Illustrated Technique Guide

Dentsply Sirona

Digital Denture Design in the 3Shape Dental System™
Printed and Milled Dentures

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Contents

Introduction

The 3Shape Dental System™[1] enables denture design and output for printing or milling. The purpose of this Illustrated Technique Guide is to assist the denture designer in using Dentsply Sirona digital denture materials in the 3Shape Dental System. This guide is not intended to replace the in-depth training provided by a 3Shape reseller.

Dentsply Sirona Denture Tooth Libraries and Materials Summary

Denture Tooth Libraries	Materials	Print	Mill	Carded
Digital HC Genios® Digital Genios®	• Lucitone Digital IPN™ Premium Tooth	✓	N/A	N/A
	• Lucitone Digital Value™ 3D Economy Tooth and Trial Placement	✓	N/A	N/A
	• DS Multilayer PMMA Disc	N/A	✓	N/A
Digital HC Portrait® Digital Portrait®	• Lucitone Digital IPN™ Premium Tooth	✓	N/A	N/A
	• Lucitone Digital Value™ 3D Economy Tooth and Trial Placement	✓	N/A	N/A
	• DS Multilayer PMMA Disc	N/A	✓	N/A
IPN 3D™ Portrait Inspired	• IPN 3D™ Digital Denture Teeth	N/A	N/A	✓

IMPORTANT: Libraries with the HC designation are intended to be used for printing denture teeth with premium-level esthetics. The HC libraries have been optimized for esthetics following the Lucitone Digital IPN workflow.

Dentsply Sirona Digital Denture Materials

Lucitone Digital Print™
3D Denture Base

Lucitone Digital Fit™
Denture Disc

Lucitone Digital IPN™
3D Premium Tooth

Lucitone Digital Value™
3D Economy Tooth
and Trial Placement

DS Multilayer
PMMA Disc

IPN 3D™ Digital
Denture Teeth

—— Denture Base ——

—— Denture Teeth ——

Lucitone Digital Fuse™
Step 1 - 3D Tooth
Conditioning Agent

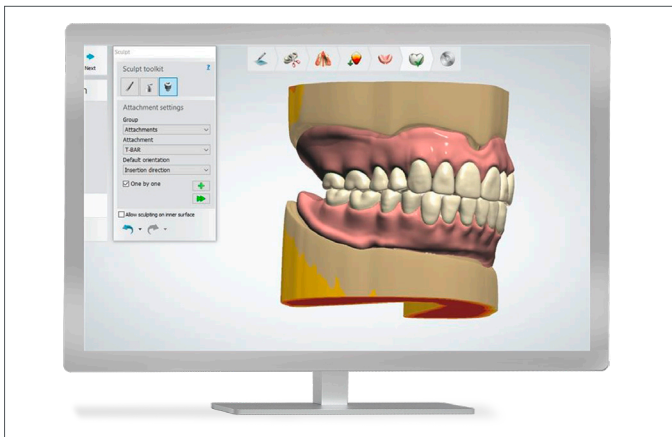Lucitone Digital Fuse™
Step 2 - 3D Denture
Bonding Resin

Lucitone Digital Fuse™
Step 3 Total -
3D Sealer

Lucitone Digital Fuse™
Step 3 -
3D Sealer

—— Fuse System ——

1.0 Library Access

Digital Genios, Digital HC Genios, Digital Portrait, and Digital HC Portrait
Libraries are dongle encrypted. To obtain access:
• Contact your Dentsply Sirona Sales Representative and provide your 3Shape dongle number.
• The Dentsply Sirona Sales Representative will communicate the activation fee and coordinate the library access.
• Following the activation, download the libraries from the 3Shape Download Center and perform a dongle update.

IPN 3D
• No dongle activation required.
• Download the library from the 3Shape Download Center and perform a dongle update.

Dentsply Sirona DME File Import
After importing, review and adjust the Dentsply Sirona denture material DME files settings per the below table.
• DO NOT change the Fuse Space default setting. Modifying this setting may compromise tooth fit in the pocket.
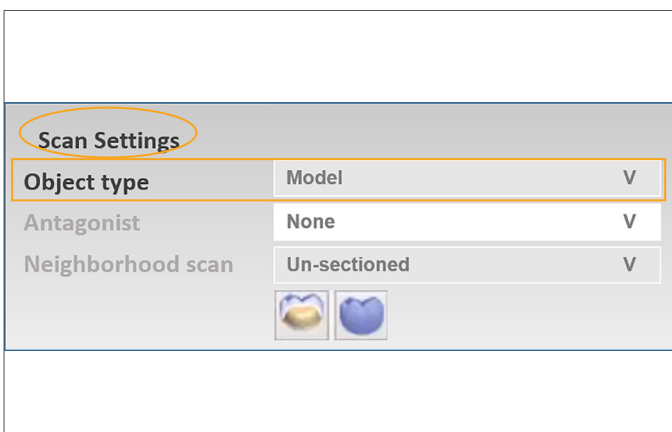
Setting	Step	Value	Print	Mill	Carded
Fuse Space	N/A (Default Setting)	0.17mm	✓	✓	✓
Maxillary Arch - Denture Base Thickness	Manually Adjust	Minimum 2.5mm	✓	✓	
Mandibular Arch - Denture Base Thickness	Manually Adjust	Minimum 3.5mm	✓	✓	

2.0 Denture Design
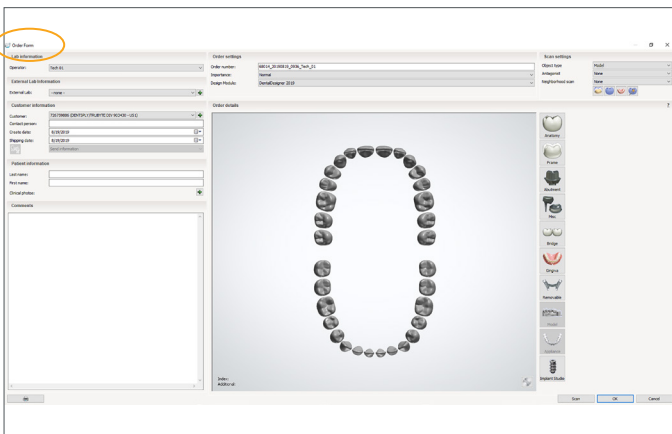
Complete the Order Form
Select the 3Shape Dental System Order Form and populate the patient case information.
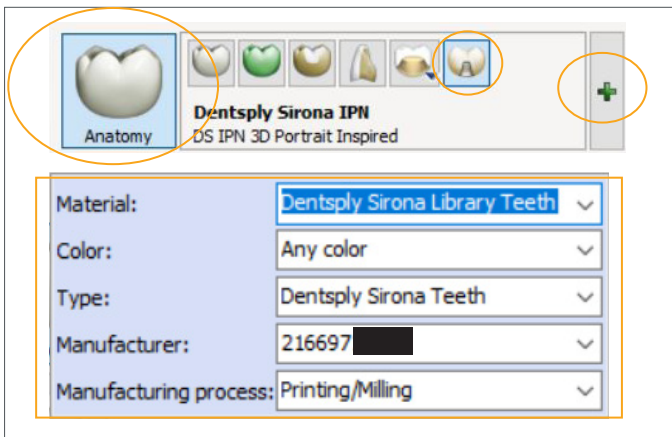

Next, in the upper right-hand corner of the Order Form, under Scan Settings, select the "Object type" for scanning: Model, Impression or Digital impression.

Scan Settings		
Object type	Model	V
Antagonist	None	V
Neighborhood scan	Un-sectioned	V

Printed and Milled Teeth
Full Arch and Tooth Segments
Select the teeth in arch(es).

Select "Anatomy," then "Artificial Tooth," and then the plus icon. Populate the inputs using the drop-down menus:

Material = **Dentsply Sirona Library Teeth**
Color = Select the applicable Dentsply Sirona **shade**
Type = Select **Dentsply Sirona Teeth**
Manufacturer = **[Auto-populates dongle number]**
Manufacturing process = **Printing/Milling**
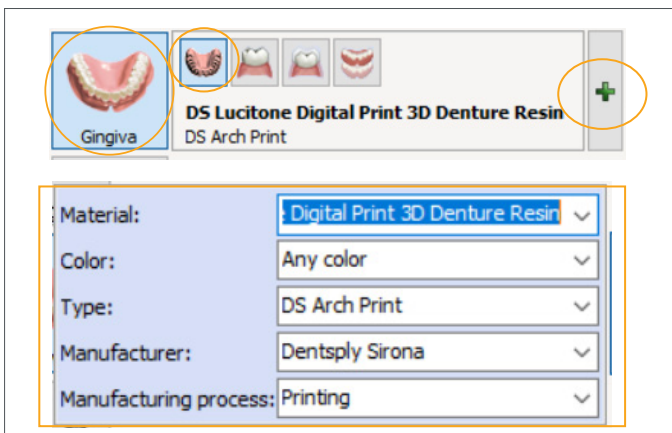
Select "Gingiva," then "Full Denture," and then the plus icon. Populate the inputs using the drop-down menus:

Material = **DS Lucitone Digital Print 3D Denture Resin**
Color = Select the applicable Dentsply Sirona **shade**
Type = Select **DS Arch Print**
Manufacturer = **Dentsply Sirona**
Manufacturing process = **Printing**

Full Arch
Highlight the teeth to join, and then select "Bridge."

Tooth Segments
Highlight the teeth to join and then select "Bridge."
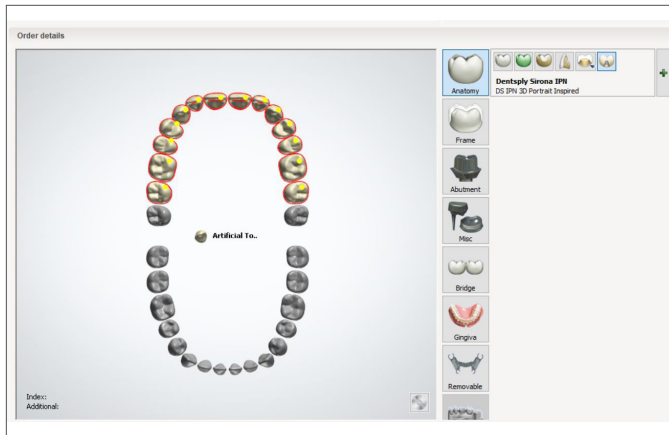Repeat this process for subsequent segments.

Complete order form shown for a **full arch**.

Complete order form shown for **tooth segments**.
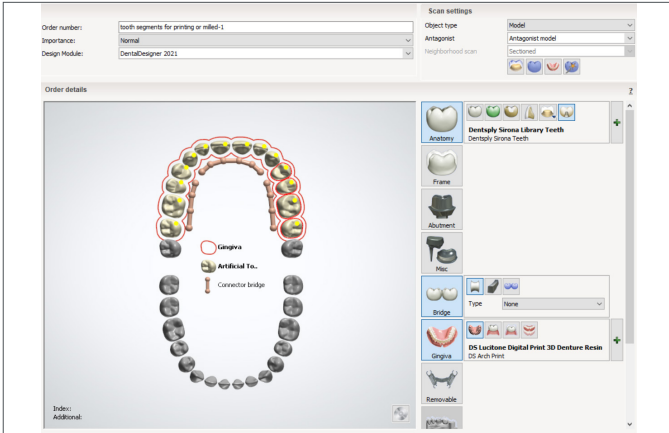
**IPN 3D Carded Teeth - Single Teeth**
Select each tooth.

Select "Anatomy," then "Artificial Tooth," and then the plus icon. Populate the inputs using the drop-down menus:

Material = **Dentsply Sirona IPN**
Color = Select the applicable Dentsply Sirona **shade**
Type = Select the applicable Dentsply Sirona **tooth library**
Manufacturer = **Dentsply Sirona**
Manufacturing process = **Premanufactured Teeth**
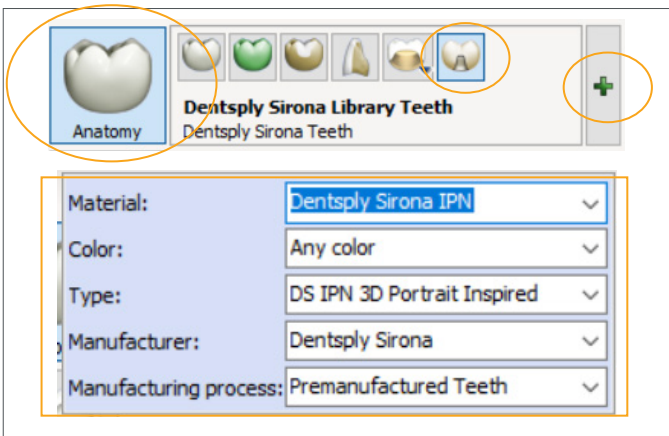
Select "Gingiva," then "Full Denture," and then the plus icon. Populate the inputs using the drop-down menus:

Material = **DS Lucitone Digital Print 3D Denture Resin**
Color = Select the applicable Dentsply Sirona **shade**
Type = Select **DS Print**
Manufacturer = **Dentsply Sirona**
Manufacturing process = **Printing**
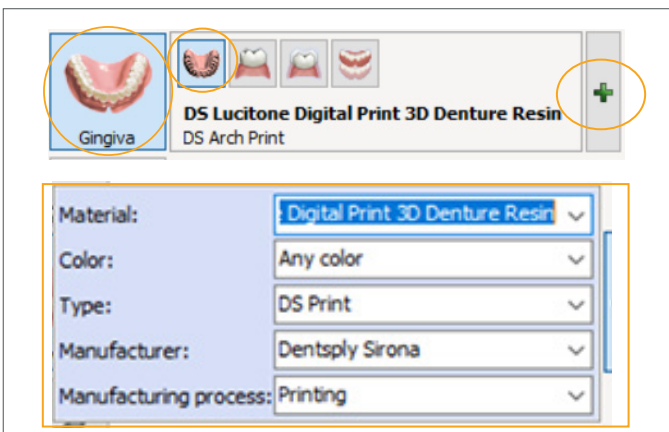
Complete order form shown for **single teeth**.
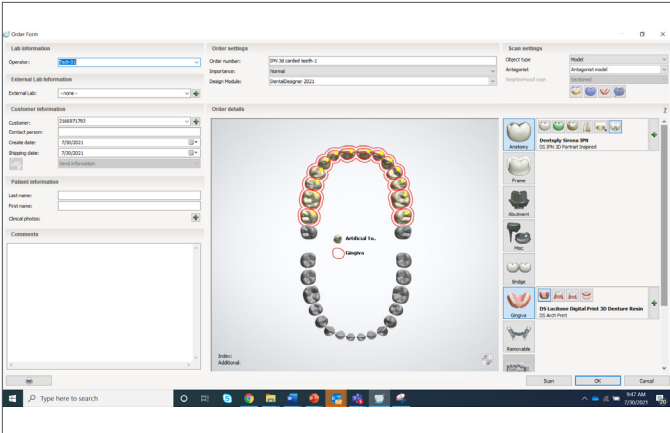
3.0 Scanning and Model Analysis
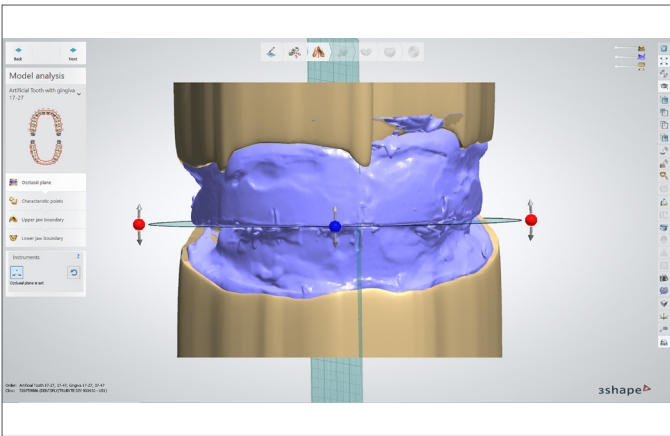
Scanning
Define the occlusal plane. Place three control points by following the line between the maxillary and mandibular rims. Place the first point on the left posterior, use the second point to define the midline and place the third point on the right posterior.

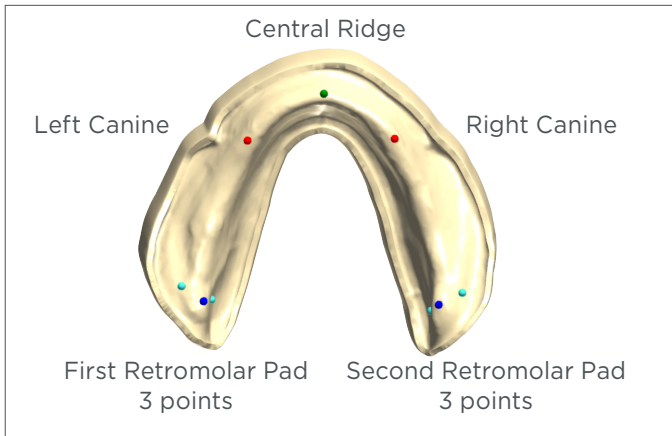The tilt and angulation of the occlusal plane follows the bite rim or records provided by the clinician.

Incisive Papilla

Right Canine   Left Canine

Right Tuberosity   Left Tuberosity
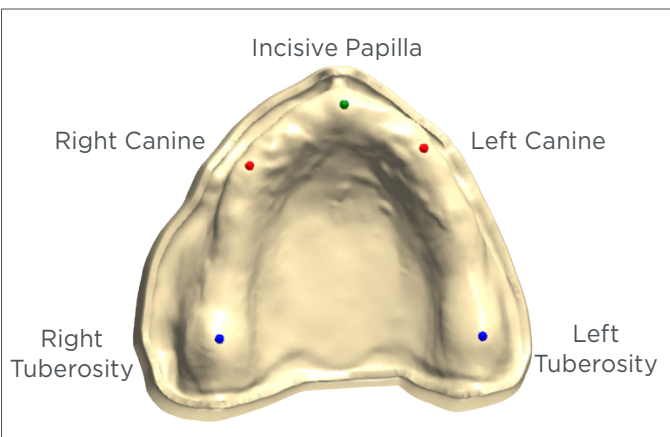
Model Analysis: Maxillary Arch
Mark the landmarks for the maxillary arch as shown: Right Tuberosity, Incisive Papilla, Left Tuberosity, Right Canine, and Left Canine.

If the bite rim does not indicate the canine placement:
• Approximate the position slightly anterior to the buccal frenum.
• Place the marks approximately 4mm back from the incisive papilla. Measure from the central mark on the wax rims and place the point in relationship to the most prominent rugae. Note: It is not necessary to be exact - the software allows for general area placement of the landmarks.

Central Ridge

Left Canine

Right Canine

First Retromolar Pad
3 points

Second Retromolar Pad
3 points

Model Analysis: Mandibular Arch

Mark the landmarks for the mandibular arch as shown: First Retromolar Pad (3 points: central, buccal, and lingual), Central Ridge, Second Retromolar Pad (3 points: central, buccal, and lingual), Right Canine, and Left Canine.

4.0 Smile Composer
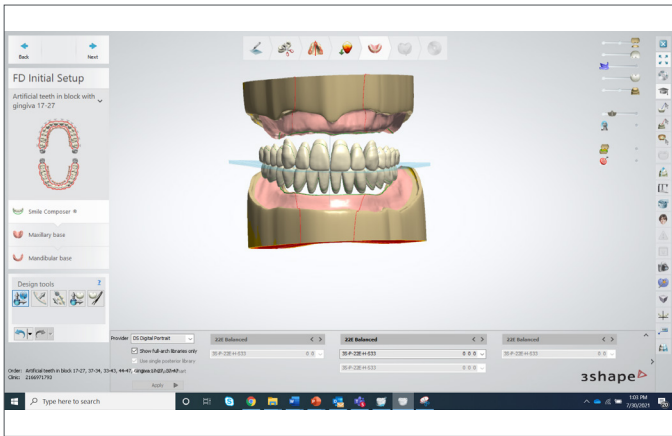
3Shape Smile Composer® "FD Initial Setup" page shown.

Note: Hover over the icons for icon description.
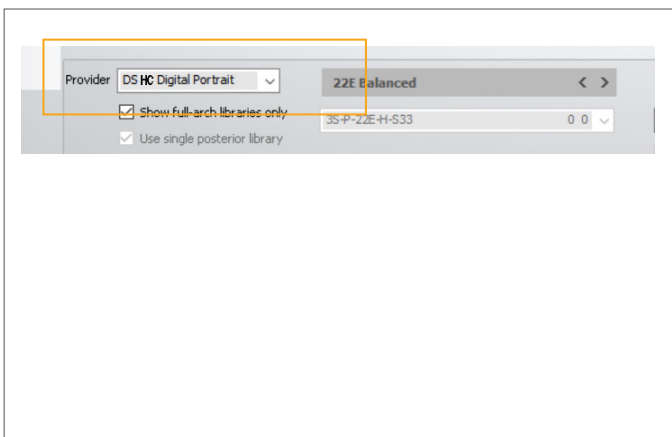
Select the applicable tooth library from the "Provider" drop-down menu: DS Digital HC Genios, DS Digital Genios, DS Digital HC Portrait, and DS Digital Portrait.

Select "Show full-arch libraries only."

IMPORTANT: Libraries with the HC designation are intended to be used for printing denture teeth with premium-level esthetics. The HC libraries have been optimized for esthetics following the Lucitone Digital IPN workflow.
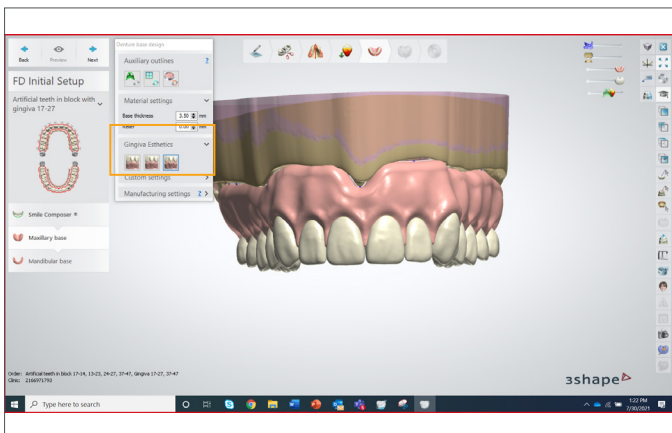
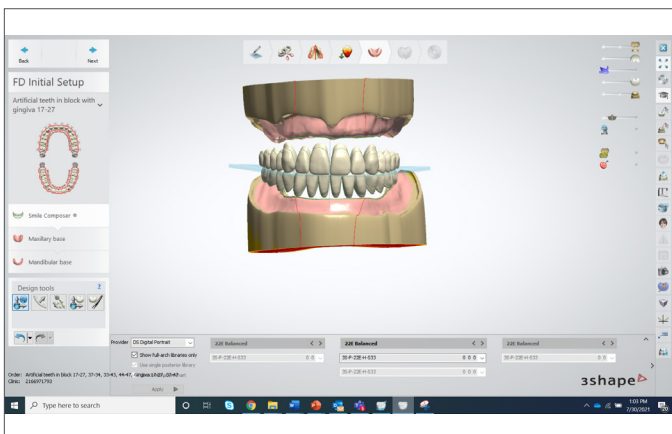Select the applicable anterior mould and occlusion.
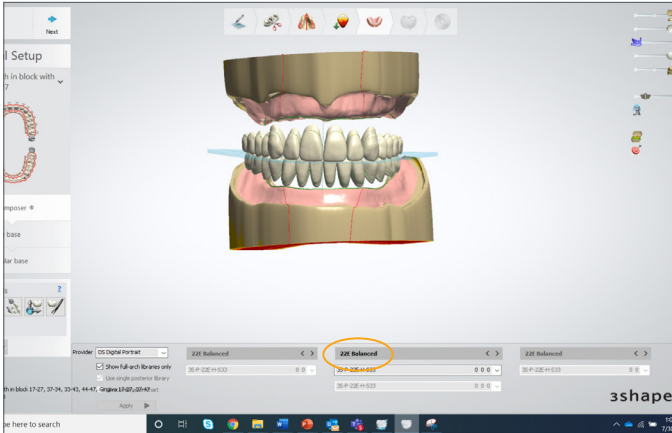
Next, select the anterior-posterior combination based upon the maxillary anterior mould selection.
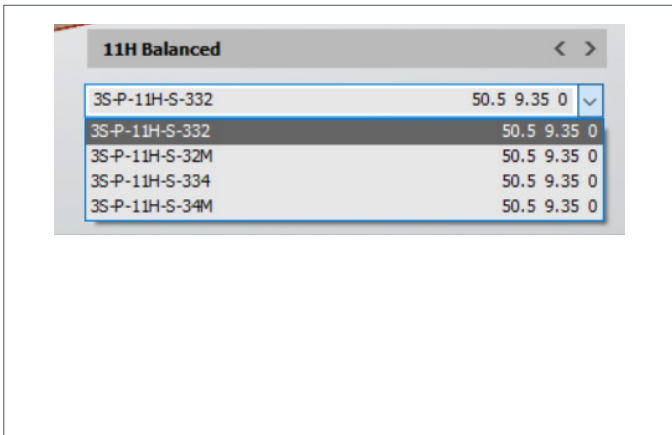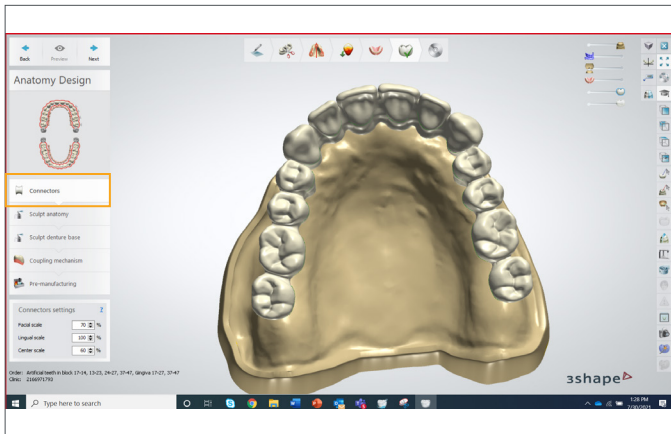
Gingiva Esthetics

Select "Delicate," "Natural," or "Intense."

Review
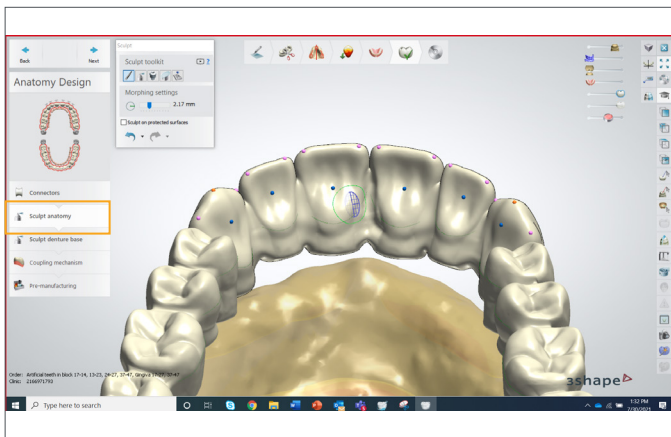
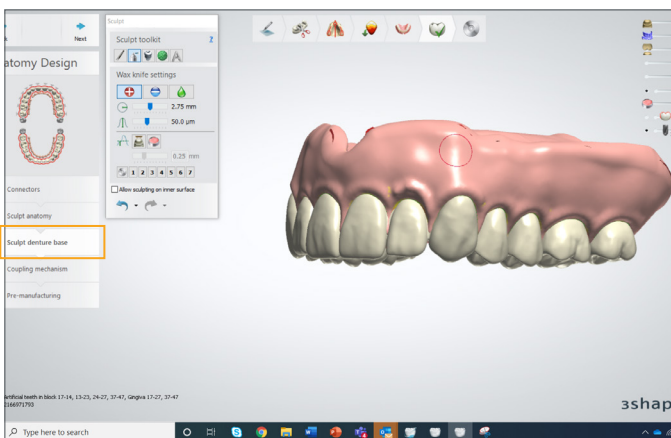Confirm "FD Initial Setup" selections.

5.0 Anatomy Design

Connectors
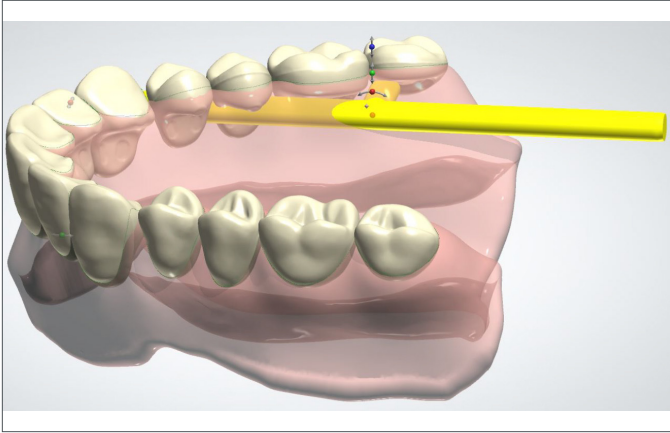Adjust the Connectors as necessary.

Sculpt Anatomy
Sculpt/resize/adjust the teeth as necessary.

Sculpt Denture Base
Sculpt the denture base anatomy as necessary.

6.0 Supports

Maxillary Supports (T-bars)

IMPORTANT: Please follow the steps in this section closely to add the necessary support structures to the denture base. **T-bar support structures are a requirement for each denture base design.**
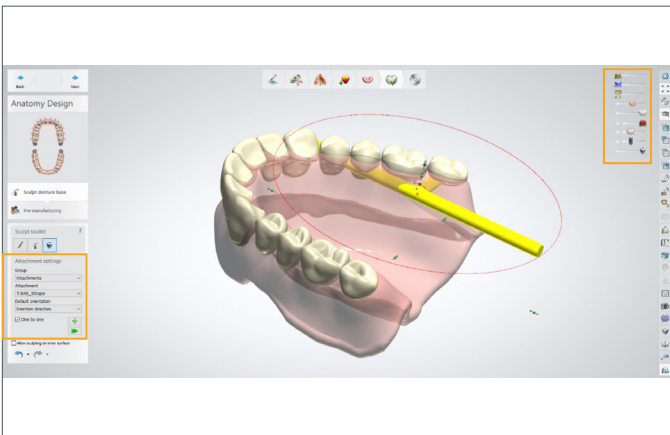

First Maxillary Support (T-bar)

Under the "Sculpt Toolkit," select "Attachment."

Select the following "Attachment Settings":
- Group = **Attachments**
- Attachment = **T-BAR_3Shape**
- Default orientation = **View direction**

Use the slide tools to adjust the following:
- Hide the "Preparation" block.
- Make the "Full Dentures" partially transparent.
- Hide the "Minimum thickness (2.50mm)."

Rotate the denture as shown. Click the mouse once to place the first bar: Place the bar between the first and second molars and **3mm** below the gingival line.
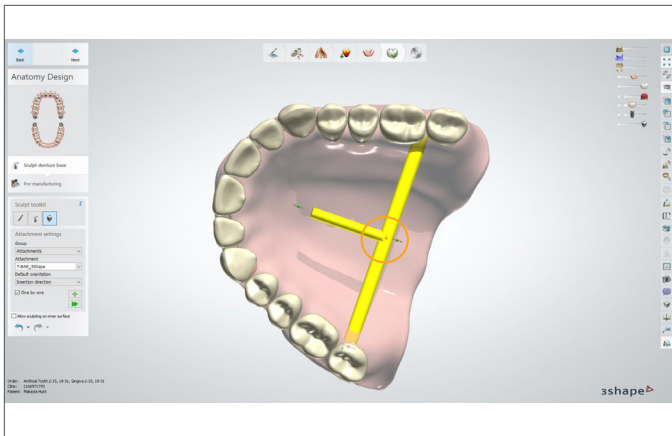
Click the red dot at the end of the bar to rotate the bar so the long edge is perpendicular to the molars.
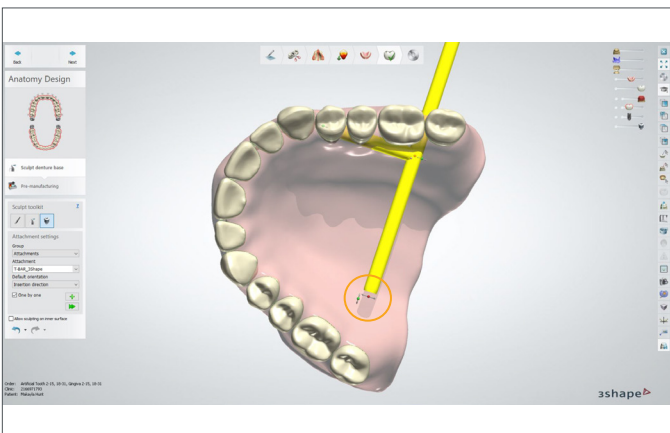
Use the yellow dot in the middle of the bar to move the bar to the correct location on the lingual side of the denture base. Note: use the yellow dot to move/center the bar at any time.

Use the green dots (at the ends of the long bar) to lengthen and shorten the bar. Position the bar to span the denture base without penetrating the intaglio surface.
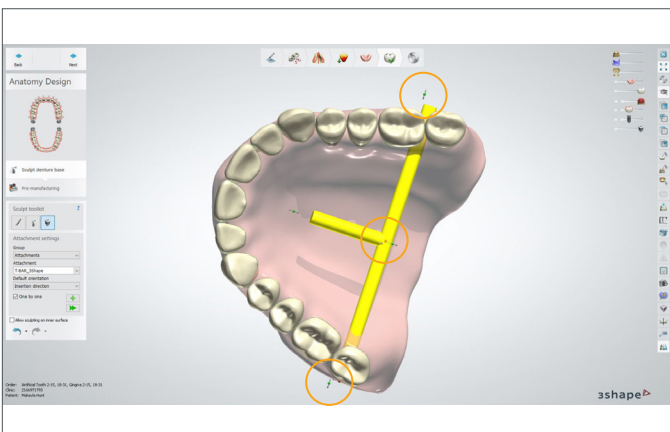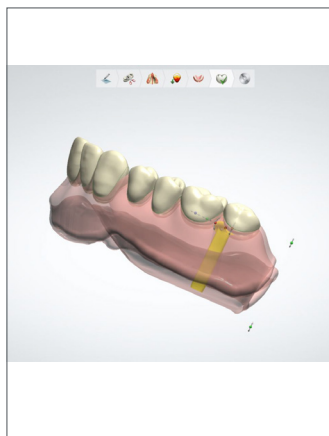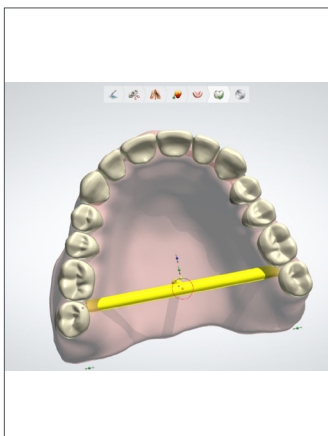
Use the red dot in the middle of the bar to rotate and position the short bar perpendicular to the surface of the denture.


Use the green dot (at the end of the short bar) to lengthen and shorten the bar. Position the bar to span the denture base without penetrating the intaglio surface.
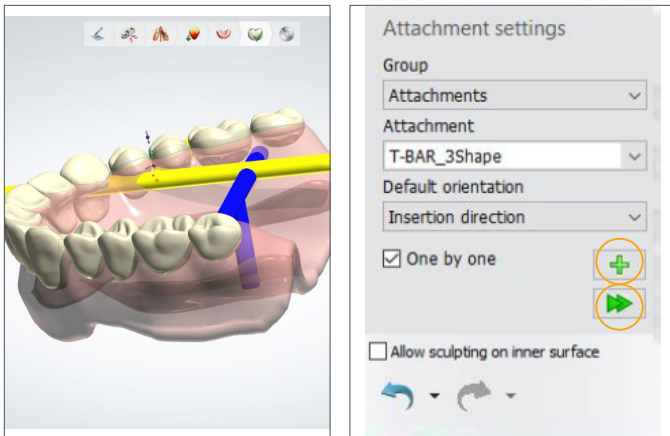

Finally, verify the bar placement is correct:

- The long end of the T-bar is between the first and second molars and horizontal from left to right on the denture base.
- The long end of the T-bar is approximately **3mm** below the gingival line.
- The short end of the T-bar is exactly perpendicular and vertical on the denture base.
- The T-bar is fully attached to the denture base without penetrating the intaglio surfaces.

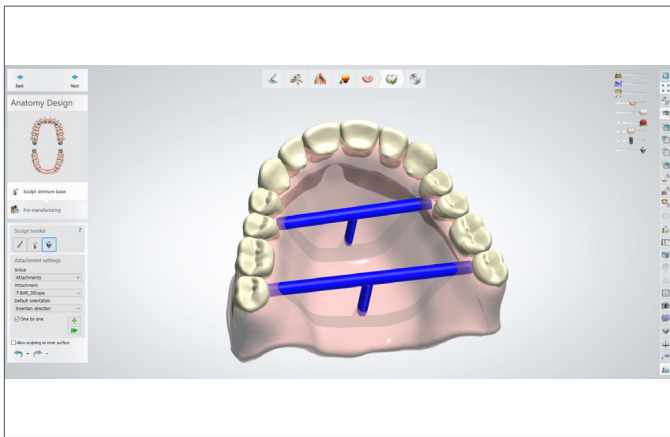Make any final adjustments - See below for example.
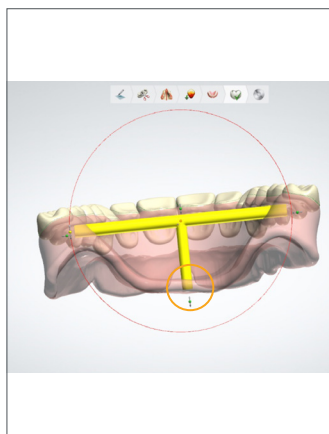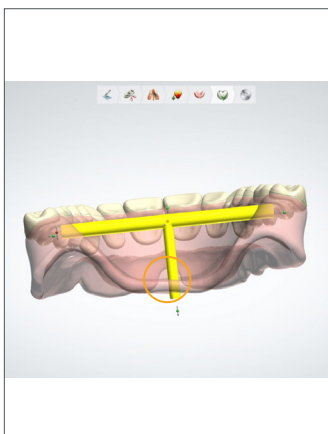
The image to the left shows the T-bar penetrating through the intaglio surface, and the image to the right shows the adjustment.

Once the final adjustments are made, it is time to place the second T-bar.

Second Maxillary Support (T-bar)

Rotate the denture base to the side view as shown, and select the plus icon followed by "Add new attachment." Select the green arrow icon to place the second T-bar.

Place the bar between the first and second premolars and **3mm** below the gingival line.

Make adjustments as necessary and then verify the following:
- The long end of the T-bar is between the first and second premolars and horizontal from left to right on the denture base.
- The long end of the T-bar is approximately **3mm** below the gingival line.
- The short end of the T-bar is exactly perpendicular and vertical on the denture base.
- The T-bar is fully attached to the denture base without penetrating the intaglio surfaces.
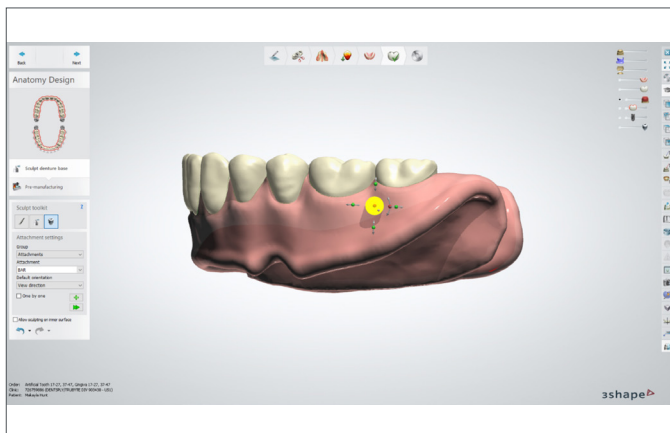

First Mandibular Support (Bar)

Under the "Sculpt Toolkit," select "Attachment."

Select the following "Attachment Settings":
- Group = **Attachments**
- Attachment = **Bar**
- Default orientation = **View direction**

Use the slide tools to adjust the following:
- Hide the "Preparation" block.
- Make the "Full Dentures" partially transparent.
- Hide the "Minimum thickness (2.50mm)."
- Rotate the denture to the side view.
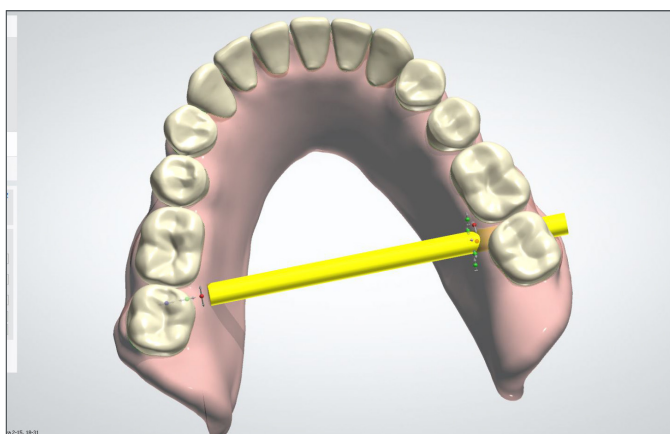
Place the first bar between the first and second premolars and **3mm** below the gingival line.

Next, rotate the denture base so that the view is looking down on the cameo surface of the denture. Use the yellow dot in the middle of the bar to move the bar to the correct location on the lingual side of the denture base.
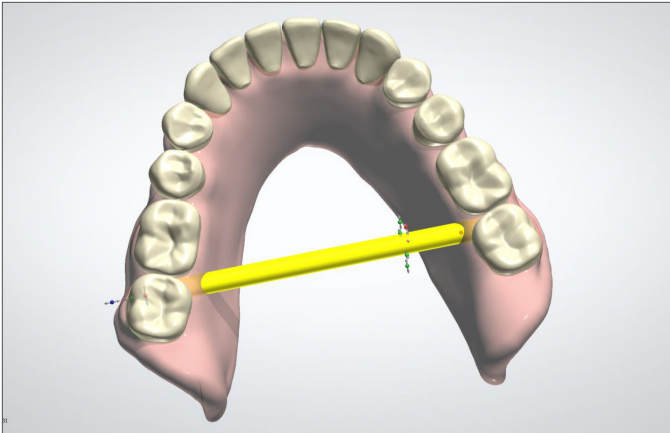
Verify the bar placement is correct:
- The long end of the bar is between the first and second molars and horizontal from left to right on the denture base.
- The long end of the bar is approximately **3mm** below the gingival line.
- The short end of the bar is exactly perpendicular and vertical on the denture base.
- The bar is fully attached to the denture base without penetrating the intaglio surfaces.

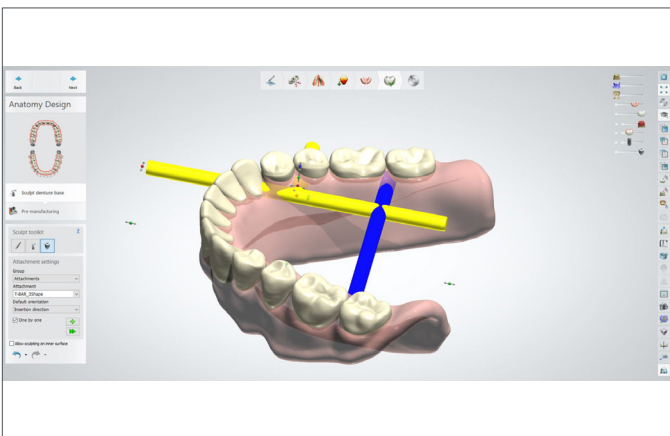Make any final adjustments.
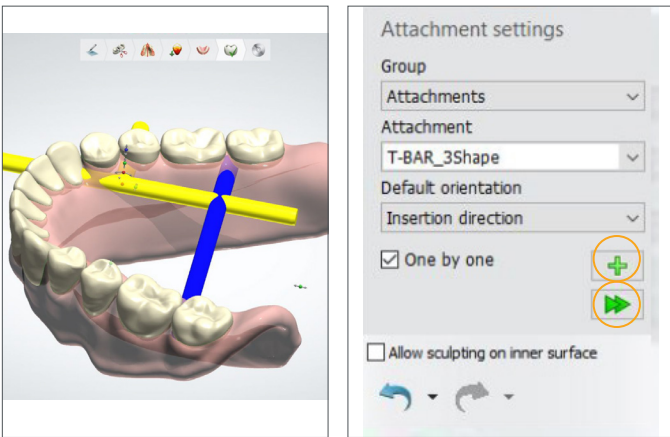
Second Mandibular Support (T-bar)
Rotate the denture base to the side view as shown, and select the plus icon followed by "Add new attachment." Select the green arrow icon to place the second T-bar.

Select the following "Attachment Settings":
- Group = **Attachments**
- Attachment = **T-BAR_3Shape**
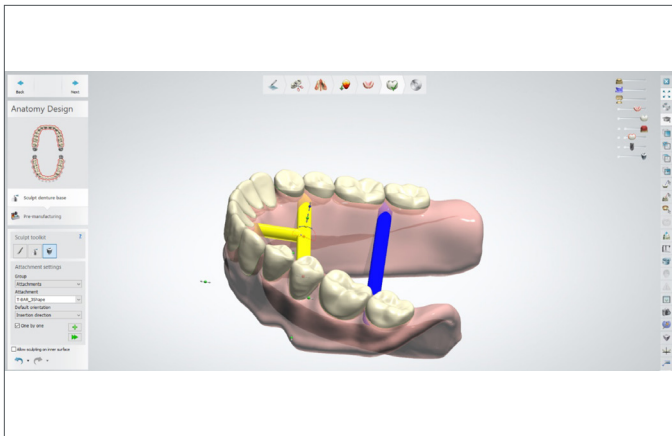- Default orientation = **Insertion direction**

Place the bar between the first and second premolars and **3mm** below the gingival line.

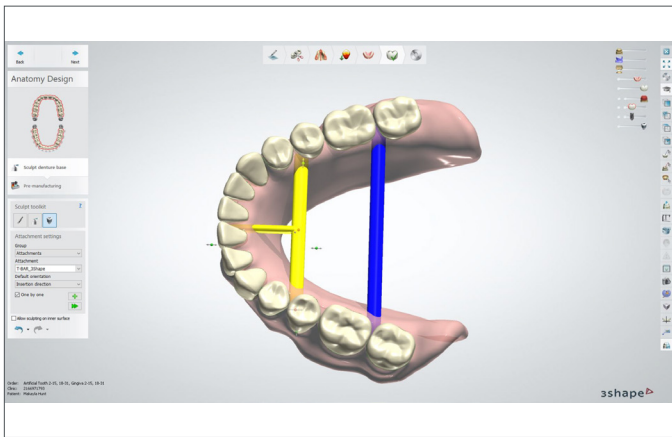Make adjustments as necessary and then verify the following:
- The long end of the T-bar is between the first and second premolars and horizontal from left to right on the denture base.
- The long end of the T-bar is approximately **3mm** below the gingival line.
- The short end of the T-bar is exactly perpendicular and vertical on the denture base.
- The T-bar is fully attached to the denture base without penetrating the intaglio surfaces.
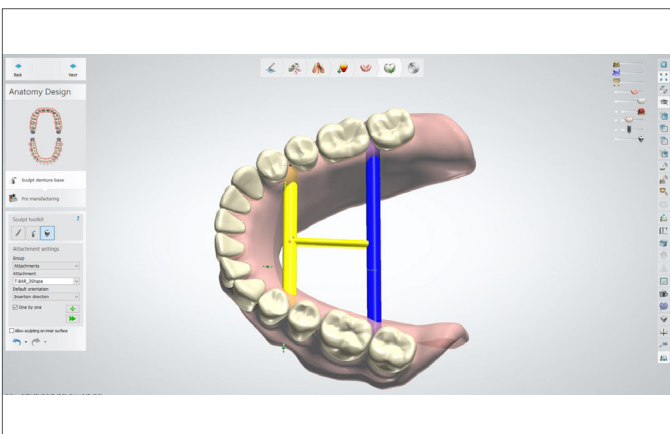

IMPORTANT: The Second Mandibular Support (T-bar) is different from the T-bar placement on the maxillary arch. Make the following adjustments: Use the red dot in the center of the T-bar to rotate the T-bar so the short edge is perpendicular with the anterior teeth of the lower denture.

Use the yellow dot in the middle of the bar to center the short edge of the bar between the centrals on the lingual surface. Note: use the yellow dot to move/center the bar at any time.


Use the green dots (at the ends of the long bar) to lengthen and shorten the bar. Position the bar to span the denture base without penetrating the intaglio surface.
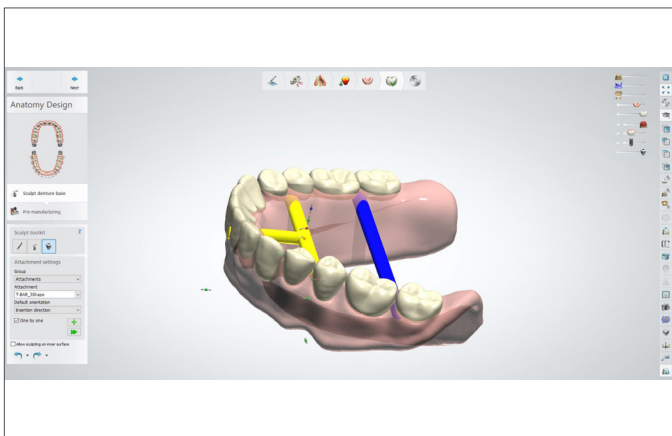

Make adjustments as necessary and then verify the following:

- The long end of the T-bar is between the first and second premolars and horizontal from left to right on the denture base.
- The long end of the T-bar is approximately **3mm** below the gingival line.
- The short end of the T-bar is centered and perpendicular to the denture base.
- The T-bar is fully attached to the denture base without penetrating the intaglio surfaces.
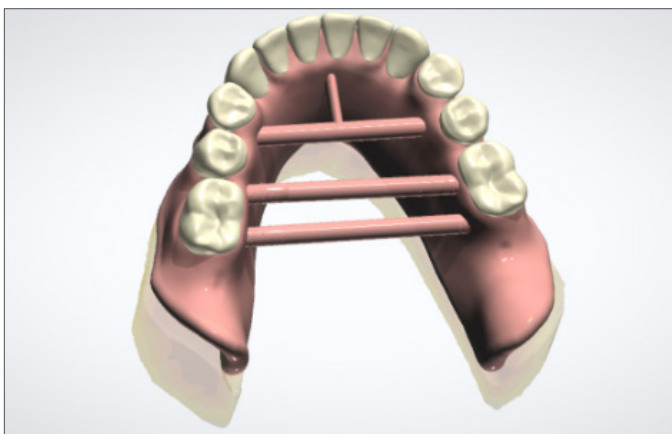
IMPORTANT: When printing with Asiga MAX™ UV and Asiga PRO 4K™ printers[2] place an additional support bar between the lower molars as shown. Follow the same steps as noted in the "First Mandibular Support (Bar)" section to add the additional bar support.
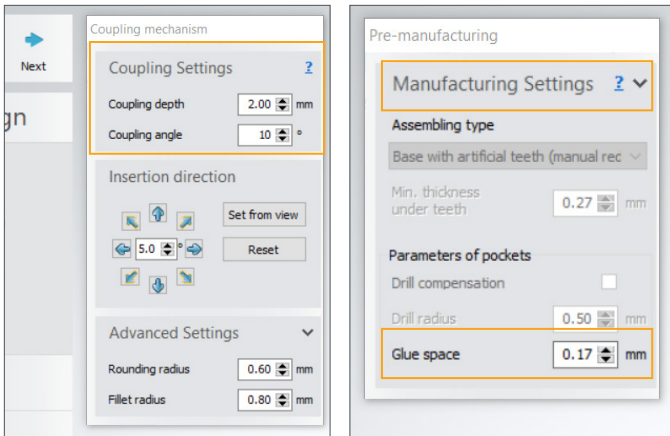
Select "Next." Use the "Coupling Settings" to adjust the tooth and gingiva coupling as necessary.
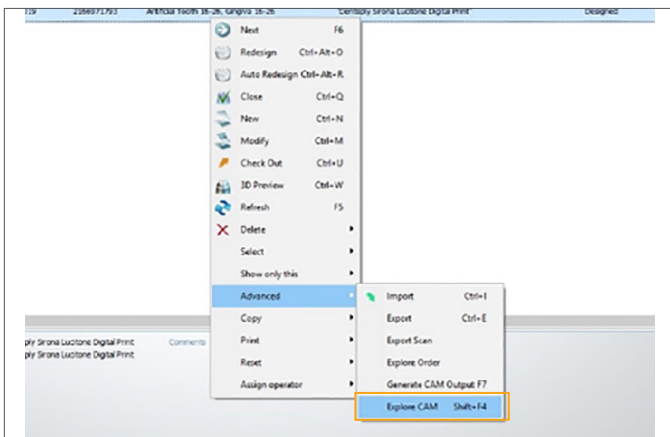
Verify in the "Manufacturing Settings" that the glue space is set to 0.17mm.

7.0 .STL File Creation
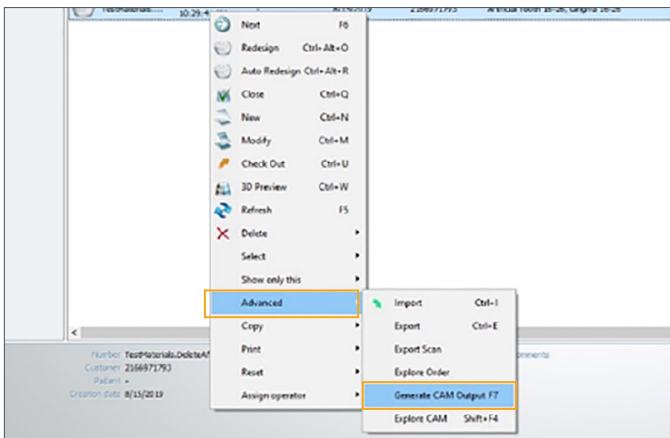
When the denture design is complete, save and close.

In Dental Manager select the job file to export and right click with the mouse. Select "Advanced" and then select "Generate CAM Output."


The files export to the 3Shape directory on your computer. Use "Explore CAM" to locate files. From this directory, the files are ready for upload to a mill or validated printer/CAM software.

8.0 Monoblock Try-In

The Try-In appliance is an important element of the digital denture workflow permitting the patient to evaluate the initial design including fit, occlusion, registration, and esthetics. Feedback between the clinician and designer is a critical milestone to achieve an optimal final appliance.
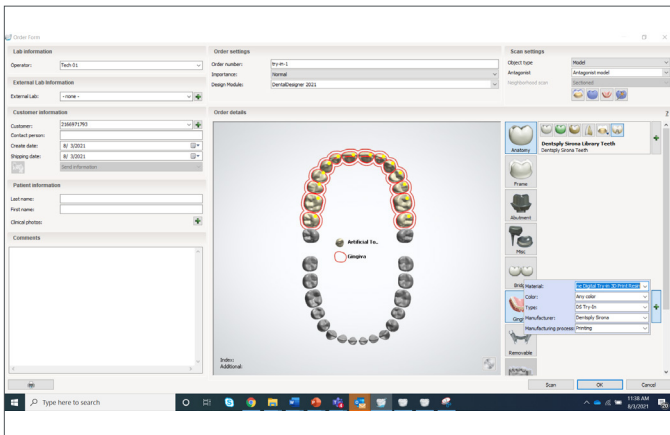

Designing a monoblock Try-In with the 3Shape Dental System follows the same steps as a denture, with a few minor modifications.

Complete the order form as shown.
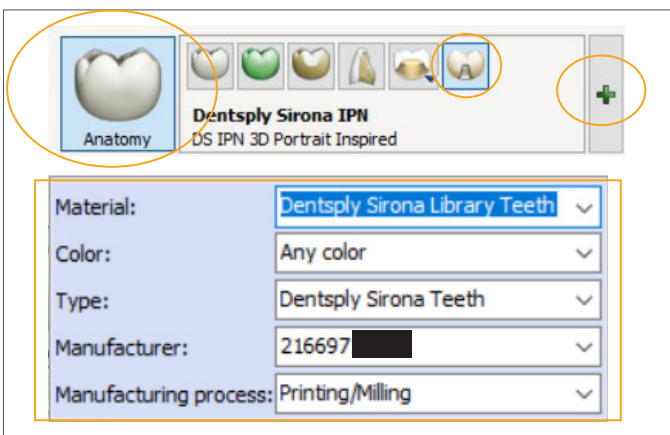
Select "Anatomy," then "Artificial Tooth," and then the plus icon. Populate the inputs using the drop-down menus:

Material = **Dentsply Sirona Library Teeth**
Color = Select the applicable Dentsply Sirona **shade**
Type = Select **Dentsply Sirona Teeth**
Manufacturer = **[Auto-populates dongle number]**
Manufacturing process = **Printing/Milling**
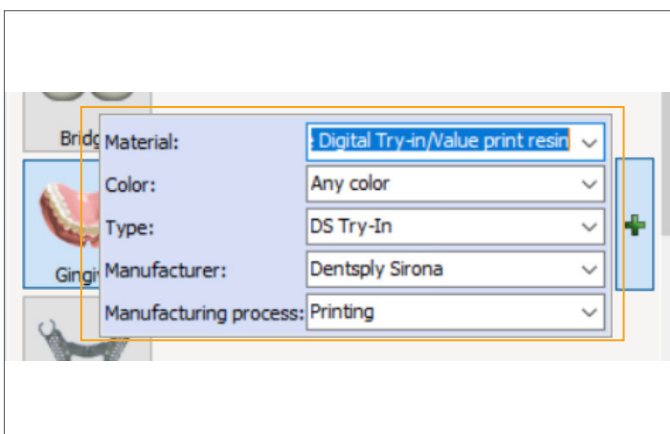
Select "Gingiva," then "Full Denture," and then the plus icon. Populate the inputs using the drop-down menus:

Material = **DS Lucitone Digital Try-in/Value print resin**
Color = Select the applicable Dentsply Sirona **shade**
Type = Select **DS Try-in**
Manufacturer = **Dentsply Sirona**
Manufacturing process = **Printing**

9.0 Reference - Denture Basics
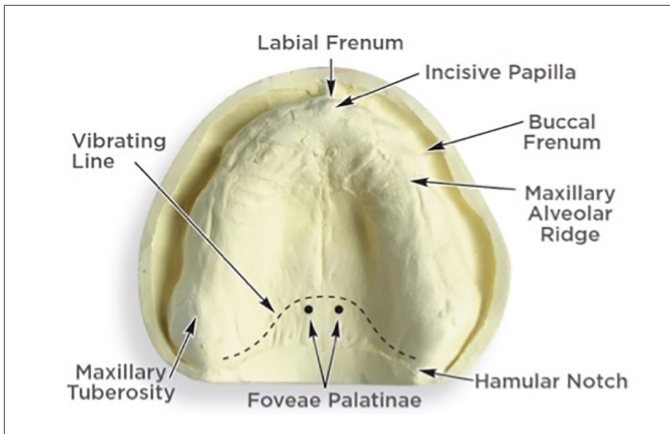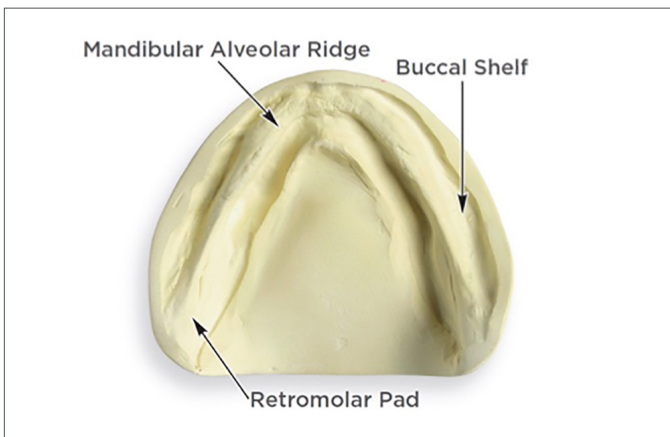

Model Landmarks
Model analysis is critical to design success.

Maxillary Arch
Ensure the scans include the following landmarks:
* Incisive Papilla
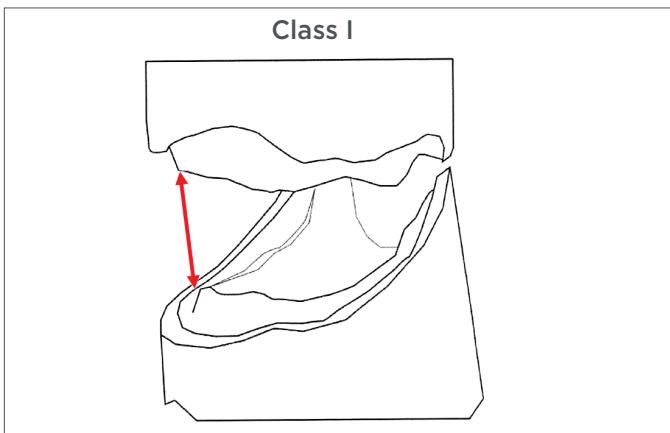* Maxillary Tuberosities
* Buccal Frenums

Additional landmarks, as shown, are helpful.

Mandibular Arch
Ensure the scans include the following landmarks:
* Mandibular Alveolar
* Buccal Shelf
* Retromolar Pads

Class I

Determine Ridge Relationship Class
The patient's jaw position can influence denture design. The clinician should indicate if the patient has a Class I, Class II, or Class III ridge relationship.

Class I (normal): The maxillary alveolar ridge crest is directly above the mandibular ridge. This is usually the most favorable ridge relation for complete dentures. Class I patients have moderate mandibular horizontal range of movement.
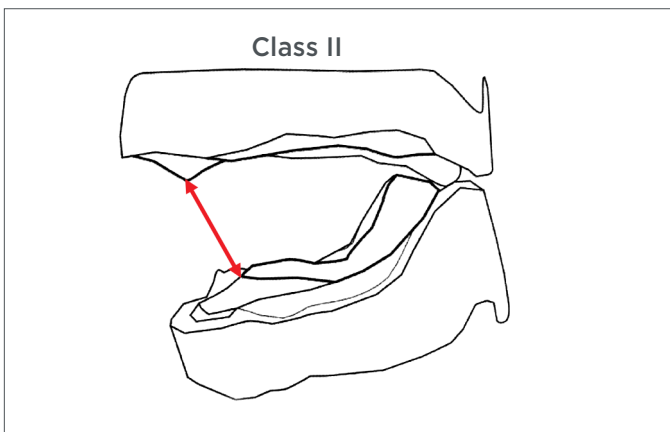
Class II

Class II (retrognathic): The mandibular ridge is narrower and shorter than the maxillary ridge. In some instances it may be as wide as the maxillae in the posterior. Class II patients will have the most mandibular horizontal range of movement that makes balanced occlusion important.
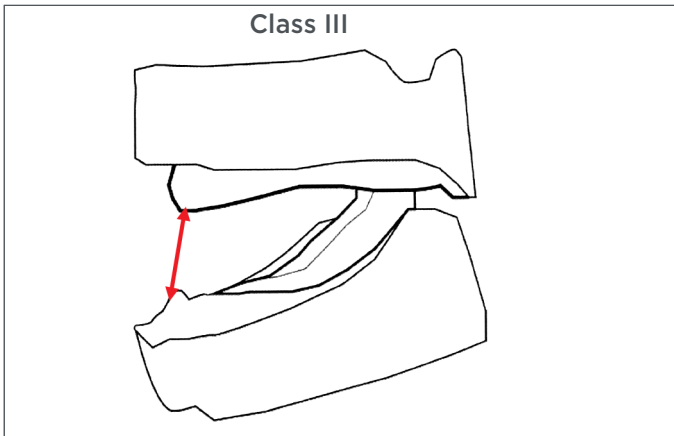
Class III

Class III (prognathic): The mandible is longer and wider than the maxillae. Such patients rarely show excessive jaw excursions but a straight opening and closing mandibular movement. Class III cases have no mandibular horizontal range of movement and posterior occlusal schemes tend to be in a cross-bite relationship.
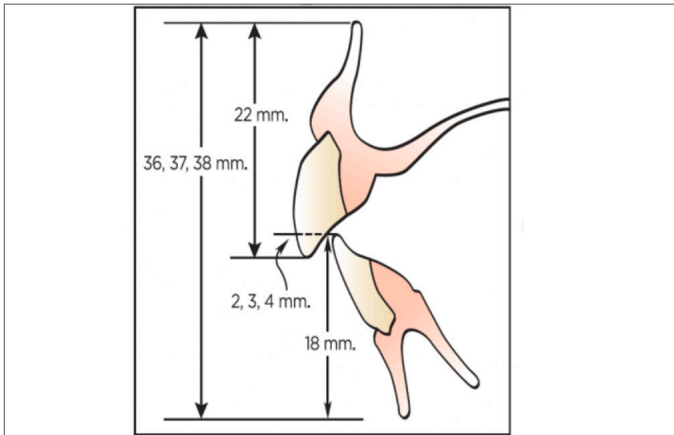
Vertical Positioning of Denture Teeth

Many factors such as ridge condition, class, size, esthetic preferences, etc., will influence teeth positioning. The illustration shown provides the vertical positioning of anterior denture teeth based upon averages.

The tooth libraries will have preset overbites and overjets based upon the mould selection. Use the 3Shape design feature, "Show Overlaps," to review and adjust the overlap and overjet in the denture design as necessary.


Balanced Occlusion

Balanced articulation is the bilateral, simultaneous occlusal contact of the anterior and posterior teeth in excursive movements. These contacts with reciprocating nonworking-side occlusal contacts are developed for the purpose of stabilizing dentures.* (*Source: The Journal of Prosthetic Dentistry, The Glossary of Prosthodontic Terms, Ninth Edition.)

Digital HC Portrait/Digital Portrait Libraries: Includes pre-occluded balanced set-ups for both semi-anatomical 10˚ posterior teeth and anatomical 33˚ posterior teeth.

Digital HC Genios/Digital Genios Libraries: Includes pre-occluded balanced set-ups for the G-Series posterior teeth.
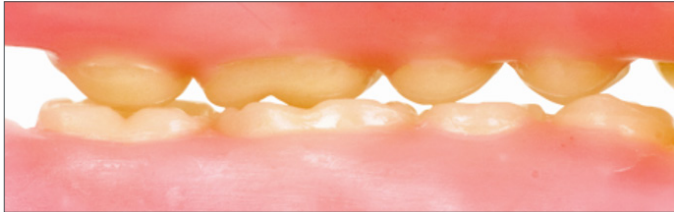
Lingualized Occlusion

A posterior tooth arrangement method that eliminates tooth contact points on the buccal cusps to assure seating and minimize tipping of the lower denture upon contact. The upper posterior teeth are set in a turned-out position so that only the lingual cusps of the upper posterior teeth contact the center of the occlusal table (the fossa) of the lower posterior teeth.

Digital HC Portrait/Digital Portrait Libraries:
Includes pre-occluded lingualized set-ups 33˚ over 10˚.

[1]3Shape Dental System and Smile Composer are trademarks of 3Shape A/S.
[2]Asiga MAX and Asiga PRO 4K are trademarks of Asiga.

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