

Jan's Lap Counter 2.6

User manual

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2 Introduction

Jan's Lap Counter is a software tool to register lap times on slotcar tracks with up to 8 slots. For analog slotcar tracks the software is connected to the slotcar track through a sensor piece which signals the drive through events via the parallel port of the PC or via a USB hardware either based on the IOWarrior chip of Code Mercenaries or the Light & Time AT-2560. These signals are registered and used for calculating the lap times and the number of laps. For digital Carrera systems the software is connected to the control unit using a suitable cable. The data collected by the control unit is read out by the software, processed and displayed.

2.1 Features

In its current version the lap counter supports the following features:

- Any sensor circuitry on the parallel port of the PC
- IOWarrior based hardware or L&T AT-2560 connected through the USB port
- Connection to a Carrera Digital Control Unit using a suitable USB-Serial-Cable
- Display the number of laps (counting up or down)
- Display the current lap time
- Display the fastest lap time
- Display the average lap time
- Display the average speed of the lap (scale in km/h, mph in real m/s)
- Start lights with random time to start the race
- Sounds when a lap is done and when there is a new fastest lap time
- Voice output of the lap count and the lap time
- Management of several race tracks, drivers and cars
- Configurable start conditions (start by lights or rolling start)
- Configurable end conditions (No end, lap limit or time limit)
- Configurable winning condition (Number of laps, fastest lap fastest average time, hitting a target time either with a single lap or with the average lap time, most consistent lap times)
- Pause the ongoing race via menu or via an external chaos button
- Storing the race info and the lap times in a *.csv file
- Simulation of fuel consumption with extensive configuration possibilities and several possible configurations for the refuel zone (refuel with either the start/finish sensor, a separate refuel sensor, a refuel zone with separate zone begin and end sensors or a refuel zone with one fuel sensor and the start/finish sensor)
- Up to three sectors per slot displaying the corresponding sector time or the intermediate time at the end of each sector
- Track power control (if supported by your hardware)
- Select driver or car via QR Code. A QR code can be generated for each driver or car and when driver or car selection is needed the QR code can be read via a webcam
- Storing of the distance driven for each car and the fastest lap times for any combination of car, driver and slot.

- Application completely translated in german language and in english language (by default selected based on operating system language, but can be also controlled via command line parameter)

2.2 System requirements

CPU with at least 600 MHz

128 MB RAM

57MB of hard disk space

Sound output

Parallel port or USB port to connect to a supported sensor hardware

Windows 7 or higher (Windows XP should also work, but is not tested)

Minimum screen resolution of 800x600 pixel for a two slot track or 1024x768 pixel for more than two slots

Since the accuracy of the time measurement is dependent on the system performance there should not be any other software running in the background while using this lap counter.

2.3 License conditions

This software is free of charge for non commercial use. Installation and usage of this software is at your own risk. The author of this software can not be held accountable for any possible damage that may result from using this software.

2.3.1 QT

The lap counter is based on the LGPL (GNU Lesser General Public License) open source version of the QT framework (<https://qt-project.org>) in version 5.5. Any further information on usage and modification of this version of QT as well as the source code can be found at <https://code.qt.io/cgit/qt/qt5.git/>

The LGPL license text is distributed with this software (file LICENSE.LGPL).

2.3.2 Inpout32

For the parallel port communication the software uses the I/O port driver inpout32.dll from <http://www.logix4u.net> in the 64Bit capable variant from Phil Gibbons (<http://www.highrez.co.uk>). This driver may be freely used, provided that the following license text is mentioned (which it is below):

*Copyright (c) <2003-2015> Phil Gibbons <www.highrez.co.uk>
Portions Copyright (c) <2000> <logix4u.net>*

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2.3.3 IOWarrior

For communication with the IOWarrior hardware on the USB port a library from the IOWarrior manufacturer Code Mercenaries (<http://www.codemercs.com>) is used. As far as I can see there is no limitation on using this library.

2.3.4 QZXing

For the creation and detection of QR codes the library QZXing is used. This library is published under the Apache licence and it is used here without any modifications. The Apache license is distributed with this software (file „QZXing.dll_LICENSE“).

3 Installation and first steps

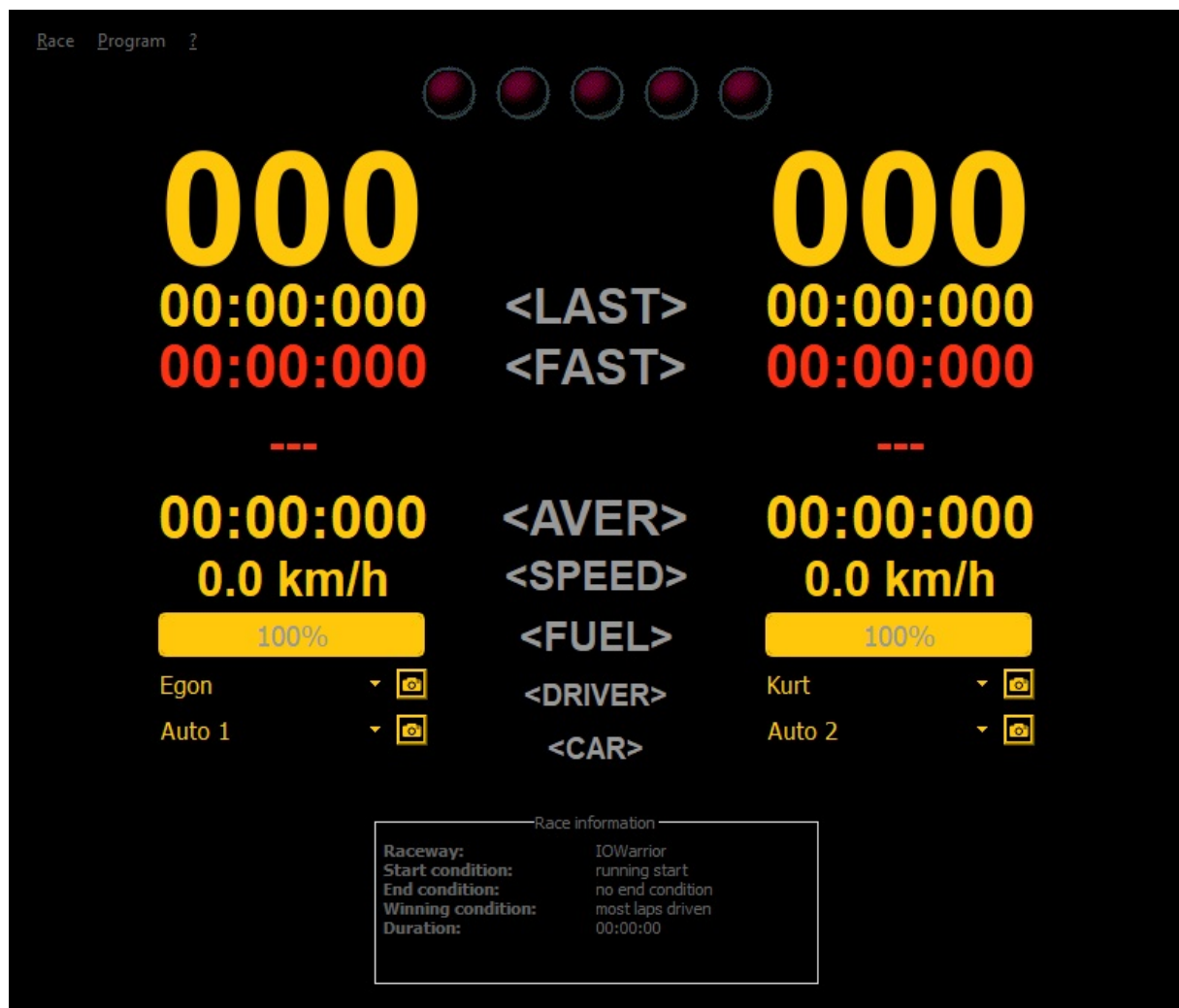
Installation only requires extracting the zip archive to any folder on your hard disk. However, it is important to ensure that the folder structure from within the zip archive is extracted as well.

To run the program simply start the file „Rundenzaehler.exe“. On the first start the program tries to install the driver inpout32.dll for accessing the parallel port and creates the storage file „rundenzaehler.db“. Therefore the very first start of the program takes a bit longer than subsequent starts.

In order to successfully install the driver inpout32.dll the program needs to be run with Admin rights once. Since Windows Vista this can be done by doing a right click on the executable file Rundenzaehler.exe and selecting „Run as administrator“.

The program starts in full screen mode by default. There is a command line parameter „-windowed“ to start it in window mode if needed.

When started the program will show the user interface like in **Fehler! Verweisquelle konnte nicht gefunden werden.**



Picture 1: Main screen

In principle the software is now immediately usable. But in order to work properly with your slot car track there are a few configurations required. The default raceway that is created on the first start of the program has two slots, default settings for a parallel port, a scale of 1/24 and no information on the length of the slots.

Attention: If the default settings for the parallel port do not match the real settings of your hardware then the signals from the track will not be received. And if you do not have configured the length of the slots then the speed can not be calculated.

3.1 Display areas on the main screen

The main screen shown in Picture 1: Main screen consists of the following areas:

- **Menu bar:** The menu bar is located on the upper left . It contains entries for „Race“, „Program“ and „?“. The menu item „Race“ contains the sub items for starting, pausing, storing and configuring a race and – if available on your track – for controlling the power of the track. The menu item „Program“ contains the sub items for settings, the simulator mode (e.g. for testing this software), for calling the dialog to see the fastest laps and for exiting the program. The menu item „?“ offers access to the info dialog which contains the version number of the program as well as a link to the web page and some other data.
- **Start lights:** At the top you can find the start lights consisting of five lights.
- **Track displays:** In the middle of the screen there are the data for the slots. By default you will see the three digit lap number, the time of the last lap and the fastest lap, a status display and the dropdown selection for driver and car.
- **Race information:** At the bottom you can find an information area that shows the race settings. After a race a small summary is shown here. When clicking this summary a separate dialoge shows the complete race report.

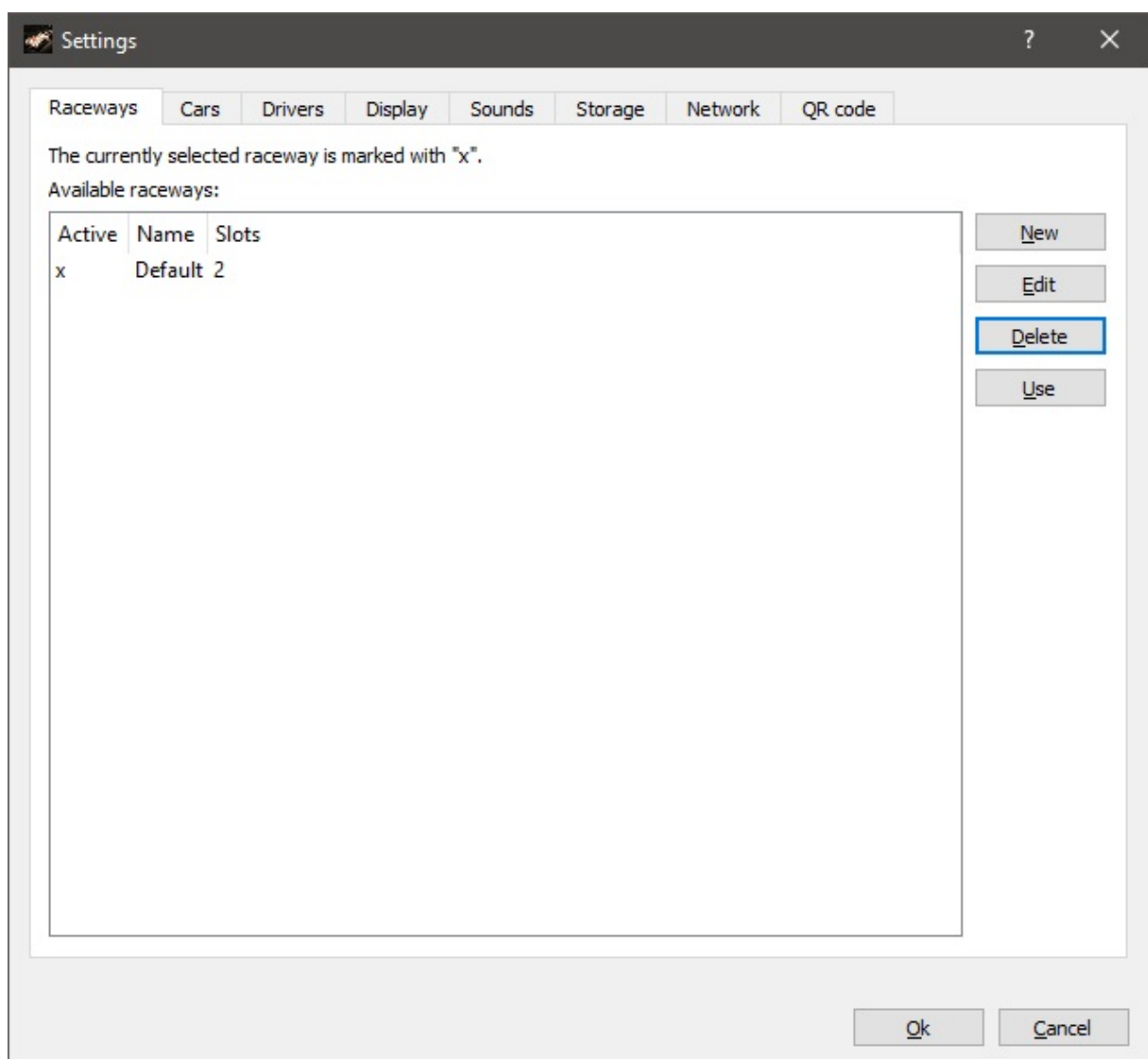
4 Settings

When selecting the menu „Program“->“Settings“ or using the shortcut „CTRL+G“ the settings dialog is shown.

This dialog contains several tabs for managing the raceways, the cars, the drivers, configuration of the display, configuration of the sounds, configuration of some default behaviour upon storage of data, configuration options for network usage and settings for the QR code reading. All these setting possibilities are described in more detail in the following chapters.

4.1 Raceways

The raceways tab (Picture 2: Raceways tab) contains a list of all existing raceways and some buttons offering functionality to manage the raceways.



Picture 2: Raceways tab

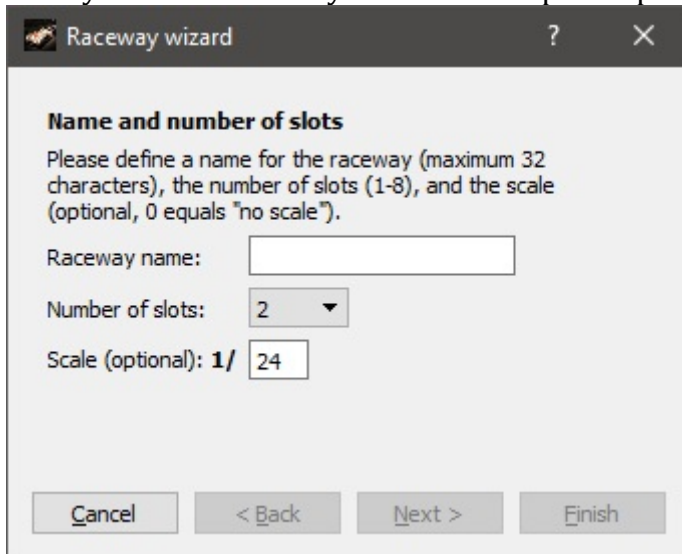
4.1.1 Creating a new raceway

In order to create a new raceway you need to select the „New“ button. This opens a new dialog that will lead you through the individual steps needed to create a new raceway.

Step 1

In the first dialog you can enter the name for your new raceway and you will need to select the number of slots (when using the Carrera Digital Control Unit please additionally consider the hints in Step 2 regarding selection of „Number of slots“). The scale is optional and will be used to calculate the speed if no scale is given for a individual car.

Once you have done all your selections please press „Next“.



Picture 3: New raceway step 1

Step 2

In this step you can configure your hardware used to connect to the track. Currently supported hardware is the Carrera Digital Control Unit, the parallel port (old printer connector, also called LPT), the IOWarrior in various variants (24, 28, 40, 56, 100, these are chips that connect to the USB port for I/O operations. You can find more information on these chips at www.codemerics.com) and the Light & Time AT-2560 hardware (more info on this hardware can be found at www.light-and-time.de).

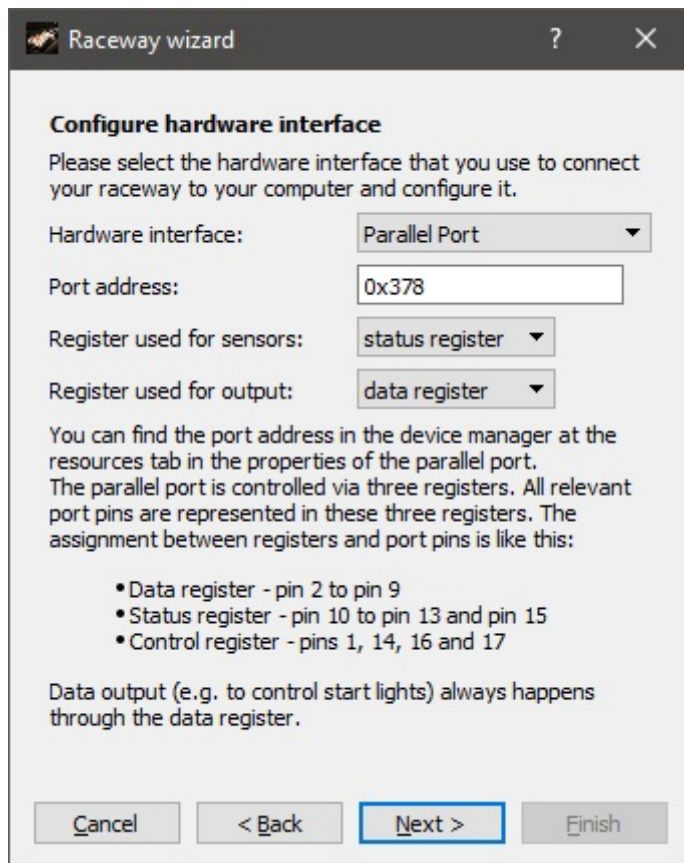
If the Carrera Control Unit is selected then also the serial port (COM-Port) that is used to connect to the Control Unit needs to be selected. The software was tested with a cable from www.light-and-time.de which is plugged into a USB-Port of the PC and then creates a virtual COM-Port (listed in the device manager as „Prolific USB-to-Serial Comm Port“). When using the Carrera Control Unit most of the following steps are skipped and the process continues with step 11.

Attention: When using the Control Unit then the „Number of Slots“ selected in step 1 is used as „number of car IDs“. I.e. if only 2 slots are selected there then only the car IDs ID1 and ID2 will be displayed and if you want to use all 6 car IDs then you also have to select 6 slots in step 1 accordingly.

When the parallel port is selected you will need to also enter the port address. You can find this in the device manager of your system under the „Properties“ of your parallel port on the „Resources“ tab. Usually it is the first value shown there for resource type „I/O-Range“. Additionally you need to select the port registers for sensors and for output. What you need to select there is dependent on your specific hardware used to connect the track to the parallel port. A hint on what registers to select can be found in the list of port pins for the 25-pin connector. The default settings should cover the most usual configurations.

For the L&T AT-2560 hardware it is also required to select the serial port (COM-Port) for communication with the hardware. When connecting this hardware to the USB-port of the PC a virtual COM-port is created automatically.

When done with your selections you can move to the next dialog by pressing „Next“.



Picture 4: New raceway, step 2, hardware settings

Step 3

In this dialog box you can select additional features that your individual hardware offers that you might want to connect to the software.

There is a check box to select if there is an external chaos button and if there is an external signal that shall be triggered during chaos phase. The chaos button has the same functionality like the „pause“ function from the menu „Race“->“Pause race“ and the shortcut CTRL+P.

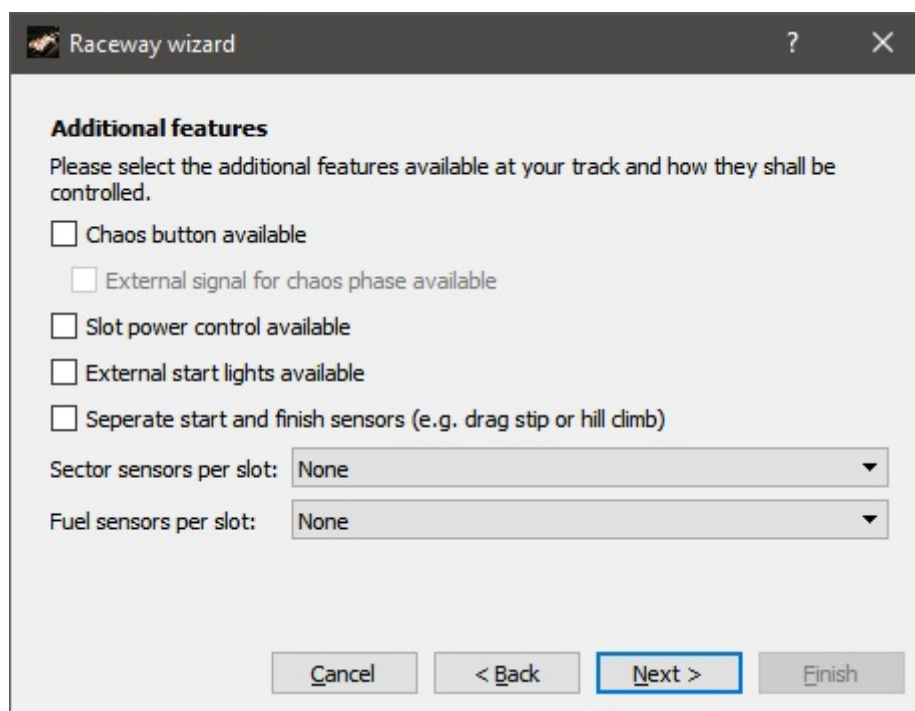
Further check boxes allow to select if there is track power control, external start lights or separate sensors for start and finish of a lap. The latter could be used for hill climb or drag strip tracks.

Additionally you can select if your track has sector sensors. The selection offers no sector sensors, one or two sector sensors, i.e. no sectors (or rather one single sector which is between start and finish), two sectors or three sectors.

Furthermore there is the setting for the fuel sensors. It is either possible to use a single sensor for refueling (refueling happens while the sensor is active) or to have a refuel zone with a begin and an end sensor (refueling happens while standing between the two sensors). The latter is possible with a combination of either the start/finish sensor and a fuel sensor (refuel zone is either before or after start/finish) or with separate sensors for refuel zone begin and end.

If you activate these check boxes the raceway configuration will later ask for the corresponding hardware signals.

When you have done your selection you can press the button „Next“ to move to the next step of the setup.



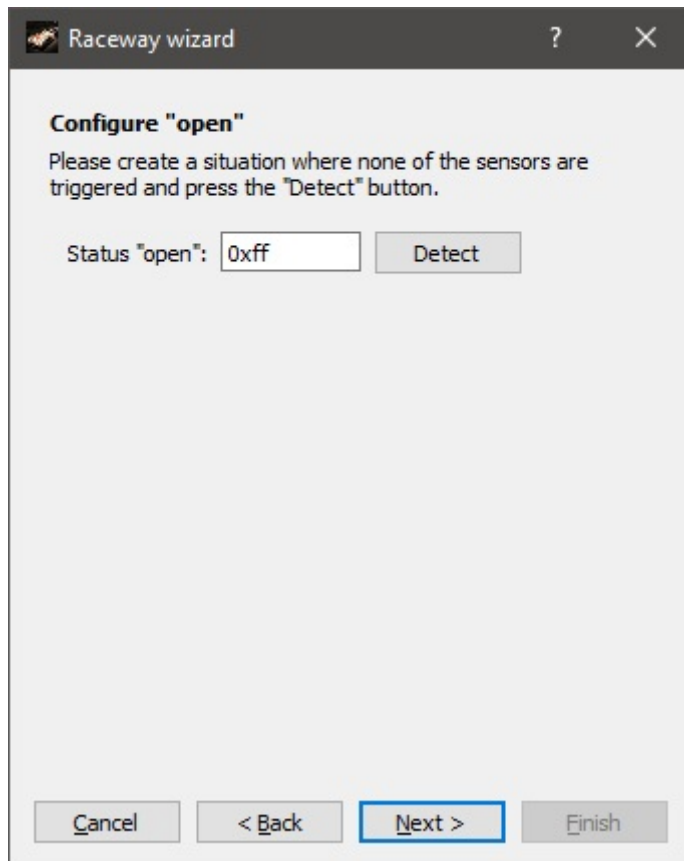
Picture 5: New raceway, step 3, additional features

Step 4

In this dialog box you're asked for the status of the signal input if non of the sensors for the slots are activated. You can press the button „Detect“ to read the current value from the sensors. All sensors should be in a non activated state, of course. I.e. all sensors should be in the state as if no car is currently driving through the sensor. Also any further sensors like the chaos button should not be activated.

In case you have selected the L&T AT-2560 hardware this step is not needed and will be skipped.

Once you have detected the „open“ state you can press the button „Next“ in order to move to the next step.



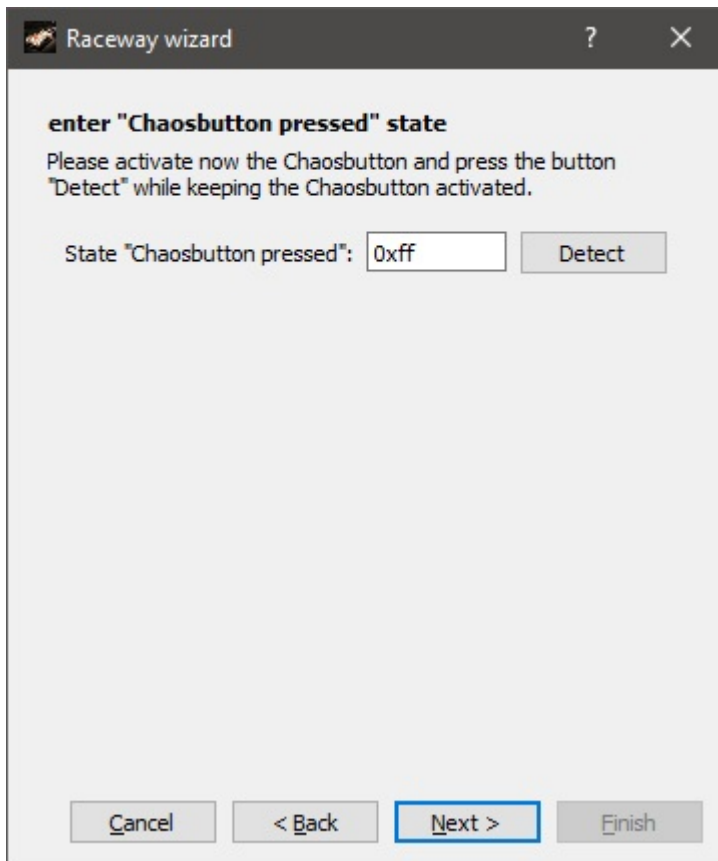
Picture 6: New raceway, step 4

Step 5 (optional)

In case you have selected earlier that there is a chaos button at your raceway you are now asked to configure the signal for this chaos button. In order to do this you need to ensure that no other sensor is active and that the chaos button is pressed. Then, while the chaos button is pressed you need to press the „Detect“ button.

In case you have selected the L&T AT-2560 hardware detection of the signal unfortunately is not possible. In this case you need to select the correct pin manually. Please see the manual for your hardware in order to find out the correct pin setting.

When done you can move to the next step by pressing „Next“.



Picture 7: New Raceway, step 5

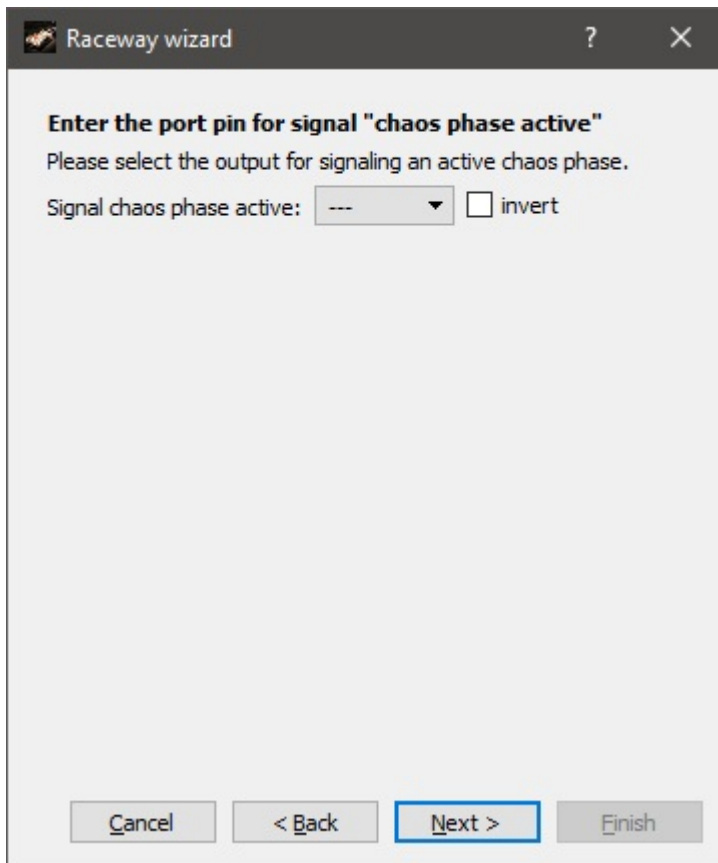
Step 6 (optional)

In case you have selected earlier that there is a signal output for the chaos phase on your raceway you are now asked to configure this signal output. You can select which pin of your connected hardware needs to be triggered in order to signal a chaos phase. You can also select to invert this signal in case it works the other way round.

Automatic detection is unfortunately not possible for output signals. If in doubt you will have to examine your hardware documentation in order to find out what pins to configure.

Attention: please be aware that in worst case a wrong configuration might lead to a hardware defect.

In case you have selected the L&T AT-2560 hardware the output pin is fixed and can not be changed.



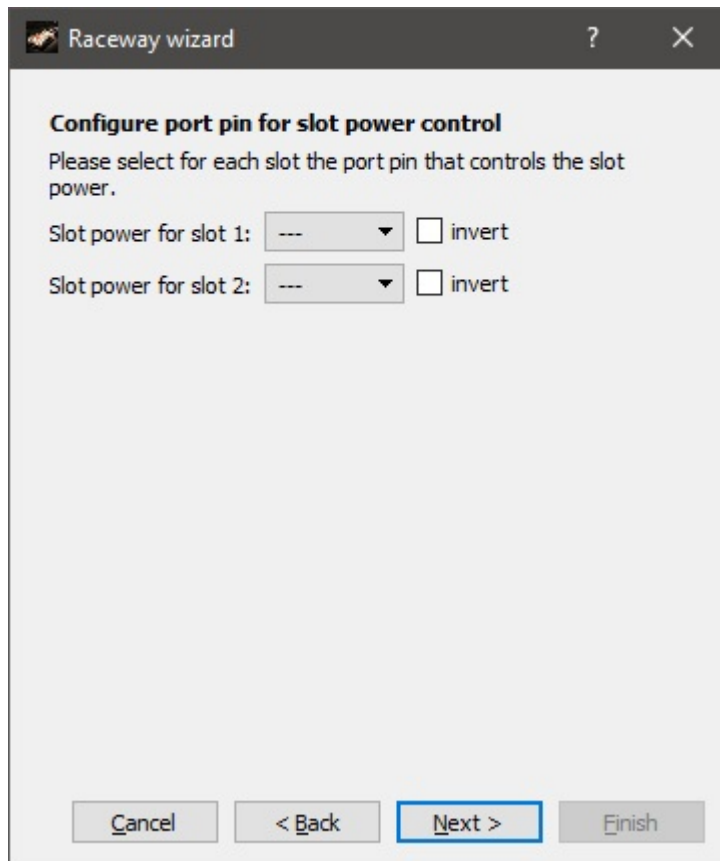
Picture 8: New raceway, step 6

Step 7 (optional)

In case you have selected earlier that your raceway has a switchable power supply you can now configure which output signal controls the power supply for your tracks. You can also select to invert the signal in case it works the other way round. Automatic detection is unfortunately not possible for output signals. If in doubt you will have to examine your hardware documentation in order to find out what pins to configure.

Attention: please be aware that in worst case a wrong configuration might lead to a hardware defect.

In case you have selected the L&T AT-2560 hardware the corresponding output pin is fixed and can not be changed.



Picture 9: New raceway, step 7

Step 8 (optional)

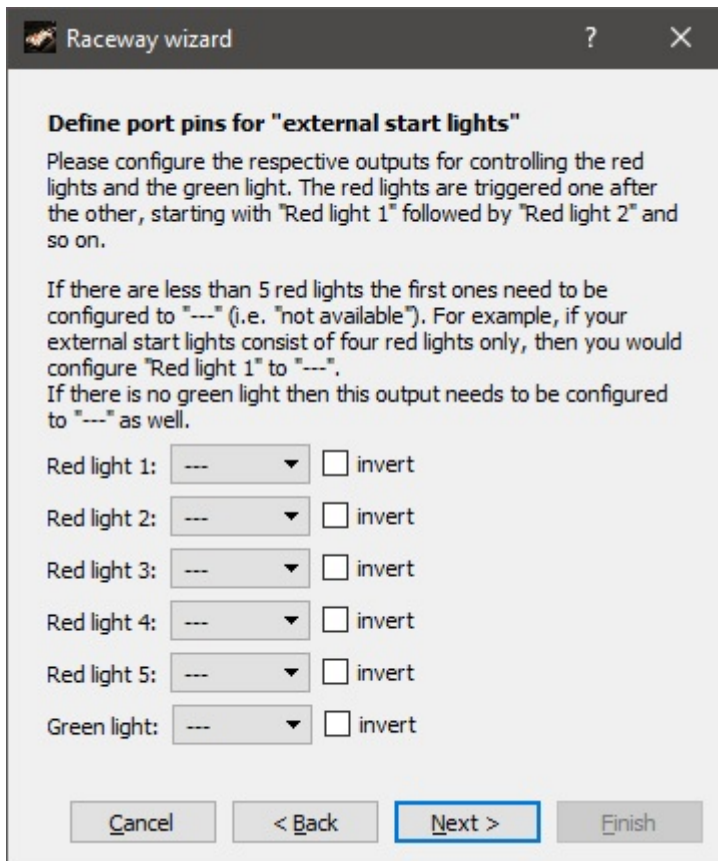
In case you have selected earlier that your raceway has external start lights you can now configure the output signals for these start lights. You can also select to invert the signals in case they work the other way round.

It is possible to configure up to five red lights and one green light. In case you have less than five red lights you will need to configure the not needed ones to "---". The not needed ones should start at „Red light 1“. If for example you only have four red lights you would configure „Red light 1“ to "---" and then „Red light 2“ to the first light on your hardware and so on. If there is no green light on your hardware then you should configure „Green light“ to "---" as well.

Automatic detection is unfortunately not possible for output signals. If in doubt you will have to examine your hardware documentation in order to find out what pins to configure.

Attention: please be aware that in worst case a wrong configuration might lead to a hardware defect.

In case you have selected the L&T AT-2560 hardware the corresponding output pin is fixed and can not be changed.



Picture 10: New raceway, step 8

Step 9

In this dialog you are asked for the setting of the individual track sensors. This dialog is shown for as many times as you have earlier stated in the number of tracks on your raceway.

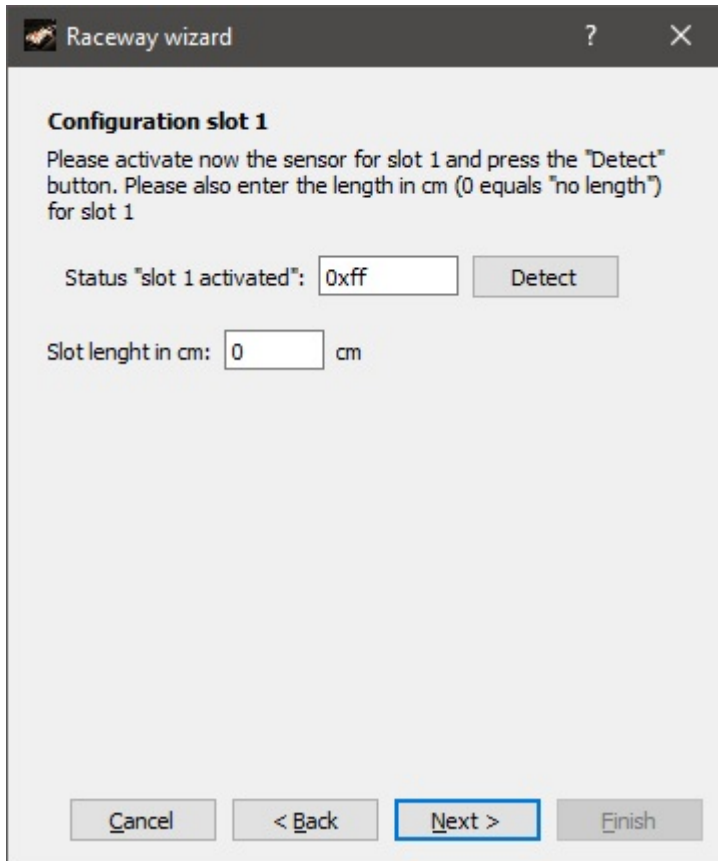
First you should activate the sensor for that specific track (again ensuring that no other sensor is active at the same time) and press the „Detect“ button.

In case you have selected the L&T AT-2560 hardware detection of the signal unfortunately is not possible. In this case you need to select the correct pin manually.

Please see the manual for your hardware in order to find out the correct pin setting.

You can also enter the length of the track in centimeters. This is optional, but speed calculations only work if you have entered the correct length for the track.

Once done you can press the „Next“ button to go to the next dialog.



Picture 11: New raceway, step 9

Step 10 (optional)

In case you have selected earlier that your raceway has separate sensors for refueling you are now asked to configure this sensors. Like with the lap sensors for each track this dialog is shown for as many times as you have configured the number of tracks on your raceway.

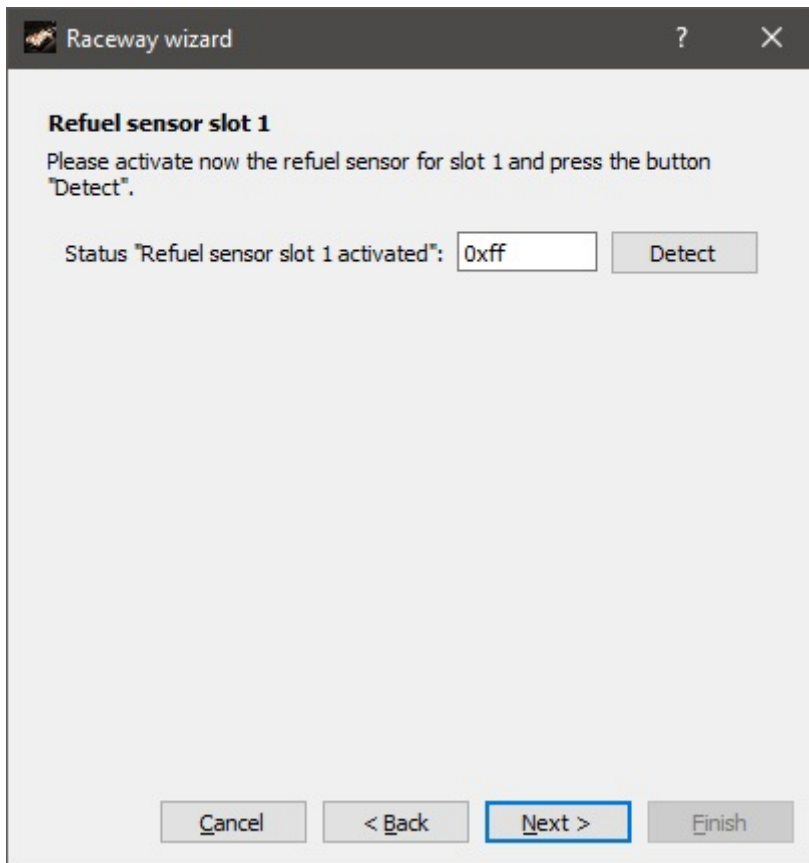
Similar to previous sensors you should again create the situation where only the refuel sensor for the given track is activated and all other sensors are not activated and then press the „Detect“ button.

In case you have selected the L&T AT-2560 hardware detection of the signal unfortunately is not possible. In this case you need to select the correct pin manually.

Please see the manual for your hardware in order to find out the correct pin setting.

In case you do not have separate sensors for refueling the normal track sensor for time measurement is also used for the refuel functionality.

The button „Next“ leads to the next step.



Picture 12: New raceway, step 10

Step 11

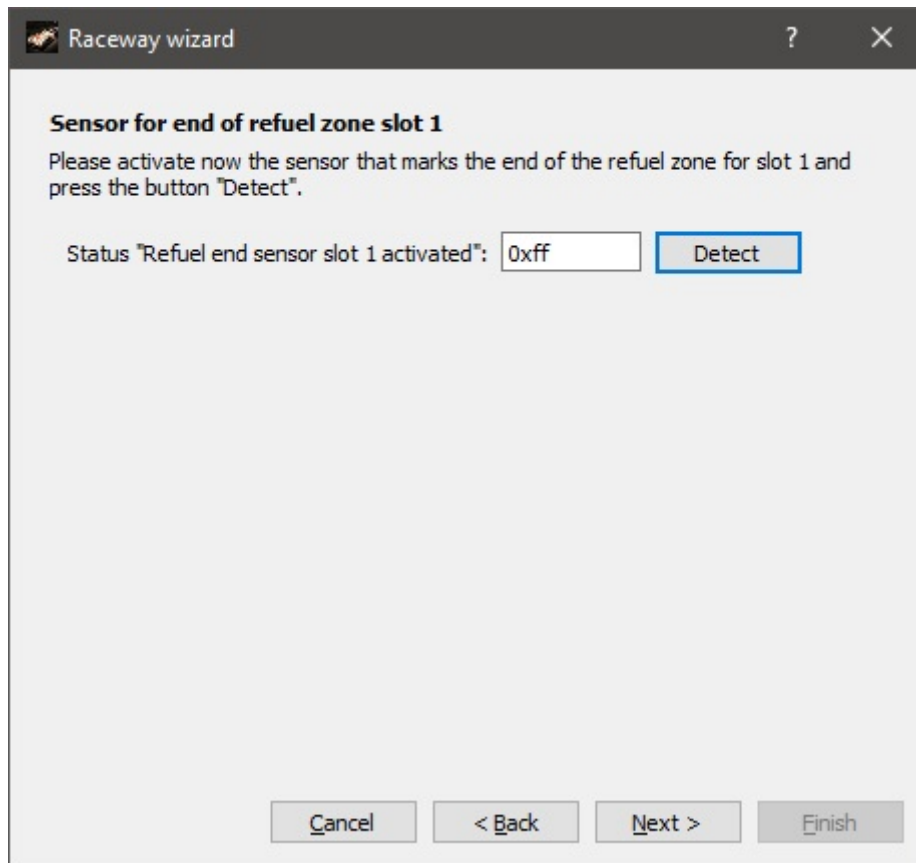
Depending on the configuration of the fuel sensors in step 3 there might be the request to configure the end sensor for the refuel zone. This is the case when you selected a configuration with separate refuel zone begin and end sensors or with a refuel zone after start/finish.

In this case the request is shown for each slot.

Again you need to activate the corresponding sensor and press the „Detect“ button.

In case you have selected the L&T AT-2560 hardware detection of the signal unfortunately is not possible. In this case you need to select the correct pin manually. Please see the manual for your hardware in order to find out the correct pin setting.

Afterwards press „Next“ to move to the next step.



Picture 13: New raceway, step 11

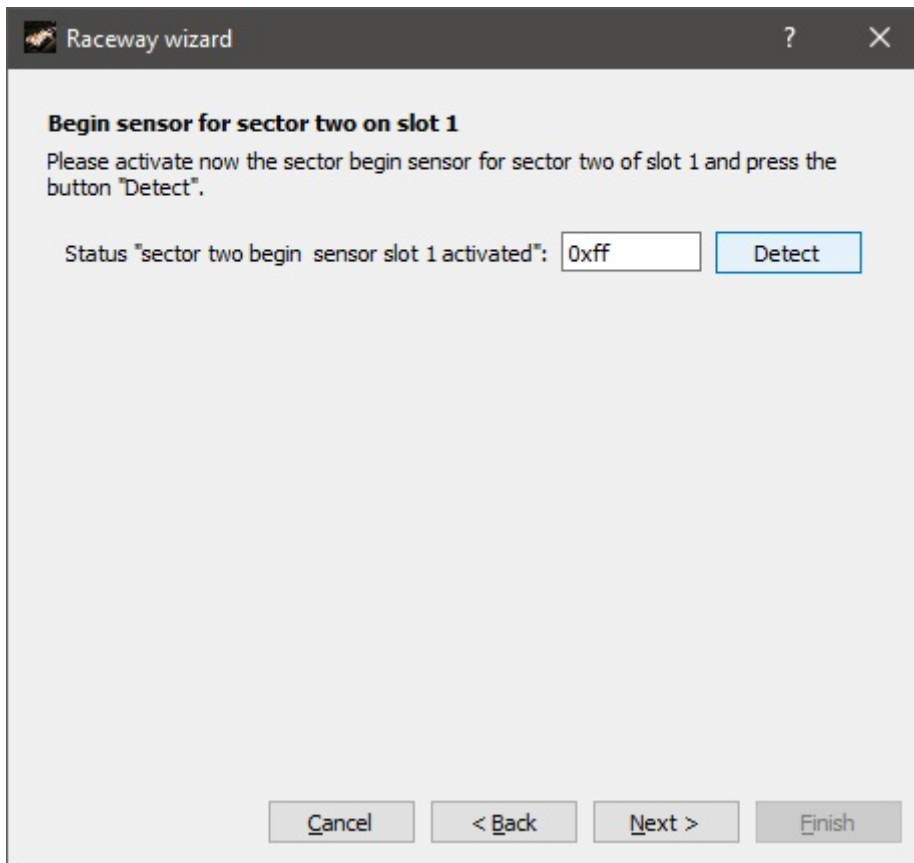
Step 12

In case you have selected one or two sector sensors in step 3, i.e. your track has at least two sectors, then there is a request for configuring the sector two begin sensor for each slot.

Again you need to activate the corresponding sensor and press the „Detect“ button.

In case you have selected the L&T AT-2560 hardware detection of the signal unfortunately is not possible. In this case you need to select the correct pin manually. Please see the manual for your hardware in order to find out the correct pin setting.

Afterwards you can select „Next“ to get to the next configuration step.

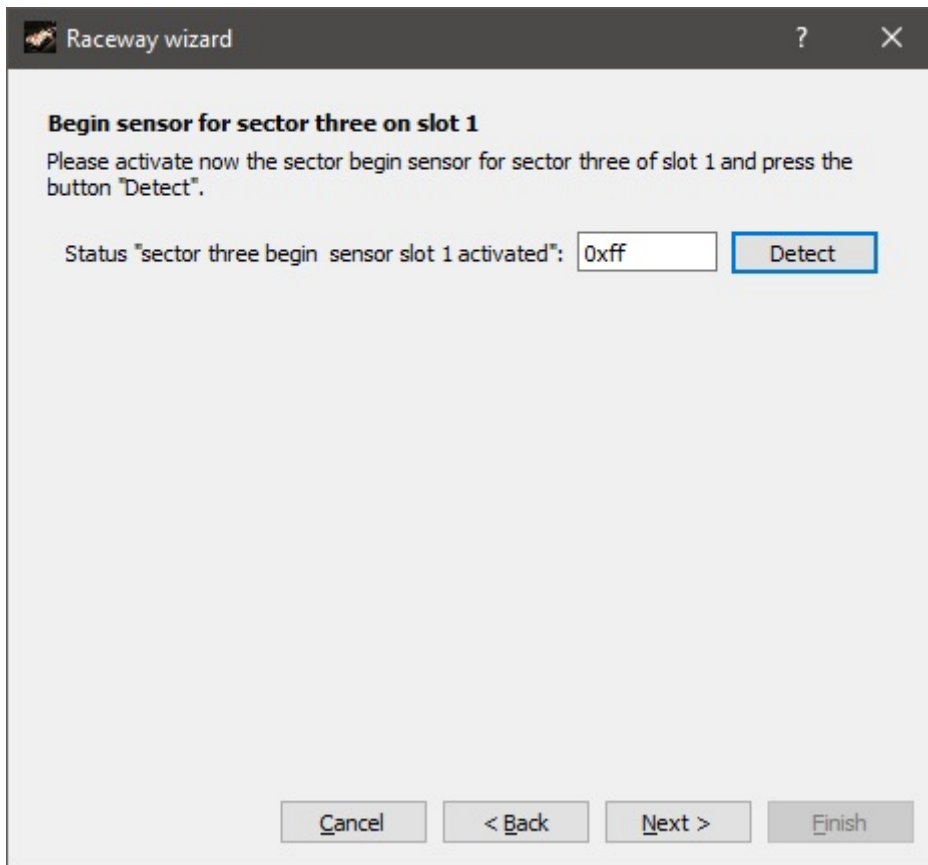


Picture 14: New raceway, step 12

Step 13

In case you have selected two sector sensors in step 3, i.e. your track has three sectors, then there is a request for configuring the sector three begin sensor for each slot. Again you need to activate the corresponding sensor and press the „Detect“ button. In case you have selected the L&T AT-2560 hardware detection of the signal unfortunately is not possible. In this case you need to select the correct pin manually. Please see the manual for your hardware in order to find out the correct pin setting.

Afterwards you can select „Next“ to get to the next configuration step.



Picture 15: New raceway, step 13

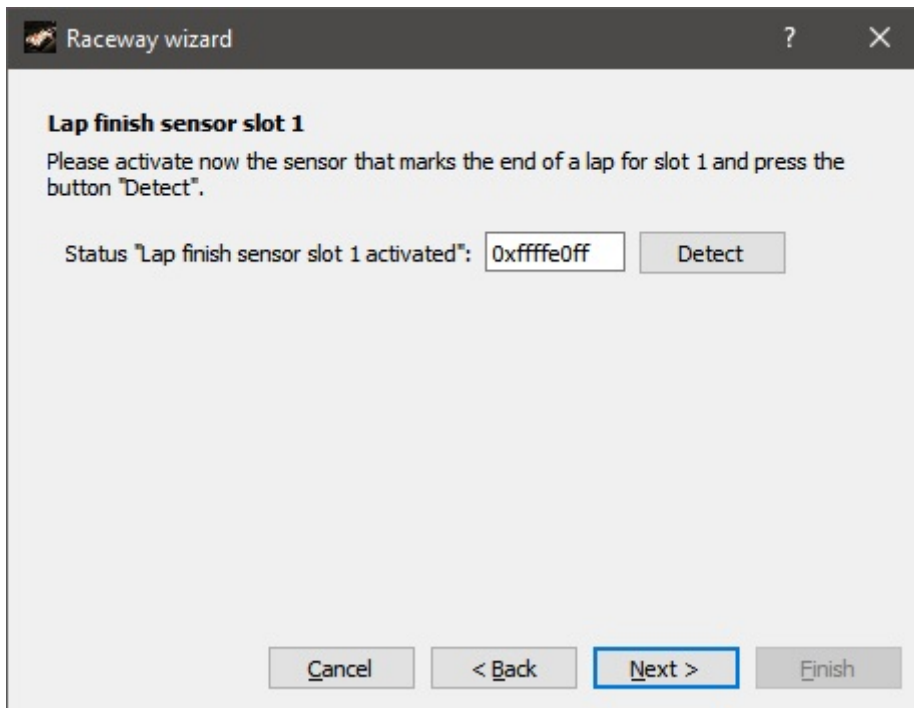
Schritt 14

If you have selected separate start and finish sensors in step 3 then you also need to configure the lap finish sensor now. As usual you need to activate the sensor and press the „Detect“ button.

In case you have selected the L&T AT-2560 hardware detection of the signal unfortunately is not possible. In this case you need to select the correct pin manually. Please see the manual for your hardware in order to find out the correct pin setting.

When separate start and finish sensors are configured then the lap is started when the start sensor is detected and ends when the end sensor is detected. However, a new lap only starts when again the start sensor is detected.

The button „Next“ leads you to the next step.

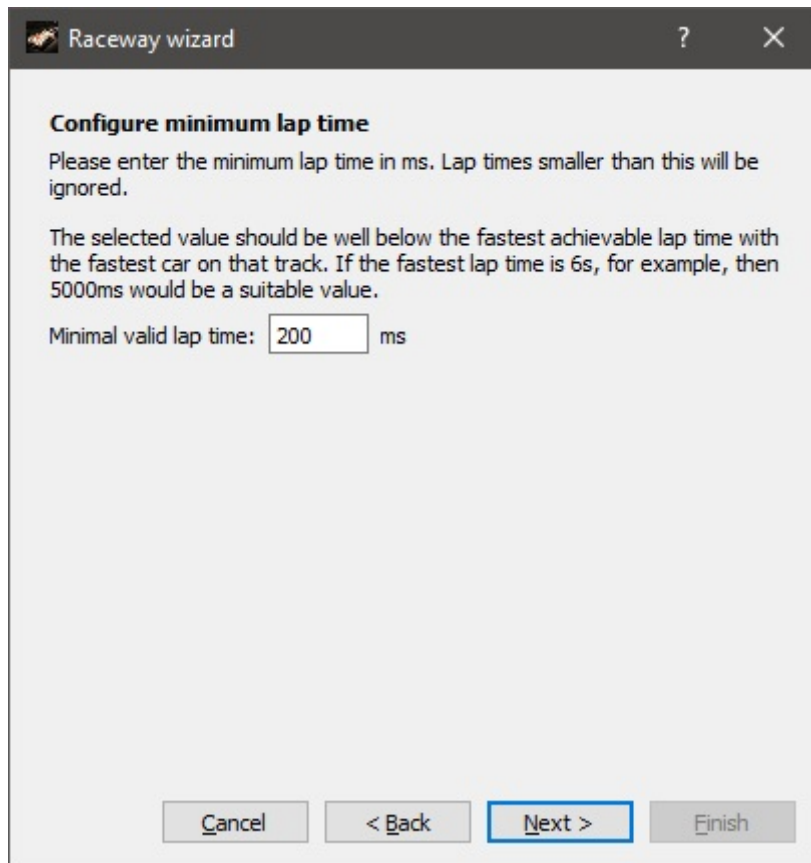


Picture 16: New raceway, step 14

Step 15

After having configured all sensors and signals for all tracks you are now asked to enter the minimum lap time that shall be considered a valid lap. Any lap time less than this minimum time will be ignored and considered a wrong activation of the lap sensor. The minimum lap time should be selected to be at least half a second or more below the fastest time with the fastest car on your raceway. This should prevent wrong countings reliably while still leave room for improvement of your lap times.

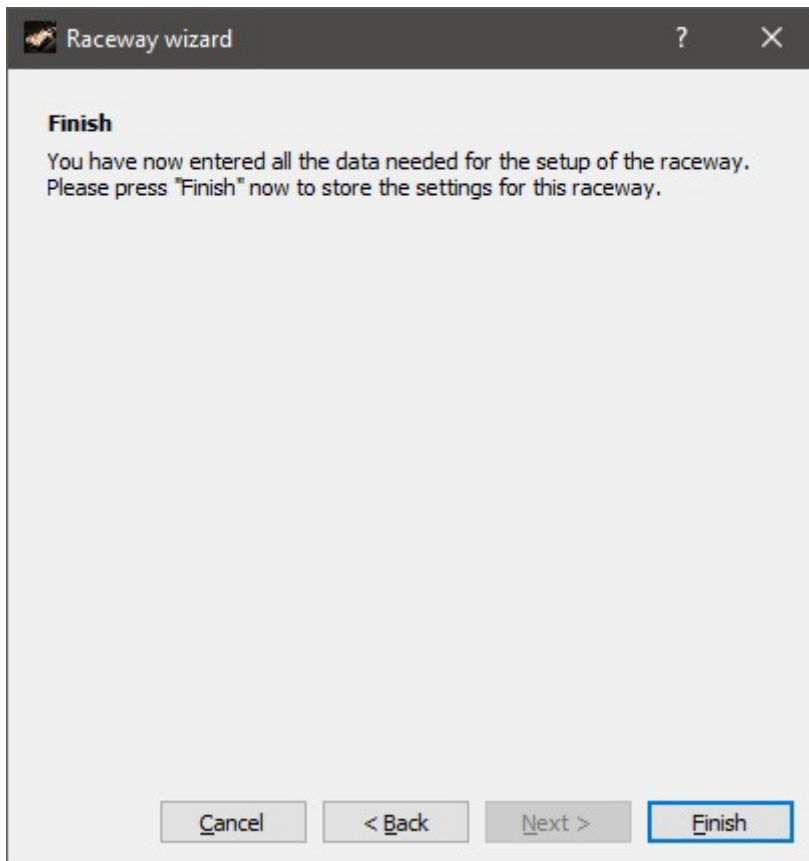
In case you modify the conditions relevant for lap times significantly (e.g. stronger motor, better tires, higher voltage, ...) you might want to adapt this minimum lap time. The button „Next“ leads to the next step.



Picture 17: New raceway, step 11

Step 16

After having entered all the data in all the dialoge windows you will see the „Finish“ dialoge window. If you press the „Finish“ button here the raceway configuration will be stored into the database. The newly entered raceway is now available in the raceway list (Picture 2).



Picture 18: New raceway, step 12

4.1.2 Modifying an existing raceway

In case you need to modify an existing raceway, e.g. because you have changed the length or you need to adapt the minimum lap time, you can select the raceway in the raceway list (Picture 2) and press the „Edit“ button. This will open the raceway in the raceway wizard and you can click through the dialoge windows just like when you have created the raceway and modify the content there. The different dialoge windows will contain the currently configured values of that selected raceway.

4.1.3 Deleting of a raceway

In order to permanently delete a raceway you need to select it in the raceway list and press the „Delete“ button. A dialog will show up asking if you are sure.

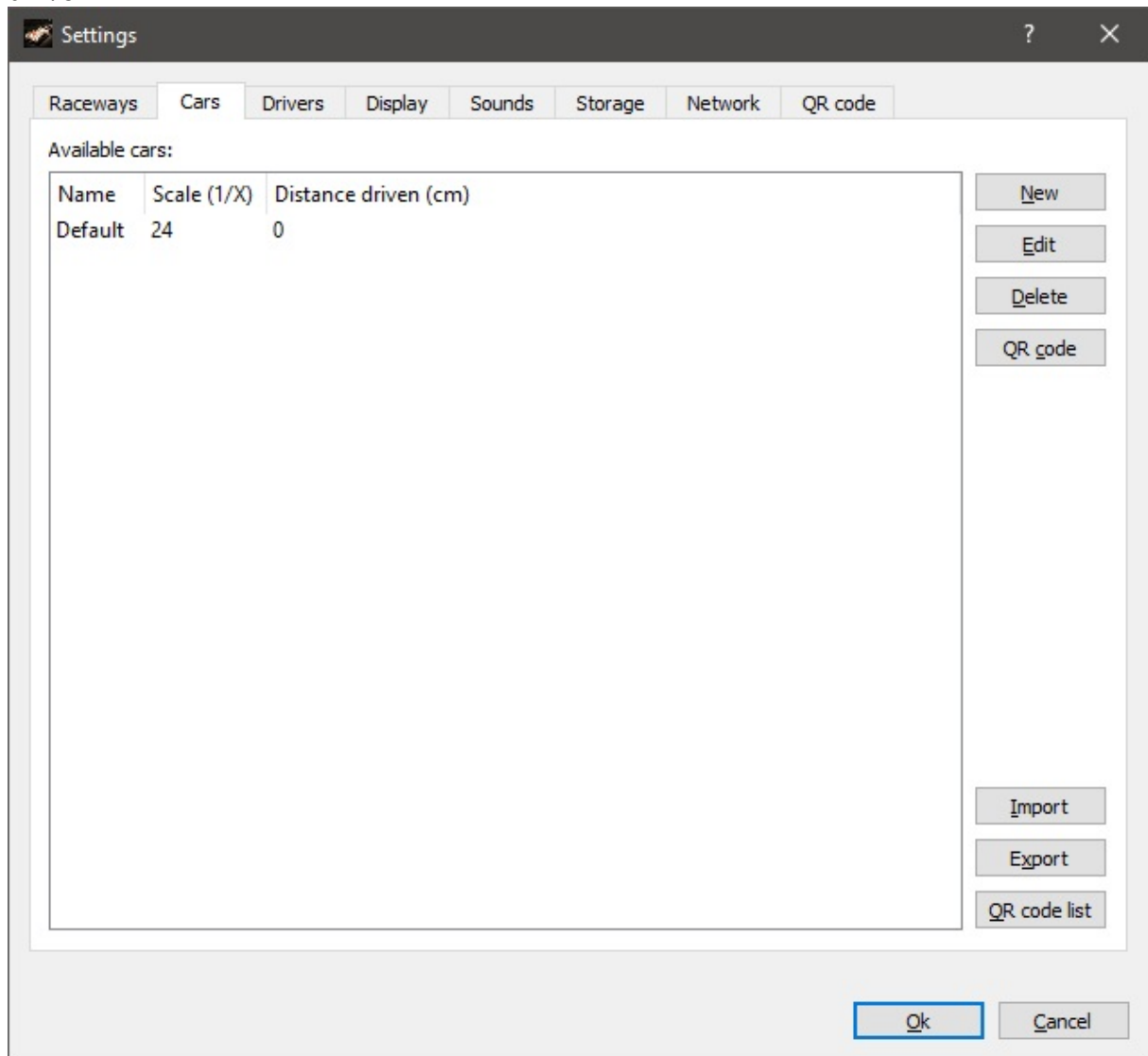
4.1.4 Selecting the current raceway

Since it is possible to have multiple different raceways in this software the currently used raceway is marked with x in the column „Active“ of the raceway list. If you want to use a different raceway from the list you need to select that raceway in the list and press the „Use“ button. The same can be achieved by double clicking the raceway. When activating a new raceway the main screen will adapt to the new configuration (e.g. number of tracks might change).

4.2 Cars

The „Cars“ tab (Picture 19) contains the functionality for managing your cars. There is a list showing the currently available cars with their name, scale and distance

driven.



Picture 19: Cars configuration

The buttons „Import“ and „Export“ allow to export all cars data into a CSV-file (Comma Separated Values) or import cars from such a file. CSV-files can be edited with any spreadsheet editor.

The buttons „QR code“ and „QR code list“ allow to generate a PDF file containing a QR code for either the currently selected car or for all cars. These QR codes can be kept with the cars and can be used – should you have a webcam connected to the PC – to quickly and easily select the car for each track.

4.2.1 Adding new cars

In order to add a new car press the „New“ button. A dialog box is shown (Picture 20) where you can enter the data for your new car.

Picture 20: Dialog box for a new car

You can enter the following data:

Slotcar name: This is the name that the car is shown with in any list or selection box in the different dialog boxes (e.g. when selecting a car for a track). Therefore the name should be unique among your cars.

Manufacturer original: This field is intended to contain the name of the vehicle manufacturer of the 1:1 vehicle (e.g. „Ford“).

Type original: The type should be the vehicle type of the original vehicle that the slotcar is modelled after, e.g. „GT40 P1075“.

Startnumber: The start number that this vehicle has based on its decals.

Scale: The scale of the slotcar. The scale is used to calculate the scale speed which can be displayed optionally.

Class: With this value the cars can be classified against each other into the categories „very fast (1)“, „fast (2)“, „normal (3)“, „slow (4)“ and „very slow (5)“. This classification can be used to select cars that are approximately equal for a race event.

Manufacturer slotcar: This field is meant for entering the manufacturer of the slotcar, e.g. „Carrera“.

Chassis: This field is meant to hold the type of the chassis, e.g. „Carrera 124 race chassis“.

Comment: This field can be used for any information that you might want to store with your car.

Fuel tank size: This field shall hold the volume of the fuel tank that shall be used for fuel simulation functionality.

Reservetank level: This field shall hold the fuel reserve threshold. If the fuel level goes below this threshold the fuel display will be coloured red to indicate that you soon need to stop for refueling.

Min. fuel consumption: This is the minimum fuel consumption per round. I.e. no matter how slow the lap time was this minimum amount will be subtracted from your fuel tank.

Max. fuel consumption: This is the maximum fuel consumption per round.

You can find further information on the fuel simulation in Chapter 5.1.4 Fuel .

Distance driven (cm): In case you have enabled the data collection in the race settings you can find here the distance that has been driven with this car so far. The value is write protected to avoid accidental modification but can be changed by pressing the „Change“ button.

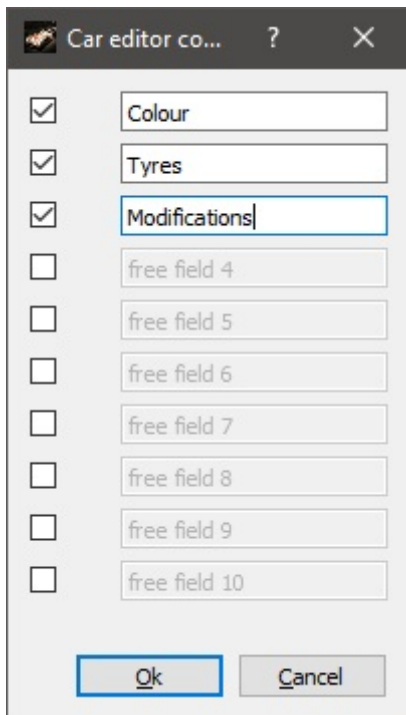
Colour: You can give a textual description of the vehicle colour in this field. *This field can be hidden or renamed for using it for another purpose. (see Chapter 4.2.1.1)*

Tyres: In this field you can put data about the tyres used on the car. This could be e.g. the manufacturer, the size, the shore, the date of last tyre change, ...
This field can be hidden or renamed for using it for another purpose. (see Chapter 4.2.1.1)

Modifikations: The purpose of this field is to note down vehicle modifications, e.g. additional weight, changed wheels, changed motor, ...
This field can be hidden or renamed for using it for another purpose. (see Chapter 4.2.1.1)

4.2.1.1 Configure Editor

The button „Configure editor“ opens a new dialog box that allows to activate or deactivate text fields in the editor or rename the fields. This allows for some customization of the car editor.



Picture 21: Configure editor

4.2.2 Editing an existing car

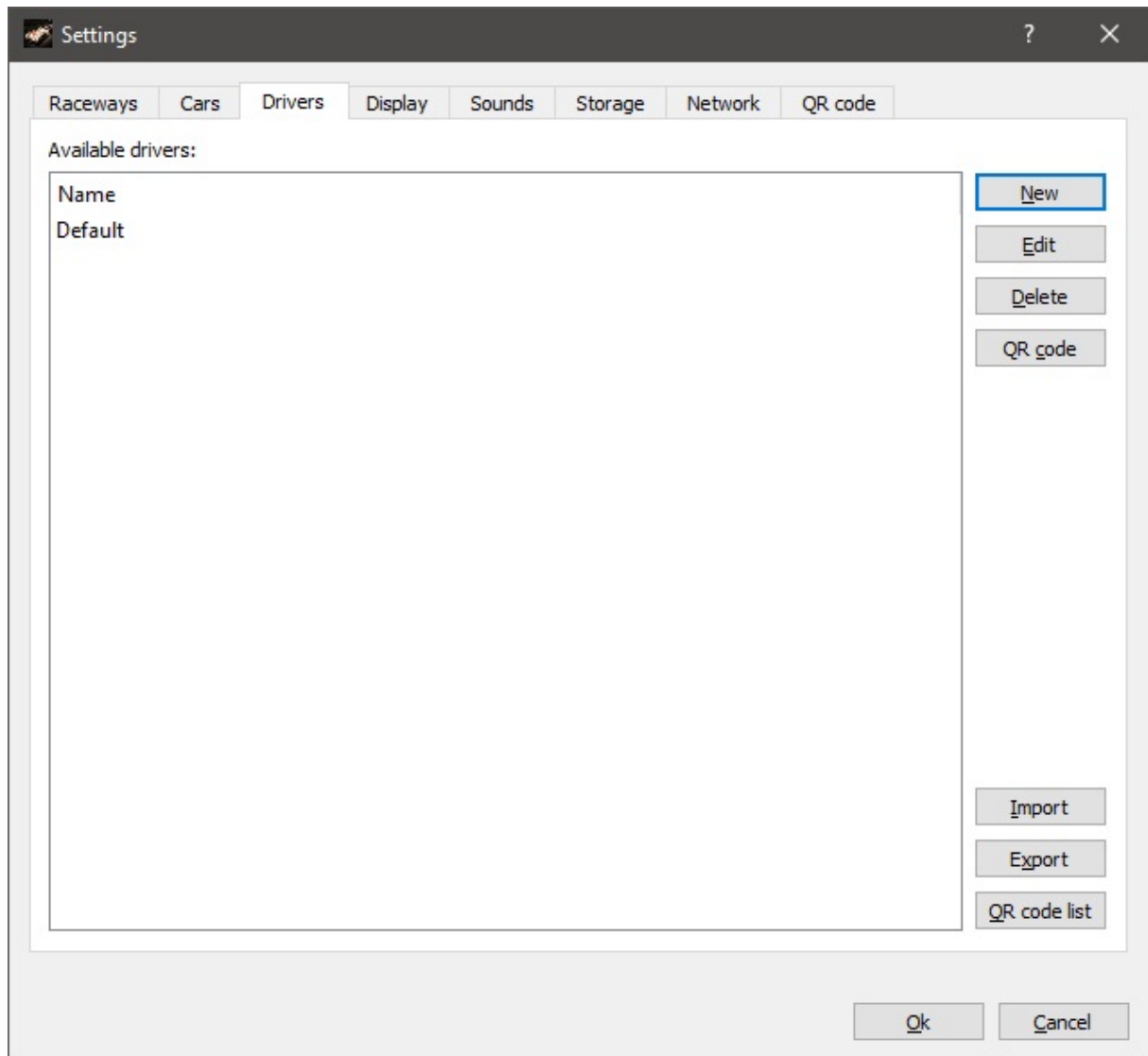
In order to change the data for a car that is already in the database you need to select the car in the car list and press the „Edit“ button. This opens the same dialog box as for adding a new car but with the data of the selected car pre-filled. You can now change the values and press „Ok“ to store the changed data.

4.2.3 Deleting a car

In order to delete a car you need to select it in the car list and press the „Delete“ button. You will be presented with a confirmation dialog. Only if you confirm the deletion by pressing „Yes“ in that dialog the car will be deleted from the database. Please be aware that there is no undo function for deleting a car.

4.3 Drivers

The „Drivers“ tab (Picture 22) contains the user interface needed to manage the drivers within the lap counter software. The list shows the currently available drivers and the buttons on the right side can be used to create new drivers, modify existing drivers or delete drivers. By creating drivers it is possible to assign race results to people and to do person related data analysis.



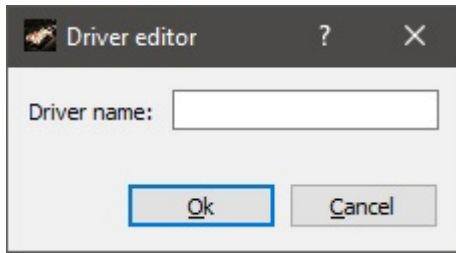
Picture 22: Drivers tab

The buttons „Import“ and „Export“ allow to export all drivers data into a CSV-file (Comma Separated Values) or import drivers from such a file. CSV-files can be edited with any spreadsheet editor.

The buttons „QR code“ and „QR code list“ allow to generate a PDF file containing a QR code for either the currently selected driver or for all drivers. These QR codes can be used – should you have a webcam connected to the PC – to quickly and easily select the driver for each track.

4.3.1 Adding a new driver

In order to create a new driver press the „New“ button. This opens a pop-up dialog box where you can enter the drivers name (Picture 23).



Picture 23: Dialog box for creating new driver

4.3.2 Editing an existing driver

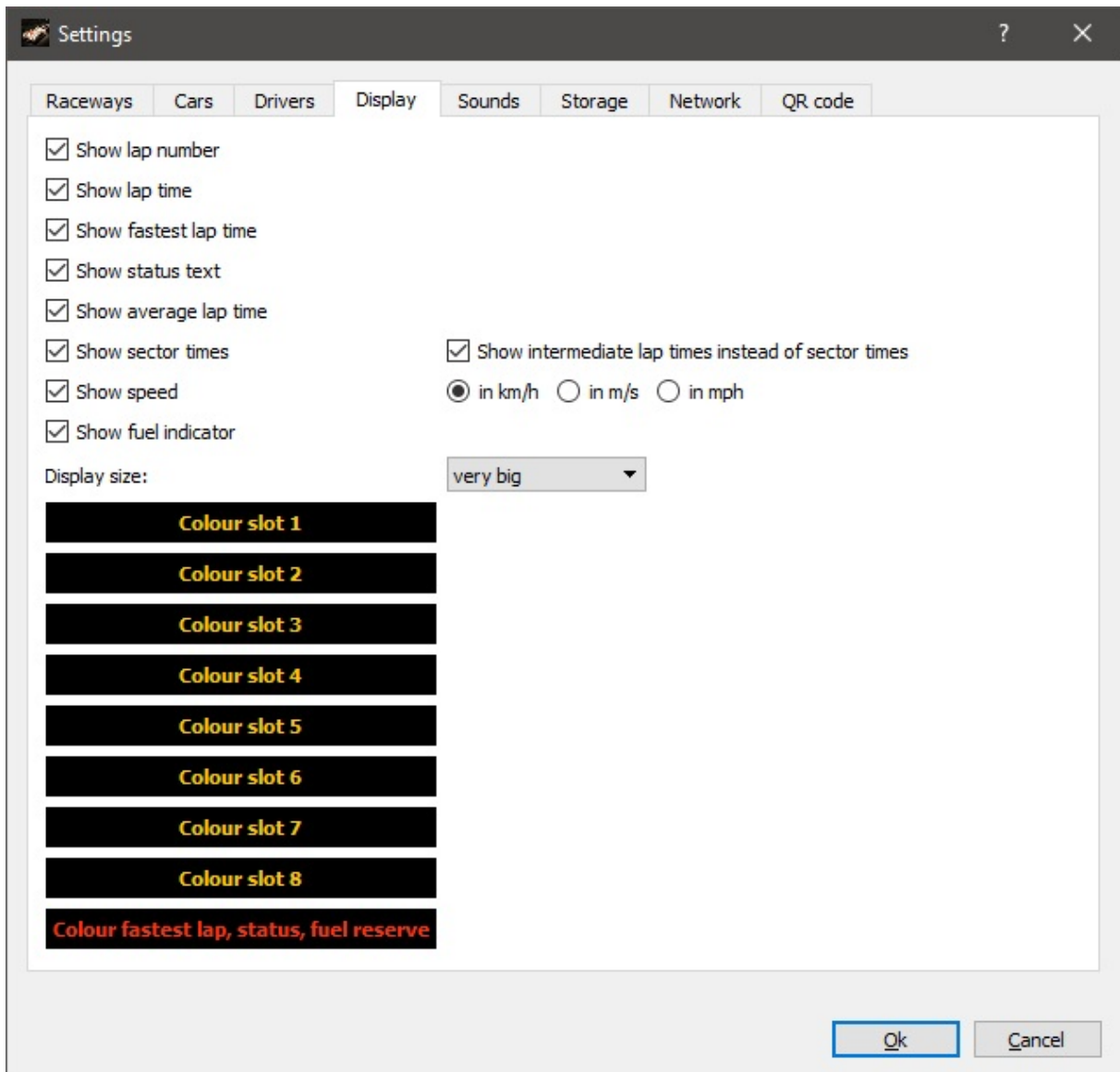
In order to edit an existing driver you need to select the driver in the list and press the „Edit“ button. The same dialog box opens like when creating a new driver, but the content is already pre-filled with the data of the selected driver. You can now change the data. Your changes will be stored when you leave the dialog box using the „Ok“ button.

4.3.3 Deleting a driver

In order to delete a driver you need to select the driver in the list and press the „Delete“ button. A pop-up box will ask you for confirmation. If you confirm by pressing „Yes“ the driver will be deleted from the database.

4.4 Display

The „Display“ tab (Picture 24) allows you to configure the track displays in the main screen (Picture 1).



Picture 24: Display settings

By checking or unchecking the different screen elements it can be selected if the screen elements shall be shown on the main screen or not. Not needed information can be hidden and the needed information remains easily readable.

Besides the selection for showing or hiding the speed on the main screen there is also the possibility to change the way the speed is shown. The possible settings are km/h (Kilometer per hour), m/s (meter per second) and mph (Miles per hour). The km/h and mph setting shows the speed in scale, i.e. the actual speed is multiplied by the scale. The m/s setting shows the real speed achieved on the track as measured.

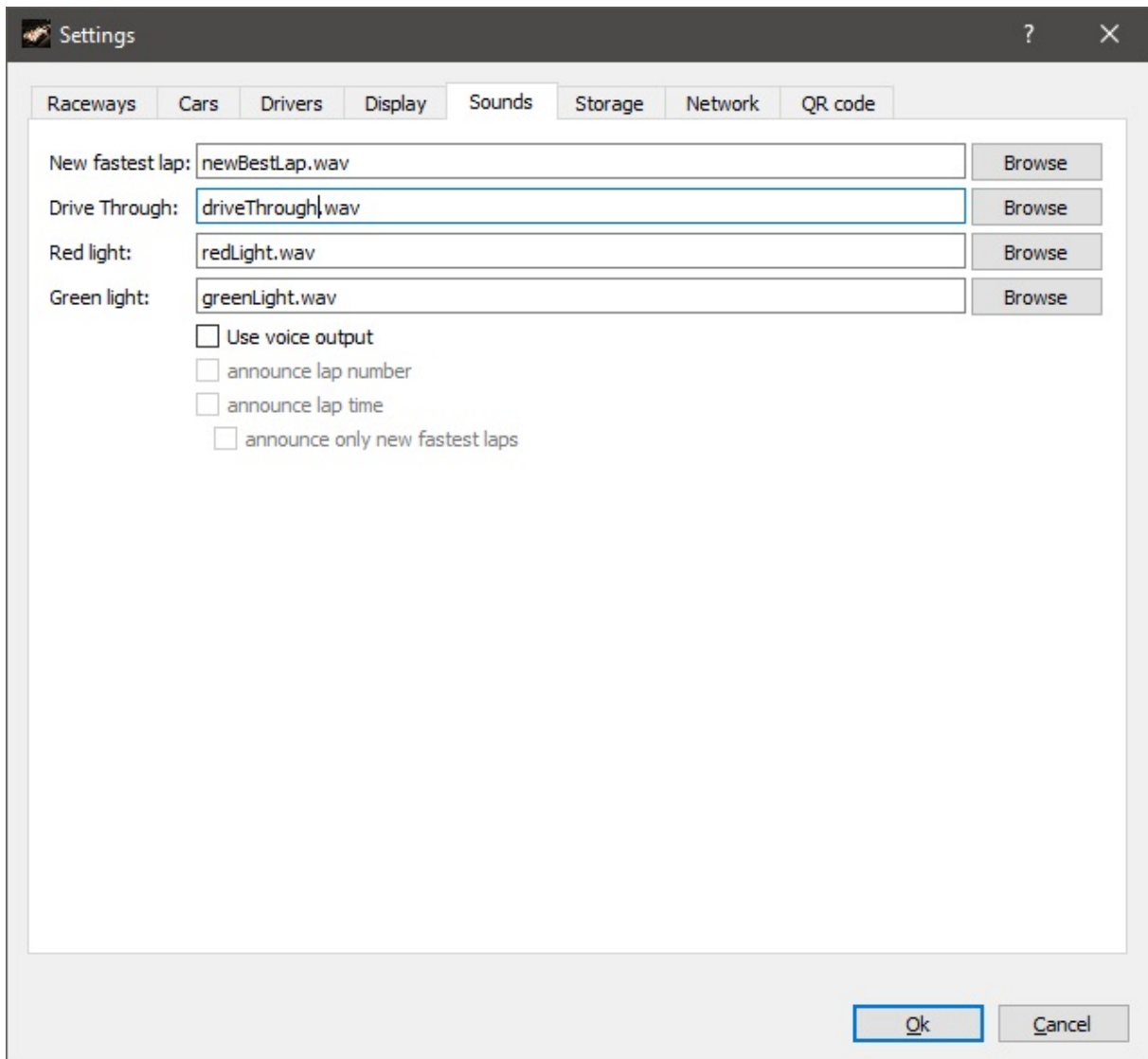
In order to make sure that all lane displays fit on the screen the size of the lane displays can be changed in four steps. This helps to accomodate the screen to the monitor used.

In the default settings all tracks will have the same display colour. By pressing the black buttons for each track you can open a colour picker box where you can select a different colour per track.

The fastest lap time, status information and fuel reserve are shown in red by default. Using the button „Colour fastest lap, status, fuel reserve“ you can also change the colour used for those on the main screen (only one setting for all tracks).

4.5 Sounds

The „Sounds“ tab () offers the possibility to select custom sounds for „New fastest lap“ and „Drive Through“ events. It is also possible to select custom sounds for switching red and green lights of the start lights. The file format needs to be .wav.



Picture 25: Sounds tab

Additionally it is possible to enable voice output. Voice output can tell the number of laps and the lap time. It is possible to limit the lap time voice output to fastest laps only.

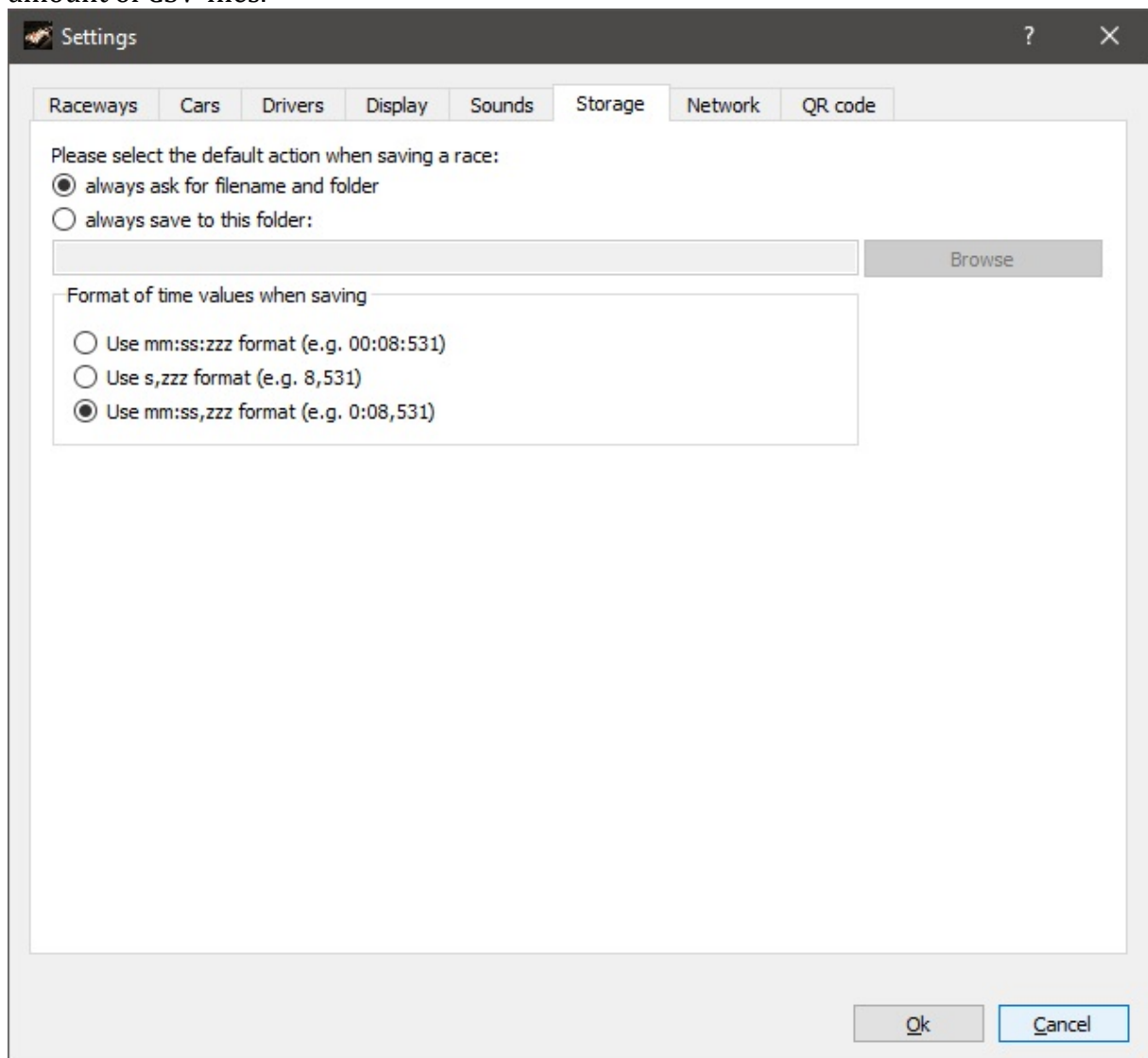
4.6 Storage

The „Storage“ tab (Picture 26) can be used to configure what happens when you select „Race“->„Store Race“ from the menu or when you press CTRL+E.

It is either possible to always show a dialog asking for folder and filename or to always store directly into a folder. In either case the filename will be composed out of date, time and names of the race members.

Race storage is done in CSV-files (Comma Separated Values). CSV-files can be edited with any spreadsheet editor.

In addition it is possible to select the time format to be used when storing to CSV-files. Different spreadsheet editors might not work with one or the other format. Please try out which format works with your preferred spreadsheet editor before creating a big amount of CSV-files.



Picture 26: Data storage settings

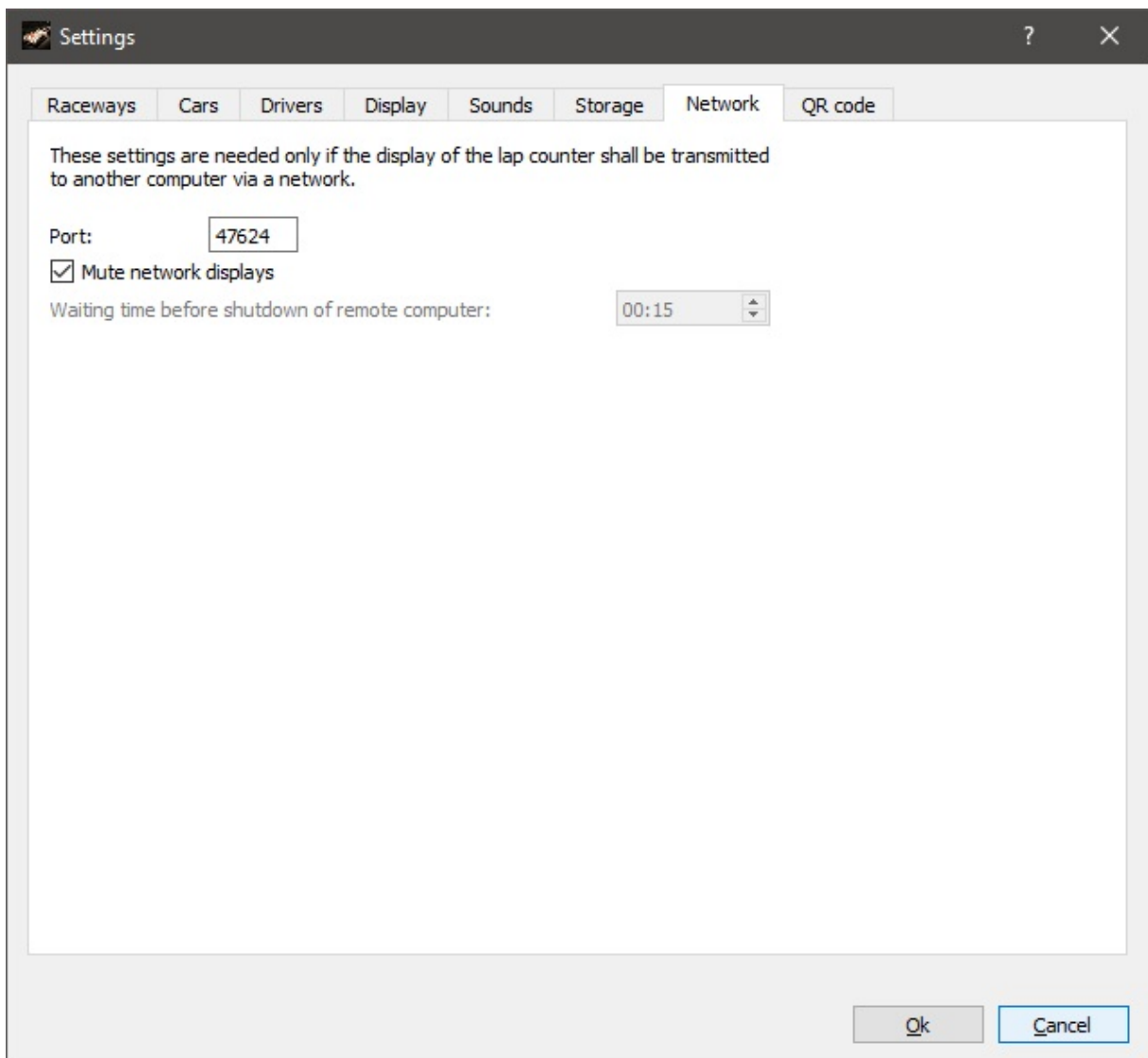
4.7 Network

The „Network“ tab (Picture 27) can be used to configure the port at which the lap counter offers its service. This network service allows to use other computers as client

displays for the lap counter to show the same information as the main screen. This port setting only needs to be changed if the same computer runs another service on the same port or if you have firewalls on the network on which you want to use the network display option of this lap counter software.

You can also select here if the connected display clients shall be muted or play sounds. The setting „Waiting time before shutdown of remote computer“ allows for setting a delay during which an abort screen is shown on remotely connected computers if the shutdown of connected lapcounter clients was selected from „Program“->„Shutdown client“.

You can find more information on the network functionality of this lap counter in chapter 7.



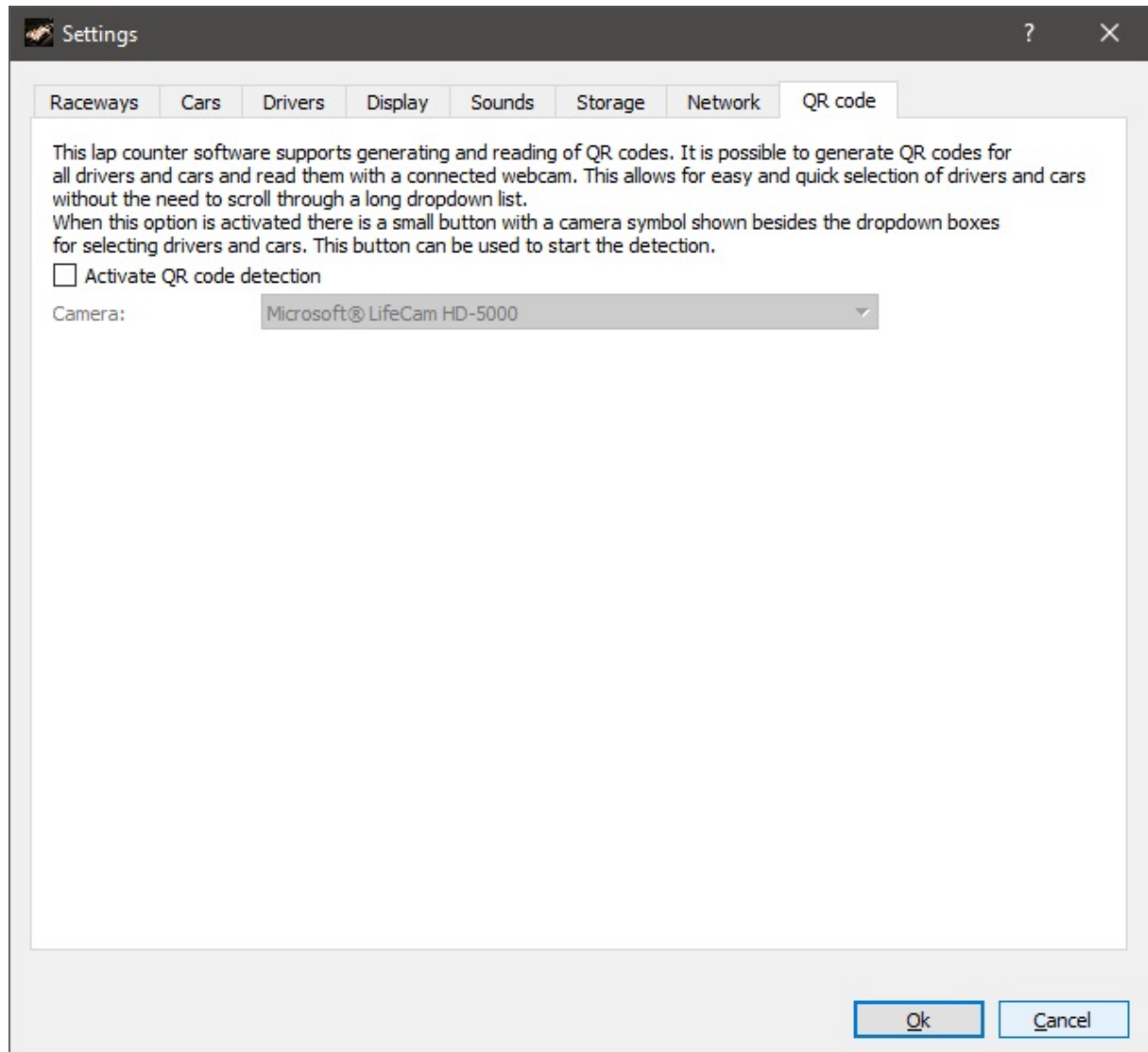
Picture 27: Network settings

4.8 QR Code


In case you have a webcam connected to your computer you can use it to easily and quickly select drivers and cars. If you have many cars the selecting from a long list which might also even truncate the names, is not convenient. If you generate QR codes for all

cars and drivers and e.g. glue them on the bottom of the cars you can easily scan those QR codes with the webcam to automate the selection.

This settings dialog can be used to enable the QR code detection and to select the webcam that shall be used.



Picture 28: QR code settings


If you have enabled the QR code detection then all places where you can use the QR code to detect a driver or car will show a small button with a camera icon on it like this: . When pressing this button a small window will pop up which shows the current camera picture of the selected webcam. While this window is shown you can hold your QR code in front of the camera. In order to make this work correctly and easily a few preconditions should be considered:

1. The webcam should have at least HD resolution.
2. The lighting needs to be good enough.
3. The QR code needs to be place in front of the camera in such a way that it is very well visible.

If you intend to use the QR code detection regularly you might want to consider building a small setup that ensures a well working position of the QR code in front of the camera.

If the camera focus and the lighting is good then the QR code detection works very fast and reliable.

QR codes can be used for selecting the drivers and the cars for each track in the main screen as well as for selecting them when filtering in the dialog box for viewing the fastest lap times.

Alternatively to the button  you can also use the key combination ALT+<track number (1 ... 8)> to be even more quick.

Hint: In case your camera has an indicator light that shows if the camera is currently active or not this light will remain on after the first usage of the webcam until the lap counter software is closed. This has the following reason:

In QT5.5 – the software library used to build this lap counter software and offering a software interface to access the webcam – there is a memory leak. If the webcam would be activated and deactivated over and over again the memory consumption of the lapcounter would increase by several megabyte each time. This would slow down the lap counter and the computer over time until it wouldn't be usable anymore and needs a reboot.

This bug is fixed in later versions of the QT framework but in order to remain backwards compatible with the lap counter to Windows 2000 and Windows XP I decided to stay with QT5.5 for now and use the workaround to simply leave the camera activated. This has the positive side effect that the camera window opens much faster when needed. But even if the camera indicates activity there is no picture or sound recording ongoing. The camera picture is exclusively used when a QR code detection is requested and neither picture nor sound are recorded or stored for any other purpose than this.

5 Race

5.1 Race Settings

The race settings dialog (Picture 29) is opened from the menu „Race“->“Settings“ or using the shortcut CTRL+I. In this dialog you can set the start, end and winning conditions for a race. There are also tabs for the fuel simulation settings and for the data storage settings.

Race settings

Start/End Fuel settings Data collection

Start condition

☒ None

☐ Start in 00:05 minutes

Minimum 500 ms wait time before the start lights switch from red to green

Maximum 2500 ms wait time before the start lights switch from red to green

End condition

☒ None

☐ End after 00:05:00 hours

☐ End after 10 laps

☐ on all slots

☐ stop counting when max. number of laps is reached

☐ Count down

Winning condition

☒ the most laps

☐ the fastest lap

☐ the best average lap time

☐ a lap time closest to the target time

☐ average lap time closest to the target time

☐ most consistent lap times, ignoring the worst 0 laps

☐ use target time

target time (format mm:ss:zzz): 00:10:000 minutes

☐ Store these settings as default

Ok Cancel Export Import Load defaults

Picture 29: Race settings

5.1.1 Start condition

The start condition defines how the race start shall be handled. The selection allows to have no start condition or to have a timer based start with starting lights. If no start condition is selected then the measurement starts with the first drive through trigger on a lane.

The timer based start can be configured with minutes and seconds. When the race is started the timer starts running. Once the timer expired the starting lights are used to actually start the race. The starting lights consist of five separate lights that are switched on one after the other until all five lights are on. The race starts when all lights go off. If the sensor of any lane is triggered before the lights are off then this is considered an early start and the race is aborted.

The time between all lights on red and switching all lights off is random within the configurable boundaries.

5.1.2 End condition

The end condition defines when a race is considered to be over. There are three basic end conditions: None, end after a defined time and end after a defined number of laps. If no end condition is selected the race does not end until manually ended.

The option to end after a defined time allows to configure any duration between 00:00:00 and 23:59:59 in hours, minutes and seconds.

The third option is to end after a specific number of laps. The number of laps can be selected between 1 and 999. By checking „on all slots“ the race will end only when all slots have reached this number of laps.

If you additionally select „stop counting when max. number of laps is reached“ then the count will stop at the defined number of laps for each lane. If this option is not selected then the counter continues beyond this number until the last lane reached this maximum number of laps.

The last checkbox allows to count down the number of laps instead of counting from 0 upwards.

5.1.3 Winning condition

The winning condition defines the criteria under which the software decides what lane won the race.

If „**the most laps**“ is selected then the winner is the one that has the highest lap count when the end condition is hit. In case several participants have an equal number of laps the one who reached this number first is considered the winner.

If „**the fastest lap**“ is selected then the participant with the fastest lap time wins.

If „**the best average lap time**“ is selected then the lowest average lap time wins.

The option „**a lap time closest to the target time**“ allows to configure a target time and declare the winner based on who reached closest to this exact time.

The option „**average lap time closes to the target time**“ accordingly declares the winner based on the average lap time being closest to the configured target time.

The last option „**most consistent lap times, ignoring the worst x laps**“ defines the winner by the least deviations in the lap times. The x biggest deviations can be ignored.

Optionally a target time can be set in which case the winner is the one with the least deviation to this target time.

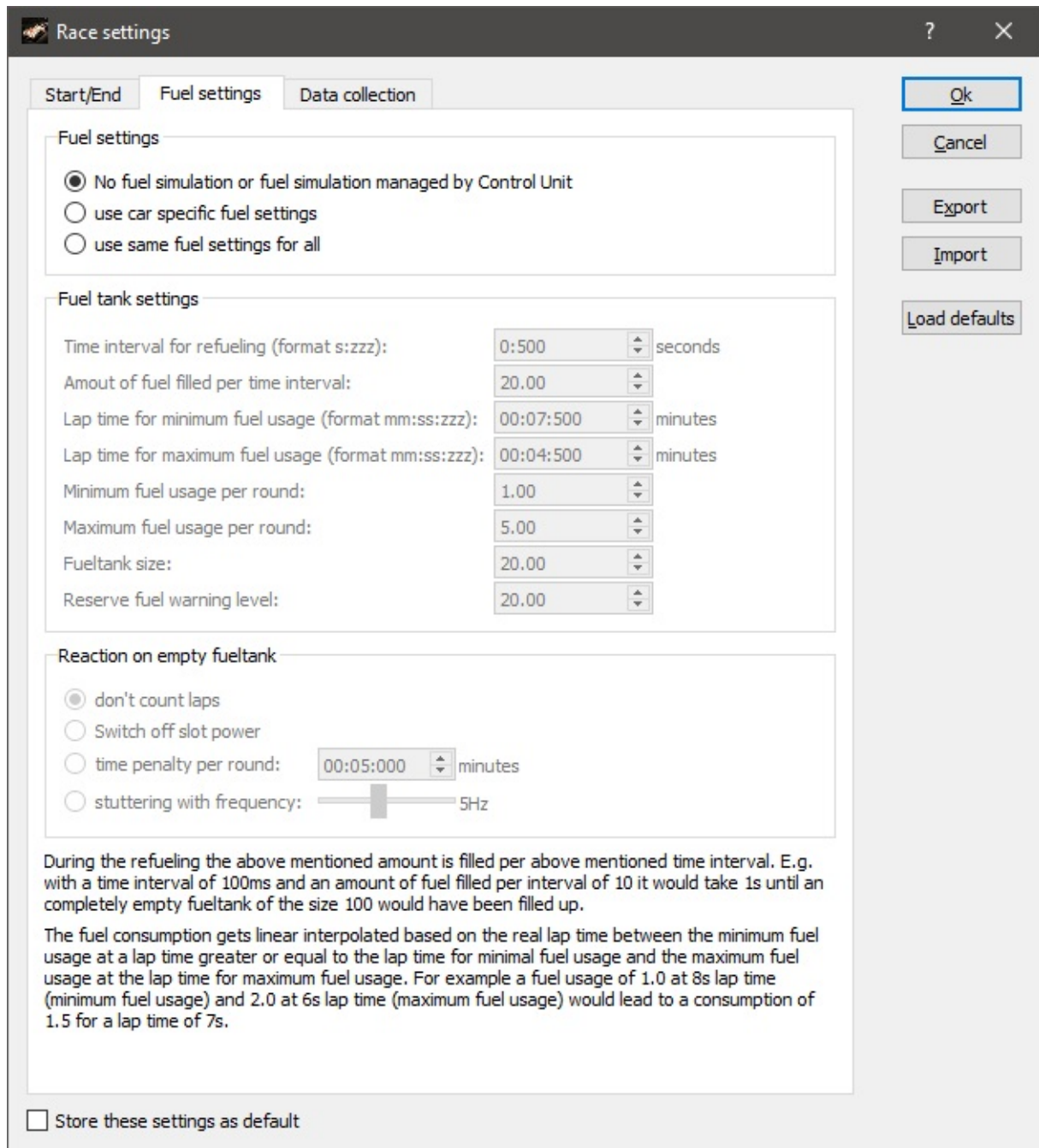
5.1.4 Fuel settings

This lap counter software contains a fuel simulation functionality aiming at recreating the tactical element of fuel consumption and pit stops during a race. The fuel consumption is based on the lap time. The faster the lap time the higher the simulated fuel consumption per lap.

The simulation requires the setting of a lap time for minimum fuel usage and a lap time for maximum fuel usage. Each vehicle accordingly gets a minimum and maximum fuel usage. A lap time equal or faster than the lap time for maximum fuel usage leads to the maximum fuel usage being subtracted from the fuel tank. A lap time equal or slower than the lap time for minimum fuel usage leads to the minimum fuel usage being subtracted from the fuel tank. For lap times in between these two limits the fuel usage is linearly interpolated.

Once the fuel tank is empty the preconfigured action is taken. For refueling the car needs to be stopped on the respective fuel sensor.

The fuel simulation can be configured in the race settings on the „Fuel settings“ tab (Picture 30).



Picture 30: Fuel settings

5.1.4.1 Configuring the fuel setting

If „no fuel simulation or fuel simulation managed by control unit“ is selected then the fuel simulation of this software is disabled.

If „use car specific fuel settings“ is selected then the fuel simulation is active and the simulation uses the individual configuration for fuel tank size and fuel consumption of the selected cars as configured in the car configuration dialog (see chapter 4.2.1). This allows for some interesting races where a slower but less thirsty car could be successful against a faster car with higher fuel consumption or smaller fuel tank.

The setting „**use same fuel settings for all**“ does also enable the fuel simulation but all lanes get the same values for fuel tank size and fuel consumption as configured in this dialog window.

5.1.4.2 Fuel tank settings

Time interval for refueling (Format s:zzz): This is the seconds and miliseconds time interval in which the „**Amount of fuel filled per time interval**“ gets added to the fuel tank content while the fuel sensor is triggered. I.e. an interval of 500ms and a amount of fuel filled per interval of 20 would fill a fuel tank of size 100 in 2.5s.

The „**Lap time for minimum fuel usage**“ and the „**Lap time for maximum fuel usage**“ configure the times at which the „**Minimum fuel usage per round**“ and the „**Maximum fuel usage per round**“ are subtracted from the fuel content. A faster lap time leads to a higher fuel consumption than a slower lap time. For lap times that are between these two limits the fuel consumption is linearly interpolated. As a lap time for maximum fuel usage you could configure a very good but not unreachable lap time with one of your fastest cars. For a lap time for minimum fuel usage you could use an average lap time with one of your slowest cars. But this really depends on you personal choice and how you want the fuel consumption to behave.

„**Fuel tank size**“ defines the total size of the fuel tank and „**Reserve fuel warning level**“ defines from which level downwards the fuel tank display switches to the warning colour to indicate a low fuel level and an imminent need to refuel.

These last four settings „**Minimum fuel usage per round**“, „**Maximum fuel usage per round**“, „**Fuel tank size**“ and „**Reserve fuel warning level**“ are only available when you have selected „**use same fuel settings for all**“. If you have selected „**use car specific fuel settings**“ then these four values are taken from the car configuration instead from here.

5.1.4.3 Reaction on empty fuel tank

In this section you can configure what happens in case a driver runs out of fuel. If set to „**don't count laps**“ the lap sensor will be ignored when crossed with an empty fuel tank as if it was not crossed at all. Accordingly the next crossing of the lap sensor with a refilled fuel tank will lead to a significantly longer lap time as all the time since you began the lap in which the fuel tank ran empty until you end the lap in which the fuel tank was refilled will be counted as one long lap.

The „**Switch off slot power**“ option leads to switching off the power supply of the slot on an empty fuel tank. This option is only available if you have the hardware and software setup for slot power switching.

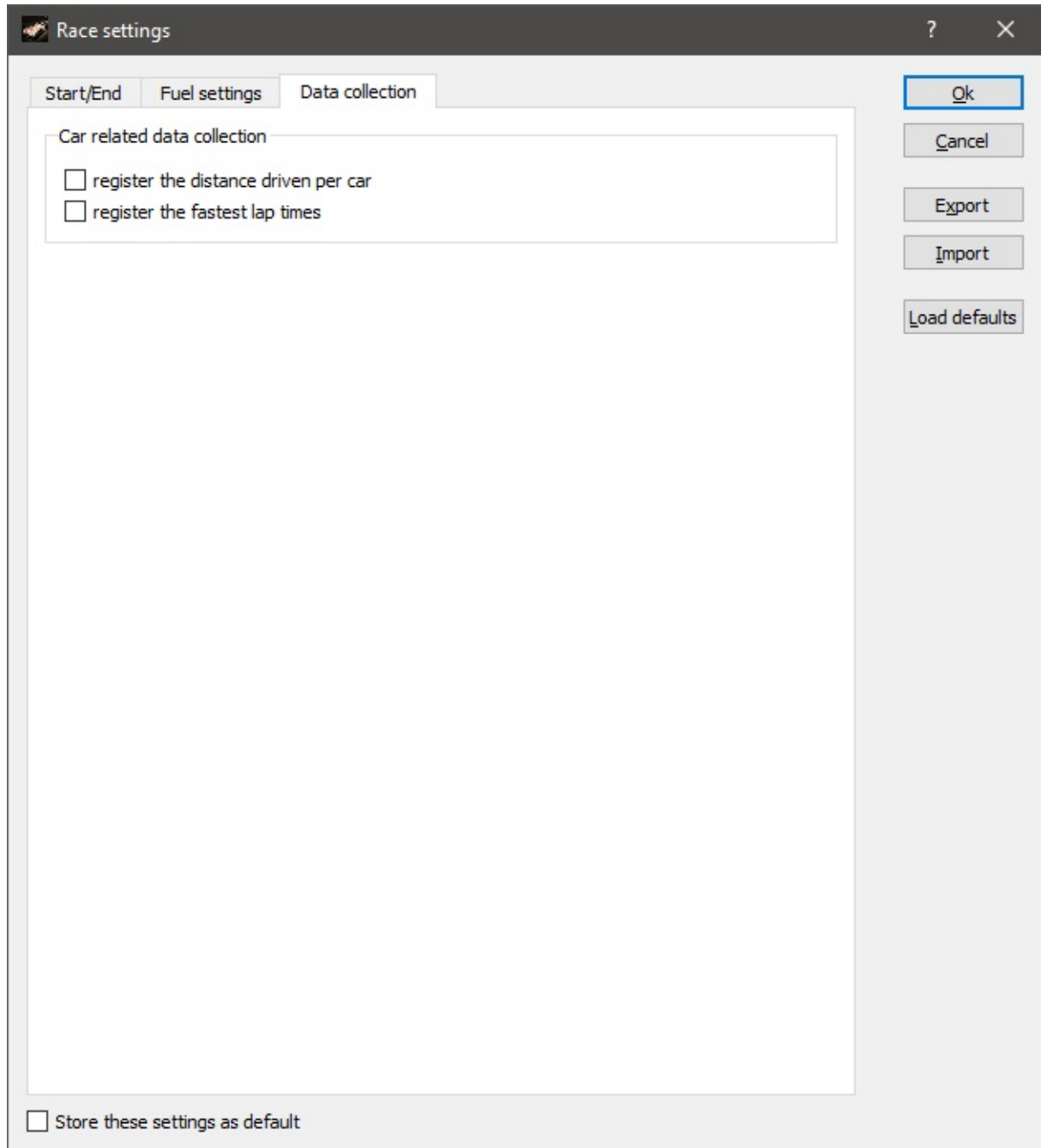
If „**Time penalty per round**“ is selected then the lap time of each lap that is finished with an empty fuel tank will be increased by the time configured here.

The „**stuttering with frequency**“ setting leads to slot power being switched on and off with the configured frequency. This means limited movement of the car but still allows to somehow reach the fuel sensor.

5.1.5 Data collection

The „Data collection“ tab offers settings related to the collection of metrics data. The checkbox controls whether the distance driven shall be stored for the cars. The second checkbox controls if the fastest laps shall be stored in the permanent list of fastest lap times. If selected, the distance driven will be summed up for each car and can be viewed in the car list (see chapter 4.2).

The fastest lap time is always recorded for the combination of raceway, slot, driver and car. I.e. if there is a new fastest lap time with the exact combination of these then the previous fastest lap time will be replaced with the new one for this combination. If one of the elements is different then a new entry in the list of best lap times will be created (see also chapter 5.7).



Picture 31: Data collection

5.1.6 Store as default

If you check the option „Store these settings as default“ before confirming the race settings dialog window by pressing „Ok“ then the current settings will be stored as the default settings. The default settings will be set on the next start of the program and they can also be reset at any time by pressing the „Load defaults“ button.

5.1.7 Export and import settings

The „Export“ and „Import“ buttons allow to save the settings into a file and load settings from a file. This allows for quick access to often needed settings or for moving settings from one PC to another.

5.2 Start quick race

This menu item or the key combination CTRL+S starts a quick race using the current race settings. Once a race is started the menu item changes to „Stop quick race“ but the key shortcut CTRL+S remains the same. I.e. the same menu item or key combination can be used to start and stop a quick race.s

5.3 Pause race

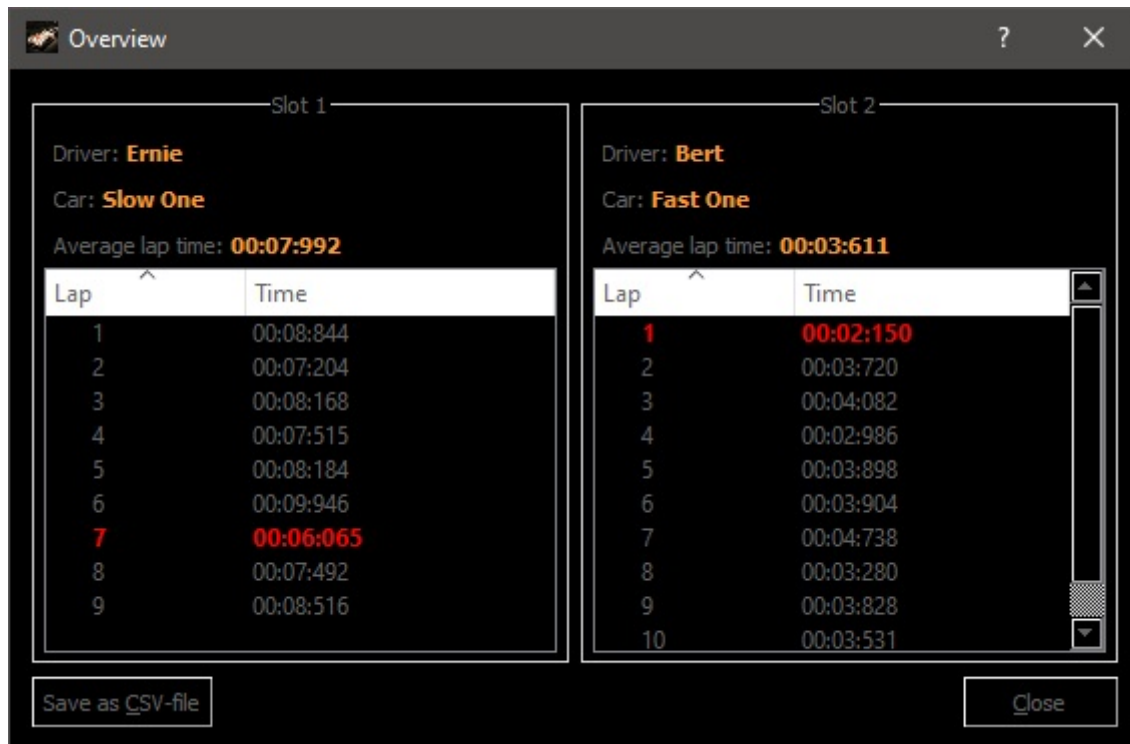
This menu item and the key combination CTRL+P can be used to pause an ongoing race. Pressing the same menu item or key combination continues the race again. While a race is paused the race time counter and the detection of drive through signals is stopped. The currently ongoing lap is dropped. When a race is continued the next drive through signal is restarting the lap time measurement for each slot.

5.4 Store race

Depending on the general setting (see chapter 4.6) this menu item either triggers a storage dialog box asking for a folder and a filename for storing the current race in a CSV-file or a corresponding file is created in the pre-selected storage folder. The default filename is created from date, time and name of the race participants. The CSV-file contains the race settings in readable text as well as the lap times for all laps of all race participants.

5.5 Show summary

Once a race is finished clicking the race result (red text in the race information area on the bottom of the main screen) or selecting „Show summary“ from the menu will show a dialog window that contains a complete overview over the lap times driven in the race (Picture 32). The lap time can be sorted in ascending or descending order. The fastest lap time is marked with red colour.



Picture 32: race summary

5.6 Slot power control

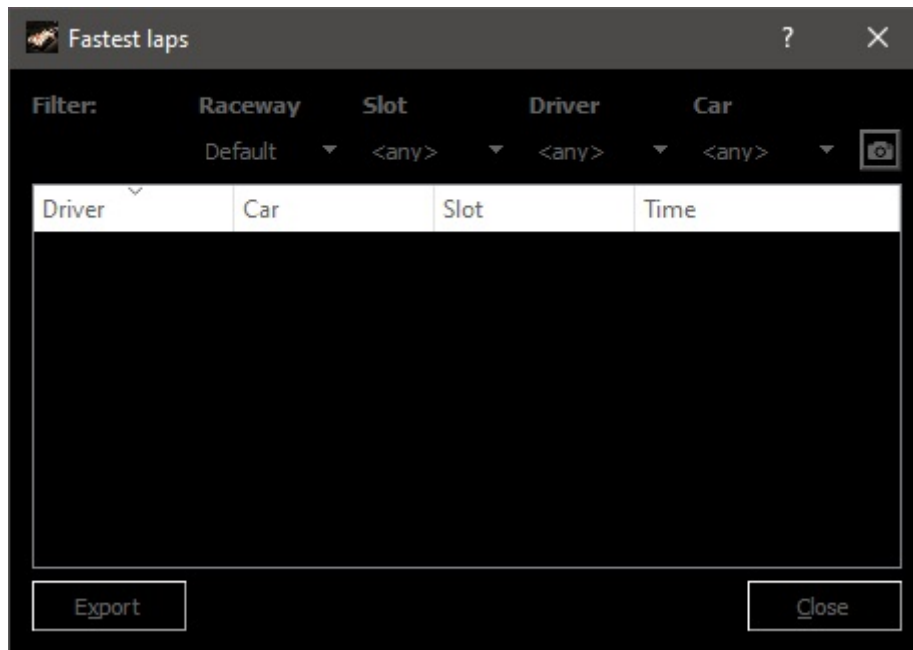
If the selected raceway has a track power control configured then the menu „Race“ will contain a sub menu „Slot power“ which allows to control the power for each slot or for all slots at once. Additionally to the menu the slot power can also be switched using the F-keys with F1 controlling the power for slot 1, F2 controlling the power for slot 2 and so on. The F9-key switches power on for all slots and the F10-key switches power off for all slots.

5.7 Show fastest laps

The menu item „Show fastest laps“ in the menu „Program“ and the key combination CTRL+F will open a dialog box () showing the fastest lap times stored in the database (see also chapter 5.1.5).

The list can be filtered for slot number, driver and car. A QR code can be used for selecting the driver or the car (see chapter 4.8).

The button „Export“ can be used to export the currently visible list to a CSV-file. CSV-files can be edited with any spreadsheet editor.



Picture 33: list of fastest laps

6 Simulator Mode

This software contains a simulator mode that allows to simulate the signals that would come from the sensors on the track. This simulator mode allows to test the raceway settings but also the race settings and it allows anyone to test the software without the need to actually have hardware connected to the PC.

The simulator mode can be enabled and disabled from the „Program“ menu or by the key combination CTRL+D. If the simulator mode is active the dialog box from Picture 34 is shown when a race is started.



Picture 34: Simulator dialog box

The dialog box contains a button simulating each signal for each slot that is configured for the currently selected raceway. Additionally there are buttons to trigger a category of signals simultaneously for all slots.

The simulator mode does not disable the signals coming from a hardware that might be connected.

7 Network mode

This lap counter software offers the possibility to connect several instances over a computer network to allow having multiple remote displays of the same content. The instance running on the computer connected to the track hardware will be the server. Clients connecting to this server will act as remote displays.

Currently only one client can be connected at a time, i.e. only one remote display is possible. The server is listening on the configured port (see chapter 4.7) for a connection request. The port for listening can also be passed as a command line parameter at the start of the server by using the command line option „--port“.

If you are using a software firewall on the server computer you might have to allow this port in the firewall settings. Usually there will be a pop-up window asking if you want to allow access to the port if a connection is requested on a port that has not yet been allowed.

The client mode can only be triggered via the command line. In order to do so you need to pass the command line command „--connect“ followed by the IP-address or network name of the server you want to connect to when starting the software. The port number can be attached to the IP-address or network name by using a colon and then the port number. A complete command line for starting a client could e.g. look like this:
`Rundenzaehler.exe --connect 192.168.0.42:35313`

This command would start the lap counter software in client mode and connect it to a computer that has the IP-address 192.168.0.42 and that is configured to listening for such requests on port 35313.

In client mode most of the menu items are disabled and the main screen shows the same content as the display of the server that it is connected to.

On the server instance there is an additional menu item in the menu „Program“ called „Shutdown client“ (shortcut CTRL+H) if a remote client is connected. This menu item sends a command to the client computer to shut down. This allows to have a display client mounted somewhere on the track and to start the client software with a autorun link automatically when the client is powered on. The menu item on the server then allows to properly shut down such a client computer before powering off.

8 Command line parameters

Some functionality of this lap counter software can be controlled directly from command line. The following table shows all available command line parameters.

Command line parameter	Meaning
<code>-?, -h, --help</code>	Shows a list of supported command line parameters
<code>--quickRace</code>	Directly starts a quick race with the default settings
<code>--windowed</code>	Usually the lap counter software is run in full screen mode without the window frame and the window controls. With this command line parameter the software is started in window mode instead
<code>--connect <server_adresse></code> or <code><server_adresse>:<server_port></code>	Runs the software in client mode and connects to the address and port passed in
<code>--port <server_port></code>	Allows to specify the port for a network connection
<code>--language <locale></code>	Starts the software with the language defined by <locale> (currently only "de" for german and "en" for english is supported)

9 Future features

This software is maintained casually but steadily. There is no fixed feature plan for the future. But if you have a urgent need or just simply a proposal for a feature then please send it to "Rundenzaehler@janschluer.de". I'm always interested in improving the software and making it more useful or versatile.