gamesontrack

# GT COMMAND MANUAL

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# 1 Welcome


With this System software, you have acquired one of the most powerful and versatile vehicle and traffic control systems existing today. This System drastically reduces the construction and connection effort for your tracks and offers you a realistic driving pleasure that you have never experienced before:

- Positioning of your vehicles with millimeter precision
- Automatic distance monitoring during operation with satellites
- Control of all vehicle functions in real time
- Realistic starting and braking behavior
- Integrated setup and control of all light signals and control components on the track with expansion modules.
- Realistic representation of the traffic on your monitor(s)

The entry-level set offers all the elements that are necessary for the first entry into the fully automated operation of the System. This set includes three satellites, one transmitter/vehicle, the Master and the System Software required for control are included.

The fun is guaranteed.

We wish you lots of creative ideas and lots of fun with your product.

***GamesOnTrack A/S***

## 1.1 About This Manual

This Manual covers version 5.x of the PC-Software for the product GT-Command ® and version 2.x of the **Faller Car System Digital ®.**

This includes relevant product series related to those.
These two products are referred to as **PC-Software** through out the document.

## 1.2 Appendices

Special sections related to specific brand hardware will be covered in appendices:

- Faller ® Hardware like Master, Cars, Satellites, Expansion Modules etc..
- GamesOnTrack ® like GT-XConnect, GT-Transmitter, GT-Satellite, GT-XControls etc..
- Digital Controllers for brands like Märklin ®, Fleishmann ®, Uhlenbrock ® LEGO ® etc..
- Voice Recognition Software.
- Mobile applications for iOS and Android

## 1.3 Colored Tags

The following tags will be used throughout this document in order to attract a special attention from the user when needed.

**WARNING**

- Identifies dangers that could lead to personal injuries and property damage!

**CAUTION**

- Identifies dangers that could lead to property damage – or unintended problems!

**TIP**

- Identifies useful help relevant to the current subject

**NOTE**

- Identifies important information relevant to the current subject

**ACTION**

➢ Identifies an action to be performed by the user

## 1.4 PDF Reader

This Manual is a PDF document which can be opened through any PDF Reader or Web Browser.

**TIP**

- We highly recommend using Microsoft Edge as PDF-reader - for a couple of reasons: It is preinstalled on Microsoft Windows 10 *(and available for Windows 7)* and it stands out in both performance and accuracy when dealing with embedded SVG images.
- The Firefox browser is also a great option!

# 2 Safety and Responsibility

## 2.1 Intended Use

The system is intended exclusively for use on a model layout. You can adapt the functions of the modules and the control components individually to your requirements.

In order to ensure the safe operation of system, the associated operating instructions and the information on road construction in the brochures must be observed.

The warranty does not apply to damage or defects caused by non-compliance with the operating instructions.

## 2.2 For Your Safety

- Read these operating instructions carefully before using the products.
- Observe the safety information and warnings in the operating instructions and on the product.
- If necessary, inform children about the contents of the operating instructions and about the dangers when using the product.
- Only operate the product when it is in perfect condition.

- Keep the operating instructions available for the product.
- Only pass the product on to third parties together with these operating instructions.

**WARNING**

**Risk of explosion**

Operating the products in an explosive environment can trigger explosions and lead to serious injuries and property damage.

- Do not operate in an explosive environment!
- Follow the instructions for charging the battery in the instructions for digital vehicles!

**Fire hazard**

Operating the product with improper connection or bridged connections can result in fire or smoke development.

- Do not operate unsupervised!

**Risk of personal injury and property damage**

Improper operation of the product can result in personal injury and property damage.

- Do not open the housing!
- If the product does not work or no longer works properly: Contact customer service!

**CAUTION**

**Risk of corrosion**

Operating products in damp rooms and contact with water can lead to property damage.

- Only operate in dry rooms!
- Avoid contact with water!

**Risk of overload**

Operating the product with an incorrect power supply can result in property damage.

**Risk of malfunction**

Devices that have not been tested for EMC can lead to interference and malfunctions.

- Do not operate any untested devices in the vicinity of the system.

## 2.3 Disposal

Dispose of in an environmentally friendly manner:

- Observe the local regulations for waste disposal.
- Dispose of the rechargeable batteries via the responsible and state-designated authorities.

# 3 The Product Overview


The ideal combination of vehicles and technical components in this system depends on your requirements and goals. In addition to the fully automatic operation of digital vehicles with the Master, Satellites and the PC-Software, you can also use the full range of functions you want individually and in combinations - from the simple change of the vehicle properties during operation (any change of light and sound functions or the speed and much more) to the software-supported control of complex road traffic situations via satellites.

**NOTE:** Only use articles from the current product ranges in the catalog for construction of your model roads and transport operations. Components of other systems are not expressly supported by the complete system.

The PC-Software can be used in many ways. The main usage are explained here:

A) As a Control application running Faller Cars in Gauge H0. Control means edit, actual driving, controlling accessories, interfacing to other controlling mechanisms like Erweiterungsmodul, Radio Expansion Module, Smart phones, Tablets etc.

B) As a Control application running Model Trains in any Gauge using a Digital Controller. Control means edit, actual driving, controlling accessories, interfacing to other controlling mechanisms like Voice control, Smart phones, Tablets etc. In this mode the PC-Software can use a digital Controller as the hardware component between the PC and Layout.

C) As a Control application for operating both Model Trains and Faller Cars together on the same layout (see NOTICE below).

D) As a Control and Positioning program. Positioning means using a hardware component to draw the layout, due to feed back from vehicle positions, monitor the vehicles as they are driving, editing signals and virtual sections on the layout, and connect all this together.

E) As a Control- and Position program for operating LEGO ® trains and Accessories.

F) As a Control and Position program operating and monitoring vehicles sending DCC and other control information direct to the vehicles by radio using the GT-XControl components in the vehicles. Vehicles meaning Lego Vehicles using normal IR or model trains, in any Gauge particular G/1/0.

G) As a simulation/game program operating layouts which have been drawn with any vehicles belonging to this layout, usable for programming automations or for sharing layout and operations between customers.

**NOTICE**

- In order to run both Faller Cars and Model Trains on the same layout, an upgrade of the PC-Software is required. A new license key will be sent to you.

## 3.1 GamesOnTrack GT-Command Products

### 3.1.1 Scope of Delivery


The following components are included in package:

| GamesOnTrack |
|---|
| **1 x** GT-Command Software (on USB-key) |
| **1 x** GT-XConnect Master V4 |
| **1 x** GT-Transmitter |
| **3 x** GT-Satellites |

**1 x** Operating instructions (this manual)

**CAUTION**

- If the user changes of modify anything in the products which are not explicitly approved by GamesOnTrack A/S, then GamesOnTrack A/S as a developer cannot stand behind neither the functionality nor the certifications of the products. In that case we have to remove your authority to operate the product by making your license void.

## 3.1.2 GT-XConnect V4 (Master)


*Figure 3.1.1: Figure 3.2.3.1: GamesOnTrack Master V4*

| Connections | Description |
|---|---|
| **USB** | USB PC connection |
| **Antenna** | Radio link between vehicle and satellite |

| LEDs | Description |
|---|---|
| **Power On** ■ | Control LED (flashes with the heart beat) |
| **Radio Tx** ■ | Transmit: Outgoing radio signal, e.g. from to a sender |
| **Radio Rx** ■ | Receive: Incoming radio signal, e.g. from a satellite |
| **Software** ■ | Software connected to Master (constant when connected) |

## 3.1.3 GT-Xsatellite


*Figure 3.1.2: GamesOnTrack GT Satellite*

| Connections | Description |
|---|---|
| **16 V AC** | Connection for the power supply (coming from the master). Thanks to the integrated rectifier, the connections cannot be polarized. |

| LEDs | Description |
|---|---|
| **Power On** ■ | Control LED (flashes when connected correctly) |

## 3.1.4 Container Sender

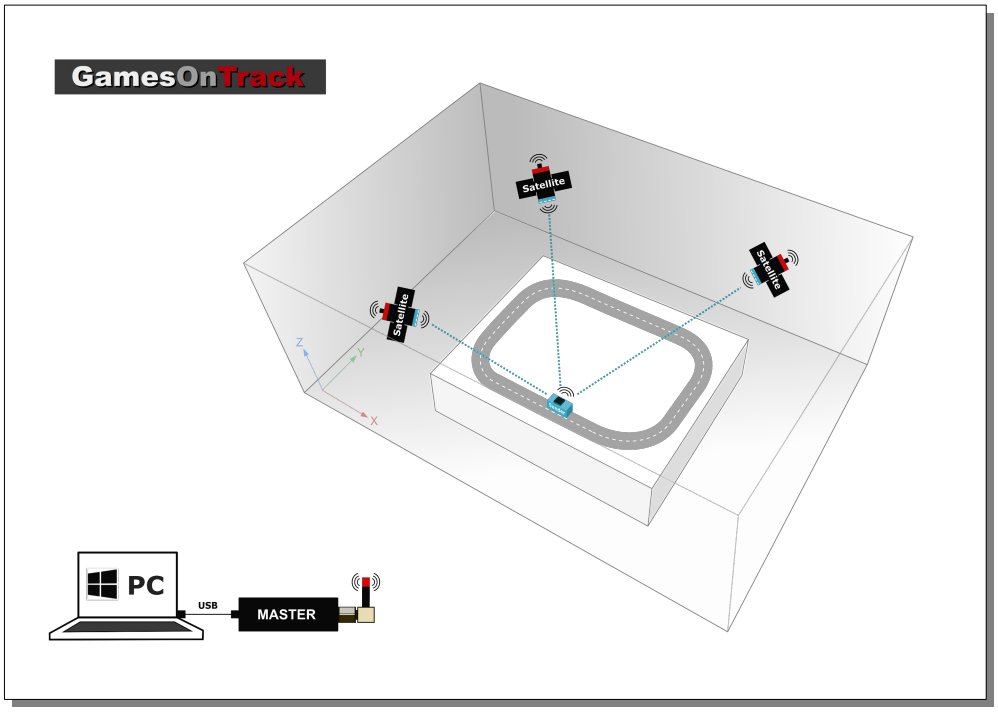

| Connections | Description |
|---|---|
| **Internal Batteries** | Connection for the power. The voltage and battery type used will depend on the vehicle type. |

| LEDs | Description |
|---|---|
| **Power On** ■ | Control LED (flashes when connected correctly). |

# 4 System Overview


## 4.1 GamesOnTrack Indoor GPS

With GamesOnTrack Indoor GPS the ideal combination of vehicles and technical components depends on your requirements and goals. In addition to the fully automatic operation of digital vehicles with the "GamesOnTrack GT-Xconnect" (hereinafter: Master), "GamesOnTrack GT-Satellite" (hereinafter: Satellite) and the "GamesOnTrack GT-Command" PC-software, you can also use the full range of functions you want individually determine and combine - from the simple change of the vehicle properties during operation (any change of light and sound functions or the speed and much more) to the software-supported control of complex road traffic situations via satellites….



# 5 Construction and Commissioning

## 5.1 Connect the Satellites

- The distance between the satellites should be min. 0.2 meters.
- Position the satellites above the system so that they form a triangle. In order to ensure an exact calibration, the angles of this triangle must not be less than 20°.
- Measurement points on the route must be in a 12-meter radius of each satellite, i.e. no satellite may be further than 12 meters from a measurement point.
- Make sure that satellites is securely and permanently attached.
- Consider grouping the satellites in one place and aligning them with the system so that you do not stand between vehicles and satellites when operating the system.
- If vehicles in certain system areas (apart from tunnels) can only be detected by two satellites, please consider installing an additional satellite.
- Using only 2 satellites is not recommended due to the poor resolution and the flat display. Should you nevertheless use a 2D scenario, the satellites must be mounted approx. 50 cm in front of or behind the system, otherwise the measuring circles will overlap and measuring points will be recorded twice.
- Position the satellites at a height of 1 to 3 meters above the system.
- You can operate a system with a maximum length of 10 meters with 3 satellites.
- Position the satellites.
- Align the satellites towards the end of the system.
- It is not possible to reverse the polarity of the satellite connection cables.
- You need at least a 2 x 0.25 mm2 cable.
- At least 2 satellites are required to operate the system. Operation with 3 satellites is expressly recommended.

**TIP**

- Position at least 2 satellites (minimum **requirement** for digital operation with PC-Software and satellites).
- You can supply up to 6 satellites with voltage via the master and position them in such a way that your vehicles can be reliably located even on large systems with poorly visible areas. If you also want to operate the system with more than six satellites, these additional satellites must be connected to a separate power supply.

### 5.1.1 Distance between satellites

The placement of each satellite is very important. If satellites are placed to close, and are part of the same triangle, the angles in the triangle can be too narrow and prevent calculation of a valid position. These triangles will be removed before any positions are calculated.

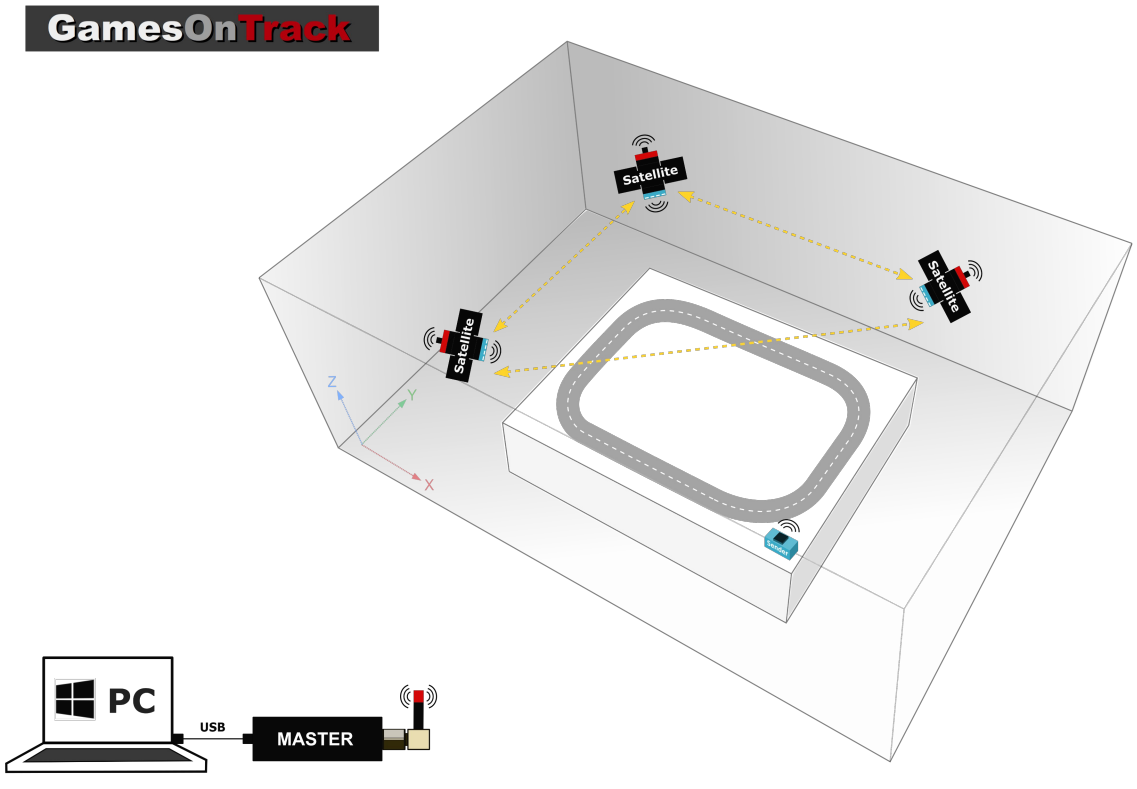



*Figure 5.1.1: Distance between satellites*

- Minimum distance between each satellite is 20 cm.

### 5.1.2 Angle between satellites

The angles in the triangle can be too narrow or too wide and prevent calculation of a valid position. These triangles will be removed before any positions are calculated.

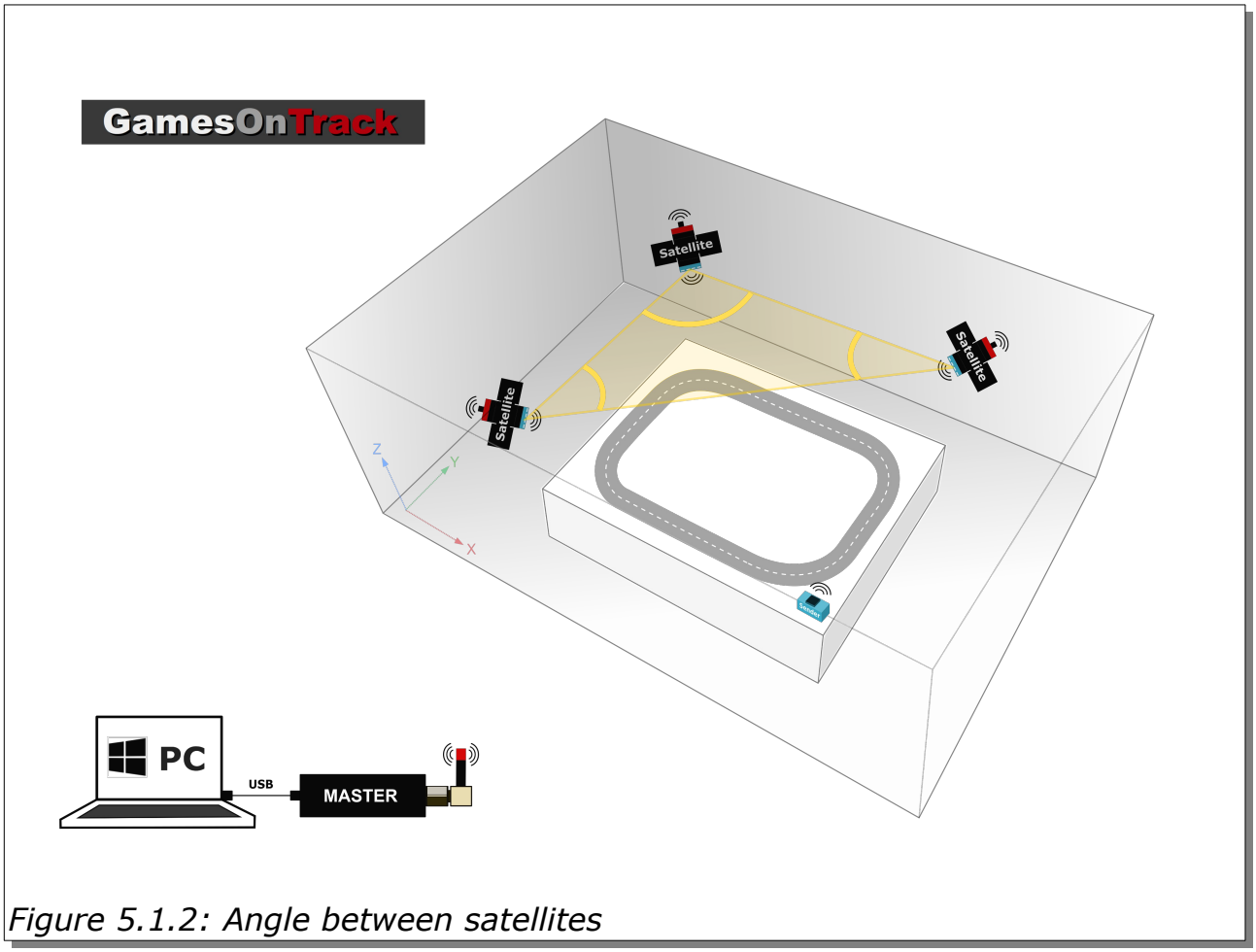



*Figure 5.1.2: Angle between satellites*

- Minimum angle between three satellites: **20°**
- Maximum angle between three satellites: **140°**

### 5.1.3 Distance from satellites to transmitter

The distance from the satellites to the senders is important for calculating a valid position.

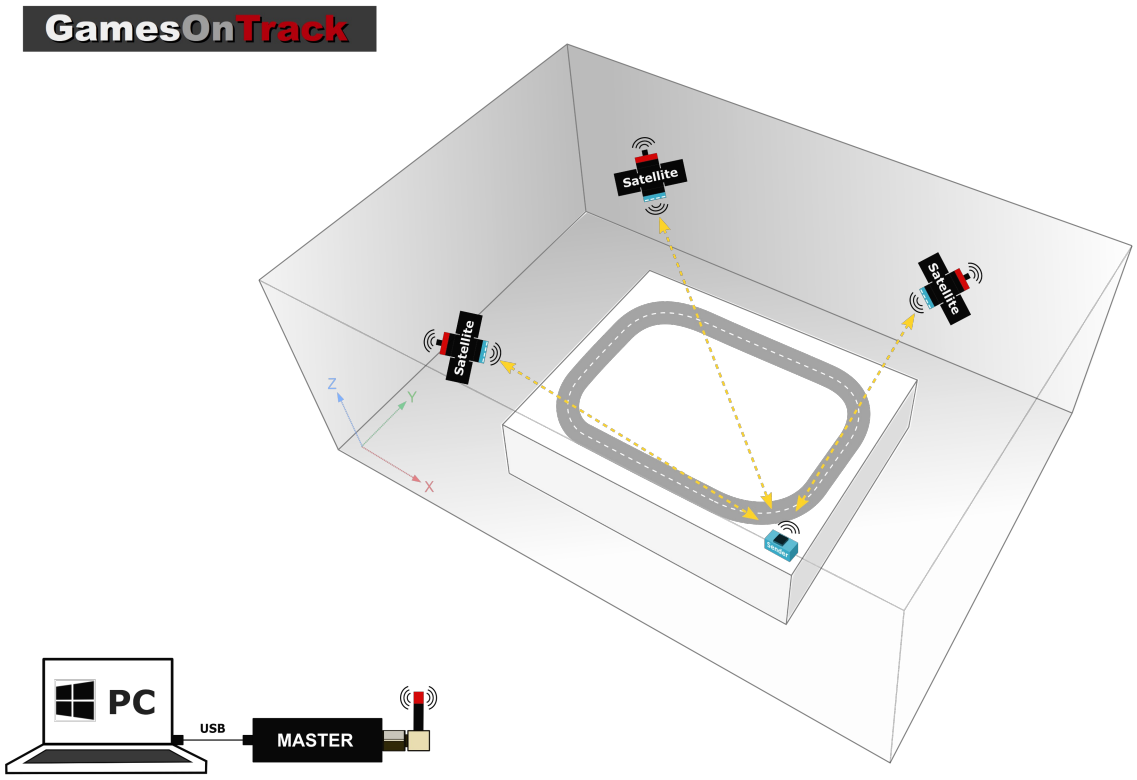



*Figure 5.1.3: Distance from satellites to transmitter*

- There's a maximum distance from a sender to nearest three satellites:
- Round transmitter Ø10 [mm]: **12 meters**
- Square transmitter: 5x5 [mm]: **5 meters**

## 5.2 Connect the Sender/Transmitter

Unit to be measured (here car and container sender)

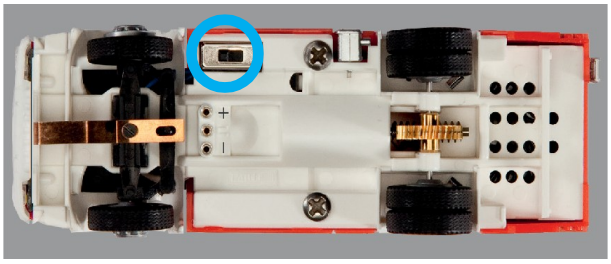



*Table 5.2.1: Connection of transmitter/sender*

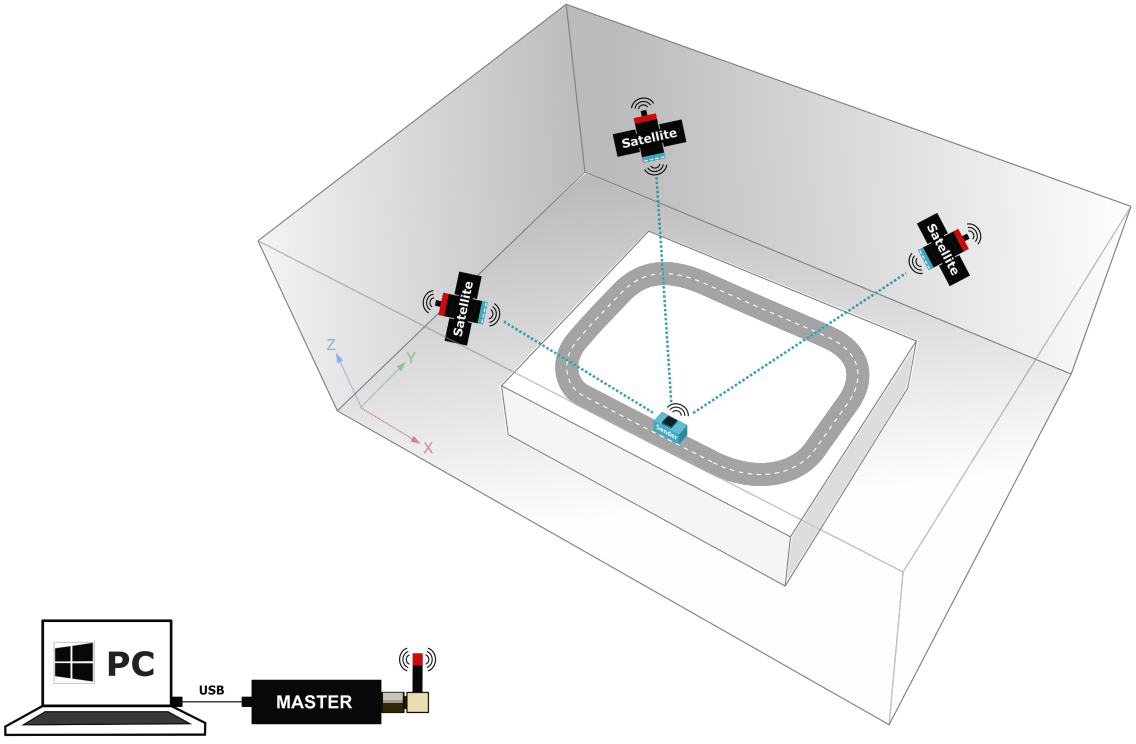



*Figure 5.2.1: Free line of sight*

- The ultrasonic transducers mounted on the satellites and transmitters have a certain angle where signals are received – imagine a cone. This angle is about 120°.
- The transmitter must have free line-of-sight to the satellites. If anything blocks this line, the distance measured will lead to incorrect positions.

# 6 Software Installation


The easy and very intuitive PC-Software fully automatically recognizes any hardware components that are added to the system like: digital vehicles, digital satellites, expansion modules etc.. The system layout is created by automatically recording a route.

**NOTE:** During the installation you will be asked to enter both the license key (software **SN**) and the registration key of your product (**reg.** No.).

The license key for the PC-Software can be found both on the back of the master and on the product information card that is enclosed with the master (or in a received e-mail from us). In order to receive your registration key, we ask you to contact the customer service. Please note that we need your license key (software SN) and the serial number of your master (serial number) to process the process.

**TIP**

- Your direct line to GamesOnTrack customer service:
  Telephone +45 2064 9622
  E-Mail: support@gamesontrack.com

## 6.1 Actions

This chapter will be a guide through a set of actions to install and activate the PC-Software:

- Note the system requirements and carry out the installation completely. This includes the .NET framework 4.x from Microsoft and drivers from Silicon Labs and FTDIChip.
- Do not connect the master until you have installed the PC-Software and the necessary drivers on your PC.
- Check System Requirements
- Install the PC-Software
- Apply the Software License

- Register the Software
- Update the Software

## 6.2 Check System Requirements

The PC-Software installs on any Windows PC with the minimum configuration listed below.

**ACTION**

➢ Confirm all requirements in the list here below are fulfilled before installing.

- OS: Microsoft Windows: 7, 8 and 10 (see NOTICE below)
- CPU: minimum 2 GHz, the more the better, particular in the graphical drawing area, but the real constraint is what one kernel can process.
- RAM: minimum 4 GB, however more will also help in the start up phase.
- HARD DISK: 300 MB, we do not use much disk space for the installation including videos, and language recognition libraries.
- NETWORK: Your PC can operate without connection to the internet. However, updates and registration, and some help, video and game samples run directly from our server. We recommend an Internet connection, at least from time to time.
- USB: Version 2.0 is necessary for connection to our MASTER V1-4. All in all you can easily use 4 USB-ports: MASTER, Mouse, Digital Controller, and a USB flashdrive.
- DISPLAY: Resolution from 1366 x 768 pixels can be used, but we highly recommend 1920 x 1080 as minimum. You can easily operate GT-Command with extra monitors.
- VIDEO: Most cards from NVIDIA and any competitors work fine, but be aware of the onboard Intel-cards on older machines. Graphics will most likely suffer on those.
- VOICE: Voice recognition uses the standard minijack for input and output, you can also use a separate, wireless headset with USB-interface, however please take care of getting your PC to recognize that headset as standard device.
- TABLET/PHONE: Can be used as remote devices for operation. They get access to the PC-control data via the WLAN connection. Remember to have both your tablets and your PC on the same Router. The system can also display the layout on your phone, and it can be scaled up and down. We do recommend to use a 10 inch tablet to display the layout. All smartphones and tablets from Android and Apple IOS can be used.

**NOTE**

- *We strongly recommend an upgrade to Windows 10.*
- *Microsoft has stopped supporting Windows 7 in 2020*
- *Microsoft has stopped supporting Windows XP in 2014*

## 6.3 Install the software

The PC-Software is delivered on a USB flashdrive placed in the product package. This USB flashdrive will include both PC-Software, necessary drivers and documentation:

- APPLICATION: GT-Command ® OR Faller Car System Digital ®
- DRIVER: FTDI Chip driver for Master V1 and V4.
- DRIVER: Silicon Labs driver for Master V2 and V3.
- MANUALS: This System Manual

**ACTION**

- Insert the USB stick into a corresponding input on your PC
- Open the file folder in the 'AutoPlay ' window or search for the removable disk in Windows Explorer.
- Click on the executable Installer file.
- Please wait while the installation is being prepared on your computer. This can take several minutes. If necessary, confirm the security warnings in the user account control with [Execute] or [Yes].
- Follow the prompts of the setup wizard with regard to the desired language, the license agreement, the target folder for the installation, etc.
- Confirm the respective steps for installing the necessary drivers in the driver installation wizards with [Next] and accept the required license agreements by ticking the box [I accept this agreement].
- End the driver installation with [Finish].

The PC-Software will be installed on your computer.

**TIP**

- If you do not have access to the internet, please use the Full installer.
- You can also download the PC-Software from our server. The full installer contains the Microsoft .NET framework version 4.5.2 and all drivers needed for the hardware products.
- You can deselect components in the install process if already installed on your PC.
- In any upgrades you do not need to uninstall the previous version. You can just install the new version over the old one. Please use standard settings.

### 6.3.1 The Default Install Directories

By default the PC-Software will be installed on your C-drive, in the following directories:

```
DefaultInstallDirectory (Faller):
[C:\Program Files (x86)\Faller Car System Digital\]

DefaultInstallDirectory (GT-Command):
[C:\Program Files (x86)\GT-Command\]
```

### 6.3.2 The Default User Data Directories

The PC-Software also creates a data directory in Documents. In this folder your data files, icons and other relevant data for your layout can be stored and managed.

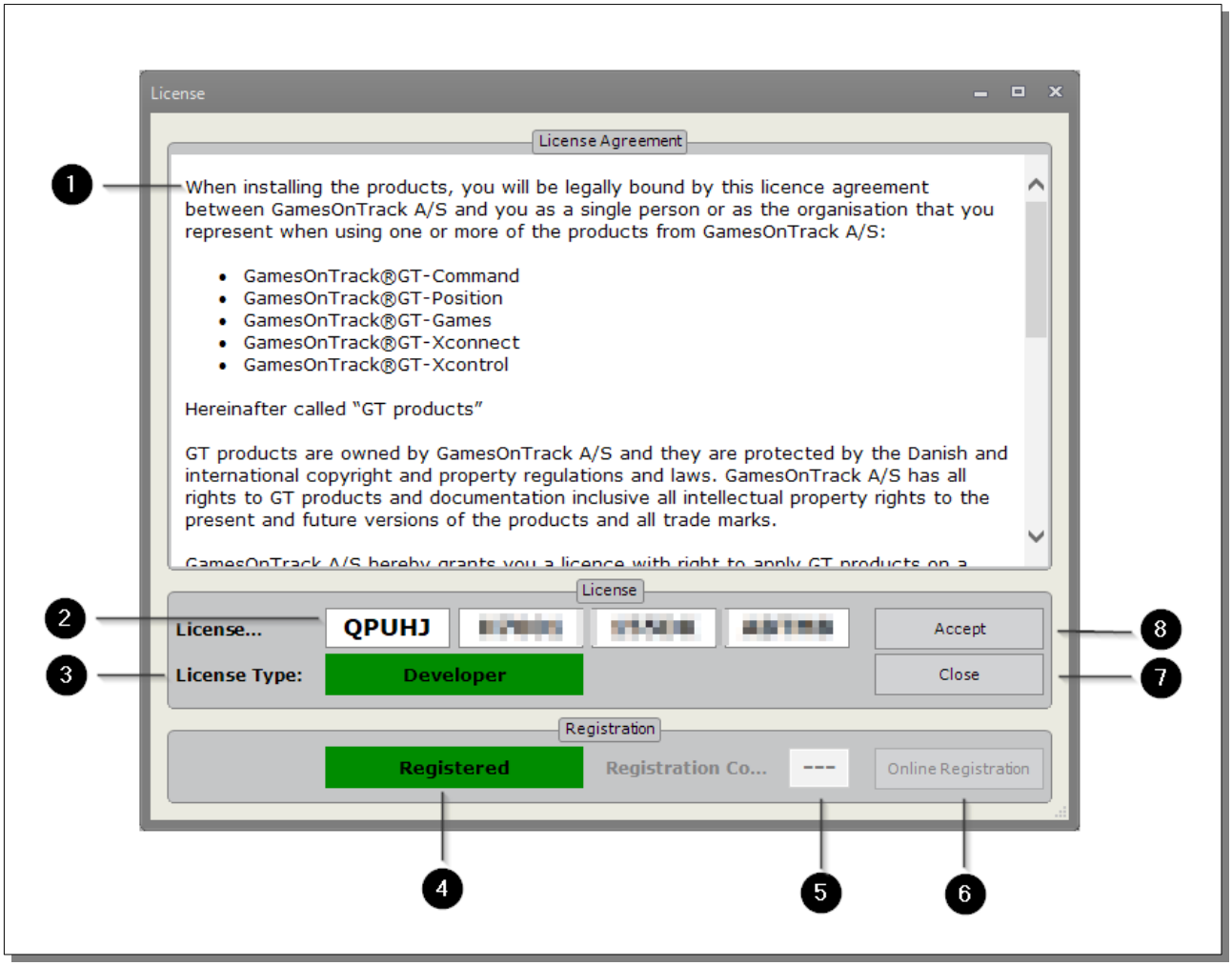
```
DefaultUserDirectory (Faller):
[C:\Users\USER\Documents\Faller Car System Digital\]

DefaultUserDirectory (GT-Command):
[C:\Users\USER\Documents\GTCommand\]

[DefaultUserDirectory]\Logs
[DefaultUserDirectory]\Settings
[DefaultUserDirectory]\System Files
[DefaultUserDirectory]\Types
[DefaultUserDirectory]\Vehicle Images
```

| USER Directories | Description |
|---|---|
| **Logs** | Any logs produced by the system will be placed here. |
| **Settings** | All special settings like positions of all component views, LocoNet and Signal Templates are placed here. |
| **System Files** | All created layouts will have the extension **.got** These files are all saved in this folder. |
| **Types** | All user defined vehicle types will be placed here. |
| **Vehicle Images** | All user created vehicle images will be placed here. |

*Table 6.3.1 User Directories*

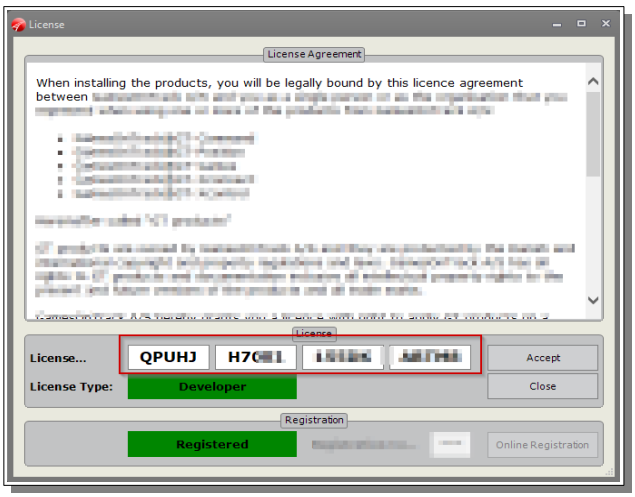
## 6.4 Software License

After completing the PC-Software installation, the program opens and asks you to enter your license key. Please make sure that the master is connected to your PC.
You will either find that license code in your package or in an e-mail sent to you.




| | Item | Description |
|---|---|---|
| 1 | **License Agreement** | Please read before using the products |
| 2 | **License Key** | **A 20 digit License Key** |
| 3 | **License Type** | The license type (Can vary a bit in GamesOnTrack and Faller respectively) |
| 4 | **Registration Status** | Status of registration |
| 5 | **Registration Code** | **A 3 digit Registration Code** |
| 6 | **Online Registration** | Click here and type in your email to receive the 3 digit registration code |
| 7 | **Close** | Close the dialog |
| 8 | **Accept** | Click Accept and the License key will be validate. If the validation succeeds the dialog will be closed and the software is ready to use. |

## 6.5 Enter The Software License




**ACTION**

- Please make sure the master is connected to your PC.
- Do not pay attention to upper and lower case letters when entering.
- Insert the 20 digit License received.
- Click button [Accept]
- Click button [OK]

**Your PC-Software has now been activated.**

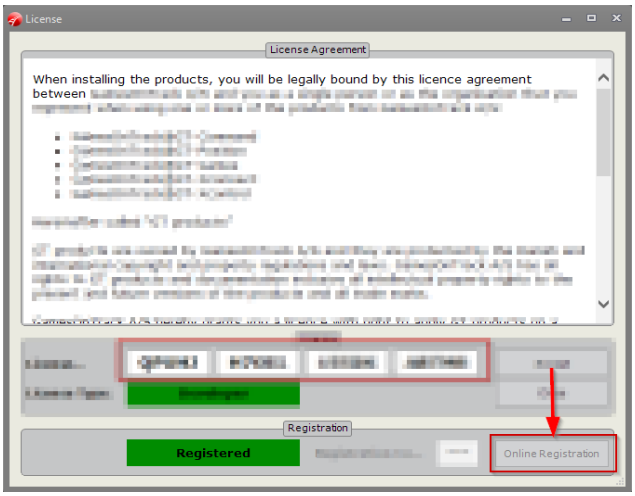
This license code is stored on your PC and on our servers. You can upgrade your license at any time. If you have purchased a new license key, you can simply delete an existing key, enter the new one and accept it as described above. If you lose your license key, our customer service will be happy to help.

**TIP**

- Your direct line to GamesOnTrack customer service:
  Telephone +45 2064 9622
  E-Mail: support@gamesontrack.com

## 6.6 Register The Software

Customer should register in order to get access to libraries and software upgrades.
After entering your license key the display of the license type is highlighted 'green'.
Now you have the possibility to enter your registration key. In order to receive your registration key (reg. No.) click [Online Registration].




**ACTION**

- Press button [Online Registration]
- Enter your email address.
- Now, check your email.

  You will receive a 3 digit registration key from our license server.
- Enter the 3 digit registration key.
- Click the button [Accept]

**Your master and PC-Software have now been registered.**

**NOTE**

- The received 3 digit registration key is your private key and it should follow your application where ever you install it. When this key is inserted with your Master, you have access to updates etc..
- The software license is tied to the serial number of the master and can therefore not be used in conjunction with another master.

## 6.7 Update The Software

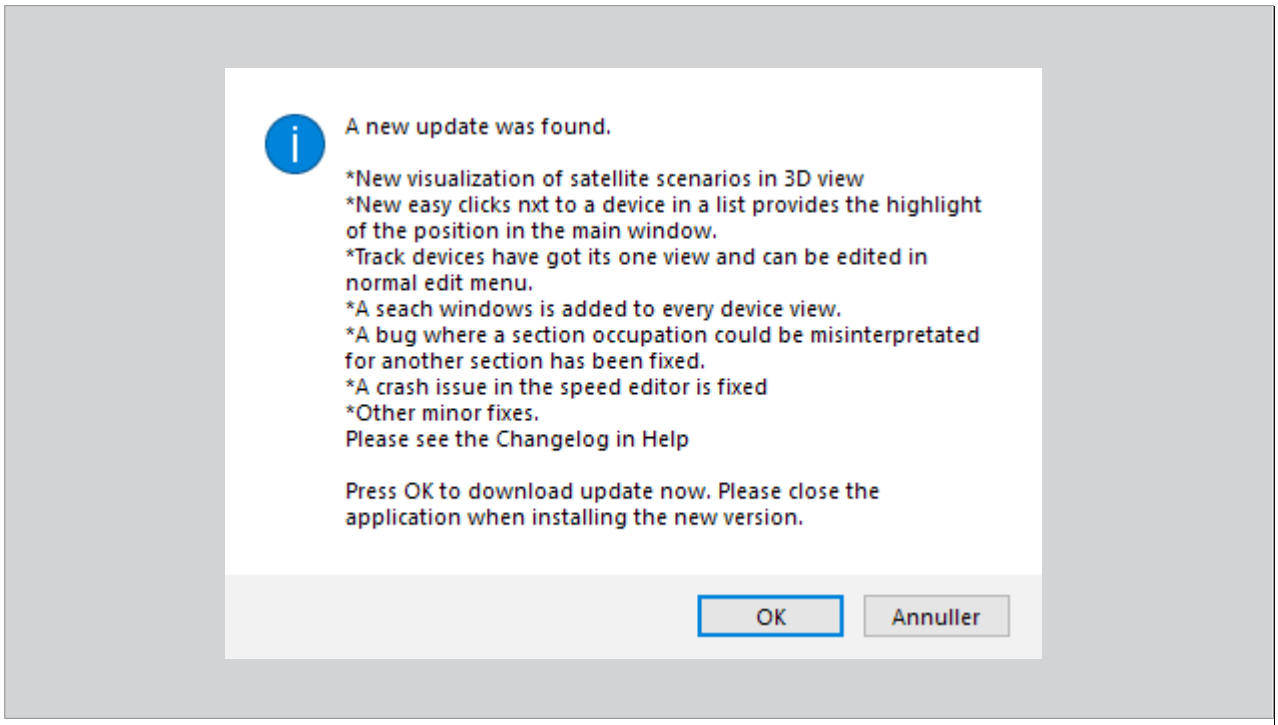



*Figure 6.7.1: Software Updates*

Software updates are automatically offered to you after starting the software, provided you are online. You can also search for an updated version yourself in the 'Help' menu.

**ACTION**

- Press [Help → Update]
- Press button [OK]
- Please wait - the download of the latest Installer file will begin shortly.
- Save the .exe file in a folder of your choice.
- Execute the downloaded .exe file with a double click.
- If necessary, confirm the security warnings in the user account control by click on [Execute] or [Yes].
- In the 'Select setup language' window, select the language to be used during the installation.
- Confirm the steps in the setup wizard with click on [Next].
- Exit the setup wizard with click on [Finish].
- If necessary, confirm the respective steps for installing the necessary drivers with click on [Next] and accept the required license agreements by marking the 'I accept this agreement' box.
- Quit the driver installation wizard with click on [Finish].
  **The PC-Software update is now installed on your computer.**

**NOTICE**

- Please note that after a software update you may have an updated version of this system manual. You can call this up at any time with the function key [F1].

## 6.8 Upgrade the Software License

You have the option of using different types of license, which differ in their scope of services.
**NOTE:** All available licenses can be reordered at any time from the customer service.

### 6.8.1 Faller License Types

| License Type | Scope | Description |
|---|---|---|
| **Basic** | 2 Digital vehicles | Car System Digital Master, Art. 161354 |
| **Standard** | 10 Digital vehicles | Car System Digital Master, Art. 161355 |
| **Premium** | Unlimited Digital vehicles | Car System Digital Master, Art. 161356 |

*Table 6.8.1: Faller License Types*

**NOTICE**

- Only the premium license allows you to run both Cars and Trains on the same layouts, and includes an additional option of a purely virtual operation of Car System Digital without a connected digital master.

### 6.8.2 GamesOnTrack License Types

| License Type | Scope | Description |
|---|---|---|
| **Standard** | 8 vehicles | |
| **Test** | 5/10/20 vehicles | Test Periods: 30/90/365 days |
| **Pro** | Unlimited vehicles | |
| **Expert** | Unlimited vehicles | Allows both Cars and Trains on the same layouts. |

*Table 6.8.2: GamesOnTrack License types*

## 6.9 Forum: Registration offline

If the PC-Software runs on a PC with no connection to the Internet, please use another PC with connection to make the registration. You can manually transfer the registration data from the system to the web form. The web-form checks if the license key is legal and free to register.

## 6.10 Forum: Registration online

Please register your license code and become a member of the Forum. When you are registered, you have access to Download. Here an example of the registration form:

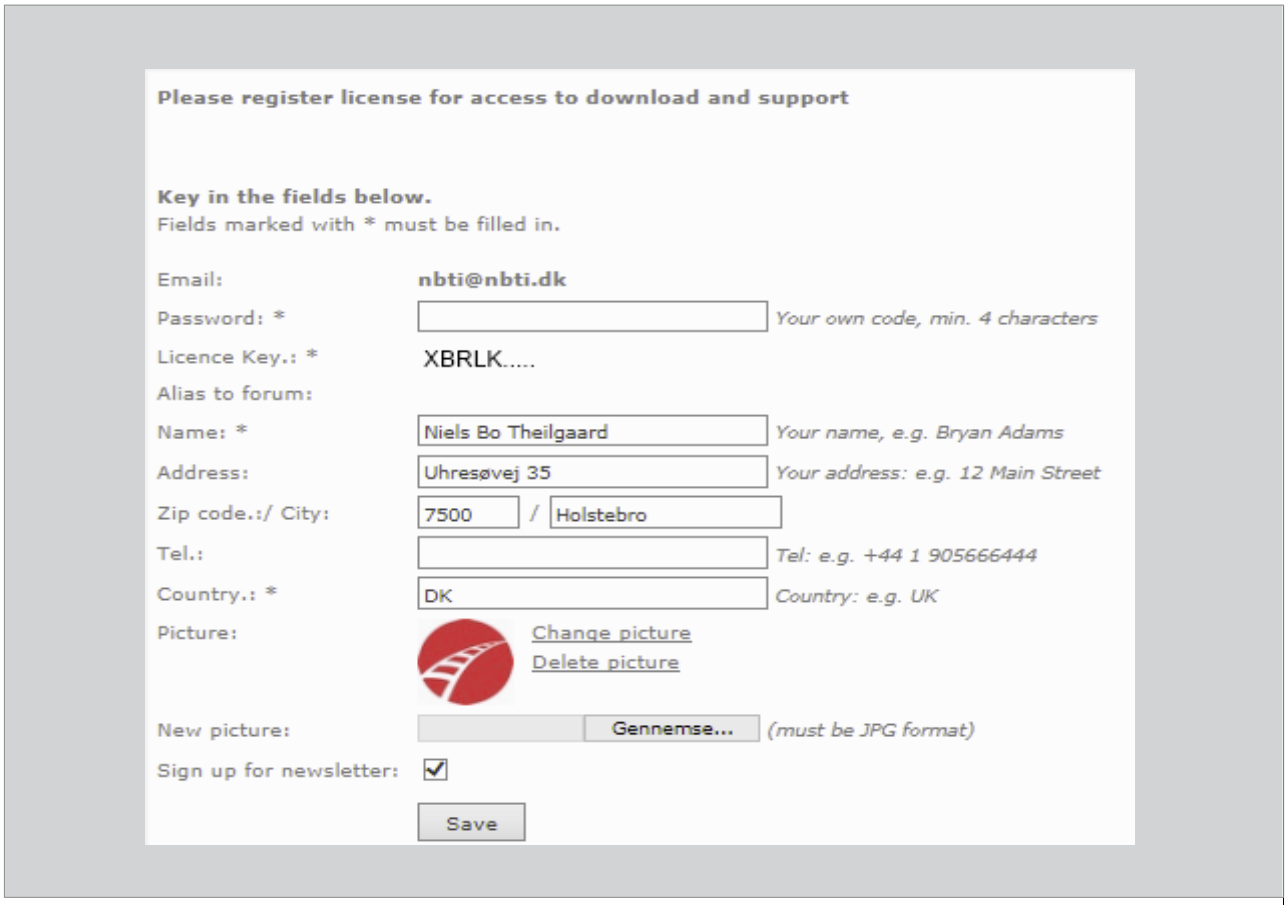



*Figure 6.10.1: GamesOnTrack Registration form*

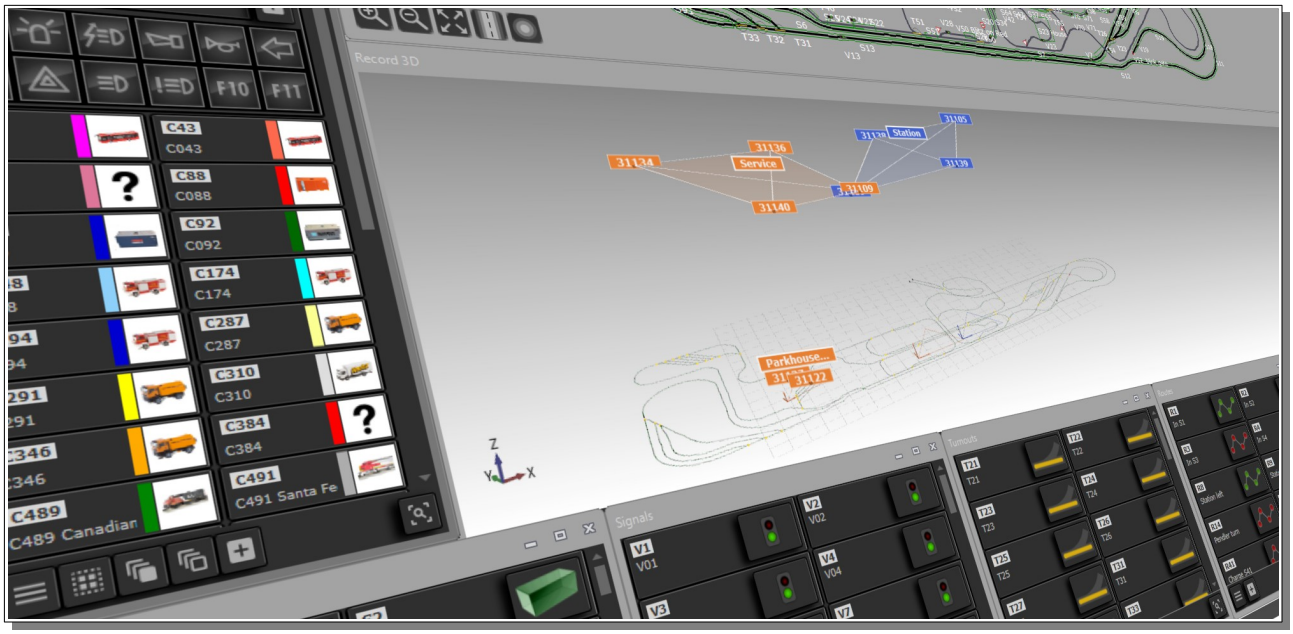
**ACTION**

- Find your license code. (Test licenses can also apply)
- Open a browser of your choice and go to **www.gamesontrack.co.uk**
- Enter the necessary information in all mandatory fields (*)
- Press Save and the web-site will validate your license code in order to accept.

**NOTICE**

- If your license for some reason is inactive, please contact support@gamesontrack.com.
- If you already are registered as a current customer, you should not register again!

# 7 The Software User Interface




The user interface shows all information and settings that you can make with the PC-Software. The entire functionality of the system is operated via a conventional Windows menu system.

If you find any grayed out menu points or buttons the reasons can be:

- They are not available at this step in your operation
- They are not available with your current License key.
  *They can be made available if you upgrade your license key.*
- They are planned in a forthcoming version.
  *In such case you will see that in this document*

The overview screen is the start screen of the PC-Software. It is divided into three main areas.

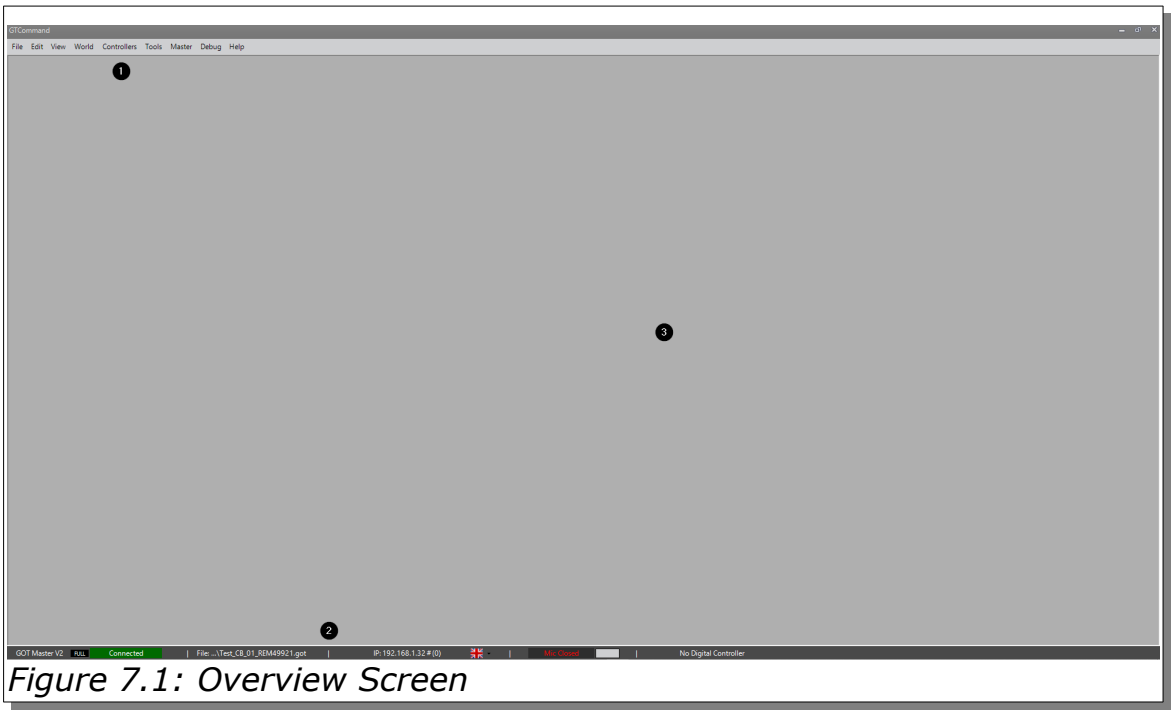
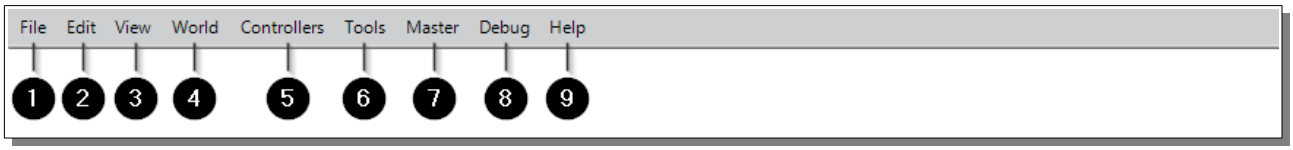



*Figure 7.1: Overview Screen*

| | Item | Description |
|---|---|---|
| 1 | **Menu line** | Shows all functions of the user interface summarized under key terms |
| 2 | **Information line** | Shows the most important information at a glance |
| 3 | **Layout and Component Views** | Shows the individual windows of the user interface |

## 7.1 The Menu Line

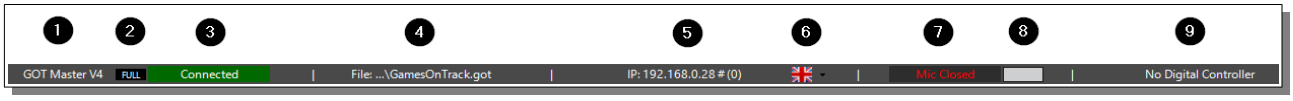
The menu is seen as the top bar of the application.




| | Menus | Description |
|---|---|---|
| 1 | **File** | Save and load of system layouts. |
| 2 | **Edit** | Preferences for general setup and various controls settings. |
| 3 | **View** | All views for various controls are listed here. |
| 4 | **World** | Views for Scenarios and the 2D/3D worlds. |
| 5 | **Controllers** | All supported hardware controllers for trains are listed here. |
| 6 | **Tools** | Miscellaneous tools. |
| 7 | **Master** | Digital Master functions like Settings, Reset etc.. |
| 8 | **Debug** | Various system debugging functionality like Log Viewer, inspectors. |
| 9 | **Help** | All kinds of help can be found here, like user manual, tutorials, language etc.. |

## 7.2 The Information Line

The information line shows you the current status of the master and further information about the system.




| | Item | Description |
|---|---|---|
| 1 | **Master Version** | Shows the current Master Version |
| 2 | **Radio Channel** | Shows the Selected Radio Channel (Full, Dual#1, Dual#2 etc..) |
| 3 | **Connection Status** | Shows the Master connection status: [Not Connected → Connecting → Connected] |
| 4 | **System File** | Shows the current loaded system file |
| 5 | **IP Address** | Shows the current IP address |
| 6 | **Language** | Shows the selected language |
| 7 | **Microphone Status** | Shows the microphone status [Mic Closed → Off → On] |
| 8 | **Microphone Signal** | Shows the strength on the microphone input signal |
| 9 | **Digital Controller** | Shows the current connected Digital Controller (Trains) |

## 7.3 The Layout and Component Views

The delivered USB stick contains the example file of a fully configured model system, which contains all the essential functions of system. This recorded route is for illustration purposes only and is intended to make it easier for you to start using the PC-Software.
When your system is installed, please start loading this layout. This is a complete system with a single scenario, a handful of vehicles, a container and some turnouts, signals, sections, automations etc.  Depending on the current license type, you can start operating the system virtually. The hardware units can be added later, when you're familiar with the basics of the system. Click on one of the vehicle images to the left and drag it somewhere on the layout. Now drag the speed slider on this vehicle to give it some speed and you'll see it driving on the layout. Now click on the turnouts and signals and try experiment with this system.

**ACTION**

- In the [File] menu click on [Load System] and a File Explorer window will appear.
- Use the menus in the dialog to search for the [Example] folder on the USB stick.
- Select the file that is in it and click [Open]. The example system is now displayed.

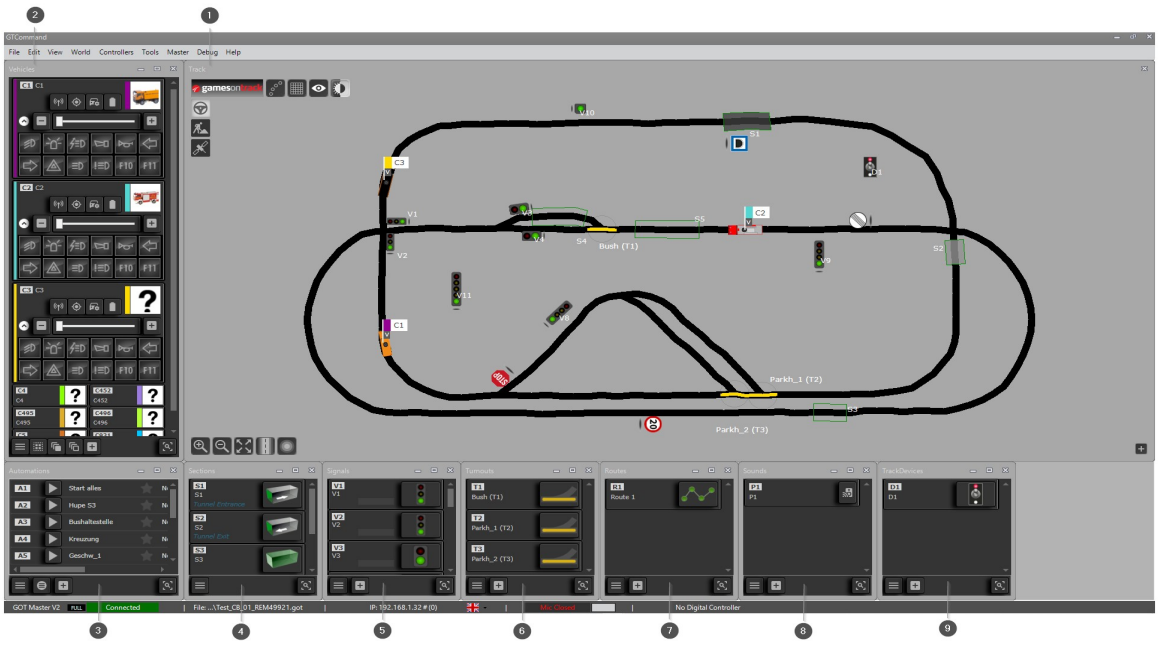


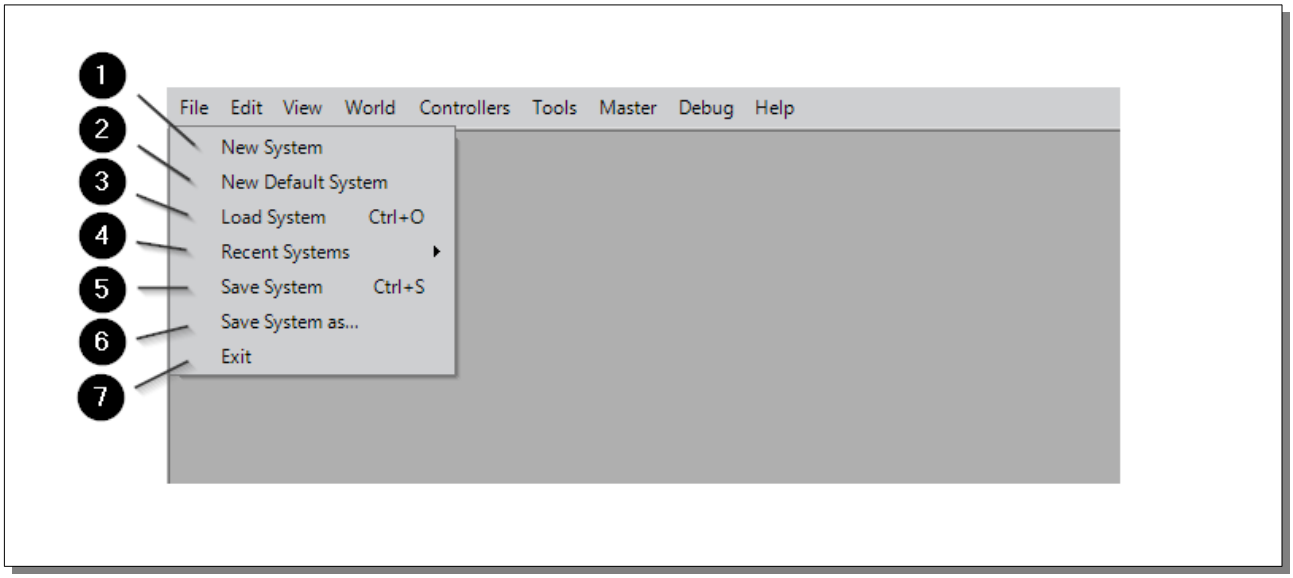

*Figure 7.3.1: Main Component View*

| Item | | Description |
|---|---|---|
| 1 | **Track** | The track displayed in 2D layout |
| 2 | **Vehicles** | List of all Cars, Trains, Containers, Transmitters etc.. |
| 3 | **Automations** | The real time programming environment |
| 4 | **Sections** | List of all Sections. |
| 5 | **Signals** | List of all Signals - available in: 2-aspect (red-green) or 3-aspect (red-yellow-green) |
| 6 | **Turnouts** | List of all Turnouts - available in: two-way, three-way, four-way-single, four-way-double |

| | | |
|---|---|---|
| 7 | **Routes** | List of all Routes – a route is a specific combination of states in signals and/or turnouts. |
| 8 | **Sounds** | List of all Sounds |
| 9 | **Track Devices** | List of all Track Devices |

## 7.4 File Menu

Settings for layout, vehicles, signals, turnouts etc.. can be saved and loaded in the **File** menu. All settings data are saved in the so called "system file". The extension of this file is **.got**




| | Menus | Description |
|---|---|---|
| 1 | **New System** | Create a complete new system from scratch |
| 2 | **New Default System** | Opens the Default System. **Please notice: This layout is read only!** Click [**Save System As**] to save any changes into a new filename of your choice. This layout can be used as a starting point for experimenting and should also be seen as a reference for tutorials on various subjects. |
| 3 | **Load System** | Open a system file from disk, using a dialog. (Keyboard shortcut: CTRL+O) |
| 4 | **Recent Systems** | Open a system file from a list of recent opened files. |
| 5 | **Save System** | Save the current opened system file. (Keyboard shortcut: CTRL+S) |
| 6 | **Save System As** | Save the current system file using a dialog to specify a file name. |
| 7 | **Exit** | Exit the application |

**TIP**

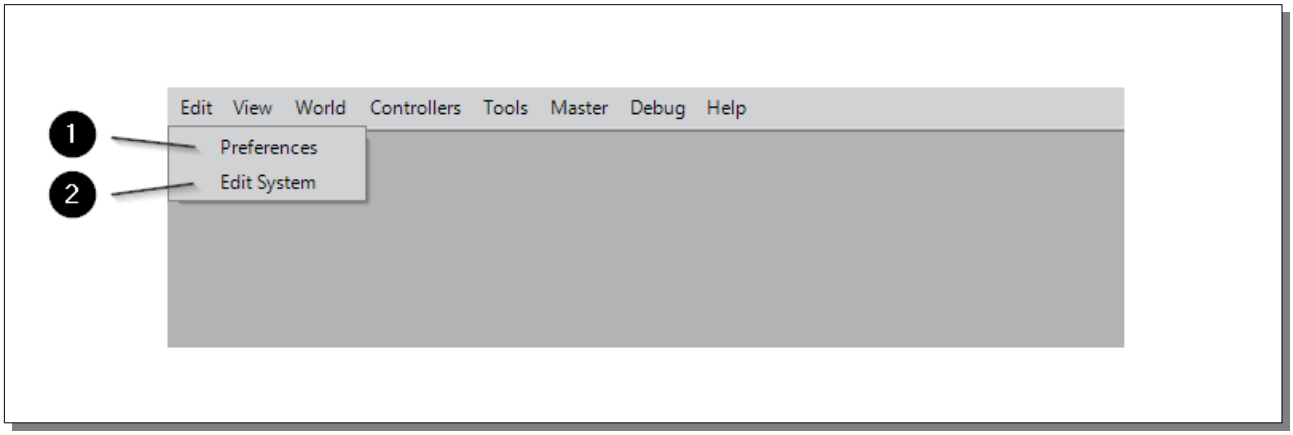
- Please use Save or Save As from the File menu or simply press the keyboard combination (CTRL + S) each time you want to save any changes made.
- If the GT-COMMAND brakes down, an immediate copy of the system file is available as a hidden file xxx.bak in the same folder as your normal system files.

A default layout is also available directly from the Menu: [File → Default Layout].

**NOTICE**

- The Default Layout is read only. This ensures you can return to a known state.
- If you want to save any changes made on the default layout, please select the Menu: [File → Save As] and give the layout a new name of your choice.

## 7.5 Edit




| | Menus | Description |
|---|---|---|
| 1 | **Preferences** | Opens up a window where the most general system properties can be set. |
| 2 | **Edit System** | Opens up a window where the properties for all types of components can be set. |

### 7.5.1 Preferences

The Preferences window contains some basic settings for the System including safety driving.

- In the System window you can select two safety functions. If a vehicle falls off the layout or it is taken away it will stop driving and turn on the warning signal.
- The border is defined as x mm from the most outside track of your layout, and the time in seconds tell how long time it takes before the vehicle is stopped crossing that border. **NOTE:** This setting MUST be disconnected when you draw you layout.
- When you restart or shut down the PC-Software, all vehicles will be stopped and all automations will be stopped as well (same as pressing F10)
- When you load any new system file the PC-Software will also be restarted in order to remove any old vehicle settings from the Master - this avoids inconsistency.
- If your vehicle has driving speed but stands still, it might be an accident or the vehicle has hit a hard stop, or it has hit another vehicle or it is blocked in a tunnel. After 9 measurements on the same spot, the vehicle will be stopped and warning signal is turned on. This solution helps when a vehicle keeps spinning the wheels but it does not move, or it hit something in a tunnel. In tunnels it might take longer to identify the stopped vehicle due to a measurements uncertainty.

- Vehicle looses battery/power and stops driving. The radio will be on for short periods, and when it dies (might take several minutes) then a blinking circle on the layout tells you the warning. As long as the blinking circle is on, any following vehicle will still respect this position and brake in front. The blinking circle will be on up to 30 seconds or longer until you have removed the vehicle by clicking on the vehicle icon. Battery comes into effect for vehicles positioned with a battery sender.
- If you select the extended train stop control, the PC-Software will stop the locomotive if the radio link is lost. The forward movement on the 2D layout screen is usually a maximum of 2.5 seconds in this case. You should only select this function when all your trains are running with transmitters. If the power supply is lost by short circuit or due to dirt, the radio connection also wants to disappear after a short time. With this function switched on, the PC-Software keeps the desired speed but the current to 0. If you then get back the current we can proceed normally under automatism.
- If the PC-Software breaks down closes, then all vehicles will be stopped and all automations will be shut down – same as F12.
- Emergency stop: Please press F12 or the voice command **Stop all**. All automations will be paused as well. If you press F12 again the vehicles will resume their directions and speed and the automations will also resume from the state where they stopped.
- If you press F11 then the power supply from any digital controller to tracks will be shut down, and F11 again will reconnect the power. To be used if a short circuit appears. Automations will not be shut off.
- If You press F10 all vehicles and all automations stop and everything must be started up again.

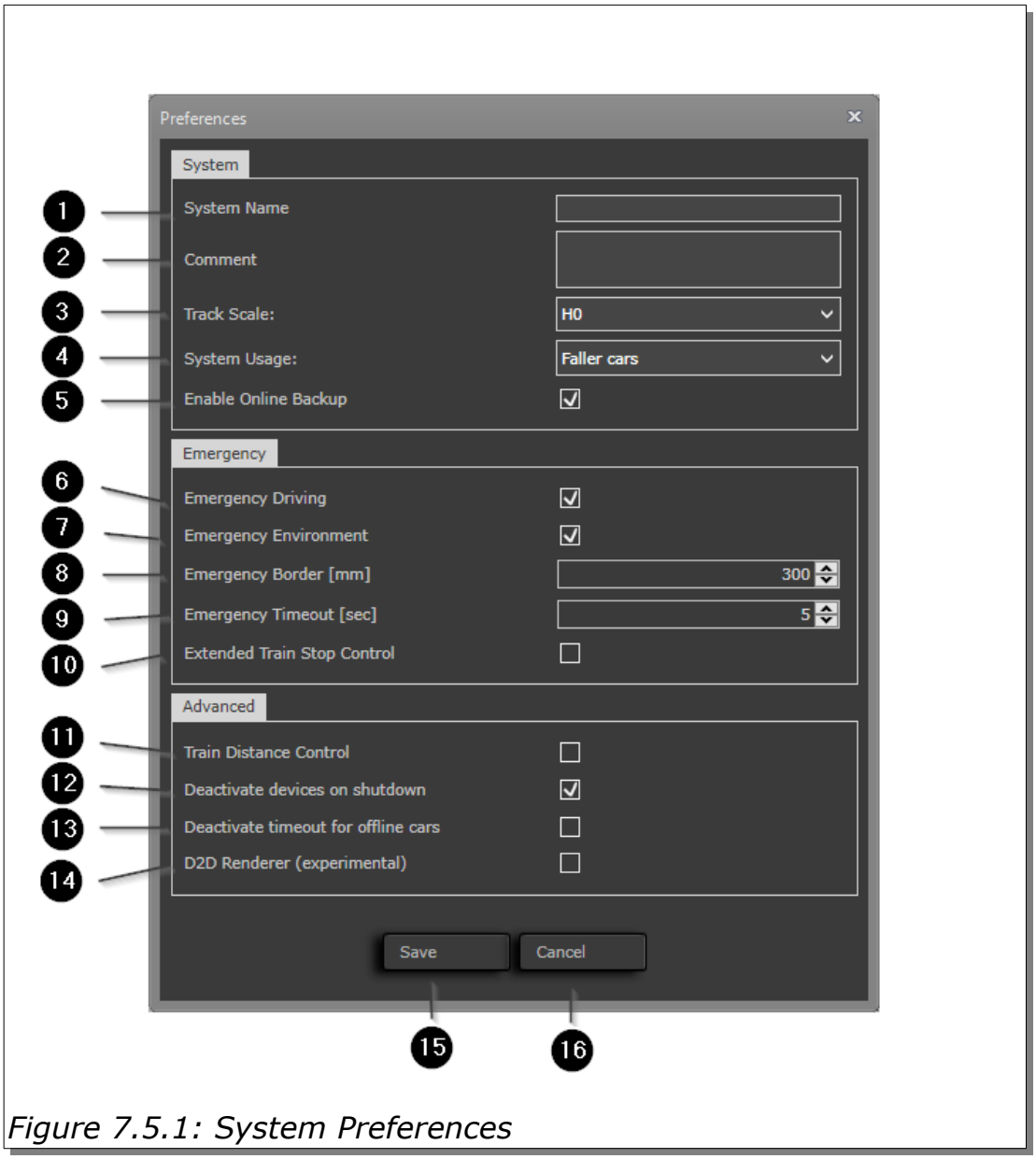



*Figure 7.5.1: System Preferences*

| Item | Description |
|---|---|
| **System** | |
| 1 **System Name** | Enter a name of the system |
| 2 **Comment** | Please remember to give your system a short description |
| 3 **Track Scale** | Supported scales: **H0, N, 0 and 1/G**<br>**NOTE:** The available items can depend on the license type! |
| 4 **System Usage** | Supported usage: **Everything, Model Trains, Lego and Faller Cars**<br>**NOTE:** The available items can depend on the license type! |
| 5 **Enable Online Backup** | We can backup your system files in our servers. Please decide if you want us to take a backup of your system file when you are online - every 10 minutes. We can later then easily help you in support, or give you the recent system file back if your PC crashes, or we can use the |

| | | |
|---|---|---|
| | | file for on-line education and training and help for other users.<br>**NOTE:** A Registration of the PC-Software is required! |
| | **Emergency** | |
| **6** | **Emergency Driving** | If a vehicle tips over, and the wheels are spinning without any changes in the GPS position - these vehicles will be stopped after the **[Emergency Timeout]** period. |
| **7** | **Emergency Environment** | If vehicles leave the layout's outer boundaries with a distance of **[Emergency Border]**, they will be stopped.<br>This setting is used to ensure vehicles that are falling off the layout or moves outside these boundaries will be stopped.<br>NOTE: Remember to disable this setting while the layout is being drawn. |
| **8** | **Emergency Border [mm]** | (See Emergency Environment) |
| **9** | **Emergency Timeout [sec]** | (See Emergency Driving) |
| **10** | **Extended Train Stop Control** | The Extended Train Stop Control can be used to avoid a too long continuous forward movement of trains in the 2D-layout when the radio signal is lost, when power is lost on digital controller by a manually shut down or by short circuit - or if tracks are not cleaned properly. The maximum forward time is 2.5 sec. |
| | **Advanced** | |
| **11** | **Train Distance Control** | This setting is a simple way of avoiding collisions. Today we use the FBF automation command to form "section-loop(s)" on the track where we can avoid collisions in a way that is more similar to the Block Control from the real world. |
| **12** | **Deactivate devices on shutdown** | This setting will reset all positions on devices like Signal = Red, Turnouts = straight. This is applied to external Controllers as well etc.. |
| **13** | **Deactivate timeout for offline cars** | In normal mode, if any vehicle not is having a good radio contact for about 6 seconds, they will be disabled and removed from the Vehicle list. Enable this setting if vehicles should stay online even if the radio is lost. |
| **14** | **D2D render (experimental)** | Setting the D2D Renderer and re-open the 2D layout will improve performance on 2D, but this feature is not quite mature yet in a couple of ways – one important thing is, that it's does not handle more than one camera at the moment. |
| **15** | **Save** | Saves the setup to memory<br>**Press [CTRL+S] to save to current file** |
| **16** | **Cancel** | Cancel the changes |

## 7.5.2 Edit System

The Edit System can be seen as the overview of most components added to the system.

All components are displayed in separate tabs with tables.

**TIP**

- Please start here when creating a complete new system from scratch.

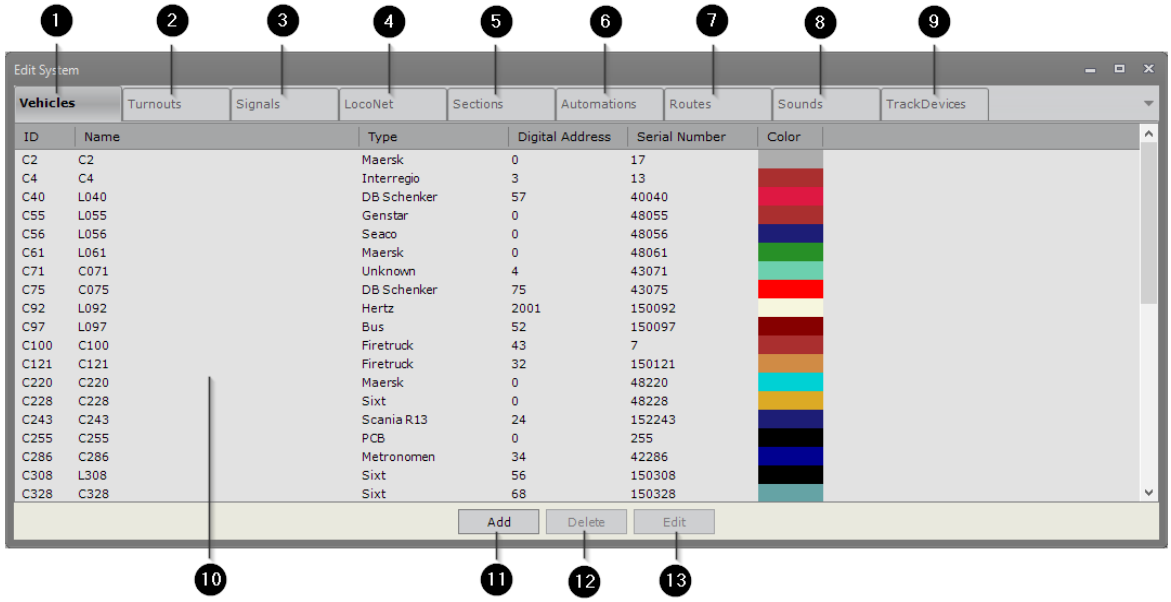
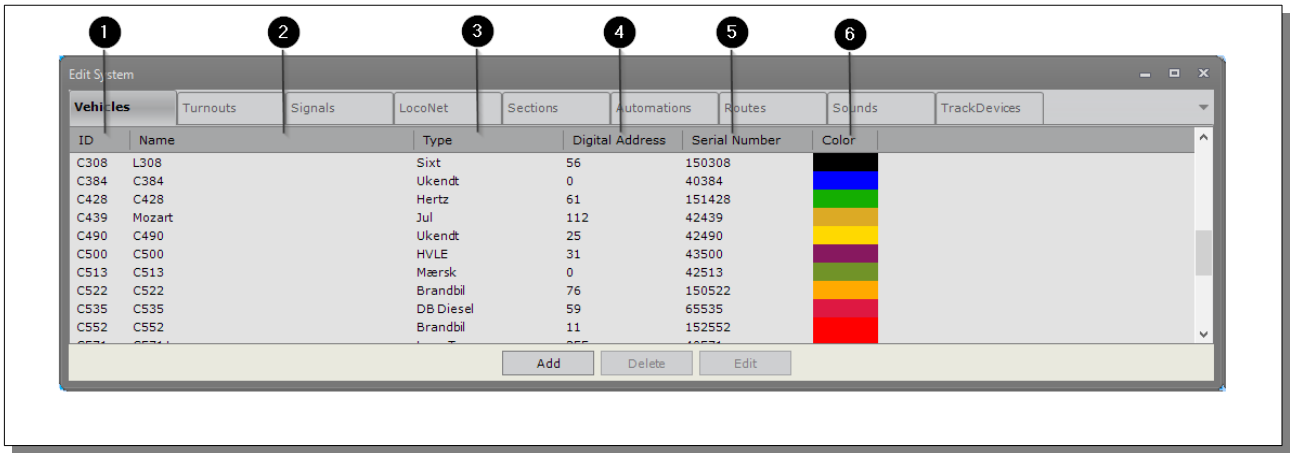



*Figure 7.5.2: Edit System*

| Item | | Description |
|---|---|---|
| 1 | **Vehicles** | List of all created Vehicles |
| 2 | **Turnouts** | List of all created Turnouts |
| 3 | **Signals** | List of all created Signals |
| 4 | **LocoNet** | List of the LocoNet setup |
| 5 | **Sections** | List of all created Sections |
| 6 | **Automations** | List of all created Automations |
| 7 | **Routes** | List of all created Routes |
| 8 | **Sounds** | List of all created Sounds |
| 9 | **Track Devices** | List of all created Track Devices |
| 10 | **Selection Area** | Click on an item in the list to handle |
| 11 | **Add** | Add new item to the list |
| 12 | **Delete** | Delete the selected item in the list |
| 13 | **Edit** | Edit the selected item in the list |

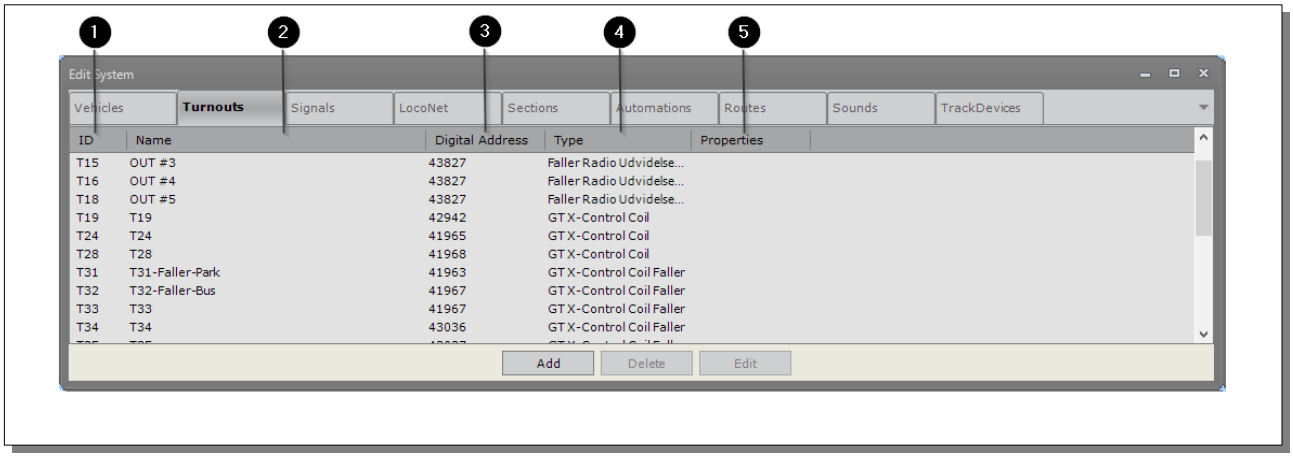
In the following tables the Add - Delete – Edit buttons are not listed, since they all have the same function as described here.

## 7.5.2.1 Vehicles



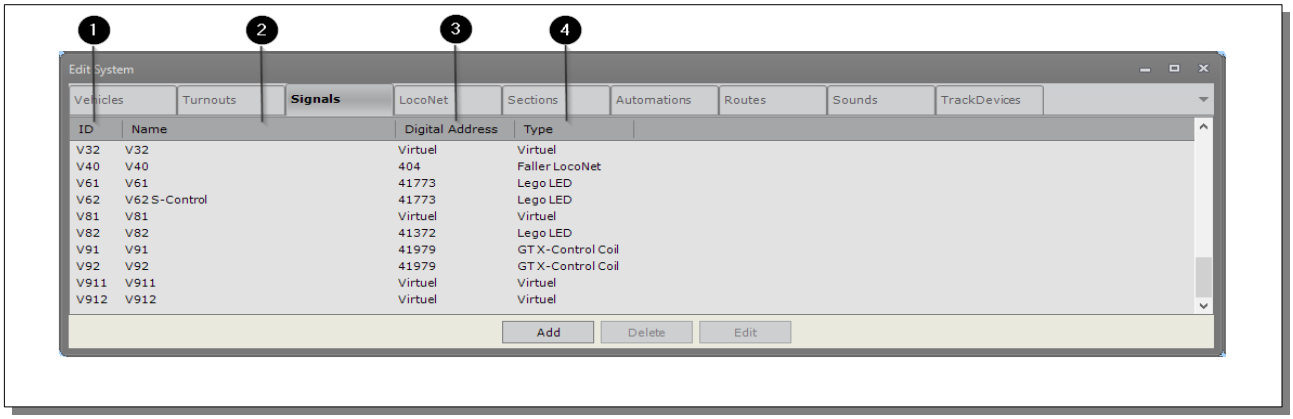

| Item | | Description |
|---|---|---|
| 1 | **ID** | The vehicle Id - an integer prefixed with the letter C (or L) |
| 2 | **Name** | Name of vehicle |
| 3 | **Type** | The Type of vehicle |
| 4 | **Digital Address** | The DCC address specified for this vehicle |
| 5 | **Serial Number** | The serial number of the device (see the label on the hardware) |
| 6 | **Color** | Selected color for the vehicle |

## 7.5.2.2 Turnouts



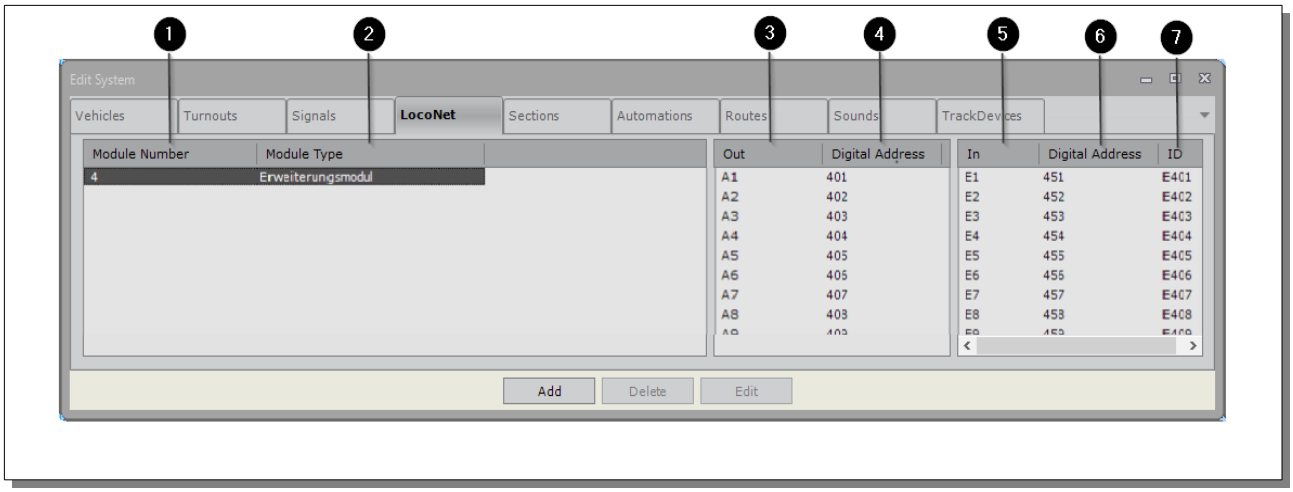

| Item | | Description |
|---|---|---|
| 1 | **ID** | The Turnout Id - an integer prefixed with the letter T |
| 2 | **Name** | Name of turnout |
| 3 | **Digital Address** | The Digital address of the device (see the label on the hardware) |
| 4 | **Type** | The Type of turnout |
| 5 | **Attributes** | Legacy – not used |

## 7.5.2.3 Signals



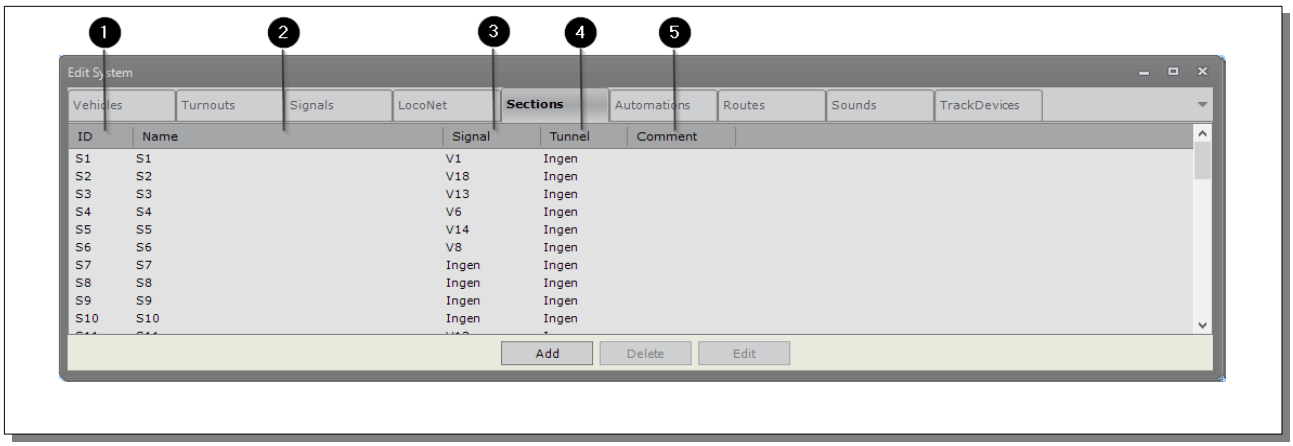

| Item | | Description |
|---|---|---|
| 1 | **ID** | The Signal Id - an integer prefixed with the letter V |
| 2 | **Name** | Name of Signal |
| 3 | **Digital Address** | The Digital address of the Signal (see the label on the hardware) |
| 4 | **Type** | The Type of Signal |

## 7.5.2.4 LocoNet



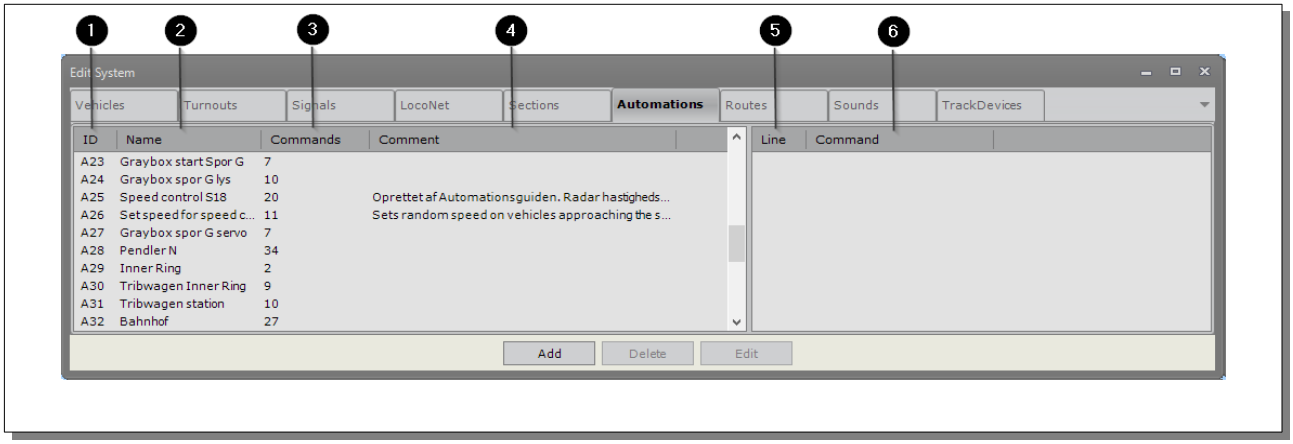

| Item | | Description |
|---|---|---|
| 1 | **Module Number** | The returned number of the module – here 4.<br>This number is normally the first digit in the digital addresses |
| 2 | **Module Type** | The returned Type of the module |
| 3 | **Out** | Outputs are named A1 to A12 |
| 4 | **Digital Address** | The Digital address specified for the outputs - here [401 to 412] |
| 5 | **In** | Inputs are named E1 to E11 |
| 6 | **Digital Address** | The Digital address specified for the inputs – here [451 to 461] |
| 7 | **ID** | The ID for the inputs – here [E401 to E411] |

## 7.5.2.5 Sections




| | Item | Description |
|---|---|---|
| 1 | **ID** | The Section Id - an integer prefixed with the letter S |
| 2 | **Name** | Name of the Section |
| 3 | **Signal** | If a Signal is attached a section, it's listed here - otherwise None will be listed |
| 4 | **Tunnel** | If the section is a tunnel, the Type of tunnel is listed here Possible types are: Tunnel, Entrance, Exit, None |
| 5 | **Comment** | A comment for the section can be specified.<br>**NOTE:** This comment can be used in a special way if e.g. the iTrain interface is connected. This way transfer we can transfer the status (free/occupied) to iTrain for these sections. |

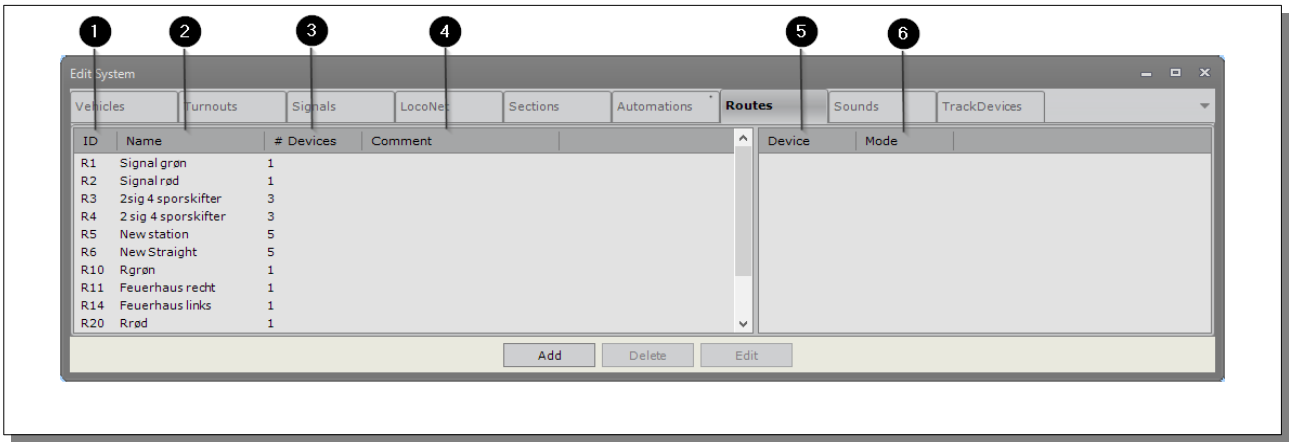
## 7.5.2.6 Automations




| | Item | Description |
|---|---|---|
| 1 | **ID** | The automation Id - an integer prefixed with the letter A |
| 2 | **Name** | Name of the Automation |
| 3 | **Commands** | The number of commands in the Automation script |
| 4 | **Comment** | A comment for this automation can be specified |
| 5 | **Line** | The line number |

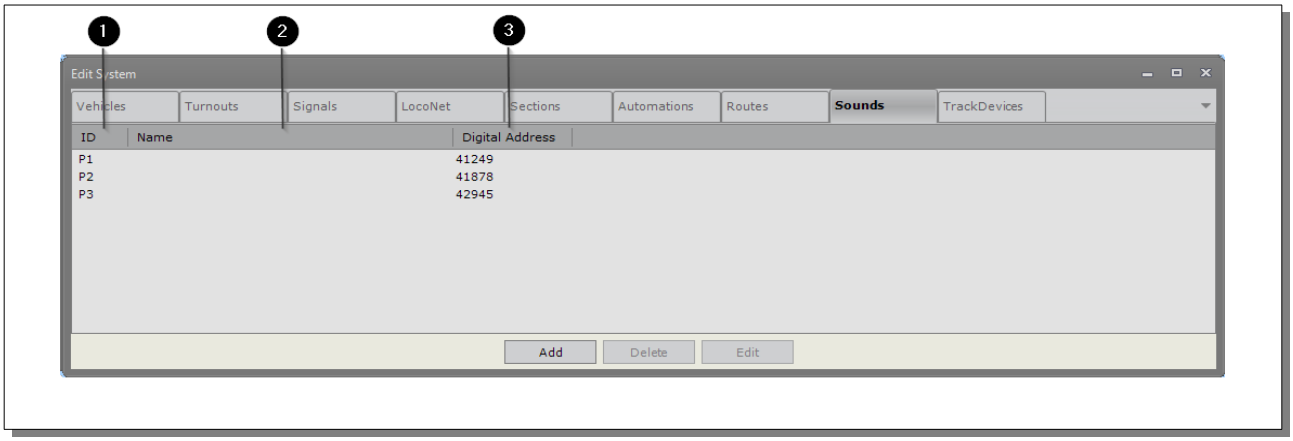
| | | |
|---|---|---|
| 6 | **Commands** | The actual command lines with arguments |

## 7.5.2.7 Routes



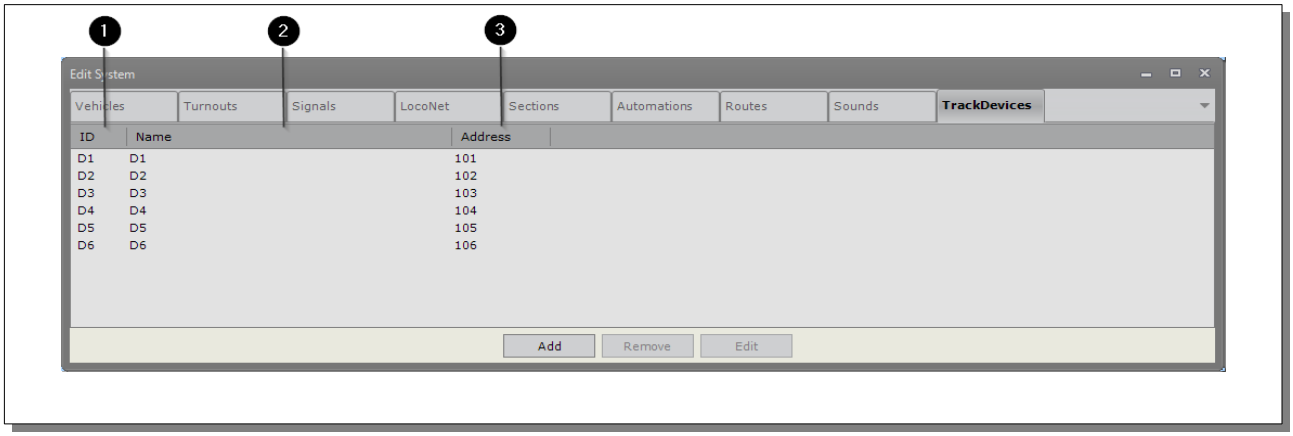

| Item | | Description |
|---|---|---|
| 1 | **ID** | The Route Id - an integer prefixed with the letter R |
| 2 | **Name** | Name of the Route |
| 3 | **# Devices** | The number of devices to be set in this route.<br>Devices (components) can be either turnouts or signals. |
| 4 | **Device** | The list of devices used in this route |
| 5 | **State** | The state to be set for each device in this route |

## 7.5.2.8 Sounds




| Item | | Description |
|---|---|---|
| 1 | **ID** | The Sound Id - an integer prefixed with the letter P |
| 2 | **Name** | Name of the Sound |
| 3 | **Digital Address** | The Digital address of the device (see the label on the hardware) |

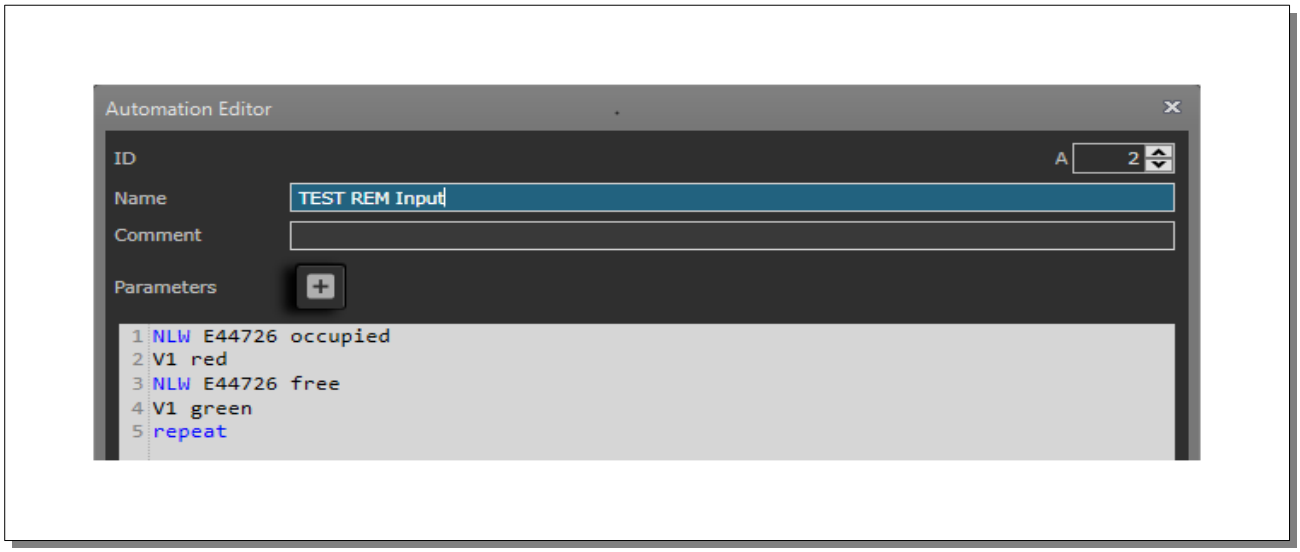
## 7.5.2.9 Track Devices




| Item | | Description |
|---|---|---|
| 1 | **ID** | The Track device Id - an integer prefixed with the letter D |
| 2 | **Name** | Name of the Track device |
| 3 | **Digital Address** | The Digital address of the device (see the label on the hardware)<br>If Erweiterungsmodul is used, this can be and address to this module. |

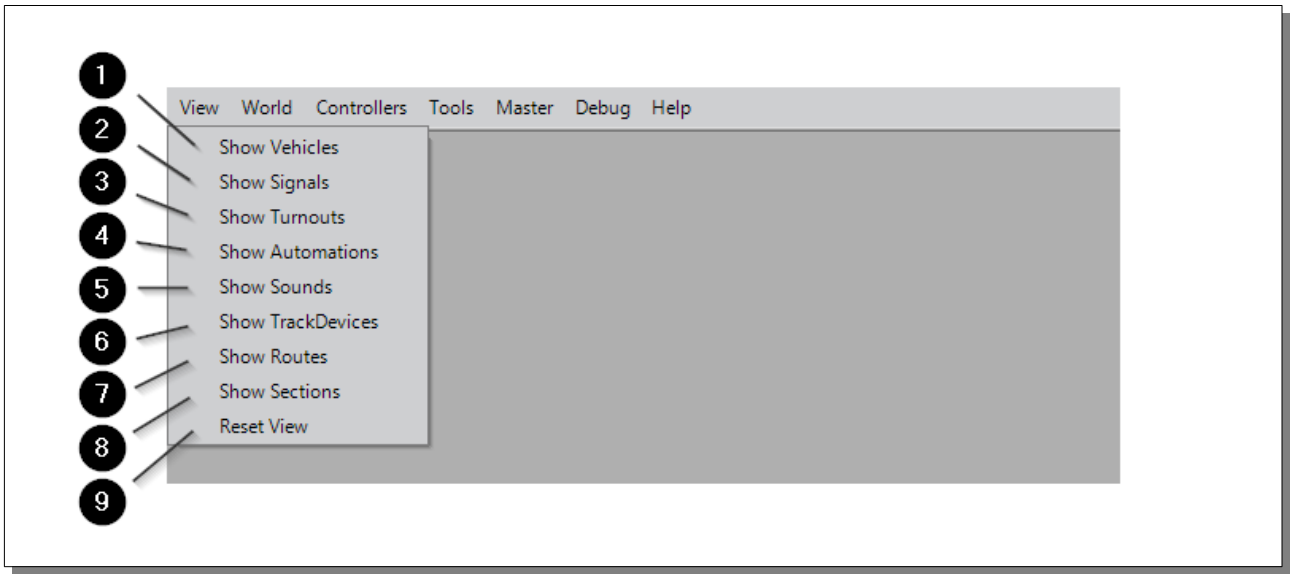
Track Devices can be setup to control the output ports of a Radio Expansion Module.
**The Input port on a Radio Expansion Module is not visualized as the outputs.**
Read the Input port is done by using automations – here is an example:
The intellisense will display the online REM modules when you type "NLW E" as shown here:


In the example here below the signal V1 is toggled between red/green whenever the REM Input port is toggled on the module with Id 44726.



## 7.6 View

Use the menu [View] to configure your screen and to enable what you want to see.
Use [View → Reset View] to set all open views on the screen back to their default positions.




| | Item | Description |
|---|---|---|
| 1 | **Show Vehicles** | Opens the list of all vehicles. |
| 2 | **Show Signals** | Opens the list of all signals. |
| 3 | **Show Turnouts** | Opens the list of all turnouts. |
| 4 | **Show Automations** | Opens the list of all automations. |
| 5 | **Show Sounds** | Opens the list of all sounds. |
| 6 | **Show Track Devices** | Opens the list of all track devices. |
| 7 | **Show Routes** | Opens the list of all routes. |
| 8 | **Show Sections** | Opens the list of all sections. |
| 9 | **Reset View** | Reset all views above to their default positions on screen. |

## 7.6.1 Show Vehicles

If your vehicle has a radio sender for positioning or for both position and operation, the vehicle will show up first time on the blank screen here as unknown adapting a default configuration.

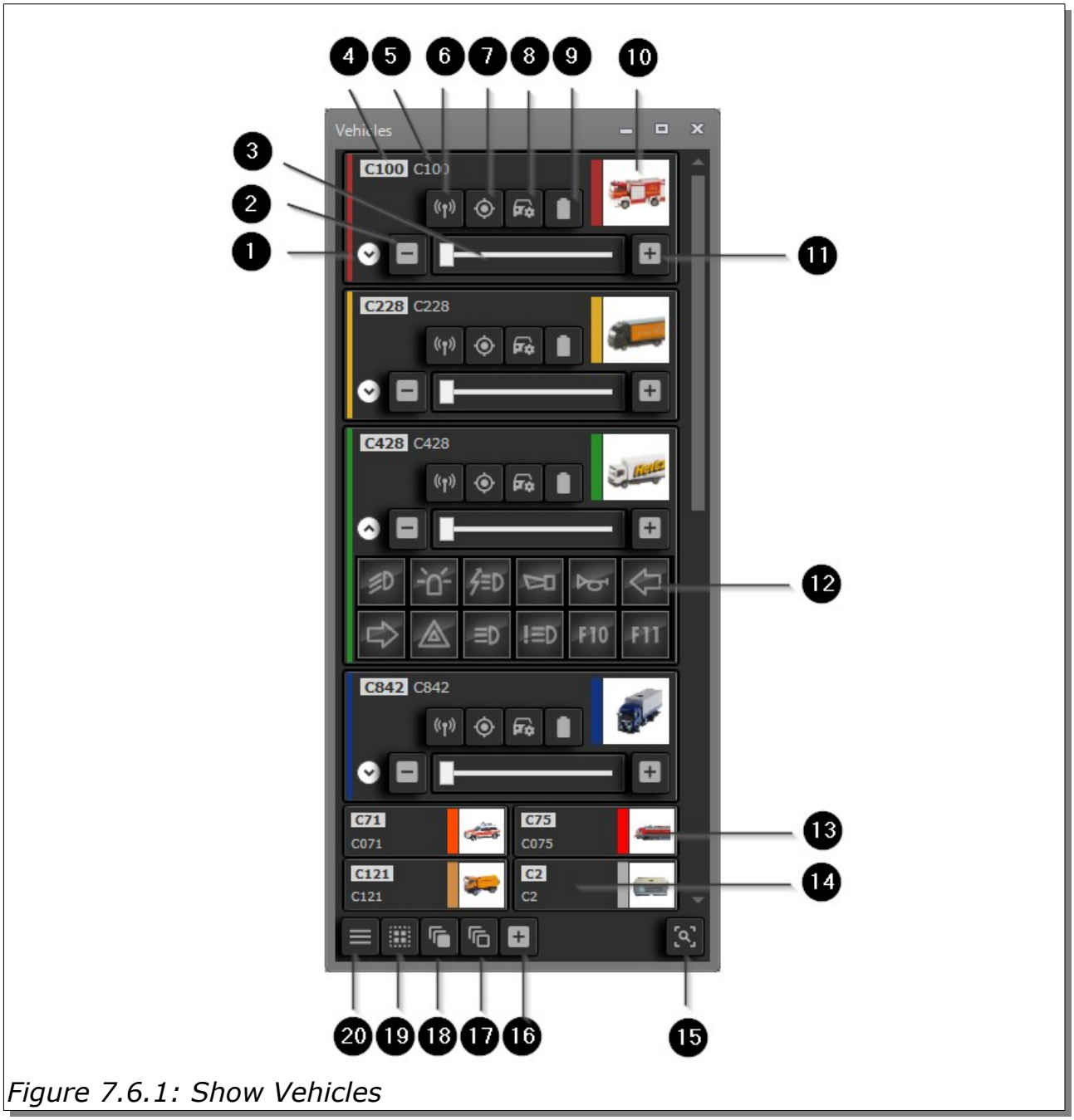



*Figure 7.6.1: Show Vehicles*

| | Item | Description |
|---|---|---|
| 1 | **Vehicle Functions** | Mouse Click will expand/collapse the vehicles Functions (see 12) |
| 2 | **Reduce Speed by Step** | Clicking here will reduce the speed by a single step.<br>A normal speed range with 127 levels are split into 10 steps. |
| 3 | **Speed Slider** | Setting the speed by dragging the slider left or right.<br>The speed range can vary for different vehicle types, but a normal range is between [1..127], and these levels are split into 10 steps. |

| | | |
|---|---|---|
| 4 | **Vehicle Id** | The vehicle Id is an integer prefixed with the letter C. |
| 5 | **Vehicle Name** | An arbitrary name of the vehicle |
| 6 | **Radio Status** | The radio status is displayed here |
| 7 | **GPS and Speed Calibration** | Mouse Hover will display the current speed and position of the vehicle in X, Y, Z.<br>Mouse Click will Open the calibration dialog. |
| 8 | **Vehicle Configuration** | Mouse Hover will display all details on you vehicle configuration.<br>Mouse Click will open the Vehicle Settings Dialog |
| 9 | **Battery Level** | Mouse Hover will display the battery status in 25, 75 or 100 % |
| 10 | **Vehicle Image** | Shows the image of the vehicle<br>Mouse Click will remove this vehicle from the 2D layout |
| 11 | **Increase Speed by Step** | Clicking here will increase the speed by one step.<br>A normal speed range with 127 levels are split into 10 steps. |
| 12 | **Vehicle Functions** | Each vehicle has a set of Functions (maximum is 32).<br>Each function can control different aspects on the vehicle like turning lights on/off, play a sound etc.. Any vehicle gets initially the function keys associated with the selected type. You can change that when creating your own types.<br>To edit these functions see **17** and **18** |
| 13 | **Inactive Vehicles** | Below the active vehicles all inactive vehicles are placed. These will have smaller icons. Use Mouse to drag to place the vehicle on the 2D layout. |
| 14 | **Inactive Vehicle Text Area** | Use mouse Double Click on the Vehicle Id or Name to open the Vehicle Settings Dialog. |
| 15 | **Search and Filter** | Mouse Click will open up a blue text search field and the list of vehicle groups. |
| 16 | **Add New Vehicle** | Opens up the Vehicle Settings Dialog, where a new vehicle can be set up. |
| 17 | **Edit Vehicle Types (Admin)** | Opens up the Edit Vehicle Types (Admin) View.<br>In this View new types of vehicles can be created.<br>When using the (admin), all existing vehicle types will be copied to the Types Directory in the user data directories *(See chapter 6.3.2)* |
| 18 | **Edit Vehicle Types** | Opens up the Edit Vehicle Types View. In this View new types of vehicles can be created.<br>When using this View, only the current created vehicle type will be copied to the Types folder in the user data directories. *(See chapter 6.3.2)* |
| 19 | **Vehicle Groups** | Opens up the Vehicle Groups View. In this View vehicles can be grouped. Groups can be created and named. |
| 20 | **Overview** | Opens up the Vehicles Tab in the Edit System |

### 7.6.1.1 Search And Filter Vehicles

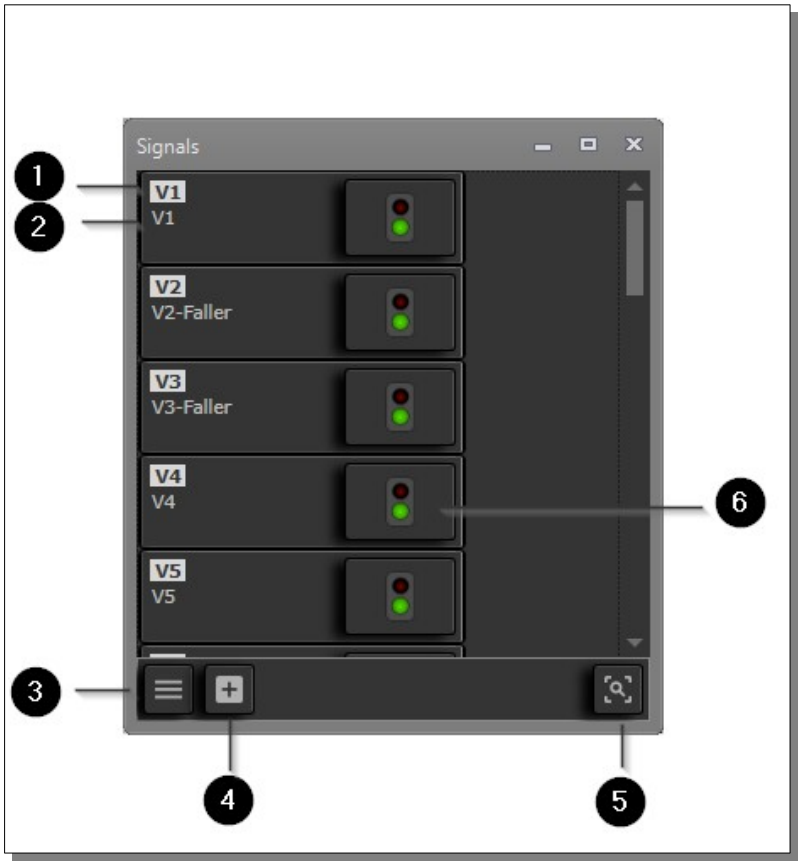
A mouse click in one of these groups will filter this group only to the list.
Typing in a few letters in the search field will do an incremental search from the first character and show the vehicles having these letters in the Id or the Name.


*Figure 7.6.2: Search and Filter Vehicles*

| | View Signals | Description |
|---|---|---|
| 1 | **Group Selection** | Click to select a group to be visible in the list |
| 2 | **Search Field** | Enter text to filter certain items |
| 3 | **Close** | Click to close for the Search/Filter/Groups |

## 7.6.2 Show Signals

The Signal component is used for traffic control, or simply for setting LED's on and off.
The menu [View Signals] will open a list containing all signals created in the system.

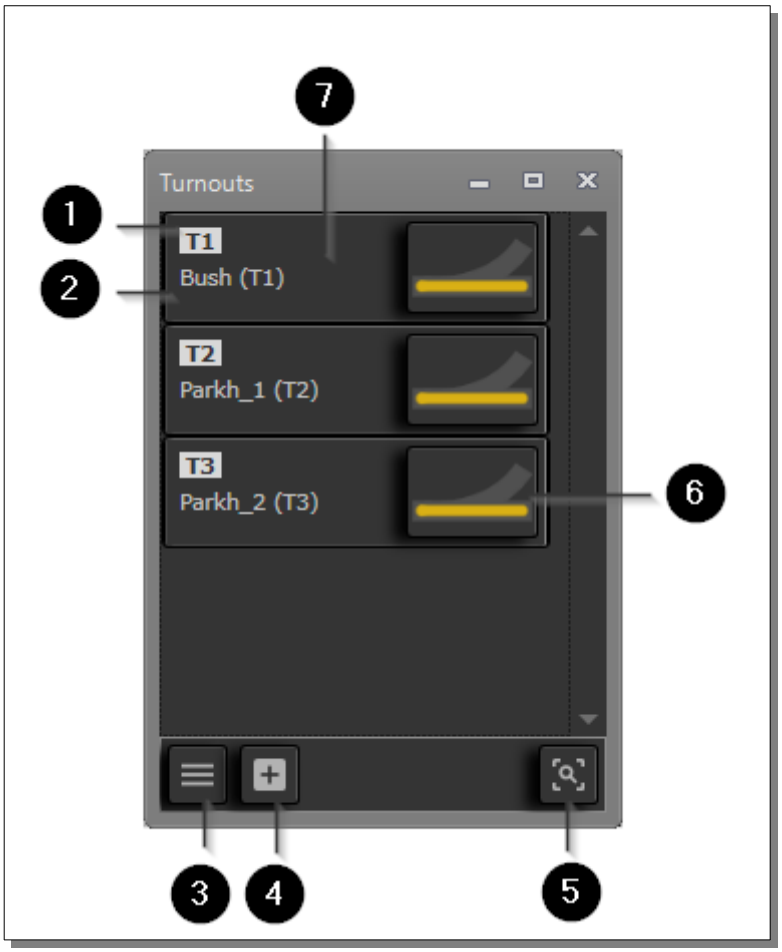



| View Signals | | Description |
|---|---|---|
| 1 | **ID** | Unique ID |
| 2 | **Name** | Name of the Signal |
| 3 | **Overview** | Opens the Edit System → Signals Tab |
| 4 | **Add** | Creates new Signal |
| 5 | **Search/Filter** | Opens the Search/Filter line |
| 6 | **Signal State** | Click this button to toggle the Signal between Red/Green ~ STOP/GO |

**TIP**

- To Edit the signal press mouse double click in the area containing the ID and Name – left to the button.
- This can be applied for all components listed in the Show menu!

## 7.6.3 Show Turnouts

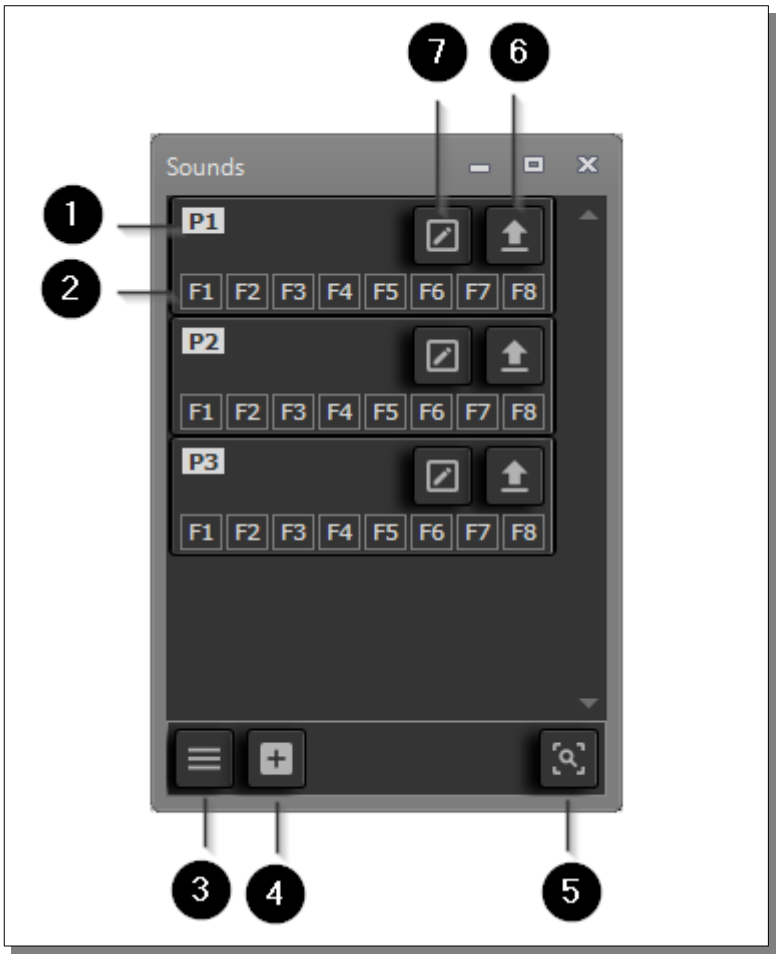



| Item | | Description |
|---|---|---|
| 1 | **ID** | The ID of the turnout |
| 2 | **Name** | The name of the turnout |
| 3 | **Overview** | [Menu: Edit → Edit System → Turnouts tab] |
| 4 | **Add** | Creates a new Turnout |
| 5 | **Search/ Filter** | Click to Search and Filter the list |
| 6 | **Toggle Section State** | Click to toggle the state of the turnout |
| 7 | **Edit** | Double Click to Edit the turnout |

## 7.6.4 Show Automations

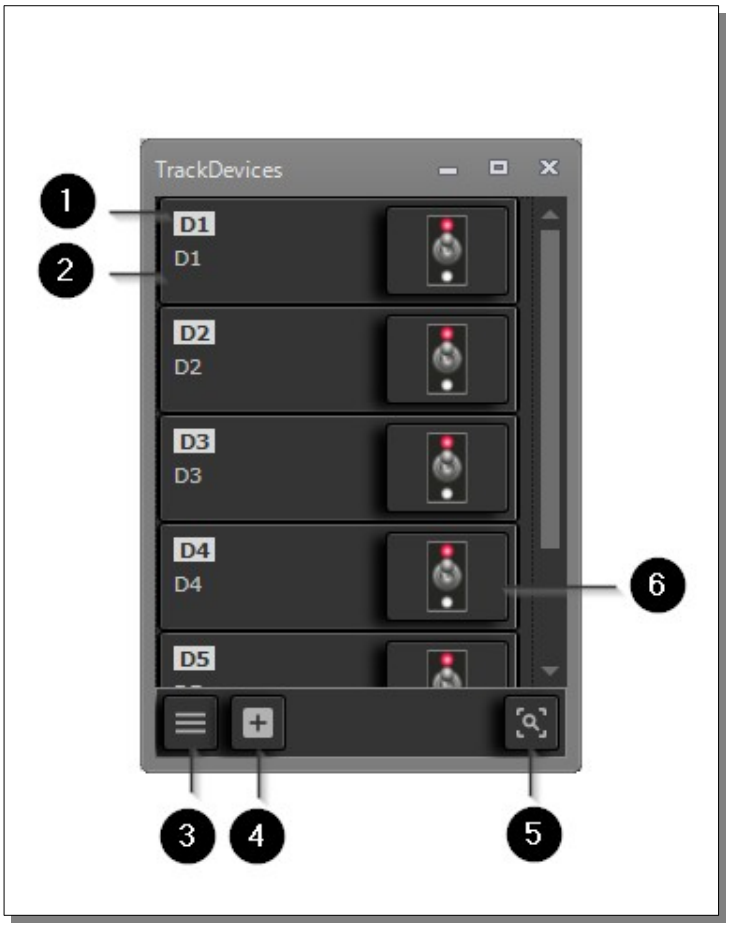

| Item | | Description |
|---|---|---|
| 1 | **ID** | The ID of the automation |
| 2 | **Start/Stop** | Click to start and stop the automation |
| 3 | **Name** | The name of the automation |
| 4 | **Favorite** | Click to mark the selected automation as a favorite.<br>Favorites will now shown at top, next time the list is refreshed |
| 5 | **Automation Status Line** | Shows real time information for each automation |
| 6 | **Search/ Filter** | Click to search and filter the list |
| 7 | **Add New Automation** | Creates a new automation |
| 8 | **Automation Wizard** | Opens the automation wizard with a selection of predefined automations |
| 9 | **Overview** | [Menu: Edit → Edit System → Automations tab] |

## 7.6.5 Show Sounds



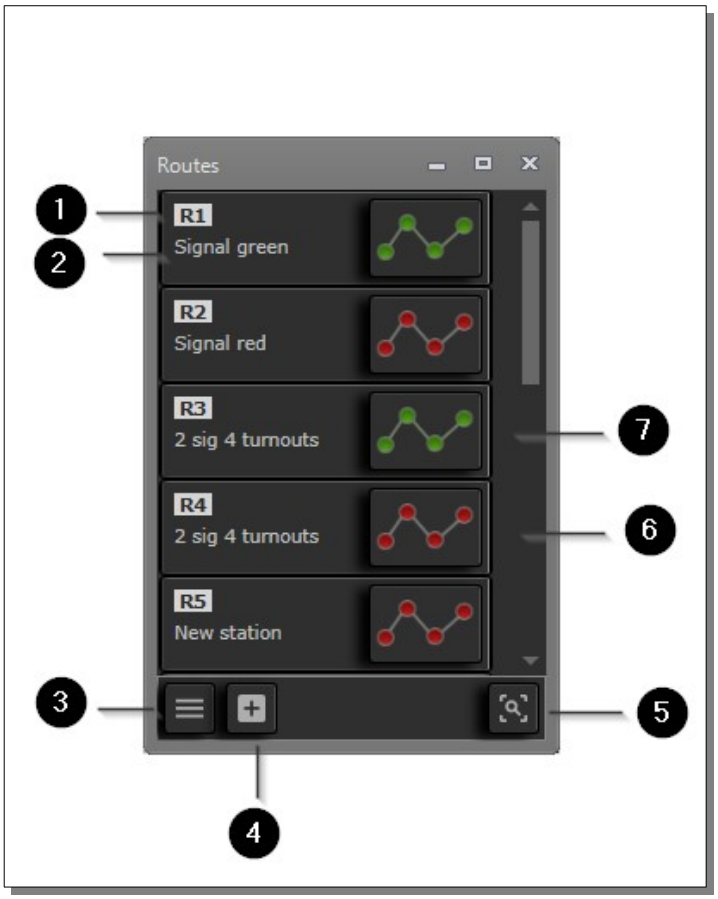

| Item | | Description |
|---|---|---|
| 1 | **ID** | The ID of the sound module |
| 2 | **Functions** | Click to play each of the uploaded sounds, placed in F1 to F8<br>The number of functions displayed will depend on the number uploaded. |
| 3 | **Overview** | Opens the [Menu: Edit → Edit System → Sounds tab] |
| 4 | **Add** | Add a new Sound Module |
| 5 | **Search/ Filter** | Click to Search and Filter the list |
| 6 | **Upload** | Click to upload sounds |
| 7 | **Edit** | Click to Edit the Sound Module |

## 7.6.6 Show Track Devices



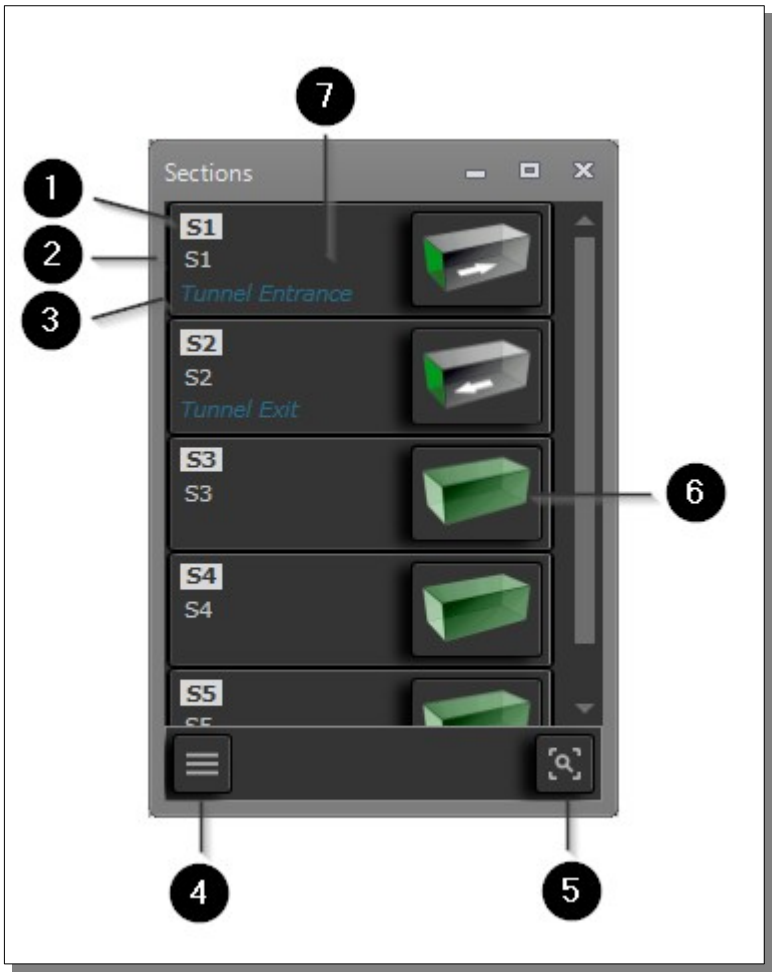

| Item | | Description |
|---|---|---|
| 1 | **ID** | The ID of the Track Device |
| 2 | **Name** | The name of the Track Device |
| 3 | **Overview** | Opens the [Menu: Edit → Edit System → Track Device tab] |
| 4 | **Add** | Click to Add new Track Device |
| 5 | **Search/ Filter** | Click to Search and Filter the list |
| 6 | **Toggle Section State** | Click to toggle the state of the Track Device ON/OFF |

## 7.6.7 Show Routes



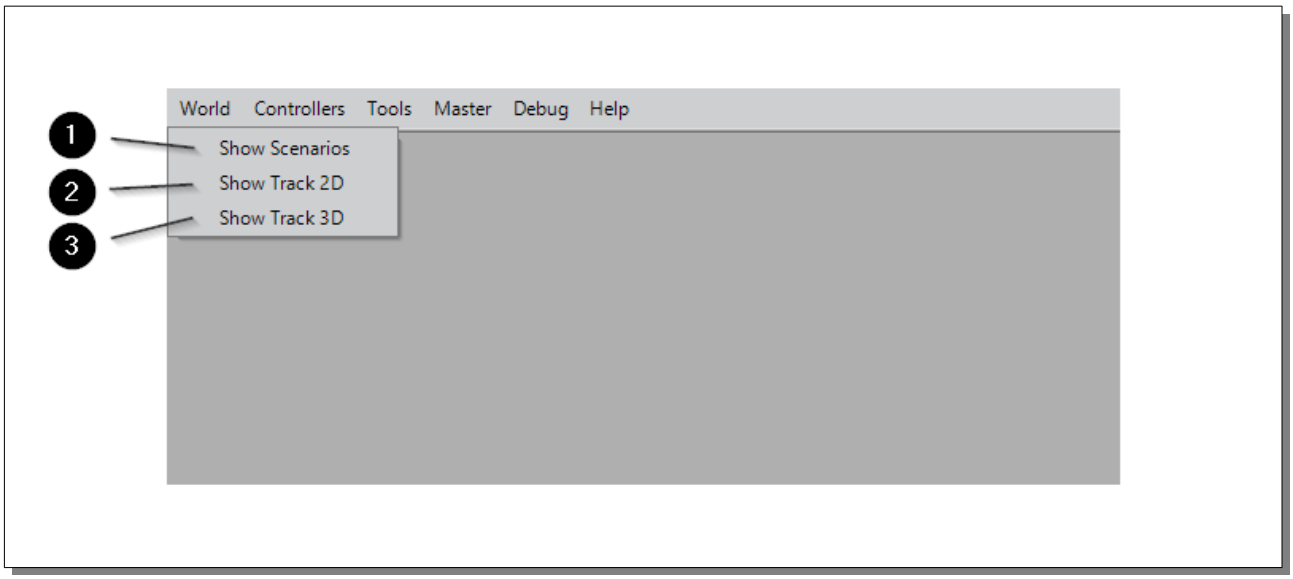

| Item | | Description |
|---|---|---|
| 1 | **ID** | Unique Route ID prefixed with the letter R |
| 2 | **Name** | Name of the Route |
| 3 | **Comment** | Overview Opens the Edit System → Routes Tab. |
| 4 | **Add** | Add a new Route |
| 5 | **Search/Filter** | Opens the Search/Filter line |
| 6 | **Red Route** | The red color indicates the route is NOT set.<br>**Click to change** - this might affect other routes! Notice the system does not 'lock' a route for changes until a certain event has happened like a manual 'unlock' or vehicles have passed all components in this route. |
| 7 | **Green Route** | The green color indicates the route is set. |

## 7.6.8 Show Sections




| Item | | Description |
|---|---|---|
| 1 | **ID** | The ID of the Section |
| 2 | **Name** | The name of the Section |
| 3 | **Tunnel** | Show the tunnel attribute: Empty if not set.<br>Available tunnel attributes: Tunnel, Entrance, Exit (visible as icons too). |
| 4 | **Overview** | Opens the [Edit → Edit System → Sections tab] |
| 5 | **Search/ Filter** | Click to Search and Filter the list |
| 6 | **Toggle Section State** | Click to toggle the state of the section free/occupied |
| 7 | **Edit** | Double Click to Edit the Section |

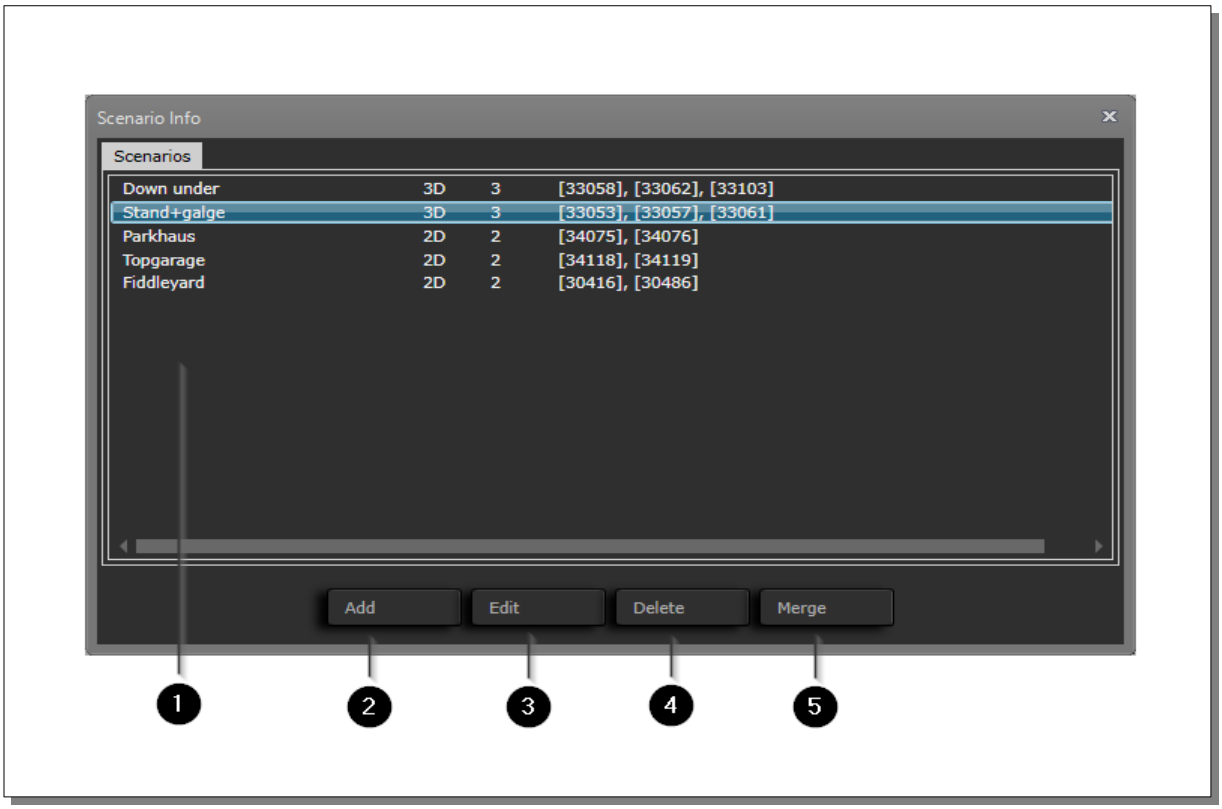
# 7.7 World




| | Item | Description |
|---|---|---|
| 1 | **Show Scenarios** | Opens up a window where all scenarios are listed. In this window new scenarios can be added, existing scenarios can be deleted, edited or merged. |
| 2 | **Show Track 2D** | This is the main View for all real time graphics in the application.<br>In this view all components can be added, edited or deleted, and your layout can be recorded and modified. |
| 3 | **Show Track 3D** | This is your 3D view for editing and recording your track layout. |

## 7.7.1 Show Scenarios

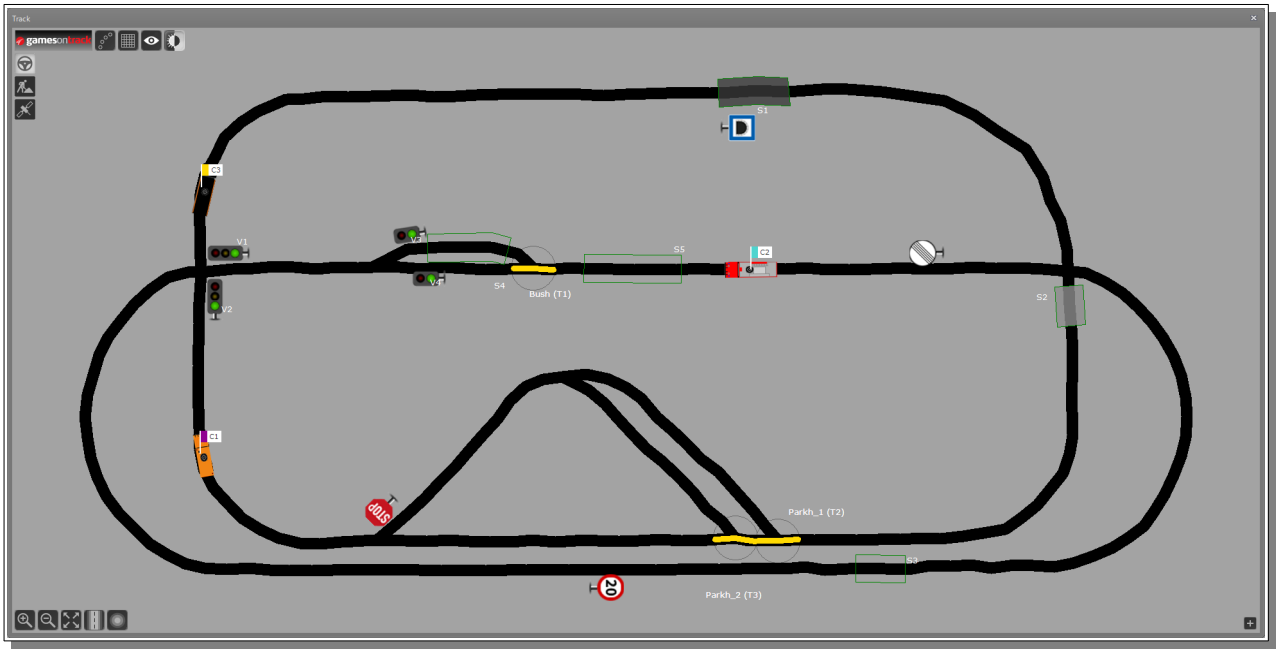
The created scenarios can be found in the Menu: [World → Show Scenarios].




| | Item | Description |
|---|---|---|
| 1 | **Select Scenario** | Mouse double-click or press [Enter] to select a scenario in this list |
| 2 | **Add** | Add new scenario. Here you can create a new 2D or 3D scenario and merge it into the main scenario. See chapter **9.4** |
| 3 | **Edit** | Edit selected scenario. See chapter **9.5.4** |
| 4 | **Delete** | Click the button to delete the selected scenario from the list. |
| 5 | **Merge** | Opens up a special 3D-view where scenarios can be merged (translated and rotated). See chapter 9.9 |

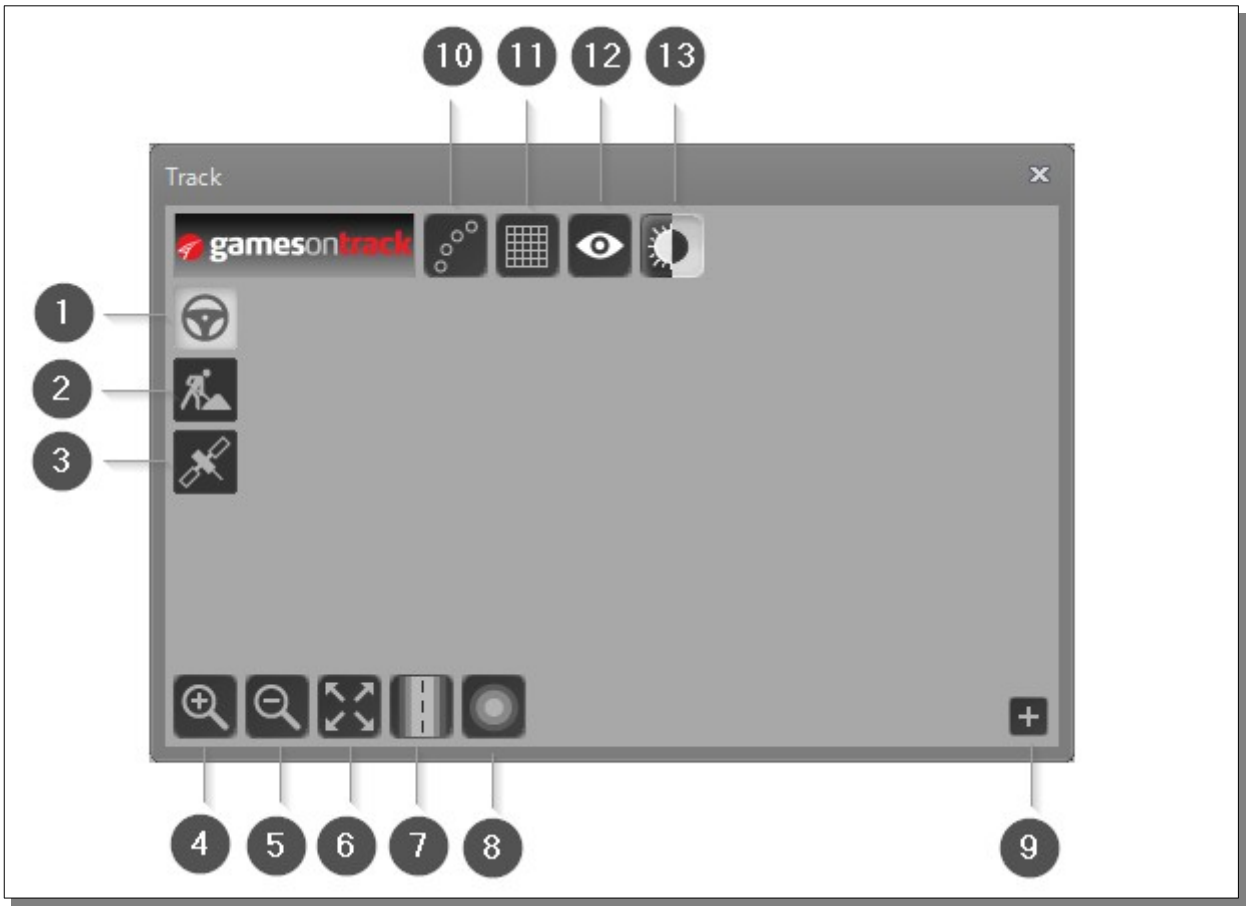
## 7.7.2 Show Track 2D

The 2D Track view has groups of tools placed very close to the outer borders in the view.



## 7.7.2.1 Driving Mode

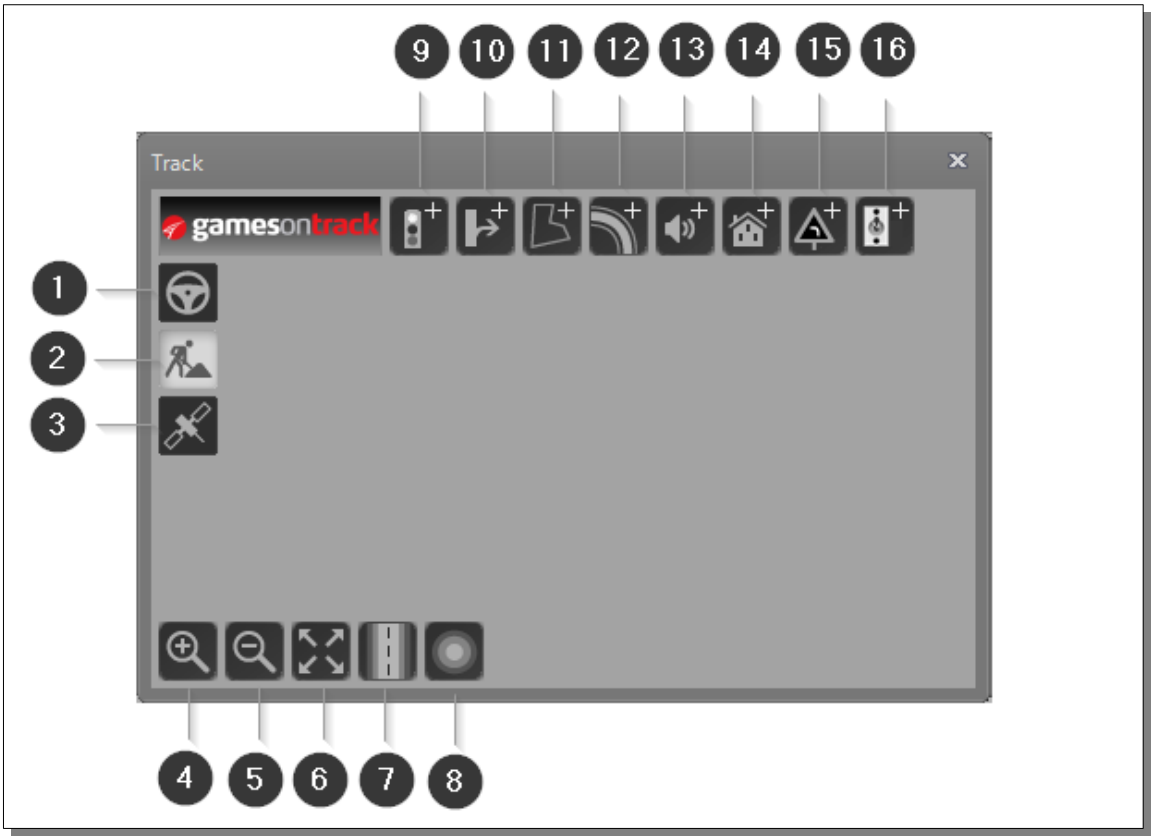
The 2D View is where all the runtime is controlled. Three different modes are found in here: [Driving, Edit and Track]. Each mode has a special set of tools (buttons).



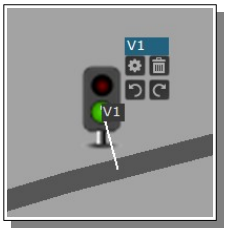

| | Item | Description |
|---|---|---|
| 1 | **Drive Mode** | Click to get the normal mode for operating the system |
| 2 | **Edit Mode** | Click to edit the components placed on the layout |
| 3 | **Track Mode** | Click to edit the Track |
| 4 | **Zoom In** | Click to zoom in |
| 5 | **Zoom Out** | Click to zoom out |
| 6 | **Reset View** | Click to Reset the view. This will move the layout to be centered in the 2D view. |
| 7 | **Adjust Track Width** | Click to toggle different sizes of the track |
| 8 | **Adjust Size Of Track Items** | Click to toggle different sizes of the symbols on the track |
| 9 | **Add Camera** | Click to Add sub cameras (maximum 3) |
| 10 | **Show Raw Measurements** | Toggle to display the raw measurements. These are displayed as small circles on top of the vehicles getting measurements for positioning. |
| 11 | **Show Grid** | Toggle to display a grid on the layout. Each square in this grid represents a size of 20 x 20 cm |
| 12 | **Show Overview** | Toggle to get a clean view without texts, sections etc... |
| 13 | **Toggle Theme** | Click to toggle the background theme between light and dark |

## 7.7.2.2 Edit Mode

The Edit Mode is where all components on the layout can be added and edited.



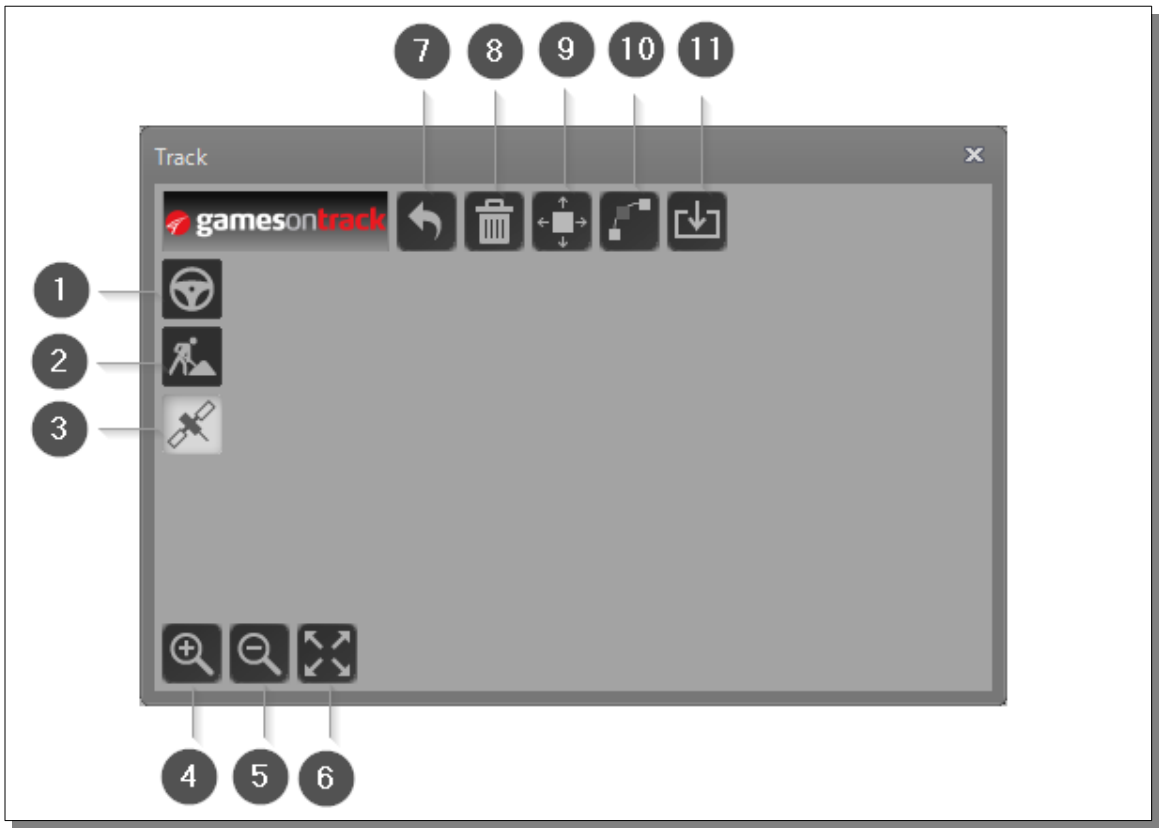

| Item | | Description |
|---|---|---|
| 1 | **Drive Mode** | Click to get the normal mode for operating the system |
| 2 | **Edit Mode** | Click to edit the components placed on the layout |
| 3 | **Track Mode** | Click to edit the Track |
| 4 | **Zoom In** | Click to zoom in |
| 5 | **Zoom Out** | Click to zoom out |
| 6 | **Reset View** | Click to Reset the view. This will move the layout to be centered in the 2D view. |
| 7 | **Adjust Track Width** | Click to toggle different sizes of the track |
| 8 | **Adjust Size Of Track Items** | Click to toggle different sizes of the symbols on the track |
| 9 | **Add Signal** | Click to add a Signal. There will be an Arrow to point at the place on the layout. Click again to place it. When the signal is placed, click the symbol to move it or edit. The white line tells the signal is a point signal and is snapped to the track. This same methods will count for the symbols in **10** to **16** |




| | | |
|---|---|---|
| 10 | **Add Turnout** | Click to add a Turnout. |
| 11 | **Add Section** | Click to add a Section. |
| 12 | **Add Point Section** | Click to add a Point Section. |
| 13 | **Add Sound** | Click to add a Sound. (Will always be placed at Z=0) |
| 14 | **Add Decoration** | Click to add a Decoration. (Will always be placed at Z=0) |
| 15 | **Add Sign** | Click to add a Sign. |
| 16 | **Add Track Devices** | Click to add a Track Device. (Will always be placed at Z=0) |

## 7.7.2.3 Track Mode

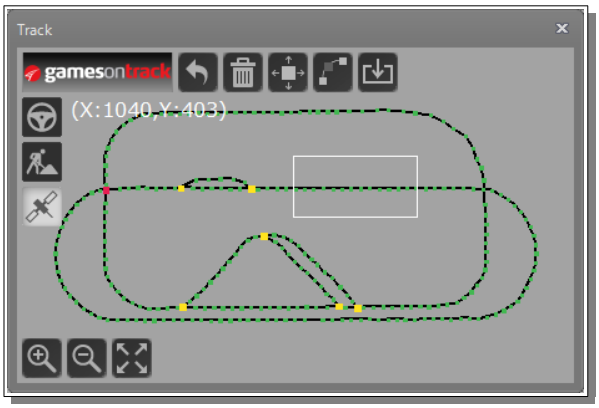
The Track Mode is where the track topology can be created and edited. In the following table all Tools for editing are described:




| Item | | Description |
|---|---|---|
| 1 | **Drive Mode** | Click to get the normal mode for operating the system |
| 2 | **Edit Mode** | Click to edit the components placed on the layout |
| 3 | **Track Mode** | Click to edit the Track |

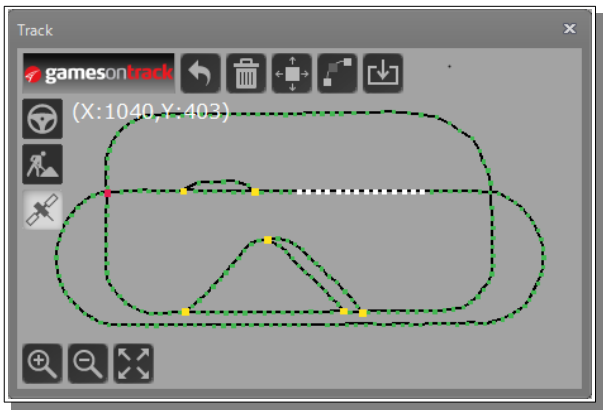
| | | |
|---|---|---|
| 4 | **Zoom In** | Click to zoom in |
| 5 | **Zoom Out** | Click to zoom out |
| 6 | **Reset View** | Click to Reset the view. This will move the layout to be centered in the 2D view. |
| 7 | **Undo** | Click to undo last operation. The keyboard shortcut [CTRL+Z] can also be used. *The maximum number of undo steps is 250* |
| 8 | **Delete Points** | Click to delete the selected points |
| 9 | **Smooth Track** | Click to smooth out the selected points. This will remove intermediate points. |
| 10 | **Insert New Points** | Click to insert new points |
| 11 | **Record Track** | Click to record the layout with a positioned vehicle. |

## 7.7.2.4 Delete Points



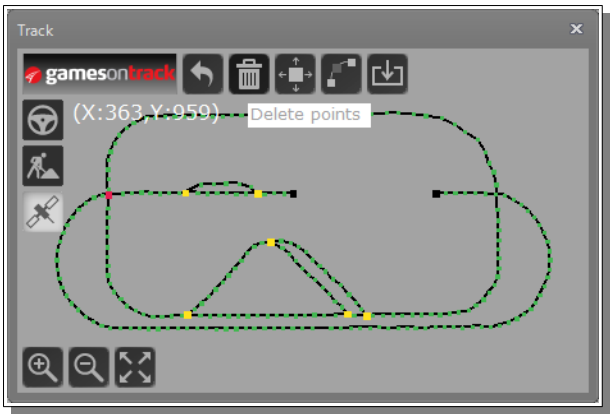

**ACTION**

- Mark the points with mouse




**ACTION**

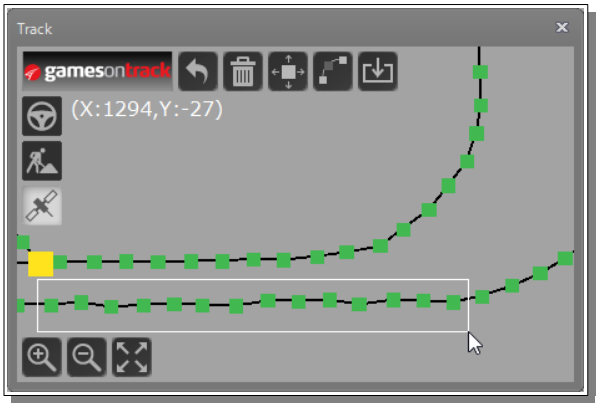
- Click the [Delete] button




**ACTION**

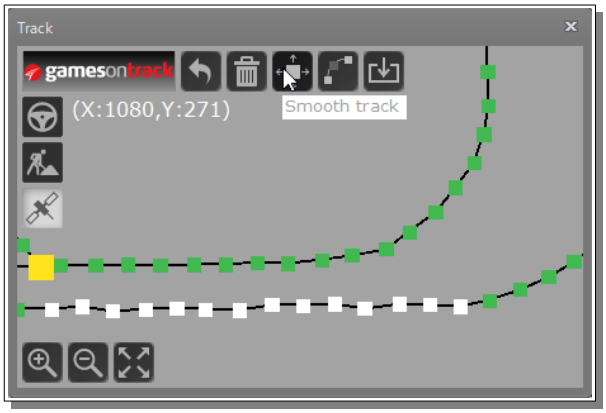
- Verify points are deleted

## 7.7.2.5 Smooth Track



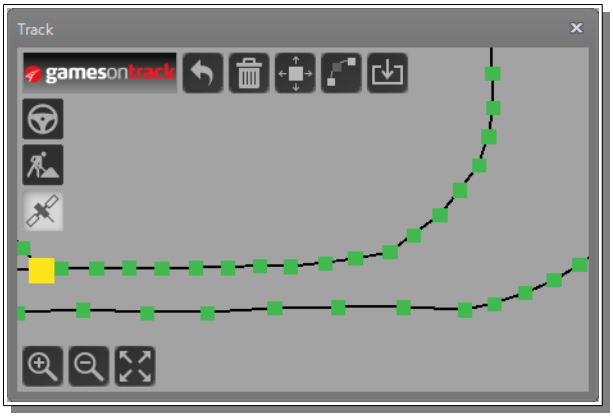

**ACTION**

- Mark the points with mouse




**ACTION**

- Click the [Smooth Track] button

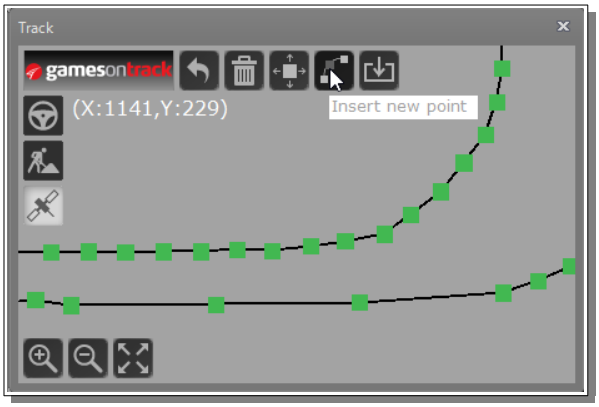



**ACTION**

- Verify points are removed
- This process can be repeated

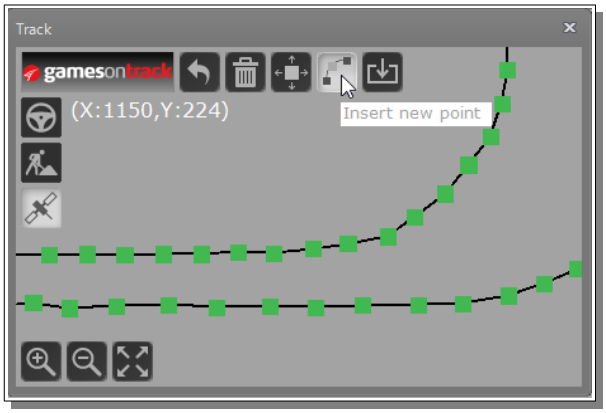
## 7.7.2.6 Insert New Points

### Insert new points between existing connected points




**ACTION**

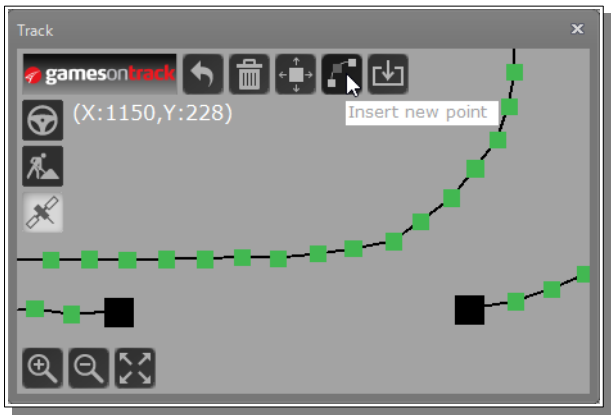
- Toggle button [Insert new point] ON




**ACTION**

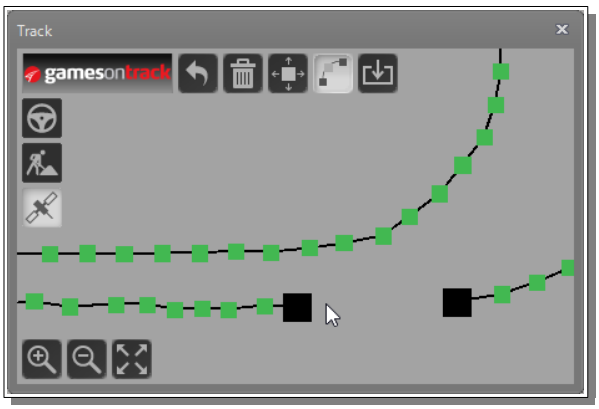
- Insert new points on the track
- Toggle button [Insert new point] OFF

### Insert new points in a gap between two points not connected.




**ACTION**

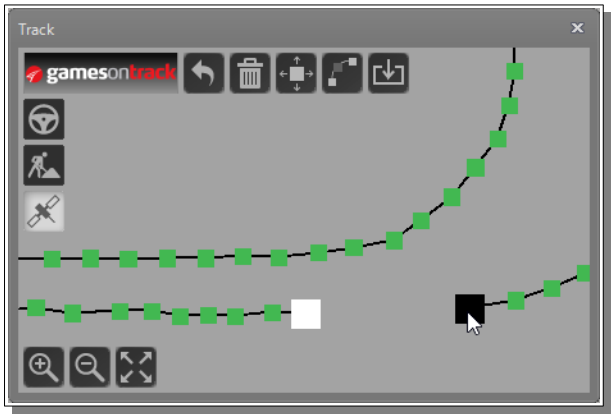
- Toggle button [Insert new point] ON




**ACTION**

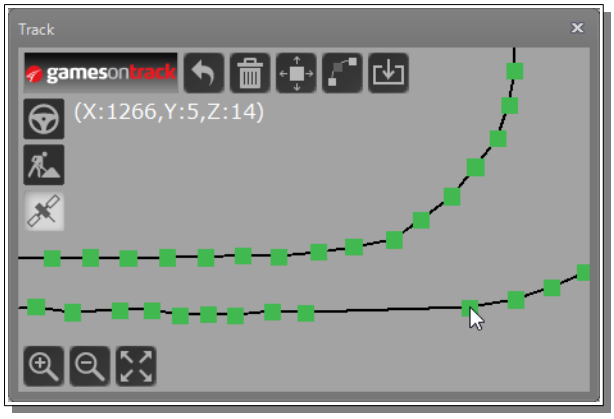
- Insert points close to existing points
- Repeat the process
- Toggle button [Insert new point] OFF

**Now connect the two end points to close the gap.**




**ACTION**

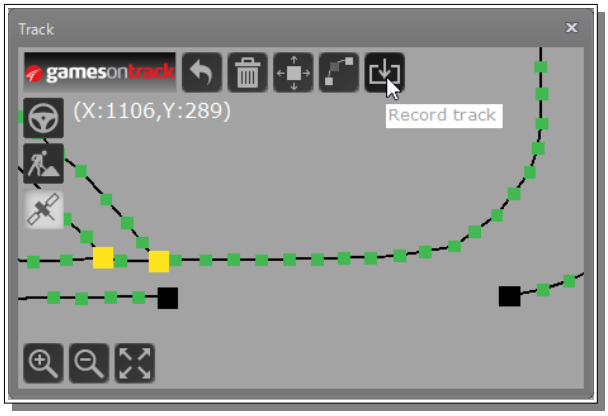
- Click the left endpoint (it turns white)
- Now click the black endpoint.




**ACTION**

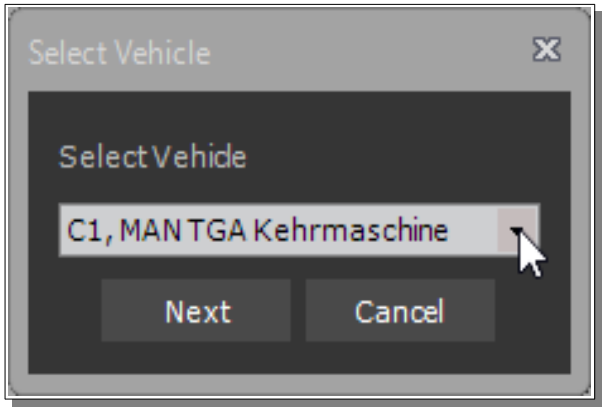
- Now validate the gap is closed

## 7.7.2.7 Record Track



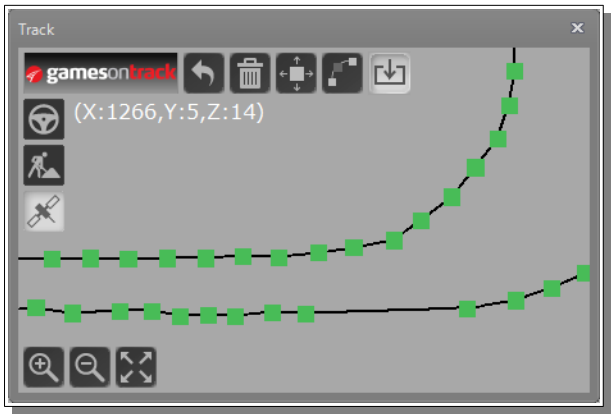

**ACTION**

- Toggle button [Record track] ON




**ACTION**

- Select an online Vehicle
- Click Next
- Now set the speed slider, so this vehicles moves on your layout.




**ACTION**

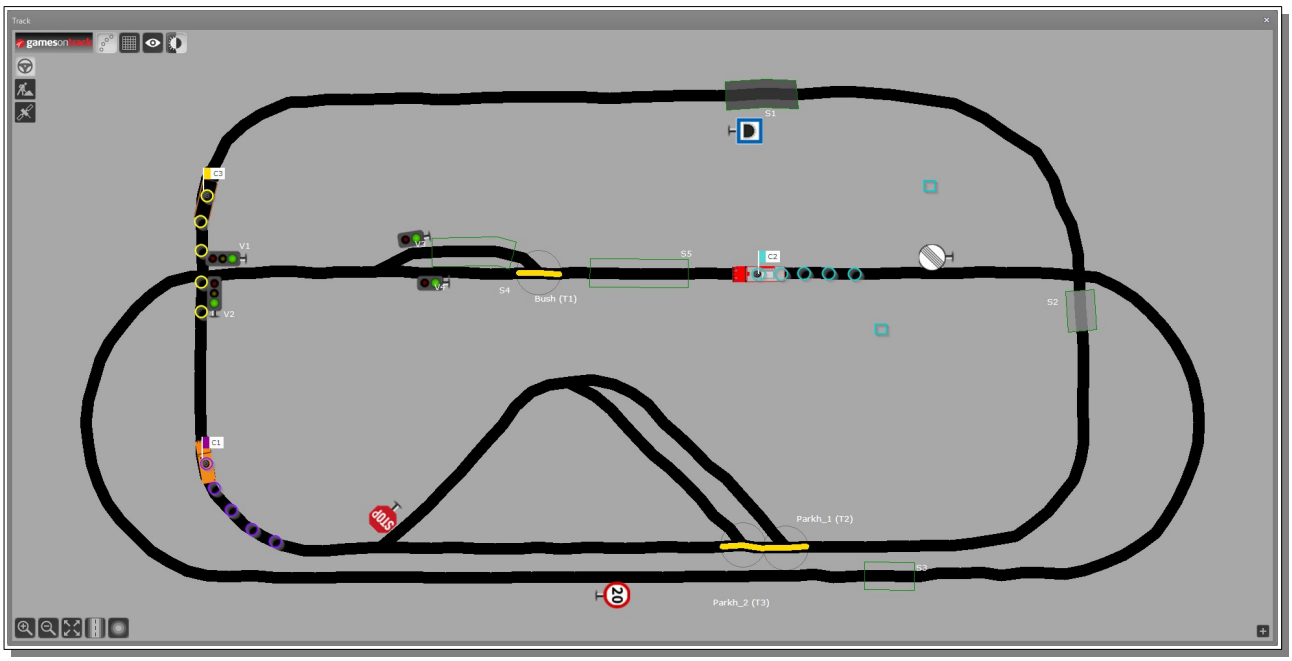
- Toggle button [Record track] OFF
- Close the track after recording.

## 7.7.2.8 Driving Mode

Driving Mode is the normal operating mode for controlling the system runtime.
There are a couple of ways to display the layout – shown here below:

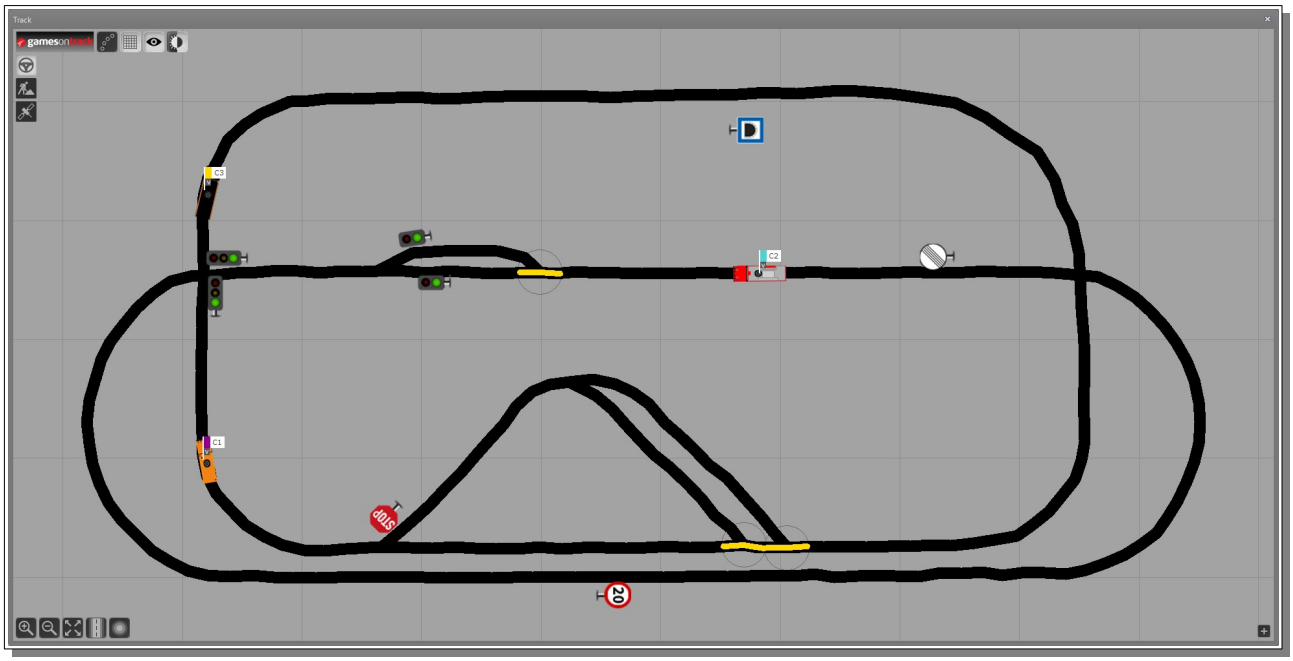
**Show Raw Measurements**

- Pressing the compass button will display circle-symbols over each physical vehicle. Each circle is representing a real time position.
- *Notice: If the calculated position is too far from the track, where the vehicle is snapped to, the symbol will change into a square – see vehicle C2.*



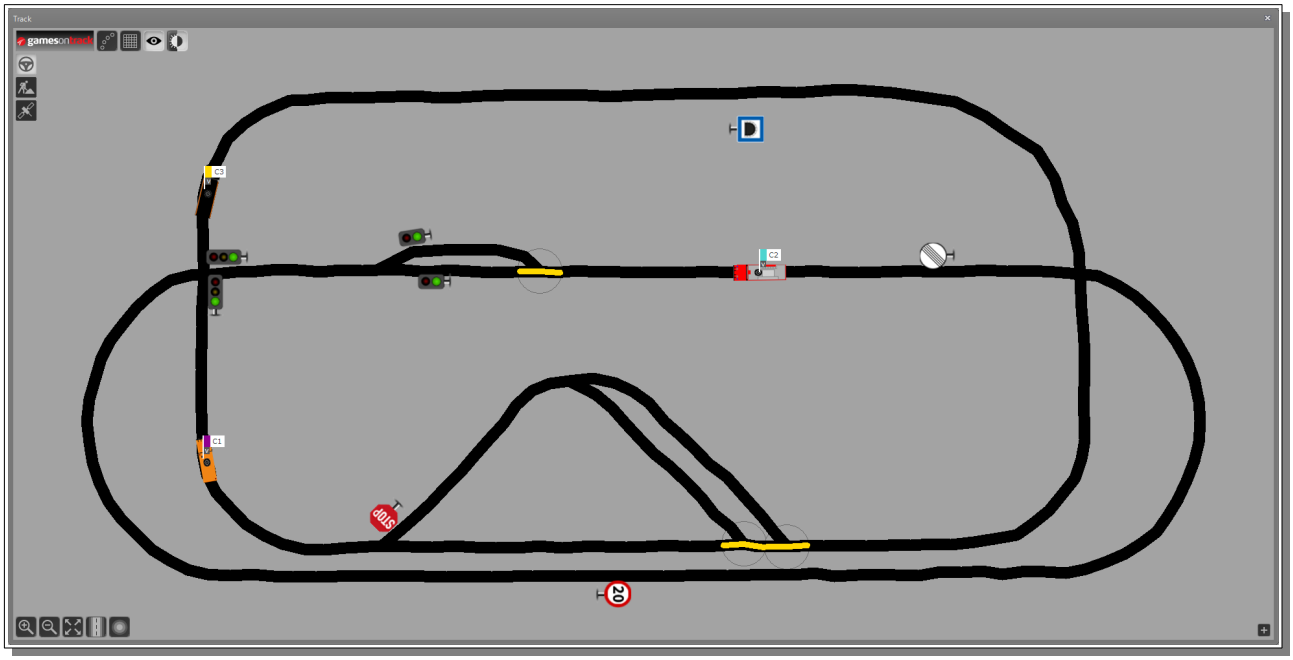

**Show Grid**

- Pressing the grid button will display a grid of squares in 200 x 200 mm.



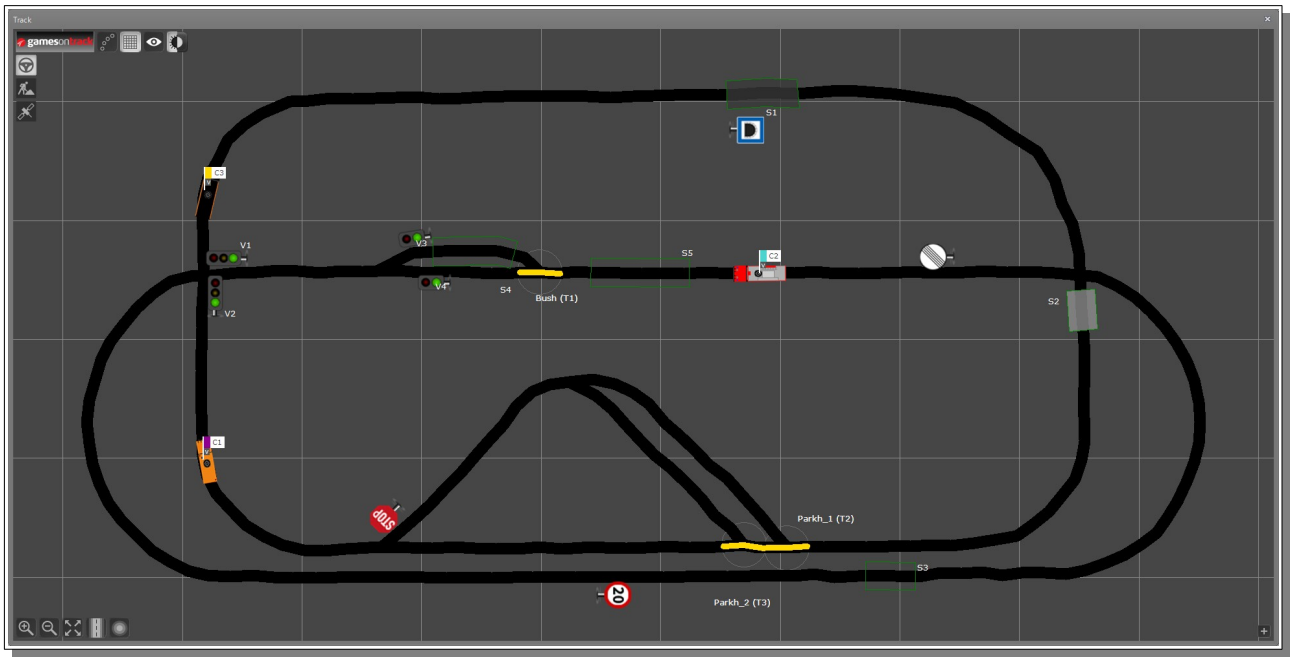
## Show Overview

- Pressing the eye button will remove all labels from the layout – except for vehicles.



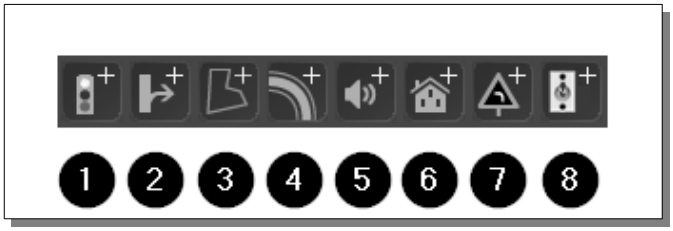

## Show Dark/Light Theme

- Pressing the Theme button will toggle between Light and Dark Theme
- The theme will also change in the 3D view.



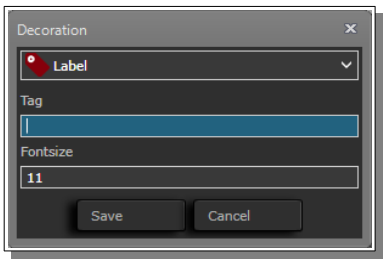
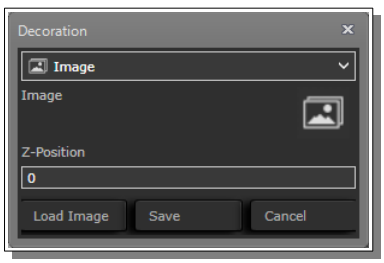
## 7.7.2.9 Edit Mode

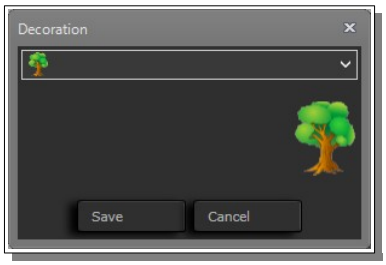
The Edit Mode is where all controls on the layout are added and edited. A full list of all controls are shown in the table below.




| | Item | Description |
|---|---|---|
| 1 | **Signal** | A signal like this will be placed on the layout. |
| 2 | **Turnout** | A turnout-symbol like this will be placed on the layout. |
| 3 | **Section** | When pressing the section button, it's possible to draw arbitrary shaped polygons. It is necessary to click in every corner of the polygon. To complete a polygon, just make the final click very close to the first start point. |
| 4 | **Point Section** | When clicking on a track and moving the mouse, a white line is created, that follows the track until clicked again. |
| 5 | **Sound** | A sound icon is added to the layout |
| 6 | **Decoration** | 3 different decorations are available. These are described in a table below. These decorations are without connection to the layout. |
| 7 | **Sign** | 13 different signs are available. Described in a table below. |

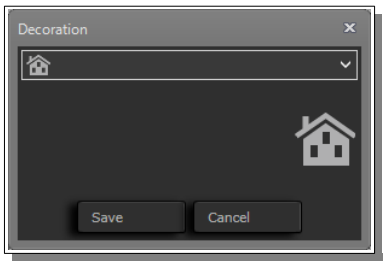
## 7.7.2.10 Decorations

| Item | Description |
|---|---|
|   | This will add a plain Text on the 2D layout.<br>■ The Tag is the text to be displayed.<br>■ The size of the font can be specified. |
|   | An image can be displayed on the 2D layout.<br>■ Z can be specified. (Default is 0)<br>■ Load Image opens a dialog to search and download an image from file. |




A simple decoration is placed on the layout.

- GamesOnTrack will display: Tree




A simple decoration is placed on the layout.

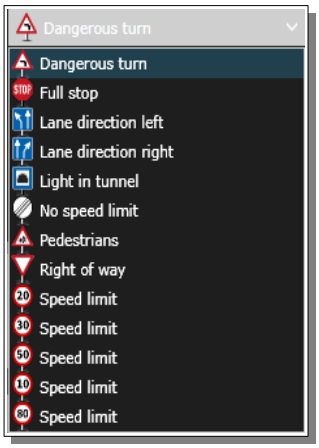
- Faller CSD will display: House

**NOTES**

- When loading images, please notice number of images and the file-size of each image, hence they can have a huge impact on the performance in the 2D-viewport!
  E.g an image with the resolution of 2500x2500 pixels in 32 bit colors will take up 16 MB, and can cause some jitter when scrolling or moving around in 2D! Using a free program like Paint.Net (https://www.getpaint.net/) this image can be changed from 32 bit colors down to 24, 16 or 8 bit. Using 8 bit will reduce the 16 MB to 4 MB.
- We only support the PNG image format. If the preferred image is in another format please use e.g. (https://www.getpaint.net/) to change the image to .PNG
- When loading the images from any place on you disk, a reference to this image is saved in your .got system file. Normally we save all small customer-images directly in this system file, but not for these large images. So if your system file is copied and transferred to another system, then please make sure all inserted images are too – otherwise you will see a warning like this: [IMAGE NOT FOUND: C:\Path\…] In this warning you're informed on which images are missing – the path is specified. Go into Edit Mode, click this image and point to a new location or delete the reference.
- When setting the Z-position, please be aware of the slider-ranges currently used in the current selected camera view. E.g. if the Z-position is specified to +200 mm, but the current camera slider-range is from -300 to +185 mm, the image will be invisible!

## 7.7.2.11 Signs

| Item | Description |
|---|---|

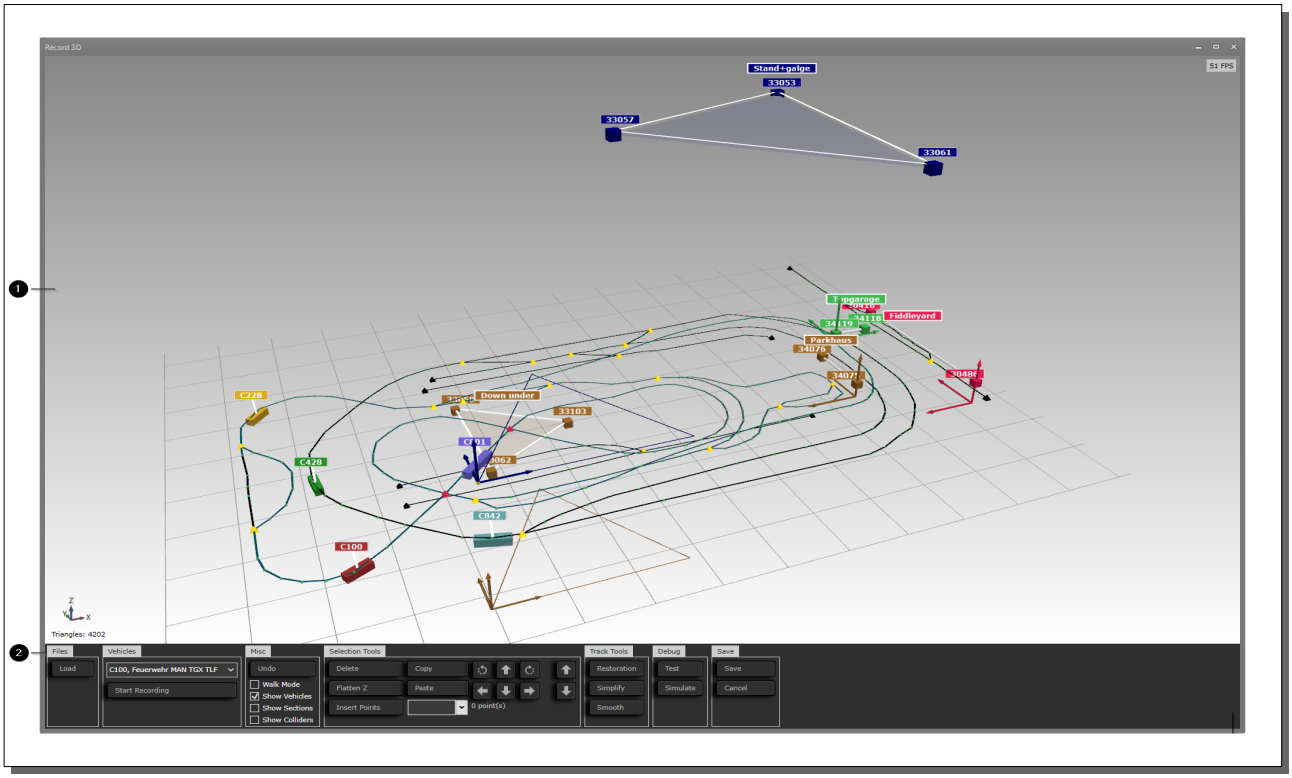

- A sign must be snapped to the track.
- A complete list of signs is available to the left.

**Snapped:** close enough to track. (white line is visible)

**Unsnapped:** too far from track. (cross over sign)

## 7.7.3 Show Track 3D

Use **[Show Track 3D]** to record your layout in 3D, and to manage layouts with more layers. Please note that the tracks can be colored, i.e. roads in one color and rails in another, or different colors for different levels. The 3D view consist of two panels:




| Item | | Description |
|---|---|---|
| 1 | **The 3D View** | The main 3D view for displaying real time positions of satellites and vehicles<br>This view also displays tracks and sections |
| 2 | **The Tools Panel** | A panel with all necessary tools for editing the layout. |

## 7.7.4 The 3D Panel

The 3D panel is displaying all tracks, satellites, scenarios, calibration triangles, sections and position of vehicles. Use a combination of keys and the mouse to navigate in the 3D panel.

| Function | Description |
|---|---|
| **Zoom In/Out** | Hold down CTRL + MOUSE RIGHT BUTTON or use MOUSE WHEEL |
| **Rotate 3D Camera** | Hold down MOUSE RIGHT BUTTON and drag |
| **Select Track Points** | Hold down MOUSE LEFT BUTTON and drag |
| **Panorate in 3D** | Hold down SHIFT + MOUSE RIGHT BUTTON |
| **Change 3D Perspective** | Hold down ALT + MOUSE RIGHT BUTTON |

## 7.7.5 The Tools Panel

The Tools panel has various functions for manipulating the elements in the 3D world.

### 7.7.5.1 Files


| | Item | Description |
|---|---|---|
| 1 | **Load** | Load can be used to load separate and old position files. As default the 3D mode will open using you current track plan. **NOTE:** Not relevant since version 4.4, but still here ensure backwards compatibility. |

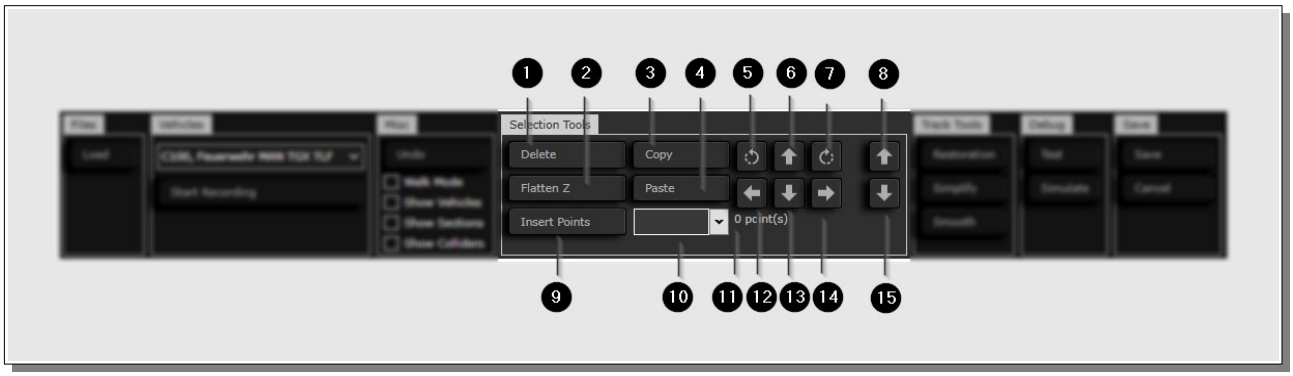
## 7.7.5.2 Vehicles


| | Item | Description |
|---|---|---|
| 1 | **Select Vehicle** | Select one vehicle from the list of online vehicles. The dialog will be closed. |
| 2 | **Start Recording** | Starts recording positions using the selected vehicle. The dialog will be closed. |

## 7.7.5.3 Miscellaneous

| Item | | Description |
|---|---|---|
| 1 | **Undo** | Undo last operation |
| 2 | **Walk Mode** | Change camera to Walk Mode (alternative to the default rotate mode in 3D) |
| 3 | **Show Vehicles** | Show all online vehicles positions in real time using primitive visuals in 3D. |
| 4 | **Show Sections** | Show all sections in 3D. |
| 5 | **Show Colliders** | Show all colliders placed inside the sections in 3D. (Debug function only) |

## 7.7.5.4 Selection Tools




| | Item | Description |
|---|---|---|
| 1 | **Delete** | A selection of points are removed. If only a single point is selected, a new connection line is made, otherwise they stop with end markers. |
| 2 | **Flatten Z** | Use Flatten Z to make a smooth curve upward/downward on selected points – knowing that in fiddle yards you might have some spikes to adjust. |
| 3 | **Copy** | Copy the selected points |
| 4 | **Paste** | The selected points copied (from 3) will be inserted on the layout. |
| 5 | **Rotate Left** | Rotate the selected points left (around the Z-axis) |
| 6 | **Move Forward** | Move the selected points forward along the positive Y-axis (Y+) |
| 7 | **Rotate Right** | Rotate the selection Right (around the Z-axis) |
| 8 | **Move up** | Move the selected points up the positive Z-axis (Z+) |
| 9 | **Insert Points** | Insert points between the selected points for having a smooth curve or just use them for more connections.<br>**NOTE:** Please do not insert massive number of unnecessary points. In general, there should be a minimum of 10 mm between points. |
| 10 | **Color Palette** | Set the color of a selection of points.<br>*Notice: The availability of this depends of you License* |
| 11 | **Points Info** | Show the number of selected points.<br>If only a single point is marked the X, Y, Z is shown. |
| 12 | **Move Left** | Move the selected points to the left along the negative X-axis (X-) |
| 13 | **Move Backward** | Move the selected points backwards along the negative Y-axis (Y-) |
| 14 | **Move Right** | Move the selected points to the right along the positive X-axis (X+) |
| 15 | **Move down** | Move the selected points down the negative Z-axis (Z-) |

- Connect two points marking the first one with the left mouse, see that it turns white, and marking the other one next with the left mouse – done!

## 7.7.5.5 Track Tools

Track tools will be applied on the whole track, and not just a selection of points.


| | Item | Description |
|---|---|---|
| 1 | **Restoration** | Use the **Restoration** button on problematic layouts – or as general clean up. Sometimes when recording a layout, spikes can occur that causes some irregular positions along the recorded track. Also when recording over the same parts of a track already recorded, some points can overlap and cause problems if not corrected or removed. |
| 2 | **Simplify** | Removes overlapping points or points too close to each other from the layout |
| 3 | **Smooth** | Will move points slightly on the track to be more aligned in order to get more smooth curves and lines. |

## 7.7.5.6 Debug


| | Item | Description |
|---|---|---|
| 1 | **Test** | The debug menu is empty by default.<br>*Cleanup track (Developer)* |
| 2 | **Simulate** | The debug menu is empty by default.<br>*Playback a recorded file from [Start Monitoring] (Developer)* |

### 7.7.5.7 Save


| Item | | Description |
|---|---|---|
| 1 | **Save** | Save changes to Memory<br>**Press [CTRL + S] save changes to the current system file!** |
| 2 | **Cancel** | Cancel all changes |

## 7.8 Digital Controllers

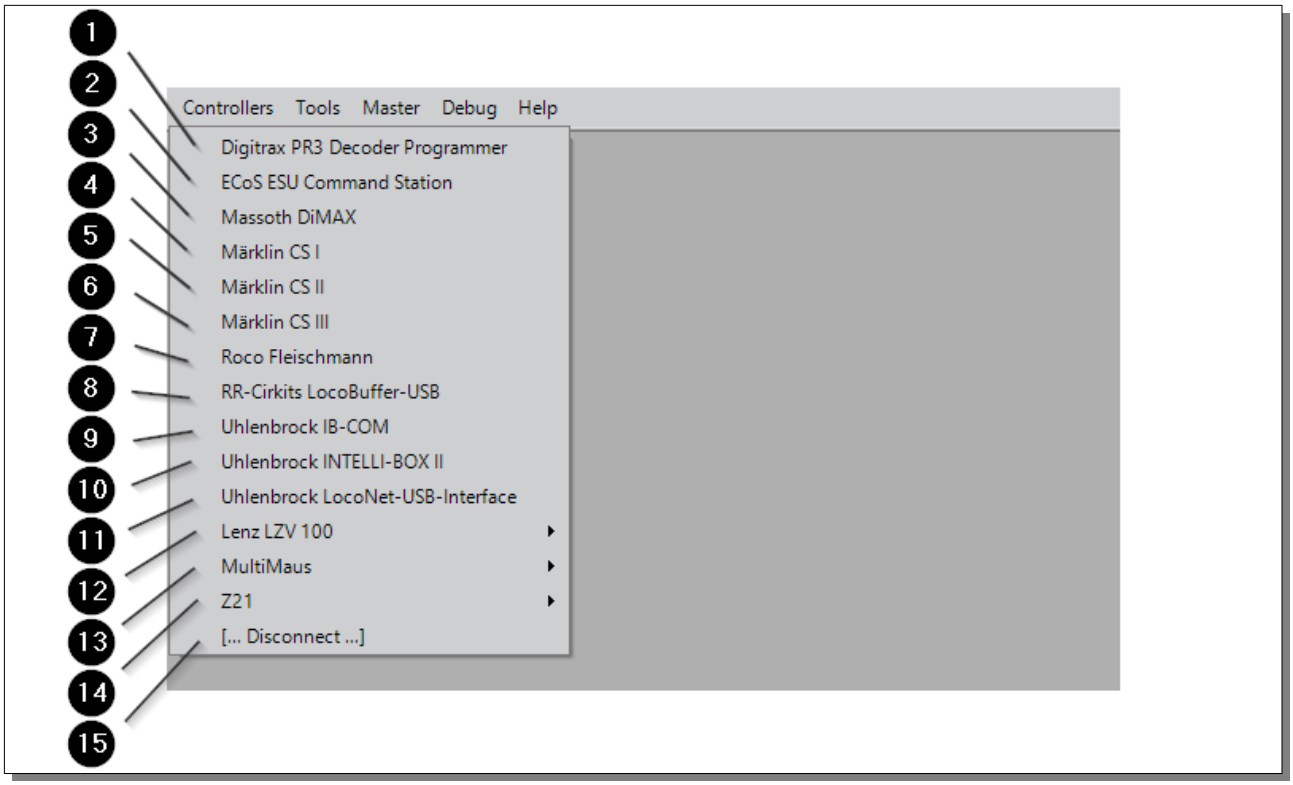
When you select a Digital Controller the PC-Software will try to connect to that controller automatically. The name of the selected digital controller is shown in the process bar if succesful connected. At the end an error message can be raised, if that connection cannot be established. It will show disconnected in the process bar, or it might come up with an advisory check box.

You do not need to have a digital controller. If you operate your Trains using the GT-XControl you might use radio directly or indirectly to pass on the DCC-commands to the trains.
**See section 12.7**

You can operate mixed with both radio based vehicles and with Digital controller based vehicles. This way you can stepwise introduce the radio method.

If you have a Digital controller or handheld with no PC-connection, then you can just connect it to the DCC entry on master V2/V3. If you have applied an XControl in booster mode to your rails, then you can pass on all DCC signals from your DCC terminal to the rails via radio.
**See section 12.7**

The following Digital Controllers are supported.

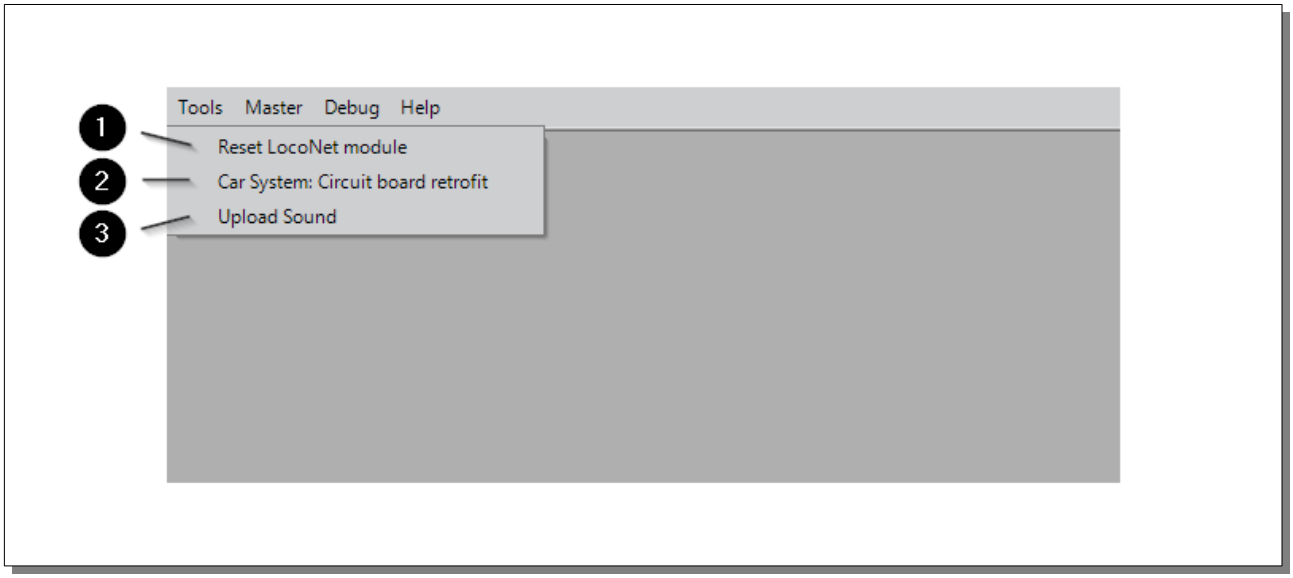



| | Item | Description |
|---|---|---|
| 1 | **Digitrax PR3 Decoder Programmer** | Digital Controller Hardware |
| 2 | **ECoS ESU Command Station** | Digital Controller Hardware |
| 3 | **Massoth DiMAX** | Digital Controller Hardware |
| 4 | **Märklin CS I** | Digital Controller Hardware |
| 5 | **Märklin CS II** | Digital Controller Hardware |
| 6 | **Märklin CS III** | Digital Controller Hardware |
| 7 | **Roco Fleischmann** | Digital Controller Hardware |
| 8 | **RR-Cirkits LocoBuffer-USB** | Digital Controller Hardware |
| 9 | **Uhlenbrock IB-COM** | Digital Controller Hardware |
| 10 | **Uhlenbrock INTELLI-BOX II** | Digital Controller Hardware |
| 11 | **Uhlenbrock LocoNet-USB-Interface** | Digital Controller Hardware |
| 12 | **Lenz LZV 100** | 1. Digitools Interface<br>2. Digital Plus by Lenz Ethernet Interface<br>3. Digital Plus by Lenz USB Interface |
| 13 | **MultiMaus** | 1. Digitools Interface<br>2. Digital Plus by Lenz Ethernet Interface<br>3. Digital Plus by Lenz USB Interface |
| 14 | **Z21** | 1. Digitools Interface<br>2. Digital Plus by Lenz Ethernet Interface<br>3. Digital Plus by Lenz USB Interface |
| 15 | **[... Disconnect ...]** | Click here will disconnect the Digital Controller |

**ACTION**

- The controller will automatically reconnect when the system is restarted.
- If you press [...Disconnect…] please reconnect the controller when system is restarted.

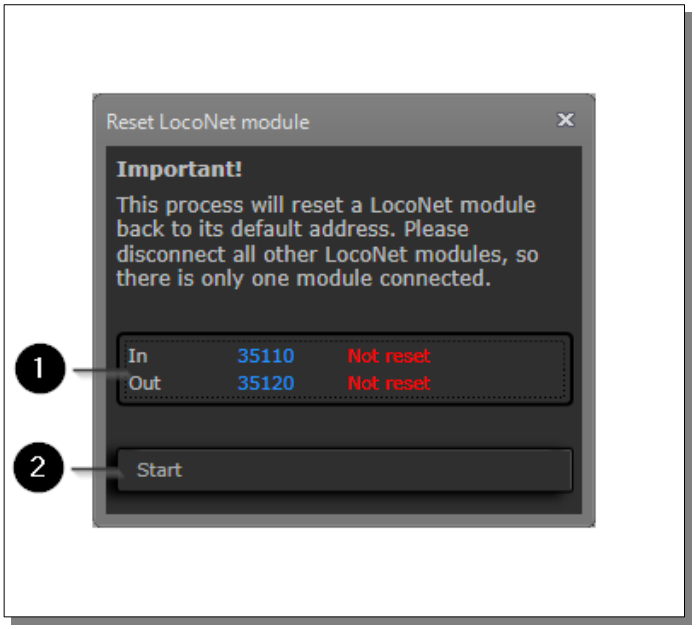
# 7.9 Tools




| | Item | Description |
|---|---|---|
| 1 | **Reset LocoNet Module** | This will Reset the connected LocoNet module. |
| 2 | **Car System: Circuit board Retrofit** | Opens up a dialog for setting Threshold Values for certain types of batteries available for Faller Cars. *Only visible if the license allows Faller Cars.* |
| 3 | **Upload Sound** | Opens up a windows for uploading Sounds to special hardware components. |

## 7.9.1 Reset LocoNet Module

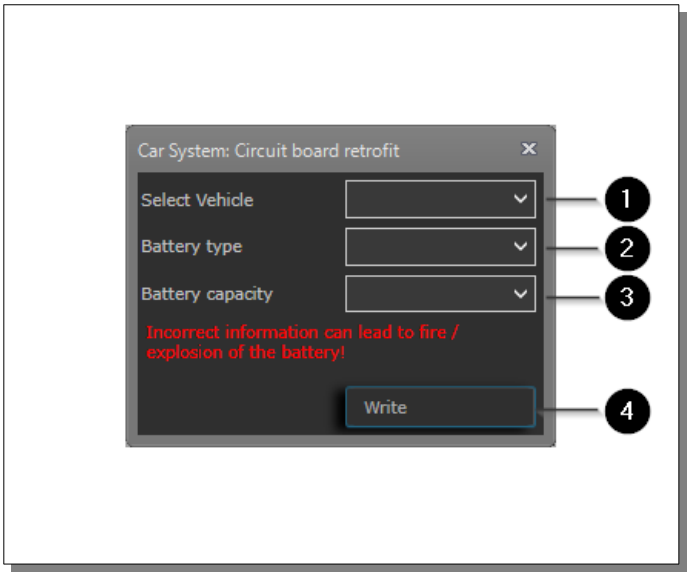
The LocoNet module can be reset using this menu.



| | Item | Description |
|---|---|---|
| 1 | **Display Status** | Display Status on In and Out |
| 2 | **Start** | Click button [Start] to reset the module<br>Display Status will change: [ Not Reset → Resetting → Reset ] |

## 7.9.2 Car System: Circuit Board Retrofit

Battery types and capacity can be changed for the vehicles using this menu.



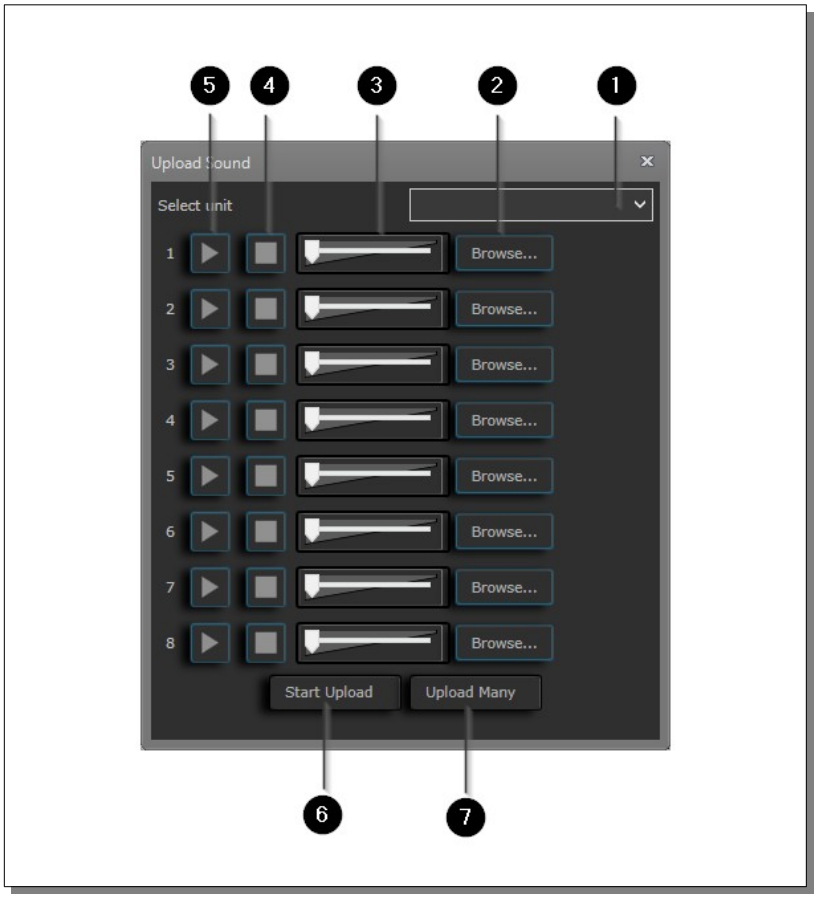

**WARNING**

- Incorrect settings can lead to fire or explosion of the battery!

| | Item | Description |
|---|---|---|
| 1 | **Select Vehicle** | Select an online vehicle |
| 2 | **Battery type** | Select a battery type from the drop down: You find 3 available types:<br>LIPO \| 1,2 V NiMH \| 2,4 V NiMH |
| 3 | **Battery capacity** | Select a battery capacity from the drop down. You find 14 available types:<br>100, 150, 200, 250, 300, 350, 400, 450, 500, 550, 600, 650, 700, 750 mA |
| 4 | **Write** | **Please read the warning above before writing the settings!**<br>Writes the settings to the selected vehicle. |

## 7.9.3 Upload Sound

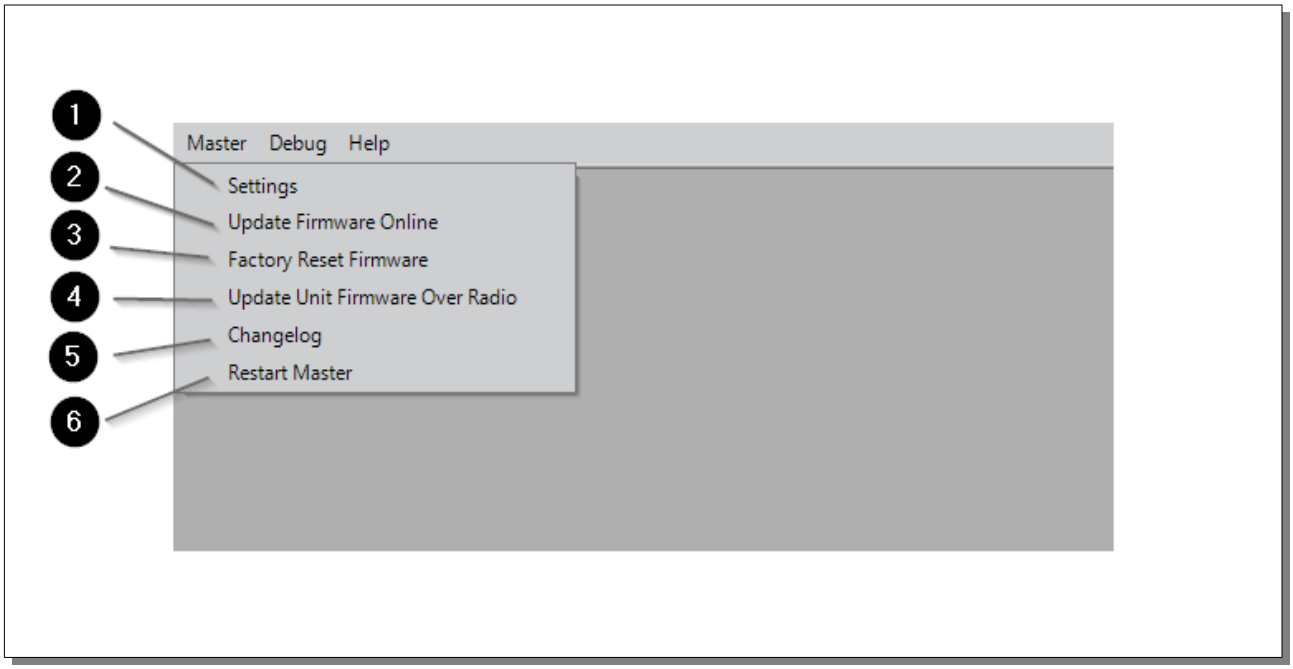
The GT-XSound module is a sound module which connects to GT-XControl IR and is intended for LEGO buildings and LEGO vehicles.




| | Item | Description |
|---|---|---|
| 1 | **Select Unit** | Select the Train |
| 2 | **Browse** | Browse for sounds (MP3 or WAV) |
| 3 | **Adjust Volume** | Adjust the volume for each sound |
| 4 | **Stop** | Stop playing the sound |
| 5 | **Play** | Play the sound |
| 6 | **Start Upload** | Pressing this button will start uploading the sounds one by one |
| 7 | **Upload Many** | Upload multiple sounds |

## 7.10 Master

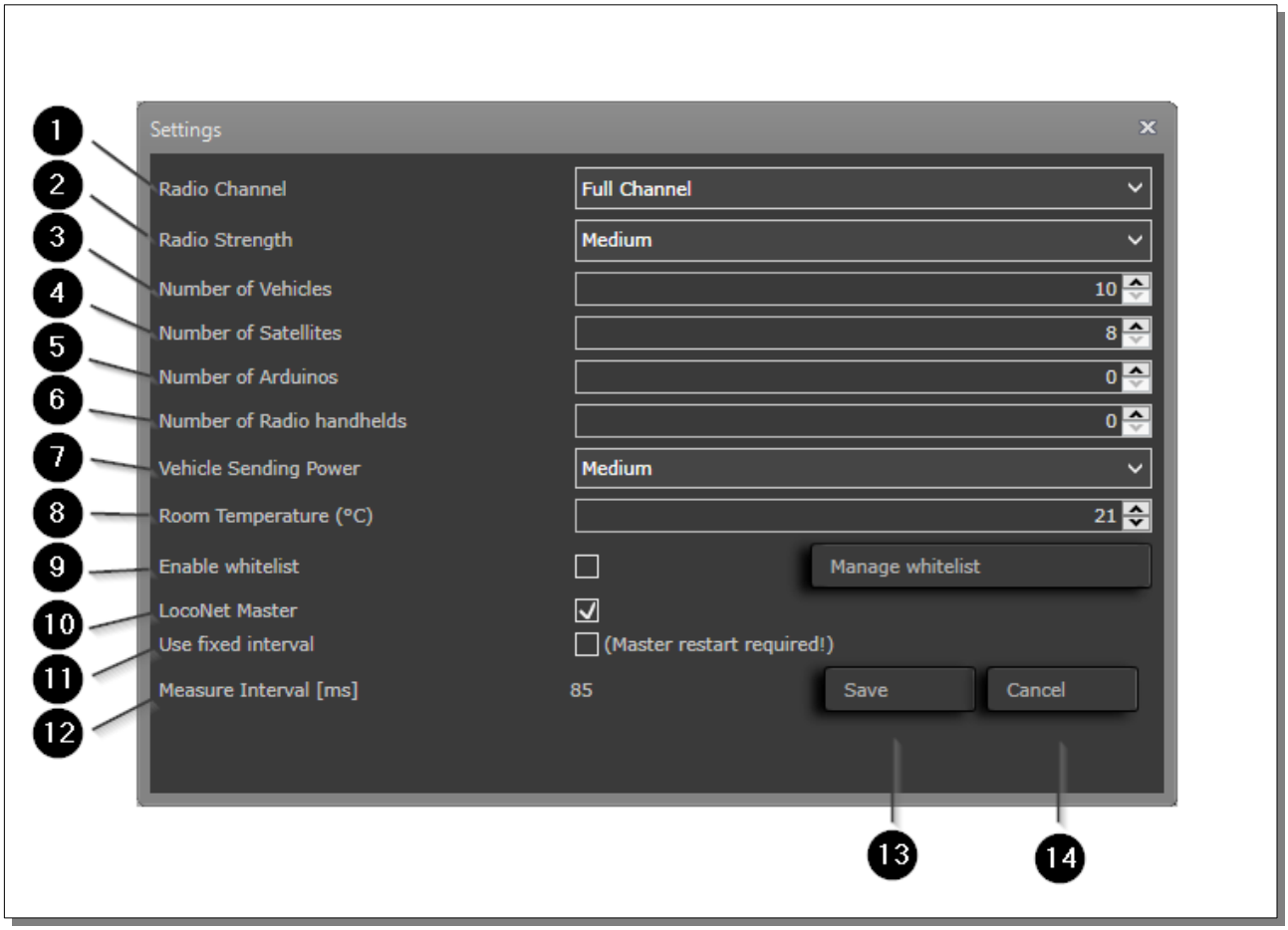
Use menu [Master] to update your Master with new firmware - or if things for various reasons might end in a blind state to restart your Master. You should only update your firmware if such a recommendation is made by GamesOnTrack or the Update system tells you to do.
When you restart you Master it will release all known units, read your set-up data again - and start listening for these to connect again.




| | Item | Description |
|---|---|---|
| 1 | **Settings** | This is the most important part for the Master. Here all settings for the Master can be set. This includes number of devices, radio and ultrasound levels etc.. |
| 2 | **Update Firmware Online** | This is the normal way to update the Master Firmware. When new versions are released, the user will be notified. |
| 3 | **Factory Reset Firmware** | This will reset the firmware in the Master to the factory version 0.8.7. **Important**: After this reset, the firmware must be updated online, to get the latest working version – see 2. |
| 4 | **Update Unit Firmware over Radio** | This feature will update the firmware on units, if they supports this. Currently the Faller REM can be updated over radio. |
| 5 | **Changelog** | This is a log of changes added to each version of the firmware released. |
| 6 | **Restart Master** | This will restart the master. The master will release all known units, read your set-up data again - and start listening for these to connect again. *The PC-Software will also clear list of all known units.* |

## 7.10.1 Master Settings

The master settings are important to be able to use a fully running system. All settings are described below.



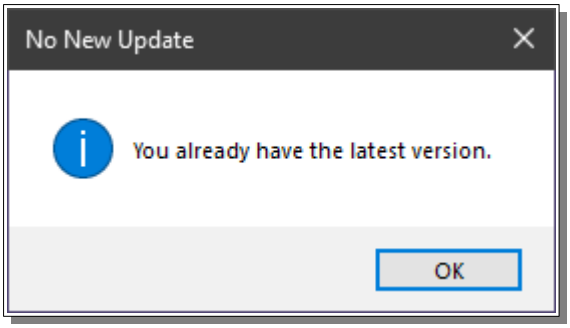

| | Setting | Description |
|---|---|---|
| 1 | **Radio Channel** | Select Radio Channel. Possible values are:<br><br>**EU:**<br>**Full Channel**: 110 Kbit/s<br>**Dual Channel #1**: 55 Kbit/s<br>**Dual Channel #2**: 55 Kbit/s<br>**Off**<br><br>**US:**<br>**FCC #1**: 200 Kbit/s<br>**FCC #2**: 200 Kbit/s<br>**Off** |
| 2 | **Radio Strength** | Select Radio Signal Strength. Possible values are:<br>**EU: Low, Medium, High**<br>*CE EN 300 220-1 Approval*<br>*Radio equipment 869.7-870.0 MHz*<br>**US: Low Booster USA, Medium Booster USA, High Booster USA**<br>*FCC 2AK9NGTX17263X*<br>*Radio 902-928 MHz* |
| 3 | **Number of Vehicles** | Please use a few more than you actually operate (Minimum is 10) |
| 4 | **Number of Satellites** | Please use a few more than you actually operate (Minimum is 8) |
| 5 | **Number of Arduinos** | Please specify the number of Arduino modules in the system |

| | | |
|---|---|---|
| 6 | **Number of Radio Handhelds** | Please specify the number of handheld devices to be used in the system. |
| 7 | **Vehicle Sending Power** | Select Vehicle Sending Power. Possible values are:<br>**Low, Medium and High** |
| 8 | **Room Temperature (°C)** | You should manually measure and set the current room temperature here.<br>The temperature can be automatically set using the GT-Temperature USB.<br>The importance of the temperature is described in chapter 8.5 |
| 9 | **Enable Whitelist** | Please do not use the whitelist unless you operate 2 or more systems (channels) at the same time in the same area.<br>In that case press the button **[Manage Whitelist]** |
| 10 | **LocoNet Master** | Enable this if LocoNet Master is used |
| 11 | **Use Fixed Interval** | Enable this if all vehicles must have same priority all time. |
| 12 | **Measure Interval [ms]** | The system calculates the round-trip it self- the smaller the faster.<br>You get one measurement and one set of radio commands in every round trip, say every 100 or 85 ms. The US system has more capacity than the EU due to higher bandwidth allowance. |
| 13 | **Save** | Save the changes |
| 14 | **Cancel** | Cancel the changes |

Please read chapter 8 [The Master] for all details related to the master!

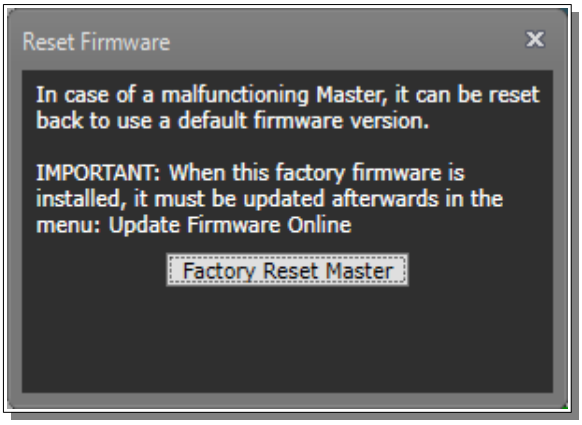
## 7.10.2 Update Firmware Online

The latest firmware is checked when GT-Command is started. The menu can also be used to check for updates.




## 7.10.3 Factory Reset Firmware

Should the master end up in a state where the system is not working, the firmware can be reset. **After resetting, it is very important to update the firmware Online afterwards!**



## 7.10.4 Changelog

The Changelog contains technical details on firmware updates. This log will be in English only.


## 7.10.5 Reset Master

When you restart your Master it will read all radio based devices from scratch and read your set-up data again.

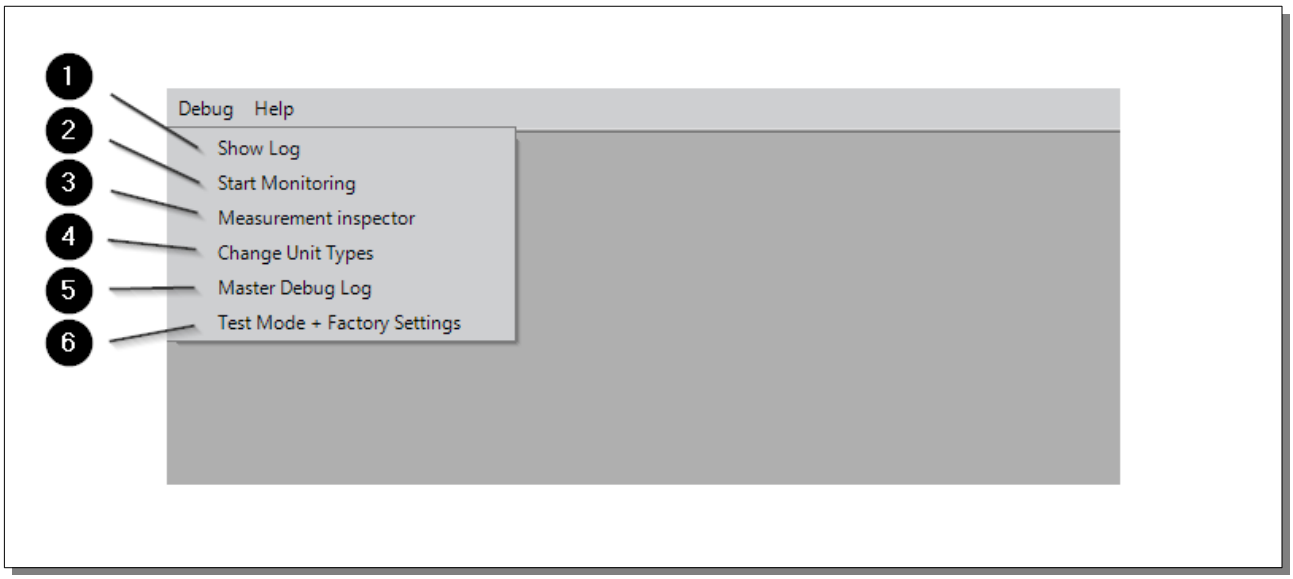
# 7.11 Debug

Most importantly the menu [Show Log] is your source to understand all your units. It helps when you are looking towards all radio units, to get the status and see if they are active.

It is the technical components windows that shows you all radio connected units and their status, including performance and events.

Do not worry, use it in the beginning only to understand if you have all your units in operation.

Start Monitoring makes 1000 measurements and record them and calculate statistics.

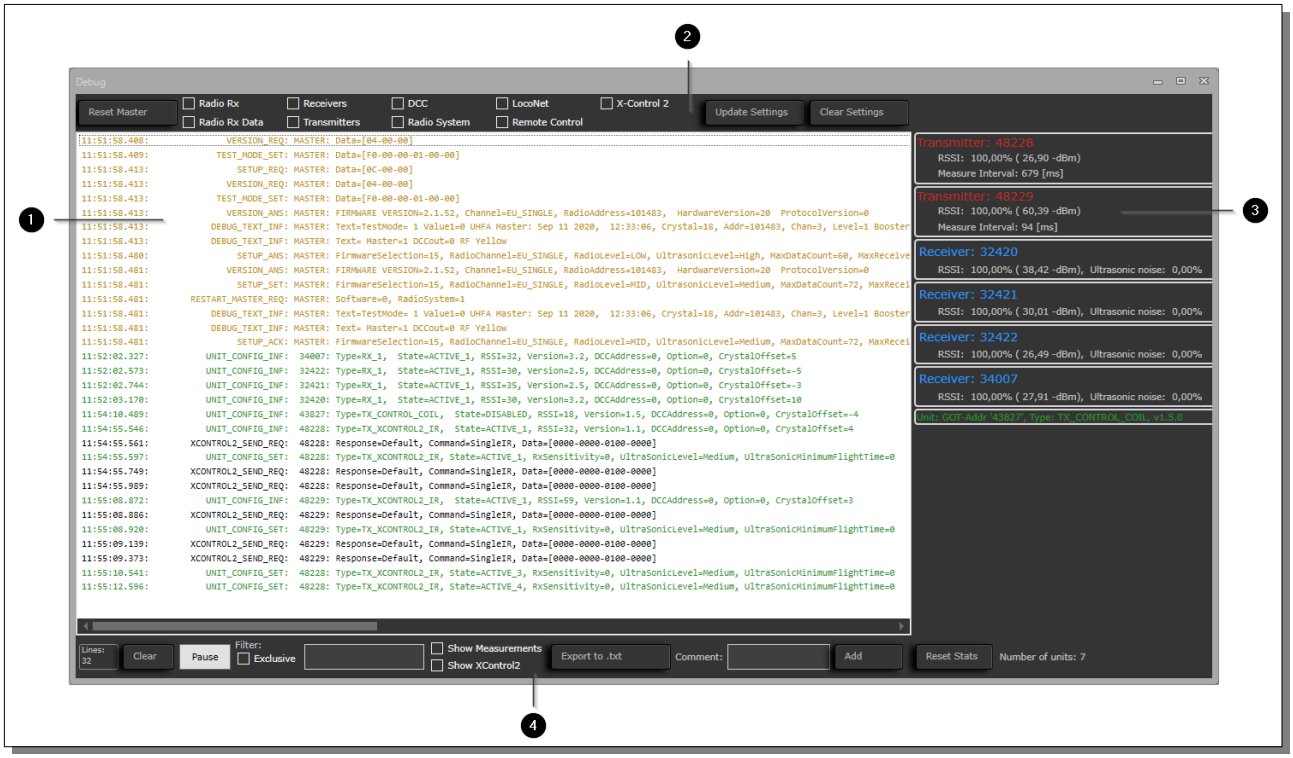



| Item | Description |
|---|---|

| | | |
|---|---|---|
| 1 | **Show Log** | This is the most important part for logging the communication between units and the Master. Here all connected units are listed and the logging can be exported to text files for inspection. |
| 2 | **Start Monitoring** | Record all communication between units as well as real time measurements for all online transmitters. |
| 3 | **Measurement Inspector** | Show the real time measurements recorded and saved during the [**Start Monitoring**] can be played back here and the positions calculated and displayed in 3D. |
| 4 | **Change Unit Types** | Some senders can have their types changed. Normally a change can be between type 2-3-4-5 or 7-9-16. All other types are fixed.<br>Relevant types are visible as readable text when connected.<br>See radio types in chapter Fejl: Henvisningskilde ikke fundet |
| 5 | **Master Debug Log** | Advanced low level debugging of hardware. (Expert License only) |
| 6 | **Test Mode + Factory Settings** | Advanced low level tests and hardware settings. (Expert License only) |

## 7.11.1 Show Log

Show Log is one of the most important part of the system when troubleshooting.




To the right it lists all active radio units, trains, cars, containers, satellites, and a short statistics about their performance. In the middle the last 5000 commands through the Master will show up. You can clear it all and you can put a filter on only to see some relevant commands.

| Item | | Description |
|---|---|---|
| 1 | **Log Messages** | This is the most important part for inspection of messages. All messages set up to be logged will be displayed here. All messages will be inserted at the bottom of this window. For each message you will see a timestamp to the left followed by some spaces and a right-justified Message Type, then the device ID, and finally the message. |
| 2 | **Log Settings** | In the top bar the Master can be restarted, and various types of log messages can be enabled. When these check boxes are enabled, please press the button [Update Settings]. Press the button [Clear Settings] in order to reset the log settings, when complete. |

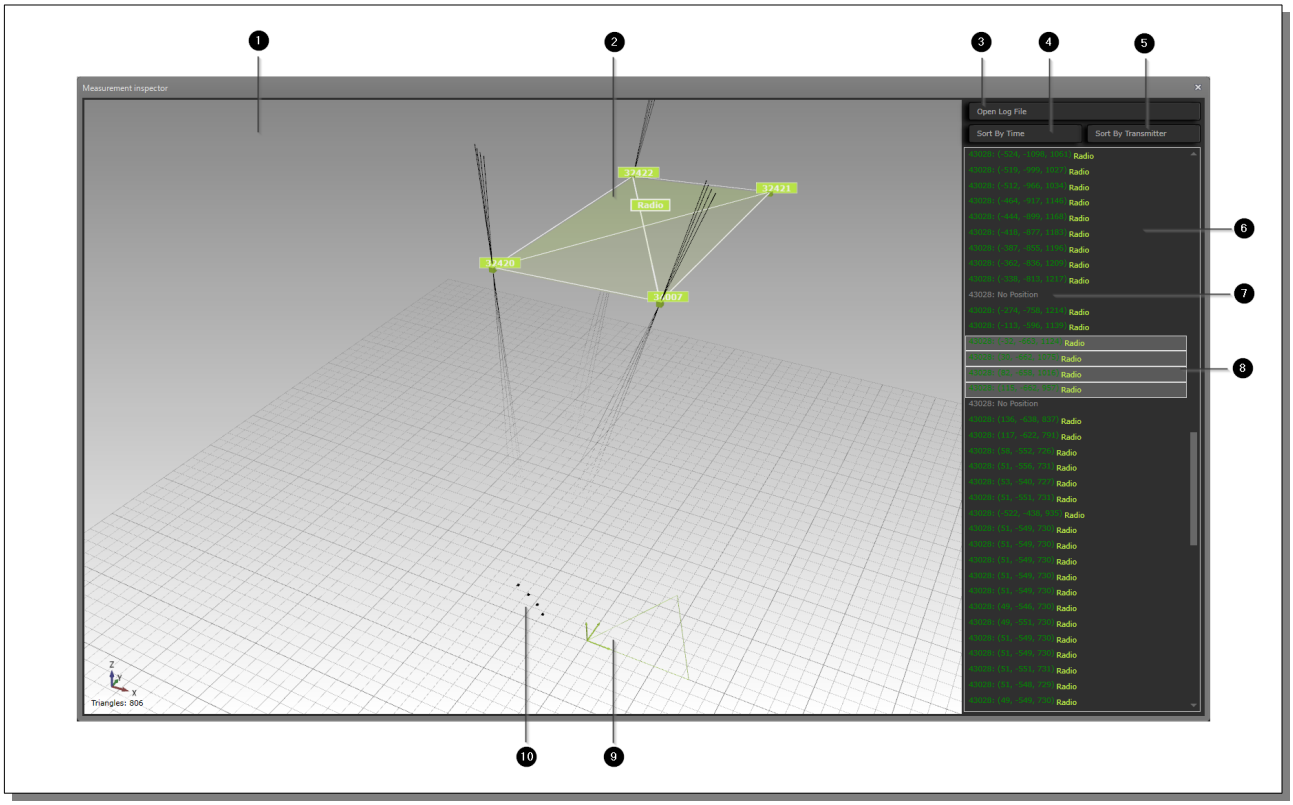
| | | |
|---|---|---|
| 3 | **Online Devices** | In this pane you will see all online devices found by the Master. Satellites will be colored in blue, senders/transmitters in red, and all other devices colored in green. For satellites and transmitters you will see a value for the radio signal quality RSSI (Radio Signal Strength Indicator). In general the RSSI should be larger than 95%.<br>For transmitters you get the measure interval, and for satellites the ultrasonic noise and the level. The Level should be > 90%. |
| 4 | **The control bar** | In the bottom you will see the following parts available from left to right:<br>■ The number of lines currently in the log.<br>■ [Clear] button to remove all log messages from the view.<br>■ [Pause] button to make the view stop scrolling<br>■ Filter checkbox. When enabled, only lines containing the text typed in the text box will be displayed in the view.<br>■ Show measurements messages received from all satellites.<br>■ Show XControl2 messages<br>■ The button [Export to .txt] will export all log messages in the current view to a text file of your choice.<br>■ Comment: Use this text box combined with the [Add] button to inject an arbitrary text into the log messages. This text will be surrounded by a pair double stippled lines.<br>■ The button [Reset Stats] will reset the calculated statistics seen in the right pane for the online devices.<br>■ The number of online devices are counted. |

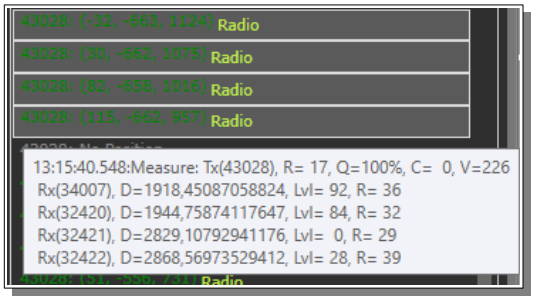
## 7.11.2 Start Monitoring

Clicking the [Start Monitoring] will open a dialog for entering a filename for the output log. In the menu you'll now see [Start Monitoring]. Click again to stop the monitoring.

You can now open the output log for inspection. This is a simple text file.

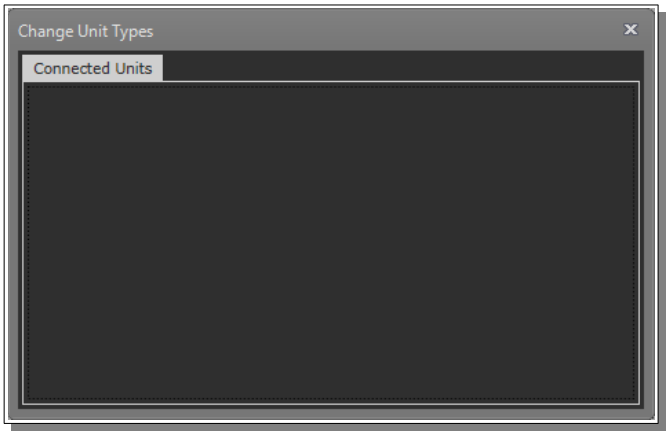
## 7.11.3 Measurement Inspector



| | Item | Description |
|---|---|---|
| 1 | **3D View** | The 3D view for displaying recorded measurements |
| 2 | **Scenario Triangles** | The Satellites are forming scenarios with triangles. These are used to calculate the actual position from the Measurements in the list |
| 3 | **Open Log File** | Click to open the saved and recorded file in **[Start Monitoring]** |
| 4 | **Sort By Time** | If the chronological order of time for all measurements received is important, then select this sorting. If multiple transmitters is used, the lines will alternate between all transmitters. |
| 5 | **Sort By Transmitter** | If you're investigating a single transmitter, then select this sorting. Now all measurements are grouped by transmitter Id. |
| 6 | **Recorded Measurements List** | The list of all measurements recorded. Each line contains the Transmitter Id to the left (here 43028), the calculated position X, Y, Z mm, and finally the name and the color of the current scenario (here named Radio).<br>  <br><br>Hovering the mouse over one of these lines will show detailed information for the measurement received:<br>**13:15:40.548** is a timestamp when message is received – with milliseconds.<br>**Measure: Tx(43028)** a measurement line for the transmitter with id 43028.<br>**R = 17** is the RSSI measured in -dBm<br>**Q = 100%** is the radio quality measured in percent C = 0 is the count of missing responses from a device.<br>**V= 226** is the transmitter battery voltage – normally in 100 mV units.<br>This measurement line includes four receivers, we just display the first:<br>Rx(34007) is the Id of the first receiver/satellite in the list. D= 1918,4508.. is the measured distance in mm – here 1918 mm.<br>**Lvl=92** is the ultrasonic level arrived from transmitter 43028 |
| 7 | **No Position** | Some measurements can have data not valid for an acceptable position calculation. |
| 8 | **Selected Measurements** | Select the measurements you want to display in the 3D view, or click the [Arrow Down] button to traverse each measurement to be displayed individually |
| 9 | **Calibration Triangle** | The calibration triangle(s) used in the scenarios are displayed |
| 10 | **Selected Positions** | The selected positions from the Recorded Measurements List are displayed in the 3D view at the calculated positions.<br>**NOTE**: Please notice the black lines going from the selected positions to the Satellites. In this case all four positions are calculated from the same three satellites, forming the triangle 32420-32422-43007. |

## 7.11.3.1 Change Unit Types

In this menu you can change the GT-Xcontrol-types, normally only between Type 2-3-4-5 and 7-9-16. All other types are fixed.




## 7.11.4 Master Debug Log Viewer

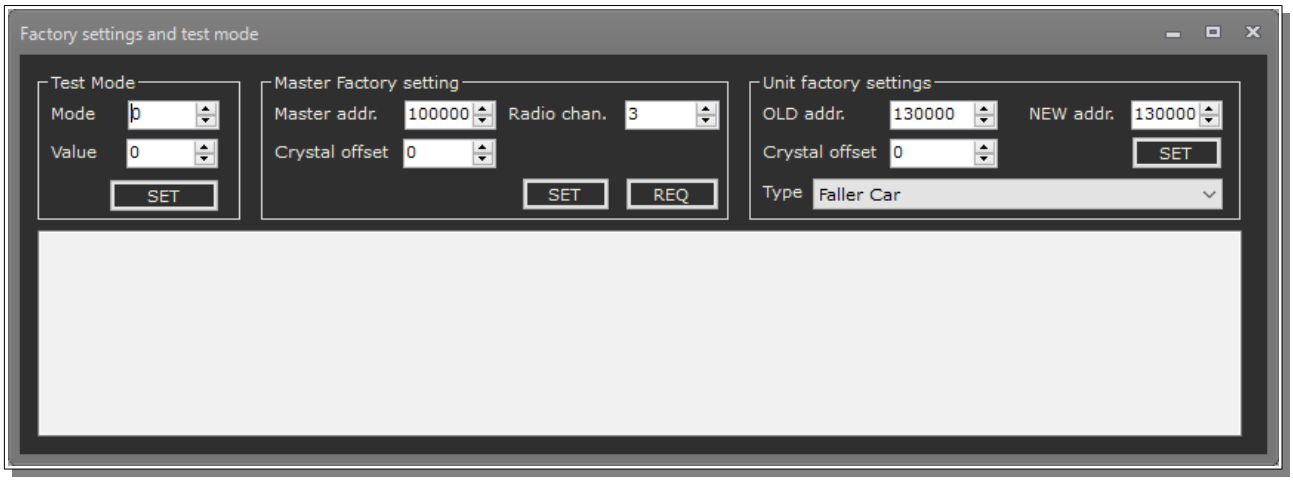
The Master Debug Log Viewer is a very complicated tool for both logging and modifying various kind of settings on devices added to your system.

**CAUTION**

- This feature is available in the Expert license only!


## 7.11.5 Test Mode + Factory Settings

The Test Mode + Factory Settings is a tool for modifying the factory settings for devices.




**CAUTION**

- This feature is available in the Expert license only!

# 7.12 Help

Click on **Help** or F1 to get access to the help file (This PDF document). This menu contains all types of help for your system, like documentation of the software and hardware plus animated tutorials. You'll also find information about License, Updates and changes to the PC-Software.


| | Item | Description |
|---|---|---|
| 1 | **Help** | Click to open this manual. |
| 2 | **Language** | Select the language of your choice. Supported languages: **DK, EN, DE and NL** You can also use the country flag on the process line, it does the same. |
| 3 | **Hardware** | Opens a PDF document with all hardware datasheets for products available in GamesOnTrack. |
| 4 | **Tutorials** | Opens a HTML document with animated gif images showing the basic usage of the system. |
| 5 | **Keyboard Shortcuts** | Opens a PDF document with all relevant Keyboard shortcuts throughout the application. |
| 6 | **License** | Opens up a dialog for entering the License code or updating an existing one. |
| 7 | **Update** | Check for software updates |
| 8 | **Changelog** | A list the describes all major changes for every release of the software. |
| 9 | **About** | A small dialog with the Application version and compile date. |

## 7.12.1 Help

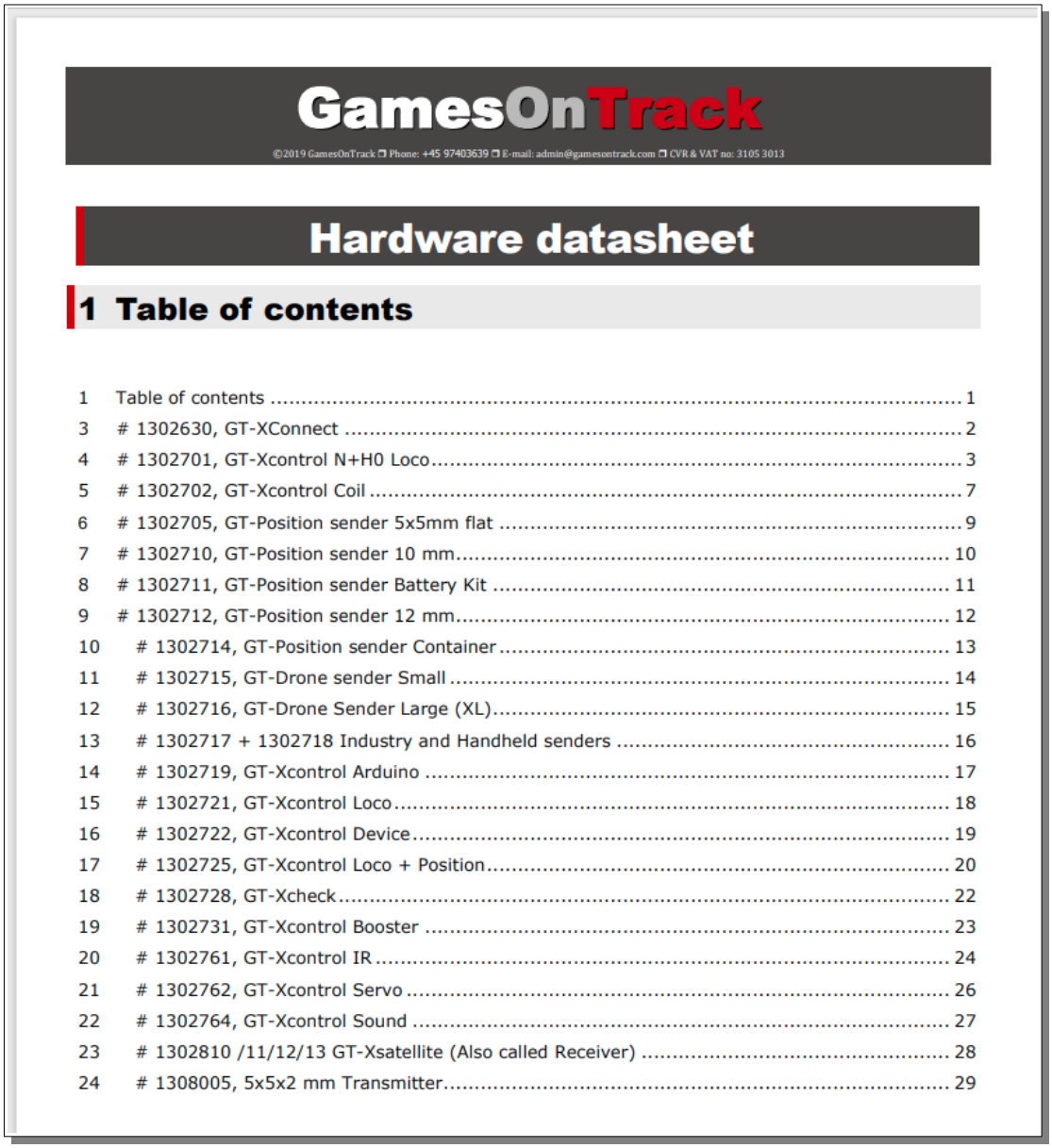
Click to open this manual. Function key [F1] will do also.

## 7.12.2 Language

Use the **Language** entry to select a new language. You are free to operate any language for all menus and help documents. However, if you use voice recognition your license tells you what language you can use for voice commands. You must then select that language if you will speak your vehicles. More easily select the flag on the process line, it does the same.

## 7.12.3 Hardware

Use the Hardware menu entry to display a PDF document containing all data sheets for the hardware products.



GamesOnTrack

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Hardware datasheet

1 Table of contents



## 7.12.4 Tutorials

The Tutorials menu entry will open up your browser containing a HTML document with animated gif images showing the basic usage of the system.

## 7.12.5 Keyboard Shortcuts

The PDF document with all relevant Keyboard shortcuts.

## Keyboard Shortcuts

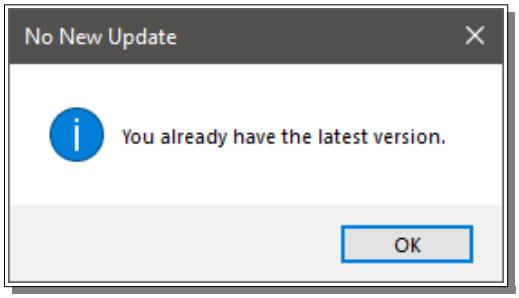
| Keys | Description |
|---|---|
| F1 | **Help (Open PDF Manual)** |
| F2 | **Speech: Toggle Microphone ON/OFF** |
| F3 | **Show Track 3D** |
| F6 | **Resume from all emergency situations** |
| F8 | **Force a new Backup** |
| F9 | **Refresh** |
| F10 | **Stops all vehicles and automations**<br>*Everything must be started up again manually.* |
| F11 | **Shuts down the Power Supply from any digital controller to tracks.**<br>*To be used if a short circuit appears.*<br>*Automations will not be shut off.*<br>*Press F11 again will reconnect the Power Supply.* |
| F12 | **Emergency Stop (PAUSE).**<br>*All vehicles and automations will be paused.*<br>*Press F12 again to resume all automations and vehicles.* |
| HOME | **Center the 2D View**<br>*(Only if view is active)* |
| CTRL + HOME | **Reset the 2D View**<br>*(Only if view is active)*<br>*Both view and rotation is reset.* |
| CTRL + S | **Save file** |
| CTRL + O | **Open file** |

## 7.12.6 License

Click this menu in order to activate and register the PC-Software. See chapter 6.4

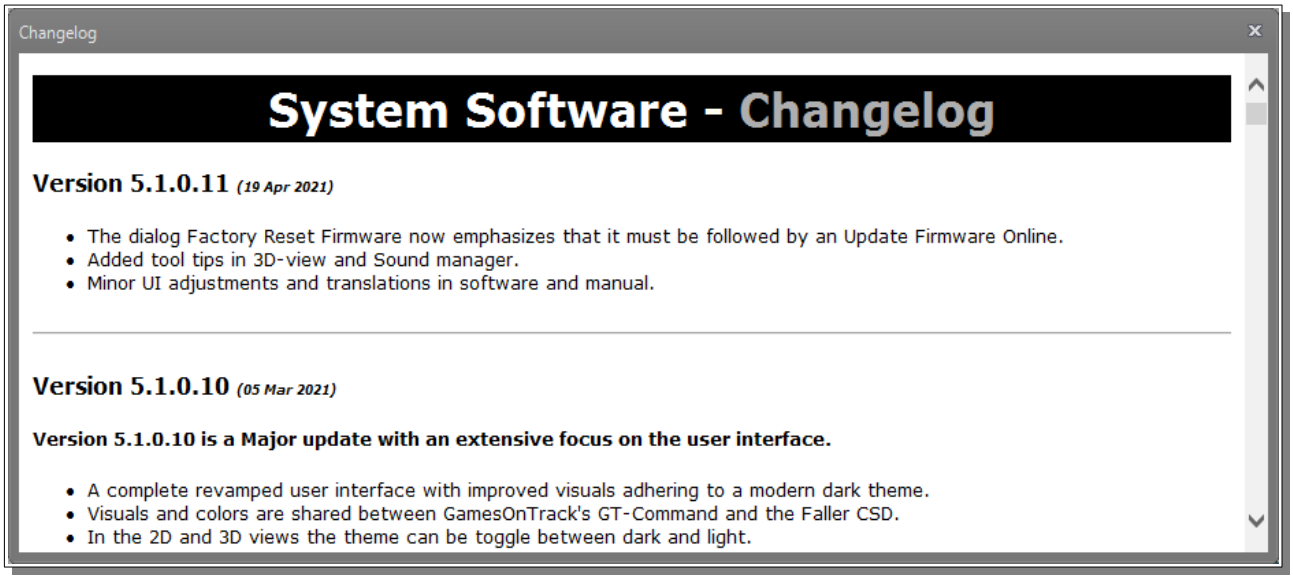
## 7.12.7 Update

Clicking this menu entry will check the servers for any new updates. This check will also take place every time you start the application. In case there is a new update, you can download the setup file and install it.



## 7.12.8 Changelog

The software changelog contains a list of all release changes applied to the application.




## 7.12.9 About

The About dialog will show you relevant information about the application like name, version number, copyrights and the compile time.


# 8 The Master


Different Master versions are available from V1 to V4. Master V4 is included in The Starter Kit. All Master versions will operate when powered on by a USB connection to the PC.

**NOTICE**

- The settings may vary if you have Master V1, V2, V3 and V4
- V1 cannot be used in US (No FCC frequencies available).
- In Master V1 you can only adjust measurement intervals and temperature.
- In Master V2 to V4 you can choose many more settings.
- The settings displayed below is for Master V4.

## 8.1 Connect The Master

**ACTION**

- Connect the Master to a USB port on the PC.
- Wait 2-5 seconds. The PC-Software will display **Connected** on the bottom line.

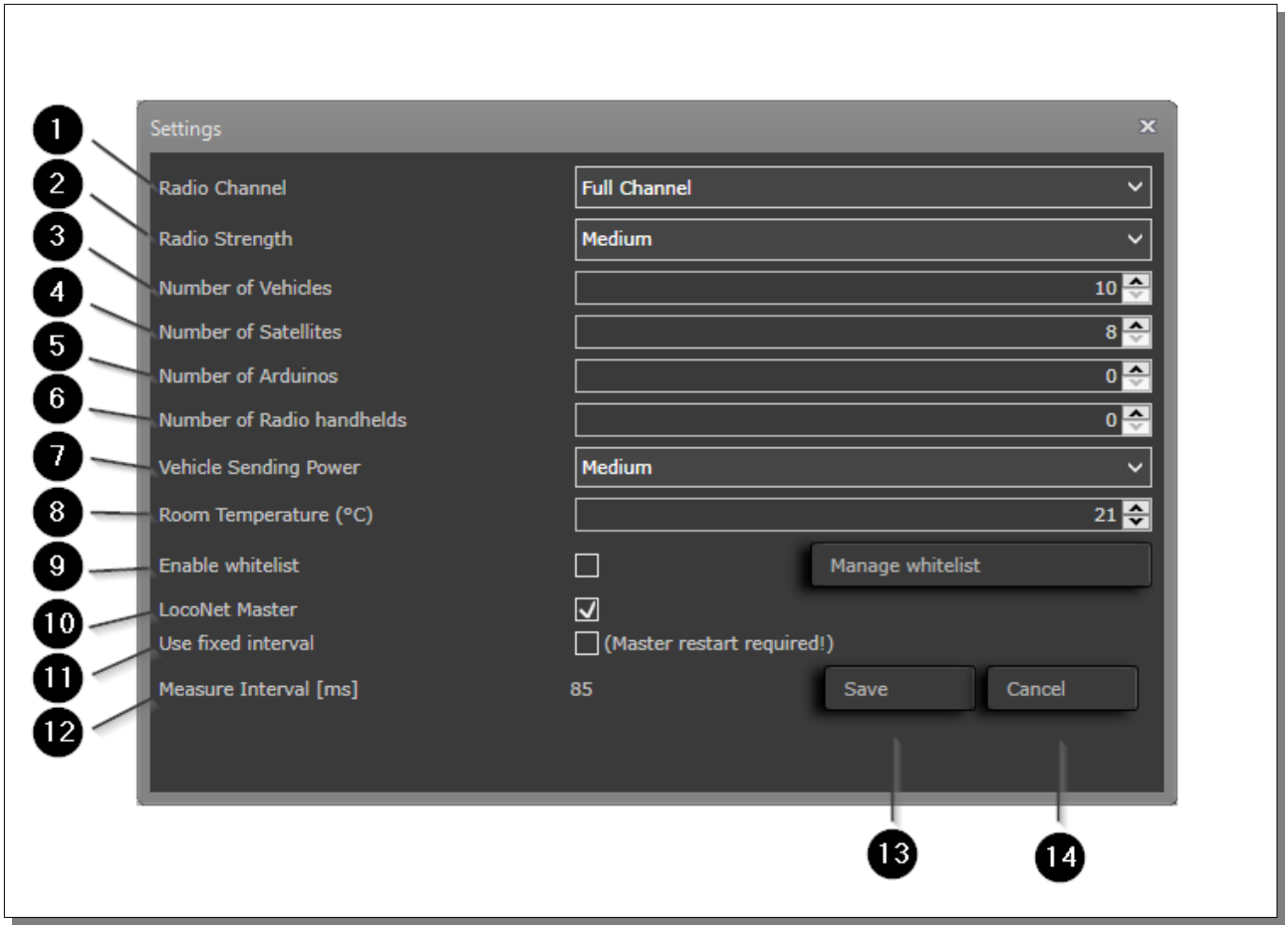
## 8.2 The Master Settings

The Master Settings handles the configuration of Master, Satellites, Transmitters etc..
In the settings you select your radio model, and the size of your system with predefined options that you can define depending on the size of your model system. Adapt these settings to the size of your system. Only change the preset values if you have sufficient knowledge.

**ACTION**

- Press Master → Settings.
- Use the default settings shown here.
- Press button [Save]
- The settings are now sent to the master. The the Rx and Tx LED's will stop flashing for a short period, until the settings are applied.

## 8.3 Default Settings on the Master




| | Setting | Description |
|---|---|---|
| 1 | **Radio Channel** | Select Radio Channel. Possible values are:<br><br>**EU:**<br>Full Channel: 110 Kbit/s<br>Dual Channel #1: 55 Kbit/s<br>Dual Channel #2: 55 Kbit/s<br>Off<br><br>**US:** |

| | | |
|---|---|---|
| | | FCC #1: 200 Kbit/s<br>FCC #2: 200 Kbit/s<br>Off |
| **2** | **Radio Strength** | Select Radio Signal Strength. Possible values are:<br><br>**EU: Low, Medium, High**<br>*CE EN 300 220-1 Approval*<br>*Radio equipment 869.7-870.0 MHz*<br><br>**US: Low Booster USA, Medium Booster USA, High Booster USA**<br>*FCC 2AK9NGTX17263X*<br>*Radio 902-928 MHz* |
| **3** | **Number of Vehicles** | Please use a few more than you actually operate (Minimum is 10) |
| **4** | **Number of Satellites** | Please use a few more than you actually operate (Minimum is 8) |
| **5** | **Number of Arduinos** | Please specify the number of Arduino modules to be used in the system |
| **6** | **Number of Radio Handhelds** | Please specify the number of radio handheld devices to be used in the system |
| **7** | **Vehicle Sending Power** | Select Vehicle Sending Power. Possible values are: Low - Medium **- High** |
| **8** | **Room Temperature (°C)** | You should manually measure and set the current room temperature here.<br>The temperature can be automatically set using the GT-Temperature USB.<br>**Please see chapter 8.5** |
| **9** | **Enable Whitelist** | Please do not use the whitelist unless you operate 2 or more systems (channels) at the same time in the same area.<br>In that case press the button **[Manage Whitelist]** |
| **10** | **LocoNet Master** | Enable this if LocoNet Master is used |
| **11** | **Use Fixed Interval** | Enable this if all vehicles must have same priority all time. |
| **12** | **Measure Interval [ms]** | The system calculates the round-trip it self- the smaller the faster.<br>You get one measurement and one set of radio commands in every round trip, say every 100 or 85 ms. The US system has more capacity than the EU due to higher bandwidth allowance. |

## 8.4 Master - Normal use

- **EU-mode**: Your normal operation is to use the Full Channel (two channels). It has the widest bandwidth and the most capacity.
- **US-mode:** In US you can use FCC1 and FCC2 in the same room, also here you could use Whitelist to bind satellites and senders to each one master. FCC1 and FCC2 are two completely separated channel sets with 25 channels in each. The system jumps between the channels in every cycle, about 100 ms per channel.
- However, if you are two neighbors, both operating GT-Command or Faller Car System within 50 meters distance, then the two Masters could affect each other on the same frequency. Then you can both decide to shift to each one of the two half channels (Dual Channel #1, Dual Channel #2). In such set-up use a radio strength Low or Medium.
- If you want to operate two systems on each two channels then you should use the White List settings. Here you bind satellites and vehicles to each one Master and they cannot jump onto the other system.
- Vehicles (senders) and satellites remember the channel where they last time found a Master and was configured. When they restart they will try to connect to that Master again on the very same frequency.
- So, the best method is to configure the systems one at a time on each one channel with the other system closed – meaning no power on satellites, master and senders. First do

one system. Turn on everything and when all units are accepted then close all cars and satellites and finally the Master – no power. Then configure the other system on the other channel. You just need to get all satellites and Vehicles open and see them in the System. When you shut them down they will remember their channel and start looking for that channel next time they start – that is also valid after an eventual recharge.

- When you start up again always turn on the PC first, then the Master and finally the satellites and the Vehicles. When you turn off, always in the opposite order, so the last thing the units remember is the Master frequency.
- The reason behind the method is that senders and satellites are pretty aggressive getting connected, and if they do not find a master on their prime frequency they will start looking for another master on another frequency.
- The dual channel method cannot cover a close set-up with 2 layouts close to each other. The prime reason is that the measurement tool uses Ultrasound with a max range of 10-12 meters. It means that the ultrasound can reach a satellite from another system on short range creating false measurements. In case you are that close, please have a solid wall in between.
- The effect of picking channel 1 or 2 might not be seen unless you have 10+ vehicles and 3+ receivers.
- You can select a standard radio model (advisable), or you can configure one yourself as a custom model.
- **Number of DCC commands:** If you operate distance control you might want to make one DCC command per vehicle per measurement interval. However if you do not brake or accelerate no commands are sent. About 200 DCC commands per second will in general be the maximum you will use, including lights, sounds etc. The system also acknowledge each DCC command which also use bandwidth. The distance control and the automation part is the biggest contributor to the number of DCC commands.
- **Measurement Interval.** Please stick to one of the standard recommendations. However, it can be changed, all the way down to 50 ms. But it comes at an expense of now many satellites you can operate, and how many acknowledgements you will get from your commands, thus reducing the overall communication quality. The type of drive where it can make sense to reduce the measurement interval is if you have a many vehicles which you operate **manually** on a layout. The layout does not run distance control, however the layout might have all kinds of section control with traffic lights, speed control, switching, parking, bus stop etc.. The lower you go the more battery consumption and the more radio capacity is used for measurements. The higher you go will provide more capacity for other things like DCC commands, many satellites on bigger layouts etc.
- **Vehicle Sending power:** This parameter sets the ultrasound signal to Low, Medium, or High. On a standard layout with up to 4 meters distance to satellites the value Low is sufficient. You can increase it with larger layouts. It is no advantage to increase it. If your drawings are OK, stay with Low. Too much ultrasound on too short distance might make a satellite to skip a measurement.
- **Number of Satellites:** You can use from 2 as minimum up to 30. The more satellites the more precision. Or you need more satellites while operating a fiddle yard or indoor parking house as an extra scenario. If you have more than 7-9 satellites you must operate with 90 ms measurement interval, if you have 10-12 satellites you must use 100 ms, and so forth.

- **Number of Arduinos:** They take a certain part of the radio bandwidth due to the ability to get inputs from the Arduinos into the PC-Software and further on in the Automation server. However, you can configure an Arduino with its input and outputs to be selected in automation like function calls.
- **Radio based terminals (Controllers):** There might be hand held terminals available for LocoNet and DCC over Radio. They will also use the bandwidth and the maximum must be set. If you have such terminals you must use a Radio model which allow that number of controllers. If you operate many vehicles manually such dedicated terminals can be useful. However, the system also supports use of Smart phones which operate over WLAN. Both handhelds can be used simultaneously and both are synchronized. You can also use normal DCC handheld controllers. Such DCC handheld controllers does NOT get any feed back from other settings.
- **No positioning:** If you do not drive using positioning you can completely eliminate the Positioning component of the measurements and use all capacity to operate vehicles and other devices associated with the system. The maximum capacity for DCC commands alone is about 400 DCC commands per second with acknowledgement. To turn off positioning select [Off] in the Radio Channel dropdown box.
- **DCC-Output:** It's possible to communicate with signals and turns attached the DCC-Output on the Master. Requirement: The Master must be type V3!
- **Measure Interval:** Displays the calculated interval in ms based on the settings.
- **Use fixed interval:** Is only relevant if there is a special need for having all units measured with an equal interval and high priority. **Notice:** The Master must be restarted manually.
- The system controls the validity of your settings. And you can receive a statistical report telling how good your system is performing from a capacity perspective. Press the menu [Debug → Start Monitoring], and select a filename. Let the system run for a period and press [Debug → Stop Monitoring]. This file contains everything about your system, and will display the statistics in the buttom of this file.

**TIP**

The most important default settings:

- **Radio Channel:** Full Channel
- **Radio Strength**: Medium
- **Vehicle Sending Power**: Medium
- **IMPORTANT!** When troubleshooting, try start with the lowest possible levels for both Radio Strength and Vehicle Sending Power and step up from **Low→ Medium→ High** until the received measurements and the calculated positions are stable.

Press [Save] to save the settings in the Master, and before you leave the GT-Command also press [Save] for the system to know the settings.

## 8.5 The Temperature

Temperature plays an important role in measuring distances between vehicles and satellites!

**NOTICE**

- Sound is propagating faster the higher the temperature is.
- In general the speed of sound is 343 m/s at 20°C.
- The change in speed is 0.6 m/s/°C - and this range is linear.
  It means that if you have 1 meter distance and the temperature is 21°C (20+1), then the sound propagates 0.6/343 ~ 0.2%, per degree per meter.
  If the increase is (20+5)°C, then the deviation is almost 1% per meter.
- This calculation is included in the system.
- Imagine a layout of 6 meters x 3 meters with four satellites mounted in the ceiling 2 meters above each corner of this layout. In this layout you can have a distance of more than 6 meters, measured from a vehicle placed in one end of the layout to a satellite in the other end. Do a calibration of this layout at wintertime using a value of 20°C manually set in the master settings. If you don't change this value of 20°C, and never re-calibrate the system - and then drive on this layout at summertime with a temperature of 30°C, you can end up having near 2% deviation. *With a 2% deviation on a 6 meters distance you get a **12 cm difference** compared to the distances measured at wintertime!* The calculated positions will always try to snap to your tracks, but you will experience that this snapping fails or simply places your vehicles in the UI at wrong positions on the layout – especially when tracks are placed very close to each other - as seen on model railways.
- You can increase and decrease the actual temperature in the [Master → Settings] window and thus you also adjust the distance calculation.
- The main principle is that if the actual measured position creeps closer to the satellites, then you might get it back on street by increasing the temperature setting, and if the position seems to be pushed away you might get it back by decreasing the temperature setting.
- However, in normal use with 2-3 meters distance to satellites, and temperature change around 2-5°C, the implication is smaller than the width of the vehicle and normally you will not see it, if the satellites are positioned as in the starter kit examples above. You might only want to use it if the temperature really has changed.

## 8.6 Restart Master

Unplugging and reconnecting the Master or pressing the Restart Master button in the Application will restart the master. The bottom left corner of the application will show the Master restart progress stages this way: **Offline** → **Connecting** → **Connected**

All Masters have LEDs mounted on the circuit board as indicators for different states.
Both the number and colors of the LEDs can vary a bit. Each LED will follow certain patterns, which are illustrated in the chapters for each individual Master version V1 to V4.

**The restart process:**

- When a Master starts operating, the Power On LED is using a 'heart beat' pattern.
- When the radio is active, the Master will look for units (devices, senders and satellites)
- When the Master finds any active radio transmitters, it starts blinking fast on the TX diode (senders) and on the RX diode (satellites) - if these are active too.
- When the Master transmits information from PC/USB, from DCC, and over LocoNet, the respective diodes will turn on.

**NOTE**

- The master has a firmware that controls functionality level. The firmware can be updated automatically when new versions are released.
  - A notification of a new release is shown when the PC-Software is started.

  When updating the Master the bottom line shows: **No firmware**
- The free program named **GOTMasterUtils -** available from download - can also be used for upgrading the firmware. The firmware can also be upgraded by GamesOnTrack if yuo prefer and might require an upgrade payment.

**CAUTION**

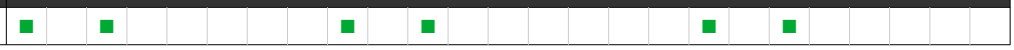
- There is a link between your Master and your license code. A broken link or a wrong license code will prevent a connection from the Software to Master.

## 8.7 LED Patterns

In this chapter all LED patterns for both Master V4, Transmitters and Satellites are described.

Led patterns for ALL Master versions V1 to V4 can be found in the appendices.

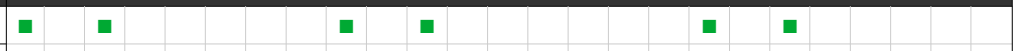
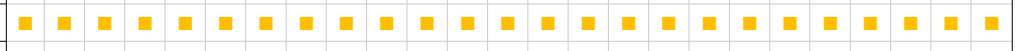
| LEDs | Description |
|---|---|
| **Power On** | Control LED (flashes with the heart rhythm) |
| **Radio Tx** | Transmit: Outgoing radio signal, e.g. to a sender |
| **Radio Rx** | Receive: Incoming radio signal, e.g. from a satellite |
| **Software** | Software connected to Master (constant when connected) |

| POWER ON [■] | |
|---|---|
| HEART BEAT |  |

| RADIO: RX + TX [■] | |
|---|---|
| OFFLINE: | OFF |
| ONLINE: INACTIVE |  |
| ONLINE: ACTIVE |  |

| FIRMWARE UPDATE | |
|---|---|
| ALL LEDs ARE RUNNING |  |

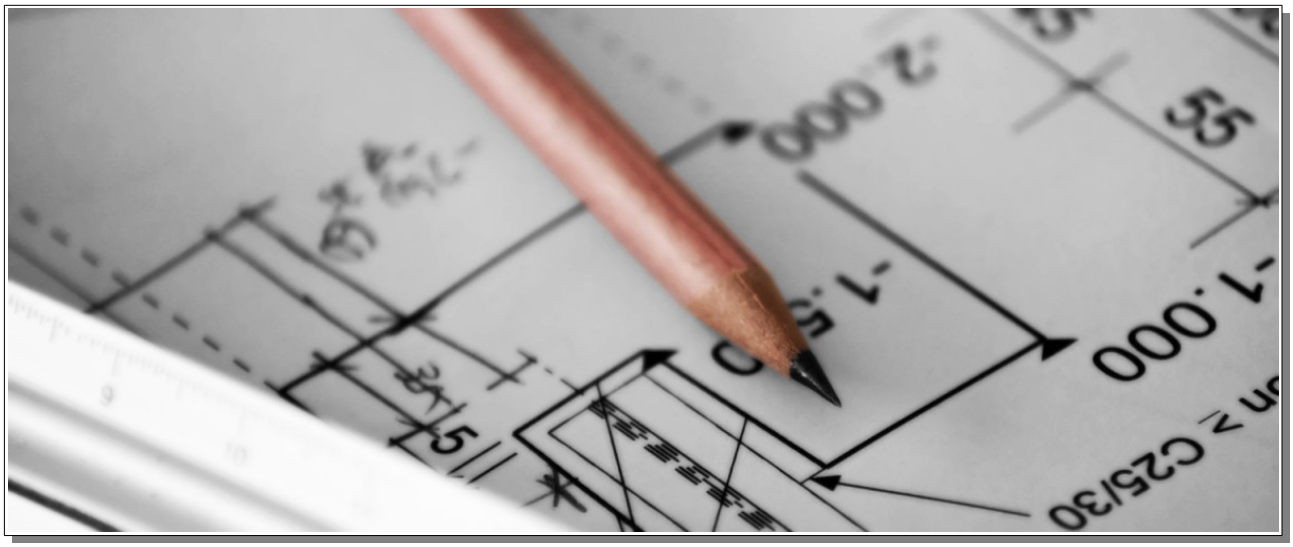
| SOFTWARE LED [■] | |
|---|---|
| NOT CONNECTED TO SW | OFF |
| CONNECTED TO SW | CONSTANT  |

| LEDs | EXAMPLE OF NORMAL OPERATION WITH ACTIVE DEVICES |
|---|---|
| POWER ON |  |
| RX |  |
| TX |  |
| SOFTWARE | CONSTANT  |

### 8.7.1 LED Patterns on Satellites and Senders

| SATELLITE LED [■] | LEDs will blink slowly when they are online *but inactive* - and fast when active: |
|---|---|
| OFFLINE: | OFF |
| ONLINE: INACTIVE |  |
| ONLINE: ACTIVE |  |
| **SENDER LED [■]** | LEDs will blink slowly when they are online *but inactive* - and fast when active: |
| OFFLINE: | OFF |
| ONLINE: INACTIVE |  |
| ONLINE: ACTIVE |  |

# 9 Create New System



## 9.1 The Basic Requirements

To create a new system for 3D positioning, the following components are required.

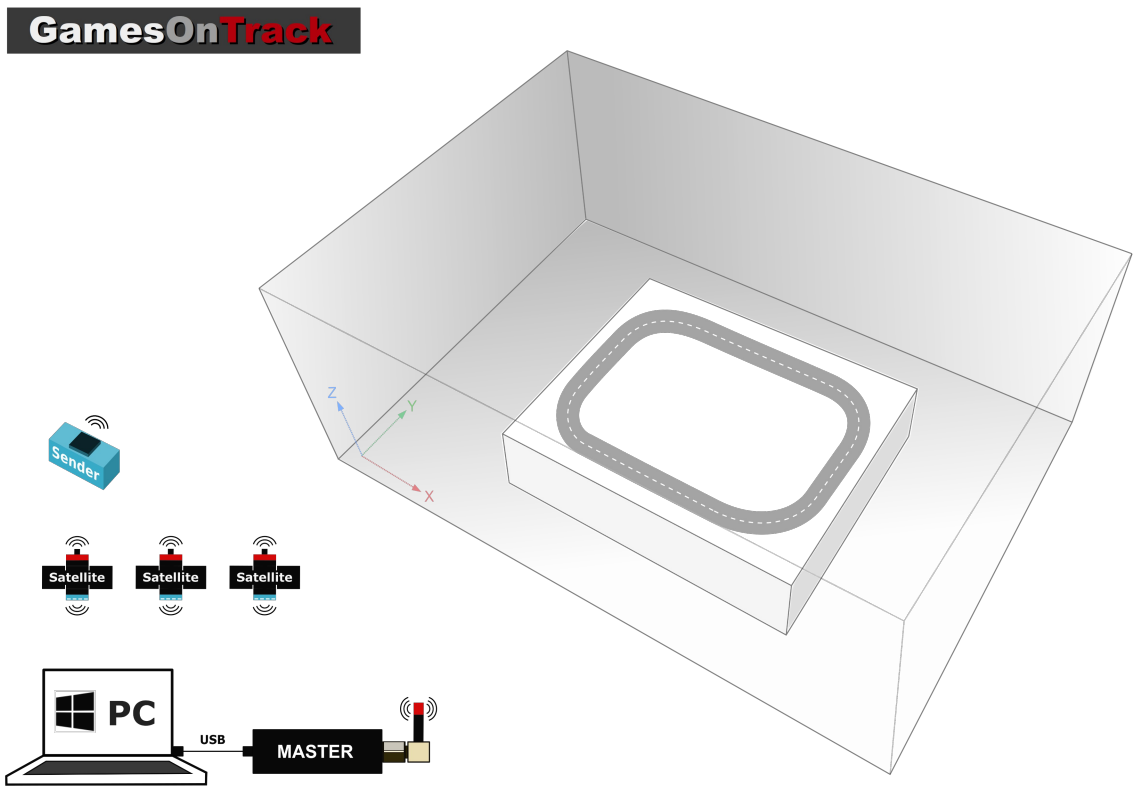



*Figure 9.1.1: 1 Sender, 3 satellites, 1 Master and 1 PC*

## 9.2 Indoor Positioning

The system in your hands is created by GamesOnTrack ® and is is a worldwide patented, real time 3D, Indoor Positioning System (hereafter: IPS) with an accuracy of 10 mm.

Technically the system is based on a combination of radio communication and ultrasonic signals. The math used to calculate the position of each device is based on Trilateration – a similar technology as seen in outdoor Global Positioning Systems like GPS.

### 9.2.1 The measurement of a position

Where GPS is using longitude and latitude measured in degrees for every calculated position, the IPS is using a Cartesian coordinate system with (X, Y, Z) measured in mm.

One of the first mandatory thing to do when creating a new system is to calibrate it.
The purpose of the calibration is to calculate and save the exact physical positions of the satellites, and then place these in the virtual world. From this calibration the distances measured from all vehicles to all satellites are calculated.

### 9.2.2 The Technical Concept

A position in 3D is calculated by using a PC, a Master, three satellites and a single transmitter.

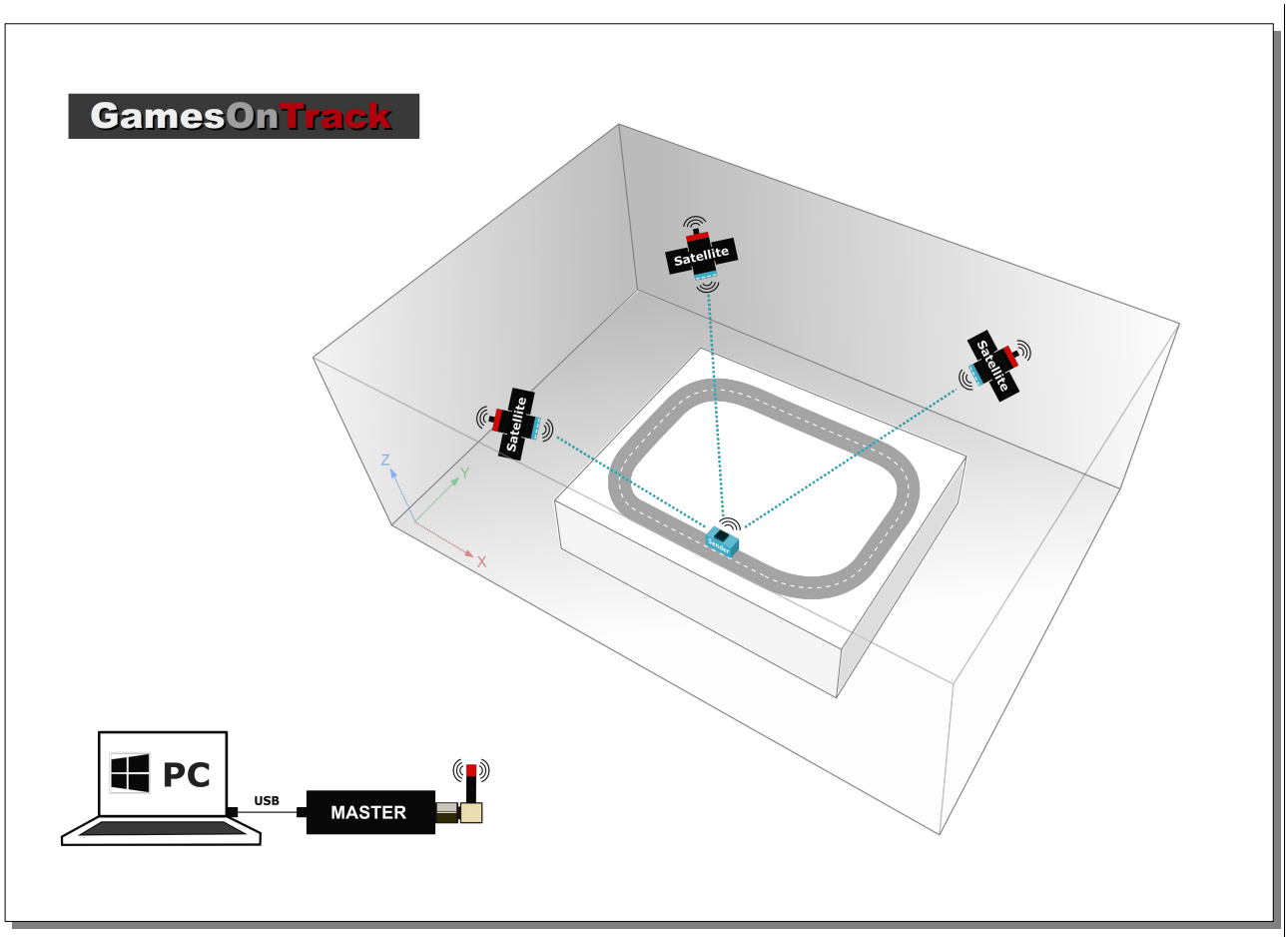



*Figure 9.2.1: Positioning*

At every 80 ms a message will be sent over the radio, asking only one single transmitter to burst out an ultrasound-signal. Each of the three satellites is now receiving the ultrasound-

burst at individual time-stamps depending how far they are placed relative to the transmitter. By using a timing-mechanism, we can now calculate the distance from each satellite to the transmitter. When the Master has received the distances from all satellites, they are sent via USB into the PC in a single package. The application is now able to calculate the exact position of this transmitter with the very high precision of 10 mm. When the position is calculated, the position of another transmitter can now be calculated the exact same way.

When adding multiple transmitters to the system, we have to wait at least 80 ms for **every** transmitter, before we can calculate the position of the first one again. Let's name this value the 'frame period'. Every transmitter spends 80 ms calculating a position. This period is a combination of several things: The speed of the ultrasound, the maximum distance guaranteed, the number of satellites and transmitters - and the processing time.
So, even if we wanted, it's hard to get far below the 80 ms frame period for each transmitter.
The speed of ultrasound is ~ 340 m/s. This is a travel distance of ~ 10 meters per 30 ms.
In the system we guarantee an absolute maximum distance of 12-15 meters between a transmitter and a satellite. This implies that all satellites must be 'open' and waiting for ultrasound in 45 ms. The value of 45 ms is fixed in order to guarantee this distance.
When the time is up – each satellite will process and send the distance received to the Master, and finally the PC can now calculate the position. All these parts will take up the last 35 ms – resulting in the total of 80 ms.

Here is an example with three transmitters A, B and C. The time between a calculated position for the exact same transmitter is: 3 x 80 ms = 240 ms. We could name this the '*loop time' or 'round trip'* for a transmitter. Now, take a look at transmitter A in the table here below:

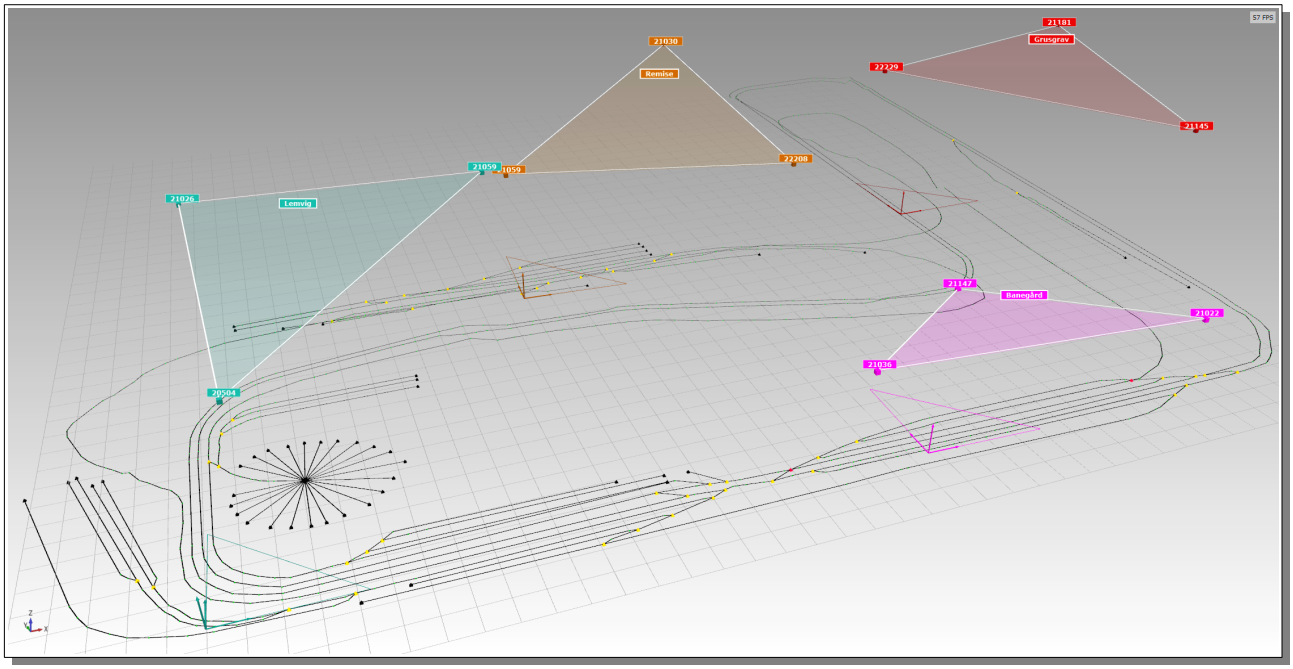
| A | B | C | A | B | C | A | B | ... | ... |
|---|---|---|---|---|---|---|---|---|---|
| 80 ms | 80 ms | 80 ms | 80 ms | 80 ms | 80 ms | 80 ms | 80 ms | ... | ... |

Imagine transmitter A is moving on the layout, and have we just calculated the position.
From this point in time, we do not know the real position of a transmitter A before both transmitter B, C and also A are calculated once more – which is after the 240 ms.
To get the position of transmitter A in the whole round trip period, we are predicting the position by knowing how fast it's moving combined with the time elapsed in each frame period.
In order to predict this with a high accuracy, the transmitter (vehicle) must be calibrated, which is a very important aspect.

**NOTICE**

- The frame period of 80 ms can be achieved by having a very low number of devices in the system. When adding many devices, this value will increase - 100 ms is quite normal. Check this by increasing the number of devices in the Menu→Master→Settings.
- When adding multiple transmitters to the system, the *round trip for each transmitter will increase relative to the number of transmitters.*
- The calibration of each vehicle is very important in general, but therefore extremely important on layouts with a high number of transmitters and satellites. As you can imagine, a layout with e.g. 30 vehicles and a frame rate of 100 ms will result in a round trip for each transmitter to be 30 x 100 ms = 3000 ms = 3 seconds.
  *In this whole period we have to predict the position for each vehicle in the system.*

## 9.3 Scenarios




**Scenario:** A scenario is an area of your layout – or your total layout – which are measured by a set of two or more satellites with known coordinates. The coordinates are found by means of the calibration triangle. Up to 6 satellites can be contained in a scenario. There can be more scenarios in a room. A minimum of 2 satellites is required to constitute a 2D scenario.
A minimum of 3 satellites is required to constitute a 3D scenario.

**Connected scenarios**: One scenario is selected to be main scenario. All positions in the other scenarios are added extra values, so that instead of being local coordinates, they now fit in the coordinate system of the main scenario. Due to the fact that all scenarios are born with their own 0 point, this corresponds to shifting the 0 points of the scenarios in relation to the main scenario.

## 9.4 Add Scenarios

The first scenario in the system will be the MAIN scenario, located at origo: **(X, Y, Y = 0, 0, 0)**

**NOTE**

- Every added scenario must be offset to the MAIN scenario – this is important!

## 9.5 Create a 3D Scenario

By following the next pages you'll be guided through a set up of a 3D scenario.

The purpose of this process is to create a coordinate system on your layout, as a reference for all measurements, and then insert the 3D satellites in that coordinate system. We have named this process [Calibration]. To create a 3D scenario select Menu: [World → Show Scenarios].

In a 3D scenario, the satellites can be placed anywhere above or outside the layout, and the 3D scenario also measures the height (the Z-value). It means that hills and bridges are projected correctly on the layout drawing.

You can have more scenarios. Our recommendation is to use a 3D scenario as the first scenario (main) above the layout. If you have fiddle yards, these should be added as 2D scenarios.

The distance between the satellites in 3D should in general be between 1-2 meters and the satellites should be placed 1-3 meters above the layout.

The 3 satellites constitutes a triangle. They have to be placed so there is no angle in that triangle less than 20°. Otherwise the software can not calculate the positions precise.

When you set up your satellites, please think about that the best measurements will be provided if the signal strength from vehicle to satellite is in the same range. In general it is a good idea not to spread out the satellites but collect them and orient them towards the layout and at a place so that you can operate normally without staying in between the vehicles and the satellites. If you have areas on your layout (apart from tunnels) where your vehicles only see two satellites and see a 3rd one badly, then you might want to add a 4th satellite.


| | Item | Description |
|---|---|---|
| 1 | **Select Scenario** | Mouse double-click or press [Enter] to select a scenario in this list |
| 2 | **Add** | Add new scenario |
| 3 | **Edit** | Edit selected scenario |
| 4 | **Delete** | Delete selected scenario |
| 5 | **Merge** | Opens up a special 3D-view where scenarios can be merged (translated and rotated) |

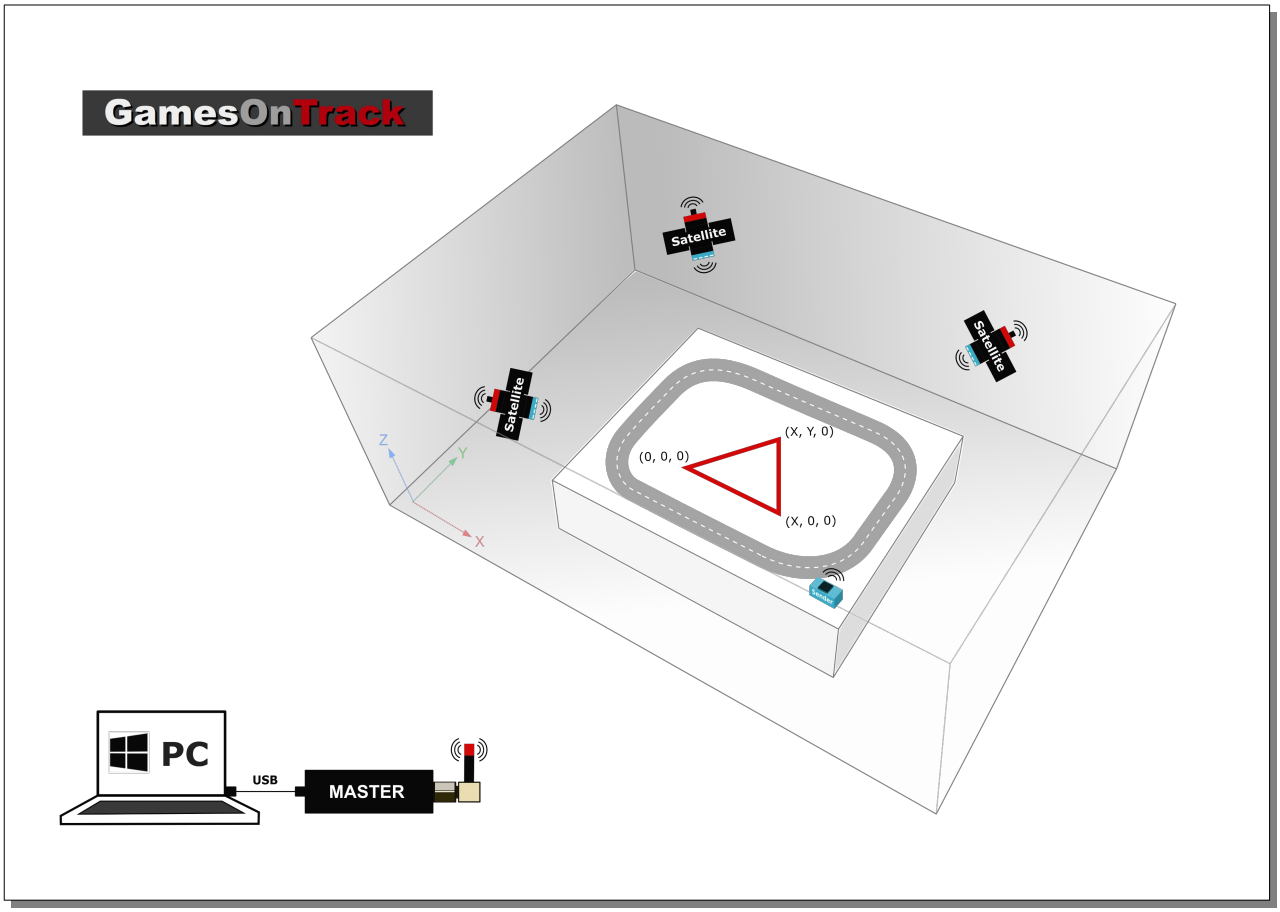
## 9.5.1 Manual Calibration

The following four pages are mandatory steps to do a manual calibration.

### 9.5.1.1 The Calibration Triangle

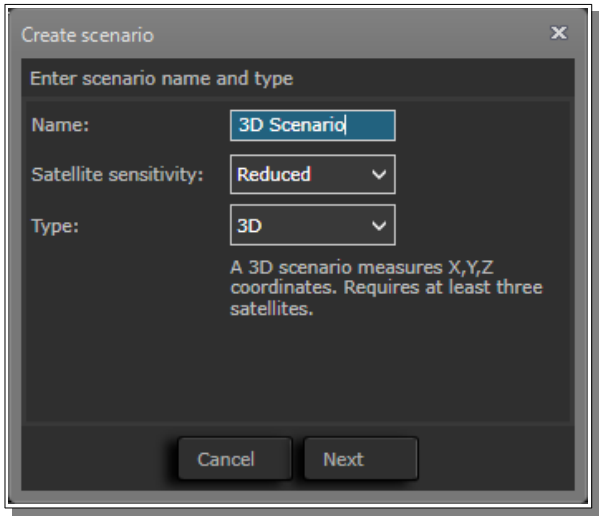
The Calibration Triangle is a triangle which you draw on your layout, and of which you measure the three side lengths. These three points are applied for calculation of the satellite positions. The base line of the calibration triangle is your X-axis in your coordination system and the plan of the triangle is your basic plan.

On your table you should mark three points with a pencil that forms a triangle, or use a fixed triangle to be placed on your table. The length of sides in the triangle have to be between 400 mm and 2000 mm. Please use the three same points every time you re-calibrate the system – otherwise you will see some 'incorrect' positions of the vehicles in the UI related to your existing track layout. In that case you can just move the main scenario until the positions 'fit' on your track, but this process can take some time if you cannot remember the exact positions from your calibration and creation of your layout.




**ACTION**

- Click the button Add in the [Show → Show Scenarios] dialog
- Follow the dialogs on the following pages.



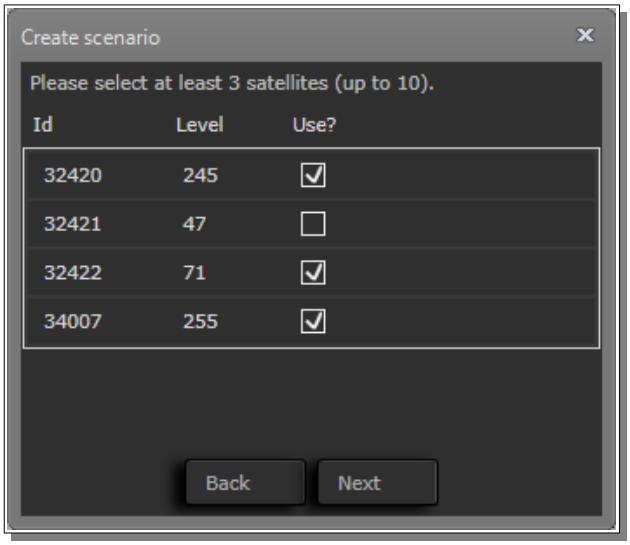

**ACTION**

- Enter a name for the scenario
- Select the default Satellite Sensitivity: Reduced.
- Press button [Next]

**TIP**

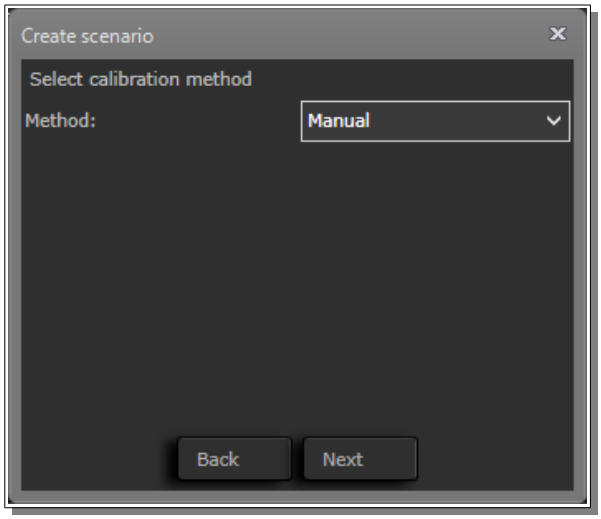
**Satellite Sensitivity:**

- **Reduced**: Use this value when the distance from transmitters to satellites is in the range of 1-6 meters.
- **Normal:** Use this value - when the distance from transmitters to satellites is in the range of 6-12 meters, or - if the small squared transmitters are used, which has a maximum distance of 5 meters.
- **IMPORTANT:** When troubleshooting, just start with the lowest possible levels for all transducers (both transmitters and satellites) and do the necessary step up in levels until the received measurements and the calculated positions are stable.



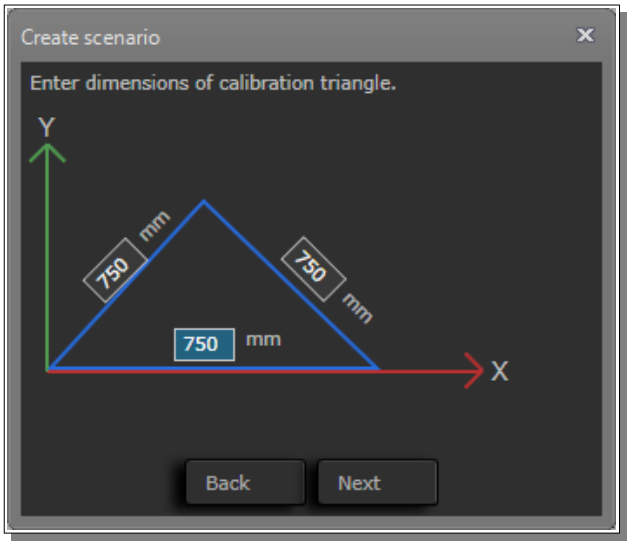

**ACTION**

- Select the three satellites
- Press button [Next]
- Press button Back to go back to the previous screen. This button exist in the next steps.



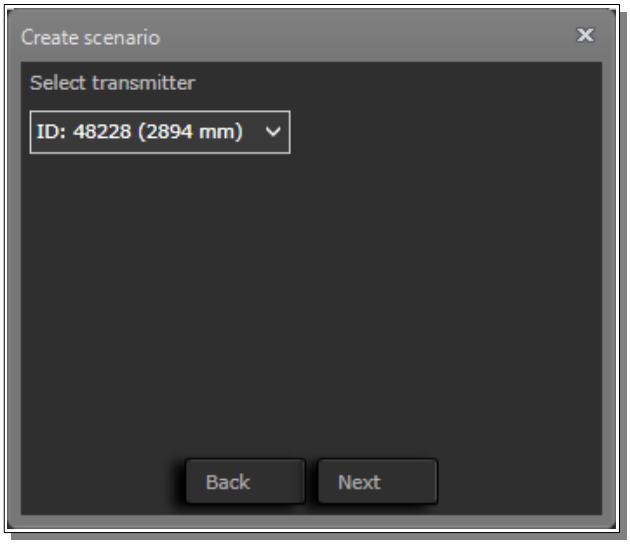

**ACTION**

- Select the default Calibration Method: Manual.
- Press button [Next]



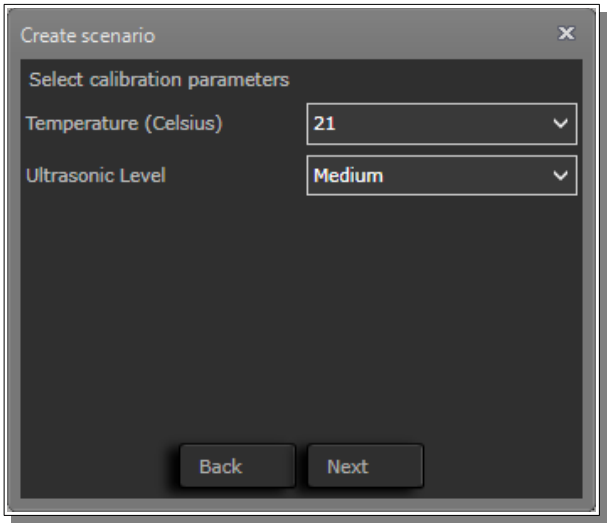

**ACTION**

- Enter the dimensions for each side in the triangle. Dimensions have to be between 400 mm and 2000 mm.
- Press button [Next]




**ACTION**

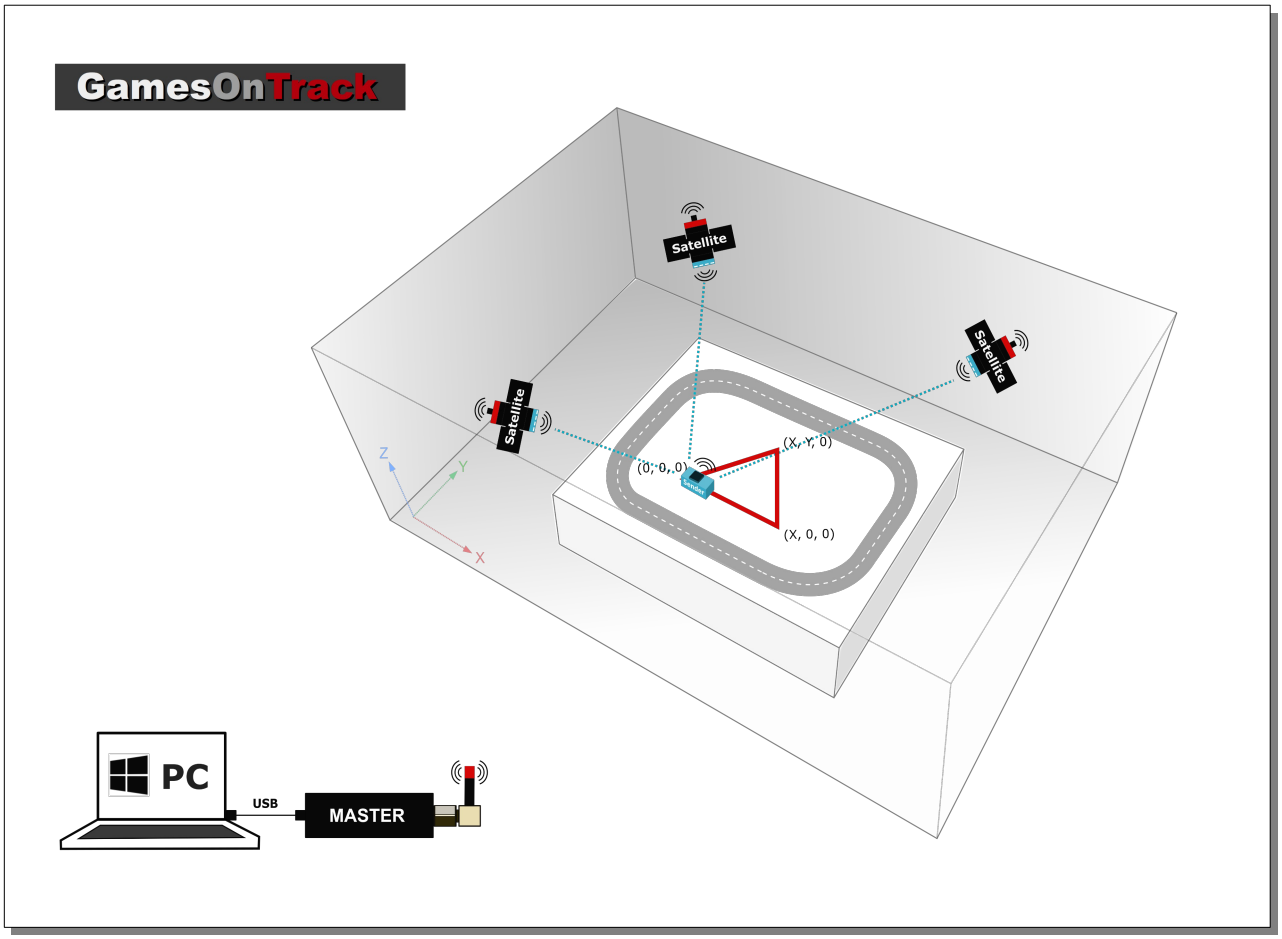
- Select the transmitter.
- Press button [Next]

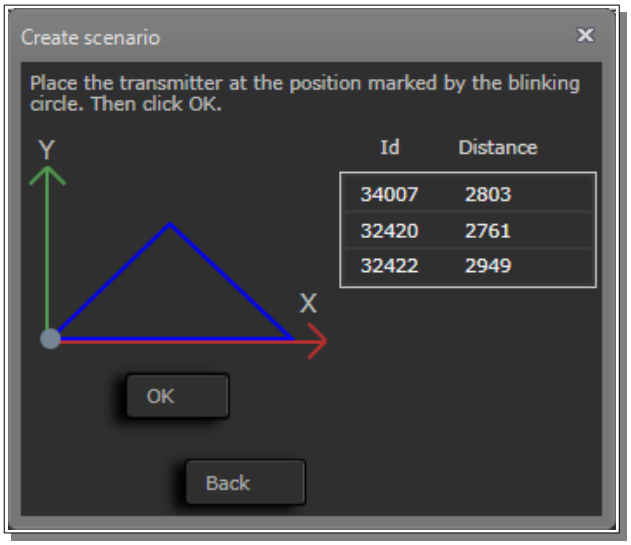



**ACTION**

- Measure the temperature.
- Select the measured value.
- Set the Ultrasonic Level
  **NOTE:** Medium is default.
- Press button [Next]

## 9.5.1.2 Place the Transmitter at Position 1



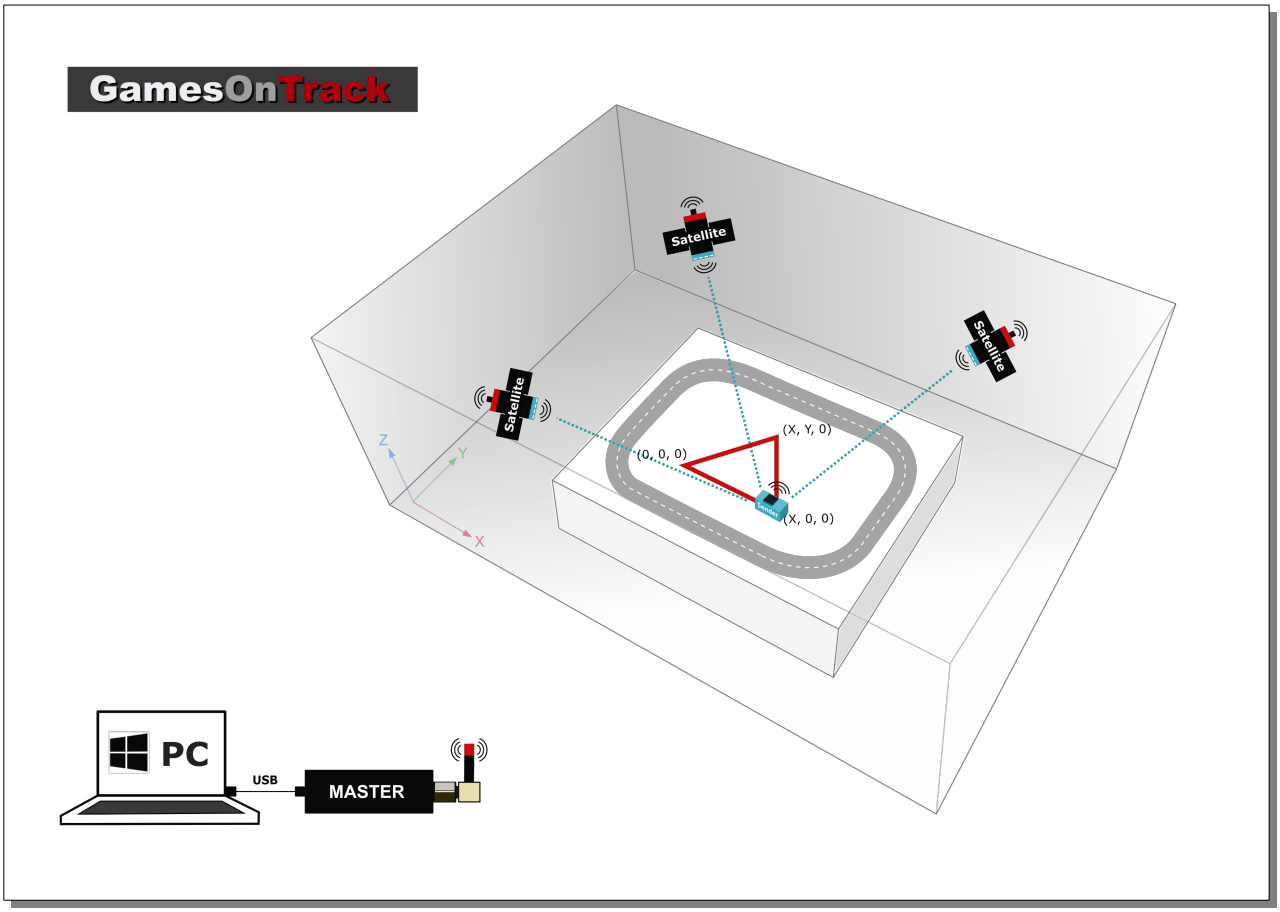



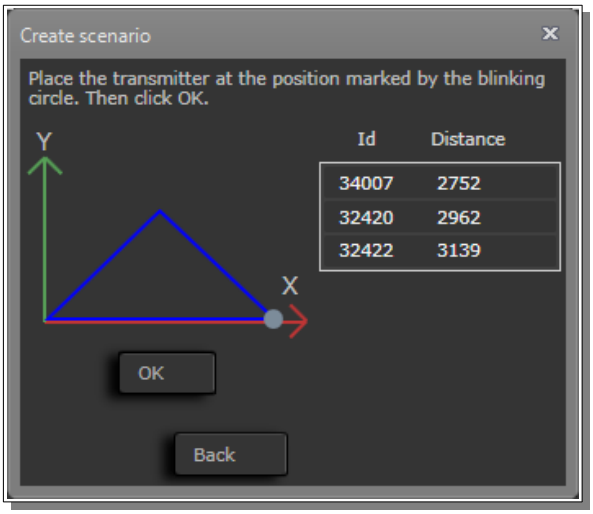

**ACTION**

- Place the transmitter in position (0, 0, 0) of the triangle.
- **Wait until all values in the Distance column are stable: ~ Max jumps of 2-4 mm.**
- Press button [OK]

**NOTE:** The button [OK] can have a blue border (disabled). This happens if the current measured distances are too close to the previous position.

## 9.5.1.3 Place the Transmitter at Position 2



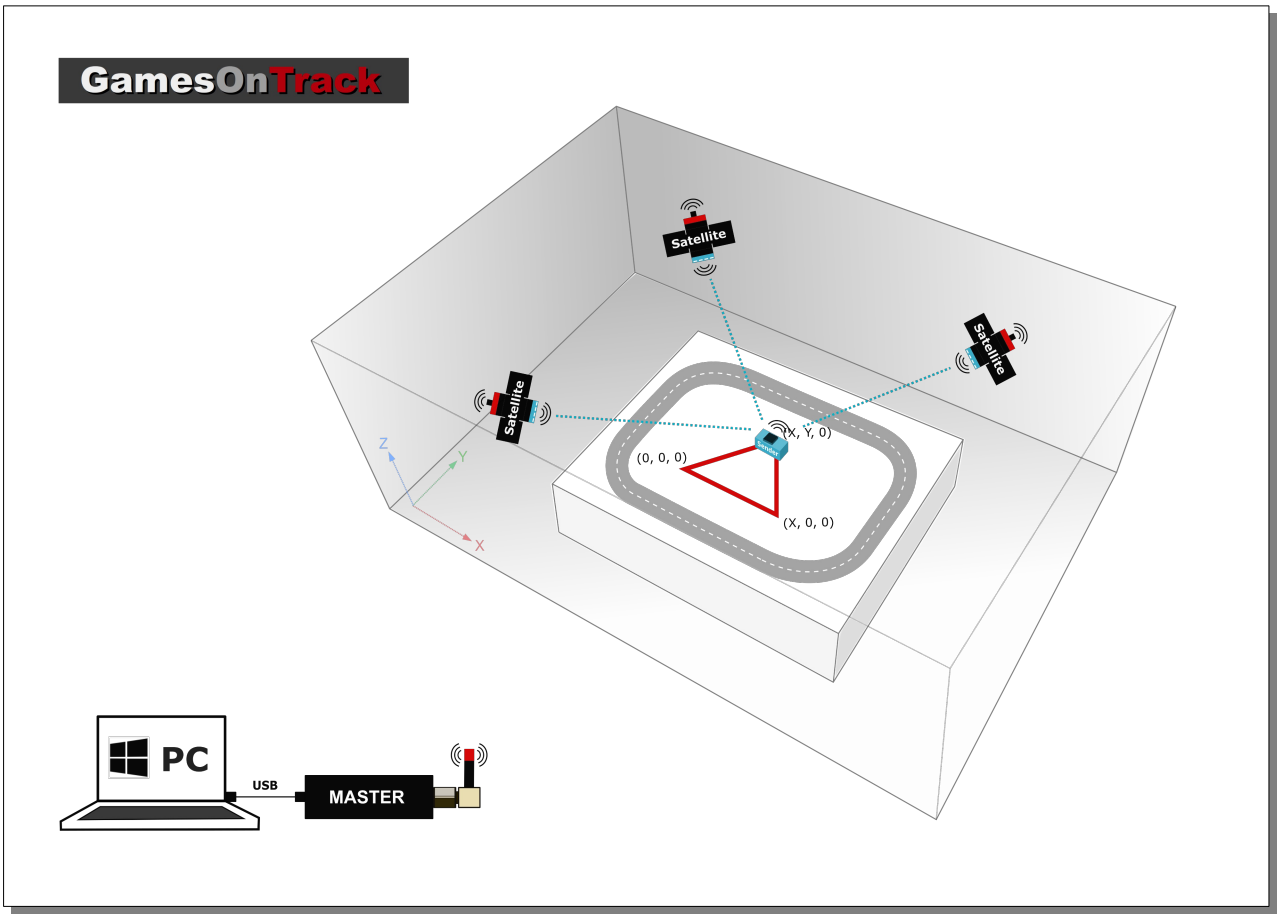



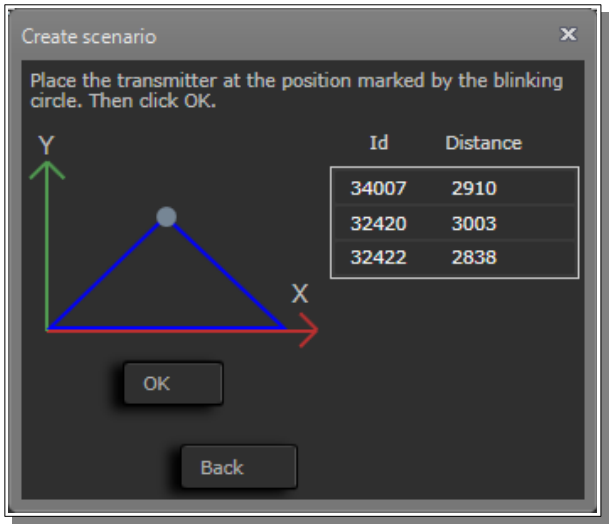

**ACTION**

- Place the transmitter in position (X, 0, 0) of the triangle.
- **Wait until all values in the Distance column are stable: ~ Max jumps of 2-4 mm.**
- Press button [OK]

  **NOTE:** The button [OK] can have a blue border (disabled). This happens if the current measured distances are too close to the previous position.

## 9.5.1.4 Place the Transmitter at Position 3



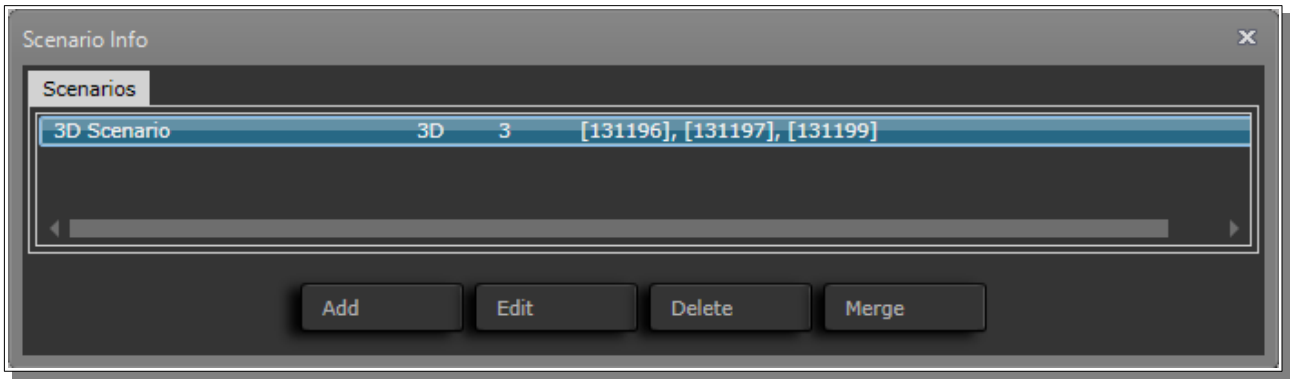




**ACTION**

- Place the transmitter in position (X, Y, 0) of the triangle.
- **Wait until all values in the Distance column are stable: ~ Max jumps of 2-4 mm.**
- Press button [OK]

  **NOTE:** The button [OK] can have a blue border (disabled). This happens if the current measured distances are too close to the previous position.

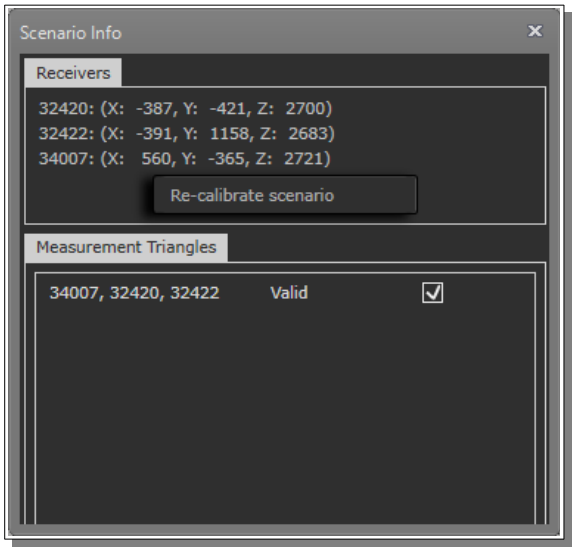
**The scenario is now created!**




## 9.5.1.5 Validate the created scenario

In order to evaluate the quality of the just created scenario, click the button [Edit] in the Scenario Info dialog. The information for the selected scenario is displayed.
Please notice the part [Measurements Triangles]. In our case we have a scenario with 3 satellites, that only creates a single triangle, and since our angles and distances are fine, it states Valid and is set enabled.

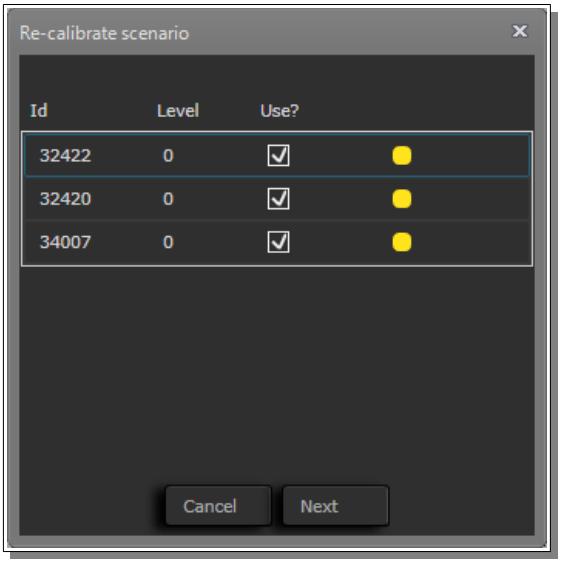
When you add more satellites to a system, the number of triangles will increase, and you'll see a list of lines here. Triangles in this list that cannot be used e.g. due to some of these are placed too close or have a too narrow angle, these will be set to **Invalid** and disabled.

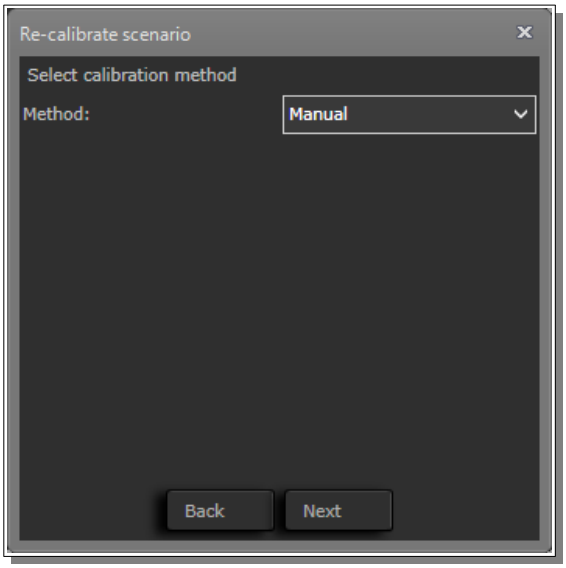


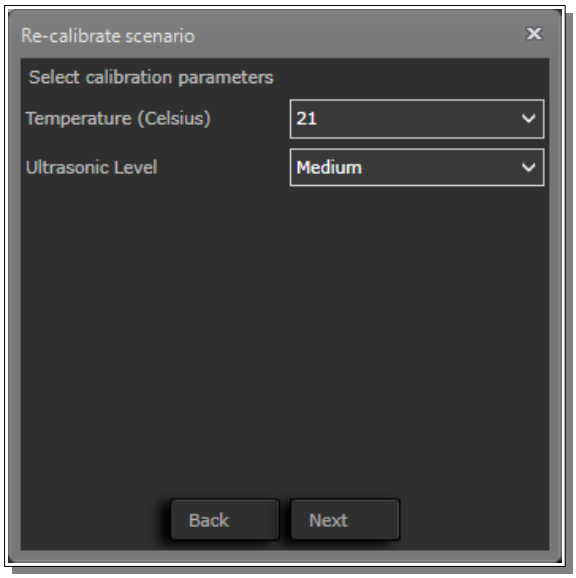

## 9.5.1.6 Re-calibrate a 3D Scenario

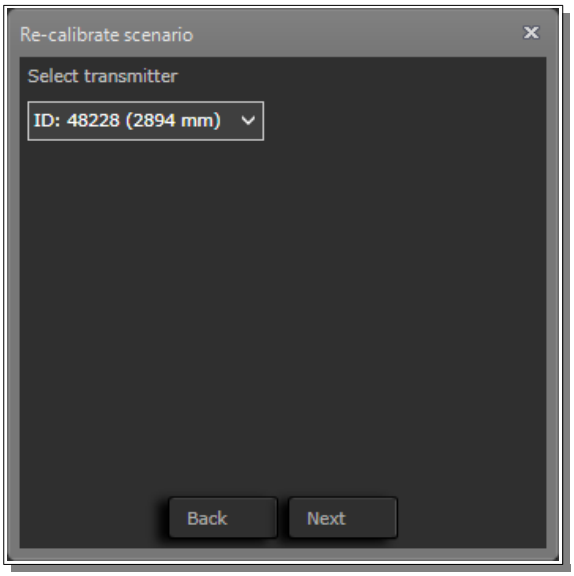
In the same dialog just shown it's possible to re-calibrate a scenario by clicking the button [Re-calibrate scenario]. This will guide you through a set of steps almost similar to creating a new scenario. Previous used settings are pre-selected. The steps are shown on the next pages:

## Re-Calibrate Scenario

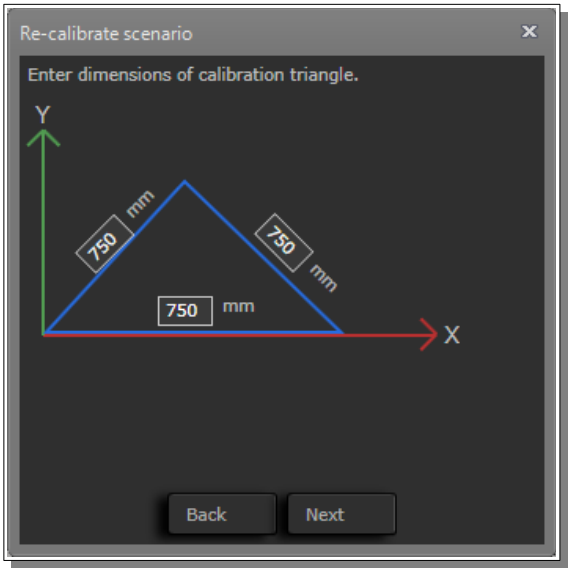


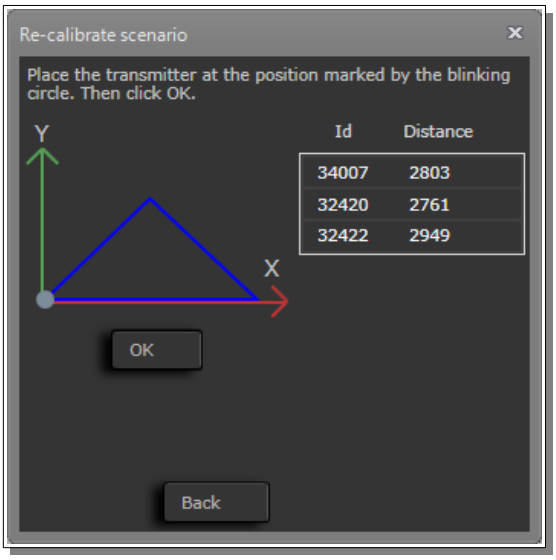



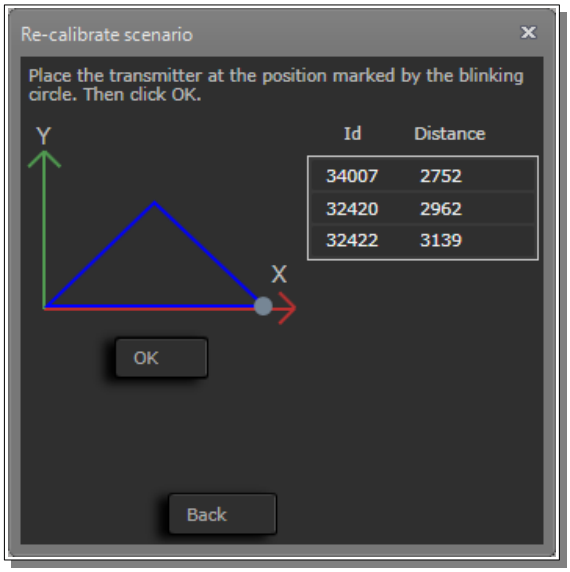



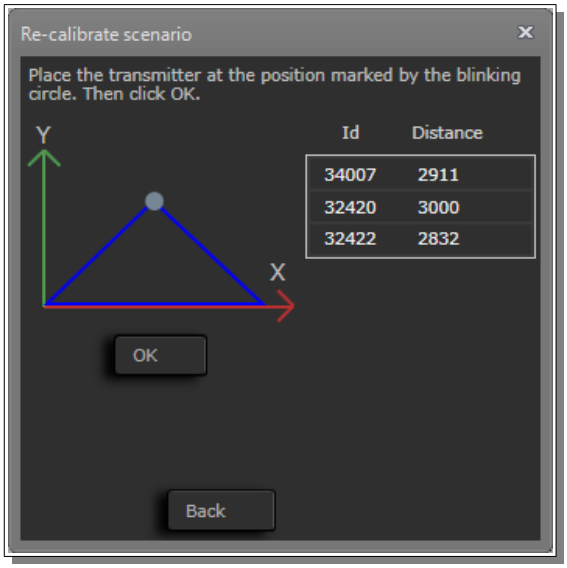



## Re-Calibrate Scenario



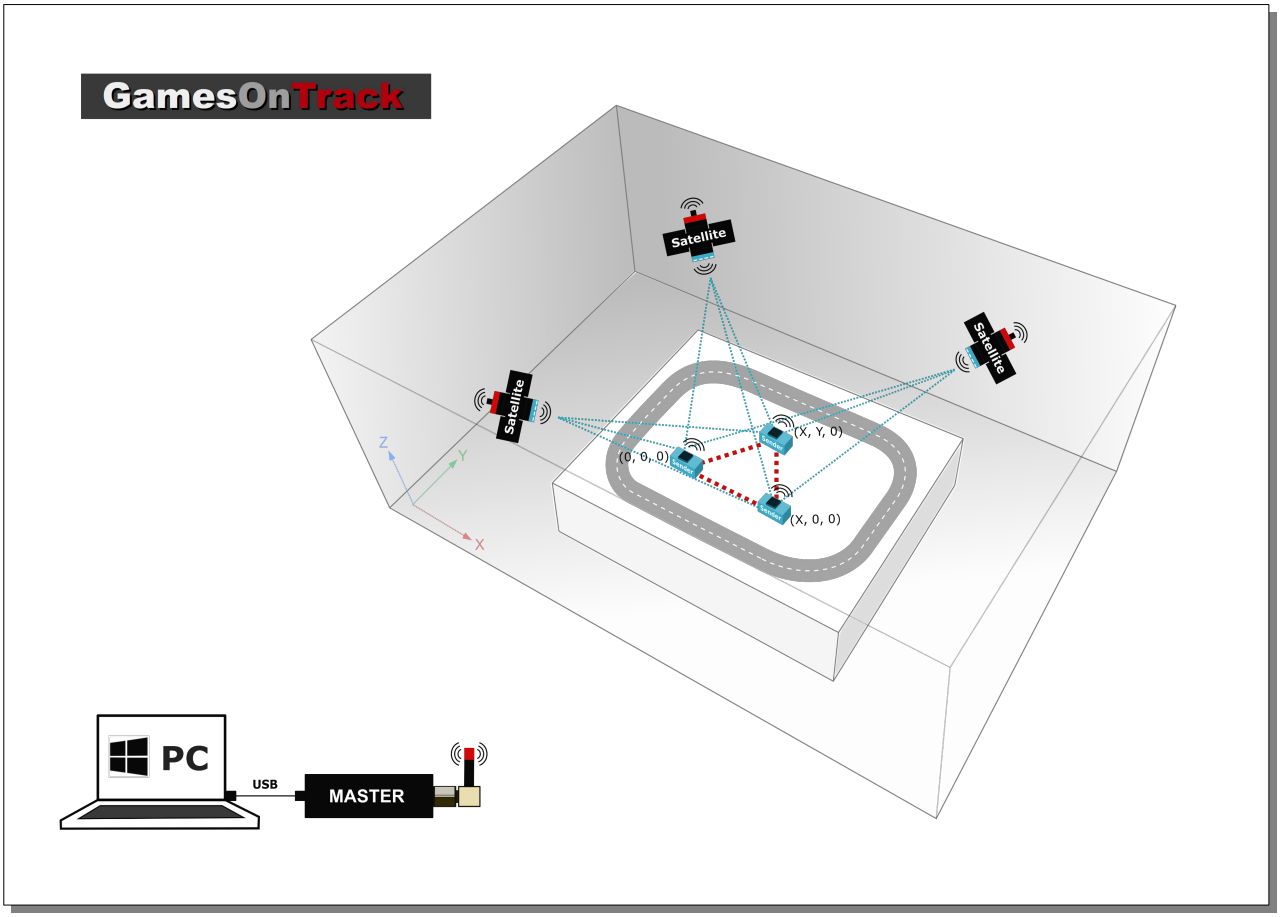



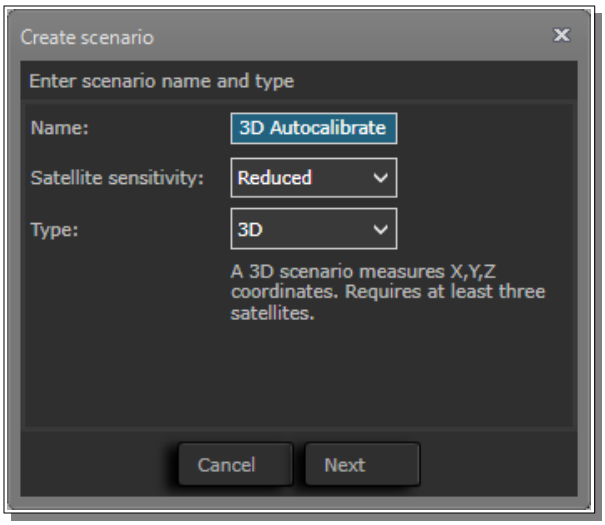



## 9.5.2 Auto Calibration

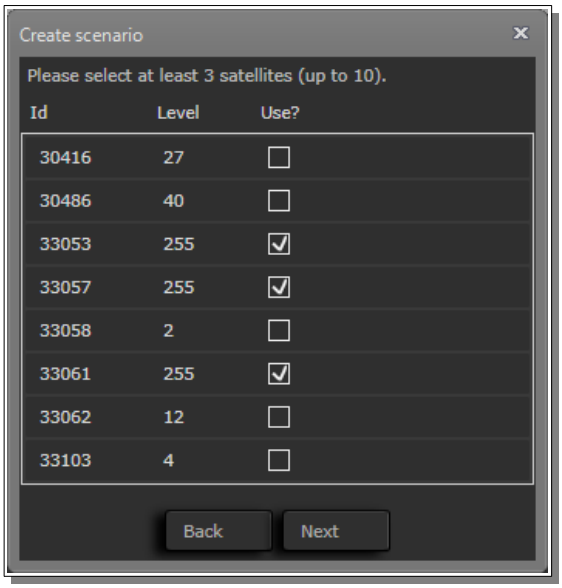
The auto-calibration requires three transmitters to be placed in each corner of the triangle. When the transmitters are placed the calibration will take place in one single process.



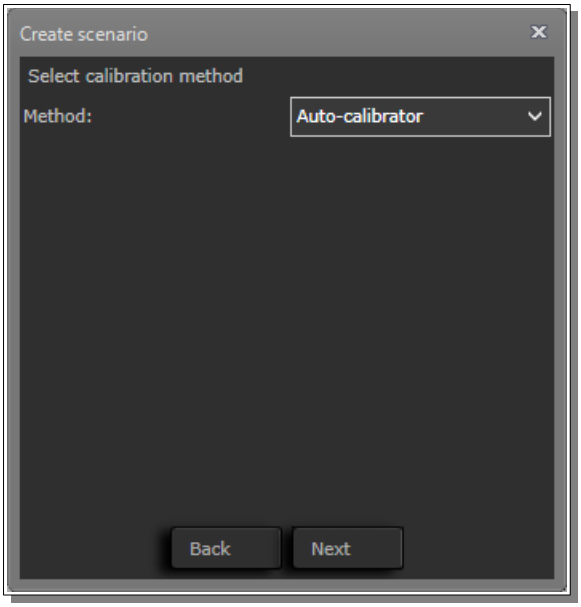

**ACTION**

- Name the scenario
- Select Satellite sensitivity NOTE: Default is Reduced
- Select Type 3D
- Press button [Next]



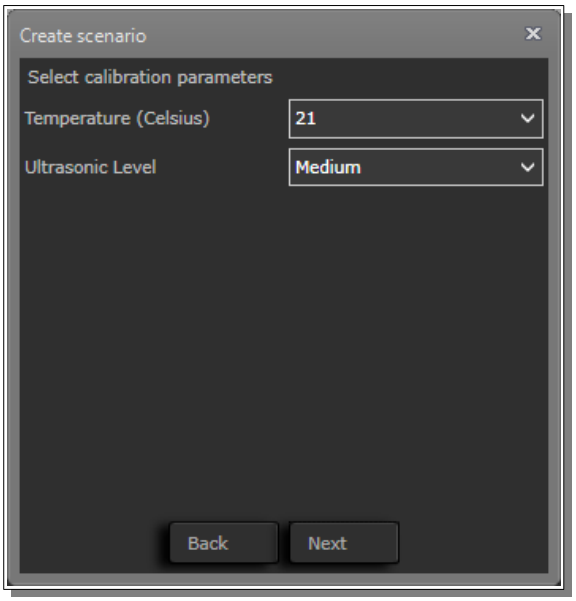

**ACTION**

- Select **3 satellites** (in this example)
- Press button [Next]



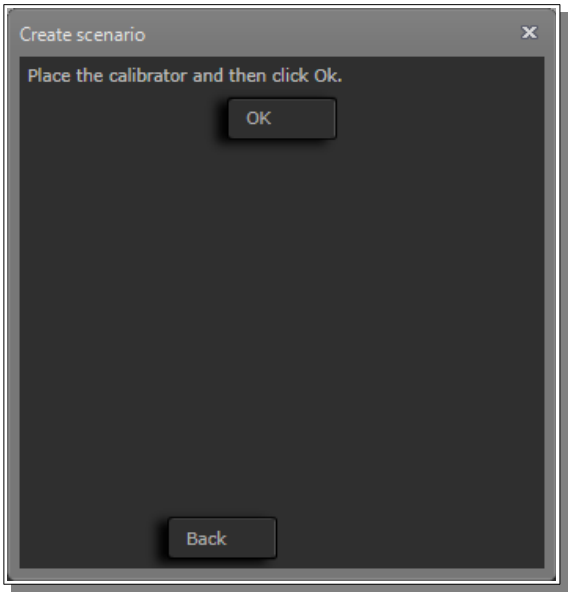

**ACTION**

- Select Method **Auto-calibrator**
- Press button [Next]



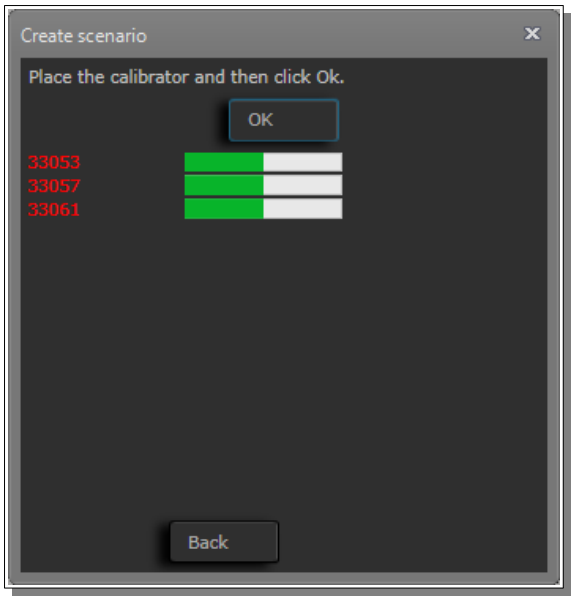

**ACTION**

- Measure the temperature.
- Select the measured value.
- Set the Ultrasonic Level
  **NOTE:** Default is Medium
- Press button [Next]




**ACTION**

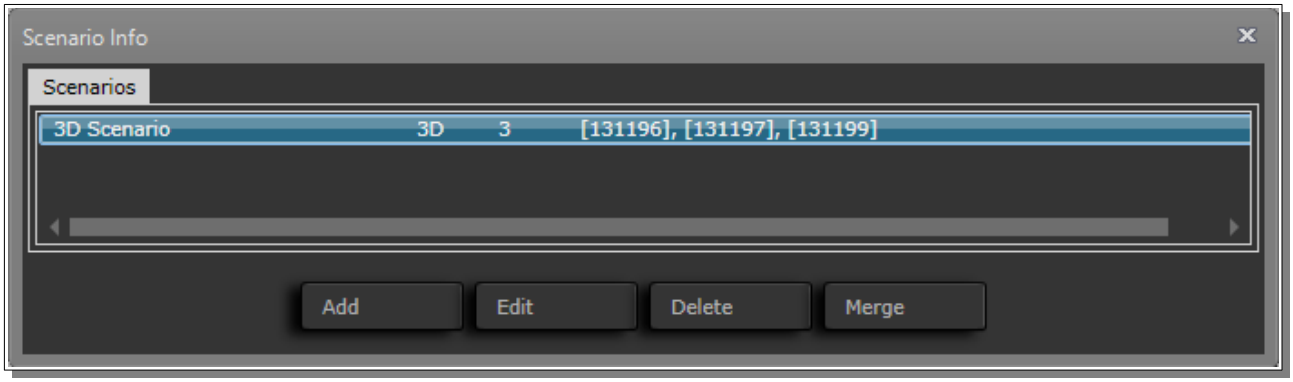
- Place the calibrator (3 transmitters)
- Press button [OK]




**ACTION**

- Wait until all progress bars for each satellite turns fully green.
- When complete the dialog closes.

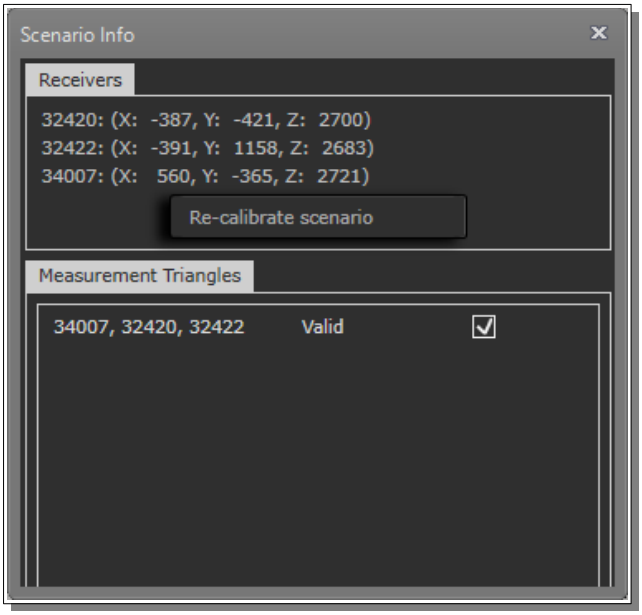
**Auto-calibration Complete**



## 9.5.3 Validate the created scenario

In order to evaluate the quality of the just created scenario, click the button [Edit] in the Scenario Info dialog. The information for the selected scenario is displayed.
Please notice the part [Measurements Triangles]. In our case we have a scenario with 3 satellites, that only creates a single triangle, and since our angles and distances are fine, it states Valid and is set enabled.

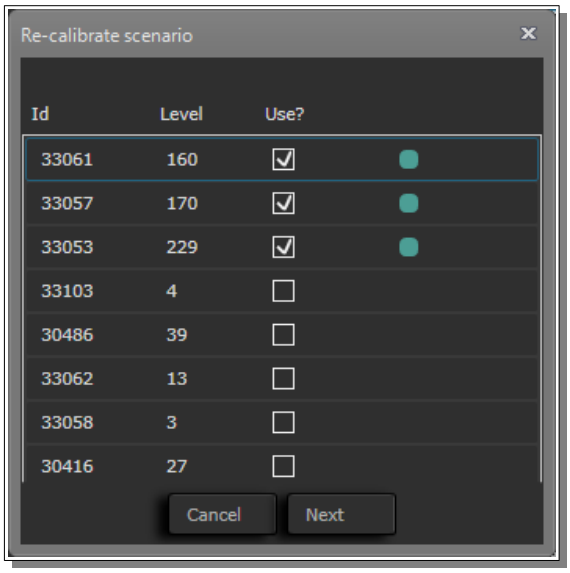
When you add more satellites to a system, the number of triangles will increase, and you'll see a list of lines here. Triangles in this list that cannot be used e.g. due to some of these are placed too close or have a too narrow angle, these will be set to **Invalid** and disabled.

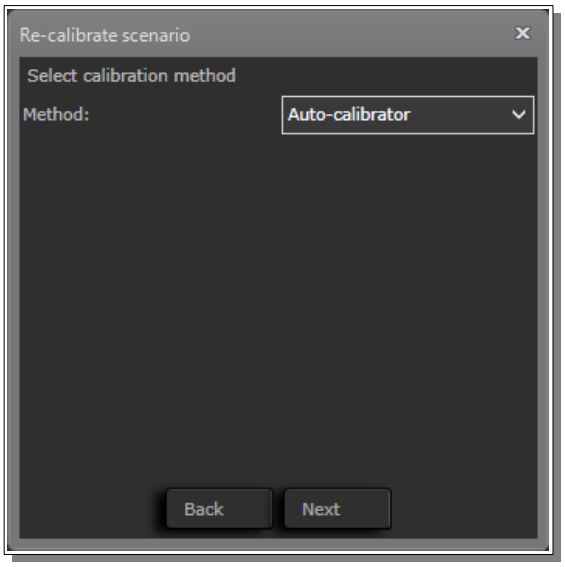


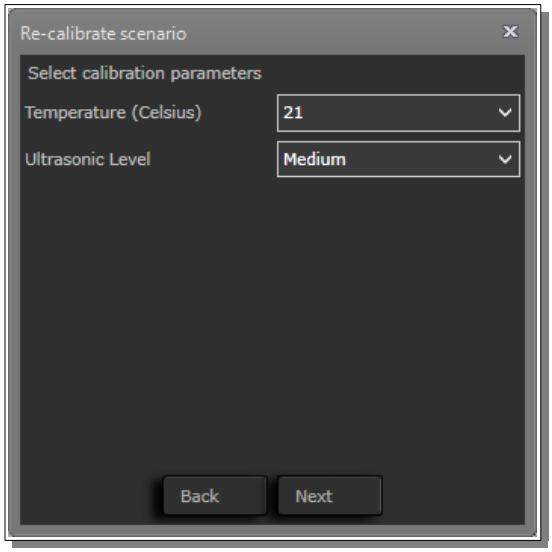

## 9.5.4 Re-calibrate a 3D Scenario

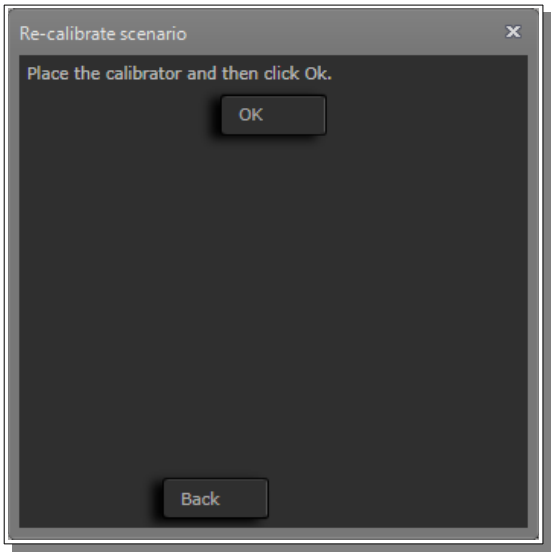
In the same dialog just shown it's possible to re-calibrate a scenario by clicking the button [Re-calibrate scenario]. This will guide you through a set of steps almost similar to creating a new scenario. Previous used settings are pre-selected. The steps are shown on the next pages:

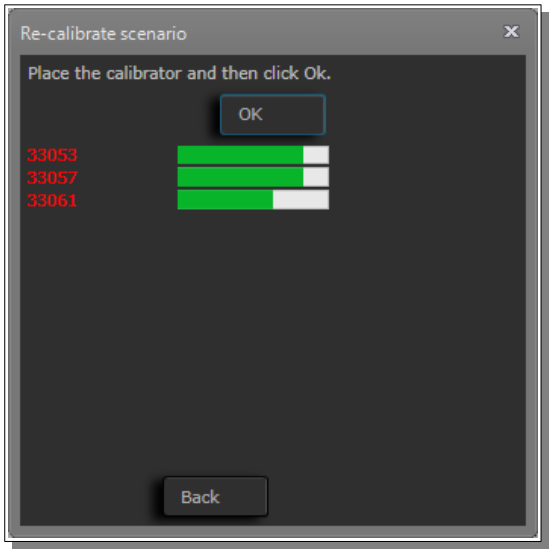
## Re-Calibrate Scenario



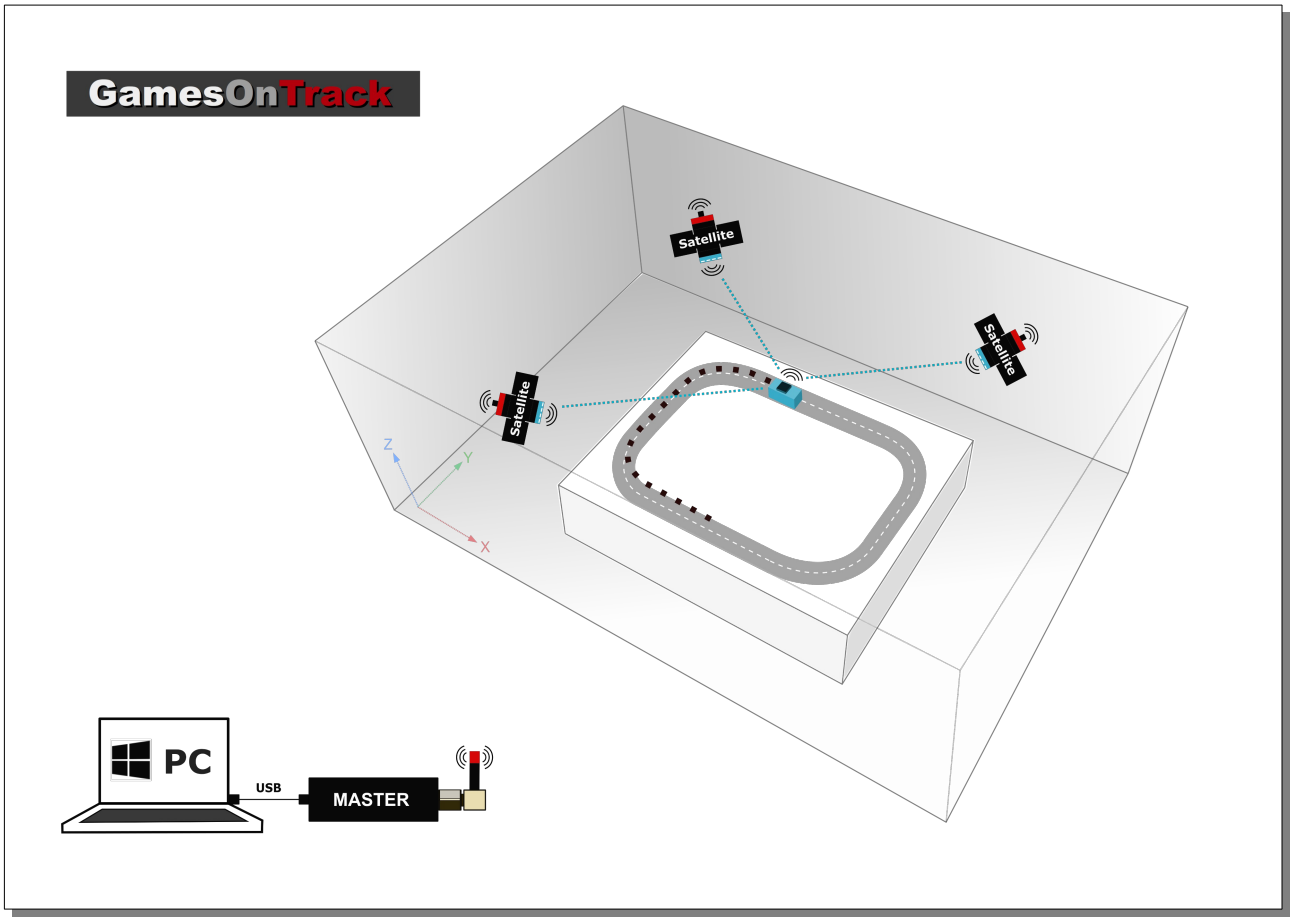



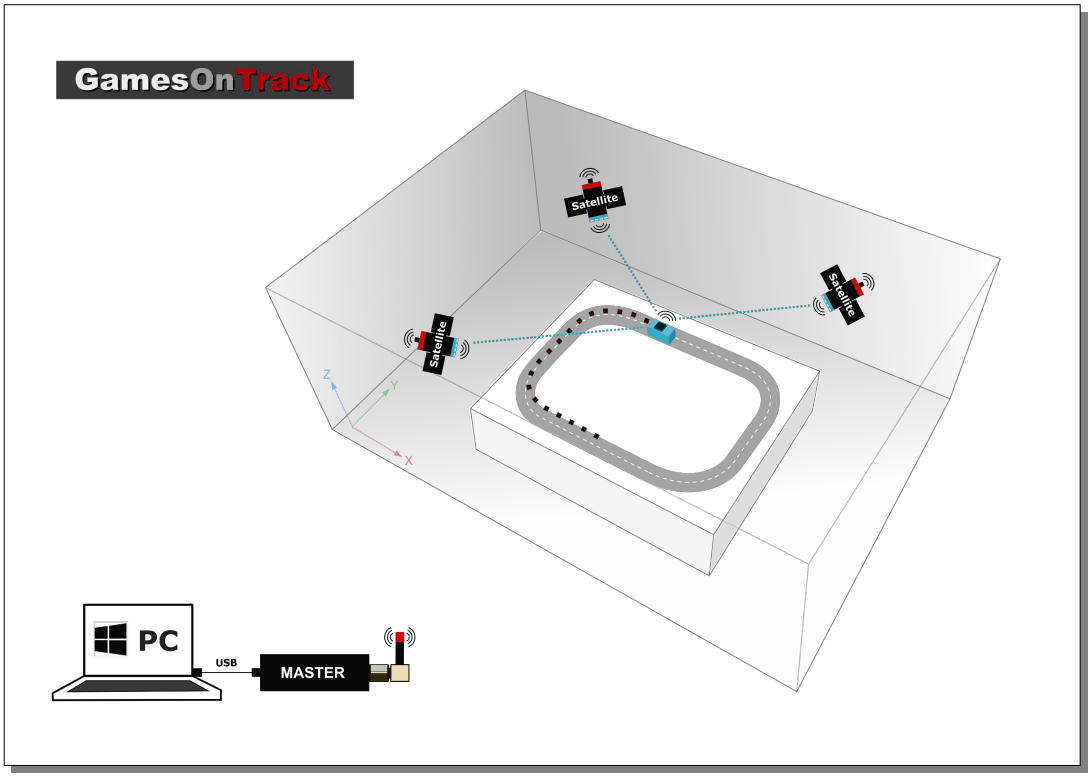
## 9.6 Recording a Layout in 3D View

In order to record a layout a vehicle must be used to drive on the physical layout. A vehicle with a sender will automatically show up in the vehicles view, and can be used for recording. The movement of the vehicle will be recorded and shown as points and lines forming a layout.




- Click the Menu: [World → Show Track 3D]
- In the panel select a Vehicle (with a transmitter/sender).
- Now set the speed of the selected vehicle in the Vehicle View.
- Setting a slow speed will result in a layout with points being very close to each other.
- Click the button [Start Recording]
- When complete click the same button [Stop Recording]

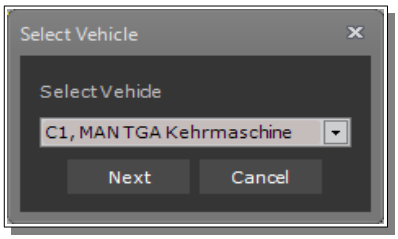
## 9.7 Recording a Layout in 2D View





**ACTION**

- Open the 2D Track View and click on the Edit button to the left – third from the top.
- Turn on the [record track] button and a selection window will open.




**ACTION**

- Select a vehicle equipped with a transmitter in the selection window.
- Set the speed for the vehicle in Menu → View → Show Vehicles
- A slow speed results in many points that are too close to each other.


**ACTION**

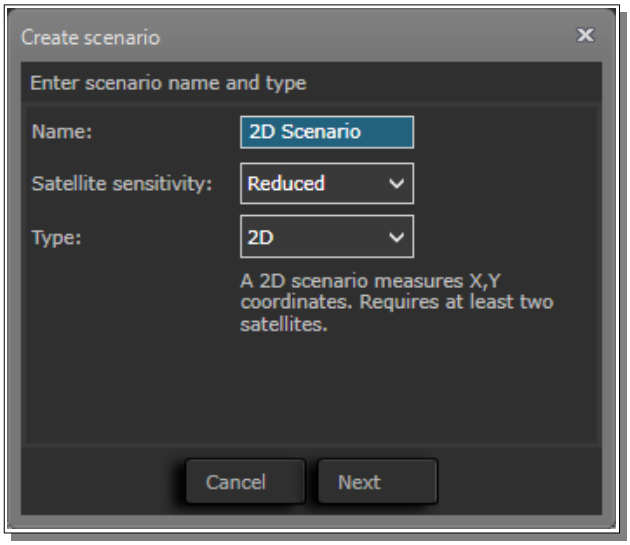
- Turn off the [record track] button when the recording is finished, or at any time.

## 9.8 Create a 2D Scenario

The created scenarios can be found in the Menu: [World → Show Scenarios].

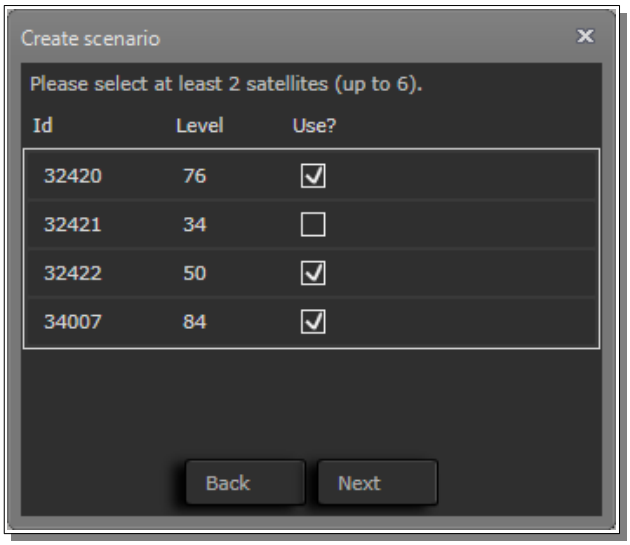
A scenario is an area of your layout – or your total layout – which are measured by a set of satellites. The minimum set is 2 satellites which will constitute a 2D scenario. 2D means that we only measure X and Y in a coordinate system, we do not measure the height. And it also means that the satellites must be placed minimum 500 mm outside the layout – that is not over the layout. If you have hills or bridges you can still use the 2D, however the drawing and the measurement will draw the distances on the hill to be closer to the satellites and thus creating a small bow on the road.

You set up your 2D scenario in a simple way: Open the menu [World → Show Scenarios] Click the button [Add] or [Edit], and follow the dialogs here below:




**ACTION**

- Edit Name
- Select Satellite Sensitivity
- Select 2D
- Press button [Next]

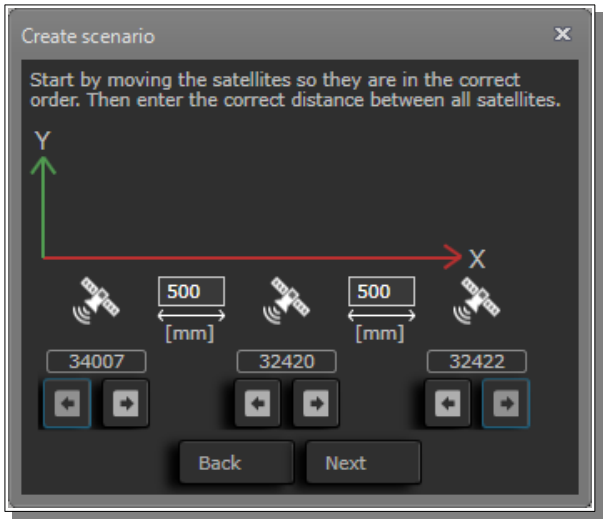



**ACTION**

- Select the satellites in the scenario.

  2D scenarios has a maximum of 6 satellites on one row, and they must all be placed at the same height (Z).

- Press button [Next]

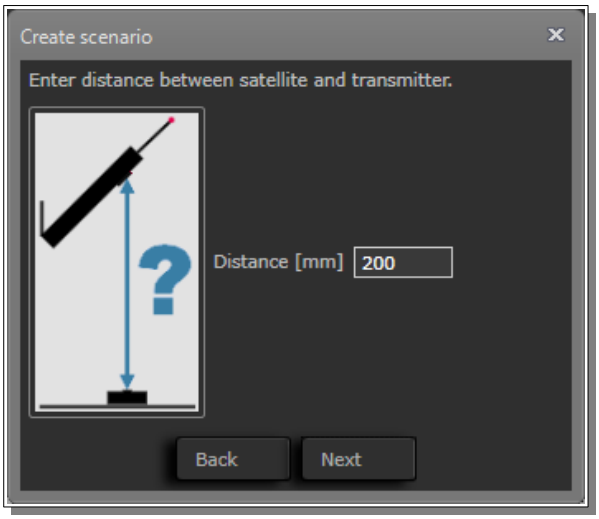



**ACTION**

- Decide the order of the satellites, from the left.

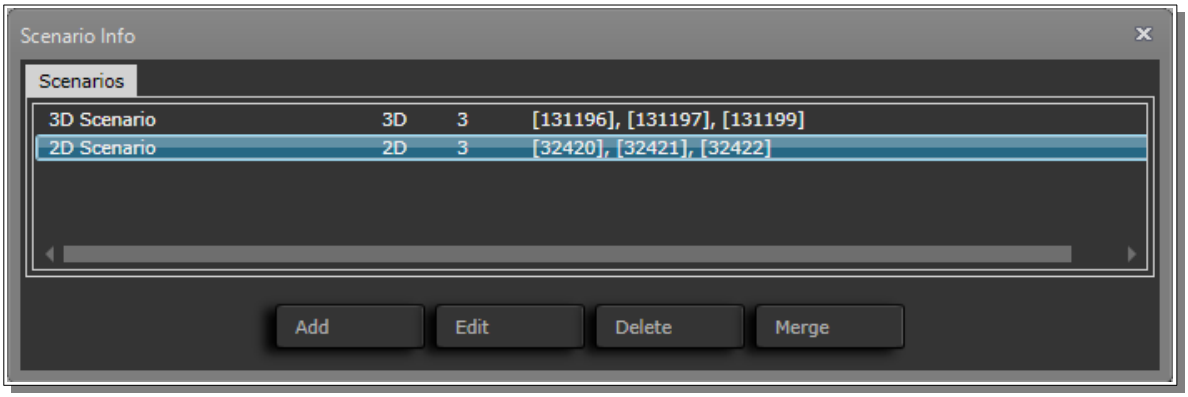
- Measure the distance between them in mm. The first one will be the 0-point for this 2D scenario, which in reality only measures x and y, but might be merged with other 3D scenarios and the get the height from the global 0-point.

- Press button [Next]



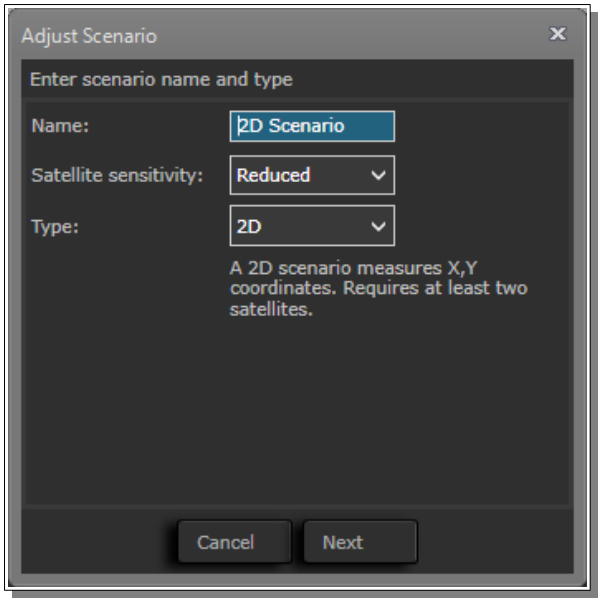

**ACTION**

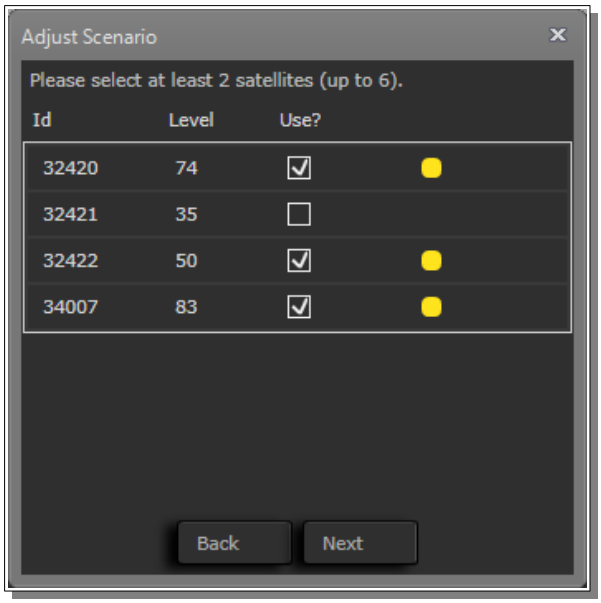
- Measure from satellite transducer to transmitter over layout in mm.
- Insert the measured height.
- Press button [Next]

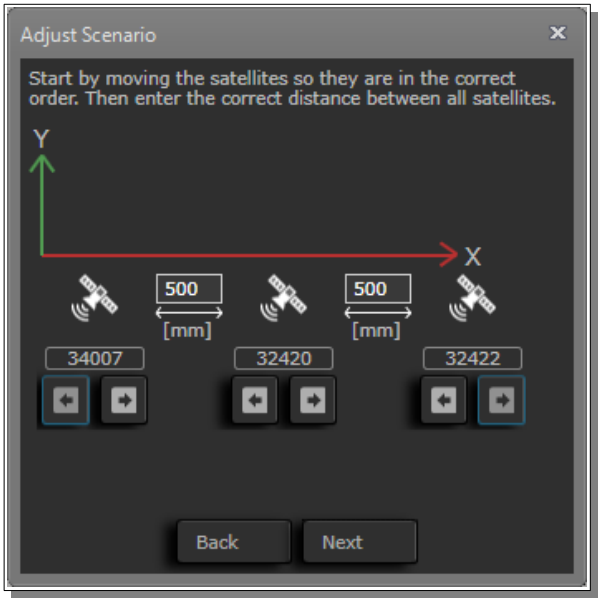


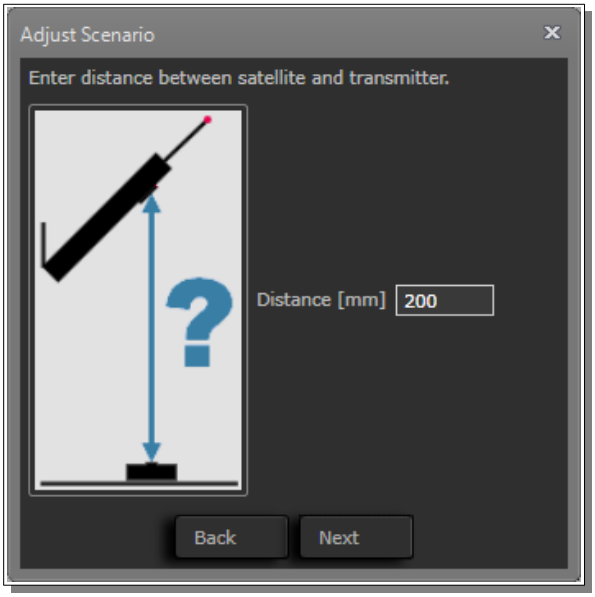

In 2D scenarios we do not re-calibrate, but instead adjusting the existing 2D scenario. Click the button [Edit] to do this (No comments – same dialogs).

## Adjust 2D Scenario



## 9.9 Merge Scenarios

When creating large or advanced layouts or when extending a layout with more satellites, you need more than a single scenario - and often in a combination of 2D and 3D. The image here below is a layout with a combination of a red 3D scenario and a yellow 2D scenario.

**TIP**

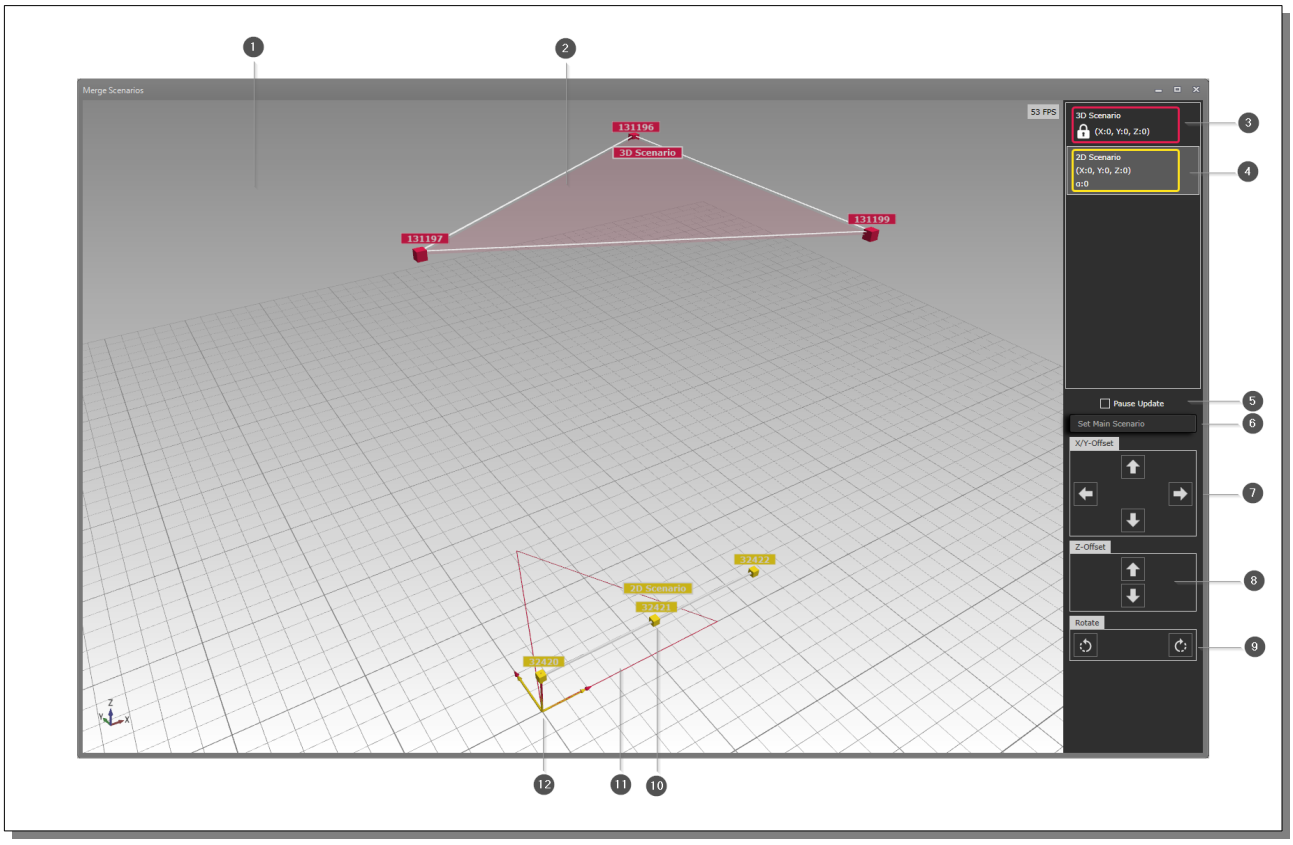
- All new scenarios are 'born' with their own coordinate system at origo (X,Y, Z = 0,0,0).
- Your first scenario (main), should have the origo marked physically on your layout.

The red 3D scenario below shows a red calibration triangle placed in origo, and the yellow 2D scenario has it's first satellite placed just above origo. See bullet **12** in the image.

Let's say you want to extend this layout with three new satelllites placed e.g. a couple of meters to the right of the red satellites, and you move the physical calibration triangle a couple of meters too in that direction just below these satellites and calibrate this new scenario.

This new scenario will also be placed in origo (X,Y, Z = 0,0,0), and your task is to offset this into the right position. To merge this scenario, you have to move the software calibration triangle into the same place where you placed the physical calibration triangle, when you calibrated this new scenario. This can be done by using the arrows and rotation buttons.

So please write down the XYZ-measurements mm from origo to the calibration triangle.




| Item | Description |
|---|---|

| | | |
|---|---|---|
| 1 | **3D View** | This is the 3D view for visualization of scenarios |
| 2 | **3D Scenario** | A 3D Scenario using 3 satellites |
| 3 | **Select 3D Scenario** | Select the 3D scenario from the list of scenarios |
| 4 | **Select 2D Scenario** | Select the 2D scenario from the list of scenarios |
| 5 | **Pause Update** | Click to stop showing active senders. |
| 6 | **Set Main Scenario** | Click to set the current selected scenario as the Main scenario |
| 7 | **XY Offset** | Move the current selected scenario in the X-Y direction |
| 8 | **Z Offset** | Move the current selected scenario in the Z direction |
| 9 | **Rotate** | Rotate the current selected scenario (around the Z-axis) |
| 10 | **2D Scenario** | The 2D scenario (here using 3 satellites) NOTE: By default a newly created 2D scenario will always be placed at origo (X, Y, Z = 0, 0, 0) |
| 11 | **Calibration Triangle 3D Scenario** | The calibration triangle from the 3D scenario<br>**NOTE:** The 3D scenario is selected as the Main scenario. A main scenario should always be placed at the Origo (X, Y, Z = 0, 0, 0) |
| 12 | **Origo** | The origo position is (X, Y, Z = 0, 0, 0) |

The image has a main scenario (red with a lock on) and a second scenario in 2D (yellow).

### 9.9.1 Merging 2D scenarios into the Main Scenario

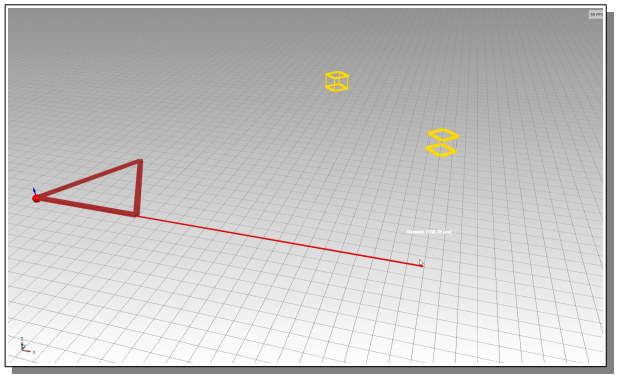
Lets say the yellow 2D scenario must be off-set with 2700 mm from main origo (0, 0, 0) in x-direction, 1000 mm in the y-direction, 200 mm in z-direction – and rotated 145°.

You can do this in 2 ways. Initially the yellow and the red coordinate system are at the same point. You see the satellites as well, the red ones and the 3 yellow ones.

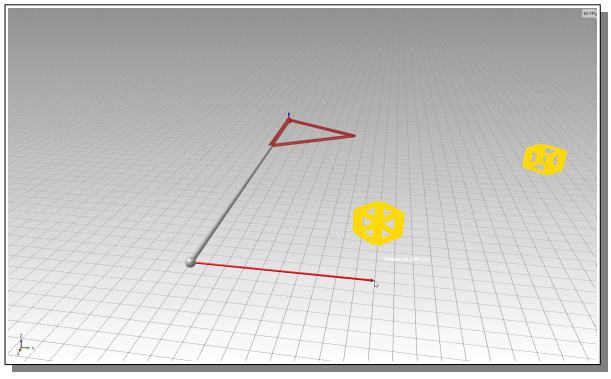
- Either use the arrows in the right pane and you will move the yellow one in the X, Y and in Z direction. You will see how much it's moved in the little colored scenario boxes in the right upper panel.
- And/or use a train or car to drive on the layout where covered by both scenarios at the same time. Then press pause when you have the two colored tracks on the layout. Then use the arrows to move these tracks to lie above each other– please also remember the z-value – then you are done.

Afterwards control your merge using the car or train and see that they move smoothly on the drawing from one scenario to the next.

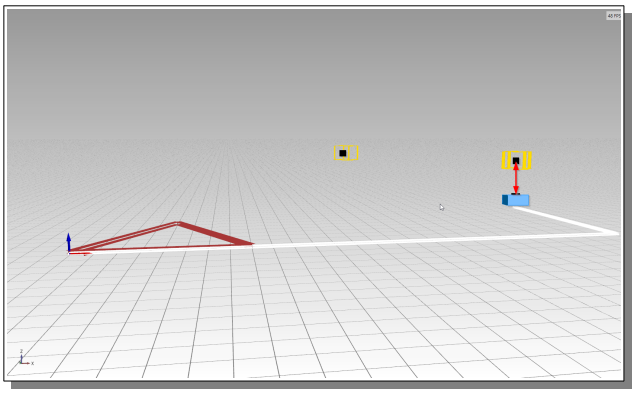
**Here is a visual example of this 2D merge using two yellow satellites SAT1 and SAT2**



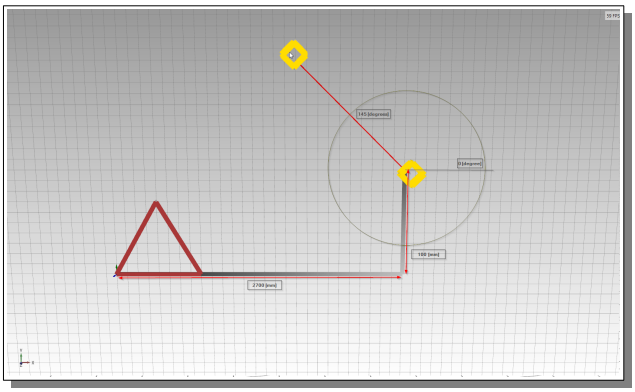
Measure the distance from 0,0,0 perpendicular to X (SAT1) **Example: X-Offset = 2700 mm**



Measure the perpendicular distance from X,0,0 to Y (SAT1) **Example: Y-Offset = 1000 mm**

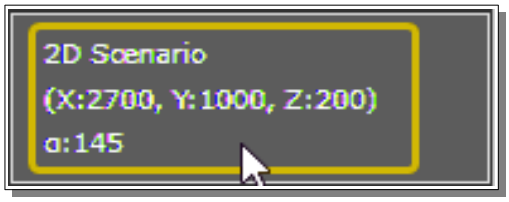


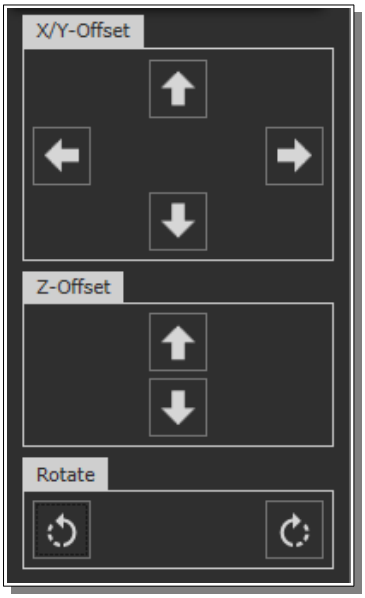
Measure the height top of the vehicle to center of transducer in SAT1.
**In this example: Z-Offset = 200 mm**

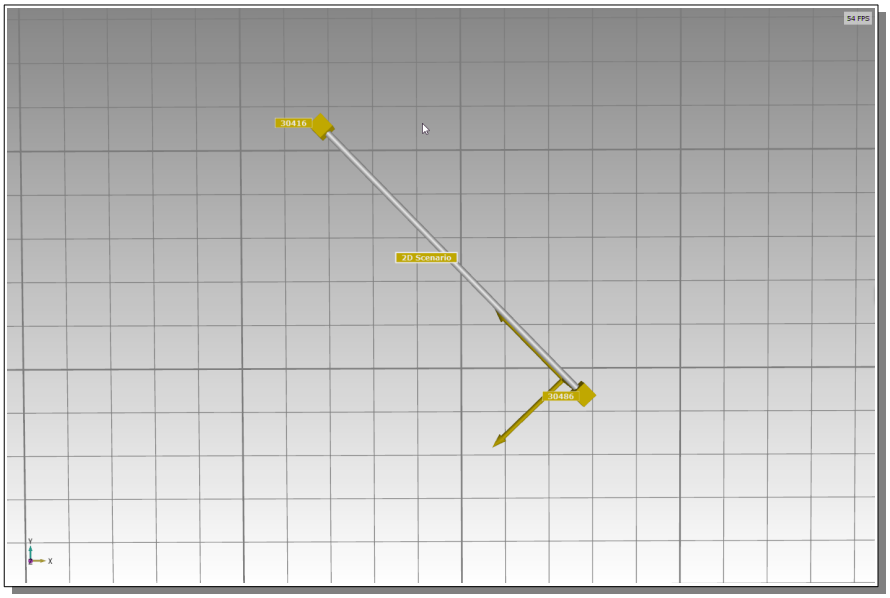


Now measure distance between SAT1 and SAT2, and the angle rotated. The positive X-axis is 0°.
**Example: Angle = 145°**

Use this measurement data to move and rotate the 2D scenario with the arrows in the screen Menu [World → Show scenarios → Merge]

## 9.9.2 Merging 3D Scenarios into the Main Scenario

First a couple of important things to remember before you start adding multiple scenarios:

- All calibrations will by default place their calibration triangles in origo (0,0,0).
- It's a manual task to measure all offset distances and rotations in relation to the main calibration triangle.
- These measurements must be done before you start calibrating

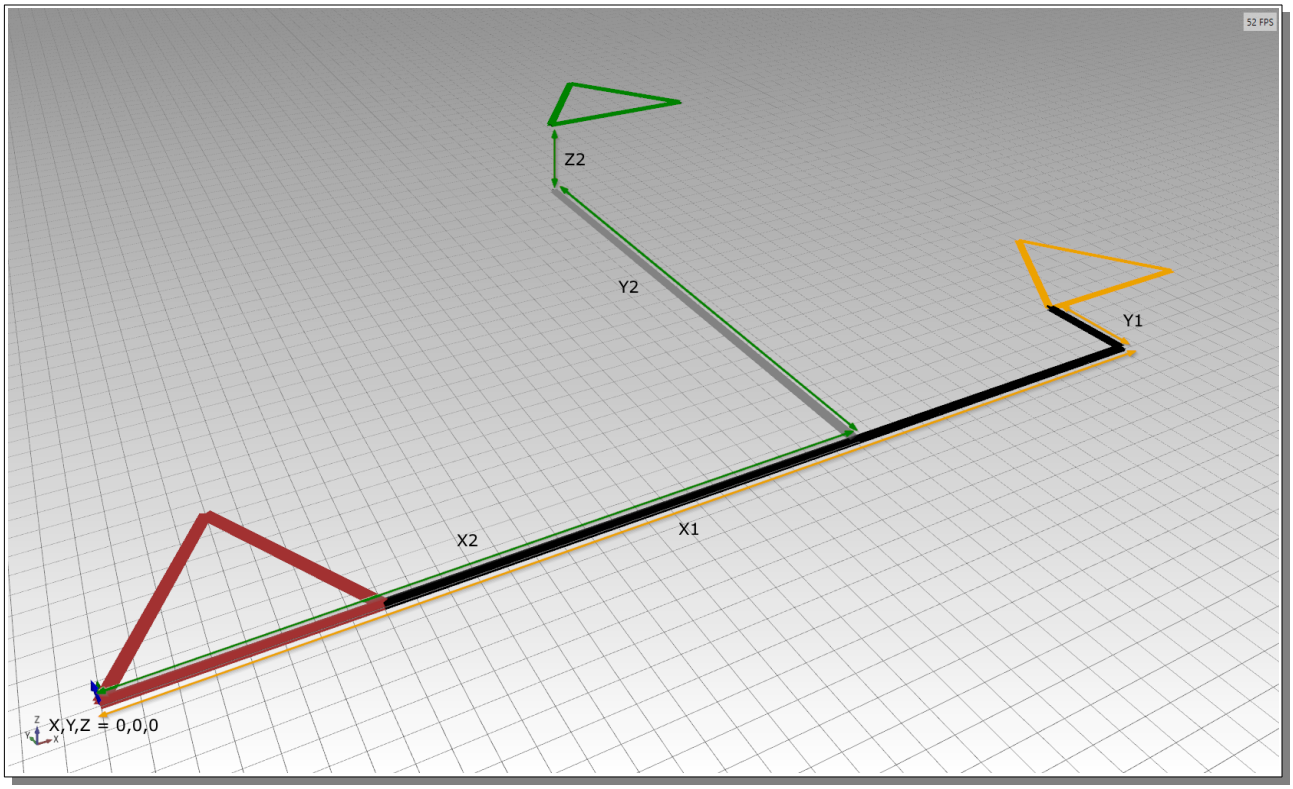
In the example shown here below, you find three calibration triangles for three Scenarios.

**Red** is the Main scenario, where all other scenarios are offset from.

**Orange** is the first scenario to offset. The calibration triangle is in the same Z-plane = 0, so only the X-offset and Y-offset must be measured before you calibrate the satellites.

**Green** is the second scenario to offset. The calibration here is elevated in the Z-plane, so both the X-offset, Y-offset and Z-offset must be measured.

In this example none of these calibration triangles are rotated. In that case you should just measure the angle, as seen in Merge 2D Scenarios.




## 9.10 Add More Satellites

In general you can expand your layout using two methods:

- The PC-Software can calibrate 6 satellites at the very same time if the sender can see them all in each step. You add the extra satellites to the calibration when you edit an existing scenario. The Process is then the same but you select more or other satellites.

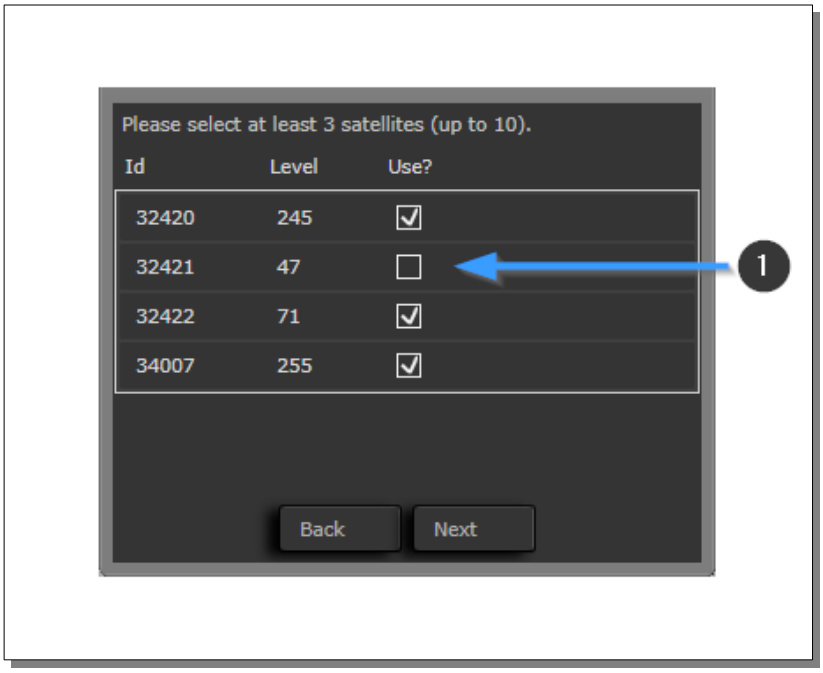
- If you change the position of your satellites - after you have drawn some of the system – then that will work without any re-drawing if you pick the very 3 same measurements points in the calibration process.
- **So Please Mark them on your layout and do not ever never paint them over.**

## 9.10.1 Add Satellites in 2D Scenarios

When you have mounted the extra satellite(s), the first thing is to measure the distance between each of the satellites. Since 2D scenarios aren't calibrated, you should only adjust the existing 2D scenario, by simply adding the extra satellite(s), and the distances between each.

## 9.10.2 Add Satellites in 3D Scenarios

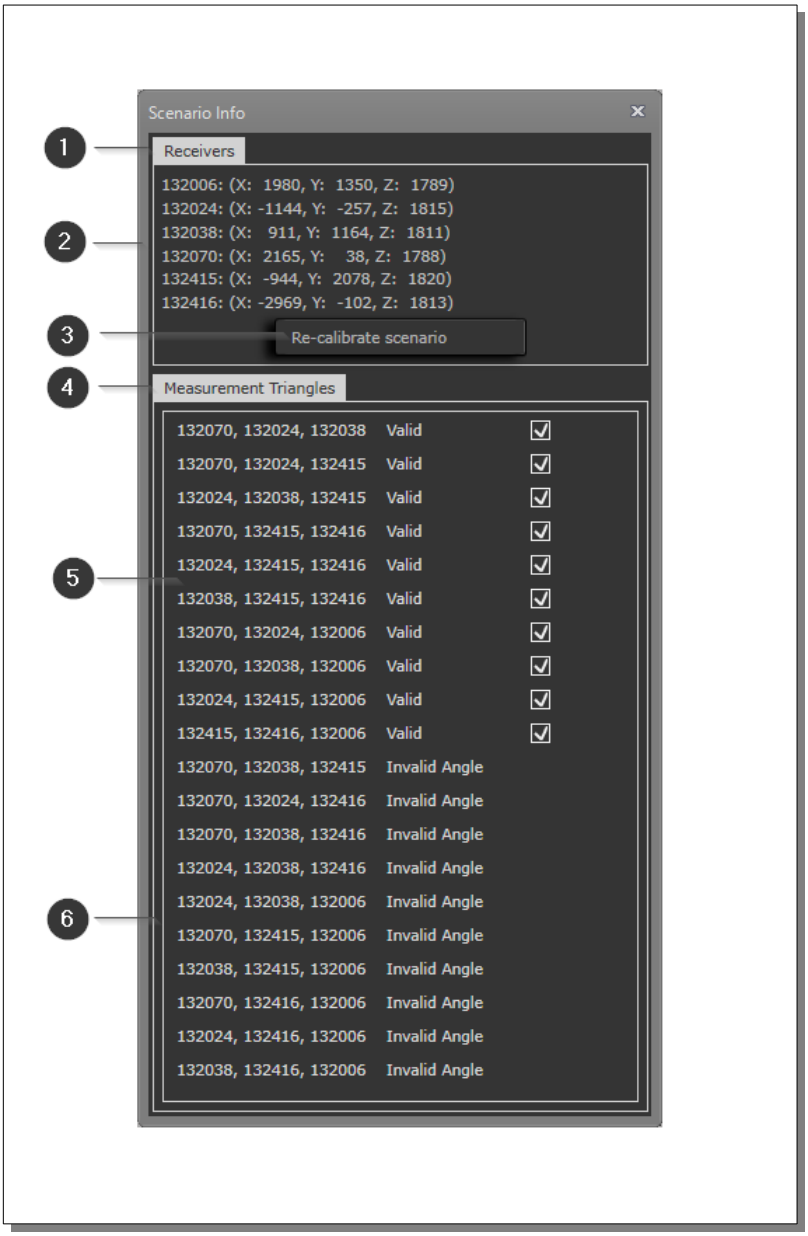
When you have mounted the extra satellite(s) to a 3D scenario, you always need to re-calibrate the scenario(s) where the satellite(s) should be used.




| Item | | Description |
|---|---|---|
| 1 | **Satellites** | If you have an existing 3D scenario with 3 satellites and have mounted 1 more satellites, you must **mark** all 4 satellites for this scenario, and then calibrate a new scenario. |

## 9.10.3 Validate the Satellites

Use the Edit Scenario to see how many valid triangles you can use in your measurements. Here is a sample from a big system:




| Item | | Description |
|---|---|---|
| 1 | **Receivers** | List of all receivers used in the selected scenario |
| 2 | **Positions** | The position (X, Y, X) of each satellite in the list |
| 3 | **Re-Calibrate** | Click to Re-calibrate the selected scenario |
| 4 | **Measurement Triangles** | A list of all triangles for this scenario |
| 5 | **Valid triangles** | List of all valid triangles (good angles and good distance between satellites) |
| 6 | **Invalid Triangles** | List of all invalid triangles (bad angles and/or bad distance between satellites) |

Invalid triangles are not necessarily a bad thing, but too many could call for an optimization of the scenarios – typically by using fewer satellites per scenario (here the maximum of 6 is used)

- o -

# 10 Operate and Edit the System

This chapter will guide you through all components of the system.

## 10.1 The Vehicles


### 10.1.1 Manage Vehicles

You can Add/Edit vehicles in more ways.

- Click menu [Edit → Edit System → Vehicles Tab] and the [Add/Edit/Delete] button
- Click the [Add] button in the Vehicles View.
- Choose the vehicle with the mouse and click on the [Edit] button.
- Double click on the ID or name of inactive vehicles to Edit.

### 10.1.2 Vehicle Configuration

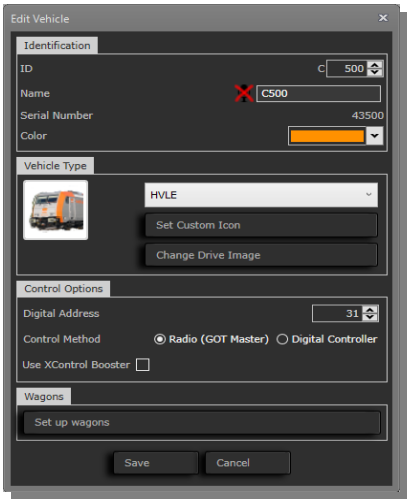
Vehicles should be configured before you can drive them. You might also want to configure vehicles which has no sender and which does not show up by themselves, then you just add a new vehicle in the Edit menu.

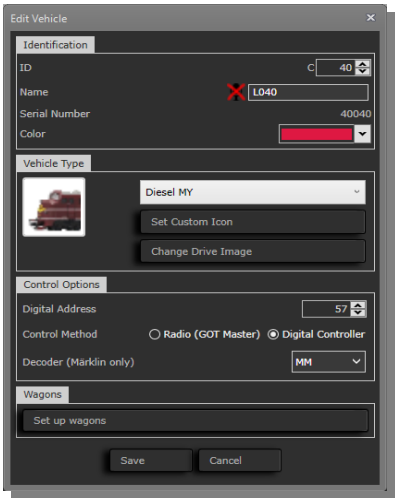
You can also configure a container sender to be a train. When the container sender shows up, just edit the sender and select a train in the configuration list, and eventually assign a DCC address for it. However, you cannot change a sender in a train, including a container sender. If you want this, then please delete the train and start with the other sender.
You can also easily move a container to another train, just change the DCC address.

Go to the Edit menu under vehicles. Select one of the vehicles in the list and press edit.
If you want to configure a train which is not in the list, please select Add.

Here some examples of vehicle configurations. Images are explained in chapters below.

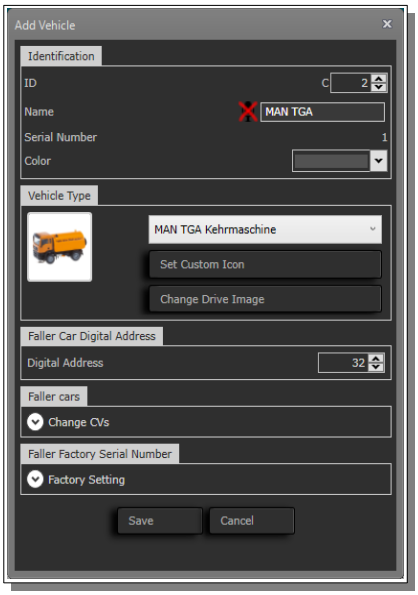
| Train (Radio) | Train (Digital Controller) | Train LEGO |
|---|---|---|

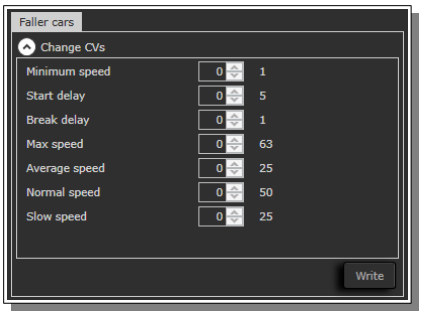


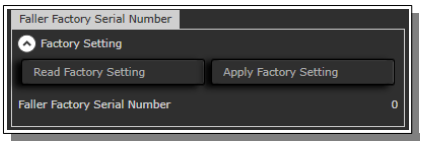





| Faller Car (Radio) | Faller CV Settings | Faller Factory Settings |
|---|---|---|




## 10.1.2.1 Radio Controlled Vehicle

We have configured the train C500 with digital address 31 which is completely radio controlled with DCC by radio and nothing on track – might be completely battery powered or take DC or DCC from track as power. It also has a digital address so that it can be understood by a digital controller. Digital addresses must all be unique. You can set all CV-values directly by radio, please see the component 1302701 for the settings.

The radio controlled car is a Faller MAN TGA type with digital address 32.

### 10.1.2.2 Digital Controlled Vehicle

We have configured L040 as Type Diesel MY using DCC address 57. It reads the information from the Type, the whole geometry, speed calibration etc as well as the driving Icon. The user can create their own icons and use them. The user can later speed calibrate this very train.

### 10.1.2.3 LEGO Train

If you have a LEGO-train it will show up when powered up and connected to the Radio. It will create the ID based on the radio address (unique). You can insert your name for that train. Please pick the type in the Vehicles type for getting an icon and standard speed calibration. Please select a color. Insert the Channel and the color where the ENGINE is connected to the LEGO IR Channel adapter. We assume that if you use the LEGO light this will be connected on the same Channel number but opposite color.

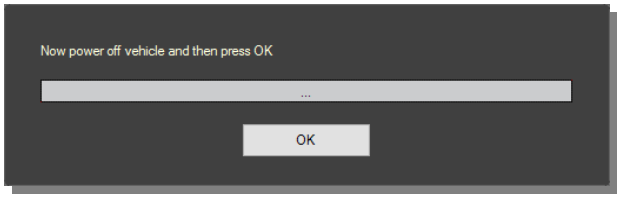
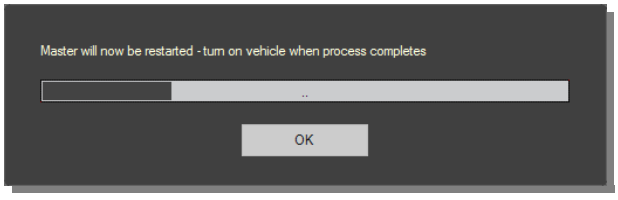
### 10.1.2.4 The CV Values

We also save a set of standard settings for CV-values, these settings can be changed by the user if the train is running directly on radio. The CV-settings except the Address have no impact if the vehicle is running by a digital controller – currently. If you want to change them please use your programming track. If you want other standard CV-settings you can change them in the vehicle type.

### 10.1.2.5 Special function: Faller Serial Number

We have introduced support for restoring the address of a Faller car to the factory default setting. When pressing Vehicle Settings the section highlighted here below is used for this reset. The Faller Factory Serial Number is initially 0 (zero). Now press [Read Factory Setting], and the Faller Factory Serial Number is now read from the unit.

Now press [Apply Factory Setting] and the following dialog will appear.

| **Press OK** | **Restoring...** |
|---|---|
|  |  |





When the vehicle is turned off and the OK button is pressed, it will take 15 seconds before the vehicle can be turned on again.

## 10.1.2.6 Drive Images

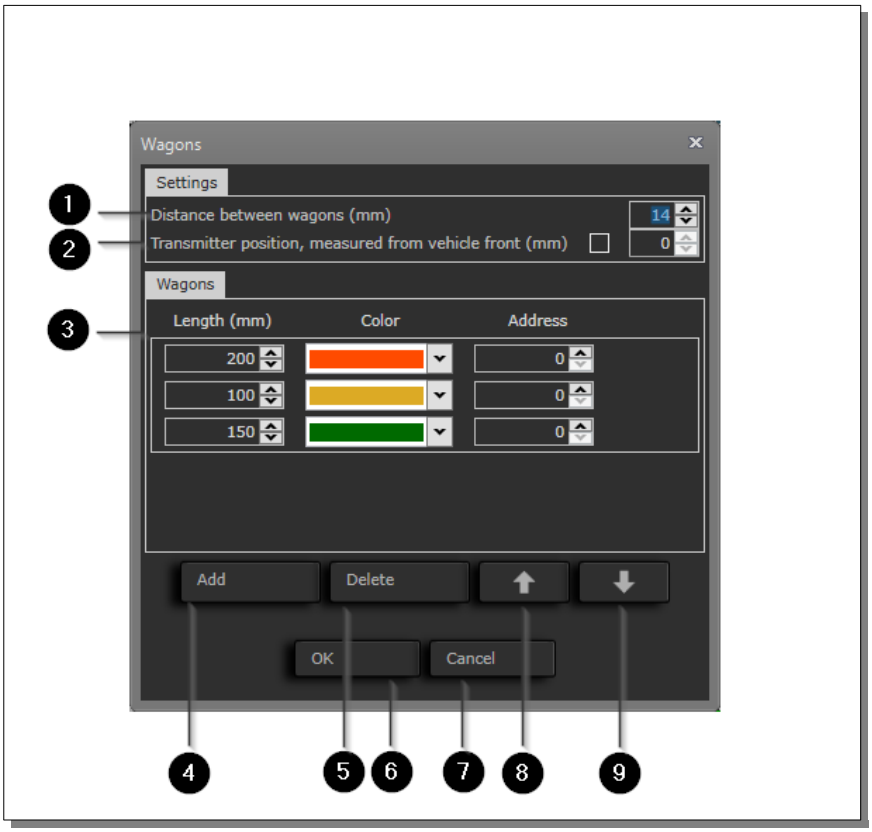
For every vehicle in the 2D-view a drive image is shown. All standard images have names prefixed with the term 'buildin'. It is also possible to use your own drive image for every vehicle. These images will be saved in the directory mentioned in chapter 6.3.2

```
[DefaultUserDirectory]\Vehicle Images
```


| Item | | Description |
|---|---|---|
| 1 | **Add** | Opens up a dialog where an image can searched and added. |
| 2 | **Edit** | 1. First select an existing image from the list.<br>2. Now press Edit, and this image will be copied into the list.<br>3. The copied image will be opened in you favorite image editor. |
| 3 | **Delete** | Delete the selected image. Build in images cannot be deleted. |
| 4 | **Image** | Selectable image. |
| 5 | **Save** | Save the image. |
| 6 | **Cancel** | Cancel any changes. |

## 10.1.2.7 Setup Wagons

Setting up wagons is quite easy, all you need is to measure the length of each wagon and distance between each wagon. An example of this is shown here below.



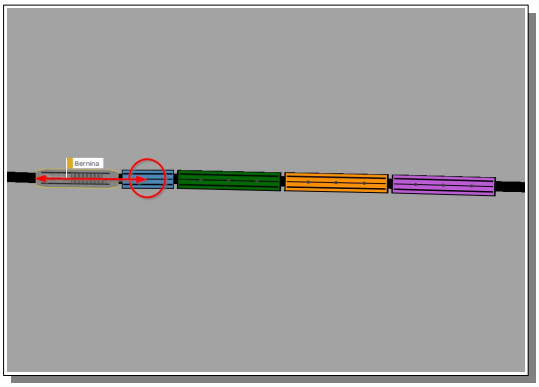
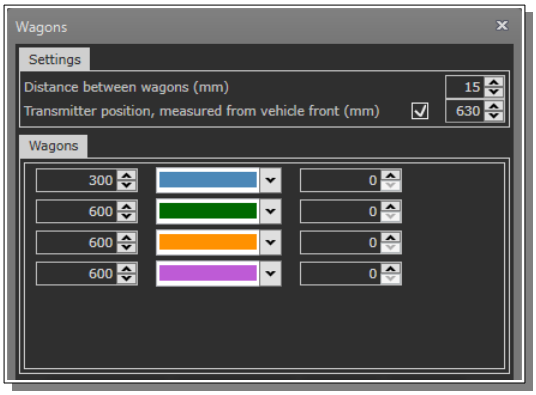

| Item | | Description |
|---|---|---|
| 1 | **Distance Between Wagons** | Set the distance between wagons. The value is measured in mm |
| 2 | **Transmitter Position** | If a transmitter (e.g. a container) is placed on one of the wagons, then enable |

| | | |
|---|---|---|
| | | the check box, and specify the distance from the transducer to the front of the vehicle. This value is measured in mm |
| 3 | **List of Wagons** | All added wagons are displayed in this list. Each wagon displays the length, the color and the device address (if used).<br>NOTE: The Address (1-7 digits) is only used when multi-traction is needed. If more trains are attached after the current locomotive, perhaps between wagons, these can all be controlled simultaneously by the exact same control messages as sent to the this main locomotive. |
| 4 | **Add** | Add a wagon to the vehicle |
| 5 | **Delete** | Delete the selected wagon from the list. |
| 6 | **OK** | Saves the settings into memory |
| 7 | **Cancel** | Cancel any changes |
| 8 | **Arrow Up** | Click to move the selected wagon up in the list |
| 9 | **Arrow Down** | Click to move the selected wagon down in the list |

## 10.1.2.8 Container With Sender


A container sender can be used in two ways:

- It can be used as a position sender for a train. In this case please configure the container as a train type with the DCC address as the one from the real train.
  The container must be placed on a wagon behind the train. Measure the length from the transducer to the front of the train. Also remember to specify the length of the wagons.
- It can also be used as an independent container placed on a wagon on a train, on a truck etc.. A default container type in the vehicle list is specified as an independent container without speed and without functions. The container is both measured and positioned, and it will also snap and follow a track, if it is close enough. Try place a container on the track; Vehicles approaching will slow down and stop to avoid collision.

| Train with Container Sender | Wagons |
|---|---|
|  |  |
| Distance from transducer to vehicle front = 630 mm | Enable and enter the distance measured: here 630 mm |



## 10.1.2.9 Multi Traction


Multi traction is needed when you add more locomotive to the same train length, in order to move a huge number of freight wagons, that a single locomotive cannot handle by itself.

Multi traction is a concept of controlling multiple vehicles by the commands sent to the main locomotive also are sent to all vehicles attached behind the main vehicle.

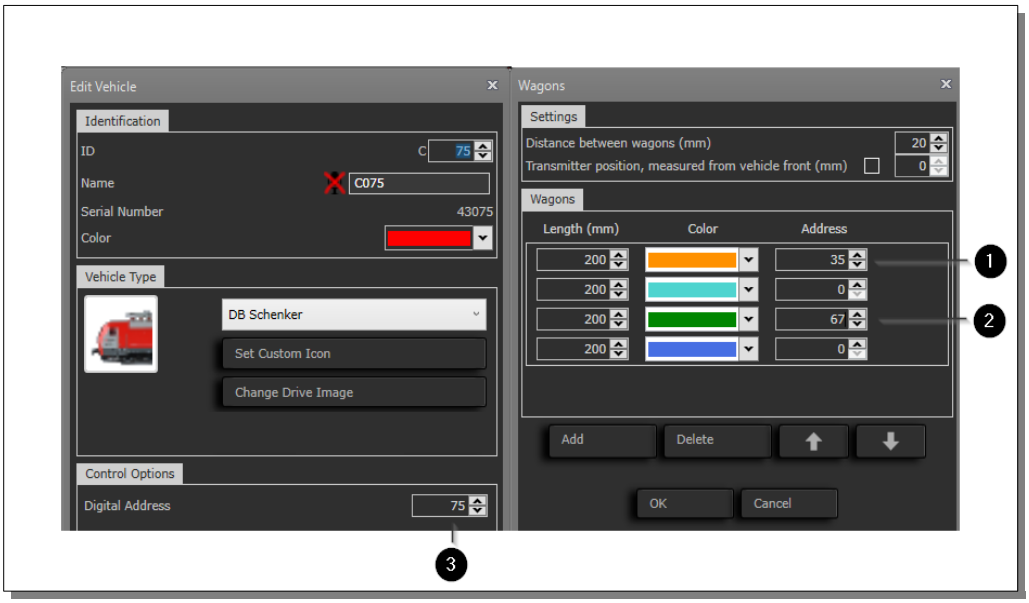
You can set up the multi traction in the vehicle configuration window – by clicking on the button Setup Wagons. You simply add a traction vehicle as if it was a wagon - just with a device address specified (5-6 digits).

In the below case we have added two locomotives with DCC address 35 and 67 to the main locomotive [DB Schenker] with DCC address 75. The two traction locomotives will get the same control information as the main locomotive. The traction locomotives will only be seen on screen as wagons. You can add more locos to the same train length - -and more wagons.

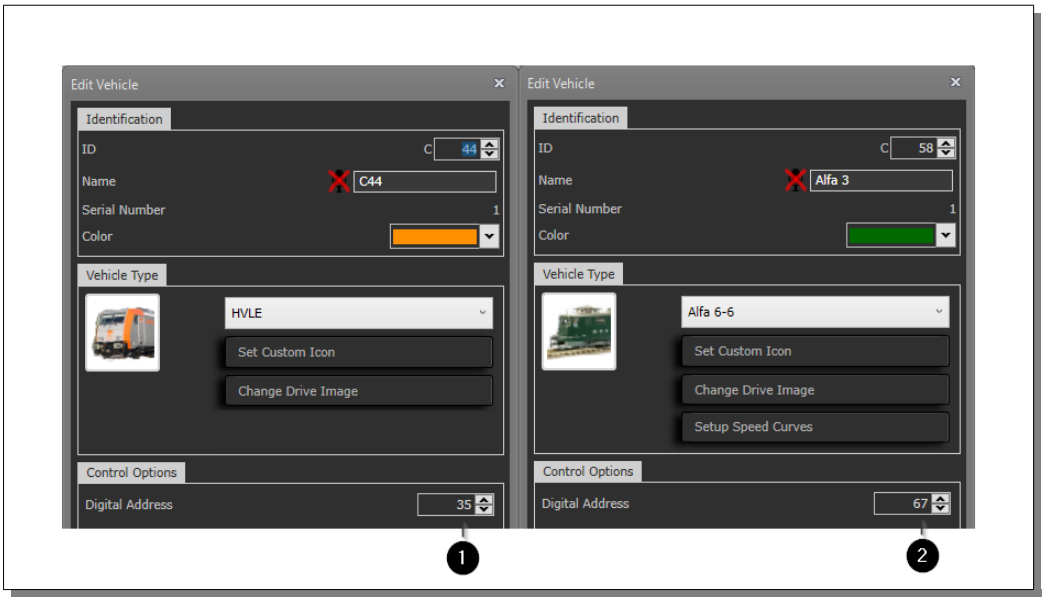
A set up with main locomotive (DCC address 75) with four wagons added in total:


**NOTE:** The two added locomotives would probably both be placed just behind the main locomotive, but for illustration purpose, we have inserted a regularly wagon in between.

## Multi traction example set up:




| | Item | Description |
|---|---|---|
| 1 | **Traction Loco** | Loco with DCC address 35 |
| 2 | **Traction Loco** | Loco with DCC address 67 |
| 3 | **Main Loco** | Main Loco with DCC address 75 |

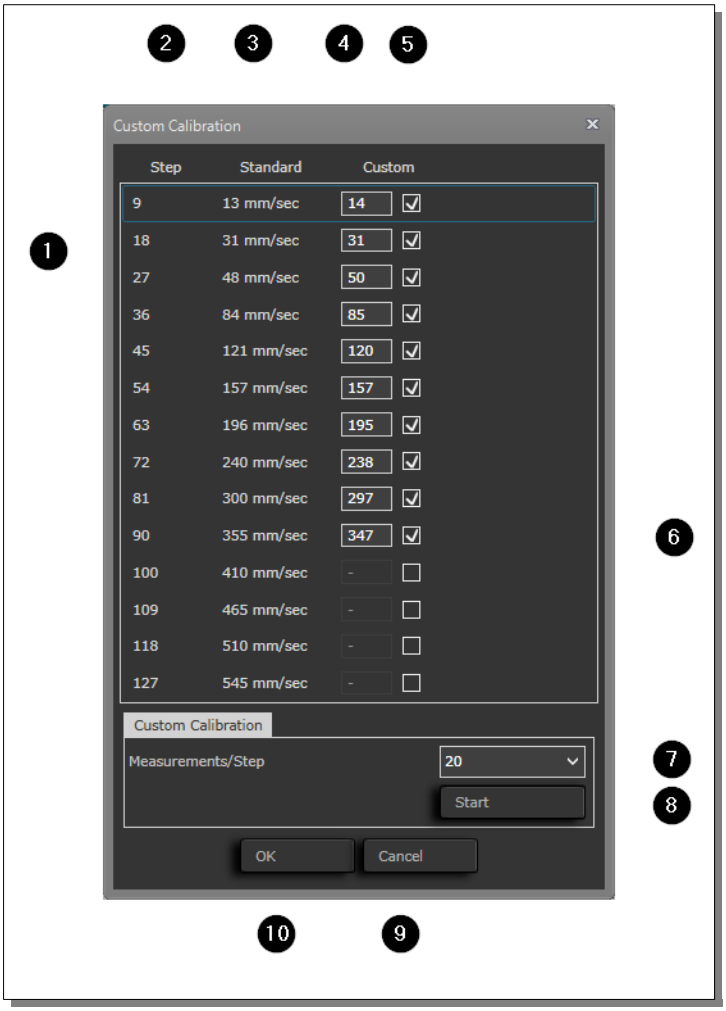


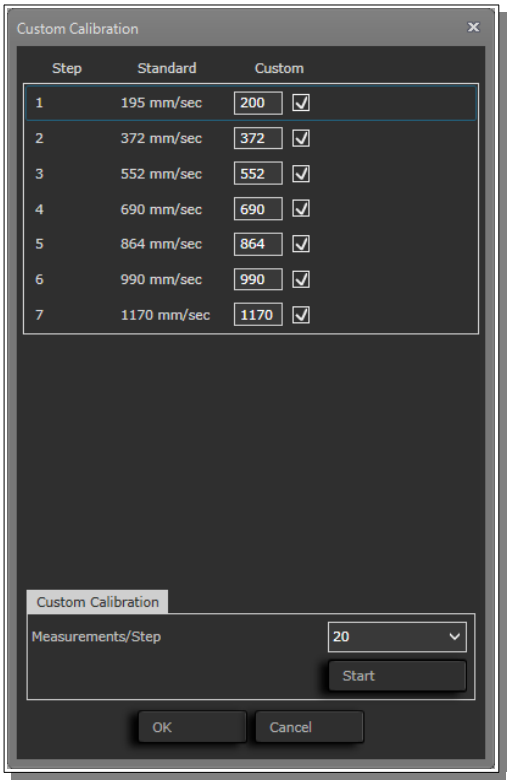

| | Item | Description |
|---|---|---|
| 1 | **Traction Loco** | Loco with DCC address 35 |
| 2 | **Traction Loco** | Loco with DCC address 67 |

## 10.1.3 Speed Calibration

Speed calibration is used in order to predict the vehicles positions between measurements. A layout with 12 running vehicles will measure a position for each vehicle every second. In this period we have to predict where the driving vehicle is until we get the next measurement. This is where speed calibration is important, and it's especially important when driving inside tunnels, where no measurements are received – here we rely on predicted positions until the vehicle exits the tunnel.

| Generic vehicles | Lego Trains has a different number of speed calibration steps |
|---|---|




| Item | | Description |
|---|---|---|
| 1 | **Speed Step** | List of Speed Steps (The maximum available is 14) |
| 2 | **Step** | The actual step |
| 3 | **Standard** | The standard default value for this vehicle (read only) |
| 4 | **Custom** | The value from the user calibration |
| 5 | **Enabled** | Mark if the step should be used |
| 6 | **The Maximum Step** | The final recorded and enabled step. The step value to the left (here 90) will be used as the maximum for the Speed Slider |

| | | |
|---|---|---|
| 7 | **Measurements/Step** | Select how many measurements should be recorded for each step during calibrating. Available values: 10, 20, 30, 40, 50 and 80 (*Default is 20*) |
| 8 | **Start** | Start the speed calibration process. |
| 9 | **OK** | Saves the current settings |
| 10 | **Cancel** | Cancel the changes |

The Speed Calibration will calculate the GPS-measured speed in mm/s - per each driving step, or per 9 driving steps in DCC, that works with 127 steps.

**ACTION**

- Please select many measurements 60/step or just 40/step when calibrating.
- Make sure that the vehicle can drive an unoccupied track several times in succession as the calibration process does not look at reasons to avoid collisions.
- Please enable what steps you will calibrate - may be not the very fast ones, they can be inserted manually.
- When you press button [Start] the vehicle starts driving and moves through the selected steps and measures the speed by the GPS. Do not move the speed slider while calibrating. The measured values will be inserted in the table. You can eventually change the values manually.
- If the same recorded value exist for a number of the final steps e.g 347, 347, 347 - please enable the first on only, and disable the rest.
- Press OK to save the chart in the system-file for exact this vehicle (not the type).
- Press cancel to avoid any savings. The chart will initially populate the values already in the system file, or if none the values from the type selected.
- Be careful doing automatic calibration on the very high steps. It might run too fast.
- Notice that measurements from tunnels and shadow areas will not be used.

## 10.1.4 Vehicle Groups

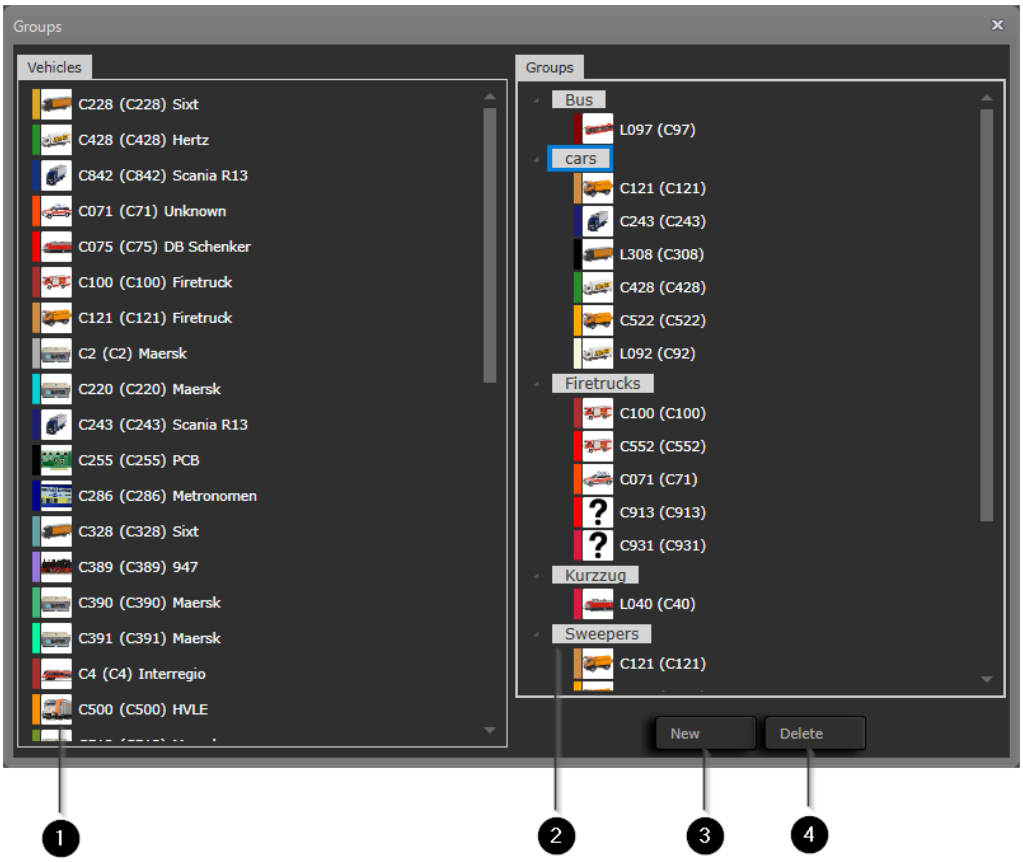
In the Vehicle Groups you can edit groups and assign vehicles to groups. The group name can be used in automations in the NLW-commands selecting vehicles from a specific group to pass on to specific tracks or to trigger certain actions. The group name can also be used in Automations for setting speed/stop/functions on all vehicles in that group.

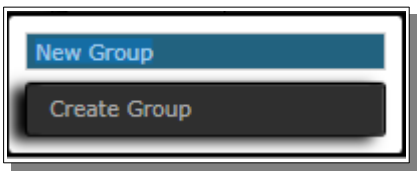
**ACTION**

- Vehicle groups can be managed from the Vehicles View by clicking on bottom line on the second symbol from the left.  This opens the "groups" view"

- Please click [New] first time and type a name of your group: Here cars.
- Pick a vehicle with mouse in the left list, drag it to the right list and drop it.
- Be sure you see the rectangle symbol before dropping and not the cross out circle.
- Group names can be used in automations. See Chapter 10.10 Automations, on how to use the NLW command and group names.

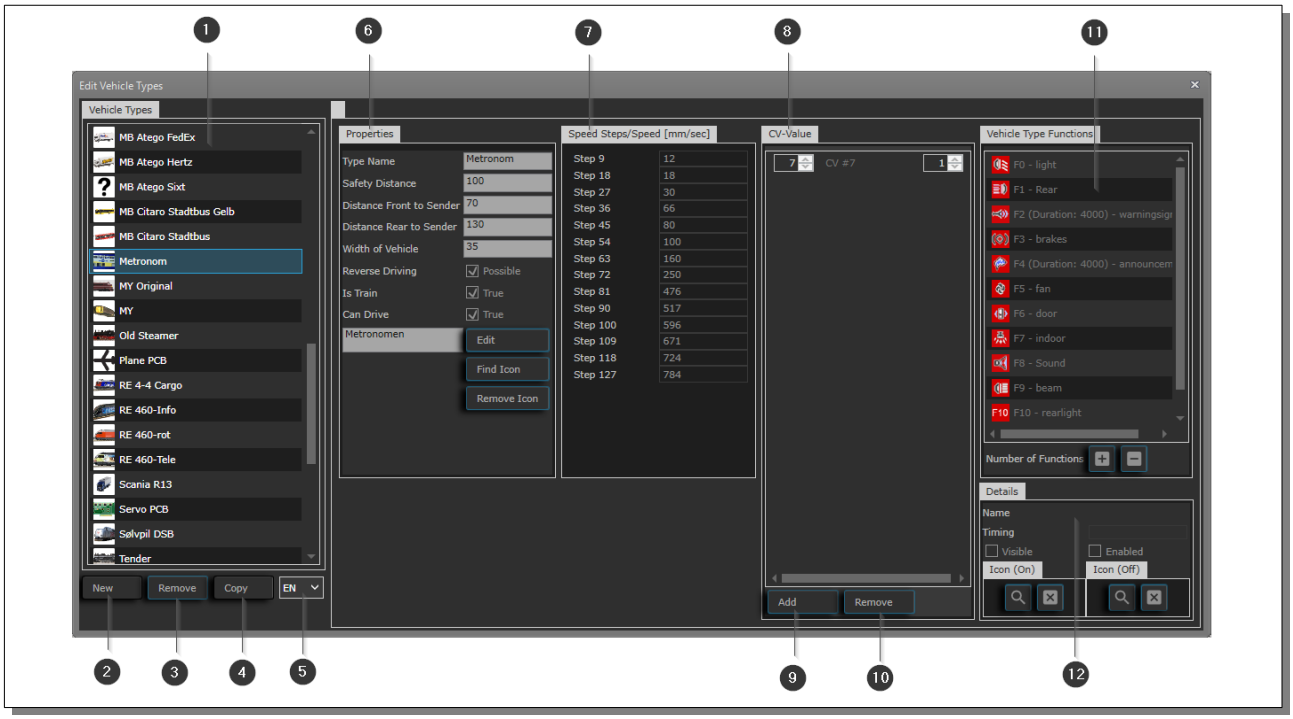
Groups are also used in the vehicles window, you can select only to see a certain group of vehicles in the window. See the Search and Filtering in the Vehicles View.




| Item | | Description |
|---|---|---|
| 1 | **Vehicles** | List of all vehicles to select from |
| 2 | **All Created Groups** | Lists of all created groups, each with the attached vehicles below. |
| 3 | **New Group** | Create a New Group. A small dialog will prompt for the name of the new group. When done press the button [Create Group]   |
| 4 | **Delete Group** | Delete the current selected Group |

## 10.1.5 Edit Vehicle Types

You can create your own vehicle types editing your private vehicle type settings. You will not be allowed to change the standard types, but you can create a user defined type by copying any existing type and modify that. This might be relevant if your vehicles are modified or have different gearing and speed calibration.




| | Item | Description |
|---|---|---|
| 1 | **List of Vehicle Types** | All vehicle types are listed here |
| 2 | **New** | Click to create a new default vehicle type in bottom of the list. |
| 3 | **Remove** | Click to delete the selected type – only customer types can be deleted. |
| 4 | **Copy** | Copy the existing vehicle type. (The normal way to work with types). |
| 5 | **Language** | Show language translations for the dynamic properties in the vehicle type. This button will display the editable texts in the tabs CV value 8 and Vehicle Type Functions 11. These two tables can contain arbitrary texts of your choice, and the translation must therefore be done here and saved in the type file. Double-clicking on items in these two tables will popup a dialog with the current translated texts. Translations can be added and edited for each language available in the system. |
| 6 | **Vehicle Properties** | The mandatory vehicle properties related to driving (see section below) |
| 7 | **Speed Steps** | The speed steps (you can override with own speed calibration steps) |
| 8 | **CV Values** | Relevant CV values can be specified here. These CV values are written to the vehicle, when it gets online. |
| 9 | **Add** | Click to add a new CV address and value |
| 10 | **Remove** | Click to remove the selected CV entry |
| 11 | **Vehicle Type Functions** | Function buttons seen on each vehicle in the Vehicle View.<br>All functions can be added, deleted and modified here (maximum is 32) |
| 12 | **Function Details** | Icons (on/off) used for each function can be specified here.<br>By checking the boxes you can control whether the selected function is visible and should be active. In this example the blue F9 icon is both enabled and visible. Because the duration is set to 1000 ms, the function is operated by a momentary switch that switches off after |

| | |
|---|---|
| | 1000 ms. The function icon indicates when the function is in operation. Set the duration to 0 ms to create a continuous function switch. |

### 10.1.5.1 Properties


| Item | | Description |
|---|---|---|
| 1 | **Type Name** | Name of the vehicle type |
| 2 | **Safety Distance** | Safety distance to vehicle in front. Measured in mm |
| 3 | **Distance Front to Sender** | Distance measured from sender to front of vehicle. Measured in mm |
| 4 | **Distance Front to Rear** | Distance measured from sender to rear of vehicle. Measured in mm |
| 5 | **Width of Vehicle** | Width of the vehicle. Measured in mm |
| 6 | **Reverse Driving** | Set this property for relevant vehicles.<br>Most Faller Cars do not support reverse driving - but trains do. |
| 7 | **Is train** | Set this property for trains only |
| 8 | **Can Drive** | Set this property true for moving vehicles.<br>Containers should have this property set to false. |
| 9 | **Display Name** | Display Name for the vehicle |
| 10 | **Edit** | Edit the Display Name for the vehicle for the available languages. |
| 11 | **Find Icon** | Set a new display icon for the vehicle |
| 12 | **Remove Icon** | Remove the display icon for the vehicle |

## 10.1.6 User defined Vehicletypes

User defined vehicle types are copied from the install folders to your user folder named [Types]. The files overrides the standard types and you can change everything needed here.

```
DefaultInstallDirectory\Types
```

## 10.2 Driving the Vehicles

You can now operate the vehicle from the screen, any automation, connected smartphones or tablets.

**ACTION**

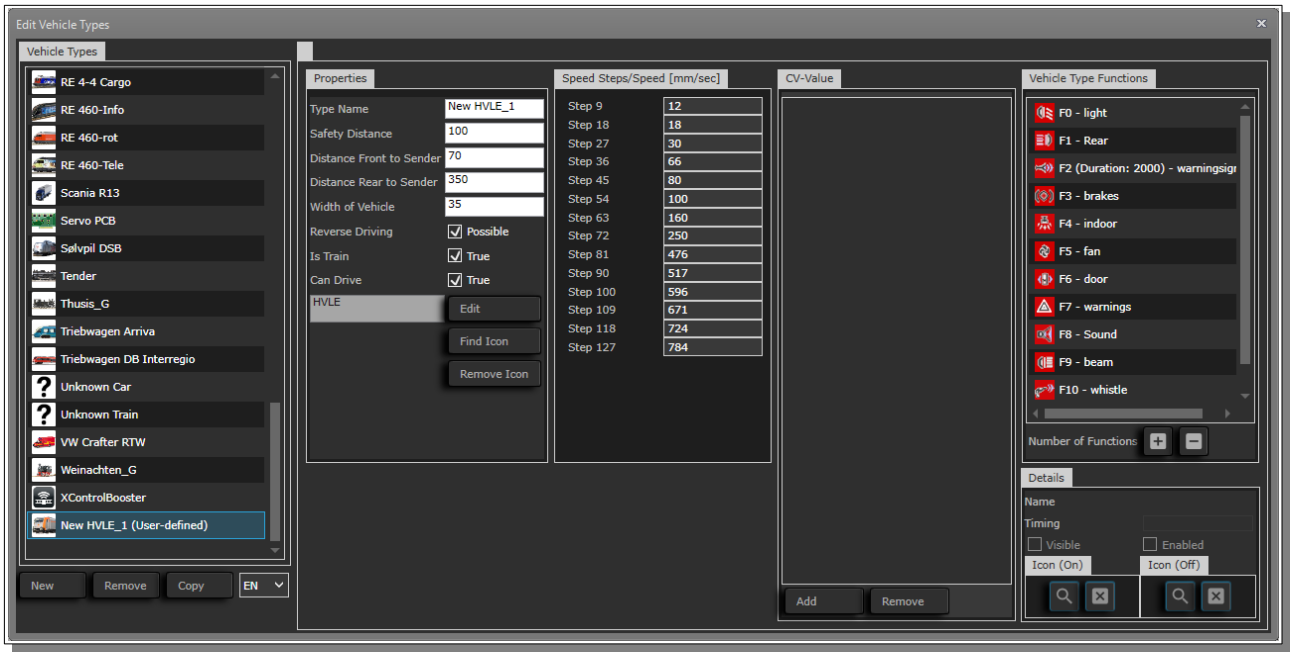
- Please ensure you have selected a digital controller.
- Turn on your vehicle and move the slider.
- Please press the F0 and the light turns on.
- Press the Vehicle-function keys – see light, sound, blink…
- Hoover the mouse over the Vehicle Settings Icon to displays address and other info.

### 10.2.1 Vehicle Length and Distance Control

Please copy a standard vehicle to a custom vehicle – your own vehicle type.

Then configure your actual train with this type. In this custom type please only insert the rear distance to be the distance to the end of the vehicle - in mm.

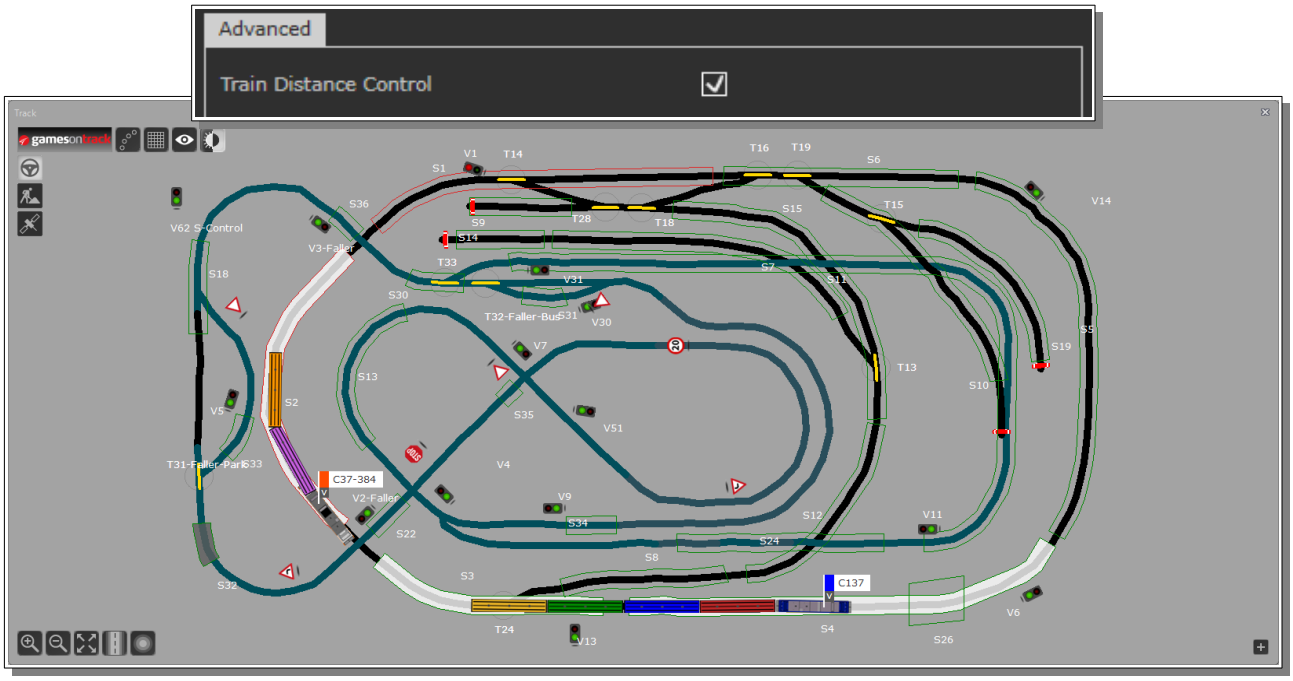
Now you have created a full train length with the total length of distance to the front + distance top the rear + number of wagons and their actual lengths. Distance Rear to Sender = 350




## 10.2.2 Vehicle Distance Control

Vehicle distance control is mandatory for Cars, but must be set manually for Trains.

In the menu [Edit → Preferences → Advanced group] the Train Distance Control can be set.




When this is enabled, each train will all the time calculate the distance to trains in front of it - in the driving direction. The train will brake if it comes too close – both if the train catch up from behind or the train is driving towards another train – in respect for the turnout settings.

**The assumptions are:**

- Trains are positioned with the position system.

- The track plan is made correctly with turnouts.
- Trains have correct distance values to the front and to the rear from the sender.
- The safety distance will act as the braking buffer.
- The trains have short braking delays ~ trains with a low mass. (Register CV4 = 1)
- A train cannot judge if the other train is driving forward or backward. Thus, the train will use the max value of the front and rear distances in its braking calculation in order to be safe. It might mean it will stop pretty far away from the train in front.

Distance control can be used together with block control, or it can be used independently. Normally, the dynamics of the trains calls for a long brake distance. It means that – at this stage – we recommend to use distance control as an additional behavior to other safety regulation like block control. Please also be aware of that distance control can prevent two trains to connect on the same track in a shunting area.

### 10.2.3 Driving in Tunnels

You can drive a vehicle through a tunnel in more ways.

- You can just let the Vehicle go and in most cases it will just drive through, however on the screen it might in many cases be drawn in pretty unsafe and jump left and right. You will then only be able to run one vehicle a time in the tunnel since distance control can not operate this way. The main principle is that it - automatically – sees the level drop and the by default turn the driving into a predict and area logic mode. However it depends on how far away the satellites are.
- You can also just mark a section as a tunnel, and then the system detects itself when the vehicle is in or out and when to stop measuring and when to resume. This type of tunnel can be used for mountains where real measurements are prevented. The section can be a track or a complete area. In this case you should extend the length of the tunnel section, so both ends will have a good portion visible outside the physical tunnel/shadowed area – set the minimum length of these portions to 100 mm in both ends. The system needs these portions in both ends in order to detect when to kick in the use of real measurements and prediction mode. These portions should probable be extended further if many vehicles are running simultaneous on the layout.


- You can also put a section in place before the entry and another one after the exit. You assign to this section a parameter saying [Tunnel Entrance] and [Tunnel Exit] respectively. This means that we ONLY drive between the two blocks uses the Area Logic and Predict. Using this method the vehicle will show up with a more transparent color. You can still manually reduce the speed or stop the vehicle in the tunnel and go on again, and you can have more vehicles after each other if the vehicle is correctly speed calibrated. Set the minimum length of Entrance and Exit sections to 100 mm.

**CAUTION**

- **Important!** Instead of the simple Tunnel we recommend using the Tunnel Entrance and Tunnel Exit sections, but it's very important these blocks are used in pairs.
- If you forget to add or mark a section as [Tunnel Exit], the system will never stop predicting the position of vehicles driving though the [Tunnel Entrance], because these vehicles will only start to use the real positions again, when driving through a Tunnel Exit section!
  **Impact: ALL these vehicles will over time get very inaccurate positions!**

**TIP**

- In one-way tunnels a pair of 2 sections are sufficient: [Entrance] and [Exit].
- In two-way tunnels you should use 4 sections in total – a pair in each end like this:
  **[Exit] [Entrance]..... inside tunnel here.....[Entrance] [Exit]**
- This will ensure that no matter what direction you enter the tunnel from, the Exit block is always passed when leaving - and the real measurements will be used again!

## 10.2.4 Add Sub Cameras in Track 2D

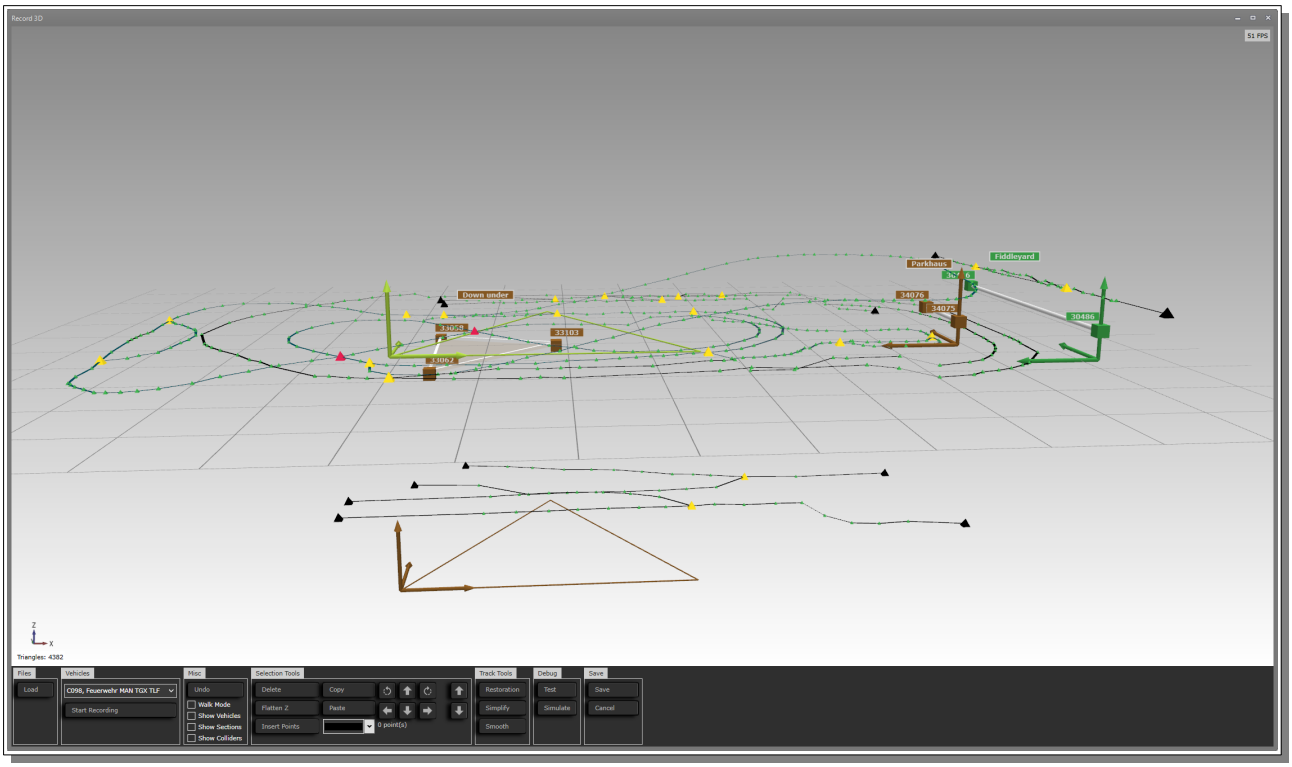
Please observe that your scenarios do not play any role in setting up these windows. They are all part of a global XYZ setting, You can have 1 main camera and 3 sub cameras showing more detailed parts of the layout, please see the figure example below.

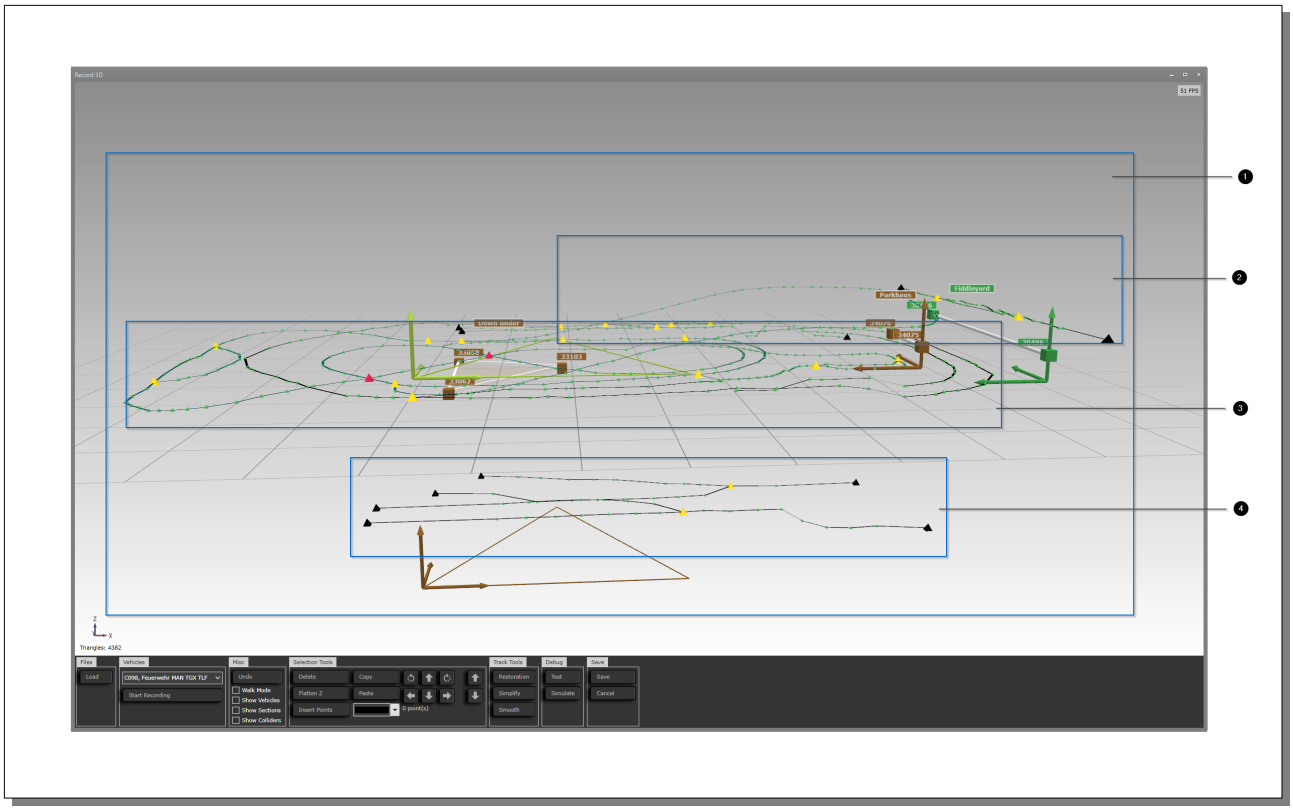
**ACTION**

- Press the + symbol down to the right, to insert a window.
- Use the Z-leveling (from the tutorial) to select the heights for each camera: Right Mouse+CTRL: Remove from the bottom Right Mouse+SHIFT Remove from the top Right Mouse+SHIFT+CTRL: Rotate
- Use the switch symbol [←] to switch the main view port.
- Use zoom to get exactly what you want to focus on
- Use the < > symbols to expand/collapse the windows

  Use the x symbol to close the sub camera view

Look at the 3D image here below: It's a main layout at level 0. From level 0 there is a couple of roads going up to a small flat hill. There's also a small separated layout beneath.

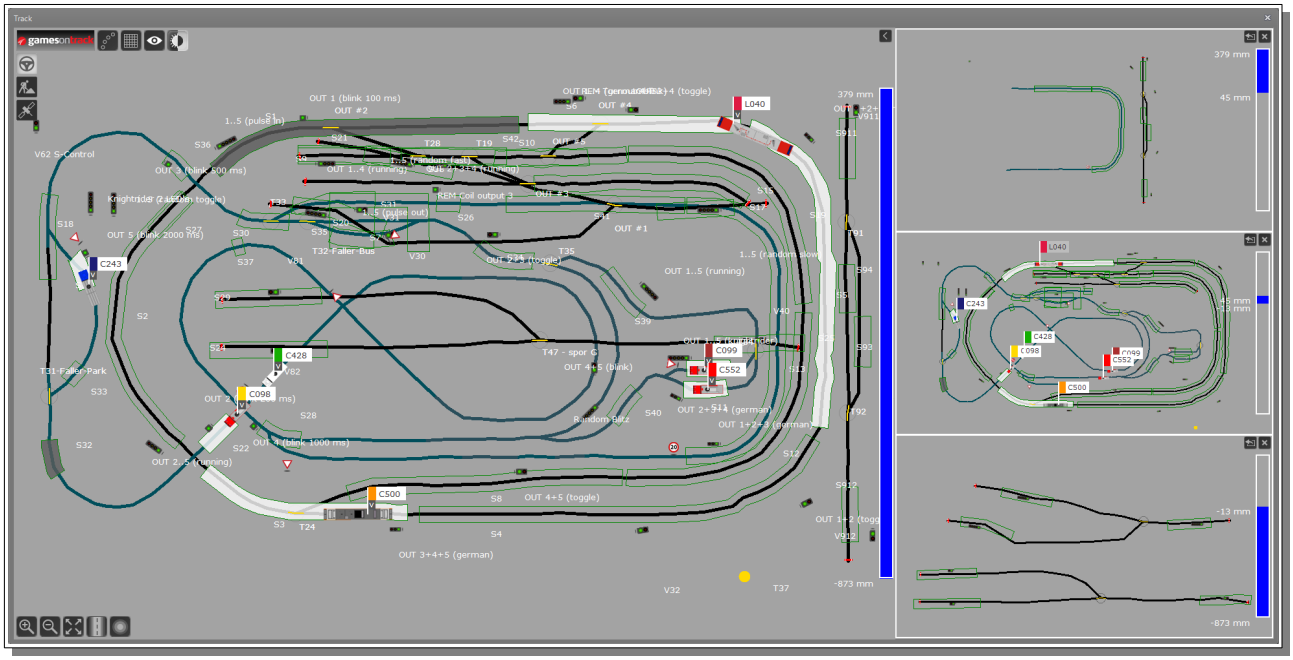





In this example we will have one main camera and three sub cameras to set up:

| | Camera | Area | Description |
|---|---|---|---|
| 1 | MAIN | Full height of layout | Range: 379 → -873 mm |
| 2 | UPPER | The small flat hill | Range: 379 → 45 mm |
| 3 | MIDDLE | Main middle layer | Range: 45 → -13 mm |
| 4 | LOWER | Separated layer below | Range: -13 → -873 mm |

*The image here below is slight manipulated: You will never be able to see the all blue vertical sliders simultaneous – they are only visible here for this illustration purpose.*



## 10.3 The Turnouts

Your turns are all placed where you can turn off from track/street/lane and drive into another track/street/lane based on the electrical switch.. In Faller you will also have places where two lanes merge into one without any magnetic device, like with trains where you just pass over a turnout without setting it.

| Two Way | Types Supported |
|---|---|
|  Straight  Turned | Motorola/DCC<br>Faller LocoNet<br>Faller DCC<br>GT X-Control<br>GT X-Control Faller<br>GT X-Control Coil<br>GT X-Control Coil Faller<br>Faller Radio Expansion Module |

| Three Way | Types Supported |
|---|---|
|  Left  Straight  Right | Motorola/DCC<br>GT X-Control |

| Four Way (Single) | Types Supported |
|---|---|
|  Straight  Crossed | Motorola/DCC<br>GT X-Control |

| Four Way (Double) | Types Supported |
|---|---|
|  A-D  B-C  B-D  A-C | Motorola/DCC<br>GT X-Control |

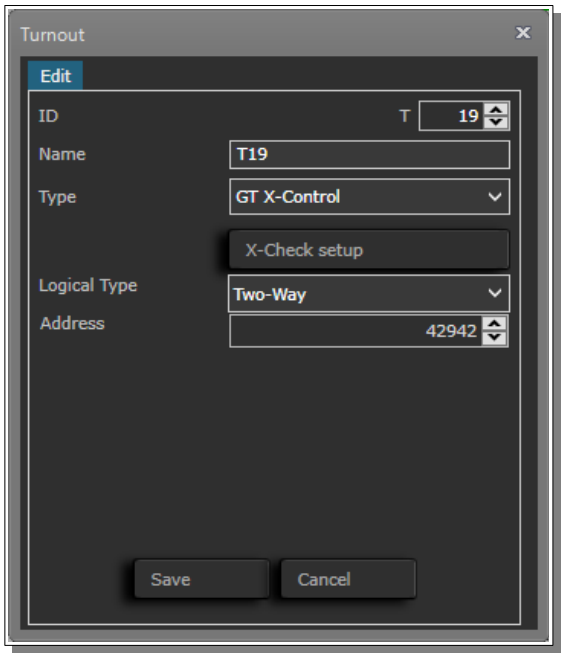
## 10.3.1 Set up GT-XCheck

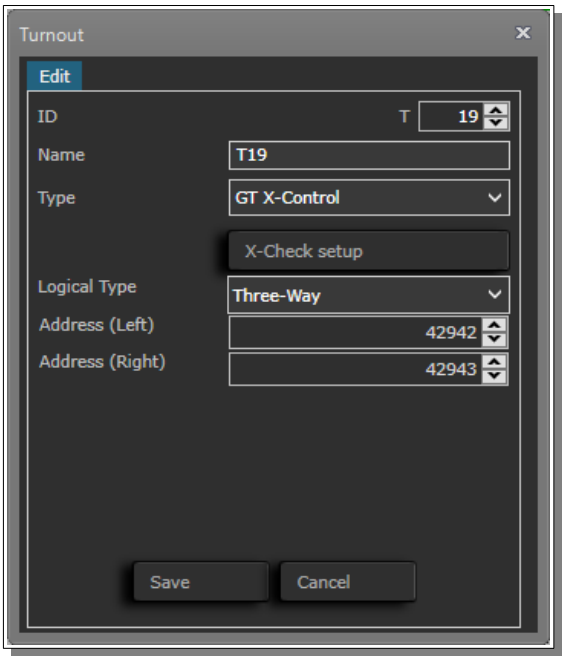
GT-XCheck is used in the hardware DCC-Motorola and GT-XControl and GT-XControl Faller.

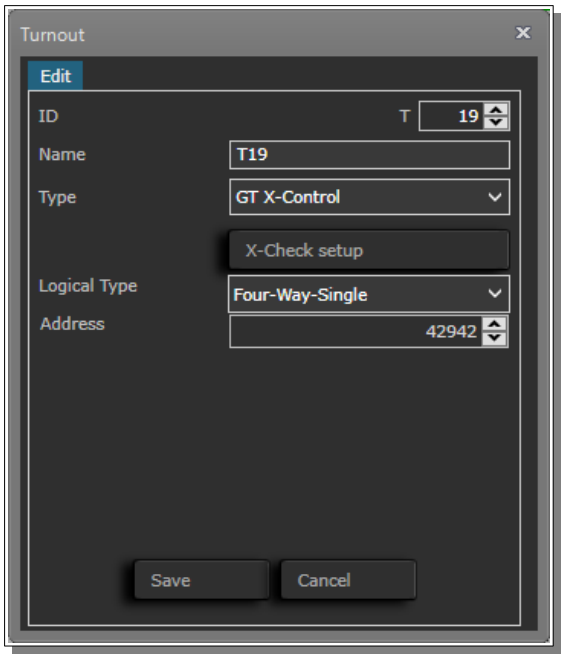
GT-XCheck reports a turnout position via radio to the PC-Software normally for Track G-scale, H0 or other turnouts.

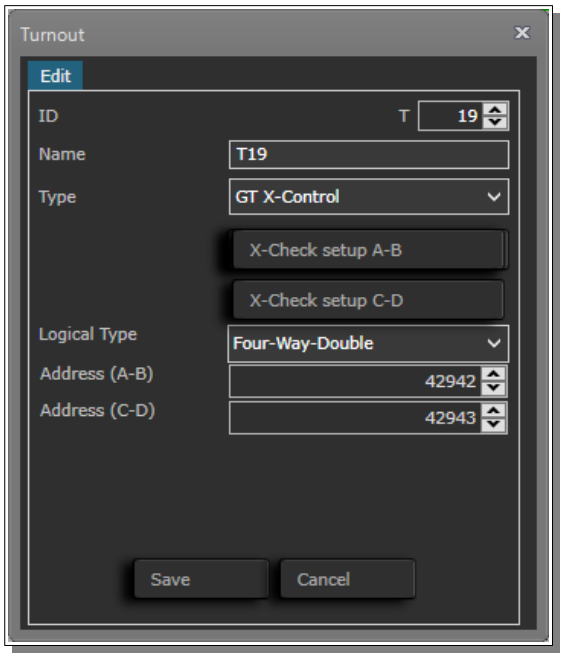
GT-XCheck reports via radio any new turnout position so that the automations always know the right position of the turnout.

Here are the screens for the four types 2-Way, 3-Way, 4-Way (Single) and 4-Way (Double):

<table>
<tr>
<td> 

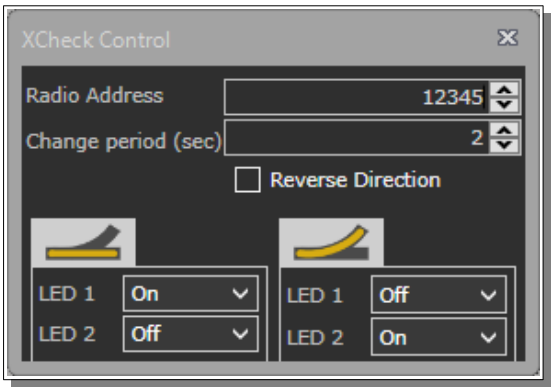
Single Address is used</td>
<td> 

Double Address is used</td>
</tr>
<tr>
<td> 

Single Address is used</td>
<td> 

Double Address is used</td>
</tr>
</table>

*Table 10.3.1*




**ACTION**

- Edit the radio address (ID labeled on the XCheck module)
- Change Period is how long the diodes blinks in a transition. Default is 2 seconds.
- Set Reversed direction (can be used to avoid rewiring the cables)
- In the drop down specify how the diodes should act: On/Off/Blink at various stages.
- Close the window and save in the turnout main menu.

**NOTE**

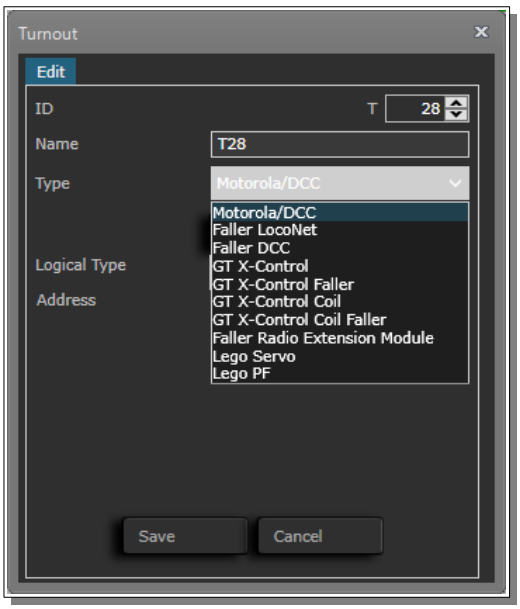
- The standard XCheck will run correctly for left turnouts if the platinum is inserted under the deck with the green antenna pointing back out from the turnout.
  If you do the same with a right turnout, please select Reverse Direction. It does not help to rotate the black/white label.

## 10.3.2 Set up Your Turnouts

Turns can be set directly on the screen, on the drawing, or they can be used in automations, or they can be called by voice control.

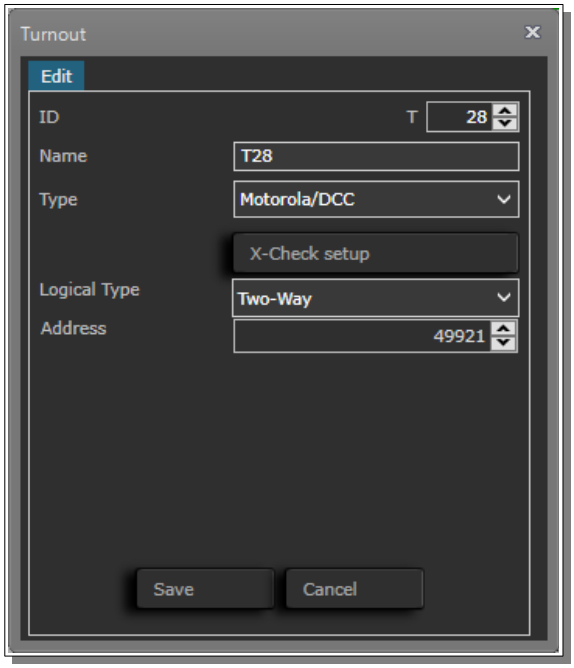
- Turn ID starts with T.
- The system propose an ID, however you can select one yourself.
  The T28 matches the GT-Command Type ID, meaning it can also be spoken ”Tango 28”
- You can add any name.
- You must select the logical type. Two-way is normal
- You must also select the type module for it (hardware)
- The turnout is as standard drawn by a 300 ms pulse.
- The XControl can draw an LGB-turnout as well as a normal dual magnetic turnout.
- The two types DCC-Motorola and GT-XControl also have a logical type. This type states how many deviations and how they are performed:
- 2-way with 1 DCC address
- 3-way with 2 DCC addresses
- 4-Way single, with 1 address
- 4-way double, 2 addresses. Please ensure to connect the logical types on the track.
  In Particular note the AD and BC settings.
- You also set the digital address for type A and B. For type C-D-E you just set the Radio ID of the device.
- You can operate the turnouts from the turnout View or via the menu

All available types of turnouts are listed in the dropdown, and the setups for each type are explained on the following chapters.



## 10.3.2.1 Motorola/DCC

Control a track turnout through a USB connected DCC controller. Used on a track with a 3rd party DCC controller, see section 7.8 for supported DCC controllers or [Controllers] menu. GT-Command communicate with the DCC controller, then the DCC controller generate DCC message on the track for 3rd party DCC decoders.

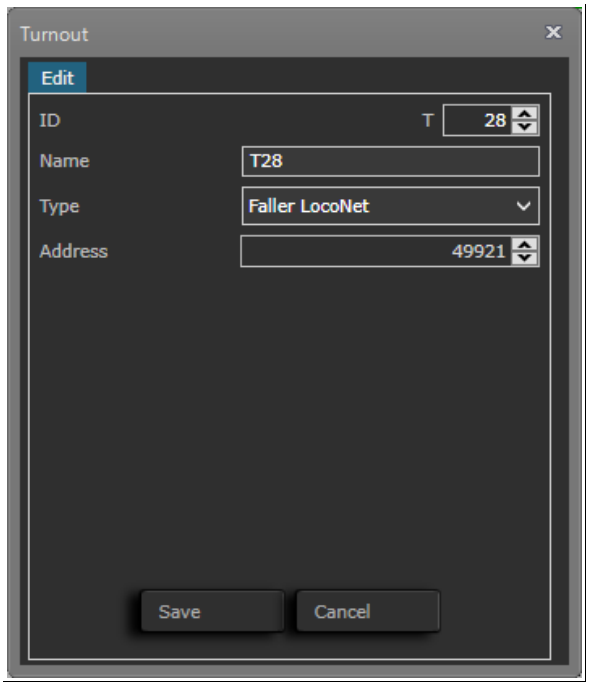



**ACTION**

- Set the ID
- Enter a Name for the turnout
- Select the type Motorola/DCC
- Select the Logical Type (first)
  *2-Way*
  *3-Way*
  *4-Way (Single)*
  *4-Way (Double)*
- *Set the X-Check (next)*
- Set the Address
  *Labeled on the hardware*
- Click Save

## 10.3.2.2 Faller LocoNet

Faller Expansion Module, Faller article no 161352. Used with smaller model scale tracks (H0 and smaller). The PCB can control 12 outputs. Used to control single coil track turnouts. Faller Expansion Module supports a series of outputs -make sure outputs used as track devices does not overlap with track turnouts. The item is addressed using a standard LocoNet-B connection found on the Master II and Master III. Each module is powered by 16VAC.

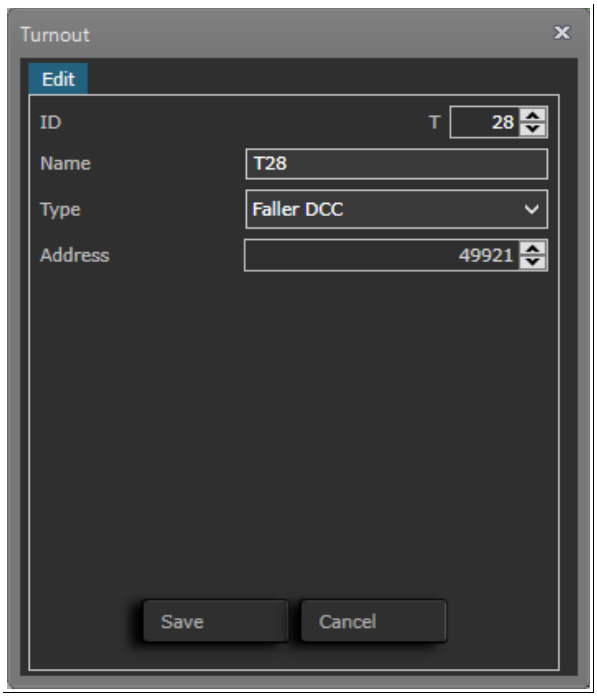



**ACTION**

- Set the ID
- Enter a Name for the turnout
- Select the type Faller LocoNet
- Set the Address
- Click Save

## 10.3.2.3 Faller DCC

Faller Master with DCC, Faller article no 161354. Used with smaller model scale tracks (H0 and smaller). The Master have a DCC controller. Used to control DCC decoders. The Master is powered by 16VAC.



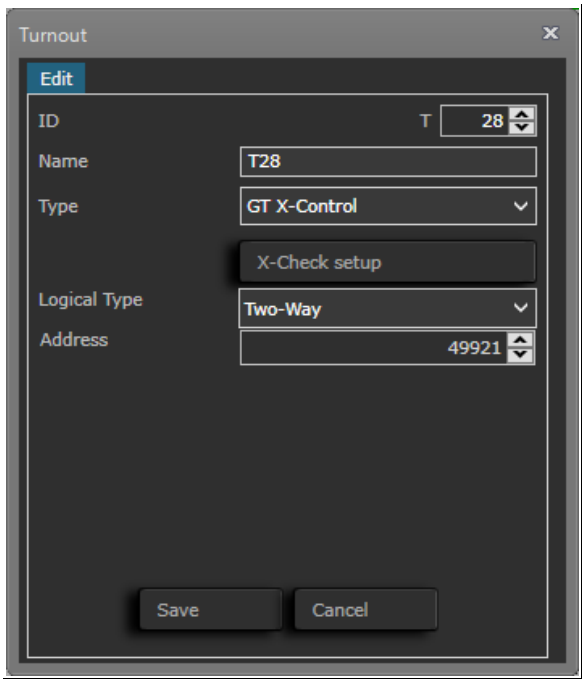

**ACTION**

- Set the ID
- Enter a Name for the turnout
- Select the type Faller DCC
- Set the Address
- Click Save

## 10.3.2.4 GT X-Control

GT-Xcontrol Device, Games on Track item # 1302722. Often used with larger model scale tracks. The PCB can control both reversed polarity track turnouts, and the more common two coil track turnout. The item is addressed with a radio ID and is controlled with the master. Can be powered directly from the tracks, with DCC or DC.

Setup allows for feedback from GT-Xcheck, Games on Track item #1302728. Signals can be setup with GT-Xcheck.

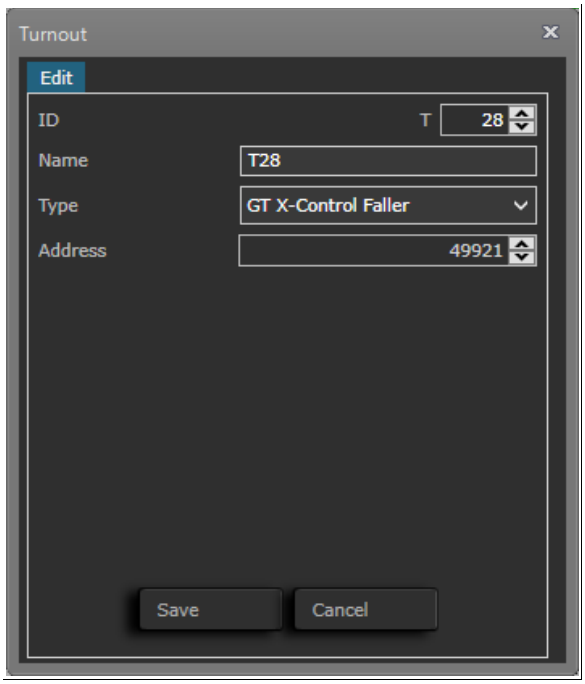



**ACTION**

- Set the ID
- Enter a Name for the turnout
- Select the type GT X-Control
- Select the Logical Type (first)
  *2-Way*
  *3-Way*
  *4-Way (Single)*
  *4-Way (Double)*
- *Set the X-Check (next)*
- Set the Radio Address
  *Labeled on the hardware*
- Click Save

## 10.3.2.5 GT X-Control Faller

GT-Xcontrol Device, Games on Track item # 1302722. Often used with larger model scale tracks. The PCB controls a single coil with continuously current output, fail-safe at max. 7 seconds after radio loss. The item is addressed with a radio ID and is controlled with the master. Can be powered directly from the tracks, with DCC or DC.

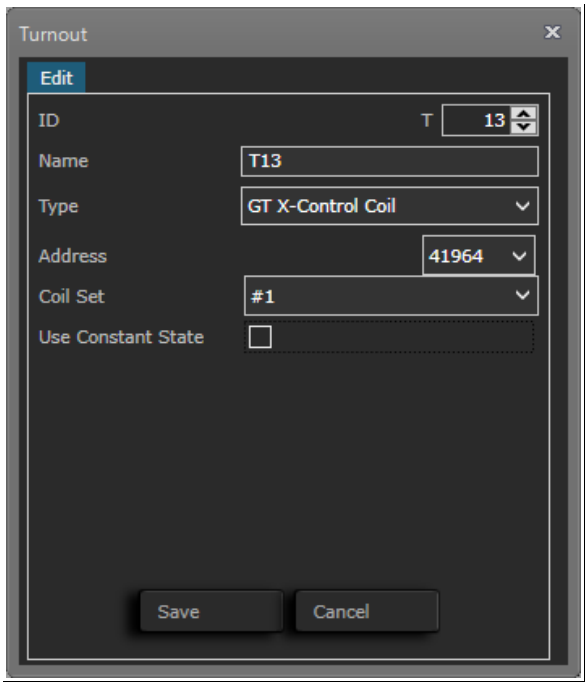



**ACTION**

- Set the ID
- Enter a Name for the turnout
- Select type GT X-Control Faller
- Set the Radio Address
  *Labeled on the hardware*
- Click Save

## 10.3.2.6 GT X-Control Coil

GT-Xcontrol Coil, Games on Track item # 1302702. Used with smaller model scale tracks (H0 and smaller). The PCB can control both dual-coil track turnout, and single coil track turnouts, like Faller turnouts (see GT X-Control Coil Faller). The PCB can control two sets of coils, wire connectors for Märklin article no 74491 are included. The item is addressed with a radio ID and is controlled with the master. Can be powered directly from the tracks, with DCC or DC.



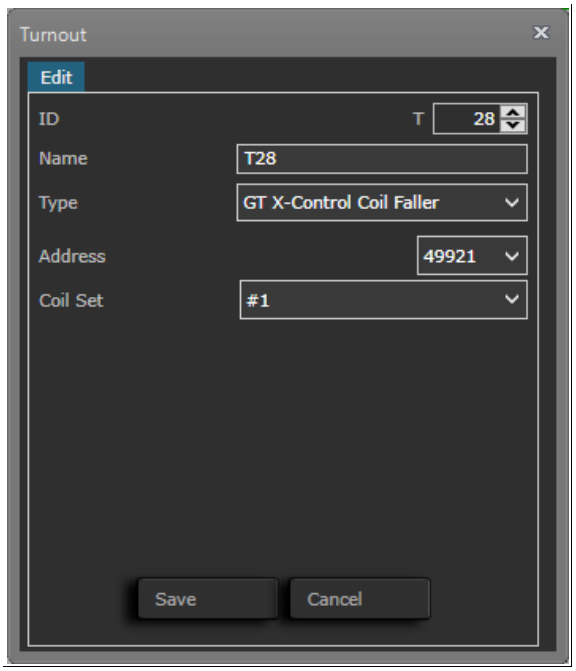

**ACTION**

- Set the ID
- Enter a Name for the turnout
- Select type GT X-Control Coil
- Set the Radio Address
  *Labeled on the hardware*
- *Select Coil Set #1 or #2*
- A pulse controls the coil, but in some cases a constant current is needed, then enable [Use Constant State]
- Click Save

**NOTE**: The GT X-Control Coil has two Coil Sets, which makes it possible to use the same hardware module for two different turnouts.

## 10.3.2.7 GT X-Control Coil Faller

GT-Xcontrol Coil, Games on Track item # 1302702. Used with smaller model scale tracks (H0 and smaller). The PCB can control both and single coil track turnouts, like Faller turnouts, and dual-coil track turnout (see GT X-Control Coil). The PCB can control a coil in each set. Wire connectors are included, but connections are to be made by the user. The PCB also supports 2 sets of LEDs, for a total of 4 LEDs. The item is addressed with a radio ID and is controlled with the master. Can be powered directly from the tracks, with DCC or DC.



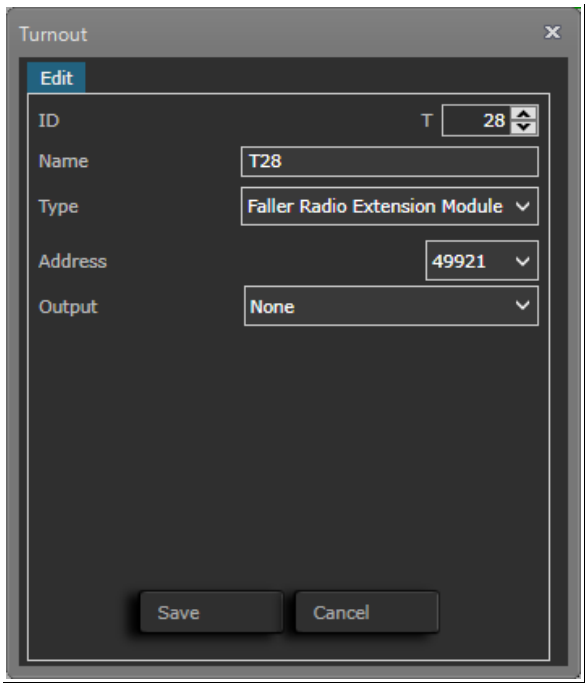

**ACTION**

- Set the ID
- Enter a Name for the turnout
- Select type GT X-Control Coil Faller
- Set the Radio Address
  *Labeled on the hardware*
- Select Coil Set #1 or #2
- Click Save

**NOTE**: The GT X-Control Coil Faller has two Coil Sets, which makes it possible to use the same hardware module for two different turnouts.

## 10.3.2.8 Faller Radio Expansion Module

Faller Radio Expansion Module, Faller article no 161345. Used with smaller model scale tracks. With 5 outputs, the PCB can control both single coil, and dual-coil track turnouts. The Faller Radio Expansion Module supports a series of LED configurations setup with the Faller Radio Expansion Module Simulator -make sure outputs does not overlap. The item is addressed with a radio ID and is controlled with the master. Can be powered directly from the tracks, with DCC, DC, or AC.



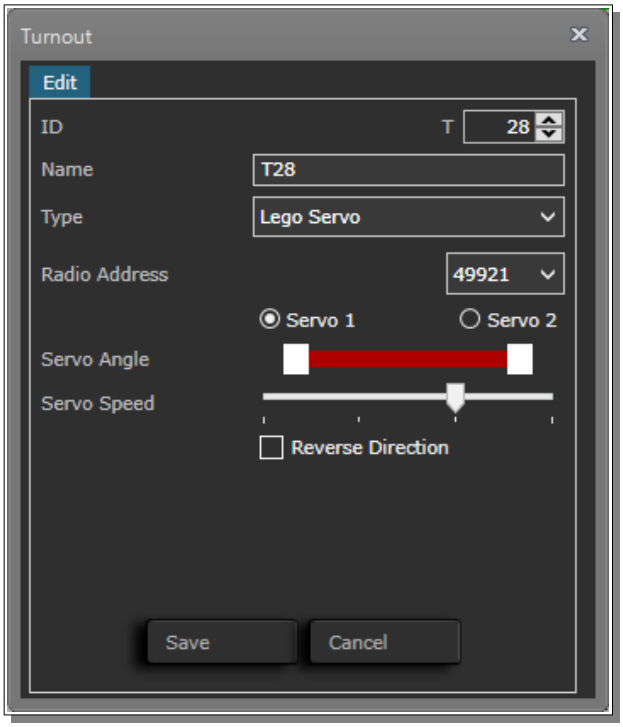

**ACTION**

- Set the ID
- Enter a Name for the turnout
- Type: Faller Radio Expansion Module
- Set the Radio Address
  *Labeled on the hardware*
- Select Output 1..5
- Click Save

**NOTE**: The Faller Radio Expansion Module has five outputs, which makes it possible to use the same hardware module for five different turnouts.

## 10.3.2.9 LEGO Servo

GT-Xcontrol Servo, Games on Track item # 1302762. Used with smaller model scale tracks and LEGO trains. The PCB can control 2 servos, with 2 distinct angles for turn and straight. The speed of the servos can be set to 4 steps. The PCB have a connector for each servo. The item is addressed with a radio ID and is controlled with the master. The PCB is delivered with a 3x AAA battery-pack, but can be powered with a MICRO-B USB connector, by a 5V phone charger.

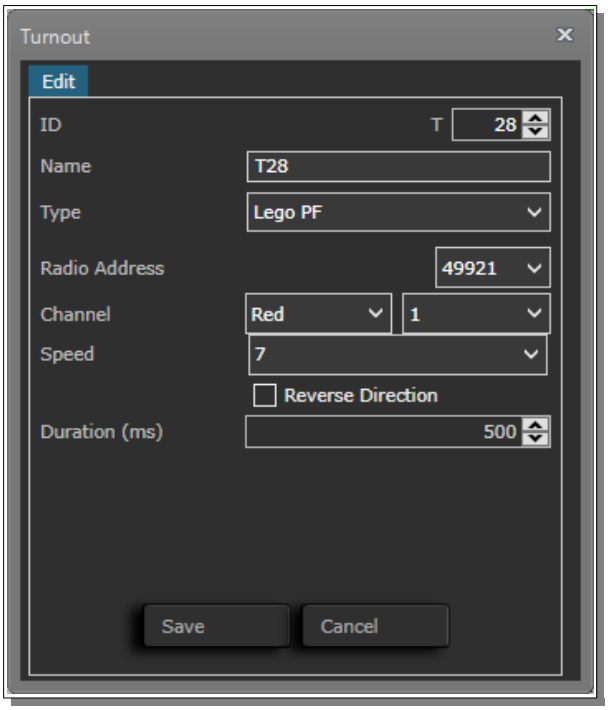



**ACTION**

- Please select a turnout ID and Name as above
- Please select Lego in the drop down list
- Please insert the radio address as printed on the device or on the device box, or seen from the debug list of all radios in the system
- Please pick in order: First Servo 1 – then Servo 2.
- For each servo use the slider to set the angle, click on one end and then the other end to find the two end points for the servo – normally not full out but close. It may vary if the servo runs a Turnout or operates a Gate. You can easily test it clicking the turnout symbol in the list.
- Please select for each servo how quickly it should move. Do not make it too slowly.
- Please Save and please ensure you have picked both servos.

## 10.3.2.10 LEGO PF

GT-Xcontrol IR, Games on Track item # 1302761. Used with LEGO IR Receivers and LEGO PF series hardware. The PCB communicate with a LEGO PF IR Receiver, LEGO item # 8884, using IR. Controls 2 outputs, with: speed, direction, and duration. Setup allows for 4 channels, red or blue output. The PCB can be powered by a 9V LEGO PF battery box, LEGO PF extension wire is not included.



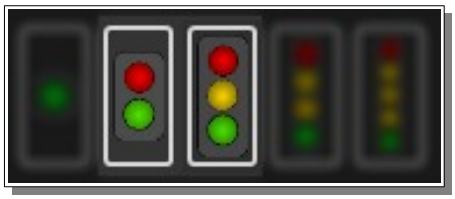

**ACTION**

- Please select a turnout ID and Name as above
- Please select Type Lego PF in the drop down list
- Please insert the radio address as printed on the device or on the device box, or seen from the debug list of all radios in the system
- Please select Channel Color and Id.
- Please set the Speed
- Please set the Reversed Direction if necessary.
- Please set the Duration in ms. Default is 500 ms.
- Save and please ensure you have picked both servos.

- o -

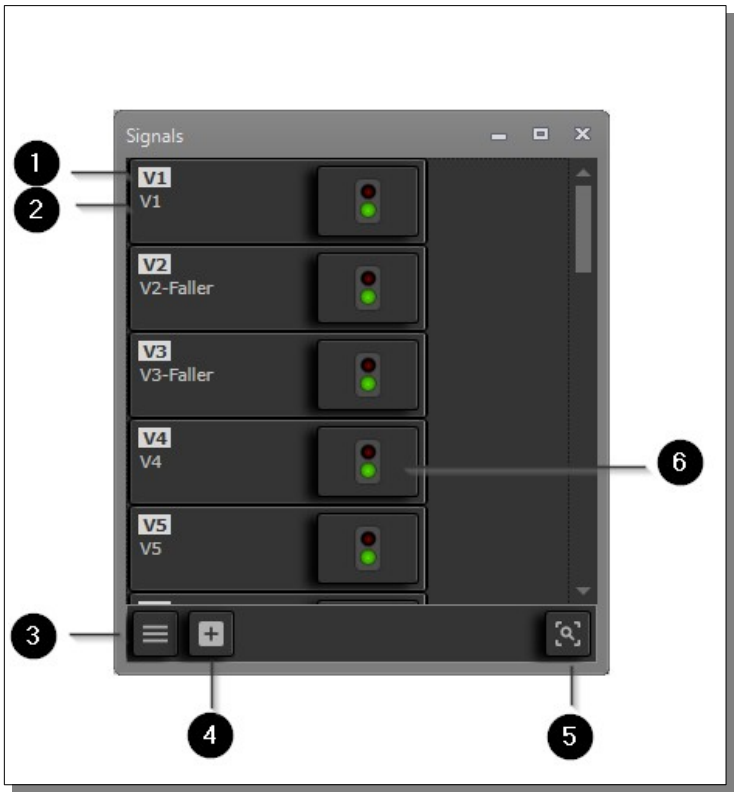
## 10.4 The Signals

The Signal component is used for traffic control, or simply for setting various LED's on and off. The menu [View → Show Signals] will open a list containing all signals created in the system.



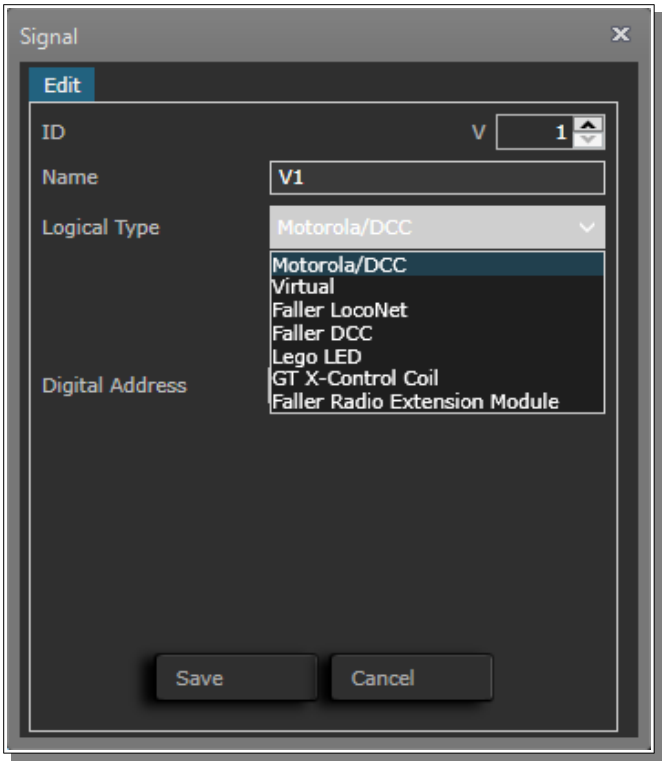
- All signals will support 2-aspects and 3-aspects – as highlighted here below.
- The support for 4 and 5 aspects signals will require the Faller Radio Expansion Module.
- Signals can be either virtual or physical. There are several types – listed below.
- Virtual signals means that you only see them on the screen.
- Physical signals are connected to the LocoNet Module as Faller LocoNet, Faller Radio Expansion Module or as direct DCC devices with a digital address on the digital controller – Motorola DCC.
  They are visible on the layout using a digital address or a Radio address as the Lego-LED. If you use Direct radio and want to set a Signal using GT-XControl please select that type and use The GT-XControl ID as the Digital Address.
- Signals can be set directly on the screen, on the drawing, or they can be used on Automations, or they can be called by voice control.
- The Signal ID is prefixed with the letter V.

- Any Signal can be operated on the screen, by pressing the symbol in the Signal View, the symbol in the 2D-layout, an associated section if the signal is attached to this, from an automation, from a route, or from voice control.
- Signals can be virtual only - in such a case they are often used to stop vehicles both on the screen and physically. Signals will have a free position as default, but they also might be a POINT-signal, meaning they will have a position that is snapped to the track. Driving vehicles  can see their position and will stop in front of them.
- You can assign a signal to a section/block in the Section edit window. Then the signal will operate as the block. If the signal (and Block) is red then a train will drive slowly and finally stop in front of the signal.
- Normally you can select the 2 or 3 aspect signal, it is only how they show up on screen. 3 aspect signal is meant for cars, 2 aspect in general for trains - you decide the usage.
- A Signal might have a position snapped to a track/street and the vehicle can see forward where this position is and brake accordingly (only if free signal, in this version it cannot yet drive slowly in a red block until the signal position is reached.)




| View Signals | | Description |
|---|---|---|
| 1 | **ID** | Unique ID |
| 2 | **Name** | Name of the Signal |
| 3 | **Overview** | Opens the Edit System → Signals Tab |
| 4 | **Add** | Add new Signal |
| 5 | **Search/Filter** | Opens the Search/Filter line |
| 6 | **Signal State** | Click this button to toggle the Signal between Red/Green ~ STOP/GO |

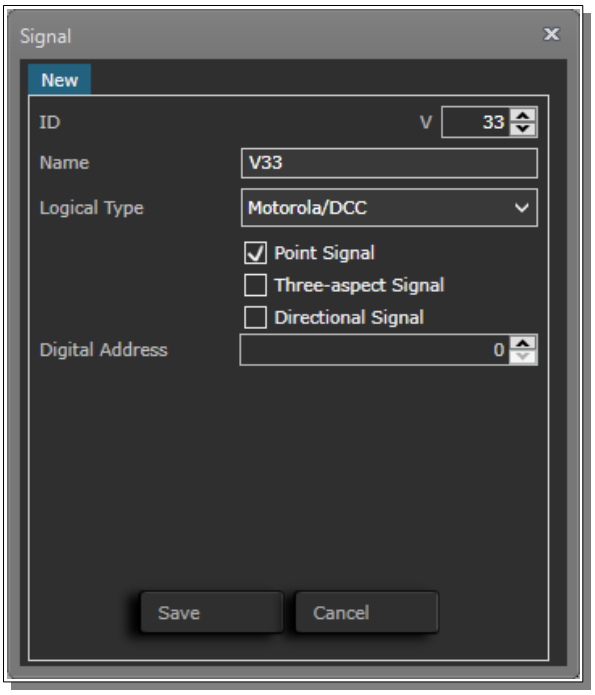
## 10.4.1 Signal Types




| | Logical Types | Description |
|---|---|---|
| 1 | **Motorola/DCC** | Support for Motorola hardware.<br>- only the DCC address must be specified |
| 2 | **Virtual** | The virtual signal is for signals with no connection to any hardware.<br>- a virtual signal type has no DCC address. |
| 3 | **Faller LocoNet** | Faller component for handling Signal via Erweiterungsmodul - the specific output address on the Erweiterungsmodul must be specified |
| 4 | **Faller DCC** | Faller component for handling Signal via DCC<br>- only the DCC address must be specified |
| 5 | **Lego LED** | GamesOnTrack component for controlling LED on LEGO components. |
| 6 | **GT X-Control Coil** | GamesOnTrack component for handling LED's or turnouts |
| 7 | **Radio Expansion Module** | The Faller REM is an advanced module, which is capable of handling up to five outputs each controlling LED's, turnouts or switches individually. |

## 10.4.2 Motorola/DCC

Control a signal through a USB connected DCC controller. Used on a track with a 3rd party DCC controller, see section 7.8 for supported DCC controllers or [Controllers] menu. GT-Command communicate with the DCC controller, then the DCC controller generate DCC message on the track for 3rd party DCC decoders.




**ACTION**

- Set the ID
- Enter a Name for the signal
- Determine if the signal should be
  Point Signal
  Three-Aspect Signal
  Directional Signal
- Specify the Digital Address
  *Labeled on the hardware*
- Click [Save]

## 10.4.3 Virtual

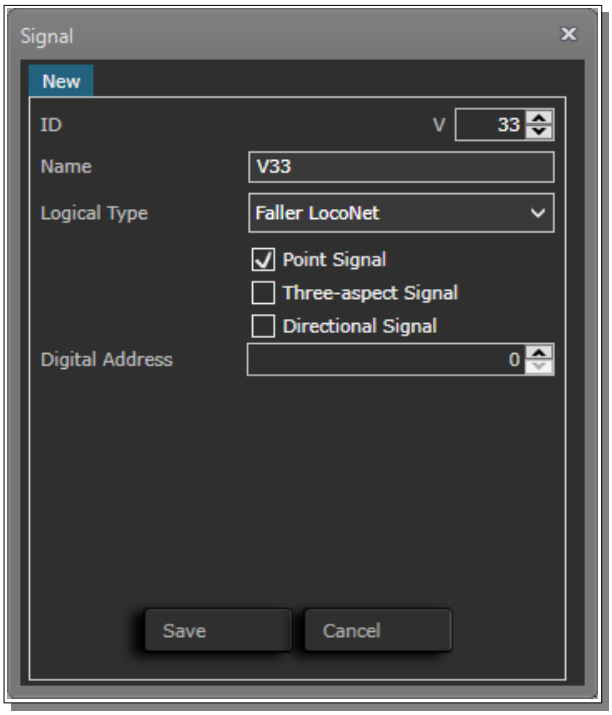
A signal only visible in software. Vehicles will respect virtual signals the same as other signal types. Often used when simulating human-like behaviour.


**ACTION**

- Set the ID
- Enter a Name for the signal
- Determine if the signal should be
  Point Signal
  Three-Aspect Signal
  Directional Signal
  Hidden Signal
- Click [Save]

## 10.4.4 Faller LocoNet

Faller Expansion Module, Faller article no 161352. Used with smaller model scale tracks. The PCB can control 12 outputs. Used to control single LEDs or a set of LEDs for track signals and traffic lights. Faller Expansion Module supports a series of outputs -make sure outputs used as track devices does not overlap with signals. The item is addressed using a standard LocoNet-B connection found on the Master II and Master III. Each module is powered by 16VAC.

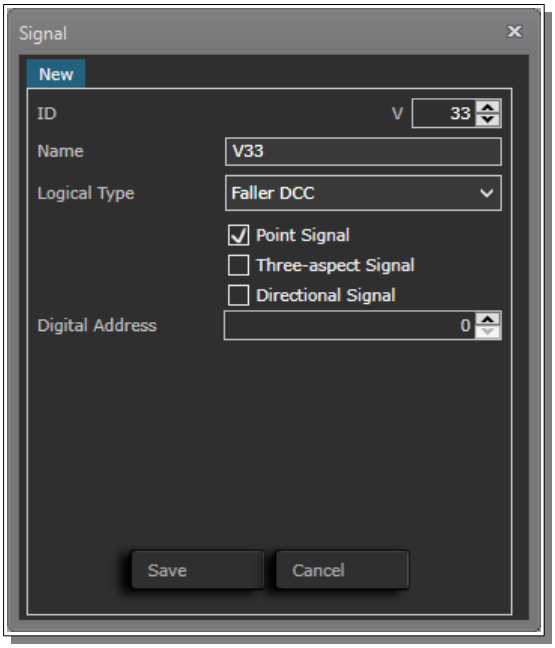



**ACTION**

- Set the ID
- Enter a Name for the signal
- Determine if the signal should be
  Point Signal
  Three-Aspect Signal
  Directional Signal
- Specify the output address on the Erweiterungsmodul
- Click [Save]

## 10.4.5 Faller DCC

Faller Master with DCC, Faller article no 161354. Used with smaller model scale tracks. The Master have a DCC controller. Used to control DCC decoders. The Master is powered by 16VAC.

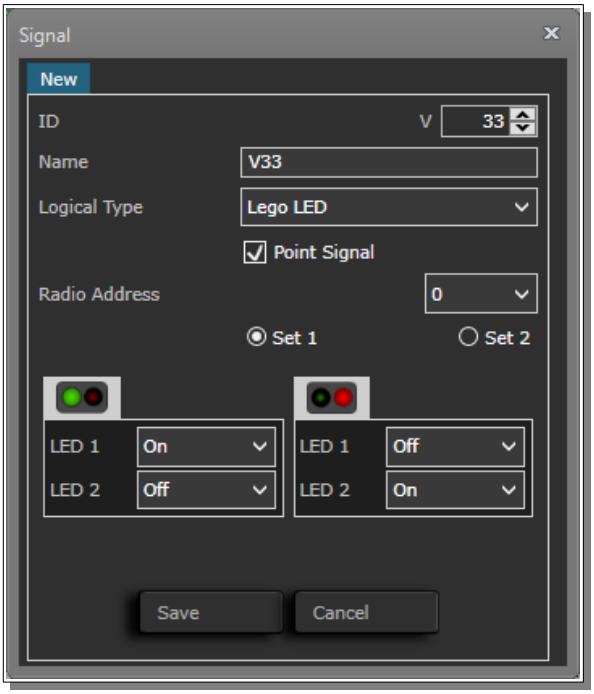



**ACTION**

- Set the ID
- Enter a Name for the signal
- Determine if the signal should be
  Point Signal
  Three-Aspect Signal
  Directional Signal
- Specify the Digital Address
  *Labeled on the hardware*
- Click [Save]

## 10.4.6 Lego LED

GT-Xcontrol Servo, Games on Track item # 1302762. Used with smaller model scale tracks and LEGO trains. The PCB supports 2 sets of LEDs, for a total of 4 LEDs. 2 sets of one red and one green LED with header is included. The item is addressed with a radio ID and is controlled with the master. The PCB is delivered with a 3x AAA battery-pack, but can be powered with a MICRO-B USB connector, by a 5V phone charger.

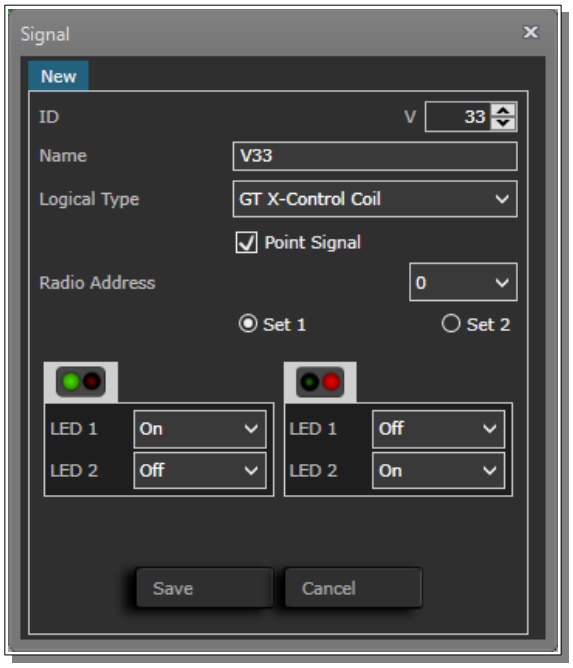



**ACTION**

- Please select a Signal ID and Name as above
- Please select Lego in the drop down list
- Please insert the radio address as printed on the device or on the device box, or seen from the debug list of all radios in the system
- The Set-up handles about what happens when you select Green or Red on the symbol on the screen or in automations. These are the two standard selections only, however a lot of different things can happen since each LED is completely independent from the other.
- For every LED please select one of the states off, on, flash, not used when pressing green and red. As an example if both LEDs are sitting as one green and one red in one signal you will select green LED 1 On and green LED 2 Off – red LED 1 Off and red LED 2 On – as shown in the example.
- As another example is the two LEDs are both red and standing in a crossing on each side you will select green LED 1 and LED 2 off and red LED 1 Flash and LED 2 Flash, then both signals will flash when you select red on that Signal
- Click [Save].

## 10.4.7 GT-XControl Coil

GT-Xcontrol Coil, Games on Track item # 1302702. Used with smaller model scale tracks. The PCB supports 2 sets of LEDs, for a total of 4 LEDs. The item is addressed with a radio ID and is controlled with the master. Can be powered directly from the tracks, with DCC or DC.

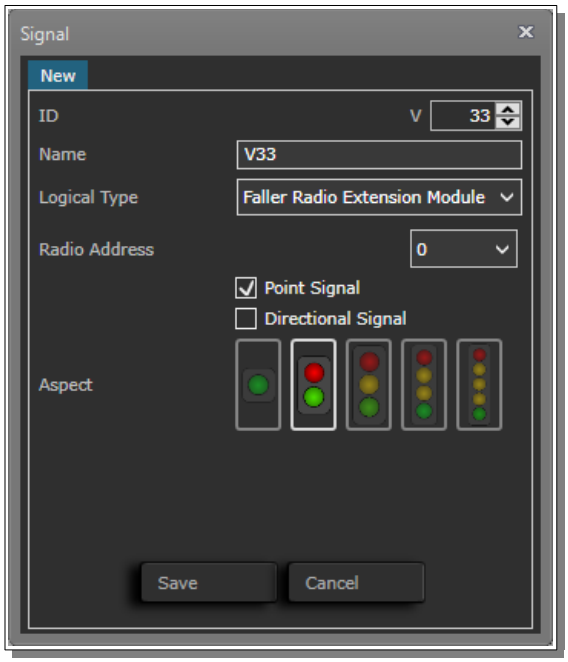



**ACTION**

- Please select a Signal ID and Name as above
- Please select GT-XControl Coil in the drop down list
- Please insert the radio address as printed on the device or on the device box, or seen from the debug list of all radios in the system
- The Set-up handles about what happens when you select Green or Red on the symbol on the screen or in automations. These are the two standard selections only, however a lot of different things can happen since each LED is completely independent from the other.
- For every LED please select one of the states off, on, flash, not used when pressing green and red. As an example if both LEDs are sitting as one green and one red in one signal you will select green LED 1 On and green LED 2 Off – red LED 1 Off and red LED 2 On – as shown in the example.
- As another example is the two LEDs are both red and standing in a crossing on each side you will select green LED 1 and LED 2 off and red LED 1 Flash and LED 2 Flash, then both signals will flash when you select red on that Signal
- Click [Save].

## 10.4.8 Faller Radio Expansion Module

Faller Radio Expansion Module, Faller article no 161345. Used with smaller model scale tracks. With 5 outputs, the PCB can control signals. The Faller Radio Expansion Module supports a series of LED configurations setup with the Faller Radio Expansion Module Simulator -make sure outputs does not overlap. The Radio Expansion Module is programmed with every command sent, which allows for changing output states and behaviour while running. Normal use is switching between a red and green state, but more states can be added using several signals on the same Radio Expansion Module. The item is addressed with a radio ID and is controlled with the master. Can be powered directly from the tracks, with DCC, DC, or AC.




**ACTION**

- Set the ID
- Enter a Name for the signal
- Select Faller Radio Expansion Module
- Select the Radio Address when module is online. *Labeled on the hardware*
- *Enable point signal if needed. Point*
- Select 1,2,3,4 or 5 aspect

**The REM Signal Configurator will now Open**

- o -

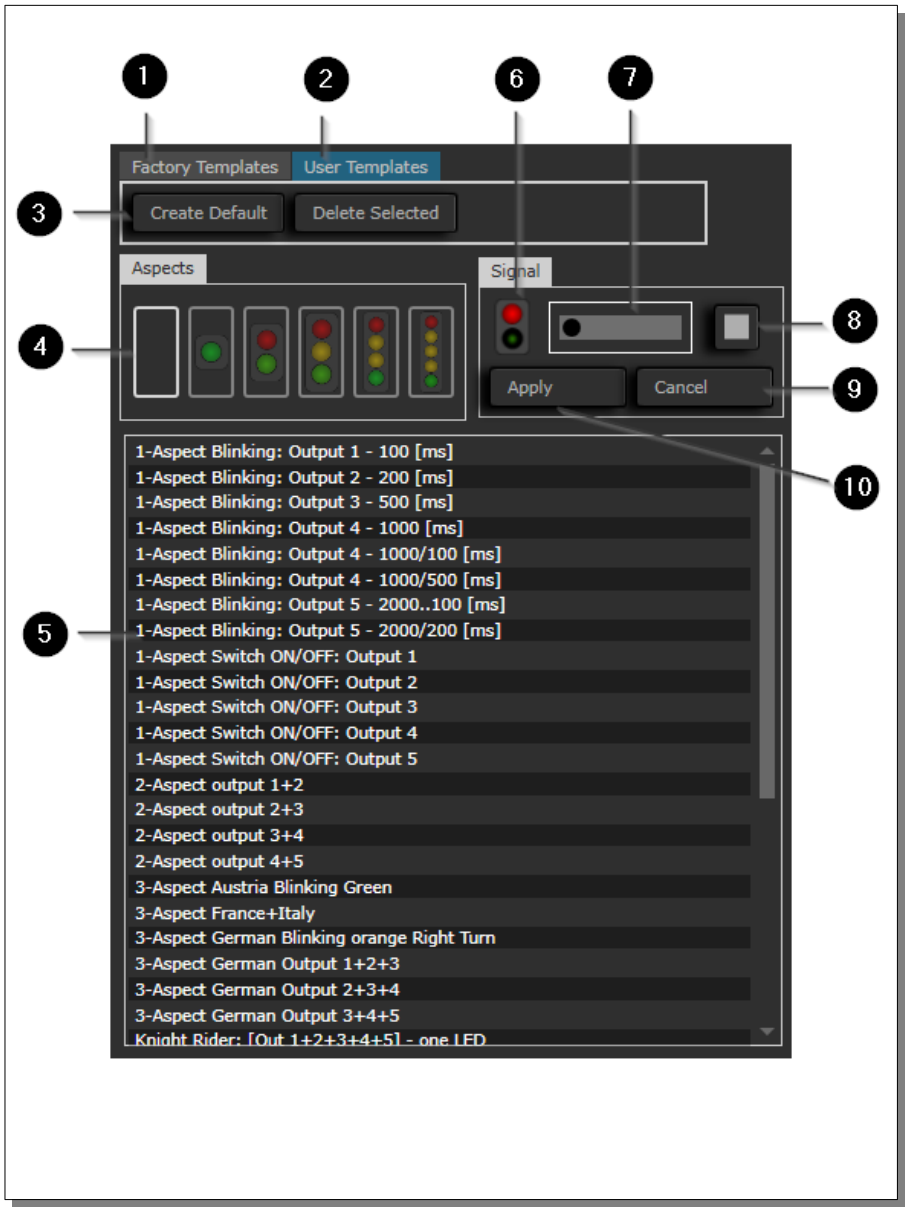
## 10.5 REM Signal Configurator

This is an advanced signal configurator, allowing set up for 1 to 5 aspect signals.

In the example here below, a German signal with 3+1 aspects is shown. The red, yellow and green lamps have normal 3-aspect behavior. The fourth orange lamp is a blinking right arrow that turns on, when the signal turns green – indicating caution at right turns!


The signal configurator is divided in two areas.

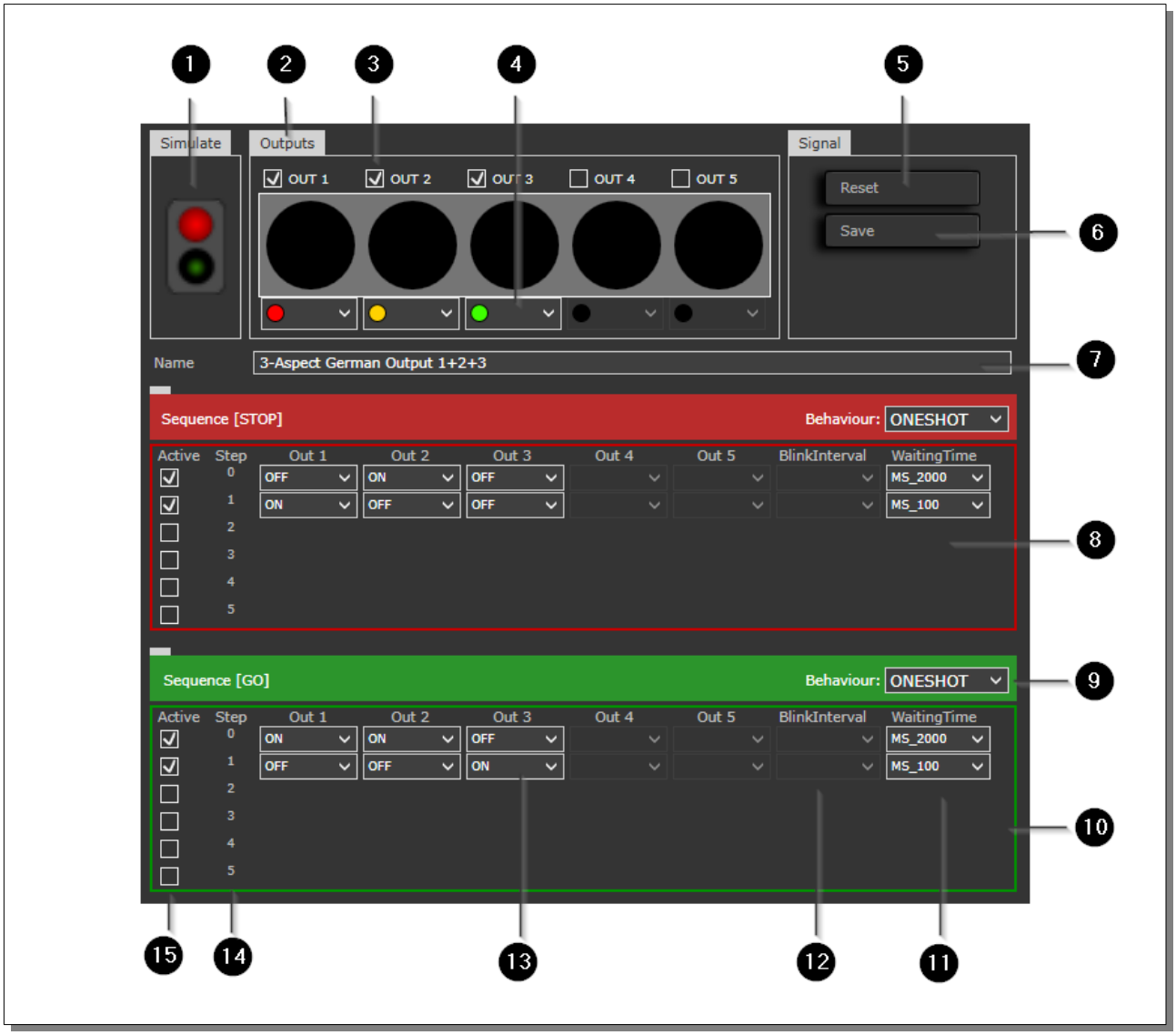
| Item | | Description |
|---|---|---|
| 1 | **Templates Area** | The left area with simple selection and test of templates |
| 2 | **Configuration Area** | The right area is for creating and simulating templates |




| | Templates Area | Description |
|---|---|---|
| 1 | **Factory Templates** | Factory templates are bundled with the PC-Software, and there will be various examples of 1..5 aspects signals |
| 2 | **User Templates** | User templates will be a copy of the factory templates, that can be modified, deleted, and new templates can be added<br>When the user templates tab is selected the buttons [Create Default] and [Delete Selected] are available<br>Click [Create Default] to create an empty template in the Configurator Area<br>Click [Delete Selected] to delete the selected template from the list. |
| 3 | **Create and Delete** | Press [Create Default] add a new default signal<br>Press [Delete Selected] to remove the selected signal from the list. |
| 4 | **Aspects** | Clicking on the aspects 1..5 will filter out relevant aspects in the list below.<br>Clicking the empty aspect will show ALL aspects in the list |
| 5 | **List of Signal Templates** | The list of aspects selected in the Aspects Group |
| 6 | **Signal [STOP/GO]** | The Signal Group contains various buttons for simulating the selected template.<br>The red/green signal button for testing the signals [STOP/GO] sequences |
| 7 | **Outputs** | The simulated LED outputs 1..5 |
| 8 | **Stop** | The Stop icon for stopping and resetting the signal simulation. |

| | | |
|---|---|---|
| 9 | **Cancel** | The [Cancel] button for canceling any changes |
| 10 | **Apply** | The [Apply] button for transferring the template to the current signal |

## 10.5.1 The Configurator - and Simulator




| Simulator | | Description |
|---|---|---|
| 1 | **Simulate** | The red/green signal button for testing the signals [STOP/GO] sequences.<br>The same button is found on the left area |
| 2 | **Outputs** | The LED outputs |
| 3 | **Enable Outputs** | Enable any LED 1..5 to be used in your signal |
| 4 | **Select Output Colors** | Select the colors for each output to simulated |
| 5 | **Signal Reset** | Click to Reset the signal |
| 6 | **Signal Save** | Click Save to persist your current templates<br>**NOTE:** All user created signal templates are found here:<br>[DefaultUserDirectory]**Settings**\UserSignalTemplates |
| 7 | **Enter Name** | Enter a name of the created template |
| 8 | **Sequence [STOP]** | This is the sequence for the STOP signal (red)<br>The sequence consist of steps |

| | | |
|---|---|---|
| 9 | **Behavior** | The behavior of a sequence. Possible values are:<br>**ONESHOT – REPEAT – KNIGHTRIDER - RANDOM** |
| 10 | **Sequence [GO]** | This is the sequence for the GO signal (green)<br>The sequence consist of steps |
| 11 | **Waiting Time** | This is the waiting time in ms for each step in the sequence.<br>Possible values: **50 – 100 – 200 – 500 – 1000 – 2000 – 5000 - FOREVER** |
| 12 | **Blink Interval** | This is the blink interval in ms for each step in the sequence.<br>Possible values: **50 – 100 – 200 – 500 – 1000 – 2000 – 5000 - FOREVER** |
| 13 | **Output States** | This is the output states for each LED. Possible values are:<br>**NOCHANGE – OFF – ON - BLINK** |
| 14 | **Step Index** | A read only index for each step – maximum 6 steps are allowed |
| 15 | **Active** | Enable the checkbox to add a step to the sequence. |

### 10.5.1.1 Behavior

The behaviors of a sequence can be: ONESHOT – REPEAT – KNIGHTRIDER – RANDOM

These different behaviors are described here below using a sequence with 3 steps.

- **ONESHOT**: Use this behavior when steps in a sequence must be executes once only.
  *Example: Step 1-2-3*
- **REPEAT**: Use this behavior when a sequence should be repeated as a continuous loop, where all steps are played from top to bottom.
  *Example: Step 1-2-3-1-2-3-1-2-3…*
- **KNIGHTRIDER**: Use this behavior when a sequence should be repeated as a continuous loop, but where all steps are alternating down-up-down-up…
  *Example: Step 1-2-3-2-1-2-3-2-1-2-3…*
- **RANDOM**: Use this behavior when a sort of random play of the LED is needed.
  *Example: Step 1-2-3-3-1-1-2-3-1-3-1-1-3-2-2-2…*

### 10.5.1.2 Waiting Time and Blink Interval

The Waiting Time must always be set, where the Blink Interval only is used if any of the LED states are set to BLINK.

### 10.5.1.3 Output States

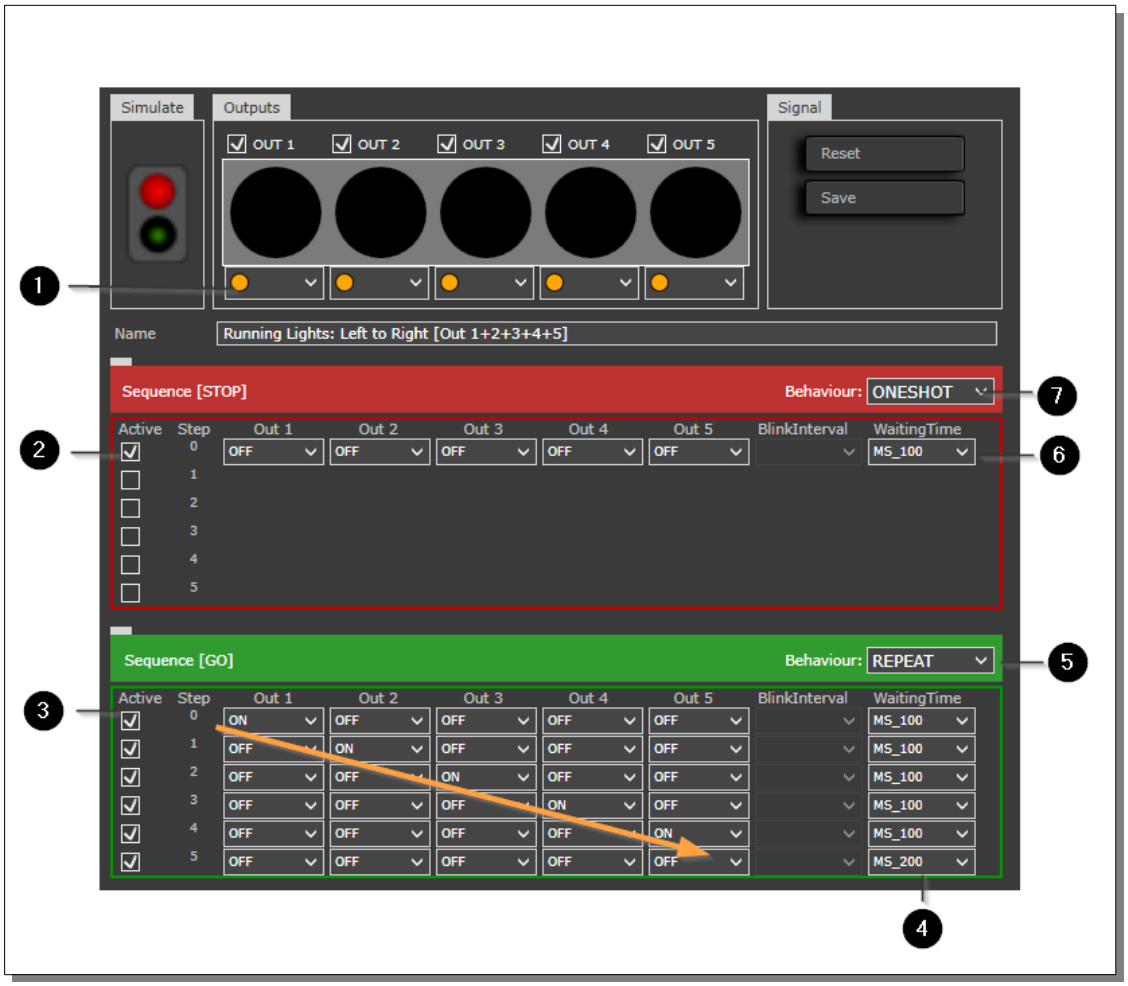
The Output States are the actual states of the LED's.

- **NOCHANGE**: The LED will keep it’s current state unchanged
- **OFF**: The LED is turned off
- **ON**: The LED is turned on
- **BLINK**: The LED will blink in the Blink Interval period

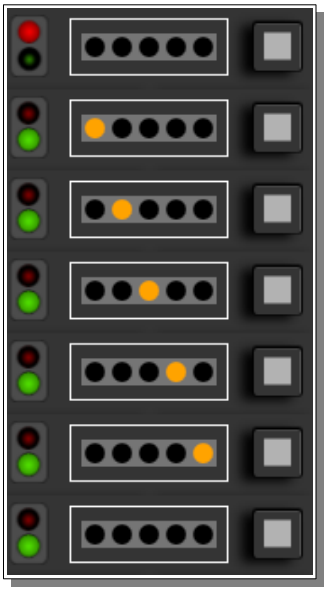
**NOTE**

- **ONESHOT + FOREVER:** When using ONESHOT, the sequence will play all steps in order. If blinking is needed to be continued continuously after the state is completed, the waiting time should be set to FOREVER.

## 10.5.1.4 Advanced Example: Five LED Running Construction Lights




| Item | | Description |
|---|---|---|
| 1 | **Enable outputs** | Setup of all five outputs to enables with orange LED's |
| 2 | **Sequence [STOP]** | Simple STOP sequence with all LED's set to OFF |
| 3 | **Sequence [GO]** | All outputs are set to OFF, except for the diagonal line, where one succeeding output is set to ON after 100 ms – making the running effect. |
| 4 | **Waiting Time** | All are set to 100 ms except for last step, in order to set a small pause before the sequence is repeated – it looks a bit more natural. |
| 5 | **Behavior** | Behavior is set to REPEAT. We want the sequence to loop |
| 6 | **Waiting Time** | You just need a small pulse – here 100 ms in order to set the LED's OFF |
| 7 | **Behavior** | Behavior is set to ONESHOT. We just want to turn off all LED's quickly |



## 10.6 The LocoNet

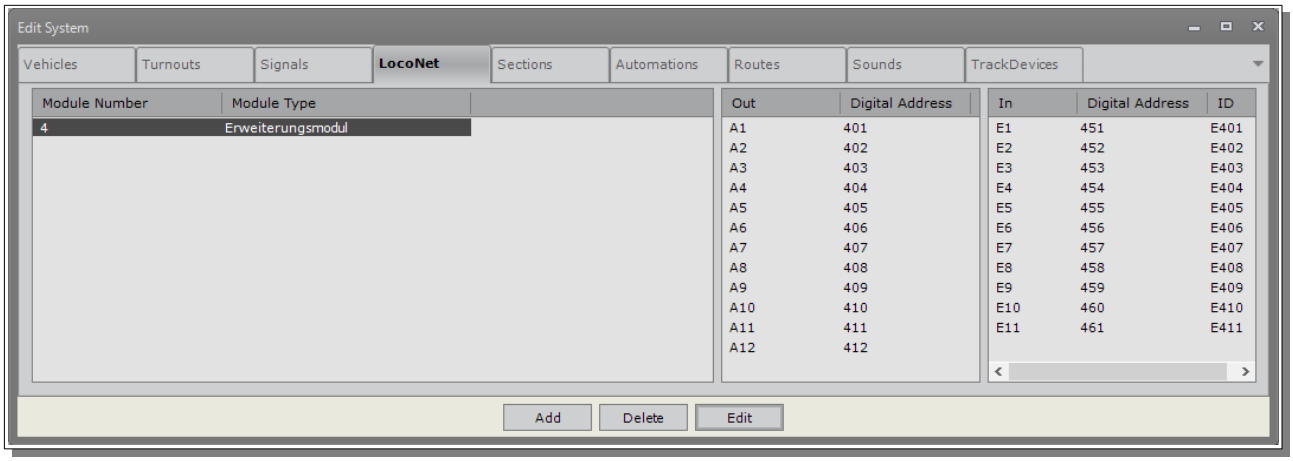
This is specific to LocoNet users who want to use the Master V2 and V3 LocoNet as the Master for all LocoNet modules. In this way you might not need any other digital controller since the Master can act as LocoNet Master. Faller is using it this way. It fits very well if your trains also operate on radio.

**NOTE**

- Always just configure one LocoNet module at a time, giving it its own unique Module number. All other modules must be disconnected.
- You must setup your LocoNet modules before you can use them.
- The PC-Software creates standard digital addresses for any turn, signal or stopping relay.
- The digital numbering is first the module number, starting with module 1, then the connection number on the module, i.e. 11, thus digital address for module 2 connection 11 is 211.
- The feed-back sensors connect to the LocoNet Modules using the same method starting with 101, so that Module 2 sensor 8 can be read using the ID E208.
- The ID's are used in automations. If you wait for sensor 8 in module 2 to be activated, you can write "NLW E208 occupied" in Automations.

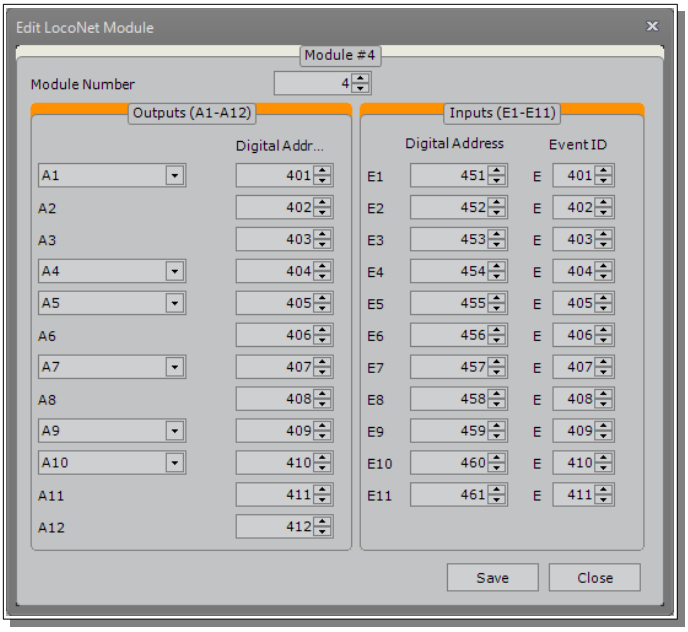
### 10.6.1 Edit LocoNet Modules

Here is an example of setting up the Faller Module (Erweiterungsmodul).
In the menu [Edit → Edit System] click on the LocoNet tab.




Click the [Edit] button and you see the windows below. The Faller Modules are 2 Half modules with both output and input signals.

Using the drop-down lists you can decide what accessory you connect. If it is a turnout only, then A4 is just a turnout. A10 is a signal with 3 aspects, you connect green, yellow and red to terminal 10, 11 and 12.



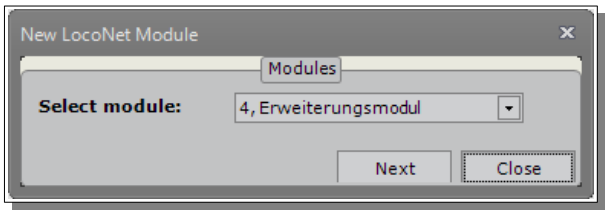

The outputs can be grouped. If e.g. A10 + A11 + A12 are used as one traffic light – this light has only one address: A10

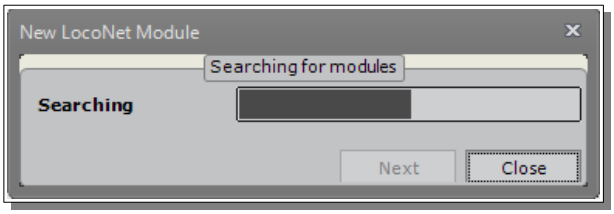
## 10.6.2 Configure LocoNet Module

**ACTION**

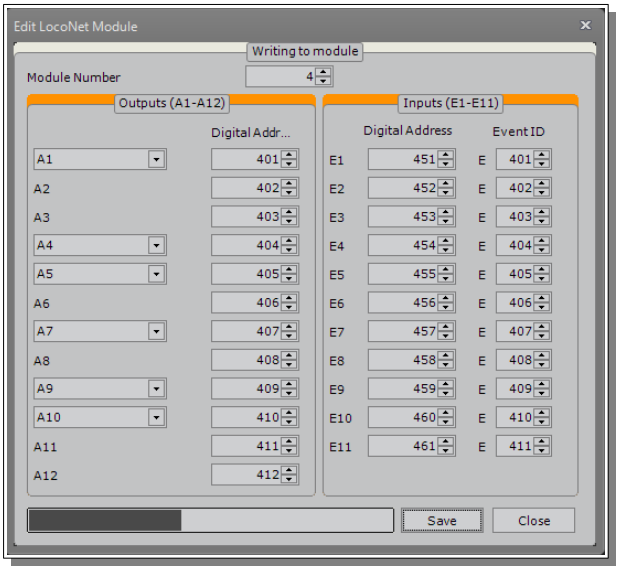
- Select the LocoNet tab
- Click Add – the system will search for new modules or find the first, they will be numbered from 1 and on-wards
- All digital addresses have been reconfigured in the new module as shown below. You can decide to have single output for a normal turnout or group outputs in 3 aspect groups – only starting with 101, and/or 104, and/or 107, and or 110. You can also use 4 aspect groups starting with 101, 105, 109.
- Please be sure that all digital address in the list have unique numbers
- Press Save.
- In this configure process the single outputs in a group will get the digital address corresponding to the first output in the group.
- If you later want to reconfigure a module, please be sure that you first reconfigure to single entries – i.e from 101 to 112 – then press Save, before you make a new grouping. Otherwise the configuration process will time out and you will end up in a non controlled state.
- If all goes wrong, please delete the module and search it again from beginning.

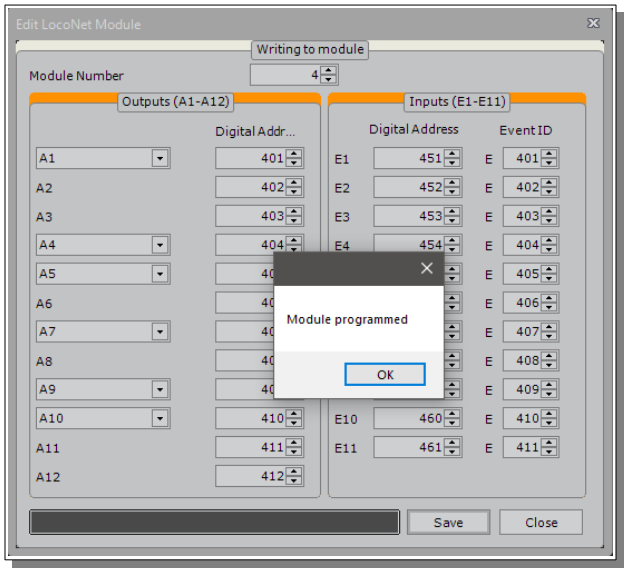
## Searching for modules




## Saving Modules




- o -

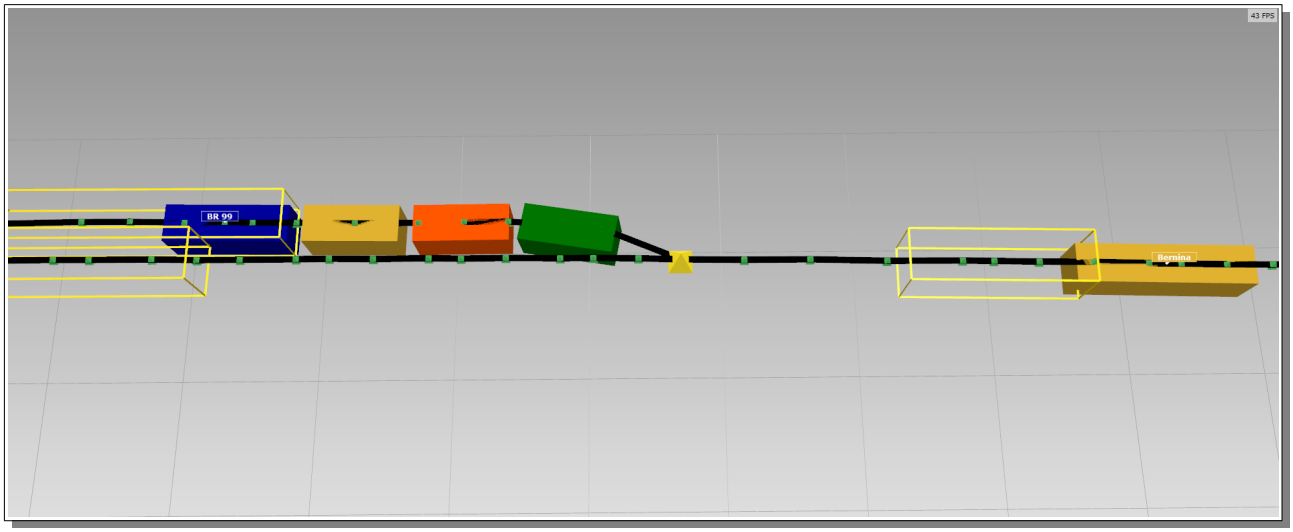
## 10.7 The Sections


Sections are virtual blocks surrounding the track or street, which trigger the vehicles passing that section, which again can be used to activate vehicle operations, speed, light, turns etc.

In order to trigger automations and in order to animate the driving on the layout you need sections on the tracks or street. Sections can be used for block-control, where only one train is allowed in a section at any time – see the automation command FSF/FBF in chapter 10.10.7.

The important part is, that the section knows which vehicle is passing and there are automation functions which then can operate directly on that vehicle. All sections have an ID with a prefixed letter S (or B) which can be used in these automations.

A Section is a virtual geometry along a track or street – or it can be drawn as a free geometry. This geometry can be a box, meaning it includes a height over and under the track.
In the 3D view you can select [Show Sections] and you might see the image here below.
In this 3D image the sections are the transparent boxes/frames colored in yellow.



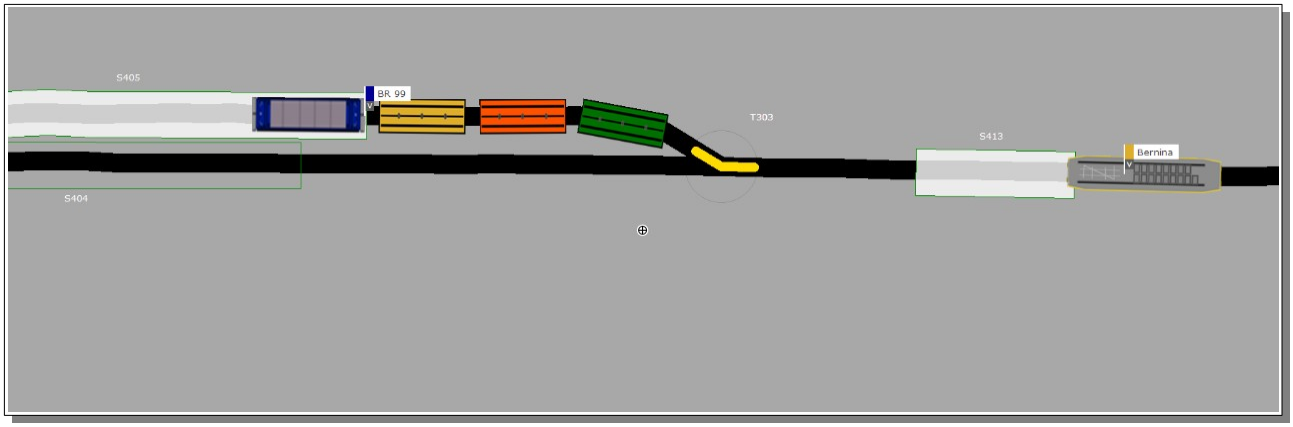
## 10.7.1 Section Colors

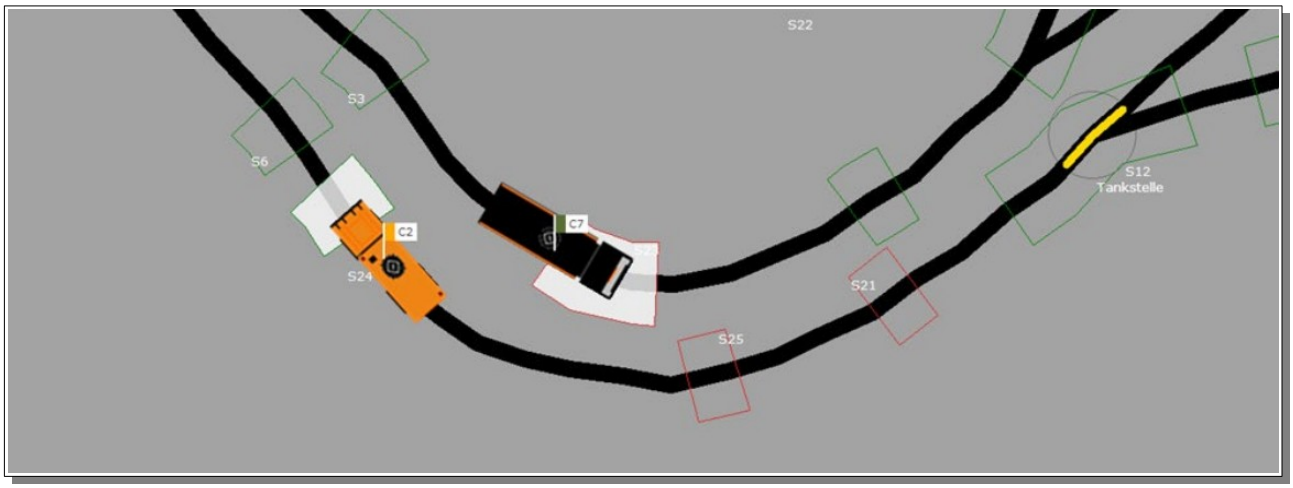
Sections can have different statuses that can be recognized by the color with which the section is displayed in the 2D view. The status can be changed by clicking on the section, by changing the state of a corresponding signal, by an automation or voice control.

**A Section has 4 colors:**

- The frame is green and the inside color is transparent, meaning the section is open for any use and no vehicle is inside.
- The frame is green but the content it white meaning it is occupied with a vehicle but the vehicle can drive.
- The frame is red and the inside is transparent, meaning the section is set to [No Go], and any vehicle coming into that section will stop.
- The frame is red and the content is white meaning it contains a vehicle which is stopped.

You can edit all sections directly in the 2D edit menu, and then select the right one when you later draw them on the layout. Or you can create them one by one when you draw them.




## 10.7.2 Section Attributes

Each section has some attributes:

- It can be a simple Tunnel, a Tunnel Entrance or Tunnel Exit. It means that when a vehicle passes a section with the Tunnel Entrance attribute the vehicle moves on without measurements only using prediction based on drawing and speed – we call it virtual driving. When the vehicle hits a "Tunnel Exit" attribute on a Sections it will resume the measurements.
- There may be a signal associated with the section. When the signal drop-down list is opened, all available signals are displayed. By selecting a signal, this specific signal (physical or virtual) becomes part of the section and always has the same color as the section. If the signal is linked to the track and marked as a point signal, this will ensure that vehicles drive slowly in a red section until the signal is reached. The signal can have any position within the section.
- Section is a 3D object with a height associated. The train is only trapped if it is measured or forward calculated inside the frame. If you have a bridge you can have a frame for the track under the bridge and a frame over the bridge. The standard value set by the system is the Z-Position corresponding to the track middle Z-value if you draw it as a section between two points, or otherwise 0. For track scale H0 the height is 48 mm (24 mm above and 24 mm below the track points). You can adjust this height.
- The default height depends on the Track scale setting in the menu [Edit → Preferences]: Track scale N=24 mm, H0=48 mm, O=96 mm and 1/G=144 mm.


**ACTION**

- Set the ID
- Enter a Name for the Section
- Attach a Signal if needed.
- Tunnel: If the section not is a tunnel – keep the value None.
- If it is a tunnel, please select type:
  **Tunnel Entrance,**
  **Tunnel Exit, or**
  **Tunnel**
- You can set a custom Height if needed
- You can also add a Comment
- Click [Save]

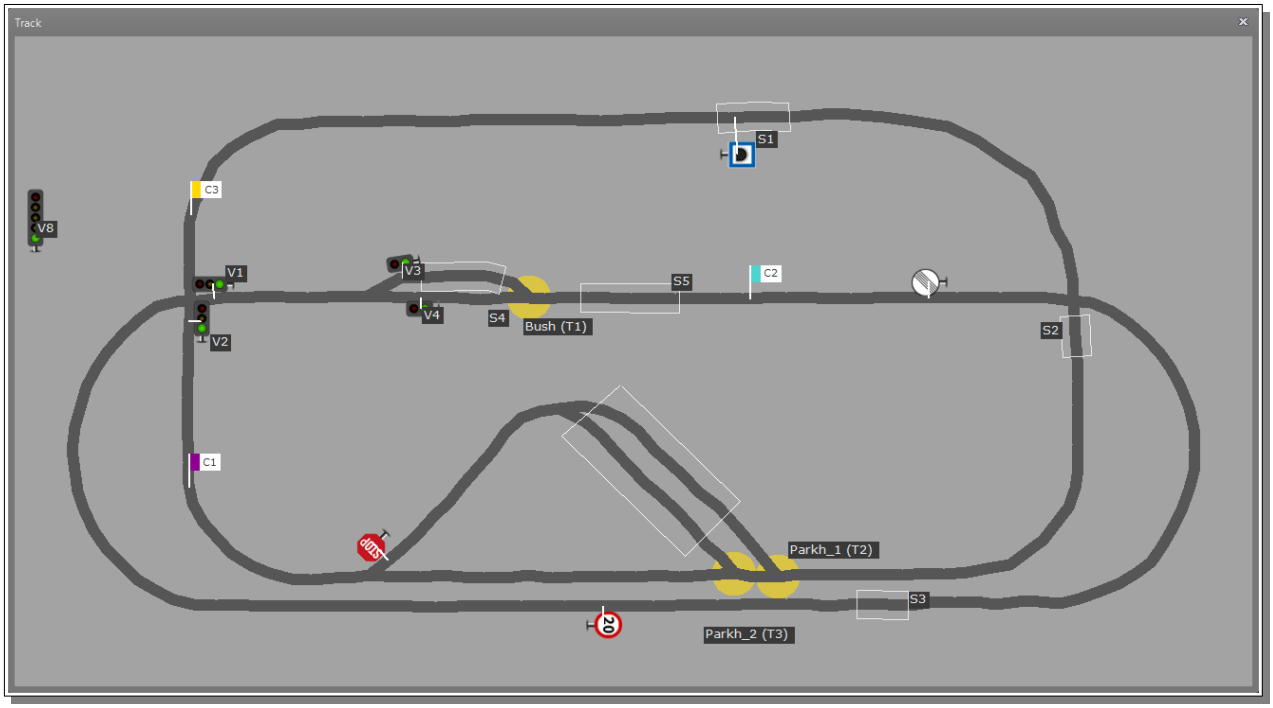
## 10.7.3 Create Sections

Creating sections is done in the 2D view by clicking the edit button (see 7.7.2.2). There are two ways to create a section, namely a point section that follows the trajectory exactly or a freehand polygonal section.

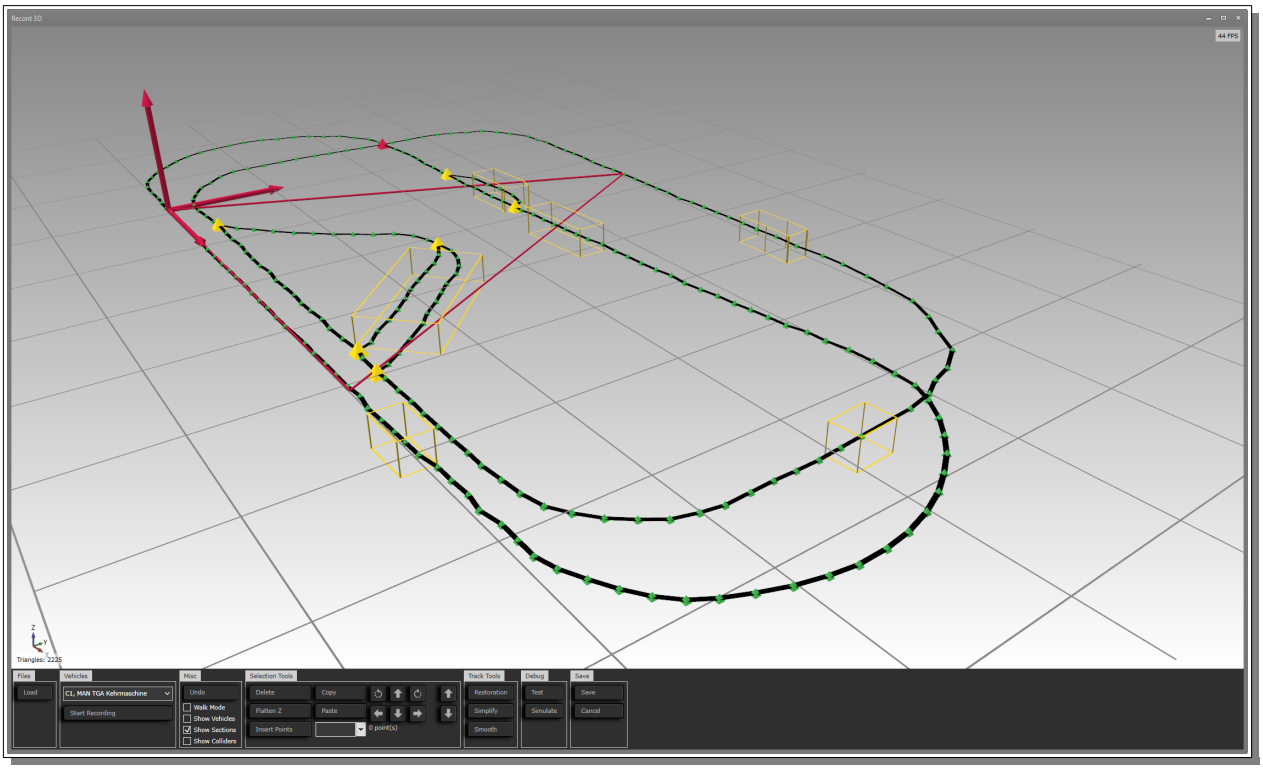
## 10.7.3.1 A Freehand Section

Click on the "Section" button (see 7.7.2.2) to get an arrow indicating the vertices of any polygonal section. After closing the section (click near the first vertice) a window will open to set the above properties of the section. In the next screenshot of the 3D view, with the Show sections checked, the sections are shown.

**2D View**




**3D View**

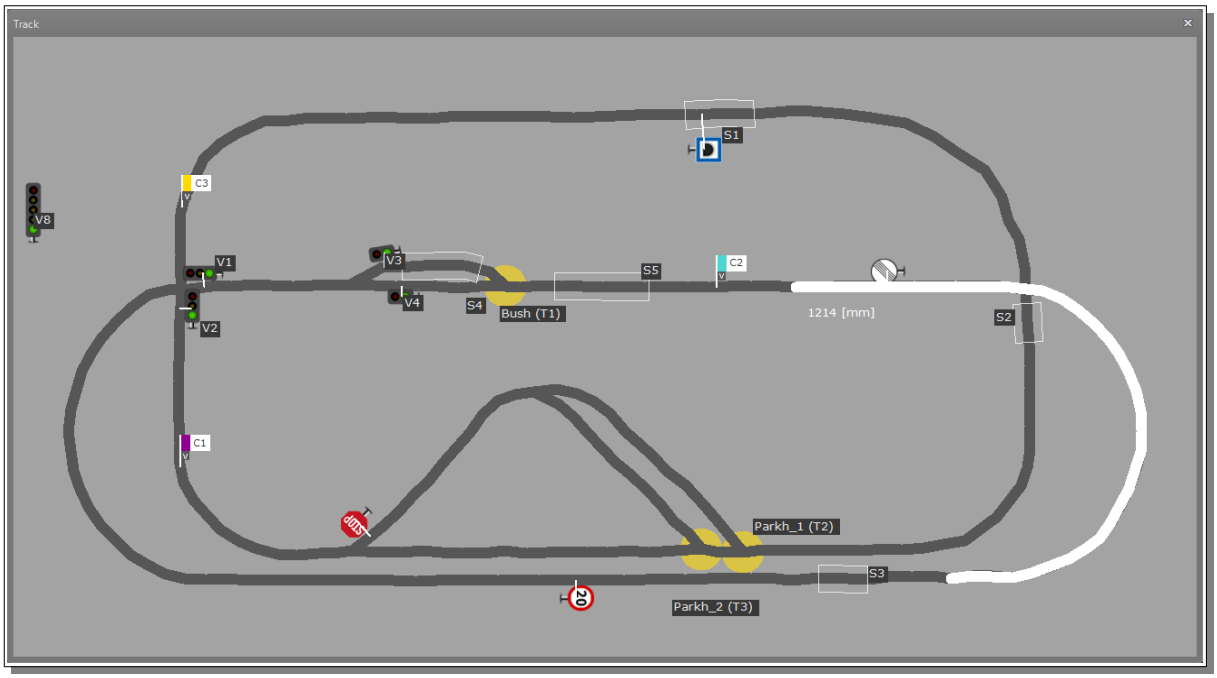


## 10.7.3.2 A Point Section

In order to draw a Point-section, select Edit mode and then click on the Point section icon. Left click the mouse on a desired track to initialize a start point. Now move the mouse, and a highlighted path will appear along the selected track: Now, click again to close the path and a dialog will appear: Select the tab [New section] and press the button [Save].

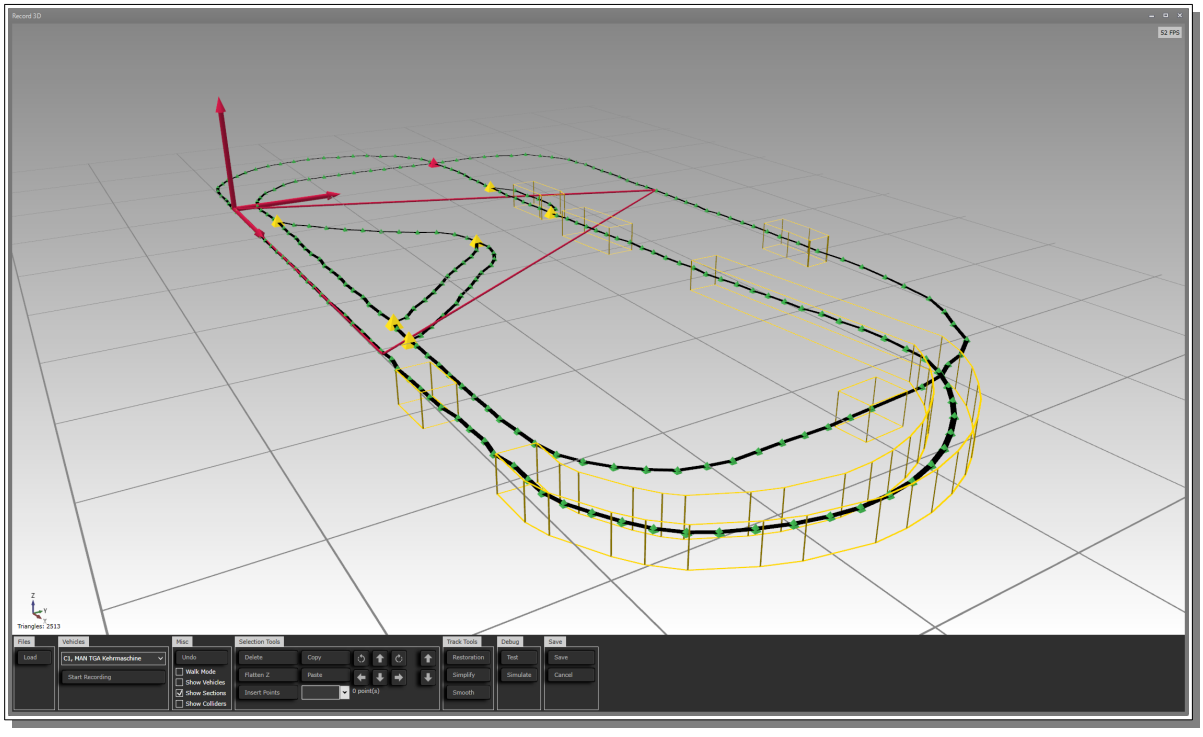
**2D View:**

A section that follows the 2D track is seen here:




**3D View:**

Select the menu [World → Show Track 3D] to see the same Point Section displayed in 3D:

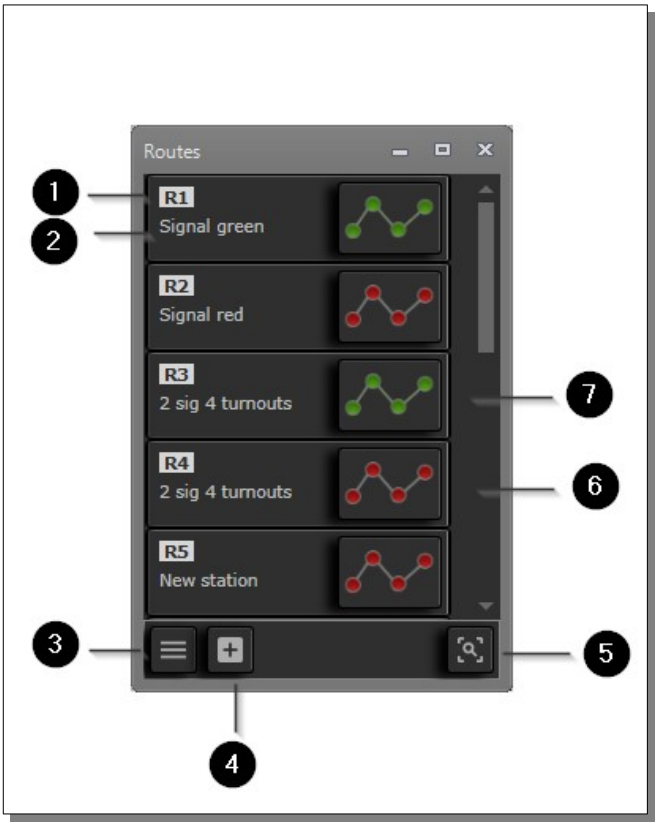


# 10.8 The Routes

Routes are groups of turns and signals which all are set to one specific state in order to support a given tour or traffic. Routes can be set directly on the screen or can be used in Automations or set by voice. Route ID starts with R.

## 10.8.1 Set Routes

Display and control routes from the main screen is done using the route window, as standard the view menu will show the route window. The zigzag symbol on the button can be red or green. The green color indicates the route is set, and red that it's not. Please click the red symbol to set a route, and it will turn green – unless and automation prevents this. If the symbol is red, then one or more accessories are false according to that specific route. If green all accessories are set right according to that route. It will always be green after pressing the symbol (unless an automation immediately try to change it)

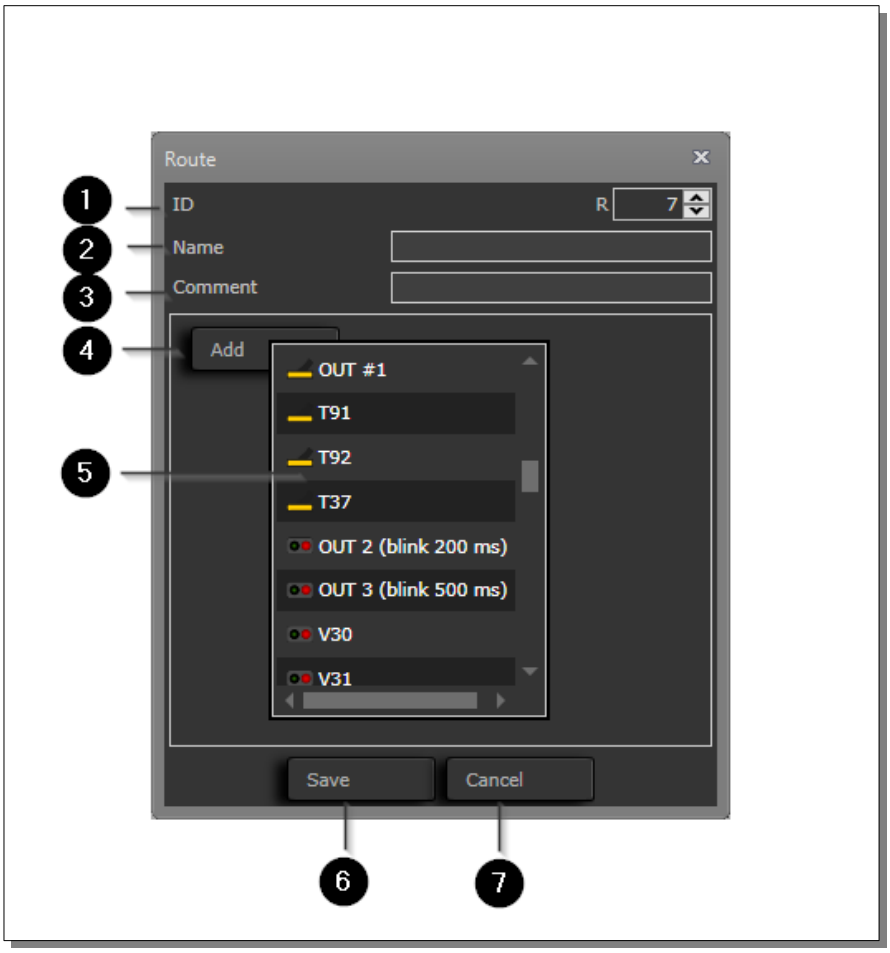



| Item | | Description |
|---|---|---|
| 1 | **ID** | Unique Route ID prefixed with the letter R |
| 2 | **Name** | Name of the Route |
| 3 | **Comment** | Overview Opens the Edit System → Routes Tab. |
| 4 | **Add** | Add a new Route |
| 5 | **Search/Filter** | Opens the Search/Filter line |
| 6 | **Red Route** | The red color indicates the route is NOT set.<br>**Click to change** - this might affect other routes! Notice the system does not 'lock' a route for changes until a certain event has happened like a manual 'unlock' or vehicles have passed all components in this route. |
| 7 | **Green Route** | The green color indicates the route is set. |

## 10.8.2 Create and Edit Routes

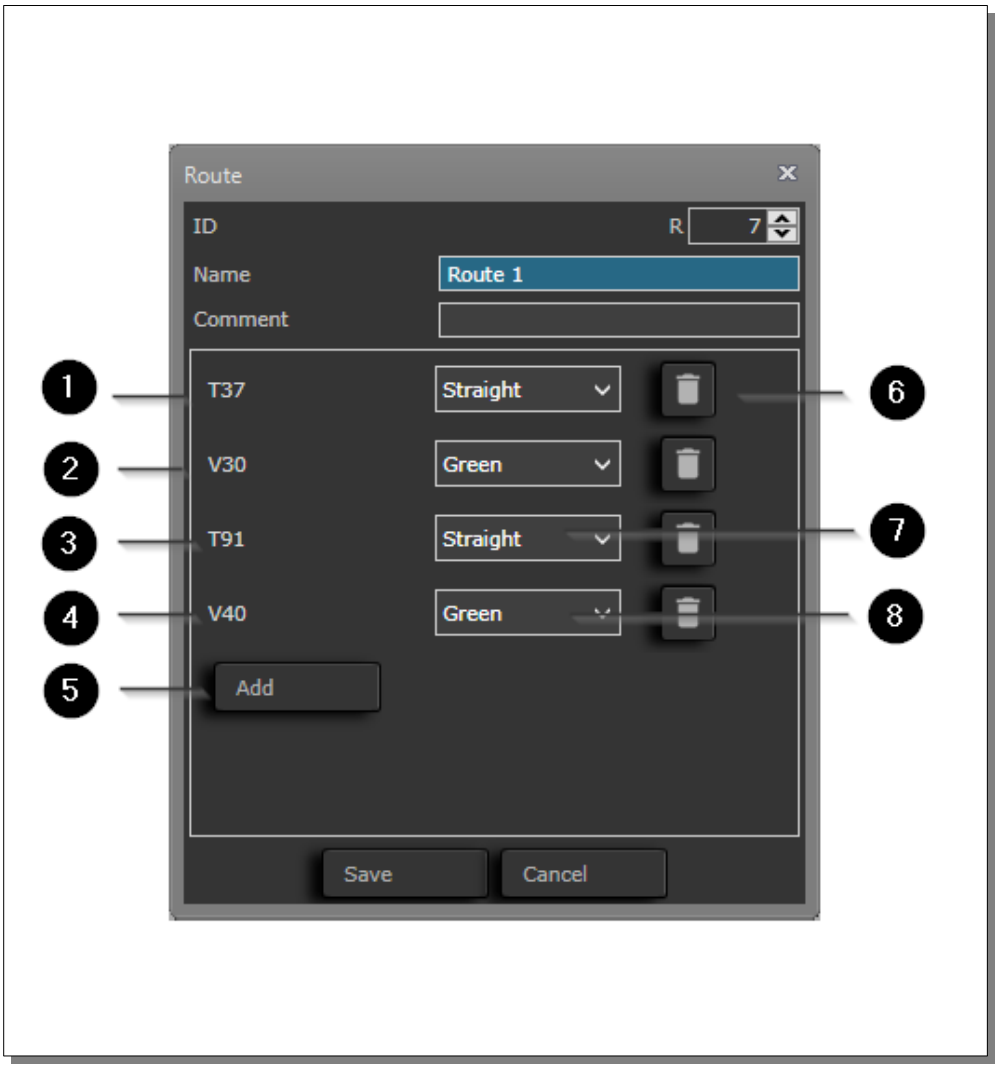
A double mouse click in the left (text) column opens a window to edit that route. In this window the route can be composed by adding or changing parts.

When adding signals or turnouts, a complete list of all available signals and turnouts is shown to choose from. As many parts can be added as needed.




| Item | | Description |
|---|---|---|
| 1 | **ID** | Unique Route ID prefixed with the letter R |
| 2 | **Name** | Name of the Route |
| 3 | **Comment** | Comment of the Route |
| 4 | **Add** | Click Add to insert Turnouts or Signals. A complete list will be available. Repeat this process if needed. |
| 5 | **Save** | Save the changes (closes the window) |
| 6 | **Cancel** | Cancel any changes (closes the window) |

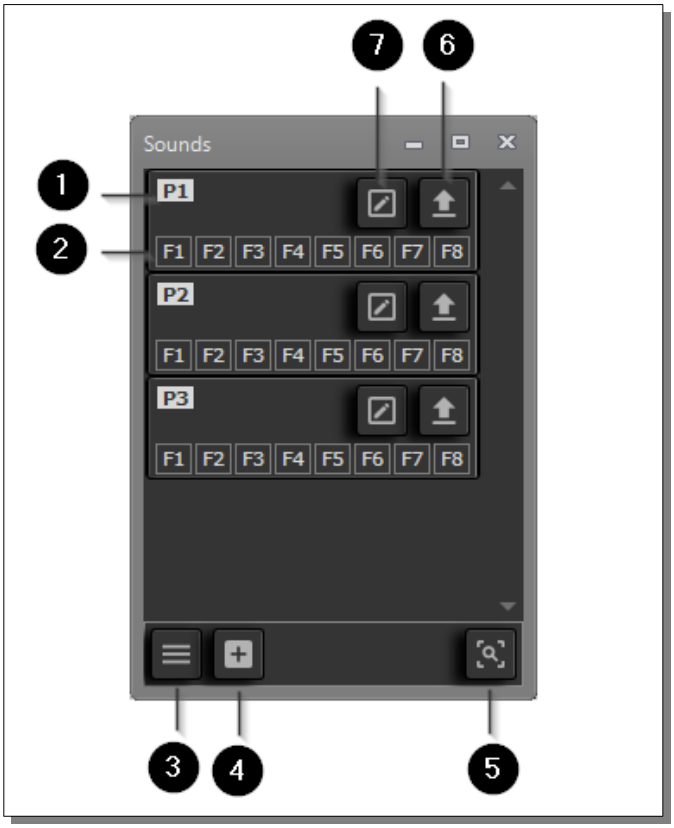
Each component added to a route must have the correct state specified. Signals can be set to Red and Green, Turnouts can be set to 2-3-4-ways states depending on the type.




| Item | | Description |
|---|---|---|
| 1 | **Turnout** | Selected T37 |
| 2 | **Signal** | Selected V30 |
| 3 | **Turnout** | Selected T91 |
| 4 | **Signal** | Selected V40 |
| 5 | **Add** | Add more signals or Turnouts if needed |
| 6 | **Delete** | Click to delete selected component |
| 7 | **Turnout State** | Select a value for this state.<br>This will depend on what type of Turnout: 2-3-4-Ways |
| 8 | **Signal State** | Select a value for this state.<br>Signals can set to Red or Green |

## 10.9 The Sounds

GT-XSound is a sound module which connects to GT-XControl IR and is meant layout sound or trains sound for LEGO vehicles. You can upload sounds to a train. Please ensure your GT-XControl IR is connected with a sound module on it.

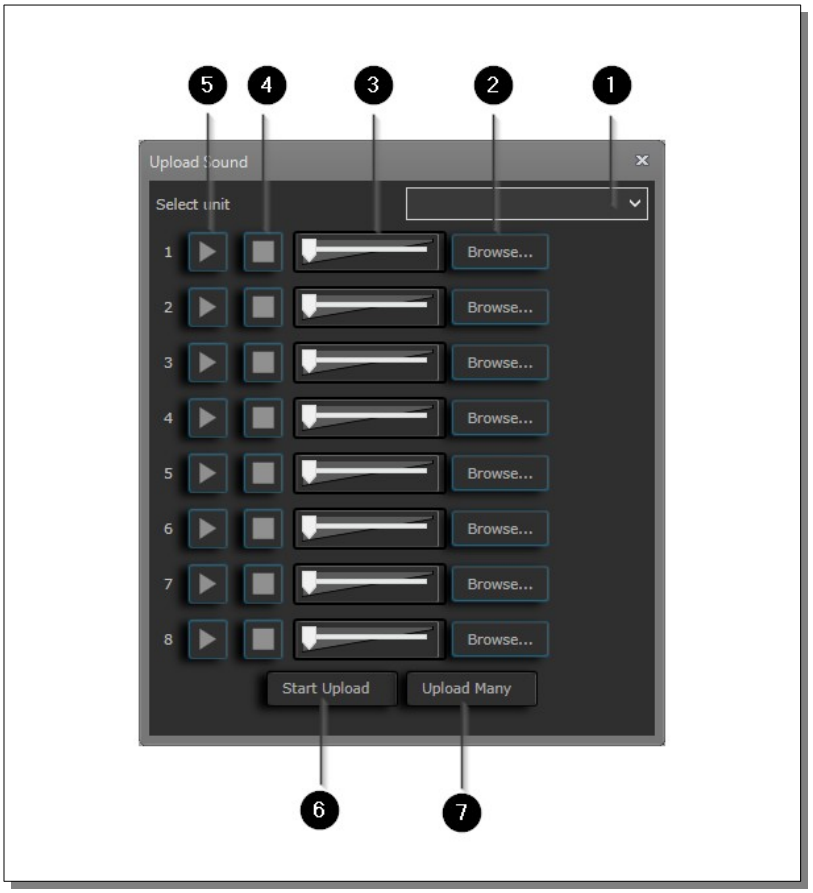



| | Items | Description |
|---|---|---|
| 1 | **ID** | Unique Sound ID prefixed with the letter P |
| 2 | **Functions F1..F8** | A sound can be attached the function keys F1..F8 |
| 3 | **Overview** | Opens the menu: [Edit → Edit System → Sounds Tab] |
| 4 | **Add** | Add new sound module |
| 5 | **Search/Filter** | Opens the Search/Filter line |
| 6 | **Upload Sounds** | Click to Upload Sounds |
| 7 | **Edit Sound** | Click to Edit sounds |

**NOTICE**

- You can have 8 sounds on that module with up to 25 seconds each.
- The sound format must be MP3 or WAV.
- You can upload sounds and play these while driving - using the function keys F1 to F8.
- The uploaded sounds can be activated from automations

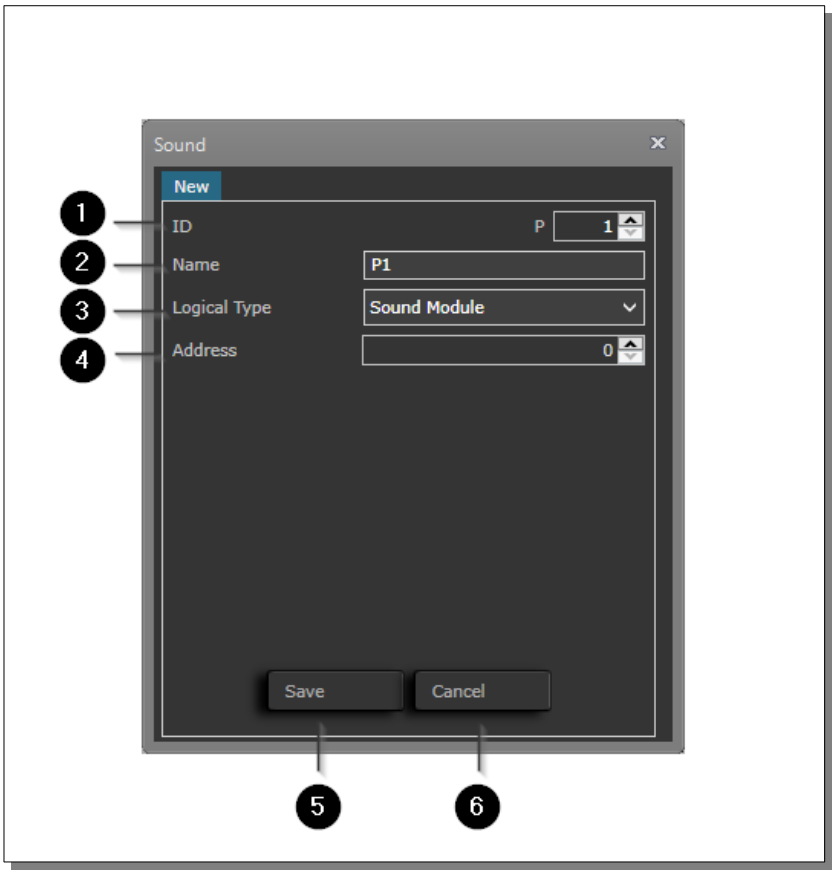
## 10.9.1 Upload Sounds




**ACTION**

- Select the Train ID with the hardware sound module.
- Pick a slot from 1 to 8, browse and insert your sounds. **MP3 and WAV is supported**. The sounds will be queued up under the F-number (slot) you have selected for it
- Set the volume slider to maximum – only lower it if necessary.
- Stop driving all vehicles! ***Uploading sounds will use the full radio bandwidth.***
- Press the button **[Start Upload]**. The upload process takes place one by one and will take between 15 and 45 seconds to upload over the radio. The process will report with an OK to the right of each slot, when succeeded
- Please avoid queuing up all sounds in one cycle - if one sound fails and must be repeated it can affect all of them.

## 10.9.2 Faller Sounds




| | Automations View | Description |
|---|---|---|
| 1 | **ID** | Unique Sound ID prefixed with the letter P |
| 2 | **Name** | Name of the Sound |
| 3 | **Logical Type** | Select the Sound Module Type. Available types:<br>Faller: [Sound Module]<br>GamesOnTrack: [Advanced Sound Module] |
| 4 | **Address** | Set the Address (LocoNet address).<br>Sounds are Addressed in a similar way as the Erweiterungsmodul. |
| 5 | **Save** | Save the changes (closes the dialog) |
| 6 | **Cancel** | Cancel any changes (closes the dialog) |

## 10.9.3 Stationary Sound Modules (Faller and GOT)

The Faller Sound is a set of surrounding sounds for your layout. The idea is that you can use the Faller module to activate sounds on small speakers on the layout – activated from the PC-Software as a consequence of the drive, using it in automations, or calling them by voice control, smartphones or tablet etc..

The Faller Sound module is a LocoNet Module, which requires Master V2 as minimum.
You can connect the module to the same LocoNet as your turns (Erweiterungsmodul).

If you install the Faller Sound Director on your PC and insert the associated USB-stick you can configure your sound module to operate sounds which are called out from the Faller Car

System Digital. You simply assign a LocoNet Address to each sound. Please go to the Solenoid Accessory (Magnetartikel) section and load the sounds you want to activate and assign a LocoNet address to the sounds. You can use any address 0-9999. If you use the same addresses as your turnouts the sound will be activated when you shift the turnouts.

Then you go into Edit mode and open the Sound tab. Please create an ID and a name for every Sound you want to play, and assign the already chosen LocoNet Address to the Sound. Now you can open the Sound window in the view menu and press the sound and it runs.

You can also open you Layout in Edit mode and select the speaker and place the speaker on a given position on your layout. Press speaker (with the associated name) and the sound plays.

If you want to use the sound automatically you can embed the sound call in automations.
You can only activate the sound since it runs until the end and then turns off itself.
The ID for Sounds is Pxx

The command "P17" will run the sound P17. As an example you can play sounds when a certain vehicle hits a certain section, just creating a simple Automation.

## 10.9.4 The GOT Sound Module

The GOT sound module for stationary sounds can be connected to the LEGO IR-sender as a moving sound or being a stationary independent module item 1302767. The item works as the Faller Sound, but sounds are uploaded over the radio.

When the module is supplied with 3.7 to 9 V DC, the sound module will report itself to the PC-Software after about 20 seconds. It has a standard of eight sounds. It can have a small speaker (standard) or a large speaker.

The GOT-sound module has dynamic upload by radio of new sounds. The modules plays like the Faller Sound Module just clicking the Function F1 to F8 on that particular sound, and it plays until it runs out.

If you click on the Edit symbol you can configure the sound to a certain radio ID. If you click on the [Arrow Up] button, you can start uploading sound to a certain Function key.

If you want a continuously play, please use an automation to set this up. In the automation write e.g. **P3 F2** to play the F2 sound from sound module P3. Surround this line with a "loop". Example: Play the same sound five times as long as section S1 is occupied:

```
NLW S1 occupied
P3 F2
Pause 3
Repeat 4
```

**NOTICE**

- You cannot write P3 F2 on/off – the arguments on/off has no function.

# 10.10 The Automations

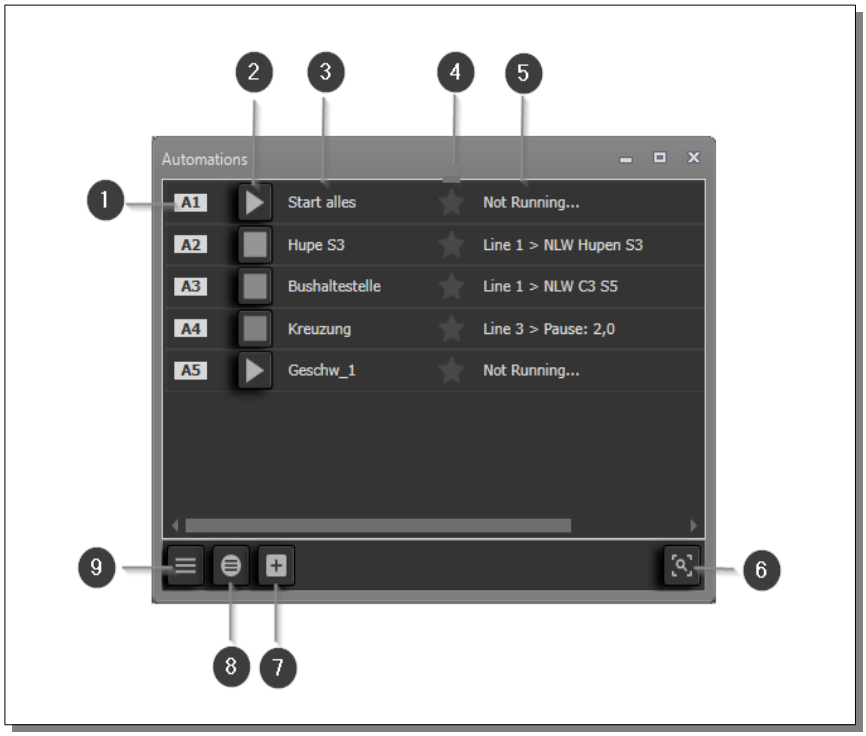
Automations are used to operate your vehicles and components automatically. You can create as many Automations as you like using the standard automation commands. Automations are edited directly in the Automation Editor. An Automation is a sequence of commands and functions to be executed when you activate the Automation.

**NOTICE**

- You license code might set limitations on the number of simultaneous operations.

## 10.10.1 View Automations

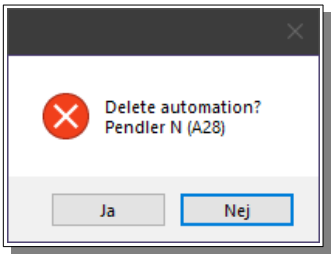
In the Menu select [View → Show Automations], and a list of the created automations will appear. This list contains five automations A1..A5. Automation A1 and A5 are not running.




| Automations View | | Description |
|---|---|---|
| 1 | **ID** | Unique Automation ID |
| 2 | **Control Button** | Button for controlling each automation individually.<br>Press this button to Start and Stop an automation.<br>Press F12 will Pause all automations. (All icons on running automations will now change to a pause symbol) |
| 3 | **Name** | The Name of the automation |
| 4 | **Favorite** | Press the star symbol to mark and highlight the automation as favorite. |
| 5 | **Progress** | This column will display the progress of the automation. |
| 6 | **Search/Filter** | Press this button to search and filter out specific automations. |

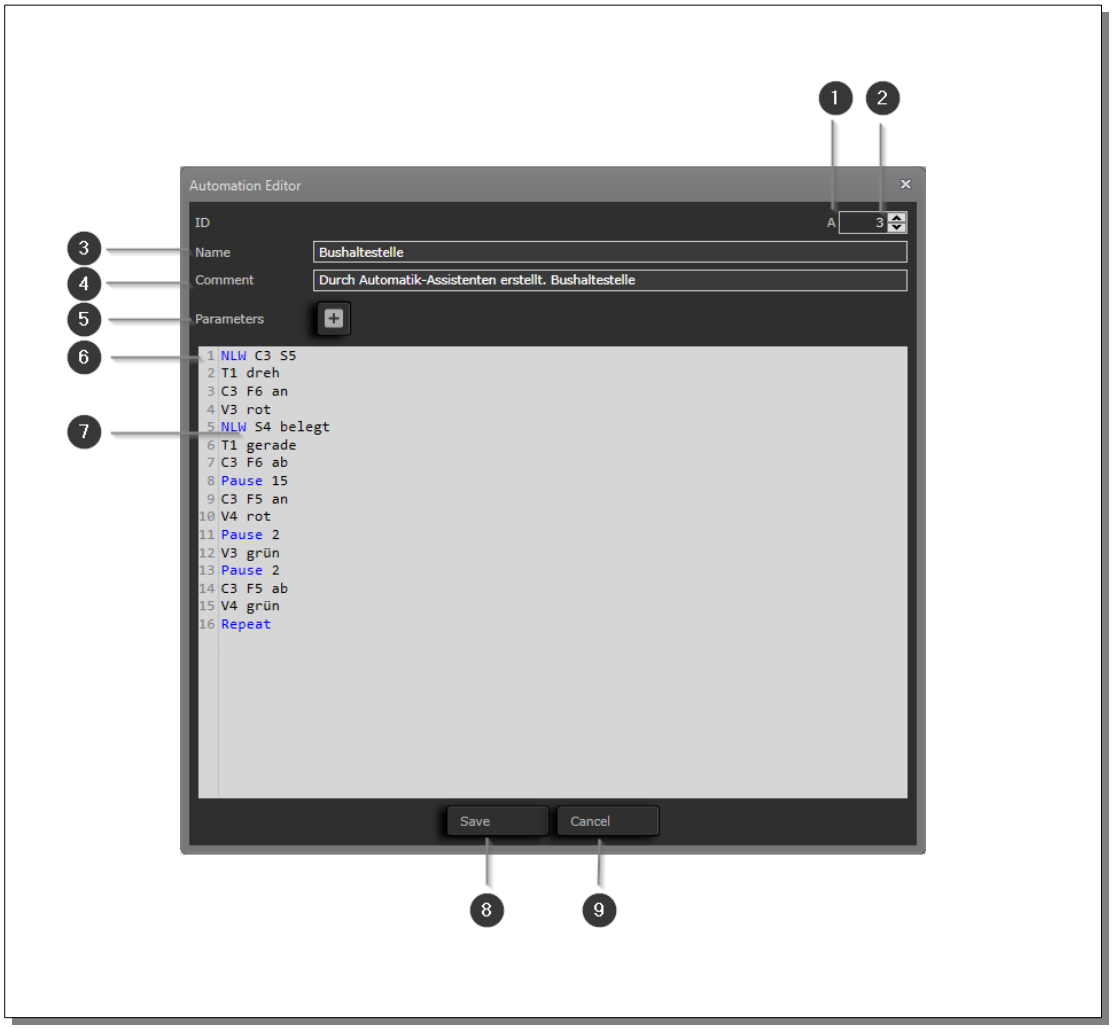
| | | |
|---|---|---|
| 7 | **Add New Automation** | Will open a new dialog |
| 8 | **Automation Wizard (Cars)** | Pressing this button will open a wizard for creating advanced automations. |
| 9 | **Overview** | This will open a grid containing an overview of all automations. |

Any automation can be deleted by clicking Right Mouse button. A dialog to confirm or cancel this operation will be presented to the user.




## 10.10.2 Automation Editor

To open the Automation Editor press the Add New Automation button or double click with the left mouse button on one of the automations in the list.



| | Automations View | Description |
|---|---|---|
| 1 | **A** | Every automation has a mandatory and read only prefixed letter "A". This letter will be displayed in front of the Id. |
| 2 | **Id** | Select a unique Id for the automation. |
| 3 | **Name** | Add an arbitrary name for the automation. This name is visible in Automations View. |
| 4 | **Comment** | Add a comment for the automation. This will not be visible in the Automations View. |
| 5 | **Parameters** | Various input parameters can be applied for automations (3 is maximum)<br>*Advanced topic!* |
| 6 | **Line numbers** | Each line in the code editor is automatically numbered.<br>Running automations will display their current line number in the Automations View |
| 7 | **Code Editor** | The actual code for the automation is entered here in the Code Editor. |
| 8 | **Save** | This button will save changes in this Automation to memory and close the window.<br>**NOTE**: Please press [File → Save…] in the Menu or [CTRL+S] to save all changes to the current loaded system file! |
| 9 | **Cancel** | This will cancel any changes and close the window. |

**TIP**

- When typing in the editor, it's possible to use the standard keyboard shortcuts: Cut = [CTRL+X], Copy = [CTRL+C] and Paste = [CTRL+V].

## 10.10.3 Automations - explained

- All automations are running line by line.
- One new line in each automation is processed every 70 ms.
- This processing time is dependent on the actual Master Settings. If the number of devices (satellites, transmitters, etc..) are increased in the Master Settings, the processing time will also increase.
- Also be aware, that you might need to insert the Pause Command between lines if you have many changes to be transmitted to the hardware - the decoders might not be able to follow so fast.
- All commands are validated in real time while typing in the editor. If you make any mistakes, the commands on the current line will be colored in red, and you cannot run the automation before the mistake is corrected.
- Automations can run repeatedly.
- Automations can be operated directly on the screen, or they can be called by other automations, or they can be called by voice.
- Automation can also be altered in the new automation window on screen while driving. Even if an automation is running, you can double click on the Automation, and the Automation Editor will pop up, where you can edit the automation. When you save the automation, you override with a new one. However, if the automation was running, it will continue operate the old one, until you stop and restart the automation.

When addressing the individual components from the automation editor, the standard component prefixes, found in the following table, should be used.

| Component | Prefix | Example | Description |
|---|---|---|---|
| **Vehicle** | **C (L)** | **C22** `forward 20` | Drive vehicle C22 forward at speed 20 |
| **Turnout** | **T** | **T17** `straight` | Set turnout T17 to straight |
| **Signal** | **V** | **V114** `red` | Set signal V114 to red |
| **Section** | **S (B)** | **S34** `green` | Set section S34 to green |
| **Automation** | **A** | **A12** `start` | Start automation A12 |
| **Track Device** | **D** | **D1** `on` | Turn switch ON for device D1 |
| **Sound** | **P** | **P2** `F5` | Play sound loaded into F5 on sound module P2 |

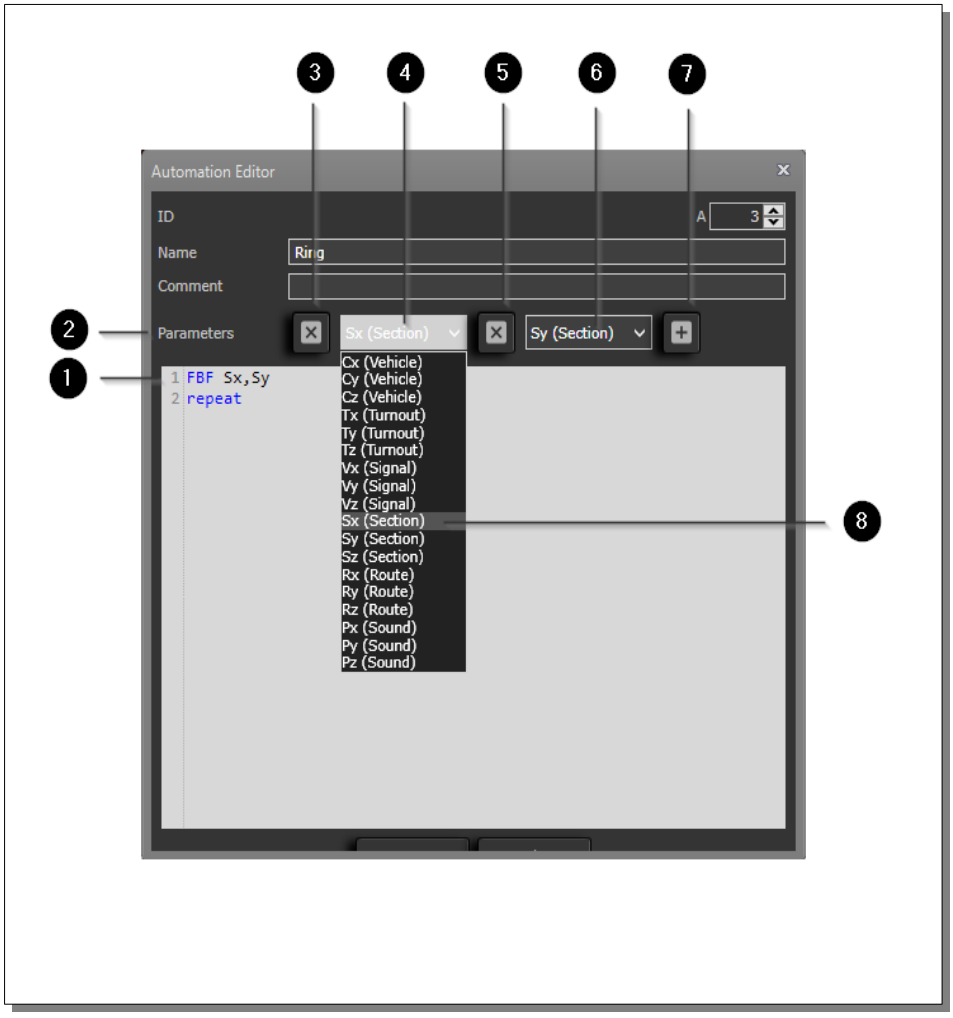
**NOTE**

- Automation commands for sections/blocks will ONLY act on the Section ID/Block ID - using the name of the section/block has no meaning in these commands

Please see the following chapters below for the full automation notation.

## 10.10.4 Automation Parameters

Automation Parameters are dynamic values used as input variables to an automation.



| | Item | Description |
|---|---|---|
| 1 | **Automation** | Command list. In this example parameters are applied in an endless loop |
| 2 | **Parameters** | Up to three parameters can be selected |
| 3 | **Close** | Click to remove the first parameter |
| 4 | **First Parameter** | Select the first parameter from the list. |
| 5 | **Close** | Click to remove the second parameter |
| 6 | **Second Parameter** | Select the second parameter from the list. |
| 7 | **Add** | Click to Add the third parameter |
| 8 | **List of Parameters** | Parameters are available for Vehicles, Turnouts, Signals, Sections, Routes, and Sounds. Each component will have the letters x, y and z attached. E.g. the first parameter for section is Sx, and the second parameter for a signal will be Vy. |

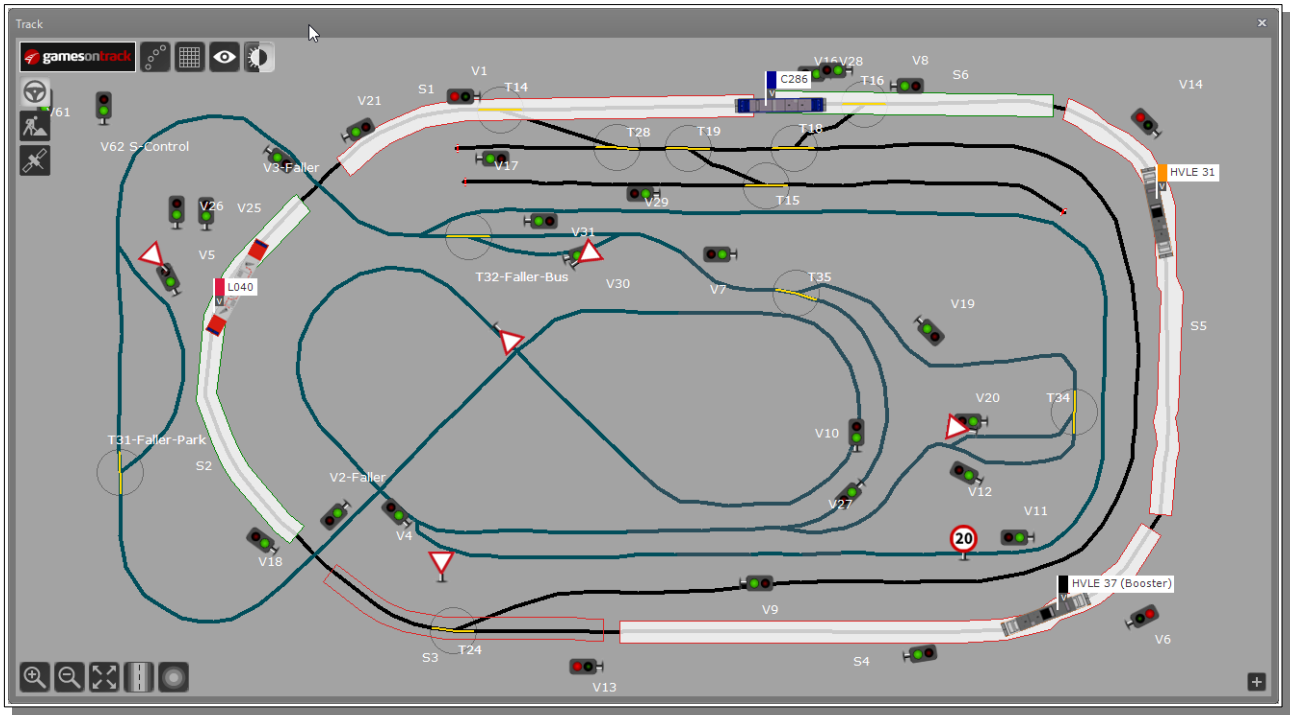
The image shown above is an example of an automation that uses these parameters.

```
FBF Sx,Sy
Repeat
```

This automation **A3** is calling the automation command FBF (Free Block Forward) in a special way. Let's take a brief look at the FBS/FSF command:

| | | | |
|---|---|---|---|
| **Section control**:<br>Free Section Forward | **FSF**<br>**FBF** | FSF S5,S6<br>FBF S5,S6 | From the section S5 watch S6 and see if it is free.<br>If S6 is free, the section S5 (and signal, if any) is set to green.<br>If S6 is occupied by any vehicle then S5 (and signal, if any) is set to red.<br>When the S6 is free the S5 (and signal, if any) turns green and the vehicle moves forward with the old speed.<br>The section must be listed comma separated and without any space. The automation waits in the FSF/FBS line until condition is fulfilled i.e. all described sections are free. |
| | | FSF S5,S6,S8 | Same as above but now both S6 and S8 must be free at the same time in order for S5 to turn green. |

The examples in the table above have section S5 and S6 explicit specified.
Imagine a layout with quite many sections placed after each other (formed in a ring).
In the image here below you have multiple trains driving in different sections.

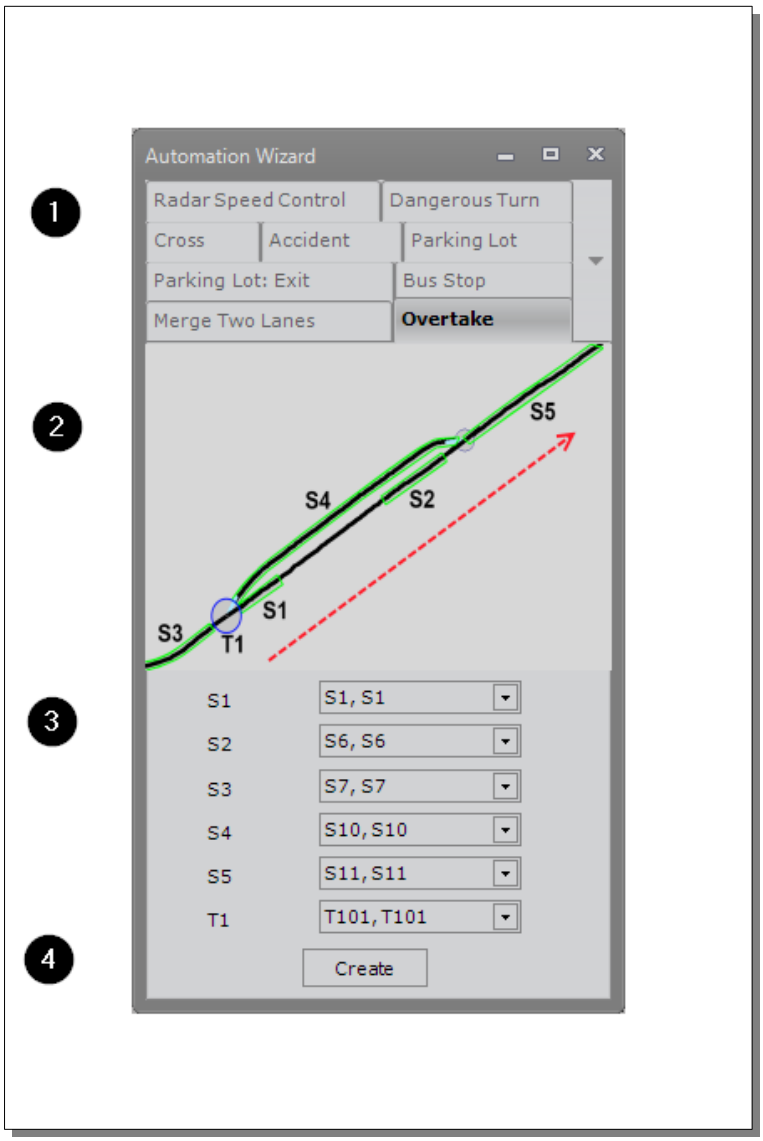


To avoid vehicle collisions we need a sort of block-control. Follow the outer "ring" with the four trains L040, HVLE 37 (Booster), HVLE 31 and C286. One way to ensure these trains never collide is to set up the FBF command in an automation for each two pairs of sections close to each other. For the sake of simplicity we name all the sections in this loop from S1..S6.
Now we can create a main start automation **A1** calling the previous created automation A3 (with Sx, Sy) for all section-pairs around the loop:

```
A3 start S1, S2
A3 start S2, S3
A3 start S3, S4
A3 start S4, S5
A3 start S5, S6
A3 start S6, S1
```

## 10.10.5 Automation Wizard (Faller Cars)

Many standard driving automations like passing a cross with lights, a bus stop, parking etc. can be made using a wizard. The Automation wizard only applies to Faller Cars at the moment.



| | Item | Description |
|---|---|---|
| 1 | **Automations** | Various Automations for different scenes |
| 2 | **Automation Scene** | An image of the selected scene |
| 3 | **Automation Elements** | List of all Elements/components required for the automation |
| 4 | **Create** | Click [Create] to add the automation to the Automation View. |

When you use the wizard you must have created the components (street sections, signals, turns..) on the layout on beforehand for that particular drive, before you run the wizard.

With the automatic assistant and the automation editor, you have two effective tools at your disposal to exhaust all the possibilities that Car System Digital offers you. Using this help you create sequences of commands and functions that are executed fully automatically.

In the automatic wizard, first look which elements (sections, signals, etc.) are required for one of the exemplary traffic situations and create these elements in advance by defining IDs and drawing and labeling the elements. In the automatic wizard you can then select these elements according to their ID.

**ACTION**

- Click on 'Automatic' in the 'Display' menu
  *The 'Automatic' display window is displayed.*
- Click on 'Automatic Wizard'
  *The wizard will appear.*
- Select an automatic.
- Create route sections according to the illustration.
- Select the route sections you have created.
- Click on [Apply].
- The automations are created by the software and will appear in the Automation View.

### 10.10.5.1 Bus stop

With the automatic 'bus stop', a vehicle is steered via a turnout onto a side lane and stopped there for a specified time. Before the vehicle drives back onto the main route, a check is carried out to determine whether the main route is free at this moment. If this is not the case, the vehicle waits until the main route is free before continuing its journey.

### 10.10.5.2 Cross

The automatic 'intersection' is used to control one or two-lane (traffic light) intersections with two relations. The two directions are alternately switched green / red and the crossing traffic is stopped accordingly.

### 10.10.5.3 Confluence

The automatic 'junction' is used for right-before-left controls. The automatic system uses two sections for this. A vehicle that is in the first section checks whether there is a vehicle in the second section. If this is the case, it will stop itself and give the right of way.

### 10.10.5.4 Obstacle

The automatic 'obstacle' controls the bypassing or overtaking of a stationary obstacle by means of a turnout along the route. The automatic system uses five sections for this.

### 10.10.5.5 Overtake

In contrast to the 'obstacle' automatic, the 'overtake' automation overtakes a moving obstacle. The automatic system uses five sections for this. The vehicle being overtaken is slowed down or if necessary, stopped.

### 10.10.5.6 Dangerous Turn

The automatic 'Dangerous route' is an area with two sections that can be used, for example, in or before cornering. A vehicle is braked in the first section and accelerated to the previously driven speed in the second section.

### 10.10.5.7 Radar Speed Control

The automatic 'radar speed control' is used in connection with the article 'radar trap', Art. 161666. A maximum speed can be set in one section. If a vehicle exceeds this speed, the flash is triggered and the vehicle's speed is reduced from this point on. If a vehicle drives slower than the set maximum speed in this section, nothing happens.

### 10.10.5.8 Parking Lot

The automatic 'parking lot' checks whether sections of the designated parking lanes are free and distributes vehicles accordingly.

### 10.10.5.9 Parking Lot: Exit

The automatic `parking lot: exit' regulates the exit from two parking lots using three sections, both of which lead to a common route. If the vehicle driving out first is in a section following the parking lanes, the second vehicle is stopped until this section is free again.

**TIP**

- You can customize an automatic that has already been created with the automatic assistant with the automatic editor.

## 10.10.6 Automation Commands – NO Positioning

The first table here shows the complete list of automation commands which do not require positioning. It means they can be used without knowing where the vehicle is, or they can be used together with external information sources like LocoNet, S88 modules and FALLER road sensors in the layout.

**TIP**

- The first Command **NLW** is a general purpose condition command to be used for most of the components in this list. Examples are listed where necessary.

| Area | Automation | Examples | Explanation |
|---|---|---|---|
| Commands |  | | |
| NLW | **NLW component condition** | **NLW S1 free** | The automation executes the next line in the automation, when section S1 is free.<br><br>NLW is a general purpose **Condition** command.<br>NLW stands for Next-Line-When condition... and can be used on most components, where some conditions must be fulfilled before the automation continues and executes the next line. |
| Pause | **Pause** | Pause 5 | The automation program waits 5 seconds before it moves on. |
| | | Pause 5.3 | The automation program waits 5.3 seconds before it moves on. |
| Repeat | **Repeat** | Repeat | The automation program starts from the top again. |
| | | Repeat 4 | The automation program starts from the top again 4 times, then it goes on or terminates if the repeat command is the last line. |
| Vehicles |  | | |
| Single Vehicle | **Cnnnn** | **C1501** forward 20 | Drive Vehicle ID C1501 forward with speed 20 |
| | | **C1501** backward 10 | Drive the Vehicle ID C1501 backwards with speed 10 |
| | | **C1501** stop | Stop Vehicle ID C1501 |
| | | **Odin** forward 20 | Drive the Vehicle named Odin forward with speed 20 |
| | | **Odin** backward 10 | Drive the Vehicle named Odin backwards with speed 10 |
| | | **Odin** stop | Stop the Vehicle named Odin |
| Vehicle Group | **Group-name** | **Steamers** forward 20 | All vehicles in the group Steamers, drive forward with speed 20 |
| | | **Steamers** Stop | Stop all vehicles in group steamers. |
| All Vehicles | **All** | Stop **all** | Set desired speed on driving vehicles to 0 |
| Vehicle Function | Cnnnn **Fnn** | C1501 **F0** on | Turn on F0 on Vehicle ID C1501 |
| | | C1501 **F2** off | Turn off F2 on Vehicle ID C1501 |
| | | L1501 **engine** on | Turn on the engine sound on Vehicle ID L1501 |
| | | Steamers **F1** on | All vehicles in the group steamers turn on Function F1. |
| | | Odin **engine** off | Turn off the engine sound on the Vehicle named Odin. |
| Vehicle Functions | Cnnnn **Fa,...,Fz** | Mozart **F0**,**F1**,**F3**,**F5** on<br>C1501 **F0,F1,F3,F5** on | Turn on all 4 functions on vehicle named Mozart or C1501 |
| | | Mozart **F0,F1,F3,F5** off<br>C1501 **F0,F1,F3,F5** off | Turn off all 4 specific functions |
| **Condition** Vehicle | **NLW** Cnnnn | **NLW** C24 stop | Continue only if vehicle with ID C24 is stopped |
| **Condition** Vehicle Group | NLW Group-name | **NLW** Steamers S24 | Continue only if a vehicle from group Steamers hits section S24. |
| Turnouts |  | | |
| Two way | **Tnnnn** | **T18** | Toggle the direction of the turnout with ID T18 |
| | | **T18** straight | Set T18 in the straight direction. |
| | | **T18** turn | Set T18 in the turn direction. |
| Three way | | **T25** left | A 3-way turnout turns left. |
| | | **T25** straight | A 3-way turnout turns straight. |
| | | **T25** right | A 3-way turnout turns right. |
| Four way Single | | **T31** turn | Normal single drive 4Way turns. |
| | | **T31** straight | Normal single drive 4Way straight. |
| Four way Cross | | **T27** AC<br>**T27** AD<br>**T27** BC | T27 is a 4-way cross with two drives.<br>T27 AD sets the direction from A to D or from D to A. |

| | | | |
|---|---|---|---|
| | | **T27** BD | |

| | | | |
|---|---|---|---|
| **Condition** Turnout | **NLW** | **NLW** T18 left<br>**NLW** T18 straight<br>**NLW** T18 right | Continue only if T18 is in left direction.<br>Continue only if T18 is in straight direction.<br>Continue only if T18 is in right direction. |
| Random Turnouts | **Random** on<br>expression1<br>expression2<br>expression..<br>expressionN<br>**Random** off | **Random** on<br>T12 straight<br>T17 straight<br>**Random** off | Randomly set either T12 straight or T17 straight<br><br>If you want to activate any **Turnout**, you can list the expressions below "Random on" as many as you like – one per line - and end with a line "Random off". This can give you a lot of random drive options on your layout. |
| Sections |  | | |
| Single Section | **Snnnn** | **S13** green | Set S13 and eventually attached signal to green |
| | | **S13** red | Set S13 and eventually attached signal to red |
| **Condition** Section | **NLW Snnnn** | **NLW S1** occupied<br>**NLW S1** free | Continue only if a vehicle has occupied Section with ID S1.<br>Continue only if no vehicle occupies Section with ID S1 |
| **Condition** Group Section | **NLW Group Snnn** | **NLW Steamers S24** | Continue only if one vehicle from the group Steamers pass S24. |
| Random Sections | **Random** on<br>expression1<br>expression2<br>expression..<br>expressionN<br>**Random** off | **Random** on<br>S14 green<br>S15 red<br>S16 green<br>**Random** off | Randomly set either S14 green or S15 red or S16 green.<br><br>If you want to activate any **Section**, you can list the expressions below "Random on" as many as you like – one per line - and end with a line "Random off". This can give you a lot of random drive options on your layout. |
| Signals |  | | |
| Single Signal | **Vnnnn** | **V11** green | Set V11 and eventually linked section to green |
| | | **V11** red | Set V11 and eventually linked section to red |
| **Condition** Signal | **NLW Vnnn** | **NLW** V11 green | Continue only if V11 is green |
| | | **NLW** V11 red | Continue only if V11 is red |
| Random Signal | **Random** on<br>expression1<br>expression2<br>expression..<br>expressionN<br>**Random** off | **Random** on<br>V21 green<br>V22 green<br>V23 green<br>V24 green<br>**Random** off | Randomly set either V21, V22, V23 or V24 green.<br><br>If you want to activate any **Signal**, you can list the expressions below "Random on" as many as you like – one per line - and end with a line "Random off". This can give you a lot of random drive options on your layout. |
| Routes |  | | |
| Routes | **Rnnnn** | **R31** | Set all turnouts and signal on route with ID R31. |
| Random Routes | **Random** on<br>expression1<br>expression2<br>expression..<br>expressionN<br>**Random** off | **Random** on<br>R1<br>R5<br>R6<br>**Random** off | Randomly set either R1, R5 or R6<br><br>If you want to activate any **Route**, you can list the expressions below "Random on" as many as you like – one per line - and end with a line "Random off". This can give you a lot of random drive options on your layout. |
| Automations |  | | |
| Automations | **Annnn** | **A11** start | Start automation with the ID A11. Automations can be started and stopped by other automations. |
| | | **A11** stop | Stop the execution of A11. |
| Random Automations | **Random** on<br>expression1<br>expression2<br>expression..<br>expressionN<br>**Random** off | **Random** on<br>A11<br>A12<br>**Random** off | Randomly start either automation A11 or A12<br><br>If you want to activate any **Automation**, you can list the expressions below "Random on" as many as you like – one per line - and end with a line "Random off". This can give you a lot of random drive options on your layout. |
| Sounds | | | |
| Sounds | **Pnnnn** | **P11** | Starts sound P11 (module 1, sound 1) and runs it to the end. |
| Modules | | | |
| LocoNet Device | **Dnnnn** | **D6** on<br>**D6** off | LocoNet Device with ID D6 turns on or off.<br>To be used with separate units, engines, couplers etc. |
| | | **DA206** on<br>**DA206** off | LocoNet unit on module 2 port 6 turns on or off |
| **Condition** S88 Modules | **NLW** | **NLW** E-2-07 free<br>**NLW** E-2-07 occupied | Continue only if Module 2 input 7 is free.<br>Continue only if Module 2 input 7 is occupied |
| **Condition** Sensor | **NLW** | **NLW** E207 free<br>**NLW** E207 occupied | If a Faller Car should react on a street sensor, then E207 sensor is the sensor on Module 2 port 7. |

## 10.10.7 Automation Commands – WITH Positioning

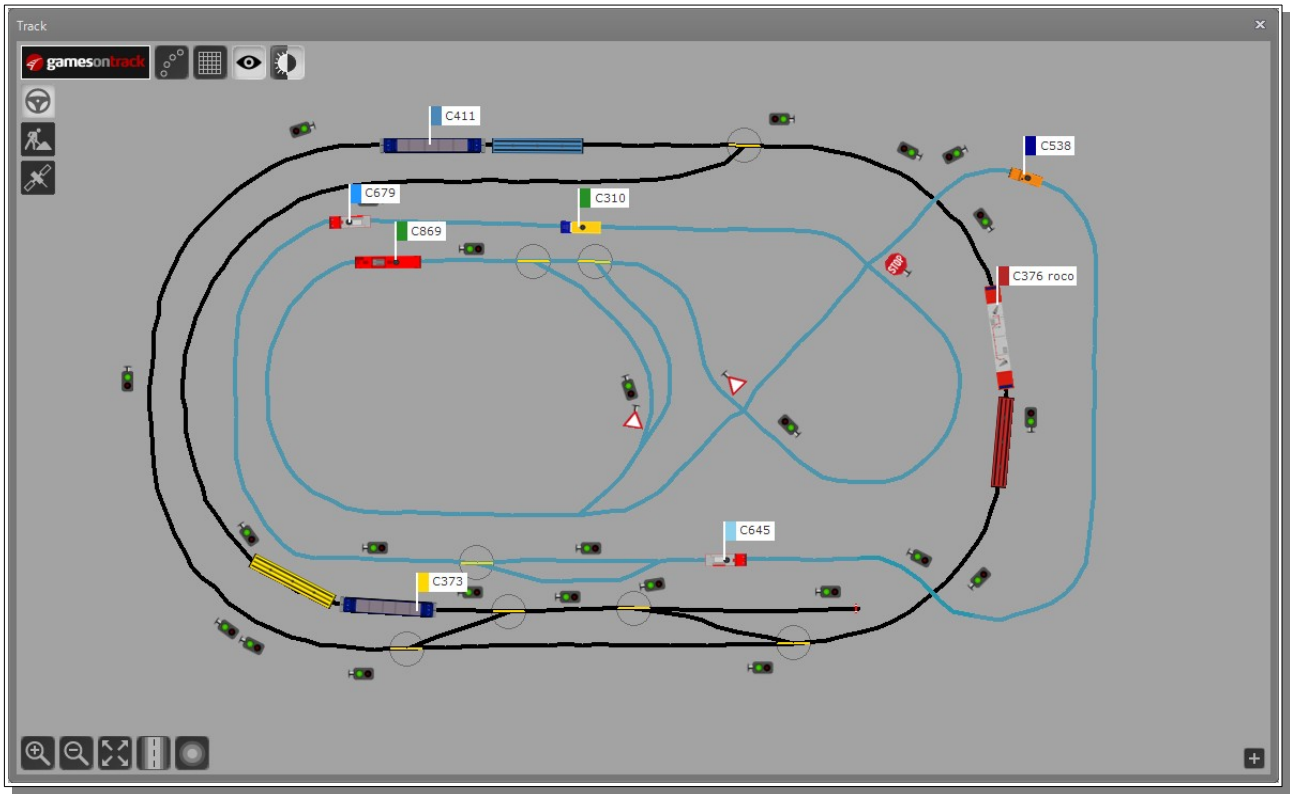
The second table here shows automation functions which are part of the positioning.

| Area | Automation | Examples | Explanation |
|---|---|---|---|
| Commands |  | | |
| None | | | |
| Vehicles |  | | |
| None | | | |
| Turnouts |  | | |
| None | | | |
| Sections |  | | |
| Vehicle in Section | **NLW** Cnnn Snnn | **NLW** C36 S5 | Continue only if the Vehicle ID C36 occupies S5. |
| Vehicle Group in Section | **NLW** Group Snnn | **NLW** Steamers S27 | Continue if one vehicle from the group steamers occupy S27 |
| Vehicle and Section control | **CSnnn** | **CS5** F2 on | When any vehicle occupies section S5 turn on the F2-function on that particular vehicle. |
| | | **CS5** F2 off | Vehicle in section S5 turns off F2 |
| | | **CS5** stop | Vehicle in section S5 is stopped |
| | | **CS5** forward 20 | Vehicle in section S5 forward with 20 or steps. |
| Remember desired speed | **CSnnn Register** | **CS5** Register<br>or<br>C138 Register (C*)<br>or<br>L3264 Register (L*) | Register remember the desired speed from a certain vehicle to be resumed later. The car in section with ID5 saves its current speed. The next commend could be: CS5 forward 10. Could also be a specific car or locomotive L3264 |
| Resume desired speed | **CSnnn Resume** | **CS6** resume or<br>L3264 resume | When the same vehicle hits the section with ID=6 it will resume the desired speed set previously. Could also be a Specific car or locomotive L3264 |
| RCMax<br><br>*Pick individual vehicle with #* | **RCMax Snnn Max-Speed** | **RCMax** S20 30<br># forward 15<br>NLW Group1 S21 occupied<br># stop | RCMax waits until a vehicle in section S20 drives faster than speed 30.<br># (the captured vehicle ID) is asked to continue with speed 15.<br># is active within the automation only.<br>RCMax can also be used if a group of vehicles can occupy S21, you can command the one vehicle in the group that occupies S21 to stop. |
| Section control:<br>Free Section Forward | **FSF**<br>**FBF** | FSF S5,S6<br>FBF S5,S6 | From the section S5 watch S6 and see if it is free.<br>If S6 is free, the section S5 (and signal, if any) is set to green.<br>If S6 is occupied by any vehicle then S5 (and signal, if any) is set to red.<br>When the S6 is free the S5 (and signal, if any) turns green and the vehicle moves forward with the old speed.<br>The section must be listed comma separated and without any space. The automation waits in the FSF/FBF line until condition is fulfilled i.e. all described sections are free. |
| | | FSF S5,S6,S8 | Same as above but now both S6 and S8 must be free at the same time in order for S5 to turn green. |
| Automatic parking | **FFR** | FFR<br>S8=R8,S9=R9,S10=R187 | FFR finds the first free section in a list, here S8, S9, and S10 and assigns the associated route. Section and route must be listed comma separated. |
| Drive out, find vehicle in section and set route. | **FLB** | FLB C1501,<br>S1=R11,S2=R12 | FLB finds Vehicle ID C1501 in the sections S1 or S2, and assigns the associated route. If S1501 is found in S2 the route R12 is set. No space, only comma between parameters. |
| $ | Target Snnn | NLW $ occupied | Waits until a vehicle enters the target section which was found using FFR.. |
| Tunnels:<br>Virtual<br>Speed Factor | **VSF** Cnnn/ALL Snnn Percent [1..200] | **VSF C12 S27 116**<br>If vehicle C12 is inside block S27, the virtual speed increases to 116%.<br>---<br>**VSF ALL S14 88**<br>All vehicles inside block S27, have the virtual speed decreased to 88%<br>---<br>Automation example:<br>*NLW S1 occupied* | When driving without positioning inside tunnels, there can be a discrepancy between the speed of the physical vehicle and the virtual vehicle displayed in the UI. In order to get a better sync between these two, this command can be used.<br><br>If the virtual vehicle is "behind" the physical, the percent-value must be set greater than 100%, otherwise less than 100%.<br><br>The percent value can be between [1..200] Notice: One second after the vehicle has left the tunnel, the virtual speed is reset to 100%. |

| | | | |
|---|---|---|---|
| | | *VSF C12 S1 114*<br>*VSF C15 S1 122*<br>*REPEAT* | |
| Generic Functions with parameters | Example FSF or FBF in automation A3 | FSF Sx,Sy<br>Repeat<br><br>or<br><br>FBF Sx,Sy<br>Repeat<br><br><br>A3 Start S3,S4<br>A3 start S4,S5<br>A3 start S5,S8<br>A3 start S8,S10<br>A3 start S7,S13 | This is a generic section/block control with e.g. two parameters Sx=initial section-from, and Sy target section-to. You select the parameters in the intelligent automation editor, please look at the intellisense guidance, which assist you with suggestions to commands and arguments while typing in the editor.<br><br>  <br><br>This generic function can cover all block controls with 2 blocks. If you press the drop-down in the parameter-box you see all selectable parameters.<br><br>Now you initiate say 5 block controls in your start-up automation:<br>You do not need to have 5 individual automations, you have just one running them all. |
| **Signals** |  | | |
| LED combination for any Signal using up to 4 LED's | **LED** Addrnnnnn | **LED** 41485 SET1 2 on<br><br>Or<br><br>**LED** 41485 SET2 1 flash<br>Pause 1<br>**LED** 41485 SET2 1 off | If you use GT-XControl Servo you have 4 LED's on it in two sets of each two. Normally you configure them as red/green signals described in Chap. 10.4. The LED command allow you to configure them individually and use other colors.<br><br>Turn the LED number 2 of GT-XControl Servo 41485 of Set 1 on.<br>Start LED number 1 on Set 2 (the upper set) on GT-XControl Servo 41485 flashing. After 1 second stop the flashing. |
| **Routes** |  | | |
| None | | | |
| **Automations** |  | | |
| None | | | |
| **Sounds** | | | |
| None | | | |
| **Modules** | | | |
| Street Sensors LocoNet | | NLW E201 | Wait until Street Sensor with ID E201 is activated by a vehicle. |
| | | | |

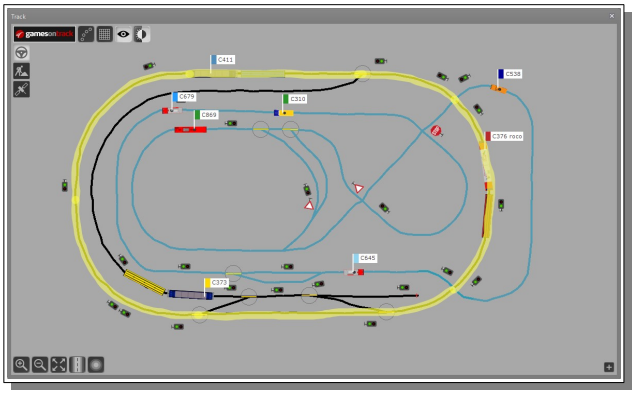
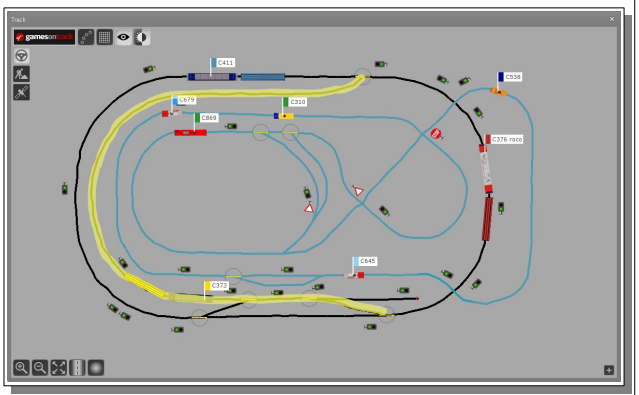
## 10.10.8 Automations With Practical Examples

The layout below is a combination of trains+cars. Rails are colored in black and roads in blue:




This layout has two sections where the road is crossing the rail – seen in the upper right and lower right part of the layout.

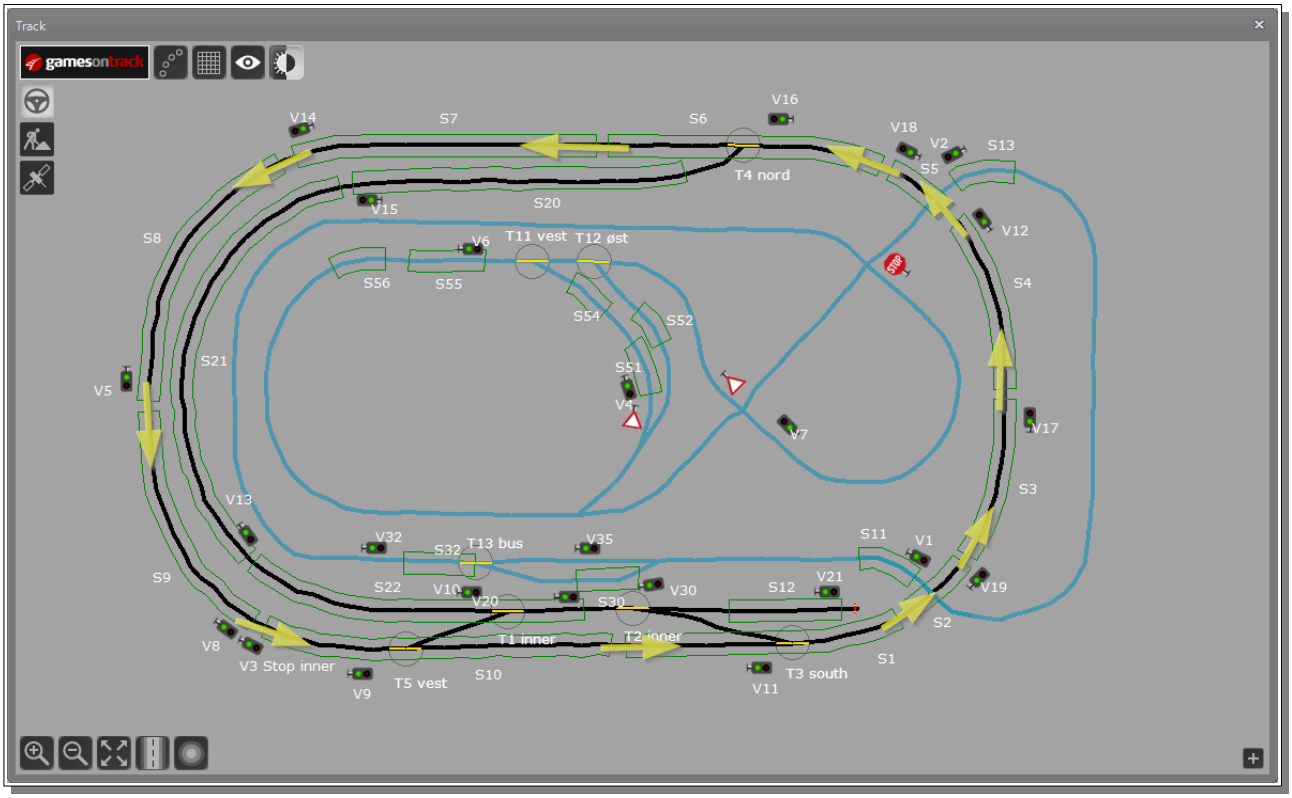
The rails are forming an outer and inner ring which are hilghlighted in yellow here below.

| Block Control | |
|---|---|
| Outer ring | Main inner ring |
|  |  |

- The primary goal here is to setup this system to avoid collissions between vehicles.
- The secondary goal is to create a few automations that make the system feel live, by creating random behaviour of the vehicles driving on the layout.

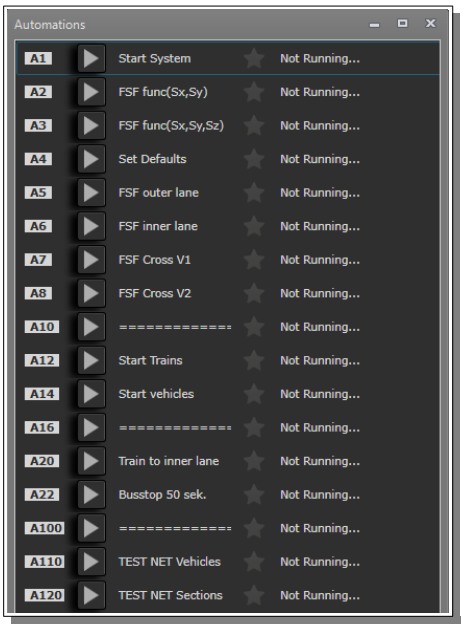
## 10.10.8.1 Avoid Collisions

Avoiding collissions between vehicles can be achieved by block control (section control).
**The outer ring:** Here ten sections are created and named S1-S10. We use the FSF command (Free Section Forward) to bind all these sections in a round robin.

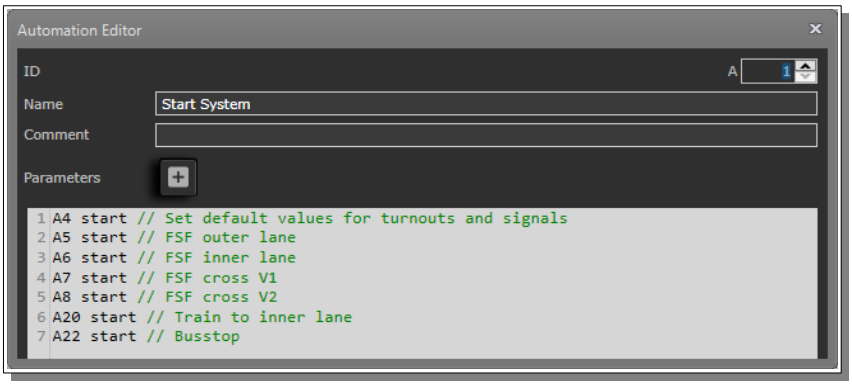



Each section in the block control is having a signal attached in the front of the section or before a turnout in that section. This will ensure vehicles approaching a red signal in this section will drive slowy towards the signal.

**Automations:** Here is a list of Automations to be used in this chapter.



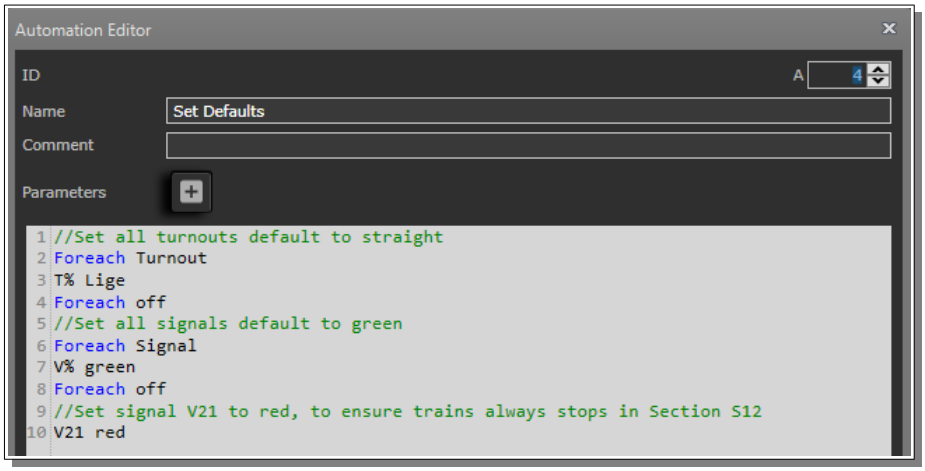
**Automation A1:** This is the main automation used to start needed automations.



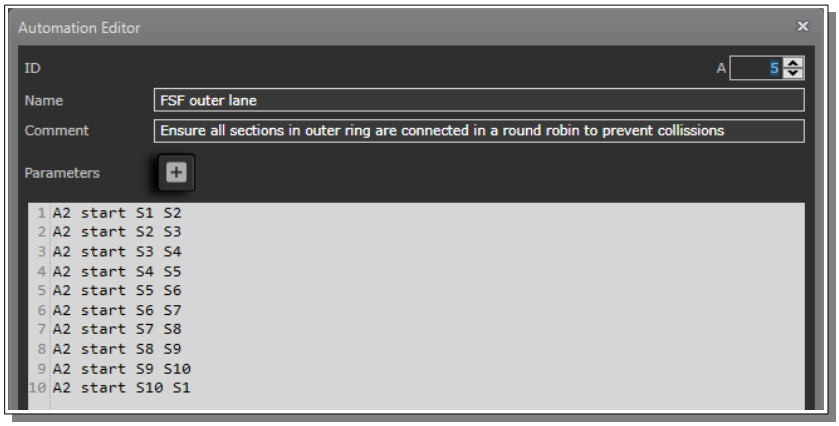

**Automation A2:** is a generic automation that continously is checking if the section ahead of the current section is free. The current section is Sx and the section ahead is Sy.


**Automation A3:** is a generic automation that continously is checking if two sections ahead of the current section are free. The current section is Sx and the sections ahead are Sy and Sz.

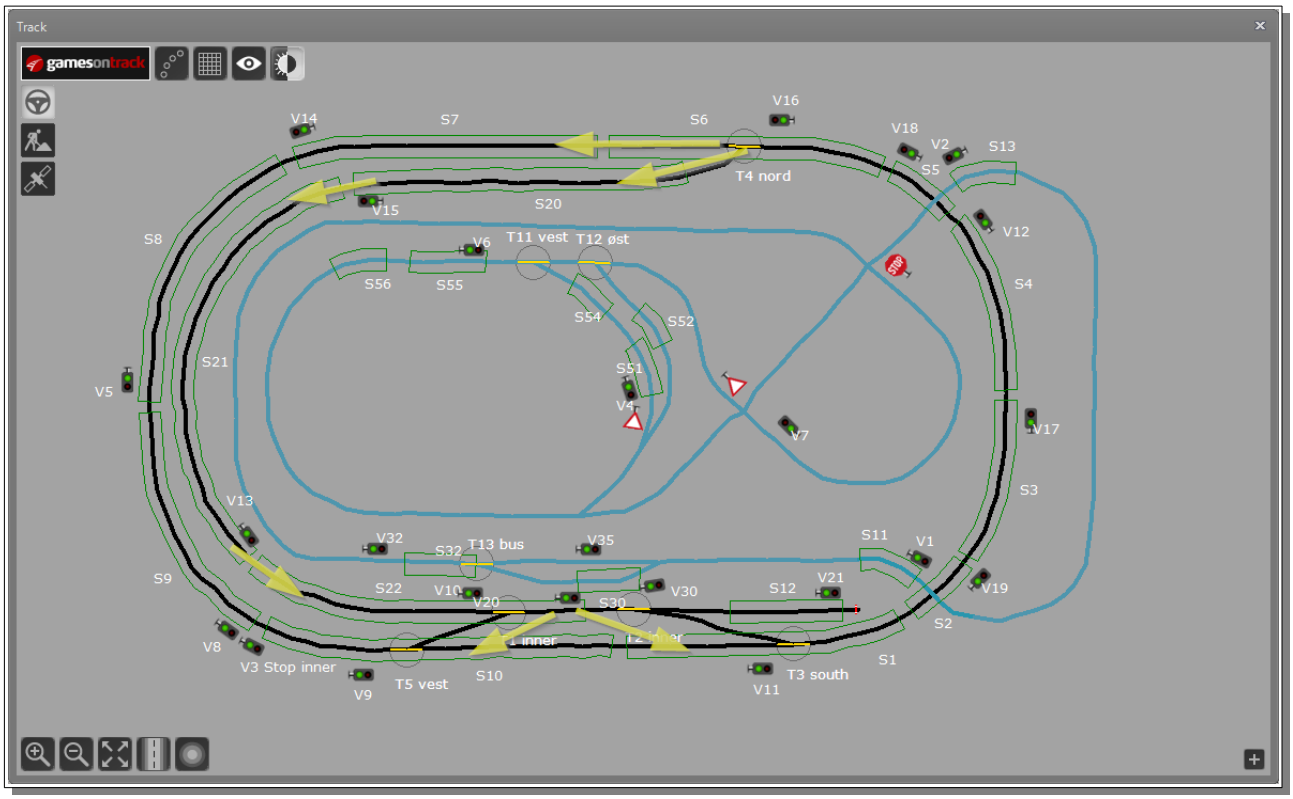

**Automation A4:** This automation is setting up some default on the layout. Here we what all turnouts to be in state = straight and all signals to be in state = green before we start driving. Finally we set the turnout T24 to be red. This is to ensure any vehicles that hit section S12 will be stopped.



**Automation A5:** This automation is creating the block control on the outer ring by calling automation A2 with the actual sections being connected. S1→S2→S3→…S9→S10

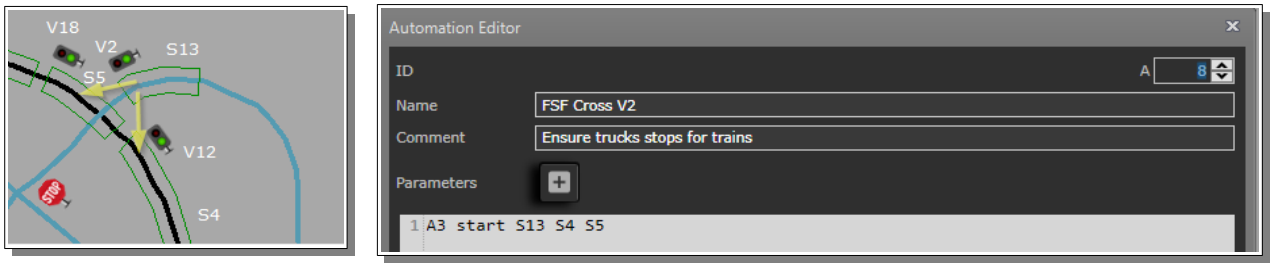



**The inner ring:**



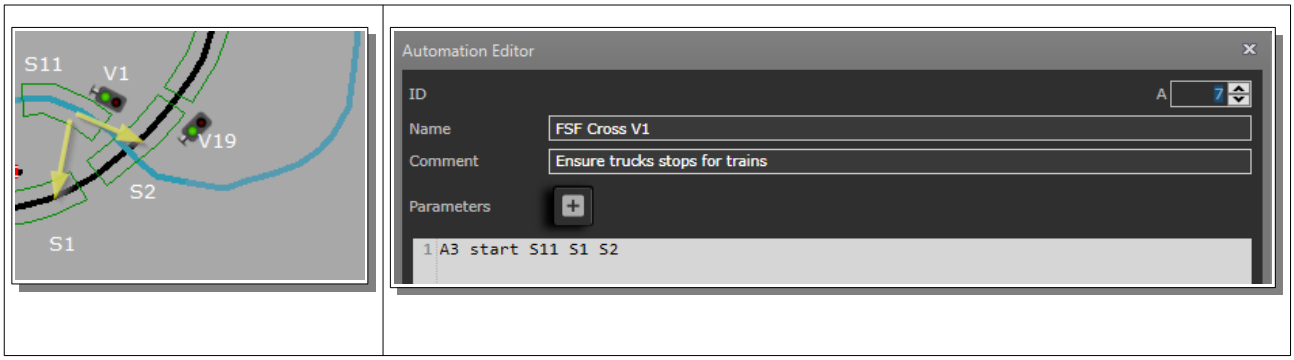

**Automation A6:** This automation creates the block control for the inner ring by using automation A2 and A3 with the actual sections connected. On the upper side of the layout (The entrance to the inner ring) we use the FSF with three arguments in order to ensure both S7 and S20 are free before a train leaves section S6. The same setup counts for the lower side (the exit from the inner ring) where section S10 and S1 are free before we leaves section S22.

**Automation A8:** The upper Cross:




The FSF command can also be used for sections placed on both the rails and roads in combination. To ensure the cars do not cross the rail if a train is approaching we setup the FSF command to look from the road towards the rail. The driving direction of a train is here from section S4 to S5. Any vehicle in section S13 are first allowed to drive when S4 and S5 are free.

**Automation A7:** The Lower Cross:



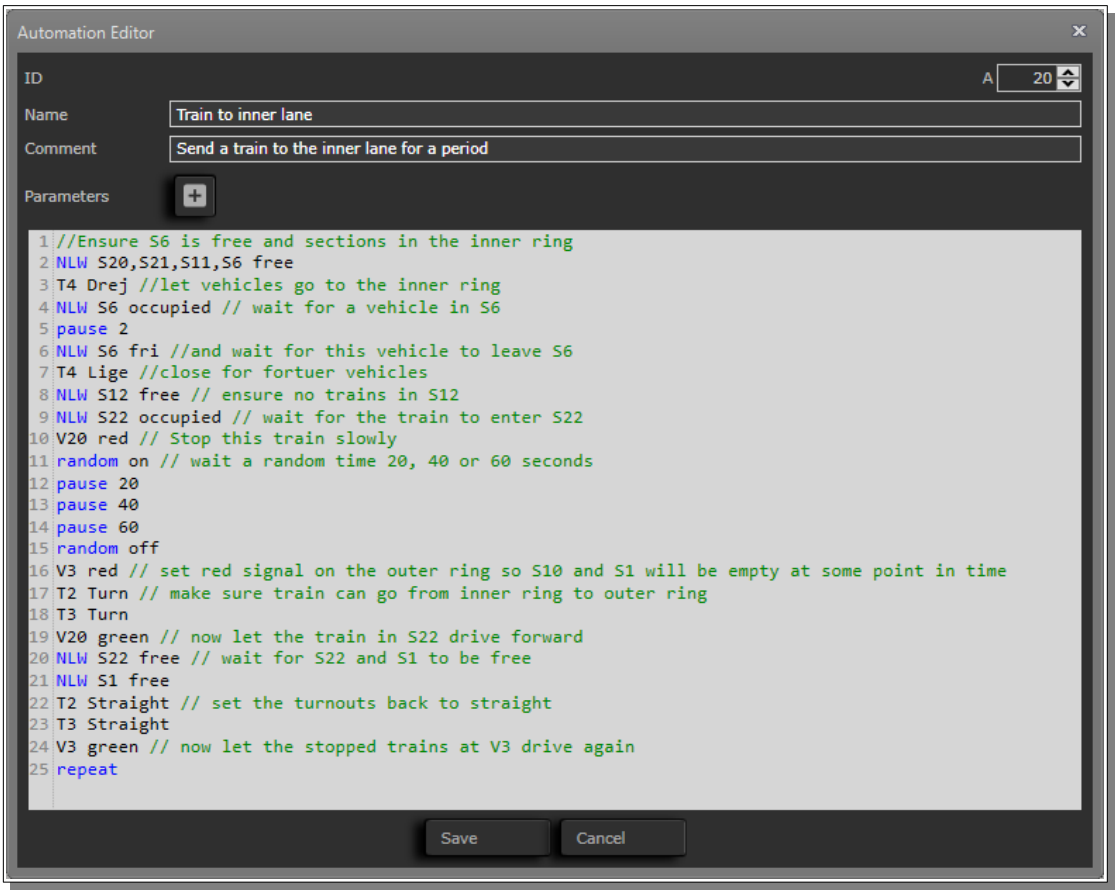

The same solution is applied for the second cross. The driving direction of a train is here from section S1 to S2. Any vehicle in section S11 are first allowed to drive when S1 and S2 are free.

**Vehicle Groups:** The following vehicle groups are created:

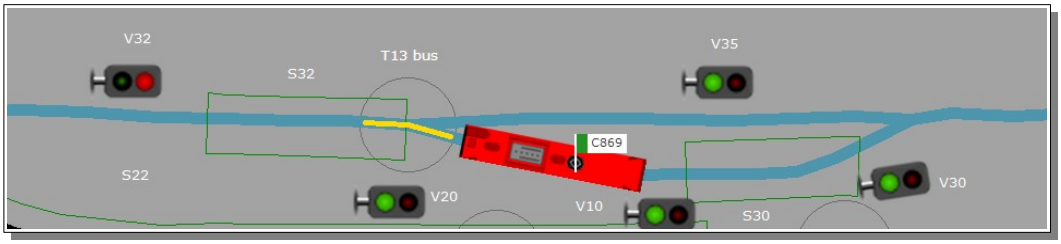
**Automation A12:** Starting the trains:

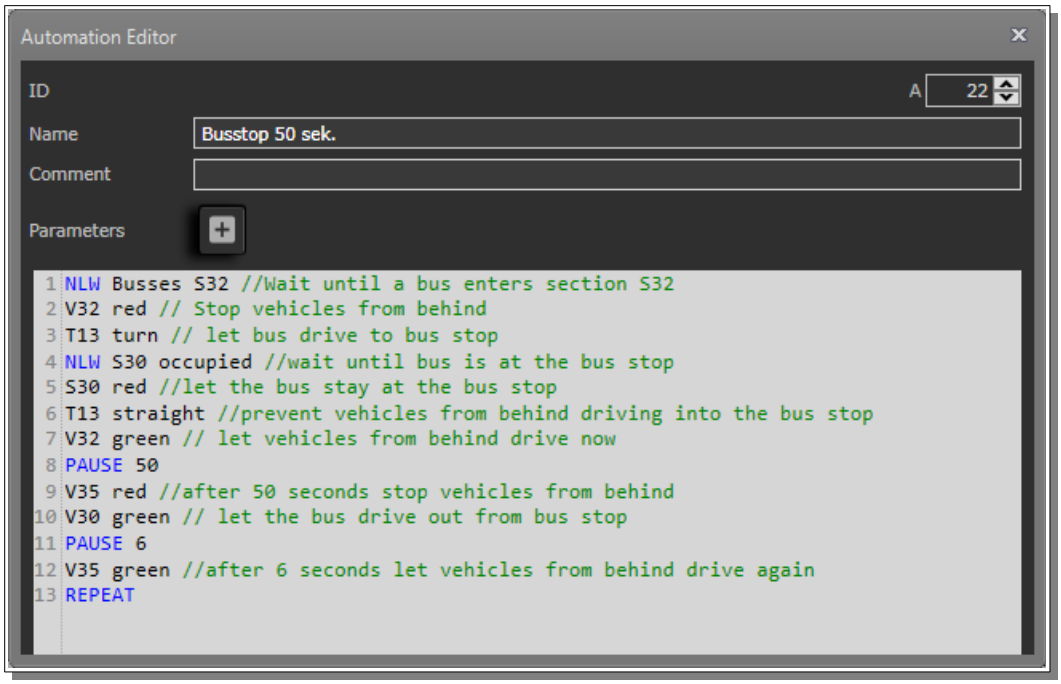

**Automation A14:** Starting the vehicles:


**Automation A20:** Trains to inner lane (and out again after some time):



**Automation A22: Bus stop:** This automation will let busses drive into a bus stop, and wait there for 50 seconds before it drives again.




**Special topic:**

**Automation A110+120:** Send information for all vehicles and sections to external application using TCP. If GT-Command is started with the argument AutomationServer, information can be sent to and from GT-Command. Automations can be started from the external application


# 10.11Voice Recognition

In order to use the Voice Recognitioning System, please do these steps

**ACTION**

- Insert your headset in the standard ports on your PC.
- Activate the voice control system by pressing F2 or saying "Microphone on". The bottom Information Line will change the Mic color to green.
- You'll see the little running sensor moving with your speech.
- Please shift to red when not in use.

**NOTE**

- You can only use Voice Control if your License code allows you to do so.

## 10.11.1 Command Principles

The Method in the Command principle is 3 words: WHO - WHAT - HOW

| The Three Words | Description |
|---|---|
| **WHO** | Will be a component Name or an ID |
| **WHAT** | Will be the action - might be optional if the accessory is a shift: (forward, backward/reverse, on, off, red, green, left, right) |
| **HOW** | Might be optional – Speed, on/off, values |

### Examples:

| Component | Prefix | Comment | Voice Command Example |
|---|---|---|---|
| **Vehicles** | C=Charlie | (here Hunter)<br>(here C12) | **"Hunter forward 20"**<br>**"Charlie 12 light on"** |
| **Turnouts** | T=Tango | (here T3) | **"Tango 3 straight"** |
| **Signals** | V=Victor | (here V11) | **"Victor 11 red"** |

| | | | |
|---|---|---|---|
| **Sections** | S=Sierra | (here S24) | **"Sierra 24 red"** |
| **Routes** | R=Romeo | (here R7) | **"Romeo seven"** |
| **Automations** | A=Alpha | (here A20) | **"Alpha 20 on"** |

**NOTE**

- All Loco Function names are set in the Vehicle Card per loco type.
- All Loco Functions have default standard names which can be changed by the user.
- If you change them, please ensure that you get the Microphone symbol outside them to show they are voice ready.
- Please also respect capital letters, i.e in German

.

## 10.11.2 Voice Commands

| Function | Command | Voice Example | Explanation |
|---|---|---|---|
| Microphone |  | | |
| **Microphone** | Turn Mic on | "Microphone on" | Activate the microphone from the yellow wait state to active green state. Now you can speak your commands. |
| | Turn microphone off | "Microphone off" | Pause the microphone when you speak with other people or you do not want to command. |
| | | | |
| Vehicles |  | | |
| **Driving Forward Backward Stop** | Odin forward 20 | "Odin forward twenty"<br>"Odin forward two zero" | Drive Vehicle named Odin forward with speed 20 steps |
| | 36 forward 99 | "thirty-six forward ninety-nine"<br>"thirty-six forward nine nine"<br>"three six forward ninety-nine"<br>"three six forward nine nine" | Drive Vehicle named 36 forward with 99 steps or 99 km/h. 99 is the max speed you can speak directly, from 99 you must use plus. |
| | 1711 forward 8 | "Seventeen eleven forward eight",<br>"seventeen one one forward eight"<br>"one seven one one forward eight" | Drive Vehicle named 1711 forward with 8 steps. If Vehicle has a number it can maximum be 4 digits. |
| | C5 forward 8 | "Charlie five forward eight | Drive Vehicle ID C5 forward with 8 steps."C" can be the only front letter in numbered names, thus identical with the ID. |
| | Sixt2 stop | N/A | The names SIXT is not in the wordbook. |
| **You can not speak or drive backwards** | Backwards | N/A: Odin reverse 5 | |
| | Speed up | "Odin plus" | Odin runs faster 1/14 of max speed |
| | Slow down | "Odin minus" | Odin runs slower, 1/14 of max speed. |
| | Forward slowly | "Odin forward slow" | Odin runs forward slowly, 3 /14 max speed |
| | Forward middle | "Odin forward middle" | Odin runs forward at the middle driving step. (7/14 max speed) |
| | Forward fast | "Odin forward fast" | Odin runs forward fast, at the 10/14 of max speed. |

| | | | |
|---|---|---|---|
| | Stop | "Odin Stop" | Stop Odin. |
| | Stop all Vehicles | "Stop all" | Stops all vehicles = F12 and stop execution of all automations, |
| | | | |
| | | | |
| **Vehicle functions** | Light (F0) | "Odin light on",<br>"Odin function zero on"<br>"Odin Foxtrot zero on" | Turn on F0 on Odin. If F0 is named "light". Please hover over the function button on the screen to see the name |
| | Whistle off | "Odin whistle off"<br>"Odin Function two off"<br>"Odin Foxtrot two off" | Turn off F2 with name "Whistle" |
| | Shift F3 on/off | "Odin left" | Shifts F3 with name "left" on/off. (left blinker) |
| Turnouts |  | | |
| | Shift no 18 | "Tango eighteen" | Shift the direction on turnout no 18. T18 is the ID in the device table. |
| | Set no 18 straight | "Tango eighteen straight"<br>"Tango one eight straight"<br>"Tango one eight green"<br>"Tango eighteen green" | Set T18 in straight direction |
| | Set no 18 to turn | "Tango eighteen turn"<br>"Tango one eight turn"<br>"Tango eighteen red"<br>"Tango one eight red" | Set T18 to turn direction |
| | | | |
| Sections |  | | |
| | Set Section S8 red | "Sierra 8 red" | S8 is a section, that can shift between red and green.<br>When set to red, it will send temp. speed 0 to the vehicle in the section. |
| | Set Section S8 green | "Sierra 8 green" | S8 is a section, that can shift between red and green.<br>When set to green the vehicle will resume at previous speed. |
| | | | |
| Signals |  | | |
| | Shift Signal 42 | "Victor fourty-two"<br>"Victor four two" | Signals use V as the front in the ID fields in the article table. The above other letters can also be used.. |
| | Set V42 to red | "Victor fourty-two red"<br>"Victor four two red" | Set V42 to red |
| | | | |
| Routes |  | | |
| | Set all turnouts and signals in one route 7 | "Romeo seven" | Set all associated turnouts and signals in route R7. |
| | | | |
| Automations |  | | |
| | Start A11 | "Alfa eleven on" | Start the automation with ID A11. The automation can start and stop other automations. |
| | Stop A11 | "Alfa eleven off" | Stop execution of A11 |
| | Start an automation named "bridge" | "Bridge on" | Start the automation "bridge" |
| | | | |

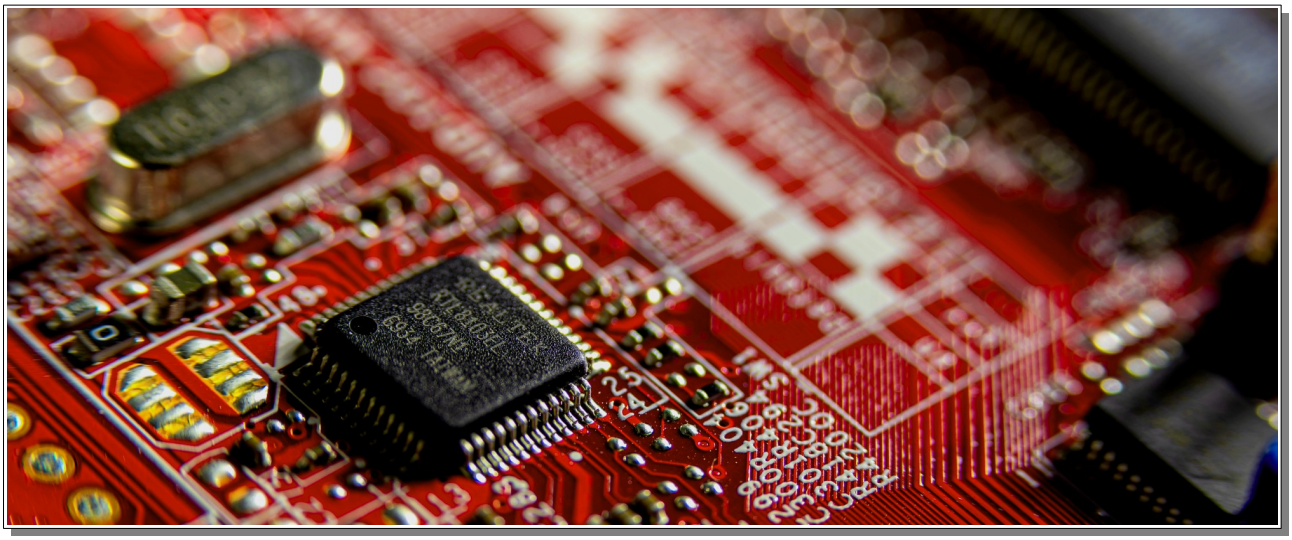
# 11 What to do if

## 11.1 Error Messages

| | Error Pattern | Source of Error | Rectification |
|---|---|---|---|
| 1 | **Master no longer responds** | Connection to the master interrupted | ➢ Check the digital addresses in the expansion module and at the junction |
| | | System error | ➢ Restart the master |
| 2 | **Turnout does not switch** | Wrong connection | ➢ Check the connected lines |
| | | Wrong digital address | ➢ Check the digital addresses in the expansion module and at the junction |
| 3 | **Vehicle stops unintentionally** | The battery is empty | ➢ Charge the vehicle |
| | | Hardware error | ➢ Switch the vehicle off and on again |
| 4 | **The vehicle stops with alternating indicators** | The battery is empty | ➢ Charge the vehicle |
| 5 | **The vehicle stops with the headlights flashing** | Radio connection interrupted | ➢ Bring the vehicle within radio range |
| | | Master has been switched off | ➢ Switch on the master |
| 6 | **Vehicle stops with hazard lights** | The vehicle is outside the intended system layout | ➢ Check the security area<br>➢ Manually bring the vehicle into the intended system layout |
| 7 | **Not working components** | Wrong connection | ➢ Check the correct connection of the components |

| | | | | |
|---|---|---|---|---|
| | | Damaged component | ➢ | Replace the component |
| 8 | **No satellite signal** | Power supply | ➢ | Check the power supply to the satellites |
| | | Satellite not set up | ➢ | Check the plant scenario |
| 9 | **Software does not respond** | Software error | ➢ | Restart the software |

# 12 Technical Data



Currently we have four different version of Masters: V1 to V4.

## 12.1 Electrical Values

| Designation | Value |
|---|---|
| **Power supply** | 16 V AC |

Tab. 72: Electrical values

**NOTE:** All devices are radio-based, 2-way transmission systems with short range that are regulated by the European standard EN 300-220-1 (2). Published under: ETSI EN 300 220-2 V2.1.1. The frequency spectrum covers the bands 868-870 MHz.

## 12.2 Radio Certificate: CE Approved for Europe

All Master versions from V1 to V4 are CE Certified for Europe to operate as a Radio Master.

***CE EN 300 220-1 approval Radio 869.7-870.0 MHz***

## 12.3 Radio Certificate: FCC Approved for US

Master versions from V2 to V4 are all certified for use in the US with the following FCC ID:

***FCC ID: 2AK9N-GTX17263X.***

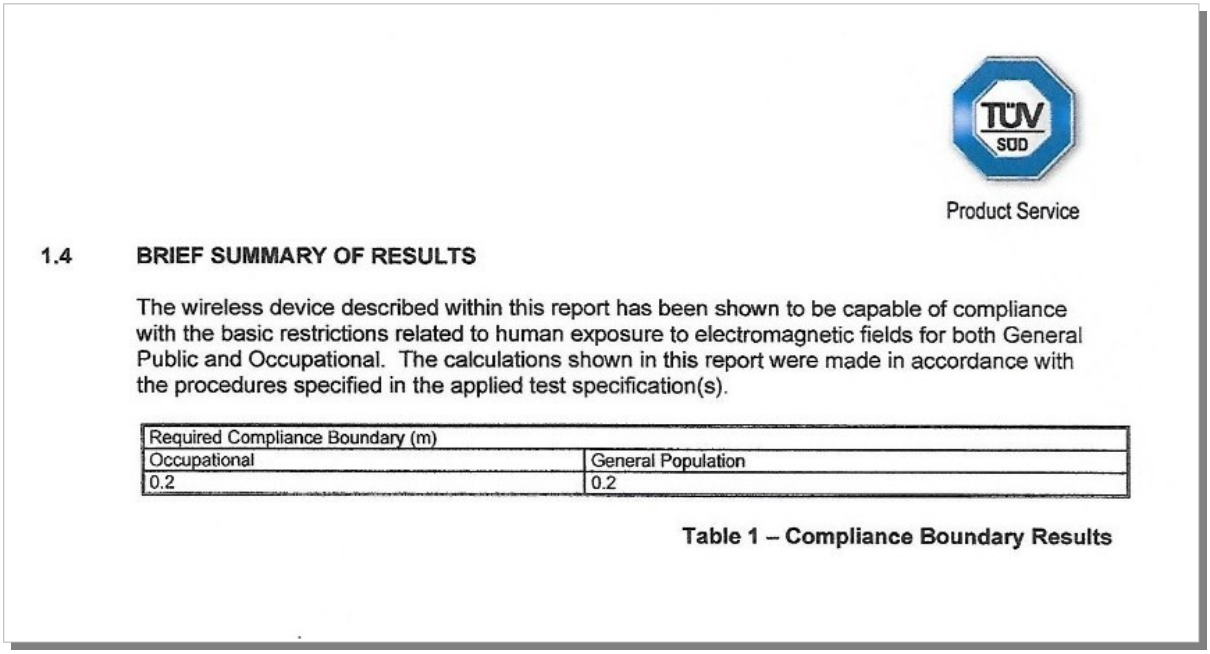
*This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is*

*no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:*

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

## 12.4 Radio Frequency Exposure

The Master is tested for RF exposure to 0,2 meters distance and found to be compliant to the FCC rules, as stated in the TÜV results here below.



TÜV SÜD
Product Service

1.4 **BRIEF SUMMARY OF RESULTS**

The wireless device described within this report has been shown to be capable of compliance with the basic restrictions related to human exposure to electromagnetic fields for both General Public and Occupational. The calculations shown in this report were made in accordance with the procedures specified in the applied test specification(s).

| Required Compliance Boundary (m) | |
|---|---|
| Occupational | General Population |
| 0.2 | 0.2 |

**Table 1 – Compliance Boundary Results**

**WARNING**

- Please keep at least 0,2 meters = 20 cm distance or more separation of yourself from the antenna - to avoid human exposure to electromagnetic fields from the device.

## 12.5 GamesOnTrack Hardware

GT-COMMAND enables the user to set individual speed, sound, light etc on the fly via an embedded radio system. The vehicle control is based on DCC decoder in the vehicle. The system controls the vehicle position via satellites hanging over the layout using a small ultrasound transmitter in the vehicle. The system can operate several vehicles with individual location aware operations.

GT-COMMAND supports  the Faller Car System 3.0 and supports LocoNet enabled switching, signals,  and street sensors.

GT-COMMAND controls a range of hardware components, from simple measurement sensors to full functioning vehicle drive.

GT-Command works as a PC-system with connected tablets and smartphones via WLAN.

For hardware details on every component, please see the file "Data-sheet "which is a PDF with all settings etc. here we only enclosed the short version and it is not complete. The Data-sheet is enclosed on the USB-stick or available as download.

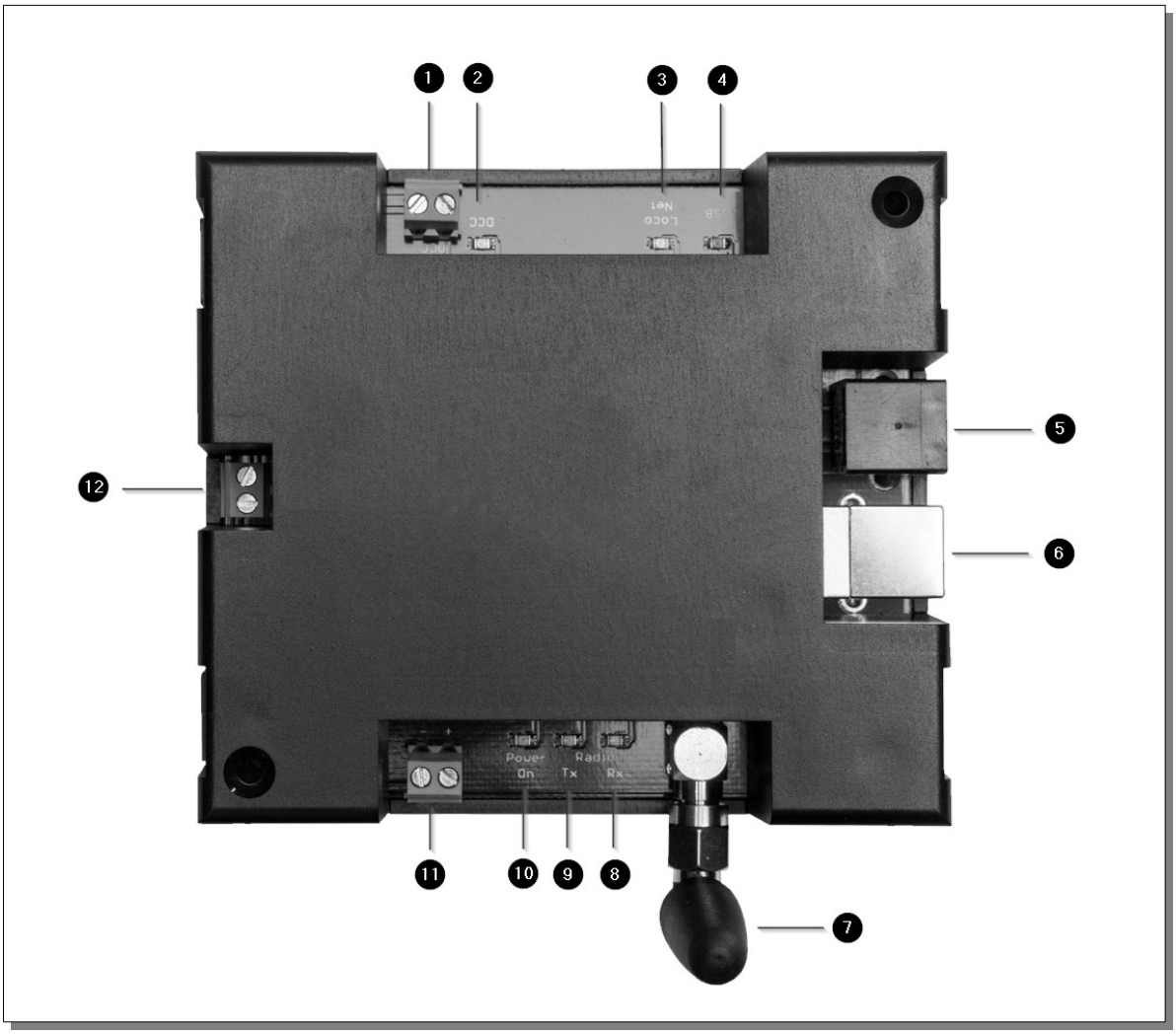
### 12.5.1  GT - Radio Control and Measure Components

- GT-XConnect corresponds to Faller Master
- GT-XControl in various versions:
  Enabling control and position of DCC-trains
  Enabling position and control of LEGO trains
  Enabling control of LEGO turnouts and signals,
- GT-Satellite (Receiver), corresponds to Faller Satellites
- GT-Position Senders, battery senders as well as build in senders driven by track power.
- Faller Cars. Both position and control
- Faller LocoNet Modules

### 12.5.2 Masters: GT-XConnect and Faller Digital Master

In principle the two Masters are identical, however they are configured differently.

In this section we describe the configurations of the GT-XConnect. You can upgrade a Faller Master to operate as the GT-XConnect top model which includes the Faller operations and the GT-XConnect operations.




| | Master V2 | Master V3 | Description |
|---|---|---|---|
| 1 | **DCC IN** | **DCC IN** | Input pins from any DCC and Motorola Central and transmits commands to the Vehicle one way. |
| 2 | **DCC LED** | **DCC LED** | LED displaying DCC status |
| 3 | **LocoNet LED** | **LocoNet LED** | LED for LocoNet status |
| 4 | **USB LED** | **USB LED** | LED displaying USB status |
| 5 | **LocoNet Connection** | **LocoNet Connection** | Connection port to LocoNet devices like the Faller Erweiterungsmodul. |
| 6 | **USB Connection** | **USB Connection** | The 2-way USB serial communication from PC and PC-connected devices. |
| 7 | **Antenna** | **Antenna** | Speed is 110 Kbit/s for main channel and 55 Kbit/s for each dual channel setup. |
| 8 | **RX LED** | **RX LED** | LED for RX status |
| 9 | **TX LED** | **TX LED** | LED for TX status |
| 10 | **Power On LED** | **Power On LED** | LED for power status |
| 11 | ***Satellite OUT*** | | Support for up to 6 satellites with power if XCONNECT is powered by an AC 16 V Trafo. 18-22 V DC is allowed also. More Satellites can be used with separate power to the satellites. |
| | | ***DCC OUT*** | DCC out pins e.g. for communication to locomotive tracks. The maximum number of DCC commands is 400/second. |
| 12 | **Power Supply** | **Power Supply** | 16V AC is allowed, 18-22 V DC is allowed also |

**XCONNECT Specifications**

- RADIO communication 110 Kbit/s on main channel and 55 Kbit/s on dual channels.
- The maximum number of DCC commands is 400/second.
- Up to 20 remote controllers using LocoNet over radio can also be applied. E.g. like the Faller Erweiterungsmodul.
- XCONNECT uses 300 mA when powered by USB
- XCONNECT can support up to 6 satellites with power if XCONNECT is powered by an AC 16 V Trafo. 18-22 V DC is allowed also. More Satellites can be used with separate power to the satellites.
- XCONNECT communicates in range up to 50 meters distance as standard.
- XCONNECT takes input from any DCC and Motorola Central and transmits commands to the Vehicle one way.
- XCONNECT takes 2-way communication from PC and PC-connected devices like Smartphones and from LocoNet devices.
- GT-COMMAND can configure the XCONNECT in the various standard radio models. Each model is prepared for a certain type and size of layout.
- XCONNECT internal firmware can be upgraded using the GT-COMMAND PC System.
- XCONNECT has a unique serial number Master ID on the bottom of the box and on the package.

**XCONNECT configurations**.

- XCONNECT communicates with all devices and control equipment in the System.
- XCONNECT transmits DCC commands to the Vehicle including CV settings and receives status information from the Vehicle in terms of CVs containing settings as well as battery level etc.
- XCONNECT communicates all settings of switches, signals and sensors over LocoNet. LocoNet Centrals can have 2-ways communication with the vehicles using the LocoNet bus.
- XCONNECT communicates all position information between Vehicles, Satellites and a PC.
- XCONNECT communicates with the GT-COMMAND system on the PC over USB
- XCONNECT installs itself on your PC when connected first time. It uses the next free COM-port. You can find it in the COM-port list with the name: Serial /Name: GOT Master.
- XCONNECT Communicates input from DCC Centrals and transmit DCC commands from DCC centrals to the Vehicles.
- XCONNECT can be powered by: USB alone, Separate 16 V AC Trafo or DCC-Central
- XCONNECT can power the satellites if the XCONNECT is powered by Trafo.
- XCONNECT is CE-marked and fulfills demands for short range radio devices in the 868-870 MHz band.

## 12.5.3 Master V1


**ACTION**

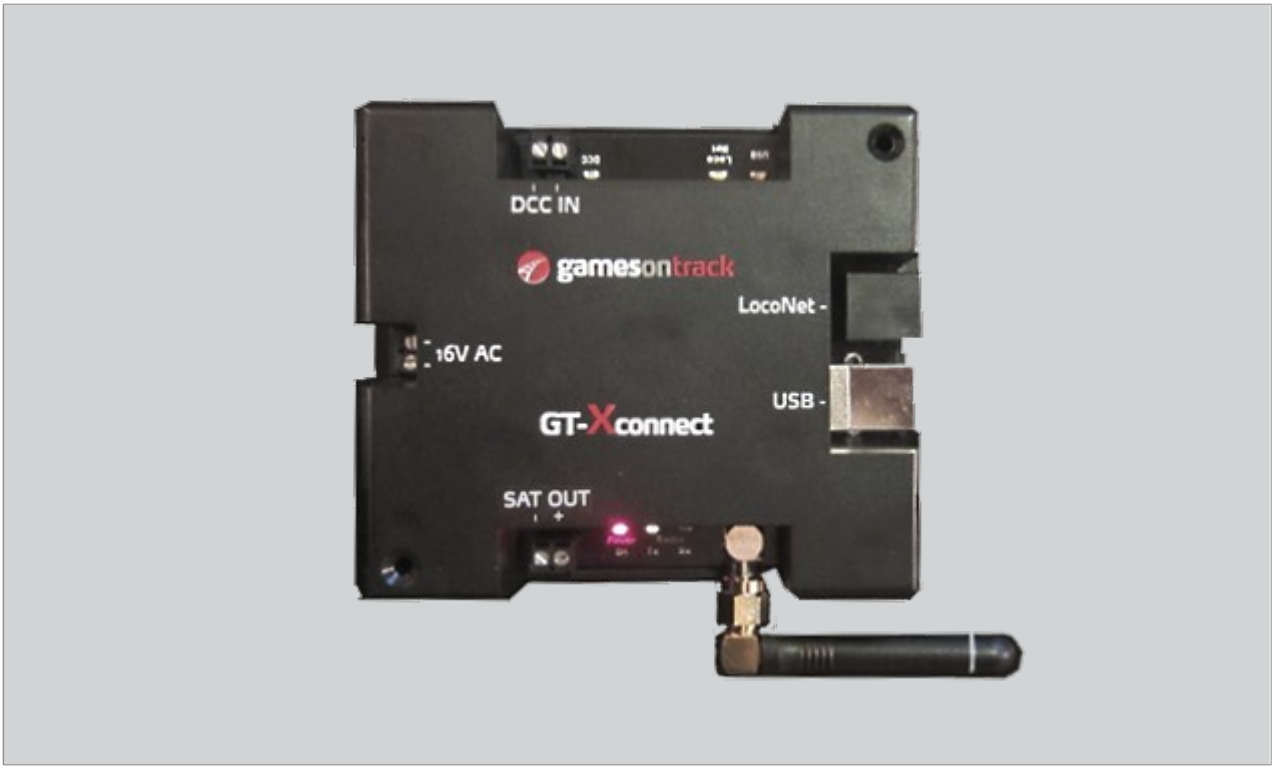
- Connect the Master to your PC using the USB-cable

Master V1 starts operating when it is powered on through the USB connection to the PC.
The Master hardware has a green diode for USB and initially flashing RX and TX diodes for radio transmission. This version connects using FTDI driver and installs itself on the PC. You might only need to find the associated COM-port.
This version is not certified for use in the US (no FCC ID).

### 12.5.3.1 LED Patterns

| | |
|---|---|
| **USB [■]** | |
| **HEART BEAT** | ■ ■ ■ ■ |
| **RADIO: RX + TX [■]** | |
| **OFFLINE:** | OFF |
| **ONLINE: INACTIVE** | ■ ■ |
| **ONLINE: ACTIVE** | ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ |
| **FIRMWARE UPDATE** | |
| **ALL LED's ARE RUNNING** | ■ ■ ■ . ■ ■ ■ . ■ ■ ■ . ■ ■ ■ . ■ ■ ■ . ■ ■ ■ . |

## 12.5.4 Master V2




This Master starts operating when it is powered on. This can happen by using one of the following actions:

**ACTION**

- Connect the Master to your PC using the USB-cable, or
- Connect a 16 V AC to the to screw terminals in the left side if you want to power up to 6 external satellites from the Master.
- Connect a DCC Central to the DCC IN screw terminals or Use LocoNet if you want input from other sources than the PC.

Master V2 will connect using the Silicon Labs drivers, which are embedded in the PC-Software installer, and can be selected during installation.

- V2 has two pins for SAT OUT

### 12.5.4.1 Master V2 Sat Out

If a 16 V AC Power supply is connected to the to screw terminals in the left side, up to 6 satellites can be connected to the two SAT OUT pins.

### 12.5.4.2 Master V2 LED Patterns

| | |
|---|---|
| **POWER ON [■]** | |
| **HEART BEAT** | ■ ■ ■ ■ ■ |
| **RADIO RX + TX [■]** | |

| | |
|---|---|
| **OFFLINE:** | OFF |
| **ONLINE: INACTIVE** | ■ ■ |
| **ONLINE: ACTIVE** | ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ |
| **FIRMWARE UPDATE** | |
| **ALL LED's ARE RUNNING** | ■ ■ ■ . ■ ■ ■ . ■ ■ ■ . ■ ■ ■ . ■ ■ ■ . ■ ■ ■ . ■ |
| **USB LED [■]** | |
| **NOT CONNECTED TO SW** | OFF |
| **CONNECTED TO SW** | CONSTANT ■ |

## 12.5.5 Master V3


This Master starts operating when it is powered on. This can happen by using one of the following actions:

**ACTION**

- Connect the Master to your PC using the USB-cable, or
- Connect a 16 V AC to the to screw terminals in the left side, or
- Connect a DCC Central to the DCC IN screw terminals or via LocoNet.

Master V3 will connect using the Silicon Labs drivers, which are embedded in the PC-Software installer, and can be selected during installation. V3 has DCC OUT pins

### 12.5.5.1 Master V3 DCC Out

On Master V3 a green LED will light up, when the DCC-Output is enabled.

**CAUTION**

If any equipment attached the DCC-Output attempt to overload the hardware, it will be both detected and prevented - and notified on both hardware, where the green DCC LED will flash and the software where the GOT Master status-field (lower left corner) will flash in red with the text **DCC OVERLOAD!**

- This notification will also raise in case the attached AC-power-supply simply is removed when online. Both a Master-Reset and a re-transfer of the settings will stop this notification.

## 12.5.5.2 Master V3 LED Patterns

| | |
|---|---|
| **POWER ON [■]** | |
| **HEART BEAT** | ■ ■ ■ ■ |
| **RADIO RX + TX [■]** | |
| **OFFLINE:** | OFF |
| **ONLINE: INACTIVE** | ■ ■ |
| **ONLINE: ACTIVE** | ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ |
| **FIRMWARE UPDATE** | |
| **ALL LED's ARE RUNNING** | ■ ■ ■ . ■ ■ ■ . ■ ■ ■ . ■ ■ ■ . ■ ■ ■ . ■ ■ ■ . ■ |
| **USB LED [■]** | |
| **NOT CONNECTED TO SW** | OFF |
| **CONNECTED TO SW** | CONSTANT ■ |
| **DCC LED [■]** | |
| **DCC OK** | CONSTANT ■ |
| **DCC ERROR** | ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ |

## 12.5.6 Master V4 (GT-XConnect)

Master V4 has a reduced physical size and require no USB cables. It can be plugged into the USB port on the PC directly. Version 4 also has no hardware ports as seen in version V2 and V3. In principle the two Masters are identical, however they are configured differently.


| POWER ON [■] | |
|---|---|
| HEART BEAT | ■ ■ ■ ■ |

| RADIO: RX + TX [■] | |
|---|---|
| OFFLINE: | OFF |
| ONLINE: INACTIVE | ■ ■ ■ |
| ONLINE: ACTIVE | ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ |

| FIRMWARE UPDATE | |
|---|---|
| ALL LED's ARE RUNNING | ■ ■ ■ . ■ ■ ■ . ■ ■ ■ . ■ ■ ■ . ■ ■ ■ . ■ ■ ■ . |

| SOFTWARE LED [■] | |
|---|---|
| NOT CONNECTED TO SW | OFF |
| CONNECTED TO SW | CONSTANT ■ |

| LED | Normal Operation |
|---|---|
| POWER ON | ■ ■ ■ ■ ■ ■ ■ ■ |
| RX | ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ |
| TX | ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ |
| SOFTWARE | ■ |

## 12.5.7 Radio Booster

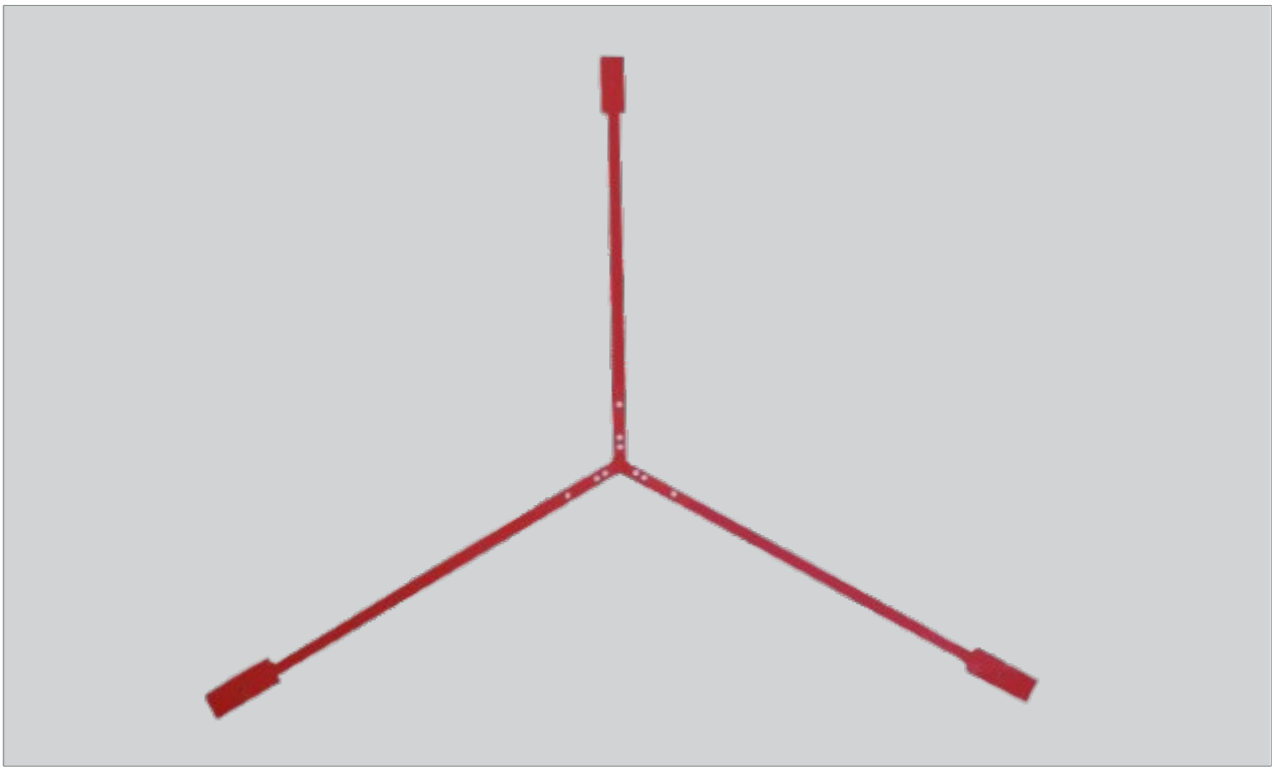
If you operate on the US frequencies FCC #1 and FCC #2 you can decide to use the booster to amplify the radio signal and obtain longer radio distances. Without the booster the Master itself

operate up to 50 meters, with the booster inclusive you can do up to 100 meters depending on environment. The booster might be extra payable. Connect the Radio booster this way:

**ACTION**

- Remove the Antenna from the Master
- Screw the booster antenna socket (above picture) onto the Master antenna output.
- Screw the Antenna onto the Booster output
- Connect the Micro USB power adapter to the Booster, and the Master USB to the PC.
- Control the Green light is turned on at the Booster.
- Go into the Master Settings in PC-Software and select the channel
- Then select the amplify level to either low, middle or high.

### 12.5.8 Calibration Triangle



## 12.6 Radio Types and ID's

All radio devices have unique ID's. Each device has also a type which you see in the small LOG-window where all radio devices are listed when they are under control of the GT-XConnect.

Each Device has a type which identifies the way of operating. As a user you can change the GT-XControl types between 2, 3, 4, and 5 if you need to. You can use the function in the tool menu. Only type 2, 3, and 4 can operate a Position Sensor.

### 12.6.1 Faller Cars

**Type 1:** the Faller Car is Radio Type 1. (The Faller Satellite is Radio Type 10.)

### 12.6.2 GT-XControl

The GT-XControl can be configured as the following Radio Types:

**Type 2:** Meant for LGB-trains, uses a broadcast method in front of the decoder. The GT-XControl must itself has a unique DCC address, however it does not matter what DCC address the LGB-train decoder has. With this type you can write all CV-values to the train decoder.

**Type 3:** Is meant for all decoder types, Uhlenbrock, ESU… The Decoder address in train must match the XControl address. They have to be identical. The reason is that not all decoders allow drive mode based on Broadcast.

**Type 4:** This type is the Standard type for any XControl Loco when delivered. Type 4 means that XControl listen to and capture all radio DCC-commands in the air and transfer them to the decoder. Type 4 corresponds in a certain way to airborne tracks. It is the decoder address which alone selects which commands is relevant for the train. There is a limit of 20 GT-XControls operating in that mode – if more trains they need to be Type 2 or 3.

**Type 5:** This type is the Standard Type for any GT-XControl Device. If you use a PC to control your System you just insert the GT-XControl Device ID-number in the DCC address for the turnout or Signal. *If you use a Digital Controller only the GT-XControl Device uses the last 3 digits of the ID as the DCC address, this is currently not changeable.*

### 12.6.3 GT-Position (Transmitters/Senders)

**Type 6:** This type corresponds to the normal Battery-sender and build in sender, whether that is inside a container or it operates as a free kit or uses track power: Item 1302710 - 1302714.

### 12.6.4 GT-XControl IR

**Type 7:** Is for the IR-sender to the trains

### 12.6.5 GT-XControl Servo for LEGO® Trains

**Type 8:** Is for the accessory controller running the Servo etc.

### 12.6.6 GT-XSatellite / Faller Satellites

**Type 10:** It is the same type for any Faller Satellite, meaning that the two satellites can operate together without any change.

### 12.6.7 GT-XCheck

**Type 11:** Is used as any other sender. Is assigned to a turnout.

## 12.7 Digital Controllers


The GamesOnTrack GT-Command system can run without any 3rd party hardware controller.

In case you want to control you trains and turnouts via third party controllers, please follow the guidelines for the various supported controllers listed in the following chapters here below.

This chapter explains how to connect to your digital controller. The text "No Digital Controller" is initially written on the process line down right. When a digital controller is connected, this text will change and display the controllers name.

### 12.7.1 LocoNet, Uhlenbrock, Intellibox, IBCOM, Digitrax, RR-Circuits

Please connect using these steps:

**ACTION**

- Connect the USB from your Digital Controller to the PC, First time wait until the system has found and installed the driver and selected a COM-port.
- Start the PC-Software
- Select the specific controller in the Controller drop-down list
- Wait until the system says "Controller name" and COM port in the process line down to the right. If the connection fails due to a blocked port to which it cannot reconnect, it can be useful to disconnect and re-establish the connection.
- If you were previously connected to this controller, then the system will recognize that and connect again if the USB-connector is inserted in the PC.

**TIP**

- The driver to the Intellibox is included as a Si-labs driver in the basic installation of the PC-Software. It is the same driver that is used for the Master V2
- There is a complexity with Master V2 here. The driver is the same as Uhlenbrock uses for Intellibox etc. GT-Command installs the latest driver on your PC, and Master V2 can try to act as Intelliboks II and therefore block it from joining.
  *The problem is solved by connecting the Intellibox first, and secondly the Master V2.*

## 12.7.2 Märklin CS II and CS III

Please connect using these steps:

**ACTION**

- Please take care of that your CS and your PC are on the same router
- Please select the appropriate window on your CS II. If older versions then select the tools window (Configuration) and select the IP-window as seen below. If newer version 60215 please go to the CAN window and select "Broadcast" and insert the destinations address as described below.
- Select the Gateway
- Insert in Destination Address the exact IP-address of your PC-Software. You find that address in the bottom process line of the PC-Software or using CMD prompt IPconfig.
- Please select Märklin CS II +III in the controller drop-down menu
- Wait until it says "Märklin CS II+III" on the process line.

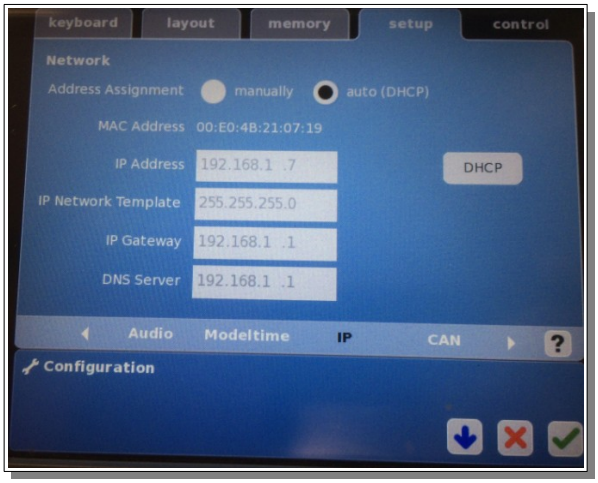
## 12.7.2.1 Märklin CS II Settings

The picture below is an old CS II for setting the destination address. If you have a newer CS II version then you set that in the CAN-window, where you also select the "Broadcast" mode.

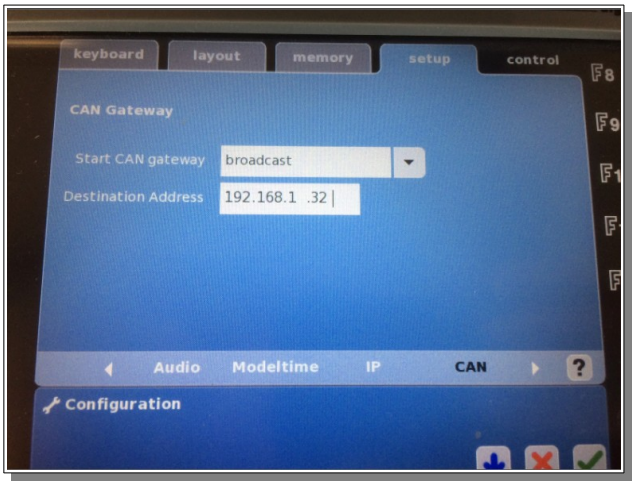
**NOTE**

- *We strongly recommend using a router and DHCP address assignment in Märklin CSII.*

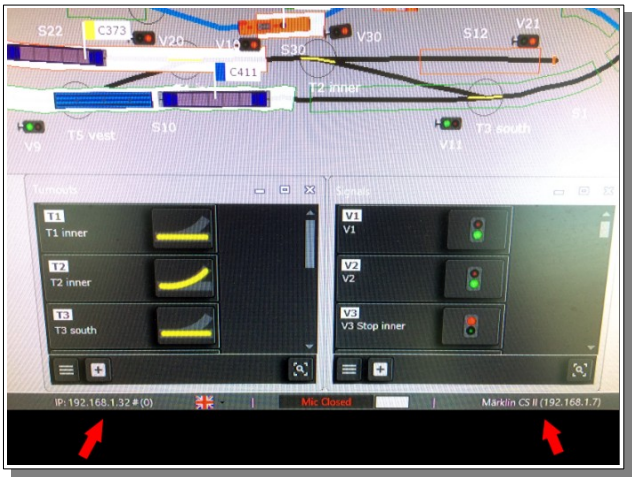

**Software Version:** Version tested 23-JUN-2021. Make sure you have updated to the latest Software Version from Marklin before doing your setup.




**IP Settings:** Connect a network cable between Märklin CSII and your Router. Make sure you PC also is connected to this router. This will ensure both devices are in the same subnet as required. (here 192.168.1)




**CAN Settings:** The Destination Address must be entered manually. The Destination Address is found at bottom left side on the info line in GT-Command – look for IP address.
***Note:*** *If connection fails, then try toggle the Start CAN gateway to Off and back again to broadcast.*

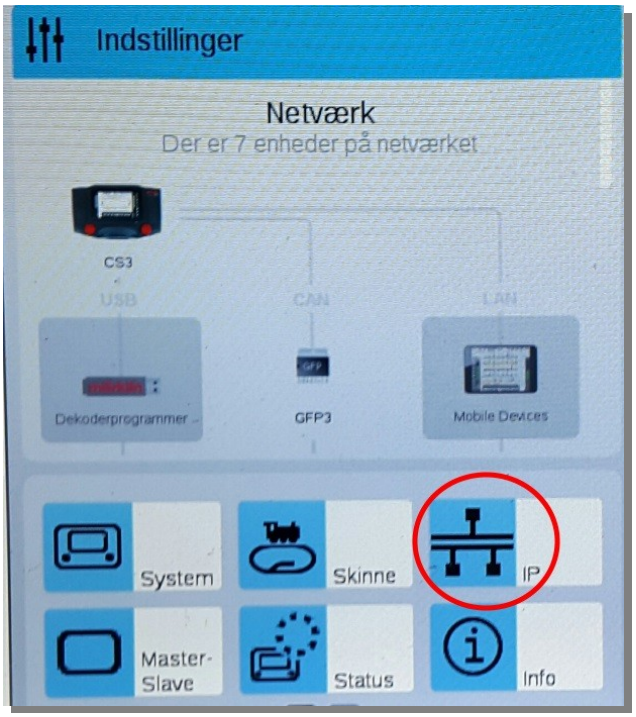



**GT-Command:** Select the Märklin CSII from the menu Controllers. GT-Command always lists the IP in buttom of screen and the Digital Controller will be displayed too when connected succesfully.

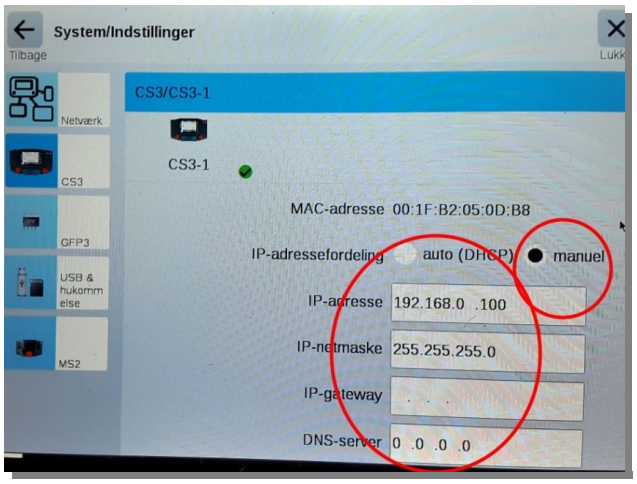
## 12.7.2.2 Märklin CS III Settings

The pictures below shows the CS III setting . You can connect either through the very same router using DHCP on both PC and CS, of you can connect directly PC to CS II/III when you on the PC set the IPV4 settings to your own address (not DHCP), in this example 192.168.0.100, and subnet 255.255.255.0 and nothing more.

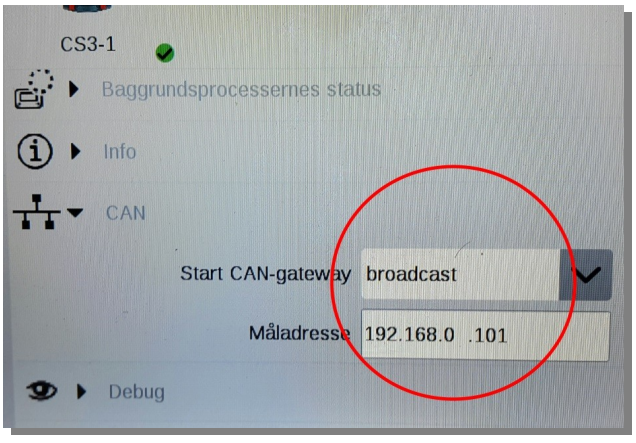
The method for operating Märklin CS II+ CS III has changed in the recent updates. Märklin has 3 different address methods for DCC, MM (Motorola), and MFX decoders. When you set-up your trains in GT-Command and select the train digital address you must also specify in the drop down menu what address type it belongs to in order to operate that train directly fro GT-Command. You see that type on your CS.



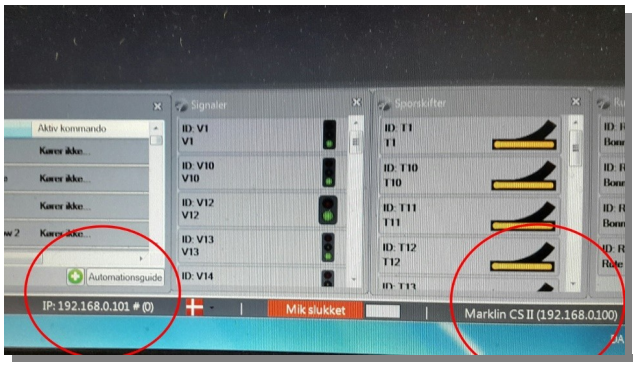

CS Own address manually set-up




Destination (PC address) inserted in the CAN window




GT-Command address, here manually specified in networks settings.




Be aware of, that if a connection fails it might be because the PC might operate on 2 addresses, one Wireless and one LAN address. You should in the first place disconnect Wireless then.

## 12.7.3 ESU ECoS 50000 and ECoS 50200

Please connect using these steps:

**ACTION**

- Select the ECoS ESU menu line in the Controller drop down menu
- Wait until it says ECoS ESU in the process line, takes may be 20 seconds.
- If this doesn't happen, you could disconnect and try to reconnect again
- The problem might be that your ECoS ESU and you PC are NOT on the same router. They must be.

If your connection later on fails it might be because your PC becomes a new IP-address from your router, please redo the connection process.

After the first connection the system will reconnect automatically if the IP-addresses are unchanged.

**NOTE**

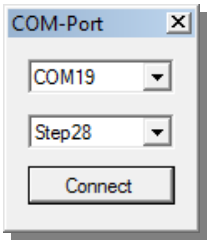
- Attention: Please take care of that all signals and turnouts with DCC addresses are correctly described in the ECoS. Otherwise feed-back commands from ECoS might result in false updates of virtual signals and blocks, which makes automations unsafe.

## 12.7.4 Massoth DiMAX

Please follow the actions here below to connect the Massoth DiMAX Central.

**ACTION**

- Connect the USB between the DiMAX and the PC and be sure the DiMAX is turned on. The PC will automatically install the driver for the DiMAX central and assign a COM-port to the DiMAX.
- On the PC please find the number of the COM-port by clicking with the right mouse button on the start symbol. Choose from the popup menu for device management. This opens an overview of all components and devices connected to the PC. Double-click Ports (COM & LPT). The devices connected to a COM-port are all named and the COM-port number is shown in brackets.
- Chose Massoth DiMAX in the controller menu. A pop-up ask you to select the COM-port, please do so. Select speed steps. You must decide a common speed step model, we recommend 28 for all trains. Reason is that you want to drive with multiple trains and multiple Navigators simultaneously. This can only be done if all trains have the same speed steps in Massoth. – sorry.




- After a few seconds the PC-Software writes DiMAX… (COM-port number) down to the right. The connection is now established.
- Please put a train on track and ensure it is configured with a DCC address. Now you can operate the train from the PC. You can also control the same train from the Massoth Navigator. Please note that if you choose the same train on the Navigator it will only be active when the turning Knob has reached the same speed as is set on the PC. Or the train speed is 0. The speed setting on the Navigator is used as desired speed for the train control on the PC, whereby you can see the speed-bar follows the Navigator settings.
- In the same way you can control Signals and Turnouts and other Accessories via the DCC address.
- However, until now you cannot on the PC see what the Navigator does – the DiMAX protocol cannot provide these data so far.

## 12.7.5 ExpressNet, Lenz, Roco

Please connect your ExpressNet devices using:

- The LI-USB: then you might access Roco Multimaus, Roco X21, Lenz LZV100 etc..
- Connect DigiPC-S88 to PC via USB

**ACTION**

**Multimaus connection:**

- Install DigiPC-S88 driver on PC from Included CD
- Connect Multimaus as master
- Connect DigiPC-S88 as slave
- Connect Tracks
- Connect Power
- Connect DigiPC-S88 to PC via USB
- Connect DigiPC-S88 to BlackBox via Ethernet
- Select Multimaus from GT-Command
- Select correct COM-Port
- Select RATE9600
- Game on

## 12.7.6 Fleischmann, Twincenter, Old Intellibox P50X

Please connect your devices using:

**ACTION**

**Multimaus connection:**

- Connect Fleischmann TWIN-CENTER or Intellibox I Old version, small display
- Connect Power and track wire to plug on TWIN-CENTER
- COM-Port is connected to computer, may need a COM to USB converter
- In GT-Command select Roco Fleischmann,
- In the menu that comes up select the correct COM port and Rate(Default is 2400)
- Rate can be determined from the Controllers Interface menu:
- Press the menu key
- Press the mode key
- Search through using the "Down" key until the entry "Interface is found"
- Further with the "Right" key
- Using the "Down" key search through until the entry "Bit per second"
- The number displayed is the same as the number to use in GT-Command
- Game on

# 12.8 The Faller Components


| Faller Car System Digital Starter Kit |
|---|
| **1 x** Faller Car System Digital Master V4 |
| **3 x** Faller Car System Digital Satellites |
| **1 x** Faller Car System Digital Software (on USB-key) |
| **1 x** USB cable for Master V3 (no USB cable for Master V4) |
| **1 x** Operating instructions |

There are different  types of Faller Vehicles (FC). Trucks, firetrucks, buses, vans etc. The type is written on the package.

FC has a unique ID which is used as the communication address, printed on the package.

FC is powered by a chargeable Battery. Battery status is shown in the Faller PC-System at each FC.

FC has a DCC decoder inside and a Radio sender/receiver. All control is communicated via the radio.

FC decoder has a standard factory setup in terms of CVs, no matter the type of vehicle. A CV is description of a single behavior of the vehicle. All vehicles are born with DCC address 3 in the first CV field. You must set your own DCC address or if the system recognizes two identical DCC addresses you can select the proposed one.

FC is turned on/off using a button under the vehicle. When the Vehicle is turned on it will immediately be detected by the Master Radio and the vehicle will show up with all its characteristics in the Faller PC-System.

FC is programmed using the Faller PC-System. If no PC-system is available the FC can be programmed over a programming device connecting to the charge-connector under the vehicle (UH-description)..

FC runs as soon as it is turned on. It can be controlled by:

- The PC using Mouse, Voice control, Smartphone or keyboard
- A connected DCC central  connected to the XCONNECT using the DCC address
- A connected LocoNet device connected to the XCONNECT using the DCC address

FC has an ultrasound transmitter in the roof acting as an indoor GPS in combination with the XCONNECT and the Faller Satellite. The FC is positioned with XYZ coordinates when operated by the position system.

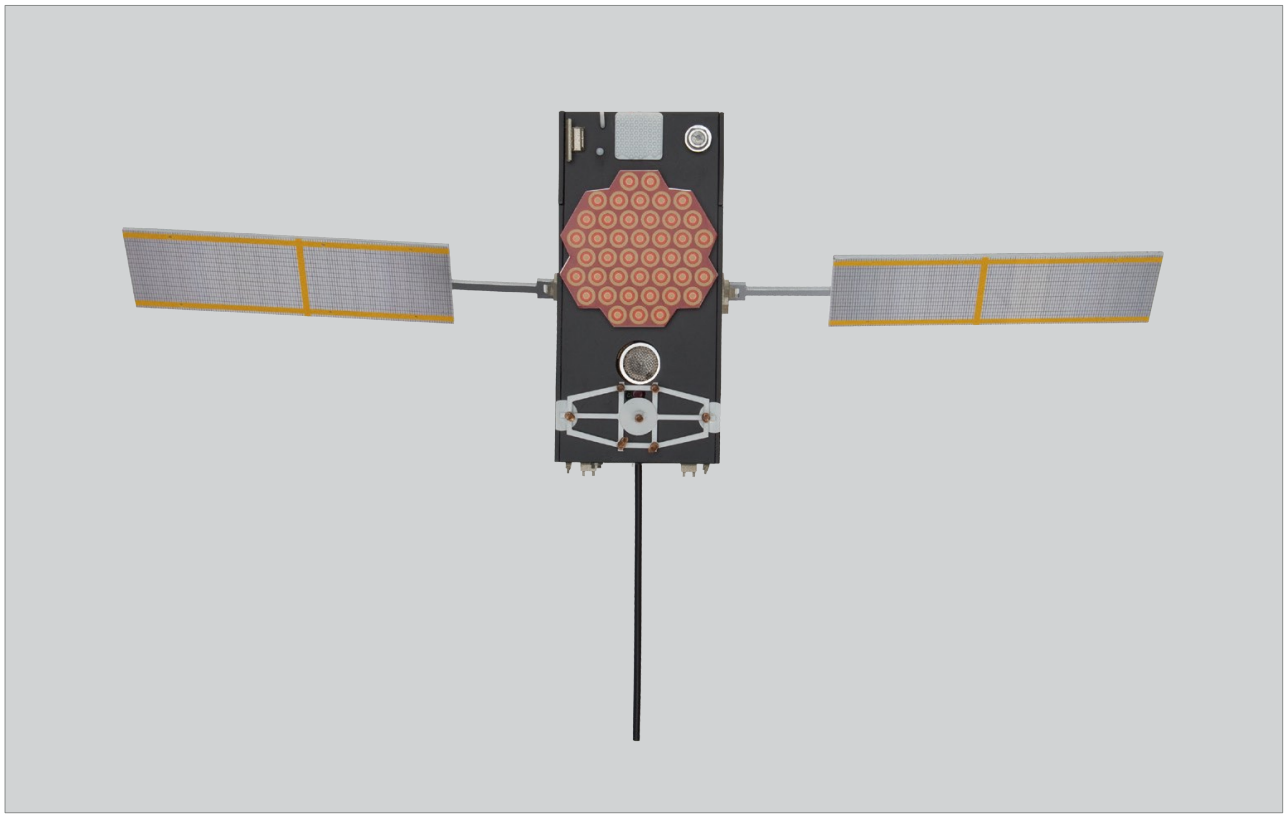
When the Faller PC-System has recognized a certain FC the user can assign detailed Type-information to the FC from the Faller Vehicle Type (picture, geometry, braking details) via the Edit menu in the Faller PC-System. If the user has registered his Faller PC-System then each vehicle has access to all individual vehicle type specifications, pictures etc., and the user can operate the vehicles according to Faller's internal recommendations. If the system is not registered the user must change the vehicle settings ( CVs) on his own.

**FC Specifications**

- FC can operate in about 6 hours on the battery depending on how many functions are in use.
- FC communicates its battery level to the PC and flags it in the Vehicle table. When under 20 % max capacity the user is recommended to start charging. It takes about 60 minutes to charge a vehicle completely
- FC follows the wire on the road using the magnetic arm on the front wheels. FC can turn left or right using the Faller switch system in the road, or it can be stopped momentarily when passing a magnetic induction coil.
- Normal radio consumption is 17 mA if measured every 100 ms.
- FC can send detection  back to the PC when passing a street sensor.

- FC does not run backwards – yet (it can do so using the automations).
- FC's ultrasound signal strength can be set to 3 different levels by the Faller PC-System. Lowest level is recommended for small layouts

## 12.8.2 The Faller Satellite



| Connections | Description |
|---|---|
| **16 V AC** | Connection for the power supply (coming from the master). Thanks to the integrated rectifier, the connections cannot be polarized. |

| LEDs | Description |
|---|---|
| **Power On** ■ | Control LED (flashes when connected correctly) |

FS can be use equivalent and mixed with standard GOT-satellites (receivers) in V2 and V3.

FS are positioned over the layout and measures the distances to every vehicle. They act as receivers for ultrasound communication sent by the vehicles, like a reversed GPS system.

FS measures flight time for the "slow" ultrasonic signal. Flight time is converted to distance.

Based on the FS set-up figures (a one time calibration made in the Faller PC-System) the FS measurements are used to calculate the 2D or 3D coordinates for the vehicle.

FS must at minimum be 2 (a pair). If only 2 FS are used then they must be placed about 50 cm outside of the layout and they can only measure in 2D.

FS can be calibrated together using the Faller PC-System from 2 to 20 FC's in one system. A normal starting system is 3 FS over the layout.

FS has a unique ID and communicates with the Faller Master/XCONNECT V2 using this ID. The ID is printed on the package and under the FS.

FS has a red flashing LED. It flashes slowly when powered on but no radio has accepted the FS

FS LED flashes as fast as the measuring interval (down to 50 ms) when radio controlled. If for any reason some measurements are jumped over the user might be able to see the flashing diode make a jumps.

FS can be powered from the Faller Master/XCONNECT, only up to 6 FS.

**FS - Module Specifications:**

- FS measures a  Faller Vehicle up to 6 m distance. Recommendation is 2-5 m distance. Not too close and not too far away.
- FS communicates ultrasound flight time, every flight time is associated with a signal level in order for the XCONNECT to evaluate the validity of the measurement.
- FS is powered by 17-22 V DC, optimal is 18 V DC. FS can be powered from the XCONNECT or from a separate DC supplier, like an old PC-Laptop supplier.
- 4 or more FSs in the same set-up will increase the precision of the system since there will be more triangles which can measure each individual FC. If line of sight is broken from FC to FS the measurement will still go on may be somewhat prolonged. Ultrasound will fly “around the corner” giving away signal power. Then another FS might take over because it receives a more powerful ultrasound signal.
- FS does not measure correctly when the FC is in a tunnel. A combination of street logic and measurement techniques can provide the position in the tunnel. If you want to do switching in a tunnel you can put extra FS in the Tunnel or you can install a couple of street-sensors.
- FS can be used to measure other moving vehicles as well like model trains.

## 12.8.3 The Faller Master V4


| Connections | Description |
|---|---|
| **USB** | USB PC connection |
| **Antenna** | Radio link between vehicle and satellite |

| LEDs | Description |
|---|---|
| **Power On** ■ | Control LED (flashes with the heart rhythm) |
| **Radio Tx** ■ | Transmit: Outgoing radio signal, e.g. from a sender |
| **Radio Rx** ■ | Receive: Incoming radio signal, e.g. from a satellite |
| **USB** ■ | Software connected to Master (constant when connected) |

## 12.8.4 The Faller Digital Master V2


| Connections | Description |
|---|---|
| **16 V AC** | Connection for the power supply (16 V AC voltage) |
| **DCC input** | Connection of a digital controller |
| **LocoNet** | Connection of a LocoNet connection |
| **USB** | USB PC connection |
| **Satellite Output** | Power supply for the satellites (Master V2) |
| ***or DCC Output*** | *DCC Output supply (Master V3)* |
| **Antenna** | Radio link between vehicle and satellite |

| LEDs | Description |
|---|---|
| **Power On** ■ | Control LED (flashes with the heart rhythm) |
| **Radio Tx** ■ | Transmit: Outgoing radio signal, e.g. from a sender |
| **Radio Rx** ■ | Receive: Incoming radio signal, e.g. from a satellite |
| **USB** ■ | Software connected to Master (constant when connected) |

## 12.8.5 The Faller Expansion Module

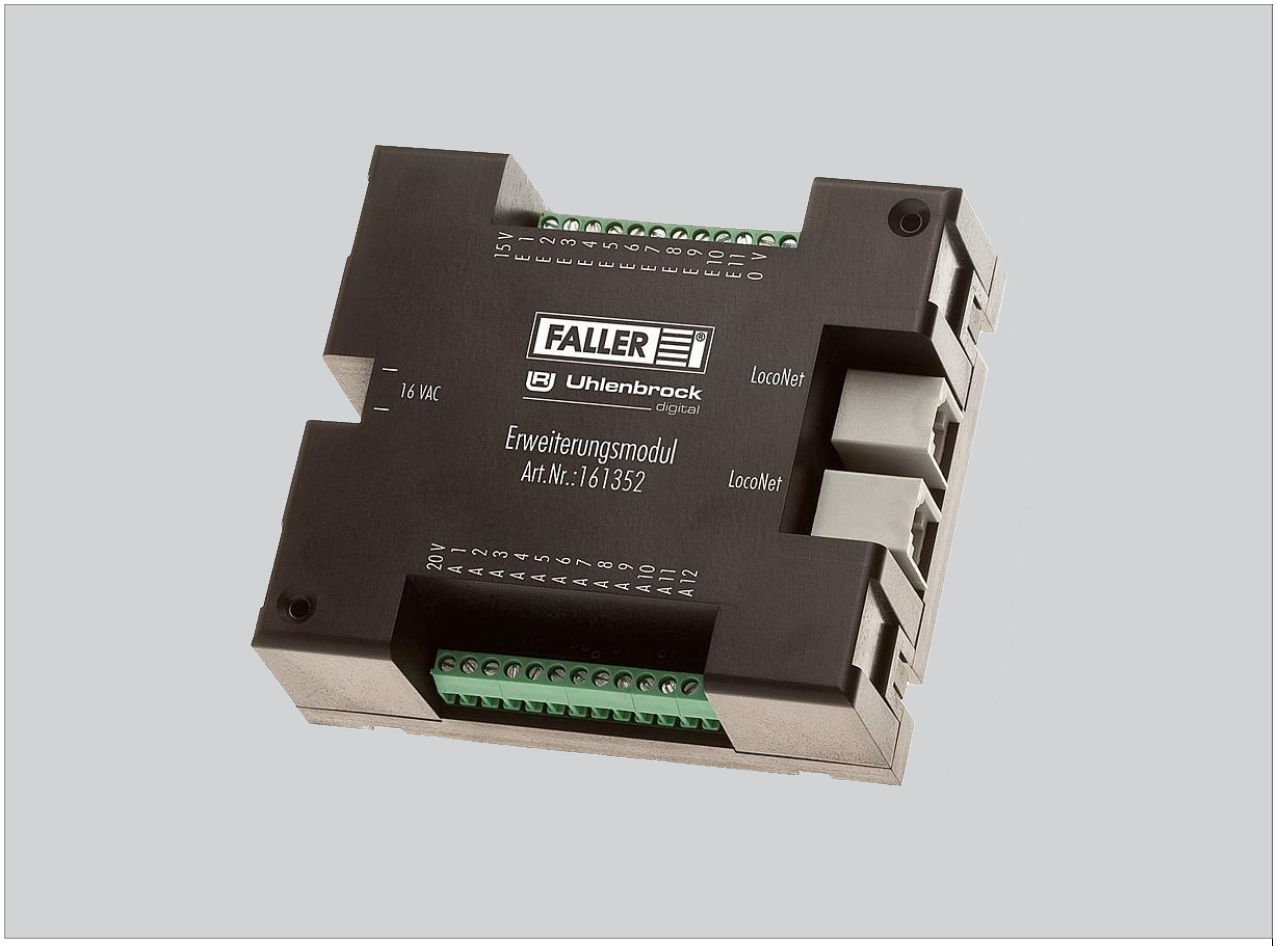



*Figure 12.8.5.1: The Faller Expansion Module (Erweiterungsmodul)*

GT-COMMAND uses a Faller Extension Module (Erweiterungsmodul) to connect switches, signals, and street sensors to the Master. The Extension Modules are connected on a LocoNet bus. New modules can be connected and configured using the Faller PC-System Master one at a time. The Faller PC-System configures the modules according to an internal recommendation for using addresses, however the user is free to use his own.

**Module Specifications**

- A Module can connect up to 12 switches or stop units (relays)
- Signals uses 3 or 4 addresses, meaning only 4 3-red-yellow-green signals can be connected to one module or 3 signals containing a stop relay.
- The module can connect 11 street sensors
- The module is powered by a 16 V AC Trafo, can be the very same Trafo as the Trafo to the XCONNECT.
- The System can address up to 99 Modules.
- You need to configure one module at a time giving module numbers from 1 to 99.

## 12.8.6 The Faller Radio Expansion Module


*Figure 12.8.6.1: The Faller Radio Expansion Module*

| Connections | Description |
|---|---|
| **16 V AC** | Connection for the power supply (16 V AC voltage) |
| **A1..A5** | A1, A2, A3, A4 and A5 are all Output pins |
| **E1** | Input pin e.g. for a switch |
| **+** | Supply for all connections A1..A5 & E1 |

## 12.8.7 Faller Car System Digital (PC-Software)

The GT-Command and the Faller PC-System are equivalent SW-programs to operate each their own vehicles. The difference is though that the GT-Command program is the superior program allowing both vehicle types on the same layout. The upgrade on both sides include the other system parts.

You will need to buy the extension from Faller or from GamesOnTrack. The extension upgrades any of the two systems to operate as a common GT-Command with Faller Cars.

You will need to upgrade your Master to operate with both vehicles as well. Please consult the Faller car web-site or the GamesOnTrack.COM/DK/DE/CO.UK website.

# 13 Appendices

## 13.1 Definitions

We use the following words to describe how the system works in the various ways:

| System Components | Description |
|---|---|
| **MASTER** | Master is either GT-XConnect from GamesOnTrack or Faller Car System Digital Master.<br>The current versions are V1 to V4 named as I, II, III, and IV |
| **SATELLITE** | Also called Receiver.<br>This is a device often placed in the ceiling used to receive and measure distance information for positioning. |
| **SENDER** | Also called Transmitter.<br>This is any electronics in a vehicle or on the layout which is used to send position information by radio. |
| **VEHICLE** | Vehicle means any Faller Car or any Model Train or any Lego Train which can be controlled and positioned by radio. |
| **FALLER CAR** | A sender placed in a Faller Car that can be controlled and positioned by radio. |
| **MODEL TRAIN** | Model train means any Vehicle which has a DCC decoder, often in scale N-H0-00-0-1-G |
| **LEGO VEHICLE** | LEGO vehicle means any LEGO-train or LEGO vehicle operated by the LEGO IR remote controller. |
| **XCONTROL** | XControl is a local device in a vehicle which receives control information from a Master and communicate this information to the vehicle. XControl can operate as a sender as well. |
| **DIGITAL CONTROLLERS** | Digital Controllers are any DCC or Motorola box with a kind of PC-interface which can transmit DCC signals and power to rails.<br>The menu [Controllers] contains a list of the digital controllers currently supported. |
| **VOICE CONTROL** | Voice Control means voice driven control information spoken using the command language in GT-Command and communicated to the PC via headset. |
| **MOBILE DEVICE** | Mobile Device is any Android or iOS device which can operate a layout or vehicles using the Mobile app. |

*Table 13.1.1*

## 13.2 Abbreviations and Links

| Abbreviations | Description |
|---|---|
| **IPS** | Indoor Positioning System |
| **GPS** | Global Positioning System |
| **RSSI** | Received Signal Strength Indicator |
| | |
| | |

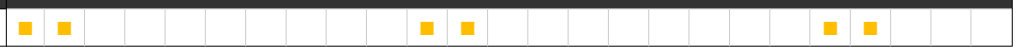
## 13.3 Version History

| Version | Description | Date |
|---|---|---|
| **5.1.0.10** | **Initial version** | **03-MAR-2021** |
| | | |
| | | |

## 13.4 LED Patterns

The examples below are displaying various LED patterns on the devices when more and more senders are added to the system:

| MASTER: RX [■] | FROM SATELLITES |
|---|---|
| ONLINE: ACTIVE |  |

| MASTER: TX [■] | SENDER 1 + 2 |
|---|---|
| ONLINE: ACTIVE |  |

| SENDER: LED [■] | |
|---|---|
| SENDER 1 |  |
| SENDER 2 |  |

| MASTER: TX [■] | FROM SENDER 1 + 2 + 3 |
|---|---|
| ONLINE: ACTIVE |  |

| SENDER: LED [■] | |
|---|---|
| SENDER 1 |  |
| SENDER 2 |  |
| SENDER 3 |  |

| MASTER: TX [■] | FROM SENDER 1 + 2 + 3 + 4 + 5 |
|---|---|
| ONLINE: ACTIVE |  |

| SENDER LED [■] | |
|---|---|
| SENDER 1 |  |
| SENDER 2 |  |
| SENDER 3 |  |
| SENDER 4 |  |
| SENDER 5 |  |

# 14 Notes

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