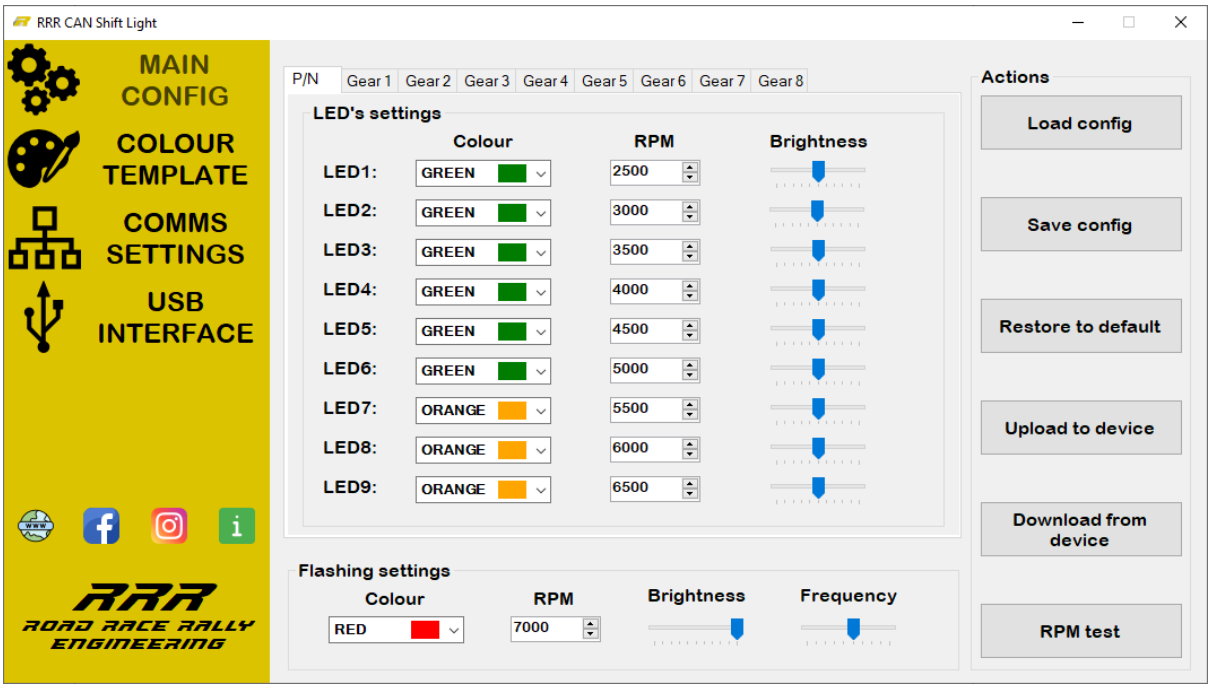

Fig.13 Main config sub-menu view

The colour can be set for every LED separately, from the drop-down list. There are 15 colours in the standard template. User can set their own colours in the “COLOUR TEMPLATE” sub-menu.

The gear depend mode can be enabled in the “COMMS SETTINGS” sub-menu. By default only P/N gear is enabled.

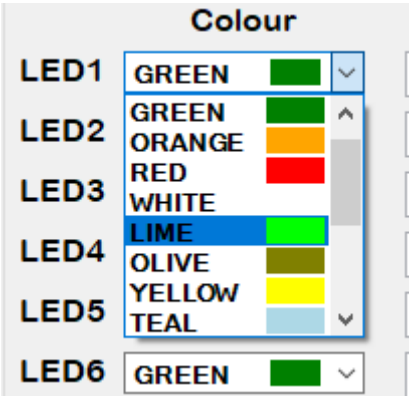

Fig.14 Colours drop-down list

The “RPM” tabs are used to set the revolutions threshold over which LED is turned ON. When RPM is below threshold a particular LED becomes darkened. The usable range is from 1000 to 10000 RPM in 25 unit steps.

The “Brightness” sliders are used for setting the brightness value of all currently activated LEDs. Each slider is corresponding to the adjacent RPM threshold. After exceeding the set of RPM threshold, the brightness is proportional to slider position. The usable range of brightness regulation is 5% to 100%.

Flashing mode

Flashing mode allows the flashing of all LEDs after reaching the set point of RPM. Options are the same as for regular mode, with this difference you have to set flashing frequency as well. The usable range of flashing frequency is from 100ms to 1s. Default flashing colour is set for red.

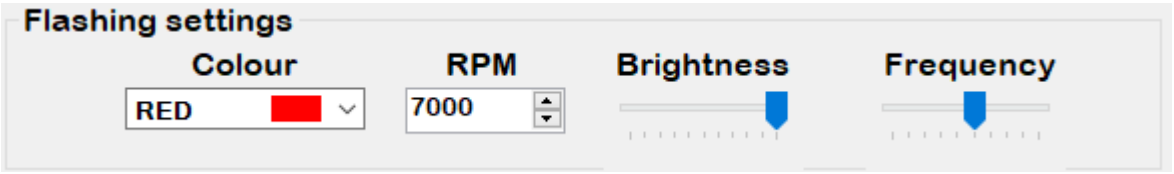

Fig.15 Flashing mode settings tab

Actions on the config

There are a bunch of additional buttons in the “Actions” tab.

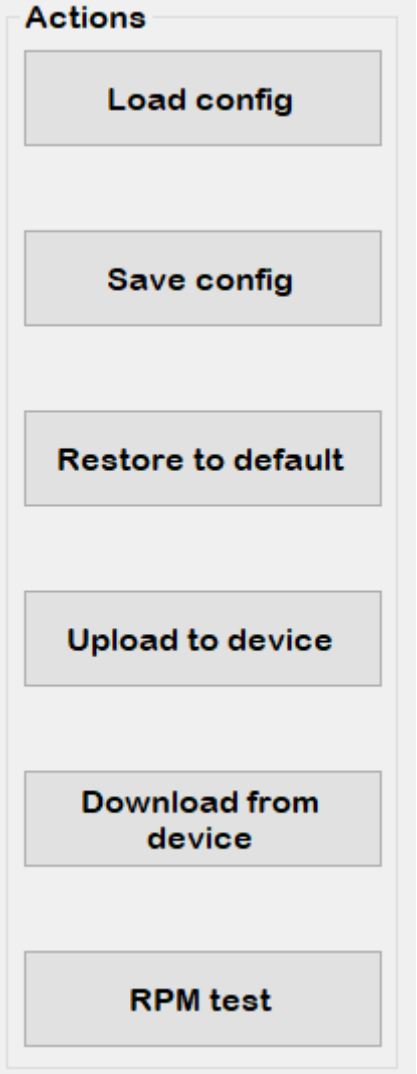

Fig.16 Actions tab

The “Load config” button is used for reading previously saved configuration from file, and updating the displayed values on the screen. This option restores variables in all sub-menus. There is a standard configuration saved in the “default.rcf” file.

The “Save config” button is used to save user-edited data into a file, which can be restored in future or sent to another user to use with its own device. All “.rcf” config files are compatible with every setup.

The “Restore to default” button works the same as loading the original non-edited “default.rcf” file.

The “Upload to device” button is used to apply all changes into a CSL device. This operation should be performed after every change you want to make permanent, and be saved into internal memory of CSL.

The “Download from device” button is used to receive the saved data from the CSL device. The data differences are actualised into all sub-menus.

The “RPM test” button is used to start the visualisation of all LEDs settings in turn. At the end flashing mode is activated five times.

The RPM test works at the basis of internal memory of a CSL device. Before testing any changes, upload a new config into CSL!

Example: Linear LEDs mode

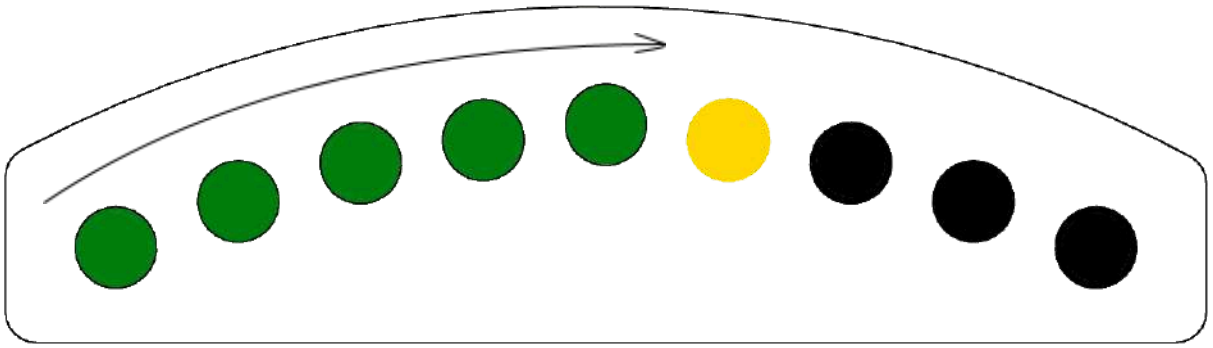

Fig.17 Principle of linear LEDs operation

There are sample settings for linear LEDs operation:

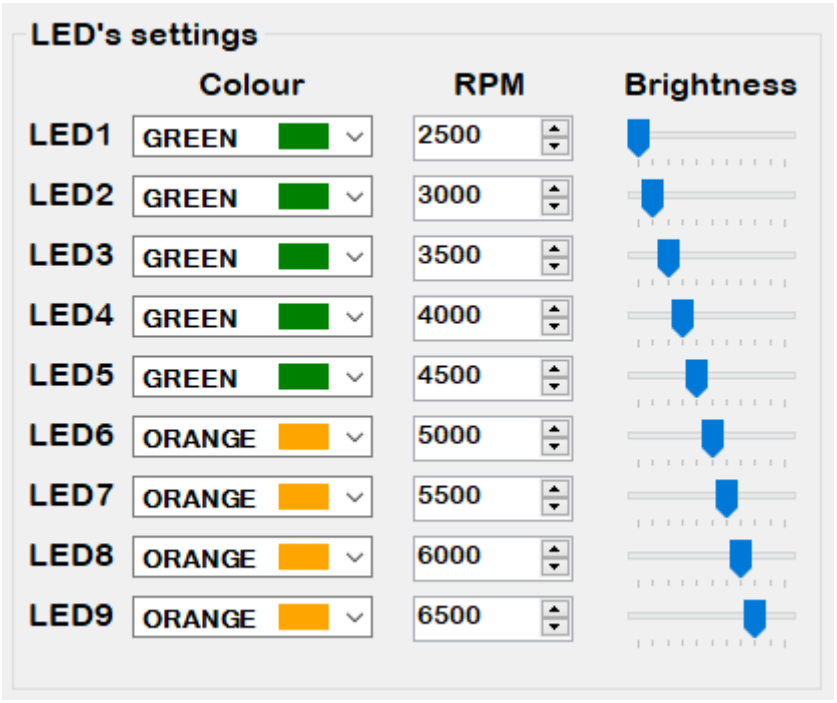

Fig.18 LEDs config example for linear mode operation

Example: Converging LEDs mode

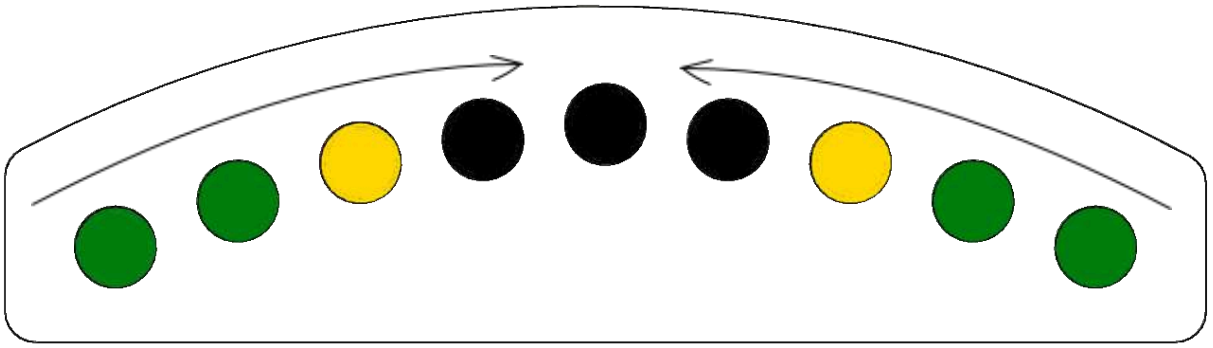

Fig.19 Principle of converging LEDs operation

There are sample settings for converging LEDs operation:

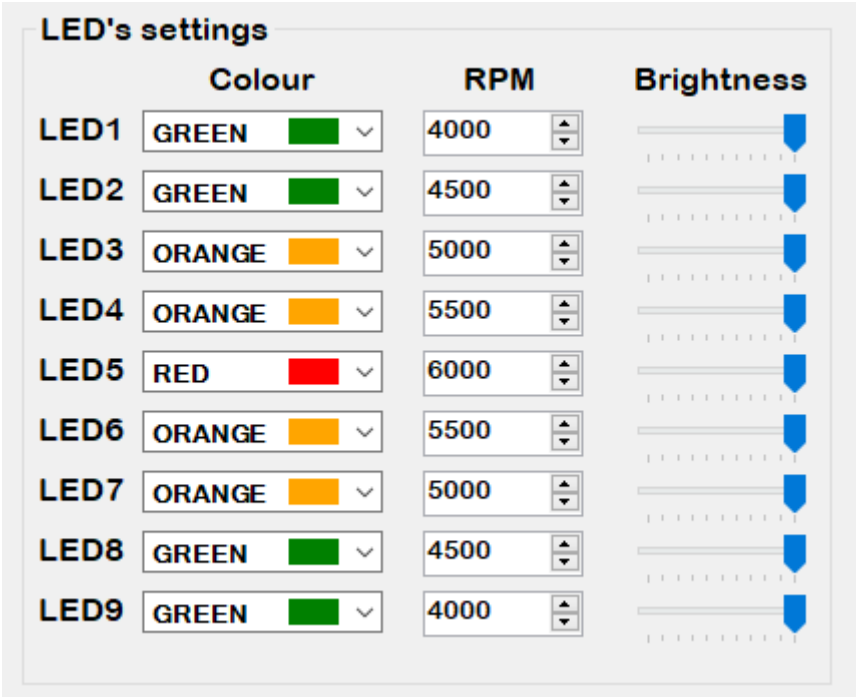

Fig.20 LEDs config example for converging mode operation

In this mode, the brightness slider corresponds to the RPM threshold stage pairs, not the individual LED. Both LEDs of each pair should have the same brightness set, to avoid incorrect operation.

Colour template sub-menu

The colour template sub-menu is used to manage the user colours pattern set. The user has fifteen colour fields at their disposal. The whole colour system is based on standard RGB values. Visual pattern is helpful to pick suitable hues.

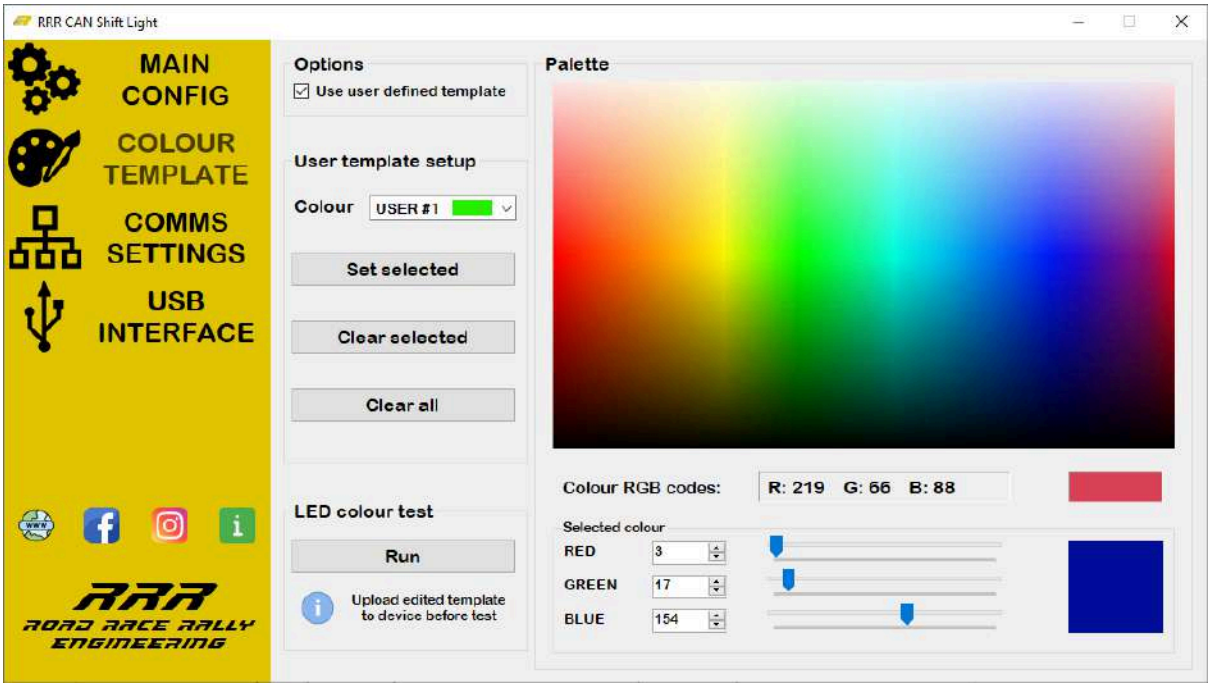

Fig.22 Colour template sub-menu view

To be able to use user defined colours when setting the LEDs, it is necessary to check the "User defined template" checkbox before.

There are three types of possible actions for each colour cell. Colour can be assigned to previously chosen colour cell. Cell can be cleared, and set as default (white). Also wipeout of all fifteen colours places are possible at the time.

Colour picking can be done in three ways. Manually enter the RGB values into tinge data places. Using sliders. Or by moving the mouse over the visual palette, and clicking to apply the values.

The "LED colour test" option is available only when connected to a CSL device, and is used for visual presentation of the user colour template. The CSL displays all the colours in a waveform one after another.

Remember to upload the edited template into CSL before the test!

Comms settings sub-menu

The comms settings sub-menu is used for configuring the CAN stream, which RPM, gear, and other modes data are getting from. The CSL device works under the CAN 2.0B protocol, and supports both standard and extended messages as well as multiplex / compound streams. The bus bitrate can be set in four default speeds: 125kbps, 250kbps, 500kbps and 1Mbps.

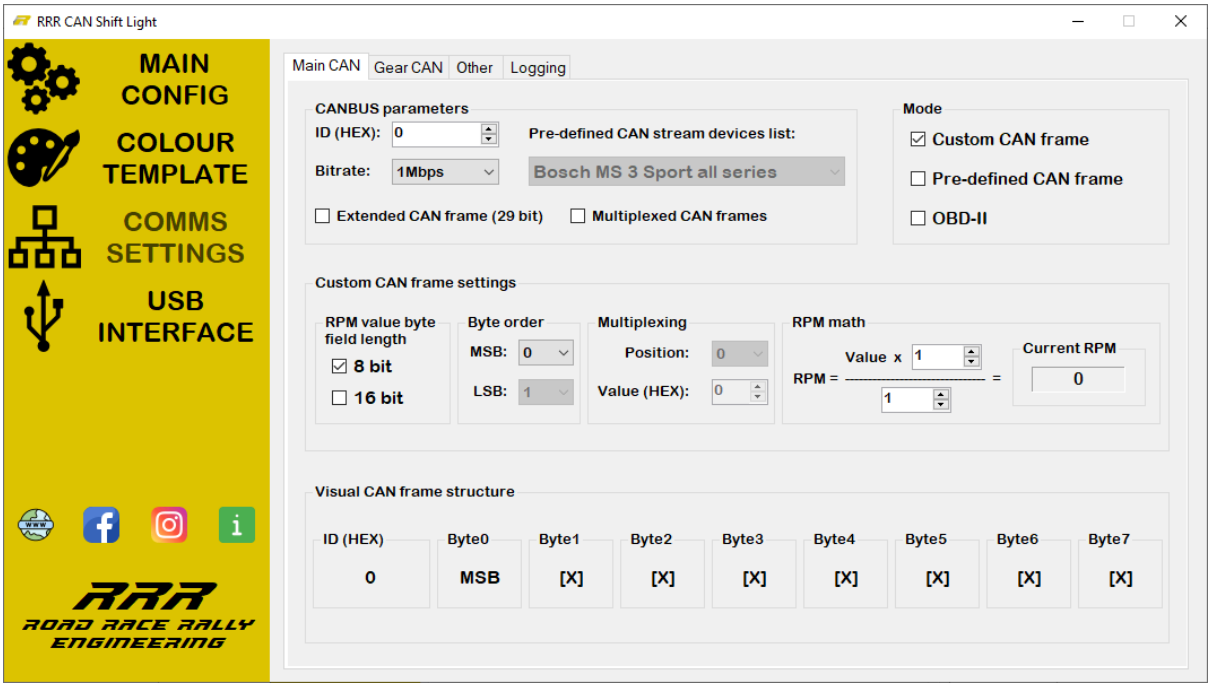

Fig.23 Comms settings sub-menu view

CAN operating modes

First is a fully user-eligible CAN stream, where proper bitrate, ID and byte configuration is needed for valid CSL functioning. Extended 29 bit CAN 2.0B frames can be turned on via check box. There is an option to set 8 bit or 16 bit RPM data field selection. Using the "Byte order" tab, it is possible to change data field position in a CAN frame and endianness (big-endian/Motorola or little-endian/Intel) as well. The "RPM math" tab is used for applying the multiplier and divider for raw CAN values to make them readable as proper RPM.

Second is a pre-defined set that contains a list of mostly used ECU's and vehicles CAN streams. In this mode there is a need to only choose the right preset from the dropdown list which is suitable for your vehicle CAN protocol.

In some cases, when a standalone ECU is selected, there is also an option to change the CAN bus bitrate.

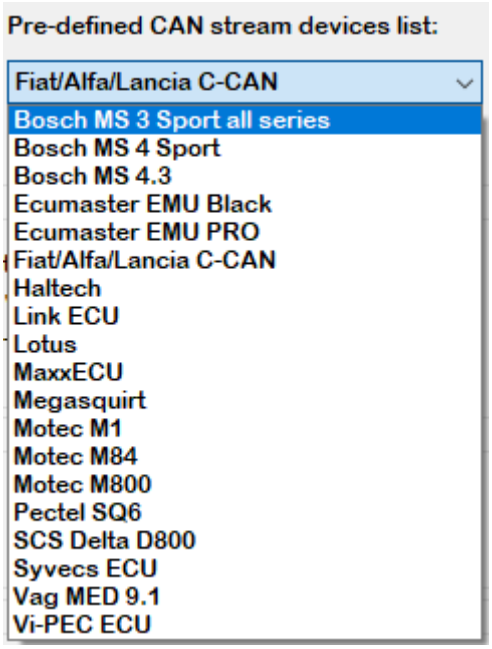

Fig.24 List of pre-defined CAN streams for ECUs and vehicles

Third mode is fully ODB-II, where CSL sends the request frames and receives RPM data. There is an option to use extended frames OBD-II, but may be necessary to change frame ID in some types of vehicles.

Multiplexed CANBUS

If multiplexed / compound messages are present, they can be also handled by CSL. There are two options to set: position of multiplex byte in CAN frame, and its value for RPM message.

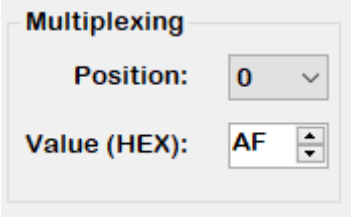

Fig.25 Multiplex menu for RPM

CAN helpers

Because of the great complexity of CAN frames structures, two helpers are provided.

The “Visual CAN frame structure” shows the actual defined CAN frame parameters from which RPM data is picked from.

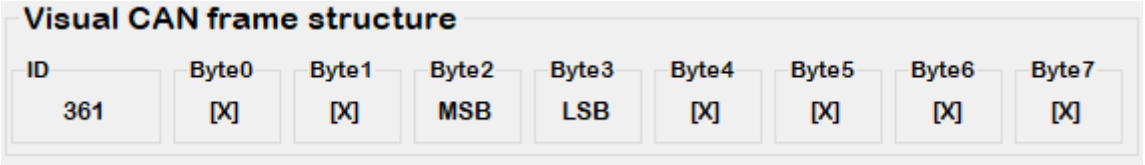

Fig.26 Example of visualised CAN frame structure

The “Current RPM” shows the actual calculated RPM. The data is live-view when the engine is running.

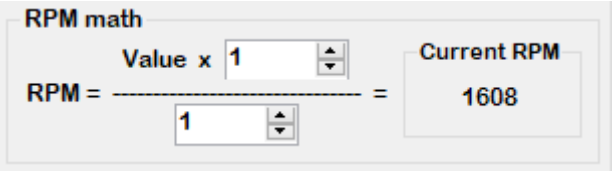

Fig.27 Live-view of engine RPM

Gear depend CAN submenu

This comms settings submenu provides setting of gear dependent shiftlight. Like the RPM submenu, the ID, mux value can be entered. User have to set the number of used gears and value of CAN field for each of them. Visual CAN frame structure viewer helps to determine which bits need to be captured from CANBUS. Variable length and start bit provide the adjustment to any type of frames.

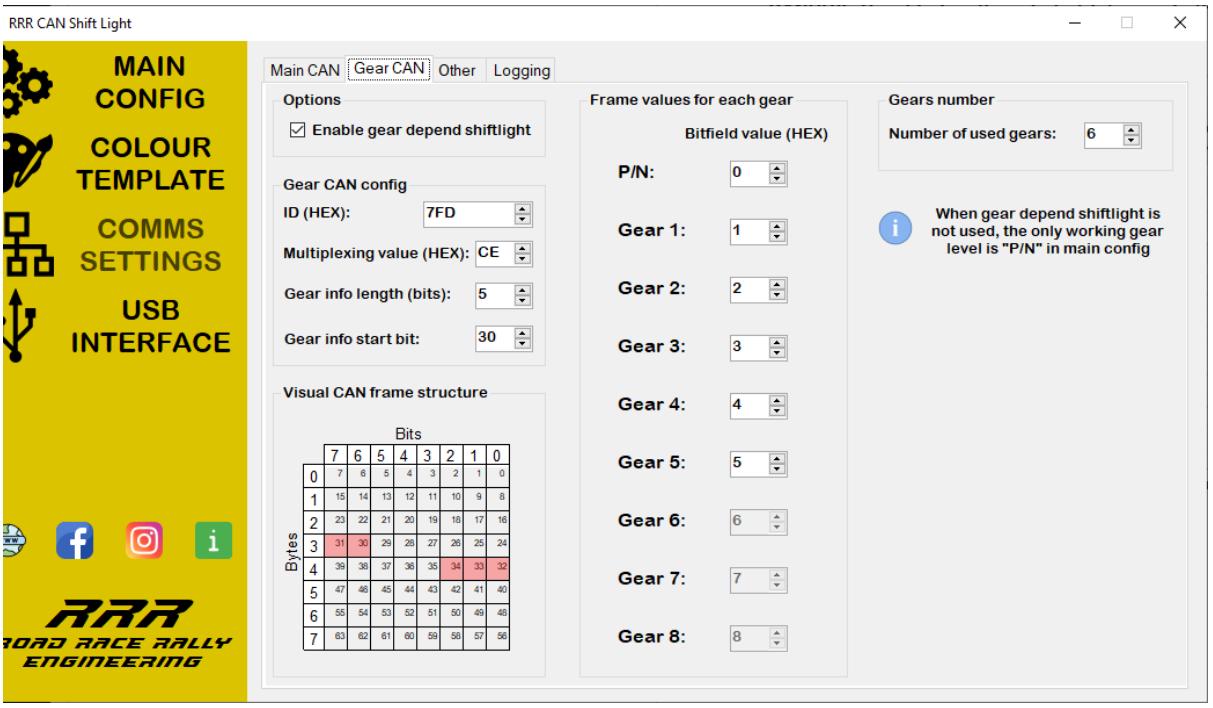

Fig.28 Gear depend submenu

Other comms settings

This menu allows the user to set up the dimming, pitlane and alarm modes. Each of them can be enabled via CAN message or discrete signal connected to hardwired input. CAN settings give the same functionality as in previous RPM and gear menus. Additional hardwired input, enabled by high (12V) state can be assigned to any of these three modes.

The dimming value is the % of the brightness values set in MAIN CONFIG.

Pitlane mode is “wandering stripe” of selected colour, where alarm is constant or fast blinking light, depending what is set.

Pitlane and alarm modes have priority over normal functionality of shiftlight.

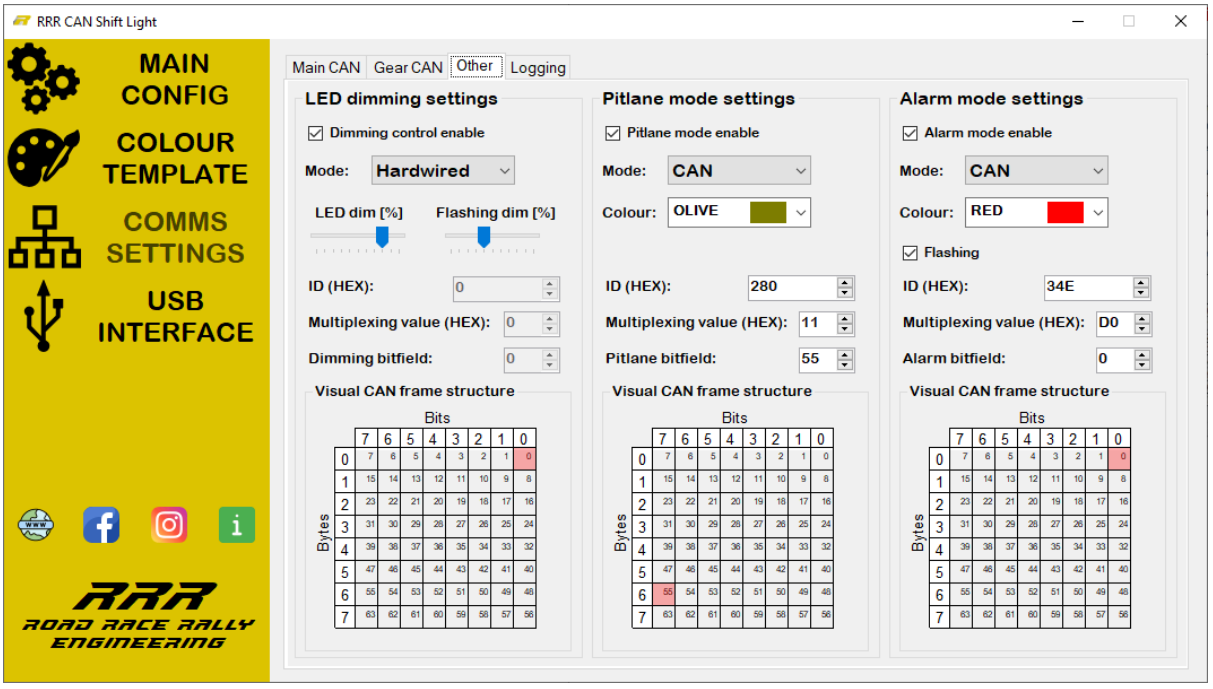

Fig.29 Other settings submenu

CAN view

This menu allows the user to display in live view current RPM, selected gear if used. Also current dimming, pitlane and alarm status is shown, whatever CAN bus or hardwired input is used. When such CAN frames based optionals are used, they are displayed in detail as well.

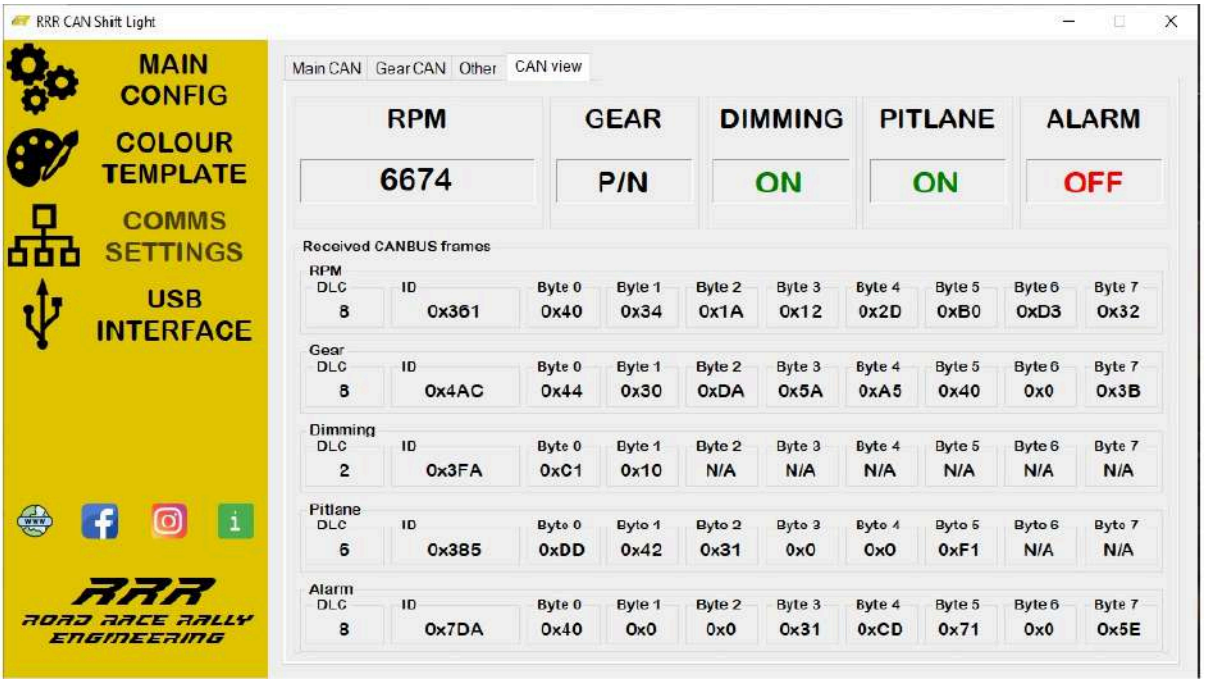

Fig.30 CAN view submenu

USB interface sub-menu

The “USB INTERFACE” sub-menu is used for setting up the communication between PC application and physical CSL device. It also indicates the actual internal state of CSL. Unique serial number and versions can be read from there too. Firmware update option is intended for future use, when new features come.

A more detailed description with regard to the USB interface sub-menu can be found in the “First launch” chapter.

Drawings

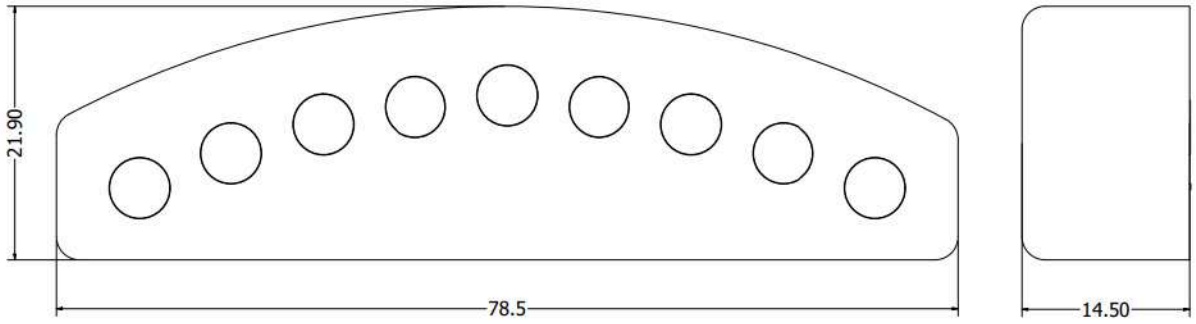

Fig.31 Overall dimensions

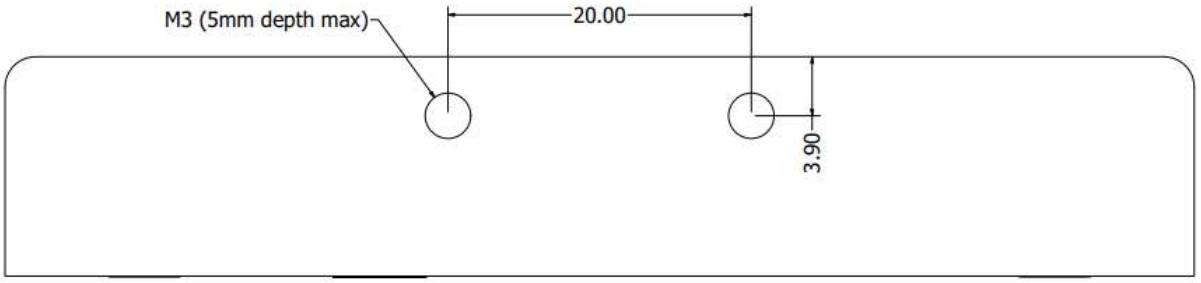

Fig.32 Mounting hole locations

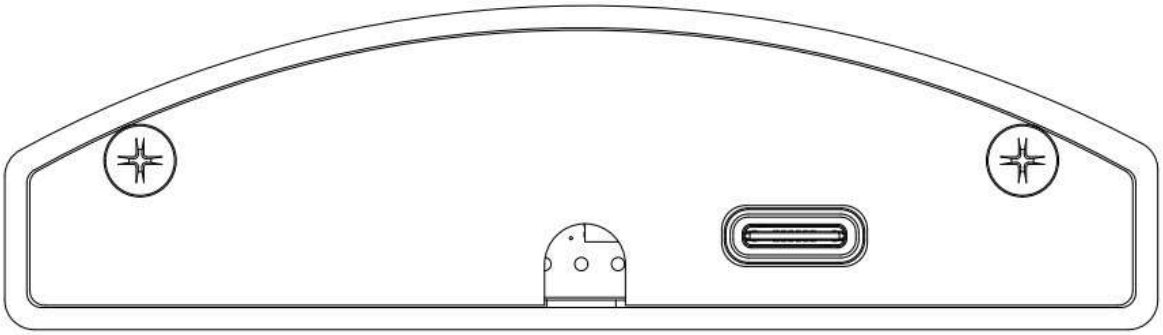

Fig.33 Rear view for cable and USB connector location

Accessories

- Deutsch DTM connector
- ASL606 connector
- CAN twisted pair wire
- Raychem 55 wire
- Roundit 2000 self-wrap
- Ecumaster EMU PRO-16 ECU
- Ecumaster EMU PRO-8 ECU
- Ecumaster EMU Black ECU