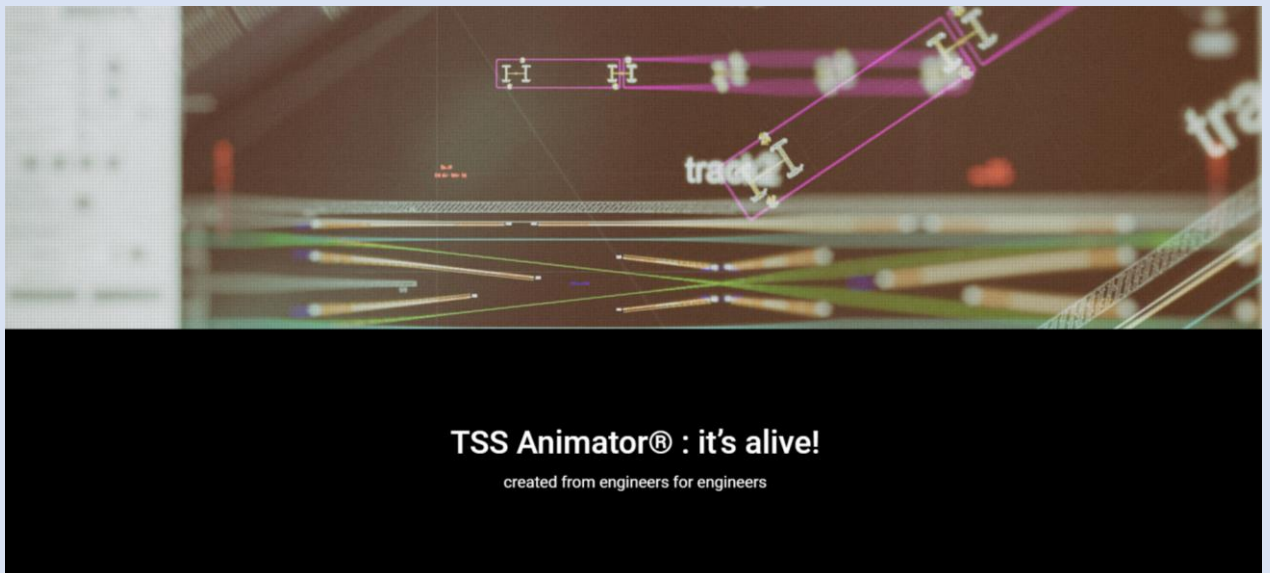


Animator ®™

USER MANUAL



www.tss.link

December 2020

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1. Why Animator®™

Animator®™ is an Autodesk® AutoCAD® tool that helps you simulate a vehicle's movement along an axis. At the same time Animator becomes really handy every time there is a need to detect clashes and interfaces of a moving vehicle with other objects in surrounding area.

Animator®™ can also be used to check/measure multiple parameters, necessary for many railway studies such as Gauge Control, Conductor Rail Gap Studies, Vehicle's interface with other elements etc. Our team has gained numerous hours of work in such tasks when working on Large Scale Metro projects.

If your workload includes tasks such as analysis with moving vehicles and clash detection, **Animator®™** is a unique tool that will take this task off your shoulders, in a fast and accurate way.

Do you have to place a vehicle along a pathway and check its movement?

Do you have to Coordinate different studies?

Do you have to measure critical distances of a moving vehicle with surrounding objects?

Do you want to elaborate on Longitudinal Cross Sections?

Do you have to check As-Built situations?

Do you have to survey and compute the length that a vehicle protrudes from a path, due to horizontal curves?

Our team, having worked for more than 25 years on Railway Projects, and particularly when performing Coordination Works, is dealing with such tasks on a permanent basis every day. The need for a tool such as **Animator®™**, was born from our needs. The concept was to help perform those tasks quickly and accurately, having a clear mind focused on the real engineering problems instead of drafting secondary issues. On a particular study with Electrification rails, the benefit was more than 70% of the time, such a study used to take in the past.

Animator®™ works in Autodesk® AutoCAD® and Autodesk® Civil 3D® (currently not benefiting from the axis properties in Autodesk® Civil 3D®, but soon to become available). Considering that there are many colleagues and friends that have previous versions of Autodesk® AutoCAD®, we are supporting previous versions until 2012.

The current version of **Animator®™** is 201.100 and has been issued on December 2020. In order to take full advantage of the tool, please read the present User Manual to get acquainted with all capabilities available.

We are confident, you will find in **Animator®™** the support you need.

You are welcome to visit our site www.tss.link and check on the other tools that can help you, depending on your specialty and expertise.

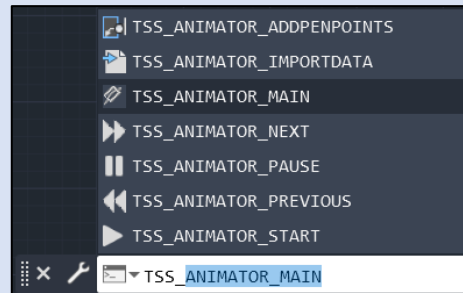
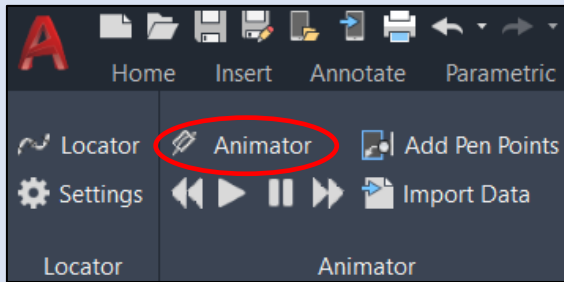
TSS has a unique target. To link CAD programming expertise with Engineering and Drafting needs.

Thank you for contacting us.

2. Setting Up Animator®™

2.1. Open Animator Palette

- A. Run **Animator®™** by pressing the button Animator on TSS ribbon or by typing “tss_animator_main” at Autodesk® AutoCAD® command line.



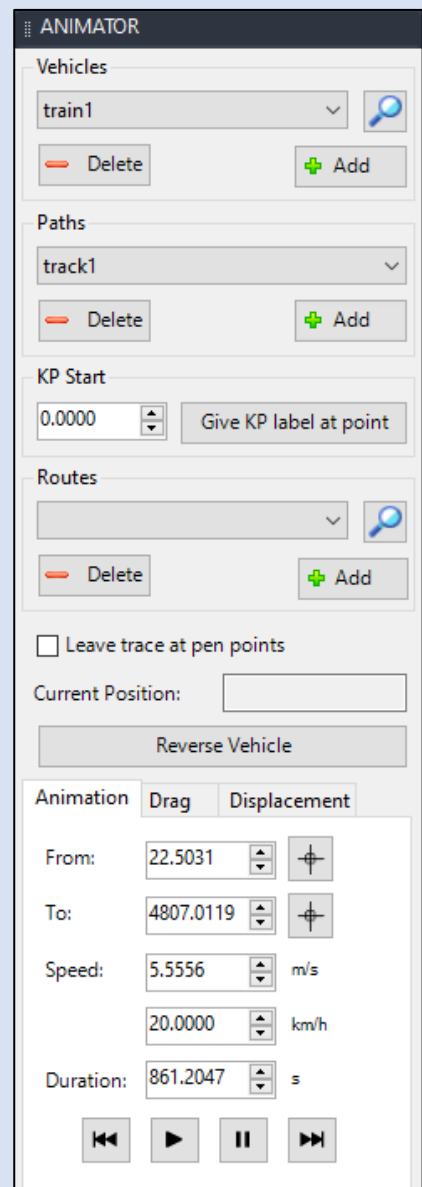
Press the [ESC] button, at any time, to exit the command.

- B. **Animator®™** Palette opens and reads the drawing.
On the right of the page there is a complete view of **Animator®™** palette.
Navigate on the palette to get acquainted with the available options.

On the top you will find the Vehicle & Path selection/definition area together with the tools to label the Starting Kilometric Position (KP) of every Path.

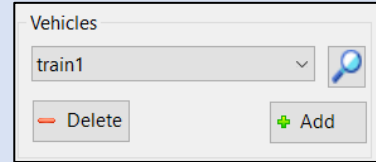
In the middle you will find the Routes selection/definition area. A route represents the unique pair of the instance of a vehicle on a specific path.
You can have multiple instances of any vehicle created on any path, each pair constituting a different “Route”.
Right below the Routes, you will find the [Leave trace at pen points] check option, where you choose whether the trace polylines will be drawn or not.
Below is the [Current Position] field, which displays the current KP of the selected route and the [Reverse Vehicle] button that reverses vehicle’s direction.

At the bottom of the Palette you will find the Tabs with the three options of movement: Animation, Drag & Displacement.



2.2. Vehicle Definition

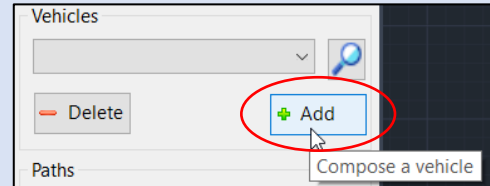
In case you had used **Animator**™ in the current drawing and had saved the drawing, **Animator**™ will read all saved vehicles and select the first vehicle (in the row, as they were saved in the drawing).



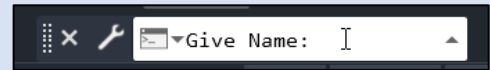
If you have never used **Animator**™ in the current drawing, there will be no saved vehicle and the first thing you have to do is to define one.

To create a working vehicle follow the steps below:

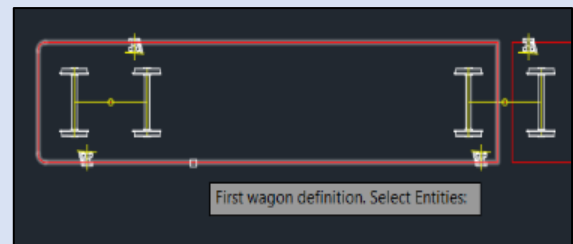
- A. Press the button [Add] which is located at the top right-hand corner of **Animator**™ 's Palette.



- B. **Animator**™ will first ask you to assign a name to the vehicle.



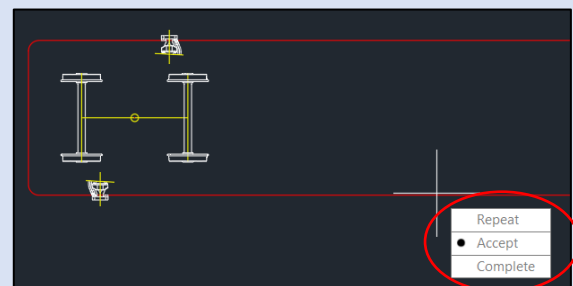
- C. Then, it's time for vehicle's wagons definition. **Animator**™ will request you to select all the entities that represent the 1st wagon of the vehicle. When all entities get selected, press right click or spacebar on your keyboard. (Note that a wagon can eventually include entities such as doors, sheats, text and generally any kind of Autodesk® AutoCAD® entities, except for splines).



- D. Then you are prompted to select one of the following three options:
a) Repeat b) Accept c) Complete.

If you select the [Repeat] option you are able to select again the entities you want, in case you have made an error.

If you choose the [Accept] option, **Animator**™ will proceed to the next wagon definition. Finally, with the [Complete] option, the definition of your vehicle's wagons is completed.

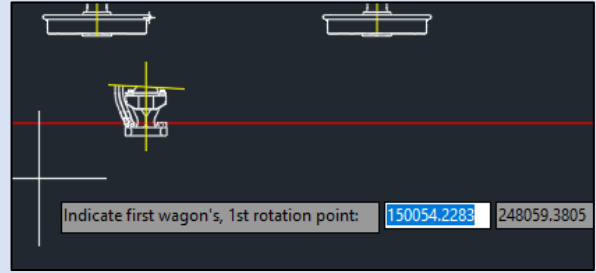


- E. Follow the same procedure in order to select and define all wagons from your active drawing, depending on the structure of the vehicle, depending on the type of project you are working on.

Note1: You can select either one or multiple wagons, for each vehicle.

Note2: If you click on spacebar or right click with your mouse, and no entities are selected, **Animator**™ will assume that wagons' definition is completed and proceed to the next step.

F. The next step is the selection of wagons' rotation points. A wagon must have two points of rotation, so **Animator**™ will ask you to select those two points for each wagon.

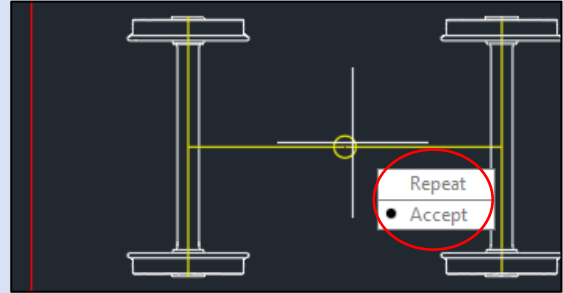


Note3: Two wagons can have a common point of rotation, meaning a rotation point can (if this is the case) be the same for two wagons. Yet you have to select it twice, one time for each wagon.

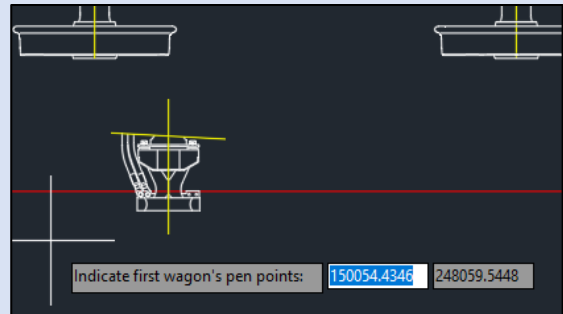
G. After the selection of a point, you are prompted to pick one of two options:

- a) Repeat b) Accept.

If you select the **[Repeat]** option you are able to select again the point you want, in case of an error during the selection process. If you choose the **[Accept]** option, **Animator**™ will proceed and ask you for the next rotation point definition.



H. After the definition of wagons' rotation points, **Animator**™ will ask for each wagon's pen points. When all pen points are selected, hit spacebar or right click. You are again prompted to choose the **[Accept]** and **[Repeat]** option. If you don't want to add any pen point on a wagon, you simply press spacebar or right click with your mouse and **Animator**™ will proceed to the next wagon.



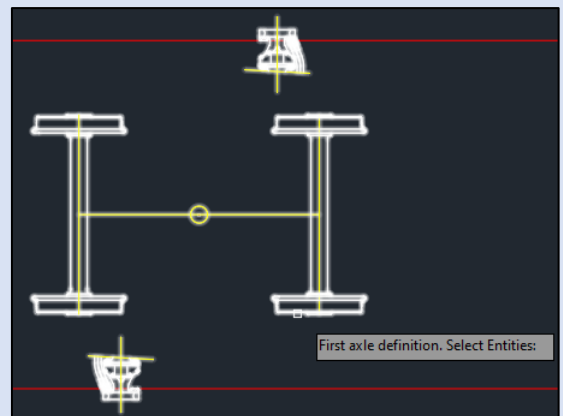
Note4: Pen points are points that will leave a trace on the drawing as the vehicle moves. Usefull for tracking purposes, gauge/swept path analysis, etc. Can be placed anywhere on the Vehicle/wagon. Usually they represent points that you want to check their position along the movement. You can either select none or even multiple pen points.

I. The next action is to determine the axles of your vehicle. Every vehicle must have at least two axles. Select all the entities that represent the 1st axle of the vehicle and right click or press the spacebar.

You are then prompted to select again one of three options mentioned above:

- a) Repeat, b) Accept or c) Complete.

J. Follow the same procedure in order to select all axles from your active drawing, depending on the structure of the vehicle.

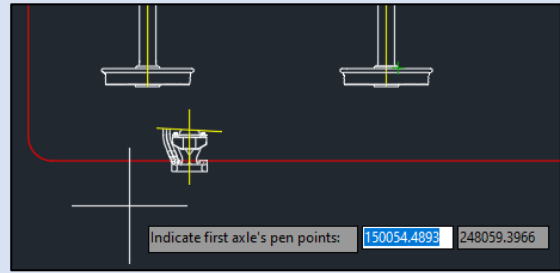


Note5: If you click on spacebar or right click with your mouse and no entities are selected, **Animator**™ will assume that axles' definition is completed and proceed to the next step.

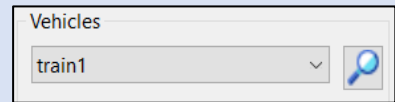
Note6: The selected entities that represent the wagons and axles of your vehicle can include polylines, lines, arcs, texts or even blocks created in Autodesk® AutoCAD®, but not splines currently.

Tip1: *If you want to include splines in your vehicle's geometry, prefer to include them in a block reference.*

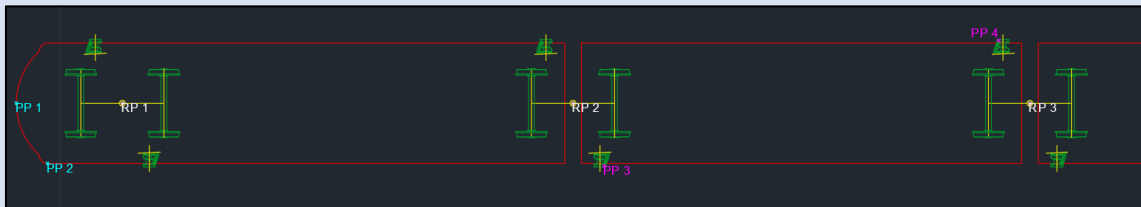
- K. The final step is the determination of each axle's pen points. Select all the pen points you want for each axle and press spacebar or right click. You are again prompt to choose the [Accept] or [Repeat] option. If you don't want to add any pen point on an axle, you simply hit spacebar or right click with your mouse and **Animator**™ will proceed to the next axle.



- L. The vehicle is completely defined. When the vehicle gets composed, its name will appear in the [Vehicles] list and the geometry of the vehicle will be saved in the drawing so that you will not have to perform the previously described procedure of vehicle composition again, after reopening it.



Please note that , **Animator**™ numbers and draws vehicle's rotation and pen points and adds texts with their labels, as shown in the image below.



The rotation points (RP 1,2,..etc) are drawn in white.

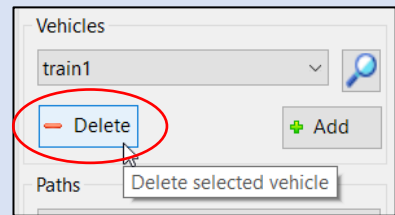
The pen points (PP 1,2,..etc) are drawn in cyan if they belong to a wagon, and in magenta if they belong to an axle.

Tip2: By changing the color or position of any point entity (PP1,PP2,..etc) representing vehicle's pen points, the drawing position and color of the corresponding trace polylines will be updated.
See §3.7. How to customize the selected pen points.

Note7: It is essential that you do not erase any of the designed rotation points.

Remember that you can create as many vehicles as you like/need!

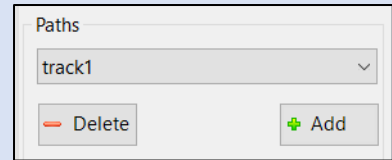
If you want to delete a saved vehicle from your drawing's database all you have to do is click on [Delete] button and **Animator**™ will remove the vehicle whose name appears in the [Vehicles] list currently, from the selection.



Note8: If you delete a vehicle from your drawing's database, all routes associated with this vehicle will also be deleted.

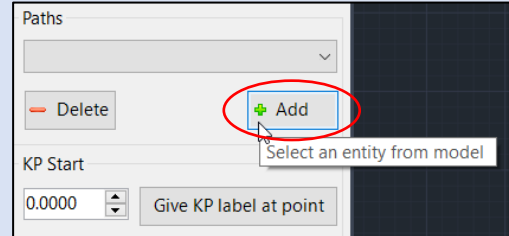
2.3. Path Definition

In case you had used **Animator**[®]**™** in the current drawing and had saved the drawing, then **Animator**[®]**™** will read all saved paths and select the first path (in the row, as they were saved originally, in the drawing).

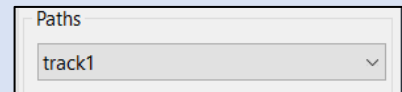


If you have never used **Animator**[®]**™** in the current drawing, there will be no saved paths and the next thing you have to do after vehicle composition, is to create one or more paths.

To create a working path, press the button [Add] in the [Paths] section. Assign your path a name and finally select an entity from your active drawing in Autodesk[®] AutoCAD[®].

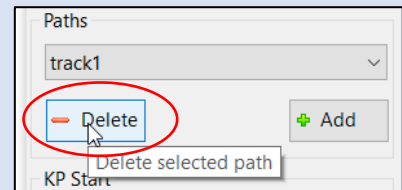


When an entity gets selected, its name will appear in the [Paths] list. You can select as many Autodesk[®] AutoCAD[®] entities as you like as pathways and they will all be saved in the drawing so that you will not have to select them again, every time.



Note1: The selected path can be any polyline, line , arc or circle created in Autodesk[®] AutoCAD[®] (but not splines).

If you want to delete a saved path from your drawing's database all you have to do is to click on [Delete] button and **Animator**[®]**™** will remove the path, whose name appears currently in the [Paths] list, from the selection.

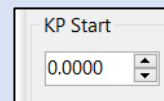


Note2: If you delete a path from your drawing's database, all routes associated with this path will also be deleted.

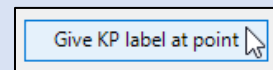
Provide the correct kilometric label for the Path Start.

In order to give a Kilometric Position (KP) "name"/label at the starting point of the path, other than zero (0+000,000) there are two options:

- If the Kilometric Position of the starting point is known, type it in the [KP Start] field. The KP Start of your path can be positive or negative.



- In case you do not know the starting point's KP, or if you are working temporarily on a part of the complete path, there is no problem. Use any other point of the path (with a known KP value) as reference. Press the [Give KP label at point] button, type its KP label in the command line and then select on the drawing the point that this label refers to. **Animator**[®]**™** will calculate the Starting KP of the complete path. You are ready to work!



Note3: The term Kilometric Position (KP) is the same as the term Chainage of an axis.

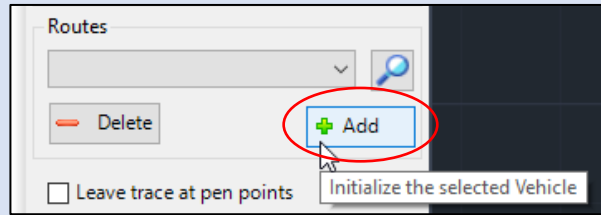
3. Exploit Animator[®]™, It is Alive.

After a vehicle has been composed and a path has been selected, you are ready to start exploiting **Animator[®]™**.

See how **Animator[®]™** can save up your time.

3.1. How to place a vehicle along a path / how to create a route

By clicking the [Add] button at the Routes section, **Animator[®]™** places your vehicle at any position along the selected path.



Each time you want to initialize a vehicle by pressing the above button, **Animator[®]™** will do the following:

- A. Ask you to select a point on the vehicle. Then **Animator[®]™** will calculate the projection of that point on the axis of the vehicle.

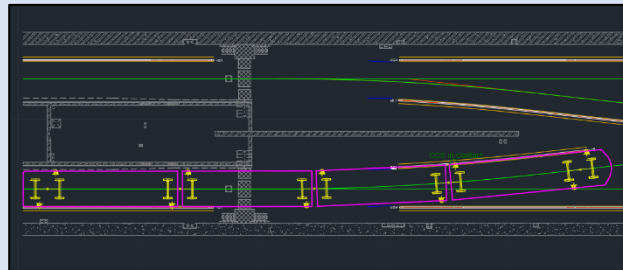
Note1: The axis of the vehicle is a polyline that passes through vehicle's rotation points.

- B. Ask you to select a point on the path. **Animator[®]™** will calculate the projection of that point on the path.

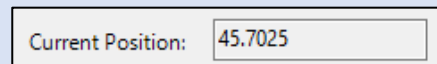
Note2: In case there are more than one projection points, **Animator[®]™** chooses the one which is closest to the original point.

Note3: In case there is no projection on the path, there will be no action from **Animator[®]™**.

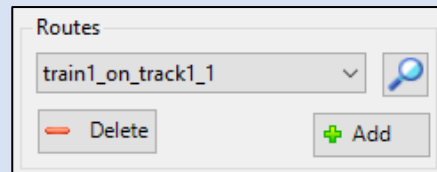
- C. Draw your vehicle on the path. **Animator[®]™** will place the projected point of the vehicle on the projected point on the path. The accurate position and rotation angle of the vehicle will be calculated automatically. Please note that the axes are always transversal to the selected path and the rotation points are always points on the path.



- D. Populate the [Current Position] field, according to the KPStart of the selected path.



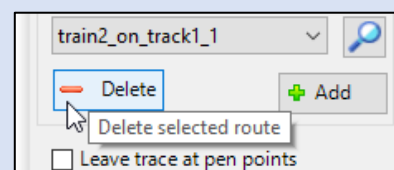
- E. Create a route and populate the [Routes] list with route's name.



Note4: Route's name is assigned based on the following format: "**VehicleName_on_PathName_1,2,..etc**", as shown in the adjacent picture.

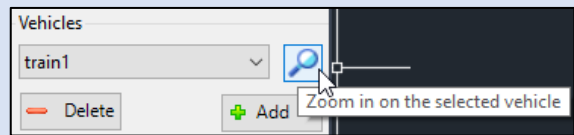
3.2. How to erase a vehicle from its current position on path / how to delete a route

Press the [Delete] button in Routes section, in order to erase the pair Vehicle-Path. This way the currently selected vehicle will be erased from its current position along the pathway.



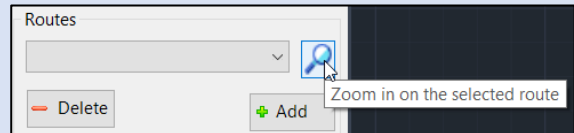
3.3. How to zoom in on a vehicle or a route

By pressing the [Zoom] button in the Vehicles section, **Animator**™ zooms to display the selected vehicle in the center of your drawing's view (will zoom on the prototype definition of the vehicle).



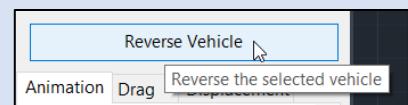
Similarly, by pressing the [Zoom] button in Routes section, **Animator**™ will zoom on the selected route, ie in the position on the path, on which the vehicle is located currently.

This feature can be very helpful if you are dealing with a large number of routes, as it helps you to distinguish/trace them.



3.4. How to reverse vehicle's direction

By clicking the [Reverse vehicle] button, **Animator**™ will reverse the direction of your selected vehicle.



3.5. How to move a vehicle along a path

After successfully creating a route, you can now move your vehicle on the selected path. **Animator**™ provides you with three options of movement:

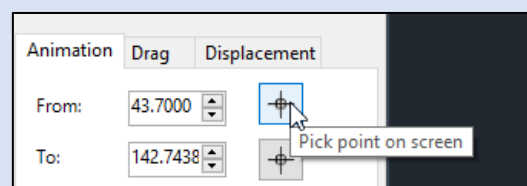
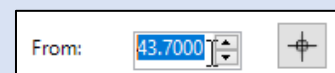
A. Animation

Select the tab [Animation] by pressing on it (in case it is not already selected) and the next thing you have to do is to set the animation properties. You must define a start KP ([From]), a finish KP ([To]) and the [Duration] of the animation or vehicle's speed.

Note1: The default values in fields [From] and [To] are pathway's start KP and end KP respectively.

a. Define movement area

You can define a start KP either by typing it in the [From] field or by pressing the cursor button next to it and select a point in the drawing. If you choose to press the button then **Animator**™ will ask you to pick a point on the screen, in the current drawing. After you select the starting point, **Animator**™ will calculate the projection of that point on the path and define the Kilometric Position at this point based on your selected KP start. The calculated KP label gets written in the adjacent [From] field.



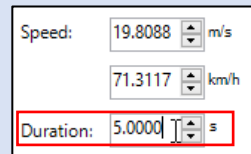
Follow the same procedure in order to set the finish KP by typing in the [To] field.

When you have selected the beginning and the end of the animation, the next step is to determine either its duration or the speed of the vehicle.

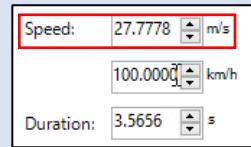
Tip1: Use *_tss Locator[®]* if you want to find/locate a point or a specific KP value along the path.

b. Specify travel speed or travel duration

In [Duration] field, type a value for the duration of the animation (in seconds). **Animator[®]** will calculate the running speed of your vehicle in both m/s and km/h units and populate the corresponding [Speed] fields.





Alternatively, type a value for the running speed of your vehicle in [Speed] field (either in m/s or in km/h). **Animator[®]** will calculate the duration of the animation in seconds and write it in the [Duration] field.





Note2: Pay attention in the units of your Path. If it has been defined in mm then the speed might look multiplied by 1000. This will create no problem to **Animator[®]**.

c. Start the animation

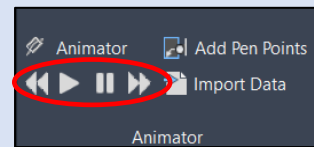
By pressing the [Play] button  the animation begins and the vehicle automatically moves along the selected path.

With [Pause] button  or by pressing escape on the keyboard the animation pauses.

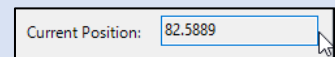
With the [Move backwards]  and [Move forward]  buttons the vehicle gets drawn in the start and end Kilometric Position respectively.

The above buttons are also located in TSS ribbon. Alternatively you can type the following commands at command line:

```
[tss_animator_start]
[tss_animator_pause]
[tss_animator_next]
[tss_animator_previous].
```



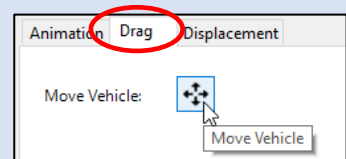
The current position of the vehicle is calculated and displayed in the [Current Position] field.



Note3: The current Position is the KP label that refers to the front point of your vehicle, where the front point of a vehicle is defined as the frontmost rotation point on path.

B. Drag

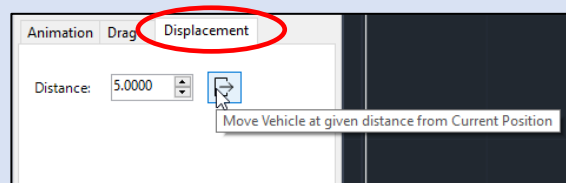
Select the tab [Drag] in order to manually move the selected vehicle. By pressing the [Move Vehicle] button, **Animator[®]** will ask to select a base point. Then, by moving the mouse cursor, the selected vehicle will follow your cursor position, from the selected base point until you click on a target point.



Note4: If while moving the cursor, the target point exceeds the edges of the pathway, then the selected vehicle is out of the selected path and gets erased from drawing, until you move your cursor back within the limits of the path.

C. Displacement

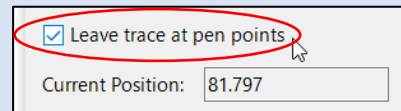
Select the tab [Displacement] and add the requested distance in the [Distance] field. By pressing the [Move] button next to [Distance] field, **Animator[®]** will move the vehicle at this distance from its current position.



Note5: Distance might be either negative or positive and it is measured along the pathway.

3.6. How to create trace polylines

A very handy tool that **Animator**[®]™ provides, is the creation of trace polylines. Tick the [Leave trace at pen points] box at the middle of **Animator**[®]™ Palette, and **Animator**[®]™ will calculate vehicle's pen points along the axis and draw polylines that pass through them during movement.



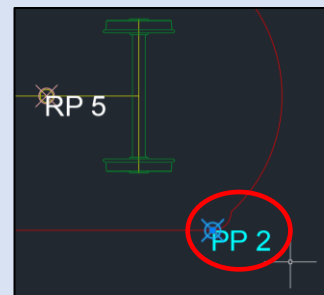
This feature can be very helpful if you want to detect clashes and interfaces with other objects in surrounding area.

3.7. How to customize the selected pen points

Animator[®]™ allows you to modify the pen points you set during the composition of your vehicle or add new ones. Specifically, you are able to:

A. Relocate a pen point

By moving the point entity (representing the pen point) on the prototype drawing of the vehicle definition, **Animator**[®]™ will update the Pen Point position in Vehicle definition data and correspondingly will draw the trace polyline according to the new position of that Pen Point, from now on, taking for granted that it belongs to the initial wagon.



B. Delete a pen point

If you delete a point entity that represents a pen point from the prototype definition of a vehicle on your drawing, **Animator**[®]™ will stop drawing the trace polyline that passes through this Pen Point, during next vehicle movement.

C. Change the color of a pen point

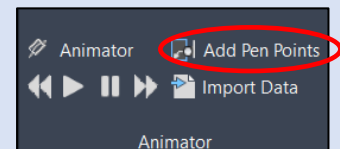
Change the color of the point entity on the prototype definition of a vehicle and the color of the drawn trace polyline will also change.

D. Add pen points

Press the [Add pen points] button on TSS ribbon in order to add new pen points on your selected vehicle.

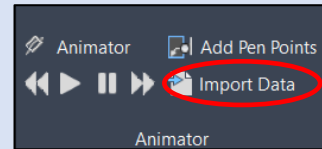
Animator[®]™ will initially ask you to select each wagon's pen points. When all pen points are selected, hit spacebar or right click. If you

don't want to add any pen point on a wagon, you simply press spacebar or right click with your mouse and **Animator**[®]™ will proceed to the next wagon. The same procedure will be followed for the selection of each axle's pen points.

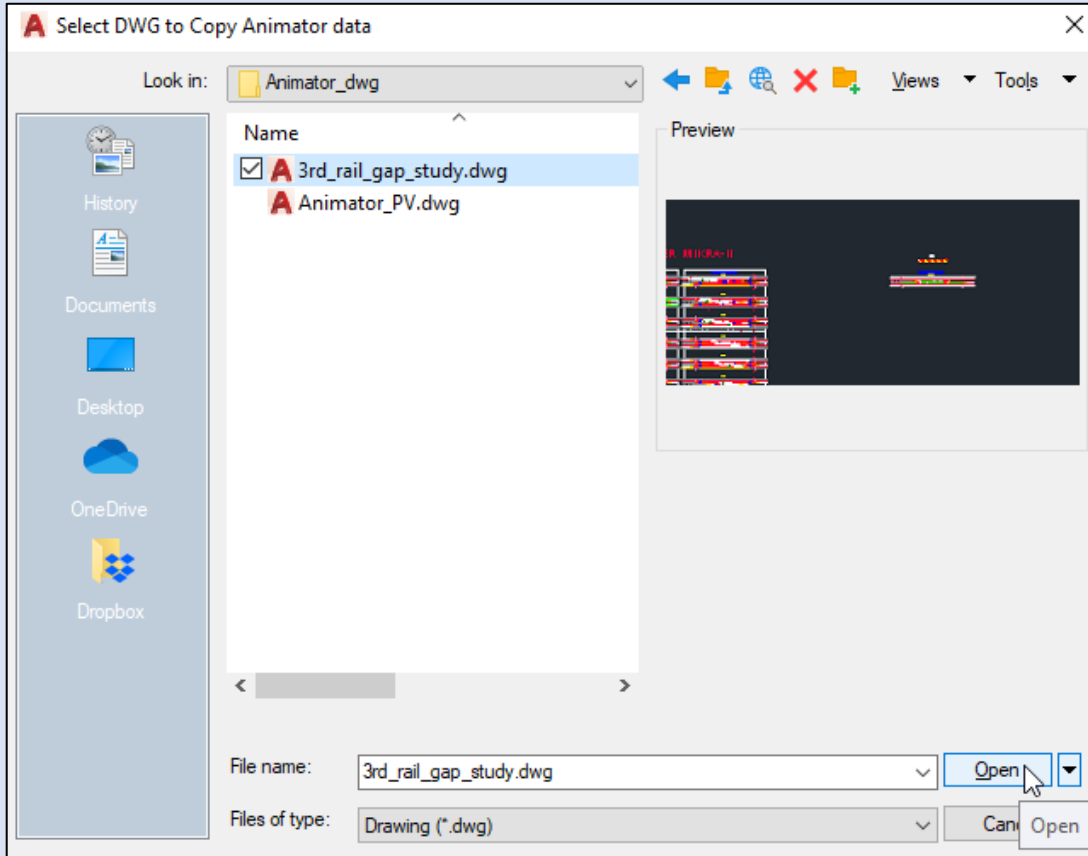


3.8. How to import Animator[®]™ data from another drawing

Animator[®]™ provides you with the option to copy vehicles and paths from another drawing and paste them into your active drawing. Simply press the button [Import data] on TSS ribbon.



In the [Select DWG to copy Animator Data] dialog box, browse to and select the dwg file that you want to import data from. After the file gets selected, click the [Open] button on the form and **Animator[®]™** will copy and draw the included vehicles & paths from the selected drawing to your active drawing.

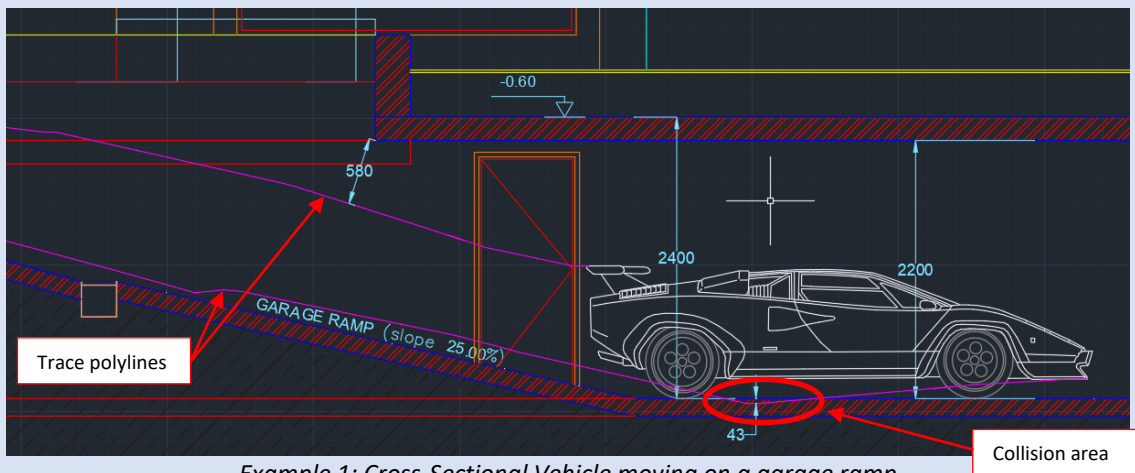


4. Animator®™'s Handy Tools.

4.1. Animator®™ & the Handy accessories.

With **Animator®™** you are able to simulate a vehicle's movement along an axis. The real benefits using **Animator®™** become more obvious when applied to certain types of project, such as Railway projects or when dealing with car/track movements (soon to be released for the public). It becomes really handy every time there is a need to simulate a vehicle's movement along a pathway and check/measure multiple parameters, necessary for many railway studies (Gauge Control, Conductor Rail Gap Studies, Vehicle's interface with other elements etc.).

The advantages of **Animator®™** can be visible not only in plan-view drawings but also in longitudinal cross-sections. You are able to create a cross-section of a vehicle and place it on a longitudinal view of an axis as shown in the picture below. In this example, with the use of Pen Points and the produced trace polylines, you can measure the critical distances or even possible collisions of a vehicle, moving on a garage ramp and thus make the necessary adjustments/corrections.



Example 1: Cross-Sectional Vehicle moving on a garage ramp

Tip1: Visit www.tss.link to get acquainted with TSS **ToolKit®™**. Bring in your work some of the most advanced and intelligent analysis tools that will help you perform tasks you wouldn't even think you could, previously.

5. Our Target is to transform our experience into your tools.

Our goal is to support Engineering and let Engineering community spend more time on real Engineering problems and less on drawings tricks and tweaks.

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