



USER GUIDE

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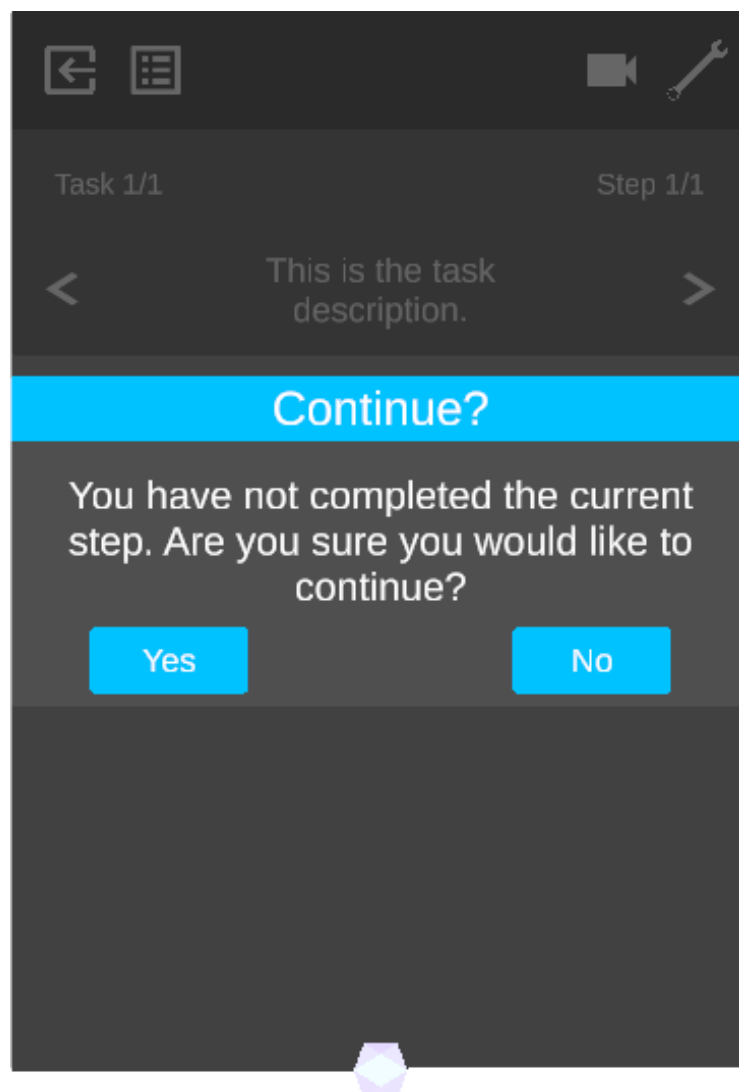
Operator Mode

Theorem Guides offers interactive training in a virtual environment. Step-by-step instructions direct operators to the tools and parts required, and positional indicators show operators where to install or move components to.

Guides are broken down into tasks and steps. Steps may or may not have a requirement to fulfil before they are flagged as 'completed'. These requirements can be:

- **Positional Requirements** – an object must be moved to a position indicated or installed as part of an assembly.
- **Tool Requirements** – a tool must be used.
- **Selection Requirement** – a user must point and click on the part specified.

If a requirement is not completed before an operator attempts to move to the next step, a warning prompt will show:



The operator can elect to go back to the active step and ensure it is completed before continuing.

Steps may be supported with various media, such as photos, videos, arrows, and warning symbols.

Guide Objects and Interactions

This section will outline the different types of objects encountered in a guide, and how to interact with them.

Models

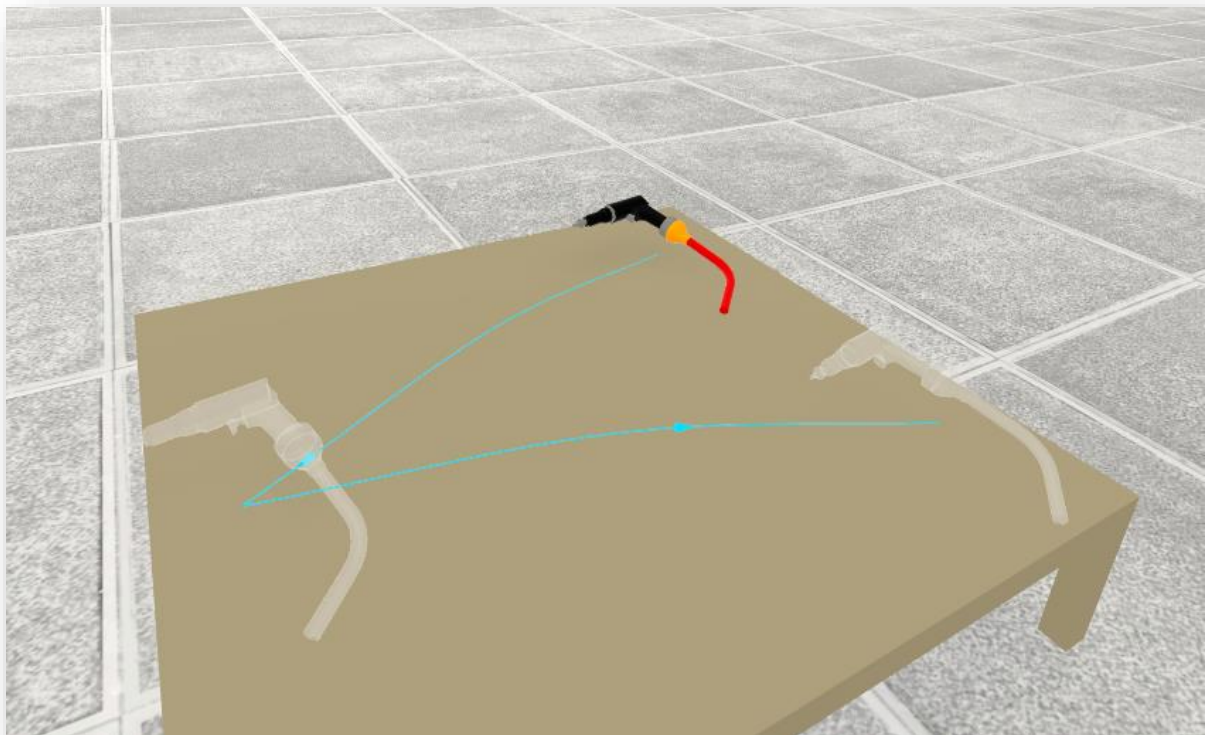
Models encountered will be either assemblies or components. When indicated, models can be grabbed and moved using the both the primary and secondary grab buttons (VR: trigger, grip; RE: left mouse button, right mouse button).

Animated Models

Animated models can be viewed in Guides if a model has an Animation Experience associated with it. If an animation is available to watch, a button labelled 'Animations' will show on the step panel. Select this button to view the available animations and play, pause, or replay them.

Ghosts

A 'ghost' is a transparent replica of a model and indicates a position requirement. An orange line connects a model and its ghost, accompanied by an animated arrow. By grabbing the model and moving it to the vicinity of its ghost, the model snaps into position.



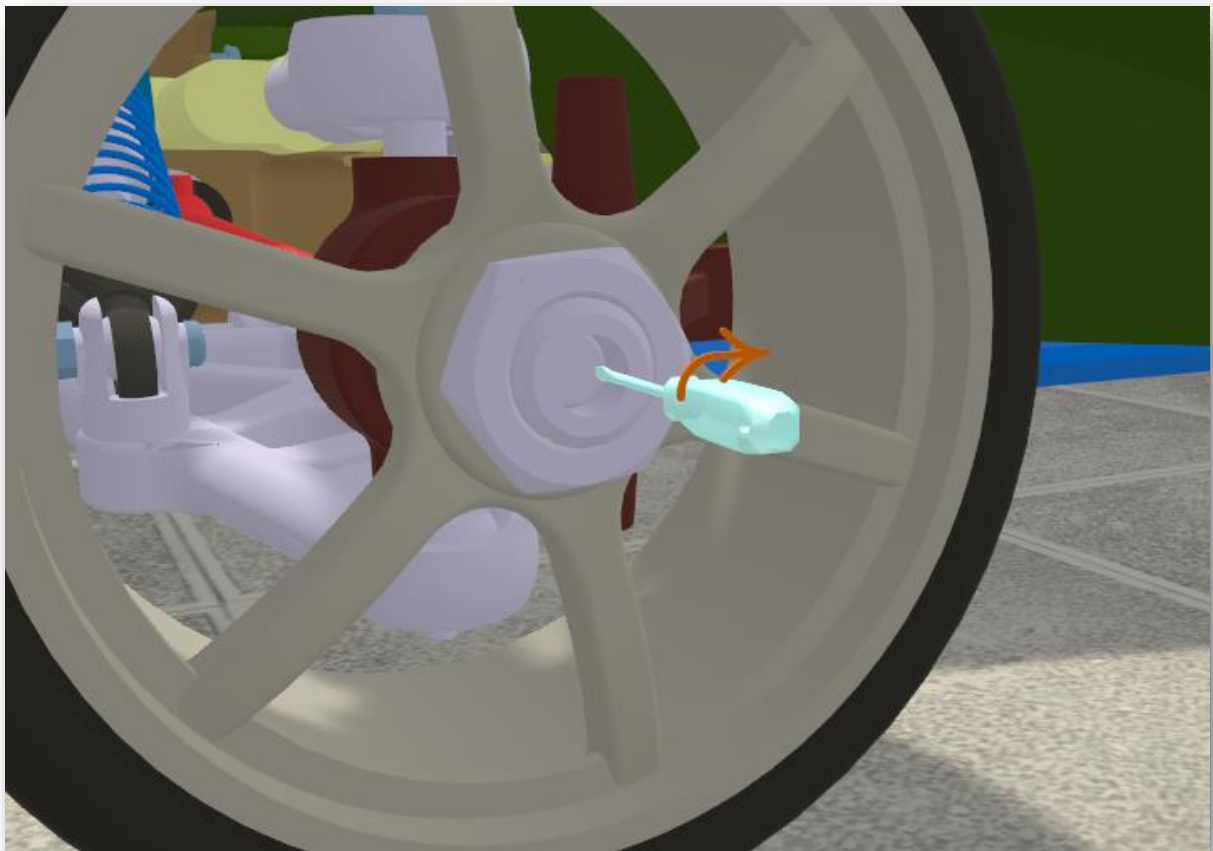
Tool Indicators and Tools

A Tool Indicator shows where a tool must be used. By equipping the corresponding tool and moving the tool near to the indicator, an animation will play, and the indicator will disappear. Currently, the tools available to equip and use are:

Flat Screwdriver
Phillips Screwdriver
Wrench
Pistol Gun

Cloth
Pliers
Glove
Adjustable Wrench

Note – the Glove tool does not show an indicator in 3D space. Instead, it can be a requirement to pick up and move objects.



This image shows a clockwise flat screwdriver indicator.

When the difficulty of the guide is increased:

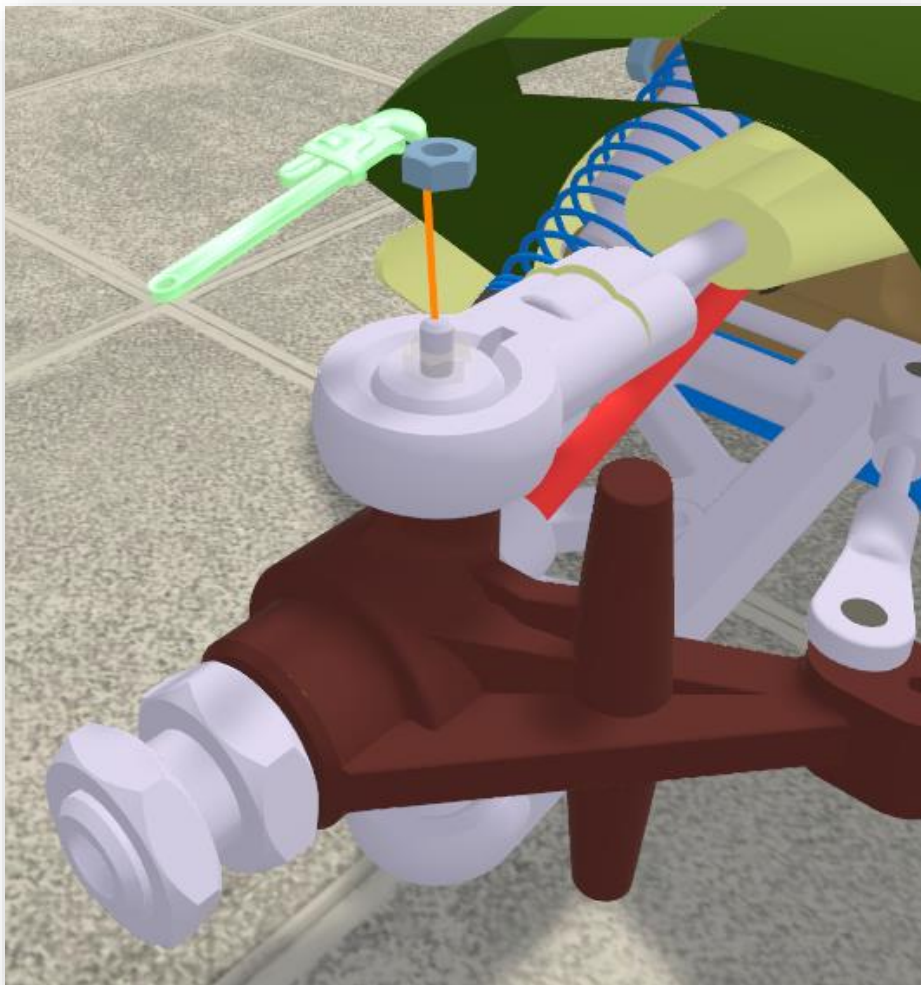
- In VR, the tool indicators are invisible, relying on the operator to remember where to use tools.
- In RE, the tool indicators become small spheres, showing that a tool must be used but not indicating which tool.

AutoMovers

Some models with active ghosts cannot be grabbed – these are AutoMovers.

AutoMovers are usually smaller objects that can be manipulated with tools, such as screws and bolts.

They will have a GREEN tool indicator nearby, which will trigger the model to AutoMove when activated with the correct tool.



When activated, the model will move along its path to the position of the ghost.

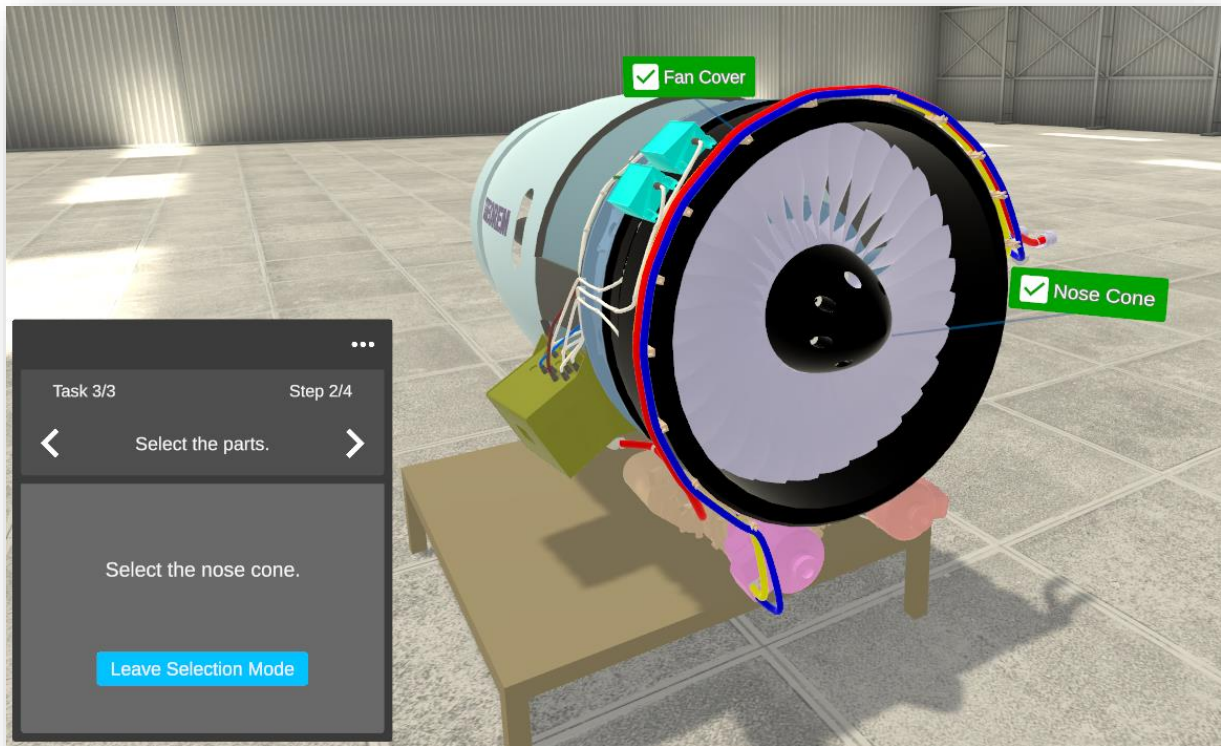
In the example shown in the image, by activating the green wrench indicator, the nut will move along its orange path into place.

Note: older versions of Guides did not show green tool indicators. To activate any AutoMovers in these guides:

- *In RE, left click on the object (the nut in the example above) and select the required tool from the menu.*
- *In VR, equip the relevant tool (the wrench) and wave it near the object (the nut).*

Selection Mode

A requirement may be to correctly identify parts.



If a selection is required, a button will show on the step panel: “Enter Selection Mode”.

After Selection Mode is toggled on via this button, the operator can point and click on parts of the assembly to select them.

When correctly identified, a green label will show. The label will persist until the end of the task (in the example above, the previous step asked the user to select the Fan Cover).

If the wrong part is selected, a red label will display for a short time, showing the name of the part selected, and a warning will be displayed in the step panel.

Selection Mode can be turned off again via the same button, which will now read “Leave Selection Mode”.

Media

Images and/or videos may be present in a guide. These will always face the camera and can be re-positioned at your convenience. Videos can be paused, rewind, and fast-forwarded.

Shapes

Shapes cannot be interacted with as an operator, but indicate objects/areas of interest, and warnings.

Shapes may have labels attached, to provide more information.



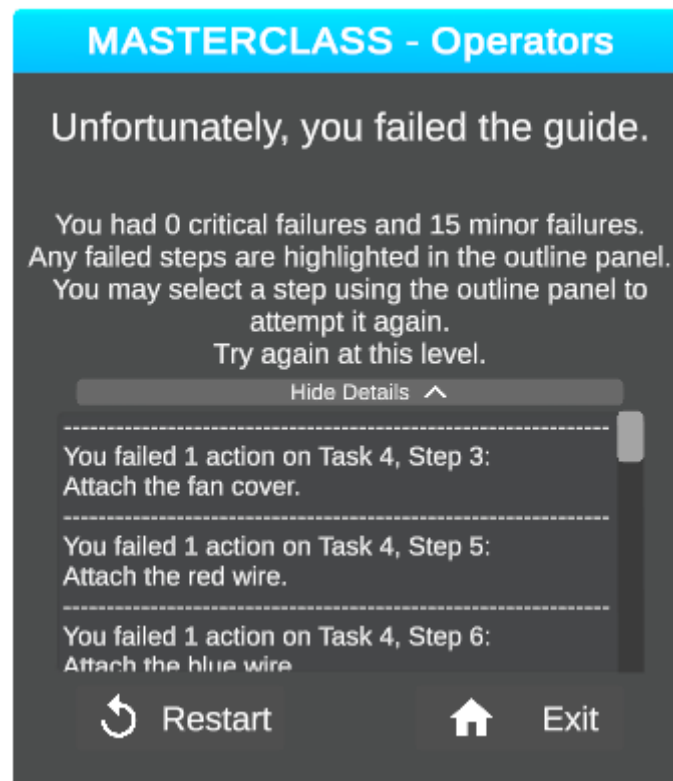
Camera View

An alternate camera view can be created at any time (VR only). A camera view consists of two parts: a camera and a viewing panel. The viewing panel shows a live feed from the camera. Once the camera is positioned, it can be hidden from view. Both parts can be manipulated at an operator's convenience.



Guide Pass/Fail

When the end of a guide is reached in operator mode, a screen will display to show whether the guide was passed or failed, giving details on any steps failed:



Red flags will appear on the outline panel indicating which steps contained a failure.

Certain steps can be marked as critical, which will result in instantly failing a guide if not completed correctly. The pass rate for minor steps is 80% (however that this is calculated based on the total number of requirements in the guide, so a guide with very few requirements will skew this result); an operator must successfully complete 80% of minor requirements to pass a guide.

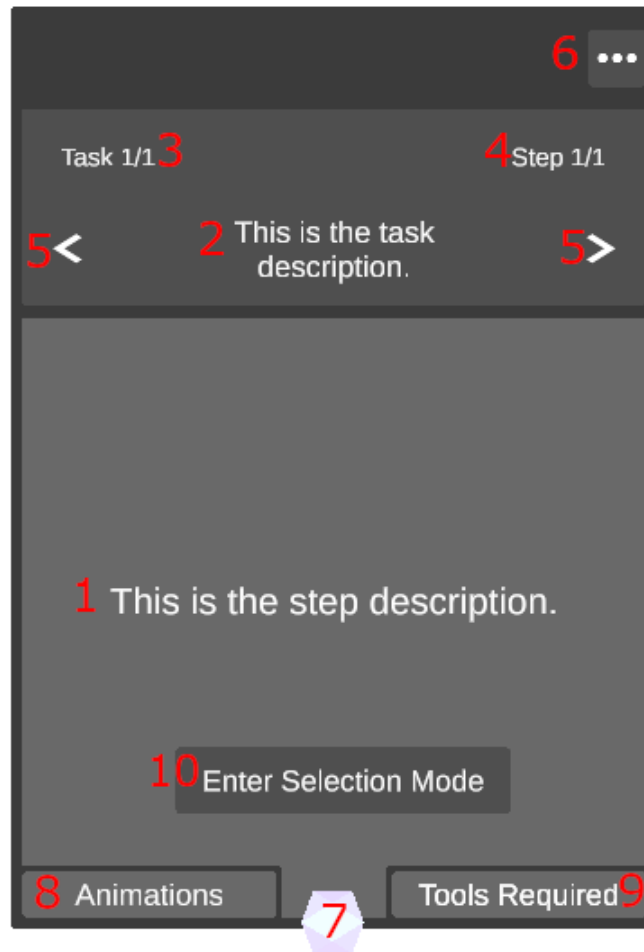
If a guide is failed, a suggestion to try again at the current or a lower training level will be given, based on the failure rate.

UI Overview – Operator Mode - VR

The UI can be summoned using the menu-hand trigger button (usually left) in VR. In TheoremRE, the UI exists displays over on screen over the environment.

Step Panel

The Step Panel shows the currently active step and relevant instructions.



1. **Step Description** – The description of the currently active step.
2. **Task Description** – The description of the currently active task.
3. **Task Indicator** – The currently active task/total number of tasks in the guide.
4. **Step Indicator** – The current active step/total number of steps in the task.
5. **Next/Previous Step Buttons** – Navigate through the guide.
6. **Menu Button** – Shows the menu.
7. **Tether Sphere** – Directs operators to a place of interest. Follow the tether line to the tether sphere to find the place of interest in the step.
8. **Animations** – If animations are available, this button will show. Click it to show the animation panel and play/pause the available animations.
9. **Tools Required** – If a tool is required this step, this button will show. Clicking the button will show the icons of the tools required on the current step. Selecting a tool icon will open the tools panel.
10. **Selection Mode Toggle** – If a selection is required on the step, this toggle will show, allowing the operator to enter Selection Mode.

Menu

Selecting the menu on the step panel shows a list of available actions, which will vary depending on whether operator or author mode is active.

In operator mode, the following functions are available:

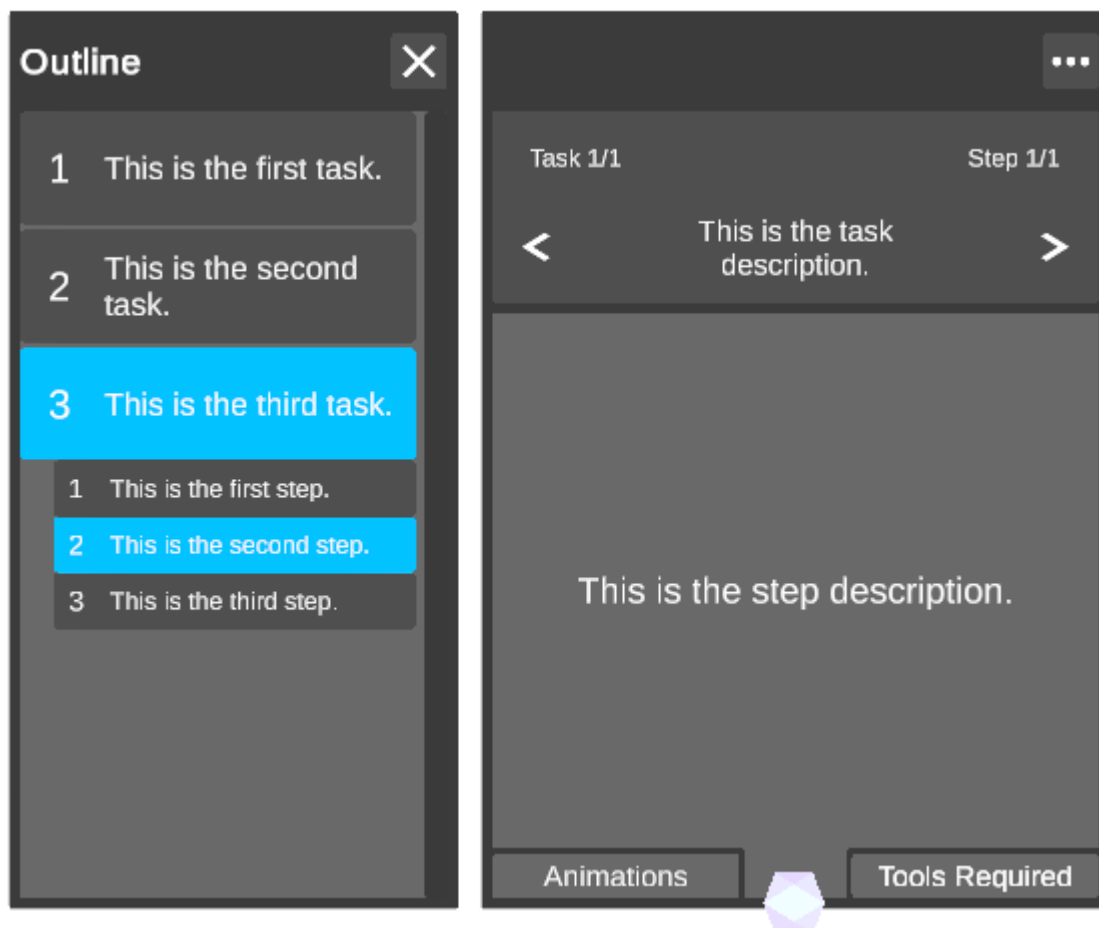
- Create a Camera View
- Show the Tools Panel
- Show the Outline Panel
- Quit

Outline Panel

The Outline Panel shows all tasks and steps in the guide. It allows users to jump between tasks and steps in a guide.

Select a task to jump to that task.

Hover over a task to display the steps in the task – a step can be selected from the dropdown to jump to that specific step.



Tools Panel

The tools currently available to use are:

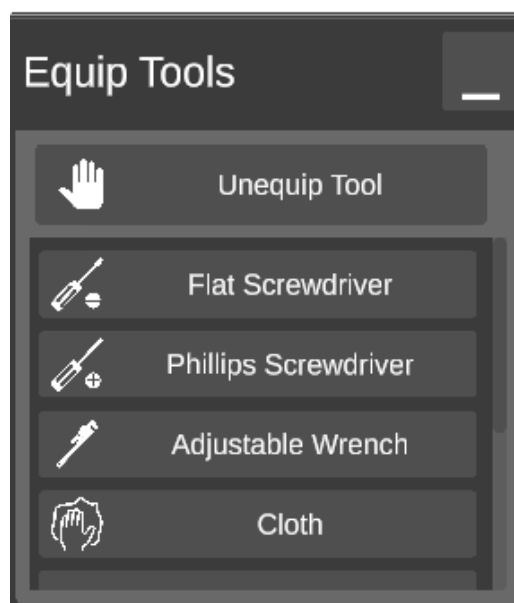
Flat Screwdriver
Phillips Screwdriver
Wrench
Pistol Gun

Cloth
Pliers
Glove
Adjustable Wrench

VR

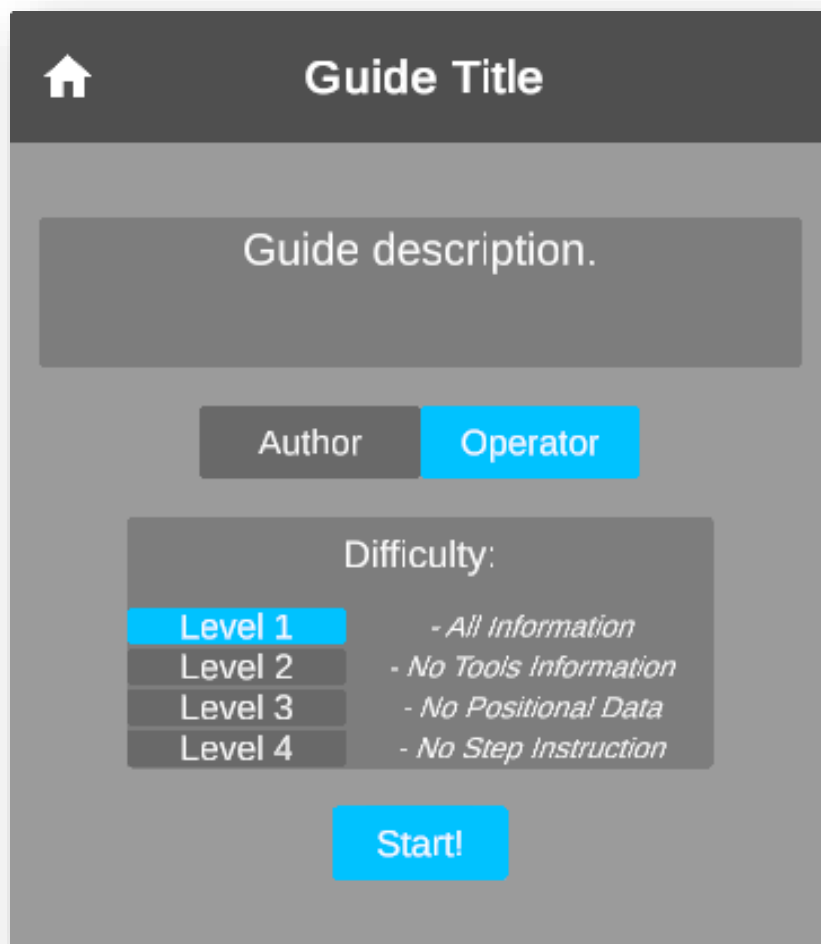
The Tools Panel allows operators to equip and unequip tools. Like the step panel, it can be positioned in space by the operator.

When a tool is equipped in VR, it will appear in the hand of the operator. The unequip button will show once a tool is equipped.



Difficulty Levels

Operators are presented with difficulty levels at the start of a guide. The levels are cumulative; for example, Level 3 (No Positional Data) also encompasses Level 2 (No Tools Information).



1. **Level 1** – Default guide state.
2. **Level 2** – Hides Tool Indicators in 3D space, and the hint on the step panel regarding tools required this step. Operators are required to know which tools to use and where to use them.
In TheoremRE, tool indicators are replaced with small spheres rather than made completely invisible.
3. **Level 3** – Hides ghosts. Operators must remember where models should be placed.
4. **Level 4** – Disables the step instruction, so each step description will read 'Step 1', 'Step 2', and so on.

UI Overview – Operator Mode - RE

UI for TheoremRE differs to TheoremVR to allow a better view for Operators and Authors.

Step Panel

The Step Panel shows the currently active step and relevant instructions. It is positioned at the bottom of the screen:



It also contains an 'Actions' panel that shows what requirements need to be met on the current step.

Outline Panel

The Outline Panel shows all tasks and steps in the guide. It allows users to jump between tasks and steps in a guide. It can be minimised and maximised using the small arrow button, on the right-hand side of the panel when it is expanded.

Select a task to display the steps in that task. A step can be selected from the dropdown to jump to that specific step.



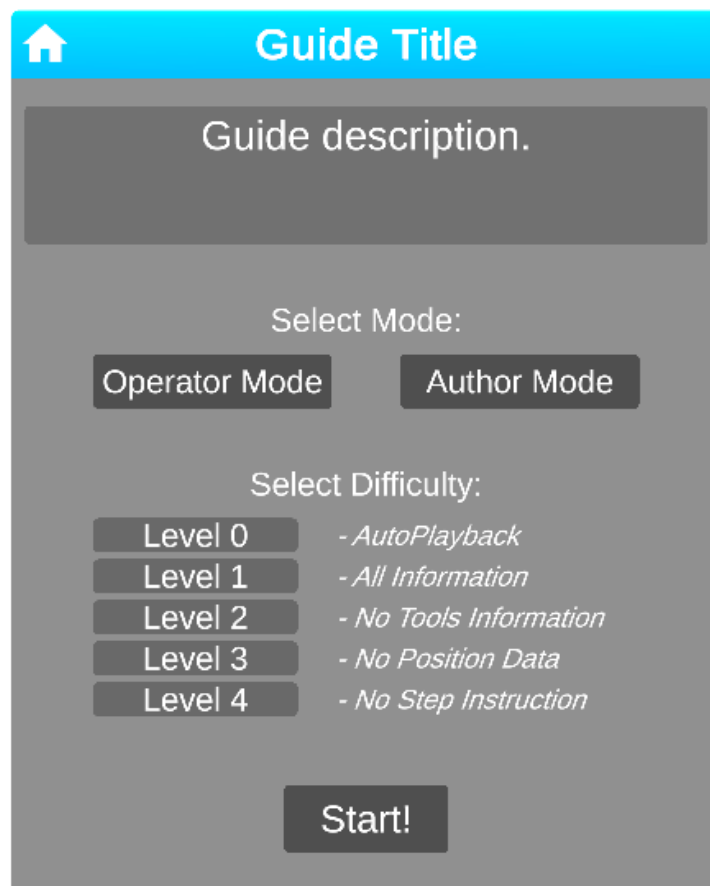
Tools Panel

To choose a tool when required, left click on the tool indicator. Note that at higher levels the tool indicator will be a simple sphere, rather than a representation of the tool.



Difficulty Levels

Operators are presented with difficulty levels at the start of a guide. The levels are cumulative; for example, Level 3 (No Positional Data) also encompasses Level 2 (No Tools Information).



The screenshot shows a mobile application interface for starting a guide. At the top is a blue header with a white home icon and the text 'Guide Title'. Below this is a grey box containing the text 'Guide description.'. Underneath is the 'Select Mode:' section with two buttons: 'Operator Mode' and 'Author Mode'. The 'Select Difficulty:' section follows, featuring a list of five levels, each with a button and a description: Level 0 (- AutoPlayback), Level 1 (- All Information), Level 2 (- No Tools Information), Level 3 (- No Position Data), and Level 4 (- No Step Instruction). At the bottom is a large 'Start!' button.

1. **Level 0** – Auto Playback. RE Only. This will only be available if the guide has been set up for Auto Playback by the author. In this mode, all requirements in the guide will be performed automatically with the operator simply stepping through each step/action.
2. **Level 1** – Default guide state.
3. **Level 2** – Hides Tool Indicators in 3D space. Operators are required to know which tools to use and where to use them. In TheoremRE, tool indicators are replaced with small spheres rather than made completely invisible.
4. **Level 3** – Hides ghosts. Operators must remember where models should be placed.
5. **Level 4** – Disables the step instruction, so each step description will read 'Step 1', 'Step 2', and so on.

Author Mode

2D Authoring

Create a Guide on the server via Data -> Guides -> New Guide.

From this page, the name, description and folder of the Guide can be chosen, as well as the layout to be loaded with the Guide.

The Guide Layout

Models that are part of the layout are there for scenery and cannot be interacted with within Guides. Any non-interactable models you wish to include in a guide should be loaded in with the layout; for example, a laboratory scene could be created as a layout and furnished with workbenches. The guide could then be launched from this layout, and interactable guide objects placed on top of the workbenches.

Create new Guide

Name

Description

Folder

Please select the folder in which to place this guide

Name	Description
☐ Common	A shared resource for all customers

<

1

2

>

Production Layout

Please select a layout option for this guide

☐ Use default Layout for guides
 ☒ Use an existing Layout

Search

Name	File Size	Modified Date	ModelName
☐ ProductionLayout	1Kb	Wednesday, 25 March 2020, 12:23:36 Greenwich Mean Time	_sphere
☐ ProductionLayout	1Kb	Wednesday, 25 March 2020, 12:23:36 Greenwich Mean Time	factory

Showing 1 to 5 of 8 rows

<

1

2

>

The 'default Layout for Guides' can be changed by navigating to Manage -> Settings -> Miscellaneous Settings, under 'Register Default Layout for Guides'.

The layout chosen can be changed at a future date by returning to this page.

Once a guide has been created, click the 'Edit Guide' button to begin authoring the guide. From the Edit Guide page, Tasks and Steps can be added, edited, and deleted:

Theorem Experience Server Licensing Models Manage RemoteExpertSessions 1 Log off

Edit Guide

Perform a limited set of edits to an existing guide. This page is primarily intended for adding tasks, steps, media and models to a newly created guide.

Name

Example Guide

Description

Guide for Tutorials.

Tasks

Drag and drop tasks using the icon to reorder.

Please note that media/models may be configured on a per step basis and that rearranging the tasks and steps here doesn't change media/model configuration.

+ Add Task

Tasks

Drag and drop tasks using the icon to reorder.

Please note that media/models may be configured on a per step basis and that rearranging the tasks and steps here doesn't change media/model configuration.

✚ This is the first task. (click to expand)

Description

This is the first task.

Steps

Drag and drop steps using the icon to reorder. Steps can be moved across tasks if your screen is large enough.

✚ This is the first step. (click to expand)

Description

This is the first step.

Delete this step

✚ This is the second step. (click to expand)

Description

This is the second step.

Delete this step

+ Add Step

Delete this task

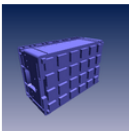
+ Add Task

Models and Media (Photos/Videos) that are required for the Guide are also added on this page (they must first be uploaded to the Non-Processed section of the server).

Models

Specify models for use in the guide.

The models can be configured per step (position, visibility, hidden/moved components etc) within the Guides app. Configured models are not removable from this page to avoid data loss.

☐	Image	Id	Name	Is Configured	Remove
☐		356520de-c951-4454-9221-4dd6f2685271	BlueCrate	false	<button>✕ Remove</button>

 Add model(s)

Media

Specify medias for use in the guide.

The media items can be configured per step (position, visibility etc) within the Guides app. Configured media items are not removable from this page to avoid data loss.

☐	Id	Name	Is Configured	Remove
☐	ff193129-d40f-4d27-8eff-1fb40f6cb880	603.jpg	false	<button>✕ Remove</button>

 Add media item(s)

Additional Models and Media can be added at a later stage by returning to this page.

When guide creation is finished, save the guide using the 'Update Guide Experience' button at the bottom of the page. It will now be available for use in TheoremRE and TheoremVR.

Following 3D Authoring, it is possible to re-arrange the steps in the guide or insert new ones ***provided the Theorem Experience Server version is 20210625 or later*** (the version is listed on the 'About' page). Attempting to re-arrange steps using a previous version of the server following 3D Authoring will cause existing objects placed in the guide to appear on the incorrect steps.

Data Backups

It is **strongly advised** that backups are made of guides that are completed to a good standard following 3D Authoring. This can be done on the server by going to Data -> Guides, then clicking the link in the 'Download' column and storing the 'guide.exp' file in a safe location.

If the data somehow becomes corrupted or overwritten, the guide can then be restored (on the same server) by going to Data -> Guides -> Upload. The file must have the name 'guide.exp' when it is uploaded to the server.

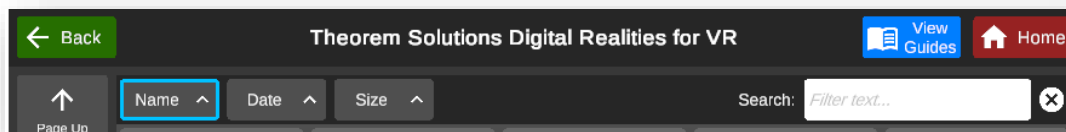
3D Authoring

It is recommended that Guides are authored in TheoremVR, as positioning an object in 3D space on a 2D screen (as in TheoremRE) can be cumbersome.

To see specific notes for Authoring in TheoremRE, please go to the end of the document. However it is recommended to read over the notes in this section to become familiar with the concepts, even if authoring in RE.

Guides can only be accessed whilst in Single User mode.

If '*GuidesSupport*' (or older preference '*Guides_Support*') is enabled in the Client Preferences, the 'View Guides' button will show in the top-right corner of the Select Model panel:



Clicking this button will show the guides available. Select a guide to load it.

Once the guide has finished loading, select 'Author Mode' to begin authoring.

Objects and Interactions

This section provides a general overview of the different objects and interactions available in Guides, as well as outlining core concepts. It is advisable that a new Author practices some of the examples in this section before attempting more complicated guides.

Whilst in Authoring mode, all objects on a step save and store their position and hidden state when the next/previous step button is pressed.

When a step is loaded, the object checks its stored information for that step, and positions and orients itself accordingly.

There are different types of objects that an author can add to a guide:

Server-based:

Components

Assemblies

Animated Models

Media (Images and Videos)

Provided with software:

Tool Indicators

Shapes

Components and Assemblies

Models made available to a guide can be loaded in as either components or assemblies.

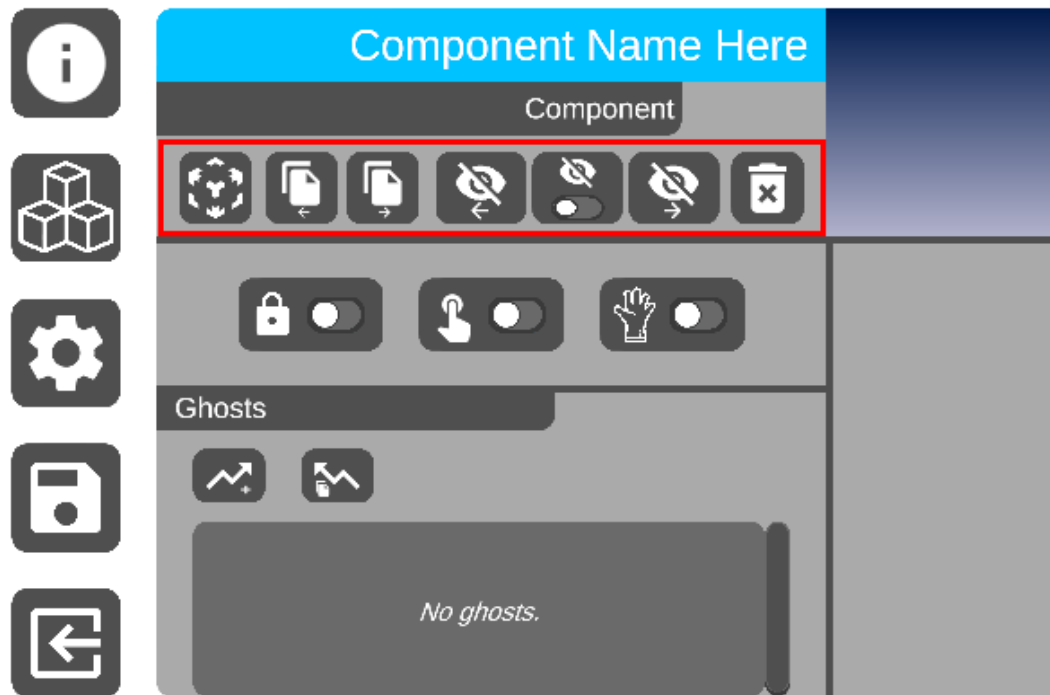
Components are models that are collapsed to a single assembly level.

Assemblies are not collapsed – each part, or ‘node’, of the assembly can be manipulated to different positions and hidden on different steps. Additionally, the nodes will remember their default position and orientation in the assembly.

Similar actions are available to components and individual nodes of an assembly; however, assemblies are vastly more complex to navigate. It is recommended that new authors become confident with the basic elements of authoring a guide (manipulating, copying, hiding, and deleting elements across different steps) using components before attempting assemblies. These key features are outlined in the next section.

Manipulate, Copy, Hide, Delete

These are the core functions, available to almost all objects. They are highlighted in the red box in the image below (please note, the Author Panel layout will be covered with more detail later in the document). Using a combination of these functions, an author can dictate on which steps a model/tool/shape/image/video will be visible, and where it will position itself.



From left to right:

Manipulate

- Manipulate the object shown in the UI via the manipulation box.

Copy

- Copy the object's position to previous steps of the guide.
- Copy the object's position to future steps of the guide.

Hide

- Hide the object in previous steps.
- (Toggle) Hide/unhide the object on the current step.
- Hide the object in future steps.

Delete

- Delete an object from the guide.

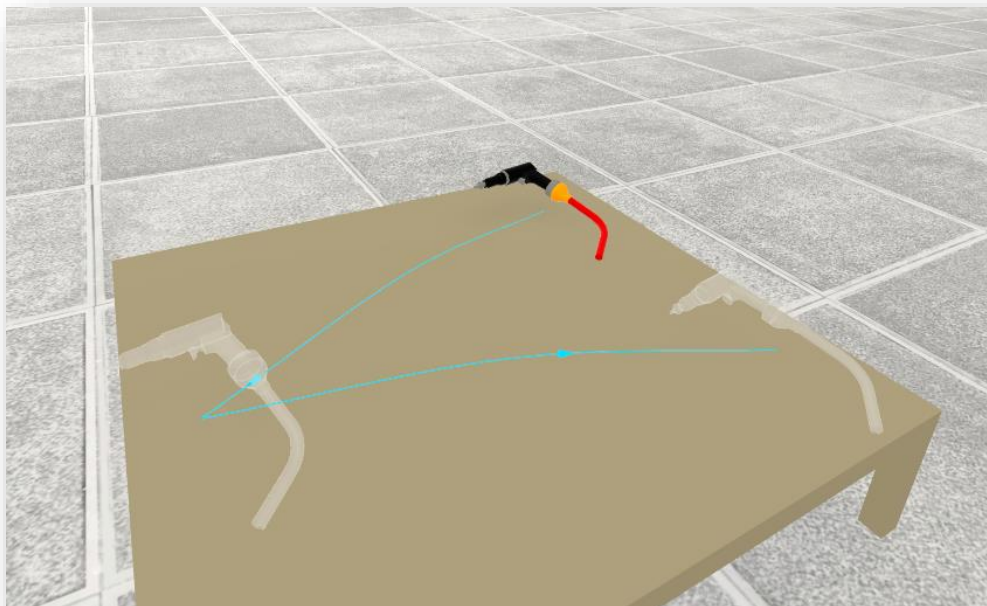
For example: if an author wished for a component to exist on steps 2, 3, and 4, this could be achieved via the following actions:

1. Load the component on Step 2.
2. Manipulate the component and place it in the desired space.
3. Hide the component in previous steps.
4. Copy the component's position to future steps.
5. Go to step 4.
6. Hide the component in future steps.

This will result in the component appearing in the same position for steps 2, 3, and 4.

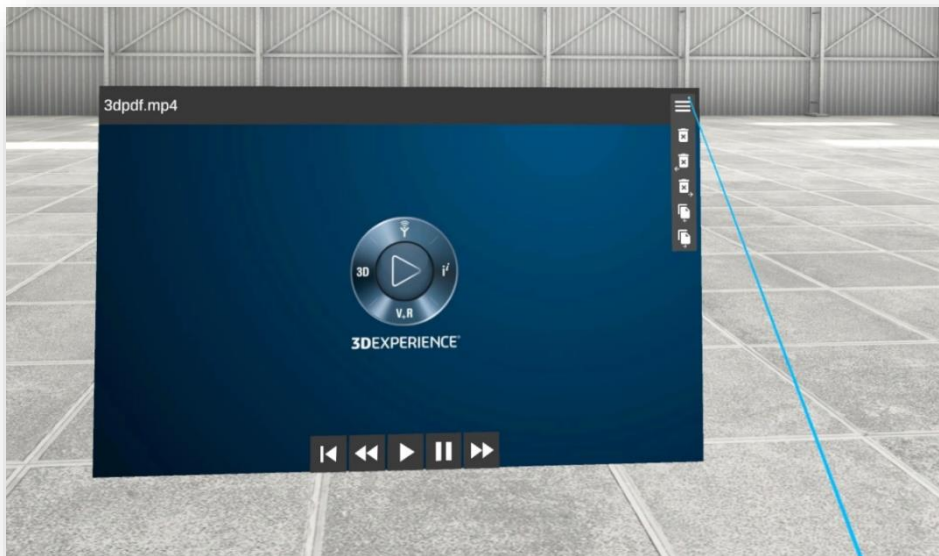
Position Requirements - Ghosts

Components and assembly nodes can be given additional 'ghost' positions. The term 'ghost' refers to almost-transparent copies of components or assembly nodes, that indicate positions for operators to move a node or component to. They are connected to their parent component by ghost lines and animated arrows. Multiple ghosts can exist for one object on a single step:



Shapes and Media

Photos and videos can be added to steps in media panels. Media panels will always load in their saved position at the start of the step but can be moved by operators.



Shapes consist of arrows, hands, areas, and hazard symbols. These can be used to draw the operator's attention. All can be scaled. Arrows and hazard symbols can be animated. Areas can be re-coloured. Hands can be changed to a pointing, grabbing, or open hand position.



Tools

Tool indicators can be placed in a guide, which creates a tool requirement on the step. An operator must equip the relevant tool and move it to the indicator.

The image below shows a screwdriver indicator positioned in 3D space, showing where an operator should use a screwdriver.



An operator must equip the screwdriver and 'activate' the indicator for the requirement to be met.

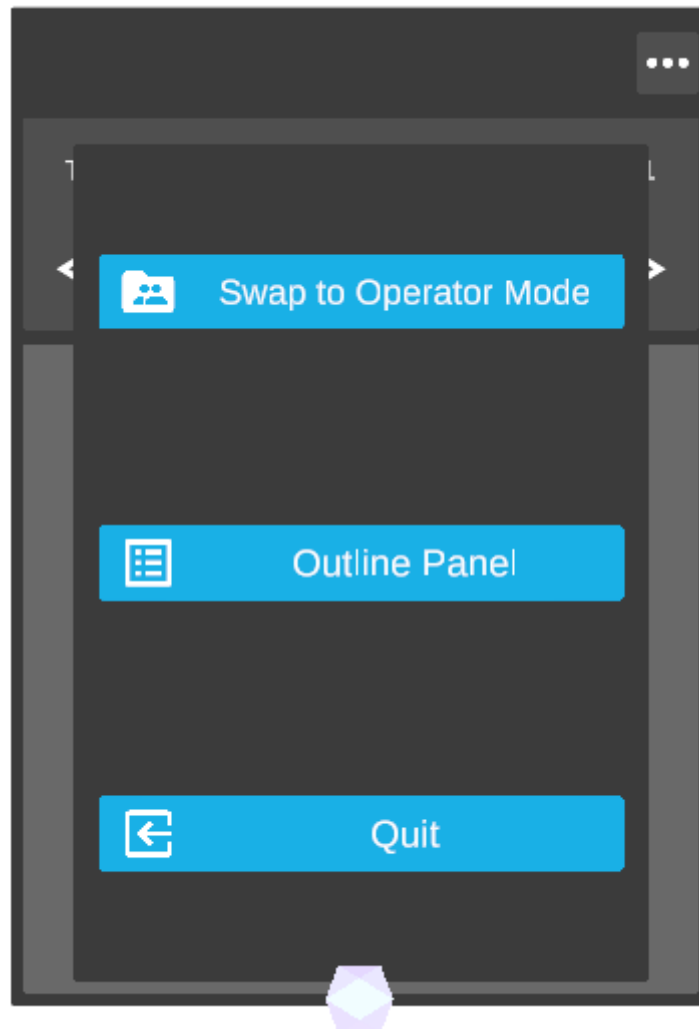
A glove requirement can also be set via the UI panel (no 3D indicator) for components and assembly nodes, which requires an operator to equip a glove before picking up the object. If the operator fails to do this, a warning will show when they attempt to move to the next step stating that they completed the step incorrectly.

UI Overview – Author Mode

This section will cover the various UI menus available to Authors.

Step & Outline Panels

See the Operator Mode UI Overview for a full overview. The step panel will display the same for authors as for operators, with mode-specific functions shown in the menu.

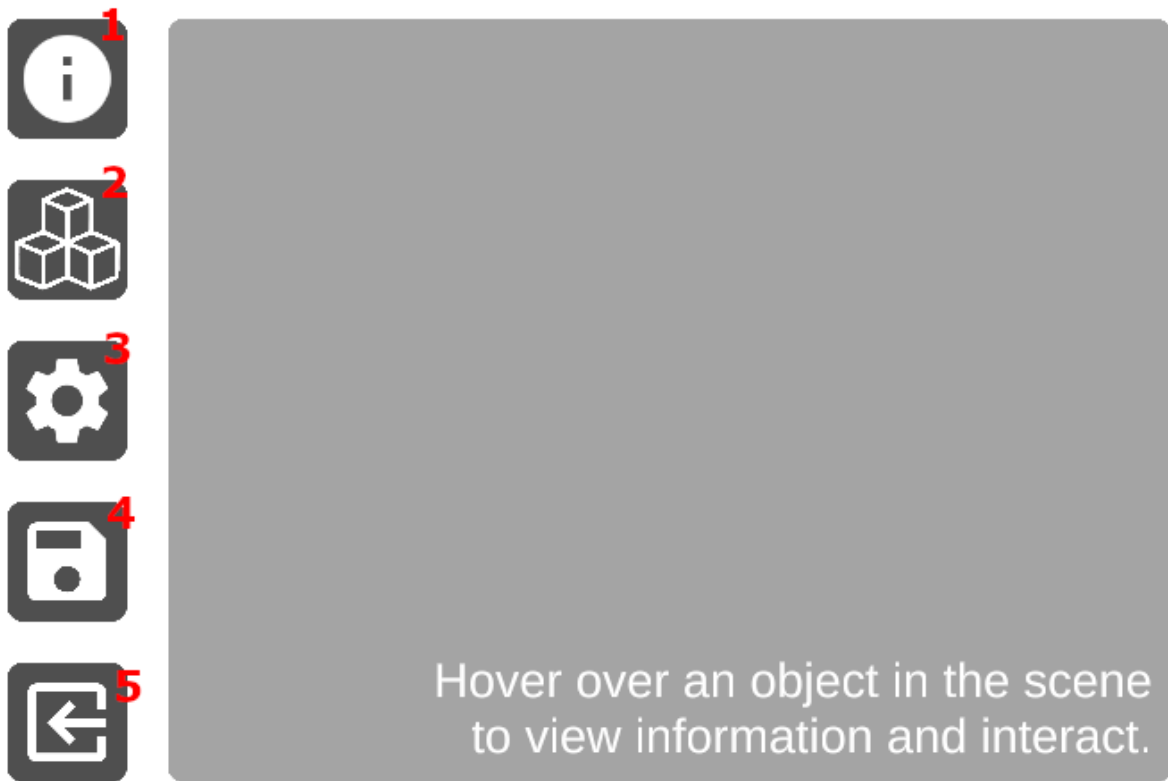


- **Author/Operator Mode Toggle** – use this to quickly test a step as it would be presented to an operator.
- **Quit Button** – Please note that the save prompt will appear on the Author Menu (attached to your hand) when this button is pressed in Author Mode.

Additionally, when in author mode the tether sphere can be positioned in the scene to lead operators to points of interest. When the tether has been positioned, a 'Reset Tether' button appears in its place on the panel, which will re-attach the tether sphere to the step panel.

Author Menu

Authors have access to a panel attached to their menu hand, which gives access to all actions associated with assemblies, components, shapes, tools, and media, as well as saving the guide.

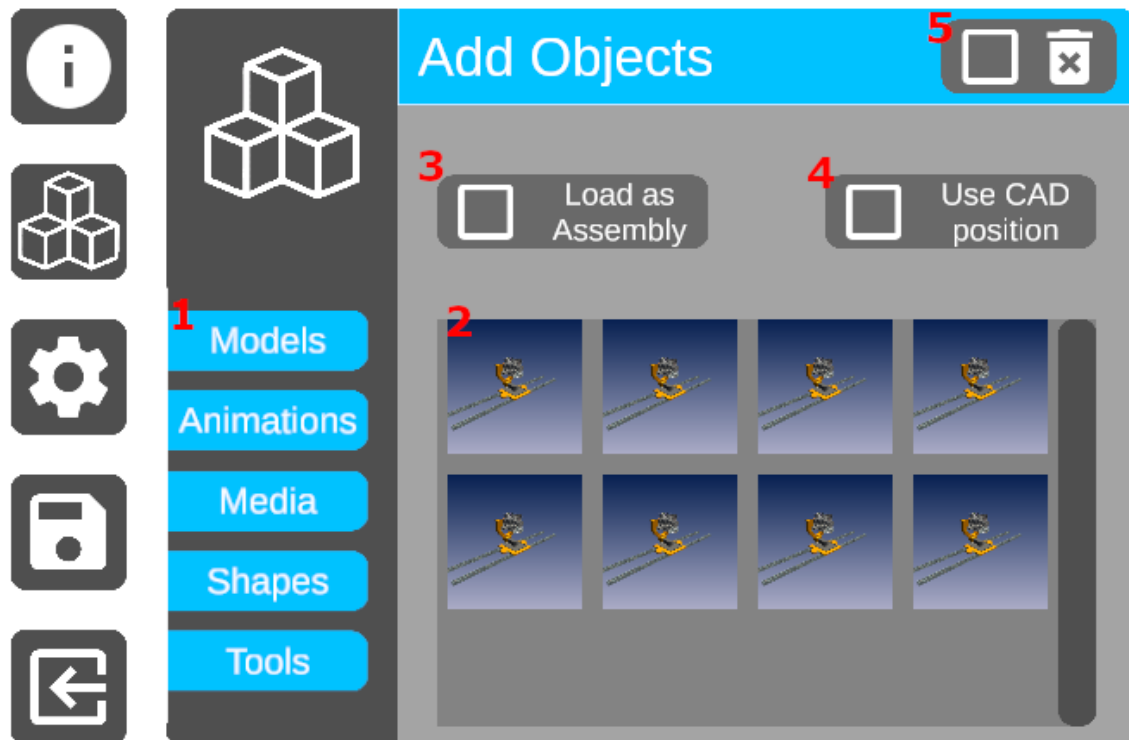


1. **Info Panel Button** – Shows the Info Panel view. The info panel shows information on the currently highlighted object (assembly, component, or shape). When no object has been highlighted, it displays text as shown in the image above.
2. **Add Media Panel Button** – Shows the Add Media Panel view. This panel is used to add new components, assemblies, images, videos, tools, and shapes to the guide.
3. **Settings Panel Button** – Shows the Settings Panel view.
4. **Save Guide Button**
5. **Exit Guide Button**

Almost every UI button has a tooltip explaining its function, which can be shown by hovering over the button.

Add Objects Panel

This panel is used to add models, media, shapes, and tools to the guide.

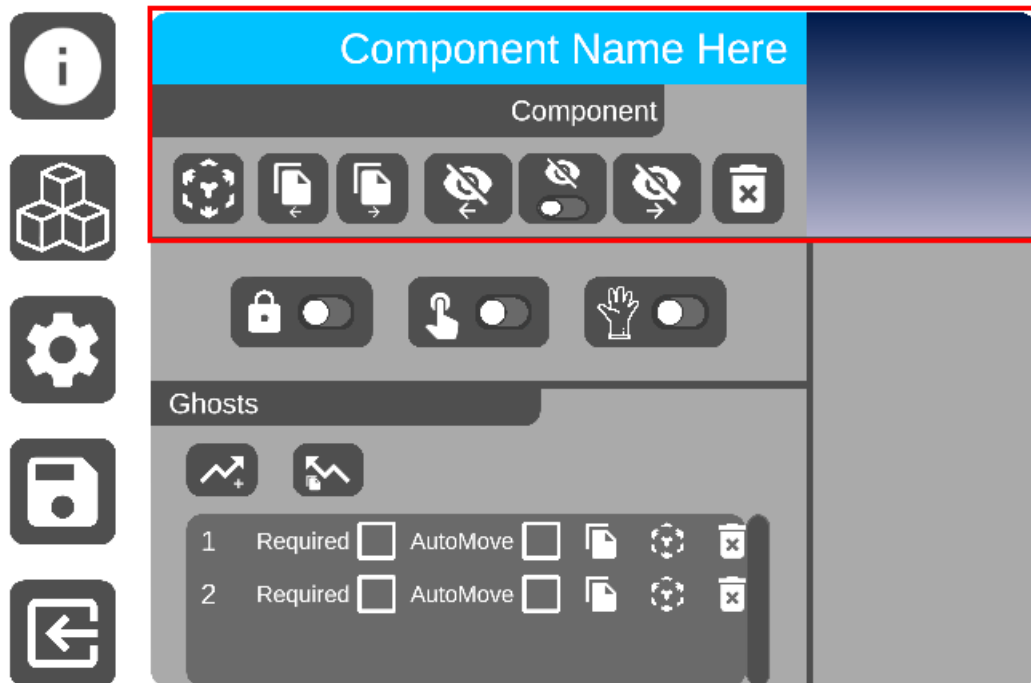


1. **Type** – Use these buttons to switch between object types. The animation and media buttons may be disabled if there are no objects of this type available to add to the guide.
2. **Thumbnails** – Click to add to the guide.
3. **Load as Assembly Toggle** – Only available on 'Models' view. When toggled, the model will load as an assembly rather than a component.
4. **Use CAD Position Toggle** – Only available on 'Models' view. When toggled, the model will load in its position as specified in the CAD data, with the origin determined by the layout model of the guide.
5. **Delete Mode Toggle** – When toggled, the author can point at click at any Guides Object in the scene to delete it (red bounding boxes will show around objects when delete mode is on). The toggle will automatically switch off when this panel is closed.

Information Panels

To view information on an object, hover the pointer/mouse over the object (model, shape, tool, etc) – the relevant information will be displayed on the info panel.

The top area of the info panel will always remain the same:

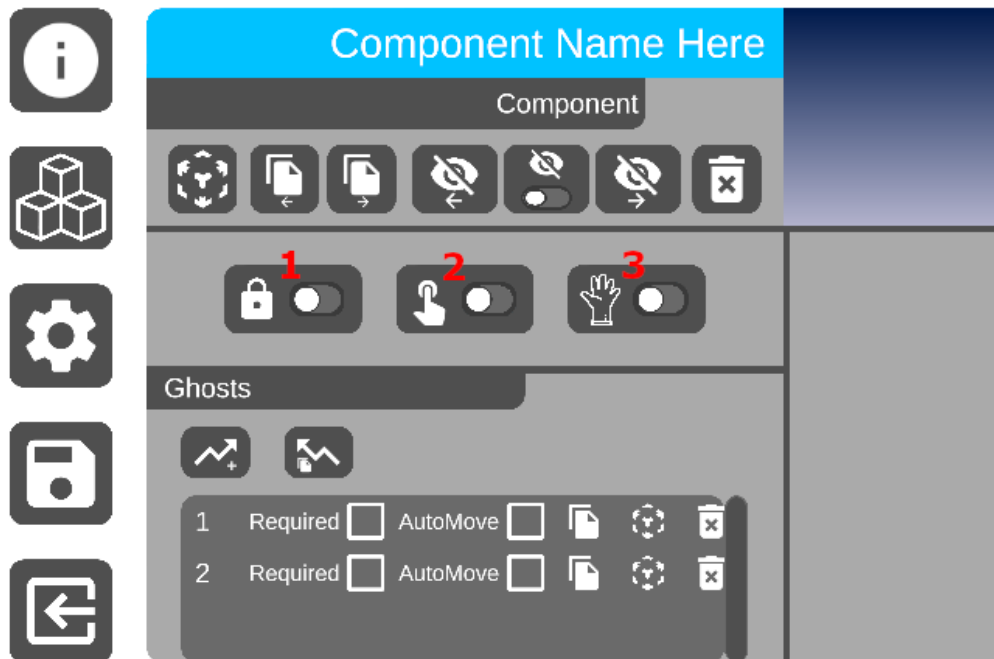


This area shows:

- The name of the highlighted object. The names of assembly nodes and components can be edited by clicking in this box.
- The Type (in this case, Component)
- The thumbnail for the object
- The core buttons (Manipulate, Copy, Hide, Delete).

The area below this will change depending on the type of object highlighted.

Components

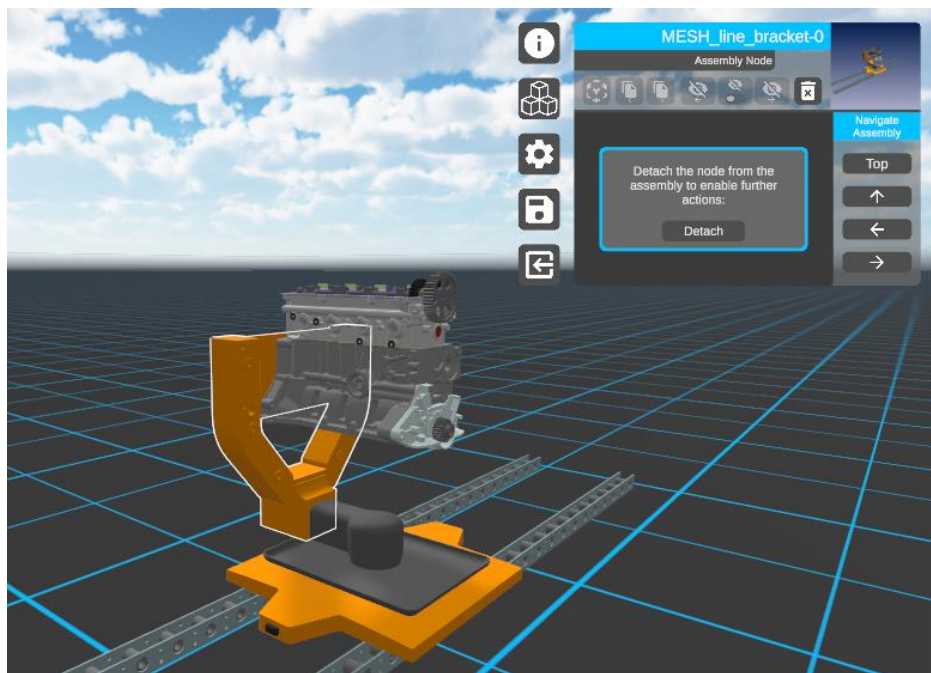


1. **Lock Component** – lock the component so that it cannot be moved.
2. **Selection Requirement** – add a selection requirement on this step. The operator will have to enter selection mode and click on this component during this step. These are covered in more detail later in the document.
3. **Glove Requirement** – add a glove requirement for this model.

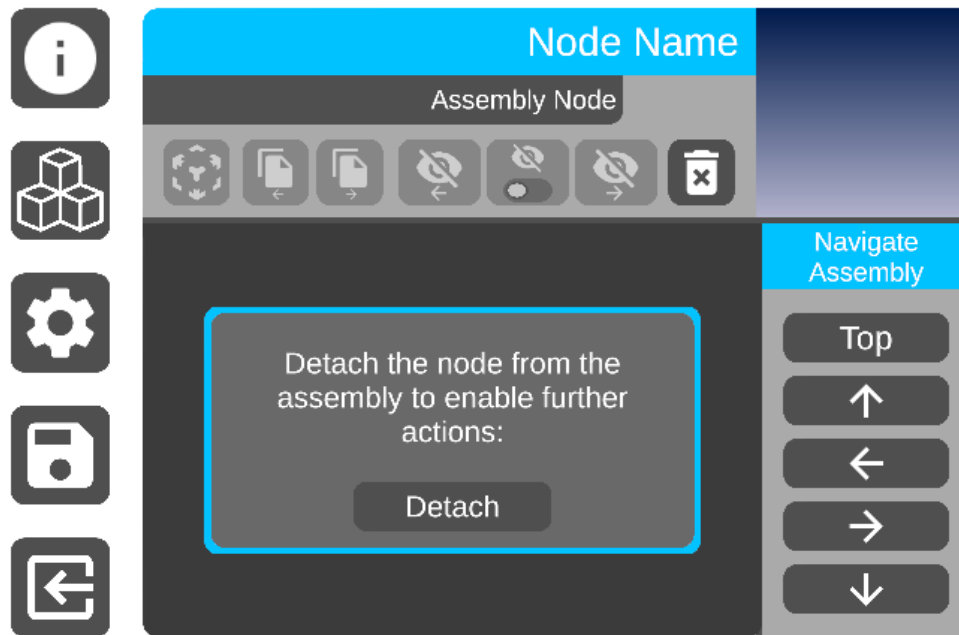
In addition to these buttons, the Ghosts section of the Info Panel will display when hovering on a component. The Ghosts section of the panel is covered later in this document.

Assembly Nodes

When hovering the pointer over an assembly, the part of the assembly that the pointer falls on will become the currently highlighted node and information about the node will display on the panel:



In the image above the bracket has been highlighted by the author, and the panel shows the relevant information for that node.

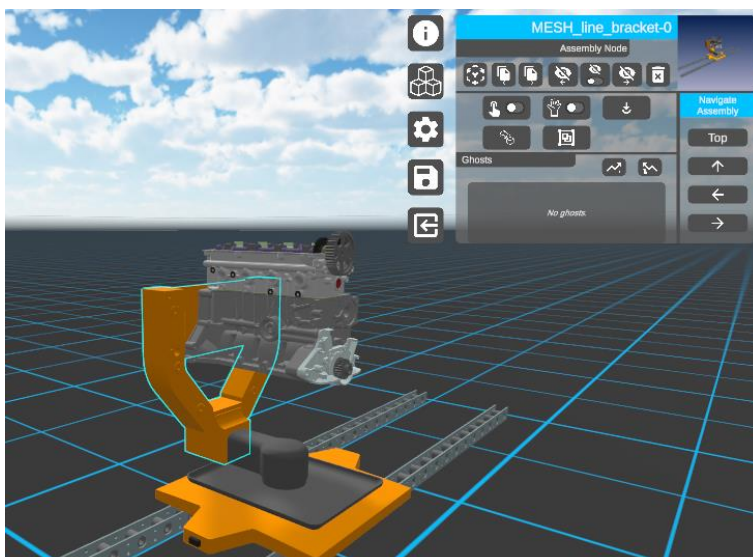


The 'Navigate Assembly' buttons on the Info Panel become available when examining an assembly. You can use these buttons to walk through the hierarchy of the assembly. As you walk up/down/through the tree, you will see the white highlight in the scene be applied to the relevant objects.

Assembly nodes must be detached from their assemblies via this panel to be manipulated as individual parts. Until this is done, the core buttons (manipulate, copy, and hide) will be disabled – as shown in the above image.

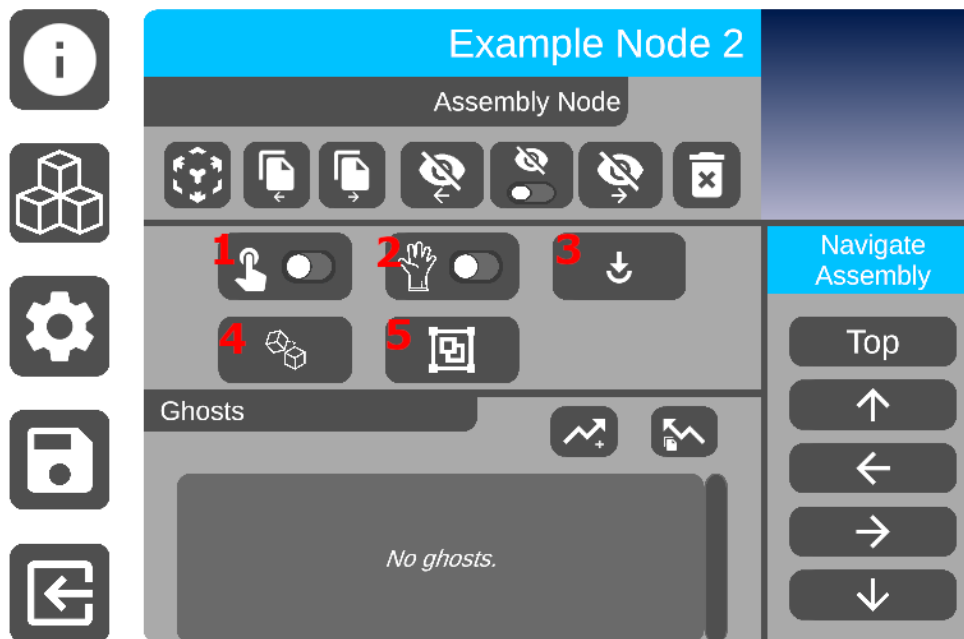
There is one exception to this rule – the top node. Click 'Top' on the 'Navigate Assembly' section of the panel after an assembly has been loaded into the scene to jump to the top node of the assembly.

The top node is useful for manipulating the entire assembly, but actions performed on the top node will not affect any detached nodes.



After a node has been detached, its outline will be cyan in the scene when highlighted, as shown on the left.

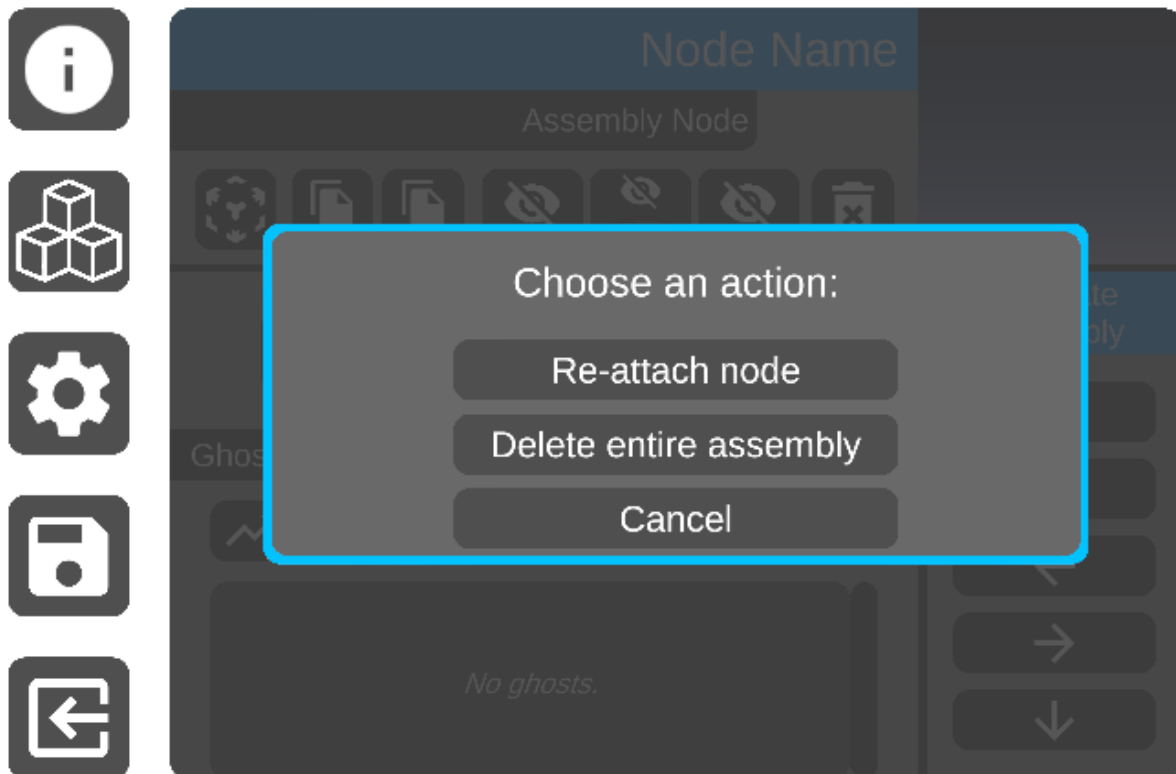
The top node (and any detached nodes) will show up on the panel like so:



1. **Selection Requirement** – add a selection requirement on this step. The operator will have to enter selection mode and click on this component during this step. These are covered in more detail later in the document.
2. **Glove Requirement** – add a glove requirement for this model.
3. **Restore to Original Position** – this will move the node back to its original/CAD position and rotation (not applicable to the Top Node of the assembly, unless loaded in CAD position).
4. **Restore Orientation** – restore the node to its original rotation.
5. **Groups** – add to and/or edit node groups.

The Ghosts section of the panel is covered later in this document.

Once a node has been detached, the 'Delete' button offers two functions, which will be presented to the author when it is pressed:



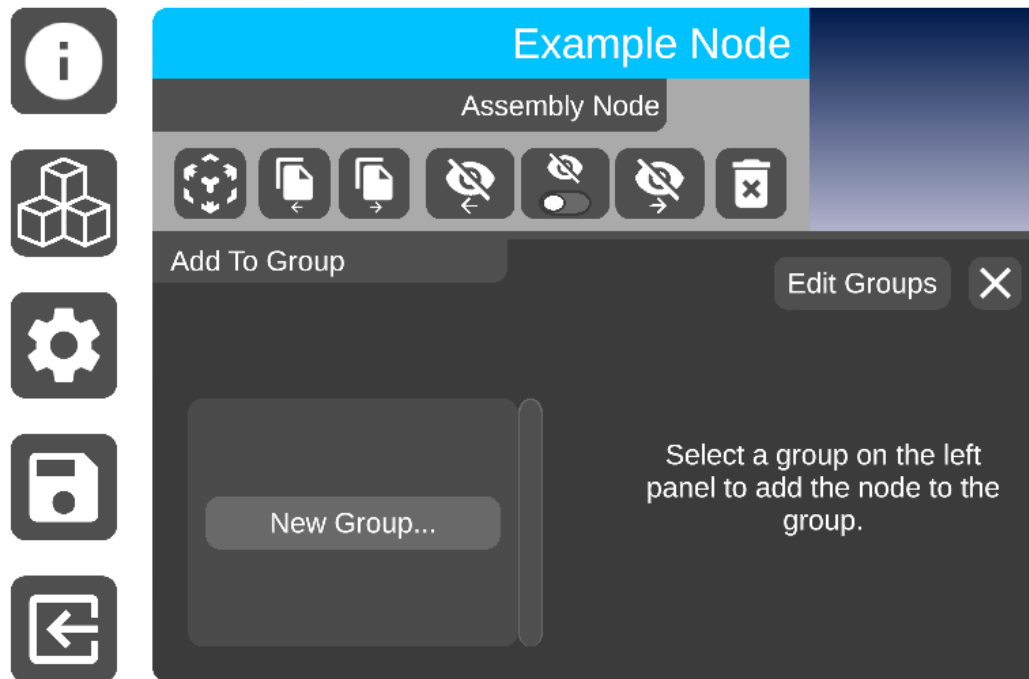
Re-attaching a node restores it to its original position and deletes any positional/hidden/selection requirements that were associated with it, so use with caution.

Deleting the entire assembly will remove all nodes, whether they have been detached or not, and eliminate all data relating to the assembly from the guide.

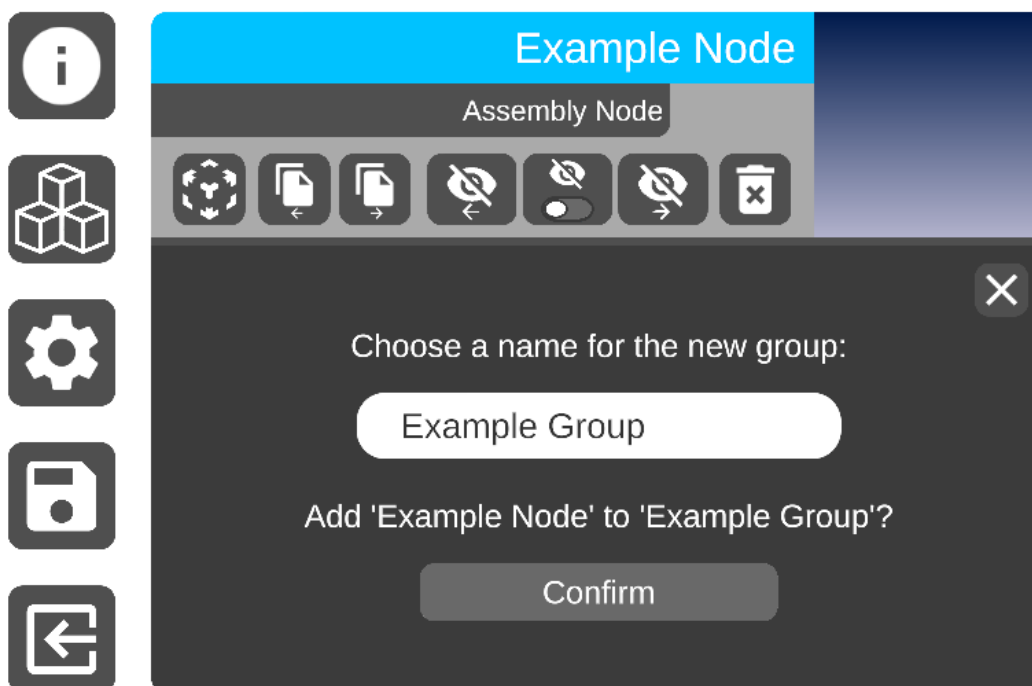
It is recommended that when pulling an assembly apart for an operator to re-assemble, authors work backwards from the final assembled step. If working through a disassembly, work forwards.

Node Groups

It is possible to group individual nodes and treat them collectively as a single node. Select the 'Groups' button on the panel when an assembly node is highlighted to show the following panel:



A new group can be created by selecting the 'New Group' button on the left. A prompt will appear to name the group:

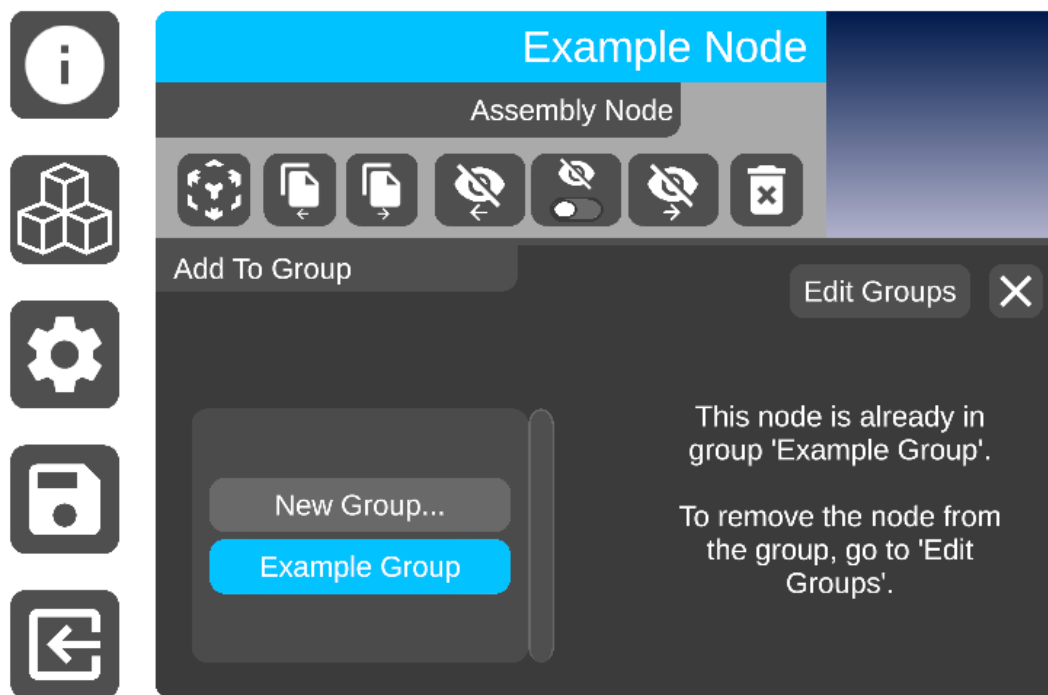


The node will automatically be added to the group that was created.

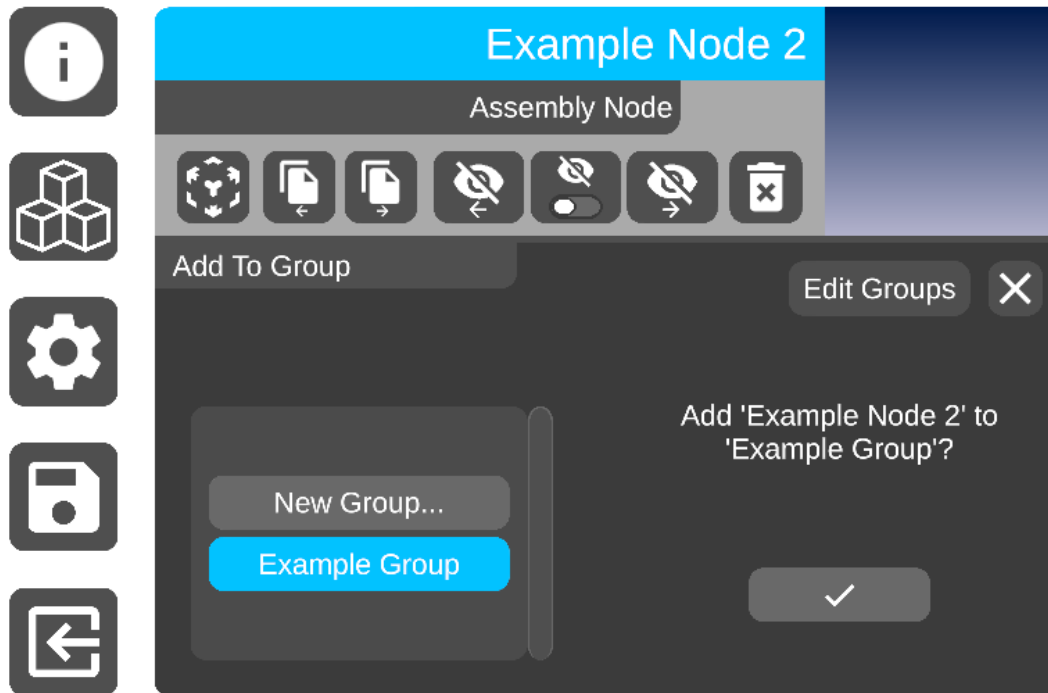
The node used to create a group is the 'core node' of the group. All nodes added afterwards will use the core node's position as their reference point in the assembly.

When a group is first created, the node will return to its original position in the assembly, so it is advisable to create a group from a node prior to moving the node.

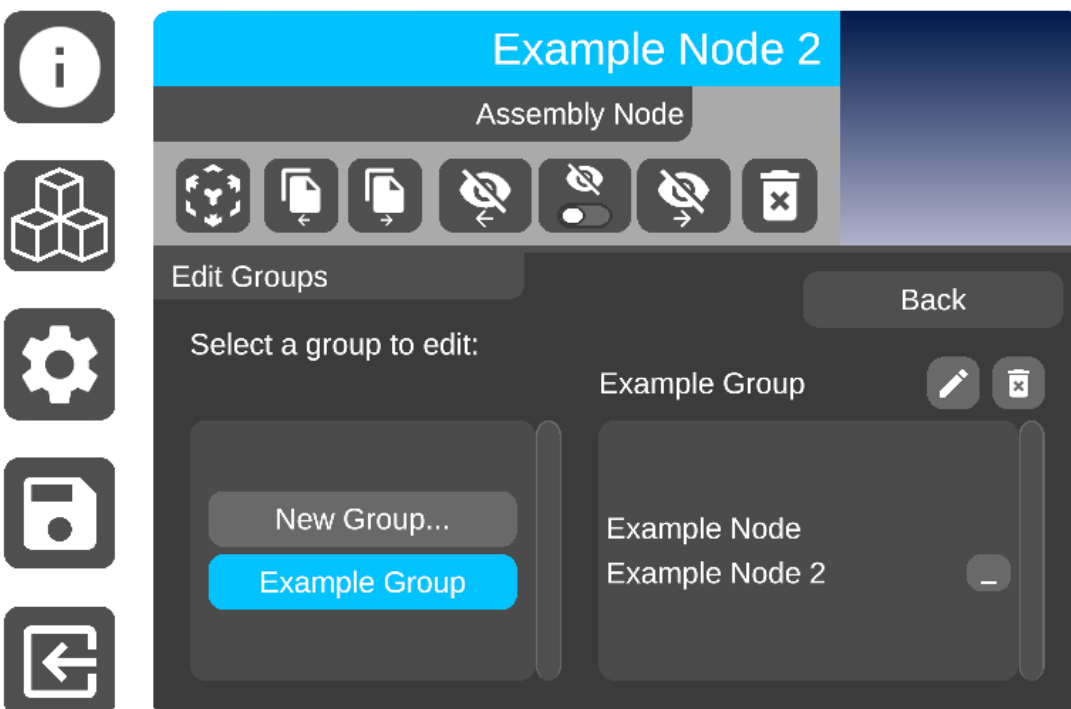
After creating the group, it will appear in the list of groups on the left:



Further nodes can now be added to the group, by highlighting the node, opening the panel, and selecting the group that was created previously:

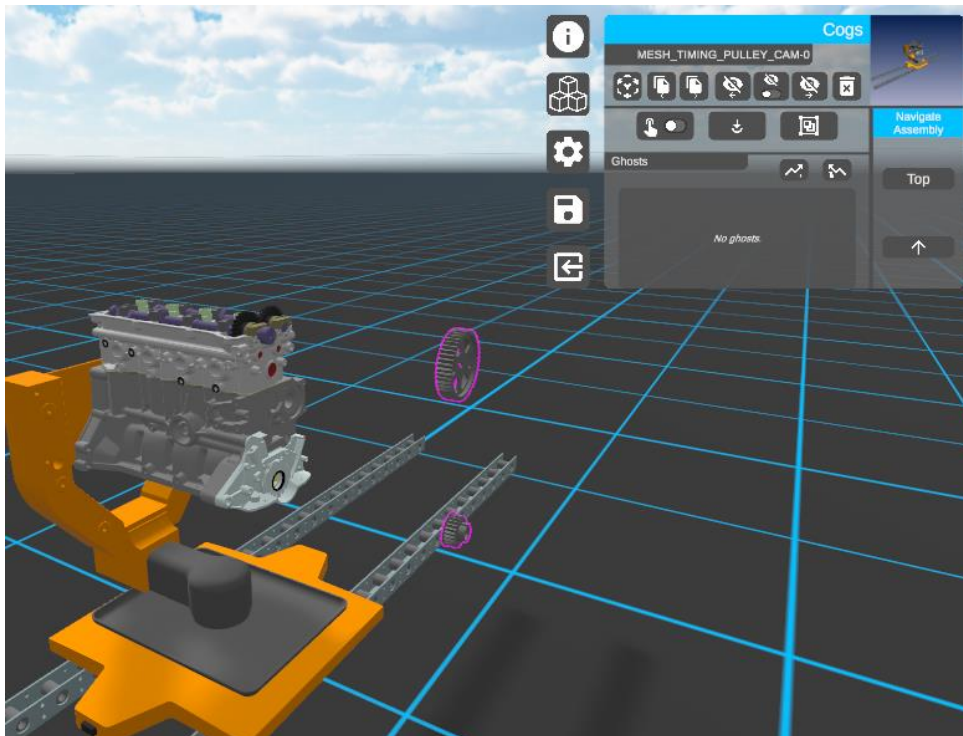


Selecting the 'Edit Groups' button shows the 'Edit Groups' panel. The group can be renamed and deleted, and nodes can be removed from the group here:



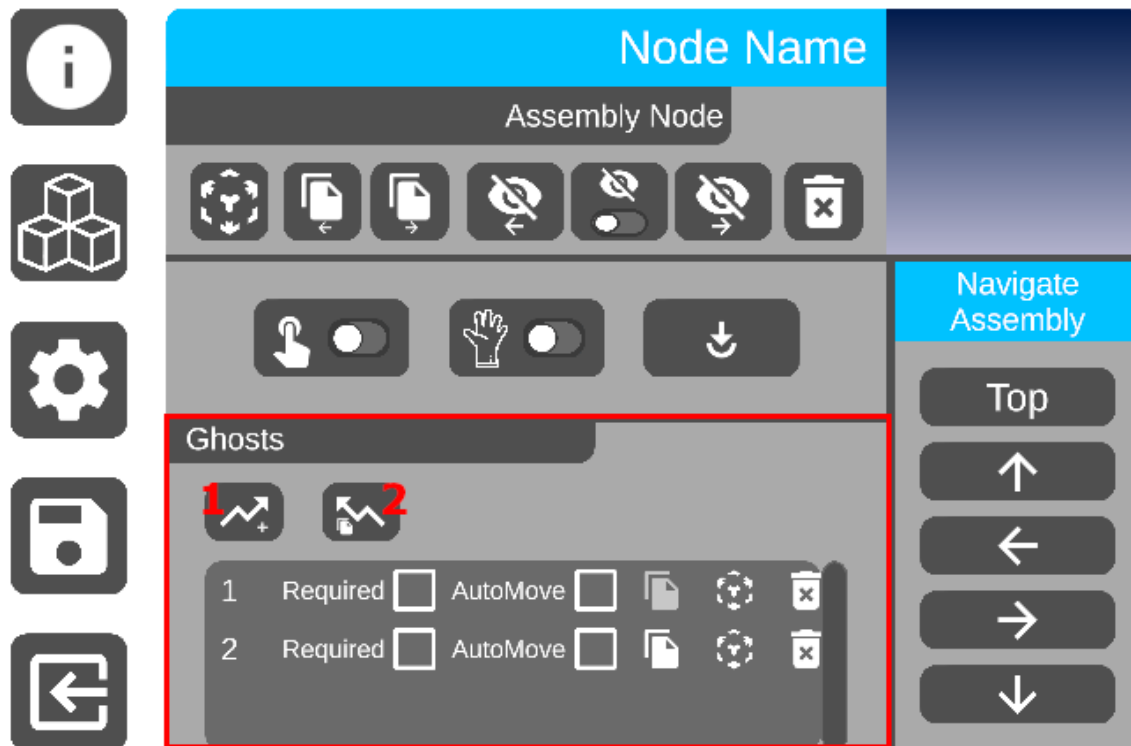
The first node added ('Example Node' in this case) cannot be removed, as groups cannot exist without a node.

Once a node group has been created, when hovering over any node in the group, the entire group will be highlighted. The highlight colour for groups is magenta. The name of the group will show on the info panel.



Ghost Area

The Ghost Area of the Info Panel will display when either a Component or detached Assembly Node is highlighted.



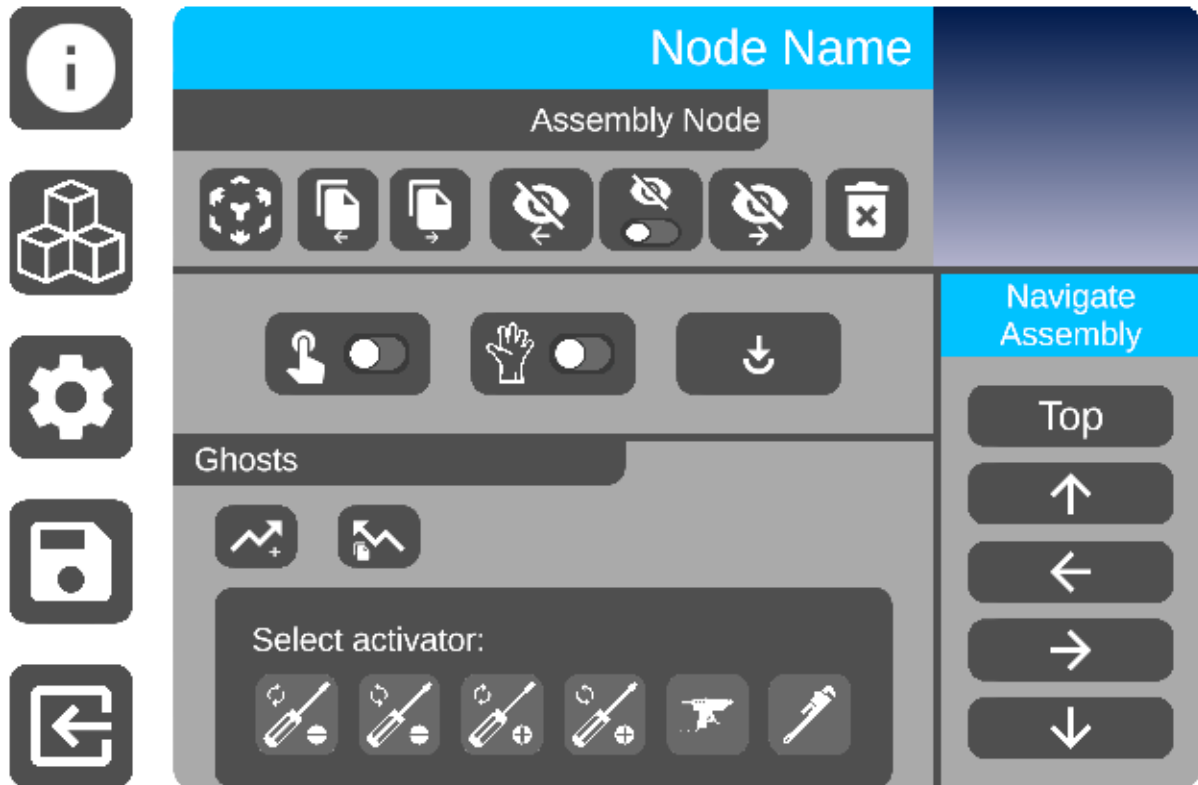
1. **Add Ghost Button** – adds a ghost on the current step. For components, this ghost will appear somewhere in front of the author. For assembly nodes, the ghost will always appear in the node's assembled position.
2. **Add Ghost on Previous Step Button** – creates a ghost on the previous step at the position of the object in the current step.

When a ghost is created, a row will appear in the listing. The copy, manipulate, and delete buttons do the following:

- **Copy Ghost's Position** – This takes the ghost's current position and uses it as the starting position of the component on the next step.
- **Manipulate Ghost** – Create a manipulation box around the ghost, for precise placement.
- **Delete Ghost** – Removes the ghost.

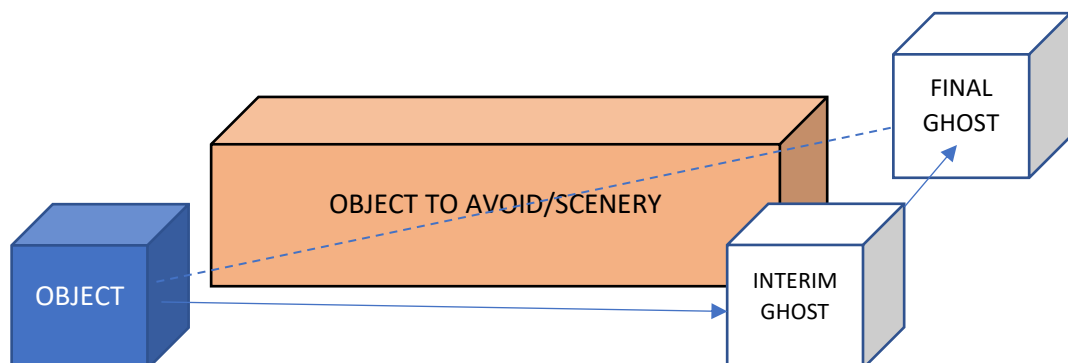
Each ghost can also be flagged as 'AutoMover' and/or 'Required'. These are more advanced features:

AutoMover Toggle – See the notes in the operators' section of this guide for an introduction to AutoMovers. These are particularly useful for screws/bolts in an assembly. Once toggled on, you must select the tool activator required to trigger the movement (the menu is shown in the image below). The tool will appear somewhere close to the author and can be repositioned in the scene.



Required Toggle – This is most easily explained with an example. A straight line connects an object with its ghost. When instructing an operator to move an object from A to B (Object to Final Ghost), an author might find that the ghost line (dashed) would intersect through other objects in the scene if point B is around a corner or behind another object. Therefore, the author will create multiple ghosts to break the path into sections (interim ghost).

If this is the case, set the Required Toggle to OFF for any intermediate Ghosts. This will allow the Operator to successfully complete the step if attempting the Guide on Level 3 or higher (in which ghosts are not visible, and the operator may take a different path).



Selection Requirements

A Selection Requirement instructs an operator to demonstrate their knowledge of parts.

Once an operator has correctly selected the object, a green label will appear with the name of the node or component (remember, names of detached nodes and components can be set by clicking their name on the info panel):



These labels will persist until the end of the current task.

If an operator selects the wrong object, a red label will appear, and a warning will show on the Step Panel.

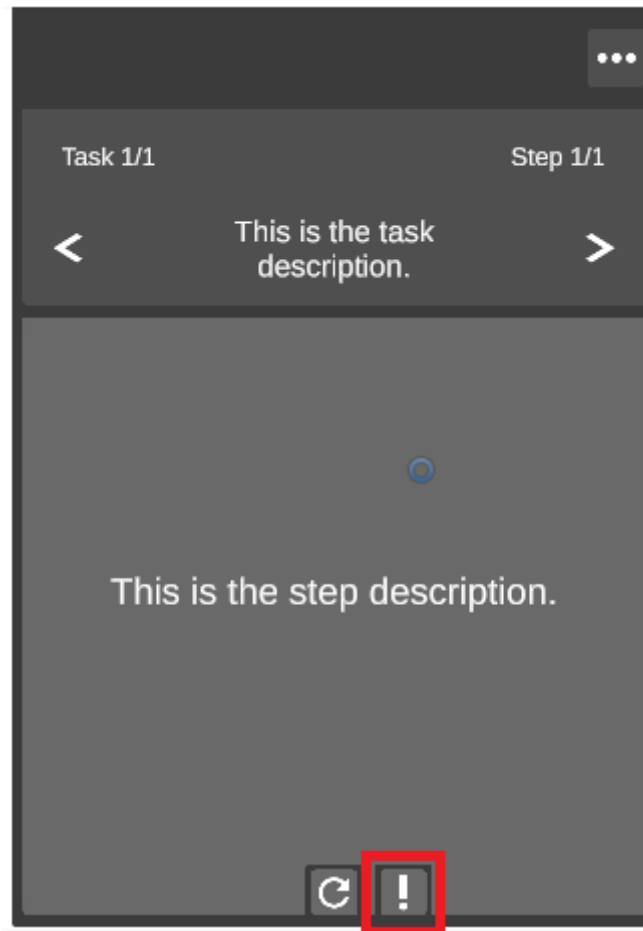
Glove Requirements

Setting a glove requirement will perform a check to see if the operator has the Glove tool equipped when attempting to move a node or component.

If the operator was not wearing a glove, a warning will show when they attempt to move to the next step that states they completed the step incorrectly.

Critical Steps

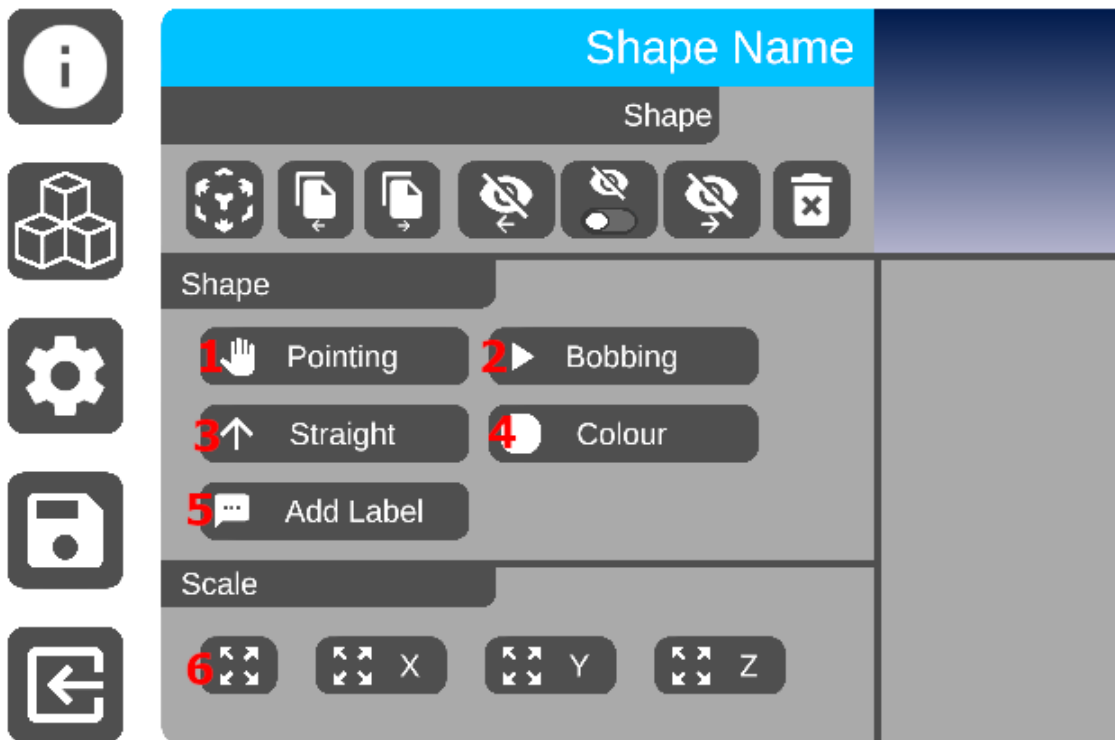
A step can be marked as critical by using the exclamation button on the step panel in Author Mode:



If an operator fails a requirement on a critical step, they will fail the guide.

Shapes

The shape panel contains a selection of buttons (1-5), not all of which will be applicable to every shape, and the scale area (6).

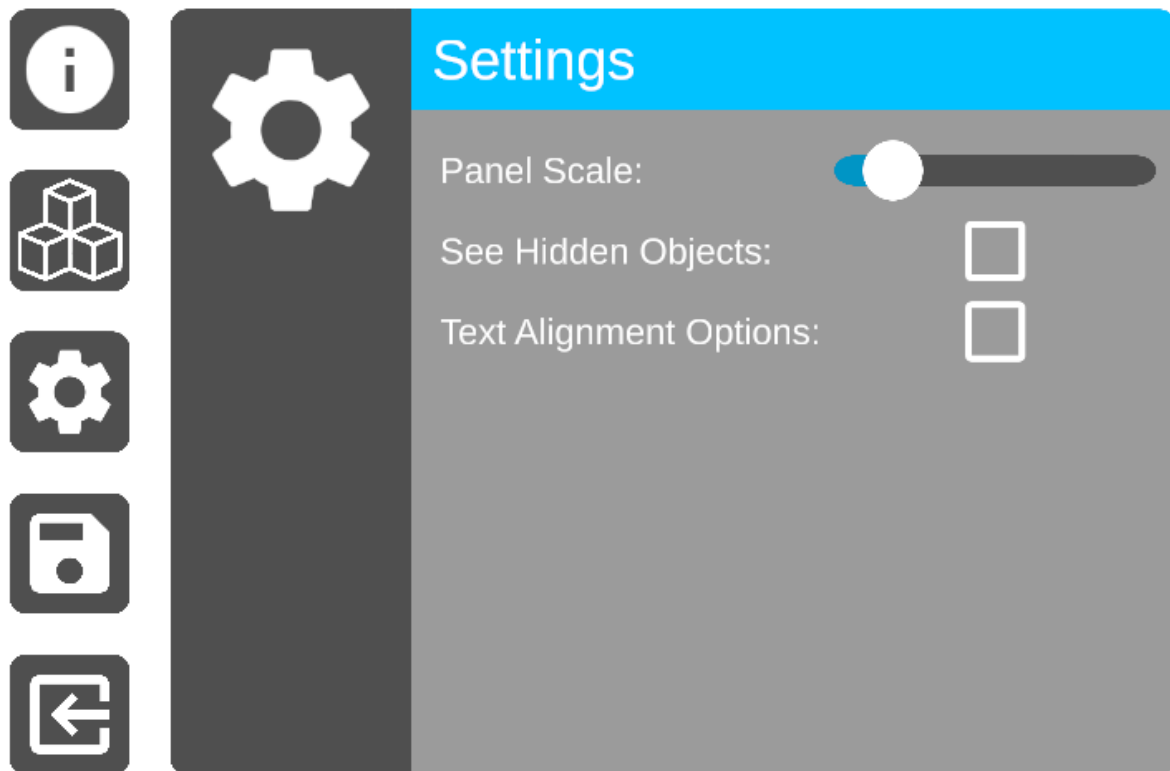


1. **Hand Type** – for hand shapes, click here to go through the open hand/pointing/grabbing settings for the hand shape.
2. **Animation Setting** – arrows and hazard symbols can be set to rotate/bounce/blip. Click this button to cycle through the animations available.
3. **Arrow Curvature** – arrows can be set to straight or right-angled.
4. **Colour** – area type shapes can be assigned colours. Click this button to open a colour picker and choose the colour from there.
5. **Add Label** – labels can be added to appear with shapes. For example, you may wish to add a label to a hazard symbol, to specify to the operator exactly what to be careful of. Clicking this button will open an input panel, where you can input your desired text.
6. **Scale** – Shapes can be scaled uniformly, or in the X, Y, or Z directions. While scale mode is switched on, the info panel will be outlined in yellow. In VR, press both grip buttons on the controllers and move your hands away from or towards each other to scale the shape. In RE, use the mouse scroll wheel or arrow keys.

Other Objects

Tools and Media Items show a mostly empty Info Panel, with just the core functions (Manipulate, Copy, Hide, Delete) available where relevant.

Settings Panel



1. **Panel Scale** – Increase or decrease the size of the Author Panel. Only available in VR.
2. **See Hidden Objects** – When toggled, hidden assembly nodes and components in the scene can be seen whilst in Author Mode. They are distinguished from visible nodes by their pink, translucent colour.
3. **Text Alignment Options** – Show or hide the text alignment options on the step panel.

Theorem RE

Most functionality in TheoremVR Guides has been ported to RE, with some UI adjustments:

1. The tether sphere is now a button; when clicked, the tether appears in the centre of the screen and can be picked up and positioned using the mouse.
2. All author panels will appear at the top right-hand side of the screen. The Author Panel contains all the same buttons as TheoremVR laid out in a more desktop-friendly way.
3. Tools cannot be equipped. Instead, they can be used (as an operator) by left clicking on a tool indicator in the scene and selecting the correct tool from the menu that appears.
4. Tool indicators are not invisible in Levels 2 onwards – they are represented by small spheres, which can be left clicked to show the tool menu.
5. Camera View is not available in TheoremRE.

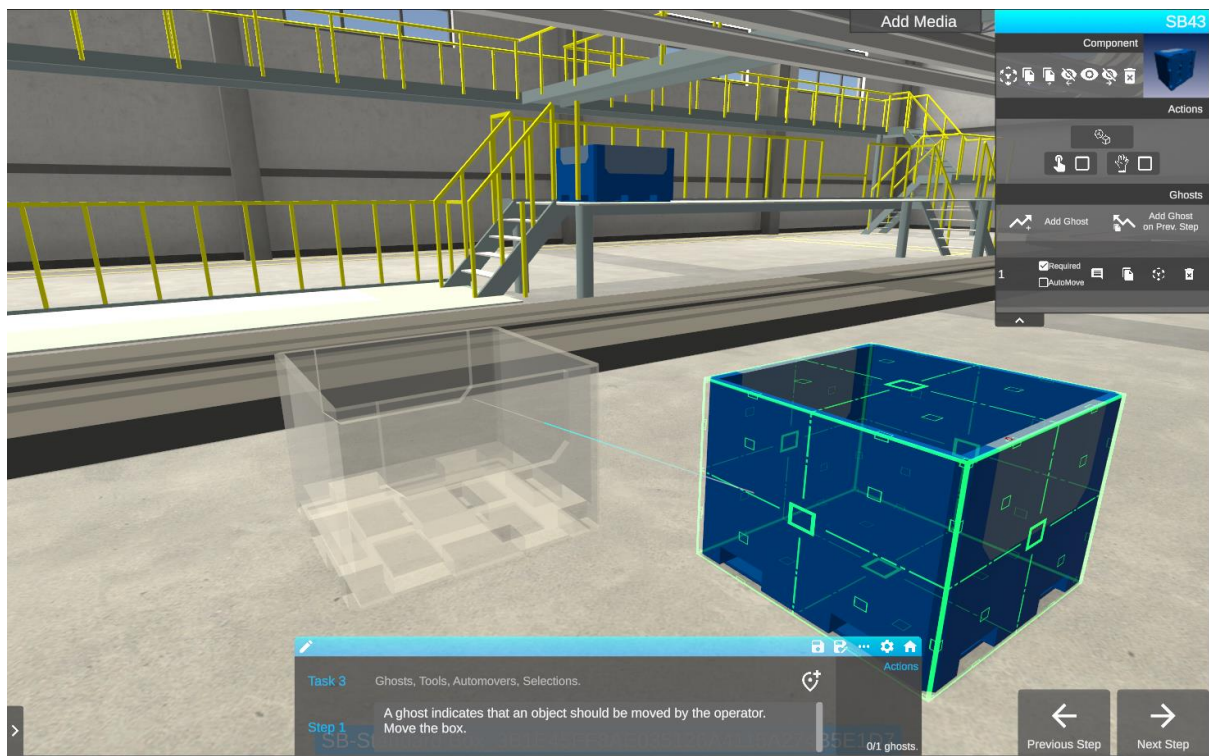
Other differences:

- Task and Step text can be edited by an Author by clicking in their respective text areas on the step panel and typing.

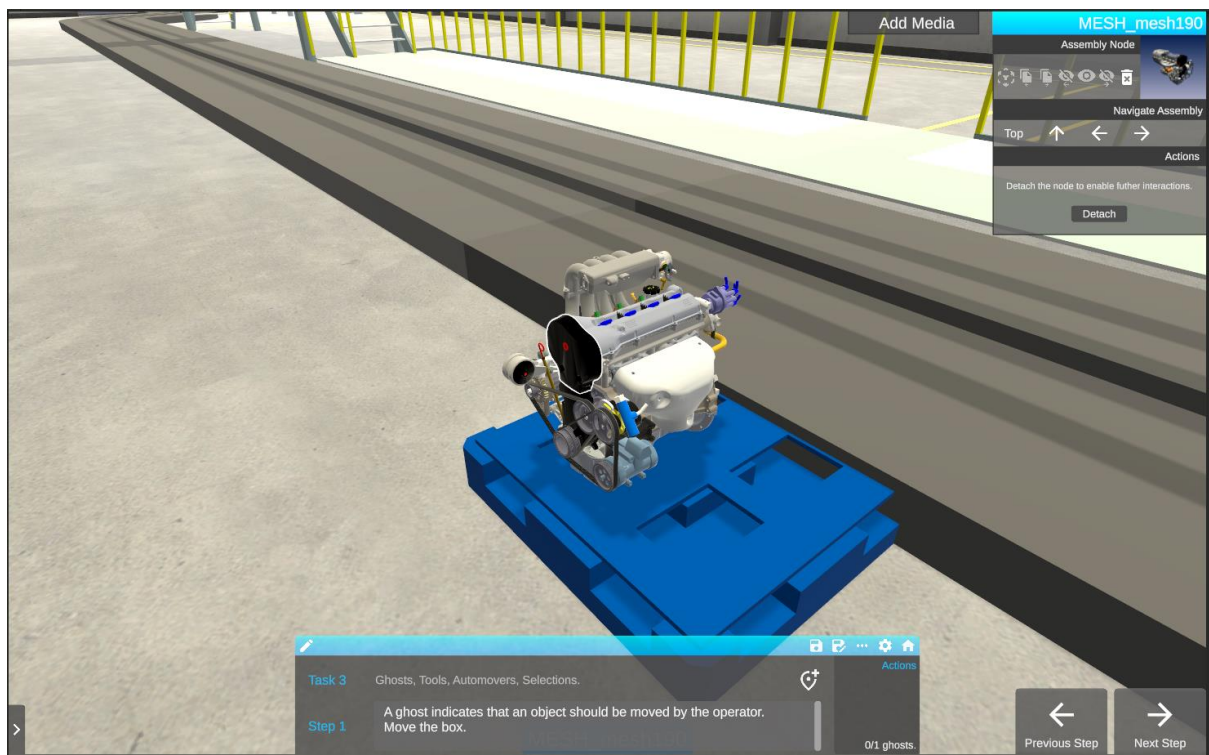
The default view for Authors in TheoremRE:



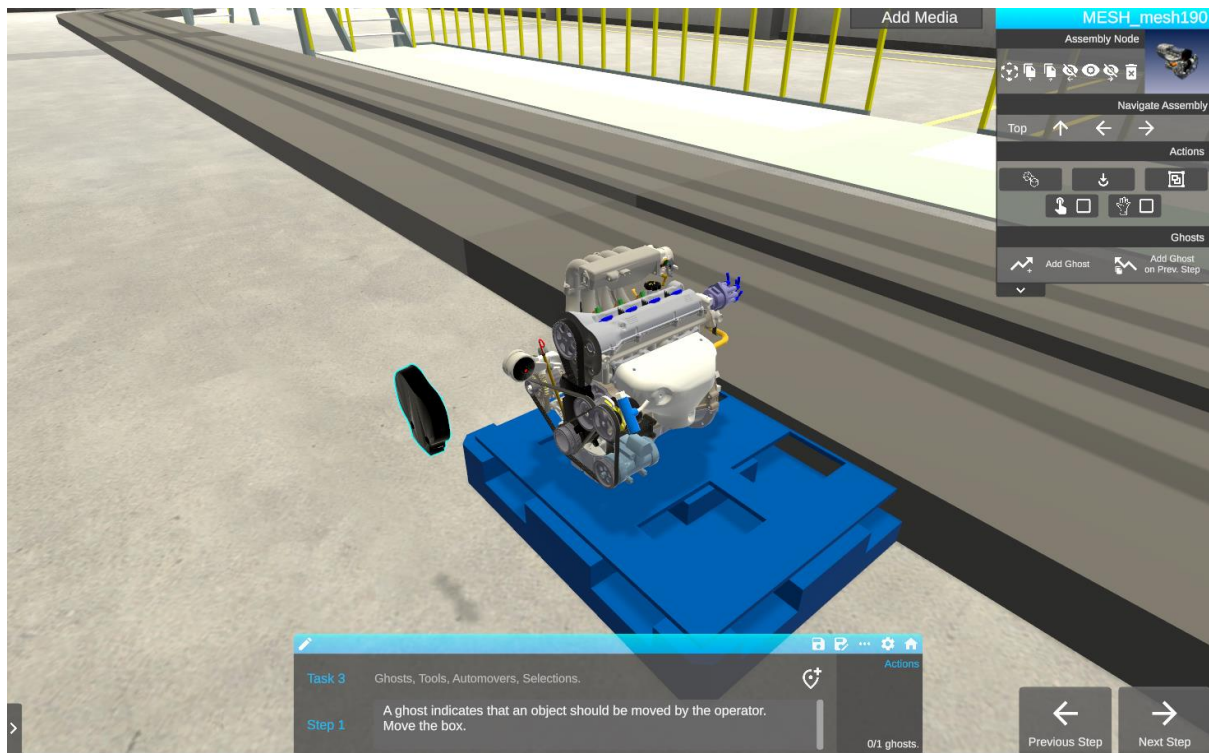
View when highlighting a component with an active ghost:



View when highlighting part of an assembly:



View when a node has been detached:



Please note that positioning objects in 3D space is far more challenging via a 2D screen. When authoring via TheoremRE, view any placed objects/tethers from as many angles as possible to ensure that they are in the desired position. The arrow keys can be used to move the object towards/away from the camera.

Auto Playback

The Auto Playback functionality allows an operator to step through the guide as an observer. All requirements are automatically performed: parts will move to their ghost positions, tools will automatically trigger their activators, and selection requirements will automatically select. This is an RE-only feature that must be set up in Author Mode in order to be accessible to the Operator.

The camera position must be set for each step of the guide. The operator's view of the environment will be moved to this position on each step.

To do this, open the Playback Panel using the camera button on the step panel:



Use the 'Set Position' button to use the current camera's position as the Playback Position.

Once set, the panel will update with a preview:



The position can then be overwritten or deleted. However, a position must be set for every step of the guide in order for the feature to be available.