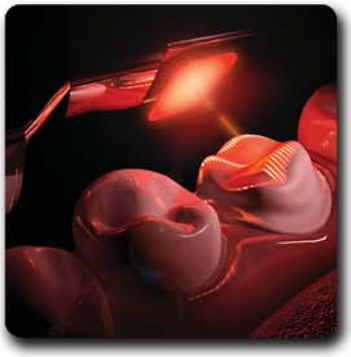
E4D TECHNOLOGIES



SCAN

DESIGN

MILL

Item 10560400 US $25.00

USER MANUAL

Table of Contents

Chapter 1 Introduction

E4D technology is available as a complete CAD CAM system as well as a range of Scan, Design, and Mill configurations to fit the needs of any dental office or laboratory.

Note: Caution: US Federal law restricts the mobile E4D cart to sale by or on the order of a dentist.

- Scanner/Wand - The Intraoral Digitizer Wand (IOD) is an E4D cart or desktop scanner that takes digital impressions which can be designed on the Design Center or sent via E4D Sky™ to E4D Digital Services or a certified laboratory for design and milling or exported to a third party. E4D Solo™ is a scan only system that uses Sky to send the cases. The scanner is referred to in documentation as the IOD, scanner, or wand.
- Design Center - E4D DentaLogic™ design software operating on an E4D cart, desktop, or laptop enables the operator to customize digital impressions from E4D Solo or other scanners. The term “Design Center” is used to refer to the machine that controls the scanner and the design software. This terminology is also used for systems that do not include a design license.
- Milling Center - E4D Mill can fabricate restorations from a variety of materials using data from E4D DentaLogic design software or other applications.

This User Manual, the online Help system, Exercise Workbook, and accompanying Quick References are the components in a set of instructional and support tools which includes basic training, advanced training, multimedia instruction, as well as telephone and Web-based technical support.

Note: Throughout the documentation, important notes and items of interest are formatted like this example.

Warning The orange Warning denotes something that can cause personal injury or physical damage to the equipment.

Some of the screenshots may have been taken in earlier software versions and may not exactly match your screen.

Indications for Use

The E4D Scanner is an optical impression system for CAD CAM of dental restorations. It is a device used for recording topographical characteristics of teeth, dental impressions, or stone models by digital methods for use in computer aided design and manufacturing of dental restorative prosthetic devices.

Contraindications

The E4D system is not indicated for orthopedics or any indication beyond dentistry.

Turn ON the Design Center

Mobile Cart

The power button on the back of the mobile cart should always be in the ON position.

Press the power button on the front of the Design Center.

The mouse tray can be used from the right or left side of the cart. The wireless mouse can also be used on a nearby counter top or desk.

Desktop System

Press the power button on the front of the Design Center.

DentaLogic Software

Once the desktop is visible, double-click the **Design Center** icon.

The software opens to the Home screen.

Moving/Viewing the 3D Model

Use the mouse or the Spaceball (optional accessory) to zoom in or out, move, and rotate the composite model.

Using the Mouse

Rotating the Model

Rotate Model
press and hold the right button, then drag

1. Click and hold down the right mouse button.

   The pointer changes to  .

2. Drag the mouse horizontally, vertically, or diagonally to rotate the image.

   Drag in small increments for more control.

3. Release the mouse button to stop rotating. Repeat as needed.

Changing the Model Size

Use the scroll wheel on the mouse to zoom in and out on the model.

Zoom Model
rotate the wheel button to change the size of the model on the screen

1. Position the pointer on your model.
2. Rotate the mouse wheel downward, toward your wrist.

   The pointer changes to  and the model becomes smaller.
3. Rotate the mouse wheel upward, away from your wrist.

   The model becomes larger.

Moving the Model

The model can be moved without being rotated.

Move Model
up/down, left/right: press and hold the wheel button, then drag.

1. Position the pointer on the model.
2. Press and hold down the mouse wheel.

   The pointer changes to  .
3. Drag the model to the desired position and release the mouse wheel.

Using the Spaceball

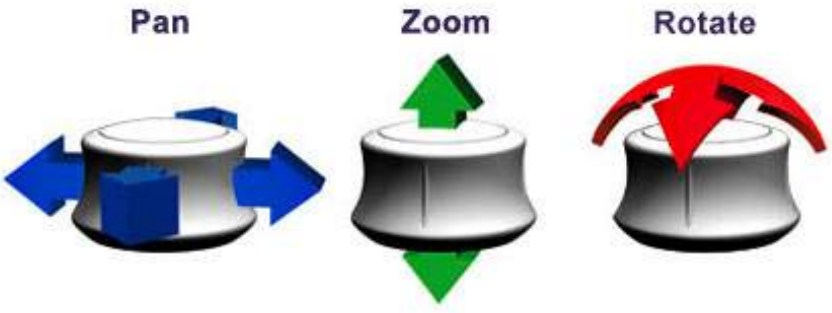
Optional accessory.

The Spaceball is a 3D controller that enables you to zoom, move, and rotate the model in a more fluid way than the mouse. The use of this controller is optional. The mouse can be used alone if preferred.

Manipulating the Model

The Spaceball enables you to pan, zoom, and rotate separately or at the same time. The base of the Spaceball does not move, only the top half, called the cap, moves.

Place the Spaceball with the cord facing away from you. Place your fingers on the raised areas of the cap. This helps orient you to match the up/down/left/right of the cap to what's on the screen.



- **Pan -** Use side-to-side motions to move the model straight up and down or left and right.
- **Zoom -** Pull up or push down on the cap to zoom in and out.
- **Rotate -** Tilt the cap in the direction that you want to rotate the model.

Press the right button on the Spaceball to re-center the model on the screen. This also re-enables the mouse for moving the model. However, once the Spaceball is used, the mouse is deactivated.

By default, the center of the model is the central rotating point. If you want a different rotating point, move that area to the center of the screen and click on the left mouse button.

Models with multiple restorations will automatically rotate around the prep for each tab once the margins have been drawn.

System Options and Default Settings

Individual tabs are used to design the restoration: Home, Setup, Scan, Margin, Design, and Mill. The tabs are dynamic. The choices you make on each tab affect the options available on that and related tabs. The typical restoration utilizes the tabs from left to right. Moving backwards in the process (e.g., modifying the settings in the Margin tab after completing the design in the Design tab) can cause settings and designs to be discarded. The system warns you when your actions will cause design data to be discarded.

Some system configurations will restrict the use and access of individual tabs.

Screenshots

You may wish to save an image of the screen for communicating with associates or E4D Customer Support.

To take and save a screenshot:

1. Press and hold down the **ALT** and **S** keys on the keyboard.
2. From your keyboard, press the  and **R** keys.
3. Type **c:\d4d\grabs** and press **Enter** or click **OK.**

   The system names the screenshot using grab_year_month_day hour. minute. second.png, for example; grab_2006_5_4 9.10.9.png.
4. You may copy and save the screenshot to a computer on your network. You can rename the screenshot if you prefer.

For Your Information
The graphics in the DentaLogic software are layered and not all layers may be captured with the screenshot.

The Settings Screens

Access Settings by clicking the **Settings** button in the Home screen or the Settings button  on each tab. These screens contain preference settings that modify the default behavior of the software. The settings are based on each screen. Use the arrows to scroll right or left. Click a category to select it. Selected categories display in the bottom of the screen.

Click **Restore Factory Defaults** to revert to original settings, click **Save** to save changes, or click **Cancel** to exit without saving.

Home Screen Settings

Workstation Type

Designates the type of workstation that you are using. This affects the logos that are displayed, it does not affect the functionality of the software.

Theme

Click to change the color theme of the software. The software must be restarted after the selection has been changed.

Version

Displays the version of the software and imaging systems.

Data License

This screen should be used only at the request of a customer service representative. Purging the license will make the system unable to communicate with the Job Server.

Design License

This screen should be used only at the request of a customer service representative. This displays the type of system license that you have and how much of the system you are able to access. If there is an expiration date for your license, it is displayed on this screen.

Reset Warnings

The warning and reminder screens have an option to **Do Not Show This Message Again.** If a new operator is using the system, you may want to reactivate these warnings.

Numbering Scheme

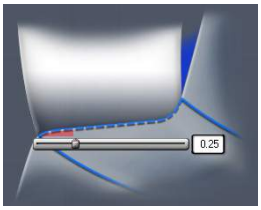
Designates the tooth numbering system to be Universal or ISO.

Sprue Angle Method

(For mill systems)

The default setting is Tooth Specific. **Tooth Specific** places the sprue in the most commonly recommended position based on the type of restoration. **Optimized** selects the placement based on the fastest milling time. In all cases, the sprue can be manually moved on the Mill tab.

Margin Ramp



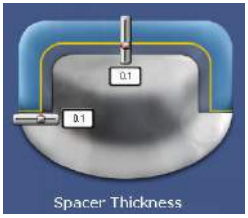
(For design systems)

Default: **0.25**

Default setting for the margin ramp incline. Use the slider or type a number in the box to change the setting.

Increasing the Margin Ramp decreases the space between the restoration and preparation at the shoulder. Decreasing the Margin Ramp increases this space.

Spacer Thickness

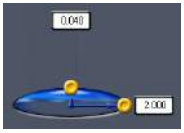


(For design systems)

Default: **0.1** Top: **0.1** Sides

Default setting for the space between the preparation and the restoration.

Dropper Tool



(For design systems)

Default: **0.040** Thickness: **2.000** Width

Default setting for the dropper tool has an amount/thickness of material and how much surface area it covers.

Spaceball Settings

(Optional accessory)

Select to activate the Spaceball option.

Network Settings

This screen should be used only under the supervision of a customer service representative. These settings are pre-configured and should not be changed.

Wand Diagnostics

(For scanning systems)

For use by Customer Support only.

Do not discard the Wand Diagnostic tool.

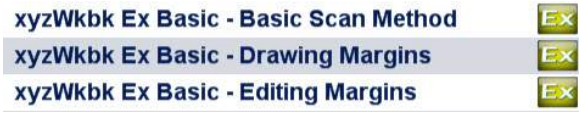
Workbook Exercises

(For design systems)

A set of Workbook Exercises come with your system. Use Restore to revert the exercises to their original state or to save the exercises with the user's initials and get a new set of exercises.

The default exercise patients have a green icon next to the names.

If the exercise name has been edited, the icon turns yellow.



1. To save the current set of exercises with the user's initials, click the **Save Prefix** field (cursor does NOT appear) and enter the desired initials.

   Note: Many clinical operators put a Z at the beginning of the initials to alphabetize the exercises at the end of the patient list.

2. Click **Save.** This renames the existing exercises with the prefix and changes the icon to yellow.

3 Click **Restore.** If the existing green exercises were not renamed with a prefix, they will be deleted and replaced with the default exercise data.

4 Click **Remove** to delete all of the green exercises.

Dentrix Connection

(For Dentrix users)

1 Click **Enable.**

2 Enter the **Dentrix Server IP** address.

3 Select **Procedure Codes** to display only the patients with a crown, inlay, onlay, or veneer scheduled. The restoration type and tooth number appear in the patient's Restoration list and on the Setup page. If Procedure Codes is not selected, the system displays all patient appointments for the day without procedure information.

4 Click **Save.**

Mill Notification Settings

(For mill systems)

Use Mill Notification Settings to enable or disable the Mill Status on the Design Center.

Sky Settings

By default, **Send Email Notifications** is selected. Notifications are sent for various actions within E4D Sky. Click to deselect this option. Emails are only sent to the main address on file.

The remainder of the fields on this screen should only be used under the supervision of a customer service representative. These settings are pre-configured and should not be changed.

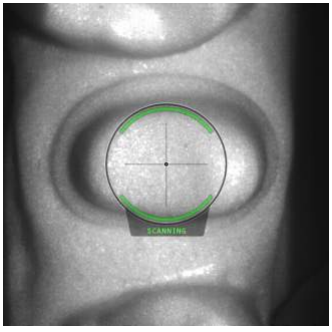
Camera Configuration

(For scan systems)

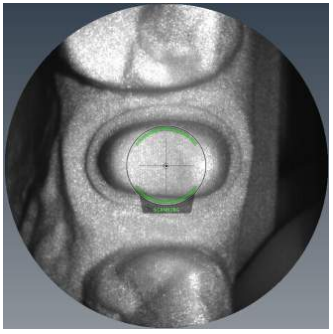
Camera Configuration for E4D Dentist Systems installed in 2011

Systems manufactured in 2011 or later that have DentaLogic version 2.0 software can operate in high density (HD) configuration, which is indicated by the HD icon that appears on the Home page.

The HD configuration scans at a faster rate than the conventional or standard density (SD) configuration, reducing motion and producing a sharper model. In HD mode, the camera focuses on a smaller area, with less likelihood for a cheek or tongue to appear in scans. With the concentrated HD view, smaller movements between scans may be required to provide sufficient common data points between scans (overlap).



HD Live View



SD Live View

Camera Configuration for Pre-2011 and Other E4D Systems

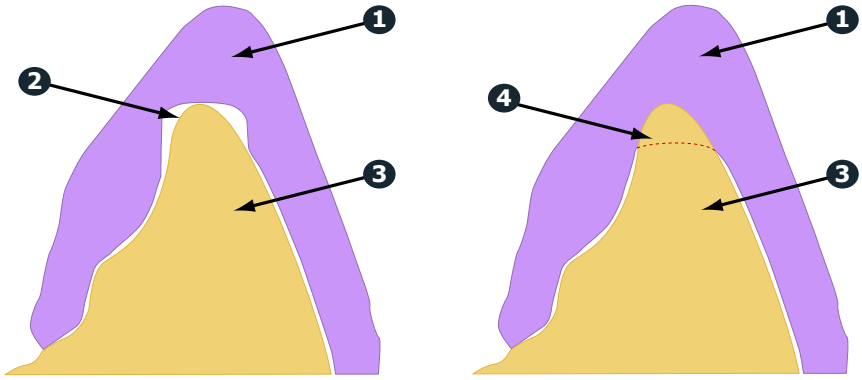
DentaLogic software version 2.0 operates on all E4D systems in the conventional (SD) camera configuration. Pre-2011 E4D systems may be updated with a Performance Package that replaces the system's graphic hardware components.

Milling Settings

(For mill systems)

Accessed from the Home screen or the Mill tab, Milling Settings determines whether to use **Standard** milling (overmill) or **Undermill.**

Milling Settings only affects proposals with a sharp interior, like an anterior incisal edge. If the interior of the proposal is smaller at the tip than the tools in the mill, the standard setting is for the mill to remove extra material at the tip. This may lead to a crown that is too thin at the top. The options are to round the preparation or to select Undermill. If Undermill is selected, the mill will not remove all of the interior. It will go as far as the tool's size will allow and the remainder must be removed manually.



1 **Proposal**

2 **Standard**

3 **Preparation**

4 **Undermill**

RapidScan™ Settings

(For scan systems)

Click **Settings** on the Home page or on the Scan tab to access the Rapid Scan Settings.

The Spacebar is used to turn Rapid Scan ON and OFF. The Foot Pedal can be used at any time if preferred.

Speed affects the speed of how quickly the scans will be taken. As you get accustomed to Rapid Scan, you will likely want to speed up the process. Move the slider towards the minus sign to slow the process down, towards the plus sign to speed it up. **Opacity** affects the translucency of the live view window. Move the slider towards the plus sign to make Live View more solid or towards the minus sign to make it more translucent.

The **Auto Pan** feature is used by both the Rapid Scan method and the foot pedal method of scanning. When Auto Pan is ON, the system moves the model as it builds to show the most recent scan on the screen. For multiple restoration cases, this will often result in part of the model being off screen.

Scan Diagnostics Settings

(For scan systems)

This should only be activated at the request of Customer Support.

Auto or Occlusal POI

(For mill systems)

This should only be changed at the request of Customer Support. Auto POI (Orientation) finds the best possible milling path to avoid undercuts and this eliminates the need to go back (on veneer and multiple cases especially) and reset POI for the mill. Occlusal POI uses the Orientation to set the tool path.

Turn OFF the Design Center

1. Click  to go to the **Home** screen.
2. Click **Exit** to close the software.
3. The operating system desktop appears.
4. Click **Start**.
5. Click **Turn OFF Computer.**
6. Click **Turn OFF.**

For Your Information
See “Milling Center Introduction” on page 188 for information on the Job Server and Milling Center.

Chapter 2
Administration

This chapter describes the administrative functions associated with the E4D CAD CAM System.

Relocating the Design Center

Mobile Cart

Use this section as a reference if you need to move your cart within your office. If you are not comfortable moving the system yourself, contact Technical Support for assistance.

The Design Center is designed to be located within visual distance of the patient chair so that the video images on the screen are visible during scanning and the scanner cord reaches from the Design Center to the patient's mouth.

The Design Center requires a clear floor space with access to an adequate power supply. Ensure the main power switch and the power cord connecting point on the rear of the Design Center are accessible at all times.

When choosing a location for the Design Center, ensure the monitor and the scanner are not exposed to direct sunlight or other intense light sources and ensure the power and scanner cables do not interfere with walkways or other equipment. Adhere to all clearance requirements stated on page 169.

1. Properly shut down the Design Center software by clicking **Exit** on the Home screen.
2. Turn OFF the Design Center.
3. Place the scanner securely in its cradle.
4. Disconnect ALL power and data connections.
5. Properly secure any components that may fall from the cart or become entangled during transport.

6 Slide the mouse tray into the Design Center and close the panel.

7 Ensure all obstacles have been removed from the path of the Design Center.

8 Unlock the wheels by raising the locking mechanism on each wheel.

9 Using the handles, carefully push or pull the Design Center to the new location.

Desktop

1 Properly shut down the software by clicking **Exit** on the Home screen.

2 Turn OFF the Design Center.

3 DO NOT unplug the IOD. The IOD should be moved along with the CPU of the Design Center.

4 Disconnect all other power and data connections.

System Information and Upgrades

Software and Hardware

System software and hardware upgrades are initiated through E4D Technologies only. No software or hardware should be added or deleted to/from the E4D systems without prior approval of E4D Technologies. Doing so may result in damage to the system and will void the product warranty.

Software Version

The current software version can be found by clicking on the Version Info button in the Settings screen on the Home page. A window appears with the current software version.

Cleaning the Mobile Cart

For intraoral scanning systems only.

Cleaning Cycle: Before and after each use, clean all areas of the Design Center.

Warning: Before and after each use, follow these instructions to disinfect the Design Center. Do not substitute any other cleaning solution or procedure. Under no circumstances should you use any paint thinner, solvents, or harsh chemicals. Use only a non-woven sponge or pre-moistened germicidal cloths when cleaning the Design Center.

1. Using a clean, non-woven sponge that has been saturated with a hospital grade, TB-rated germicide or pre-moistened germicidal cloths, apply the germicide to the entire surface of the scanner, keyboard, mouse, mousepad, handle, and any other surfaces that you touch that were not covered by a disposable barrier. Do not spray the germicide directly on the items and do not submerge the scanner or mouse in the germicide.
2. Follow the germicide manufacturer's instructions.

Additional Assistance

The following additional materials are provided to assist you in operating the E4D system:

- Quick Reference Cards
- Exercise Workbook
- Online Help 
- Training Videos available at e4d.com/resources on the ECO Member's page.

If you have questions, please contact Customer Support at

Toll Free	800-537-6070
E-mail	customersupport@e4d.com
Fax	972-479-1106
Hours of Operation Monday - Thursday Friday	 7 am – 7 pm CT 8 am – 5 pm CT
Web site	www.e4d.com
Mailing Address	 D4D Technologies LLC dba E4D Technologies 650 International Pkwy Richardson, TX 75081

See "3M and E4D Support Guide" on page 257 for information on who to call if you are using a 3M True Definition™ scanner.

Chapter 3
Scan and Design Center Safety

Warning: Failure to adhere to all safety warnings may result in personal injury, equipment damage, or data loss.

● *Intraoral Systems*

Mobile carts are indicated for intraoral use.

- E4D Full System – Cart
- E4D Solo – Cart (with or without Design license)

○ *Non-Intraoral Systems*

Desktop and laptop systems are not indicated for intraoral use.

- E4D Full System – Desktop
- E4D Solo – Desktop (with or without Design license)
- E4D Design Studio – Laptop or Desktop (with or without Milling license)

● = Intraoral	○ = Non-Introaral	
●	○	This equipment is intended to be grounded. Connect the E4D products to earth grounded outlet only.
●	○	DO NOT disconnect or remove the wand from the system. Please call Customer Support for assistance.

● = Intraoral ○ = Non-Introaral		
●	○	If a power cord (other than the one provided with the equipment) is used for connecting to the power source, ensure it meets all of the following requirements: • Detachable power supply cord • Type SJT • 18 AWG • 3 conductor • Rated 10 A or better • For products outside of the United States and Canada, the power cord must be marked “HAR” or with a suitable agency marking from the country of intended use. The attachment plug and appliance coupler must be marked with a suitable agency marking from the country of intended use.
●		• The power cord bears the marking “Hospital Only,” “Hospital Grade,” or equivalent and has been listed by an appropriate regulatory agency. Grounding reliability can only be achieved when the equipment is connected to an equivalent receptacle marked “Hospital Only” or “Hospital Grade.”
●	○	Do not use the E4D products for any purpose other than its intended and labeled use.
●	○	To prevent electrical shock, do not open any sealed or user restricted access panels or connectors.
●	○	A detachable non-locking type power cord has been provided with this equipment as the disconnect device. Do not block access to the power cord. In case of emergency, remove power from the device by unplugging the cord at either end.
●		In conformance to UL electrical safety requirements, the manufacturer instructs you to not touch the patient while operating the E4D products keyboard.
●	○	The IOD is a Class 1 Laser Product and will not present any safety hazards under normal operation. Always observe safe laser practices. Project the laser only onto surfaces or materials as directed by E4D instruction material. Avoid shining the beam directly into the eye. Use the laser product only as described by this manual.
●		The IOD is not intended for contact with flowing blood. Thoroughly clean and close all open wounds in the mouth before using the scanner. Before scanning a patient’s restoration site, ensure the scanner has been properly covered with a disposable aseptic sleeve.
●		After using the scanner on a patient, dispose of the aseptic sleeve according to accepted protocol and clean the scanner according to the cleaning instructions found in “Cleaning the Mobile Cart” on page 27.

● = Intraoral ○ = Non-Introaral		
●		The handles on the mobile cart are intended to be used only for rolling the Design Center. Do not use the handles for lifting and do not apply excessive downward force on the handles.
●		Even though the Design Center has castors to permit rolling, do not sit upon or ride the Design Center.
●	○	Do not block any of the E4D products's cooling vents. Doing so may result in overheating and damage to the products and will void the product warranty.
●	○	When placing components, adhere to all clearances stated on page 169.
●	○	Do not make any unauthorized repairs or modifications to the system software or hardware. This includes installing unauthorized software on the E4D computer system or altering or bypassing any safety switches or mechanisms.
●	○	Do not install or operate the E4D products in an environment where an explosion hazard exists, e.g., high oxygen area.
●	○	Comply with all applicable regulations when disposing of waste materials from the E4D products.
●	○	Do not attach any equipment or devices to the E4D products unless their use has been specifically authorized by E4D Technologies.
●		Medical electrical equipment requires special precautions regarding EMC (Electromagnetic Compatibility). The E4D products must be installed and placed into service according to the EMC information provided in the documentation that accompanies the E4D products.
●		Portable and mobile RF (Radio Frequency) communications equipment can affect medical electrical equipment.
●	○	The wireless components in the E4D products may be interfered with by other equipment, even if the other equipment is fully compliant with CISPR (International Special Committee on Radio Interference) emission requirements.
●	○	When possible, electrical equipment should not be used when adjacent to other electrical equipment. If adjacent use is necessary, the equipment should be observed to verify normal operation in the configuration in which it will be used.
●	○	When connecting the E4D components, use only the cables supplied with the products. Failure to do so may result in increased electromagnetic emissions or reduced immunity to external electromagnetic emissions.
●	○	Do not immerse the scanner in liquid or expose the E4D products to conditions outside the operating conditions shown on page 169. Clean the scanner according to "Cleaning the Mobile Cart" on page 27.
●	○	Ensure your E4D products are properly maintained through periodic maintenance.

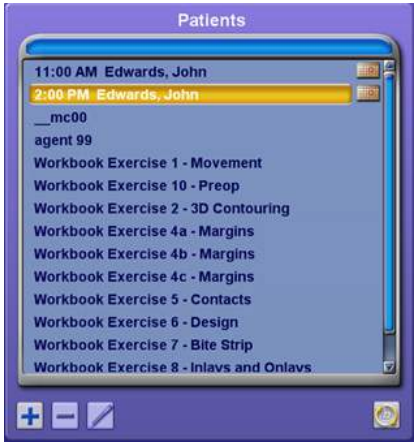
● = Intraoral	○ = Non-Introaral	
●	○	If you suspect equipment malfunction or failure, discontinue using the E4D products and contact E4D Technologies Technical Support immediately. Do not attempt to make any repairs on the E4D products.
●	○	Read and comply with all safety, warning, and instructional labels on the E4D products.

Chapter 4
Setting Up a Restoration

The software opens to the Home screen. The patients are listed on the left side of the screen. Click a patient name to see the patient's list of Restorations on the right.

The Home screen is where you will Exit the program.

Dentrix Patients



The E4D system can import data on patient appointments from your Dentrix system and display it at the top of the Patient list on the Home page. The list is automatically updated when the software is started. Click **Refresh Dentrix** below the list of patients to manually update the list if desired. Patients are listed in order of their appointments for the day. Any changes to the appointments will only be seen when the Refresh button is clicked. In the example shown, there are two appointments for John Edwards. After the case setup is complete, the patient's name appears in the regular alphabetical list of patients. If this is the same John Edwards in Dentrix, the restorations will show up under one name. If it is two patients with the same name, the second patient will have a (1) appear after their name.

All Dentrix appointments start out at the top of the screen, even if the customer already exists in the list below. Once the setup is complete on the restoration, the appointment will go away and the restoration will be added to the existing patient name.

If the Dentrix Connection has not been created, the Refresh button will not appear on your screen. See *"Dentrix Connection" on page 19* for setup instructions.

Adding a Patient

Before you can create a restoration for a patient, you must add their information to the Patients list. Use the Home screen to add, delete, and edit patient information.

1 Add

3 Edit

2 Delete

4 Enter

1 Click  to add a patient.

The patient Name box appears.

2 Type the patient's name (or any other identifying information) as you want it to appear in the Patients list.

3 Click the arrow  to add the patient.

The patient appears in the Patients list.

Deleting a Patient

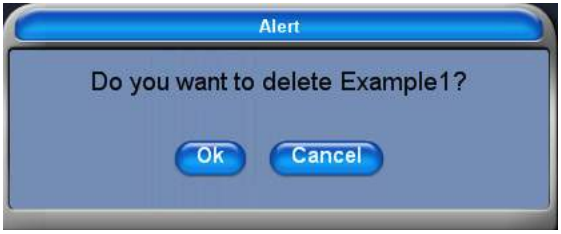
To delete an existing patient file:

Note: Deleting a patient cannot be undone. Deleting a patient deletes all of the restorations associated with that patient.

1 Click the patient's name you would like to delete. This highlights the name.

2 Click  below the patient screen.

3 A screen pops up verifying you want to delete this patient and all of their restorations. Click **OK** to delete the patient. Click **Cancel** to keep the patient.



Editing a Patient Identifier (Name)

To edit the patient name:

1 Highlight the patient's name to select it and click the  pencil icon.

2 Change the patient Name.

3 Click the  arrow icon to save the change or press the **Esc** key to exit without saving changes.

Deleting an Existing Restoration

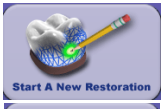
1. Click to highlight the patient.
2. Click the **Restoration** you want to delete.
3. Click the  button below the Restorations list.

Note: Be sure to click the button below the Restorations list. If you click the one under the Patients list, you will delete the entire Patient file.

4. A verification screen appears. Click **OK** to delete the restoration. Click **Cancel** to keep it.

Starting a New Restoration or Opening an Existing Restoration

After entering the patient's name, you can proceed to setting up a restoration.



1. Click to highlight the patient you would like to set up.
2. Click **Start a New Restoration.**

   Or, to continue working on an existing restoration, click **Open Existing Restoration.**

   The Setup tab appears.

Setup tab

Use the Setup screen to set the restoration type, occlusal data type, material, and tooth library. If you open an existing restoration in the Home screen, many of these settings may already be selected.

The Setup screen requires that the settings be made in a particular order because certain parameters depend upon previous selections. Always define a restoration in the following order:

1 Select a restoration site by clicking on the anatomical model. If no teeth have been selected, the anatomical model is closed until the mouse cursor is moved near it.

The currently selected tooth is orange. If any other teeth are part of this restoration file, they are green.

For bridges, select the abutments and the pontic(s). See “Designating a Bridge” for more information.

> **Note:** You can do up to 16 restorations on the same arch at one time. Repeat these steps for each tooth individually.

2 Choose the restoration type.

3 Select the opposing scan type.

> **Note:** The majority of E4D Sky case recipients will require Buccal/Opposing cases. Bite registration cases can only be sent to someone else using an E4D Design Center system.

4 Specify a tooth library. See *"Smile Design" on page 40* for more information on the tooth libraries.

5 Specify a material. See *"Block Selection" on page 42* for more information on material selection.

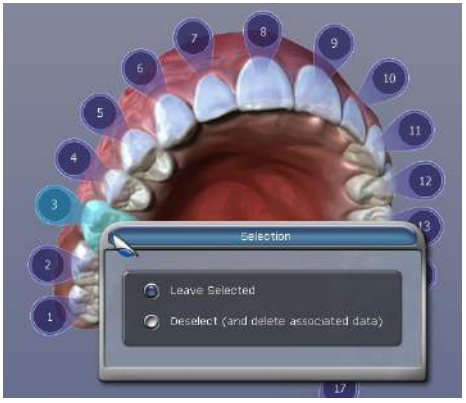
6 Specify a shade. The shade is shown on the Milling Center instructions along with the material and block size.

> **Note:** You can change the tooth library on the Design tab. The system offers block size options on the Mill tab. The material can be changed on the Mill tab Settings

7 Click the **Scan** tab or click **Next.**

Changing the Tooth Selection

1 If the wrong tooth was highlighted for the restoration, right-click the tooth and click **Deselect.**

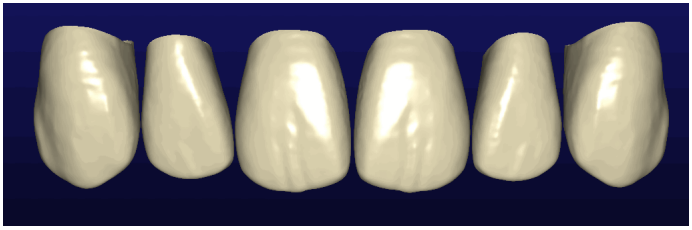


2 Click on the correct restoration site.

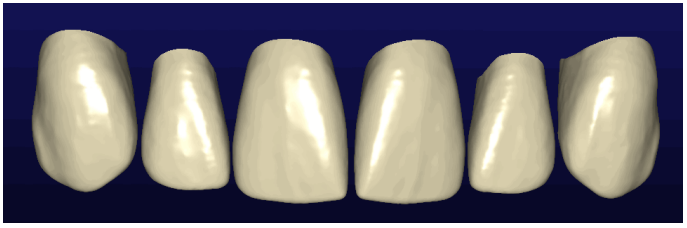
Smile Design

The facial pictures below show the anterior library options grouped together by type.

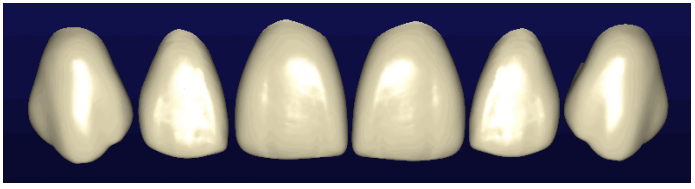
Round-Round
Teeth 7 through 10 are **Anterior A1.** Teeth 6 and 11 are **Library A.**



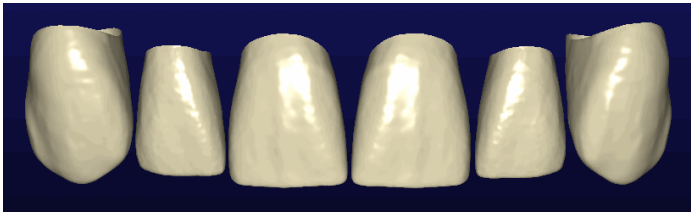
Square-Round
Teeth 7 through 10 are **Anterior A2.** Teeth 6 and 11 are **Library A.**



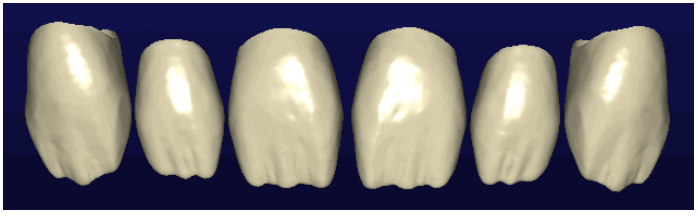
Square-Round
All teeth are **Library C.**



Square-Square
Teeth 7 through 10 are **Anterior A2.** Teeth 6 and 11 are **Library A.**

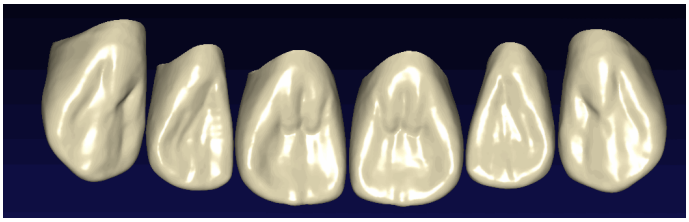


Cutback A4

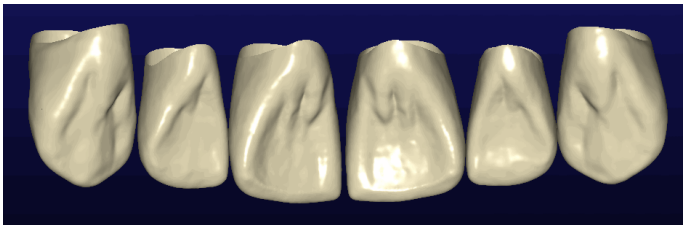


The lingual pictures below show the anterior library options grouped together by type.

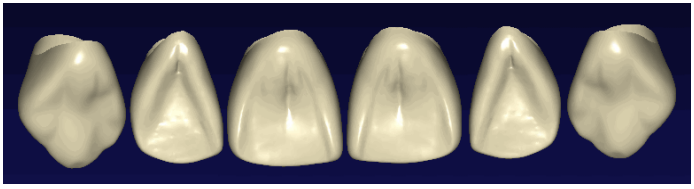
Round-Round
Teeth 7 through 10 are **Anterior A1.** Teeth 6 and 11 are **Library A.**



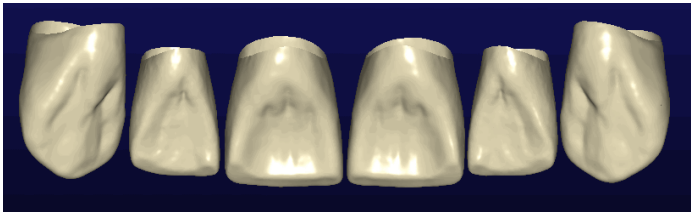
Square-Round
Teeth 7 through 10 are **Anterior A2.** Teeth 6 and 11 are **Library A.**



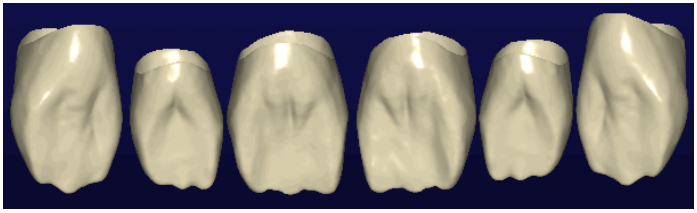
Square-Round
All teeth are **Library C.**



Square-Square
Teeth 7 through 10 are **Anterior A2.** Teeth 6 and 11 are **Library A.**



Cutback A4



Block Selection

With over 200 combinations of block sizes, materials, and shades available, the selection of the correct block can be a daunting task. Here are some guidelines (for more specific directions, contact your local Ivoclar Vivadent or 3M ESPE representative):

- 3M ESPE supplies E4D's composite block - **Paradigm® MZ100.** Because of the custom mill paths within the milling center, this block will typically mill much quicker and have less associated bur (tool) wear. These blocks are cylindrical. Insurance coverage may vary compared to ceramic blocks.
- **Lava Ultimate** is a nano resin ceramic ideal for all indications including implant superstructures. Fast milling, no firing for great results.
- Ivoclar Vivadent categorizes their **IPS Empress®** block selection by amount of translucency; **LT** blocks have lower translucency and therefore are more opaque, allowing some visual blocking of the underlying tooth structure (ideal for full coverage). **HT** blocks are higher translucency blocks; they are great for inlays and onlays where surrounding tooth structure can positively affect the esthetic outcome.
- **Multiblocks** are blended in color and translucency from cervical to incisal and allow for complete esthetic control.
- **IPS e.max** is a lithium disilicate glass-ceramic material that comes in a pre-crystallized state which changes color and strength when fired. In its final tooth colored state, IPS e.max CAD offers 360 MPa of flexural strength which is nearly three times the strength of many millable ceramics available chairside. Adjustments should be made to the e.max restorations while in the blue stage.
- **IPS e.max Impulse** are supplied in three Values (Value 1, 2, 3) and two Opal shades (Opal 1, 2). They are mainly used for veneers. The Value blocks feature different brightness values: 1 is the lowest and 3 the highest. The Opal blocks exhibit a decreasing opalescence and increasing brightness value from 1 to 2.
- **Telio CAD** blocks are intended for long-term provisional restorations (maximum wear of 12 months).
- **Zirlux FC2** is full contour zirconia that can be milled with the E4D Milling Center. Zirlux FC2 requires a sintering oven.
- **Burn Out Blocks (BOB)** are used to manufacture an acrylic pattern for further fabrication methods utilizing the burnout technique, including casting and pressing for inlays, onlays, crowns, as well as other dental applications.

The block selection chart provides general direction on what block or category of block is recommended for different types of restorations. Please understand that the clinical situations and parameters (preparation, occlusion, patient compliance) are all factors in the success of the final restoration regardless of the material.

Restoration → / Material ↓		Anterior - full crown	Anterior - veneer	Posterior - full crown	Inlay/ Onlay	Implant	Bridges
3M	Paradigm MZ100					Provisional Only	
	Lava Ultimate						
Ivoclar Vivadent	IPS Empress CAD HT						
	IPS Empress CAD LT						
	IPS Empress CAD Multi						
	IPS e.max CAD HT						Anteriors Only
	IPS e.max CAD LT						Anteriors Only
	IPS e.max CAD Impulse						
	Telio CAD						Provisional Only
	Zirlux FC2						
D4D	Burn Out Blocks (BOB)	For cast or pressed indications only.					

Primary indication

Secondary indication

With manufacturer caution

Chapter 5
Scanning

This chapter does not apply to cases that are imported from another scanning system.

Warning The E4D scanner is a high precision Class 1 laser scanning instrument. Always store the scanner in its cradle when not in use. To prevent damage or misalignment, do not drop or strike the scanner. Follow all stated precautions when using the scanner.

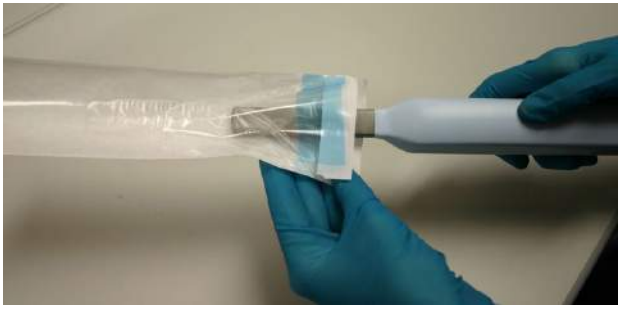
The scanner captures the restoration site with a laser system and delivers live images to the monitor. As you take multiple snapshots, the system creates a composite image of the restoration site, revealing any areas that need further scanning.

Using the Aseptic Sleeve and Standoff

For intraoral cart scanners only.

Using an aseptic sleeve and standoff on the scanner is recommended. The sleeve is a disposable contamination barrier and helps avoid fogging of the lens. The autoclavable standoff aids in positioning the scanner and holds the sleeve in place.

1 Lift the white tab of the sleeve and insert the scanner window side down.

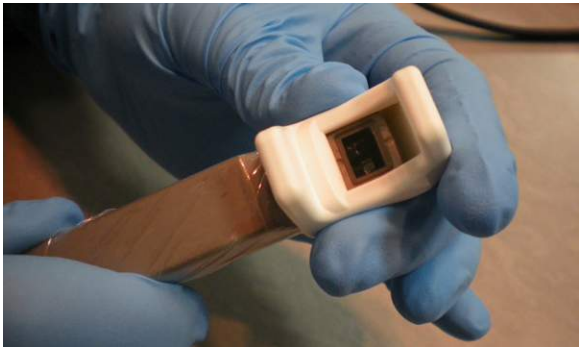


2 Slide the scanner all the way into the sleeve.

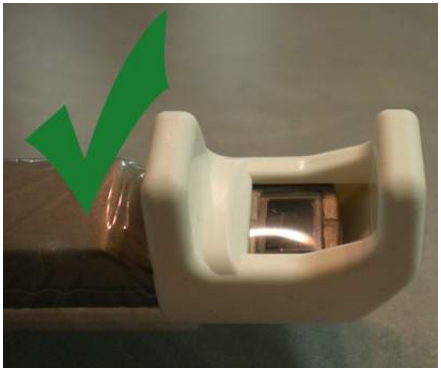
3 Pull up on the blue tab to remove the outer layer. Discard the outer layer.

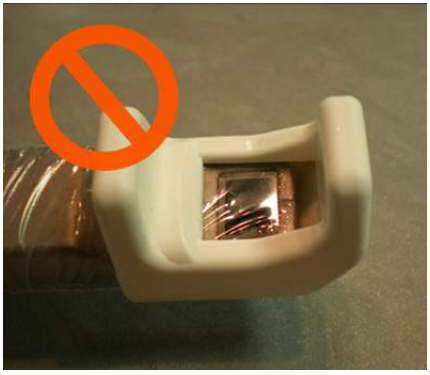
4 Gently pull down on the sleeve so that the plastic is taut around the tip of the scanner. The plastic should be smooth over the window.

5 Slide the standoff onto the tip of the scanner.



6 Ensure the plastic over the window has no bubbles or wrinkles which would interfere with the scan.





Note: If the standoff is removed during scanning, ensure the sleeve does not loosen and cause bad scanning.

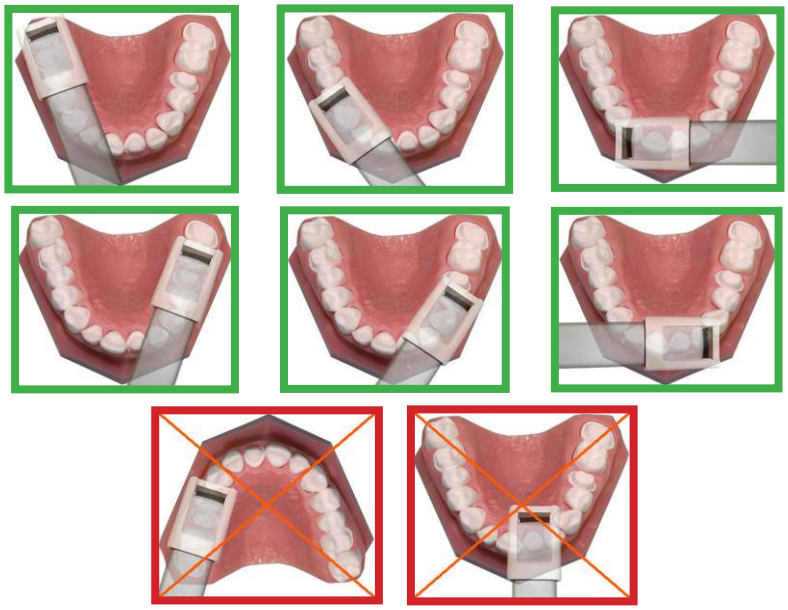
7 Wrapping the handle in a disposable barrier is recommended for contamination control and to keep the sleeve from sliding.

Scanning with the Standoff

The autoclavable standoff stabilizes the wand during scanning. Press down on the flexible standoff to get closer to the preparation during scanning.

Positioning the IntraOral Digitizer Wand (IOD)

Position the scanner along the mesial-distal axis with the tip of the wand pointing towards the distal. The axis follows the curve of the arch. The pictures below show good and bad positions along the arch.



Take the first scan of the preparation and opposing from the occlusal. It is the most important scan because it sets the alignment (Orientation). Buccal bite scans are taken only from the buccal point of view.

Ensure opposing and buccal scans of models have the wand pointing towards the distal. You will not be able to align the scans if the models have been scanned incorrectly.

The focal distance of the scanner is 10 mm to 25 mm so the ideal distance from the scanner to the preparation surface is approximately 17 mm.

Rapid Scan™

Rapid Scan provides automatic scanning with live feedback. This enables you to take scans quickly and easily.

1 Click the **Rapid Scan** button or press the **Spacebar** on the keyboard to activate Rapid Scan.

The Live View displays on the right.

2 Position the scanner or model for the first scan. Hold still while the scanner takes the first scan.

Note: Take the first scan from the occlusal. It is the most important scan because it sets the alignment (Orientation).

3 Move to the next position and hold still for the next scan.

The target in the Live View gives continuous feedback on the scan position. A black circle shrinks within the green target as the scan is taken.

Green = good. The system will take a scan.

Red - will not scan. See text below the target for the reason

The system is evaluating the Live View.

Red Target Text:

- **Need Overlap -** the current view is too far away from the previous scans and the system cannot connect the images.
- **Less Motion -** there is too much movement to take a good scan.
- **Need Better Data -** this is usually caused by fogging or the image is out of focus.

4 Move to the next position and hold still for the next scan. Repeat for all scans.

5 Click the **Rapid Scan** button after the scans have been added to the model or press the **Spacebar** at any time to deactivate Rapid Scan.

Note: The model will not process until Rapid Scan is deactivated

Rapid Scan Settings

Click **Settings** on the Home page or on the Scan tab to access the Rapid Scan Settings.

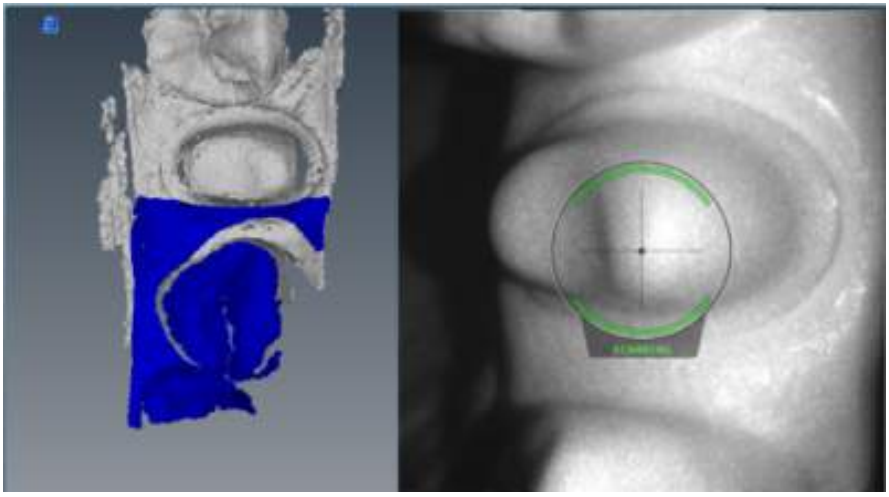
The Spacebar is used to turn Rapid Scan ON and OFF. The Foot Pedal can be used at any time if preferred.

Speed affects the speed of how quickly the scans will be taken. As you get accustomed to Rapid Scan, you will likely want to speed up the process. Move the slider towards the minus sign to slow the process down, towards the plus sign to speed it up. **Opacity** affects the translucency of the Live View window. Move the slider towards the plus sign to make Live View more solid or towards the minus sign to make it more translucent.

The **Auto Pan** feature is used by both the Rapid Scan method and the foot pedal method of scanning. When Auto Pan is ON, the system moves the model as it builds to show the most recent scan on the screen. For multiple restoration cases, this will often result in part of the model being off screen.

Interim Model

The Live View shows the current view from the wand. The interim model shows each scan being added to the model. As the scans are added to the model, the newest scan is a dark blue. Watch the developing model for misaligned scans.

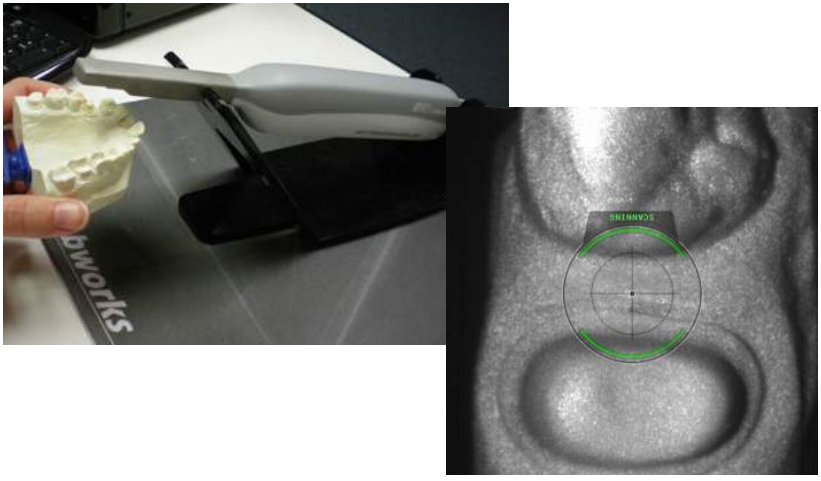


The interim model stays on screen until Rapid Scan is deactivated.

Rotate View

For desktop systems.

The Rotate View is for desktop operators who prefer the scanner pointing towards them as shown below. The Rotate View button on the Scan tab rotates mesial to the top of the screen in the Live View. The rotation makes the Live View match the actual orientation of the model and facilitates intuitive movement of the model for scanning. The scanner must still point towards the distal.



Scanning Overview

Scan the restoration site using the E4D scanner to capture the image of the tooth (pre-operative or wax-up), preparation, opposing teeth, buccal bite, and/or bite registration. Scanning the restoration site requires proper site preparation, correct placement and movement of the scanner, and a sufficient number of scans to ensure adequate digitalization of the restoration site. The basic steps are:

1. Click the **Scan** tab.
2. Click the desired scanning mode: **Clone, Prep, Bite Registration, Opposing,** or **Buccal Bite.**

- **Clone -** Used to utilize the patient's existing dentition or a wax-up as the model for creating the restoration.

- **Prep -** Used to scan the prepared site of the restoration. All free flowing blood, saliva, and residue should be removed from the preparation site before scanning.

- **Bite Registration -** Used if you have produced a bite registration for use in defining the occlusal anatomy. This button is active when Bite Registration is selected on the Setup tab.

- **Opposing -** Used to scan the teeth on the opposite arch of the preposition. Scan the same number of teeth as the preparation model to ensure good alignment.

- **Buccal Bite -** Scan the buccal view of the preparation, proximals, and opposing teeth.

3. For intraoral scanning, attach a disposable cover.
4. Attach a standoff (optional) on the scanner.
5. Shield the site from strong extraneous light sources (dental lights, sunlight, etc.).
6. Activate Rapid Scan with the button on the screen or with the Spacebar on the keyboard.

7 The Live View displays a Scanning Target with live feedback. Place the scanner or model so that the camera is centered over the occlusal of the restoration site.

Note: The system assumes that the first scan is taken from the occlusal. Ensure the first scan is taken at a 90 degree angle to the occlusal surface. If the first scan is not optimal, delete it and retake it.

8 Follow the “Basic Scanning Pattern” on page 56.

9 Continue taking snapshots until the composite model is fully formed.

10 Evaluate the model.

11 Click the **Margin** tab or click the **Next** button when finished with scanning.

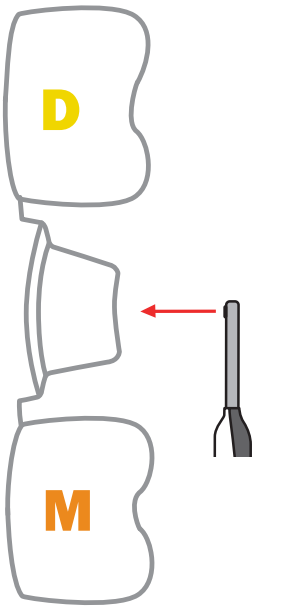
Scanning a Posterior Preparation

- Begin with the occlusal. Top down scans to lay down foundation
- Rotate right first (camera on the right - notice the shadow on the left)
- Rotate left

The first scans are of the occlusal surface.

The first scan is the most important scan because it determines the default orientation. The angle of the first scan should be an occlusal scan of the preparation.

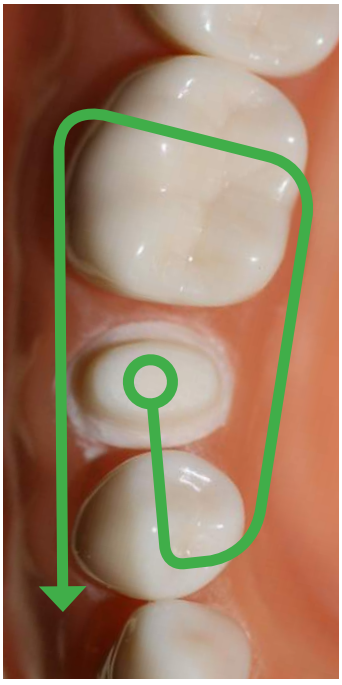
Starting over the preparation, take scans of the occlusal surfaces moving in half tooth increments.



D Distal M Mesial

Basic Scanning Pattern

Begin at the location of the circle in the diagram below. Move in half-tooth (or smaller) increments and take overlapping scans. Use small rotations at the corners of the diagram. As you go down the buccal and lingual sides, the wand can be held at close to 90°.

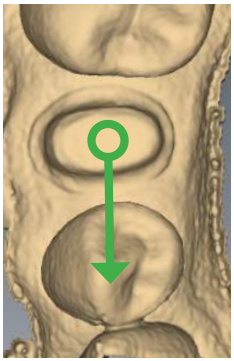


Scanning Pattern

Scanned Model

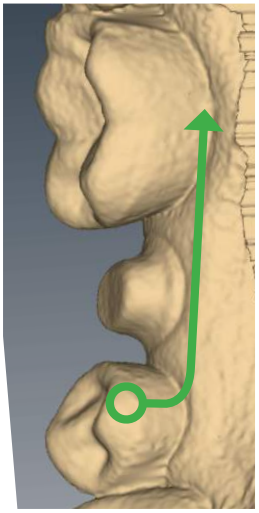
Step-By-Step

Occlusal scans



1. The first scan is of the preparation.
2. Keep the wand parallel to the occlusal table. Take overlapping scans and move in half-tooth (or less) increments.
3. The last occlusal scan is the center of the mesial proximal neighbor.

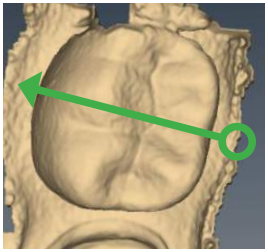
Rotate Clockwise



The right side of the wand is stronger because of how the laser is reflected. That is why you always want to rotate to the right before going to the left.

1. Use small rotations over the mesial proximal neighbor to create overlapping scans as you transition from occlusal scans to a clockwise rotation.
2. Scan along the right side of the teeth. Rotate the wand to almost 90° from the occlusal table.
3. Watch as your model builds to see any areas that might require a different rotation or angle.

Distal Proximal Tooth

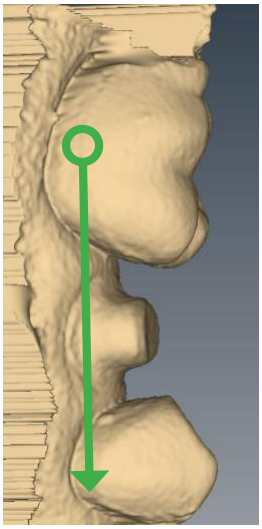


Rotate in small increments across the distal proximal tooth until you reach the left-hand side. This enables you to capture the occlusal data as you shift from one rotation to the other.

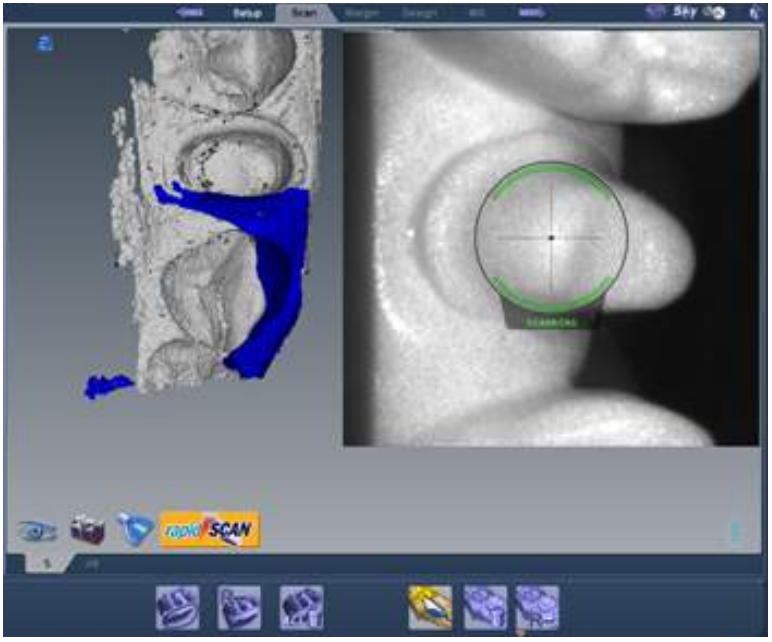
Rotate Counter-Clockwise

Scan from the distal to the mesial along the left-hand side of the teeth.

The last scan is of the mesial proximal neighbor.



The system displays a model based upon the scan data. The Live View appears on the right and the model builds on the left. After each successive scan, the system adds more detail to the model. There is a slight delay between the scan being taken in the Live View and the data being added to the model. Do not wait for the data to be added before moving to the next scan position. Watch the target. Once the circle shrinks in a green target, move on to the next scan position.



Click **Highlight Low-Data Areas** to evaluate the model for low data. See “Checking Your Model For Missing Data” on page 62 for more information.

For design purposes, you may want to acquire more details of the proximals. If extra scans are desired, deactivate Highlight Low-Data Areas to speed up the process. Reactivate when finished scanning.

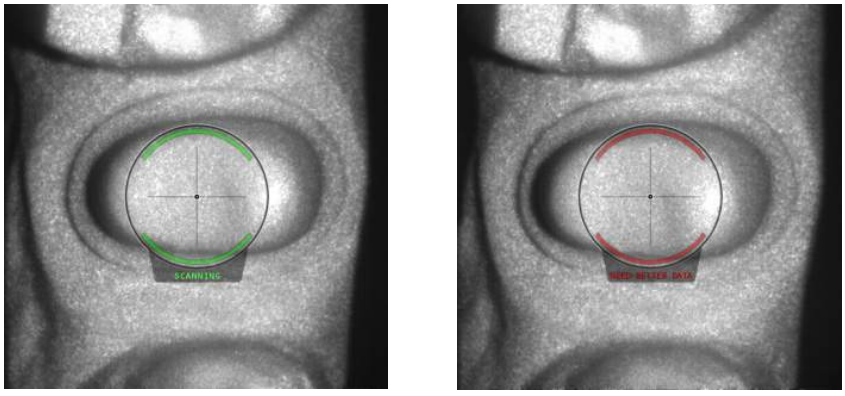
Note: If the mesial proximal tooth is missing, take scans of two teeth on the distal side and vice versa.

Scanning with the Foot Pedal

Foot pedal scanning gives feedback on the previous scan instead of feedback on the current Live View.

1 Press and hold down the foot pedal.

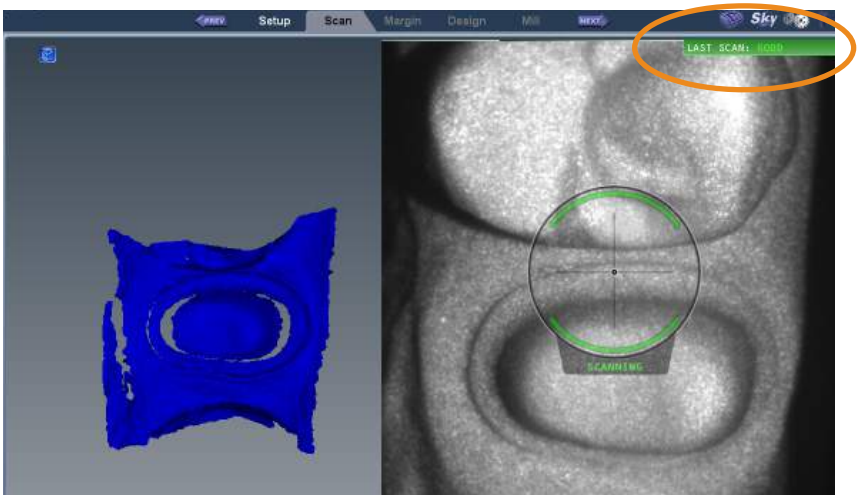
The Live View displays with a target color that matches the previous scan taken, even if it was on another case. Use the target for positioning and ignore the color and text of the target.



The color and text of the target is based on the previous scan, it does NOT represent the current Live View. The examples above have the same Live View, but the previous scans were different.

2 Position the wand for the desired scan. When you are happy with the Live View, release the foot pedal.

The system takes the scan. If it was a good scan, it is added to the model. If it was a bad scan, the data is ignored. Feedback on the previous scan is displayed as text in the upper right corner.



Red Target Text:

- **Need Overlap -** the current view is too far away from the previous scans and the system cannot connect the images.
- **Less Motion -** there is too much movement to take a good scan.
- **Need Better Data -** this is usually caused by fogging or the image is out of focus.

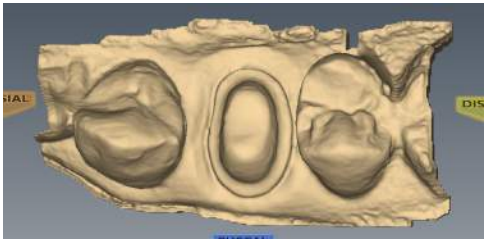
3 Continue taking scans in the basic scan pattern.

Evaluating Your Model

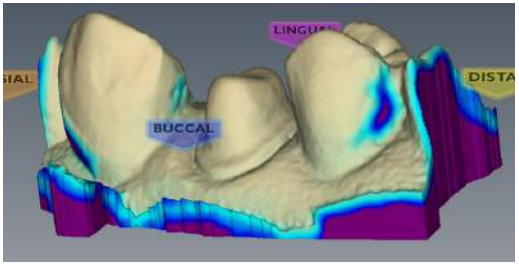
Checking Your Model For Missing Data

Click **Highlight Low-Data Areas** to evaluate the model for low data. If multiple scans are needed, deactivate this button to speed up the process.

Your model should resemble the example below. The proximal teeth are important in designing the restoration. Ensure you have enough detail, approximately 90%, to align the restoration with its neighbors.

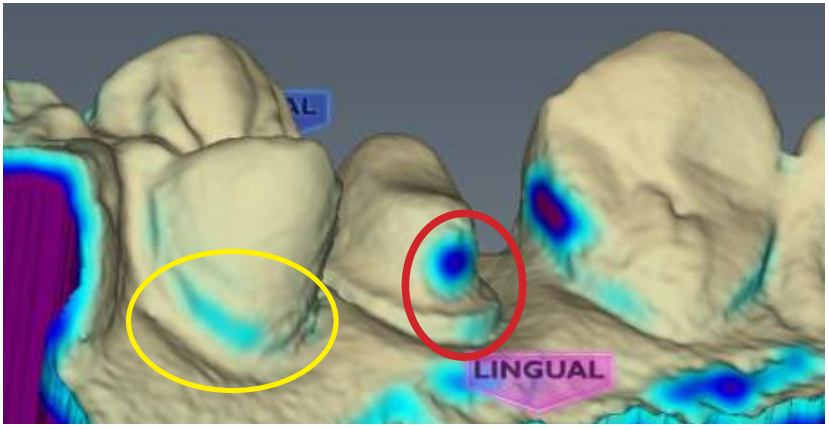


1 Click **Highlight Low-Data Areas** if it is not already activated. The model refreshes with the dark blue and purple areas indicating the least data. Rotate the model to analyze it.



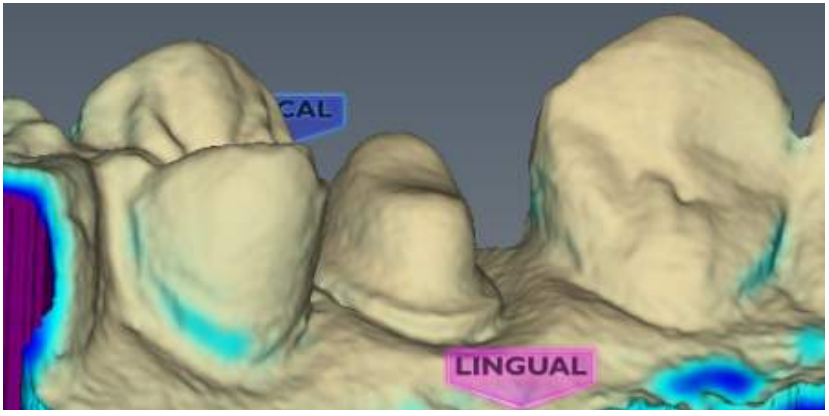
2 Dark areas on your restoration site should be rescanned.

In the example below, the standard scan pattern was not taken and key areas are missing data. Look for colored areas on the prepared tooth, especially on the margin (circled in red below). The adjacent teeth should have good data on the interproximal contact area, occlusal surfaces, and of the lingual and buccal contours. Data below the height of contour is not as crucial on the proximal teeth (circled in yellow below).



3 If areas lack detail, take additional scans and ensure the surface lacking detail is within the circle.

With a couple of additional scans, the example is greatly improved.



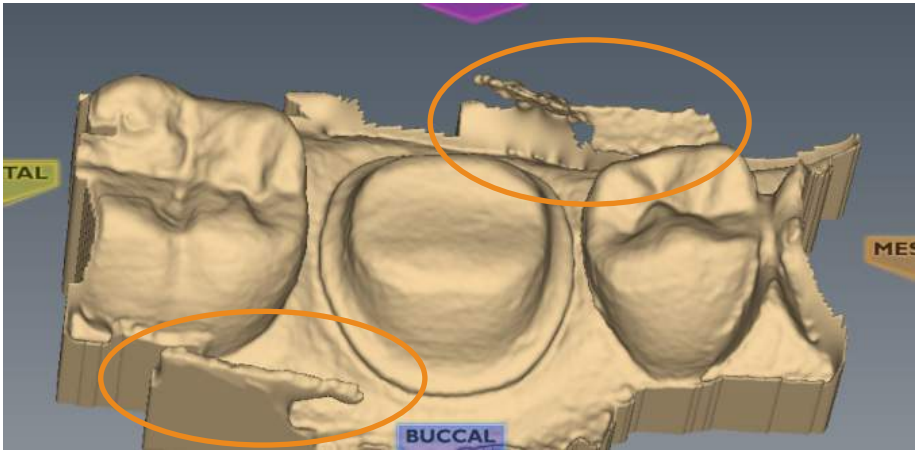
4 Click **Highlight Low-Data Areas** again to return to the normal view.

5 Click the **Margin** tab or click the **Next** button when finished with scanning.

Trim Model

Trim Model is available to designate the area that the system should ignore when scanning, such as tongue, cheek, finger, etc. The filter can be applied at any time after the first scan. If more scans are taken after the filter has been activated, anything scanned in that area will continue to be ignored.

In the example below, there are two problem areas. It is important to remove this extra data so that the system does not include it in the design of the proposal.

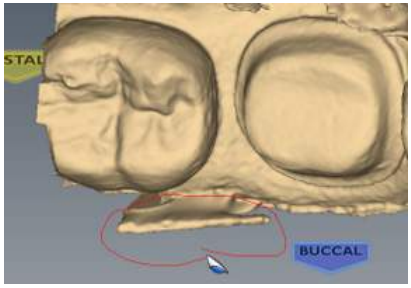


Use **Trim Model** to designate the scan areas that the system should ignore.

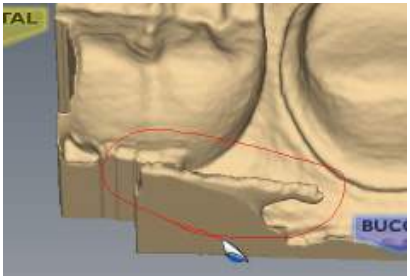
1 Click **Trim Model.**

The button is highlighted in orange. The pointer does not change.

2 Rotate the model so that the problem area, in this case the buccal side, can be seen with only the background behind it. Circle the problem area.

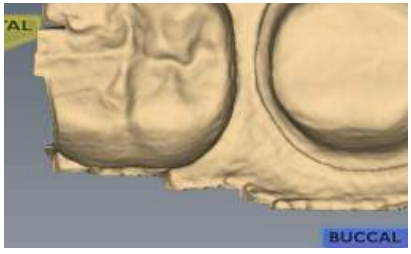


Ensure the circled area includes only the bad data and the background.

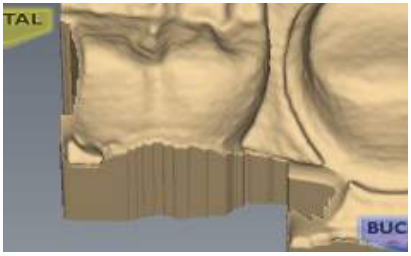


Do not trim when there is good data behind the area you are trimming. The system will remove all data in the circled area.

When the mouse is released, the system redesigns the model with that data area ignored.

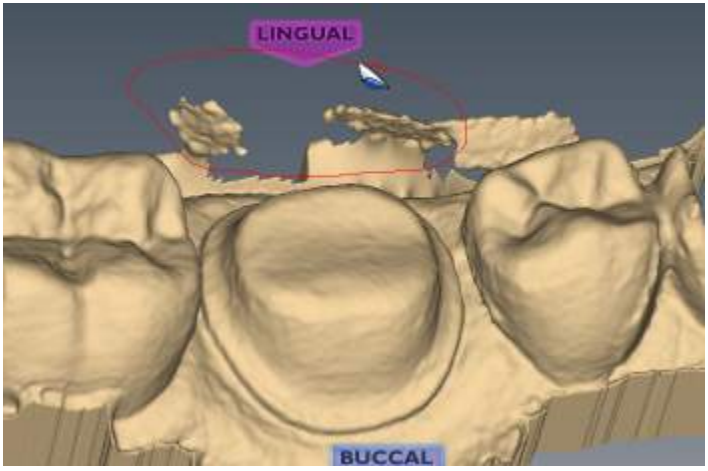


Only the bad data was removed.

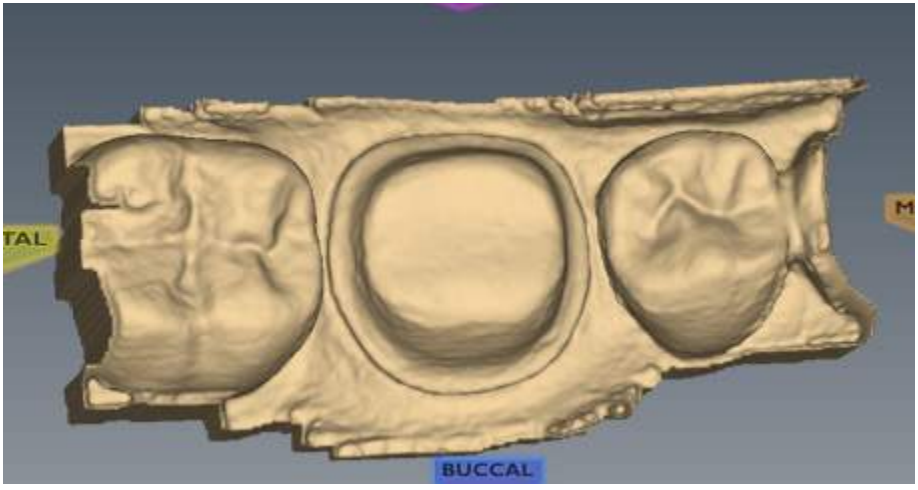


Good data was removed, including part of the margin.

3 Rotate the model and remove any other pieces of extra data. In this example, there is extra data on the lingual that comes very close to the proximal tooth. Circle the extra data that is not directly next to the good data.



In this case, the system removes all of the bad data on the lingual side. By removing some of the data, the system knows to ignore the similar data next to it. The finished model will resemble the following.

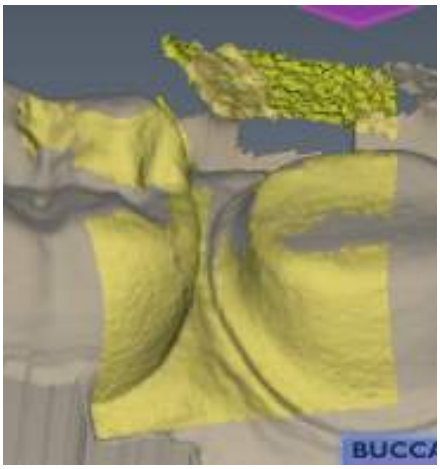


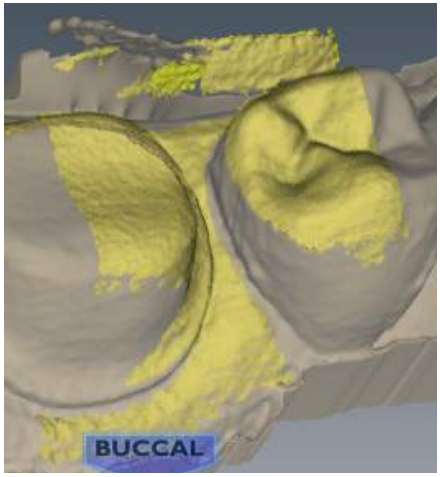
4 To remove the Trim Model filter, click **Reset.**

Scan Select

Another option for analyzing scans and removing data is the Scan Select button. This is helpful in analyzing possible misaligned scans or if you cannot trim bad data without removing good data.

1. Click **Select Scan.**
2. Click anywhere on the model to see the scan data for that area.





Brighter areas of yellow indicate data in the scans that were not applied to the model.

3. To remove a scan from the model, highlight the desired scan and click **Delete Scan.**
4. If any scans have been removed, more scans may need to be taken of that area. Click **Highlight Low Data Areas** to evaluate the model.

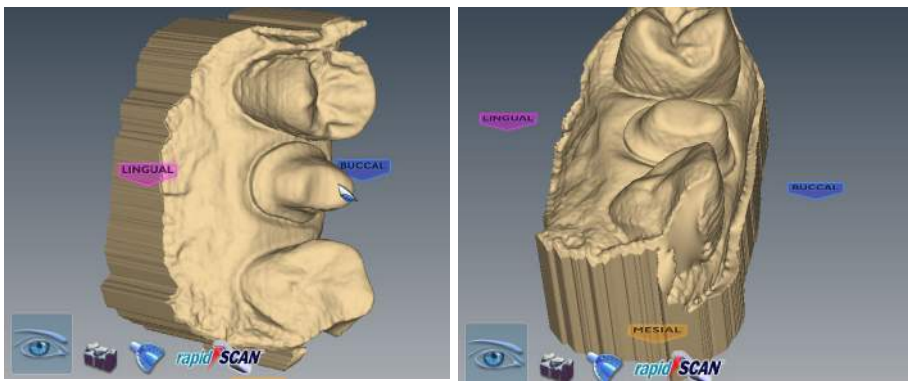
5. To replace removed scans, click **Restore All Scans.** Reset only works if you have not left the Scan tab. Once you have gone to another tab, removed scans are deleted permanently.

Viewing Scans from an Angle

Occlusal is the default view for scanning. There may be times when you want to watch the scans as they're added to the model from another view. For example, you may want to watch the facial scans of anteriors or you may be watching an interproximal area that is low on data.

1. Click **Settings.**
2. Click **Rapid Scan Settings.**
3. Deselect the **Auto Pan** check box.

   With Auto Pan OFF, the model no longer moves to show the most recent scan.
4. Move your model to the left side of the screen so that it will not be covered up by the Live View.
5. Ensure the distal end of the model is pointing upwards. If not, the system will change the model to be distal up as the first scan is applied to the model.
6. Rotate the model along the mesial/distal axis to show the desired area. As long as the distal is still pointing towards the top of the screen, the model will not move drastically after the first scan. This enables you to watch multiple scans being added to that side of the model.



When the distal is pointed towards the top of the screen, the model will not move drastically after the first scan is added.

Scanning Occlusion Data

Note: Cases being sent to via E4D Sky usually need to be Buccal/Opposing cases.

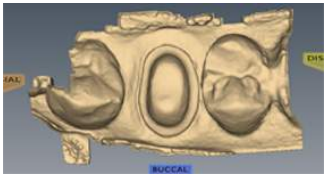
The proposal's occlusion can be evaluated and designed using:

- Bite registration
- Buccal bite and opposing dentition
- Clone a waxup or existing anatomy before preparation

On the Setup tab, select Bite Registration or Buccal/Opposing. If you are scanning a clone, leave the default to Bite Registration.

Scanning a Bite Registration

A bite registration can be used to optimize occlusion for proper alignment with the opposing tooth. After scanning the preparation, prepare and scan the bite registration. Ensure there is enough detail of the proximal dentition and/or gingival tissue in your preparation scans to align the bite registration scans.



Bite registration preparation

Keep the following recommendations in mind as you prepare bite registrations:

1. Place the bite registration material so that it completely covers the preparation surface.
   - The bite registration material should not cover the proximals. If it does, trim to the interproximal after the material sets.
   - There must be sufficient data of the proximals in the scans of the preparation and the bite registration in order for the two models to align.
   - Ensure there are no gaps between the bite registration material and the proximal teeth.

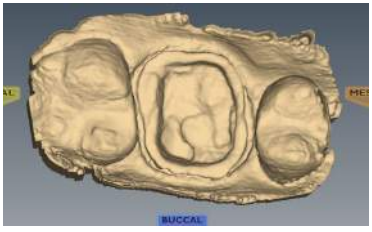
2 Have the patient bite down firmly or press the articulated model down firmly for the impression.

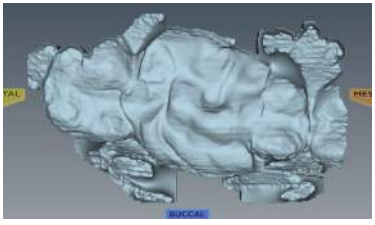
Bite registration scanning

1 On the Setup tab, select **Bite Registration**.

2 On the Scanning tab, click **Bite Registration** scanning mode on the leftmost menu.

3 Scan the bite material and proximals from the occlusal angle. Ensure there is enough detail of the proximal dentition and/or gingival tissue, which is required for proper alignment. The examples on the right show the preparation model (yellow) and the bite registration model (blue).

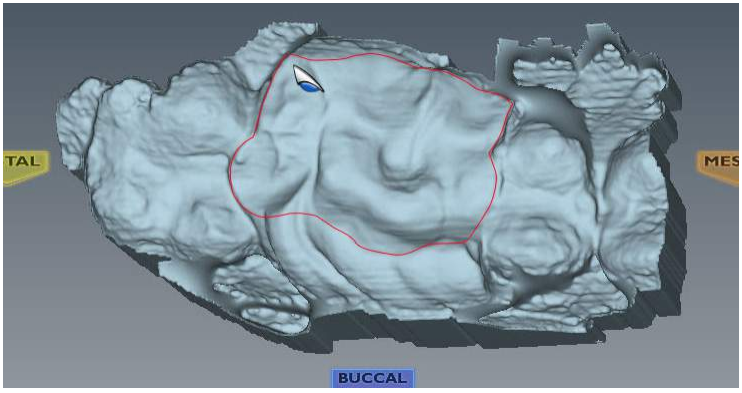




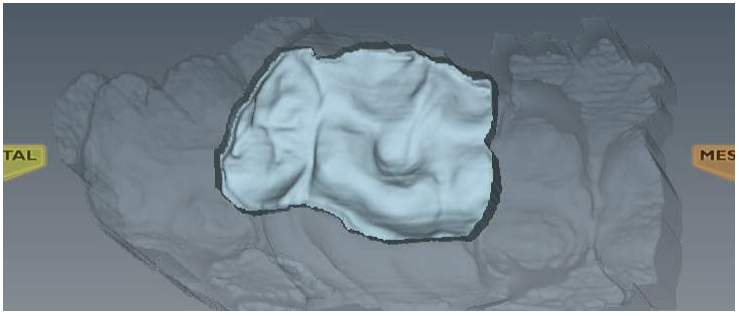
4 Use **Trim Model** to trim any data that would not match the preparation model, such as tongue, cheek, finger, etc.

5 Click **Select Bite Area.**

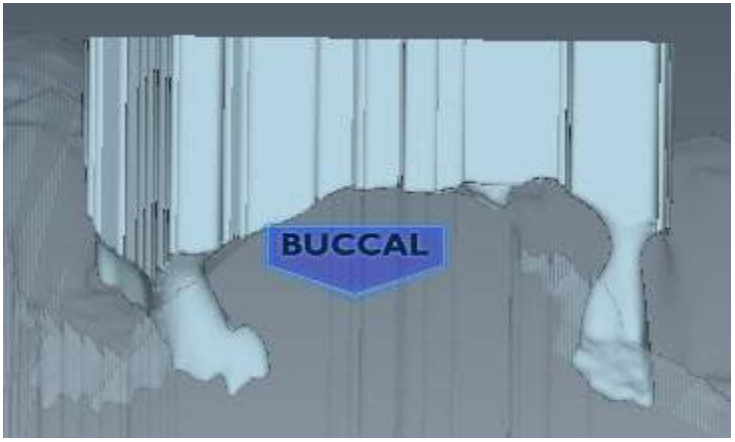
6 Designate the area of the opposing dentition (as shown in the example).



The circled area is highlighted and inverted to represent the opposing dentition. The greyed out areas will be used to align the template and the restoration model.



7 Rotate the bite and look for any low hanging areas of data. These should be trimmed using **Remove Bite Area** since they could cause false contacts.



8 Circle the entire bite with Remove Bite Area to reset the selection and start over.

Scanning Buccal/Opposing

The opposing teeth are scanned to acquire bite information for the proposal. The buccal bite is scanned to align the preparation model with the opposing model.

Scan Opposing

1 On the Setup tab, select **Buccal/Opposing.**

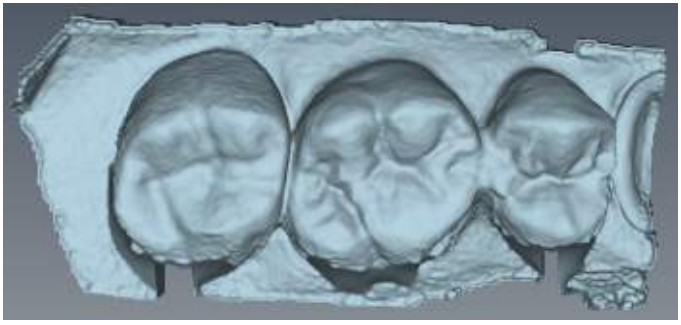
2 On the Scanning tab, select **Scan Opposing.**

3 Starting with an occlusal view, scan the occlusal surfaces of the opposing dentition. Include the same number of teeth as the preparation model. Ensure there is good cusp tip data on both the lingual and buccal sides.

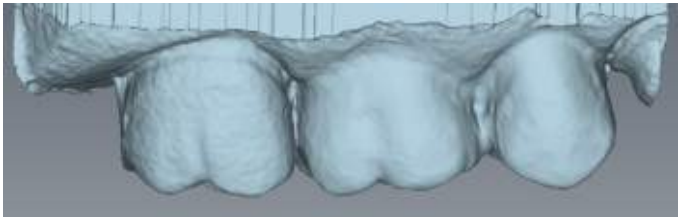
4 Roll to the buccal and scan the buccal side of the opposing dentition. Include gingival data, do not stop halfway down the tooth.

Your model should resemble the following:

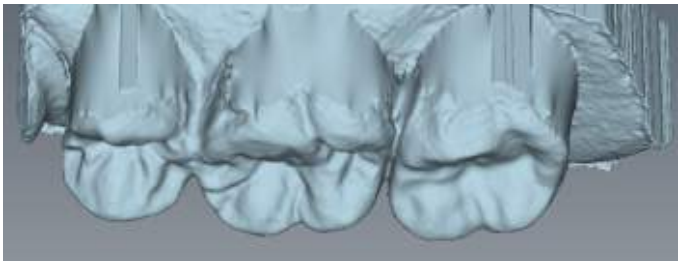
- Good occlusal data



- Good buccal data



- Good lingual cusps. Lingual axial data is not needed.

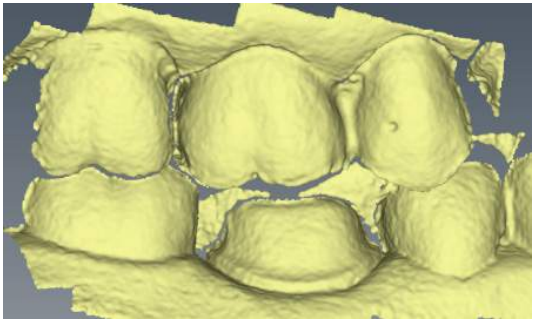


5 Trim the opposing model to remove extra data.

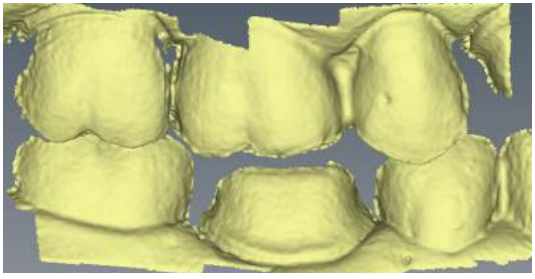
Scan Buccal Bite

1. Click **Scan Buccal Bite.**
2. Press the articulated model down firmly or have the patient bite down firmly and tell them not to move while you are scanning. If they shift during the scanning, the alignment may be incorrect.
3. Scan at a 90° angle to the teeth. Scan the sides of the teeth that were captured in the preparation and opposing models. Ensure some gingival data is captured.

   Your model should resemble the following. Ensure there is good data on the buccal sides of the teeth. Intraoral scans will most likely have the tongue in the background. Model scans will have empty space showing between the upper and lower teeth.

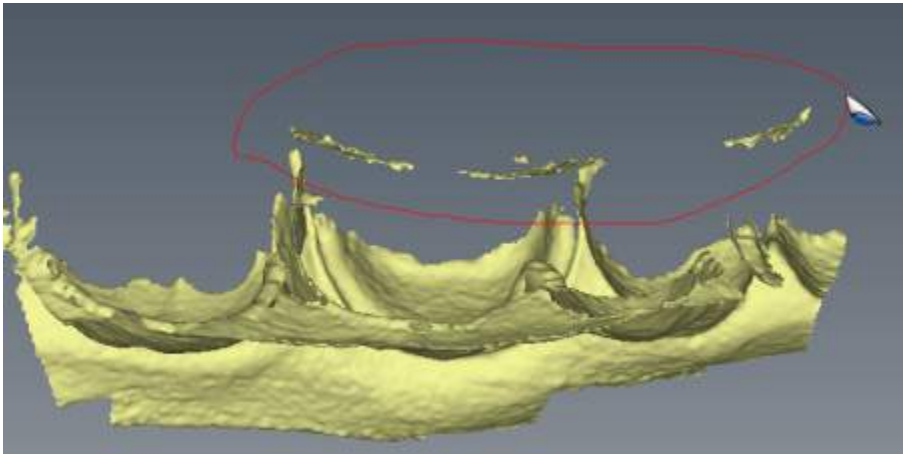


Intraoral scans show tongue behind the preparation.

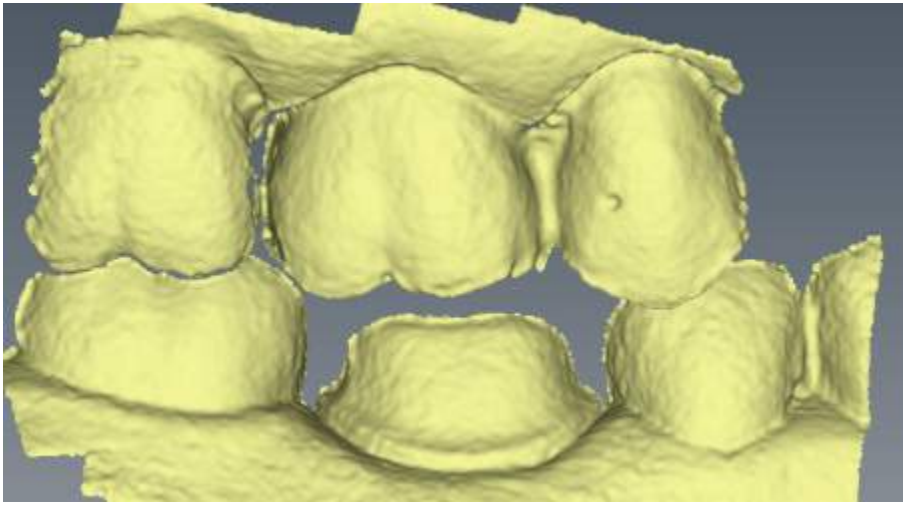


Articulated model scans show empty space behind the preparation.

4 For intraoral scans, rotate the model to the occlusal so that the tongue data can be seen clearly. Trim away the tongue data.



Once the tongue data is removed, empty space can be seen between the teeth.



5 Trim the model to remove any other excess data.

Aligning the models is done on the Margin tab. See “Buccal Bite Alignment” on page 114.

Scanning a Clone

Use Scan Clone when you want to scan a pre-operative tooth or a wax-up. Clone scans can be used in combination with the Library tooth or can be used as a template, like a bite registration.

1. On the Scan tab, click **Scan Clone.**

   Scan the pre-operative tooth or wax-up with the same scanning techniques used for the prepared anterior or posterior tooth.

2. Prepare the tooth.

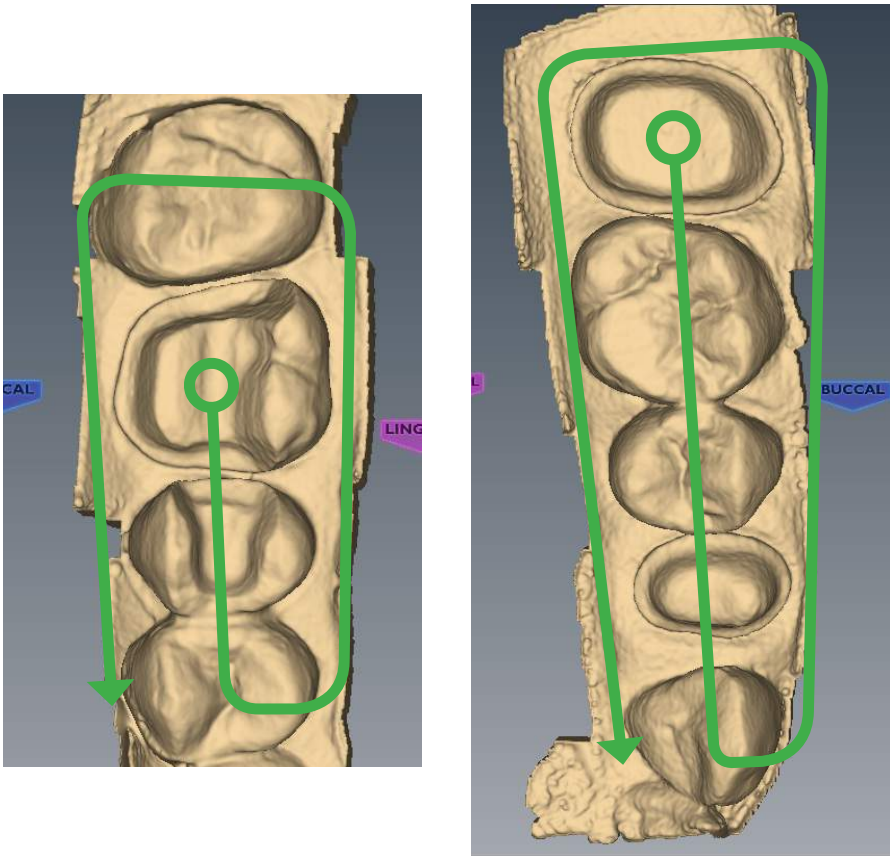
3. On the Scan tab, click **Scan Prep.**
4. Scan the preparation with the steps listed in the previous sections.
5. Cloning can also be used with multiple CROWN restorations. In that case, follow the techniques described below.

Scanning Multiple Restorations

In scanning multiple restorations, the basic scanning technique is expanded to encompass the extra preparation(s).

1. On the Setup panel, select the tooth number for the first preparation and then select a **preparation type, library, material,** and **shade.**
2. Repeat for each prepared tooth.
3. Click the **Scan** tab.

4 Start on the most distal preparation. Two examples of multiple restoration models shown below.

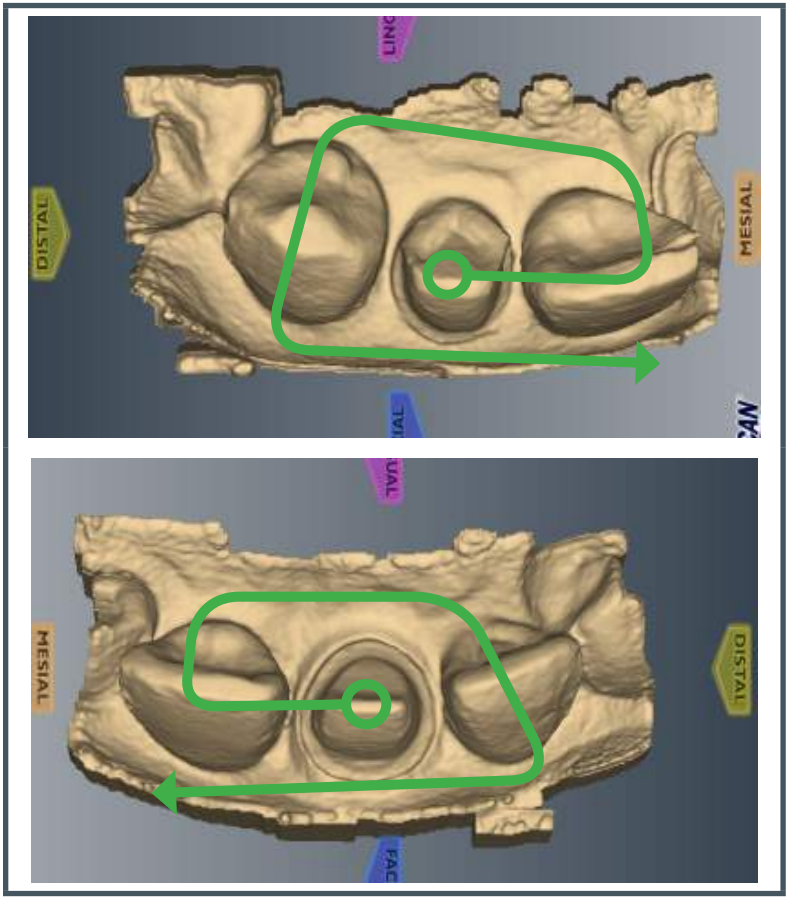


The basic scanning pattern is expanded to encompass the extra preparations and any teeth in between.

Scanning an Anterior

The scanning pattern for anteriors is similar to the posteriors. Since there is more varying data on the lingual side, it is recommended that the lingual scans be taken after the occlusal scans.

1. Start on the prep and scan the occlusal of the prep and the mesial proximal.
2. Rotate to the lingual and scan the prep and proximals.
3. Rotate across the distal proximal to reach the facial side.
4. Scan the facial side.



Watch the model as it processes to ensure the scans are applied to the correct area. Anterior teeth are often very similar to each other. Following the suggested scanning steps lowers the chances of misalignment. The scanning method is the same for all anteriors.

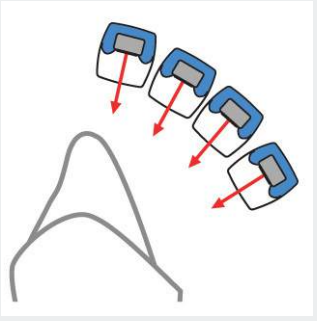
When scanning intraorally, it is sometimes more comfortable to have the wand tip pointing towards the mesial instead of the distal. In this case, the surface indicators on the model will be incorrect until the Orientation is changed.

For Your Information

Optional Additional Scans

Evaluate your model. When you have long and straight anterior teeth, additional facial scans are sometimes needed to capture all of the data. With the proximal or preparation in the center of the circle, take 2 to 3 scans as you gradually rotate down the facial side of the tooth.

For optimal design, more scans of the proximals may be desired.



5 Click **Highlight Low Data Areas** to verify the integrity of your model. Rescan any dark areas on the preparation or proximals.

6 Click the **Margin** tab or click the **Next** button when finished with scanning.

Scanning Multiple Anteriors

When scanning multiple anteriors and crossing the midline, start the scanning with the highest tooth number (Universal) or higher quadrant (ISO) to get the correct orientation.

For Your Information

When scanning intraorally, it is sometimes more comfortable to scan with the wand tip pointing towards the mesial instead of the distal. There are a couple of options for dealing with this situation.

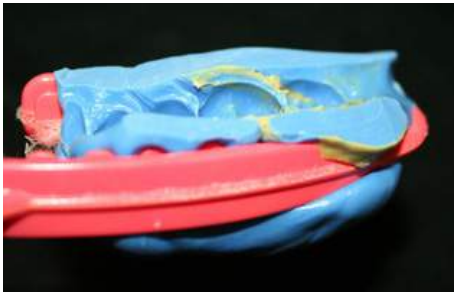
- Take the first scan with the scanner pointing the correct way. Turn the scanner around to a more comfortable position and retake the first scan. Watch the model as it applies the second scan and ensure the scan is placed correctly. This will not work if there is insufficient data for the system to recognize the two scans as the same position. If the second scan aligns correctly, continue scanning in the normal pattern.

  When crossing the midline, lingual scans are recommended for more data and fewer flat surfaces. After you turn the scanner around, pay careful attention to where the system places the next scan. Repeating a previous scan can help the system recognize that the scanner has been turned around. If the scan is placed in the wrong area, there may not be enough data on your model to turn the scanner around and more scans will be required.

- Alternatively, take the first scan of the higher tooth number with the scanner pointing towards the mesial or start with a lower tooth number. In this case, the surface indicators will be incorrect until you reach the Margin tab. On the margin tab, turn the model around when setting the Orientation.

Scanning Impressions

Remove the excess impression material so that the scanner can get closer for scanning. Remove the standoff which is not utilized for scanning impressions.

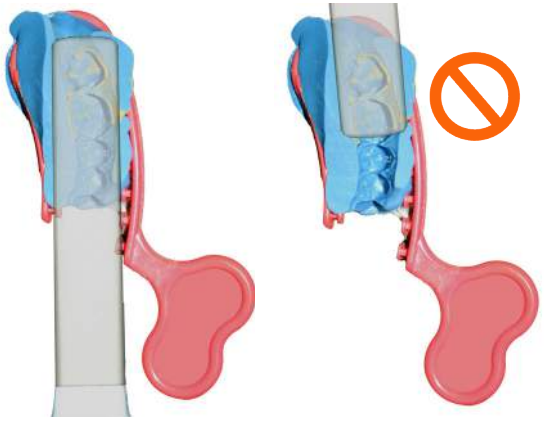


Note: Any impression material can be used. The system does not require a particular color or type of material.

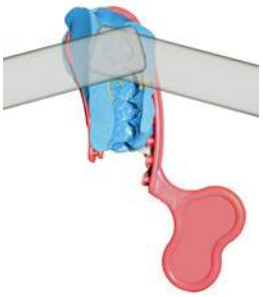
Note: The Buccal/Opposing scan option cannot be used with impression scanning. Use the impressions to create an articulated model.

Positioning the Scanner

When scanning the impression, ensure the tip of the scanner is pointing towards the distal so that the orientation of the model will be correct.



Due to the nature of impressions, the normal positioning of the scanner may not be able to capture all of the walls of the impression. You can also tilt the scanner up or down to achieve the necessary point of view.

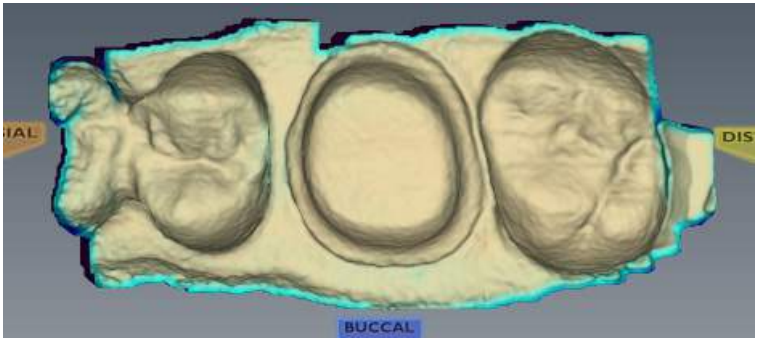


Scanning the Impression

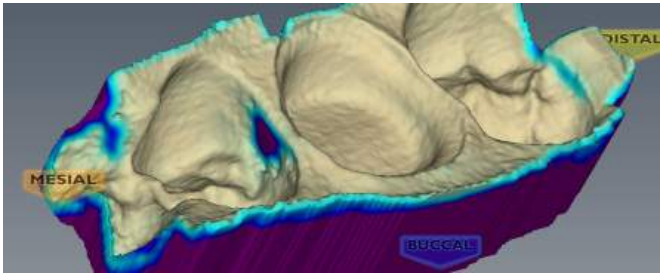
Remove the standoff to scan impressions and ensure the scanner is positioned correctly. See above for positioning. Be careful not to squeeze or otherwise distort the impression while scanning.

1. On the Scan tab, select **Scan Prep** if it is not already selected. Do NOT select Scan Bite Registration, which resembles an impression.
2. Use the same scan pattern as for an intraoral or a model scan.
3. Click **Highlight Low-Data Areas** to evaluate the model for low data.

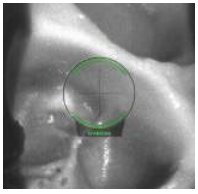
   Note that from the occlusal view, the impression can give the optical illusion of looking like a regular model.

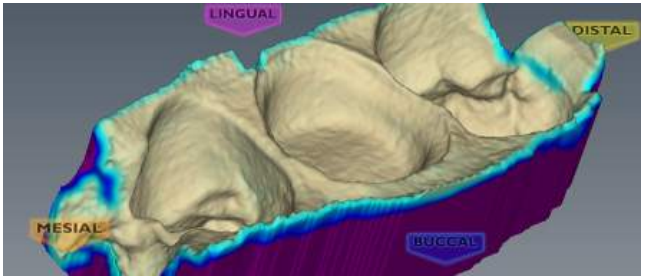


4 Rotate the model to see all of the impression. Be sure to check the contact areas on the proximal teeth.



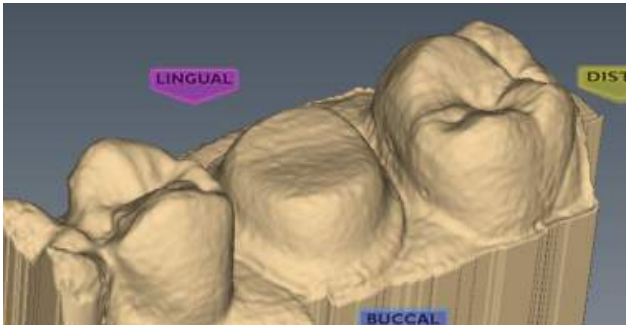
5 If there are areas that need additional scans, such as the mesial interproximal area shown above, take extra scans. One more scan enables us to capture that interproximal area.





6 Click **Highlight Low-Data Areas** to deactivate it.

7 Click **Impression Mode** to invert the model into the normal view. All other tabs will use the inverted model of the impression for creating the proposal.



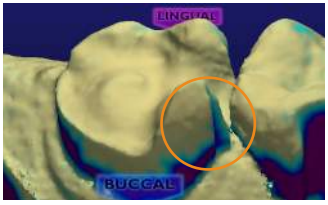
Note: Orientation does not show the pink shading on undercuts for impressions.

8 Click the **Margin** tab and continue with the normal procedure for drawing the margin and designing the proposal.

E4D Accent

Scenario 1: When a model has a metal implant, the glare from the metal can cause scanning issues.

Scenario 2: For intraoral cart scanners only.



There may be clinical situations where the preparation design or the natural translucency of the enamel does not allow the laser to capture the margin of the preparation with precision. This most often occurs along the vertical walls of inlay and onlay preparations. Translucency can also be an issue on anterior clone scanning.

As shown, the areas that are not captured adequately will present with low data density highlights which will be evident in both ICE and Stone view.

Scenario 3: For intraoral cart scanners only.

Another possible issue is glare from proximals with metallic restorations such as amalgam or gold.

These situations can be easily resolved with the light application of E4D Accent™ which provides the required opaqueness to the area(s) in question.

Application Steps

1 Shake the foil packet/dispenser.

2 Open the E4D Accent foil packet and remove the microbrush.

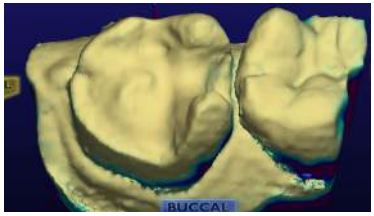
3 For intraoral scanning, clean and dry the marginal area(s) to be enhanced.

4 Push microbrush handle into foil packet/dispenser to activate and coat brush tip.

5 Apply the enhancement aid to the indicated areas.

6 Thin if necessary, or dry with air.

7 Scan the preparation using the conventional scan technique.



8 After the area has been scanned:

- For intraoral scanning, use water/air spray to clean all areas.
- For model scanning, use alcohol to clean the area.

9 Identify the margins using the Model View.

E4D Studio™ Satellite Design Station

If you have purchased the E4D Studio workstation, see “Digital Impressions” on page 252 for instructions on how to send the cases and receive the finished designs.

For Your Information

For scanning systems only.

Thumbnails of Scans

In previous software versions, there was no live feedback on the scans. Clinical operators would use thumbnails of the scans to evaluate the data. The thumbnails are still available, if desired. To see the other screen layout, click the **Expand Thumbnails** arrow in the bottom right corner of the screen.

The thumbnails are displayed at the bottom of the screen.

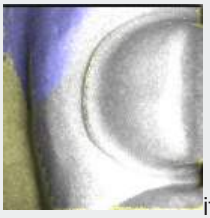
For Your Information

Thumbnail Header Colors

The headers are green (good) or orange (too far). The orange scans are acceptable and are added to the model, but the focal distance is further than usual.

Note: Misaligned scans can have any thumbnail color.

Thumbnail Graphic Colors



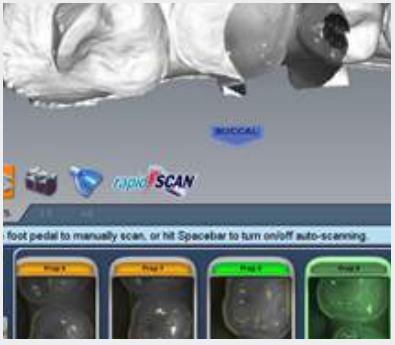
- White/Grey - Data that has been added to the model is white or grey.
- Yellow - Areas with rejected data appear yellow. This is normal and a small amount will be seen in all scans. Data is rejected when there is not enough data or when is contradicted by other scans.
- Blue - Trimmed areas of the model show as blue. These areas are being ignored and are not represented on the model.

it

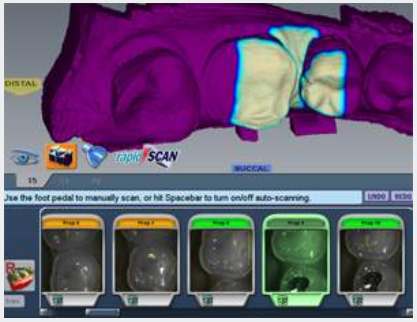
Evaluating Scans

When the thumbnails are showing, the Scan Select, Delete Scan, and Reset Model buttons are not available.

There are a couple of ways to identify a scan's location on the model: View ICE Preparation and Highlight Low Data.



When **View ICE Preparation** is activated, the scan being currently viewed is highlighted in green.



When **Highlight Low Data Areas** is activated, click a thumbnail to see the location of that scan on the model.

For Your Information

Deleting Scans

Click the **View/Hide** box in the lower left corner of the thumbnail to remove it from the model. Hidden thumbnails are removed when another tab is selected. If you return to the Scan tab, the kept thumbnails are renumbered. Hold down the CTRL key to View/Hide multiple scans at the same time. The model will not process the changes until the CTRL key is released.

Chapter 6
Orientation

This chapter does not apply to E4D SOLO systems. E4D SOLO operators will click Orientation to deactivate it and proceed to mark the margin (page 107) and align the buccal scans (page 122).

Orientation - The selected model position for Autogenesis to propose the new restoration. Autogenesis in turn uses this set position as a starting point for cusp height and marginal ridges based on the adjacent teeth.

The first scan determines the initial positioning of the model.

Orientation affects two major aspects in E4D Design Center.

- Design - Orientation plays a large part in Autogenesis and determining that the anatomy aligns with the adjacent teeth.
- Milling - The path of insertion determines the Orientation needed for milling. In order for a restoration to mill out properly, the margin and axial walls must be visible from the occlusal view.

In most cases, these two factors can be accomplished with one Orientation and will only need minor adjustment. There are situations when greater adjustments to Orientation are required.

Intraoral scanning examples:

- Tooth position and size of the patient's mouth can sometimes make it difficult to get a perfectly positioned first scan.
- Depending on an anterior tooth's placement and whether you are right or left handed, it may be necessary to point the wand in the wrong direction. If the tip of the wand is pointing towards the mesial instead of the distal, then the surface indicators on the model will be incorrect until the Orientation is changed. see "Rotating the model" on page 99 for more information.

Model or impression scanning:

If you accidentally scan a model or impression backwards (with the wand pointing towards the mesial), see “Rotating the model” on page 99. Only the preparation model can be turned around. If you scanned a clone, buccal bite, bite registration, or opposing model backwards, then they must be rescanned.

When the Margin tab is selected, **Orientation** is automatically activated. The model displays with pink shading and the Orientation Circle. The pink shading represents undercut areas. This shading is helpful in evaluating the preparation for possible undercut issues.

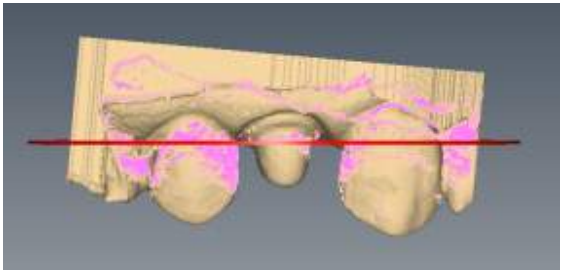
When Orientation is active, the model is rotated using the left mouse button.

Viewing the model

In Orientation, the model displays with a circular graphic labeling the mesial, distal, buccal, and lingual surfaces. Zoom out to see the buccal and lingual labels, if desired.

Note: The Skyball is deactivated for Orientation.

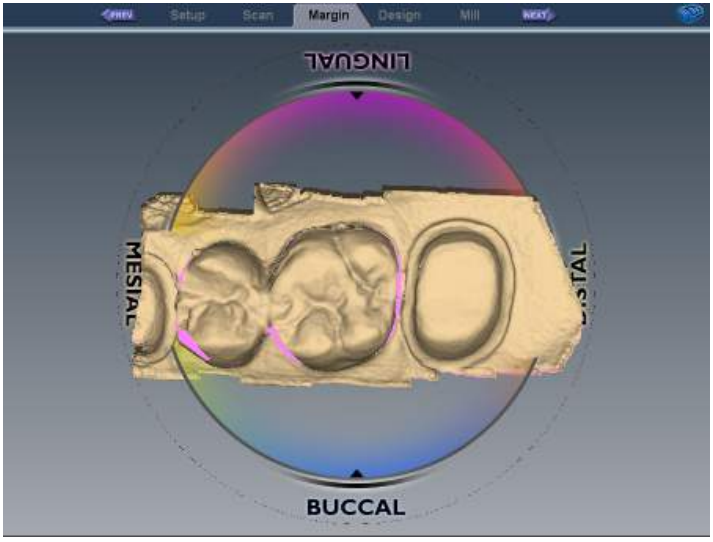
The model should also be evaluated from the sides. Click the arrows in View Controls to view the desired surface.



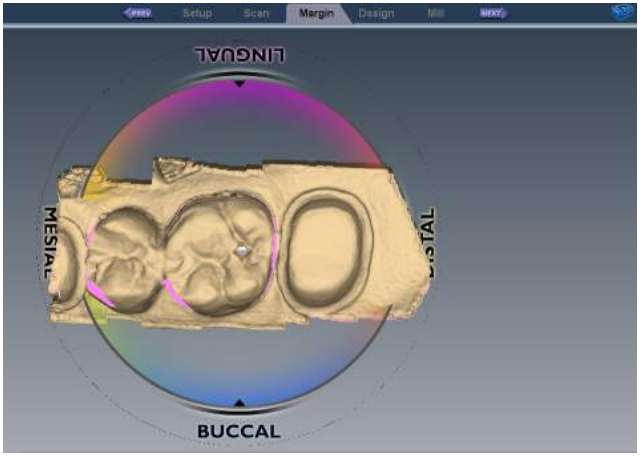
Moving the central point

The central point of the orientation circle is the middle of the screen, which may or may not be the location of your prep. If the central point is not on your preparation, it can be a little confusing when rotating the model.

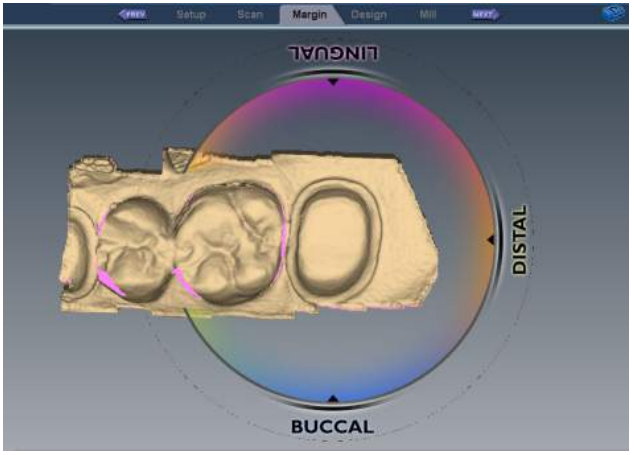
It is not necessary to center the model on the preparation, but it can be helpful if you are new to rotating a 3D model or if you have multiple preparations. The example below shows a preparation with no distal neighbor, so the prep is not in the middle of the screen.



To move the model so that your preparation is centered, hold down the mouse scroll wheel and move the model. The circle graphic moves with the model, but you can see the model moving in relation to the tabs at the top of the screen. When the scroll wheel is released, the circle graphic refreshes and moves to the center. Repeat as necessary.

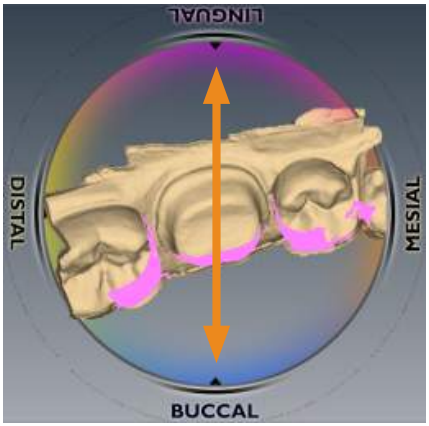


Moving with scroll wheel held down



After scroll wheel is released

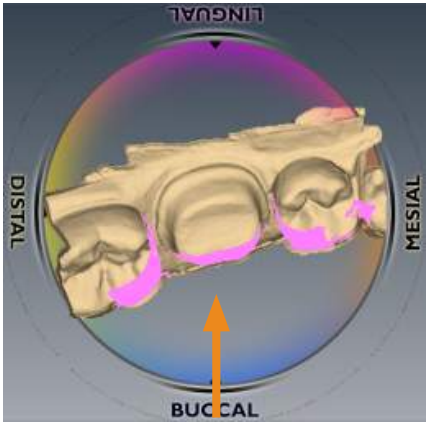
Occlusal View



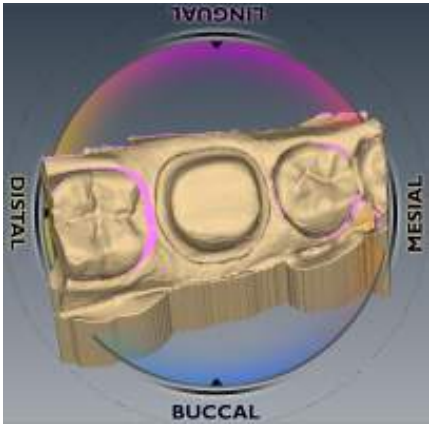
If the wand was not parallel to the preparation on the first scan, the model will be tilted. In this example, the model is tilted to both the buccal and mesial sides.

The occlusal view is good for buccal/lingual adjustments.

1. Position your mouse near the Buccal label on the circle graphic.
2. Hold down the left mouse button and move the mouse straight up as indicated by the arrow in the graphic below. Rotate the model until it has a good buccal/lingual alignment. You should be able to see the occlusal tables clearly and you can see the same amount of data on the buccal and lingual sides of the adjacent teeth. Do not worry about aligning the central grooves.



Before



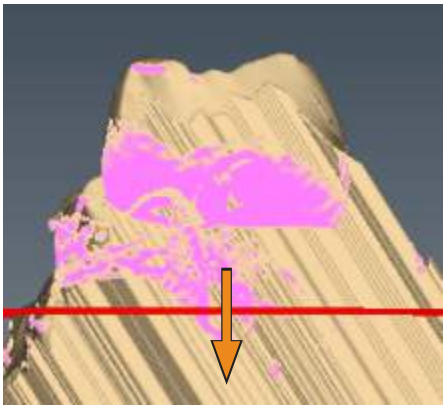
After - model has rotated towards the lingual. Buccal/lingual data is visually even.

Distal View

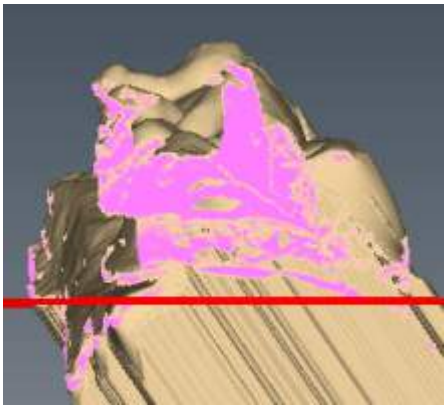
The distal or mesial view is good for mesial/distal and occlusal/gingival adjustments.

1 Click the **Distal** arrow in View Controls.

The distal view is sometimes obscured by high distal data. Tilt the model up or down to see the cusps of the adjacent teeth.

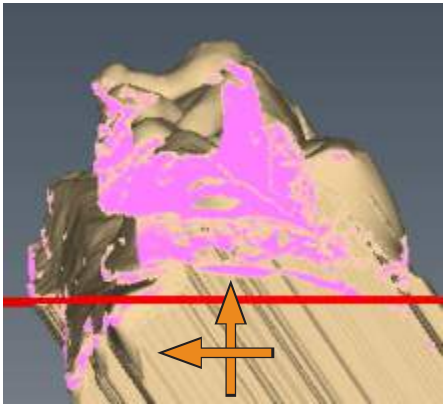


Before

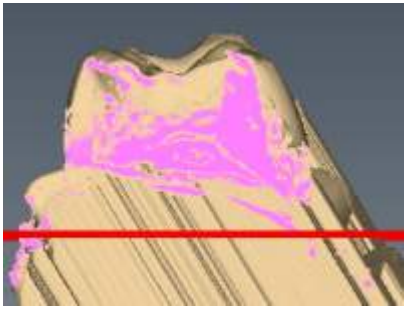


After - proximal cusp tips are visible.

2 Evaluate the cusp heights of the adjacent teeth. Align your cusps and axial walls according to the Curve of Spee.

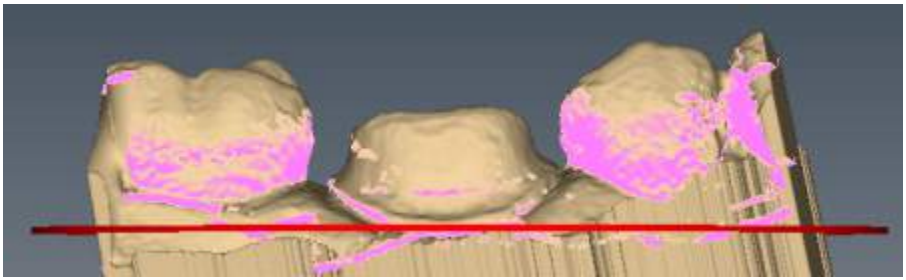


Before



After - proximal cusp tips and axial walls are aligned

3 Click **Buccal** or **Lingual** to view from the side.

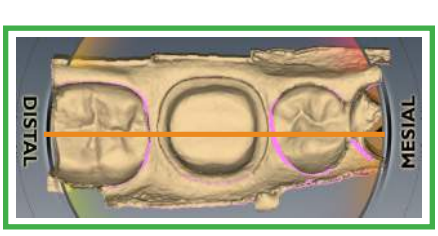


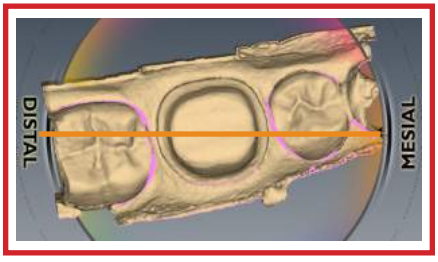
Use the red line as a guide to evaluate the marginal ridge alignment of the adjacent teeth. In this example, the alignment is good.

Return to the Occlusal or Distal view to make adjustments if necessary. You do not want to adjust the orientation from the buccal or lingual point of view because it is easy to accidentally change the mesial/distal alignment at the same time.

4 Click **Occlusal.**

5 From the occlusal, ensure the model is straight across from mesial to distal. Imagine a straight line going from the mesial to the distal (shown in orange below).





6 When satisfied, click **Orientation** to accept changes.

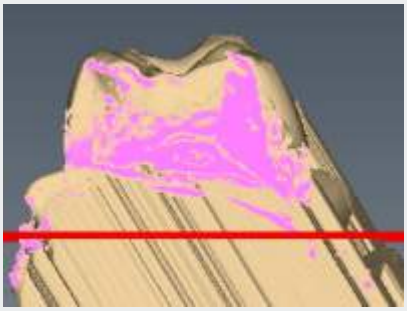
Orientation can be reactivated and altered at any time. If Autogenesis has already been applied, be sure to go to the Tooth Libraries screen and reapply the library tooth for the new orientation. See “Apply the changes” on page 125 for instructions.

For Your Information

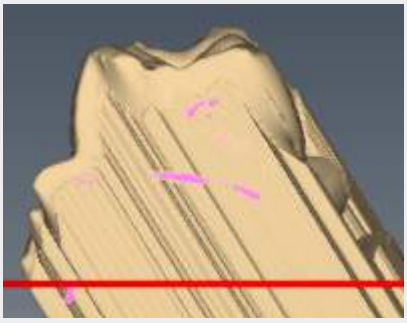
The side view can be obstruction from high data or too much pink shading.

If there is extra data, try trimming the model.

To reduce the pink undercut indicators, accept the Orientation, draw the margin, then reactivate Orientation. When the margin is drawn, the undercut indicators appear only inside the margin. See “Creating the Margin” on page 107 for more information.



Distal view without margin drawn



Distal view with margin drawn

Verifying Orientation

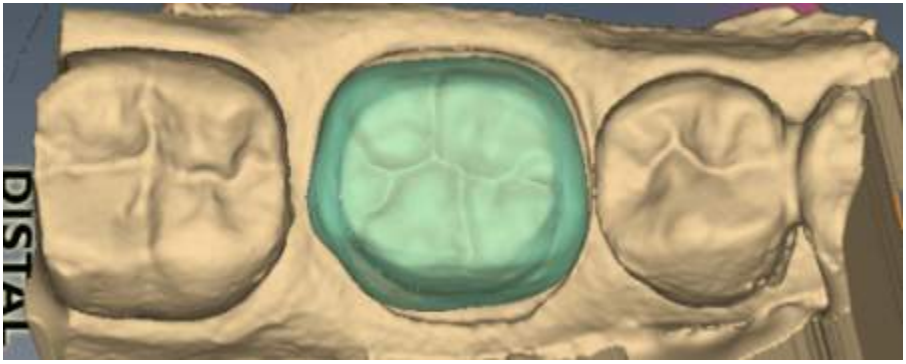
After the Margin is drawn and edited, the Preview Library icon appears. See “Creating the Margin” on page 107 for more information. This is an optional step that displays an example proposal that has not been aligned with the adjacent teeth. The position of the preview tooth is based on the Orientation. It can be used to evaluate and adjust the Orientation.

1 Click **Preview Library.**

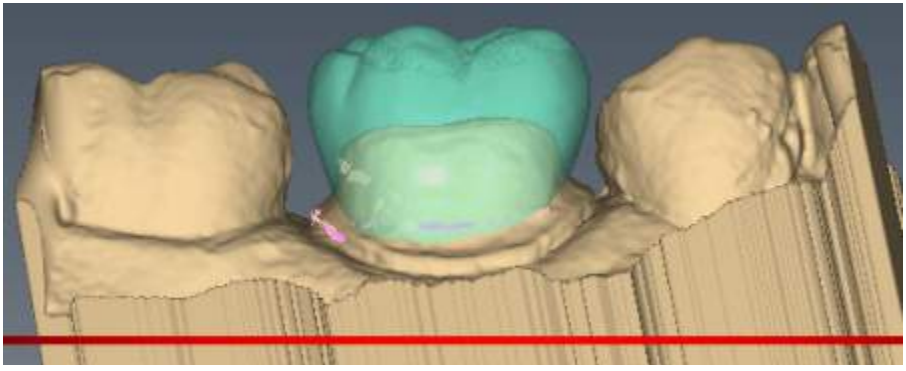
A green tooth appears above the margin. If this is a partial restoration, the preview tooth may be significantly smaller.

2 With Preview Library activated, you can activate Orientation and evaluate the overall alignment of the model.

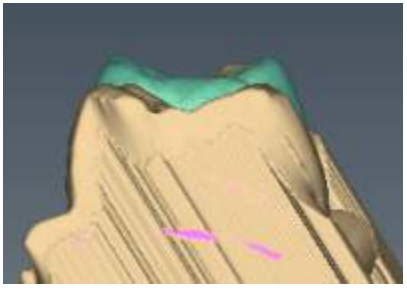
3 From the occlusal, is the central groove in alignment?



4 From the buccal, are the marginal ridges parallel to the marginal ridges of the adjacent dentition? Note that the preview tooth is usually higher than the adjacent teeth. The proposal will drop down to align with the adjacent teeth during Autogenesis.



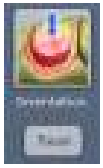
5 From the distal, are the cusp tips in parallel alignment? Since the preview tooth usually sits higher than the adjacent teeth, it will not follow the curve of spee.



6 Make any necessary changes to the Orientation.

7 When satisfied with the alignment, click **Orientation** to accept the current position.

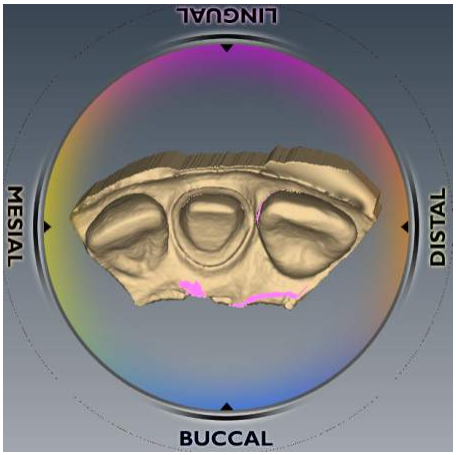
Resetting the Orientation



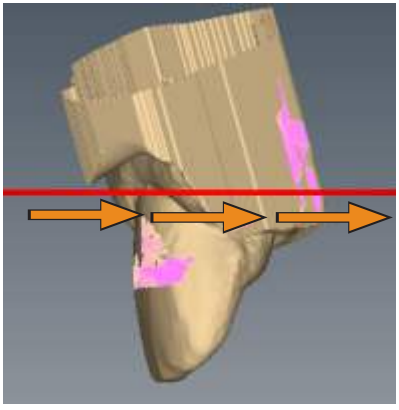
The Orientation can be Reset at any time. If there are multiple restorations, the Reset will only affect the tooth of the currently selected tab. Clicking Reset moves the model into position based on the first scan.

Rotating the model

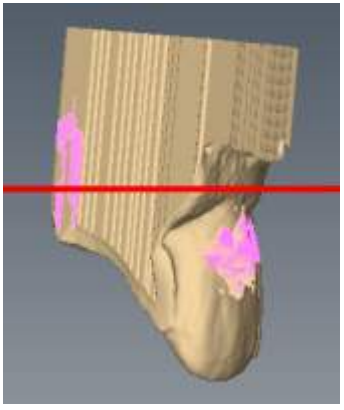
In this example, the model is facing the wrong direction. If the scanner is not pointing towards the distal on the first scan, the surface indicators will be backwards. This is easily fixed with Orientation.



1. Click the **Distal** arrow.
2. Click and drag the mouse in a sideways motion multiple times to turn the model around.



Before



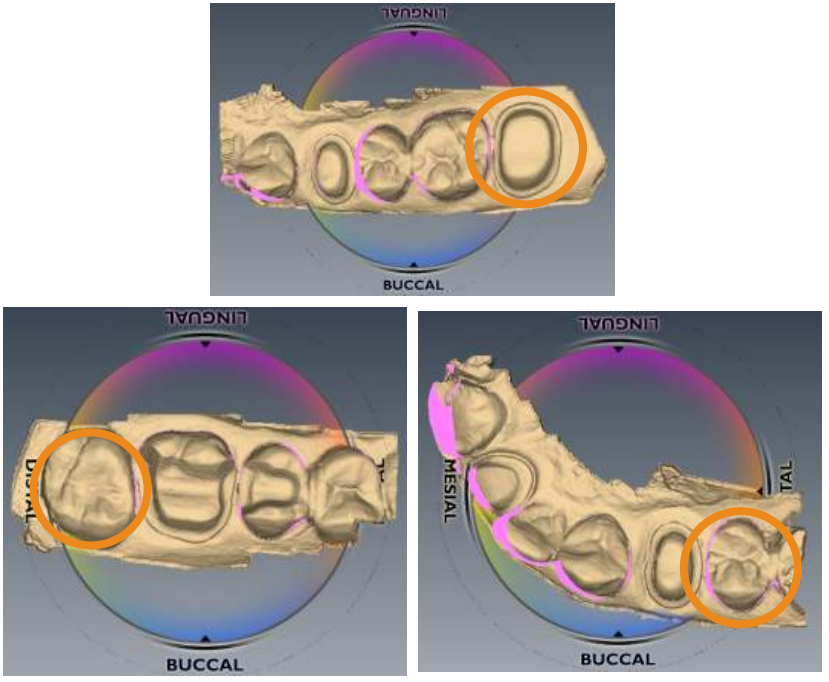
After - model is facing the other way

3. Continue with the normal Orientation workflow.

Multiple Restorations

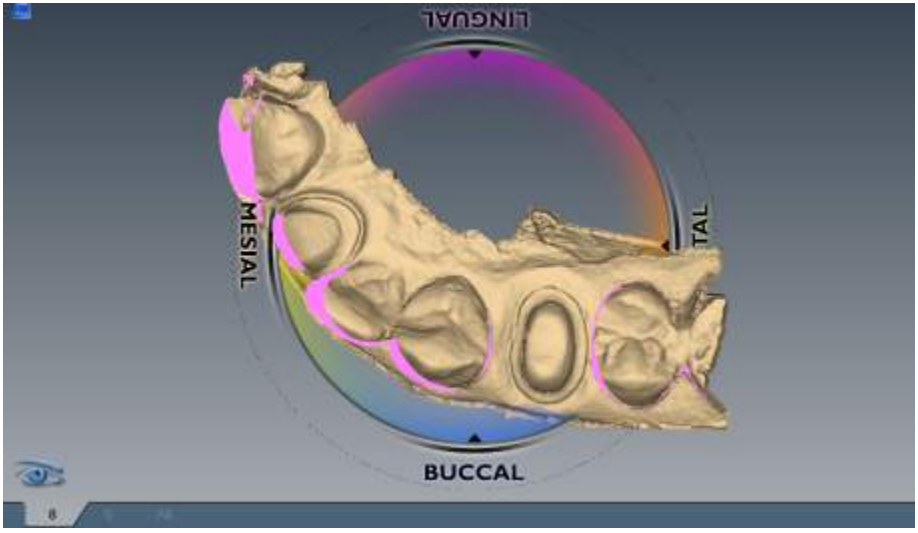
A different Orientation is assigned to each restoration. The curve of Spee affects the orientation of each restoration.

The default orientation is based on the first scan. In the case of multiple restorations, the basic scanning technique starts with the distal proximal neighbor. See “Scanning Multiple Restorations” on page 76 for more information.



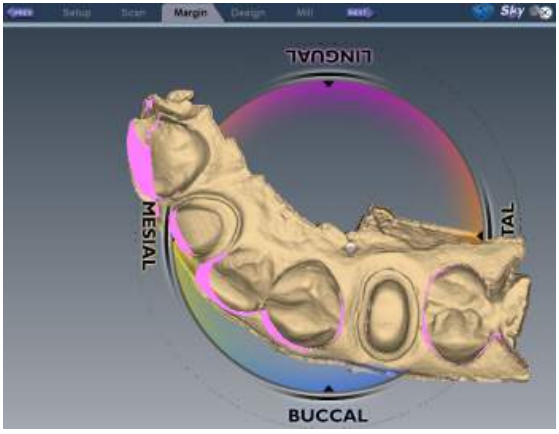
Default Orientation is based on the first scan (circled in orange on the examples above)

The system displays the model with the lingual side facing the top of the screen. The tooth number tabs are in the same left-to-right order as the teeth on the model. In the example below, Tooth 8 (1-1 ISO) is the first tooth.

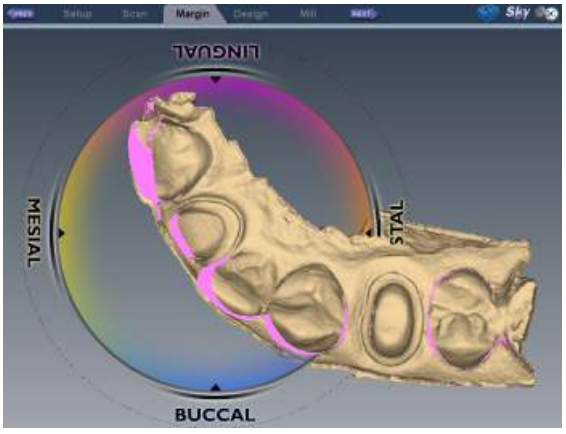


The model rotates around the central point of the orientation circle. The model can be moved so that an individual preparation is at the center of the circle. This is an optional step which can make it easier to alter the orientation for each restoration.

1 Click and hold the scroll wheel. Drag the model until the first tooth is centered in the middle of the screen. The circle graphic moves with the model, but you can see the model moving in relation to the tabs at the top of the screen. When the scroll wheel is released, the circle graphic refreshes and moves to the center. Repeat as necessary.



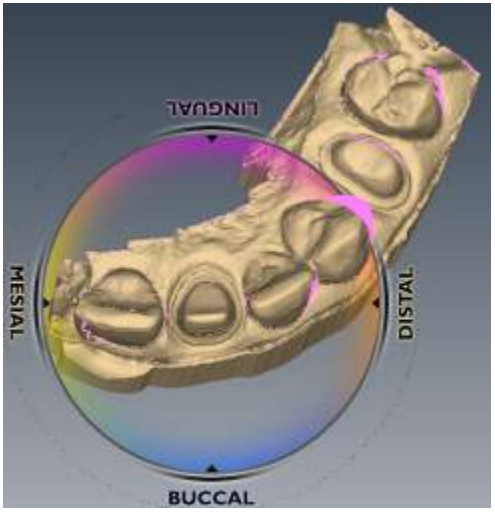
Moving with scroll wheel held down



After scroll wheel is released

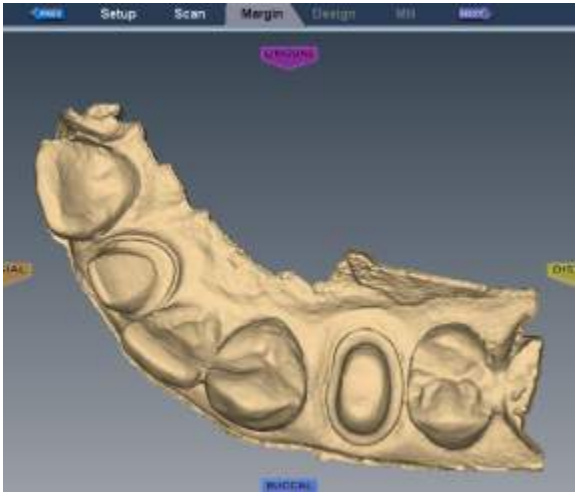
2 Rotate the model to get the correct Orientation for the first tooth. When satisfied, click **Orientation** to accept.

> **Note:** If you cannot use the distal or mesial view to make the adjustments due to the length of the model or the malalignment of the teeth, make all of the adjustments from the occlusal view.



3 Click the tab for the next tooth.

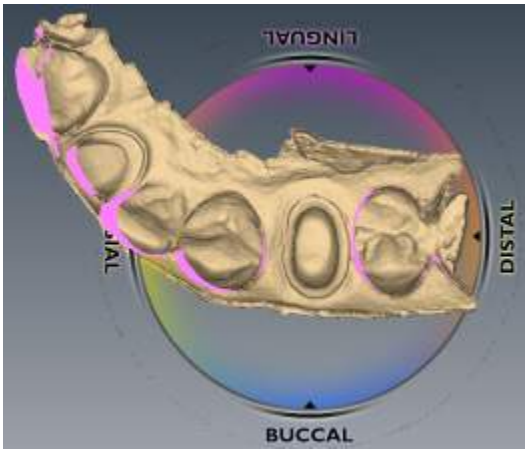
The model reorients back to the original orientation. If you click back on the previous tab, the model will shift to the path for that tooth.



4 While on the second tab, click **Orientation** to designate the orientation for the second preparation.

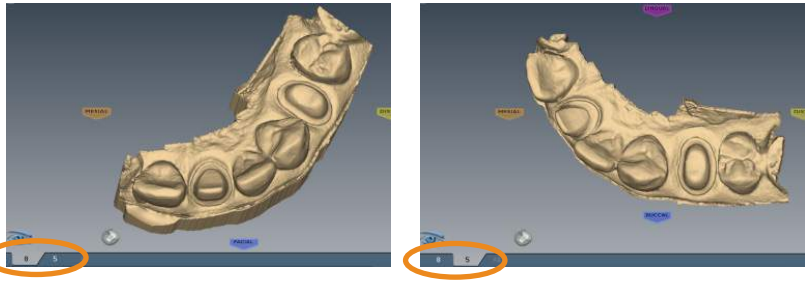
5 Drag the model so that the second preparation is centered.

6 Rotate the model to the correct orientation.



7 Click **Orientation** to accept.

Clicking on each tooth's tab moves the model to that tooth's orientation.



Note: The model is centered on the original central point regardless of which tooth you have selected.

Chapter 7
Margin Tab

The Margin tab contains tools for quickly and easily creating and modifying the margin.

There are four tools on the Margin tab.

- Margin Tool
- Selection Area Tool
- Clone Editing Tool
- Align Buccal Scan

Margin Tool

Clicking the **Margin Tool** activates the margin editing mode in which various methods are available to create and edit the margin.

There are three aids available when working with the margin:

- View ICE Preparation
- Show Features
- Toggle Margin

There are three options for creating your margin:

- Paint - Create the margin using a broad brush stroke.
- Trace - Create the margin using individually marked points along the edge.
- Lasso - Create the margin by marking several points along the edge

Note: You can zoom and rotate the model while you are creating or editing the margin.

After the margin is created, it can be edited using one or both of the following:

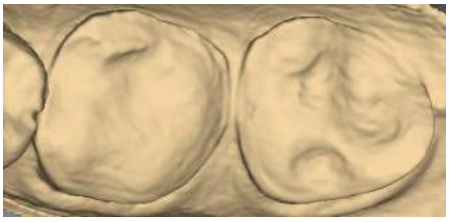
- Add Segments - Replaces existing segments of the margin.
- Move Margin - Adjusts the curve of the existing margin.

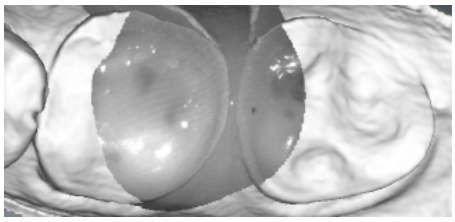
Margin Aids

View ICE Preparation

For intraoral cases only.

Use **View ICE Preparation** to toggle between ICE view and stone view. ICE View shows one scan at a time near the center of the screen. Rotate and move the model to view different ICE scans.





Show Features

Click **Show Features** to highlight high contour areas in green. This can be helpful in finding the margin edge on supragingival preps, inlays, and onlays.

Creating the Margin

When creating the margin, use either the Paint, Trace, OR Lasso tool. They are not used in combination.

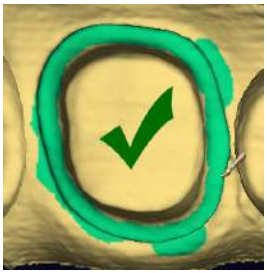
Paint tool

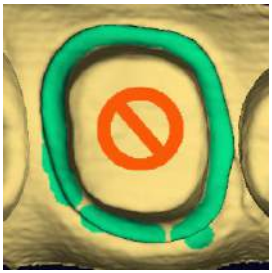
The Paint tool is recommended for supragingival margins.

1 Click the **Paint** tool.

The pointer changes to  .

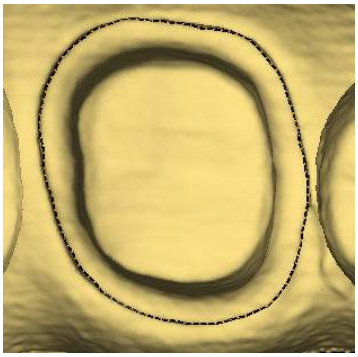
2 Hold down the mouse button and drag the Paint tool around the scanned prep to highlight the outer margin edge. The margin doesn't have to be perfect, but gaps must be avoided.





3 Click the **Paint** button again.

The system automatically draws the margin.



4 To delete the margin and start over, click the **Paint, Trace,** or **Lasso** button.

Trace tool

The Trace tool can be used on any margin, but it is especially recommended for equigingival and subgingival margins.

1 Click the **Trace** button.

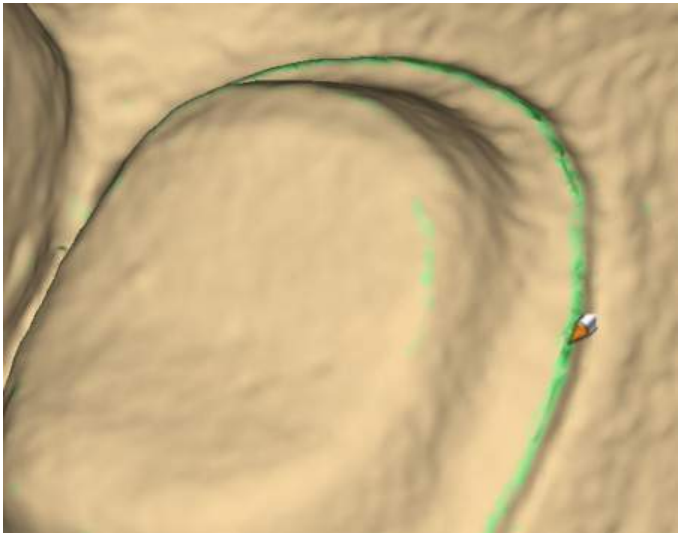
The pointer changes to  .

2 Click **Show Features** to highlight high contour areas in green.

3 Zoom in and rotate the model until there is a good view of the margin.

4 Position the Trace tool in the middle of the green high contour indication on the margin.

Note: Show Features is recommended as an aid in finding the edge of the margin, it is not necessary for using the Trace tool. Draw the margin in the middle of the green high contour indication.



5 Click on the margin. A dot appears as the starting point.

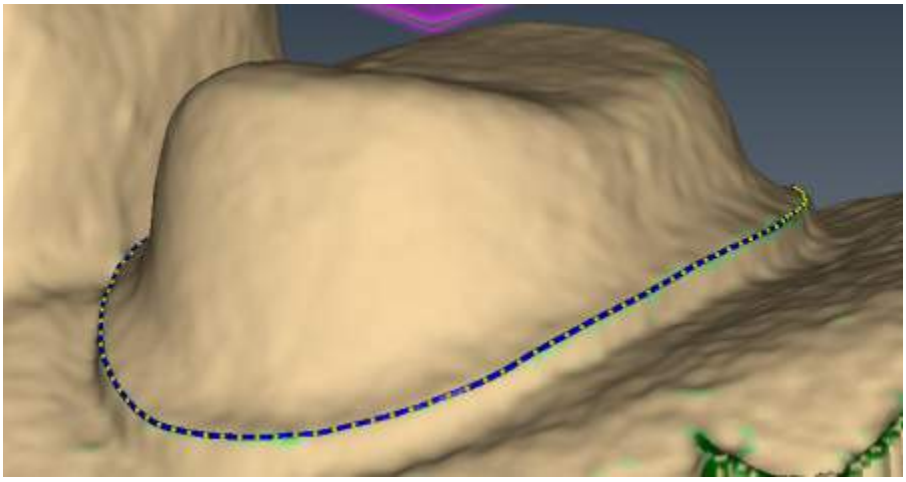
6 There are two options when drawing the margin with Trace.

- Click along the margin in small increments. The system creates straight lines between each click.
- Hold down the left mouse button to draw a continuous line. Release the mouse at any time to stop. This requires a steady drawing hand with the mouse and is not recommended for beginners.

If desired, switch between small clicks and continuous lines.

7 Click the starting point to finish the margin. The system automatically changes the trace line to a margin line.

Your margin should resemble the following.



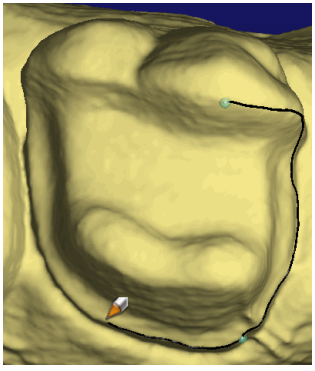
8 To delete the margin and start over, click the **Paint, Trace,** or **Lasso** button.

Lasso tool

The Lasso tool is recommended for partial restorations and supragingival margins with a sharp edge.

1 Click the **Lasso** button.

The pointer changes to  .



2 Click along the margin at large intervals. The system creates a line along the edge between each click.

The starting point and the most recent point clicked appear as blue dots.

3 Click to accept the previewed segment. Click the starting blue dot to finish the margin.

4 To delete the margin and start over, click the **Paint, Trace,** or **Lasso** button.

Note: If Lasso is having trouble finding the margin, you can change the ICE Margin Mode to Texture Only. See below.

Margin Tab Settings

ICE Margin Mode

For intraoral cases only.

ICE Margin Mode determines which view the system uses to create the margin curve when using the Lasso tool.

1. Click **Settings.**
2. Click **ICE Margin Mode.**

The default setting, **Normal,** means that the system uses both the stone and ICE view to determine where the Lasso line should appear.

3. Select **Texture only** to indicate that the system should ignore the stone model and focus on the differences in the ICE view. If **View ICE Preparation** is deactivated, this setting returns to Normal mode.
4. Click **Save** to save the change or **Cancel** to exit without saving.

Modifying the Margin

The Margin tab provides two tools for modifying an existing margin path: Move Margin and Add Segments.

Before selecting a tool, enlarge and position the model to ensure an optimal view of the margin area. You can use either tool or both sequentially, they do not remove previous changes when clicked like the margin drawing tools.

Toggle Margin

Once the margin is created, **Toggle Margin** shows or hides the margin. This is helpful in verifying the margin has been drawn correctly.

Move Margin tool

Use the Move Margin tool to drag and drop a section of the margin into a new position.

1 Click the **Move Margin** button.

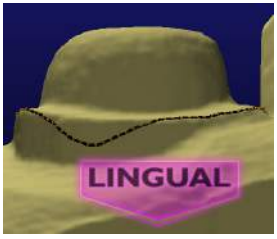
2 Position the pointer on the margin; click and hold down the mouse button.

Note: Area of Influence - Change the tool's area of influence by dragging the yellow button to increase or decrease the size of the ellipse.

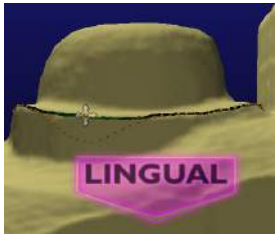
3 Drag the margin onto the margin shelf and release the mouse button.

The system automatically redraws the margin in the new location.

4 Repeat as needed.



Before



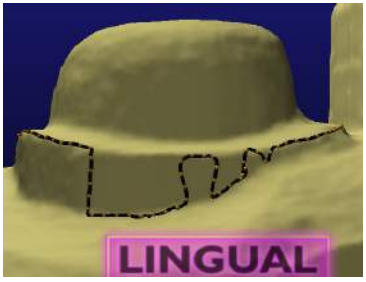
Drag into correct position

After

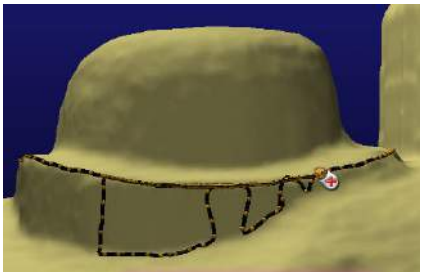
Add Segments tool

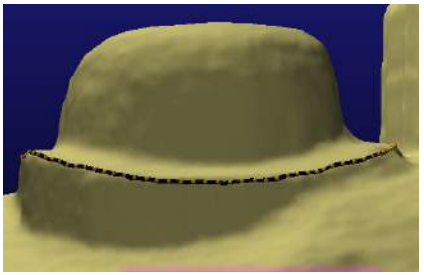
Use the Add Segments tool to redraw a portion of the margin.

1 Click the **Add Segments** button.



2 Start by clicking on a portion of the margin line that is acceptable. Then, click to add new points across the gap in the line. A line traces where you click. Use multiple clicks to create a curve.





3 Click **Add Segments.** The system redraws the margin and removes the unacceptable section.

4 Repeat as needed.

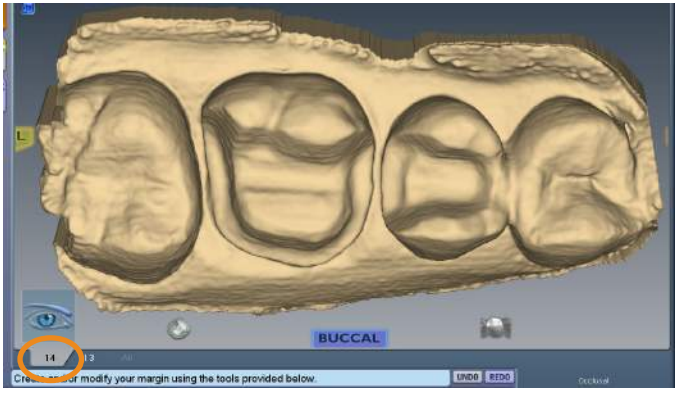
Preview Library

Click **Preview Library** to display a preview of the library tooth on top of the preparation. The size of the preview tooth is based on the margin. The tooth may appear small on partial restorations. The preview tooth is positioned according to the Orientation. Click Orientation to use the library tooth as a guide to change the model's alignment.

Multiple Restorations

On multiple restoration cases, the tooth number is assigned to each preparation when the margin is drawn.

1 Click the desired tooth number tab.



2 Draw and edit the margin for the selected tooth number.

3 Select the next tooth number.

4 Draw and edit the margin for the selected tooth number.

Drawing the margins is how the tooth number is designated for each preparation. If the wrong tooth number is selected when a margin is drawn, the margin must be marked again on the correct tooth tab.

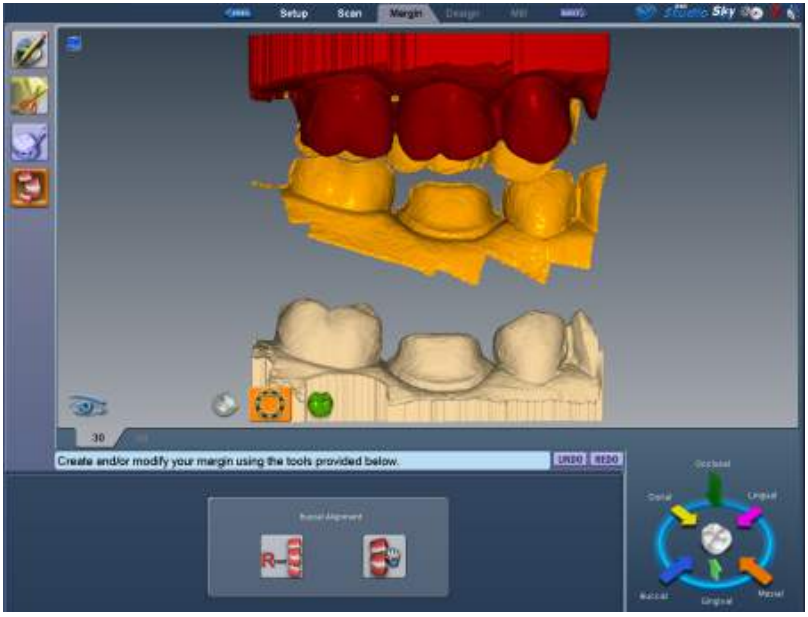
Note: See the Bridges chapter for information on drawing pontic margins.

Buccal Bite Alignment

Use **Align Buccal Scan** to designate the position of the three models (preparation, opposing, and buccal bite) in relation to each other.

1 Click **Align Buccal Scan.**

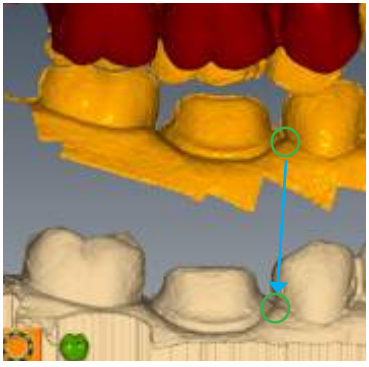
Three models appear. In the example below, the red and orange models are overlapped, but they are not aligned.

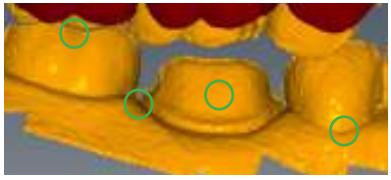


Note: On Buccal/Opposing cases, the Design tab is not available until after the buccal and opposing have been aligned with the preparation model.

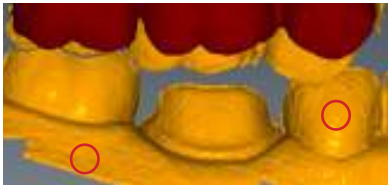
2 Click **Grab Model.**

3 Look for a distinctive feature on both models. Click directly on a distinctive feature in the buccal bite and drag the model until the pointer is directly over the same distinctive feature on the preparation model. As you drag the buccal bite model down, it will disappear behind the preparation model. It is important to know the point that you grabbed and drag it to the same point on the preparation model.



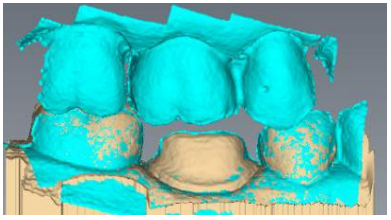


Distinctive features can include a cusp tip, groove, unique gingiva, etc.

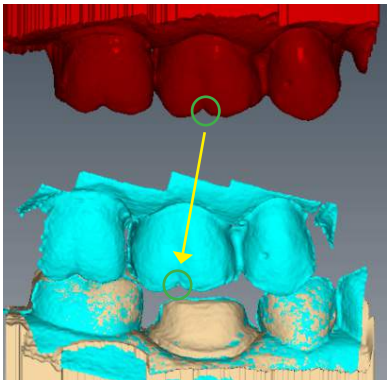


Do not click on smooth/round parts of the model or the model base.

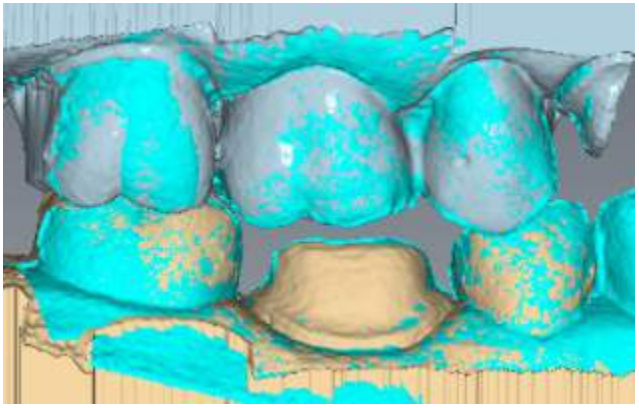
The buccal bite model changes color and snaps into place.



4 Click directly on a distinctive feature in the opposing model and drag the model until the mouse is directly over the same distinctive feature on the buccal bite model.



The opposing model changes color and snaps into place. Your alignment should resemble the following.



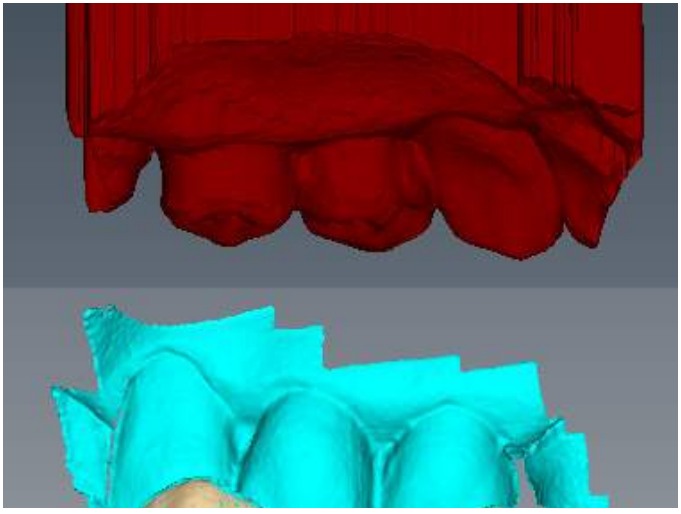
If you are not happy with the alignment, click **Reset** to start over or click and drag a model away from the aligned models and try again. If a model has become tilted, it may be difficult to align. Click Reset to start over.

The buccal alignment can be evaluated on the Design tab after the proposal has been generated. See “Evaluating Template Alignment” on page 134.

Rotating the Buccal or Opposing Scans

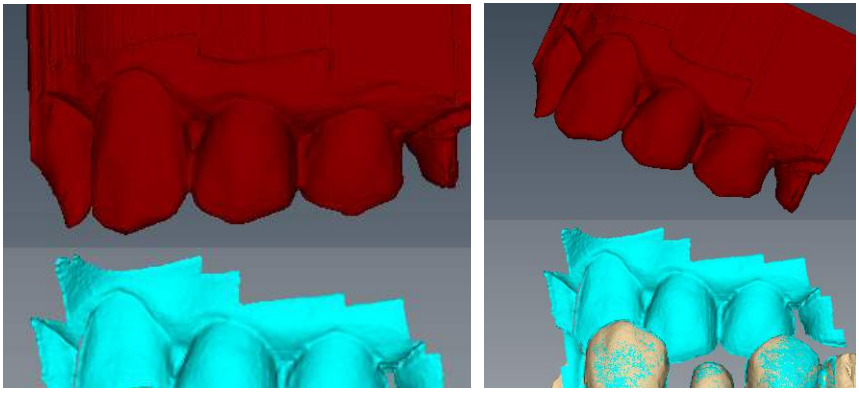
When scanning, the wand should always point towards the distal. When scanning a model or scanning anteriors intraorally, it is possible that one or more of your models may not be oriented correctly. In order for the preparation, buccal bite, and opposing models to align, they must all be facing the same way.

In the example below, the opposing teeth were scanned incorrectly on an articulated model.



1 Click **Rotate Opposing.**

2 Use a horizontal motion in short increments to rotate the opposing model until it is showing the buccal side. A tilted model is acceptable. As long as it is facing the correct direction, the models will be able to align.

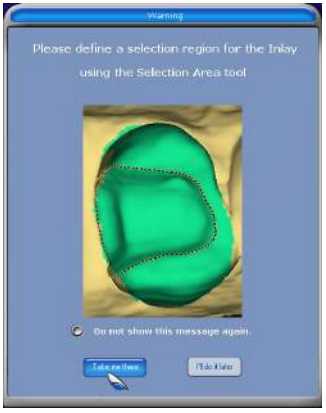


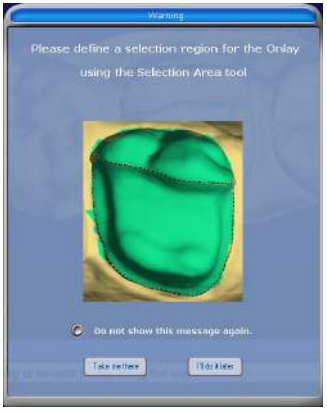
3 Continue with the normal alignment process.

Selection Area Tool

For designing systems only.

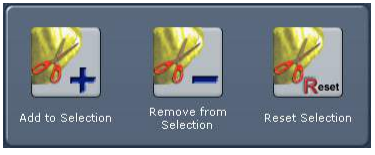
As soon as the margin is drawn on an inlay or onlay, one of the following messages appears. If you do not want this reminder to appear in the future, select **Do not show this message again.**





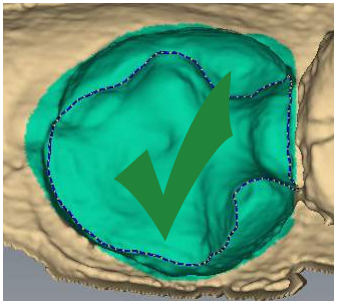
1 Click **Take me there.**

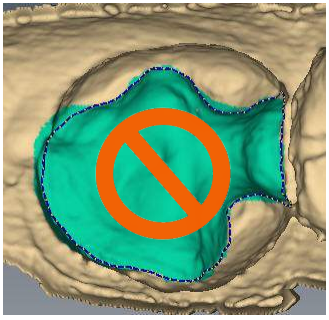
The system takes you to the Selection Area screen. The Selection Area options appear at the bottom of the screen.

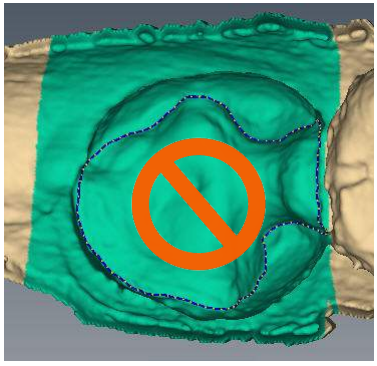


2 Click **Add to Selection.**

3 Click and drag a circle around the entire tooth. After you let go, an area is highlighted. Do not go too far beyond or short of the natural tooth or the proposal will be distorted. This process is recommended for inlays, onlays, and window prep veneers.



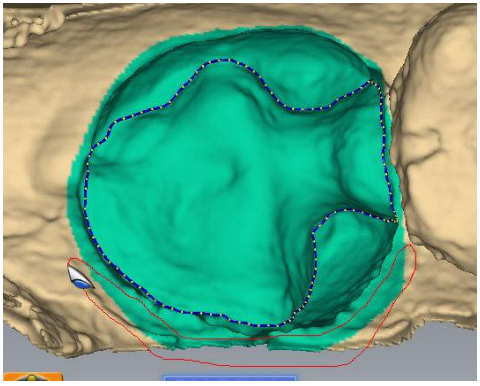




4 When you are satisfied with the Selection Area, click **Margin Tool** to edit the margin.

Remove From Selection

1. Click **Remove from Selection.**
2. Click and drag the mouse to select the areas that you want to remove.



3. Repeat as needed.
4. When finished, click **Margin Tool.**

5. Click **Hide Model** to view your trim region. Hide Model is only available on the Margin tab when a Selection Area has been designated.

Reset

To remove the Selection Area and start over, click **Reset.**

Clone Editing

For designing systems only.

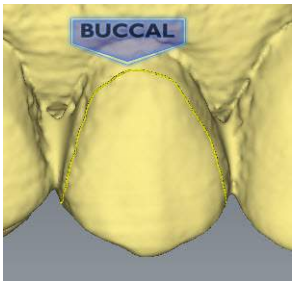
The Clone Editing tool is used to designate the area of the clone scan that will be combined with the library tooth. This step is not necessary if the clone scans are being used as a template only.

1. Click **Clone Editing.**
2. To designate the clone's library surface, use the tools at the bottom of the screen. These act the same as the margin tools.
   - Trace - Removes the existing line. Draw a new clone area.
   - Move Curve - Click to drag an exiting curve into a new position.
   - Add Segments - Click to add a new line or curve to the existing area.

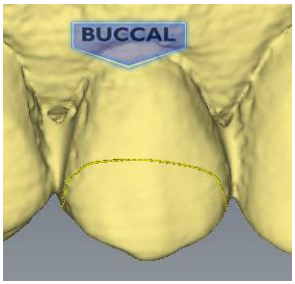
Trace

1. Click **Trace.**
2. Click or drag the mouse around the edges of the clone to designate the area that you want to combine with the library tooth.

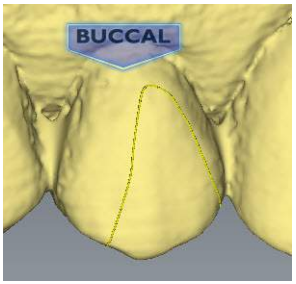
   Be sure to only designate areas with good data.



Down to the near the gingival tissue



Occlusal cap only



Partial tooth - often used when original anatomy is chipped

3. Click on the blue dot to finish the clone area. The software automatically changes the trace line to a margin line.

Move Curve

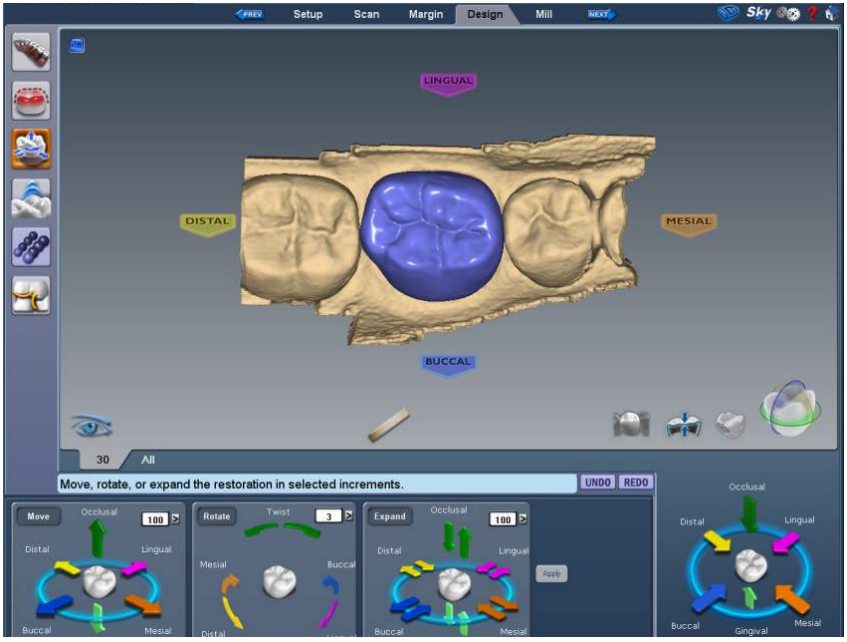
1. Click **Move Curve.**
2. Click and drag the curve into the desired position.
3. Release the mouse button to view the new occlusal area line.

Add Segments

1. Click **Add Segments.**
2. Start by clicking on the portion of the line that is good. Then, click to add new node points across the gap in the line. A black line traces where you click. Use multiple clicks to create a curve.
3. Click **Add Segments.** The system redraws the clone area line and removes the bad section.
4. Repeat as needed.

Chapter 8
Designing the Restoration

After you have scanned the preparation and defined the margin, the Design tab provides an array of tools and options to customize the proposal.



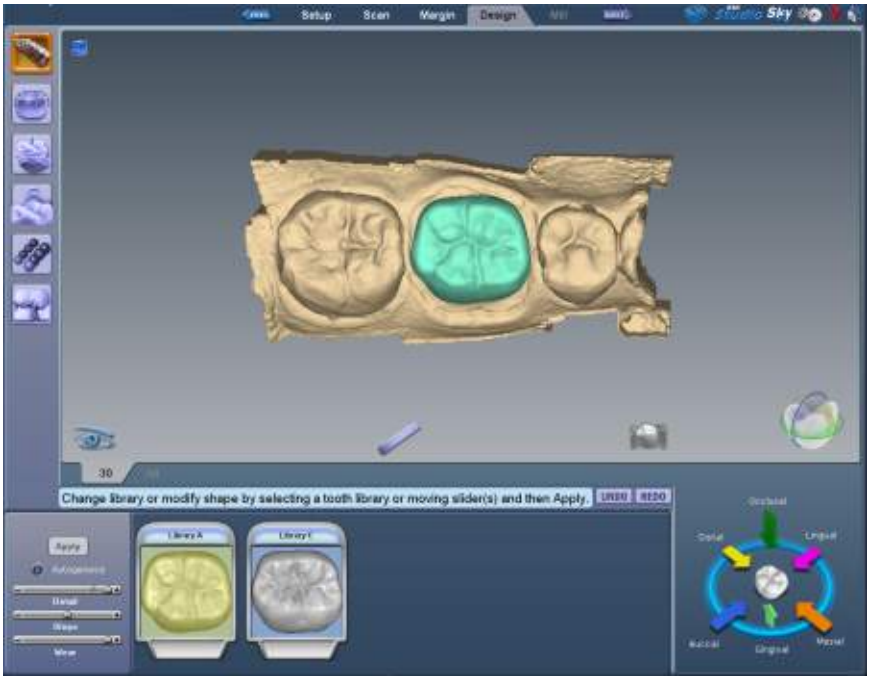
Select from the design tools on the left menu, each of which provides additional options in the box below the restoration:

- Tooth Libraries
- Spacer Tool
- Incremental Change Tools
- Freeform Change Tools
- Alignment
- Contact Refinement

Tooth Libraries

On the Design tab, the system defaults to the Tooth Libraries page. You can change the tooth library that was selected earlier in the Setup tab. This may be useful to find a better match with the actual anatomy. You can also resize/move the preview tooth, change the anatomy levels, and/or deactivate Autogenesis for this restoration.

The library thumbnails appear in the Options box below the restoration. A green preview tooth display. The selected library is highlighted in yellow.



Select a Library

If desired, click another library to view the preview tooth. Select the library with the closest anatomy.

Resize the Library Tooth

The preview tooth can be resized to aid in Autogenesis.

Hold down the ALT key and use the UP or DOWN arrows to resize the preview tooth. It should be close in size to the adjacent teeth.

Move the Library Tooth

The preview tooth can be moved to aid in Autogenesis.

Click and drag the tooth into closer alignment with the adjacent teeth.

Anatomy Levels

The anatomy levels enable you to deactivate Autogenesis and/or select different anatomy details for this proposal. Most restorations will use the default settings.

Note: The red line on the Detail slider represents the maximum amount of detail that can be milled into the restoration.

1. If desired, use the sliders to change the amount of **Detail, Slope,** and/or **Wear.**
2. To deactivate Autogenesis, clear **Autogenesis.**

Apply the changes

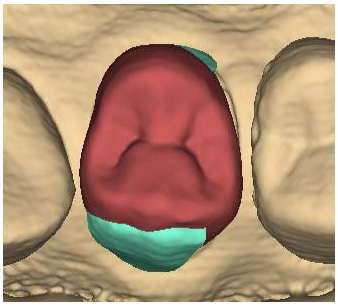
3. Click **Apply** if any changes have been made to the library, Autogenesis activation, or anatomy levels.

Clone as Library Tooth

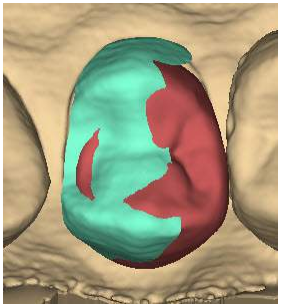
When Clone is selected as the Library tooth, Autogenesis combines the clone selection with the Library A tooth. Use the following steps to move or resize the Library A tooth to modify the proposal, if desired.

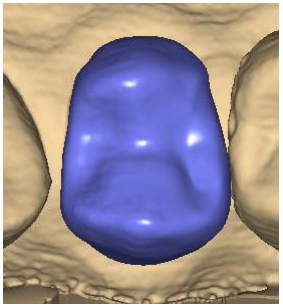
1 Click **Tooth Libraries.**

The Clone selection preview displays as green. Library A tooth displays as dark red.



Move and/or resize the library tooth to be a closer match to the clone selection.





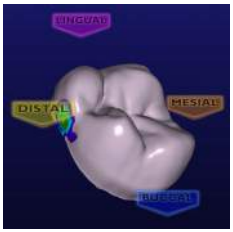
2 Click **Apply.**

3 Repeat as needed.

Viewing Options

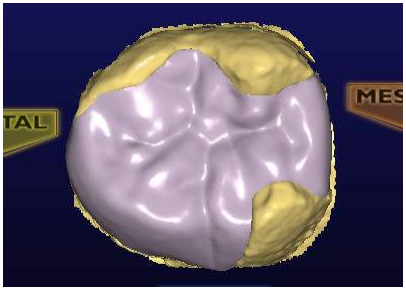
The Design tab contains additional viewing options to aid in optimizing the design that appear below and to the right of the restoration. These functions can be used with most of the tools listed above.

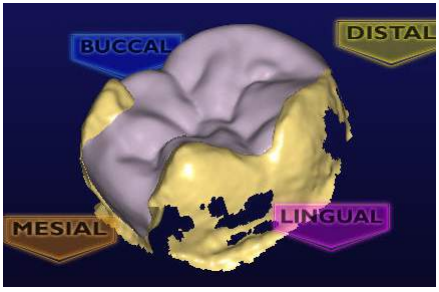
Hide Model



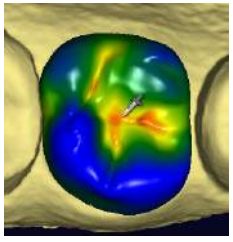
Click to show or hide the adjacent teeth. This is especially helpful when adjusting the contact area.

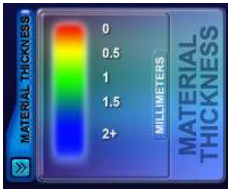
When Hide Model is activated on partial restorations, the area that remains is the area that was designated as the Selection Area. Rotate the proposal. Depending on the designated selection area, you may see holes. These are usually not a deterrent to the design process. If desired, return to the Margin tab and edit the Selection Area.





Material Thickness



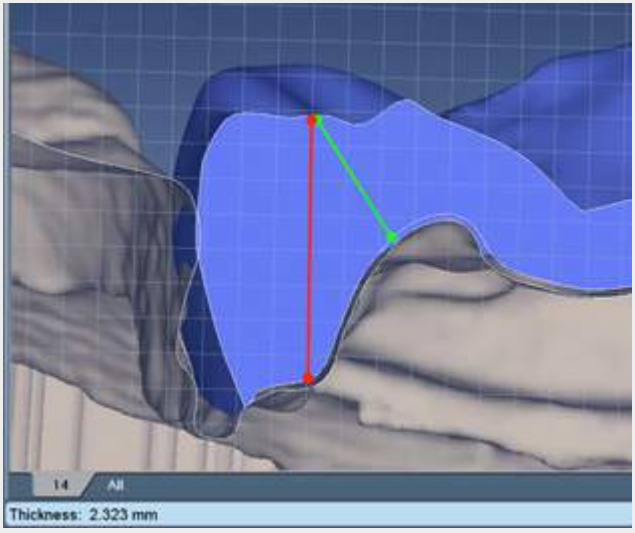


Clicking Material Thickness alternately shows and hides the material thickness indicators in the Design tab.

When Material Thickness mode is active, the system colors the proposal based upon material thickness at each point on the restoration and displays a legend to indicate the thickness associated with each color.

For Your Information

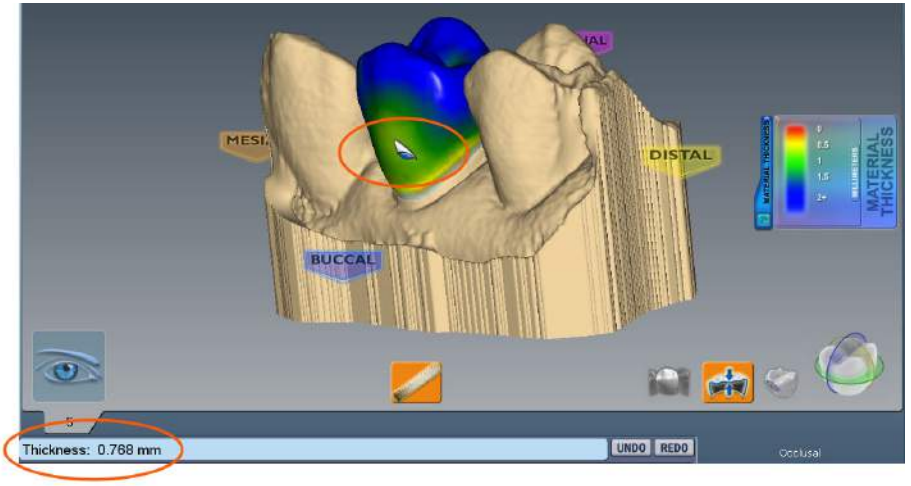
The thickness shown represents the shortest distance to the preparation (green line) and not necessarily the vertical thickness at that point (red line).



Use Slice Place and the measuring grid to calculate the thickness of other areas.

Measure

Click the **Measure** button and click anywhere on the proposal to see the material thickness measurement displayed in the information bar.

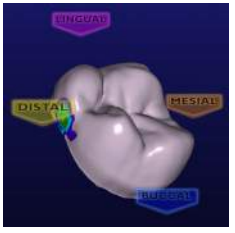


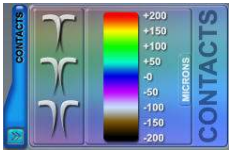
Note: Measure does not have to be used with Material Thickness.

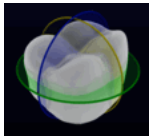
View Contacts

Clicking **View Contacts** alternately shows and hides the strength of contact between the restoration model and adjacent dentition. Use **Hide Model** to remove the adjacent dentition from view.

When View Contacts is active, the system colors the proposal based upon contact strength at each point on the restoration and displays a legend to indicate the measurement associated with each color.

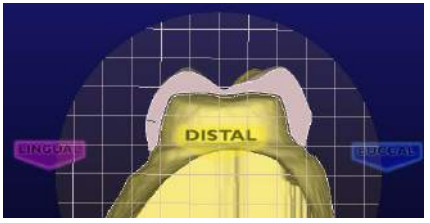




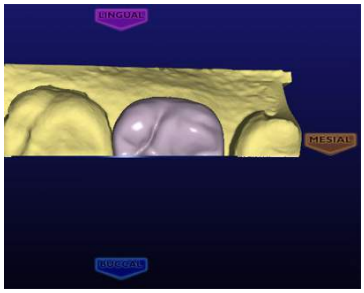


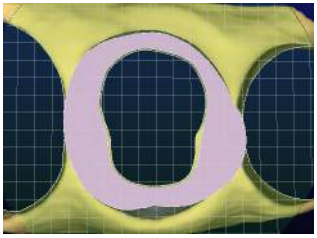
Slice Plane

Slice Plane enables you to view the restoration along various cross sections. This is especially helpful in optimizing material thickness and contacts.

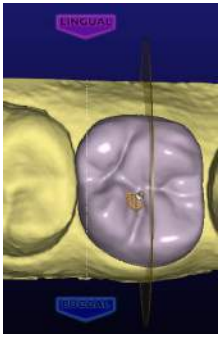


Each time you click Slice Plane, you see a different cross section.

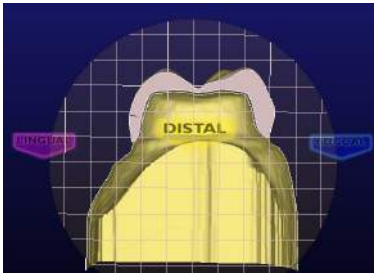




In the picture above, the buccal/lingual slice is not centered on the restoration. Click and drag the slice plane line into the desired position, if needed. The thin dotted white line represents where the slice plane was originally.



Rotate the image to see the cross section.



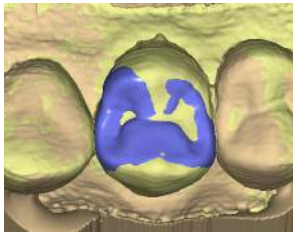
The Slice Plane button shows the measurement represented by the grid lines. Zoom in or out to change the measurement. Zooming in will decrease the measurement. Zoom out will increase it.

View Bite Registration, Opposing Model, or Clone

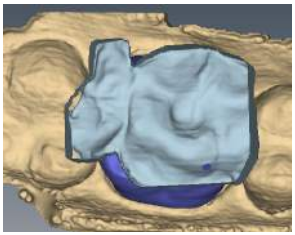
If a bite registration, opposing model, or clone was scanned, it can be viewed anytime during the designing process.

1 Click **View Clone** or **View Bite Registration.** Click **View Bite Registration** to view the opposing model.

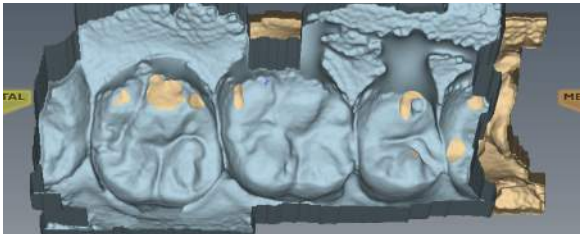
2 The clone (yellow) or bite registration/opposing model (blue) template appears on top of the restoration.



Clone



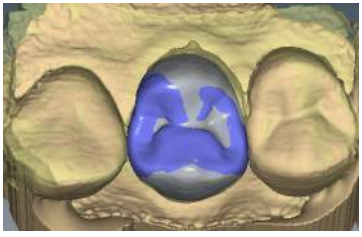
Bite Registration

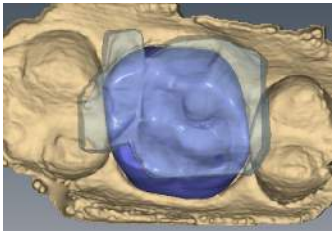


Opposing Model

Note: See “Evaluating Template Alignment” on page 134 for instructions on using Slice Plane to evaluate a template’s alignment.

To make the template translucent, click **View Clone** or **View Bite Registration** again. Use the slider to adjust the transparency of the template.





3 Use the clone, bite registration, or opposing model to aid in your design of the restoration's anatomy.

4 Click again to remove the template from view.

Template Alignment

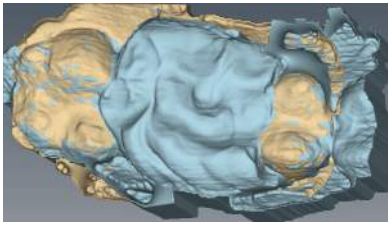
The Template Alignment tool enables you to correlate the restoration model with bite registration or clone scans for alignment and occlusal definition.

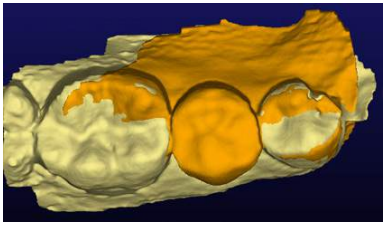
The Template Alignment tool is not available for Buccal/Opposing cases. Use the **Align Buccal Scan** on the Margin tab to adjust the Buccal/Opposing templates. See "Buccal Bite Alignment" on page 114 for more information.

1 Click **Template Alignment** on the left most menu.

The Template Alignment options appear at the bottom of the screen.

The bite registration (blue) or clone scan (yellow) model is shown superimposed over the restoration model.





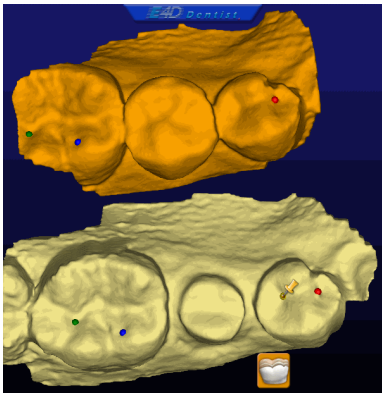
Realigning the Template

If the template needs to be realigned, click **Reset.**

1 **Bite Registration** or **Clone** is selected by default.

2 Click the **Alignment Points** tool.

Use the Alignment Points tool to define four pairs of points. It is recommended that you click on grooves or cusps, not on the slopes of the proximals.



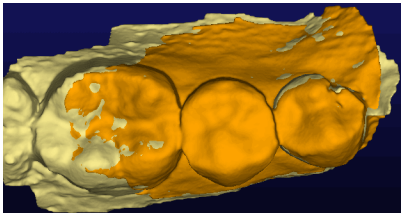
3 Click on a distinctive feature on the bite registration/clone template. A colored dot appears. Whenever possible, click on high and low points. Clicking on sloped areas increases the risk of a misalignment.

Note: Alignment points must be placed on the proximals. The proposal is only a virtual component and you cannot place alignment points on it.

4 Click on the preparation model in the corresponding spot. The same color dot appears.

5 Repeat until you have four pairs of points.

After you click the second point in the fourth pair, the system snaps the bite registration into alignment with the preparation model.

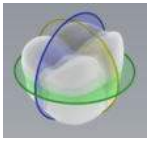


6 Use **Slice Plane** to verify the alignment is acceptable.

Evaluating Template Alignment

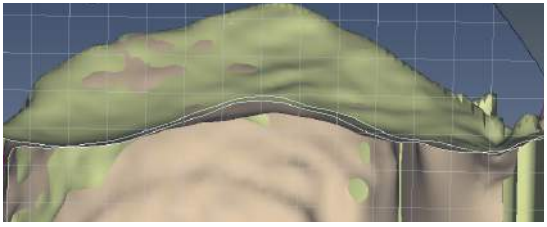
- Bite Registration can only be evaluated on the Template Alignment screen. On the Design tab, only the Select Bite Area is displayed and you cannot compare the proximal data.
- Clone templates can be evaluated on the Design tab or on the Template Alignment screen.
- Buccal Bite can only be evaluated on the Design tab after the proposal has been generated.

1. Click View Clone or View Bite Registration. The View Bite Registration button is used for Buccal Bite to display the opposing model.

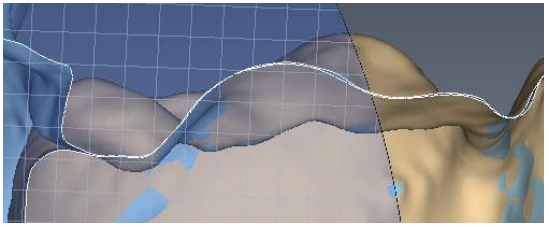


2. Click **Slice Plane**.
3. Move the slice placement if desired.
4. Rotate the model and zoom in.

Clone and Bite Registration templates include the same anatomical features of the proximal dentition as the preparation model. When you zoom in on the Clone or Bite Registration proximal dentition, there should be very little difference between the two templates.



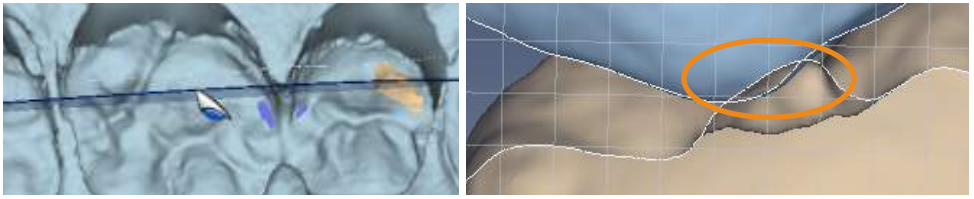
Clone



Bite Registration

On buccal bite cases, it is normal to see contact points. Because the opposing and preparation models are two different surfaces, it behaves differently than Bite Registration and Clone. In this case you are not comparing two scans of the same data, but you may want to evaluate the contact points to ensure there is not too much overlap.

Overlap allowances are subjective, similar to contact strengths. Follow your office preferences.



Opposing Model

Incremental Change Tools

Use the Incremental Change Tool options to move, rotate, or expand the restoration's occlusal table while leaving the margin intact.

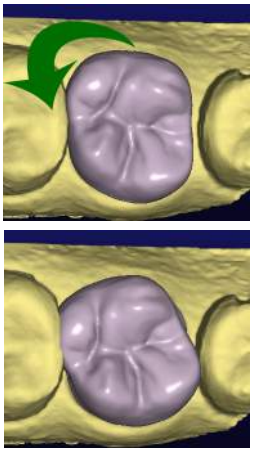
Click **Incremental Change Tools** on the left most menu.

The Incremental Change options appear.

Note: The pictures for rotating, moving, and expanding the restoration use exaggerated examples to help illustrate how the tools work. These examples do not represent realistic restorations.

The recommended order is as follows:

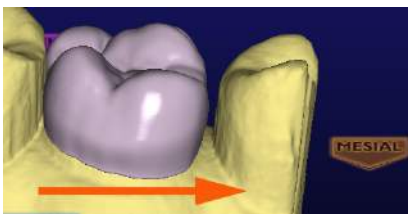
Rotate



The Rotate controls use a numerical rotation angle field in conjunction with three pairs of rotation arrows to rotate the occlusal table about a selected axis.

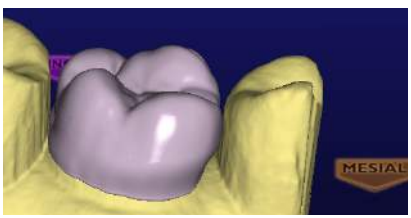
1. Use the number field or pop-up list to set the rotation angle in degrees.
2. Click the desired rotational direction arrow to rotate the occlusal table the specified number of degrees in the desired direction.

Move

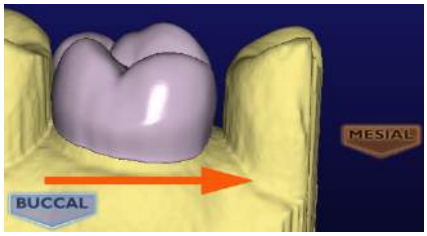


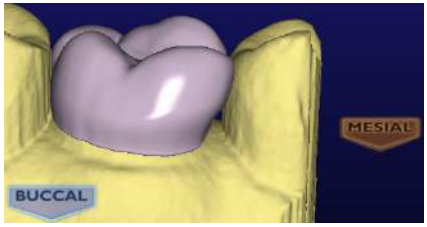
The Move controls are for overall movement and use a numerical distance field in conjunction with six directional arrows to move the occlusal table.

1. Use the number field or pop-up list to set the movement distance in microns.
2. Click the desired directional arrow to move the occlusal table the specified distance and desired direction.



Expand





The Expand controls are for fine movement and use a numerical field in conjunction with six pairs of arrows to scale the cervical cap in a given direction. This is different from Move and Rotate controls that move the cervical cap as a unit.

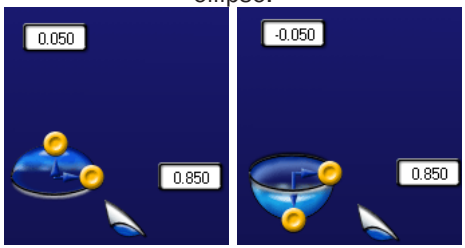
1. Use the number field or pop-up list to set the expansion in microns.
2. Click the desired directional arrow to expand or contract the restoration the specified amount in the desired direction.

Freeform Change Tools

The Freeform Change Tools options enable you to modify the restoration in an unrestricted manner rather than the defined increments of the Incremental Change tools.

Note: The pictures for freeform changes on the restoration use exaggerated examples to help illustrate how the tools work. These examples do not represent realistic restorations.

Note: Area of Influence - Change the tool's area of influence by dragging the yellow button to increase or decrease the size of the ellipse.



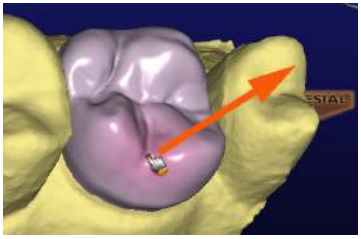
1 Click **Freeform Change Tools** on the left most menu.

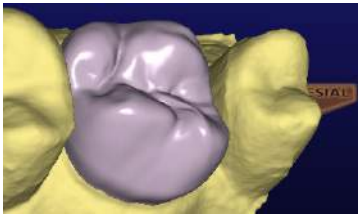
The Freeform Change options appear.

- Rubber Tooth
- Dropper
- Move Cusp
- Smooth Surface
- Move Margin
- Define Feature

Rubber Tooth

Use the Rubber Tooth tool to change the form of the restoration by pushing or pulling inward or outward on the restoration. In this example, the tooth was pulled in the direction of the arrow.



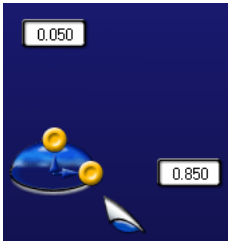


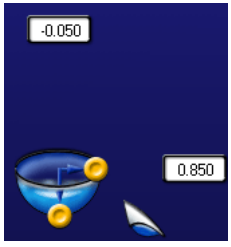
1. Click the **Rubber Tooth** tool.
2. Click and hold down the left mouse button on the part of the restoration that you want to change. The area that will be affected turns pink.
3. While holding down the left mouse button, drag the cursor in the direction that you want the restoration to move.

   Small moves are recommended. Rotate and zoom as needed to view the changes.
4. Click **Undo** to remove changes.

Dropper

The Dropper tool adds/removes virtual beads of material to/from the restoration, analogous to placing beads of liquid wax on a cast model. The vertical axis of Area of Influence determines whether the material is being added (positive number) or removed (negative number).





1 Click the **Dropper** tool.

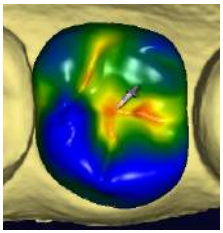
2 Ensure **Material Thickness** is activated. This is the best way to see the effect of the dropper. To speed up the process, leave Material Thickness deactivated.

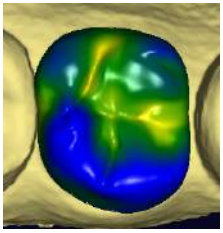
3 Position the pointer where you would like to add/remove beads of material to the restoration.

4 Click and release the mouse button. Rotate and zoom as needed to view the changes. Click and hold while dragging to make a line of material.

5 Repeat, as necessary.

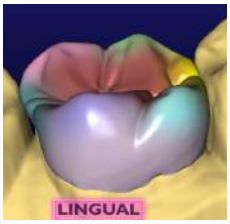
6 Click **Undo** to remove changes.





Move Feature

Use the Move Feature tool to modify a cusp, marginal ridge, or the occlusal table.



1 Click the **Move Feature** tool.

Each anatomical feature is now represented by a different color.

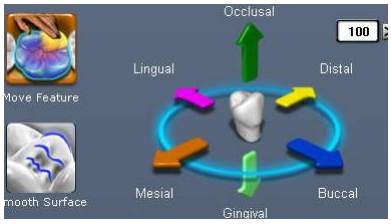
2 Click the desired feature to activate it.

The selected feature is highlighted.

3 Click and drag the feature to the desired position.

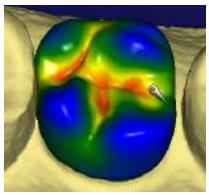
Or, use the Control arrows to move the selected feature.

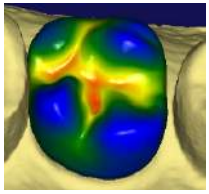
Small moves are recommended. Rotate and zoom as needed to view the changes.



4 Click **Undo** to remove changes.

Smooth Surface





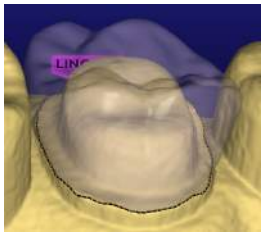
Use the Smooth Surface tool to make an area of the proposal's surface more uniform.

1. Click the **Smooth Surface** tool.
2. Click on the desired area to smooth it.

   Small, gradual changes are recommended. Rotate and zoom as needed to view the changes. Click and hold while dragging the mouse to make continuous changes.
3. Click **Undo** to remove changes.

Move Margin

The Move Margin tool allows you to make minor margin adjustments without losing the design work.

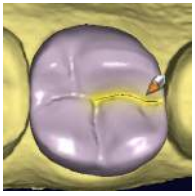


1. Click the **Move Margin** tool.

   The restoration becomes translucent.
2. Position the pointer on the margin line.
3. Click and hold down the mouse button.
4. Drag the margin into the new position and release the mouse button.

   The system automatically redraws the margin in the new location.
5. Click the **Move Margin** tool to see the solid restoration view.

Define Feature

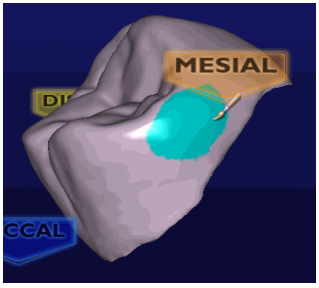


Use Define Feature to add anatomical features to the restoration. Multiple features can be drawn and moved simultaneously.

1. Click **Define Feature** and trace the feature on the restoration proposal.
2. Use the arrow controls to move the feature line(s) in the desired direction.

   As an alternative, use the **Rubber Tooth** to pull or push the feature to the desired position or shape.

Paint Feature



Use Paint Feature to designate an area of the proposal that you want to move. This is often used to designate a contact area that you want to move.

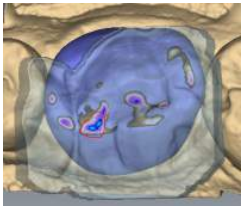
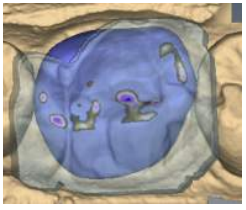
1. Click **Paint Feature** and paint the desired area of the proposal.
2. Use the arrow controls to move the highlighted area in the desired direction.

   As an alternative, use the **Rubber Tooth** to pull or push the feature to the desired position or shape.

Contact Refinement

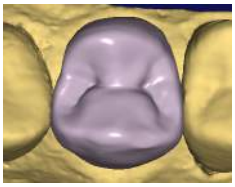
Contact Refinement enables you to set the strength of the occlusal and/or interproximal contacts. It also enables you to broaden the interproximal contacts by making the proposal more square.

1. Select the desired **Strength** for the **Bite** and/or **Contacts.**
2. There are two ways to make the adjustment to the selected strength.
   - Click **Refine** to automatically change the occlusal table or the interproximal contacts.
   - Circle the desired area.

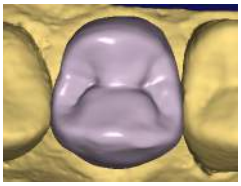



Another way to change the interproximal contacts is to make the proposal more square.

3 Click **Occlusal** in View Controls.

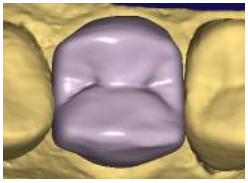


4 Click **Broaden Distally** and/or **Broaden Mesially** to make the proposal more square. This will usually be utilized on posterior crowns.



Note: The **Broaden** buttons change the proposal in set increments. It is not connected to the selected Strength.

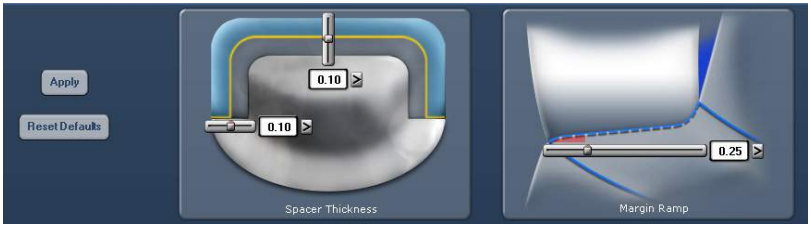
Be careful when using this feature. Overuse will make the proposal too square. See the exaggerated example below.



5 Click **Undo** or reapply the library tooth to remove the changes if desired. If the library tooth is applied, ALL design changes will be lost.

Spacer Tool

You may use the Spacer Tool to override the default spacer thickness and margin ramp values.



Spacer thickness is the space between the restoration and the preparation. The tool has separate settings for the axial and occlusal walls.

Margin ramp is the contact zone for the margin.

Use the sliders or pop-up menus to change the values.

Design Tab Settings

Click **Settings** to select which features Autogenesis uses, to enter the default Bite and Contact Strengths, and to use Margin Boost.

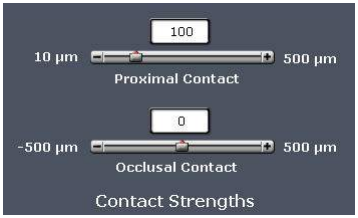
Autogenesis Settings

Each type of restoration has the option of different settings.

By default, Autogenesis uses all of the options when creating a crown. Inlays and Onlays have Contacts and Occlusion selected. All of the options are deselected for Veneers. Select which settings you desire for each restoration type.

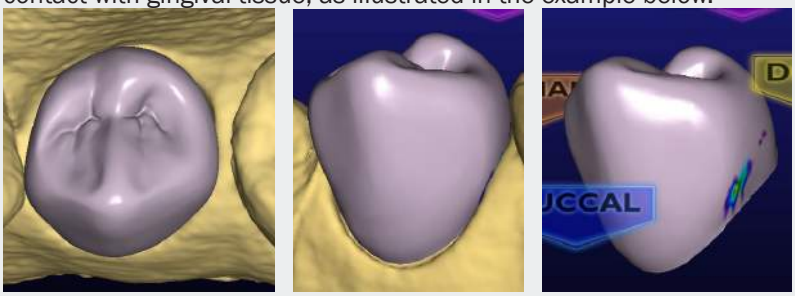
Contact Strengths

Contact Strengths designates the default strength of the Proximal Contact and Occlusal Contact in Autogenesis and Contact Refinement.



For Your Information

Autogenesis may not create an interproximal contact if the proposal makes contact with gingival tissue, as illustrated in the example below.



In these cases, you must create the contact manually.

Margin Boost

Margin Boost setting enables clinical operators to increase the thickness of the proposal around the margin. Margin Boost is OFF by default.

Use Margin Boost Settings to designate the default margin boost for each restoration type.

The controls are similar to the Dropper tool. The Area of Influence (blue bubble) affects the width and thickness of material added. The width is represented by the horizontal arrow, 1.000 in the example. The thickness of material is represented by the vertical arrow, 0.100 in the example. The vertical slider on the right is the height of the material added. This is generally kept towards the bottom, near the margin.

The effects of this tool are most easily seen on clone cases where there is a gap between the margin and the clone template, however this tool can be used on all cases to ensure sufficient material thickness and avoid chipping during milling.

Default Clone Autogenesis™ - No Margin Boost

Autogenesis with Margin Boost

Make any desired changes to the Margin Boost. In Tooth Libraries, click **Apply** to regenerate the proposal with the new settings.

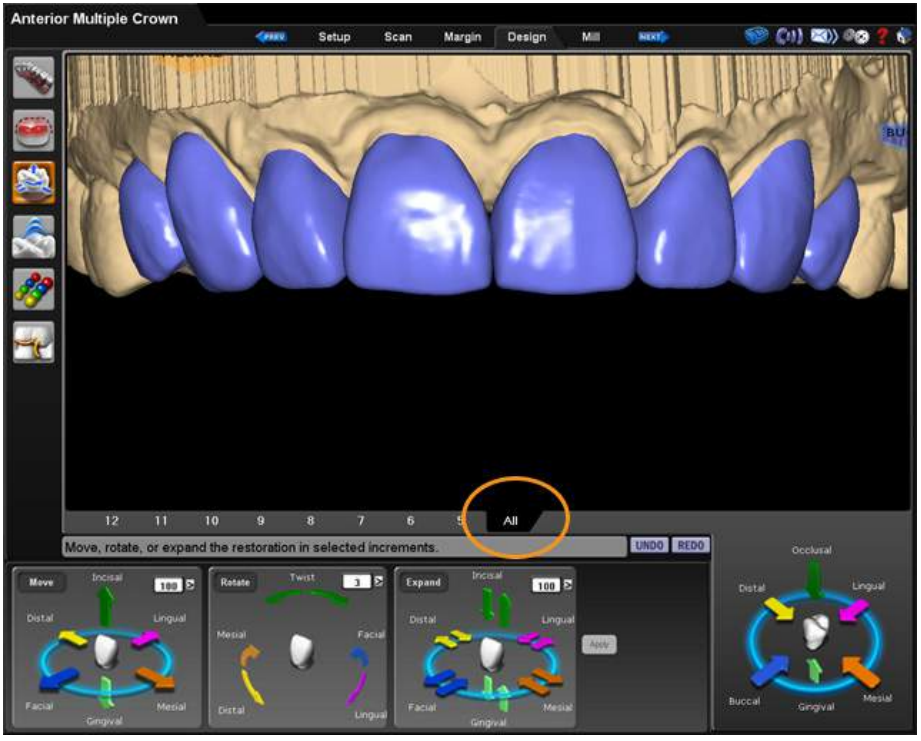
The settings are saved for the next proposal.

Note: Margin Boost is recommended over the use of Margin Thickness.

Designing Multiples

On cases with multiple proposals, click the desired tooth number tab to designate which tooth is being designed.

The ALL tab enables certain design tools to manipulate every proposal at the same time or activates all proposals at the same time to enable individual manipulation without switching tooth tabs.



Manipulate ALL proposals at the same time

Incremental Change Tools

- Move
- Rotate
- Expand

Manipulate individual proposals without switching tabs

Freeform Change Tools

- Rubber Tooth
- Dropper
- Smooth Surface

Note: When using the Incremental Change tools, The margins do not adjust to the new position until Apply is clicked or another tool is selected.

Chapter 9
Mill Tab

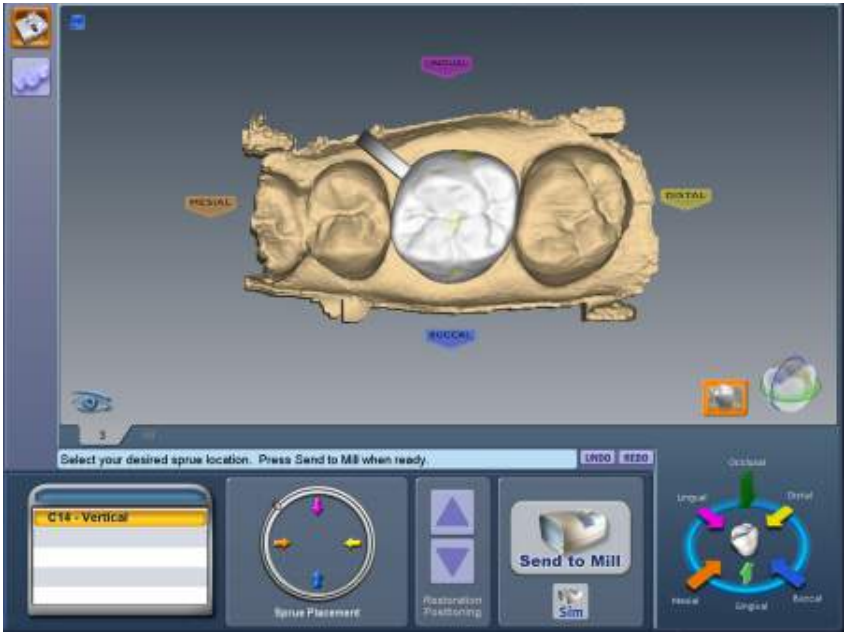
On the Mill tab of the Design Center:

- select a block
- choose a size and location for the sprue
- position for the restoration in a multiblock
- specify tool path settings
- view mill simulation
- send the design data to the Milling Center

At the Milling Center, you will load the block, ensure the milling tools are in place, verify the fluid is at the correct level, and then start the mill process.

Setting up the restoration for milling

Final restoration setup is done on the Mill tab in the Design Center.



Note: Yellow or red shading on the restoration indicates the material in the shaded area is thin and the material manufacturer recommends adjustment. Return to the Design tab to make changes in material thickness.

Click the **View Model** icon to view or hide the preparation and proximals, if desired.

Select a Block Size

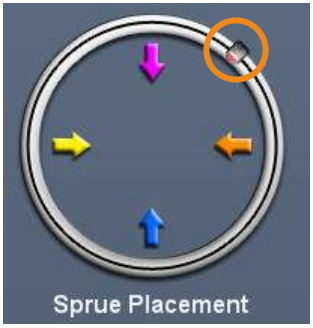
Available block sizes are listed in the Blocks section. A default size is selected. Click on another size if desired. If the restoration will not fit into any of the block sizes available in the chosen material, click **Settings** to select a different material.

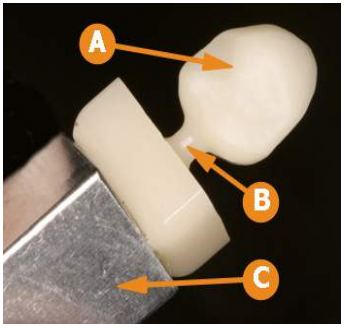
Sprue Placement

The default setting for the sprue can be changed with “Sprue Angle Method” on page 17.

Change the location of the sprue on the restoration, if desired, by moving the placement indicator (circled in orange below) along the circle that represents the exterior of the restoration or by clicking one of the arrows. Recommended locations are as follows.

- Anteriors/posteriors: midway between lingual and the mesial or distal
- Premolars: mesial or distal
- Inlays and Onlays: largest proximal box



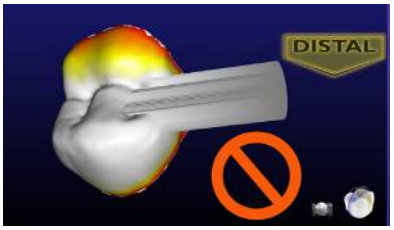


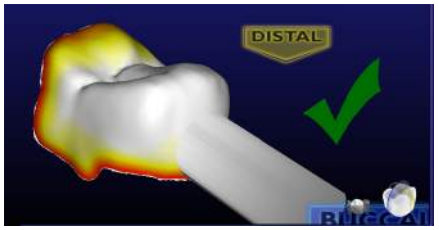
1. Restoration
2. Sprue
3. Mandrel

Note: The sprue is the connection between the restoration and the mandrel.

Rotate and inspect the restoration to ensure the sprue is not positioned on a groove. Move the sprue towards a flatter area of the restoration. This is usually near the interproximal, but should not be put on the contact area unless it is necessary.

Take care in positioning the sprue on inlay and onlay restorations. Ensure the sprue is not attached to an upper surface. Deactivate **View Model** to ensure the sprue is properly placed.





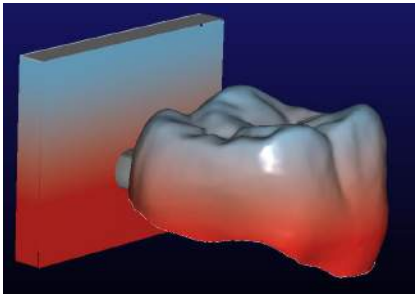
Occlusal Only Inlays

Since occlusal only inlays have no external proximal walls, sprue position can become an issue. There are two options. The sprue can be placed on the internal aspects, but this will result in manual adjustment of the internal fit, which can affect the integrity of the restoration.

The recommended method is to use the dropper tool or rubber tooth tool to “pull up” an area of the occlusal surface and create a raised area on which a sprue can be attached. Manual adjustment of the occlusal surface will be required after milling, but internal fit will not be compromised. For more details or information, contact SOS.

Restoration Positioning

When using an IPS Empress CAD Multiblock, the **Restoration Positioning** arrows are enabled. Use the arrows to move the restoration up or down within the block to achieve the desired shading. Be aware that if the restoration is near the top or bottom of the block, extra milling time will be required to remove the extra material.



Mill Simulation

The Simulation Mode portrays the milled restoration. It takes about 10 seconds to generate and is recommended before milling to check the internal fit. If a hang-up is seen, you can increase the spacer or make any other necessary design changes.

1. On the Mill tab, click **Sim** (located under Send to Mill).
2. Confirm the desired setting:

   - **Standard** is recommended for full coverage restorations.
   - **Detailed** is recommended for partial coverage restorations.
3. Click **OK.**

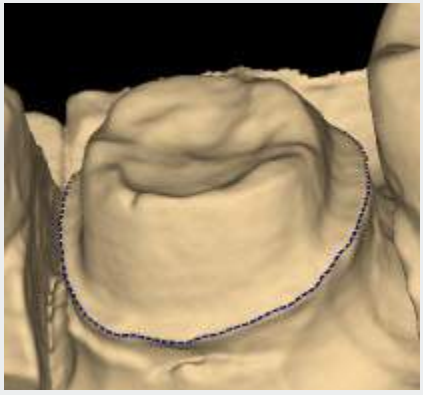
   The system takes a few seconds to create the simulation.

   Evaluate the simulation, looking for any issues.

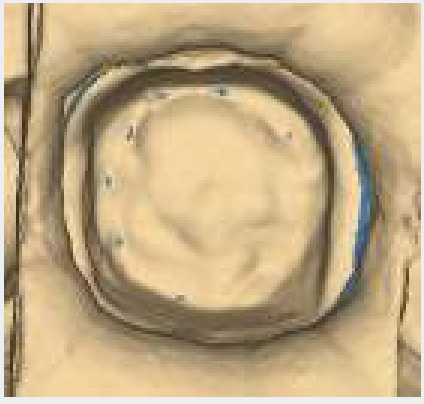
EXAMPLE - Hang-ups

The preparation in this example has irregularities on the occlusal surface that can result in hang-ups within the interior of the restoration.

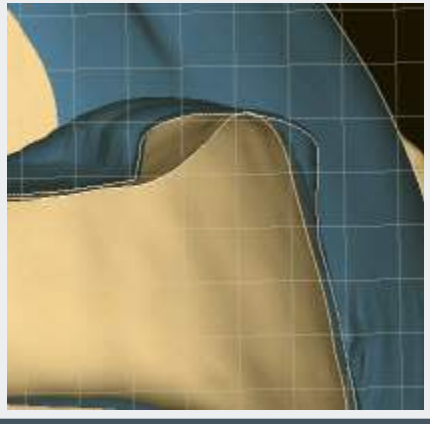
Mill simulation shows the spots where the bur is too large to get into the sharp areas on the preparation.



To evaluate the mill simulation, rotate the model and view it from the gingival. This shows the interior of the preparation. Blue areas are where the restoration is touching the preparation. Blue spots that are not on the margin are areas for concern.



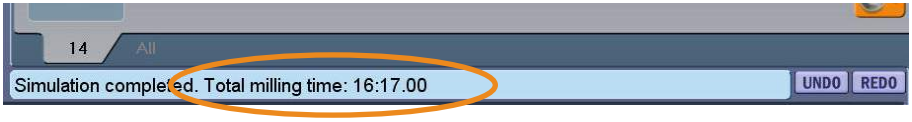
Slice Plane shows the sharp angle of the prep and the gap created by the width of the bur.



If there are issues, there are several options for making adjustments.

- Mill the restoration as it is currently shown and adjusted manually.
- Expand the spacer and run another simulation.
- Adjust the design of the preparation.

When running a Quality simulation, the mill time is displayed in the information bar. See “Simulation Settings” on page 156 for more information.



Send to Mill

1. Click **Send to Mill** when you are satisfied with the restoration and mill set up.
2. Confirm the desired setting.
   - **Standard** is recommended for full coverage restorations.
   - **Detailed** is recommended for partial coverage restorations.

Mill Tab Settings

Click **Settings** to change any of the settings listed below.

Network Settings

This should only be changed by a customer service representative. Incorrect network settings will make the Design Center unable to communicate with the Job Server and Milling Center.

Material/Shade Settings

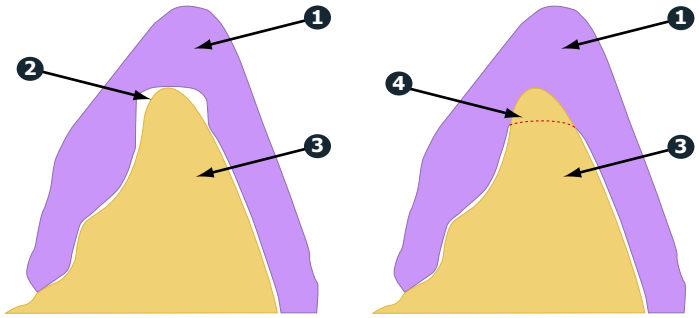
The material and shade for the current restoration can be changed here.

Margin Thickness Settings

Select the minimum material thickness along the margin. The recommended margin thickness is 70 to 100 microns to reduce margin chipping or potential short margins.

Milling Settings

Milling Settings only affect proposals with a sharp interior angle, like an anterior incisal edge. If the interior of the proposal is smaller at the tip than the tools in the mill, the **Standard** setting removes extra material at the tip. This may lead to a crown that is too thin at the top. The options are to round the preparation or to select **Undermill.** If **Undermill** is selected, then the mill will go as far as the tool's size will allow and the remainder must be removed manually.



1. Proposal
2. Standard
3. Preparations
4. Undermill

Simulation Settings

Click **Settings** on the Mill tab to view/edit the **Simulation Settings.** The default selection is **Speed.** This will give you a faster simulation. Select **Quality** for a more accurate simulation, but be aware that it will take longer to process. Note that when the Design Center software is restarted, it will return to the default Speed setting.

Note: Mill time is displayed in the information when Quality simulations are processed.

Chapter 10
Bridges

Bridge cases are unique in that they are designed as individual teeth and milled as one unit.

This chapter assumes familiarity with multiple restoration cases and other intermediate to advanced topics. Refer to other chapters for more information.

Tooth Preparation for Bridges

Ensure the preparations for the abutment teeth are not angled in different directions. If one is pointed towards the lingual and one towards the buccal, there may be problems with path of insertion and overmilling. Cantilever and Maryland bridges are not supported.

Designating a Bridge

A bridge is made up of two or more restorations that are connected. On the Setup tab, select each tooth on the anatomical model that is part of the bridge. For each tooth, you must select the restoration type.

1. Select each tooth that is part of the bridge - the abutment(s) and the pontic(s).
2. Select the **Restoration Type** for each tooth. In the example below, Tooth 19 is a Pontic and the abutment teeth are Crowns.

3. Click **Link.** The cursor changes to a chain symbol.

4 Click the mesial and distal teeth of the bridge. After each end of the bridge is selected, the teeth turn purple.

The teeth are now designated as a bridge.

5 Select the first tooth in the bridge and designate the Library, Material, and Shade. The material and shade is duplicated on the other teeth in the bridge when you click on them.

6 Select the remaining teeth in the bridge and designate the Library. Library must be chosen for each restoration before you can continue to the Scan Tab.

Note: Note: If Library, Material and Shade are chosen before linking the bridge. The software will replace the Material and Shade of the remaining restorations with that of the highest tooth number after the link.

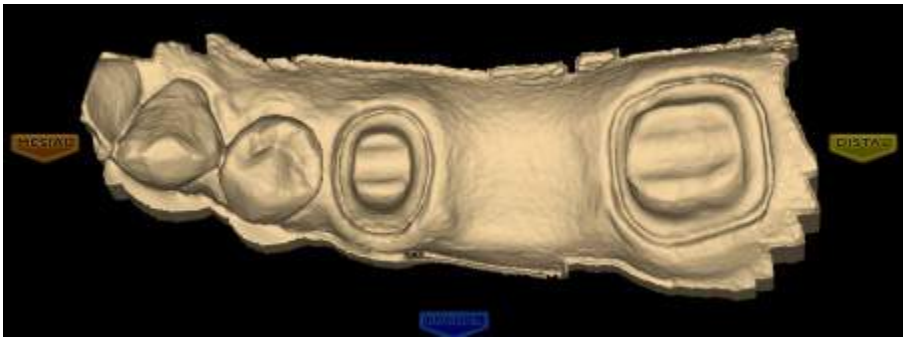
Multiple bridges can be created on the same arch. Repeat the steps above to create another bridge.

Unlinking a Bridge

If there is an error in how the bridge was linked, click Unlink and click on any of the teeth in the bridge.

Scanning Bridges

The scanning procedure for a bridge is the same as that for a multiple restorations case. Scan the prepped teeth, the edentulous area, and two unprepped neighbors or more unprepped neighbors to aid in design.



Note that scanning more teeth on anterior bridges will aid in the smile design.

Bridge Orientation

Set the Orientation for each tooth tab. Good model alignment will aid Autogenesis with the design.

Drawing Pontic Margins

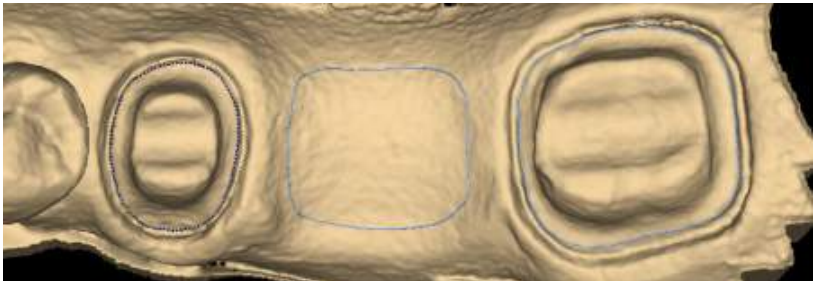
A margin is drawn for each tooth in the bridge.

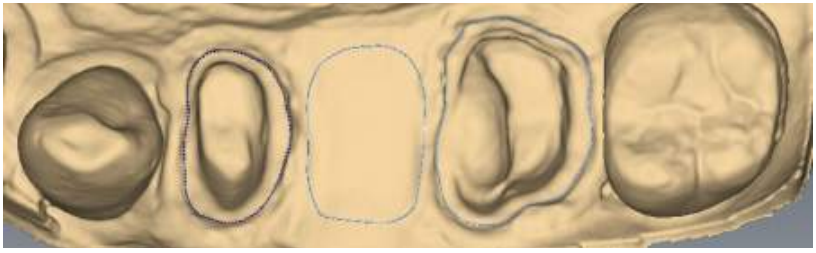
1 Click the tooth number tab for each abutment and draw the margin on the selected tooth.

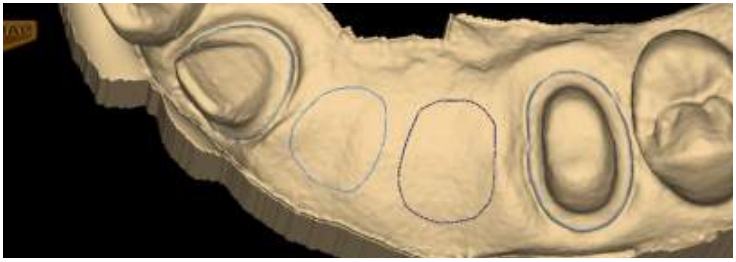
An edentulous space does not technically have a margin. The margin is drawn to aid the design process.

2 Click **Trace** and designate the position and extension of the base of the pontic on the gingival tissue to fit the appropriate contour.

Note: Do not go too far down the curve of the gingival tissue or you may not be able to fit the bridge in the block.







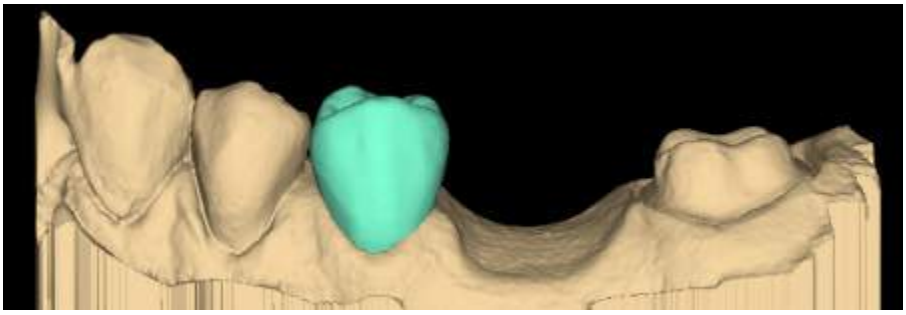
Designing the Bridge

With any multiples case, it is generally best to start the Autogenesis process on a tooth with an existing neighbor. In a bridge case, that means starting with the abutments.

1 Rotate to evaluate the position of the preview library tooth.

In this example, the preview tooth is high because the system is attempting to match the height of the higher mesial data. This will result in a distorted initial proposal. The size and position of the preview tooth is important when Autogenesis is deactivated.

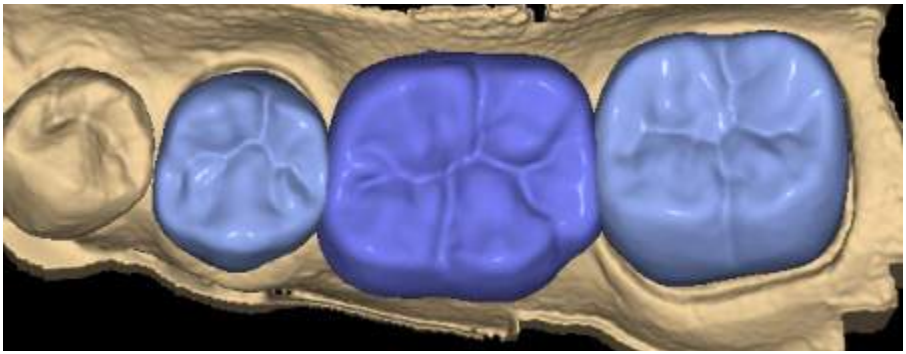
2 Resize **(Alt + arrows)** and move **(drag and drop)** as needed.



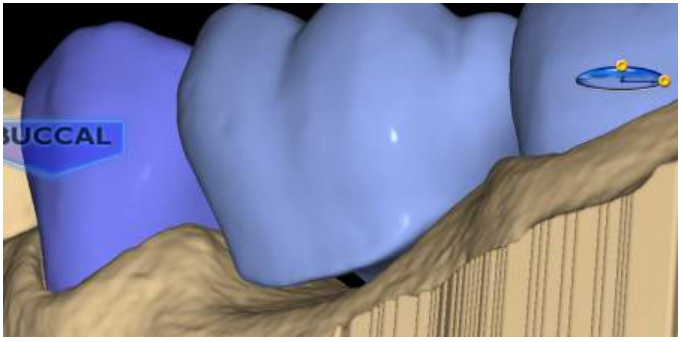
3 Click **Apply.**

4 Repeat these steps for the other abutment.

5 Repeat these steps for the pontic(s).



When you rotate the model, you will notice that the pontics have a solid base and are raised above the gumline (0.75 mm). The gingival aspect of the pontic follows the contours of the edentulous tissue and can be adjusted utilizing the design tools.



6 Follow the normal design workflow with interproximal contacts being the only difference.

7 Adjust the interproximal contacts that touch unprepped teeth to the same contact strength that you normally use.

The contacts of the bridge teeth will be fused together to form the bridge, so the actual contact strength is not a concen, but the contact should be heavy enough to ensure a proper connection.

8 When you are satisfied with your designs, click the **Mill** tab.

Evaluating the Connectors

It is important to evaluate the connections on the bridge and look for possible hangups.

The sprue will be on the mesial or distal side of the bridge.

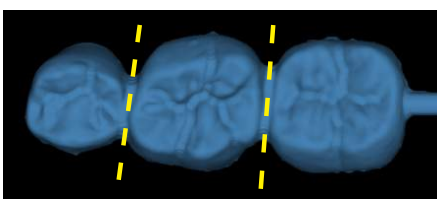
1 Click **View Model** to hide the model.

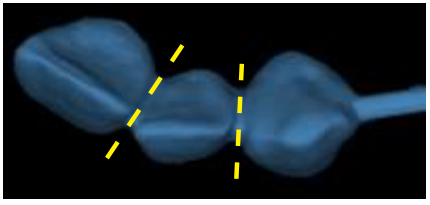
2 Click **Sim.**

When the Simulation is run, the connections between the teeth are displayed.

3 Click **Slice Plane** twice.

When Slice Plane is activated on a bridge mill simulation, the system measures the slice width. If the slice is thinner than the material guidelines, the slice displays as red. It is important to slice the simulation through the thinnest part of the connectors (yellow lines in the examples).



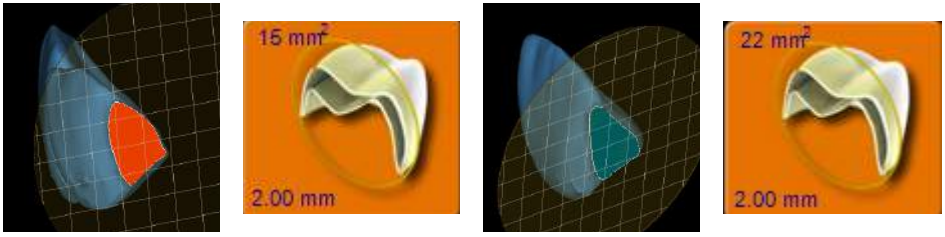


Posterior cases tend to have wider contacts with smaller embrasures and are unlikely to be thin. Anterior cases have smaller contacts and larger embrasures. Any thin area should be evaluated.

4 Move the Slice Plane to a connector. If the Slice Plane needs to be rotated to slice through the thinnest part, hold down the **Ctrl** key while moving the mouse to rotate.

5 Rotate the model to view the slice.

6 If the slice is red, adjust your embrasures and/or contacts and try the simulation again. Note that when the model is hidden, the Slice Plane icon displays the mm^2 area.



Minimum required thickness:

- Zirlux FC2 - 9 mm^2
- Telio CAD - 12 mm^2
- IPS e.max - 16 mm^2

7 Click **View Model** to activate it.

8 Click the **Gingival** View Control arrow to view the model from underneath.

9 Look for internal hangups (blue seen through the stone model on the axial walls or occlusal surface). Blue around the margin is expected due to the margin ramp. If there are any hangups, adjustments need to be made to the Spacer on the Design tab. Call Customer Support for help on your first few cases of hangups on Bridges.

Spacer Tool Settings on Bridges

The default Spacer Tool settings are different on bridges to account for the larger Path of Insertion.

The normal maximum for the spacer is 0.20 mm. On bridge cases, the spacer defaults to 0.20 mm and can be increased to 0.30 mm.

A larger default margin ramp of 1 mm is used to aid in stability.

Chapter 11
Data Management

Data Management

Archiving Patient Data

It is important to archive your patient data on the E4D hard drive to speed processing.

The patient files can be archived onto your network, a flash drive, or another external USB device.

1 On the Design Center Windows Start menu, click **My Computer.**

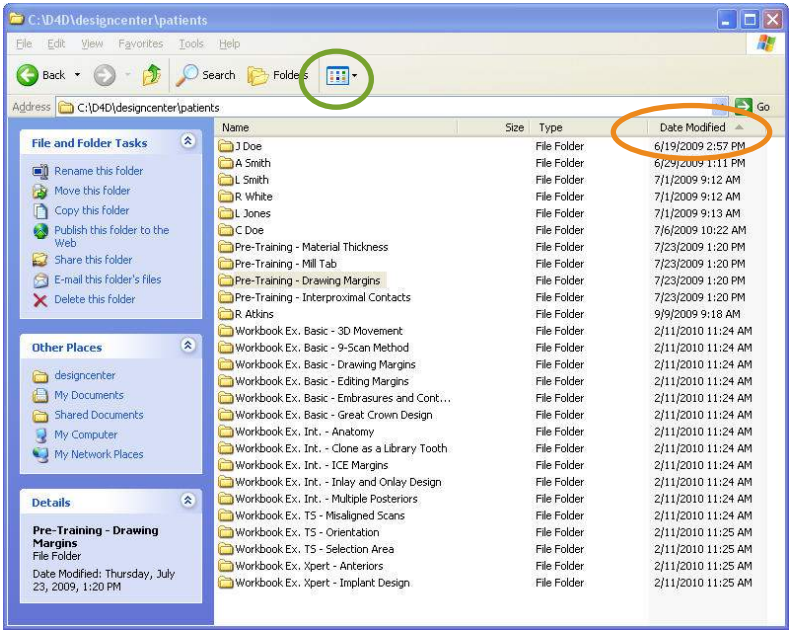
2 Double click the **C** drive.

3 Double click the **d4d** folder to open it.

4 Double click the **designcenter** folder.

5 Double click the **patient** folder.

6 Click **Date Modified** (circled in orange below) to sort the list. If Date Modified is not showing, click Views (circled in green) and select Details.



7 Highlight the older patient folders you want to archive.

8 Press **Ctrl+X** to cut the highlighted folder(s). The files will not be deleted until they are pasted in another folder.

9 Click **My Computer** in the menu on the left.

10 Double click on the on the desired destination.

11 Press **Ctrl+V** to paste the files.

> **Note:** If preferred, you can use drag and drop instead of cut/paste to move the data to the desired destination.

12 Your files are now saved at the desired destination.

If preferred, you can copy and paste the patient folders and then return to the original folder to delete them manually.

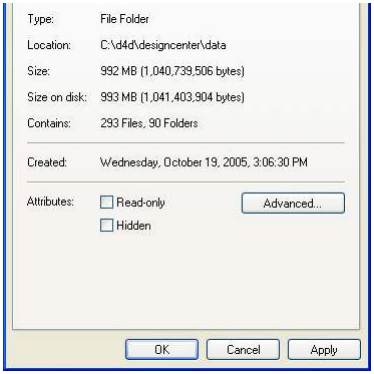
Backing up Patient Data

Patient data backups are recommended prior to update installations. Follow the archiving directions, but use **Ctrl+C** to copy the entire Patients folder instead of removing individual patient files. When backing up the data, you do not need to delete the files from the Design Center.

Restoring Patient Data

Archived or backed up patient data can be restored on the Design Center if needed.

1. On Start menu, click **My Computer.**
2. Open the folder that contains the saved patients.
3. Highlight the desired patient folder(s) and press **Ctrl+C** to copy.
4. Click **My Computer.**
5. Double click the **C** drive.
6. Double click the **d4d** folder to open it.
7. Double click the **designcenter** folder.
8. Double click the **patients** folder.
9. Press **Ctrl+V** to paste.
10. Right-click the pasted folder(s) and click **Properties.**



11. If **Read Only** is selected, clear the box and click **OK.**

Chapter 12

Scan and Design System Specifications

The components use standard electrical current.

Mobile Carts and Milling Centers

CE 0123 EC REP

EMERGO EUROPE
Molenstraat 15
2513 BH, The Hague
The Netherlands
Phone: +31.70.345.8570
Fax: +31.70.346.7299

Note: Caution: US Federal law restricts the mobile cart device to sale by or on the order of a dentist.

Intraoral Systems

Mobile carts are indicated for intraoral use.

- E4D Full System – Cart
- E4D Solo – Cart (with or without Design license)

Non-Intraoral Systems

Desktop and laptop systems are not indicated for intraoral use.

- E4D Full System – Desktop
- E4D Solo – Desktop (with or without Design license)
- E4D Design Studio – Laptop or Desktop (with or without Milling license)

● = Intraoral ○ = Non-Intraoral		
		Model Number:
●		E4D-D0S1, E4D-D0S2,
	○	E4D-LABW1, E4D-DLS2, E4D-STU1
		Electrical Ratings:
	○	120-240Vac, 50-60Hz, 350W
●		E4D-D0S1 - 120/240 Vac, 350 W, 50/60 Hz E4D-D0S2 - 100-120, 200-240 Vac, 350 W, 50/60 Hz
●	○	Storage conditions: -20 °F to 100 °F (-29 °C to 38 °C)
		Operating conditions:
●		67.5 °F to 82.5 °F (20 °C to 28 °C) < 90% non-condensing relative humidity maximum altitude 6,562 ft (2,000 m)
	○	Indoor use only 41 °F to 104 °F (5 °C to 40 °C) Transient overvoltage category II per IEC 60364 Maximum altitude 6,562 ft (2,000 m) Maximum 80% non-condensing relative humidity for temperatures up to 88 °F (31 °C) decreasing linearly to 50% relative humidity at 104 °F (40 °C) Pollution degree 2
●		Dimensions: 51 in. (1299 mm) tall x 18 in. (465 mm) wide x 22 in. (559 mm) deep
●		Minimum Clearance: Sides: 1 in.; Rear: 2 in.; Top: 1 in.
●		Weight: 95 lb. (43 kg)

Cables

When connecting components, ensure you use only the cables provided with the system. The following cables were provided with the Design Center.

IOD Interface Cable	Ground bonded, shielded, maximum 66 in. long

Wireless Component Specifications

The E4D CAD CAM System features a number of wireless components. This section lists each component and provides technical specifications.

Wireless USB Ethernet Adapter

Compatibility	IEEE.802.3, IEEE.802.3u, IEEE.802.11g, IEEE.802.11b

Wireless Mouse

Frequency Range	2,402.0-2,473.0 MHz

Wireless Keyboard and Mouse

For desktop and laptop systems.

Frequency Range	27MHz

Applicable Standards

Intraoral Systems

Electrical and Mechanical Safety	ANSI/AAMI ES60601-1:2005, 3rd Ed w/Rev 2010 UL 60601-1, 1st Edition:2006 CAN/CSA C22.2 No. 60601-1:2008 w/Rev 2011 CAN/CSA C22.2 No. 601.1-M90:2005 IEC 60601-1:1995 2nd Edition IEC 60601-1:2005 3rd Edition w/Rev 2009 EN 60601-1:2006 + Corr. 2010
EMC	IEC/EN 60601-1-2
Laser	IEC/EN 60825-1 CFR 21, Part 1040 FDA Laser Notice 50
Packaging and Environmental	ISTA Class 2B
Biocompatibility	ISO/EN 10993
Additional Standards	IEC/EN 60601-1-1 ISO/EN 14971 IEC/EN 60601-1-4 EN ISO 13485:2003/AC:2009 ISO 13485: 2003 CFR 21, Part 820 SOR-98-282 Canada Medical Device Regulations FDA Class II Special Controls for Computer Assisted Design and Manufacturing of Dental Restorations European Directives • 93/42/EEC for Medical Devices • 2006/42/EC for Machinery • 1999/5/EC for Radio & Telecom

Non-Intraoral Systems

Laser	IEC/EN 60825-1 CFR 21, Part 1040 FDA Laser Notice 50
Packaging and Environmental	ISTA Class 2B
Additional Standards	ISO/EN 14971 EN ISO 13485:2003/AC:2009 ISO 13485: 2003 CFR 21, Part 820 SOR-98-282 Canada Medical Device Regulations FDA Class II Special Controls for Computer Assisted Design and Manufacturing of Dental Restorations European Directives • 93/42/EEC for Medical Devices • 2006/42/EC for Machinery • 1999/5/EC for Radio & Telecom

Approvals (All Systems)

North America	Product Safety Mark (NRTL) - UL C/US
International	CB Scheme Test Certificate (UL) CE Mark (TUV)
Quality System Certifications	ISO 13485 Registered Firm CMDCAS (Canada) Japan GMP

Electromagnetic Emissions

The E4D Design Center is intended for use in the electromagnetic environment specified below. The customer or the user of the E4D Design Center should ensure that it is used in such an environment.

Emissions Test	Compliance	Electromagnetic Environment - guidance
RF emissions CISPR 11	Group 1	The E4D Design Center uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class A	The E4D Design Center is suitable for use in all establishments other than domestic and those directly connected to the public low voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations / flicker emissions IEC 61000-3-3	Complies	

Electromagnetic Immunity

The E4D Design Center is intended for use in the electromagnetic environment specified below. The customer or the user of the E4D Design Center should ensure that it is used in such an environment.

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment - guidance
Electrostatic discharge (ESD) IEC 61000-4-2	+/- 6 kV contact +/- 8 kV air	+/- 6 kV contact +/- 8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%
Electrical fast transient / burst IEC 61000-4-4	+/- 2 kV for power supply lines +/- 1 kV for input/ output	+/- 2 kV for power supply lines N/A	Mains power quality should be that of a typical commercial or hospital environment

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment - guidance
Surge IEC 61000-4-5	+/- 1 kV differential mode +/- 2 kV common mode	+/- 1 kV differential mode +/- 2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5% Ut (>95% dip in Ut) for 0,5 cycle 40% Ut (60% dip in Ut) for 5 cycles 70% Ut (30% dip in Ut) for 25 cycles <5% Ut (>95% dip in Ut) for 5 sec.	<5% Ut (>95% dip in Ut)for 0,5 cycle 40% Ut (60% dip in Ut)for 5 cycles 70% Ut (30% dip in Ut)for 25 cycles <5% Ut (>95% dip in Ut)for 5 sec.	Mains power quality should be that of a typical commercial or hospital environment.
Power frequency (50/60 Hz) Magnetic field IEC 61000-4-8	3 A/m	N/A (The E4D Design Center has no magnetically susceptible components.)	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
Note: Ut is the a.c. mains voltage prior to application of the test level.			

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment - guidance
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	3 Vrms	Portable and mobile RF communications equipment should be used no closer to any part of the E4D Design Center, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance $d = 1.2\sqrt{P}$ $d = 1.2\sqrt{P}$ 80 MHz to 800 MHz $d = 2.3\sqrt{P}$ 800 MHz to 2.5 GHz where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in metres (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,[a] should be less than the compliance level in each frequency range.[b] Interference may occur in the vicinity of equipment marked with the following symbol: 
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.5 GHz	3 V/m	

NOTE 1 At 80 MHz and 800 MHz, the higher frequency range applies.

NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

a. Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the E4D Design Center is used exceeds the applicable RF compliance level above, the E4D Design Center should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the E4D Design Center.

b. Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.

Recommended Separation Distances

Recommended separation distances between portable and mobile RF communications equipment and the E4D Design Center

The E4D Design Center is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the E4D Design Center can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the E4D Design Center as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter W	Separation distance according to frequency of transmitter m		
	150 kHz to 80 MHz $d = 1.2\sqrt{P}$	80 MHz to 800 MHz $d = 1.2\sqrt{P}$	800 MHz to 2.5 GHz $d = 1.2\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in metres (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

IOD Specifications

Warning Using controls, making adjustments, or performing procedures in a manner other than is specified in this documentation may result in hazardous radiation exposure.

Laser Class[a]	Class 1
Output	161.3 µW (Illumination Mode) 27.6 µW (Normal Scanning Mode)
Pulse Duration	25 µS
Wavelength	658 nm
Beam diameter	800 µm
Beam divergence	1.6 mrad

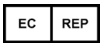
a. Laser product classified to standard IEC60825-1, Edition 1.2, August 2001.

The scanner laser projection system utilizes a collimated beam powered by a non-accessible laser source with a maximum power output of 130 mW. The scanner incorporates safety features that prevent exposure to any hazardous levels of laser radiation in normal operation modes and in any reasonable fault conditions.

Labels

Symbols

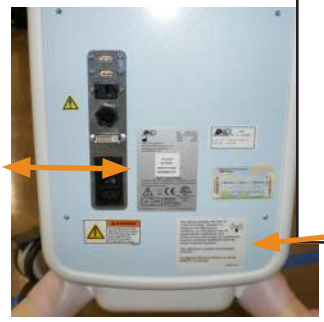
The following symbols are used on various labels on the system.

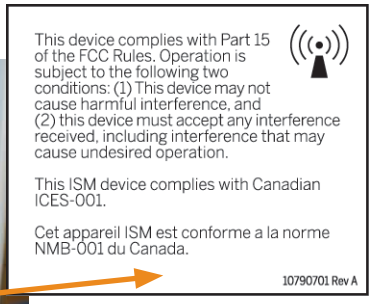
Symbol	Definition
	Alternating Current IEC 60417-5032
	Authorized Representative in the European community
	Caution: See instructions for use.
	Date of Manufacture
	This product must NOT be disposed of with other waste. It is the user's responsibility to dispose of their waste electrical and electronic equipment by handing it over to an approved reprocessor, or by returning it to E4D Technologies for reprocessing. For more information about where you can send your waste equipment for recycling, please contact your local city office or E4D Technologies.
	Do Not Reuse ISO 7000-1051
	European conformity
	Manufacturer
	OFF Power IEC 60417-5008

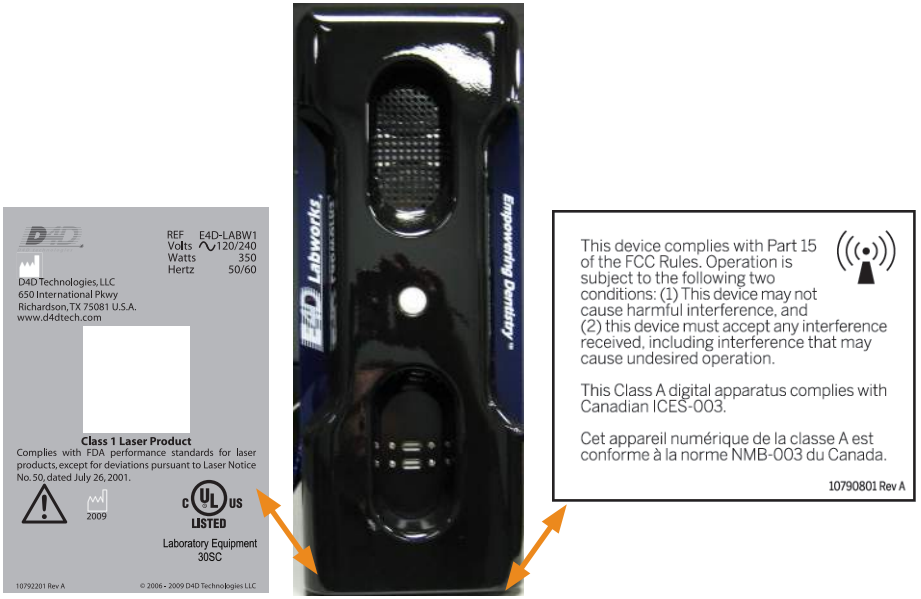
Symbol	Definition
	ON Power IEC 60417-5007
	On/Off Power IEC 60417-5010
	Operating Instructions ISO 7000-1641
	Protective Earth IEC 60417-5019
	Type B Applied Part IEC 60417-5840
	Warning: Dangerous Voltage ISO 3864-B.3.6
	General Warning ISO 7000-W001

Product Identification Labels

Affixed to the Design Center are product identification labels that contain identification and safety information. Be certain to read all product labeling. The following figures show each safety and warning label and describe where on the apparatus each can be found. The identification label for the Labworks is on the bottom of the computer.







Note: If any of the labels are missing or illegible, please contact E4D Technologies Customer Support for replacement labels.

Note: Label examples are not shown actual size. The labels may have changed since this book was published.

Attention Labels

Attention labels are located in numerous places on the E4D components. These labels direct you to specific safety entries in this user manual. Adhere to all such safety warnings at all times.

External Components and Connectors

When connecting external components to the E4D system, attach only components that have been tested for compliance with IEC 60601-1 or UL 60950.

Connectors for attaching external devices conduct low voltages. Avoid touching the connector pins.

Protected Earth Ground Label

The Protected Earth Ground label is attached to the Design Center and Milling Center e-boxes as shown.

Fuse Replacement

The E4D fuses are not user-replaceable. For fuse replacement, contact customer service. A service technician will replace fuses only with fuses having the specified voltage and current ratings.

S

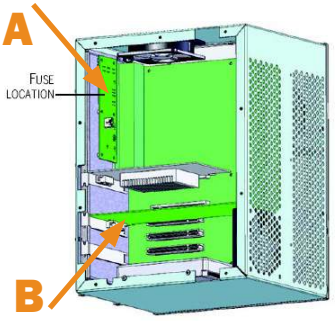
Internal Fuses

A

- F2-F10, F12, F13 - 1A/125V/FF/50A IR
- F11, F14 - 4A/125V/FF/50A IR

B

- F1, F2 - 2A/63V/FF/50A IR
- F3, F4 - 1A/125V/FF/50A IR



UL Listing: Scan and Design Center

UL Medical Equipment Listing

For intraoral cart scanners only.

MEDICAL - GENERAL MEDICAL EQUIPMENT

AS TO ELECTRICAL SHOCK, FIRE AND MECHANICAL HAZARDS ONLY

IN ACCORDANCE WITH ANSI/AAMI ES60601-1 (2005, 3rd ed.)

UL 60601-1, 1st Edition:2006

CAN/CSA C22.2 No. 60601-1

CAN/CSA C22.2 No. 601.1-M90:2005

IEC 60601-1-1

IEC 60601-1-2

IEC 60601-1-4

IEC 60825-1

30SD

Applied Part Label

For intraoral cart scanners only.

The Applied Part label is attached the scanner cradle of the Design Center.

Power Supply Cord

The power supply cord features an information label, shown below for reference.

Chapter 13
Design Center Troubleshooting/Repair

If you have questions, please contact Customer Support at

Toll Free	800-537-6070
E-mail	customersupport@e4d.com
Fax	972-479-1106
Hours of Operation Monday - Thursday Friday	 7 am – 7 pm CT 8 am – 5 pm CT
Web site	www.e4d.com
Mailing Address	D4D Technologies LLC dba E4D Technologies 650 International Pkwy Richardson, TX 75081

Symptom	Probable Cause	Corrective Action
No power	Power cable unplugged	Verify power cable is plugged into a live AC outlet.
	Outer power supply switch turned OFF	Set power supply rocker switch at rear of the unit to “ON” position.
	Inner power supply switch turned OFF	Ensure switch on power supply is turned ON. (Call Customer Support)
Login screen appears	Screensaver login turned ON	Go to properties, then screen saver and turn it OFF.

Symptom	Probable Cause	Corrective Action
Failing to send restoration		(See Job Server troubleshooting).
Fan making loud noises		Replace fan. (Call Customer Support)
	Out of balance	Call Customer Support.
DentaLogic™ application freezing	Low memory	Re-start application or re-start system.
Mouse not responding	Low batteries	Replace batteries.
	Loose mouse dongle	Ensure dongle under keyboard has not vibrated loose. Press the connect button to make sure it is activated.
Laser flickering	IOD Cable not grounded properly	Call Customer Support.
Skyball not responding	USB cable not plugged in	Plug USB in
	3D Connexion settings are incorrect	Open the 3D Connexion program and check the settings.

Chapter 14
Milling Center Introduction

Turn ON the Job Server

Press the **Power** button on the front of the Job Server to turn it ON. No monitor or mouse needed.

Turn OFF the Job Server

The Job Server can be left ON overnight, but it should be shut down and restarted every few days.

Press and hold the Power button on the front of the Job Server. Release after a few seconds. The power light will turn OFF.

Turn ON the Milling Center

Power Buttons

Press the small round button on the front of the Milling Center to turn it ON.

Note: The power button on the back of the mill shuts off electrical power to the mill. This is generally left ON. The red button on the front of the mill will stop/abort the milling process.

1 **Stop/Abort** 2 **Power**

The screen on the mill is a touch screen. No mouse is needed.

Display Screen

When the Milling Center application loads, the following screen appears.

1 Close the lid and remove the interlock key if needed.

> **Note:** The interlock key is used by service technicians for diagnostic purposes and is located on the right side of the mill.

2 Touch **YES** and wait for the machine to finish initializing. The lid lights turn green when the mill is ready.

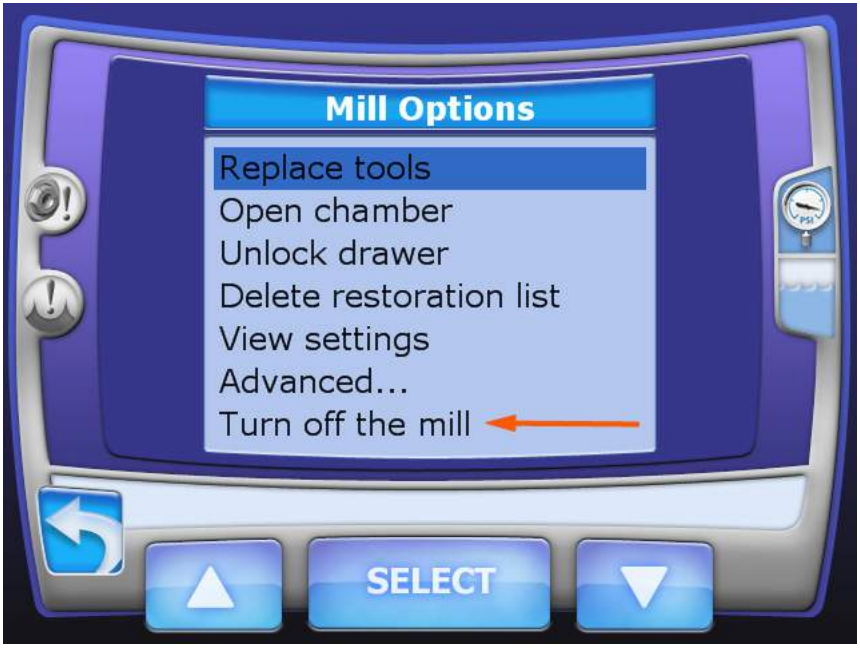
Lid Lights

The lid lights change color based on the status of the mill.

Lid Color	Description
Blue	Mill is initializing.
Green (solid)	Mill is idle or is milling. It can accept instructions (select restorations, cancel milling, replace tools, etc.)
Green (flashing)	Milling complete. The restoration has completed milling and the lid is open.
White	Lid is open.
Yellow	Warning is being displayed.
Red (solid)	The mill is in the “diagnostic” mode. Re-initialize the mill to return to idle.
Red (flashing)	The mill has faulted. Warning screen: Re-initialize to clear the fault or enter the diagnostic state to attempt to diagnose the problem.

Turn OFF the Milling Center

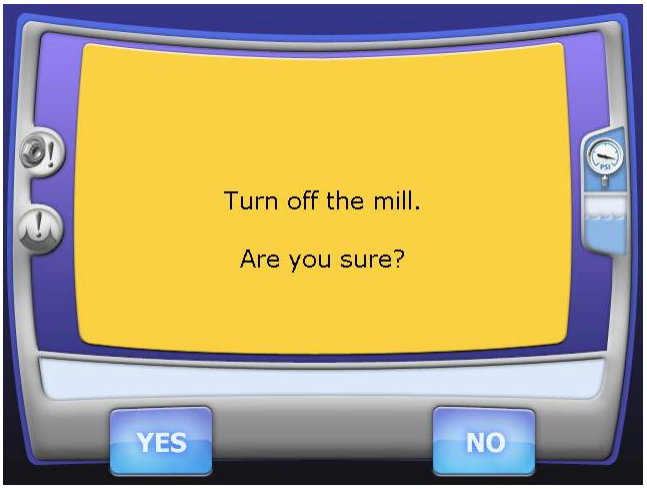
1 Touch **Maintenance** to see the Mill Options screen.



2 Touch **Turn OFF the mill.**

3 Touch **Select.**

A verification screen appears.



4 Touch **Yes** to turn OFF the mill. Touch **No** to leave it ON.

The desktop for the operating system appears.

5 Touch **Start.**

6 Select **Shut Down.**

Relocating the Milling Center

Warning: The Milling Center weighs approximately 220 lb. (100 kg). Always follow these guidelines when relocating the mill.

Be certain to drain the Milling Center's fluid reservoir before moving the unit.

The Milling Center is designed to operate on a level and stable surface in an environment free from excessive moisture or dust. The mill should be located away from the patient access area. When choosing a location for the mill, adhere to all clearance requirements stated in System Specifications.

1 Ensure no milling operations are in progress.

2 Open the front access panel and remove the fluid reservoir.

3 Empty the fluid reservoir according to your approved material disposal protocols.

4 Turn OFF the mill.

5 Disconnect all power and data connections.

6 Lift the mill onto a cart that is capable of supporting the weight of the mill and its accessories. You are advised to use a suitable cart rather than moving the mill by hand. Lifting and carrying should be kept to a minimum.

Note: The mill weighs approximately 220 lbs (100 kg). Lifting the mill requires at least two people.

Those lifting the Milling Center should:

- Stand close to the mill with their feet approximately shoulder width apart, and one foot slightly in front of the other for optimal balance.
- Squat down by bending at the knees, not at the waist, keeping their backs as vertical as possible.
- Firmly grasp the mill before beginning the lift.

Note: Be certain to lift the mill by the underside metal framework, not by the plastic housing.

- Refrain from twisting their bodies and slowly begin lifting, using their legs, not their back, to lift.
- Keep the mill as close to the body as possible to minimize stress on the back.
- If turning is required, turn by shuffling their feet, not by twisting their body.
- If it is necessary to place the mill below the level of their waists, each person lifting should follow these procedures in reverse order, keeping their backs vertical and bending at the knees.
- Be careful to avoid obstacles.

System Information and Upgrades

Software and Hardware

System software and hardware upgrades are initiated through E4D Technologies only. No software or hardware should be added or deleted to/from the E4D systems without prior approval of E4D Technologies. Doing so may result in damage to the system and will void the product warranty.

Job Server Software Version

The version of software on the Job Server will not be accessible without keyboard and monitor. If there is a question on the version of software, please contact a Customer Support Representative.

Milling Center Software Version

1. To view the version of software being used on the Milling Center, select Maintenance from the Home screen.
2. From the Mill Options screen, select **Support Console.**
3. Select **Configuration.**
4. Select **Versions.**

   The Model Number and Serial Numbers are on this screen.

   When placing a call for service or support, you may be asked to provide the serial number, model number, software version number, or similar identifying data. The serial number and model number are located on the Product Identification Label, affixed to the rear of each unit. See “Product Identification Labels” on page 180.

Chapter 15
Milling Center Safety

Warning: Failure to adhere to all safety warnings may result in personal injury, equipment damage, or data loss.

The Milling Center weighs approximately 220 lb. (100 kg). When lifting or moving the mill, follow the guidelines in *"Relocating the Milling Center" on page 193*.

Always ensure the Milling Center is on a surface capable of supporting its weight of approximately 220 lb. (100 kg).

Use caution when handling the Milling Center's cutting tools.

Before milling a restoration, ensure the Milling Center has adequate milling fluid. Adequate milling fluid is required to prevent overheating and possible damage to the restoration blank and cutting tools.

Do not open the Milling Center cover while a milling operation is in progress. Doing so will result in the loss of data and restoration block; the milling process will have to be repeated.

To prevent flooding the interior of the Milling Center, do not refill the mill's fluid tank by adding fluid to the milling chamber. Instead, open the fluid tank drawer, remove the fluid tank, and add fluid to the fluid tank directly.

This equipment is intended to be grounded. Connect the E4D products to earth grounded outlet only.

If a power cord (other than the one provided with the equipment) is used for connecting to the power source, ensure it meets all of the following requirements:

- Detachable power supply cord
- Type SJT
- 18 AWG
- 3 conductor
- Rated 10 A or better
- For products outside of the United States and Canada, the power cord must be marked “HAR” or with a suitable agency marking from the country of intended use. The attachment plug and appliance coupler must be marked with a suitable agency marking from the country of intended use.

Do not use the E4D products for any purpose other than its intended and labeled use.

To prevent electrical shock, do not open any sealed or user restricted access panels or connectors.

A detachable non-locking type power cord has been provided with this equipment as the disconnect device. Do not block access to the power cord. In case of emergency, remove power from the device by unplugging the cord at either end.

Do not block any of the E4D product’s cooling vents. Doing so may result in overheating and damage to the products and will void the product warranty.

When placing components, adhere to all clearances stated in *“Minimum Clearance” on page 239*.

Do not make any unauthorized repairs or modifications to the system software or hardware. This includes installing unauthorized software on the E4D computer system or altering or bypassing any safety switches or mechanisms.

Do not install or operate the E4D products in an environment where an explosion hazard exists, e.g., high oxygen area.

Comply with all applicable regulations when disposing of waste materials from the E4D products.

Do not attach any equipment or devices to the E4D products unless their use has been specifically authorized by E4D Technologies.

The wireless components in the E4D products may be interfered with by other equipment, even if the other equipment is fully compliant with CISPR (International Special Committee on Radio Interference) emission requirements.

When possible, electrical equipment should not be used when adjacent to other electrical equipment. If adjacent use is necessary, the equipment should be observed to verify normal operation in the configuration in which it will be used.

When connecting the E4D components, use only the cables supplied with the products. Failure to do so may result in increased electromagnetic emissions or reduced immunity to external electromagnetic emissions.

Ensure your E4D products are properly maintained through periodic maintenance.

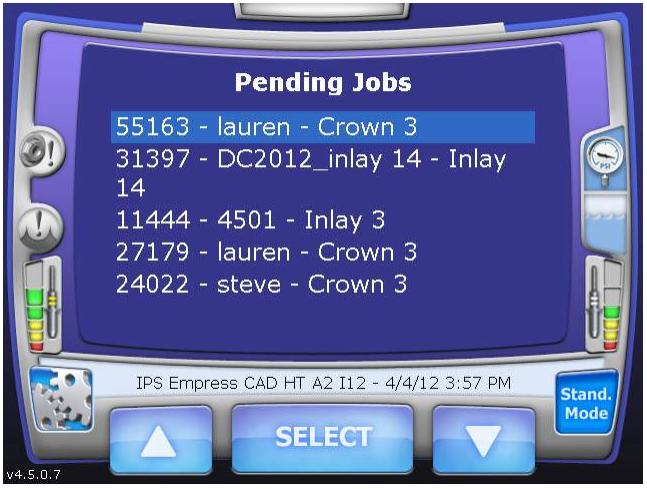
If you suspect equipment malfunction or failure, discontinue using the E4D products and contact E4D Technologies Technical Support immediately. Do not attempt to make any repairs on the E4D products.

Read and comply with all safety, warning, and instructional labels on the E4D products.

Chapter 16
Operating the Mill

Pending Jobs

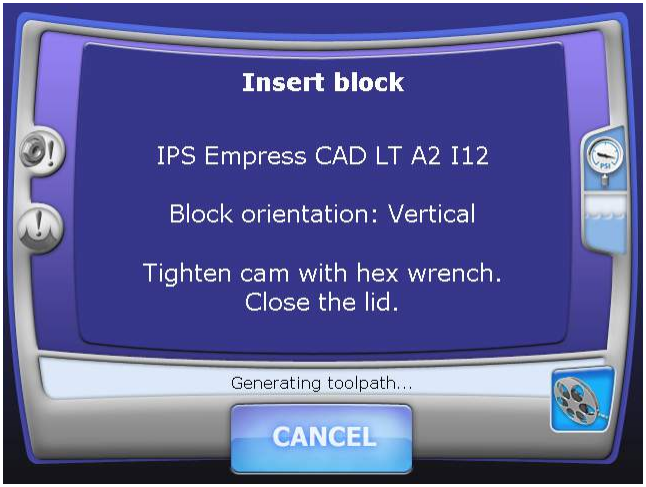
The Pending Jobs list is the default screen.



1 Scroll to find the desired restoration by touching the up and down arrows. When the restoration is highlighted, touch **Select.**

Note: Always wait until the lid lights turn green before making any selections on the touch screen.

2 The system opens the lid and prompts you to insert the block that matches the material selected in the Design Center.



Inserting Blocks

Blocks can be inserted vertically or horizontally. The Insert Block screen specifies the block orientation. Notice the notches face right in the examples below. If the notch is pointing to the left, you will not be able to insert the block. Round blocks use the vertical orientation of the mandrel.

Note: The mandrel is the metal piece of the restoration block that is inserted into the mill to hold the block steady during milling.

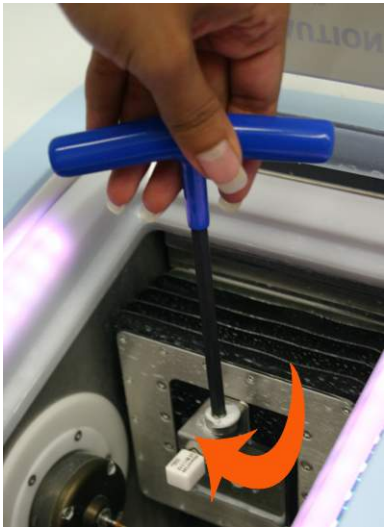
Horizontal Orientation

For the horizontal orientation, the wide side of the rectangular block faces up, with the mandrel notch points to the top right. This side will usually have the printed label. Note the position in the picture below.

Vertical Orientation

For the vertical orientation, the narrow side of the rectangular block faces up, with the mandrel notch points to the bottom right. The round blocks are inserted with vertical orientation.

1. Insert the Mandrel T-Handle into the cam and turn 180 degrees counter-clockwise to loosen the cam.
2. Insert the block in the correct position and lock the block in place by tightening the cam.

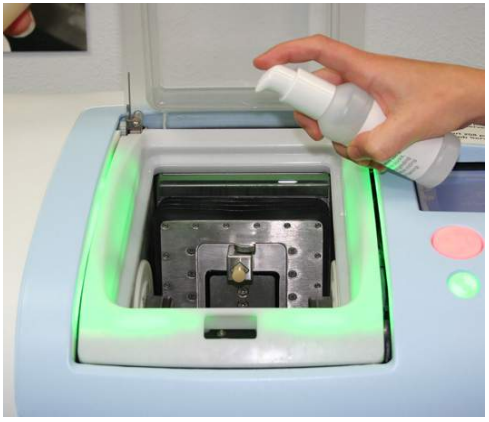


To view a video that demonstrates the block insertion procedure, touch the movie icon. Use this process in reverse for unloading the finished restoration.

Composite Block Defoaming Solution

A Composite Block Defoaming Solution is used with 3M's Paradigm MZ100 blocks. Due to the nature of the composite material when milled, it is necessary to use this solution every time you mill with the MZ100 block. Without the defoaming solution, the milling fluid may foam and overflow.

1. After inserting the MZ100 block into the milling chamber, shake the bottle of defoaming solution and position it over the chamber.



2. Press down once to release the solution directly into the milling chamber.
3. Close the chamber and begin the milling process as explained below.

Zirlux FC2 Scale Factor

See the manufacturer's Instructions for Use provided with the Zirlux FC2 blocks for processing instructions.

Zirconia shrinks in the sintering oven. There are numbers on the side of the box that the blocks come in. You must keep this box with the blocks. Do not mix blocks from different boxes. Each box can have a different amount of shrinking. The Milling Center asks for the Scale Factor before a Zirlux FC2 is milled. The system will increase the size of the restoration according to this number. This means you cannot test the fit of the restoration before sintering.

Note: It is necessary to clean the mill and change the water **before** milling Zirlux FC2. If the zirconia is contaminated with other materials, it will turn green when sintered. Cleaning after milling is recommended because the zirconia acts as a thickening agent with the water.

Starting Milling

Milling is an automated process that varies in length of time based on the restoration data.

1 After inserting the block, close the lid and wait for the lid lights to turn green.

The system checks the positioning of the block and begins generating the toolpath.

You may wait a few minutes for the toolpath to be generated and then see the milling time in the Time Remaining field.

Note: See the Troubleshooting section for assistance if you experience a problem generating a tool path or if the mill times out.

After the milling process is complete, the lid automatically opens.

2 Remove the restoration and any debris and close the lid.

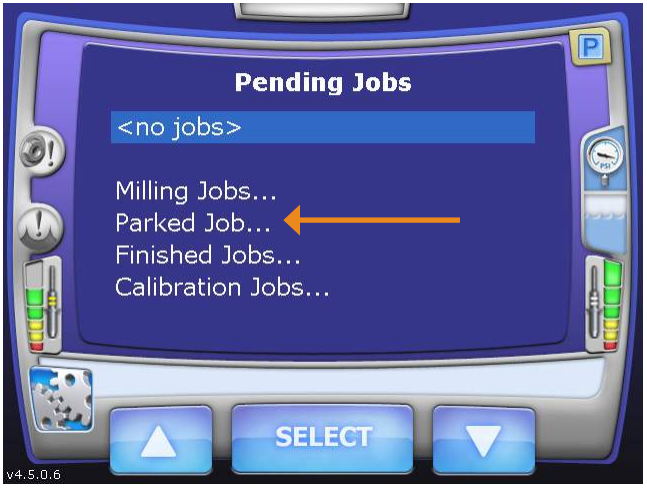
Parked Job

When a job is interrupted by an error message or a manual cancellation of the job, it is saved in Parked Job. Only the most recent job is available in Parked Job.

Note: Jobs interrupted by a power failure are not parked.

When a job has been saved, an icon will appear in the corner to notify you.

1. To restart the interrupted job, touch **Parked Job...**



2. Touch **Select.**
3. Reinsert the partially milled block if it had been removed.

Note: Do NOT insert a new block for a Parked Job. A new block will result in **broken tools.** To restart the job with a new block, use Pending Jobs.

4. Follow the on-screen instructions.

   The milling restarts from where it was cancelled.

Finished Jobs

Previously finished jobs can be milled again if desired.

1 To see a list of Finished Jobs, scroll to the bottom of the Pending Jobs list.

2 Touch **Finished Jobs...**

3 Touch **Select.**

The Finished Jobs list appears.

4 Touch the desired job to highlight it.

5 Touch **Select.**

You are prompted to insert the appropriate block. Milling continues as usual.

Deleting Jobs

Using the Delete Job List tool to delete individual jobs or all of the pending and finished jobs. This does not affect the patient or restoration lists in the Design Center.

1 Touch the **Maintenance** button.

The Mill Options screen appears.

2 Touch **Delete job list.**

The job list is displayed with the text in yellow. This indicates that the mill is in the delete mode.

3 Stay on the Pending Jobs screen to delete a job from the pending list or touch Finished Jobs to switch to that job list.

4 Touch a job to highlight it.

5 Touch **Select.**

A warning message appears asking if you are sure you want to delete the job. Touch **Yes** to delete the job.

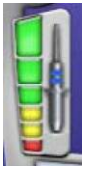
6 If you want to delete all of your pending and finished jobs, touch **All Pending, Parked, and Finished Jobs...**

7 Touch the **Return** button to return to the restoration list.

Automatic Tool Changer

The Milling Center's automated tool changer holds an array of grinding tools. The tool changer switches between grinding tools as the milling task demands.

The main screens display a graphic that indicates the age and type of tool in each spindle.



Minutes Used in Milling	Indicator Bars
0-39	3 Greens
40-79	2 Greens
80-119	1 Green
120-139	2 Yellows
140-159	1 Yellow
160+	1 Red

Tool Type	Tool Stripe Color
Ellipsoidal	Yellow
Tapered	White
Conical	Blue

Use "Replacing/Inserting Tools" on page 210 to fill the tool changer, exchange tool shapes, or to replace broken tools.

Broken Tools and Restoration Inspection

If a conical tool breaks halfway instead of at the shoulder, the broken tool may not be detected right away. If the broken tool continues to mill, it can cause damage or put black marks on the restoration.

By default, the new Restoration Inspection feature is activated.

If a tool breaks:

- The lid lights turn blue and the lid pops open
- The operator assesses the restoration and closes the lid

Once the lid is closed, a new message displays.

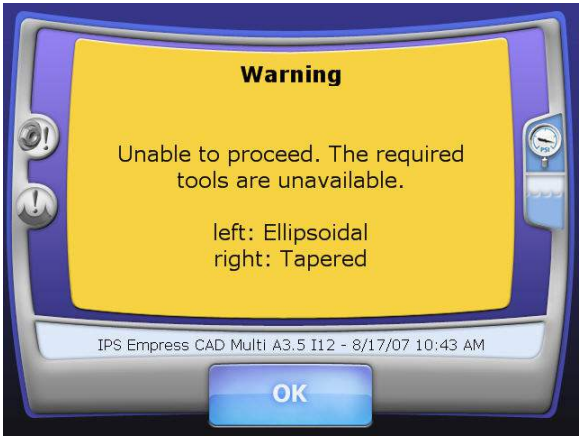
If the restoration has black marks or has come off of the mandrel, click No. The lid pops open. Remove the block. Select the job to restart milling. The system will prompt you to insert a new block at the beginning of the restarted milling process.

To continue milling with a new tool, click Yes.

To deactivate this feature, contact Customer Support.

Replacing/Inserting Tools

If a needed tool is not already in the tool changer, the following message will appear.



The reasons for replacing a tool include:

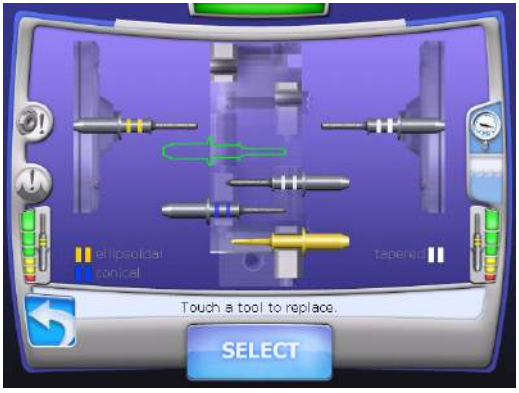
- Tool(s) needed for the restoration are not in the tool changer.
- Fill empty slots in tool changer.
- Tool in spindle is broken.

- Tool is too worn down to use.

1 On the Home screen, select **Maintenance.** The Mill Options menu appears.

2 Highlight **Replace tools** by either touching the screen or using the up/down arrows and touch **Select.**

The Replace tools screen appears. In the example below, there is a tool in each spindle, three extras in the tool changer, and one empty slot (green outline). There are two vacant places shown in the tool changer that do not have the green outline. The tools in the spindles will be placed there when they are being exchanged for another tool in the changer.



Empty

Tool
(colored stripes represent tool shape)

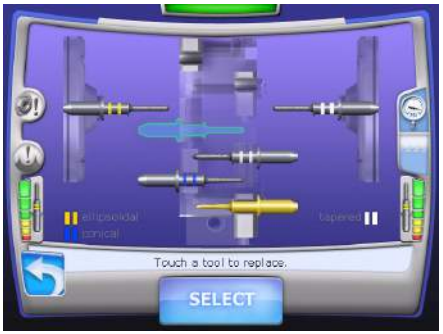
Old Tool

Worn Tool

Broken Tool

3 Touch the desired tool or empty slot.

The tool or empty slot changes color when selected. The bottom of the screen details the position, diameter, and elapsed time of the selected item. The tools are color coded to match the legend at the bottom of the screen.



4 Touch **Select.**

5 Highlight the shape of the new tool or touch empty to remove the tool without a replacement.

6 Touch **Select.**

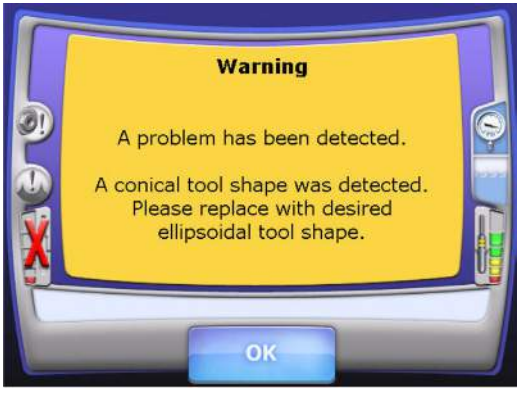
7 Remove the old tool from the collet.

8 Place the new tool in the collet. Ensure it is pushed all the way in (fully seated).

9 Close the lid.

10 The Milling Center seats and clamps the tool, profiles the new tool, and returns to the Mill Options screen when finished.

If the wrong tool shape was inserted, a message will appear. Click **OK** to insert the correct tool shape.



11 If you are filling the tool changer, repeat the steps above until there are no green outlines left.

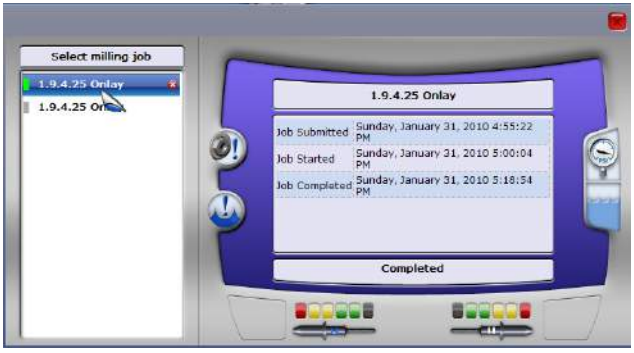
12 Touch the **Return** button to return to the restoration list.

Mill Status

Check the status of your job on the mill from the Design Center!

The Mill Status icon appears in the upper right corner on all Design Center screens. The icon is inactive on the Scan tab.

1. Click **Mill Status** to see the Job List on the mill.
2. Click a job on the left to see details on the right. The tools and status icons (water level, collet cleaning, etc.) reflect the state of the Milling Center at the time the restoration was milled.



The colors next to each job name indicate job status.

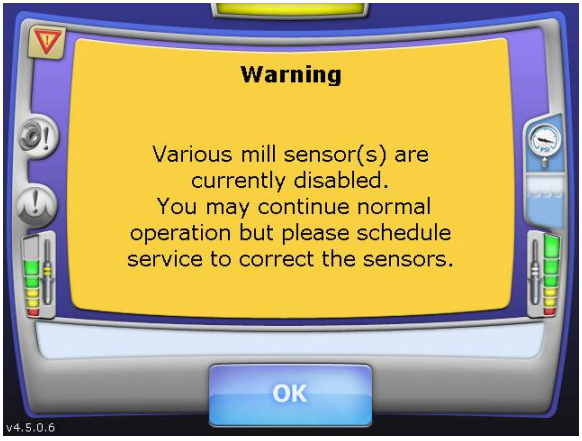
- Red - Attention Needed
- Yellow - Restoration Inspection
- Grey - Pending
- Blue - Milling
- Green - Finished
- Black - Cancelled

The Mill Status screen is for information only. Actions taken on this screen do not affect the Milling Center.

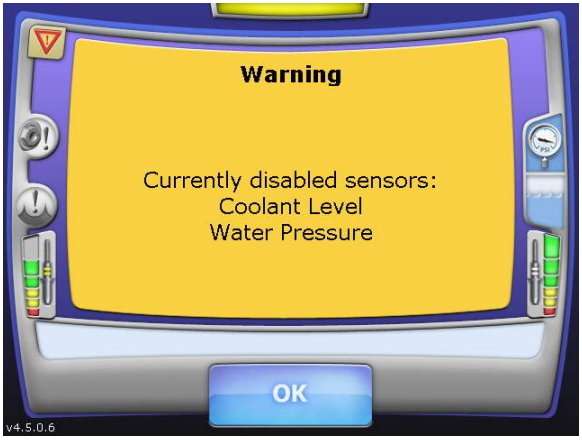
3. Click the red X next to completed jobs to remove the job from the status screen. This is recommended to keep the list at a manageable length. The job will still be available on the mill.

Override Mode

If the system has been put into Override Mode by Customer Support or a service technician, the following screen will be displayed upon startup.



The Override Warning icon appears on all screens. Touch the icon to view which sensors are being ignored.



When the Milling Center is in the Override Mode, normal operation can continue.

Chapter 17
Milling Center
Troubleshooting/Repair

If you have questions, please contact Customer Support at

Toll Free	800-537-6070
E-mail	customersupport@e4d.com
Fax	972-479-1106
Hours of Operation Monday - Thursday Friday	 7 am – 7 pm CT 8 am – 5 pm CT
Web site	www.e4d.com
Mailing Address	 D4D Technologies LLC dba E4D Technologies 650 International Pkwy Richardson, TX 75081

Milling Center

Symptom	Probable Cause	Corrective Action
Milling Center does not turn ON	Power cable unplugged	Verify power cable is plugged into a live AC outlet.
	Power supply switch turned OFF	Set power supply rocker switch at rear of mill to ON position.
	Faulty ON/OFF switch	Call Customer Support.

Symptom	Probable Cause	Corrective Action
Block orientation on mill incorrect.	Dirty Block Orientation Sensor	Using a small/long object, push very gently on the sensor switch two or three times.
Pump making fast thumping noise.	Dirty tank	Clean tank. May also have to clean the collets.
 Air failure message (icon turns red)	Loss of air pressure	Ensure there is power to the office compressor.
	Air line loose	Secure air line from compressor to mill.
Fluid Level Low Message	Low water supply	Fill tank with water.
	Faulty sensors	Clean or replace sensors (Call Customer Support)
Tool stuck in collet	Collet rusty or caked with ceramics	Remove tools manually. Done in the maintenance/command screen on mill. (Call Customer Support for assistance).
	Tool jammed due to air pressure	Verify the supply air pressure 50 psig. Verify the pressure multiplier is maxed out. i.e. the adjustment knob is turned fully clockwise this doubles the pressure to 100 psig.
Not generating tool path	Incomplete information from the Job Server	Restart Job Server and Milling Center.
Drawer won't close	Pump assembly is lowered because drawer was not closed properly. If the drawer is closed and reopened before it can lock or if it is left open when the mill is shut down, the pump assembly is lowered and in the way of the drawer path.	Press Maintenance. On the Mill Options screen, press Unlock Drawer. The pump assembly rises and allows the drawer to close.
		If the Maintenance button is not showing, press the Stop button until the current process is stopped.
Milling is not completing on the facial surface of an anterior tooth	Restoration is longer than normal	On the Design Center, change the block selection to Multi Block, but be sure to select the same block size. You can then insert a standard Empress LT or HT block of the same size. The Milling Center makes multiple passes on Multi blocks while other materials use a single pass.

Job Server

Symptom	Probable Cause	Corrective Action
Job Server does not respond	No power to Job Server	Make sure power cable is plugged into a live AC outlet
	Job Server process not running	Re-start Job Server
	Job Server turned OFF	Ensure Job Server is turned ON

Chapter 18
Preventive Maintenance/Cleaning

Routine Milling Center Maintenance

Cleaning Cycle: High volume offices should clean daily. Most offices will need to clean weekly.

Note: The mill must be cleaned more often when e.max or zirconia blocks are used.

Cleaning the chamber and replacing milling fluid are required to ensure proper operation of the mill.

Warning: Operating the Milling Center with insufficient milling fluid will damage the mill, void your warranty, and destroy the restoration that is being milled. Personal injury from the Milling Center overheating may result from inadequate milling fluid.

Clean Fluid Tank:

The Clean Fluid Tank icon turns red when the tank is scheduled to be cleaned. Touch the icon at any time to see how many milling hours are estimated before the tank needs to be cleaned.

1. Touch and hold the **Clean Fluid Tank** icon.
2. A message appears and shows the number of hours remaining before a scheduled cleaning is needed. Touch **Yes** to continue.
3. Follow the on-screen instructions for opening the drawer and removing the tank.
4. Remove the drain plug and tip the tank at an angle. Empty the liquid through the drain hole.
5. Rinse the tank and the strainer basket to remove any ceramic residue.
6. Insert the Nozzle Cleaning Brush into the small holes of the spindle cap.

7 Add one gallon of water (3.5 liters) and six ounces of fresh milling coolant to the tank.

Note: Milling coolant must be used or the warranty will be void.

8 Remove and clean the strainer when prompted by the on-screen instructions.

The tank, floats, and strainer should be cleaned once a week to prevent mold growth or build-up of ceramic material and for optimal circulation. High volume offices need to clean the strainer and fluid tank more frequently.

For Your Information

Dirty tank floats and strainer will affect the fluid pressure of the mill and not allow the Milling Center to work properly.

9 Reinstall the strainer and click **Next.**

10 Replace the tank in the drawer when prompted by the on-screen instructions.

11 Close drawer carefully, with audible click. The Milling Center automatically locks the drawer.

Refill milling fluids:

The water level icon shows when the water level is too low to continue milling.

1 In the Control Panel Home screen, touch **Maintenance.**

2 Select **Unlock drawer** on the Mill Options menu.

3 Follow the on-screen instructions for opening the drawer.

4 Remove the tank.

5 Add one liter (or quart) of water. If additional fluid is required, then perform a tank cleaning and replenish the tank with fresh coolant and water.

6 Replace the tank in the drawer.

7 Close drawer carefully, with audible click. The Milling Center automatically locks the drawer.

Clean the mill chamber:

1 Select **Open chamber** on the Mill Options menu.

The lid opens.

2 Wipe down the lid and the chamber.

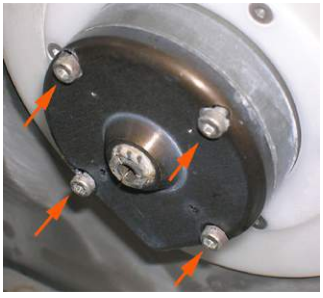
Spindle Cap and Collet Cleaning

Cleaning Cycle: As Needed

Over time, residue from the milling process may build up in the spindle caps and/or on the collet. This inhibits coolant delivery and/or reduces the spindle's tool holding capability. Clean the collets and spindle caps when the icon turns red or the tools "walk" (do not stay flush with the spindle) during a restoration. Replace the fluid regularly to reduce residue buildup.

The Collet Cleaning icon turns red when the collets and spindle caps are scheduled to be cleaned. Touch the icon at any time to see how many milling hours are estimated before the caps need to be cleaned.

There are two spindle cap types available on the Milling Center. Follow the directions for the spindle caps in your machine.

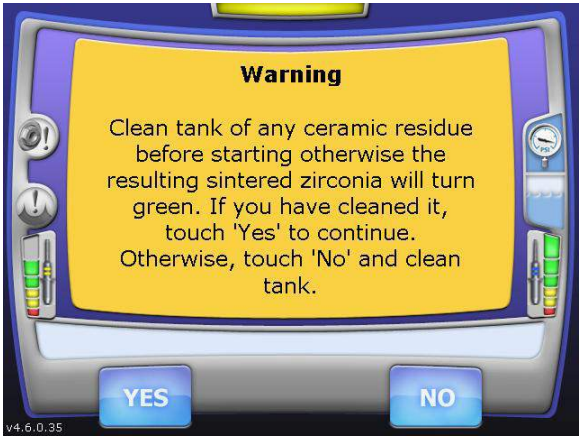


Spindle Cap A - four visible screws
See "Spindle Cap A" on page 222

Spindle Cap B - no visible screws
See "Spindle Cap B" on page 228

Zirlux FC2 Mill Maintenance

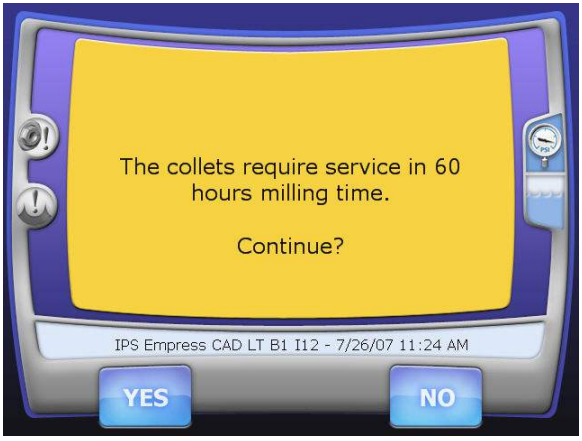
It is necessary to clean the mill and change the water **before** milling Zirlux FC2. If the zirconia is contaminated with other materials, it will turn green when sintered. Cleaning after milling is recommended because the zirconia acts as a thickening agent with the water.



Spindle Cap A

1 Touch and hold the **Collet Cleaning** icon.

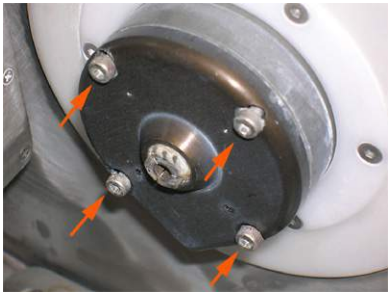
A message appears and shows the number of hours remaining before a scheduled cleaning is needed.

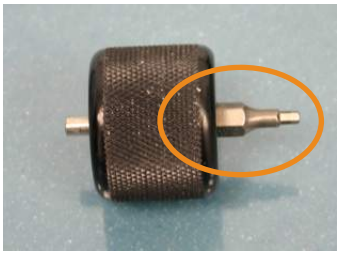


2 Touch **Yes** to continue.

The tools are automatically placed in the tool changer and the bellows are moved out of the way. The lid pops open when ready.

3 Use the hex wrench side of the collet tool to remove the (4) 3 mm screws from the spindle cap and remove the spindle cap and gasket. Ensure the gasket has been removed along with the spindle cap. Sometimes it sticks to the spindle housing.

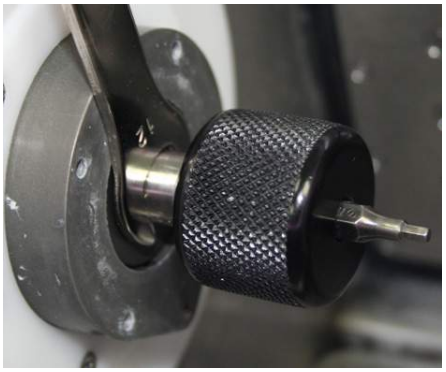




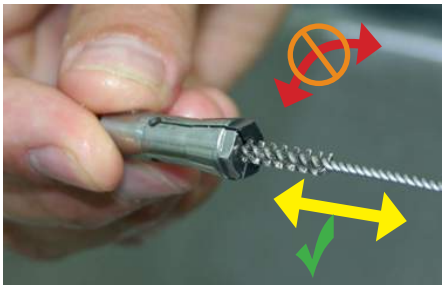
Collet Tool

Spindle Cap and Gasket

4 Remove the collet using the other side of the collet tool. If the spindle is turning instead of the collet, use the 12 mm side of the silver collet wrench to hold the spindle in place while you loosen the collet.



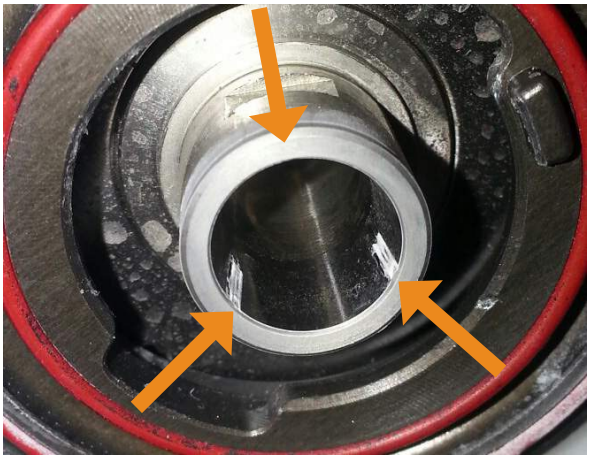
5 Rinse the collet and use the small silver wire brush to clean the inside, running it through a couple of times.



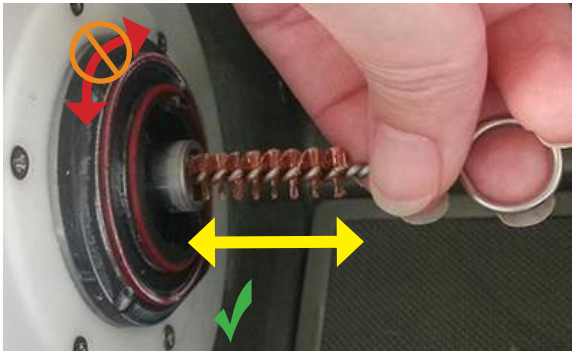
6 Clean the outside of the collet as well. Any debris on the collet will cause the tool to not seat properly.

7 In the spindle (collet shaft), you are likely to see 3 lines of debris that need to be cleaned. These are from the slits in the collet. If they are not cleaned, the collet will not seat properly and will lead to “walking tools”.

Note: The lines are not necessarily going to be positioned as seen in the example below. There will be three equidistant lines. The top one cannot be seen from the angle shown.



8 Use the larger bronze wire brush in the collet shaft. Be sure to use a straight in-and-out motion and do NOT use a circular motion.



Note: The air must be blowing during this step.

9 Use a dental mirror to inspect the spindle or rotate it using the wrench to ensure all the debris has been removed.

10 Use a DRY paper towel to wipe the inside of the collet shaft.

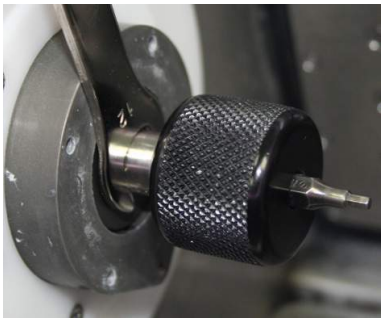
For Your Information

Cleaning the collets and spindles is a very important process to keep your Milling Center running smoothly. Dirt will cause the tools to “walk” (not be seated properly) and can cause broken tools.
Five minutes of cleaning can mean the difference between the pictures below. Focus on cleaning the tapered surface inside the shaft and the front face. The tapered surface is critical.

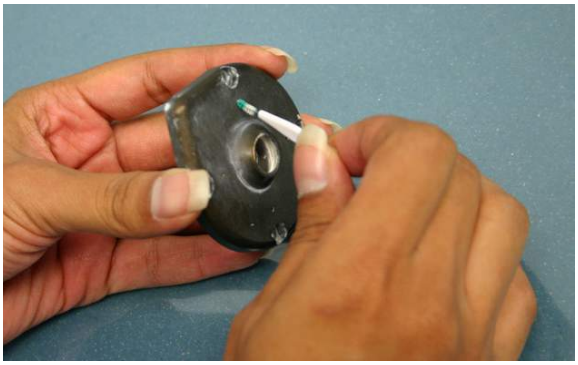
Clean the outside of the collets as well as the inside. Dirt on the outside (as shown on right) can also cause the tools to “walk” if the collet cannot clamp properly.

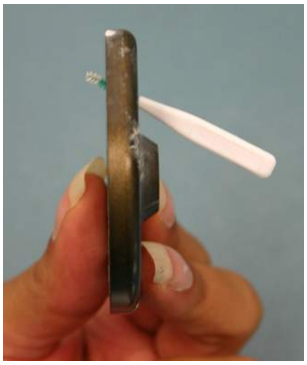
11 Insert the collet into the spindle.

12 Use the wrench to hold the spindle housing in place and use the collet tool to tighten the collet. Be sure to **use your fingertips** to turn the tool to avoid using too much torque.



13 Insert the Nozzle Cleaning Brush in the small holes on the spindle cap at an angle. This will push any ceramic buildup out of the hole.

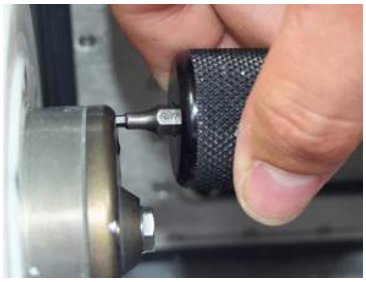




14 Clean the cap and the gasket with water.

15 Replace the spindle cap with the gasket.

16 Align the spindle cap and gasket using two of the screws. This ensures the gasket does not slip out of position while the pieces are being screwed into place.



Tighten the screws with the hex wrench side of the collet tool. **Use your fingertips** to turn the tool to avoid using too much torque.

17 Close lid when finished.

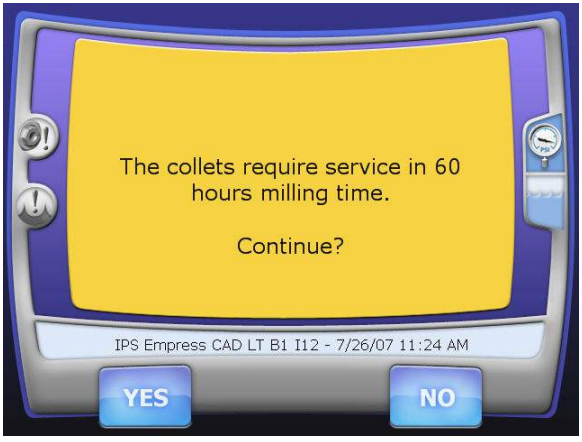
The tools remain in the tool changer until the next restoration is selected to mill.

To skip the instructions for the other type of spindle cap, see “Cleaning the Orientation Sensor” on page 236.

Spindle Cap B

1 Touch and hold the **Collet Cleaning** icon.

A message appears and shows the number of hours remaining before a scheduled cleaning is needed.



2 Touch **Yes** to continue.

The tools are automatically placed in the tool changer and the bellows are moved out of the way. The lid pops open when ready.

3 Use the Spindle Cap Tool to turn the spindle cap counter clockwise until the point of the spindle is pointing approximately to the 1:00 position. Remove the spindle cap.

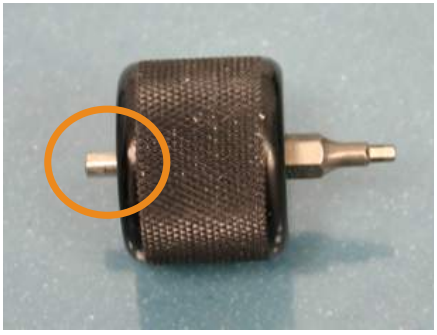
Spindle Cap

Spindle Cap Tool in locked position - point of the spindle cap pointing down

Note: The spindle cap can be removed by hand, but it is often easier with the tool, especially when the spindle cap is wet.

4 Remove the collet using the shorter side of the collet tool. If the spindle is turning instead of the collet, use the curved collet wrench to hold the spindle in place while you loosen the collet.

Curved Collet Wrench

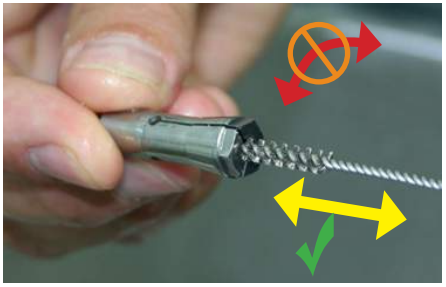


Collet Tool

Curved Collet Wrench - the curve of the collet wrench enables you to reach the grooves on the spindle

Use the wrench to hold the spindle in place while the collet tool turns the collet.

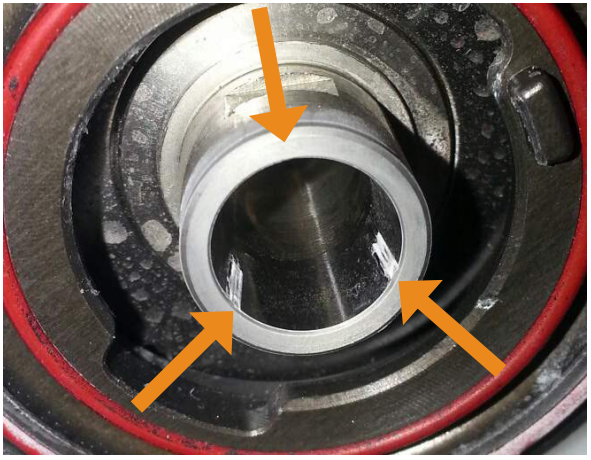
5 Rinse the collet and use the small silver wire brush to clean the inside, running it through a couple of times.



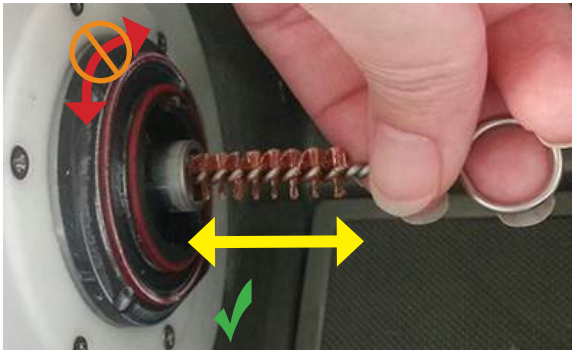
6 Clean the outside of the collet as well. Any debris on the collet will cause the tool to not seat properly.

7 In the spindle (collet shaft), you are likely to see 3 lines of debris that need to be cleaned. These are from the slits in the collet. If they are not cleaned, the collet will not seat properly and will lead to “walking tools”.

Note: The lines are not necessarily going to be positioned as seen in the example below. There will be three equidistant lines. The top one cannot be seen from the angle shown.



8 Use the larger bronze wire brush in the collet shaft. Be sure to use a straight in-and-out motion and do NOT use a circular motion.



Note: The air must be blowing during this step.

9 Use a dental mirror to inspect the spindle or rotate the spindle using the wrench to ensure all the debris has been removed.

10 Use a DRY paper towel to wipe the inside of the collet shaft.

For Your Information

Cleaning the collets and spindles is a very important process to keep your Milling Center running smoothly. Dirt will cause the tools to “walk” (not be seated properly) and can cause broken tools.

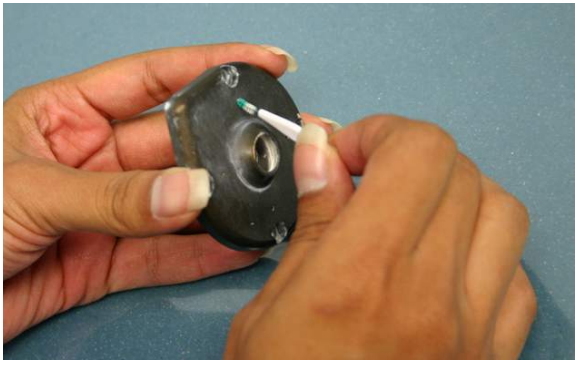
Five minutes of cleaning can mean the difference between the pictures below. Focus on cleaning the tapered surface inside the shaft and the front face. The tapered surface is critical.

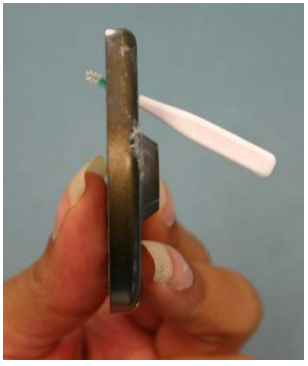
Clean the outside of the collets as well as the inside. Dirt on the outside (as shown on right) can also cause the tools to “walk” if the collet cannot clamp properly.

11 Insert the collet into the spindle.

12 Use the wrench to hold the spindle housing in place and use the collet tool to tighten the collet. Be sure to **use your fingertips** to turn the tool to avoid using too much torque.

13 Insert the Nozzle Cleaning Brush in the small holes on the spindle cap at an angle. This will push any ceramic buildup out of the hole.





14 Clean the cap with water.

15 Wipe the red O-Rings with a damp paper towel to remove any residue.

16 Replace the spindle cap. Note the L or an R on the spindle caps to denote on which side of the mill it belongs.

Note the alignment grooves on the spindle cap and spindle housing and the pointed extension on the spindle cap. You will use these for proper alignment.

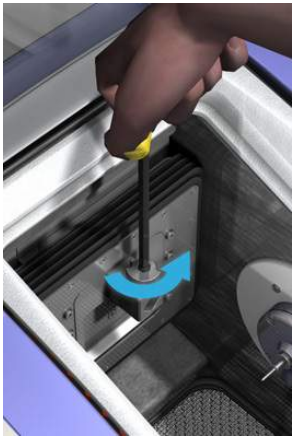
To attach the spindle cap, align the grooves so that the spindle cap extension is pointing upwards. Then turn the spindle cap clockwise until the extension points downward and the cap groove aligns with the housing groove.

17 Close lid when finished.

The tools remain in the tool changer until the next restoration is selected to mill.

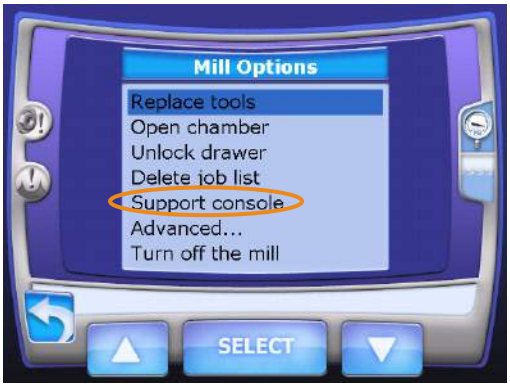
Cleaning the Orientation Sensor

Cleaning Cycle: As Needed

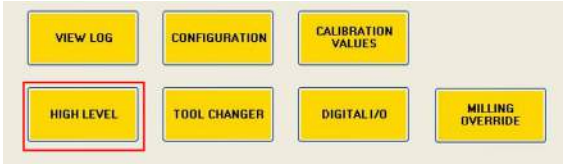


The Orientation Sensor is located in the Milling Center's mandrel holder.

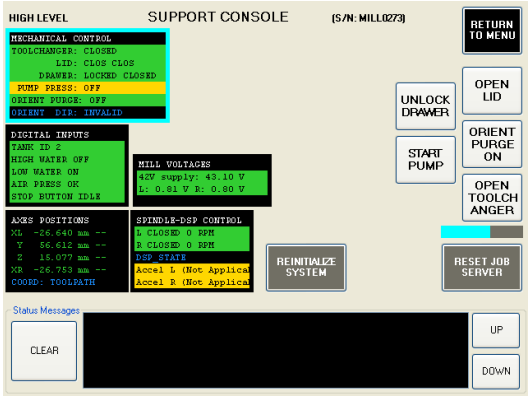
1 On the Mill Options screen, select **Support console.**



2 Select **High Level.**



3 Touch the **Mechanical Control** box. The box will be outlined in blue when selected.



4 Touch **Open Lid.**

5 Touch **Orient Purge ON.**

6 If necessary, remove the block from mill.

7 Using a cotton swab and some alcohol, gently push the cotton swab into the mandrel holder.

8 Clean this area very carefully.

9 When finished, touch **Orient Purge OFF.**

10 Close the lid.

11 Touch **Return to Menu.**

12 Touch **Exit Console.**

Chapter 19
Milling Center System Specifications

CE 0123 EC REP

EMERGO EUROPE
Molenstraat 15
2513 BH, The Hague
The Netherlands
Phone: +31.70.345.8570
Fax: +31.70.346.7299

The components use standard electrical current and do not need to be attached to a water supply or drain.

Model Number: Milling Center	E4D-DMC1
Electrical Ratings: E4D-DMC1	100-240 Vac, 300 W, 50-60 Hz
Mains Fuses:	6.3A/250Vac/Medium-Acting or T/1500A Breaking Capacity
Air Requirements:	50 - 130 psi, minimum 2 cfm, filtered, dry air
Data Connection Requirements:	Cat5 Ethernet cabling
Storage conditions	-20 °F to 100 °F (-29 °C to 38 °C)

Operating conditions for E4D equipment	Indoor use only 41 °F to 104 °F (5 °C to 40 °C) Transient overvoltage category II per IEC 60364 Maximum altitude 6,562 ft (2,000 m) Maximum 80% non-condensing relative humidity for temperatures up to 88 °F (31 °C) decreasing linearly to 50% relative humidity at 104 °F (40 °C) Pollution degree 2
Dimensions:	16 in. (399 mm) tall x 27 in. (676 mm) wide x 24 in. (608 mm) deep
Minimum Clearance	Sides: 2 in.; Rear: 1 in.; Top: 12 in.
Weight:	190 lb. (86 kg)

Applicable Standards

Electrical and Mechanical Safety	UL 61010-1:2004 w/Rev 2008 CSA C22.2 No. 61010.1.04 w/Rev 2008 IEC 61010-1:2001, 2nd Edition EN 61010-1
EMC	IEC/EN 61326
Packaging and Environmental	ISTA Class 2B
Additional Standards	ISO/EN 14971 EN ISO 13485:2003/AC:2009 ISO 13485: 2003 CFR 21, Part 820 SOR-98-282 Canada Medical Device Regulations FDA Class II Special Controls for Computer Assisted Design and Manufacturing of Dental Restorations European Directives • 93/42/EEC for Medical Devices • 2006/42/EC for Machinery • 1999/5/EC for Radio & Telecom

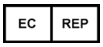
Approvals

North America	Product Safety Mark (NRTL) - UL C/US
International	CB Scheme Test Certificate (UL)
Quality System Certifications	ISO 13485 Registered Firm CMDCAS (Canada) Japan GMP

Labels

Symbols

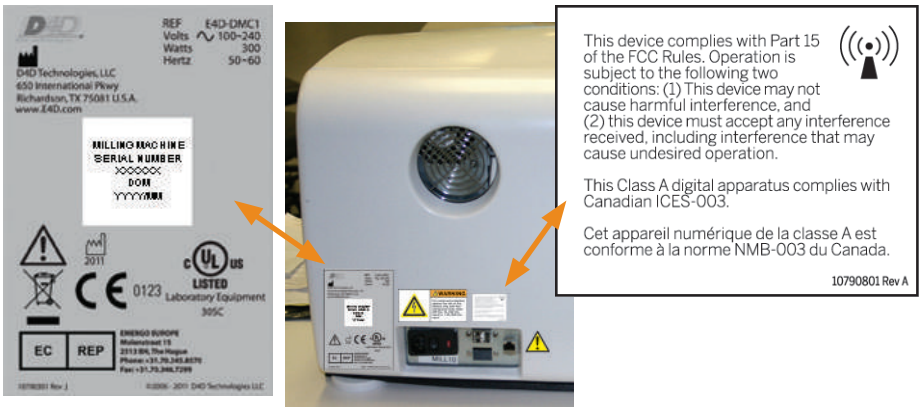
The following symbols are used on various labels on the system.

Symbol	Definition
	Alternating Current IEC 60417-5032
	Authorized Representative in the European community
	Caution: See instructions for use.
	Date of Manufacture
	This product must NOT be disposed of with other waste. It is the user's responsibility to dispose of their waste electrical and electronic equipment by handing it over to an approved reprocessor, or by returning it to E4D Technologies for reprocessing. For more information about where you can send your waste equipment for recycling, please contact your local city office or E4D Technologies.
	Do Not Reuse ISO 7000-1051
	European conformity
	Manufacturer
	OFF Power IEC 60417-5008

Symbol	Definition
	ON Power IEC 60417-5007
	On/Off Power IEC 60417-5010
	Operating Instructions ISO 7000-1641
	Protective Earth IEC 60417-5019
	Type B Applied Part IEC 60417-5840
	Warning: Dangerous Voltage ISO 3864-B.3.6
	General Warning ISO 7000-W001

Product Identification Labels

Affixed to the Milling Center are product identification labels that contain identification and safety information. Be certain to read all product labeling. The following figures show each safety and warning label and describe where on the apparatus each can be found.



Note: If any of the labels are missing or illegible, please contact E4D Technologies Customer Support for replacement labels.

Note: Label examples are not shown actual size. The labels may have changed since this book was published.

Attention Labels

Attention labels are located in numerous places on the E4D components. These labels direct you to specific safety entries in this user manual. Adhere to all such safety warnings at all times.

External Components and Connectors

When connecting external components to the E4D system, attach only components that have been tested for compliance with IEC 60601-1 or UL 60950.

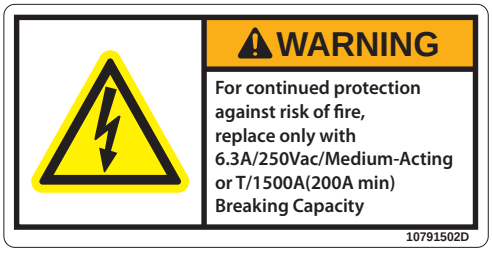
Connectors for attaching external devices conduct low voltages. Avoid touching the connector pins.

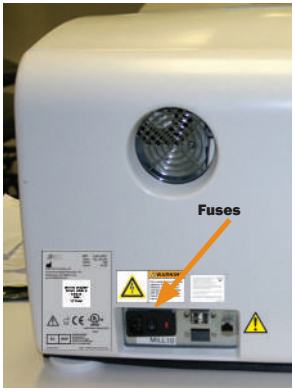
Protected Earth Ground Label

The Protected Earth Ground label is attached to the Milling Center e-box as shown.

Fuse Replacement

The E4D fuses are not user-replaceable. For fuse replacement, contact customer service. A service technician will replace fuses only with fuses having the specified voltage and current ratings.





UL Listing:

UL Laboratory Equipment Listing

IN ACCORDANCE WITH UL 61010-1

30SC

Index

Appendix A Glossary

A

Anatomy - the features that define the shape of a tooth: a series of concavities and the convexities that forms the light reflective surfaces that create the apparent shape of a tooth

Auto Pan - ON by default, Auto Pan moves the model as new scans are added to show the newest scan centered on the screen

Autogenesis - the process that E4D NEVO uses to create a custom proposal for the scanned model. For full coverage crowns, Autogenesis looks at the features on the proximal teeth and creates a custom proposal based on cusp alignment, marginal ridges, contacts, occlusion, and minimum thickness.

B

Bellows - located inside the milling chamber, the bellows resembles an accordion and moves the restoration block

C

Clone - scans of a pre-operative tooth or wax-up are combined with Library A to create a proposal. The desired anatomy is designated on the Margin tab with the Clone Editing tool.

Contact - the area of a tooth that touches the adjacent tooth

D

DDX - Henry Schein DDX Digital Dental Exchange. Used with E4D Sky.

F

Fossa - an irregular depression or concavity on the occlusal surface of the tooth

G

Glaze - a thin, transparent coating on porcelain restorations

I

ICEverything - pronounced “I See Everything”, often referred to as ICE. The textured view of the model, usually used for scans done in the mouth.

Inlay - a restoration made to fit a tapered cavity preparation, original cusps remain intact.

Insertion - the path created in the tooth preparation which will allow the restoration to be seated into the patient’s mouth

Interlock Key - used for diagnostics by service technicians. It is important that you keep the key and know where it is stored in your office.

M

Mandrel - the metal piece of the restoration block that is inserted into the mill to hold the block steady during milling.

Margin - the outside edge of the preparation which marks where the outside of the restoration should meet prepared tooth.

O

Onlay - a restoration that restores one or more cusps and adjoining occlusal surfaces of the tooth.

Orientation - The selected model position for Autogenesis to propose the new restoration. Autogenesis in turn uses this set position as a starting point for cusp height and marginal ridges based on the proximal neighbors. The Orientation is used to align the model to aid in Autogenesis. When the orientation is correct, the proposal should be able to drop from the occlusal onto the preparation and the central groove should be aligned with the proximal teeth’s central grooves. When viewed from the buccal or lingual, the model should follow the correct curve of spee.

R

Rapid Scan - click the Rapid Scan button or use the Spacebar on the keyboard to scan without using the foot pedal. The scans are taken when there is no movement in the Live View window.

S

Scan - an image of the prepared tooth and surrounding teeth

Sprue - the connecting material between the restoration and the mandrel

W

Walking Tools - This is a term that refers to tools in the mill that are not seated properly, so they shift (walk). This can damage/ruin the block and cause the tools to break. Proper mill maintenance should prevent this problem.

Appendix B
Digital Impressions

E4D Studio

Digital impressions and full cases can be shared via E4D Studio™.

E4D Studio Satellite Design Center enables you to transfer data via your internal network from one workstation to another in-office system to enable multitasking and sharing of information. No internet connection is needed for E4D Studio.

The Studio module is not part of the basic E4D system and is purchased separately.

For details on the E4D Studio system, see “Scan and Design System Specifications” on page 168.

Sending Jobs to Studio

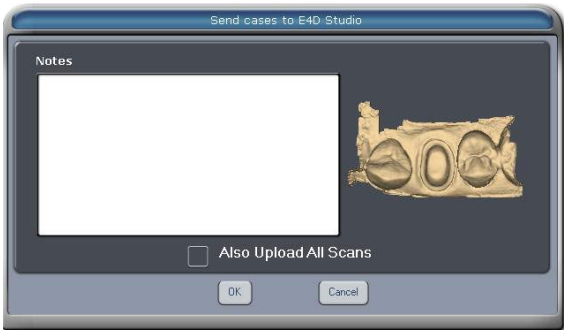
After a case has been scanned, it can be sent to the Studio workstation. A case can be sent at any time in the margination or designing process.

1. If it is not already open, select the desired case and proceed to the Margin, Design, or Mill screen.

   Note: If you are on the Margin screen and Orientation is active, deactivate it. E4D Studio is not available while Orientation is active.

2. Click **E4D Studio** in the top right corner of the screen.

A screen with sending options appears.



3 Enter any desired Notes.

Note: Also Upload All Scans is inactive by default. Including the scans will significantly increase the file size and should only be activated when necessary.

4 Click **OK** to send the data to the Job Server.

5 A message appears to confirm a successful upload or to tell you if there was an issue. Click **OK.**

Retrieving Jobs on Studio

1 At the Studio workstation, click **E4D Studio** on the Home screen.

A screen appears with a list of available jobs for download and the instruction options that had been chosen.

2 Select the desired case and click **Retrieve.**

3 A confirmation message appears. Click **OK.**

The patient name will appear on the Home screen with an Rx symbol to signify the patient data has been downloaded. If there is already a patient with that name in the list, the system will add a new patient file with a number following the name.

Using Studio

Design the restoration using the normal workflow. Send the finished restoration to the Milling Center directly from Studio, click E4D Studio to export the data to the Job Server so that it can be imported back on another in-office station, or upload the case to E4D Sky.

Importing 3M True Definition Data

E4D systems that have the 3M collaboration software (licensed) can import scans from the 3M True Definition™ scanner.

1 Export the case from the 3M True Definition system.

The case is automatically transferred to the Design Center's hard drive into the **C:\D4D\Lava** folder.

Note: The license for importing 3M files is sold separately. When the license is active, the button for importing is on the Home Screen next to Start a New Restoration.

2 Click **3M True Definition Import**.

The available cases are listed.

3 Click the desired case to highlight it.

4 Click **Transfer.**

The case is imported and a message appears.

The case has been removed from the Lava folder and has been added to the Design Center patient list. The patient name starts with 3M and includes the case number.

5 Click the patient name and highlight the restoration.

6 Click **Open Existing Restoration.**

The Setup tab is already filled in. If the material that was selected is not available on the E4D system, it is automatically changed to another default material.

Buccal/Opposing is automatically selected and cannot be changed. All other fields can be adjusted.

The Scan tab is not available on imported cases.

7 Click the **Margin** tab.

8 Adjust the **Orientation.**

9 Draw the **Margin.**

10 Click the **Design** tab.

11 Proceed with the normal design and milling workflow.

Note:

- Imported buccal alignment cannot be adjusted in the Design Center. If the buccal alignment is incorrect, delete the case, adjust the alignment in 3M True Definition, and repeat the export/import process.
- ICE View is not available on imported cases.

3M and E4D Support Guide

3M Scanner Hardware and Software Questions

1-800-634-2249 Option 2

- 3M Hardware
- 3M Software
- Wireless Connection
- Scan Data
- Case Upload
- Scan Protocol

E4D Hardware, Software, Application, and Restoration Questions

1-800-537-6070

- E4D Design Center or E4D Mill Software
- E4D Design Center or E4D Mill Hardware
- Networking
- Design Protocol
- Indications
- Restoration Fit

Chapter 20
E4D Sky

Digital impressions and full cases can be shared via E4D Sky. E4D Sky is a service for transferring files through the internet via DDX for design or fabrication services:

- E4D Sky Services
- Certified E4D Laboratories
- File conversion to STL

E4D Sky

E4D Sky is a service for transferring files through the internet via Digital Dental Exchange (DDX) for design or fabrication services (E4D Sky Services, Certified E4D Laboratories, or file conversion). DDX is a global web-enabled application by Henry Schein that allows dental professionals to communicate more effectively. It can be integrated into practice management and lab management software or run through a standard internet browser and accessed through the E4D Sky network.

E4D Technologies is not endorsing nor responsible for the products and services received from third party companies through the use of E4D Sky.

Your credit card information is requested every time that you use a new laboratory. If you choose to save the credit card information online, you will not have to enter it again for that laboratory.

There are several available procedures in E4D Sky:

- **Design My Case -** Send a case to design experts in the E4D Design Support lab to provide design services to assist you with more complex cases or when your office just needs some extra help at busy times. The completed design is returned to you and ready for milling. Additional fees and restrictions apply.
- **Mill My Case -** Complete your design and have E4D Technicians mill your design from specified material and shade. (IPS e.max, IPS Empress, LAVA Ultimate, Zirconia [finished only]) Additional fees and restrictions apply.
- **Make My Models -** Send your preparation and opposing scans and have SLA models fabricated (Quadrant only) and returned to you or to a specified address. Additional fees and restrictions apply.
- **Send to a Certified E4D Laboratory -** Collaborate with an authorized E4D laboratory and send your digital impression data to them for design assistance or full production of the final restoration. See “Send to a Certified E4D Laboratory” on page 263 for instructions. Fees for these services are determined by the selected laboratory.
- **Export and Send Buccal Bite Case (.stl) -** Create an authorized conversion of scanned images (bite, model, or clone) or final restoration design to an open file format (.stl). This allows maximum flexibility for model fabrication, material utilization, and additional treatment options. Additional fees and restrictions apply. See “Export and Send Buccal Bite Case (.stl)” on page 265.

Sky Setup

Dentists - If you do not have a DDX account, call E4D Customer Support at 1-800-537-6070 for help with setting up an account.

Laboratories - If you do not have a DDX account, call Henry Schein at **1-877-244-9345** to activate your account. A representative will help you set up your account over the phone. This could take approximately 20 minutes. This must be done before you can register for Sky. After your lab account is set up, you must log out of DDX before registering for Sky.

Sky Sign In

1. On the Home screen, click **Please Sign In** next to Sky.

2. Click the **email** field. The color of the field changes to indicate that field is selected.

3. Enter the email address used on your DDX account.
4. Click the **Password** field. You cannot use the Tab key to move between fields.
5. Enter your DDX password.
6. Click **Submit.**

The Sky logo is not greyed out and the text shows you are signed in and displays the email address being used. If the password and/or email does not match the DDX account, you will not be signed in to Sky and the Sky logo will be grey. Click **Reset Your Password** on the Sign In screen if necessary.

The user remains signed in until the email address is clicked and log out is verified.

E4D Sky Services

1. If it is not already open, select the desired case and proceed to the Margin, Design, or Mill screen.
2. If you are on the Margin screen and Orientation is active, deactivate it. Sky is not available while Orientation is active.
3. Click **Sky** in the top right corner of the screen.

The Sky options appear. **Also Upload All Scans to Sky** is inactive by default. Including the scans will significantly increase the file size and should only be activated when requested by the recipient or when the recipient will need to use ICE View.

4. Click **Access E4D Sky Services.**

A new screen appears.

By default, when the patient name is imported for the case form, the system assumes the first name is first and last name is second. If the patient has more than one name, only the first two are imported.

5 Scroll down to see the service options.

6 Click the desired service(s).

The **Payment Details** section appears. The amount for each selected service is multiplied by the number of restorations on this case.

7 Select the desired payment type.

8 Enter the payment information.

9 Click **Submit Case** or to exit without submitting your case, click **Close.**

See “Transmitting Cases” on page 266 for more information about the cases as they are uploaded to E4D Sky.

Becoming a Certified E4D Laboratory

You must be certified in order to appear on the E4D Sky network and receive cases from E4D Dentists. To become a Certified E4D Laboratory, please contact:

Alex Alvarado, CDT
Manager, Digital Services
aalvarado@e4d.com
214.432.6376

You will be provided with a set of example jobs to complete.

Send to a Certified E4D Laboratory

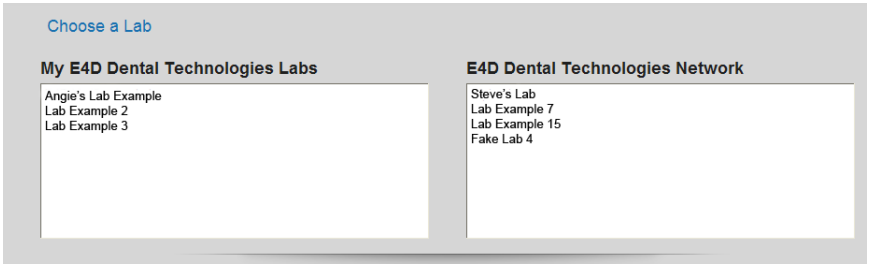
1. If it is not already open, select the desired case and proceed to the Margin, Design, or Mill screen.
2. If you are on the Margin screen and Orientation is active, deactivate it. Sky is not available while Orientation is active.
3. Click **Sky** in the top right corner of the screen.

The Sky options appear. **Also Upload All Scans to Sky** is inactive by default. Including the scans will significantly increase the file size and should only be activated when requested by the recipient or when the recipient will need to use ICE View.

4 Click **Send to a Certified E4D Laboratory.**

The Choose a Lab screen appears. **My E4D Dental Technologies Labs** on the left includes laboratories that you have used before or requested an account. All other available laboratories appear on the right.

Note: Fictional labs shown in the example.

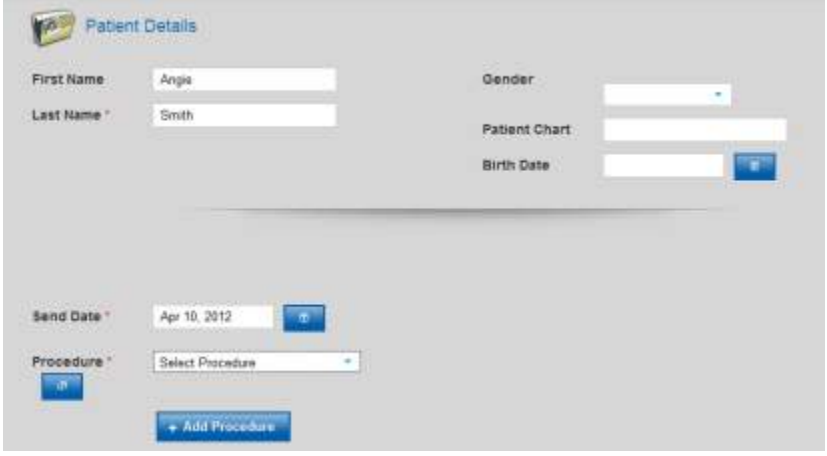


5 Select the desired laboratory. If you select a new laboratory, they may require that you send an account request.

The Lab Details appear when a lab is highlighted.

6 Click **Use Lab.**

A new screen appears with the patient details filled in. By default, when the patient name is imported for the case form, the system assumes the first name is first and last name is second. If the patient has more than one name, only the first two are imported.



7 Select a **Procedure** from the drop down list.

8 Fill out the form details.

9 Click **Add Procedure** to add another service, if desired. When a second procedure is added, the first procedure is summarized. Double click a summarized procedure to edit it or click the minus sign to delete a procedure.

10 Click **Submit Case** or to exit without submitting your case, click **Close.**

See “Transmitting Cases” on page 266 for more information about the cases as they are uploaded to E4D Sky.

Export and Send Buccal Bite Case (.stl)

Important: Ensure you have **aligned the buccal bite scans** on the margin tab in Design Center prior to exporting.

1 If it is not already open, select the desired case and proceed to the Margin, Design, or Mill screen.

2 If you are on the Margin screen and Orientation is active, deactivate it. Sky is not available while Orientation is active.

3 Click **Sky** in the top right corner of the screen.

The Sky options appear. **Also Upload All Scans to Sky** is shown on this screen, but it does not apply to the Export function,.

4 Click **Export and Send Buccal Bite Case (.stl).**

A new window appears with the patient details and the Payment Details.

5 Fill out the Patient and Payment details.

6 In the Save and Send Options section, select **E-mail STL File.**

The STL Export creates very large files. It is recommended that you use the e-mail function to create a downloadable link from DDX and include yourself in the e-mail.

7 Click **Submit Case.**

STL files are saved on your hard drive at **C:\D4D\STL** with the patient name as the beginning of the file name. If E-mail STL File was selected, you are prompted to select the files you want to send and enter the recipient address(es). An e-mail will be sent containing a download link to retrieve the files from the DDX exchange service.

A message appears.

8 Click **Open Folder** to view the files or click **Done** to continue working.

If you did not e-mail the link to retrieve the files from DDX, you can copy these files onto your network, upload via the internet, or save to a USB drive.

Transmitting Cases

While the case is transmitting, the Sky icon changes and cannot be activated again until the case is finished transmitting.

On the Home Screen, move the mouse near the Sky icon to see the status of the currently transmitting case.

To interrupt the upload of a case, click the **Stop** button below the status bar.

Do not turn OFF or close the Design Center software while a case is transmitting. A warning appears when the Exit button is clicked while a file is transmitting. If the Design Center is turned OFF or exited while a case is transmitting, the case will have to be resent.

Payment for Design On Site and Save As STL is processed when the case is submitted. If the case was cancelled and you do not plan to resubmit, please contact Customer Support at 800-537-6070 for a refund of the payment.

Interrupted transmission cases have a red Sky icon. Open the case and resend. To resubmit a case, open the case and click the Sky icon on the Margin tab. You do not have to fill out the form again or resubmit payment; the case immediately starts transmitting.

Submitted cases have the Sky icon next to them and additional material information displays at the bottom of the home screen. After a case has been submitted, it cannot be sent to another laboratory.

If a case has a grey Sky logo, it was deleted from the Sky network from another workstation. The case can be resubmitted if desired.

Downloading from E4D Sky

Dentists - Use these instructions to download cases from E4D Sky that are ready to mill or review.

Laboratories - Cases received from customers are downloaded from E4D Sky on the Home screen.

1 Click **Sky** on the Home screen to import a case from Sky.

A list of cases appears. Cases with a green checkmark match what is already on your system. Cases with a red X are different than what is on your system and are ready for download.

2 Select the desired case.

3 Click **Rx** to see the prescription details.

4 Click **Retrieve** to download the case to your system.