



RailCOMPLETE v1.0 Tutorial

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Introduction

This tutorial is a quick walkthrough on how to use the main features of RailCOMPLETE. This guide starts with a blank document, and ends with a typical model with infrastructure, tables and 3D-models.

The tutorial is meant to be used in workshops but can also be used by beginners and anybody who want to explore the features of RailCOMPLETE.

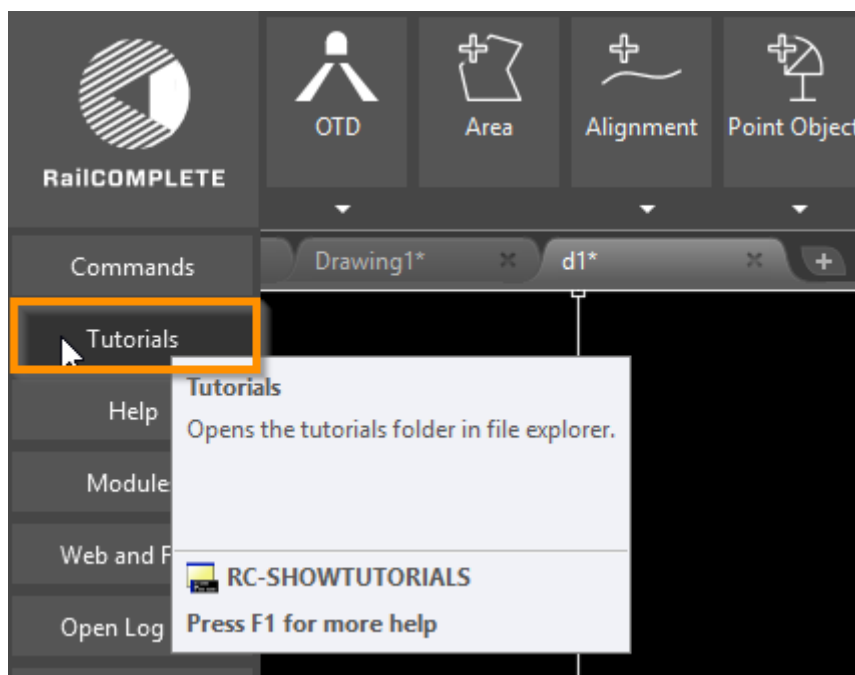
The purpose of this guide is to get new users familiar with how to use the application. The RailCOMPLETE Reference Manual contains more detailed information about all features in the application.

Prerequisites

RailCOMPLETE needs to be installed alongside AutoCAD®. RailCOMPLETE is loaded when AutoCAD is started.

RailCOMPLETE is shipped with a built-in evaluation-period of 60 days. To receive a copy of RailCOMPLETE, contact support@railcomplete.no or download the latest version from www.railcomplete.com/downloads.

All example files used in this tutorial exists in the applications tutorial folder. This folder is opened in a file browser when the Tutorial button is selected.

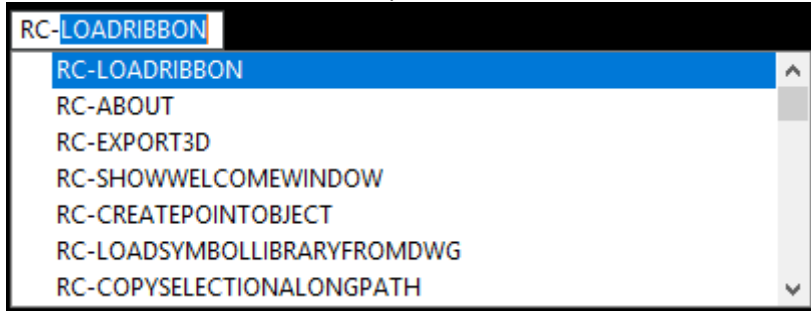


Using RailCOMPLETE

Commands

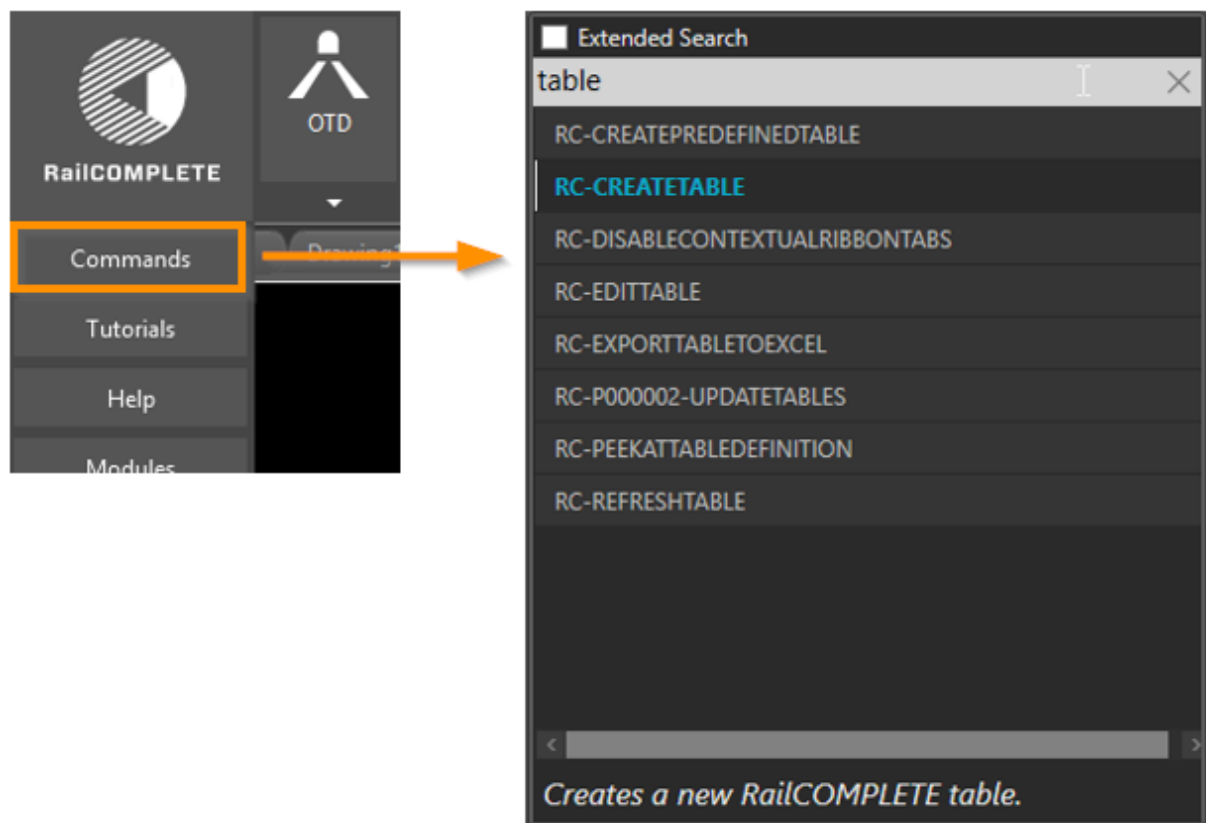
Most of the functionality in RailCOMPLETE is command based. Like AutoCAD, commands are executed by typing in command name inside the modelspace.

All RailCOMPLETE commands is prefixed with “RC-”.



Commands list

By selecting “Commands” below the RailCOMPLETE icon, a searchable command list is opened. Commands can be executed by double-clicking or pressing <enter>.



Getting help

All buttons in RailCOMPLETE have a brief and/or a more detailed description behind the tooltip.

Even more detailed information exists inside the help system. The help system is launched by pressing F1, while hovering over the menu item.

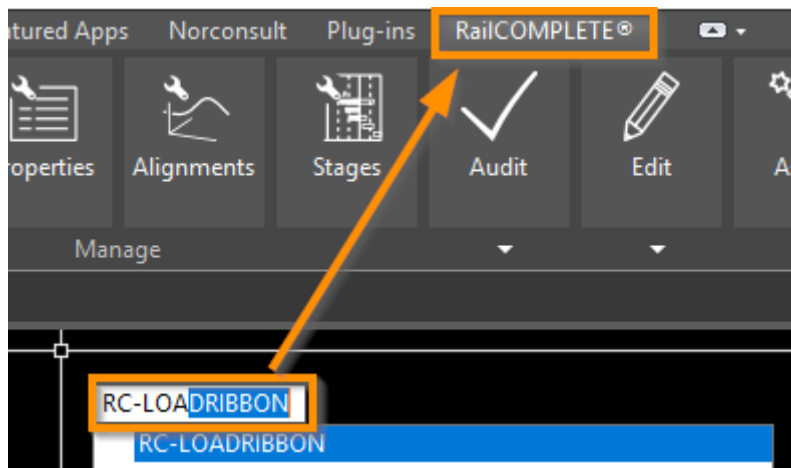
Tutorial example

This section will show the process of importing alignments from LandXML and how to use basic functionality in RailCOMPLETE.

Load RailCOMPLETE ribbon

If RailCOMPLETE is loaded correctly during the launch of AutoCAD, the buttons and menus are visible under the RailCOMPLETE menu.

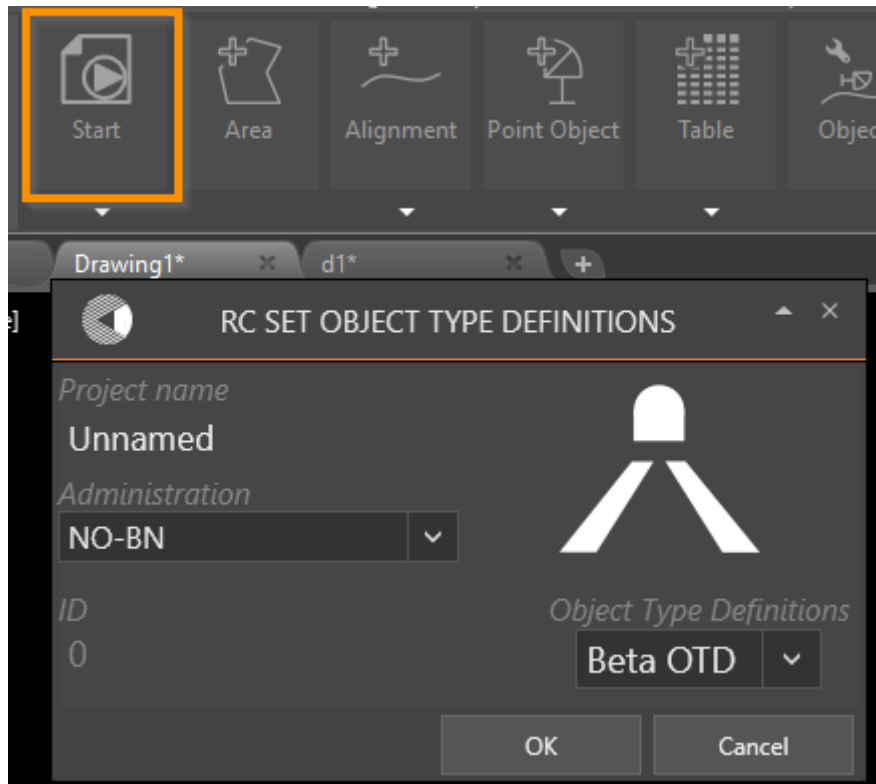
If RailCOMPLETE is not visible, the buttons and menus are loaded with the command RC-LOADRIBBON.



Start new RailCOMPLETE document

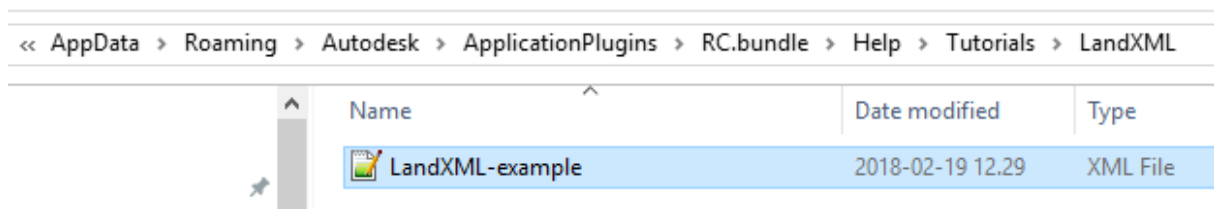
The document must be converted to a RailCOMPLETE document to utilize the features within the application.

To convert a new document (or an existing DWG), select the Start-button to set the correct Object Type Definition. In this tutorial, just use the default values and click OK.

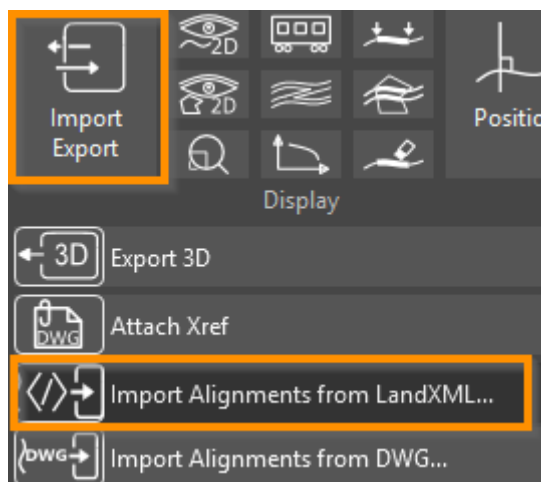


Import alignments from LandXML

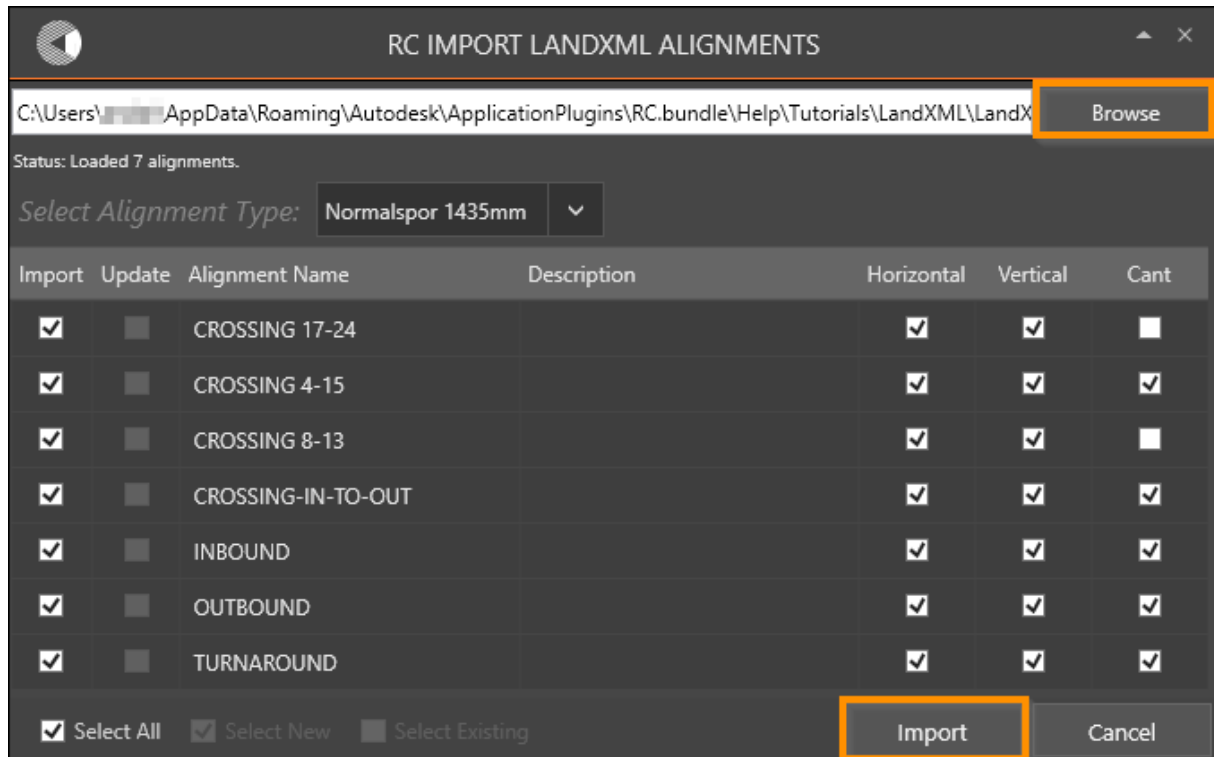
The file needed to complete this chapter is stored within the LandXML-folder inside the tutorial resources.



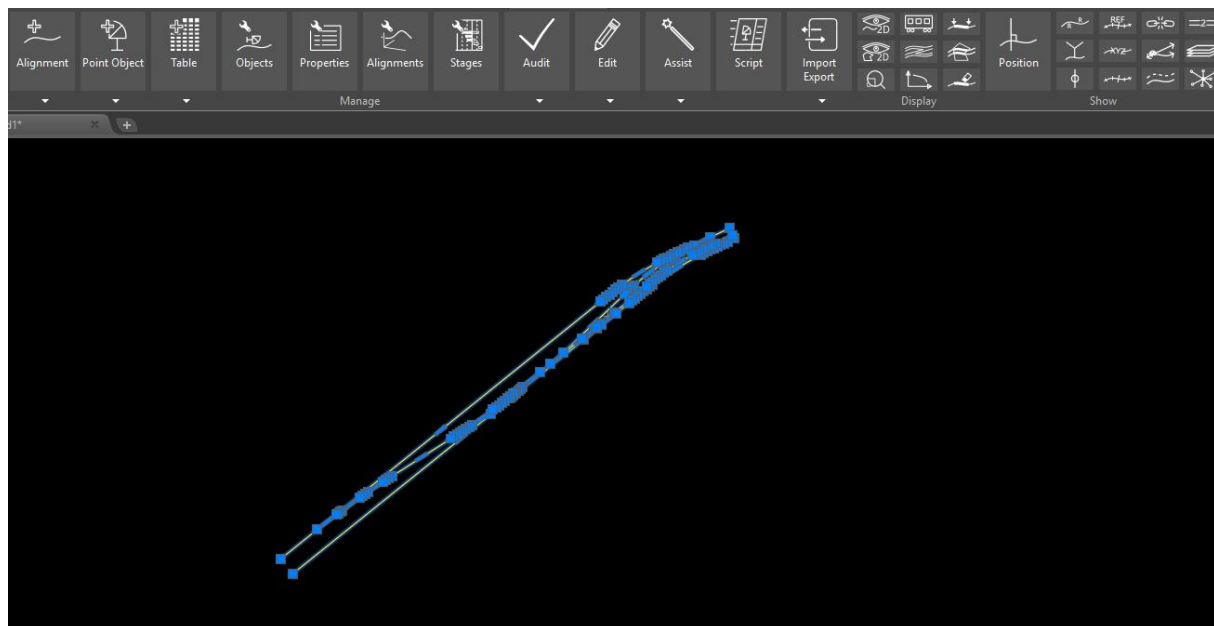
Start the import window by selecting *Import Alignments from LandXML*, below the Import/Export button.



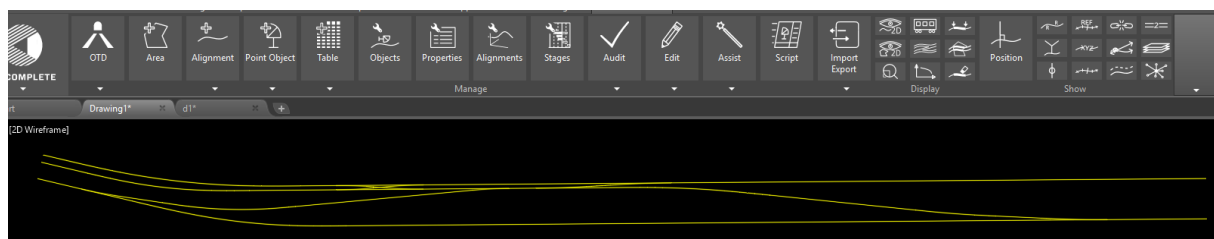
Select the example file and press Import.



The result should be something like this.



Use the AutoCAD commands UCS and PLAN to rotate the alignments in a more horizontal angle.



Work with annotations

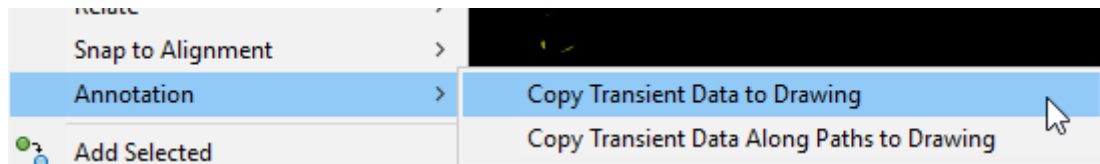
A lot of helpful tools are placed at the “Show” section in the ribbon.



Toggle some of the annotation buttons to see what happens. The detail-level will also change during zoom.

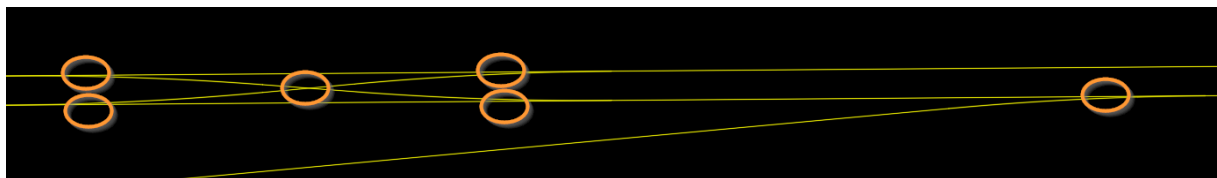
Copy annotation to drawing

The annotations are only transient graphics. To make the annotations permanent in the drawing with a fixed size, select “Copy Transient Data to Drawing”. Make sure the zoom-level is acceptable before making the transient annotation permanent.

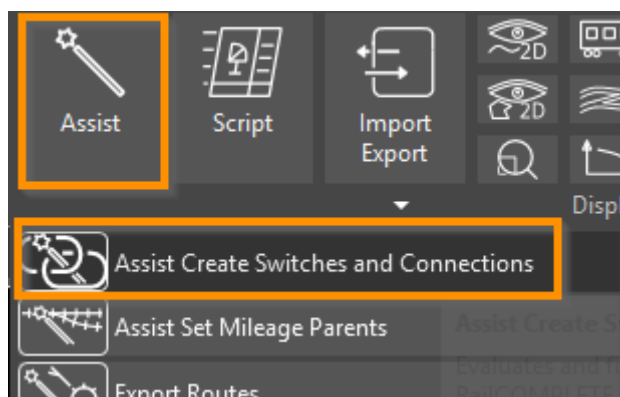


Insert switches

RailCOMPLETE will search for possible connections along the alignment geometry and insert switches (as well as connections) automatically.

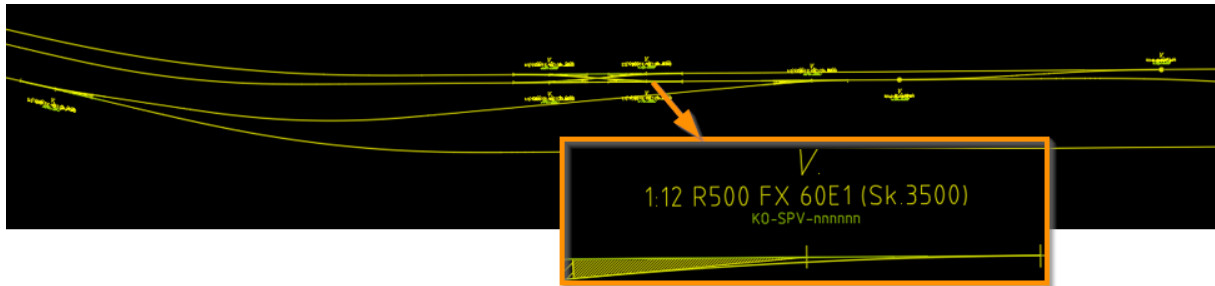


Start the Assist Create Switches and Connections and answer select “Insert All missing switches”.



Accept **insert All missing switches** when prompted.

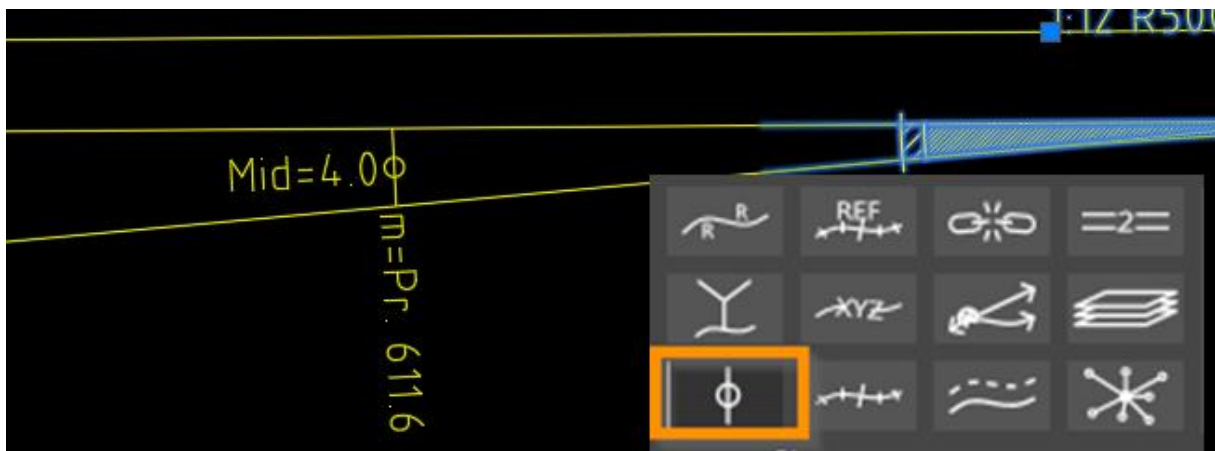
The switches are now created, and the drawing should look something like this.



Add fouling points

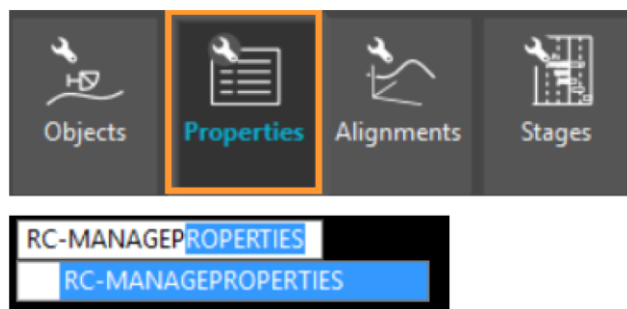
Now that the drawing contains switches, it is possible to add fouling points.

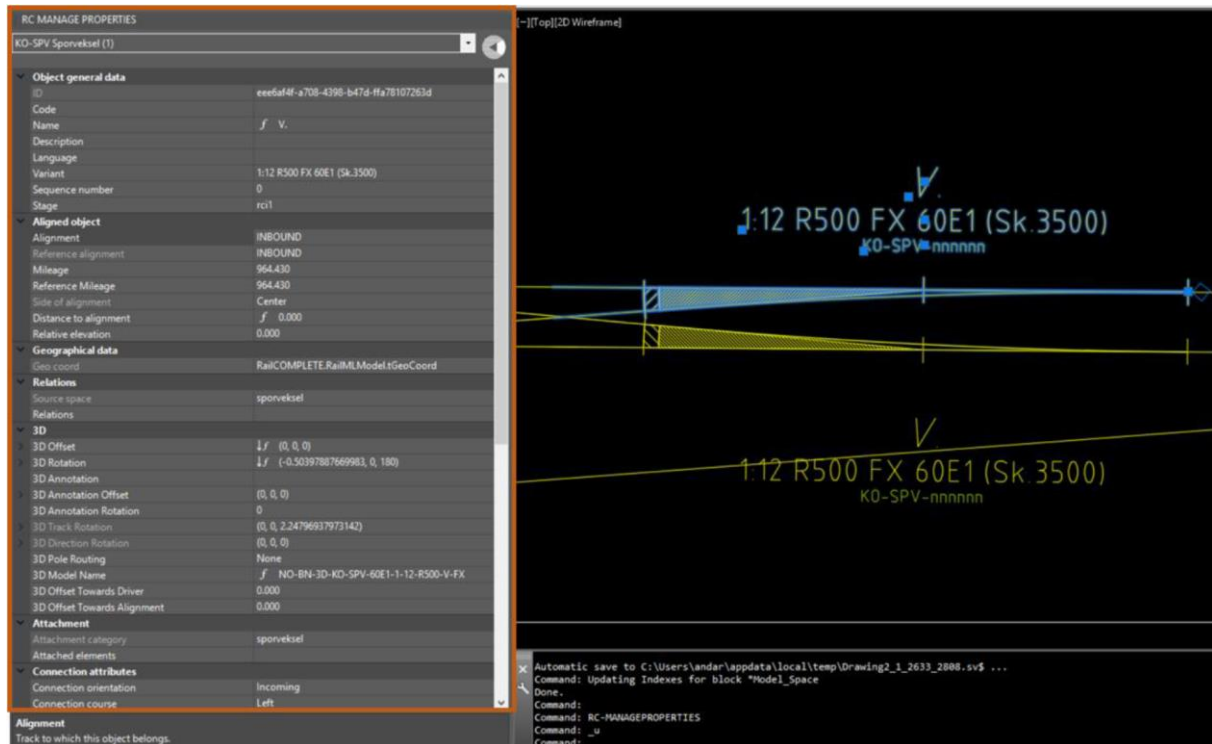
Toggle the fouling-point button and select one of the switches to get the fouling point annotation.



Make the fouling point permanent in the drawing by zooming to the desired detail level, right click and select "Copy Transient Data to Drawing"

Select one of the switches and have a look at the RailCOMPLETE properties for the switch. The properties window is opened by selecting Properties in the ribbon bar, or by typing RC-MANAGEPROPERTIES in the model space window in AutoCAD.

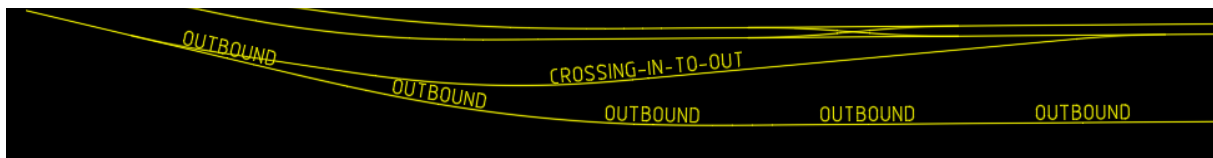




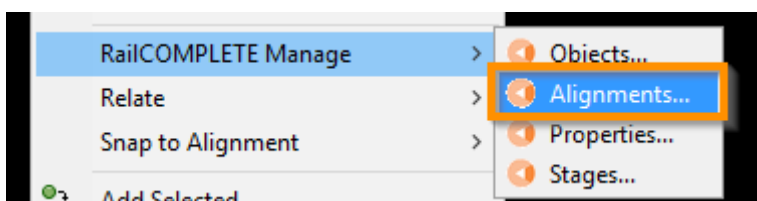
Work with alignments

Define reference alignment

In this example we are going to make the OUTBOUND alignment the parent alignment for CROSSING-IN-TO-OUT.

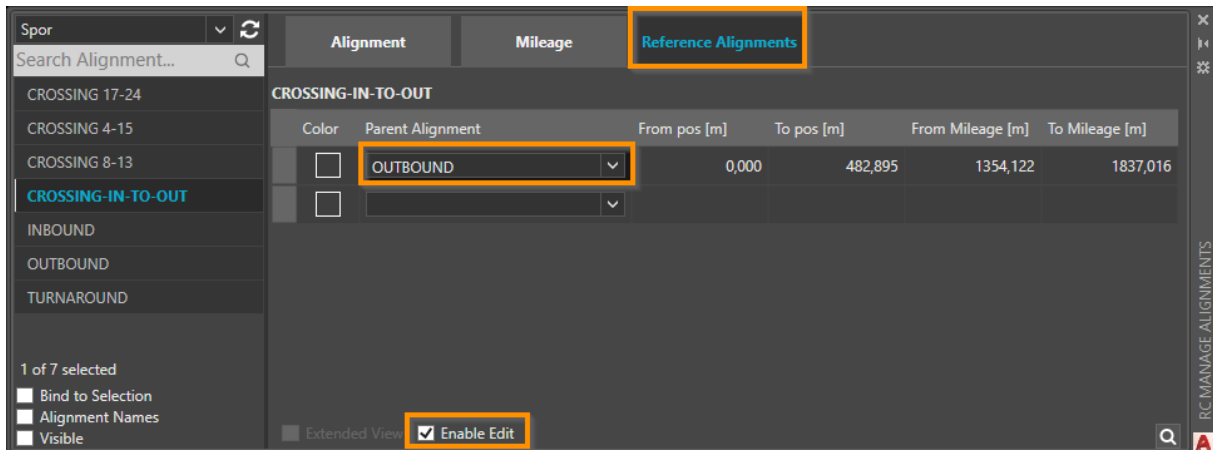


Select the CROSSING-IN-TO-OUT alignment, right click and choose RailCOMPLETE Manage -> Alignments.



This will bring up the alignment manager, where mileage data and reference alignments can be manipulated.

Select the Reference Alignments tab, Enable Edit and choose OUTBOUND alignment as parent alignment.

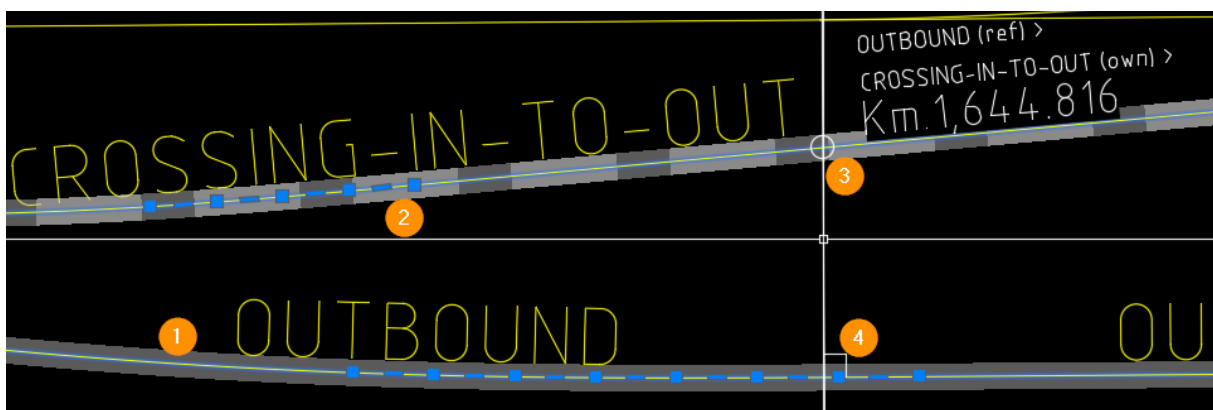


CROSSING-IN-TO-OUT has now inherited mileage data from the parent alignment OUTBOUND.

This can be visualized by selecting the CROSSING-IN-TO-OUT alignment and toggle the “Show Reference Alignment” button and the Reference toggle (below the Position button).



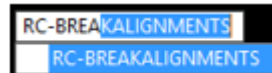
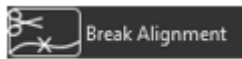
The parent alignment is show as a hatched solid line (1) and the parent line is dashed (2). The reference position is show as a circle at the reference alignment (3) and a perpendicular symbol (4) where the position is derived from at the parent alignment.



Changing parent alignment

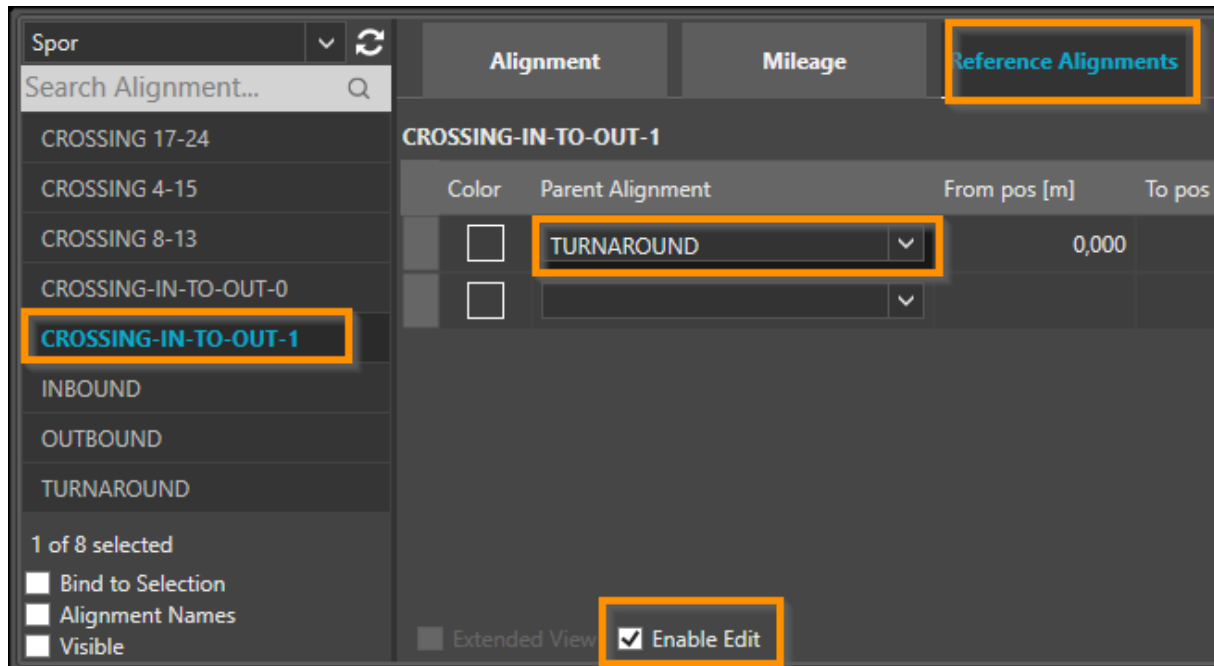
In this chapter, we want to split the CROSSING-IN-TO-OUT alignment in two and assign the TURNAROUND alignment to the last half CROSSING-IN-TO-OUT.

First, we need to split CROSSING-IN-TO-OUT somewhere in the middle. Select Break Alignment below the Edit-button or type in RC-BREAKALIGNMENTS in the modelspace view.

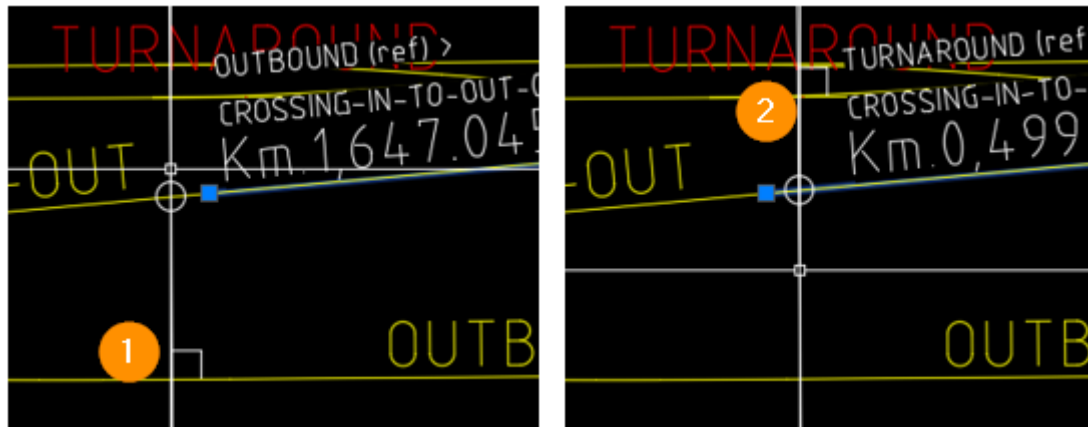


Follow the instructions and finish the command with defining the break-line.

Open the alignment manager and locate the new alignment. This has now changed name to CROSSING-IN-TO-OUT-1. Change the parent alignment as shown below.



Notice how the position now shows the parent alignment and position at both sides of the split.

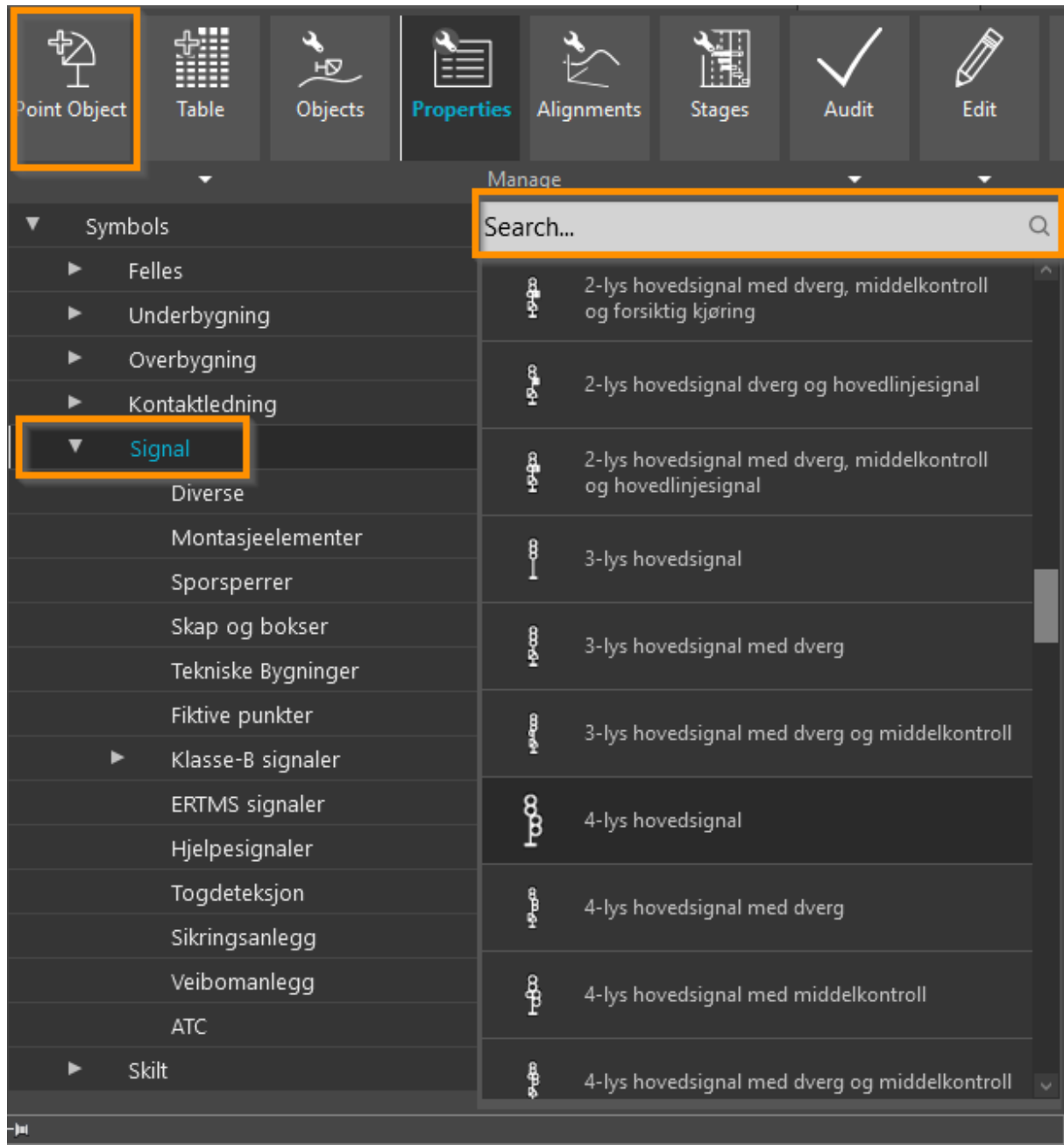


Point objects

Point objects are all objects that has a position along the track. This can be signals, signs, switches and masts. But also labels and watch objects.

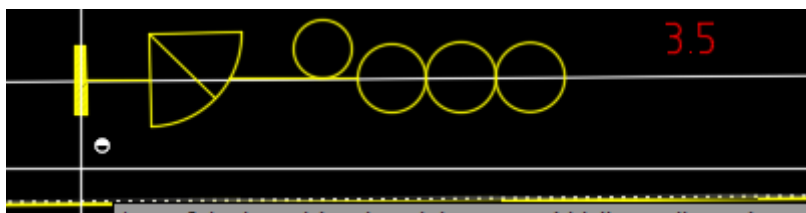
Insert signal

To insert a signal, open the Point Object menu and search for any signal.



Click on the desired signal and hover over the desired target area.

The object will snap to a distance ± 3.5 m from the alignment (if the snap-mode is on).

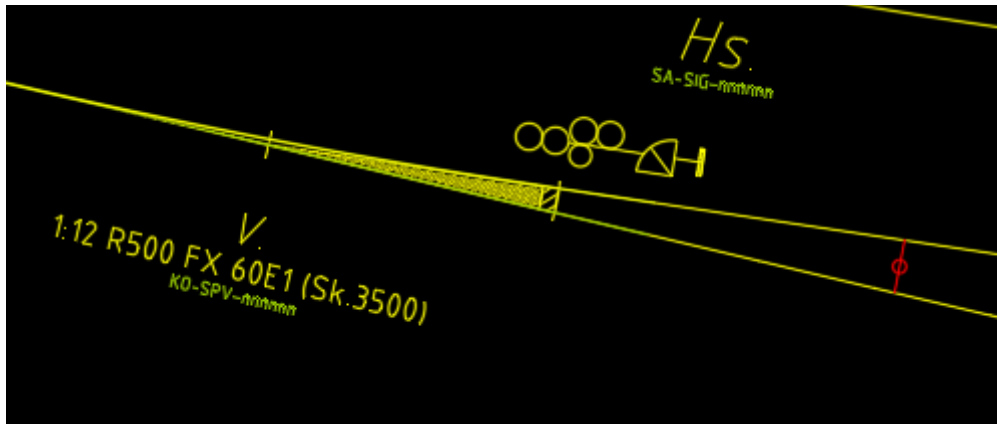


Use shot-cut keys D, V, B and S to change direction, variant, previous variant and toggle snap mode.

[Direction cycleVariant cycleBackwards Snap]

Position the signal

In this example we want to position the signal 5 meters ahead of the fouling point.



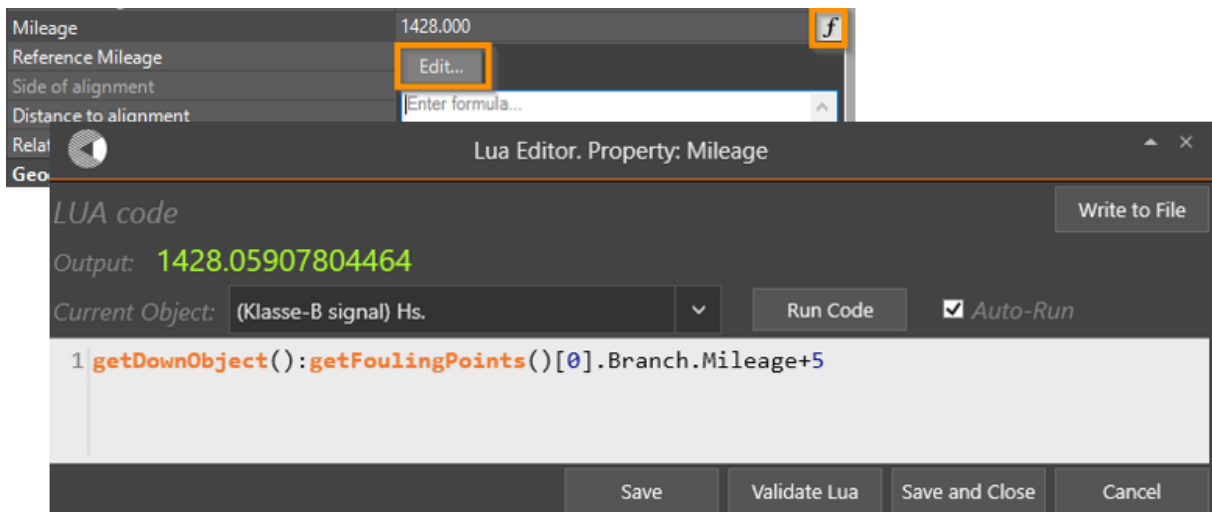
The signal has randomly been placed close to a switch.

It is possible to move the signal by adding 5 meters to the fouling-point position property.

Open Manage Properties and locate the mileage property. Enter the fouling point position and add 5 meters.

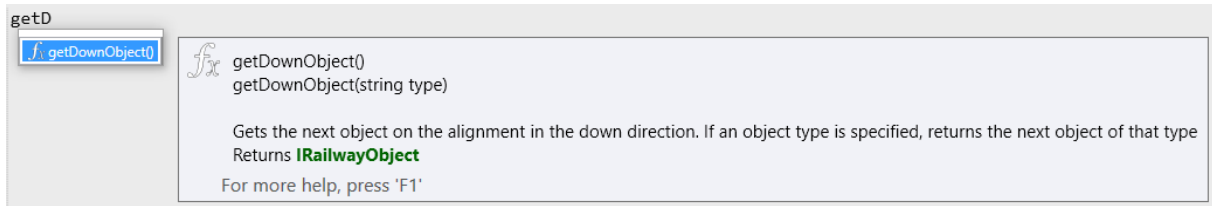


Another option is to add an equation directly into the mileage property.



The equation above asks for the closest fouling point position in down direction and adds 5 meters to the position.

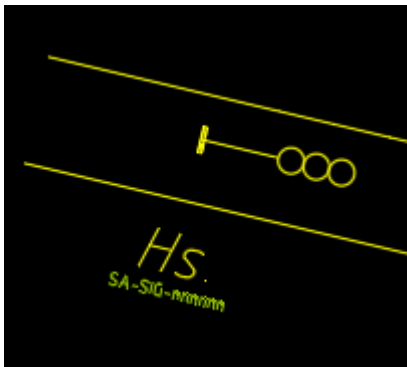
It is surprisingly easy to create custom equations. An intelligence guides the user, and the output-value is constantly validated. And F1 brings the user directly to the help document. More on Lua programming in a later chapter.



Copy objects

It is easy to duplicate an object or group of objects along an alignment. In this example we will copy a signal 4 times with 100 meters distance.

Add any kind of signal to the end of an alignment.



Start the command RC-COPYSELECTIONALONGPATH from the menu (below the Edit button) or just type the command into the model space.



Follow the instructions and use 100 meters as increment and set Number to 4 before selecting Copy.

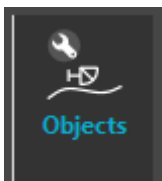
Managing Objects

The object manger is a nice tool for doing mass update and to locate objects in the drawing.

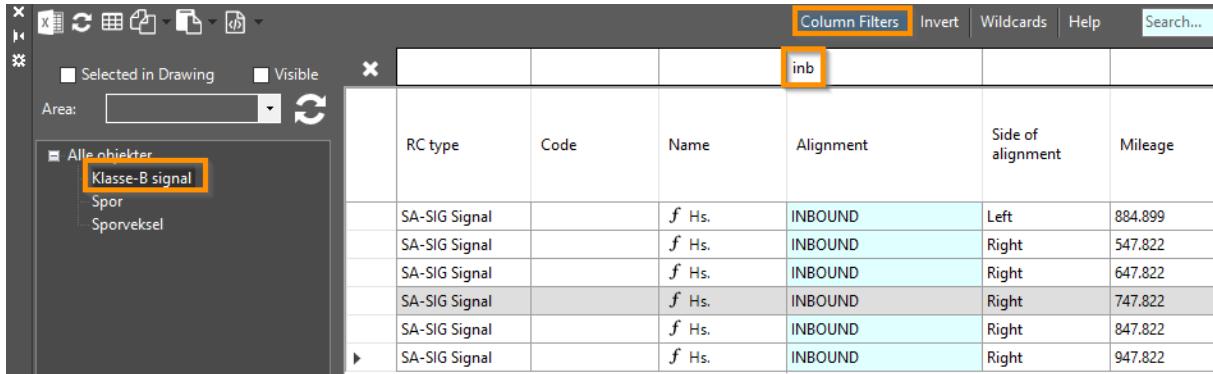
Auto numbering

This example shows how to auto number and auto name signals along the INBOUND alignment. Make sure some objects are placed along this alignment.

Open the object manager with the Objects button.

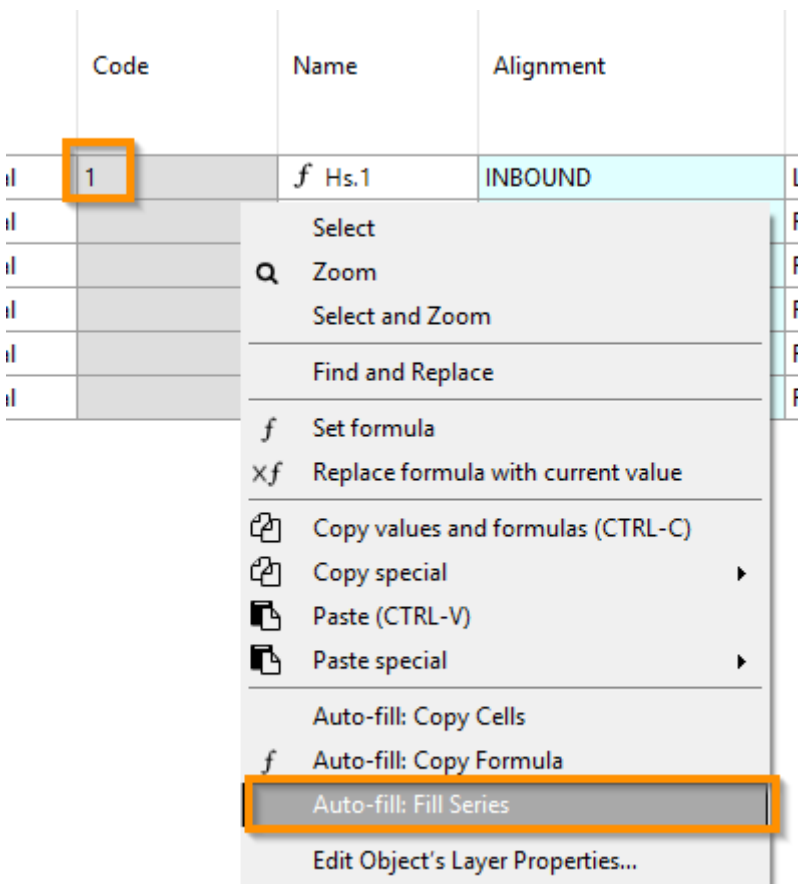


Hide all other signal objects by using filter and object-tree.



| RC type | Code | Name | Alignment | Side of alignment | Mileage |
|---------------|------|-------|-----------|-------------------|---------|
| SA-SIG Signal | | f Hs. | INBOUND | Left | 884.899 |
| SA-SIG Signal | | f Hs. | INBOUND | Right | 547.822 |
| SA-SIG Signal | | f Hs. | INBOUND | Right | 647.822 |
| SA-SIG Signal | | f Hs. | INBOUND | Right | 747.822 |
| SA-SIG Signal | | f Hs. | INBOUND | Right | 847.822 |
| SA-SIG Signal | | f Hs. | INBOUND | Right | 947.822 |

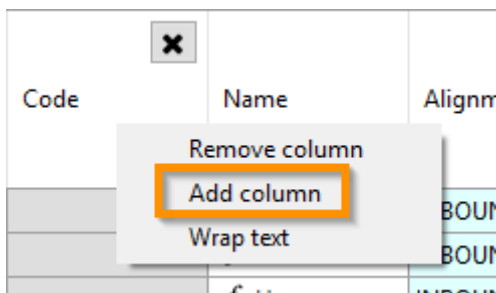
Assign a number to the first cell and auto-number the Code-column by selecting the Code-cells, right-click and select Fill Series.



| Code | Name | Alignment |
|------|--------|-----------|
| 1 | f Hs.1 | INBOUND |
| | | |
| | | |
| | | |
| | | |
| | | |

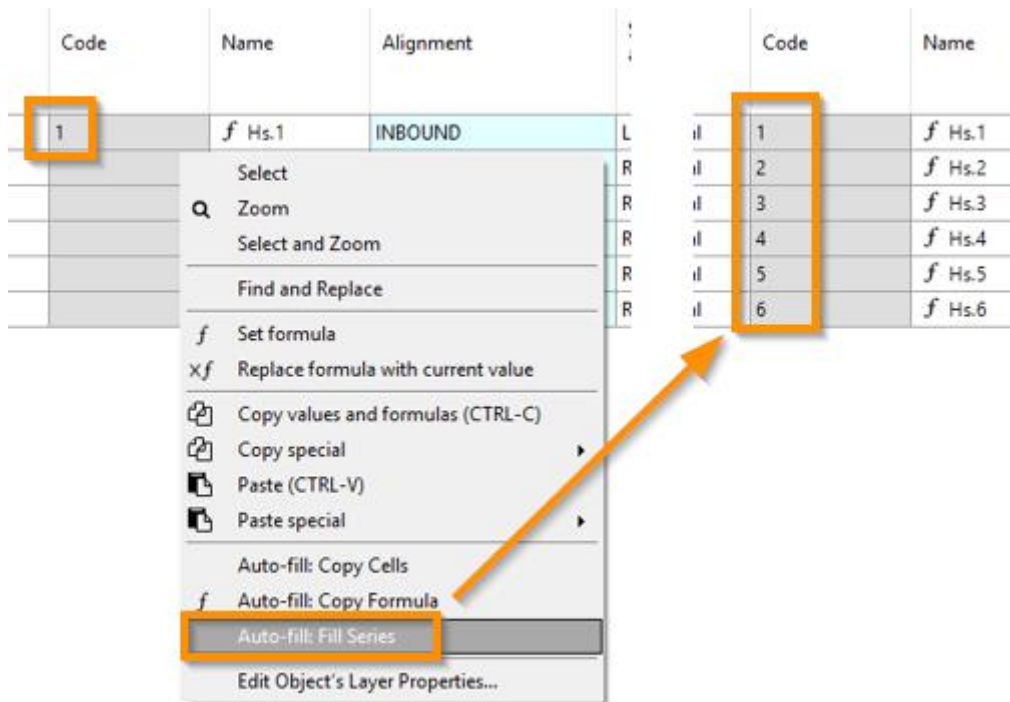
- Select
- Zoom
- Select and Zoom
- Find and Replace
- Set formula
- Replace formula with current value
- Copy values and formulas (CTRL-C)
- Copy special
- Paste (CTRL-V)
- Paste special
- Auto-fill: Copy Cells
- Auto-fill: Copy Formula
- Auto-fill: Fill Series**
- Edit Object's Layer Properties...

If the Code-column is not visible, add the column by right-click the column header section and select Add column. Make sure the Alignment and Name columns also are visible.



| Code | Name | Alignn |
|------|------|--------|
| | | |
| | | |
| | | |

- Remove column
- Add column**
- Wrap text



Note how the name also is updated accordingly. This is because the Name by default has a built in formula =**"Hs."**..**code**.

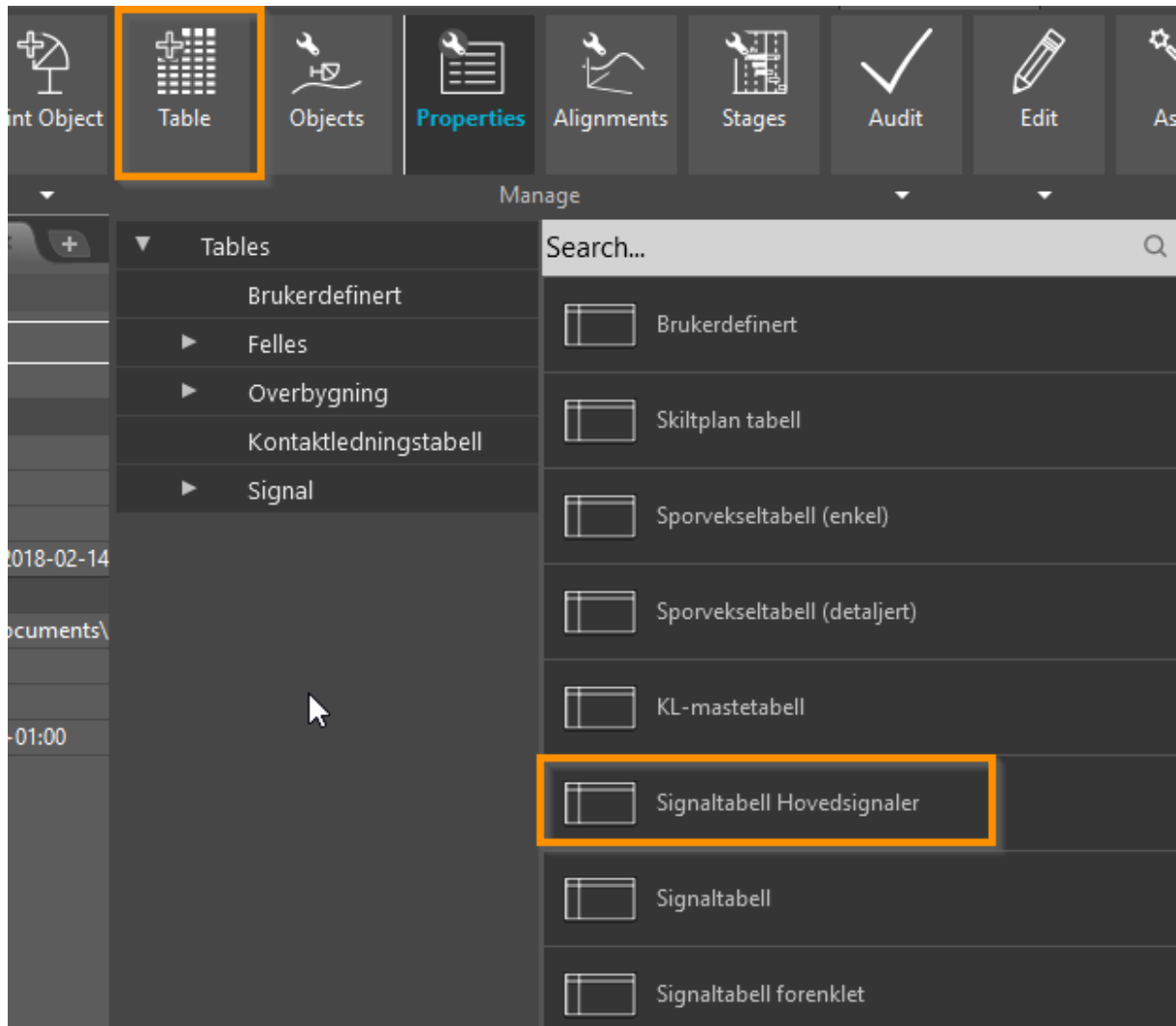
More examples on how to use the object manager is described in the help documentation.

Tables




RailCOMPLETE has a built-in table feature with predefined live tables that enables users to update values whenever changes are done in the drawing.

Create predefined table

Select a predefined table below the Table button. Select a signal table and the place in the drawing to put the table.

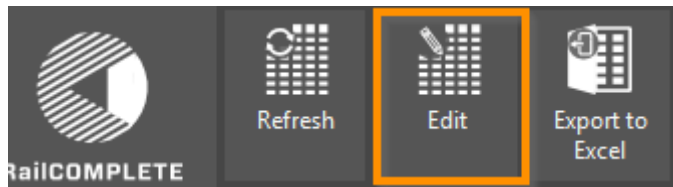


This will give a table like this.

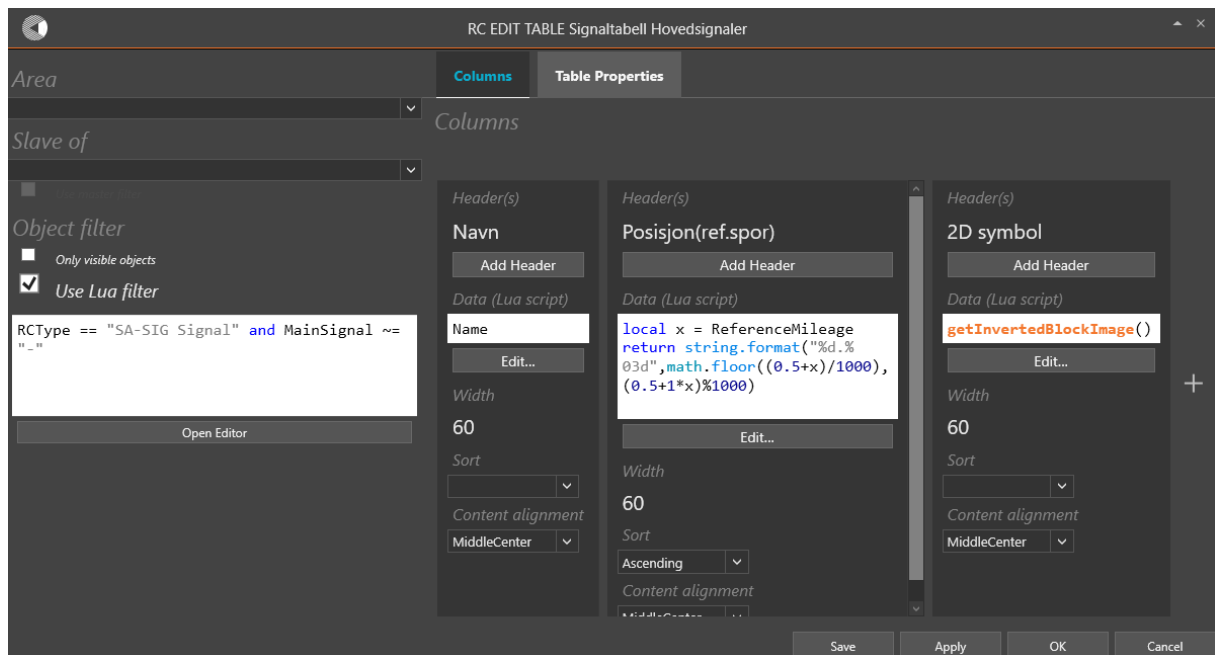
| Signaltabell Hovedsignaler | | |
|----------------------------|--------------------|---|
| Navn | Posisjon(ref.spor) | 2D symbol |
| Hs.2 | 0.548 |  |
| Hs.3 | 0.648 |  |
| Hs.4 | 0.748 |  |
| Hs.5 | 0.848 |  |
| Hs.1 | 0.885 |  |
| Hs.6 | 0.948 |  |
| Hs. | 1.428 |  |
| Hs. | 1.428 |  |

Modify table

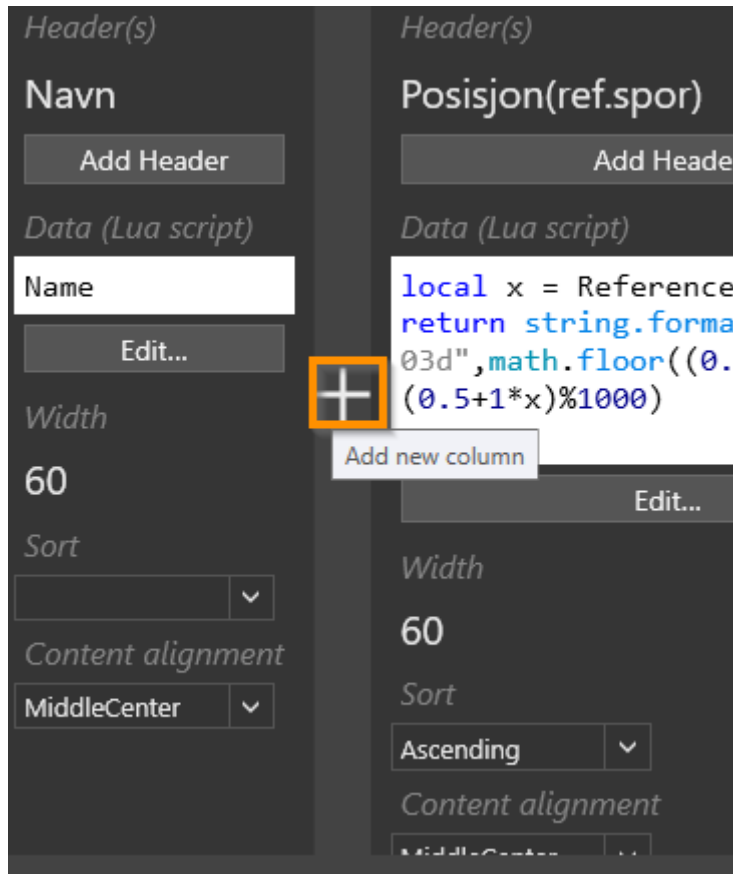
To modify the table, click on the table, and select Edit in the ribbon bar.



In this example, we want to add a column and modify the 2D-symbol column to make the table show 3D symbol instead.



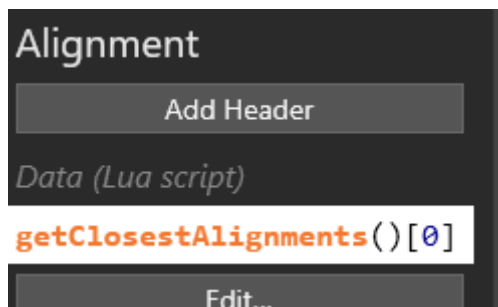
To add a new column, hover the mouse pointer to a position in the table column definition where the new column is supposed to be added.



Click on the + sign and add a value.


In this example we will add the name of the alignment the signal is connected to.

Set the header to Alignment, and Data to `getClosestAlignments()[0]`.



In the 2D symbol, column, modify the header and set the Data to `getget3DBlockImage()`.

Note that the table in AutoCAD will still show the 2D symbol, while an export to Excel, will show the 3D symbol.

| | A | B | C | D |
|---|-------------|------------------|----------------------------|---|
| 1 | | | | Signaltabell Hovedsignaler |
| 2 | Navn | Alignment | Posisjon(ref. spor) | 3D symbol |
| 3 | Hs.2 | INBOUND | 0,548 |  |

The modified table will now have the Alignment name as a new column.

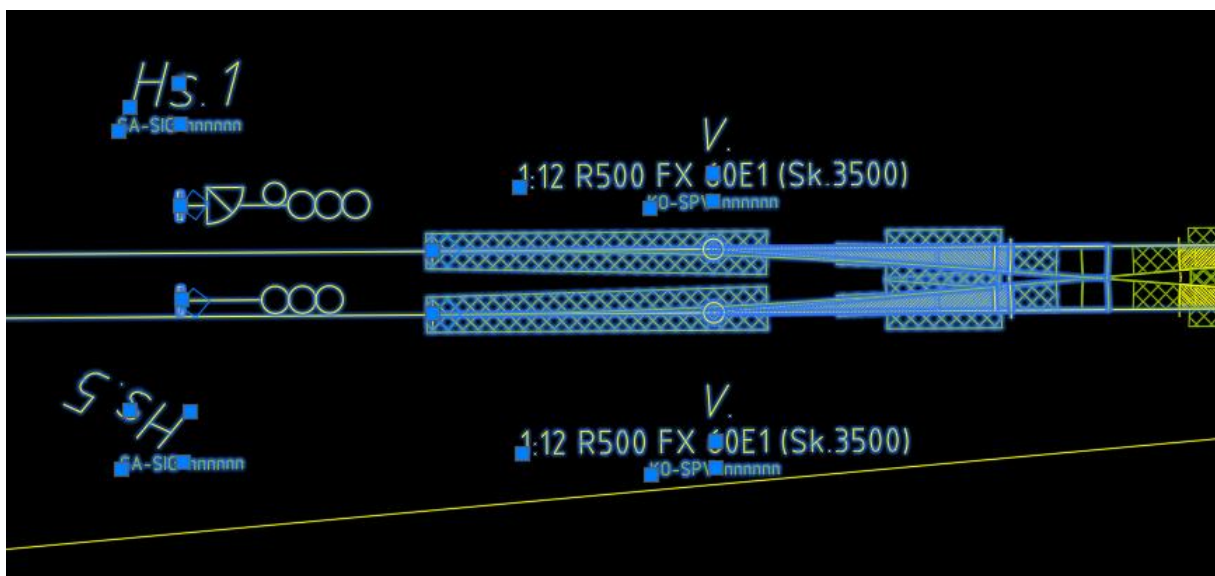
| Signaltabell Hovedsignaler | | | |
|----------------------------|----------------------|---------------------|---|
| Navn | Alignment | Posisjon(ref. spor) | 3D symbol |
| Hs.2 | INBOUND | 0,548 |  |
| Hs.3 | INBOUND | 0,648 |  |
| Hs.4 | TURNAROUND | 0,748 |  |
| Hs.5 | TURNAROUND | 0,848 |  |
| Hs.1 | INBOUND | 0,885 |  |
| Hs.6 | CROSSING IN-TO-OUT-0 | 0,948 |  |
| Hs. | CROSSING-IN-TO-OUT-0 | 1,428 |  |
| Hs. | OUTBOUND | 1,428 |  |

Export to 3D

The typical workflow in RailCOMPLETE is that all modelling are done in 2D, while 3D visualization is done by an export to 3D.

Export example

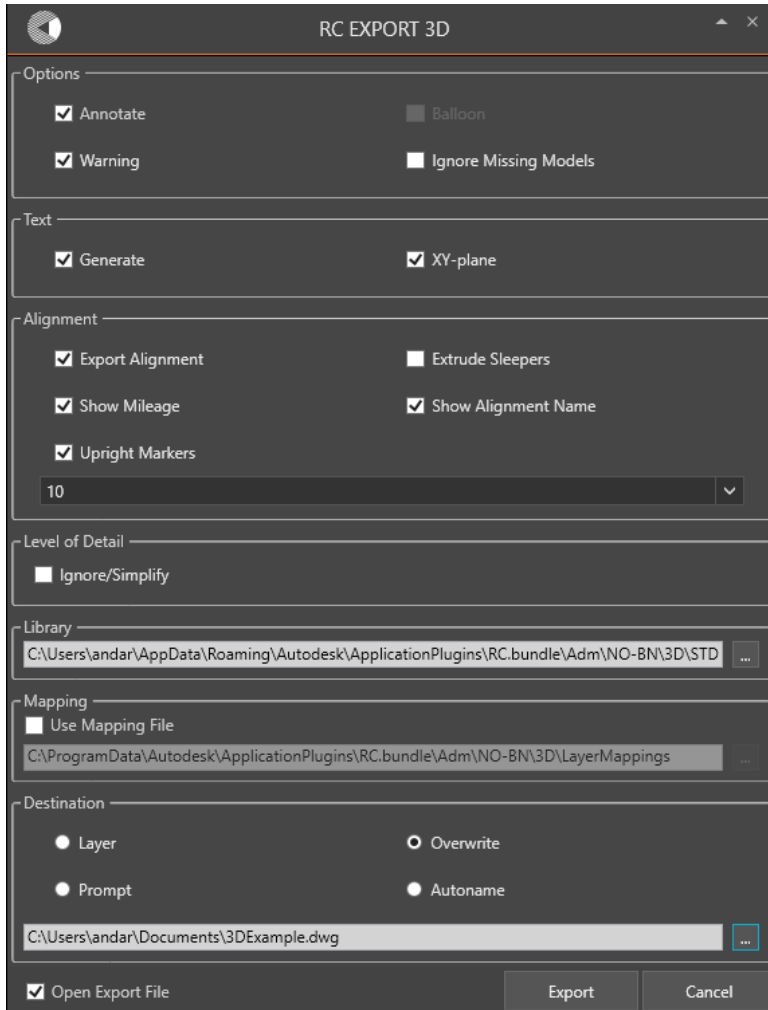
Select some objects in the drawing. In this example, two alignments, two signals and two switches are selected.



Start the 3D-export menu by selecting Export 3D below the Import/Export button or type RC-EXPORT3D in the model view.



Use the same selections as show below and press Export button.



The screenshot shows the 'RC EXPORT 3D' dialog box with the following settings:

- Options:**
 - ☒ Annotate
 - ☐ Balloon
 - ☒ Warning
 - ☐ Ignore Missing Models
- Text:**
 - ☒ Generate
 - ☒ XY-plane
- Alignment:**
 - ☒ Export Alignment
 - ☐ Extrude Sleepers
 - ☒ Show Mileage
 - ☒ Show Alignment Name
 - ☒ Upright Markers
 - 10 (dropdown)
- Level of Detail:**
 - ☐ Ignore/Simplify
- Library:**
 - C:\Users\andar\AppData\Roaming\Autodesk\ApplicationPlugins\RC.bundle\Adm\NO-BN\3D\STD ...
- Mapping:**
 - ☐ Use Mapping File
 - C:\ProgramData\Autodesk\ApplicationPlugins\RC.bundle\Adm\NO-BN\3D\LayerMappings ...
- Destination:**
 - ☒ Layer
 - ☐ Overwrite
 - ☐ Prompt
 - ☐ Autoname
 - C:\Users\andar\Documents\3DExample.dwg
- ☒ Open Export File
- Buttons:** Export, Cancel

This might take some time, dependent on the complexity.

The result should look something like this.

RailCOMPLETE brings BIM to a whole new level. In addition to contain traditional BIM-info, RailCOMPLETE makes the objects smart and programmable.

Select a group of objects and open the properties window.

| | |
|---------|------------|
| Mileage | *VARIES*+2 |
|---------|------------|

Most input fields have the possibility to have equations or programs attached. Like Excel all equations starts with the '=' sign. But unlike Excel, each cell can be programmed.

In this example we are going to give automatic description for a signal. We want the output value to be "Signal placed <Side of alignment> at mileage <mileage> on alignment <alignment>"

Locate the Description field in properties and click on the f button and then select Edit.

| | |
|-----------------|----------------------|
| Description | f |
| Language | Edit... |
| Variant | |
| Sequence number | Enter formula... |
| Stage | |
| Time stamp | |

This will open the Lua editor.

Enter the text as shown below.

| | |
|--|---|
| LUA code | |
| Output: | Signal placed Right at mileage 949.822 on trackCROSSING 8-13 |
| Current Object: | (Klasse-B signal) Anders Run Code <input checked="" type="checkbox"/> Auto-Run |
| <pre>1 "Signal placed "..SideOfAlignment.." at mileage "..Mileage.." on track"..getClosestAlignments()[0].name</pre> | |

The output field will be updated during texting and will give an error if there are any syntax errors.

Copy formula

In this example we will copy the formula to all other signals using the object manager.

Open the object manager, use filter to get all signals. Make sure the Description column is displayed and select all target cells as well as the source cell.

Select Copy Formula

| type | Description | Na |
|-------------|---|----------------|
| -SIG Signal | f Signal placed Right at mileage 949.822 on trackCROSSING 8-13 | f |
| -SIG Signal | | f |
| -SIG Signal | | f |
| -SIG Signal | | f |
| -SIG Signal | | f |
| -SIG Signal | | f |
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| -SIG Signal | | f |
| -SIG Signal | | f |

Select
Zoom
Select and Zoom
Find and Replace
f Set formula
xf Replace formula with current value
Copy values and formulas (CTRL-C)
Copy special
Paste (CTRL-V)
Paste special
Auto-fill: Copy Cells
f Auto-fill: Copy Formula
Auto-fill: Fill Series

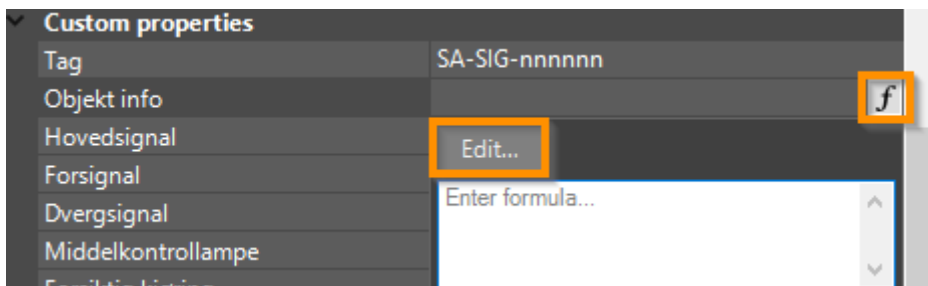
The result should be something like this:

| Description |
|---|
| f Signal placed Right at mileage 949.822 on track CROSSING 8-13 |
| f Signal placed Left at mileage 847.822 on track INBOUND |
| f Signal placed Left at mileage 1428.0590780446 on track CROSSING-IN- |
| f Signal placed Right at mileage 1430 on track OUTBOUND |
| f Signal placed Right at mileage 549.822 on track INBOUND |
| f Signal placed Right at mileage 647.822 on track INBOUND |
| f Signal placed Right at mileage 749.822 on track TURNAROUND |
| f Signal placed Right at mileage 849.822 on track TURNAROUND |

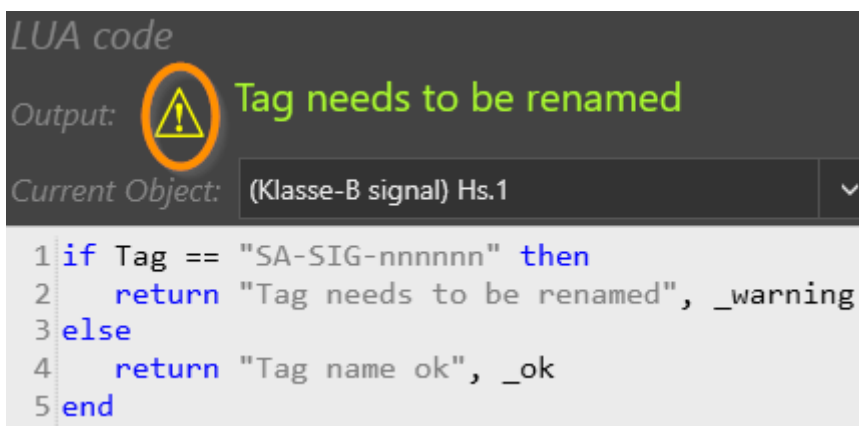
A simple Lua program

In this example we are going to give a warning if the signal tag still has the initial value of "SA-SIG-nnnnnn".

Select the Object info field in the properties window, and open the Lua editor.



The program to check for tag value is strait forward. Enter the code as shown below.



Note that the `_warning` and `_ok` at the end of the return statement also gives a warning and valid-sign.

Press OK, and check the Object info.

| | |
|-------------|---------------------------|
| Tag | SA-SIG-nnnnnn |
| Objekt info | ⚠ Tag needs to be renamed |
| Hovedsignal | Hs3 |

Now go and modify the Tag field to i.e. SA-SIG-001234.

| | |
|-------------------|----------------|
| Custom properties | |
| Tag | SA-SIG-0001234 |
| Objekt info | ✓ Tag name ok |

If we go into the object manager and add Tag and Object info, we get the same.

| RC type | Alignment | Objekt info | Tag |
|---------------|----------------------|---------------|----------------|
| SA-SIG Signal | OUTBOUND | | SA-SIG-nnnnnn |
| SA-SIG Signal | INBOUND | | SA-SIG-nnnnnn |
| SA-SIG Signal | INBOUND | | SA-SIG-nnnnnn |
| SA-SIG Signal | INBOUND | | SA-SIG-nnnnnn |
| SA-SIG Signal | INBOUND | | SA-SIG-nnnnnn |
| SA-SIG Signal | INBOUND | | SA-SIG-nnnnnn |
| SA-SIG Signal | CROSSING-IN-TO-OUT-0 | | SA-SIG-nnnnnn |
| SA-SIG Signal | INBOUND | ✓ Tag name ok | SA-SIG-0001234 |
| SA-SIG Signal | INBOUND | | SA-SIG-nnnnnn |
| SA-SIG Signal | INBOUND | | SA-SIG-nnnnnn |

If we copy the program in Object info to all other signals, the object manager will show these values.

| Objekt info | Tag | Side of alignment |
|--------------------------|----------------|-------------------|
| ✓ Tag name ok | SA-SIG-0001234 | Left |
| ⚠ Tag needs to be rename | SA-SIG-nnnnnn | Right |
| ⚠ Tag needs to be rename | SA-SIG-nnnnnn | Right |
| ⚠ Tag needs to be rename | SA-SIG-nnnnnn | Right |
| ⚠ Tag needs to be rename | SA-SIG-nnnnnn | Right |
| ⚠ Tag needs to be rename | SA-SIG-nnnnnn | Right |
| ⚠ Tag needs to be rename | SA-SIG-nnnnnn | Right |
| ⚠ Tag needs to be rename | SA-SIG-nnnnnn | Left |
| ⚠ Tag needs to be rename | SA-SIG-nnnnnn | Left |

Using the object manager to update the Tag values, will also update the Object info at the same time.

| Objekt info ▼ | Tag | Side of alignment |
|--------------------------|----------------|-------------------|
| ✓ Tag name ok | SA-SIG-0001234 | Left |
| ⚠ Tag needs to be rename | SA-SIG-nnnnnn | Right |
| ✓ Tag name ok | SA-SIG-123456 | Right |
| ⚠ Tag needs to be rename | SA-SIG-nnnnnn | Right |
| ⚠ Tag needs to be rename | SA-SIG-nnnnnn | Right |
| ⚠ Tag needs to be rename | SA-SIG-nnnnnn | Right |
| ⚠ Tag needs to be rename | SA-SIG-nnnnnn | Right |
| ⚠ Tag needs to be rename | SA-SIG-nnnnnn | Right |
| ⚠ Tag needs to be rename | SA-SIG-nnnnnn | Left |
| ⚠ Tag needs to be rename | SA-SIG-nnnnnn | Left |
| ⚠ Tag needs to be rename | SA-SIG-nnnnnn | Left |