RAYDENT designer User Guide

RUG-920-EN

Rev. 2.7

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Table of Contents

1 About RAYDENT designer

RAYDENT designer is a computer-aided design software that allows dental technicians to quickly and efficiently design copings, crowns and bridges in a virtual environment. Many of its automated functions enable the users to conduct quick design according to actual needs.

1.1 System Requirements

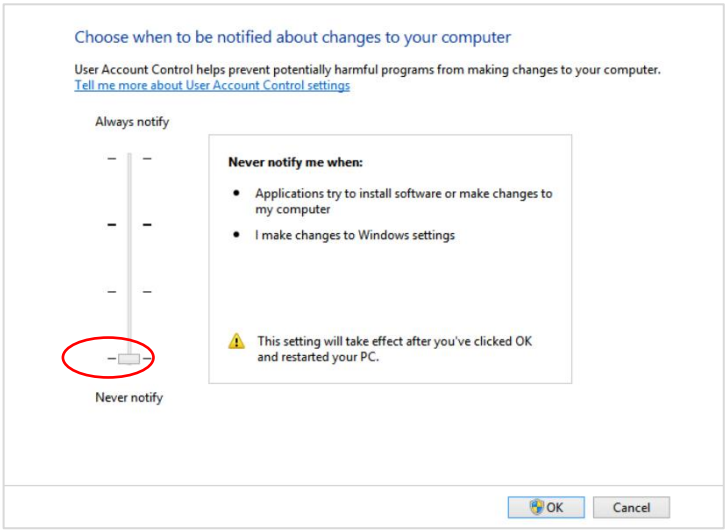
Class	Minimum requirements	Suggested requirements
CPU	Intel Core i7 8th	Intel Core i7 10th
Ram	16 GB	32 GB
Graphic Card	Intel UHD Graphics 630	NVidia GeForce GTX1060, 6GB
HDD Space	500GB SSD	1 TB SSD
OS	Windows 10 64-bit	Windows 10 64-bit
Monitor Resolution	1920x1080	1920x1080

1.2 User Account Control Settings

In order to avoid the problems or limitations during the software usage, it is necessary to set User Account control.

1. Click ***Start*** menu and search by “User Account”. Then, ***Select Change User Account Control settings***. Alternatively, follow the path: Control Panel -> User Account -> Change User Account Control settings.

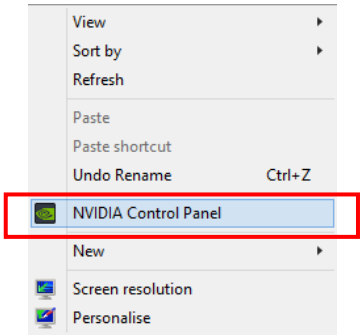
2. In the User Account Control setting dialog, move the slider to the bottom at “Never notify.”



1.3 NVIDIA Settings

For the computer with NVIDIA graphics card, it is suggested setting dedicated NVIDIA graphics card for the software use after installing the software.

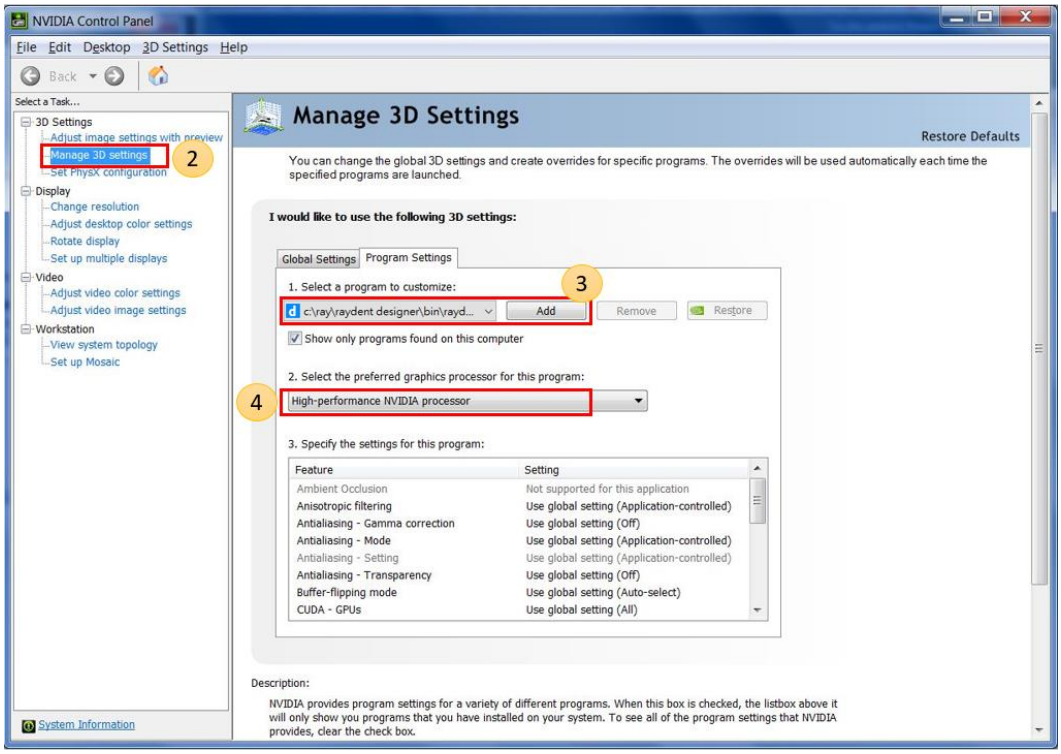
1. Right click on the desktop and select ***NVIDIA Control Panel.***



2. Select ***Manage 3D Settings*** under 3D Settings task lists.

3. Click ***Program Settings*** tab, and click ***Add*** button to browse to the below path: Computer-> Drive (C) -> Ray -> RAYDENT designer -> Bin. Then, select ***RAYDENT designer.***

4. Select ***High-performance NVIDIA processor*** from preferred graphics processor drop down list.



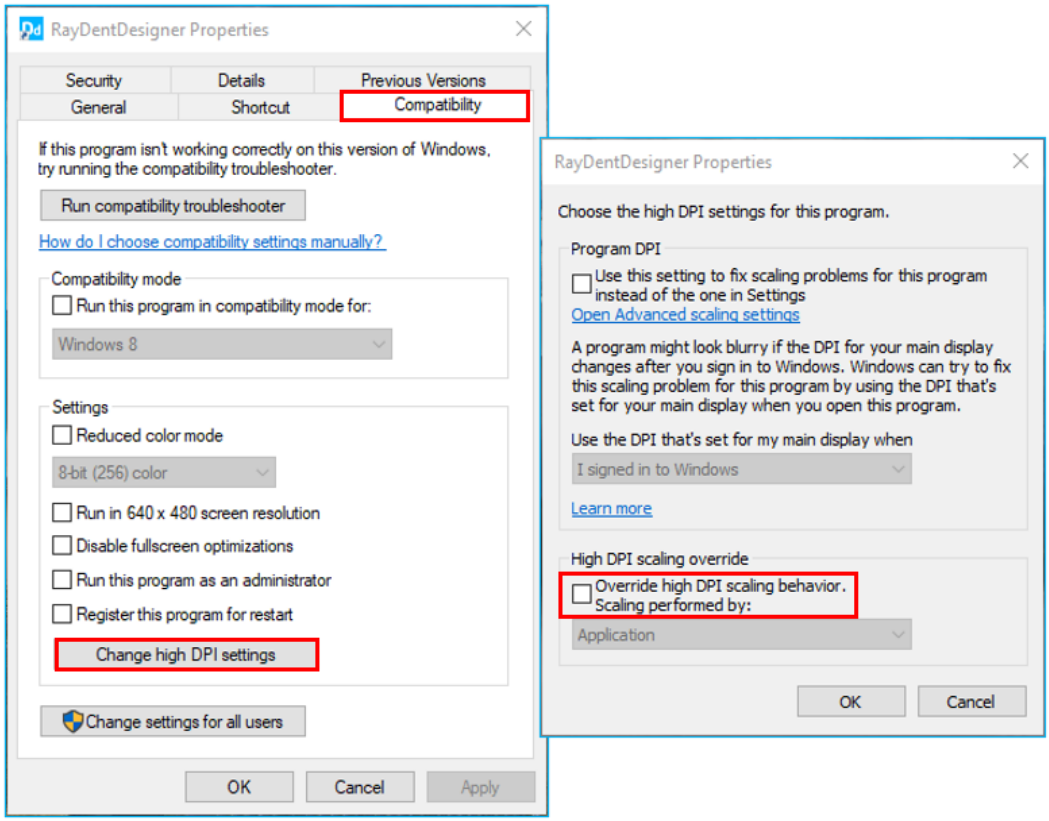
5. Click ***Apply*** button.

1.4 DPI Setting

In order to ensure the correct display of RAYDENT designer, it is recommended adjusting DPI settings before software usage.

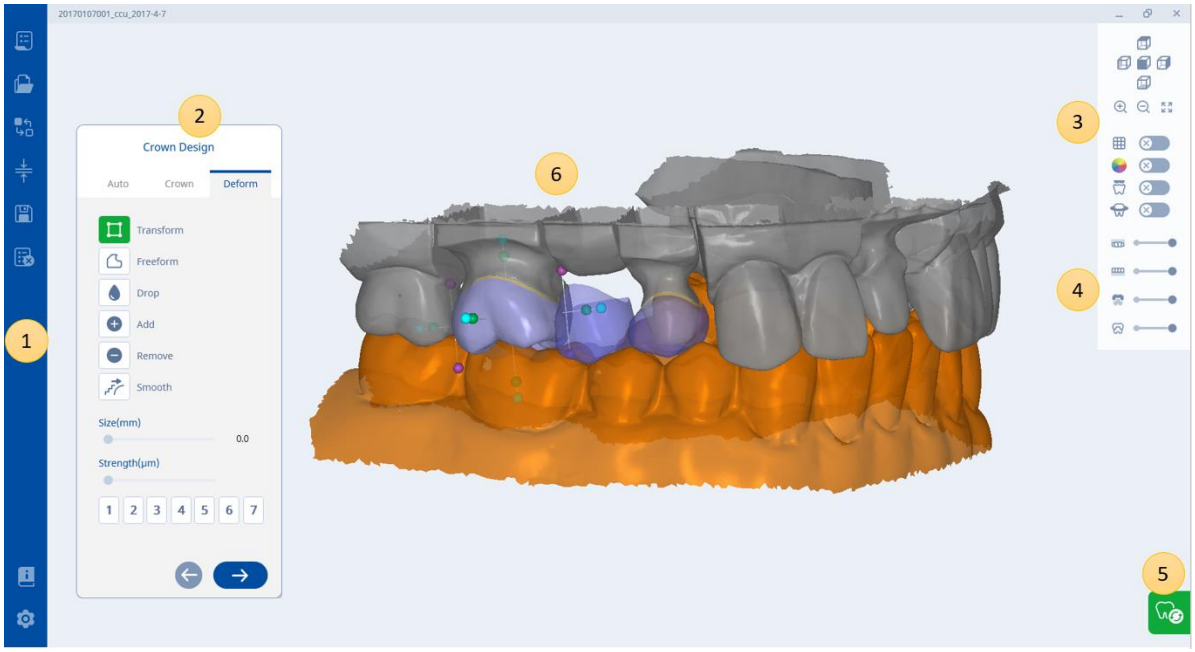
1. Right click on the software shortcut icon on the desktop.

2. Click ***Properties*** from the drop-down menu.
3. Click ***Compatibility*** tab.
4. Click ***Change high DPI settings*** button. Leave “Override high DPI scaling behavior” checkbox unchecked. Click ***OK*** button.



5. Click ***Apply*** button.

2 RAYDENT designer Interface



1	Main menu	4	Visualization sliders
2	Function panel	5	Design change menu
3	Viewing tools	6	3D view window

2.1 Main Menu

	Create order		Save Project
	Open Project		Close Project
	Mesh Alignment		Manual
	Model Alignment		Setting

2.2 Toolbars

- **Viewing Tools**

	Top view		Zoom in
	Bottom view		Zoom out
	Left view		Show grid (1mm*1mm)
	Right view		Show color
	Front view		Show collision
	Zoom all		Show 2D cross section

- **Visualization Sliders**

Click the icon or drag the slider to change the transparency of the object.

	Show/hide the upper model		Show/hide smile teeth
	Show/hide the lower model		Show/hide occlusal plane
	Show/hide the active tooth		Show/hide face scan
	Show/hide the inactive teeth		

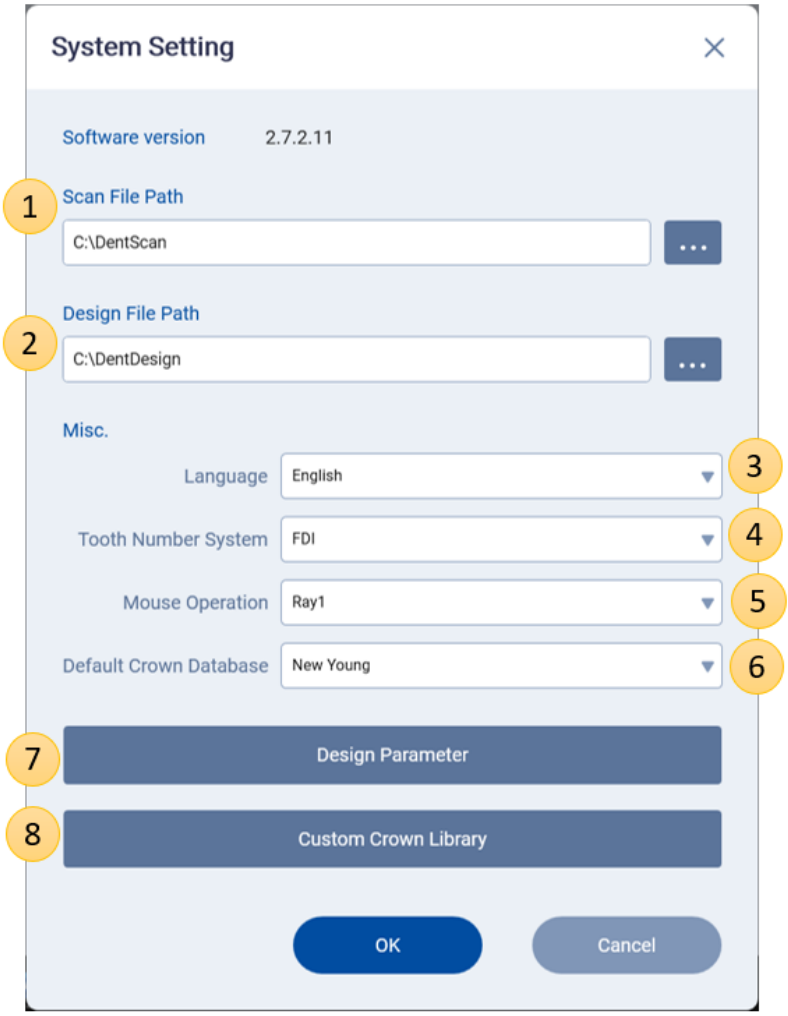
2.3 Mouse Operation

The default mouse operation system is **Ray 1**.

	1. Set the object as active 2. Execute functions
	Rotate view
	Pan view

2.4 System Setting

Click  ***Setting*** button on the main menu to change system settings if needed.

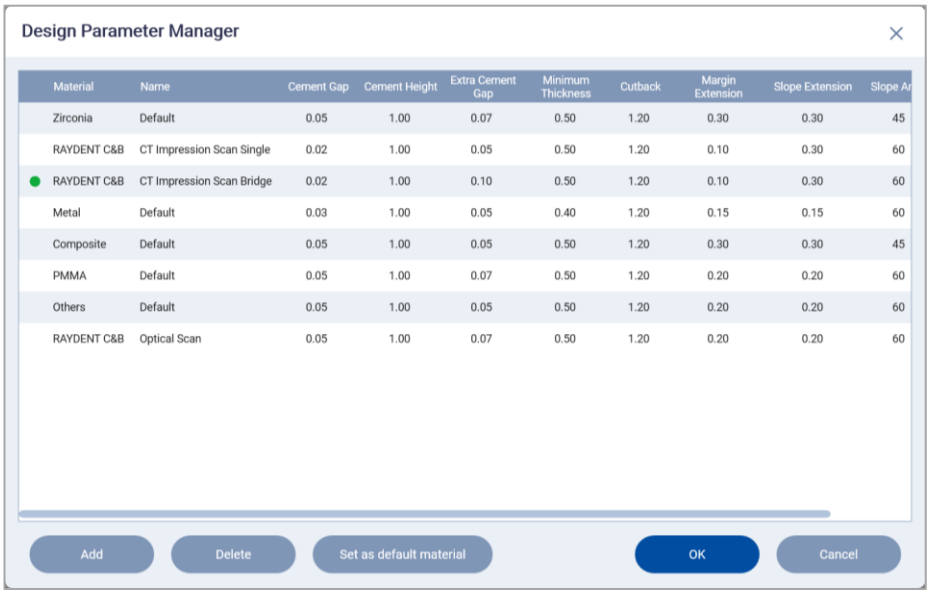


1	Set scan file path (STL)	5	Set mouse operation system
2	Set design file path	6	Set default crown database
3	Set system language	7	Set Design Parameter
4	Set tooth number system (FDI, UNS)	8	Customize Crown Library

2.5 Design Parameter

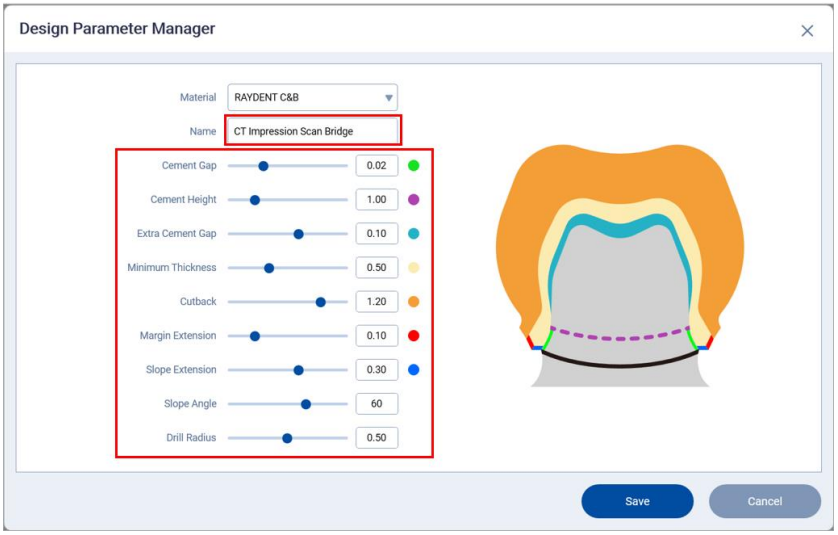
The user can set the various kinds of design parameters for different materials.

Click  ***Setting*** button on the main menu and select ***Design Parameter*** button to open Design Parameter Manager.



NOTE*:* There should be at least one material in the Design Parameter Manager.

- To add or delete design parameter:
  - Click ***Add*** button and modify the parameter values. You can enter the desired name for the material. Each parameter can be adjusted by dragging the slider, enter the desired values on the value field, or scroll the mouse wheel with the cursor hovering the slider. Then, click ***Save*** button.

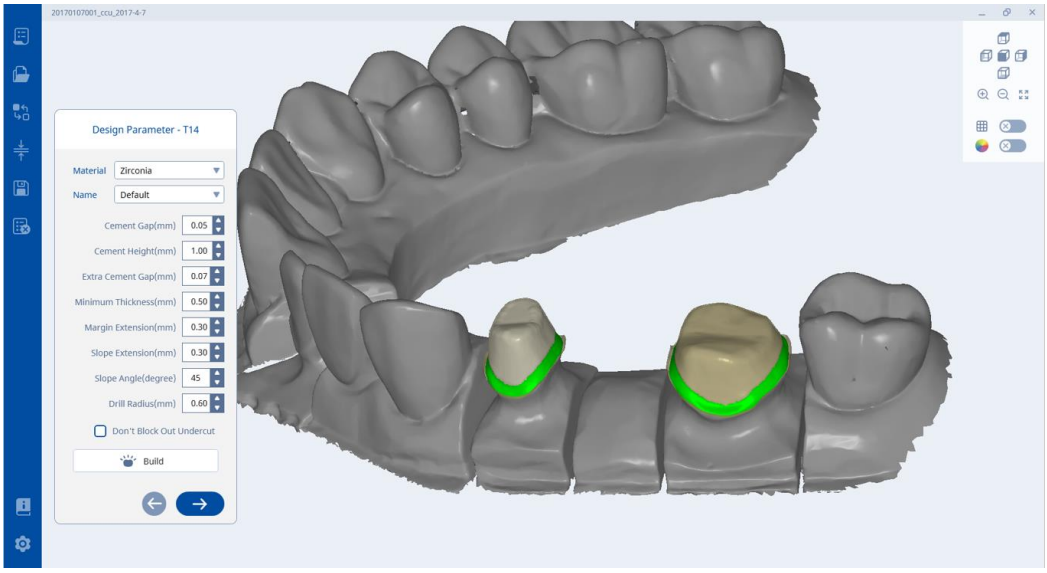


- Click on the design parameter on the list, and click ***Delete*** button to remove it.

- To edit the design parameter:
  Double click on the material and the parameter details will pop up. Modify the parameter details, and click ***Save*** button.

You can select one material and click ***Set as default material*** button. The material with  represents the default material.

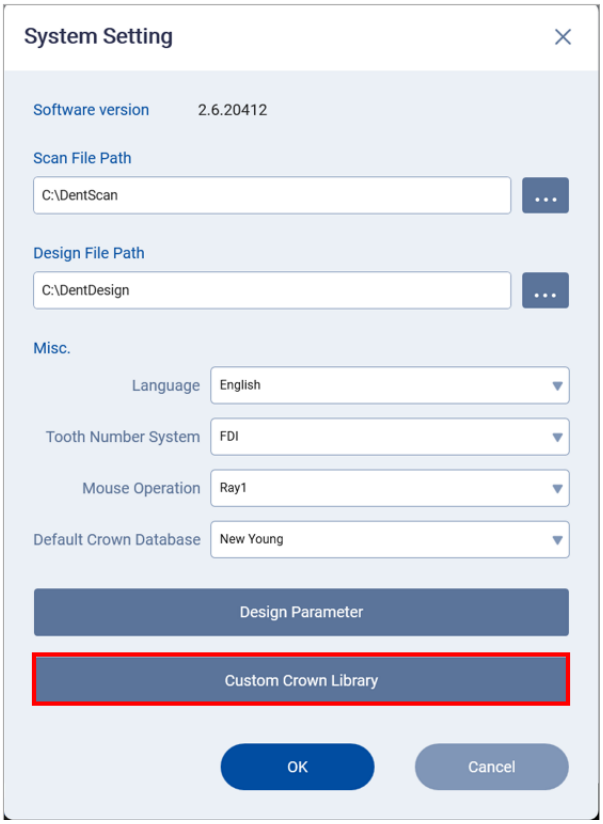
Then, the default material will be shown at the Design Parameter step.



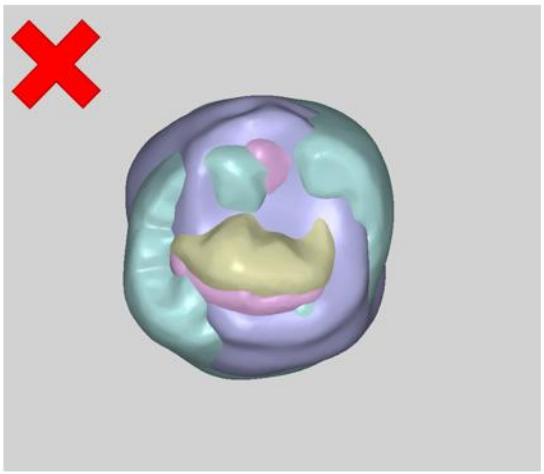
2.6 Custom Crown Library

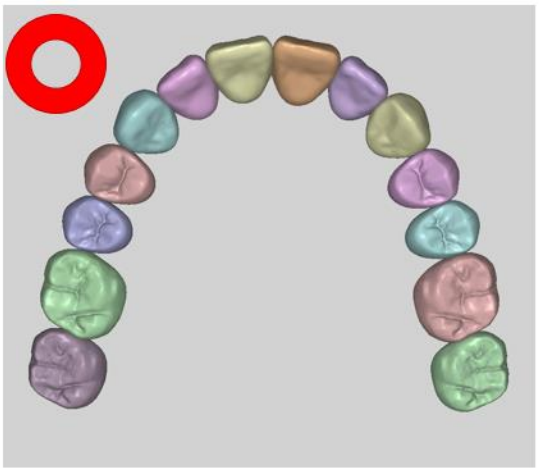
You are free to add the desired crown library to RAYDENT designer.

Click  ***Setting*** button on the main menu and click ***Custom Crown Library*** button.



NOTE: For the preparation for crown library, each scanned single crown needs to be aligned to the model to obtain the correct dentition.



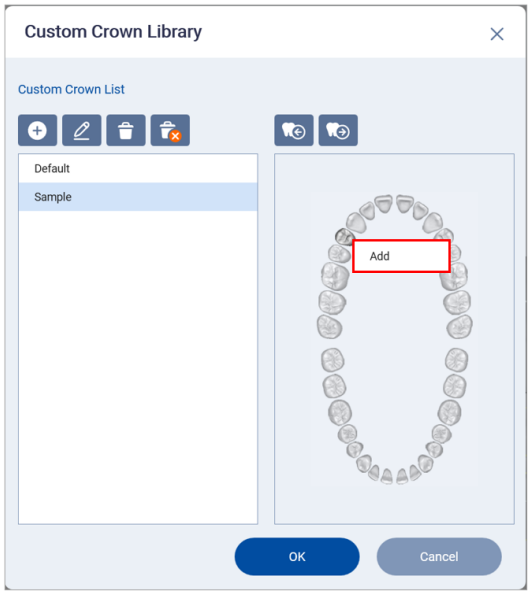


The procedures of creating crown library are explained in the followings:

1. Click  button. Enter the name for the new crown library and click  button.

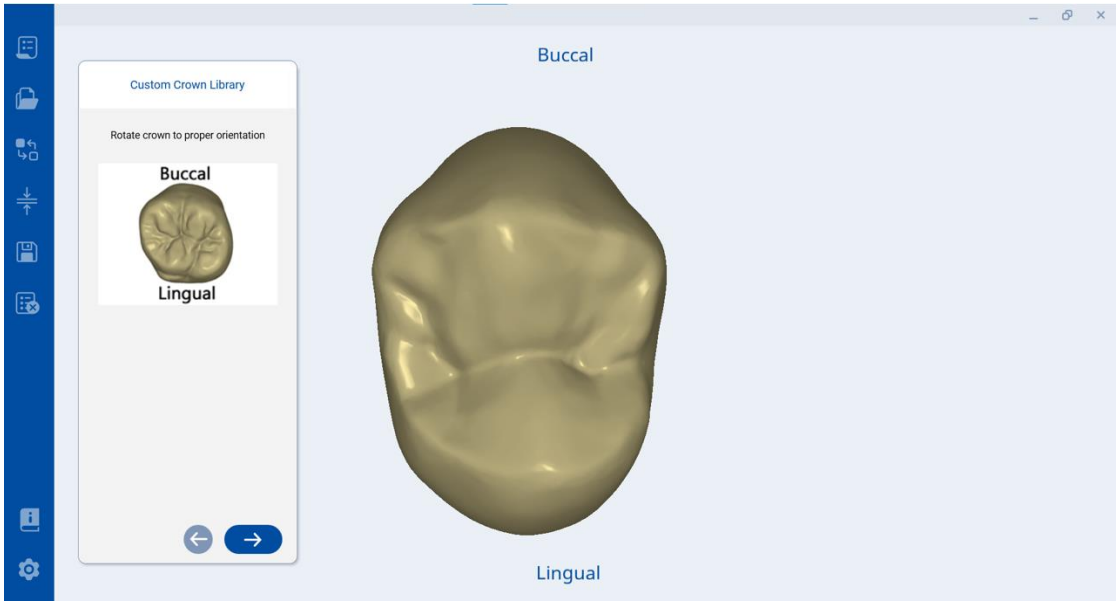
- Clicking  button allows you to modify crown library name.
- Select the crown library on the list and click  button to delete it.
- Click  button to delete all crown libraries on the list.

2. Left-click the tooth on the tooth chart and click ***Add*** button. Click ***OK*** button to proceed.

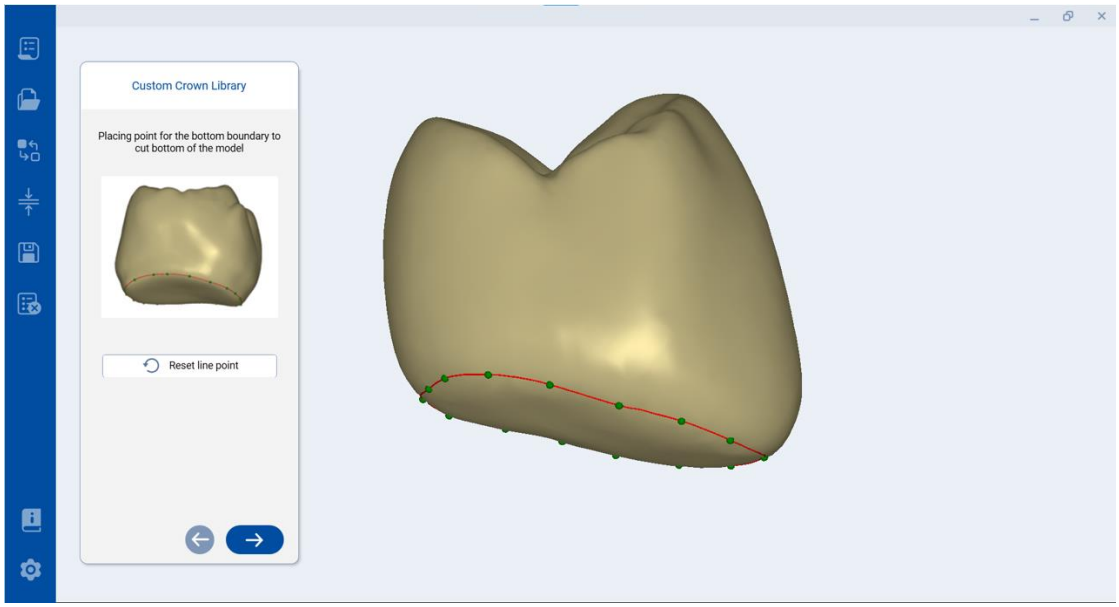


3. Browse to the computer and select the scanned crown file (STL format). After importing the crown file, please rotate the crown to the correct buccal-lingual direction. Click → ***Next*** button.

NOTE: The occlusion should face the user.



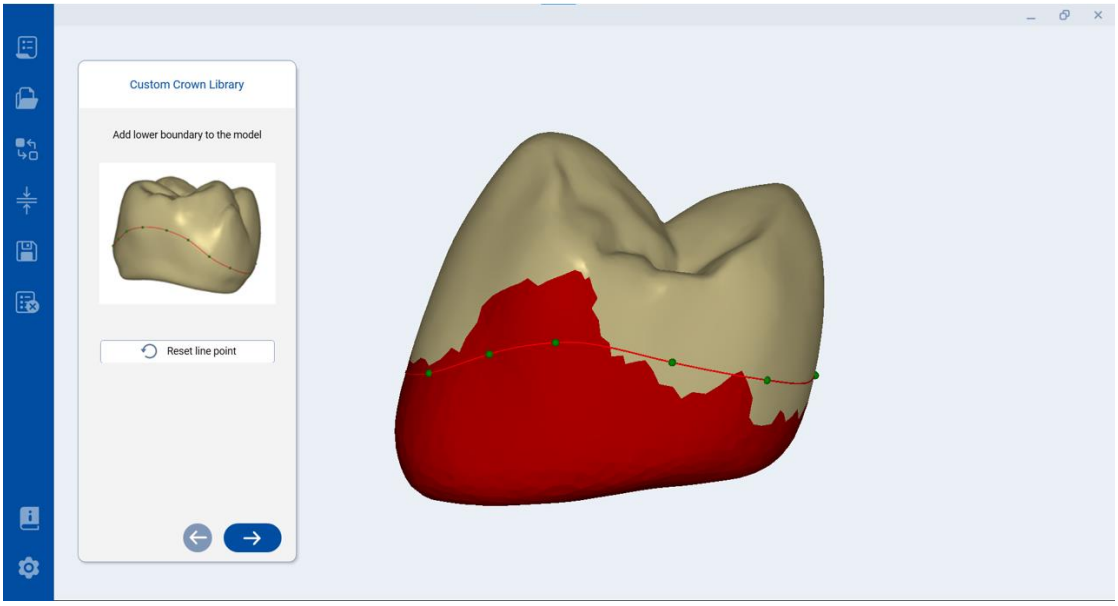
4. Click to place control points on the bottom of the crown. Click → ***Next*** button.



	Move and insert control point.
	Remove the previous control point during placing the point.

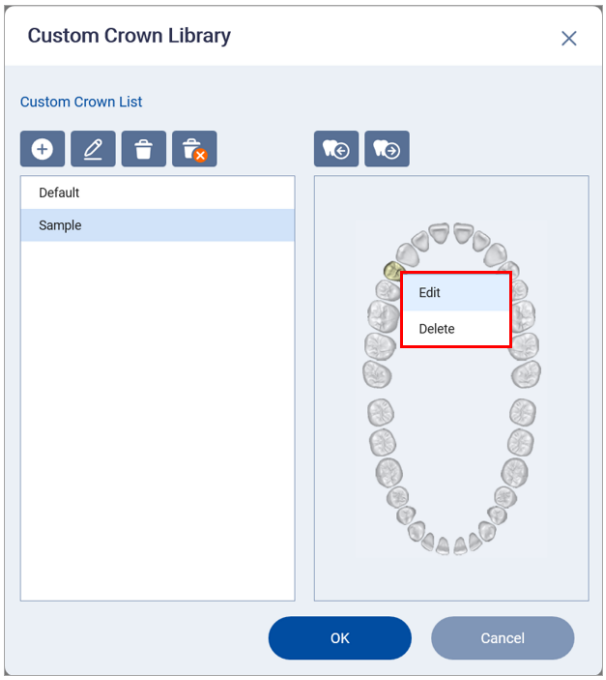
5. Click to place control points along the contour of the crown. Click → ***Next*** button.

The red area represents the undercut.

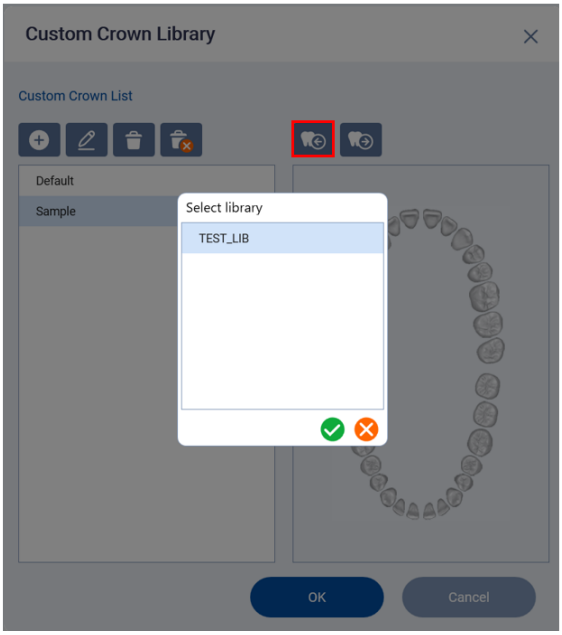


Following the above steps allows you to create crown library for other teeth.

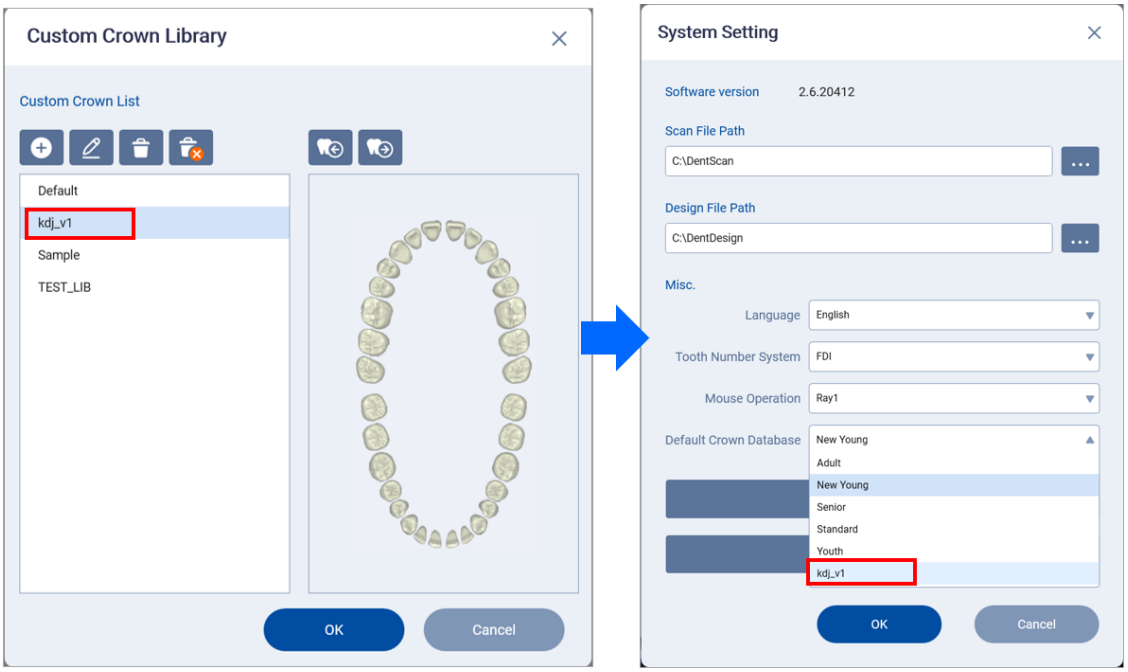
Once the crown library of the tooth is established, left-click the tooth on the tooth chart to ***Edit*** or ***Delete*** the established crown data.



You are able to ***Import***  or  ***Export*** the selected crown library (*.zip).

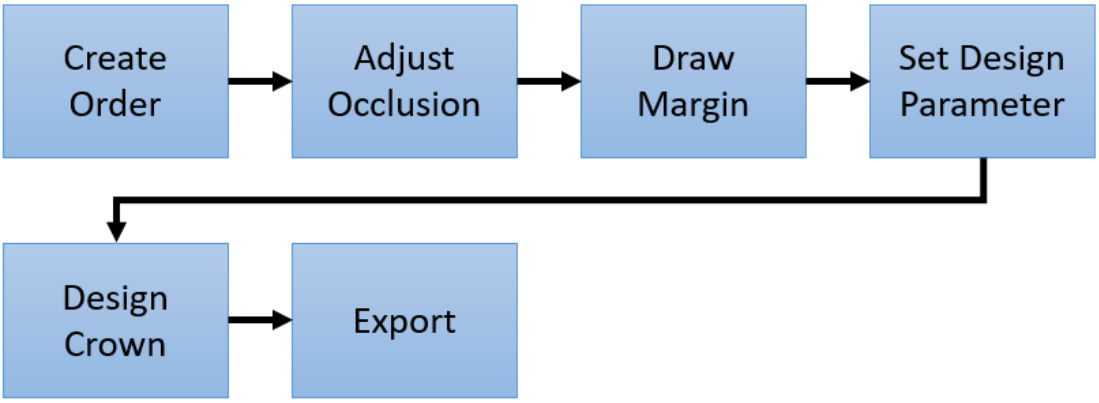


When the crown library for all teeth (32 teeth) is established, you are able to set it as Default Crown Database on System Setting window.



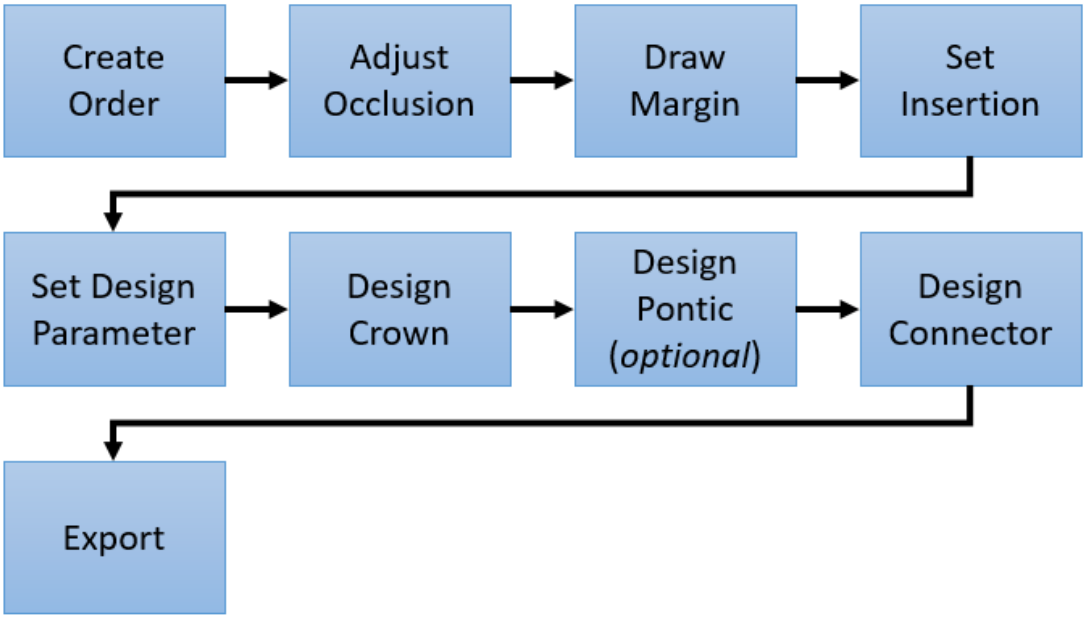
3 Design Process

3.1 Crown Design Process



*Crown design process varies depending on the product

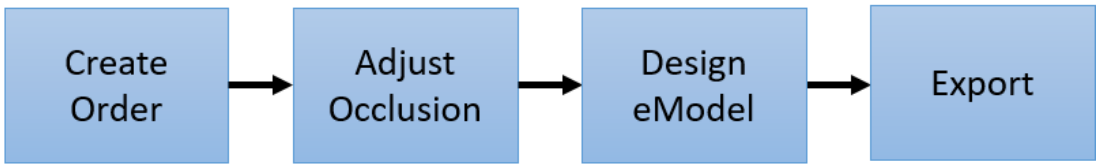
3.2 Bridge Design Process



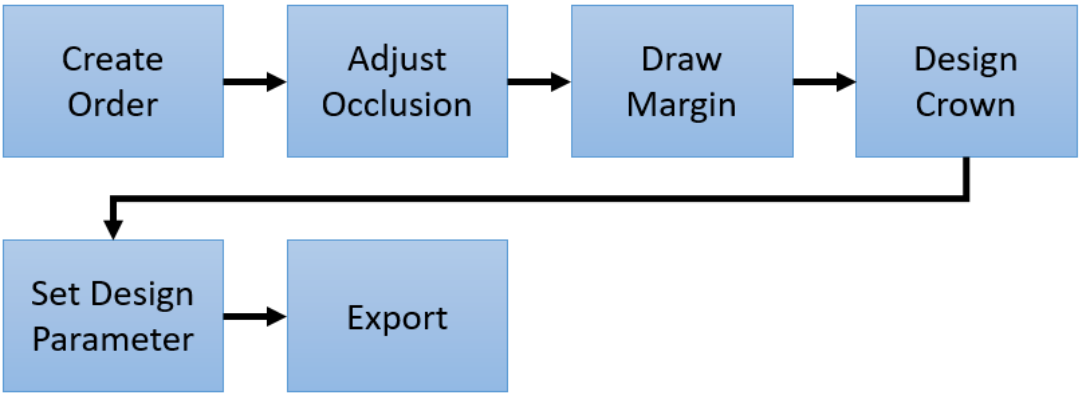
*Crown design process varies depending on the product.

*Optional: Pontic design is required if there is pontic on the case.

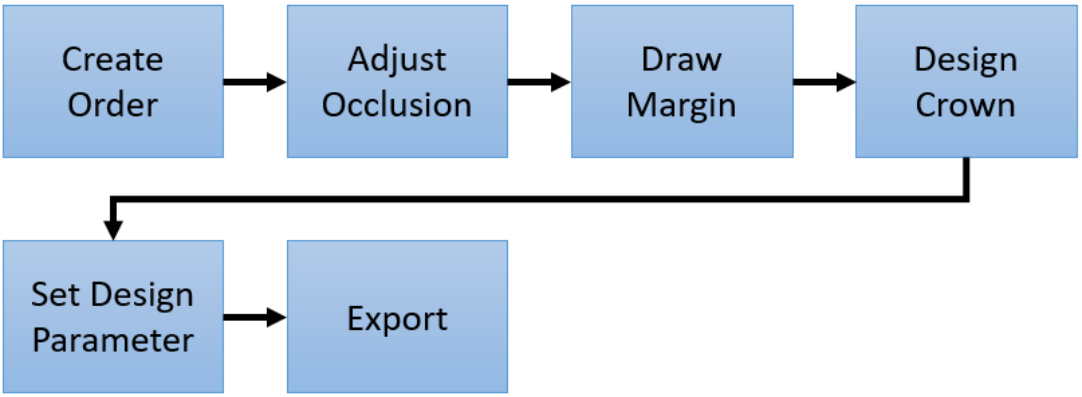
3.3 Digital Model Design Process (for IntraOral Scanner)



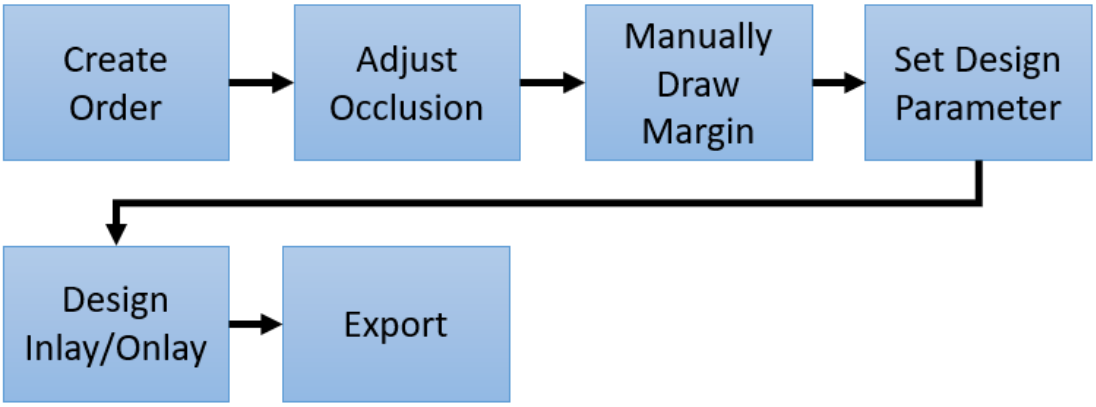
3.4 Provisional Crown Design Process



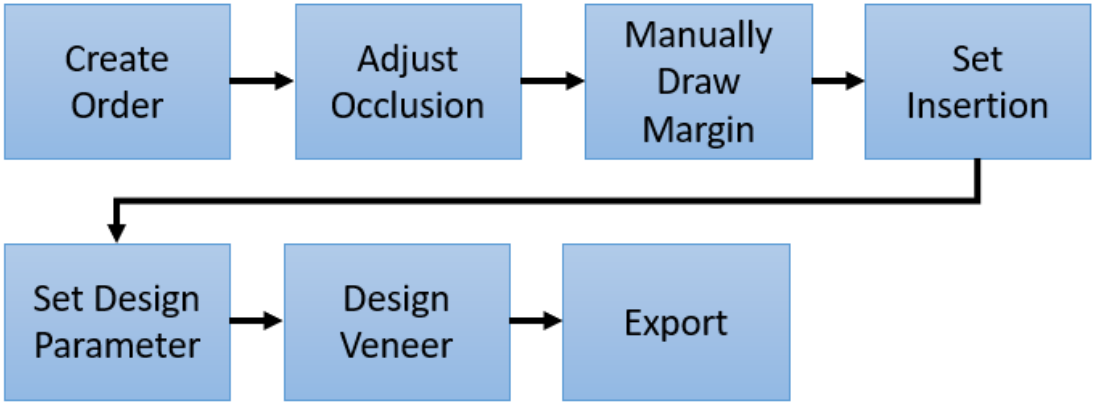
3.5 Anatomic Crown Shell Design Process



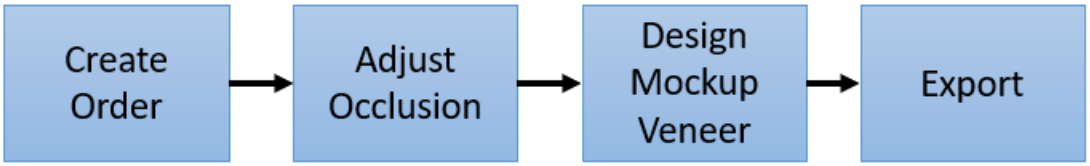
3.6 Inlay/Onlay Design Process



3.7 Veneer Design Process

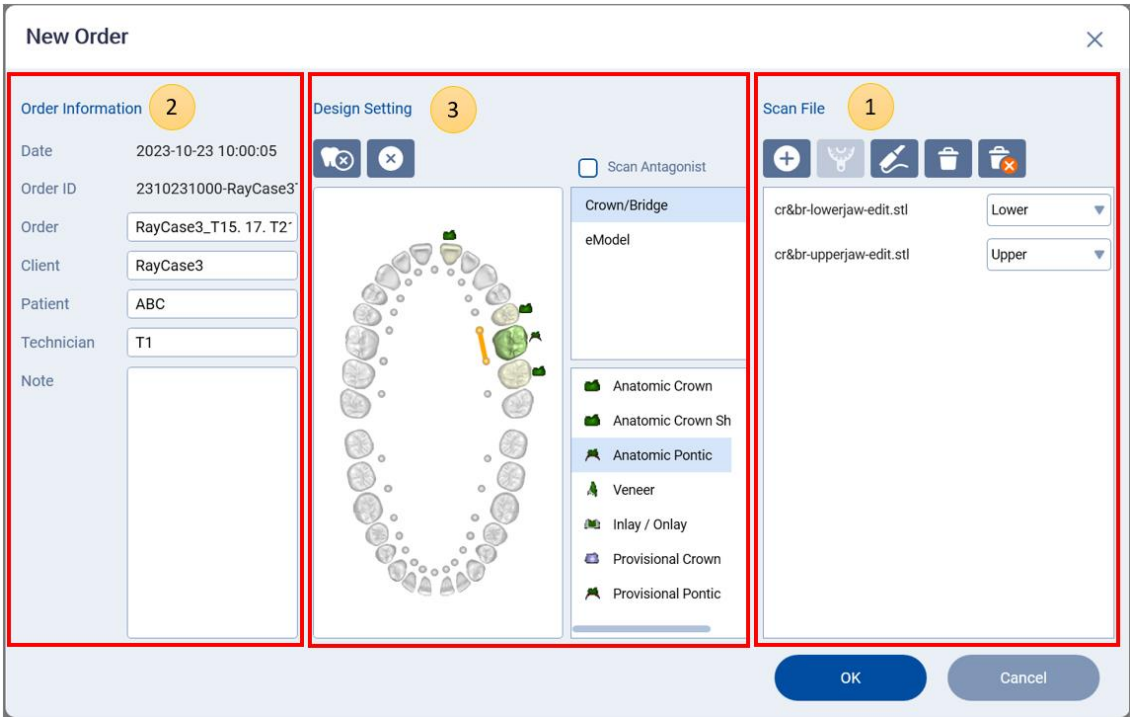


3.8 Mockup Veneer Design Process



4 Create Order

Click  ***Create Order*** button on the main menu to open the New Order window.



1	**Import scan file**
	**Add scan files**
	**CT impression scan**
	**Optical scanner project**
	**Clear scan files**: Clear the selected scan file
	**Clear All**: Clear all scan files

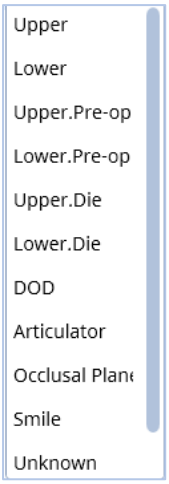
The software can directly import the scanner project files from the following scanners.

Shining3D: bom.xml

iTero: V10-V23 xml

Rayface: *.rfs

Scan Type:



When the scan file name contains “Upper” or “Lower”, the program will automatically detect the scan file type. If the file name does not contain “Upper” or “Lower”, the user needs to select the scan file type from the drop-down list.

If pre-op files are imported, please select “Upper.Pre-op”, or “Lower.Pre-op”.

When the die scan file is the independent scan file, the user can select “Upper.Die” or “Lower.Die”, and the software will automatically integrate with “Upper” or “Lower” scan file.

For the following scan file types, please import the registered data.

- **DOD**: Smile teeth file (*.obj or *.ply)
- **Articulator**: Articulator file (*.stl)
- **Occlusal Plane**: Occlusal plane file (*.stl)
- **Smile**: Face scan file (*.obj or *.ply)

2	**Order Information**

Input order information if needed.

3	**Design Setting**

Select the teeth on the tooth chart and the product type.

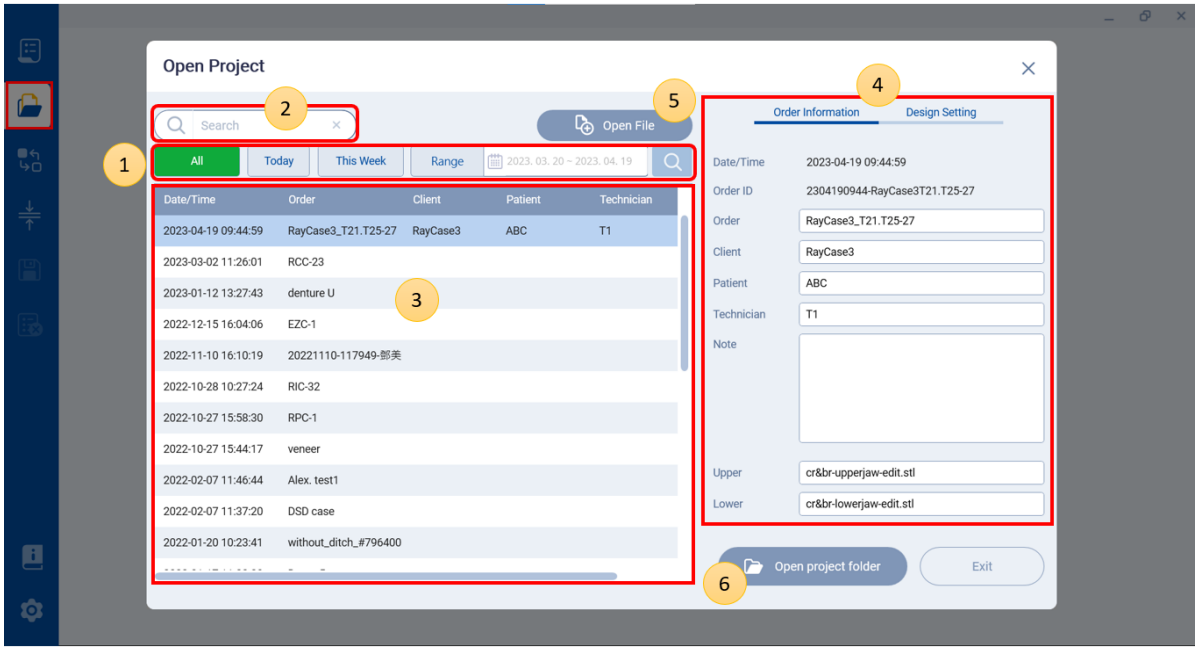
- ***Scan Antagonist***: When checked, RAYDENT Connect software will be called and the antagonist scan file will be searched.
- ***Cancel Select***  allows you to cancel the product type of the selected tooth/teeth.
- ***Cancel***  allows you to cancel the product types of all the teeth.

While selecting the teeth, the shortcut keys are available to select multiple teeth quickly.

Ctrl 	Select multiple teeth in separate positions.
Shift 	Select multiple teeth in contiguous positions.

4.1 Open Project

Click  ***Open project*** button on the main menu.



Open Project window includes the following contents:

1	**Filter by time**

All	All the orders will be displayed on Order List.
Today	The order created today will be displayed.
This Week	The orders created this week will be displayed.
Range	The orders created during the set date range will be displayed.

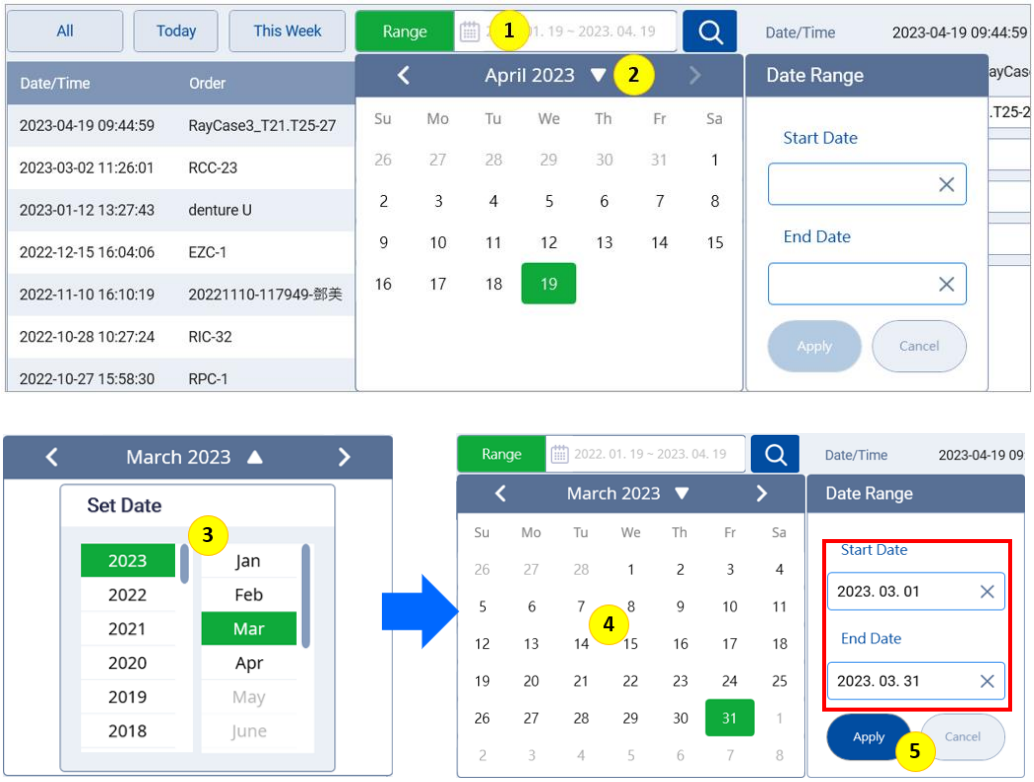
(1) Click ***Range*** button and click on the blank to show the calendar.

(2) If the search start date is not in the current month, click  button,  or  button.

(3) Select the year and month.

(4) Click on the dates to set as the start date and end date.

(5) Click ***Apply*** button to search for the orders.



2	**Search**

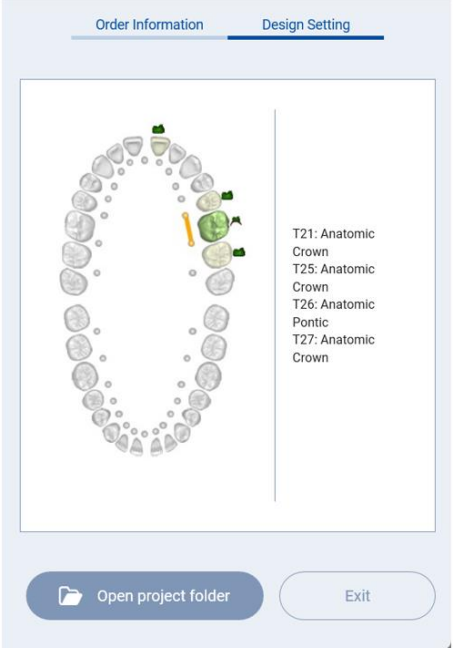
Entering the texts of order name, client, patient or technician and click ***Enter*** key or button to search.

3	**Order list**

Order list shows all the orders or searched results. Double-click on the selected order will open the project file in the software.

4	**Order details**

The order information and design setting of the selected order will be shown on the right side.



5	**Open File**

Browse on the computer and search for a specific order. Select the project file (*.xml format) to import to the software.

6	**Open project folder**

Select the order on the Order list. Click ***Open project folder*** button to view the project folder of the selected order.

5 Model Preprocess

After the order is created, the software will navigate to the model preprocess.

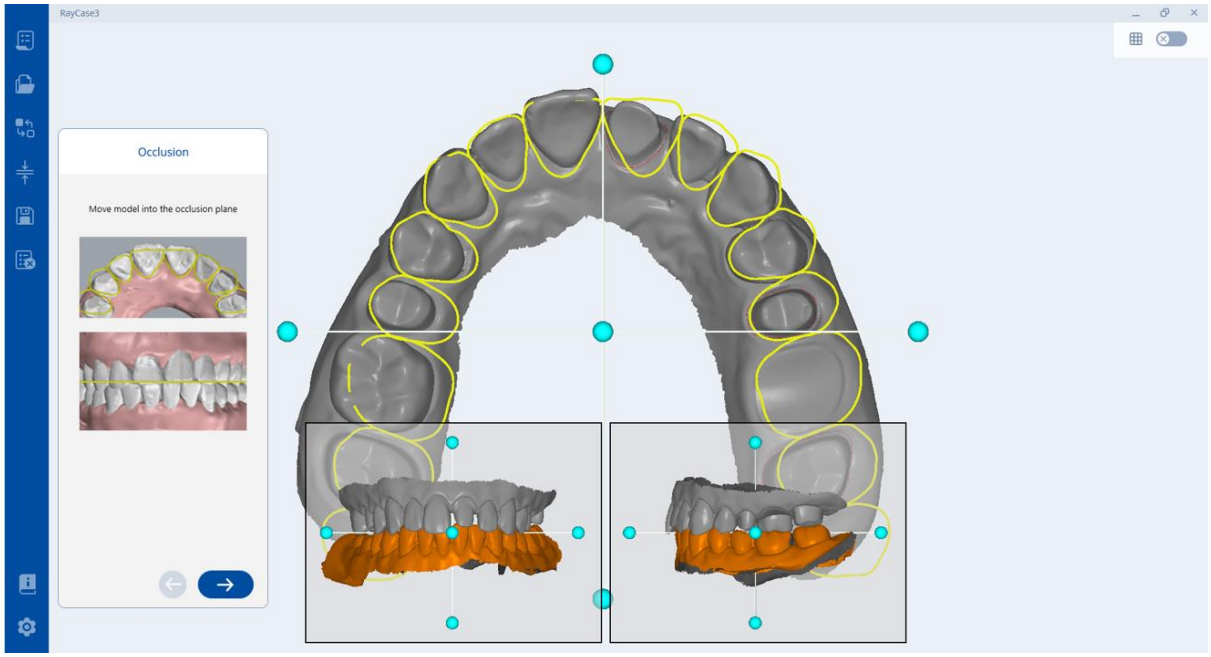
5.1 Adjust Occlusion

At Occlusion step, there are three view windows.

On 3D view window, move the model to fit the yellow tooth contour and occlusal plane.

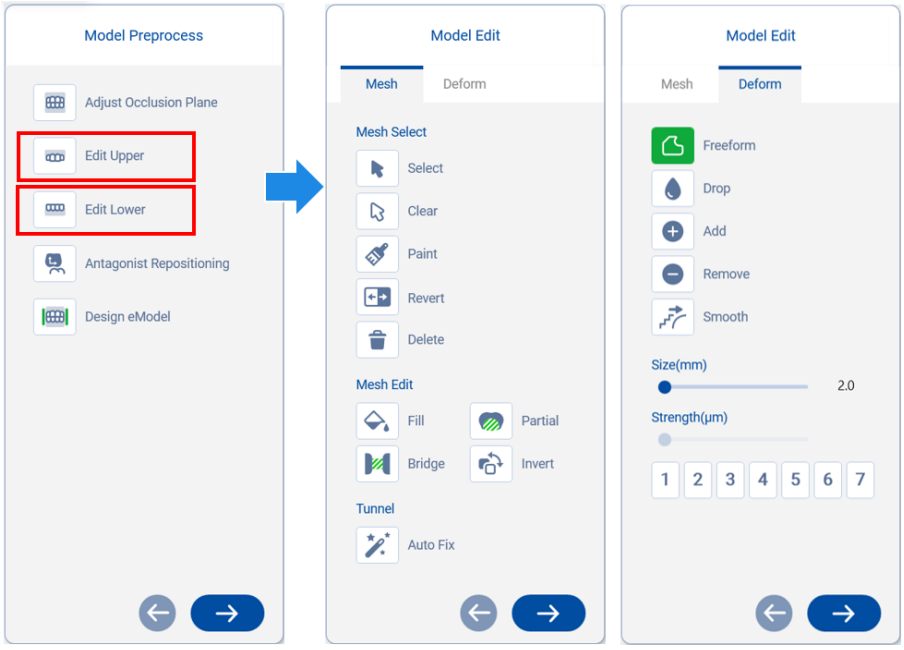
- Click on the model and drag to move the model.
- Click on the blue ball and drag to rotate the model.

Click → ***Next*** button to go to the next design step.



5.2 Edit Model

When Occlusion adjustment is complete, you will be navigated to Model Preprocess step. Click button will go back to Order page. Click ***Edit Upper*** or ***Edit Lower*** to edit the model mesh data. Model editing is not mandatory at the current step. You can click ***Next*** to skip this step and move on to the next design step.



The Model Edit function panel contains the following functions:

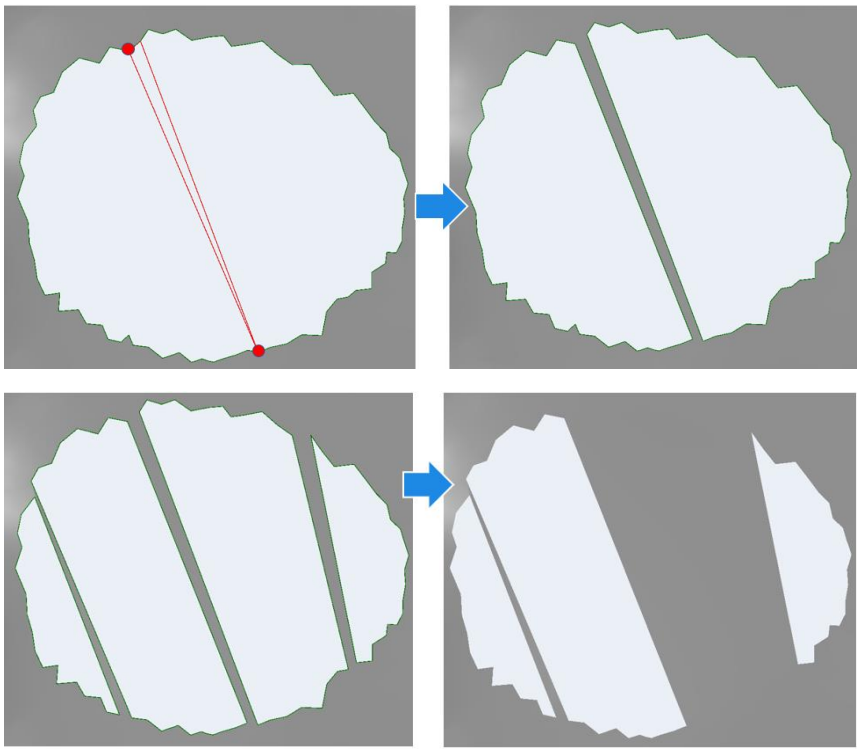
- **Mesh tab**

	**Select** - Draw a straight line and left-click to turn the line to select the redundant area. Right-click to finish the line and mark the area in black.
	**Clear** - Clear all the selection.
	**Paint** - Brush over the redundant area.
	Change brush size.
	Paint the highlighted area to unselect.
	**Revert** - Revert the mesh.
	**Delete** - Delete the mesh.

	**Fill** - Fill hole by clicking on the boundary of a hole.
	**Bridge** - Form a bridge by placing 2 points on the boundary of the hole to partition the hole into two parts.
	**Partial** - Place 2 points on the boundary of the hole to partition the hole into two parts and fill the selected hole.
	**Invert** - Invert the mesh data.
	**Auto Fix** - Automatically fix the tunnel.

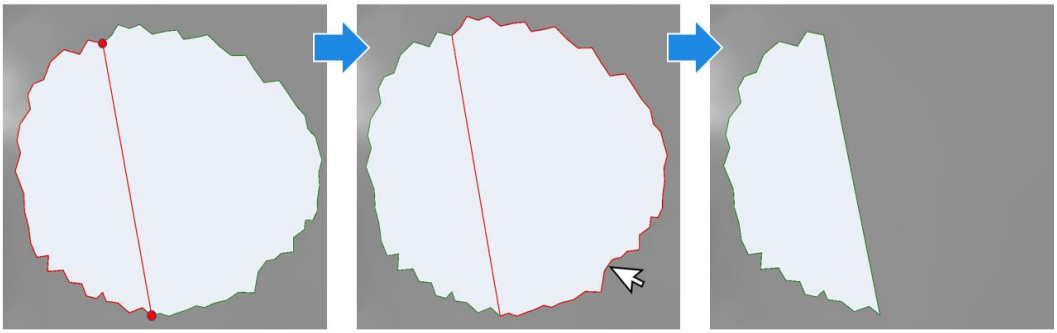
 **Bridge:**

Left-click to place two points on the boundary of a hole to partition the hole into two parts. You are allowed to create bridges to partition the hole into several parts. Then, ***Fill hole*** function can be applied to fill the specific area.



 **Partial**:

Left-click to place two points on the boundary of a hole to partition the hole into two parts. Hover the mouse cursor to the boundary of one part. The boundary of the selected part will be shown in red. Left-click and the selected hole will be filled.



- **Deform tab**

	W	**Freeform** - Left-click on the area you want to modify and drag to the desired position.
	E	**Drop** - Hold down the left mouse button, and drag over the area where you want to add. Pressing ***Shift+Left-click*** to reduce the material using drop.
	R	**Add** - The amount of added material will be accumulated when dragging the mouse on the same area back and forth. Toggle to Remove by pressing ***Shift+Left-click.***
	T	**Remove** - The amount of material will be removed when dragging the mouse on the same area back and forth.
	Y	**Smooth** - Smooth the surface of the crown.

The size and strength of the deformation can be quickly adjusted by the following shortcut keys.

Shift	Change the size of the deformation.
Ctrl	Change the strength of the deformation.

Deformation functions of Add/Remove/Smooth can be quickly switched with predefined shortcut keys.

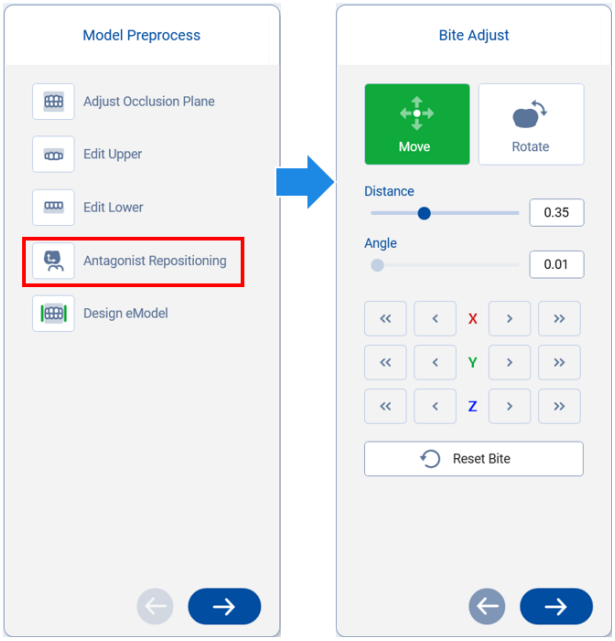
Ctrl + 1 ~ 7	Save the corresponding size and strength of Add/Remove/ Smooth as the defined settings.
1 ~ 7	Apply the corresponding predefined settings of Add/Remove/ Smooth.

Undo and Redo actions can by operated with the following shortcut keys.

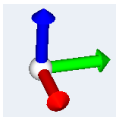
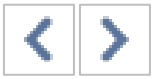
Ctrl Z	undo
Ctrl Shift Z	redo

5.3 Reposition Antagonist

Antagonist Repositioning enables the user to adjust the position of the antagonist model.



The Bite Adjust function panel contains the following functions:

	**Move** – Move the bite.
	**Rotate** – Rotate the bite.
	Adjust the moving distance and rotation angle by dragging the slider, enter the desired values on the value field, or scroll the mouse wheel with the cursor hovering the slider.
	Red arrow: X direction Green arrow: Y direction Blue arrow: Z direction
	Move or rotate the bite according to the distance or angle value in X/Y/Z direction.
	Move or rotate the bite by 2 times of distance or angle value in X/Y/Z direction.
	**Reset Bite** - Reset to the original bite position.

6 Draw Margin

At Margin Operation step, there are two ways to obtain margin:

One is to automatically detect the margin, and the other is to manually draw the margin.

Margin Operation function panel contains the following functions:

	**Detect** - Detect margin line automatically.
	**Draw** - Manually draw margin line.
	**Move Point**
	**Fast Edit**
	**Clear margin**
	**Set View as Insertion**
	**Go Insertion View**
	**Ditching** (Plaster model)
	**No Ditching** (IntraOral Scanner)

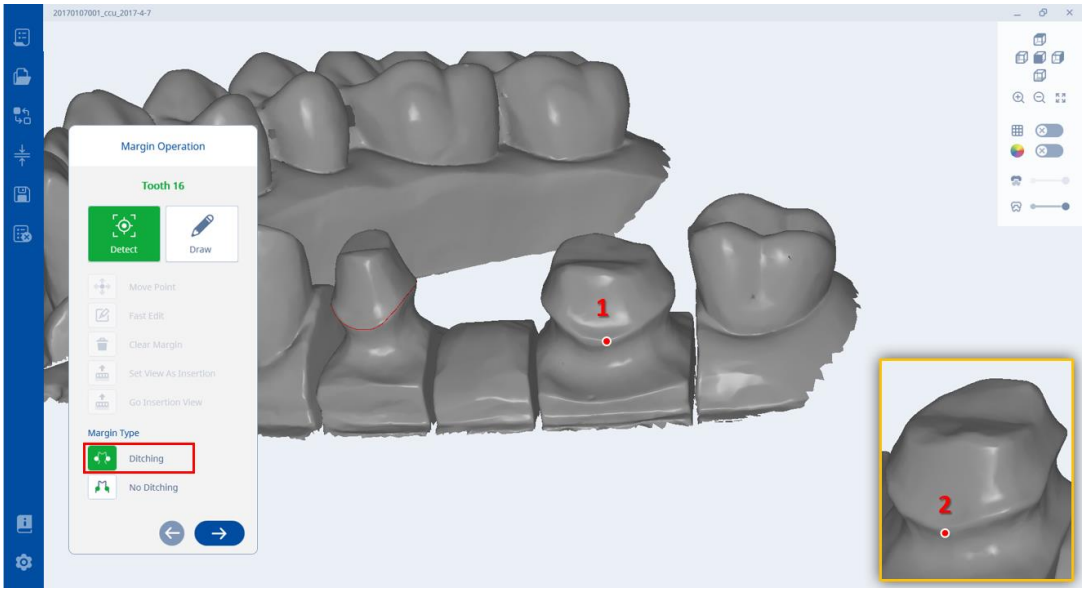
1. Draw the margin

   When  **Detect** mode is used, choose either Ditching mode or No Ditching mode.

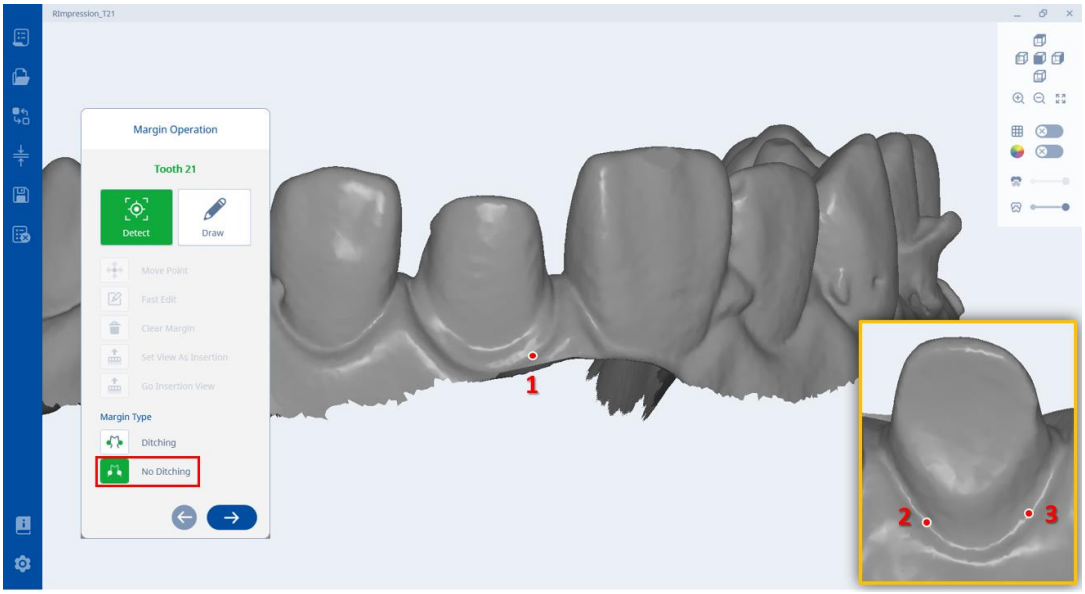
   - Generate the margin in one click

   Select the ditching mode (Ditching or No Ditching) according to the model, and then **ONE-CLICK** on the margin. The margin will be automatically generated.

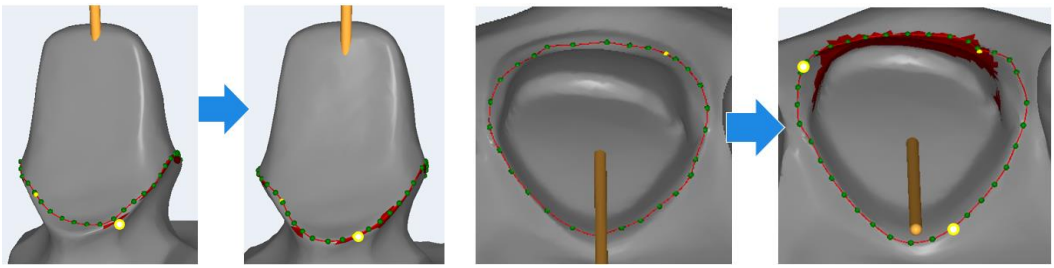
- If there is no margin after one click, please follow the below process:
  - For  Ditching mode, click on **ONE** prominent point on the margin and **ONE** prominent point at the lingual side to complete the margin line.



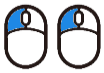
  - For  No Ditching mode, click on **ONE** pit on the margin and on **TWO** pits at the lingual side to complete the margin line.



- If the margin result is not good after one click, press **Ctrl + Left-click** to place **1** point at another side of the margin to improve the margin for ditching mode, or **2** points for no ditching mode.



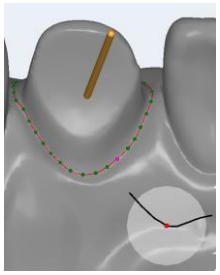
When  **Draw** mode is used, left-click to place control points to mark the margin.

	Form the margin line as a closed loop when the last point is close to the first point.

After margin line is formed, you could adjust the margin with the following tools:

-  ***Move Point*** button allows you to drag the control points to the desired positions.

  When moving the mouse cursor over the model, 2D cross-section view will be automatically displayed to help you locate the right margin position.



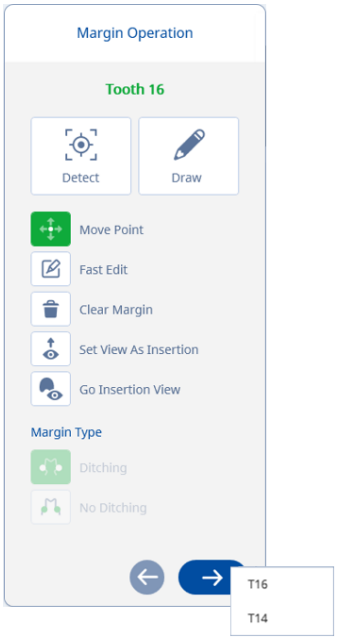
-  ***Fast Edit*** button allows you to adjust margin position quickly by manually drawing the desired margin line with the mouse cursor.

Shortcut keys for margin adjustment are explained in the below table.

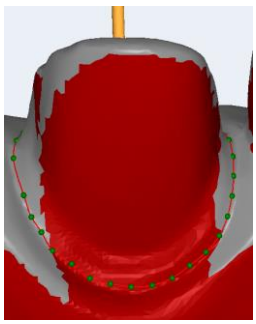
	Move and insert control point.
	Remove the previous control point during drawing the margin.
Shift 	Remove control point on the margin.

Shift + mouse	Move the margin by 0.05 mm.
Ctrl + mouse	Move the margin by 0.1 mm.
Space	Hide/Show undercut.
← →	Switch to the previous/next control point.
↑ ↓	Move the control point up/down.

After the margin line is drawn, holding down the left mouse button on ← or → button on Margin Operation panel enables you to switch to other teeth.



2. For a single coping/crown design, the insertion needs to be set at this step. When the margin line is obtained, the undercut area will be shown in red. ***Space*** key enables you to show or hide the undercut display.



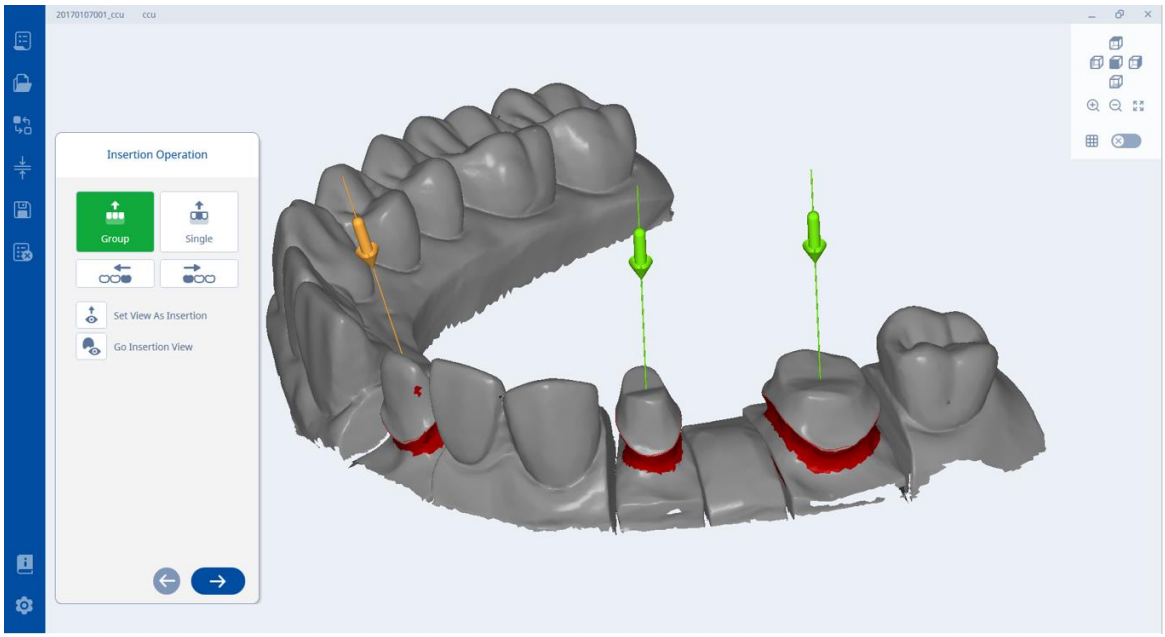
You can adjust the margin line according to the undercut.

- Click ***Go Insertion View*** button to examine the current insertion.
- Adjust the insertion and click ***Set View As Insertion*** button.

3. After the margin is adjusted, click → ***Next*** button to move to the next tooth. When the margin of all teeth is obtained, the software will navigate to the next design step.

7 Set Insertion

For the bridge design, the software will navigate to the insertion step. You need to set the insertion for each bridge. The undercut generated from the insertion will be removed in the next step.



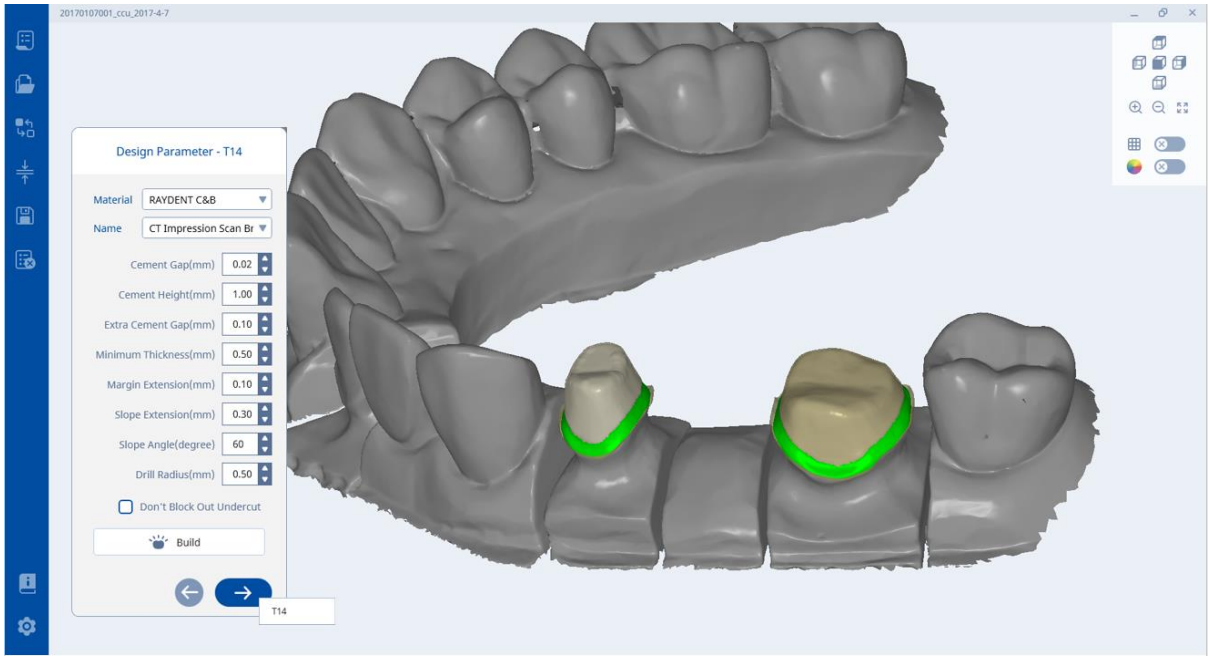
Insertion Operation function panel contains the following functions:

	Insertion setting for the bridge
	Insertion setting for a single unit
	Previous bridge/Next bridge (Previous tooth/Next tooth)
	Set View as Insertion
	Go Insertion View
	In Single Setting, click the arrow of one tooth to set as active. (The arrow of the active tooth is green).
	In Single Setting, click the arrow of the multiple teeth and the arrow of the active teeth turns into green. The insertion of the active teeth will be set as the same insertion after Set View as Insertion button is used.

After adjusting the insertion, click → ***Next*** button to go to the next design step.

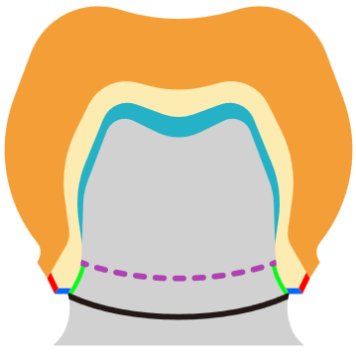
8 Set Design Parameter

At the Design Parameter step, you can select the preferred material from the drop-down list and adjust the parameters if needed. Then, click  ***Build*** button. In the case of multi-unit teeth with the same parameters, press  ***Build*** button for 1 second and click ***Build All*** button to apply the desired parameters to all tooth.



Pressing the left mouse button on  or  button enables you to switch to other teeth.

Parameters are explained as follows.

Cement gap		
Cement height		
Extra cement gap		
Minimum thickness		
Cutback		
Margin extension		
Slope extension		
Don't Block Out Undercut		Undercut will not be blocked out.

After each parameter is set, click  ***Next*** button to move to the next design step.

Set your own parameters as default

You can set your desired parameters as the default values

.

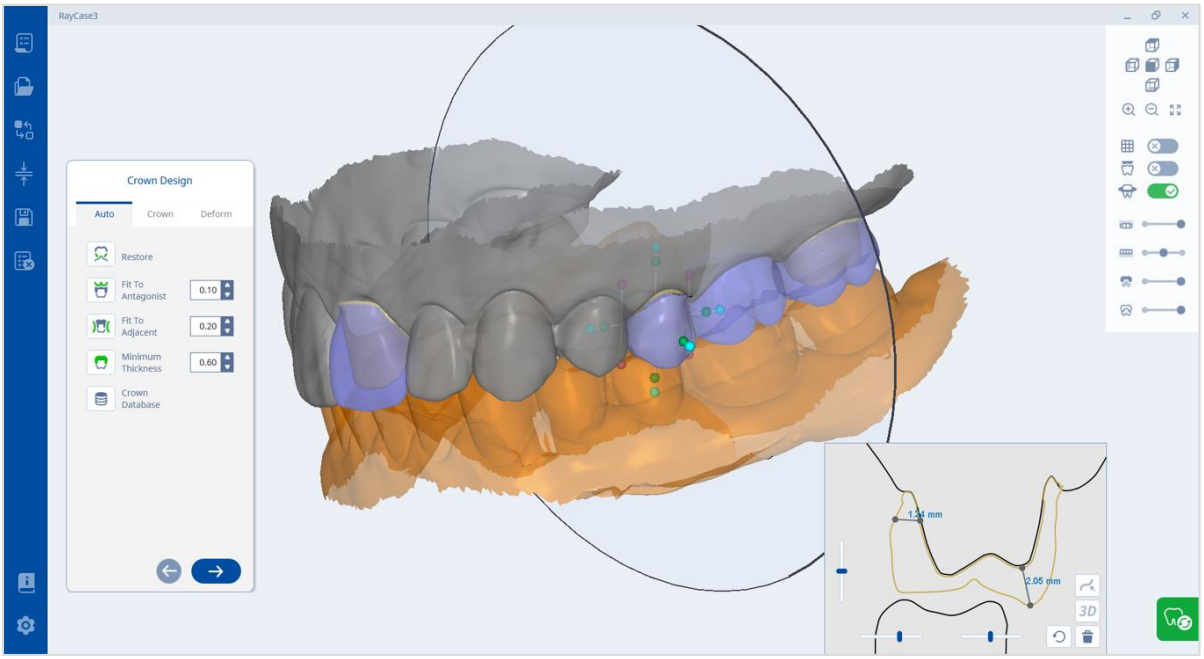
1. Open DesignParameter file (XML format) which can be found via the below path:

   Computer -> Drive C -> Ray -> RAYDENT designer -> Bin

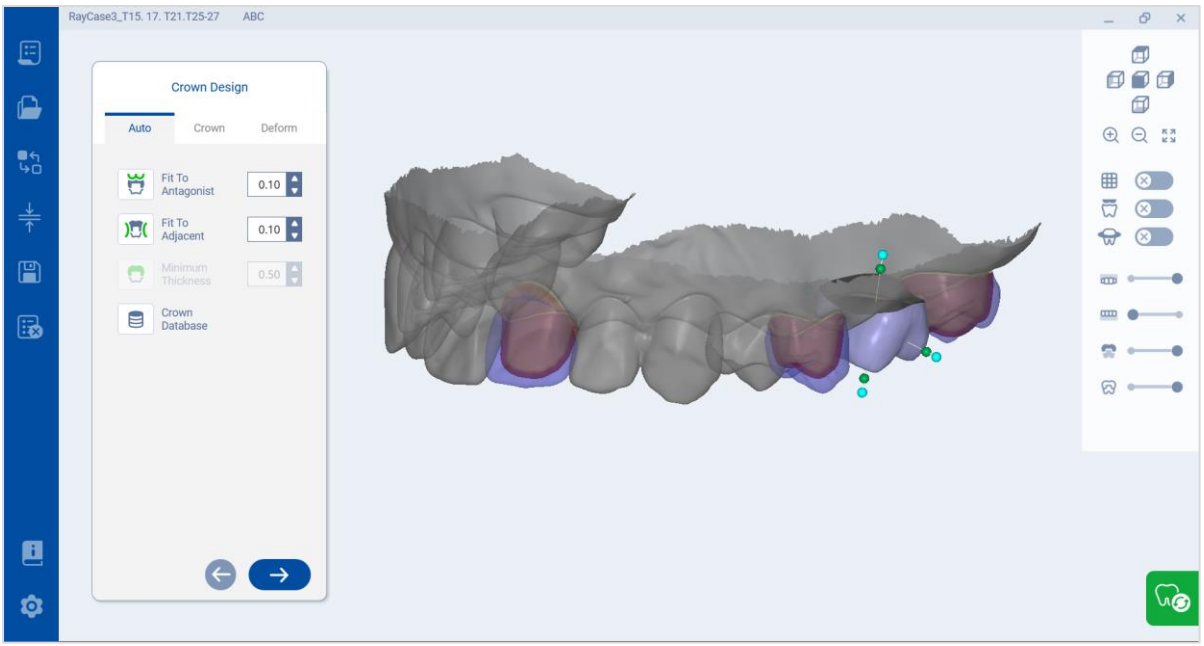
2. Change to your desired values for the corresponding parameters in DesignParamter file and **Save** the file.

9 Design Crown

When the product is an anatomic coping or anatomic crown, the software will navigate to crown design step. At the crown design step, deformation functions are provided to modify the crown or to modify the specific areas of the crown.

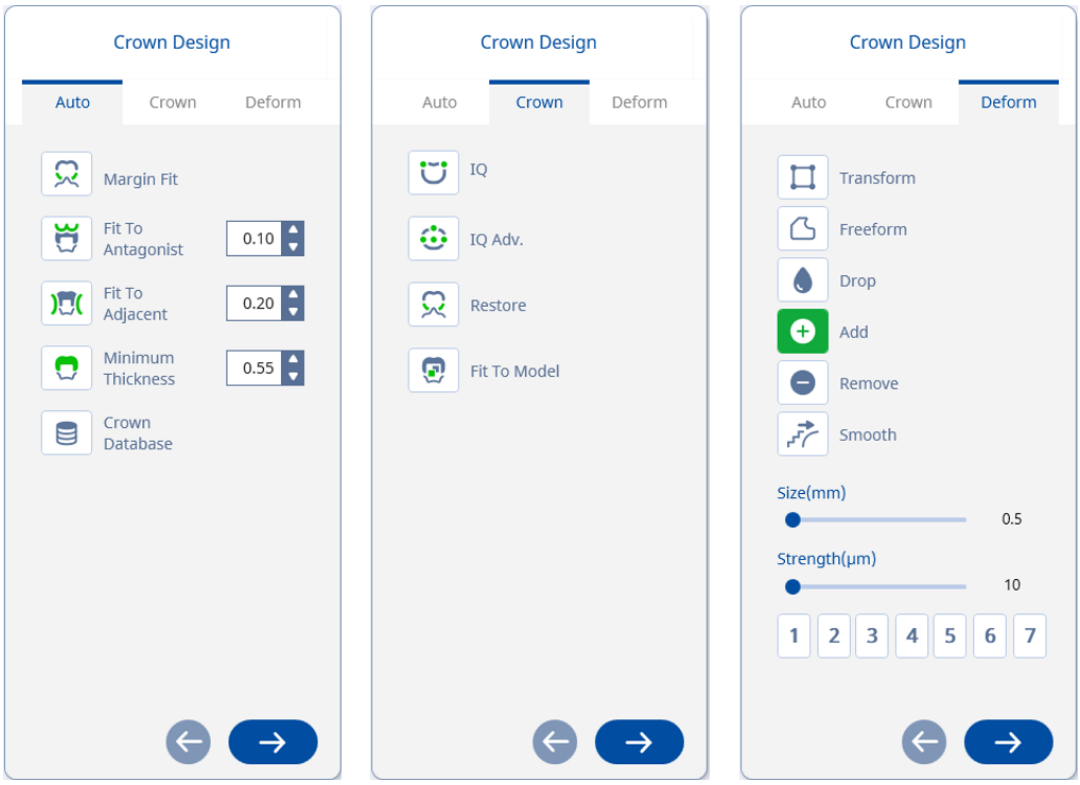


At Crown Design and Deformation step, the use is able to view the minimum thickness at Design Parameter stage.



Space	Hide/Show the minimum thickness at Design Parameter stage.

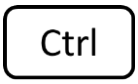
Crown Design function panel includes the following functions:



Auto tab	
	Margin Fit/ Restore – Stitch the crown bottom area to the margin, or to restore.
	Fit To Antagonist – Automatically set the occlusion contact area.
	Fit To Adjacent – Automatically set the contact area with the adjacent tooth.
	Minimum Thickness – Automatically set crown thickness as the input value.
	Crown database – Change crown database.
Crown tab	
	IQ – This function is to modify the specific areas of the crown based on the different crown morphology. Drag the point to change the shape of the crown.
	IQ Adv. – This function makes detailed modifications to the specific areas of the crown. Drag the point to change the shape of the crown.
	Fit to Model – This function is available when pre.op or denture scan file is loaded at Create Order step.

Deform tab	
	**Transform** – Adjust the position, shape, and angle of the crown quickly. • Drag the orange control ball to change the size of the crown. • Drag the green or purple control ball to change the shape of the crown. • Drag the blue control ball to rotate the crown. • Click on the crown and drag to move the crown.
	**Freeform** – Left-click on the area and drag to the desired position.
	**Drop** – Hold down the left mouse button, and drag over the area where you want to add Toggle to remove effect by pressing ***Shift+Left-click***.
	**Add** – The amount of added material will be accumulated when dragging the mouse on the same area back and forth. Toggle to Remove function by pressing ***Shift+Left-click.***
	**Remove** – The amount of material will be removed when dragging the mouse on the same area back and forth
	**Smooth** – Smooth the surface of the crown.

When  ***Transformation*** button is selected, the following shortcut keys are available

	Select multiple teeth in serial (e.g., T21~T27)
	Adjust the symmetrical tooth simultaneously.
	Select all teeth.
	Scale 0.1mm
	Scale 0.05mm

When  ,  ,  ,  or  is selected, the following shortcut keys can be used to set the size and strength of the deformation tools.

Shift + 	Change the size of the deformation.
Ctrl + 	Change the strength of the deformation.

Deformation, such as  ,  or  , can be quickly switched with predefined shortcut keys.

Ctrl + 1 ~ 7	Save the current size and strength of Add/Remove/Smooth as the defined settings.
1 ~ 7	Apply the corresponding predefined settings of Add/Remove/Smooth.

Deformation tools can be activated by the following shortcut keys.

Q	Transform
W	Freeform
E	Drop
R	Add
T	Remove
Y	Smooth

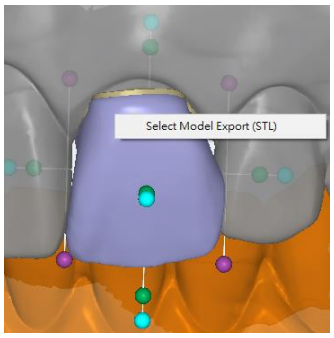
When manipulating deformation tools, Undo and Redo actions can by operated with the following shortcut keys.

Ctrl + Z	undo
Ctrl + Shift + Z	redo

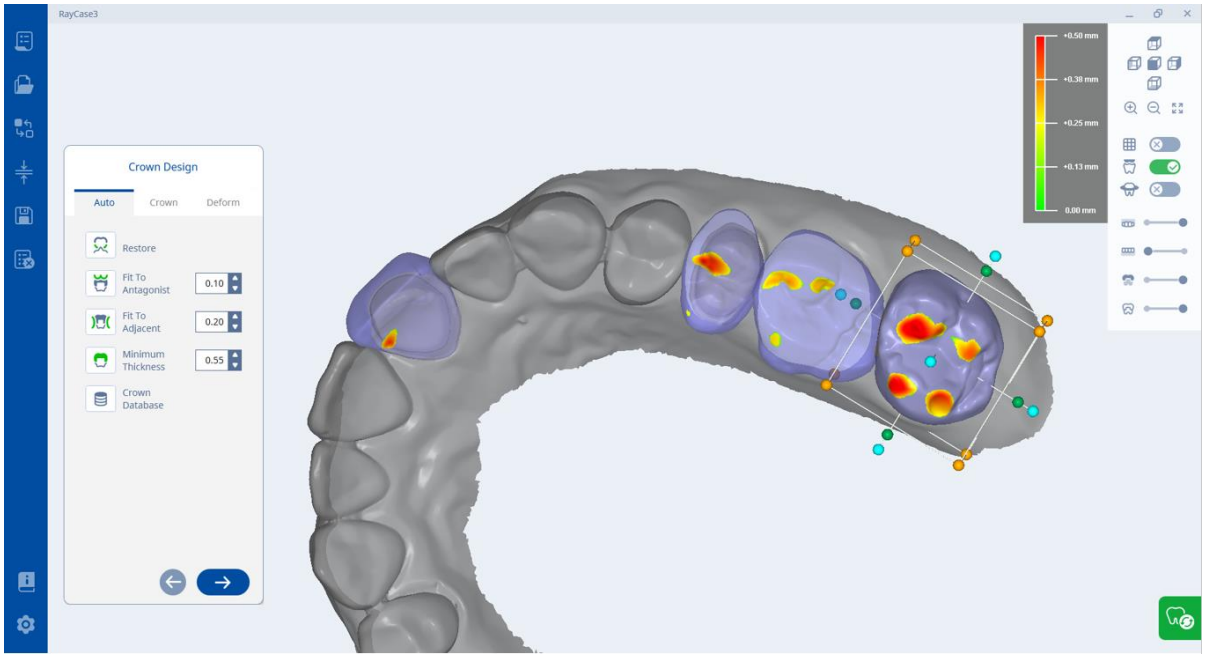
The following shortcut keys to control object display

A	Switch the visibility of the antagonist model.
S	Switch the visibility of the preparation model.
D	Switch the visibility of the active tooth.
F	Switch the visibility of the inactive teeth.

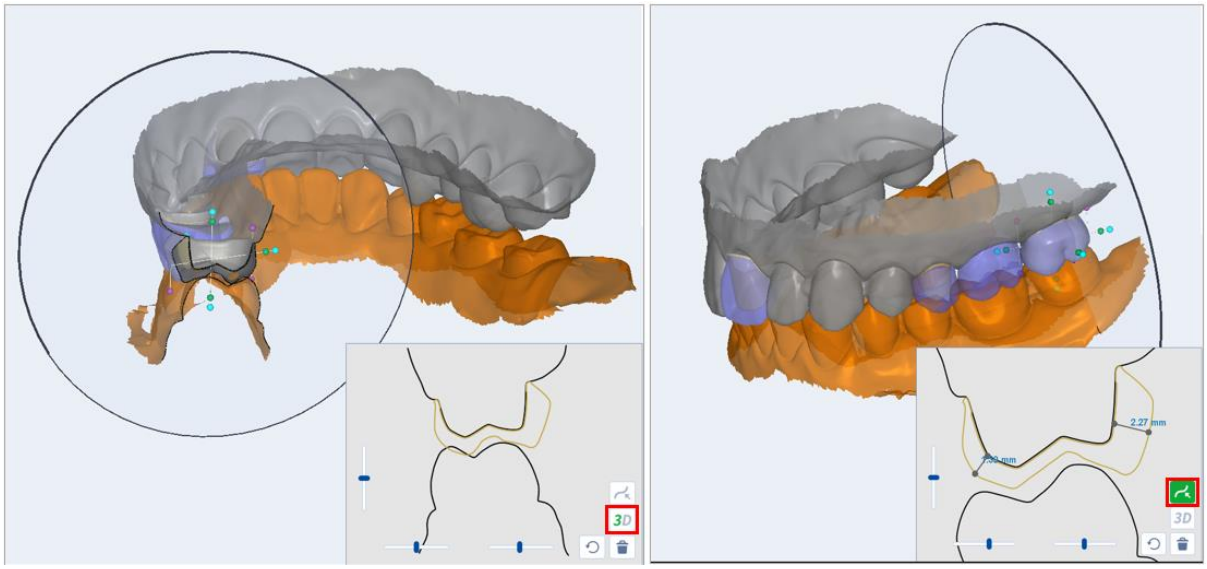
During crown design, ***Right-click*** on the crown and click ***Select Model Export (STL)*** to save the crown as STL file.



 **Show collision** with antagonist and neighboring tooth.

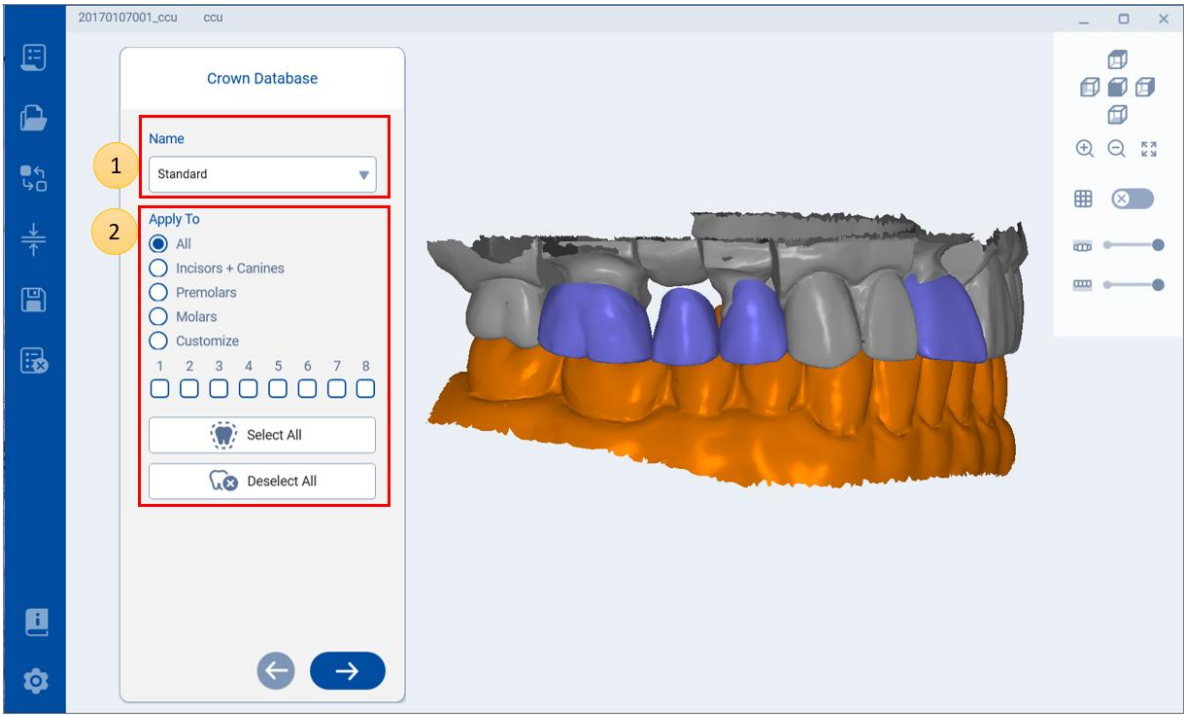


Show 2D cross section: click any two points on cross section window to measure the distance.



	Click two points on the contour line to measure the distance.		Clear measured data.
3D	Show 3D section view.		Reset 2D cross section window.

Crown Database: Apply the desired crown library to the specific teeth.



1	**Name**: Select the desired crown database from the drop-down list.

There are five sets of built-in crown database: **Adult, New Young, Senior, Standard, Youth.** The crown database can be added by the user (Please refer to Chapter 2.6).

2	**Apply to**: Apply the selected crown database to the specific teeth

- **All**: Apply to all designed teeth.
- **Incisors+ Canines**: Apply to incisors and canines only.
- **Premolars**: Apply to premolars only.
- **Molars**: Apply to molars only.
- **Customize**: Tick the tooth number checkboxes to designate the specific tooth numbers which the selected crown database will be applied to.
- **Select All**: Select all tooth number checkboxes.
- **Deselect All**: Deselect all tooth number checkboxes.

Click  button to return to Crown Design step without changing the crown database.

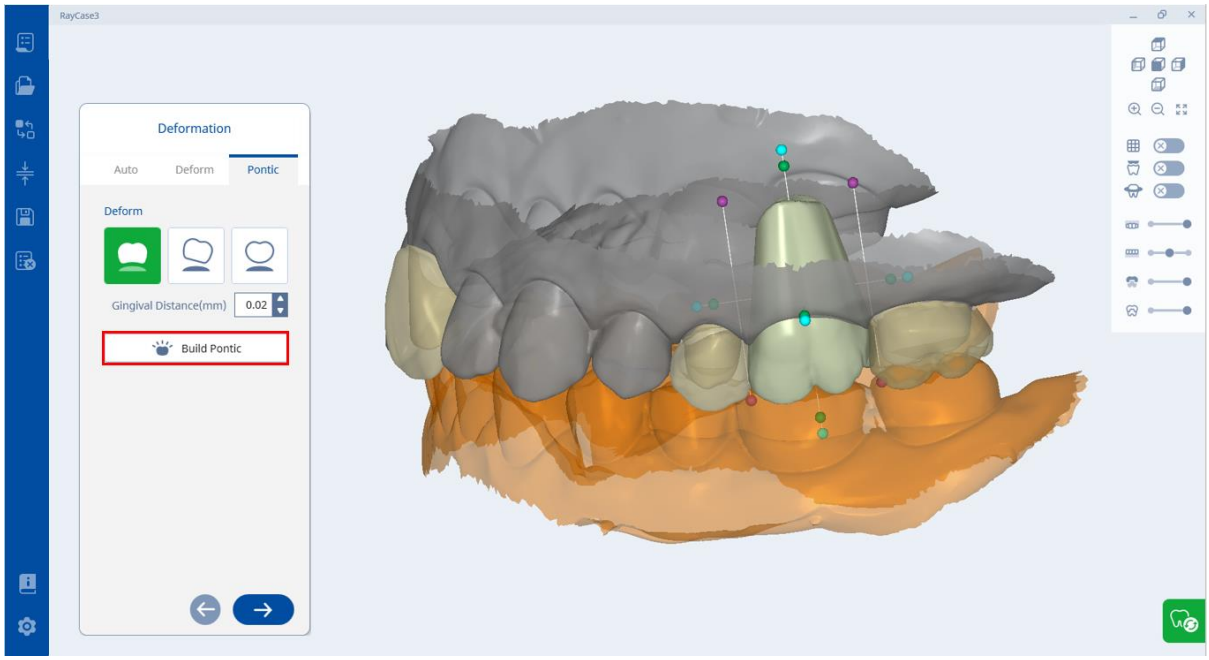
Click  button to change the crown database on the selected teeth.

10 Design Pontic

At Deformation step, you can still make the modifications on the crown. In addition, the pontic can be designed at this step.

For pontic design, toggle to the pontic tab. Select the desired pontic shape, adjust the desired gingival distance and click  ***Build Pontic*** button to execute.

For the multi-unit pontics, press  ***Build Pontic*** button for 1 second and click ***Build All*** button to apply the desired settings to all pontics.



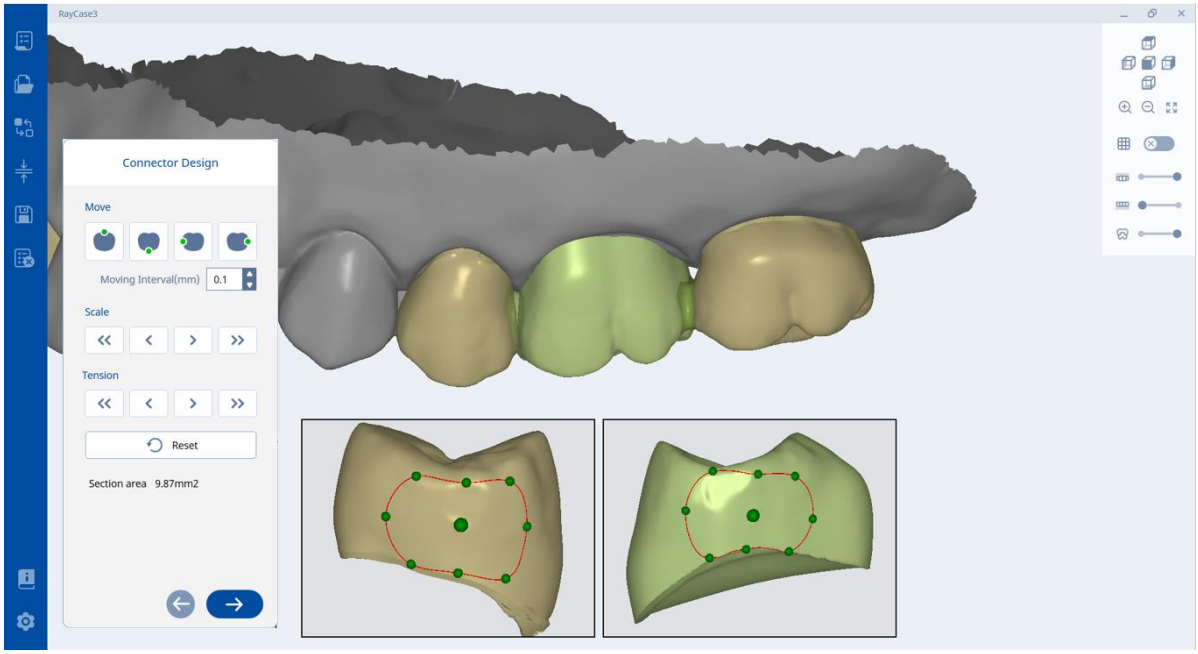
There are three pontic shapes:

	Saddle
	Ridge Lap
	Bullet-shape

11 Design Connector

For the bridge, the connectors can be designed at this step.

- 3D view window shows the bridge including copings/crowns, pontic(s), and connectors.
- The two bottom windows show the connected areas at both sides of an active connector.
- The active connector is transparent; the inactive connector turns to solid and is not available for modification.



Connector Design function panel contains the following functions:

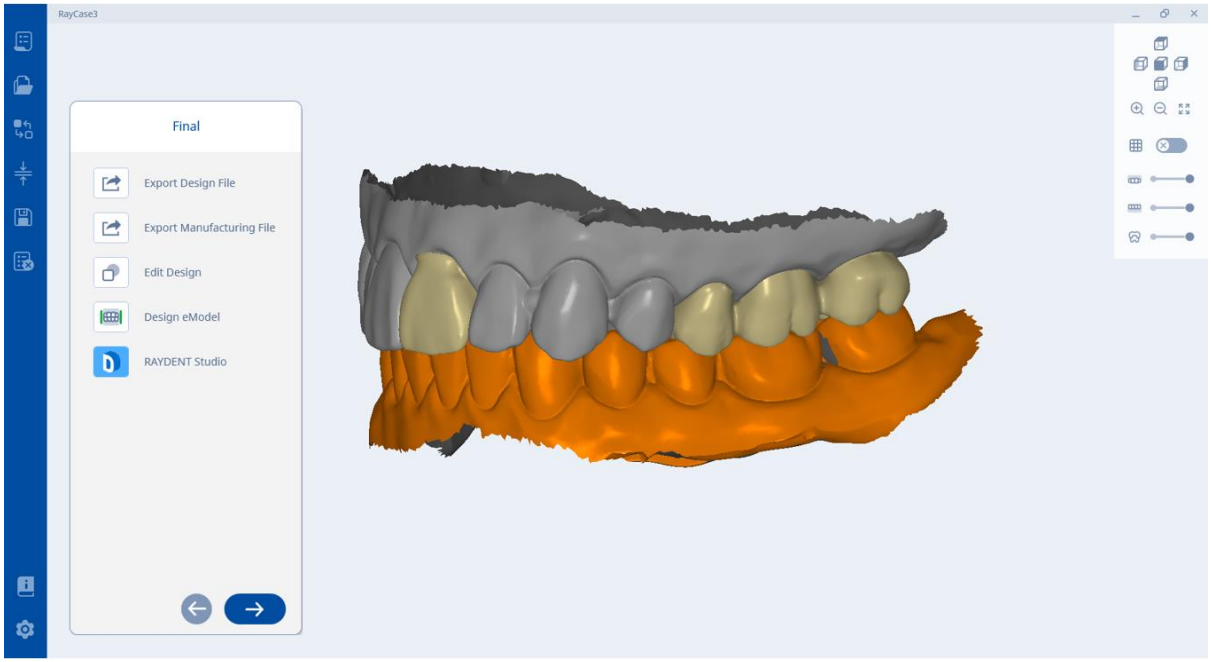
	Click one of the four direction buttons to move the connector up, down or in the buccal or lingual direction. The increment of each movement can be set in the *Moving Interval* field.
Scale	Click the arrow button of Scale to set the size of the selected connector. Right arrow is to enlarge, and left arrow is to narrow down.
Tension	Click the arrow button of Tension to adjust the central area of the connector. Right arrow is to increase, and left arrow is to decrease the central area of the connector.
	Restore to the original position and size.

The colors of the connector are judged by the following standards:

Connector color	**One side of the connector is coping or crown**	**One side of the connector is pontic**
Green	Connector is larger than 9 mm^2	Connector is larger than 12 mm^2
Yellow	Connector is between 7 and 9 mm^2	Connector is between 9 and 12 mm^2
Red	Connector is smaller than 7 mm^2	Connector is smaller than 9 mm^2
Black	Connector is problematic	Connector is problematic

12 Export

Once design is complete, the software will navigate you to Final step. You are able to export files and make further adjustment or design eModel.



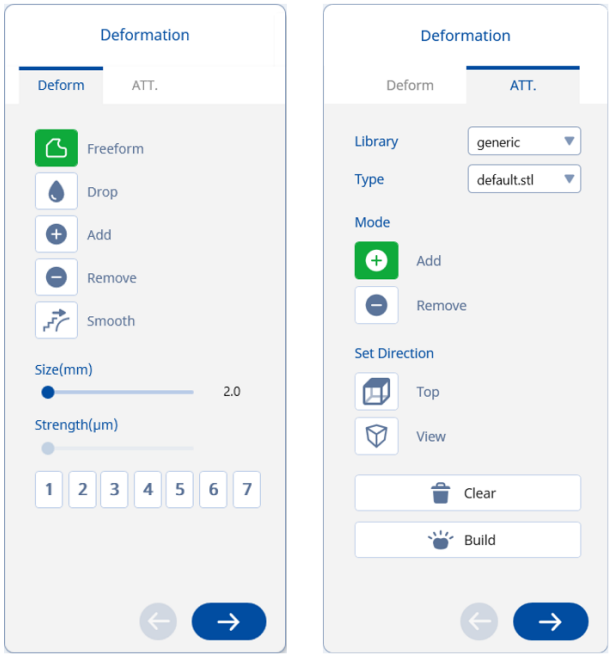
Final function panel provide the following functions:

	**Export Design File** – The design will be exported and saved in the design file folder under the default path.
	**Export Manufacturing File** – Move the coordinate system of the design file to (0, 0, 0) and output design file in STL and PTS format.
	**Edit Design** – Adjust the design by using deformation functions, or edit the attachment.
	**Design eModel** – Design digital model.
	**RAYDENT Studio** – Connect to RAYDENT Studio.

12.1 Edit Design and Attachment

When selecting  ***Edit Design*** button in Final step, you will be navigated to Deformation function panel.

- You can make final adjustments on the design before exporting the design file by using deformation functions under the Deform tab.
- You can also add an attachment or dig a hole under ATT tab.

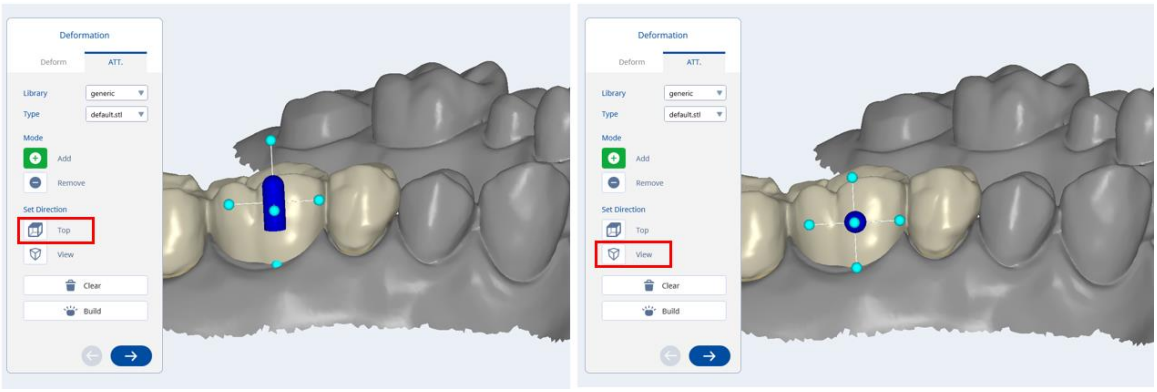


ATT. tab contains the following functions.

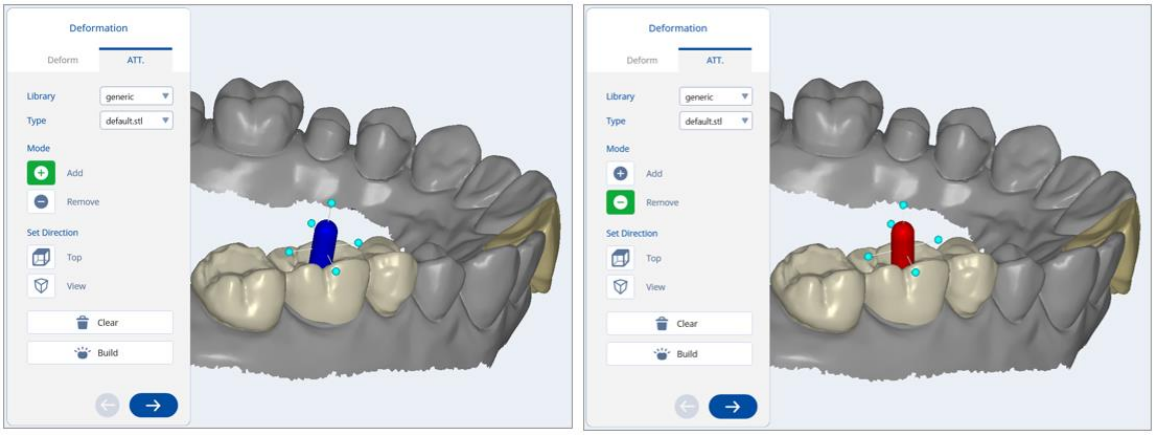
Library	Attachment library.
Type	Attachment types.
	**Add** – Add attachment.
	**Remove** – Attachment will be used to dig holes on the crown.
	**Top** – Turn the object to Top view (Z-axis).
	**View** – Set the attachment according to the current view.
	**Clear** – Clear attachment.
	**Build** – Execute the operation of adding or removing the attachment.

The following steps explains how attachment operation works:

1. Select the **Library** and **Type** of attachment.
2. Select the mode for attachment operation.
   - **Add**: The attachment shown in blue will be added to the crown.
   - **Remove**: The attachment shown in red will be removed and this can be used to dig a hole on the crown.
3. Click on the tooth to place the attachment.
4. Set the direction for the attachment.
   - Click  ***Top*** button to set the attachment in the top view.
   - Click  ***View*** button to turn the attachment to face the current view.



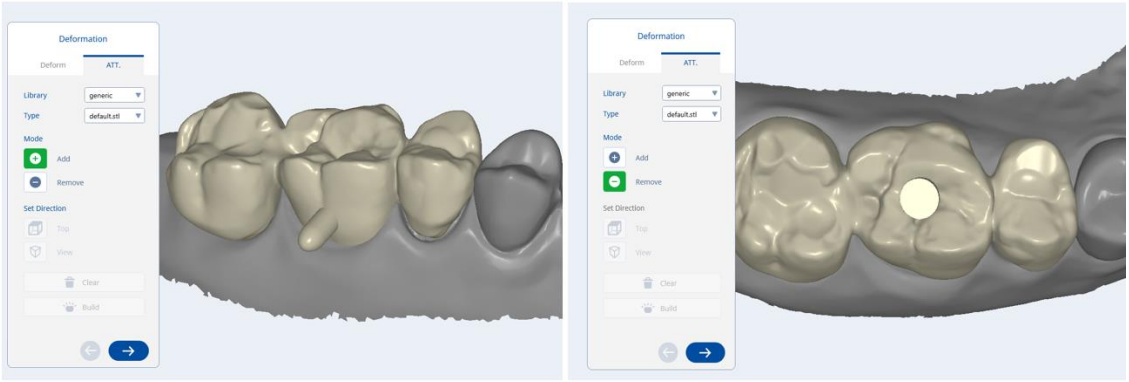
5. Adjust the attachment.
   - Drag the blue control ball to rotate the attachment.



Shortcut keys allows you to adjust the attachment position and size.

	Click on the attachment and drag to move the attachment.
	Scale the attachment in Z axis when hovering the cursor above the attachment.
Ctrl 	Scale the attachment in XY axis when hovering the cursor above the attachment.
Shift 	Scale the attachment in XYZ axis when hovering the cursor above the attachment.

6. Once the attachment adjustment is complete, click  ***Build*** button to add/remove the attachment.



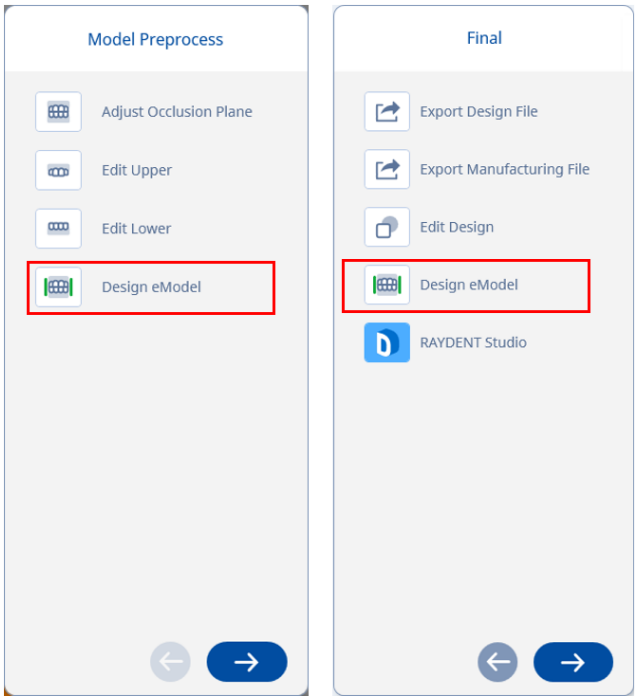
7. Click  ***Next*** button to return to Final step.

13 Design Digital Model

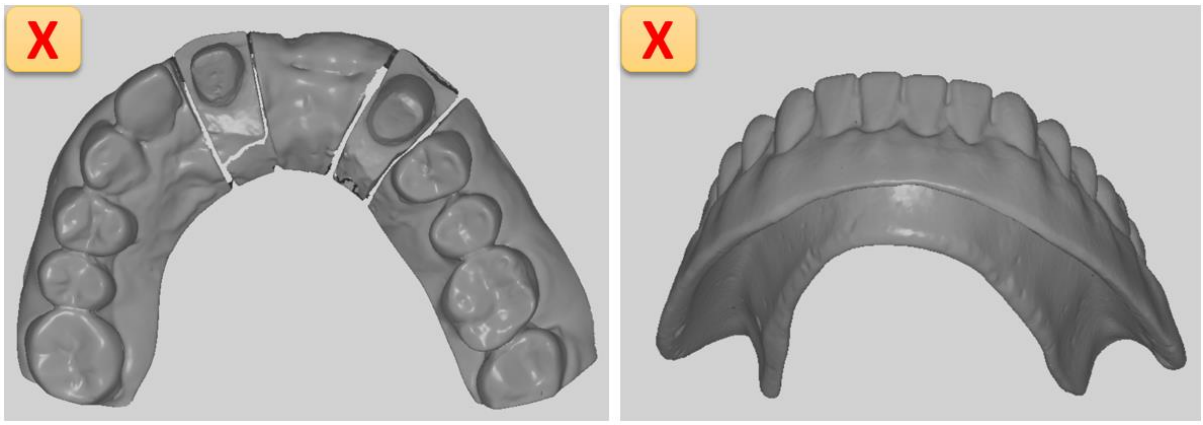
There are two entries to design digital model:

(1) At Model Preprocess step, click  ***Design eModel*** button.

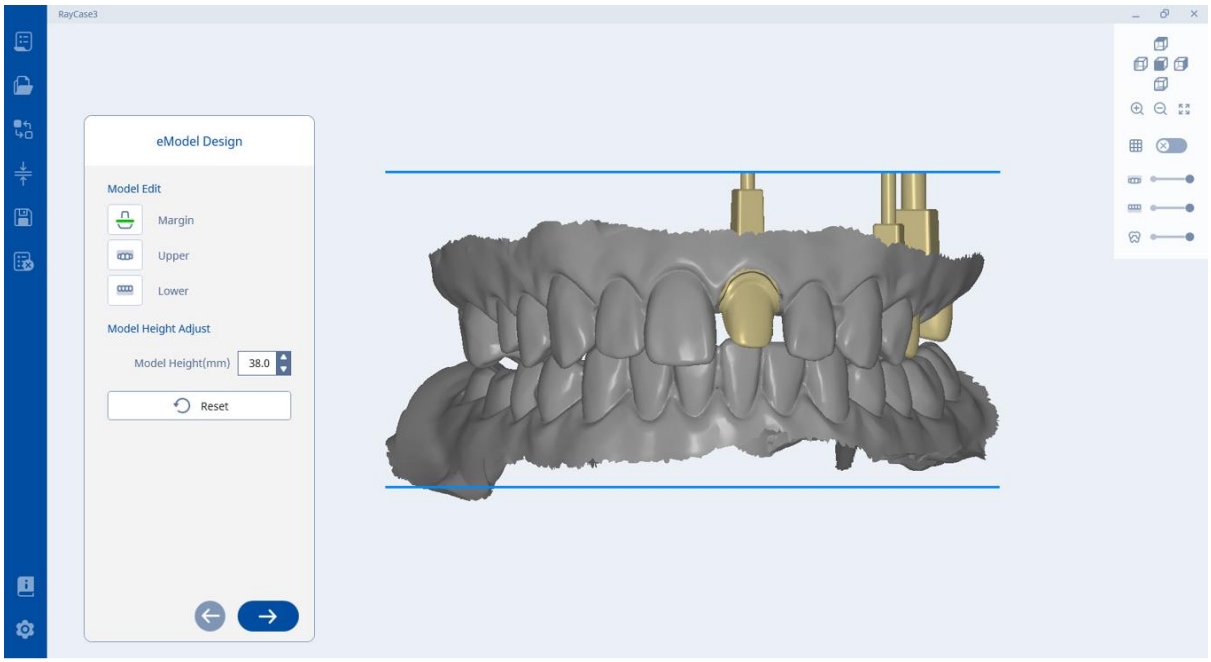
(2) At Final step, click  ***Design eModel*** button.



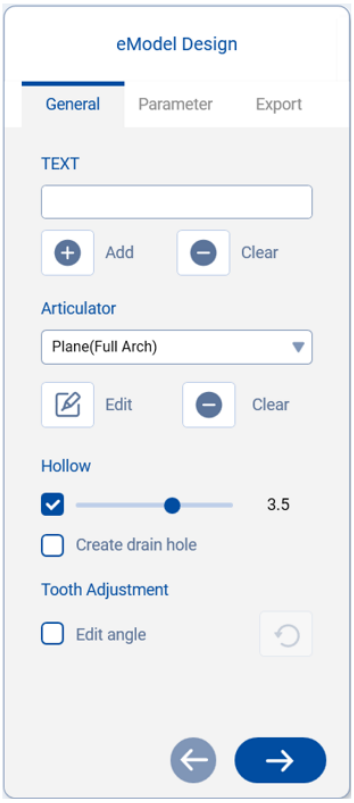
NOTE: eModel cannot be designed on separated model and closed model.

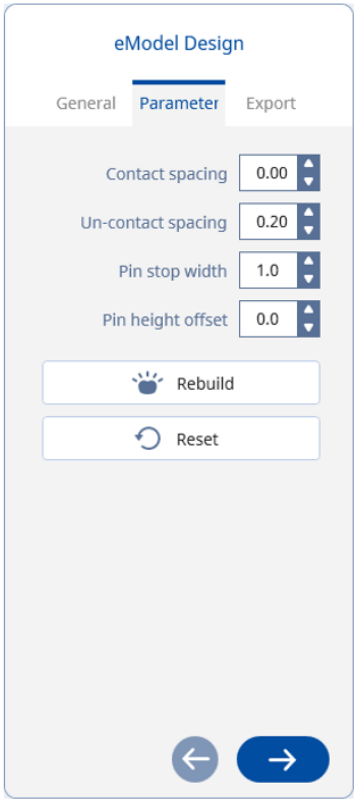


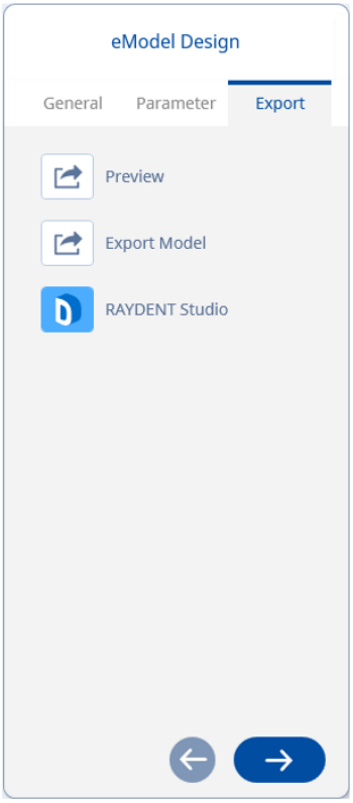
On eModel Design function panel, you are able to edit margin and model mesh data, and also adjust the total model height. Then, click ***Next*** button to construct digital model.



eModel function panel include the following functions:





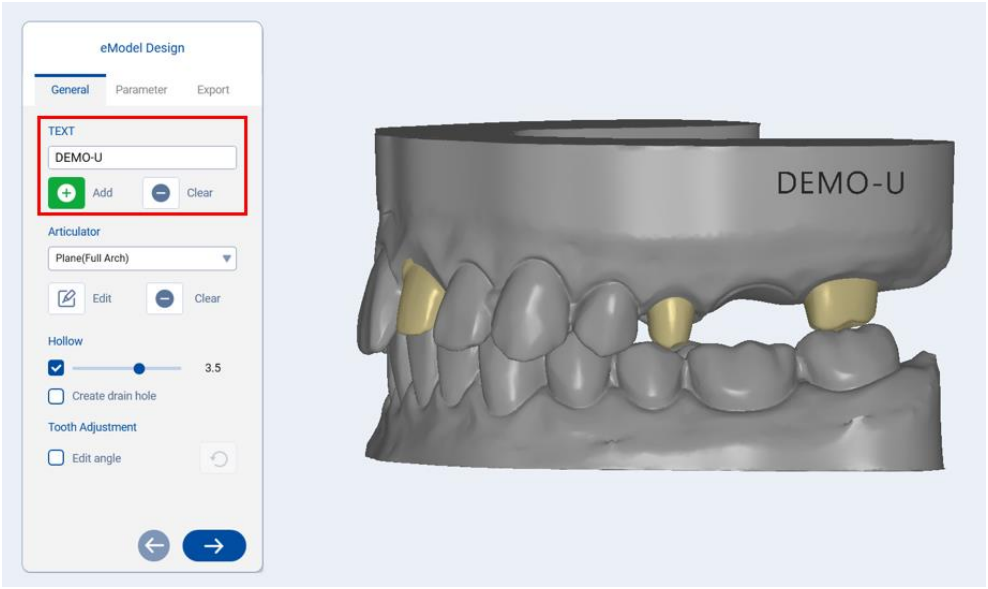


1. General tab

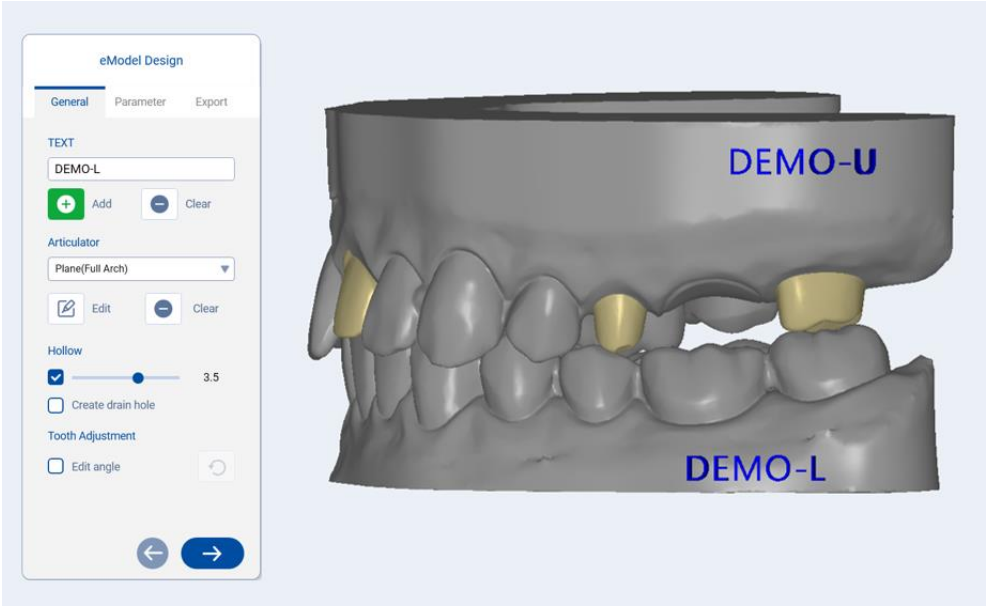
- **Add Text**

- Enter the texts in the TEXT field and click  ***Add*** button

- Move the mouse cursor to view the text on the model.



- Left-click to place the text on the model and the text will turn into blue. You can add different texts to the upper and lower models.



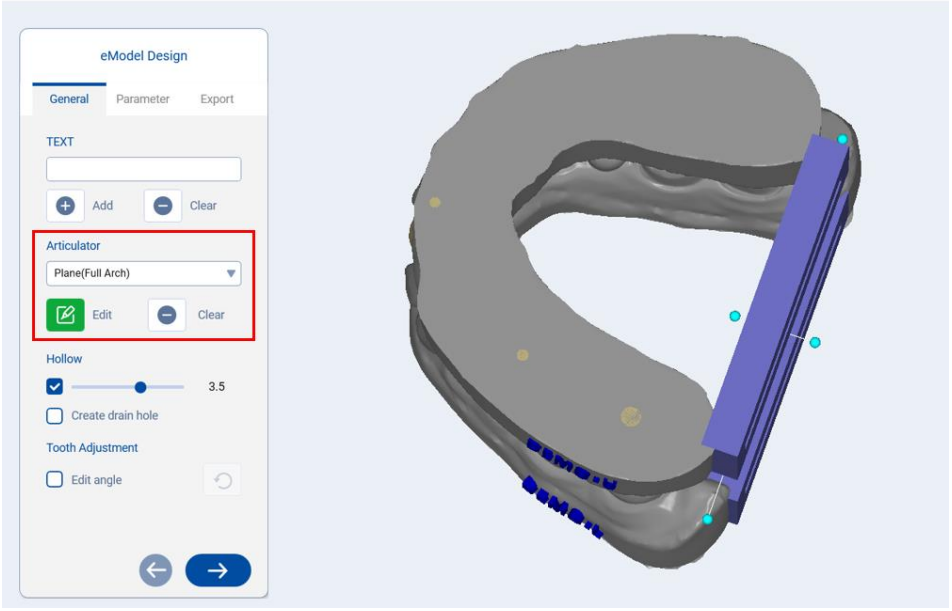
- Click  ***Clear*** button and click on the text to delete the selected text.

- **Add Articulator**

  - Select the articulator type.

  - Click  ***Edit*** button and click on the model to place the articulator.

    - Click on the articulator and drag to move the articulator to the desired position.
    - Drag blue control ball to rotate the articulator.

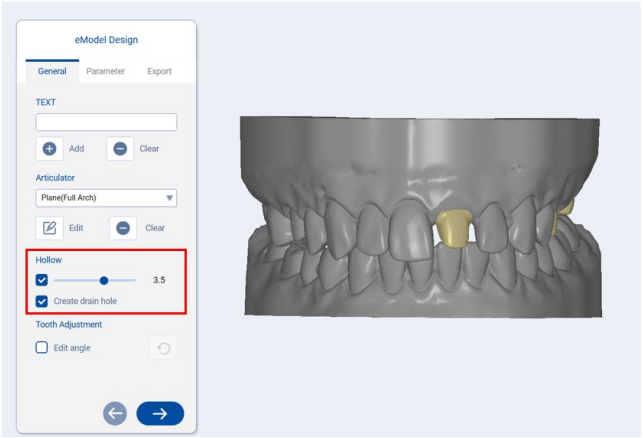


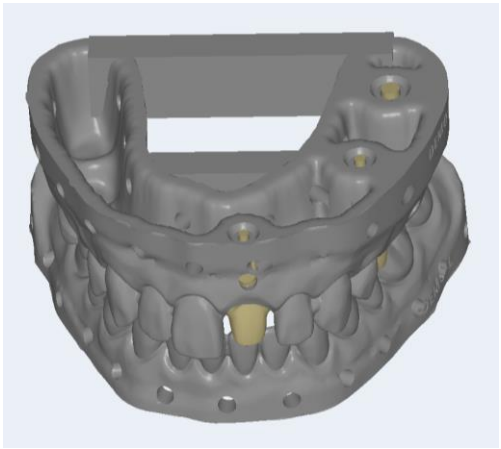
  - Click on the articulator and press ***Del*** key to delete the selected articulator.

  - Click  ***Clear*** button to clear all articulators.

- **Hollow the model**

  - Tick ***Hollow*** checkbox and adjust the hollowing thickness by using the slider.
  - Tick ***Create drain hole*** checkbox to make holes for resin to be flowed out.

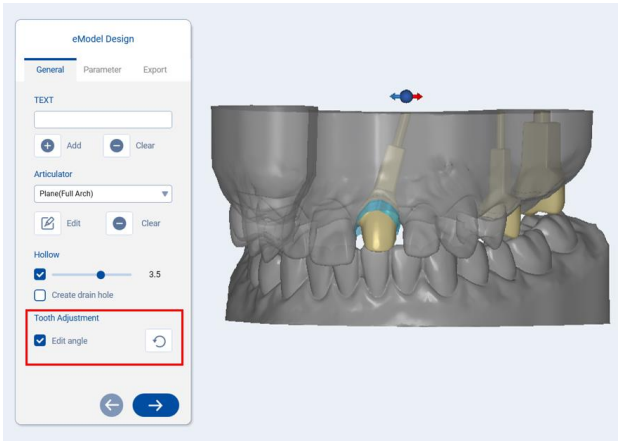


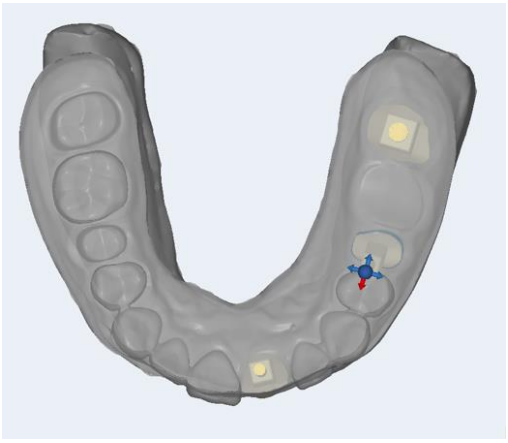


- **Tooth Adjustment**

  Tick the ***Edit angle*** checkbox and drag the arrow to adjust the angle of the pin to prevent it from interfering with the neighboring teeth. Click on the tooth and adjust the pin.

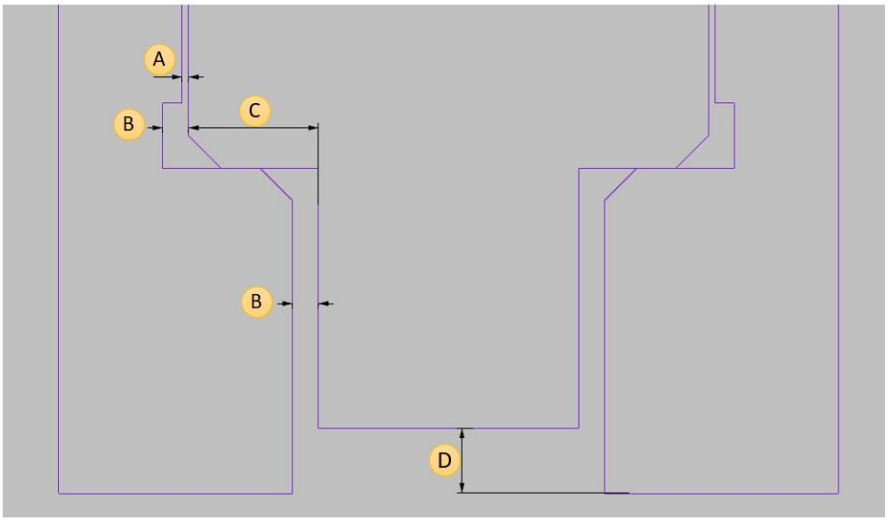
  - Use  button to reset the pin.





2. Parameter tab

You can adjust parameters for ditched model.



A	Contact spacing
B	Un-contact spacing
C	Pin stop width
D	Pin height offset

	Apply the parameters to rebuild the pin.
	Restore to the original settings.

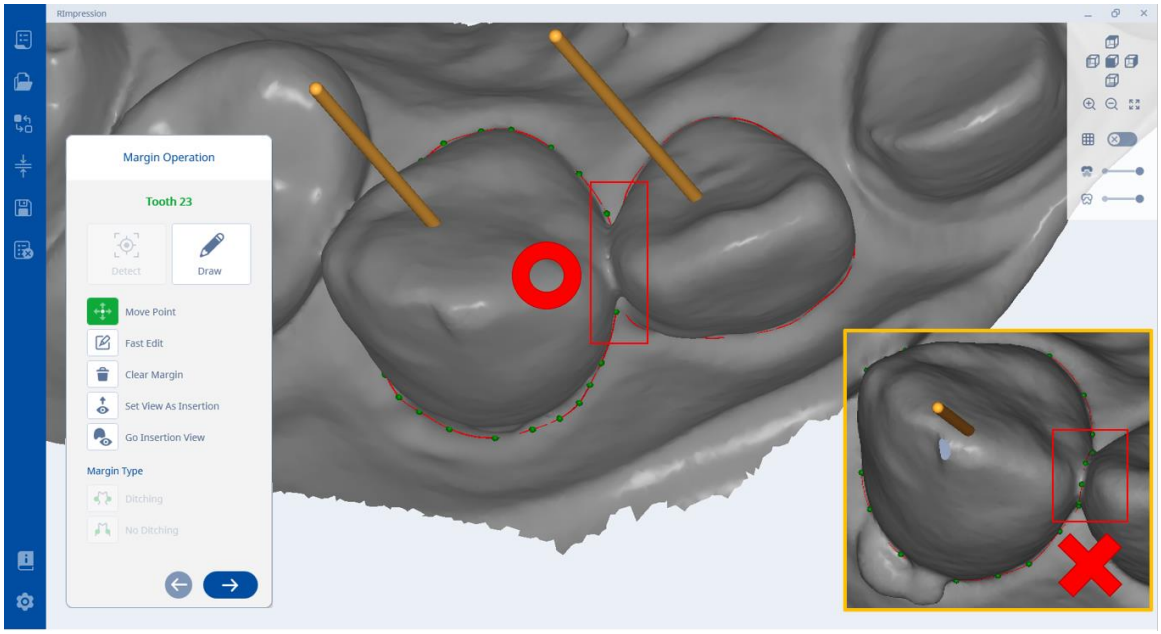
3. Export tab

-  ***Preview:*** preview the emodel result.
-  ***Export Model:*** output model file in STL format.
-  ***RAYDENT Studio:*** connect the printer.

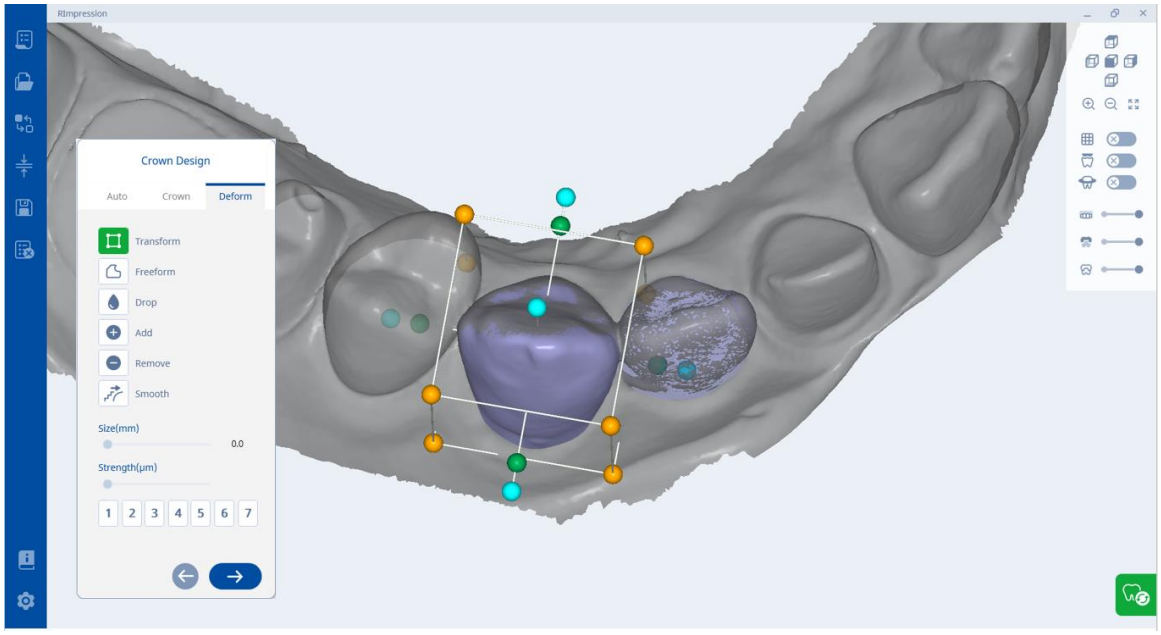
14 Design Provisional Crown

When the product is set as Provisional Crown, the partial design process is different from Anatomic Crown design. The different design process is explained below.

1. Please locate the margin points across the mesiodistal area, instead of placing the margin points on the scan data.

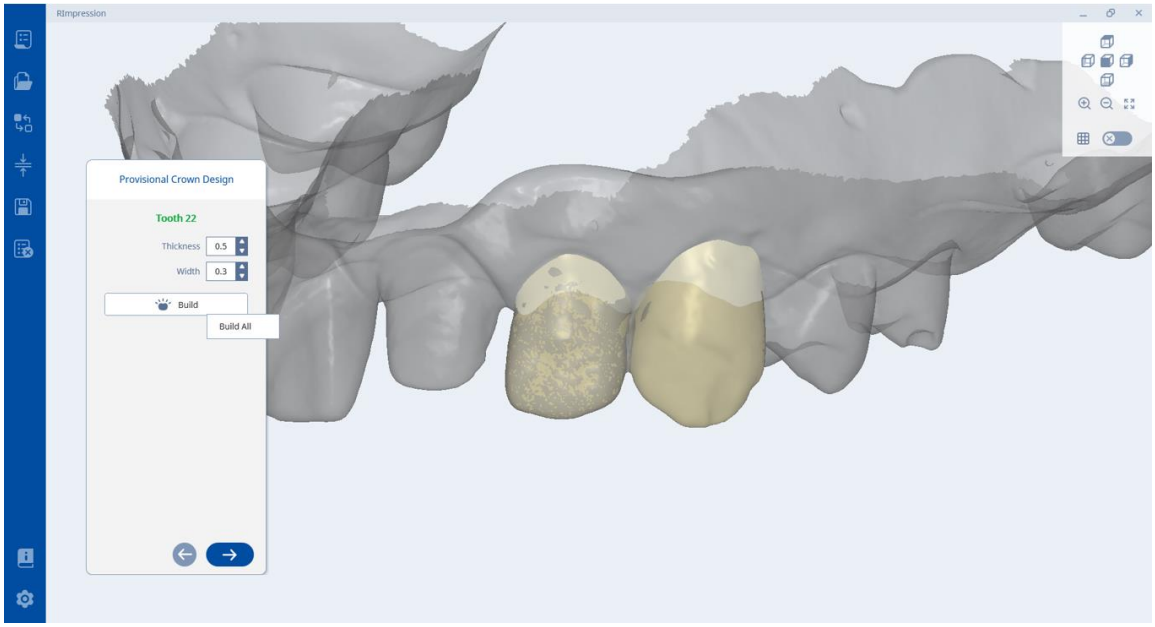


2. After the insertion is set, the provisional crown will be automatically generated. You can use deformation functions to modify the provisional crown when needed.



3. Set the thickness and width for the provisional crown and click  ***Build*** button to create the provisional crown.

   For multiple provisional crowns, press  ***Build*** button for 1 second and click ***Build All*** button to apply the desired settings to all crowns.



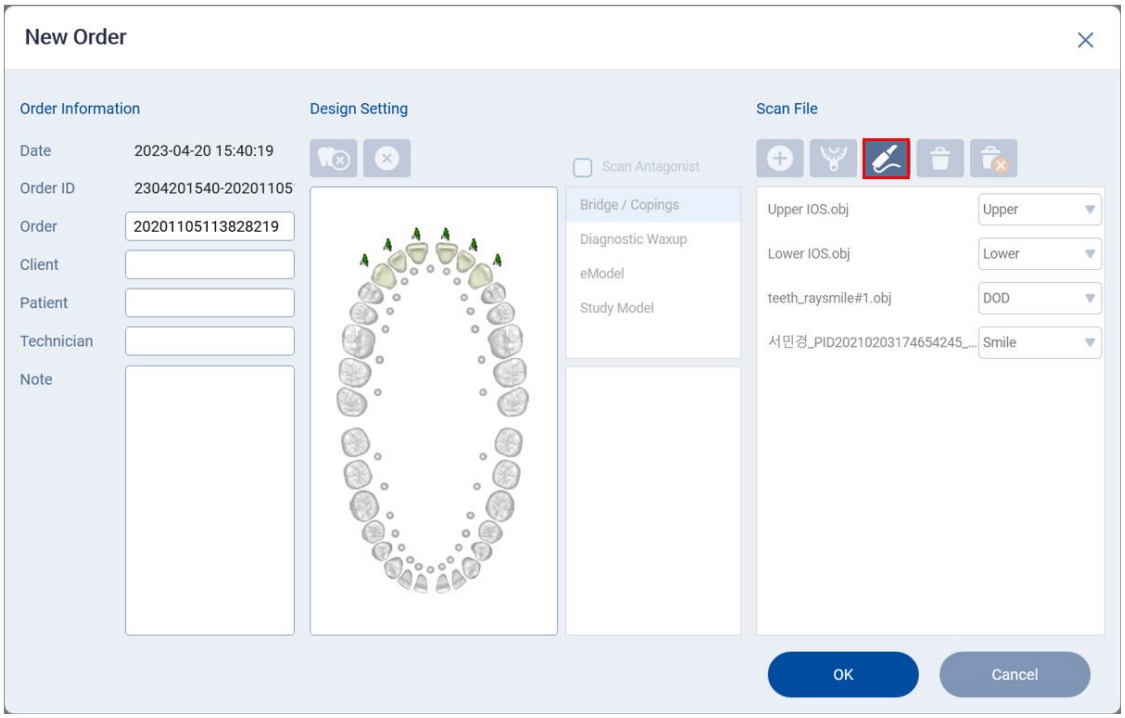
4. After the provisional crown is created, it can still be modified and then exported.

15 Design Mockup Veneer

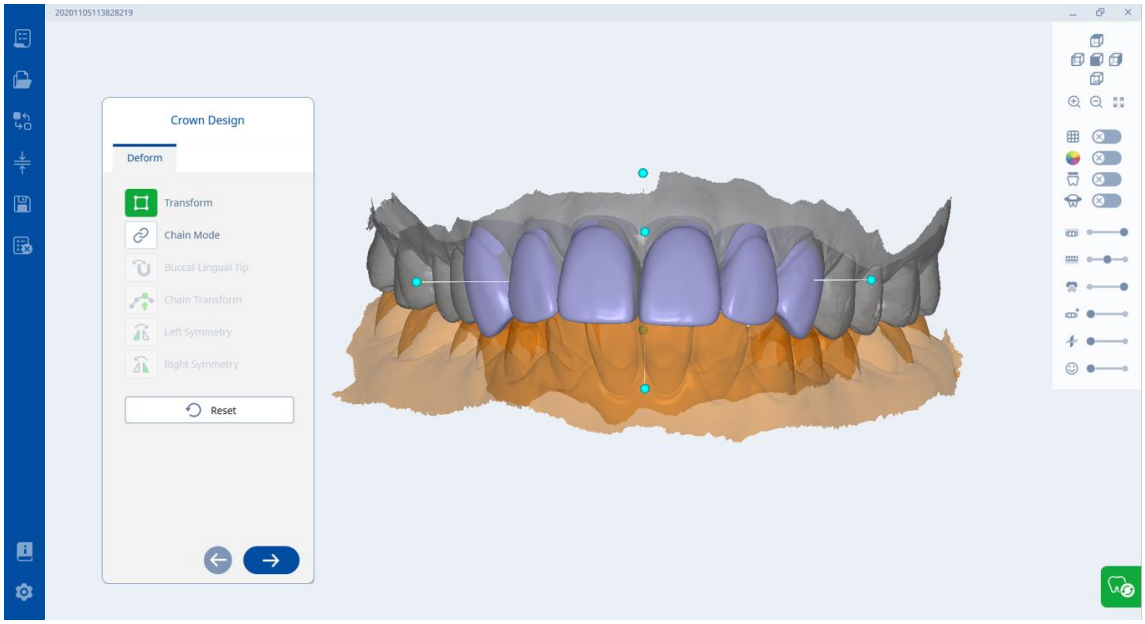
The design process of mockup veneer is explained as follows:

1. On New Order window, click  button and select ***RayFace*** from drop-down menu.

2. Load RayFace scan file (*.**rfs**). Teeth position and product type will be automatically selected.



3. Mockup veneer will be automatically created.



4. Crown Design function panel includes the following functions:

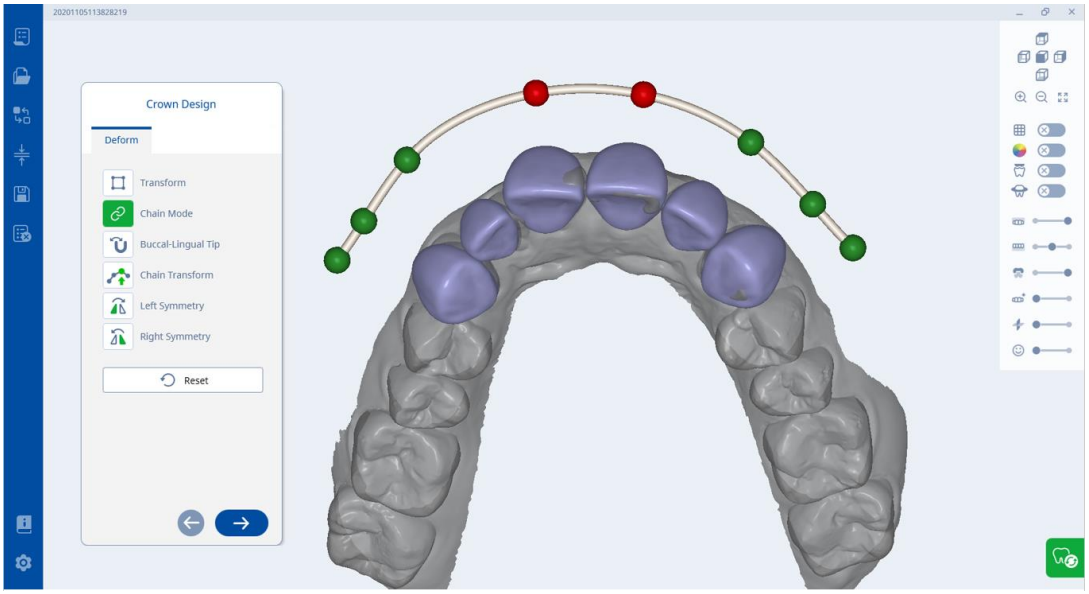
(1) **Transform**

Ctrl + 	Scale the current model by 0.02 time.
Shift + 	Scale the current model by 0.01 times

(2) **Chain Mode**

When  button is on, you can move the mockup veneer in a chain:

- **Lock**: Click the green ball to fix the individual tooth to the current position. The ball of locked tooth turns into red. The movement will not apply to the locked teeth.
- **Move**: Click any tooth marked in green ball and drag to modify the shape of mockup veneer.



Under Chain Mode, you are able to manipulate the following functions:

- **Buccal-Lingual Tip**

Under Chain Mode,  ***Buccal-Lingual Tip*** function allows you to make the individual tooth or the partial crown shell tip in buccal-lingual direction.

- Tip in a Chain: Click on the tooth marked with green ball and drag to make partial crown shell tip in buccal-lingual direction.
- Tip a single tooth: Press ***Shift+Left-click*** on a single tooth and drag to tip.

- **Chain Transform**

  Under Chain Mode,  ***Chain Transform*** function allows you to adjust the mockup veneer in a chain by moving, rotating, or scaling.

  Lock function can only apply on a single tooth.

  Hold down the following key and left mouse button on the tooth and drag to perform the actions:

	Move the tooth.
Ctrl 	Rotate in horizontal direction.
Alt 	Rotate in vertical direction.
Shift 	Scale the tooth

- **Symmetry:**

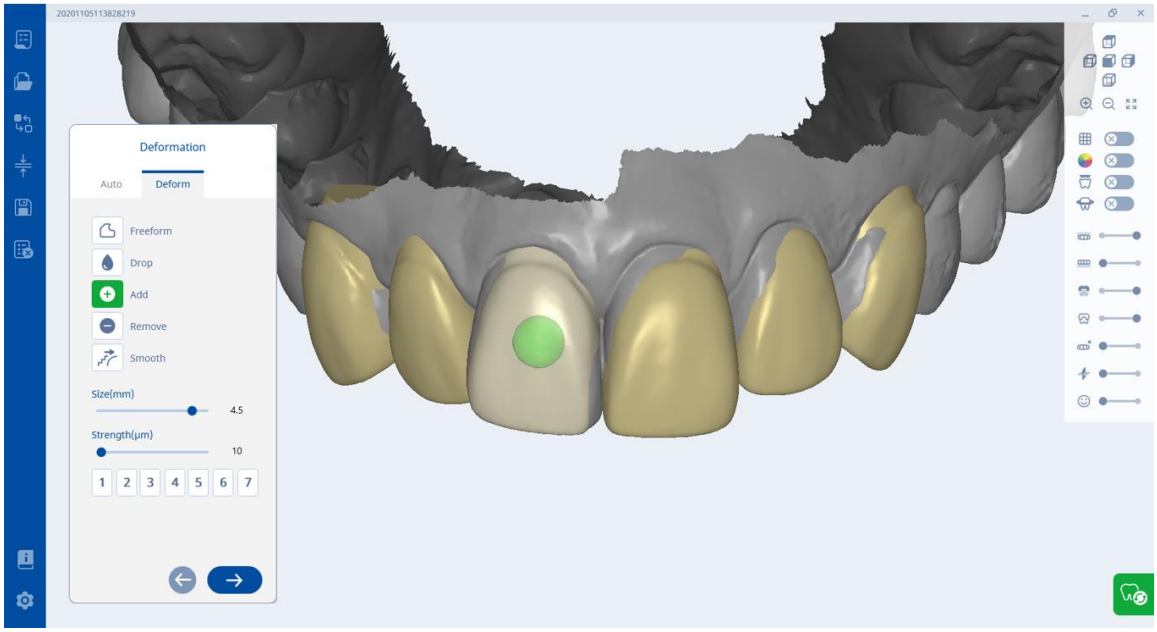
  When Symmetry button is on, *Chain Mode, Buccal-Lingual Tip* or *Chain Transform* function can also be used. The movement will be symmetrically updated.

  -  ***Left Symmetry***: Mirror the left quadrant to the right. The right is symmetrical to the left.
  -  ***Right Symmetry***: Mirror the right quadrant to the left. The left is symmetrical to the right.

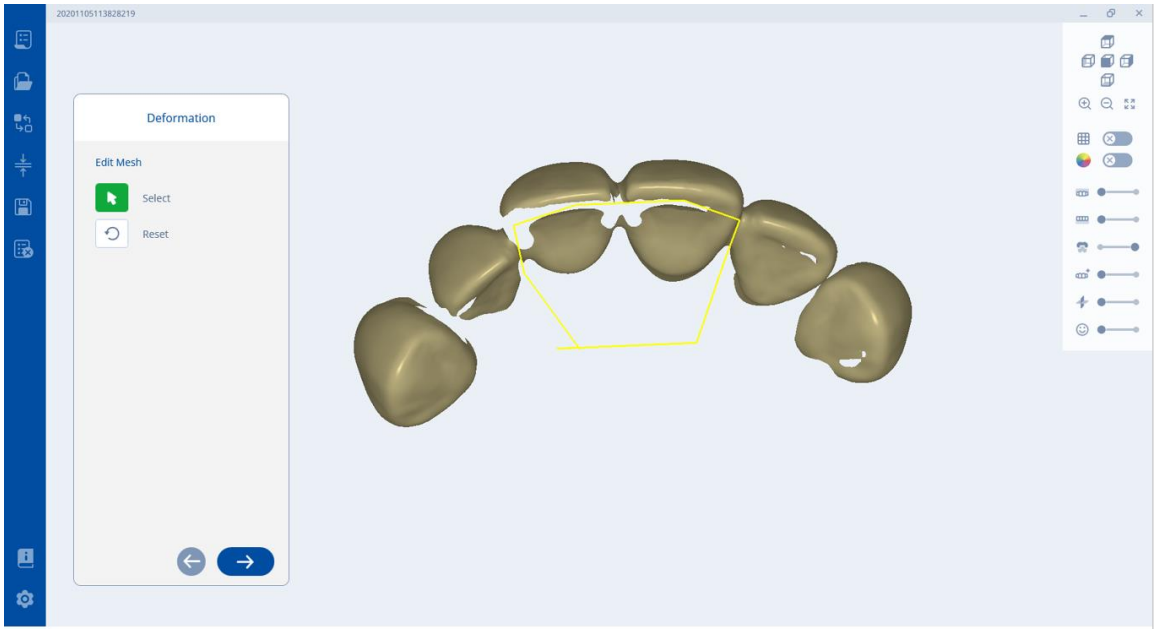
  Undo and Redo actions can by operated with the following shortcut keys.

Ctrl Z	undo
Ctrl Shift Z	redo

5. You can adjust the mockup veneers with deformation functions.



6. You can edit mesh data on mockup veneer when needed.



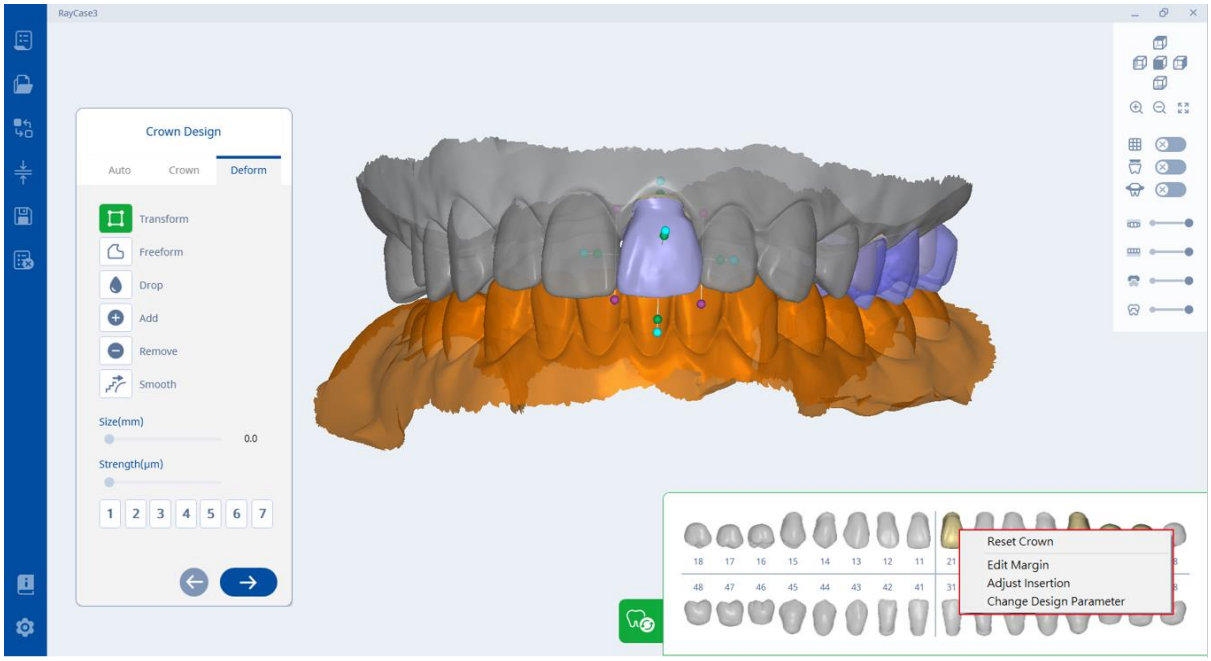
	**Select** - Drawing a line to select the redundant area. ***Right-click*** to finish the line and selected area will be deleted.
	**Reset** - Reset the mockup veneer.

7. Final step

You are able to export files and make further adjustments or design eModel.

16 Quick Design Change

At Crown Design and Deformation step, Design Change menu on the right side of 3D view window help you quickly modify the design.



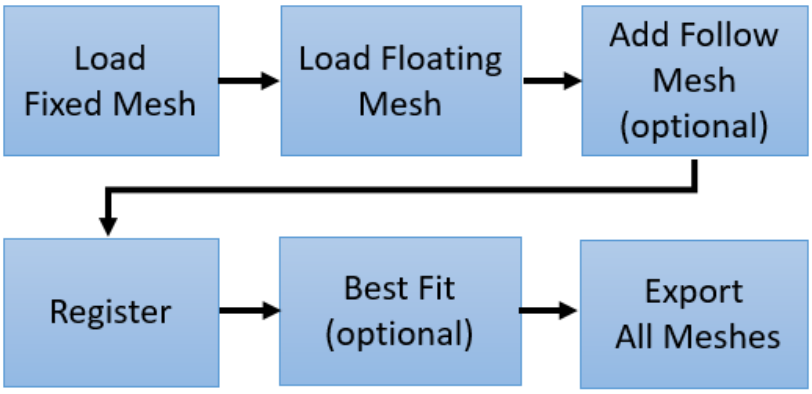
Click  button and ***Left-click*** the tooth to be modified. Select the quick design change function from the menu.

- **Reset Crown**: Restore crown shape.
- **Edit Margin**: Return to Margin Operation step to adjust the margin.
- **Adjust Insertion**: Return to Insertion Operation step to adjust the insertion.
- **Change Design Parameter**: Return to Design Parameter step to change the parameters.

17 Mesh Alignment

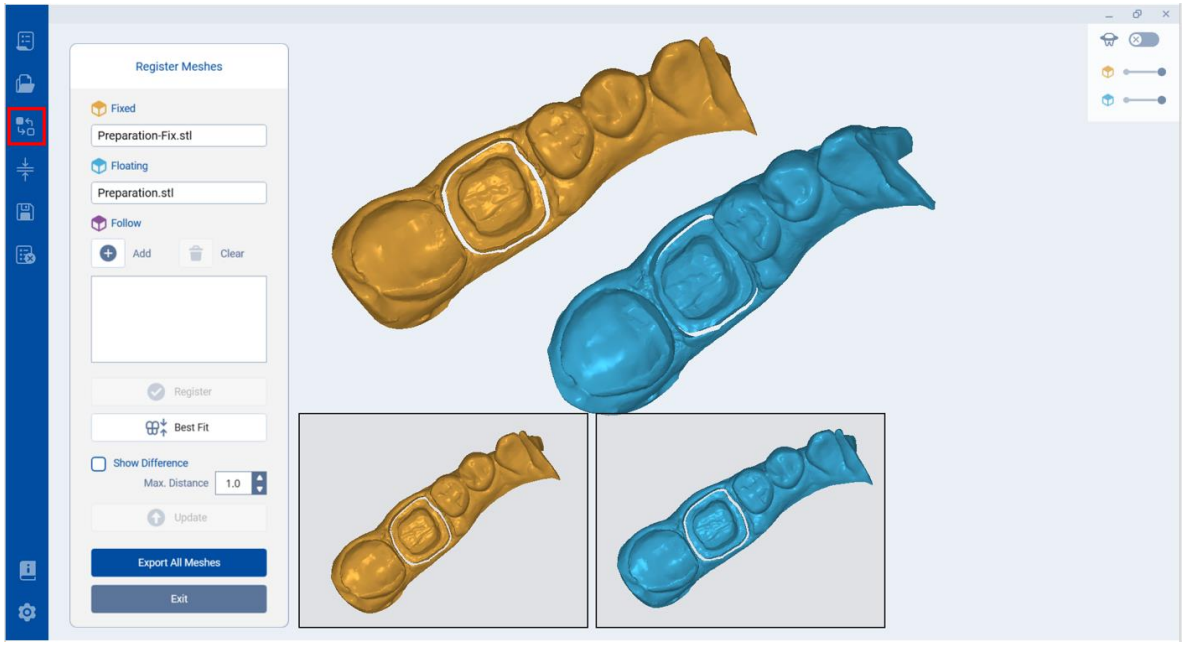
This software provides a handy mesh alignment function for the user to align mesh data.

The workflow of aligning meshes is as follows.



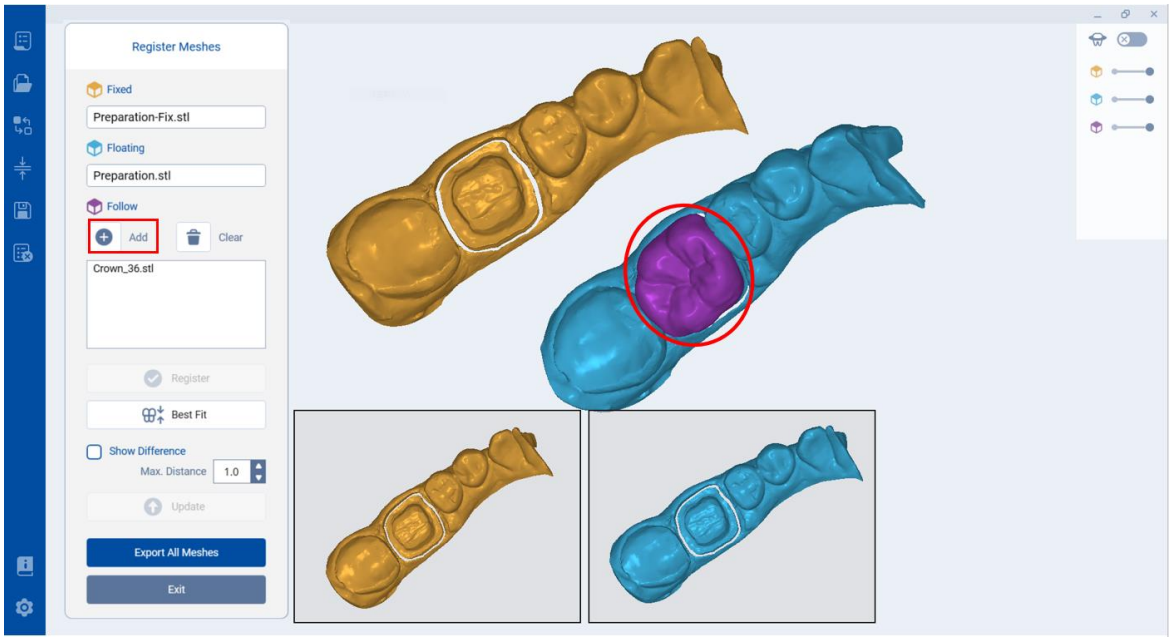
Following the steps to register meshes.

1. Click  ***Mesh Alignment*** button on the main menu.
2. In the pop-up Load Fixed Mesh window, select the referenced mesh data from the computer.
3. In the pop-up Load Floating Mesh window, select the mesh data which will be aligned to the reference data.

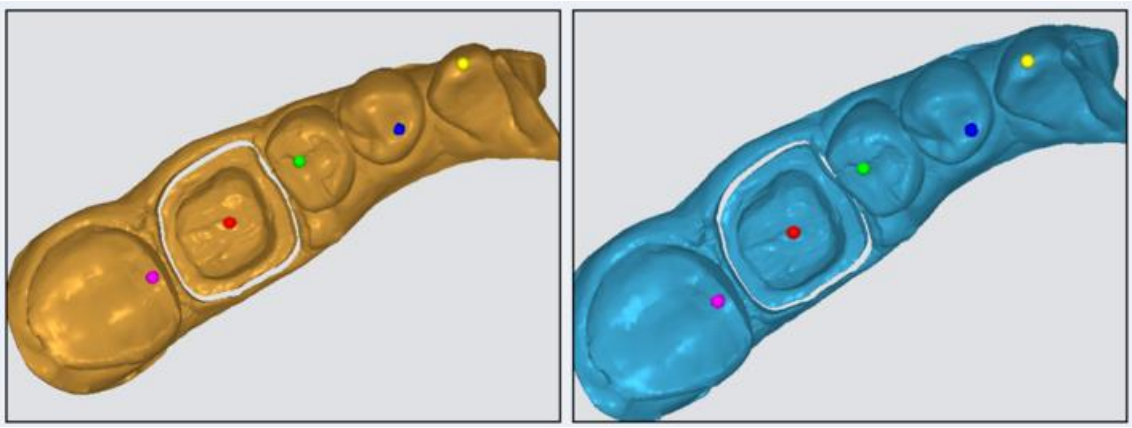


4. If there is any mesh object to be added onto the floating mesh data, click  ***Add*** button and select the followed mesh object.

   Click  ***Clear*** button to delete the followed mesh object from the list.



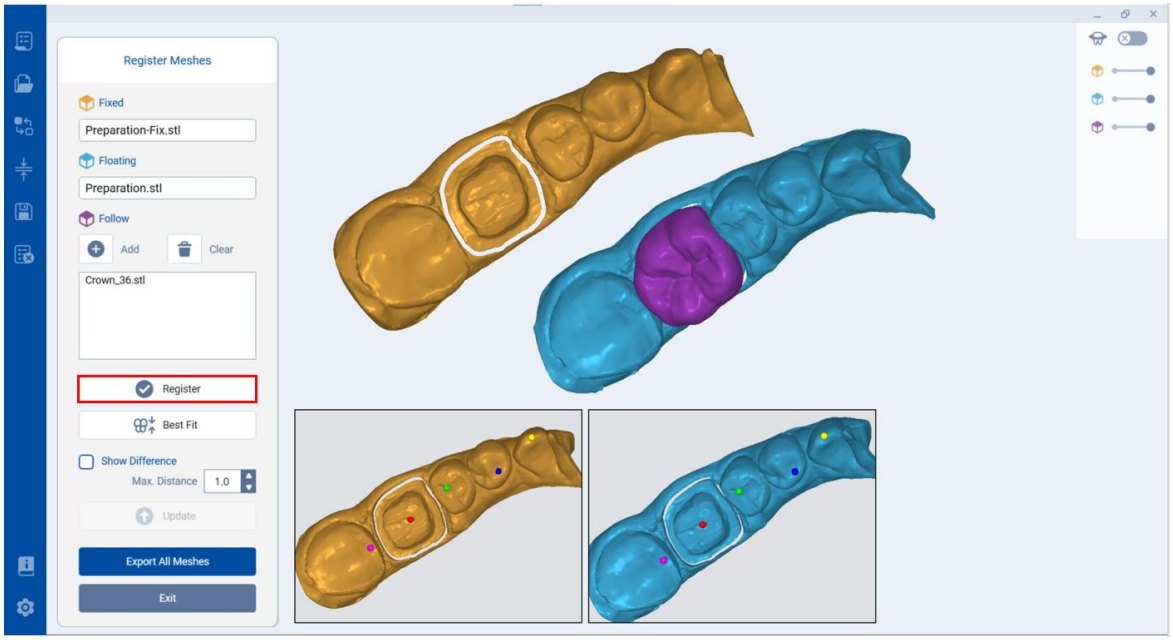
5. Click to mark matching points between mesh objects. The marked point numbers should be more than 3 and less than 10.



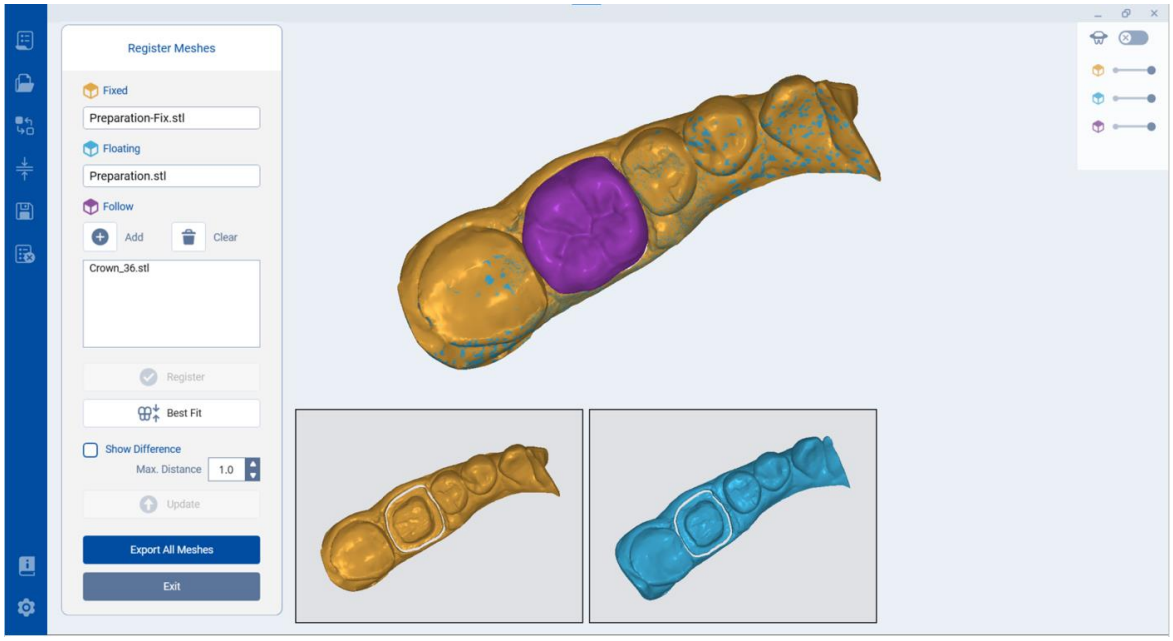
The matching point operation is shown as follows:

	Add matching point.
	Remove the matching point

6. Click  ***Register*** button to align both mesh data.

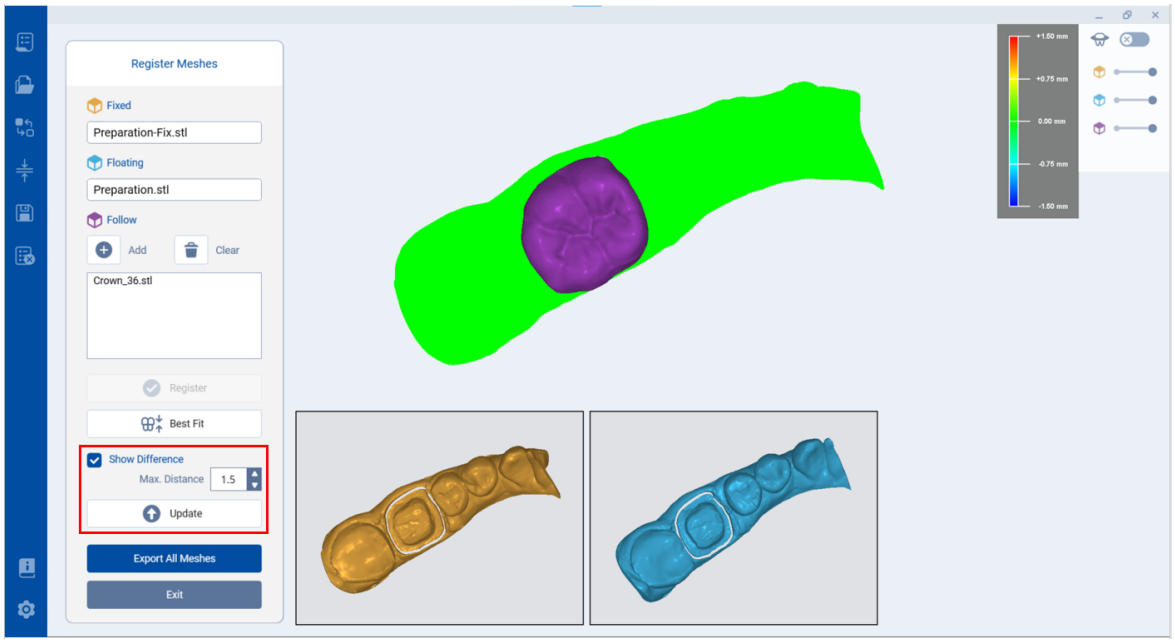


After mesh alignment, the floating mesh is aligned to fixed mesh.



7. If the alignment result is not satisfying, click  ***Best Fit*** button to fine-tune both mesh alignment result.

8. Tick ***Show Difference*** checkbox to show the difference between the fixed mesh and floating mesh.
   - You are able to define the preferred maximum distance of the difference on ***Max. Distance*** field. Then, click  ***Update*** button to update the color map.



9. When mesh alignment is complete, click ***Export All Meshes*** button and browse to the desired folder to save the aligned mesh data.

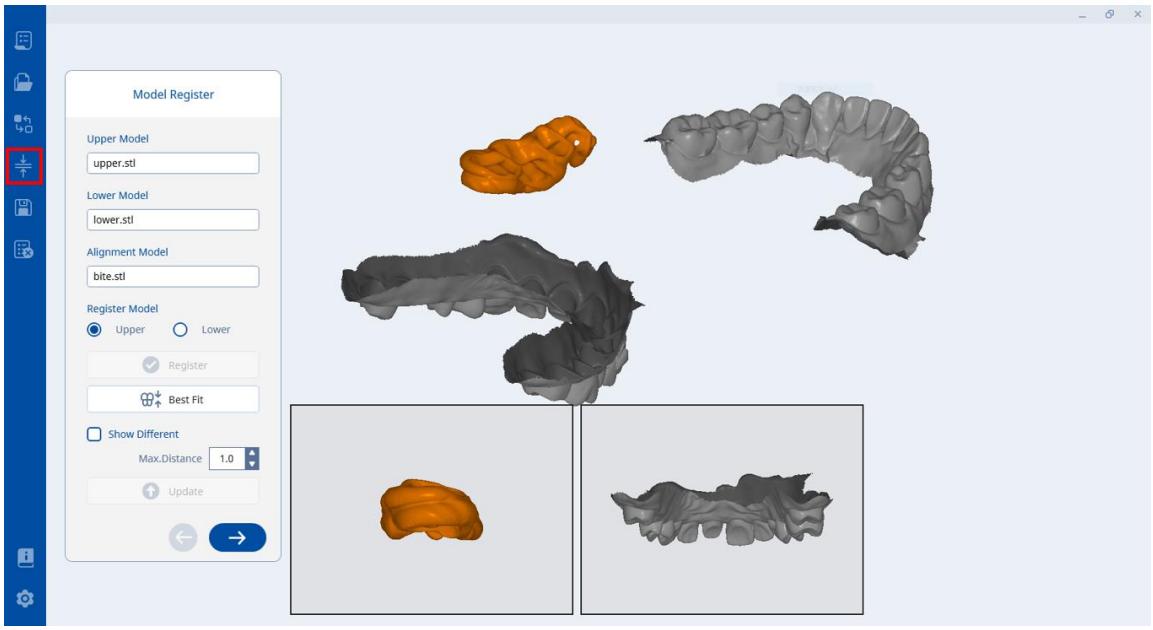
18 Model Alignment

In this section, you are able to align the upper model and lower model with the bite model.

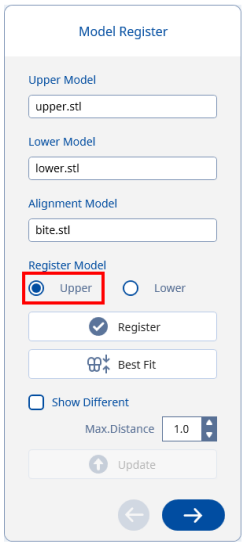
1. Click  ***Model Alignment*** button.

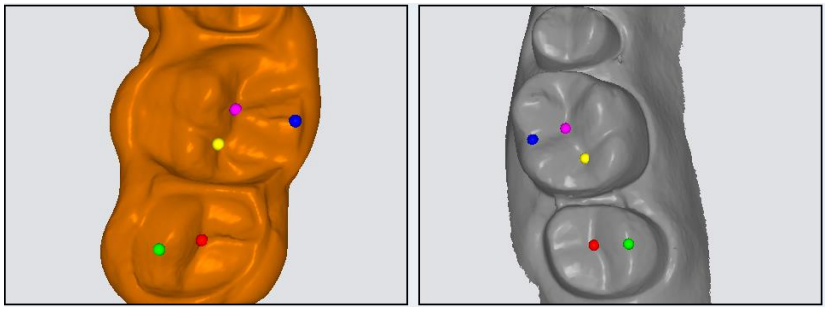
2. Load model data in the following order:

   - upper model file,
   - lower model file
   - bite model file



3. When ***Upper*** is selected, click to mark matching points on the bite model and upper model. The marked point numbers should be <u>more than 3 and less than 10.</u>

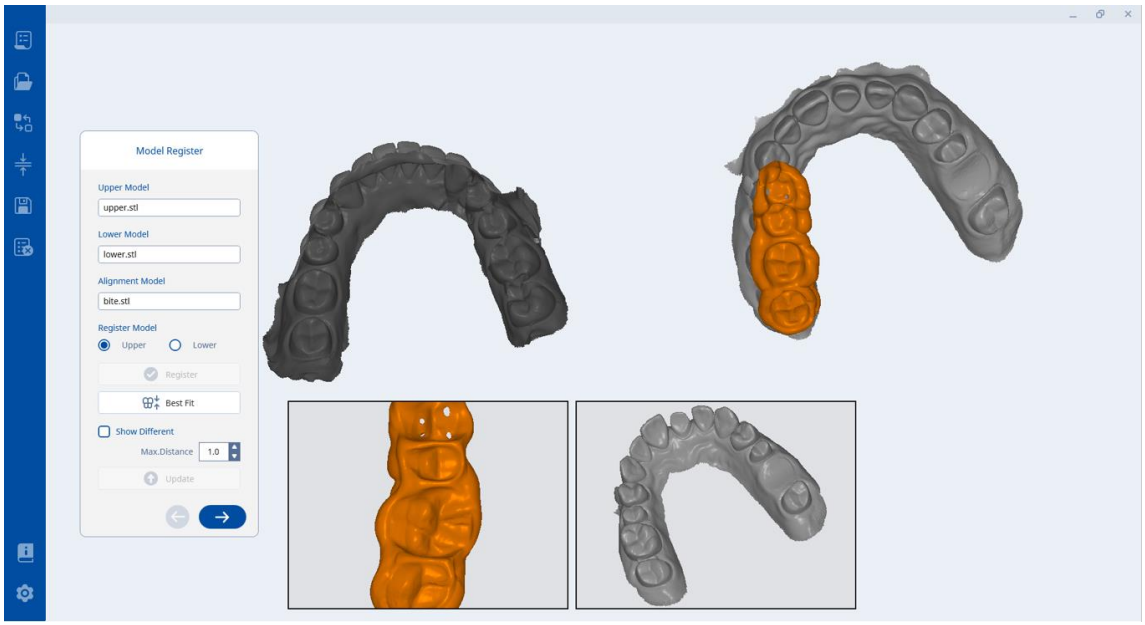




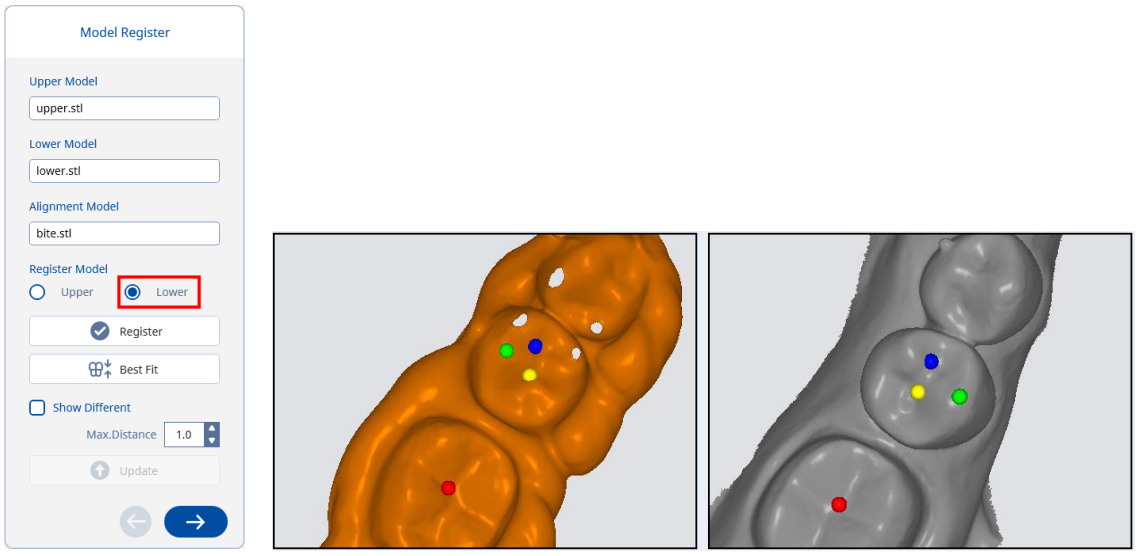
The matching point operation is shown as follows:

	Add matching point
	Remove the matching point

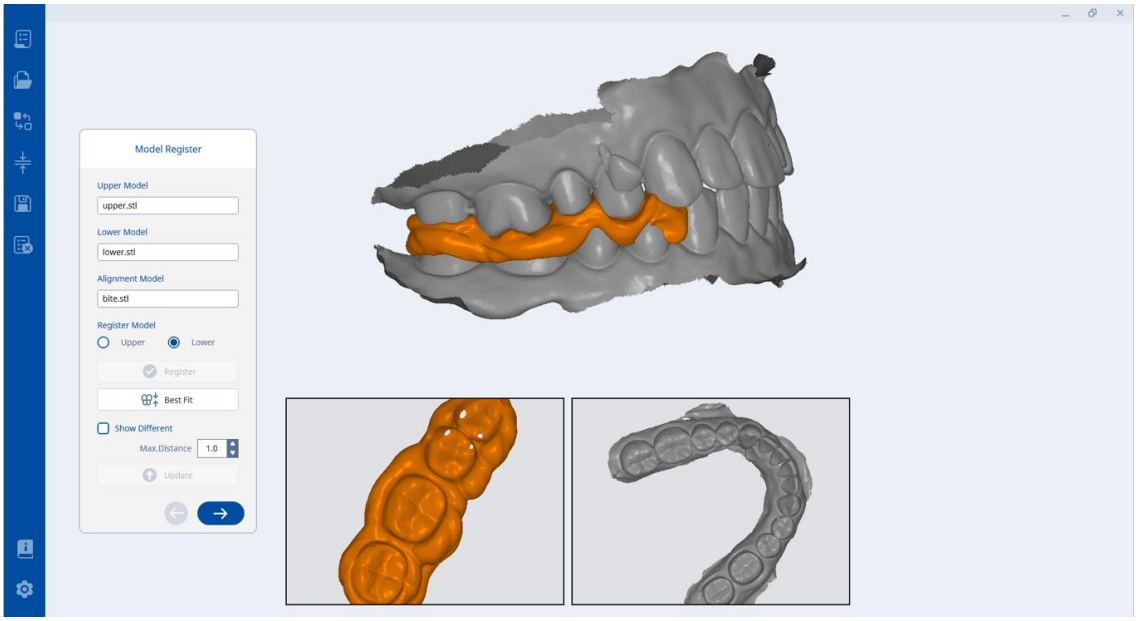
4. Click  ***Register*** button to align bite model with the upper model. You can also use  ***Best Fit*** button to fine-tune alignment result.



5. Select ***Lower*** and mark matching points on the bite model and lower model.

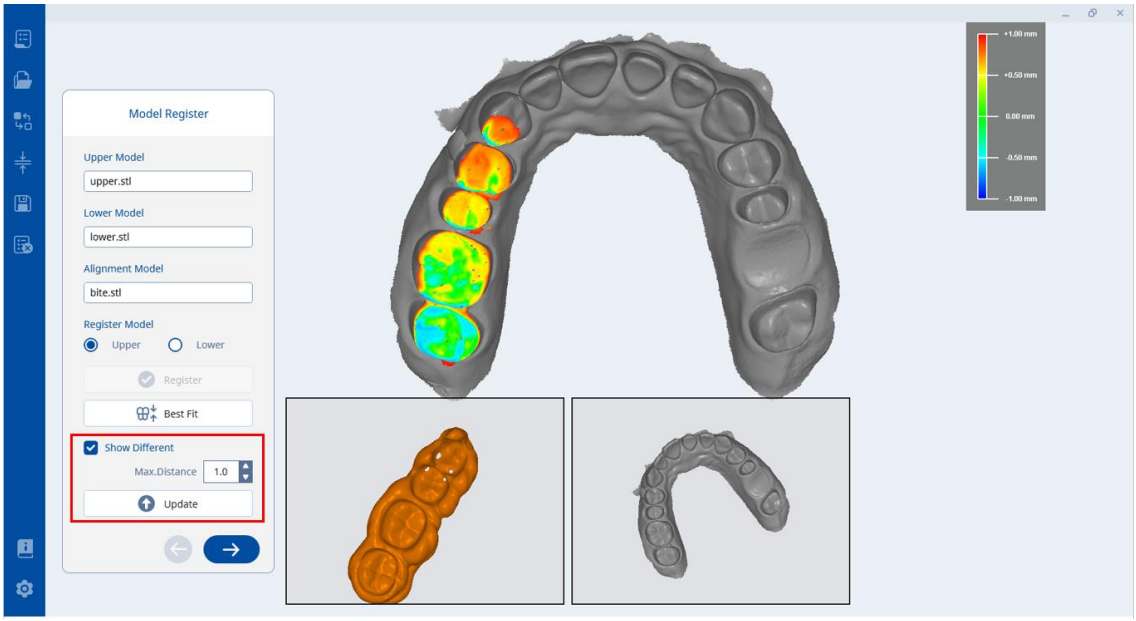


6. Click  ***Register*** button to align the bite model with the lower model. You can also use  ***Best Fit*** button to fine-tune both alignment result.

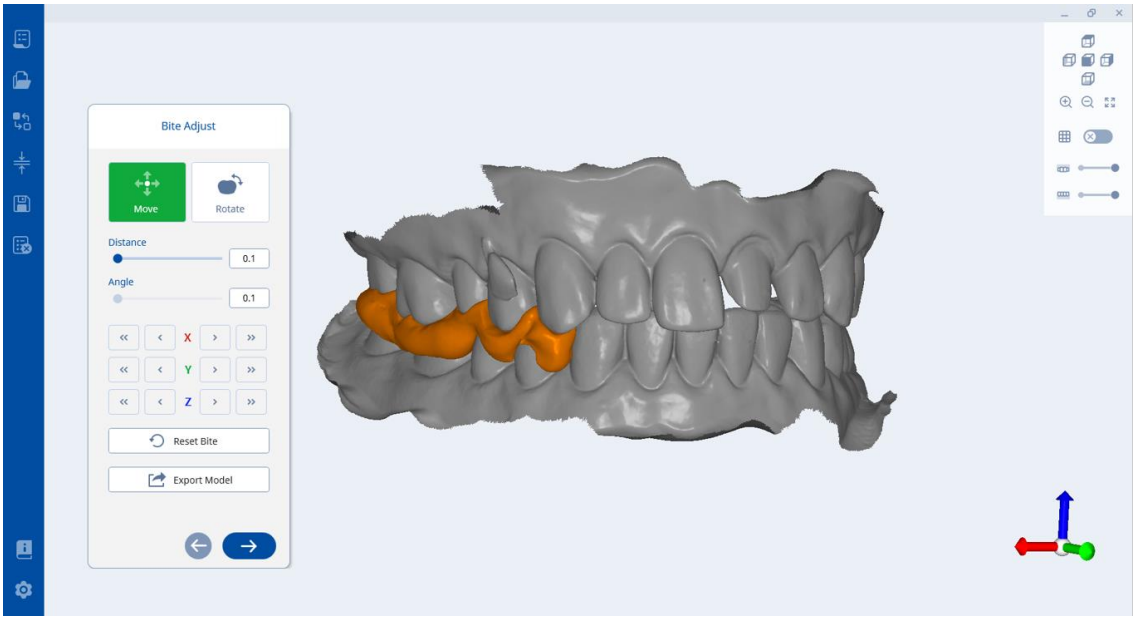


7. Tick ***Show Difference*** checkbox to show the difference between the bite model and Upper/Lower model.

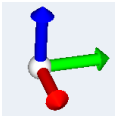
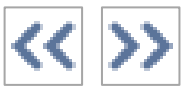
   - You are able to define the preferred maximum distance of the difference on ***Max. Distance*** field. Then, click  ***Update*** button to update the color map.



8. Click  button. Bite Adjust step allows you to adjust upper model position manually.



Bite Adjust function panel contains the following functions:

	**Move** – Move the model.
	**Rotate** – Rotate the model.
	Drag the slider to adjust the moving distance and rotation angle.
	Red arrow: X direction Green arrow: Y direction Blue arrow: Z direction
	Move or rotate the model according to the distance or angle value.
	Move or rotate the model by 2 times of distance or angle value.
	**Reset Bite**: Restore to the original position.
	**Export Model**: Export the aligned model data.

Appendix. **Shortcut Keys**