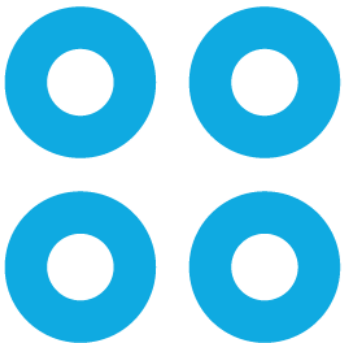


ONDEMAND3D
DENTAL

OPERATING MANUAL

OM-5 [Rev 8.0]

Ver. 1.0.10.7462
(2017.11.22)

CYBERMED

TABLE OF CONTENTS

1 Introduction

OnDemand3D™ Dental is designed for private dental clinics with CBCT equipment. The Dental package contains essential functions needed to view DICOM images aiding dentists with higher precision, better implant and treatment planning and most of all, accurate diagnosis.

The following modules are included in the OnDemand3D™ Dental package.

☞ DBM (Database Manager)

As its name suggests, the DBM module manages the user's Databases. Here, users can easily sort through patient DICOM data, project files, reports and attachments including image files or surface mesh data. Import/export data from a Remote PACS server, write CD/DVDs, and view STL data straight from this module. Data on PACS can now be opened directly without the need to import.

☞ DLB (Dynamic Lightbox) [Optional]

Dynamic Light Box is a simple image viewer to browse through slice images easily and quickly. This module provides axial, sagittal and coronal views and provides functions such as an Oblique Slice View, 3D Zoom and virtual endoscopy.

☞ DENTAL

The Dental module includes useful tools for diagnosis, patient treatment and implant placement planning such as 3D zoom, panoramic, cross-sectional and MPR images, nerve marking, and TMJ study views. OnDemand3D™'s library of virtual implants includes large varieties from major manufacturers around the world.

☞ 3D [Optional]

The 3D module provides state of the art tools for 3D visualization, segmentation, and analysis of DICOM images. The 3D module has various rendering modes such as VR (Volume Rendering), MIP, minIP, and X-ray. After segmentation, users will be able to export objects as STL data.

☞ REPORT

The Report module keeps track of captured images and allows users to create quick reports in HTML format. The Report module supports the extended functions of capture, save, convert and print. Send captured images to PACS or print patient data on film, all from this module.

☞ X-REPORT

X-Report has two main features: the X-Report tool, included in most of the modules on OnDemand3D™ and X-Report Template Designer. The X-Report tool is a user-friendly method of patient reporting, where users will be able to simply drag and drop images from their screen onto a pop-up report template that can then be expanded for further editing. X-Report Template Designer, on the other hand, creates report templates for OnDemand3D™. It allows users to create a specialized report specific to a patient's needs and increase the efficiency of writing a report.

☞ IN2GUIDE [Optional]

In2Guide utilizes OnDemand3D™'s powerful 3D engine to create a 3D volume from DICOM data for an intuitive way to plan your implant surgery. You can turn your virtual planning data into a real custom made surgical template with depth and angle control by ordering directly from In2Guide.

☞ FUSION [Optional]

Fusion is a visualization tool for superimposing two sets of DICOM data or for stitching two smaller FOV volumes to create a larger volume. Fusion uses the MI or Mutual Information method, a widely accepted technology for superimposition and stitching.

☞ 3D CEPH [Optional]

3D Ceph calculates the relative functions between points, lines, and planes in a 3-dimensional setting providing more precise and accurate values for analysis. The user can customize and define the points, lines, planes, and functions for analysis, orthodontic and aesthetic treatment planning.

The user can also superimpose two sets of data, such as pre and post-op data for analysis, as well as use a 2D photo for a 3D volume mapping and generate a 2D X-ray for patient consultation.

☞ XIMAGE [Optional]

OnDemand3D™ takes integrated database management to a new level with XImage. Both 2D and 3D data are integrated into a modality-centered layout with full acquisition capabilities. A powerful tool that converts imported common image files into DICOM format (.dcm) for transmitting to PACS. XImage includes a selection of customizable Filter Presets along with a set of image manipulation and measurement tools.

Other products:

EasyRiter
This simple Cone Beam CT reporting program was developed by a radiologist and a pathologist to help clinicians generate simple yet precise reports for their patients, records and referrals. Using the simple template format provided, the clinician simply selects the appropriate statements in each of the anatomic areas being examined.

Please visit us at www.ondemand3d.com or contact us at info@ondemand3d.com for more info.

2 Installation

2.1 System Requirements

CPU	2GHz Dual-Core or higher
RAM	2GB or higher (higher than 4GB recommended)
Dedicated Video Memory	1GB or higher (higher than 2GB recommended)
Video	1280x1024 or higher resolution
GPU	NVIDIA (GeForce GTX 750Ti or later recommended) AMD (Radeon RX 460 or later recommended) Note: "CPU Rendering" mode can be used with all GPU brands/cards.
OS	Microsoft Windows Vista / 7 / 8 / 8.1 / 10 (32bit/64bit) Note: 64-bit is recommended, especially for working with large FOV DICOM data.
.NET Framework	Microsoft .NET Framework 3.5 (or higher compatible version)
Open GL	OpenGL 2.1 or higher
DirectX	DirectX 9.0 or higher
Accessibility Rights Req.	**[Admin] account with full administration rights**

** Large volume data will be rendered in lower resolution if video memory is insufficient.

WARNING	OnDemand3D products will not continue to support Windows XP and we recommend to upgrade your Windows to a newer version.

INFO	Please make sure the font size is set to default (100%). Medium font size (125%) will distort images. The font size can be changed in any Windows OS by accessing: [Control Panel] → [Fonts] → [Change Font Size].

INFO	For Windows 8, 8.1, 10, .NET Framework 3.5 may need to be manually activated: [Control Panel]→[Programs and Features]→[Turn Windows features on or off], and check the box next to ".NET Framework 3.5 (includes .NET 2.0 and 3.0)".

2.2 Installation of OnDemand3D™ Dental

Step 1: Double click on the "Setup.exe" file in the Setup folder.

Step 2: Follow the steps in [Install Shield Wizard] and click [Next] to proceed as shown in Fig. 1.

Fig. 1 Select items to install

INFO	Please do not check [**Project Viewer**] if it is not included in the purchased license. It needs a license to be activated. For more info, please visit our website (www.ondemand3d.com).

When prompted with [Language Selection Dialog], select country and a preferred language.

Fig. 2 Country and language selection dialog

Step 3: Select folder path, and finish installation.

Step 4: Repeat steps 1 through 3 for [Leaf Implant].

Fig. 3 Leaf Implant installation window

Step 5: Run OnDemand3D™ App.

** [Leaf Implant] library should be installed for use in implant planning and simulation.

2.3 Cybermed License Manager

[Cybermed License Manager] is used to register and manage software licenses (HASP, Serial, etc.) as well as store license information. When OnDemand3D™ is first installed; [License Manager] will run automatically. To access [License Manager] manually, use either of the two methods below.

1. Click Info. at the bottom left corner of the OnDemand3D™ screen and press License Manager at the bottom left corner of the [Info] window.

2. Go to [Start menu] -> [OnDemand3DDental] -> [Cybermed License Manager] as shown in Fig 4.

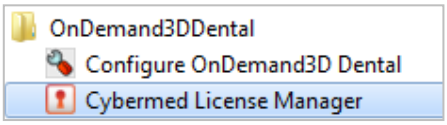
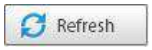


Fig. 4 Access [Cybermed License Manager]

When the user runs [License Manager], it searches for license information previously used on the workstation and displays key type, status (enabled/disabled), key number and expiration date information. If a license is missing, try refreshing with the  icon provided.

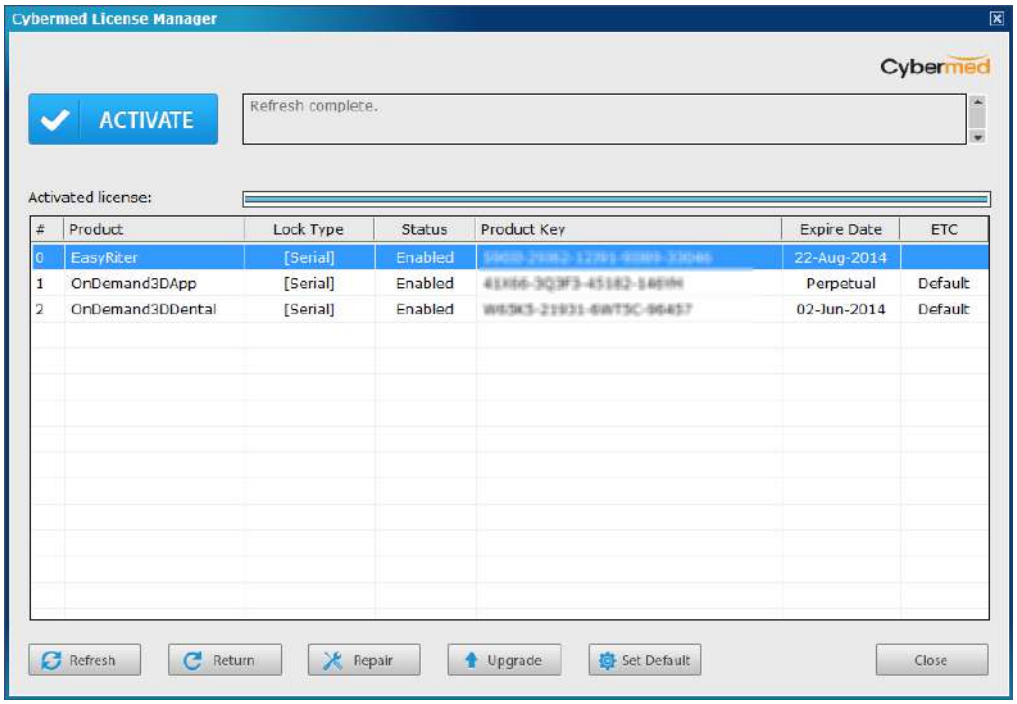


Fig. 5 Three serial keys each for OnDemand3D™ App, OnDemand3D™ Dental and EasyRiter™ detected

Information. For information on any of the licenses, simply double-click and the modules contained in the license will be displayed along with an option to set it as the default license key.

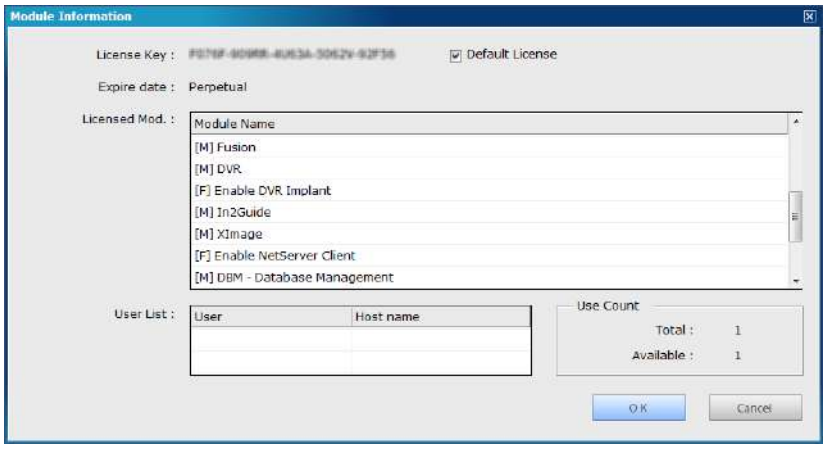


Fig. 6 Double-click to view information on expiration, licensed modules, user list and count

Function	Description
Refresh	Click to [Refresh] contents.
Return	To use a license on a different computer, please [Return] the license to the server first and then re-activate the license from another computer.
Repair	If license [Status] shows 'Broken' and/or in case of corruption, press [Repair] to repair the license.
Upgrade	Use to 'Upgrade' license information.
Set Default	Click to set the selected license as the default for the software. It is highly recommended to set a default key, as it will shorten booting time. For the changes to take effect, a re-boot of OnDemand3D™ is necessary.

INFO	Users with time license key will get expiration notification starting 30 days before the expiration date.

HASP License Activation

Please plug in HASP/dongle key into the workstation and press Refresh. It might take a few seconds for the driver to be installed and for the software to recognize the license. The process is the same for both single workstation and network licenses.

TIP	For initial troubleshooting, please make sure to update to the latest HASP driver available. To download, please visit the [Resources] section on our website at https://www.ondemand3d.com/pages/resource/utilities. If problems with license recognition persist, please go to [services.msc] and restart any services in the list with names that contain either [Sentinel] or [HASP].

Serial License Activation

Click ACTIVATE to activate a new serial key. The following dialog will pop up.

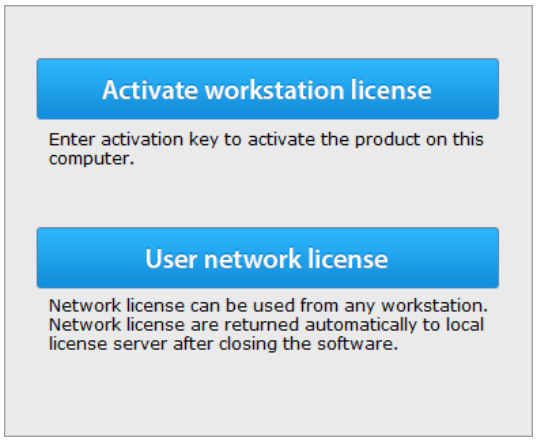


Fig. 7 Select between a workstation or a network license

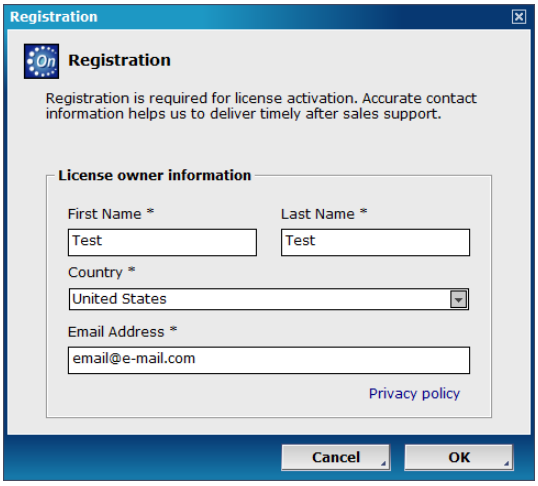


Fig. 8 Please input true user information

All licenses will require the user to input contact information, which will later help us in delivering timely after sales support.

Workstation Licenses

Users who have workstation licenses will be able to access OnDemand3D™ on a single workstation only. The user has the option to choose either offline or online activation as shown below.

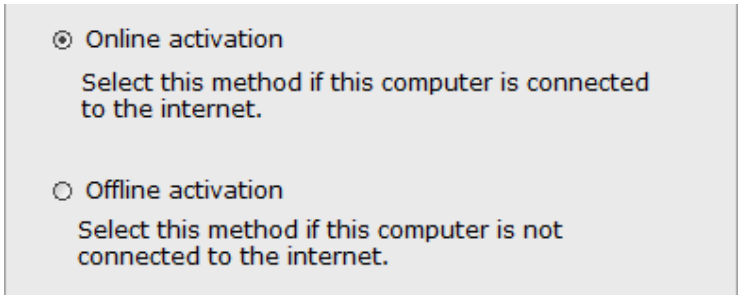


Fig. 9 Online activation is simpler and the recommended method

Online Activation

Input key into the [License Activation] window, and press [Activate].

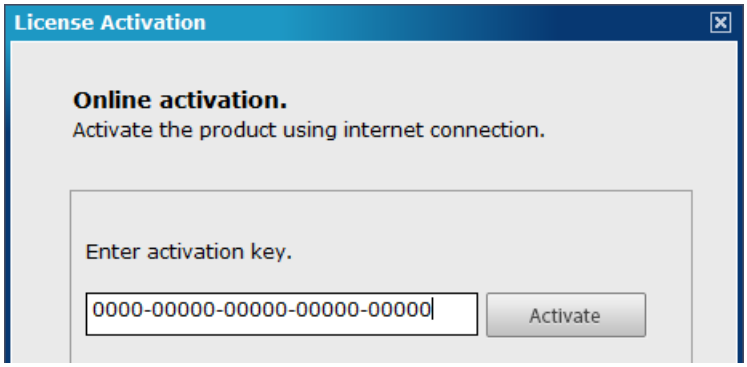


Fig. 10 Enter key that was provided at the time of purchase

Offline Activation

For workstations that do not always have access to the Internet, OnDemand3D™ offers offline activation with the following three-step method.

Step 1. Enter the key provided at time of purchase into the field and press [Collect Info]. Save the requestXML file, which will need to be registered on the activation site.

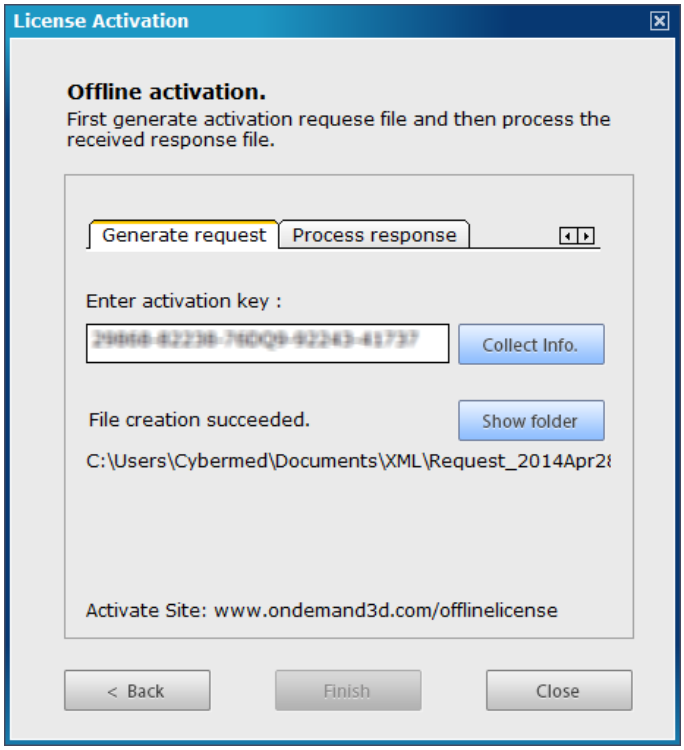


Fig. 11 Save the requestXML file onto a portable disk or remote server for access from another workstation with an Internet connection.

Step 2. Go to www.ondemand3d.com/offlinelicense or double-click the shortcut file provided with the XML file, as shown below, and upload the requestXML file to register the license and download the responseXML file, which will be provided in return.

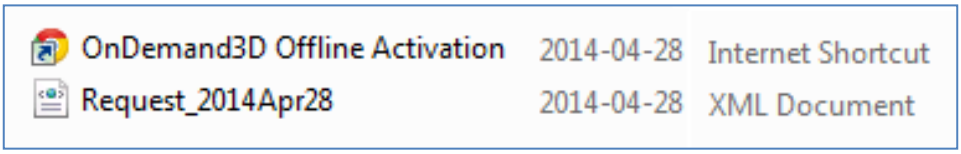


Fig. 12 An internet shortcut to the activation website is included along with the requestXML file

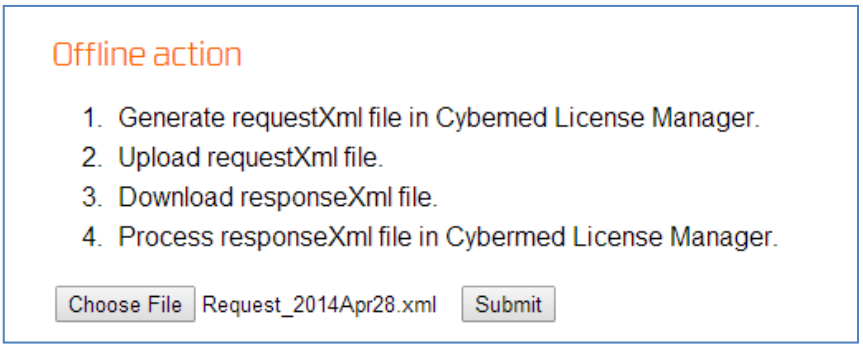


Fig. 13 Once on the website, [Choose File] and [Submit]

Step 3. Process the responseXML file using [Cybermed License Manager] on the workstation to finish activation.

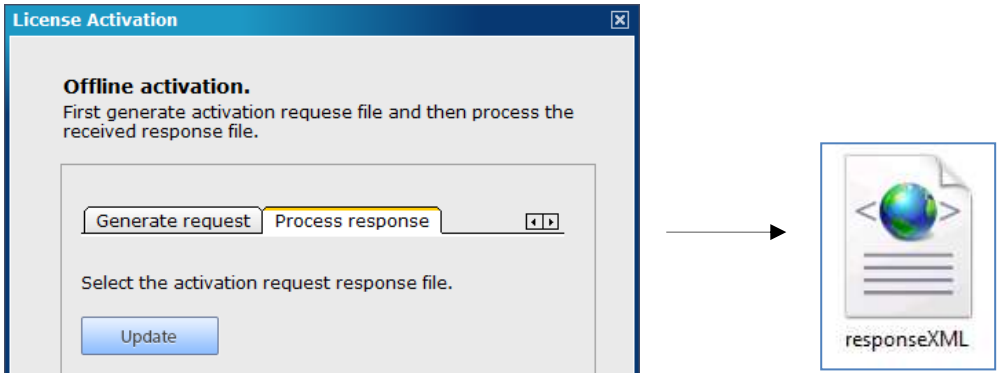


Fig. 14 Press [Update] and choose file to process

Network Licenses

Activating network licenses will require the user to input the [Local license server address] as shown in Fig.15. Please input the IP address of the local license server, which is the workstation that currently has the network license activated.

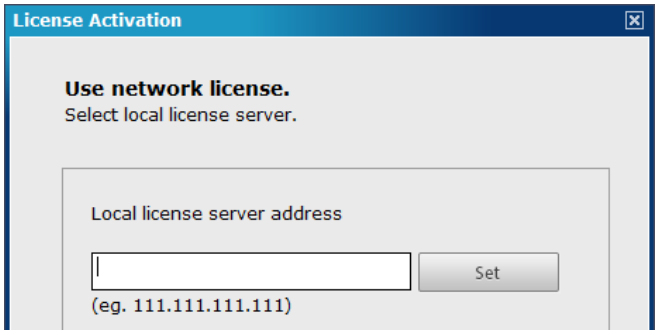


Fig. 15 Connect to the local license server to activate network license

INFO	After activation, close [Cybermed License Manager] and open OnDemand3D™. [Cybermed License Manager] only has to be run whenever a new key needs to be activated.

2.4 Configure Quick List & Toolbar

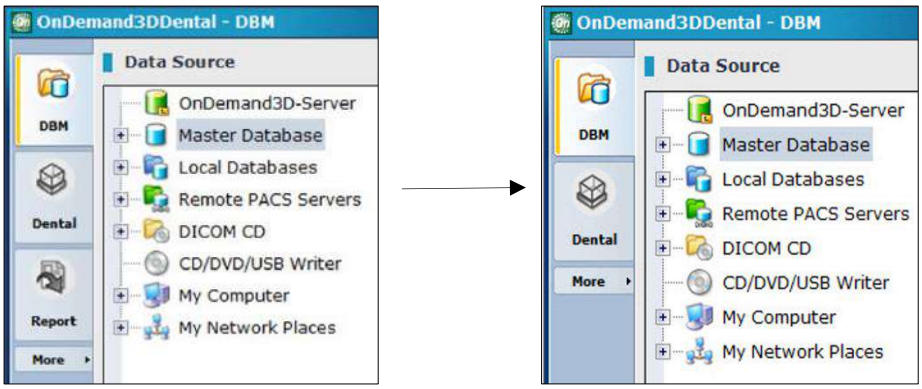
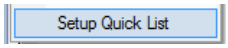
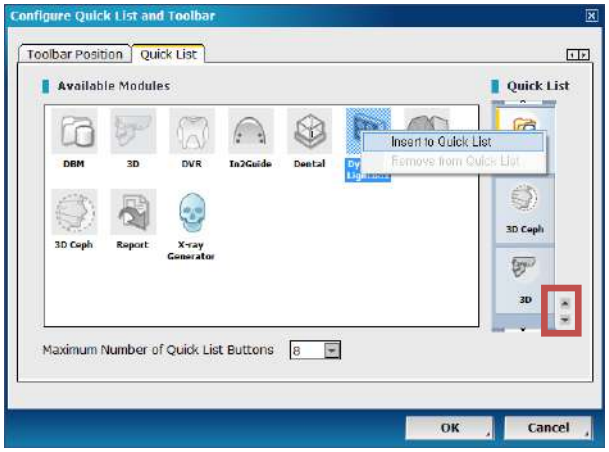


Fig. 16 Select which modules to display

Quick List is the module bar provided on the far left of the OnDemand3D™ layout. Click on the 

icon and select 

to configure which modules and the number thereof to display. The Quick List and Toolbar positions can also be configured using the [Toolbar Position] tab.



Right-click and select [Insert to Quick List] to add, or vice versa to remove.

After the module has been added to the Quick List, use the  to move it up or down in the Quick List in accordance to the user's preferred order of appearance.

Fig. 17 Right-click and select [Insert] or [Remove] to customize

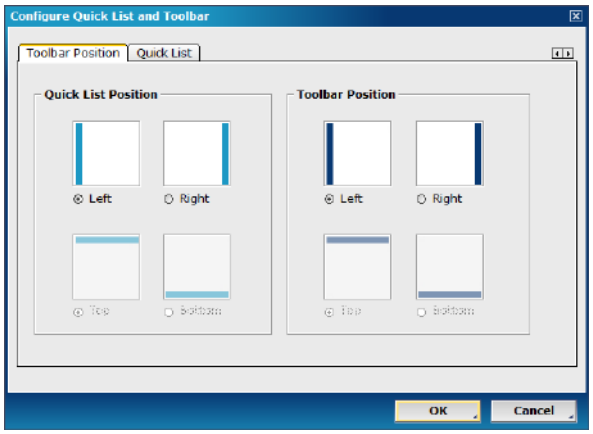


Fig. 18 Choose preferred positioning of both the [Quick List] and [Toolbar]

2.5 Updated User Interface Color Scheme

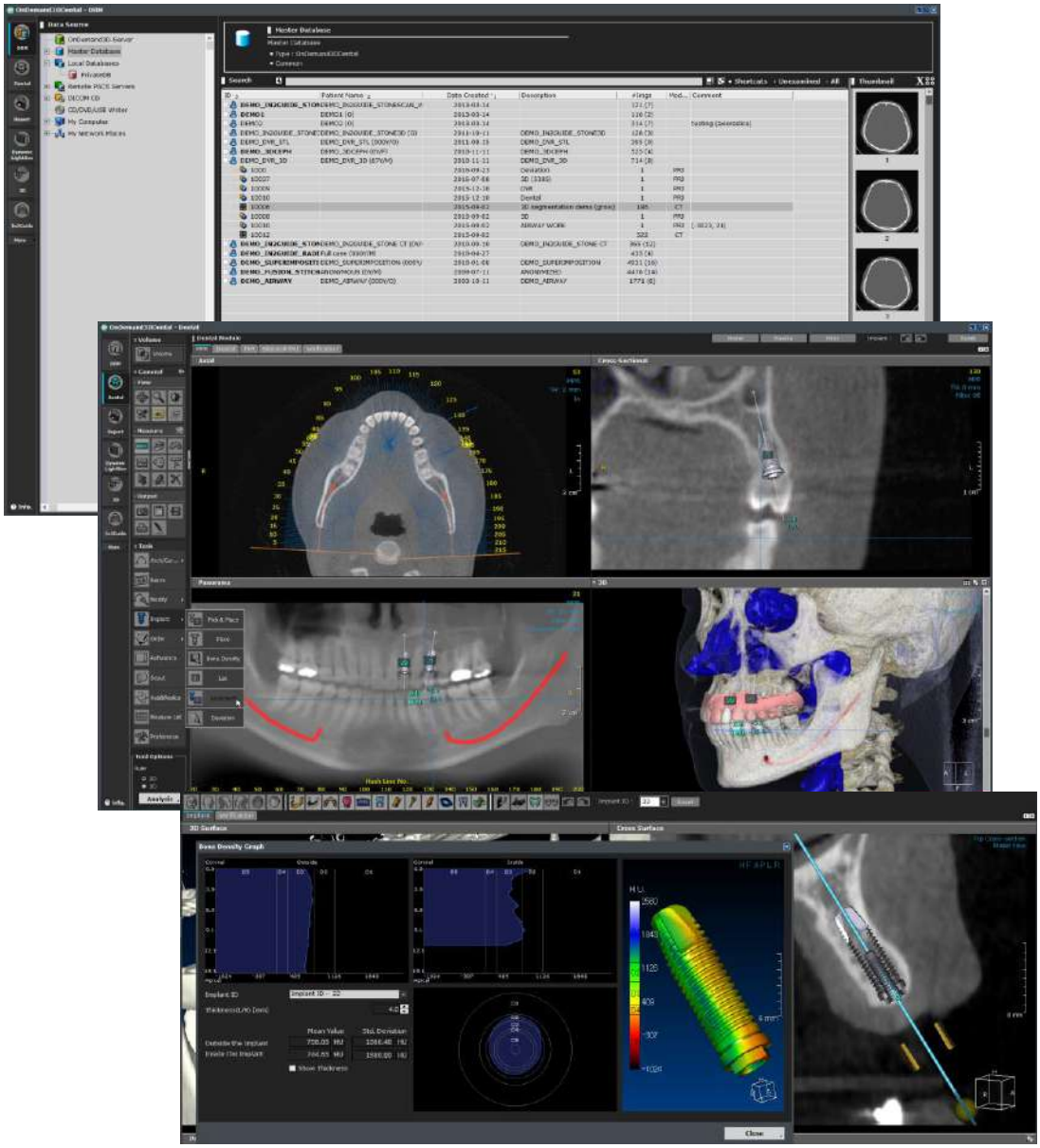


Fig. 19 Updated User Interface Color Scheme.

OnDemand3D's User Interface has been updated with a new color scheme.
A darker toned palette has been implemented to enhance appearance and reduce visual fatigue during use over prolonged periods.
All icons and menu positions have been retained in order to provide the user with the same familiar OnDemand3D user experience.

3 DBM (Database Manager)

DICOM (Digital Imaging and Communication in Medicine) is a standard format used in various medical imaging equipment. The DICOM protocol was established by the RSNA (Radiological Society of North America) meeting in 1992. Since then, working groups of the ACR-NEMA (American College of Radiology - National Electrical Manufacturers' Association) have been established to work on international standardization. Currently, DICOM 3.0 has been made public and consolidated as the standard format for medical image files and inter-equipment networking.

Today, most medical or dental imaging equipment utilize DICOM format, and OnDemand3D™ is no exception. OnDemand3D™ lets you import DICOM data to your local database or a remote location such as [OnDemand3D Server] or a [Remote PACS Server]. In addition to supporting both multi-frame and split-frame DICOM data, users will be able to convert one from the other straight on OnDemand3D™.

3.1 Layout

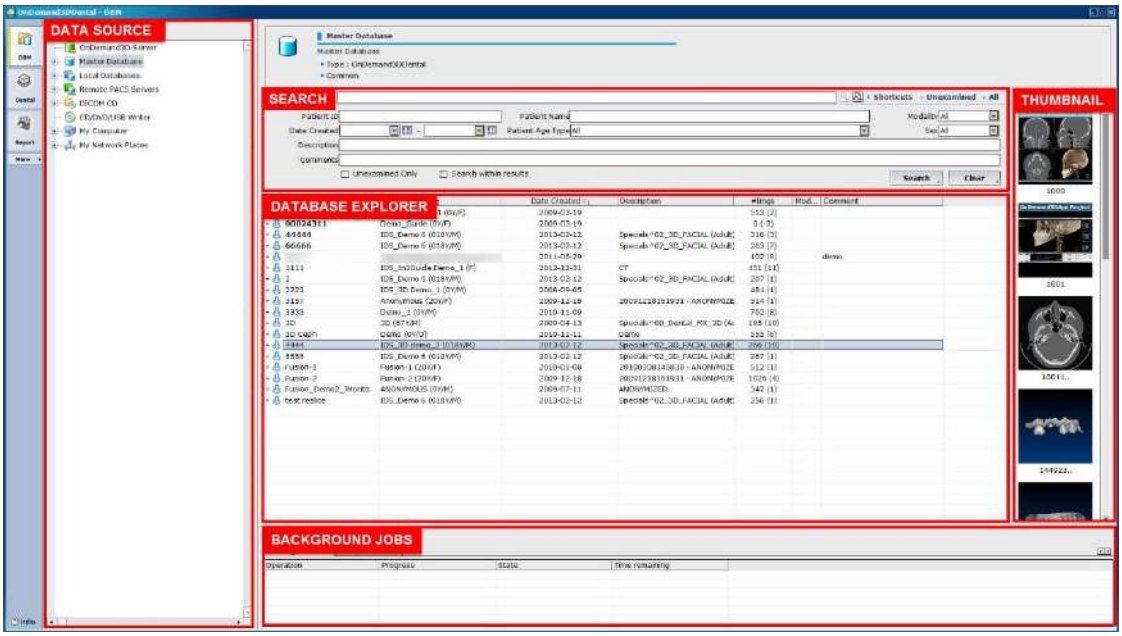


Fig. 20 DBM layout

[Data Source] - List of available data sources
[Search] - Search through data using the options available
[Database Explorer] - List of DICOM data from the currently selected Data Source or search results
[Thumbnail] - A preview of the DICOM data and Project Files contained in the patient study
[Background Jobs] - List of importing or exporting jobs in the background

3.2 Data Sources

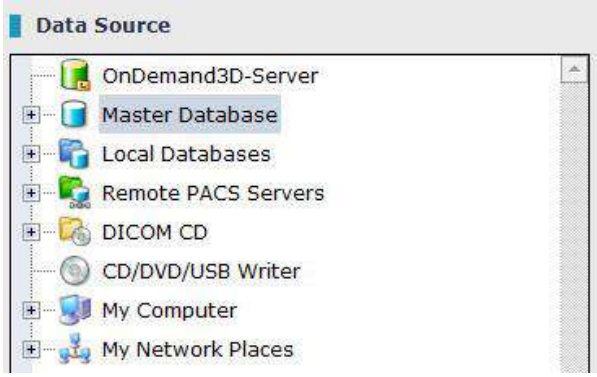


Fig. 21 [Data Source] section

The DBM module acts as a database explorer to import to and export from on OnDemand3D™ Dental.

OnDemand3D™ Server

Users are able to save patient data and Project Files on OnDemand3D™ Server, which would be accessible from other workplaces as long as an Internet connection is available. For more info on how to purchase, please contact local distributor or contact us directly at info@ondemand3d.com and visit our website at www.ondemand3d.com

To load DICOM files saved on OnDemand3D™ Server, click the [OnDemand3D–Server] icon in the [Data Source] window. When the [Server Log-in] window appears, as shown in Fig. 22, input User ID, Password, Server Address (Server Computer ID) and press [Connect].

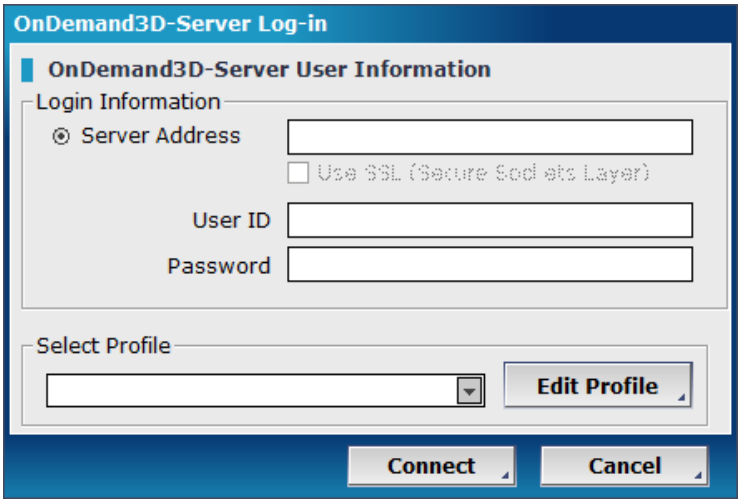


Fig. 22 [OnDemand3D-Server Log-in] window

When using multiple servers, users can simply make a profile for each server and then log-in using the [Select Profile] menu for easier access. To add or edit server profiles for easier access, click on the Edit Profile button.

To set [OnDemand3D-Server] as the default data source, enable [Start to OnDemand3D Gate Server] in the [OnDemand3D™ Dental Environment Settings see page 209 (☞ *OnDemand3D™ Dental*

Environment Settings: DBM). To automatically login to the [OnDemand3D-Server], check [Auto login] option in [Edit Profile].

Master Database

The [Master Database] is a user's own database on a certain workstation. This database will not be affected by software updates. The user can run DICOM CD/DVDs or USBs and import the data into their [Master Database].

Import data by a simple drag and drop motion or right-click and select [Import]. Users can also set the depth of sub-directories to be imported by selecting [Import depth]. Attach patient-related files, such as PDF, images, and X-report data to the patient study by right-clicking and selecting [Add Attachment]. Or attach a 3D model (STL) by right-clicking and selecting [Import 3D Model (STL)]. When the patient study is exported, a separate [Attachment] folder containing all attachments will be created.

To disable or hide [Master Database] see page 207 *(☞ **OnDemand3D™ Dental Environment Settings: Database Engine).***

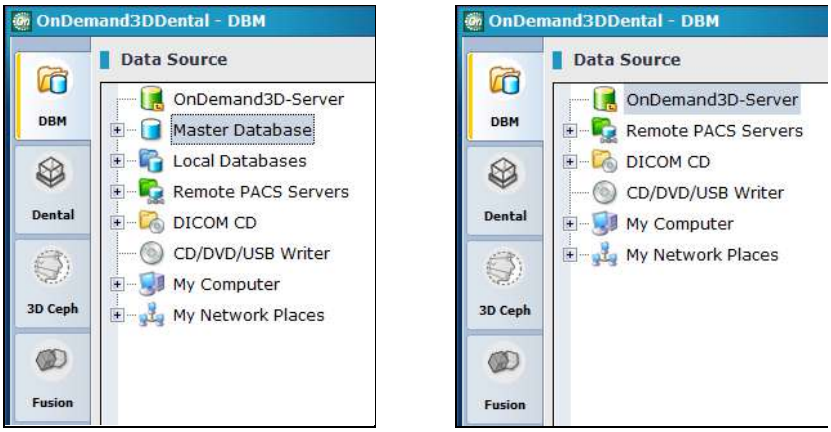


Fig. 23 [Master Database] by default (left), disabled (right)

Local Databases

Local Databases have an archiving feature and are used when the current default [Master Database] is becoming too large or reaches a specific threshold, which in its turn slows down the process and cause difficulties finding particular patient data or sift through the patients' data.

Users can create their own local database, archive and relocate existing [Master Database] data to a secure drive with more space by simply right clicking and selecting whether to create new database or add an existing one. All the functions and features of the [Master Database] such as importing data by a simple drag and drop, patient-related files attachment, saving the data to the local databases are available. [PrivateDB] is the default Local Database, however others can be created. [Local Databases] can be disabled in the OnDemand3D Dental Environment Settings.

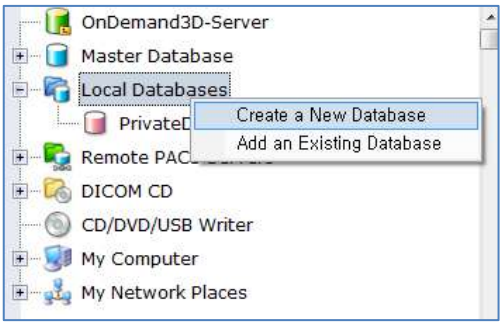


Fig. 24 Create/Add New Database

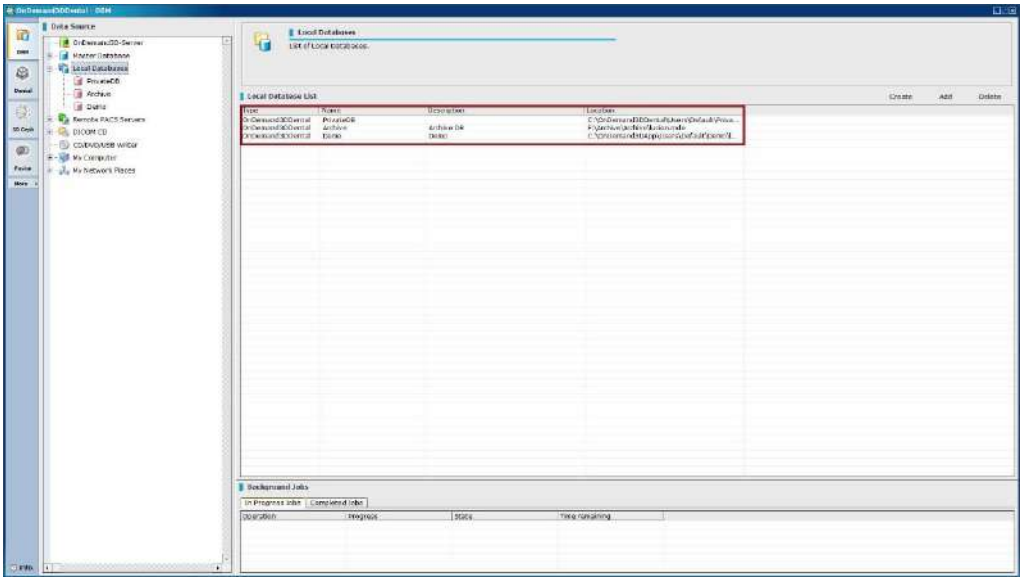


Fig. 25 Local Database List (highlighted in red)

To disable [Local Databases] see page 207 *(☞ **OnDemand3D™ Dental Environment Settings: Database Engine).***

Remote PACS Server

Right-click on the [Remote PACS Servers] and select [Add a Remote Server], as shown in Fig. 26, to add a remote server.

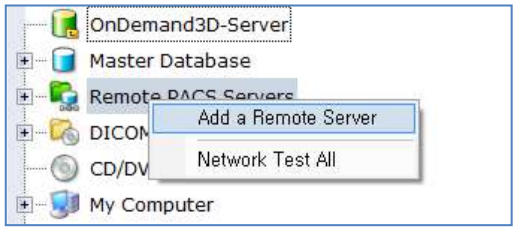


Fig. 26 Add a new remote server

Input the AE Title, IP Address, Port number into the corresponding fields, and press [OK].

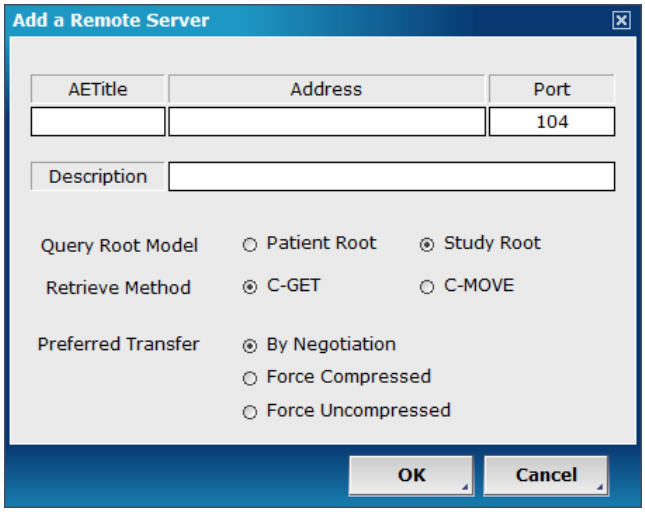


Fig. 27 Add remote server information

WARNING	Please contact the PACS Server provider to confirm if the PACS Server can be connected with OnDemand3D™ Dental.

DICOM CD

DICOM data stored on a CD/DVD can be imported into the user's [Master Database] or viewed directly. Insert a DICOM CD/DVD into the computer disc drive, and the DICOM CD/DVD information will automatically appear in the [Data Source] section underneath [DICOM CD].

TIP	A CD without DICOM information (Meta file) will not appear under the DICOM CD tab.

CD/DVD/USB Writer

A backup CD can be created using OnDemand3D™ if there is a CD/DVD-R or CD/DVD-RW driver installed on the computer. From one of the Databases or OnDemand3D-Server, select the desired patient data and drag it into the [CD/DVD/USB Writer] tab in the [Data Source] window. Or alternatively, right-clicking and select [Copy To] > [CD/DVD/USB Writer].

Recording & Burning Options

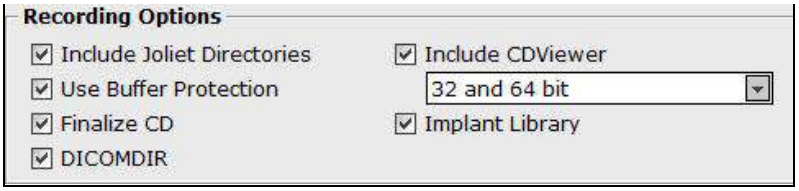


Fig. 28 Recording options

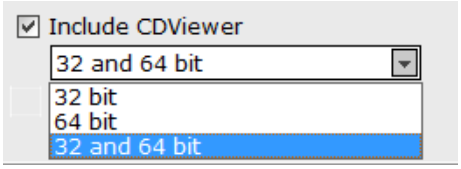
Function	Description
Include Joliet Directories	The standard file system named “Joliet” is used to support long file names and compatibility with non-Roman characters. A CD made without checking this option may result in compatibility problems.
Include CD Viewer	Includes DICOM Viewer program inside the CD/DVD. [Include CD Viewer] option is checked by default and has CD Viewer creation options for 32-bit, 64-bit, 32-bit and 64-bit operating system. To enable the CD Viewer data to be opened on a particular operating system, choose the respective option in the drop down menu. 
Use Buffer Protection	This function is used to prevent a “Buffer Under Run” error.
Implant Library	Includes real implant models when recording a CD. The Implant Library files will increase the overall data size, thus it is recommended to use a DVD when burning multiple volumes.
Finalize CD	Disables “Multi-Session” recording on a CD. The CD-RW must be reformatted entirely to change data once it has been burned.
DICOMDIR	References files and contains a description and access information for all the studies on the CD.

Fig. 29 Burning options

Function	Description
Media Info	Shows CD/DVD information.
Erase Media	If the medium is a CD/DVD-RW, the user can erase the contents of the CD.
Detect	Detects the size of the data to be recorded.
Delete All	Delete all imported data to clear spool directory. ****Recommended to use once before dragging in data and burning CD.**
Record CD/DVD	Start burning the CD/DVD.
Record USB Drive	Record the selected data to a USB, network drive, etc.

Select CD-ROM drive and burn speed using the drop-down menus shown below.
Volume Name is automatically labelled with the (first) Patient's Name, but can be changed by the user.

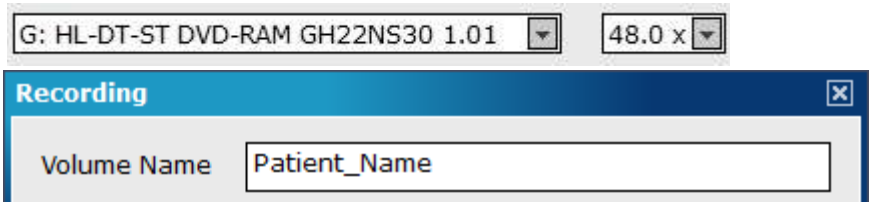


Fig. 30 CD options

My Computer and Network Places

Click on [My Computer] to view or import/export data stored on the computer or click [My Network Places] to view folders or other computers linked through the local network.

3.3 Search Options

Click the icon beside Search to expand the search options.

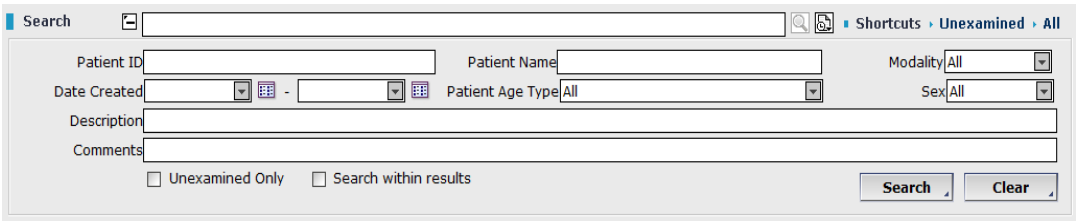


Fig. 31 Search options

OnDemand3D™ allows the user to search patient data by patient ID, name, data modality, sex, date created, patient age, description and comments.

Quick Access: Recently Opened

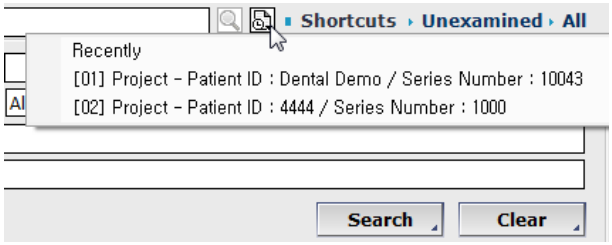


Fig. 32 Recently accessed patient data can now be accessed with a simple mouse-click

Quick Access: Search Shortcuts

To add search shortcuts for quick access, click on the Shortcuts icon and input shortcut information in the [Configure Search – Shortcut Buttons] window.

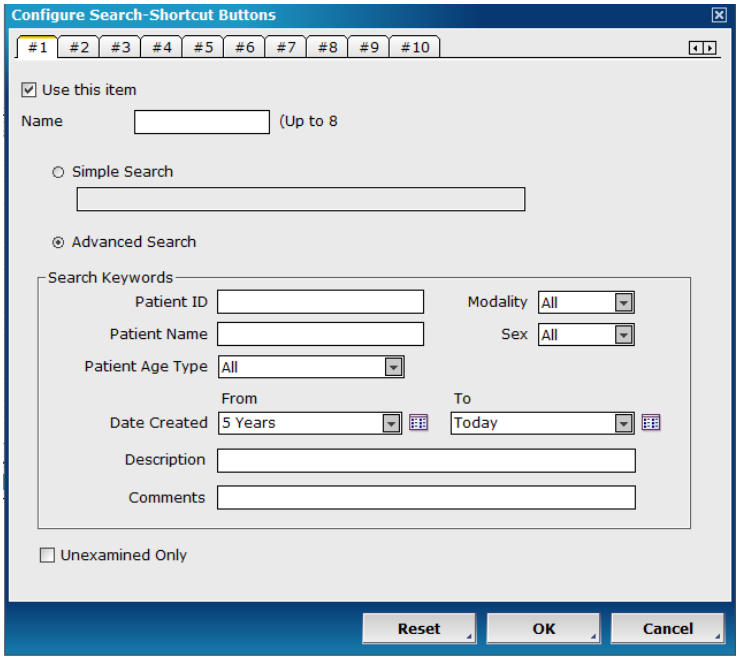


Fig. 33 Configure search shortcuts for easy access

OnDemand3D™ allows for up to 10 shortcuts, which will then be easily accessible by a quick click of the mouse Shortcuts › TMJ › Implant right along the [Search] bar.

Additional Options

Users have the option to display only [Unexamined] data or [All] using the Unexamined All icons provided on the [Search] bar. The same can be applied to search results using the Unexamined Only option. To perform another search within the shown search results, simply check the Search within results option.

3.4 Database Explorer

The [Database Explorer] shows DICOM data from the selected [Data Source]. The user will be able to import/export patient data or select patient data to load into a module from this section.

To start treatment planning or patient diagnosis and analysis, first click on the patient data in the [Database Explorer] and then click on a module of choice.

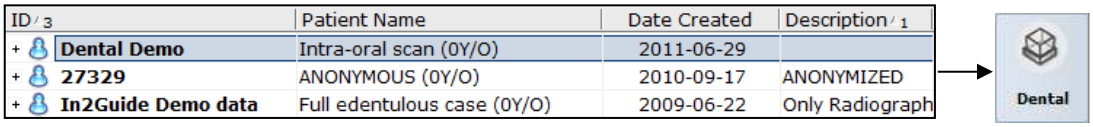


Fig. 34 Load selected patient data onto module

DICOM [Loading Options]

When patient data is loaded onto a module, the [Loading Options] dialog shown in Fig. 35 should pop up.

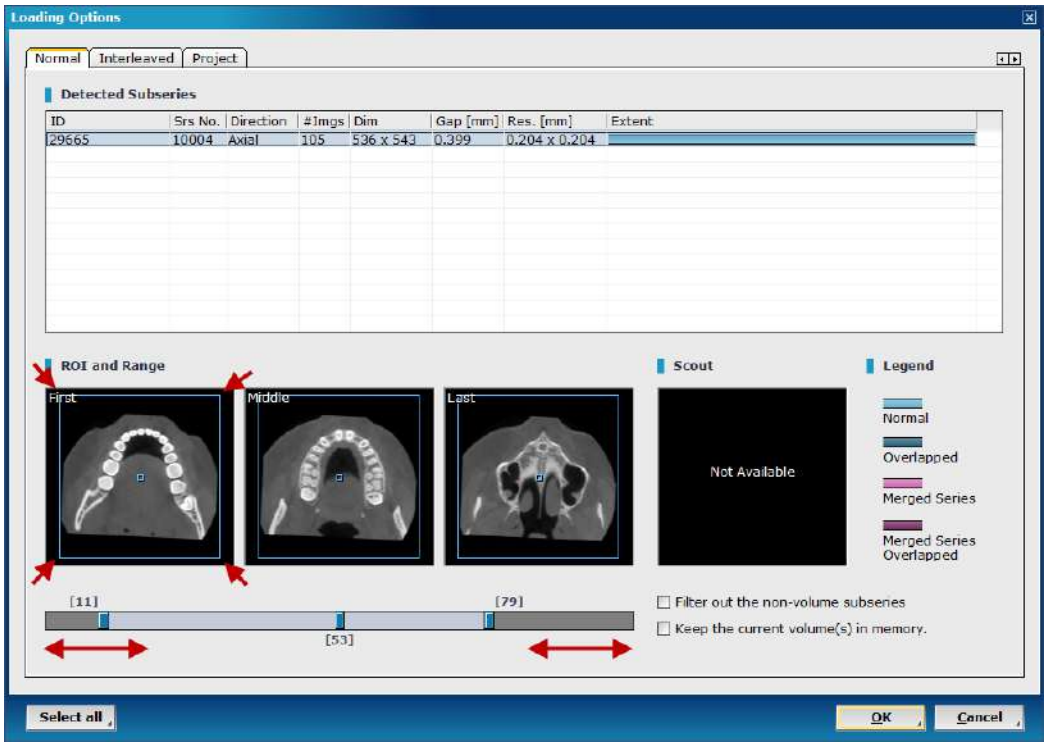


Fig. 35 If necessary, use the blue rectangular outline provided on the [ROI and Range] images and the slider bar provided at the bottom to adjust region and range of interest.

Function	Description
Detected Subseries	When multiple series are selected in DBM, all of the series are listed in [Detected Subseries]. To select two or more series, click while holding down the [Shift] or [Ctrl] key.
ROI (Region Of Interest)	Select the region of interest to be loaded onto the module by dragging the parameters of the blue box shown in all three views.
Filter out the non-volume Subseries	Filter out the non-volume sub-series which are not used to create volume rendered models.
Keep the current volume(s) in memory	If this option is selected, the current volumes in memory will not be removed. After loading a new data, click the [Volume] button at the top of the toolbar to select and load stored volume data.
Range	Adjust the range of images in the selected series by dragging the tips of the blue slide bar. The bars indicate the images that are currently selected.

WARNING	• OnDemand3D™ does not load a single DICOM slice. At least two slices are needed to reconstruct a 3D volume. • OnDemand3D™ does not support RGB DICOM data. When loading RGB DICOM data, the [ROI and Range] windows show the text “Not Available”.

Project File Info

Double click on a Project File from [Database Explorer] to load. When the [Project Info] window appears, as shown in Fig. 36, click [Open] to load the Project File with the corresponding DICOM data.

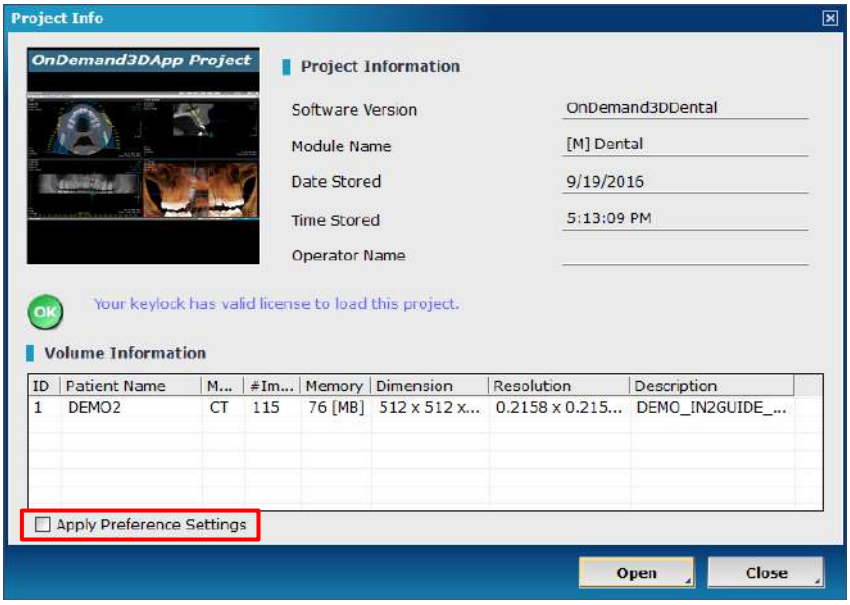


Fig. 36 [Project Info] dialog

INFO	Project sharing option for Dental, DVR and In2Guide modules is available in OnDemand3D. Project sharing allows users who have one of the aforesaid modules to load and work with projects that have been created with any of the other above mentioned modules. (i.e. Projects files created with DVR can be loaded with Dental or In2Guide module and vice versa.)

INFO	**[Apply Preference Settings]** overrides the Project’s saved Preference Settings with the user’s current Preference Settings (e.g. Tooth Numbering system, Default Nerve radius).

DICOM [Database Explorer] Options

TIP	To export/import DICOM data, right-click or simply drag and drop onto desired [Data Source].

Right-clicking on a DICOM folder in [Simple File View] will show the following drop-down menu.

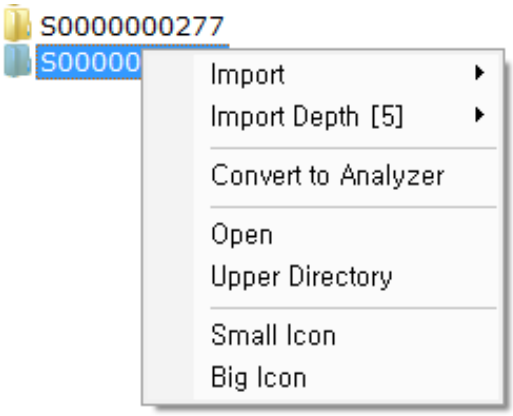
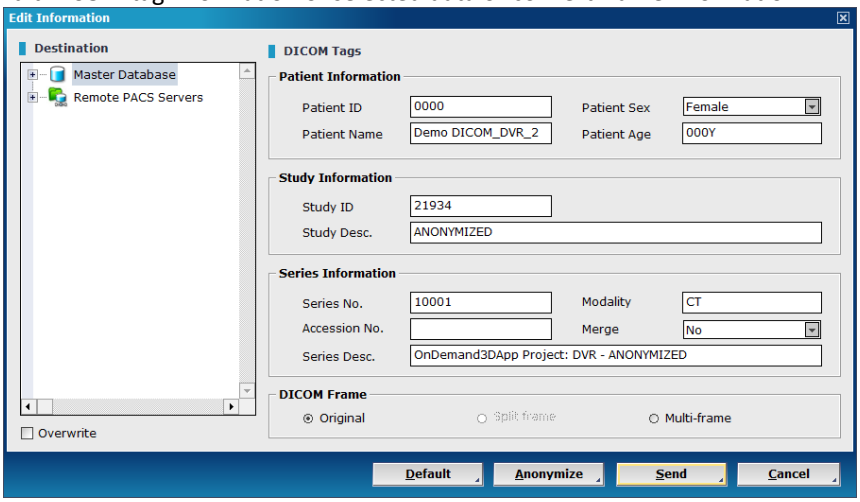
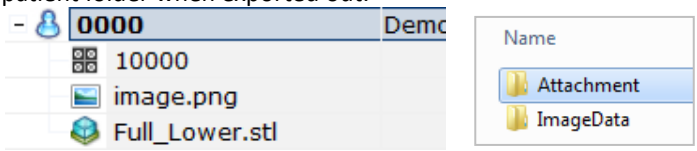


Fig. 37 DICOM folder drop-down menu

Function	Description
Import	Import data to the **Server** or the [Master Database].
Import Depth	Select the number of sub-directories to be imported.
Convert to Analyzer	View patient study information in the [DICOM Analyzed View].
Open	Open current folder.
Upper Directory	Go to upper directory.
Small Icon	Changes the icon size to small. (default)
Big Icon	Changes the icon size to large.

Right-click on a patient series in [Database Explorer] and see the following menu:

Fig. 38 Patient series 'drop down menu'

Function	Description
Delete from DB	Delete selected data from the [Master Database].
Set as Examined	Set the study as examined data. (Patient ID is shown in normal font.)
Set as Unexamined	Set the study as unexamined data. (Patient ID is shown in bold font.)
Copy to	Copy selected data to the Server, Private DB and CD/DVD/USB Writer
Move to	Move selected data to the Server.
Export	Export selected data to a remote source such as an USB drive, external hard drive, Desktop, etc.
Send to	Send selected data to [Remote PACS Server].
Properties	View DICOM properties such as patient age, name, and number of images.
Edit	Edit DICOM tag information of selected data or convert frame information.  Fig. 39 [Edit] data information In the [Edit Information] dialog shown above, users will be able to re-enter information such as patient ID, patient sex, patient name, age, study ID, etc. To convert DICOM frame information, simply choose between [Original], [Split-frame] or [Multi Frame] and press Send. To anonymize patient data, press Anonymize or press Default to revert back to default info.
Import 3D Model (STL)	Import 3D Model (STL) data as Cybermed Surface Mesh (.CSM) data. (Color .PLY file type is supported for all 3D Model functions in OnDemand3D.)
Add Attachment	Add files such as JPEG, PNG, PDF or STL under a patient study series. The attached files are saved in the [Master Database] and are included in the patient folder when exported out.  Fig. 40 Patient with attached PNG and STL data as seen in [Master Database] (left image) and seen as exported data (right image).

3.5 Thumbnail

When a patient series is selected in the [Database Explorer] window, the user should see a preview of the data contained in the [Thumbnail] section of the DBM layout. The [Thumbnail] section previews DICOM data, Project Files, reports, and imported STL data.

INFO	The [Thumbnail] section will move around depending on the user's chosen layout or screen width.

3.6 Background Jobs

When an [Import] command is given, the following dialog will pop up. OnDemand3D™ will not be accessible when this pop up is open, so please click on Background to collapse it to the bottom of the screen, as seen in Fig. 41.

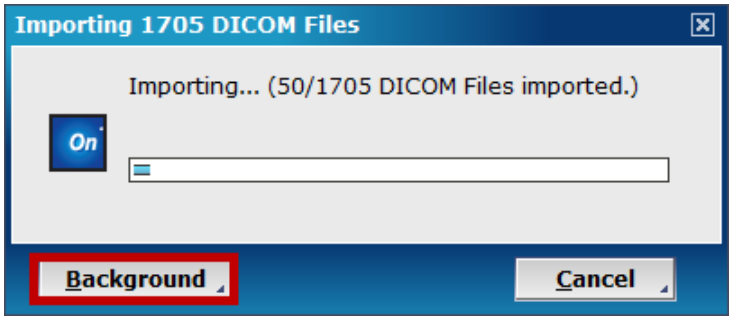


Fig. 41 [Importing] dialog

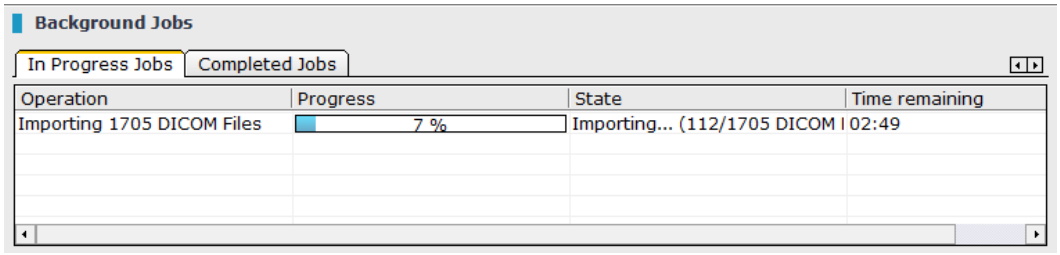


Fig. 42 [In Progress Jobs] running in the background

4 Tools

OnDemand3D™ provides various tools and image options for 3D and 2D image analysis.

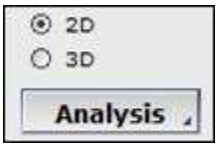
4.1 General Tools

These tools include some of the most used on OnDemand3D™ and are included in all of the available modules. They are displayed right alongside the module on the left side of the screen.

Viewing Tools

Function	Description
	**Pan**. Pan the selected image. Select this tool and simply click and drag.
	**Zoom in/out**. Select this tool and drag up/right to zoom in and drag down/left to zoom out.
	**Windowing**. Adjust the Window Width and Level (WWL) of the selected image. Select this tool and drag left/right to control Windowing Width and drag up/down to control Windowing Level. Go to [Tool Options] and click on [Preset] for windowing presets. 
	**Inverse image**.
	**Text Overlay**. Turn on/off text overlays. Useful for keeping patient's anonymous.
	**VOI Overlay**. Activate VOI (volume of interest) overlay to adjust interest region on MPR images.

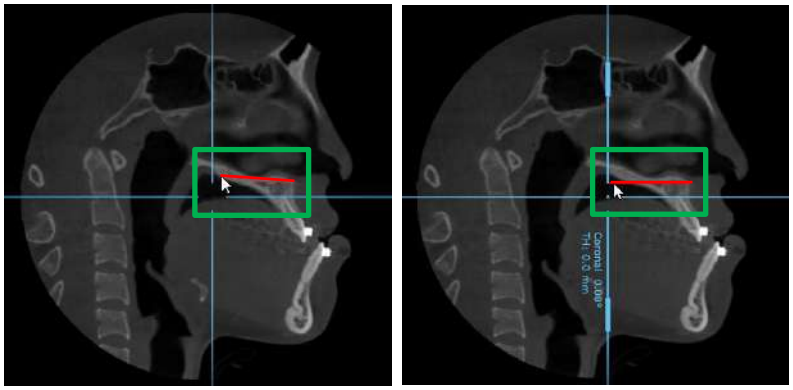
Measuring Tools

Function	Description
	**Ruler (+ Measurement Analysis Tool).** Measure the distance between 2 points. See [Tool Options] for 2D/3D options and Measure Analysis Table. 

Ruler: "Snapping" to Reference Lines.

Note: This function is only available in Modules with *Reference Lines* – Dental (MPR Tab), 3D, Fusion, 3D Ceph (MPR panes)

When the *Ruler* line gets close to a perpendicular *Reference Line* (blue), it will automatically "snap" to it (as seen below).



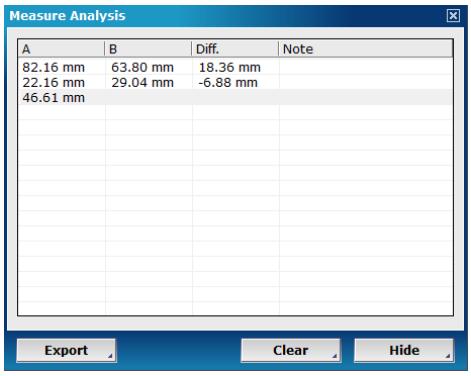
To disable the "Snapping" feature, press [Enter] key on a pane to hide the *Reference Lines*. To reactivate the feature and *Reference Lines*, simply repeat the action.

Ruler: Measure Analysis Table.

Note: 2D only. 3D Option will not work with this function.

While the *Measure Analysis Table* is open, placing *Ruler* lines (2D) will automatically enter the corresponding measurement values in the table. Changing the *Ruler* line length will automatically update the value and calculation in the table.

By default, the values are entered left to right (as seen below).



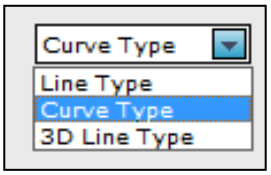
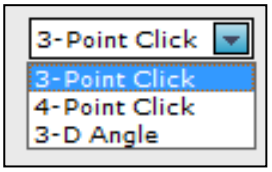
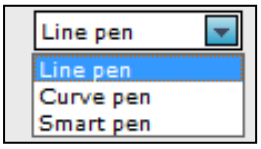
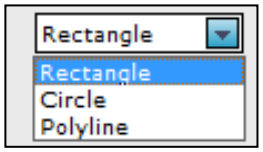
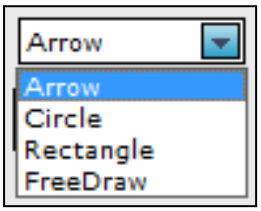
Note: Deleting the *Ruler* line also removes the related entries from the *Analysis Table*.

Pressing the Export button will export the content to an Excel (CSV) file.

Pressing the Clear button will delete all entries in the *Analysis Table* only.

Pressing the Hide or button will collapse the table (but retain the entries). Pressing the Analysis button again will re-open the table.

Note: Closing OnDemand3D and/or changing the Module will clear the data in the *Measure Analysis Table*.

	**Tapeline**. The [Tapeline] tool is used to measure the distance between multiple points connected either by straight or curved lines. See [Tool Options] for more. 
	**Angle**. Measure the angle between lines. Choose between a 3-point click, a 4 point click and a 3D angle. 
	**Profile**. Displays a graph which represents the density values of a selected line on a 2D image. Use this tool to draw a line, and a profile graph will be generated. Drag the ends of the graph to adjust.
	**Area.** Measure the area of a region. Use this tool to draw a region of interest. See [Tool Options] to choose between [Line Pen], [Curve Pen] and [Smart Pen]. 
	**ROI.** Measure the minimum, maximum, average and standard deviation density values within a region. Use this tool to draw a region of interest first. From [Tool Options], choose from [Rectangle], [Circle] or [Polyline]. 
	**Arrow.** Draw an arrow. Choose between [Arrow], [Circle], [Rectangle] and [FreeDraw] from [Tool Options]. Select arrow color using the [Color] menu beforehand. 
	**Note.** Write a note/annotation.
	**Delete.** Delete all measurements and annotations.

Annotation Settings

In the [Annotation Settings] you can change Annotation & Overlay Size, Color List, and Overlay Date type. To access the [Annotation Settings], please use the [Tool Settings] icon in the top-right corner of the *Measure* section, as shown below.

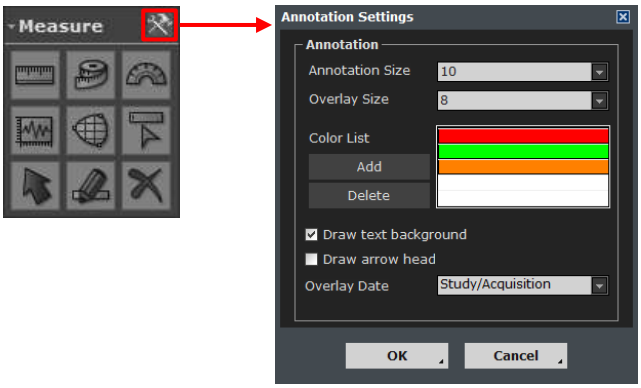


Fig. 43 [Annotation Settings]

TIP	Font Sizes can also be manually entered by typing and not limited to the selection of *8, 10, 12, 14, 16.*

The *Color List* can hold a selection of up to 5 colors. Any colors contained in the *Color List* are auto-rotated according to order for each placed annotation.
To add an additional color to the *Color List,* click [Add] and select the desired color from the palette.
To change one of the colors in the *Color List*, click the desired color and choose a new color from the palette. To remove the last color in the *Color List,* simply click [Delete].

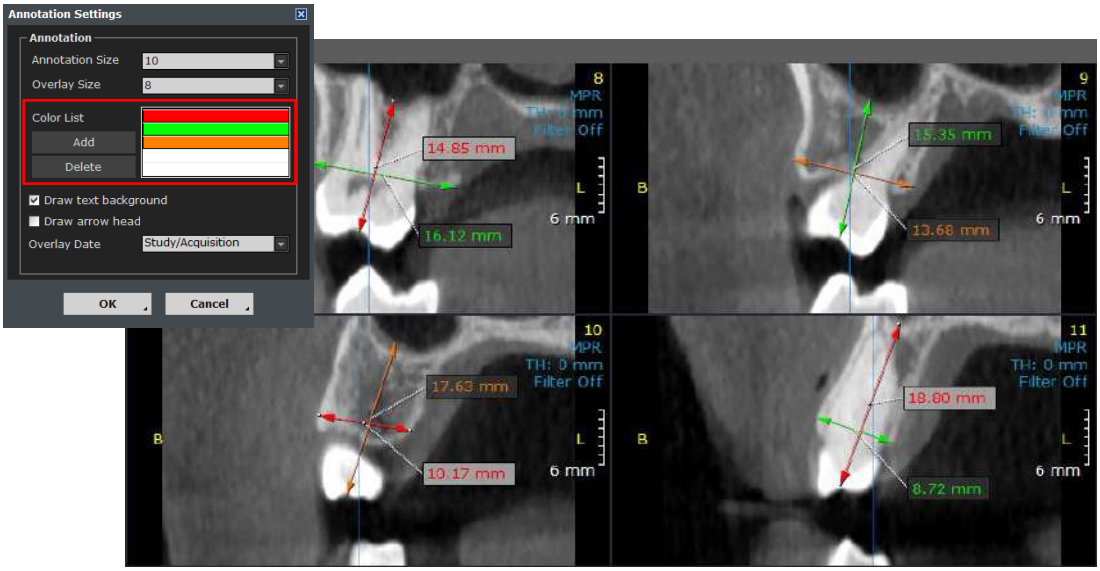
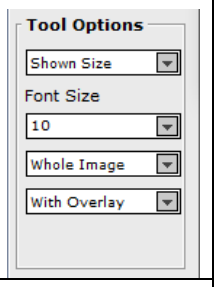


Fig. 44 A selection of three colors in the *Color List* being auto-rotated per annotation

TIP	To apply the same single color to all annotations, make sure that only ONE color is selected in the *Color List*.

Output Tools

Function	Description
	**Capture**. Capture a pane of choice or the entire screen. The capture images are stored on the local hard disk and can be accessed and used from the Report module. See [Tool Options] for the options shown below. **Pane with overlay** — Capture an image on a pane with text overlay information such as patient ID, patient name, etc. **Pane original data** — Capture an image on a pane without text overlay information. **Region with overlay** — Capture a rectangular region by clicking and dragging the mouse. The image will include text overlay information. **Region original data** — Capture a rectangular region by clicking and dragging the mouse. The image will not include text overlay information. **Full Screen** — Capture the entire screen.
	**X-Report.** Open an X-Report template on the [Local Report] window to drag and drop images. For more information, please refer to page 101 (☞ ***Chapter 7: X-Report***). The tool options are for how images and text overlays are to be displayed on the X-Report. 
	**EasyRiter.** Open built-in EasyRiter window. (Only available with additional purchase, please visit www.ondemand3d.com for more information.)
	**Save Project.** Users can save their work on OnDemand3D™ as a Project File. Click on the icon, type in operator and description info and select [OK] to save. Saved Project Files will be accessible under the current study in DBM.
	**Print.** Print out current layout of images.

	For more tips and tricks on pane navigation such as keyboard and mouse click combinations, please refer to the page 236 (☞ ***Appendix G: Shortcut keys)***. Example: Use a combination of the [Ctrl] key and the left button on the mouse, and drag the mouse in to zoom in or out to zoom out.

Additional Tools

Right-click. Some of the tools mentioned above can also be accessed by right-clicking on a pane of choice (see image shown right). The tools included in the menu may vary by pane.

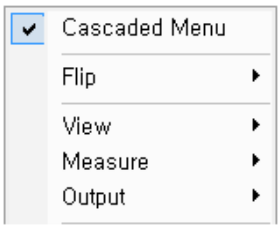
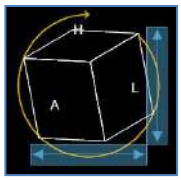


Fig. 45 [Cascaded Menu]



Direction Displayer. As its name suggests, the [Direction Displayer], shown left, displays the direction or orientation of the 3D or 2D volume. The user can also use it to re-orient the 3D volume to their liking.

Fig. 46 [Direction Displayer]

4.2 Image Options

Image rendering options and filter options are available on the top right corner of each pane and along the top bar of OnDemand3D™. Window-Width/ Window-Level and Zoom information are displayed on the bottom right corner of each pane.

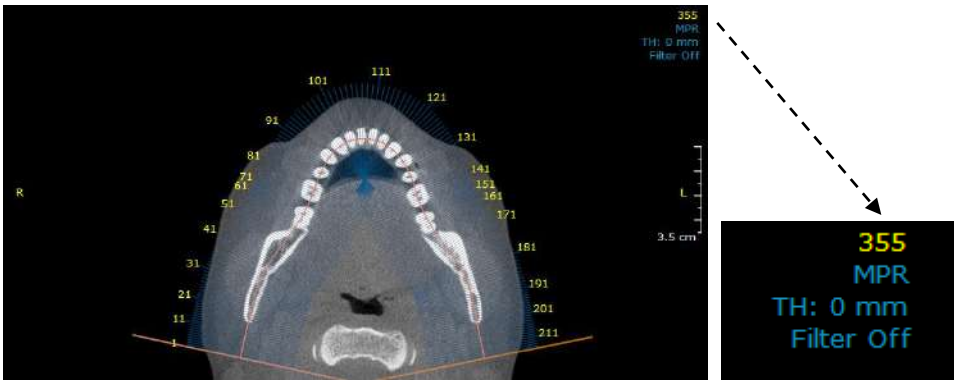


Fig. 47 Image options

Rendering mode. The number 355 in Fig. 47, shown above, stands for the slice number, while [MPR] is the currently set rendering mode. To change settings, click on the [MPR] text and the menu below should pop up.

Fig. 48 Available rendering modes

Mode	Description
MPR	Multi Planar Reformat
MIP	Maximum Intensity Projection
minIP	Minimum Intensity Projection
VR	Volume Rendering
Apply to All	Apply to all MPR panes

Slice thickness. The slice thickness can also be adjusted by clicking on the [TH: 0 mm] text and inputting a value manually or selecting a value from the drop down menu. To set a default slice thickness on OnDemand3D™, please refer to page 211 *(☞ Chapter 10: Subsection: MPR).*

Filters. Users can visually enhance the image data by using one of the various Filter tools provided.

The Basic Filters simply sharpen or blur the image, where the Advanced Filters use specific algorithms that target elements of the image data to achieve a desired visual enhancement.

Click on the [Filter Off] text in the image pane or select Filter from the top bar of OnDemand3D™ to select a filter to apply to the image.

(Note: Unlike [Filter Off], [Filter] button is applied to images in all MPR panes.)

Basic Filters	Description	
1x	Basic Sharpen x1	
1.5x	Basic Sharpen x1.5	
2x	Basic Sharpen x2	
Blur	Blur	
Advanced Filters	**Description**	
Sharpen	Emphasizing Edges	Uses increased contrast to emphasize the edges, but also the noise and flaws are emphasized as a byproduct. **This filter is the most basic of the sharpening filters with the least effect.*
Unsharpen	Emphasizing Edges	High frequency components are emphasized while also retaining the low frequency components. **This filter's sharpening affects are stronger than that of the Sharpen filter.*
HighBoost	Emphasizing Edges	A modified form of *Unsharpen* filter with extreme emphasis placed on high frequency components. **The strongest of the sharpening filters but can produce a "grainy" image.*
GaussianBlur	Blurring	Achieves a blurred effect by utilizing a Gaussian Function to convolve the image which reduces the high frequency components. **This filter is the most effective in removing noise, however one disadvantage is that the edges and detail are not preserved.*
Average	Blurring	Achieves a blurred effect by replacing each pixel value with the average value of its neighboring pixels to eliminate values unrepresentative of the surrounding. **This filter preserves the edges slightly better than a Gaussian while reducing some of the random noise in an image.*
Median	Blurring	This filter's process is similar to the *Average* filter, but uses the median value of the neighboring pixels. **This filter attempts to preserve the details and is most effective at minimizing noise. Particularly effective when there is lots of "speckle" (salt-and-pepper) noise consistently throughout the image.*
Anisotropic	Remove Noise	Decreases noise in a similar manner as a *Gaussian* but retains the edge clarity and detail. **This filter reduces image noise without removing the edge clarity, it has a similar affect as the Median filter but retains more detail.*
Bilateral	Remove Noise	An image smoothing effect obtained by changing the intensity of each pixel to the weighted average based on the spatial closeness and intensity difference of surrounding pixels. **This filter smooths the image which results in noise reduction while preserving the edges. The noise reduction factor is the highest however the smoothing does remove a lot of the texture within the edges.*

Each of the *Advanced Filters* can be customized and applied in XImage for enhanced X-Ray analysis. Please refer ***(☞ Chapter 13: XImage: Preset)***.

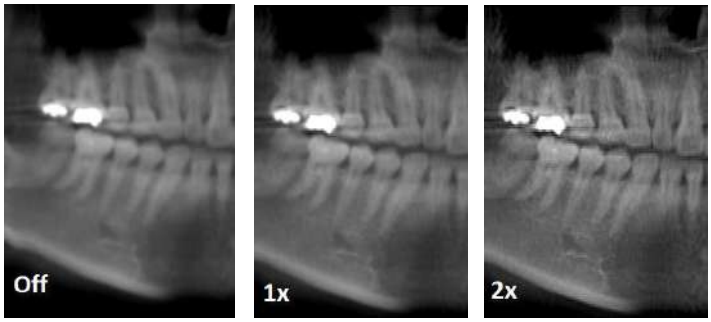


Fig. 49 Comparison of a panoramic image with Basic Filters: 1x, 2x (Thickness: 20mm)

Viewing angle [3D Volumes]. For 3D image panes, users will be able to choose the direction the 3D Volume faces.

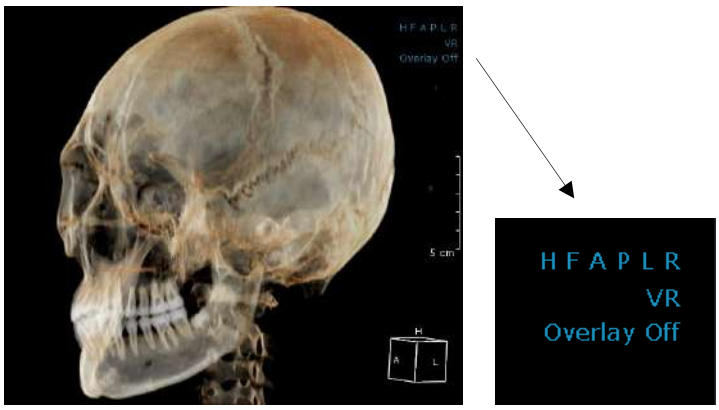


Fig. 50 Viewing angle

Abbreviation	Viewing Angle	Description
H	Head	View from head/superior angle.
F	Foot	View from foot/inferior angle.
A	Anterior	View from anterior angle.
P	Posterior	View from posterior angle.
L	Left	View from left lateral angle.
R	Right	View from right lateral angle.

Overlay settings. Users can choose to view different types of overlays, for example the MPR overlay, Plane overlay and Outline overlay.

Fig. 51 Plane Overlay (left); Outline Overlay (middle); MPR Overlay (right)

Windowing and Zoom. Windowing width, windowing level and zoom ratio value information are all shown on the lower right corners of each pane, as shown below in Fig. 52.

Fig. 52 WWL & Zoom

Threshold. Threshold options are available in the Panorama pane. Users can set a minimum density value to display. If the threshold value is set to '0', only the regions with the density value of '0' or higher will be displayed.

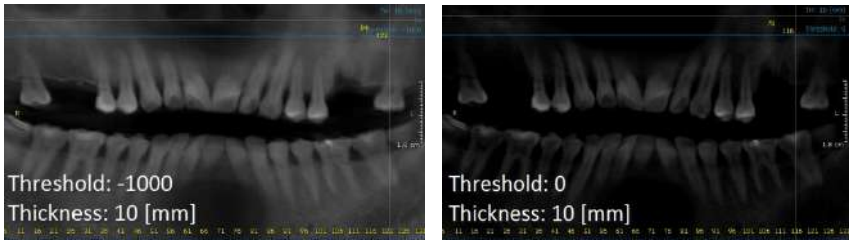


Fig. 53 Same panoramic image with a threshold value of [-1000] (left) and [0] (right)

Cross-Sectional Layout. The number of slices shown in the CrossSectional or Panorama panes can be set by the user. Click the icon choose desired layout. Users will also be able to click Edit and manually enter the number of cross-sectional images wanted as shown below.

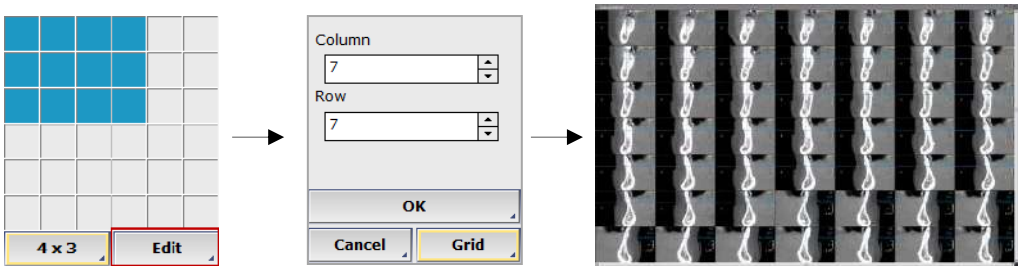


Fig. 54 Cross-sectional layouts go up to 15 rows and columns

TIP	Press the [Enter] key to show or hide reference lines on images.

Maximize and Minimize. Click the icon on the top right corner of the pane. The window will maximize to fit the screen. The Panorama pane spreads horizontally and hides the 3D pane when it is maximized.

Additional commands. For 2D panes, click the icon on the top right corner of the pane to flip the image. For 3D panes, there will be additional tools for changing rendering speed settings and background color.

4.3 Quick LightBox [QLB]

Quick LightBox is tool that provides the user with a quick review of a series of images that can be easily scrolled through, along with some handy tools such as the Cine Player function, which can generate and export video AVI data from image files.

Quick LightBox, launched from a 2D pane, can provide the user with a series of slice images according to the slice thickness, spacing and rotation the user has set, while launched from a 3D pane, it can show the 3D volume in a series of images depicting a rotation along parameters also set by the user.

Launching Quick LightBox

Step 1: Users can access QLB using the  icon provided on the top right corner of certain panes.

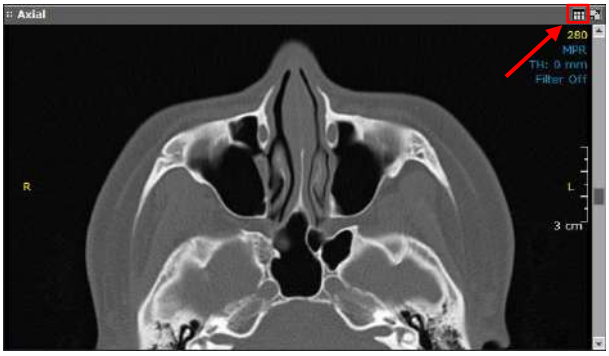
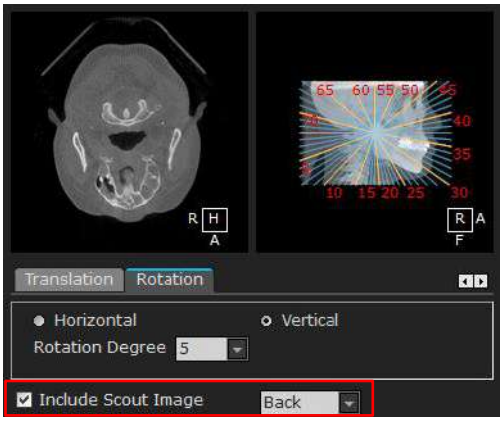


Fig. 55 Quick LightBox can be accessed from most panes

Step 2: Click on the QLB icon to view the [Options for Quick LightBox] window shown below.

Fig. 56 Set options for Quick LightBox using the [Translation] and [Rotation] tabs provided

Users can select their region of interest using the slide bar provided and the slice spacing and thickness settings on the [Translation] tab.



The [Rotation] tab lets the user choose between a [Horizontal] and [Vertical] slice angle. Set the [Rotation Degree] values between each slice.
If the [Rotation Degree] value is set as '5', the angle between each slice will be 5 degrees.

TIP	Check [Include Scout Image], and then using the dropdown option select the position (Front or Back) that it will be loaded in QLB.

Fig. 57 The [Rotation] tab on QLB

Step 3: Click [OK] to launch Quick LightBox with the current settings.

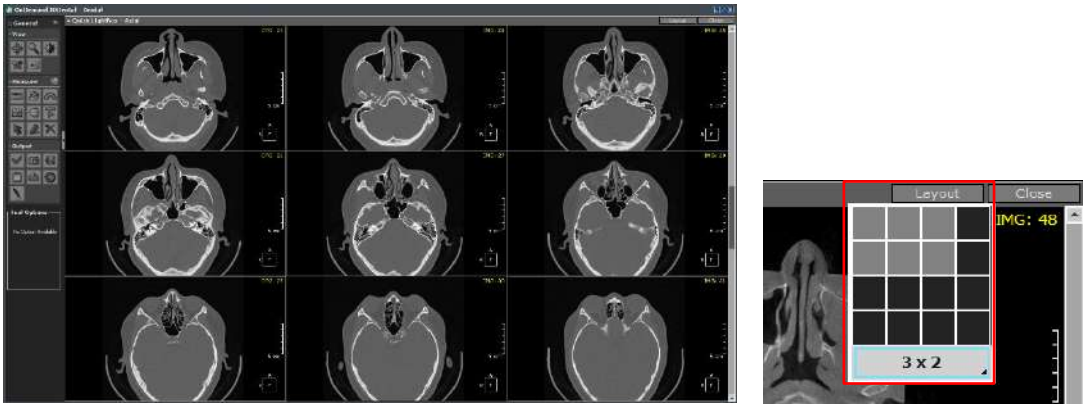


Fig. 58 Quick LightBox layout and layout options

Click on [Layout] in the utmost right corner to change the number of images displayed and scroll through the slices for a quick overview.

A specific option for QLB launched from *Panorama* pane, is the [Include Hash Line] checkbox.

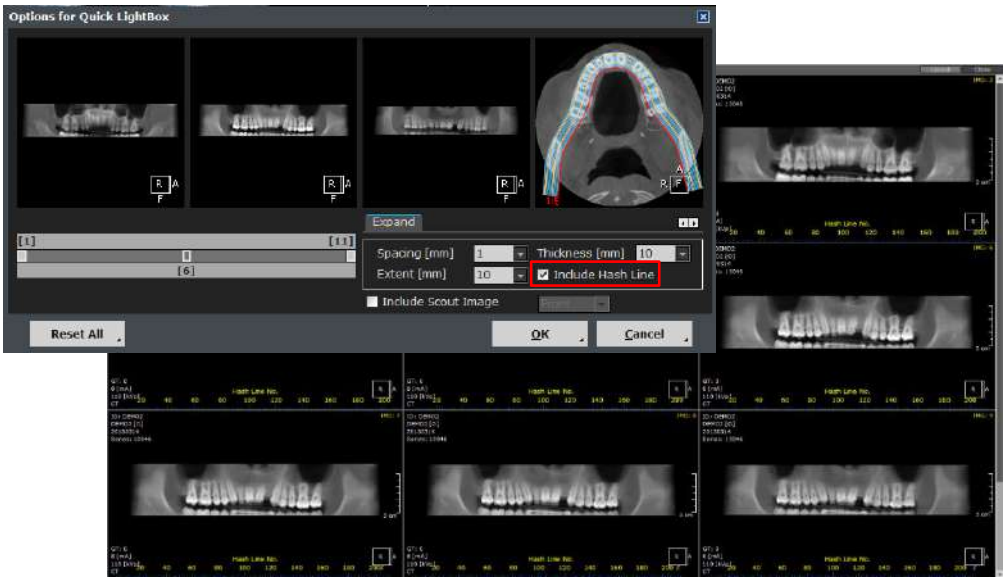
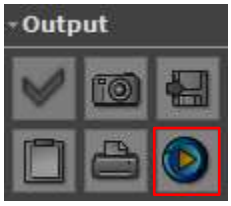


Fig. 59 Panorama view in QLB with [Include Hash Line] option checked

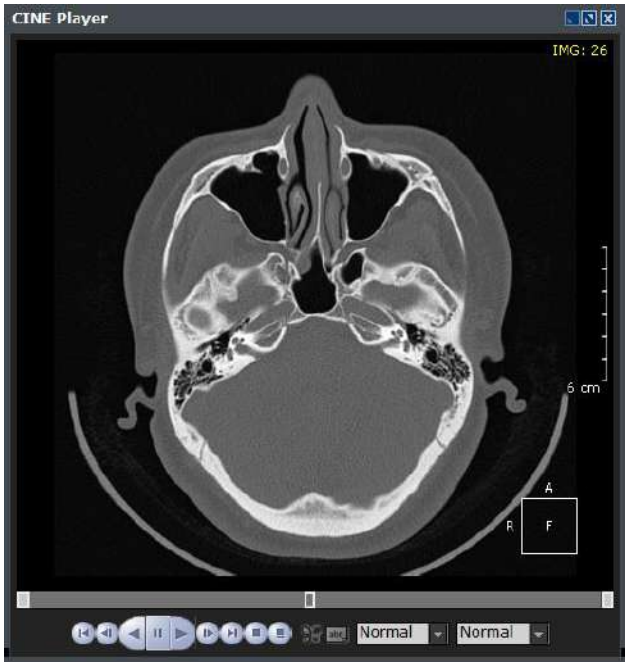
Cine Player



There is one additional [Output] tool in QLB called the [Cine Player].

Users can generate a video file using the image data currently loaded onto Quick LightBox. Click the  icon to see the window shown in Fig. 61.

Fig. 60 [Cine Player] icon



Use the tools provided at the bottom of the player window.

The user can set **speed** and **playback** settings with the 

menus provided.

Export the video file as AVI data using the  icon.

Fig. 61 [CINE Player] window displaying generated video data

The same steps shown in 4.3 QLB can be repeated with 3D and 3D Zoom panes, as shown below.

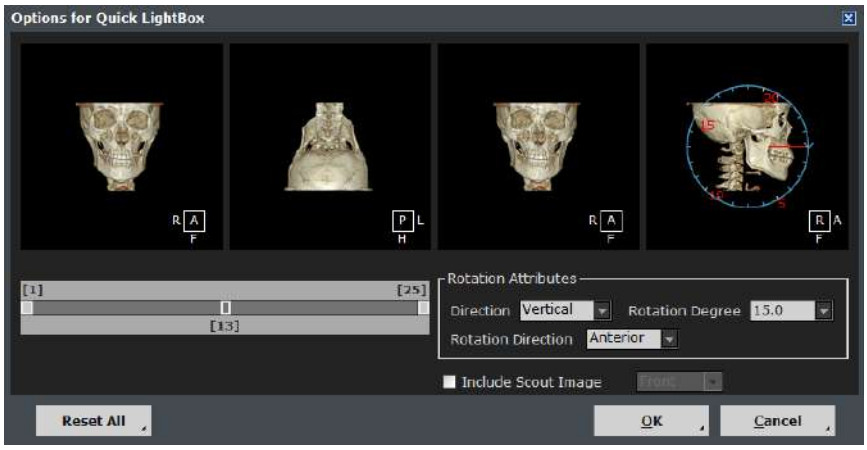


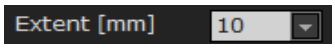
Fig. 62 Example of Quick LightBox used on a 3D pane

TIP

As Quick LightBox options can vary according to which pane Quick LightBox is launched from, some additional settings to look out for can be seen below.

- This option shown on Sagittal panes refers to reversing the regular slicing direction (left to right), in order to slice from right to left.

- This option shown on Endoscope panes refers to the viewing direction of the camera. If checked, the camera will be reversed a full 180 degrees.



- Shown on CPR or Curved Planar Reformat planes, this one refers to the FOV (Field of View). If the [Extent] value is set to '10', then the total FOV will be 10 mm.

5 Dynamic LightBox [DLB] (Optional)

Dynamic LightBox displays the axial, sagittal and coronal planes generated from patient DICOM data. The DLB module also offers various additional tools for patient diagnosis and analysis including 3D Zoom and virtual endoscopy functions.

5.1 Layout

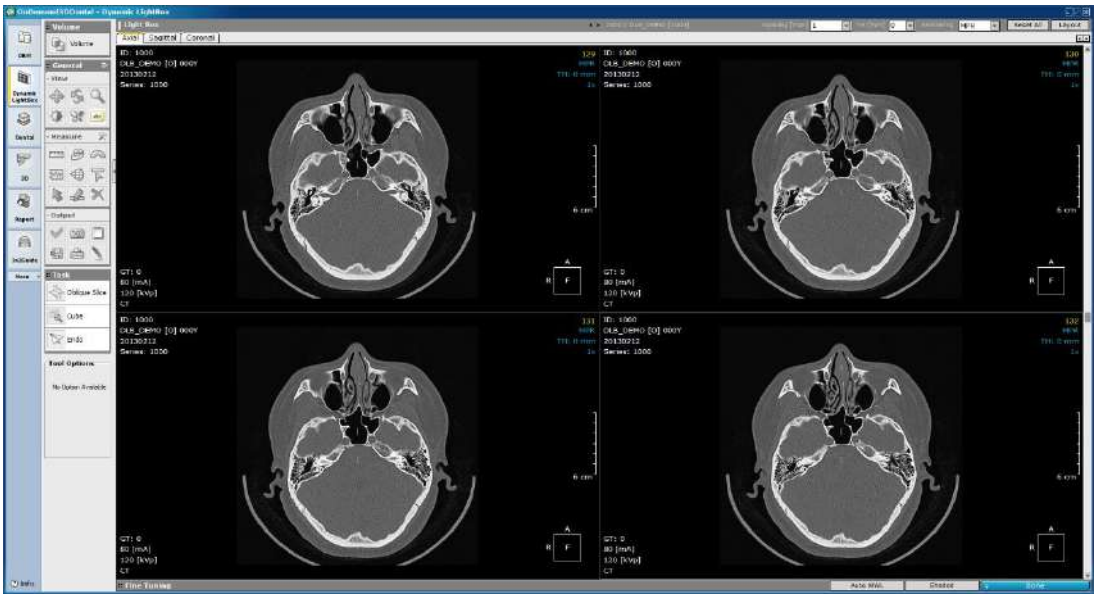


Fig. 63 DLB Layout

There are three tabs in DLB: Axial, Sagittal and Coronal. Navigate through the planes by selecting the appropriate tab, as shown in Fig. 64.

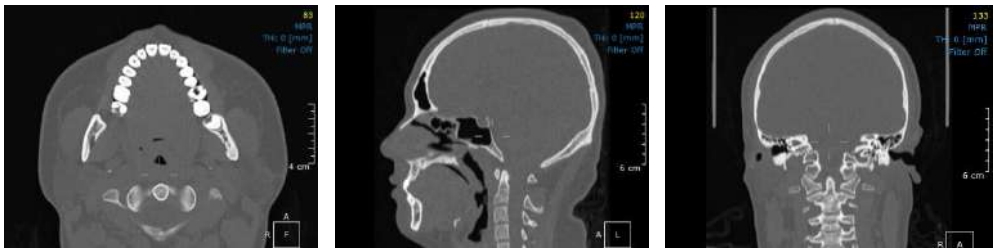


Fig. 64 DLB planes

5.2 Tools

Use the toolbar, shown below, located on the upper right corner of the DLB layout to set slice spacing, thickness, and rendering. To set the number of images displayed, click on [Layout].

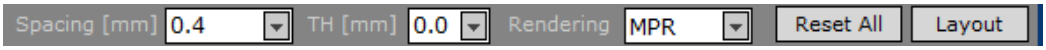
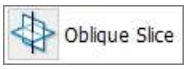


Fig. 65 DLB Local toolbar

DLB includes the following three task tools: [Oblique Slice], [Cube], and [Endo], as shown in below.

Fig. 66 DLB task tools

Oblique Slice.

To create an oblique slice image, first click on 

from the [Task Tools] section and click on a point on the image and drag it out, as shown in Fig. 67. The orthogonal section image created will appear on the right pane.

Drag out/in the squares at the edges of the orange reference line in the Axial pane to expand or shrink the region of interest. The same effect can be achieved by clicking on the edges of the square shown in the Oblique pane.

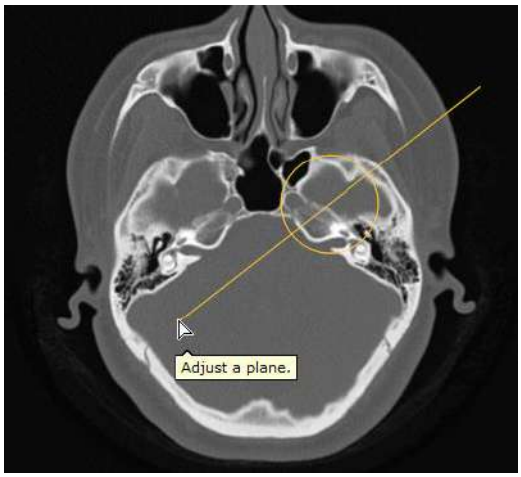
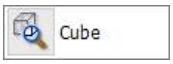


Fig. 67 Create an [Oblique Slice]

The orange circle in the reference line can be used to move the reference line to view other desired regions. Rotate the reference line to view different angles of the selected plane.

Cube.

Create a 3D Zoom Cube by selecting 

from [Task Tools] and clicking on the image and dragging it out as far as needed.

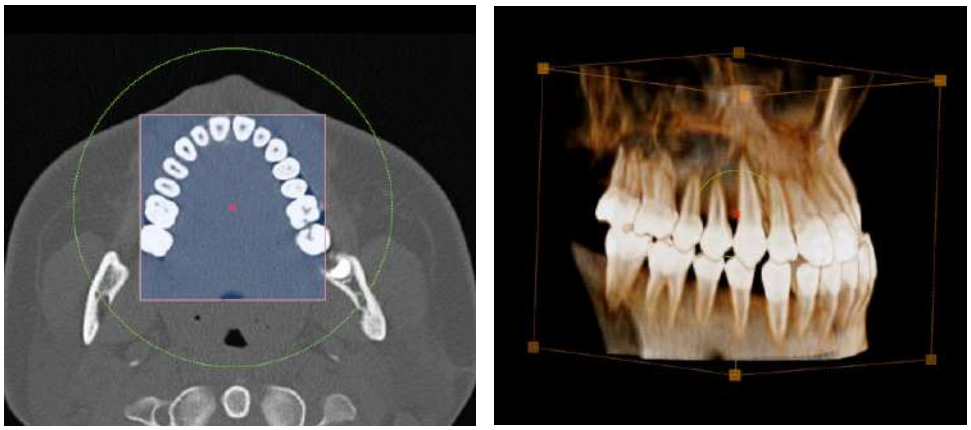


Fig. 68 3D Zoom Cube

Move the square in the Axial pane by dragging the red [X] to view different areas of the image, and adjust the region of interest by placing the cursor over the green circle and dragging it out, or by the dragging the vertices on the edges of the cube in the 3D-Zoom pane. On the 3D-Zoom pane, users will be able to right-click and hold to rotate the cube and view it from different angles.

Endo. The Endo tool offers a virtual Endo Camera to the interior of a selected structure. Select 

from [Task Tools] and click on a point to observe as shown in Fig. 69.

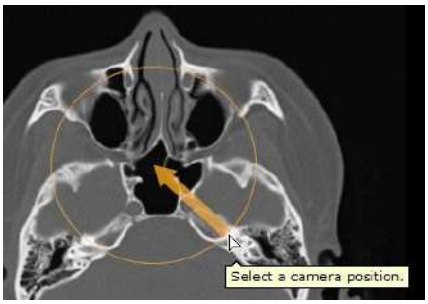


Fig. 69 Select a camera position

Move the red [X] to view different areas. The camera angle can be rotated using the [Viewing Point], and the green circle can be used to expand or shrink the region of interest. Please refer to Fig. 70.

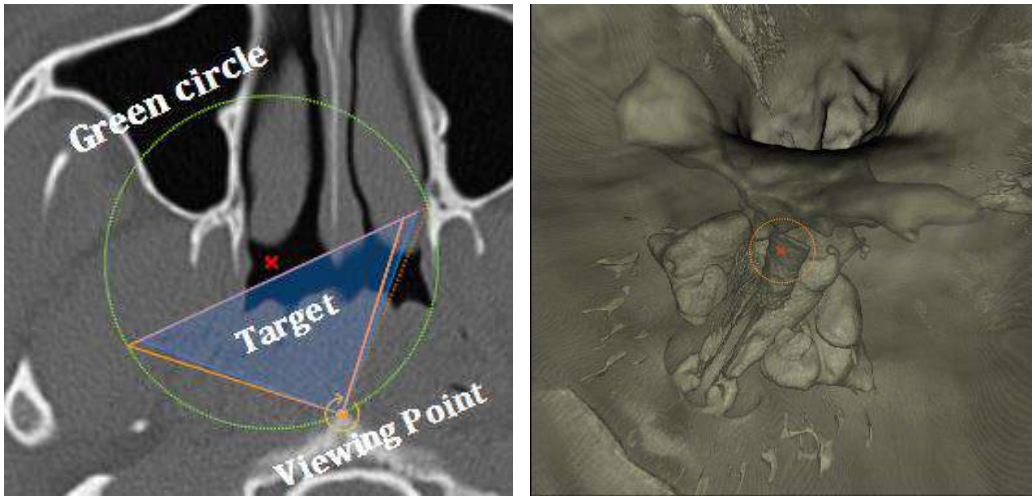


Fig. 70 Endo camera

6 Dental

OnDemand3D™ Dental is designed for private dental offices with CBCT equipment. Dental contains essential functions needed to view DICOM images aiding dentists with higher precision, better implant and treatment planning and most of all, accurate diagnosis.

6.1 Layout

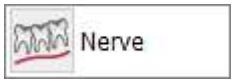
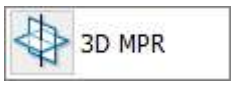
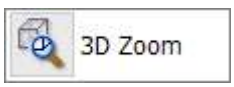
Fig. 71 Dental [MPR] layout

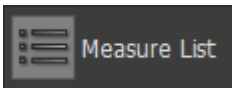
The default layout of the Dental module is [MPR]. The user can come back to this screen at anytime using the [3D MPR] tool in task toolbar. The five different tabs in the Dental module, as shown below, are: [MPR], [Dental], [TMJ], [Bilateral TMJ] and [Verification].

Fig. 72 Dental tabs

6.2 MPR (Layout)

The [MPR] layout has four Task Tools.

Function	Description
	Allows user to mark the inferior alveolar nerve path.
	Allows the user to modify marked nerve paths.
	Resets to the default [MPR] layout.
	Provides a high resolution 3D zoom image.

	Each measurement is added to the list upon being placed on the slice, and double-clicking on an entry will jump to the slice where the measurement is placed.

Nerve. The [MPR] layout allows you to mark the inferior alveolar nerve path using the coronal, axial and sagittal views. Click on [Nerve] and place the first point, scroll through the views and click once on each point to continue the path, and click twice to finish drawing. To start over while drawing, click [Esc]. For more instructions, please refer to page 50 (☞***Subsection: Nerve***).

TIP		If somehow, the software doesn't allow for clicking on an image during this process because of the [MPR Control Line] shown left, press [Enter] and the control line should disappear. Press [Enter] again to undo.

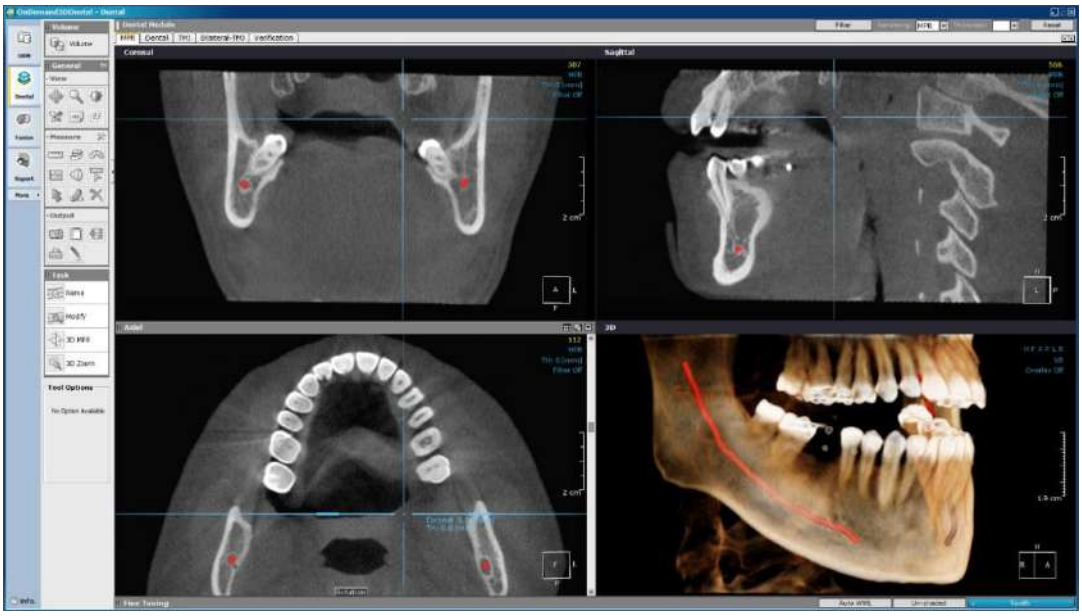


Fig. 73 Mark the nerve for easier and safer planning

Modify. To modify or make adjustments to the drawn nerve, click on [Modify] from [Task Tools] and reposition the nerve markers one by one or delete the whole path. Right-click on a nerve marker for more options, as shown below.

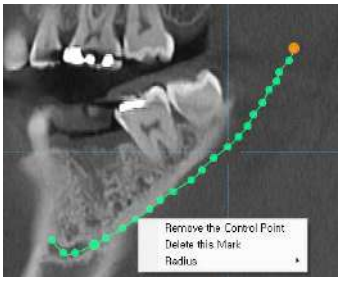


Fig. 74 Modify nerve markers (control points)

3D MPR. Resets changes made with the [3D Zoom] tool and goes back to the default layout.

3D Zoom. This tool allows the user to zoom in on a specific region in high resolution. Different from simple magnification, it re-renders the selected area as to minimize loss in resolution. 3D Zoom can be utilized in viewing the finer structures of the whole anatomy.

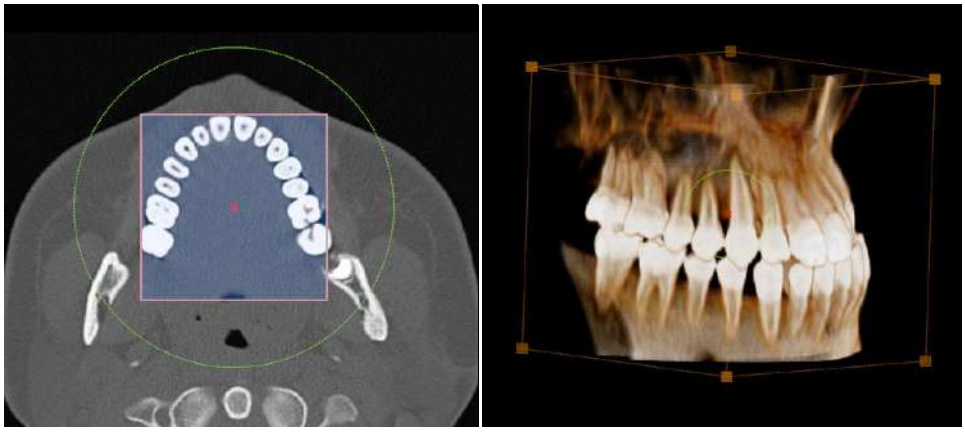


Fig. 75 3D Zoom function

Click on [3D Zoom] and click on the area to zoom in on. Drag the area out as far as needed.

After the cube has been drawn, click on the red [x] in the middle to move the cube to a different region and drag out the green circle to expand the area.

Measure List. Each measurement is added to the list upon being placed on the slice, and double-clicking on an entry will jump to the slice where the measurement is placed.

Fig. 76 Double-click on an entry in the [Measure List] to jump to the slice with the measurement.

6.3 Dental (Layout)

The [Dental] tab consists of 4 different panes: Axial, CrossSectional, Panorama and 3D.

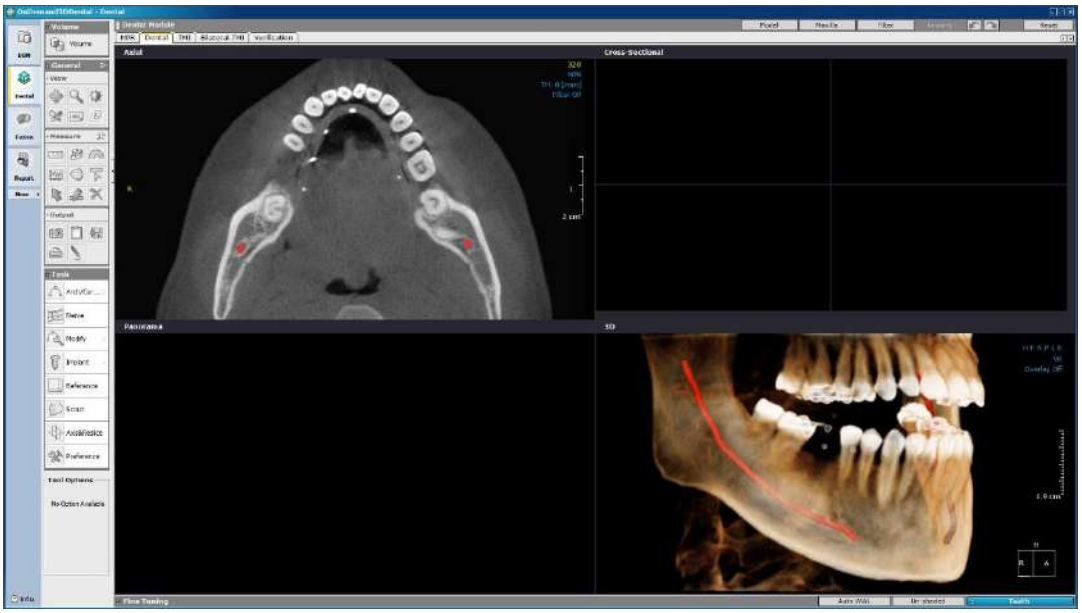
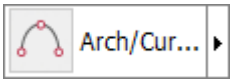
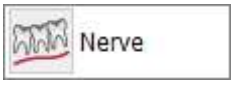
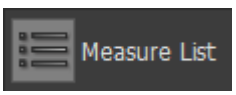
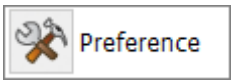


Fig. 77 Dental layout

Task Tools

The Dental tab has the following tools available:

Function	Description
	Draw an arch/curve to obtain a Cross-Sectional and Panorama image. Either pick points manually or use the [Auto Arch] for automated arch generation.
	Allows users to mark the alveolar nerve path.
	Allows user to adjust the [Nerve], or [Arch/Curve].
	Start implant planning and simulation.
	Shown as two intersecting blue lines. It represents the currently selected area in the Axial, Cross-Sectional, and Panorama panes.
	Adjust axial slice position and range of view for reconstructing other images.
	Adjust the original data axes to reslice original DICOM data.
	Each measurement is added to the list upon being placed on the slice, and double-clicking on an entry will jump to the slice where the measurement is placed.

	Set preferences.

Arch/Curve. This tool is used to generate panoramic and cross-sectional images.

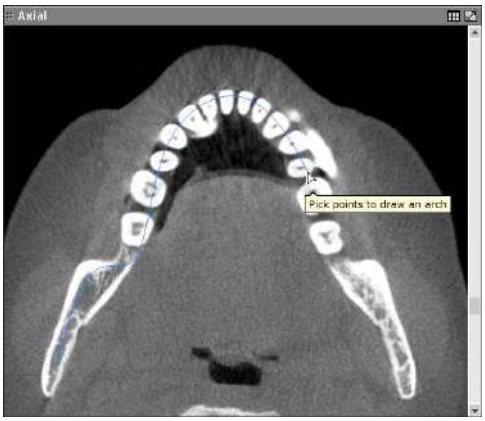


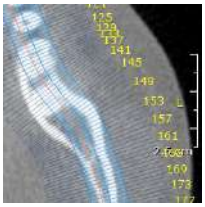
Fig. 78 Drawing an arch on the [Axial] pane

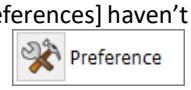
Select [Arch/Curve] from [Task Tools] and click on a starting point. Click along the arch and then double click to finish drawing. Panoramic and cross-sectional images will be automatically generated using the arch drawn by the user.

For automated arch generation, go to an axial slice where the full arch is visible and click  and select  . The low bound tooth density settings can also be changed for better results if needed. After the arch is drawn, the layout will fill in the images for the Cross Sectional and Panorama panes, as shown below.

Fig. 79 Dental layout with [Panorama] and [CrossSectional] panes filled in

TIP



The user will not be able to see hash lines if the software [Preferences] haven't been set yet. This can be done using the 

icon in the [Task Tools] section.

Please refer to page 60 (☞ ***Subsection: Preference***) for more instructions.

Nerve. The [Nerve] tool enables users to draw along the inferior alveolar nerve path, which is vital for treatment planning and diagnoses. Users can utlilize any of the panes available.

Select [Nerve], click along the path to draw, as shown in the image below, and double-click to finish. To start over, click [Esc] on your keyboard.

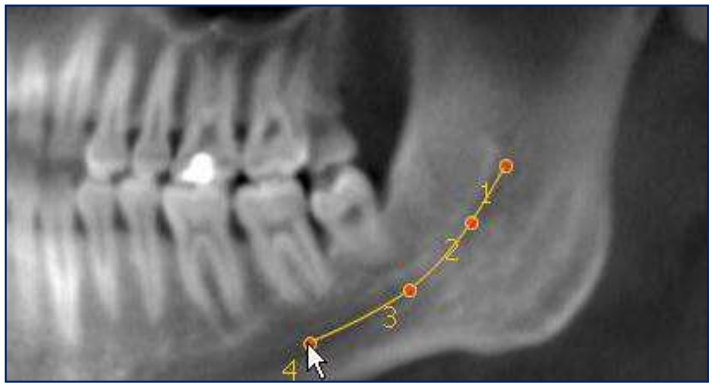


Fig. 80 Draw along the nerve path

TIP

The most widely used pane for drawing along the nerve path is the [Panorama] pane. The optimal level of slice thickness, same as the image above, is 10 mm.

However, the more accurate but slower method is to use the [Cross Sectional] and [Axial] panes.

To draw using the [CrossSectional] pane, select [Nerve] from the [Task Tools] menu and click on a starting point in the [CrossSectional] pane as shown below. Scroll using mouse scroll-wheel and click on the next connecting point. The same process can be repeated on the [Axial] pane.

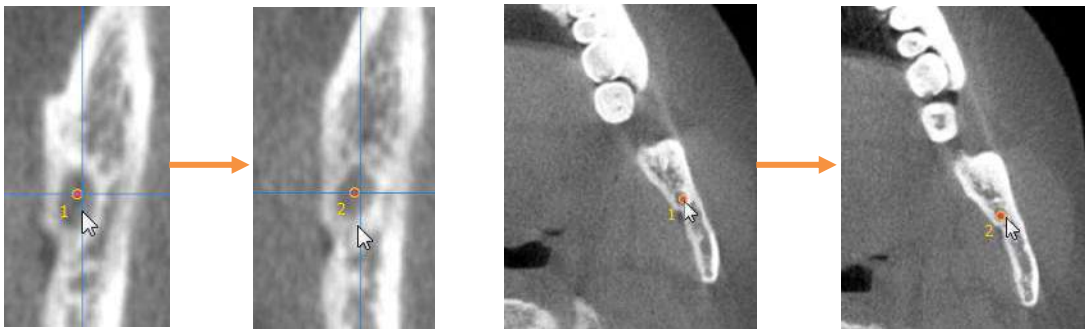


Fig. 81 Drawing along nerve path in the [CrossSectional] and [Axial] panes

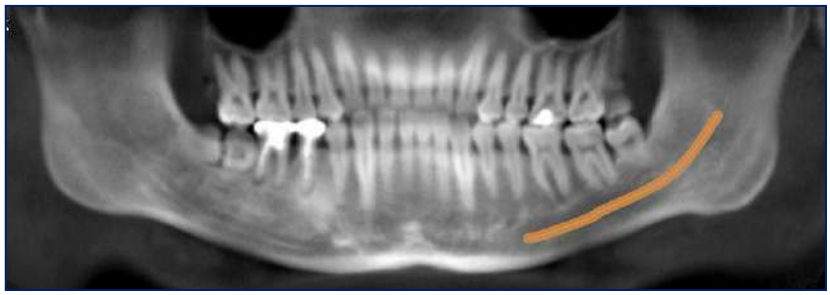


Fig. 82 Result shown on the [Panorama] pane

After the nerve is drawn, the marked nerve path will be highlighted and visible in all of the panes on the layout. The color and visibility can also be set in the [Preferences] menu in the [Task Tools] section.

Modify. To make modifications to the drawn nerve path or the arch, click on [Modify] and select either one. As shown below, the points along the path can now be manipulated.

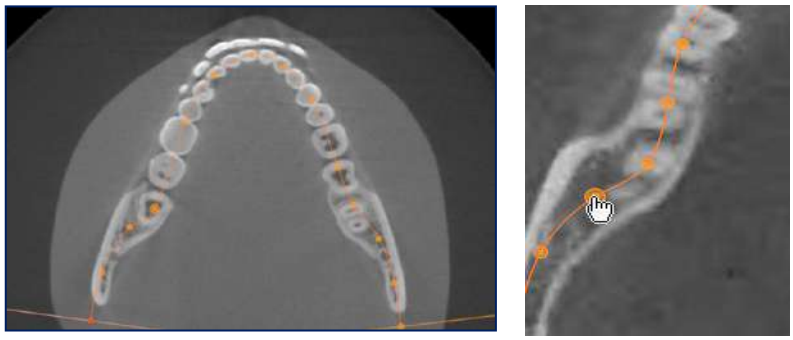


Fig. 83 Modify arch/curve in [Axial] view

Reposition control points one by one or move the entire arch. Users can also right-click and insert additional control points, delete selected control points, or delete the whole arch.

The same goes for nerve paths.

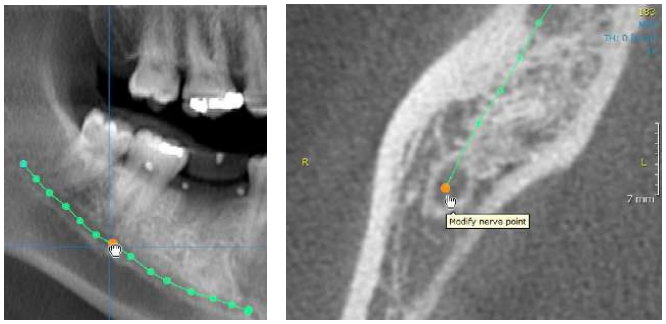
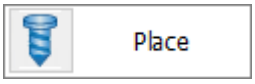


Fig. 84 Modify nerve markers as shown on [Panorama] (right) and [Axial] (left) panes

Press [Esc] when finished.

Implant. The Dental tab allows for implant planning and surgery simulation. OnDemand3D™'s implant library includes real-size implant fixtures and abutments from all major manufacturers. Some of the analysis tools available on this tab are [Bone Density Graph] and [Angle].

Function	Description
	Pick implant fixture from library and place.
	Place a previously selected implant.
	Displays bone density information inside and surrounding the implant in graphs and color maps.
	View properties of the placed implants.
	Provides an abutment library.
	Calculate the deviation between two implants.

Pick and Place. The [Implant Library] window as shown in Fig. 85 provides the user with a Manufacturers list, a Product Lines list, a Preview window and a section where the individuals implant models are to be selected from.

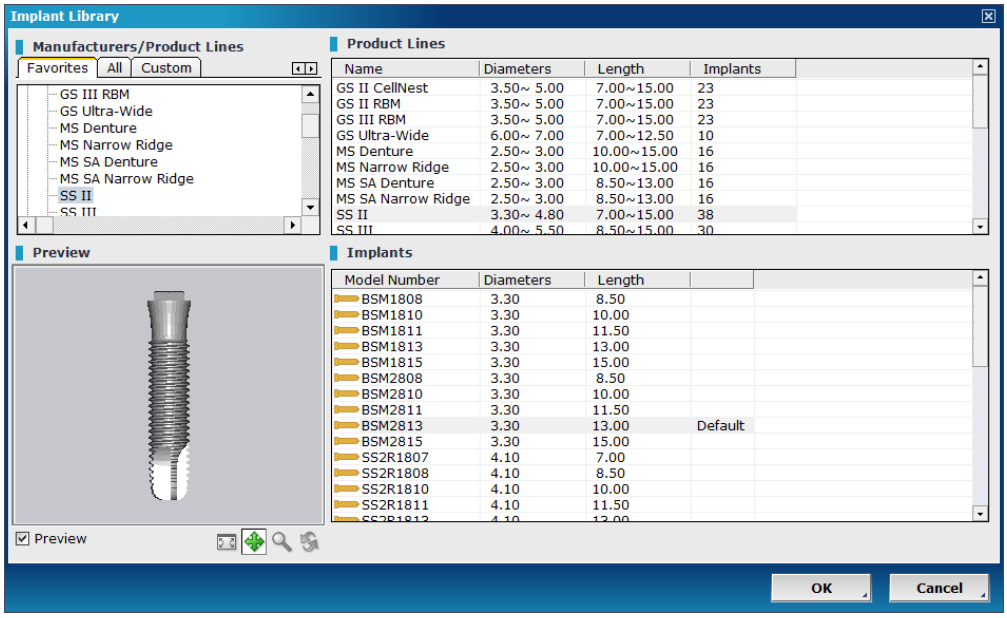


Fig. 85 [Implant Library] window

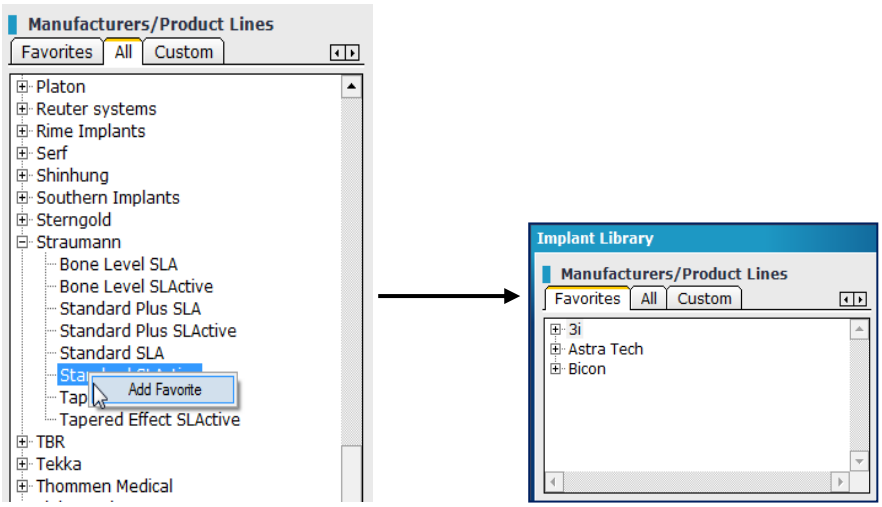


Fig. 86 Add to favorites

In the 'Manufacturers' section, the user will find three tabs: [Favorites], [All], and [Custom]. To add a product line or implant to [Favorites], right click and choose [Add Favorite].

Users can also create their own implants by going to the [Custom] tab and clicking on 

. In the [New Implant] window shown in Fig. 87, input the naming and parameter settings of the new implant and press [OK].

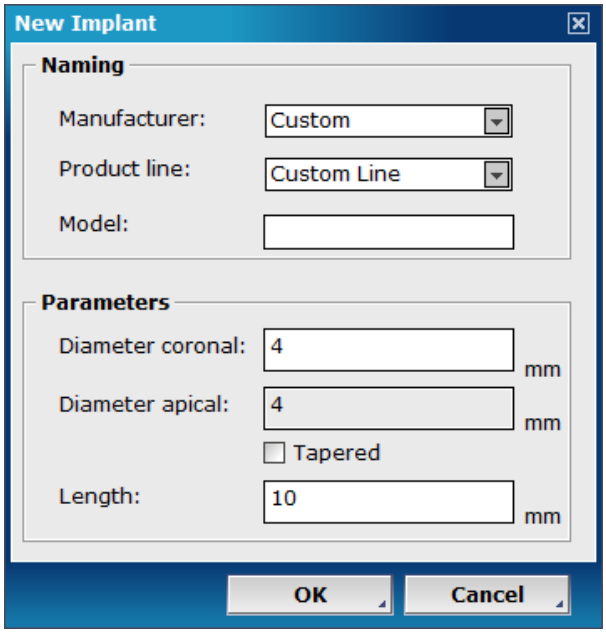


Fig. 87 Create custom implants using the [New Implant] window

Place. To place an implant fixture, click on the area where the virtual implant is to be placed and select the corresponding tooth number when the dialog below pops up. The default tooth numbering system can be changed in the [Preference] menu when needed.

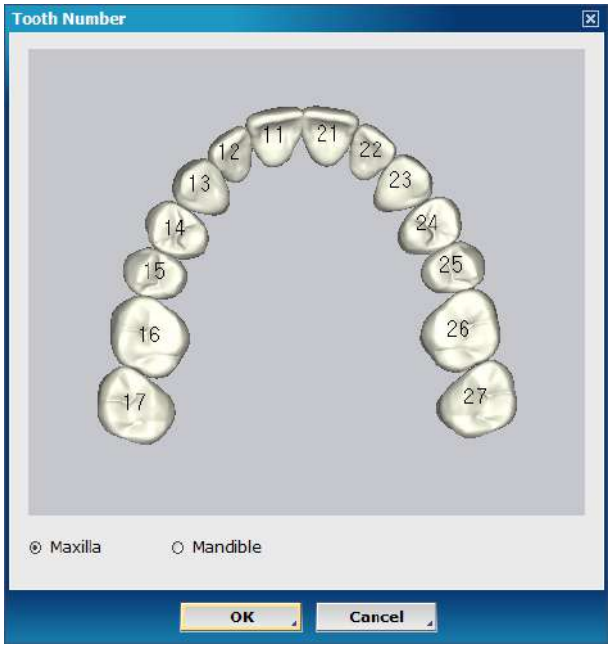


Fig. 88 [Tooth Numbering] dialog

After the implant fixture has been inserted, users can adjust and reposition accordingly in all of the panes provided. Simply click and drag.

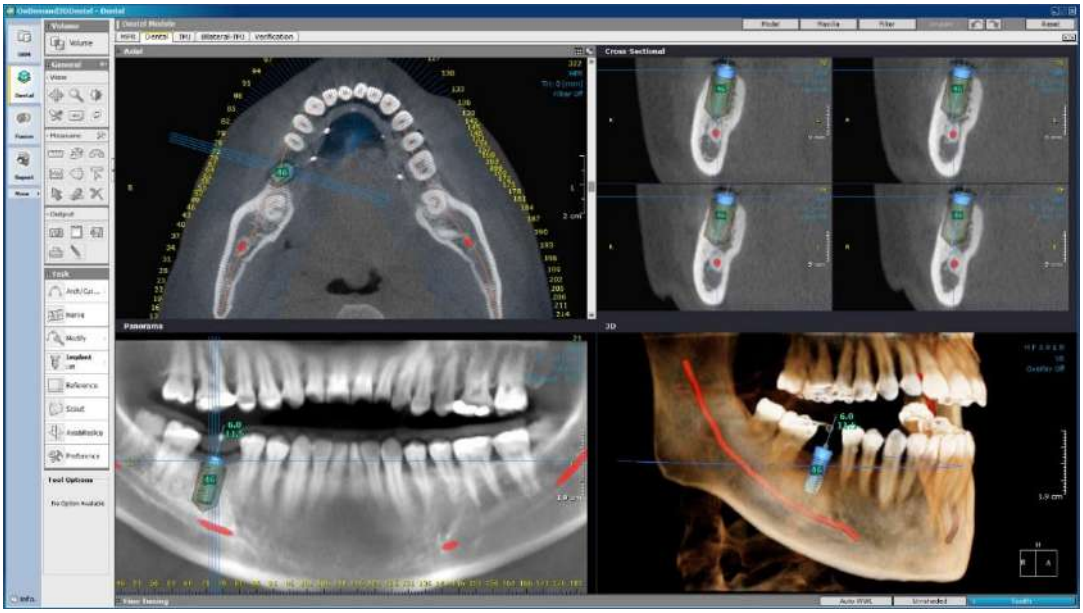


Fig. 89 Implant simulation

Bone Density Graph. This tool provides graphs on the bone density information for each This information is displayed in two viewing directions: Coronal-Apical (the two graphs on the top) and the Implant Perpendicular direction (the lower graph). Click [Bone Density] graph from [Implant Task Tools] and choose the ID of the implant in question.

Users will be able to see bone density information of both the inside and outside of the implant fixture. [Thickness] refers to the thickness of the shell around the implant that is used to gather bone density

values. Any changes made to the implant while the [Bone Density Graph] is still open will be immediately registered and updated on the graph.

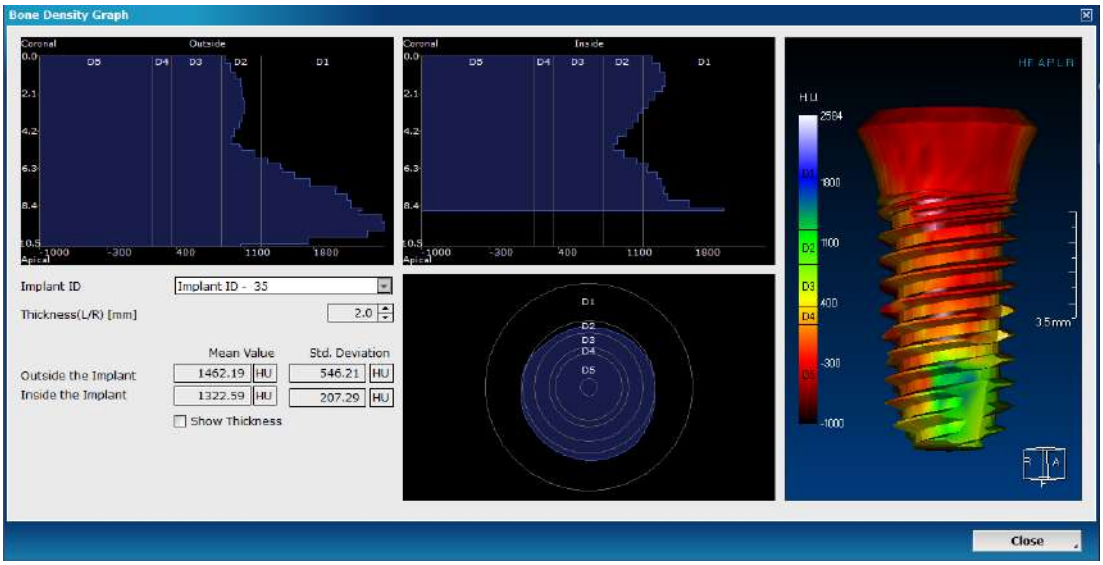


Fig. 90 [Bone Density Graph]

Lekholm and Zarb Scale	Lower bound	Upper bound
D1	More than 1250 HU	
D2	850 HU	1250 HU
D3	350 HU	850 HU
D4	150 HU	350 HU
D5		Less than 150 HU

WARNING	The D1 – D5 values are based on Medical CT values. Cone beam CT values may differ. In addition, please be warned that HU values are not completely reliable when it comes to CBCT scans.

For more options, users can right click on an implant fixture, and the following drop-down menu will appear.

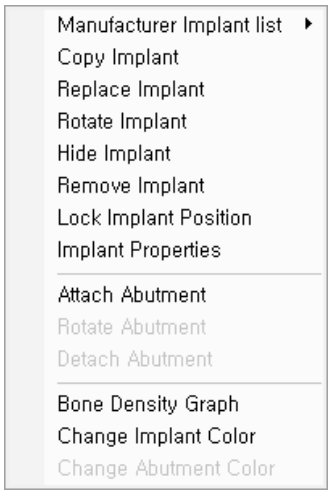
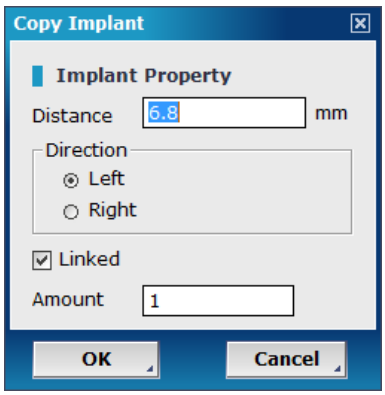
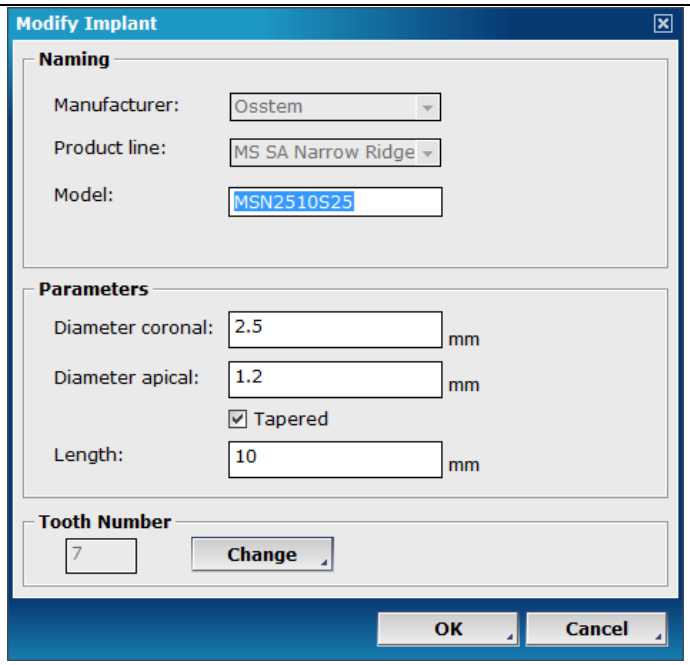
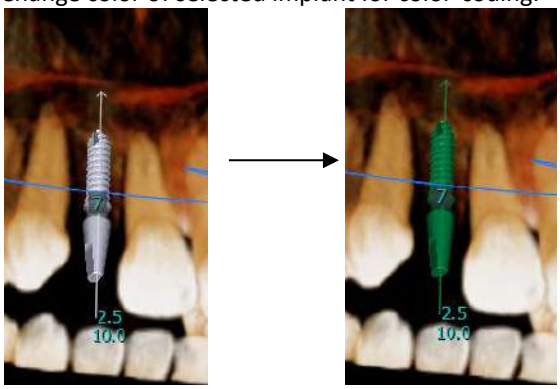


Fig. 91 Implant right-click menu

Function	Description
Manufacturer Implant list	A quick menu to replace existing implant with another from the same manufacturer
Copy Implant	Copy the selected implant with angle and distance settings.  Fig. 92 [Copy Implant] [Distance] is the distance from the original implant to the copied implant. [Direction] selects whether the copied implant is to the right or left side of the original implant. [Linked] keeps the original implant at the same angle of the original one. To [Unlink], right-click on an implant. [Amount] is the number of implant copies to be made.
Replace Implant	Replace with another implant from the library
Rotate Implant	Rotate implant
Hide Implant	Hide selected implant
Remove Implant	Remove selected implant
Lock Implant Position	Lock selected implant’s position information
Implant Properties	View and edit implant properties. The [Modify Implant] dialog will pop up with all of the main properties. Users are also allowed to change ‘Tooth Number’ information by selecting [Change].

	 Fig. 93 [Modify Implant]
Attach Abutment	Attach an abutment
Rotate Abutment	Rotate selected abutment
Detach Abutment	Remove selected abutment
Bone Density Graph	Provides a shortcut to the implant [Bone Density Graph], which displays bone density information inside and surrounding the selected implant fixture. For more info, please see page 54 ***(☞ Subsection: Bone Density Graph***).
Change Implant Color	Change color of selected implant for color-coding.  Fig. 94 Change implant color
Change Abutment Color	Change color of selected abutment

List. This tool provides information on all of the currently placed implants including implant ID, apical/coronal diameters, and the length of each implant. [Show], [Hide], [Remove] or [Locate] all from this window.

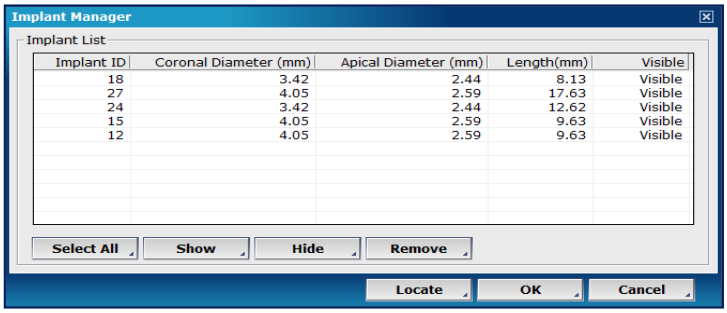


Fig. 95 [Implant Manager]

Abutment. Users can place abutments on implant fixtures from our library.

Deviation. A tool that calculates the deviation between any two implants (including Angle, Global, Lateral, Depth Deviation analysis).

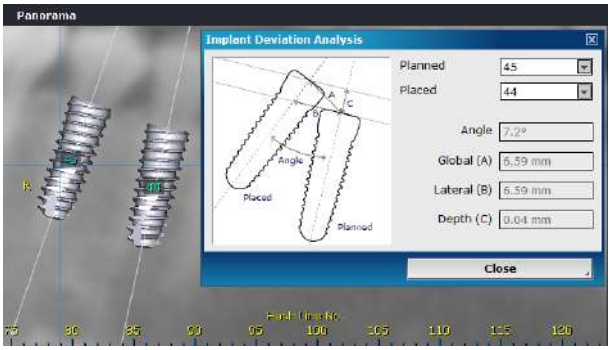


Fig. 96 [Deviation] dialog

Reference. The point where the two blue lines cross is called the [Reference] point, and this is what is shown in the [CrossSectional] pane. For a closer look, users can first choose [Reference] from [Task Tools] and then click wherever they need. It is recommended to use this tool before an implant fixture is placed.

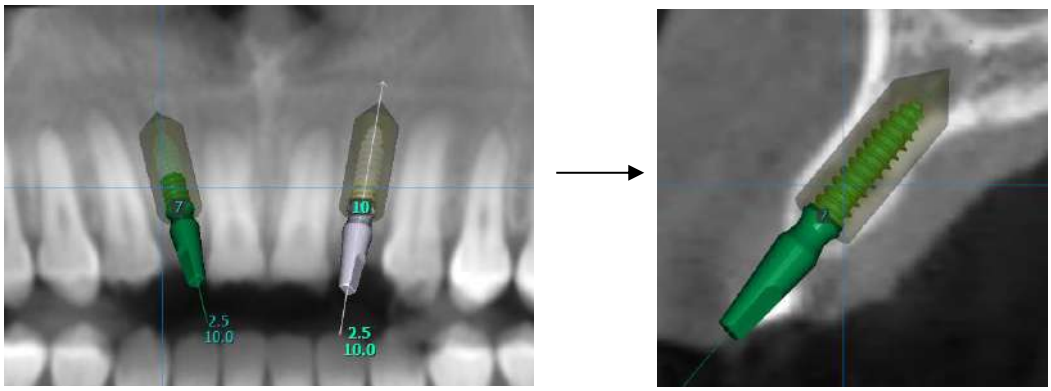


Fig. 97 [Reference] line and the CrossSectional pane

Scout. Users can use the [Scout] image as a guide to switch to a different axial slice or to reslice the data to include less of the whole CT data. If the panoramic image is showing too much of the sinus, the region of interest can be adjusted using this tool, as shown in Fig. 98.

As seen in Fig. 98, the blue line refers to the axial slice position. The area within the orange rectangle is the area of interest for the user. If a full skull view is not needed, users can set their area of interest by expanding or shrinking the orange rectangle.

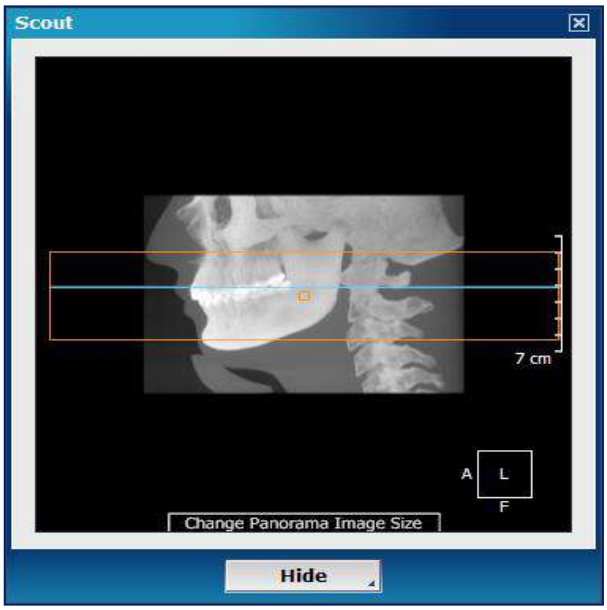


Fig. 98 [Scout] image

Axis & Reslice. This tool is used to make adjustments to the axes of CT data. Drag the blue reference lines to readjust and click [Reslice] to reslice as a newly aligned DICOM data. For easier viewing, do not forget to make use of the grid by checking [Show Grids].
Rotation degrees will be shown in yellow on the [Axial] pane, while the yellow line on the 3D pane refers to the horizontal plane of the teeth. Please note that in case the user chooses to reslice, most of the layout settings will be lost along with any pre-drawn arch information.

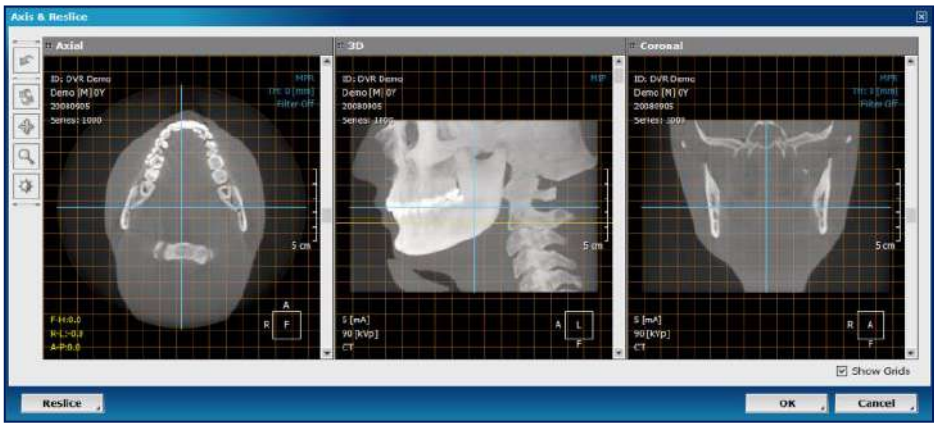


Fig. 99 To temporarily change the axes instead of reslicing, press [OK]

Measure List.

Each measurement is added to the list upon being placed on the slice, and double-clicking on an entry will jump to the slice where the measurement is placed.

Fig. 100 Double-click on an entry in the [Measure List] to jump to the slice with the measurement.

Preferences.

Most of the user's software preferences are set in this menu and are saved for all future projects.

As can be seen below, the [Preferences] menu has three tabs: [View], [Settings], and [Color]. In the default **[View]** tab, users will be able to set preferences for whether they want to be able to see hash lines, nerve segments, implant safety cylinders, etc.

In the **[Settings]** tab, users will find more advanced settings such as the default radius of the nerve in millimeters and tooth numbering system settings. To change the colors of curves, nerves and reference lines, please refer to the **[Color]** tab.

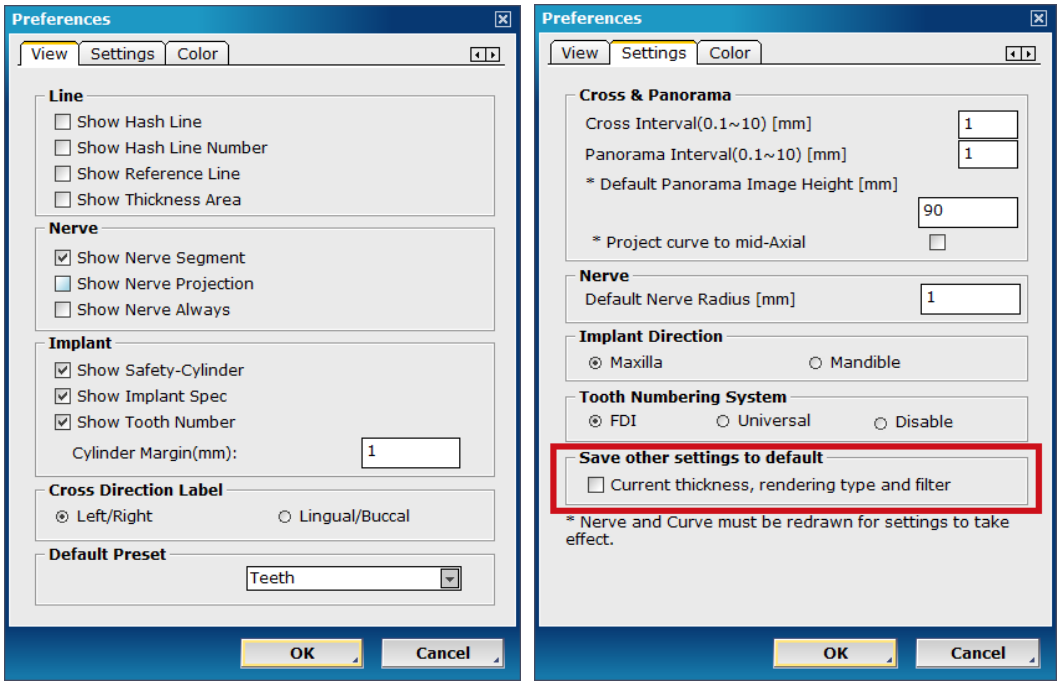


Fig. 101 Dental [Preferences]

INFO	Checking **[Save other settings to default]**, shown above in red, will save the user's current settings of thickness (e.g. Panorama thickness), rendering mode (MIP, minIP, VR) and filters (1x, 2x) to the user's default settings. **For changes related to the arch and nerve to take effect, users will have to redraw [Arch/Curve] and/or [Nerve].

Additional Tools

For intra-oral/3D model scan alignment, users can use [Model] and [Maxilla] buttons provided on the top gray bar of the Dental tab.

Align

The [Align] function is characterized as merging intra-oral scan/3D model scan to the patient DICOM data. The following is a representation of the user's workflow on intra-oral scan/3D model scan alignment with patient DICOM data.

Step 1: Click 

on the top gray bar and select volume clipping direction by choosing [Maxilla] or [Mandible]. When in the [Align Model Wizard Step] adjust how much of a volume to clip using scrollbar on the left of the 3D pane.

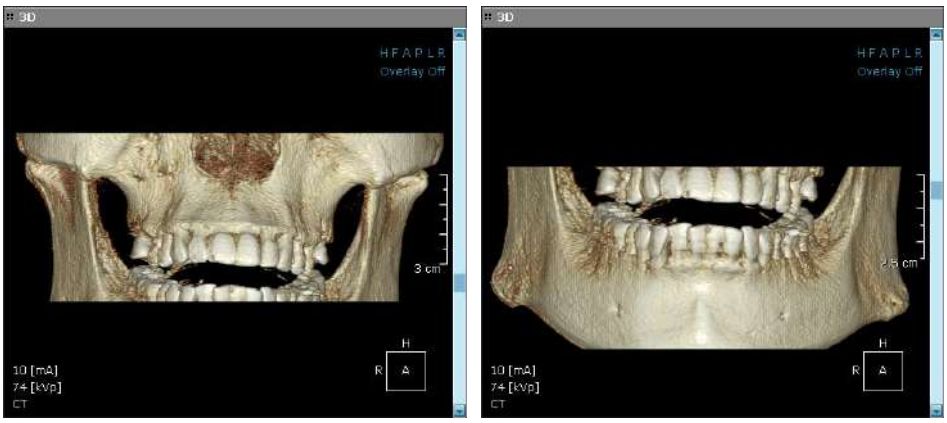
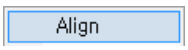


Fig. 102 Clipping Direction [Maxilla] (left), [Mandible] (right)

Step 2: Click 

and select [Align] 

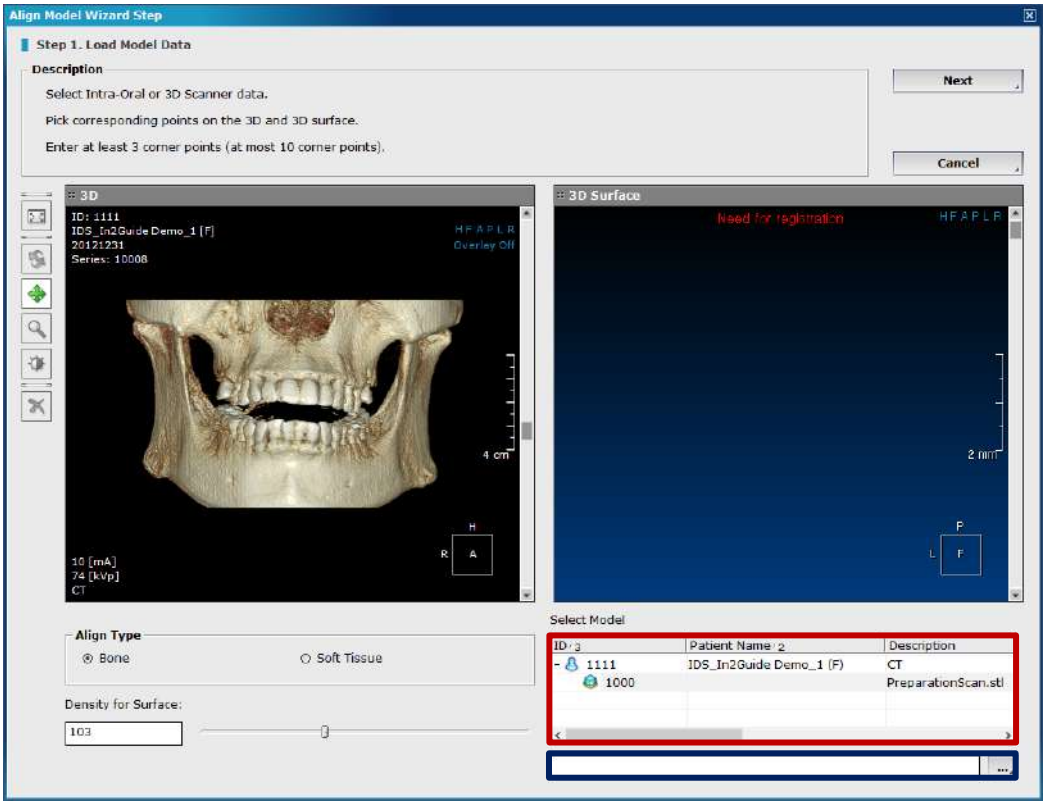


Fig. 103 Align Model Wizard Step

Step 3: Load Model Data (Step 1 of the Align Model Wizard Step)

Load intra-oral/3D model STL file straight from the DBM or click  button at the bottom-right hand corner (see Fig 98 highlighted in red and blue respectively) and locate file on your PC.

***Step 3 (A)*:** Select Align Type**.** Select either Bone or Soft Tissue for the DICOM data.
(Choosing Align to Bone will automatically select Soft Tissue color for the STL, choosing Align to Soft Tissue will automatically select Bone White color for the STL.)

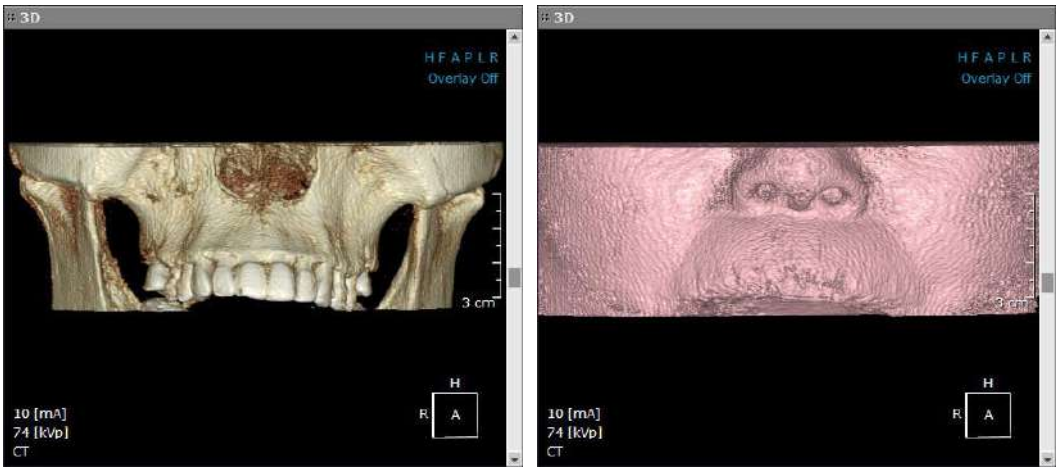


Fig. 104 Align Type (Bone (left) VS Soft Tissue (right))

***Step 3 (B)*:** Density for Surface Adjustment.

Using [Density for Surface] adjust the density (threshold) settings to create a clear image of the patient. Scroll the density bar left and right to adjust the density value. To achieve the best result adjust for the clearest image of the patient with minimum scatter and noise.

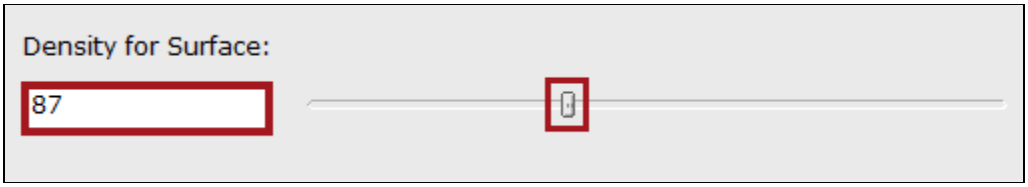


Fig. 105 Density for Surface

TIP

Get the right density

Density set too low. Volume is missing with roots exposed and missing bone information.

Density set right. Teeth are in the right shape with little to no scatter or noise.

Density set too high. The density is high and teeth look blurry with lots of scatter and noise

Step 4: Picking corresponding points.
After loading STL data and adjusting Align Type along with Density for Surface, double click on each dataset to pick three to ten corresponding points from the 3D and 3D Surface.

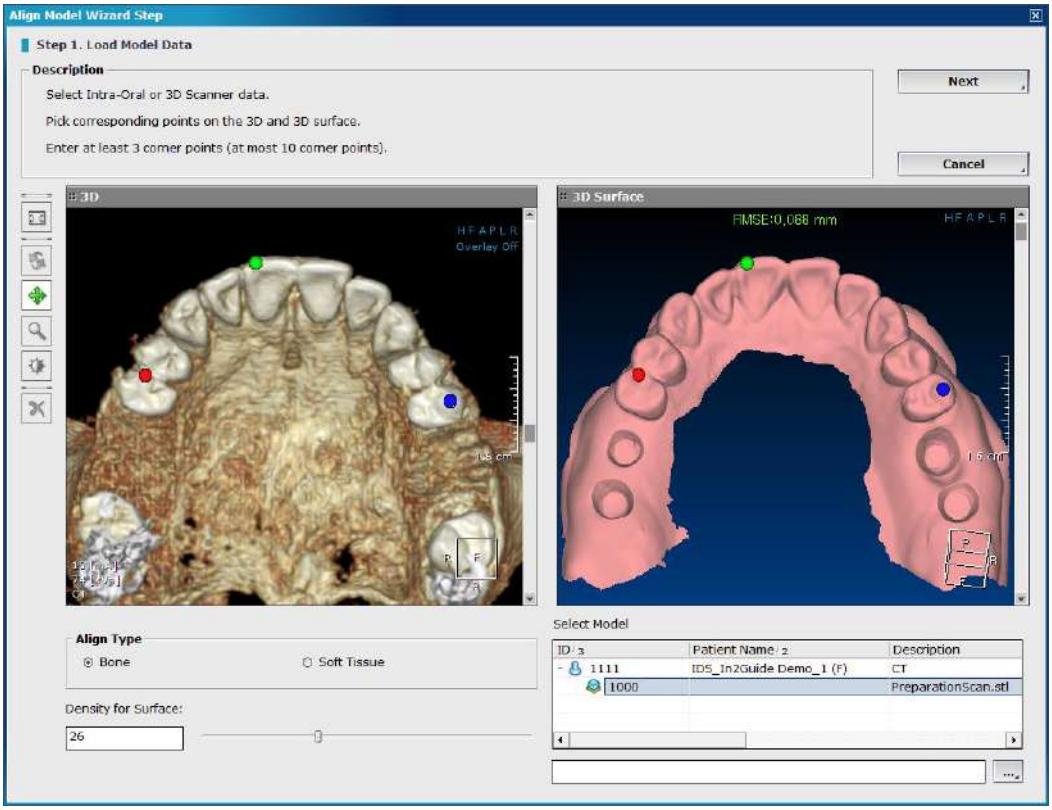


Fig. 106 Three corresponding points have been selected on the 3D and 3D Surface

Use the toolbar on the left of the Align Model Wizard Step window to reset, rotate, pan, zoom in/out, adjust windowing, as well as remove all SR points.

TIP	- Zoom in/out both sets of data using [Zoom] tool , for a more accurate placement of the corresponding points. - Avoid areas with scatter - Place points on cusp tips if possible - Place at least one point on molar/premolar if possible - Place points in a triangular pattern

The RMSE (Root Mean Square Error) must be under 2.000 (mm) in order to proceed with alignment and achieve accurate results. The RMSE value will change to green once the corresponding points are in the acceptable RMSE range. If not, it will be shown in red. In general, RMSE under 0.200 (mm) is recommended for best results.

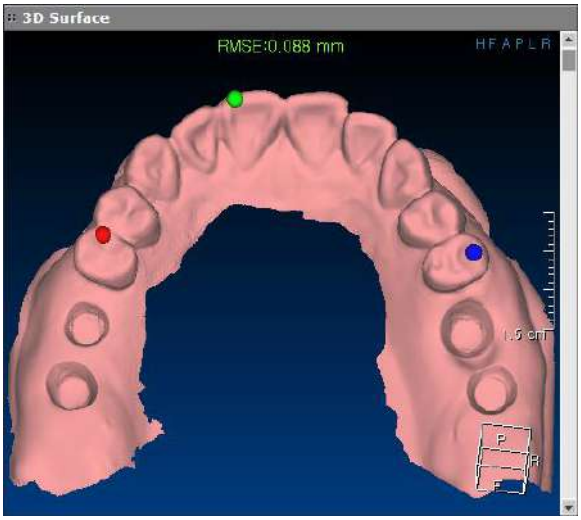


Fig. 107 RMSE of 0.088

Step 5: Click Next to proceed or click [Cancel] to close Align Model Wizard Step window

Step 6: Finish (Step 2 of the Align Model Wizard Step).

Verify the alignment at the final step by scrolling through the Axial and Cross-Sectional views and making sure STL data is tightly in contact with the patient data. The colored contour on the Axial and Cross-Sectional panes indicates the STL data, as shown in Fig 103. Once the contour is verified, click OK to finish the alignment.

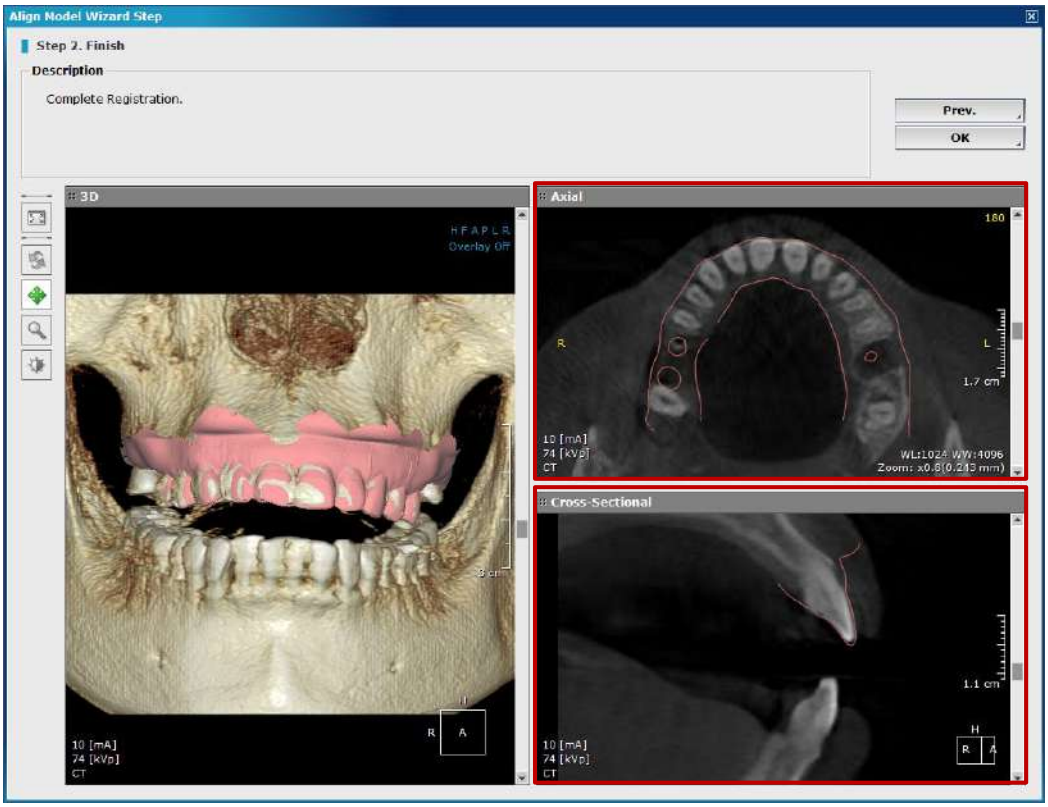


Fig. 108 Alignment Verification (STL data is tightly in contact with the patient data)

INFO

Color .PLY 3D model files can also be used for the [Align] function.

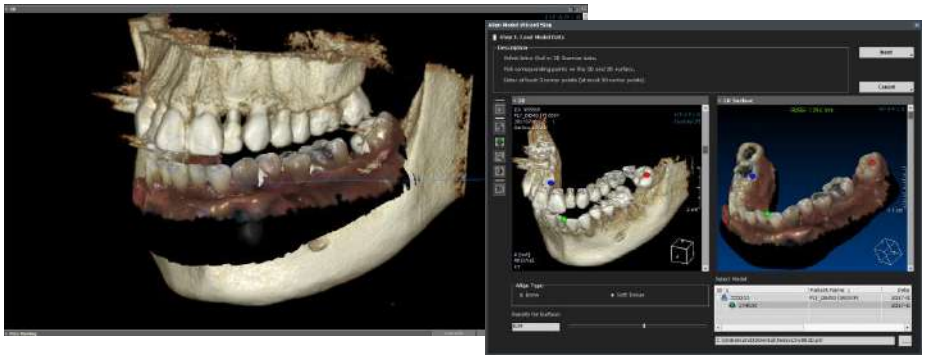


Fig. 109 Color .PLY 3D model aligned to 3D volume

3D Model

Click Model and select 3D Model to check and edit the list of 3D models available.

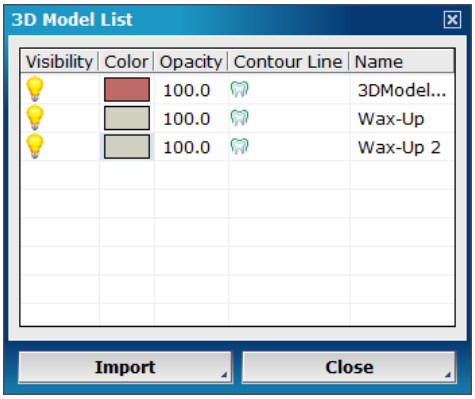


Fig. 110 3D Model List

Click Import to import 3D model onto the aligned data. Input object name and choose whether to import 3D model onto the [Patient] data or onto the [Guide/Stone] which is previously aligned STL data.

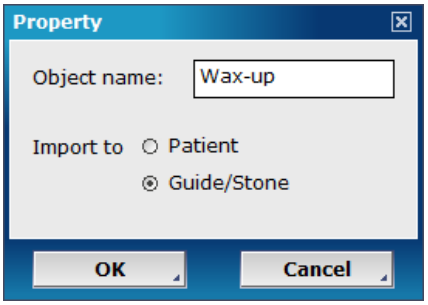


Fig. 111 Input object name and select import type

[Visibility], [Color] and [Contour line] of the imported 3D models can be adjusted according to the user's preferences. To change aforementioned settings simply click on the light bulb to change the visibility, color bar to change the color as seen in Fig. 112 and tooth icon to change the contour line.

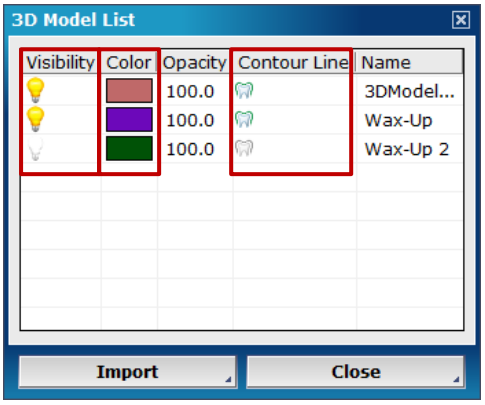


Fig. 112 Adjust visibility, color and contour line

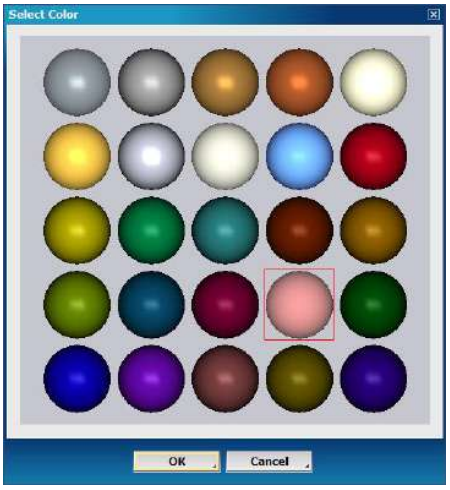


Fig. 113 Select 3D Model Color

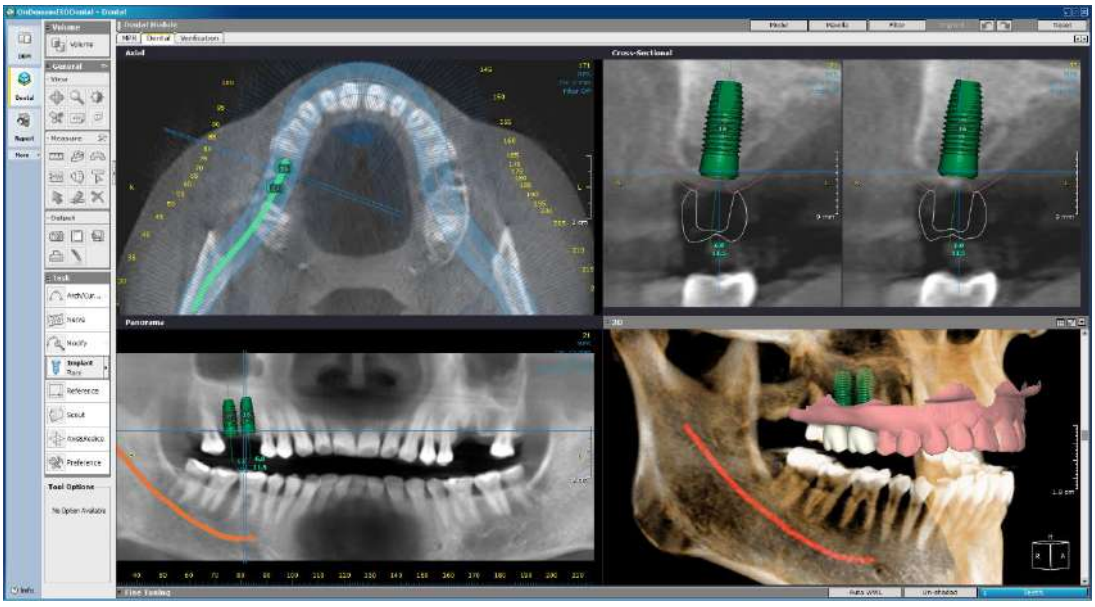


Fig. 114 Final result of implant planning and 3D model alignment performed in the Dental Tab

6.4 TMJ (Layout)

The TMJ layout is designed so that users can study the Temporomandibular Joint with the four different views available: Axial, 3D, Coronal and Sagittal. The following two task tools have a specialized function in the [TMJ] layout.

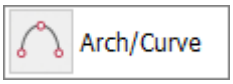
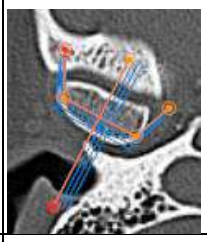
Tool	Function
	 The [Arch/Curve] tool in the [TMJ] layout is used to draw a half hexagon on the TMJ area in the [Axial] pane, which in turn generates the images in the [Coronal] and [Sagittal] panes seen in Fig. 115.
	Used to make modifications to the arch/curve.

Fig. 115 TMJ layout

TIP		To change the layout of the [Coronal] and [Sagittal] panes to show more than one image, use the icon shown on the left.

6.5 Bilateral TMJ (Layout)

The [Bilateral TMJ] layout mirrors the already drawn arch/curve on the [TMJ] layout on the other side. Use the [Modify] tool from [Task Tools] to make changes to the arch/curve.

Fig. 116 Bilateral TMJ layout

6.6 Verification (Layout)

The [Verification] tab is for verifying the placement of simulated implants. [Implant Cross] and [Implant Parallel] panes are included in this layout for a much more precise planning.

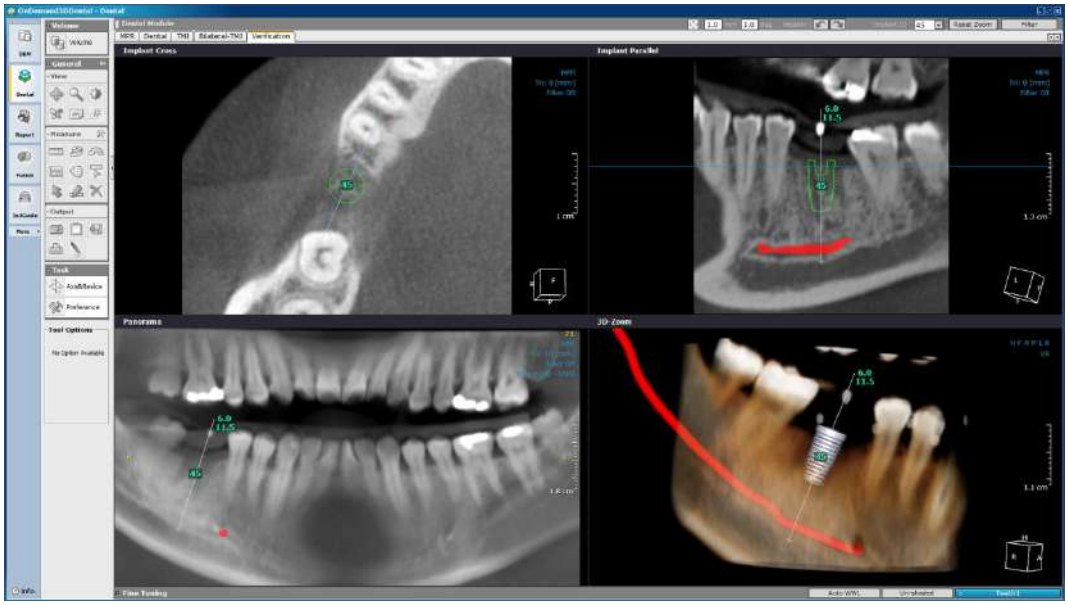


Fig. 117 [Verification] layout

To access [Verification] for specific implants, the user can click on an implant first on the [Dental] tab and then click on the [Verification] tab or simply right-click on an implant and select [Verification].

For more than one implant, users can switch between them using the implant ID on the provided toolbar located above the four panes, as shown below.

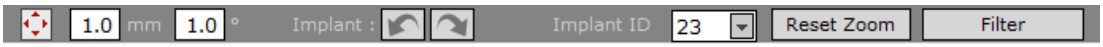
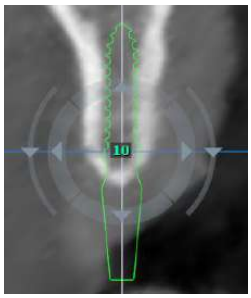
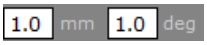


Fig. 118 [Verification] toolbar



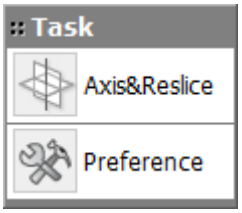
The  icon shown in Fig. 118 refers to the reorientation of implants. The user will be able to see four arrows surrounding the selected implant, and two arrows outside for precise rotations in the [Implant Parallel] pane.
The distance the implant is moved in each direction by one click, and degrees the implant is rotated by one click can all be set using the 

settings. Any changes made can also be reversed using the 

icons.

Fig. 119 [Reorientation]

The [Verification] tab has only two task tools:



[Axis/Reslice] for reslicing DICOM data and resetting the axes. Refer to page 59 (☞ ***Subsection: Axis & Reslice***) for more info.

[Preferences] accesses the software preference settings. Refer to page 60 (☞ ***Subsection: Preference***).

7 3D (Optional)

The 3D module provides three-dimensional visualization of DICOM images to aid in patient diagnosis and analysis. Users are provided with various features such as MPR, curved planar reformat (CPR), oblique slice, 3D zoom, and virtual endoscopy. The main function of this module is [Segmentation] where users can create object masks through segmentation and choose to keep, remove, restore, etc. Object masks can then be exported out as surface mesh data in STL format.

Select a patient study from DBM and click on 

to start.

7.1 Layout

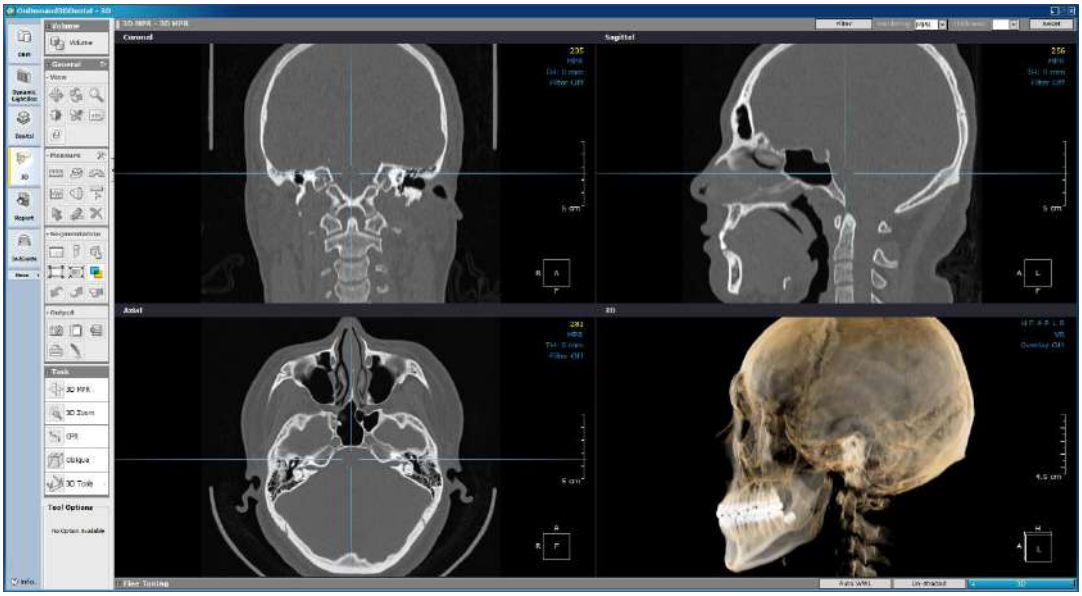


Fig. 120 3D module layout

7.2 Navigation

A unique navigation system exists in the 3D module that allows the user to use the 3D volume as an “interactive positioning map” for the MPR pane positions.
When a specific point on the 3D volume is double-clicked, the MPR image slice positions and control line coordinates automatically move to the corresponding position.

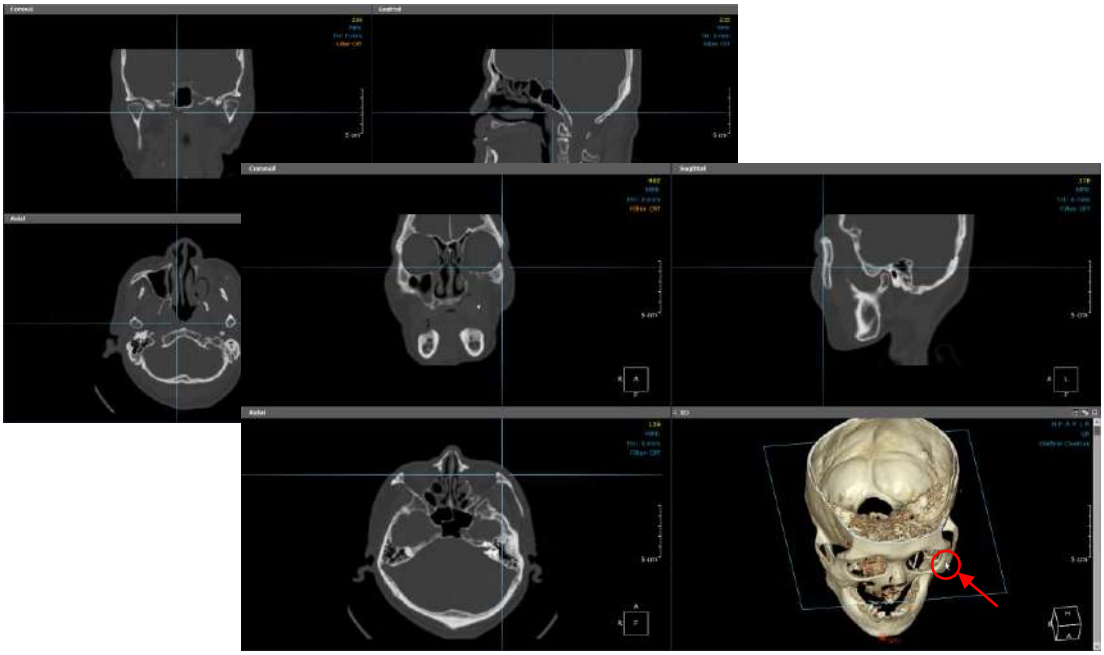


Fig. 121 Image slice positions and control lines relocate to the corresponding positions upon double-clicking the 3D volume.

7.3 Task Tools

As can be seen below, there are a total of five task tools provided in the 3D module.

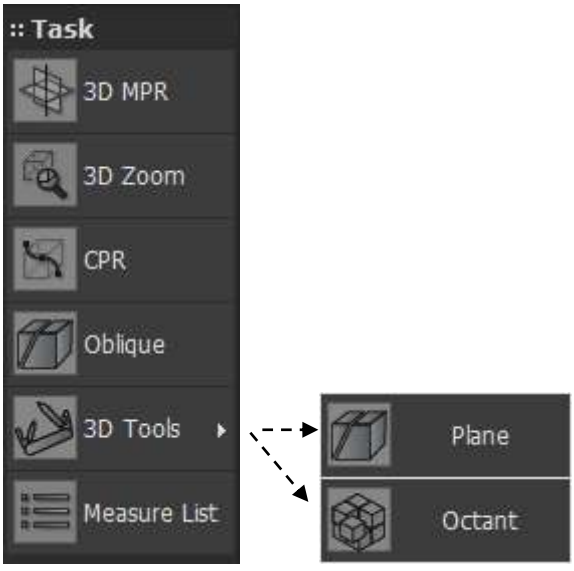
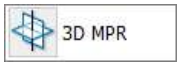


Fig. 122 Tools provided in 3D

3D MPR. At any time, the user will be able to click 

and return to the original layout shown Fig. 120. When in this mode, users will be able to use the MPR control lines, shown below in blue and circled in red. The lines control which slice images the other two panes show.

To change the orientation of the panes, simply click on the gray top bar of any pane and choose a preferred orientation, as shown below.

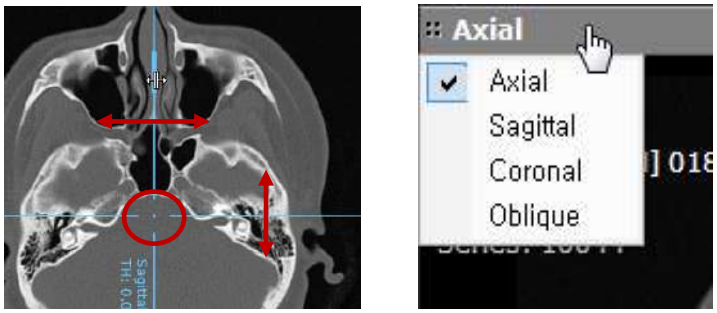


Fig. 123 MPR Control lines & pane orientation

3D Zoom. The 

function provides a high resolution 3D image, allowing the user to zoom in on a particular region without any pixelation issues. Select [3D Zoom] from [Task Tools] and click on the image and drag out area of interest. After size has been adjusted, click again, and the [3D Zoom] pane will appear with a re-rendered, high-quality zoom-in volume.

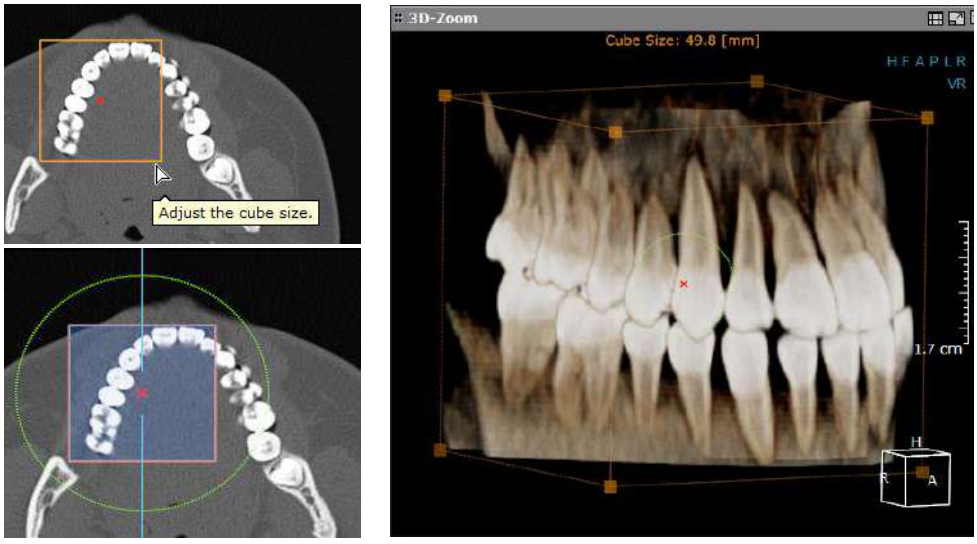


Fig. 124 High quality [3D Zoom] cube

The cube created can then be rotated and viewed from all angles. To re-position the cube, use the red (x) provided in the middle of the blue square shown above. Use the outer green circle to expand or shrink the region of interest.

Click Change to Endo, located on the top right corner of the screen to generate a virtual endoscopy.

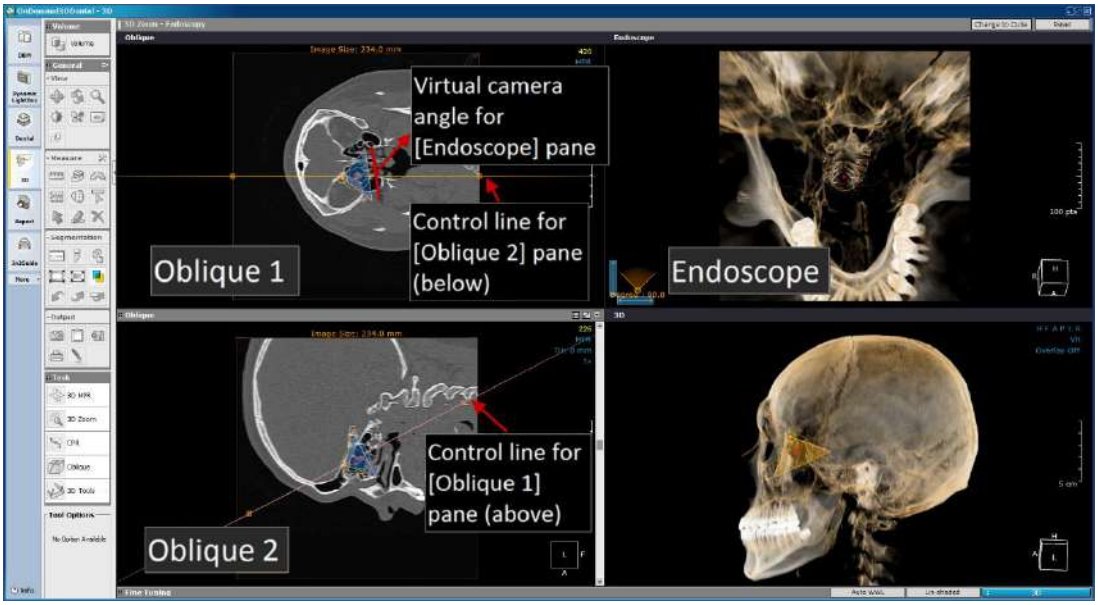


Fig. 125 General overview of [Endo] mode

[Endo] mode creates two oblique slice panes, each with their own control lines (see Fig. 125 above) and an additional pane (upper right) for the virtual endoscope. The virtual camera angle of the [Endoscope] pane can be seen and modified on all four panes.

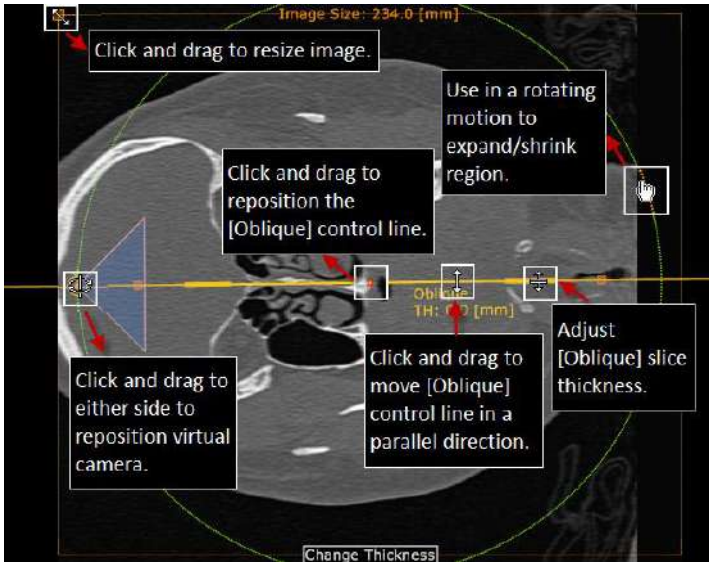


Fig. 126 Controls available on both [Oblique] panes in [Endo] mode

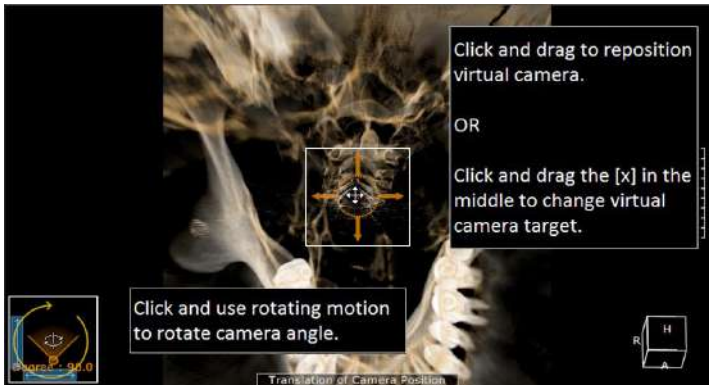


Fig. 127 Controls available on the [Endoscope] pane

CPR. The 

or Curved Planar Reformat tool, available from any of the layouts in 3D, allows users to analyze tubular areas such as veins, airways, and root canals. To start drawing, select [CPR] from [Task Tools] and click along the desired path as shown in Fig. 128. Double click to finish drawing and the CPR image will be generated in the [Aiming Perpendicular] pane.

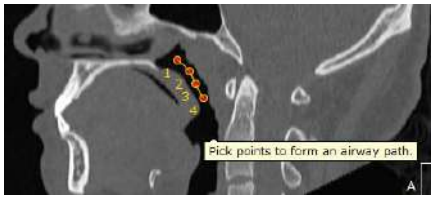


Fig. 128 Create a path

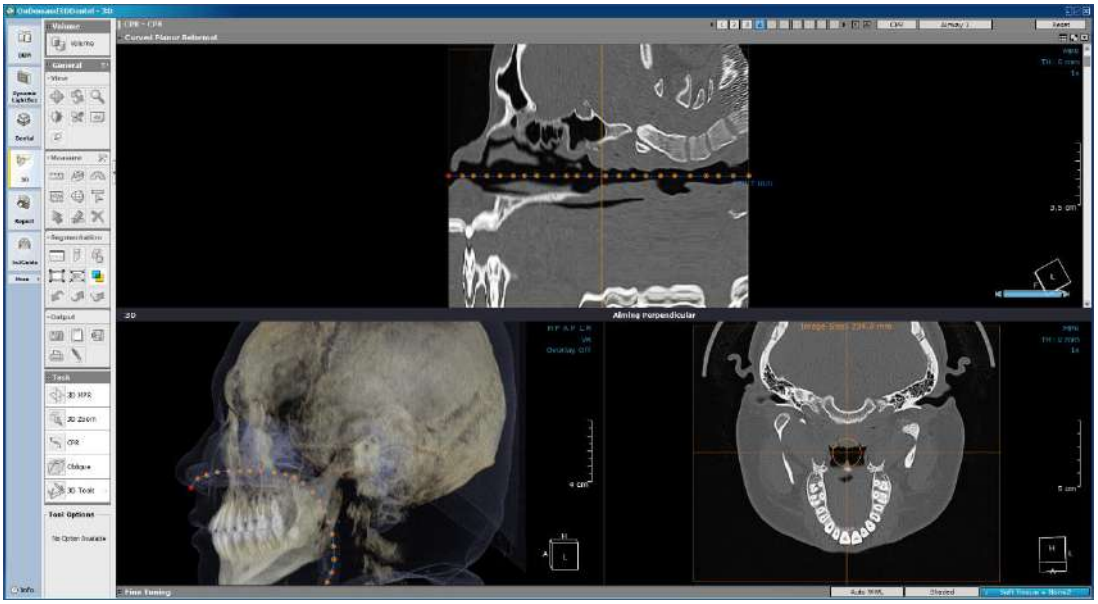


Fig. 129 CPR generated according to the path

The path can be edited in any of the panes including [3D]. Either drag to re-position control points on the [3D] and [CPR] panes or use the following method on the [Aiming Perpendicular] pane.

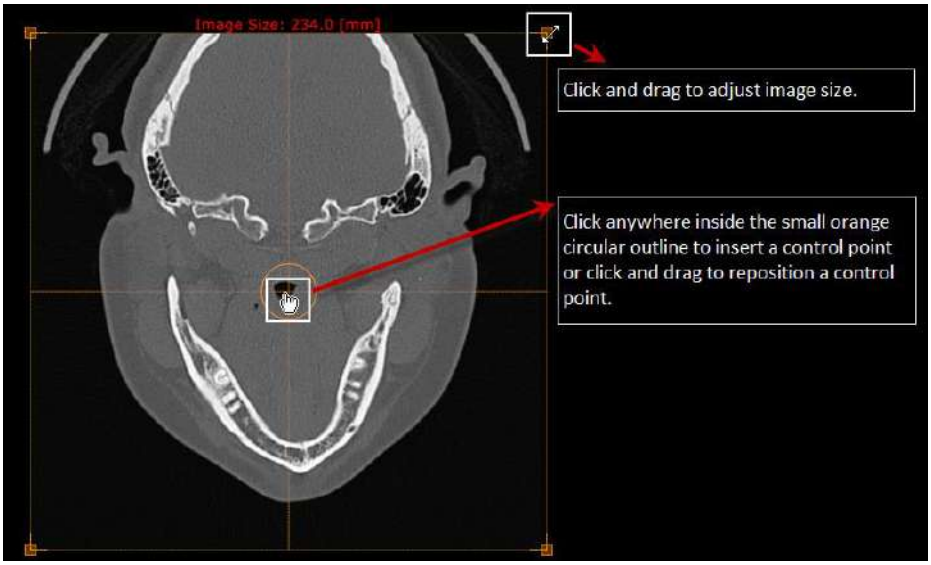


Fig. 130 Controls available on the [Aiming Perpendicular] pane

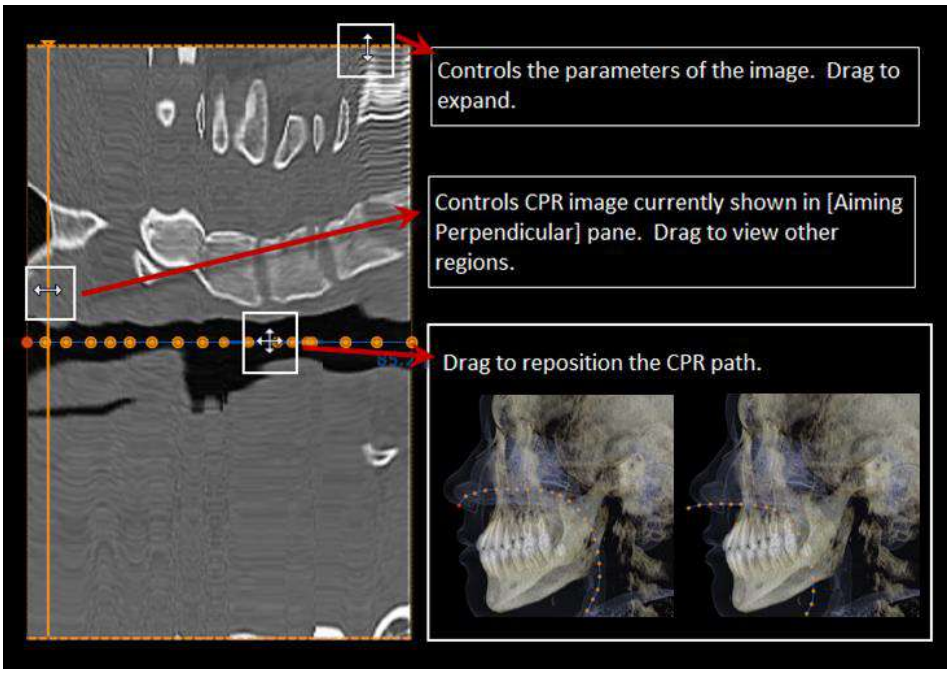
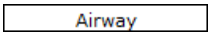


Fig. 131 Controls available on the [CPR] pane

Scroll along the [Aiming Perpendicular] pane to view the reformatted path.

Fig. 132 Top toolbar provided on the CPR layout

Go back to [3D MPR] mode and create as many CPR paths as needed. Users will be able to switch back and forth between created paths using the numbers along the top bar of the CPR layout (shown above in Fig. 132). The first path created for the current patient is saved as [1], the second as [2] and so on. Press  to delete a path or  to delete all.

Users can also click  on the top right corner of the screen to change to [Airway] mode.

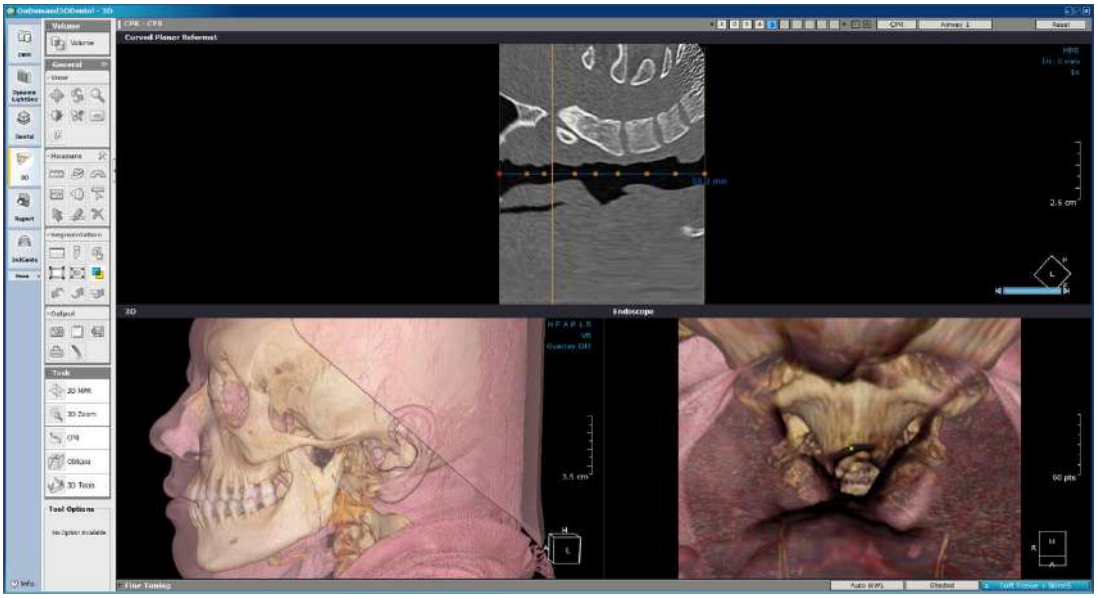


Fig. 133 [Airway] view generated from CPR path

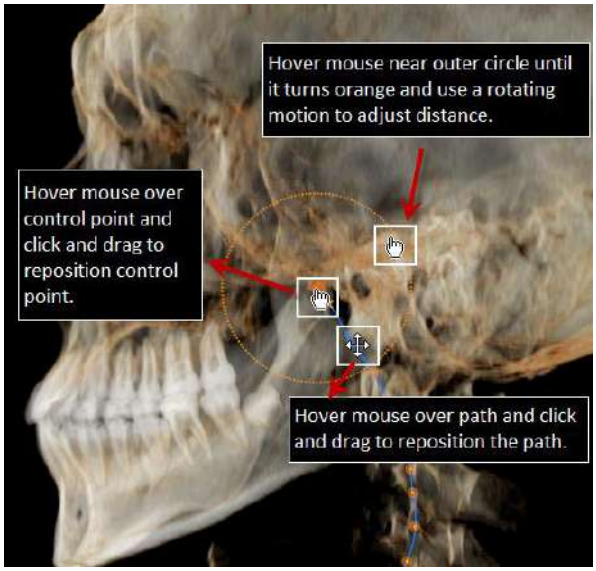
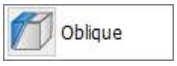


Fig. 134 Controls available in [Airway] mode on the [3D] pane

INFO	For the best results, please make sure to use a preset made for viewing soft tissue, as shown in Fig. 133.

Oblique. This tool is used to recreate an oblique slice image. This function can be used on 2D panes as well as 3D panes. Select 

from [Task Tools] and pick a center point, then drag out region of interest. The oblique slice is generated in the [Oblique] pane.

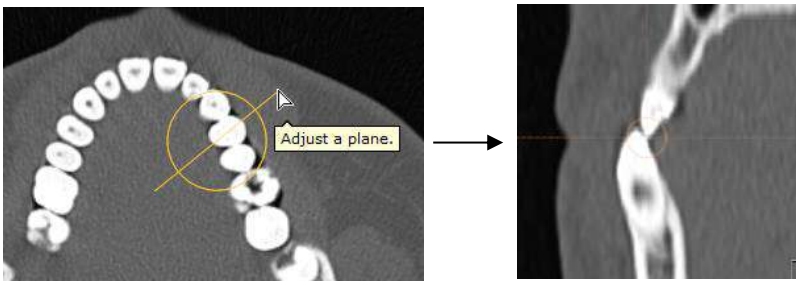


Fig. 135 Example: An oblique slice created for a closer look at the patient's occlusion

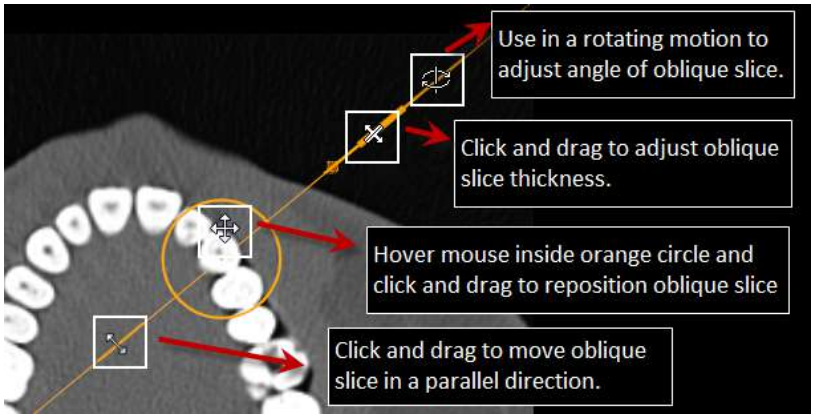


Fig. 136 Controls available on [Oblique] pane

To view other regions, use the controls provided on the [Oblique] pane (shown in Fig. 136 above) or simply draw another one.

OnDemand3D™ allows users to draw oblique slices within the [Oblique] pane as many times as needed. The created slices can then be viewed with the help of arrow controls provided on the extended [Oblique] pane (see Fig. 137 below).

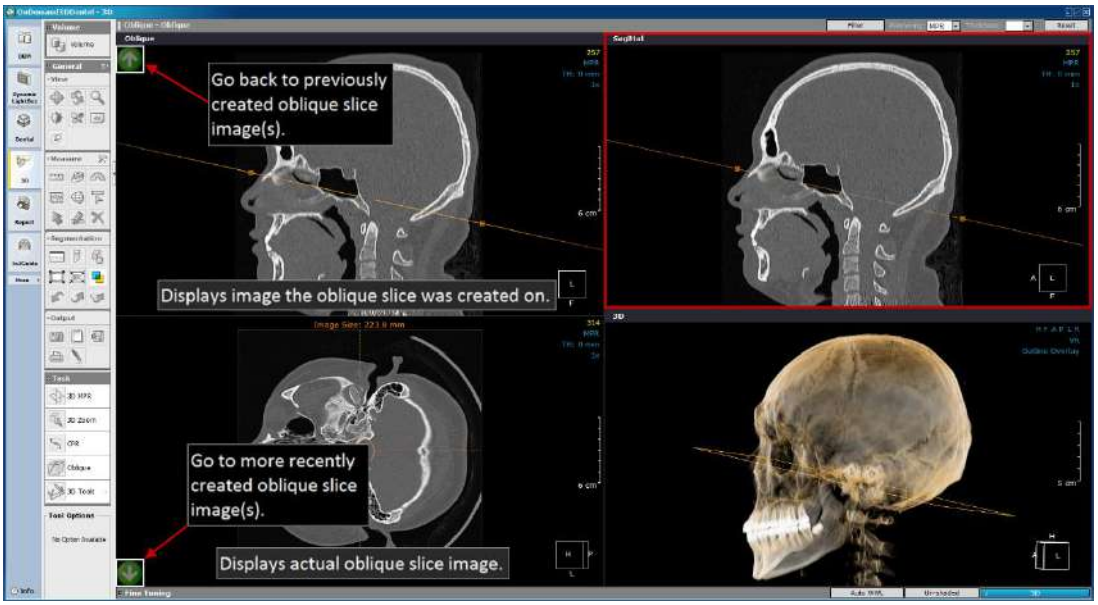


Fig. 137 Draw an oblique slice within an oblique image

To start over completely, click Reset provided on the upper right corner of the OnDemand3D™ layout and choose [Reset All] or use the simple method described below.

As shown in Fig. 137, there's one remaining MPR pane in [Oblique] mode (highlighted in red). Simply draw an oblique slice using the Oblique tool on this pane and both of the [Oblique] panes should reset.

If the user needs to draw the oblique slice from another orientation than is currently displayed, click on the upper left corner of the pane and change the pane orientation as shown below.

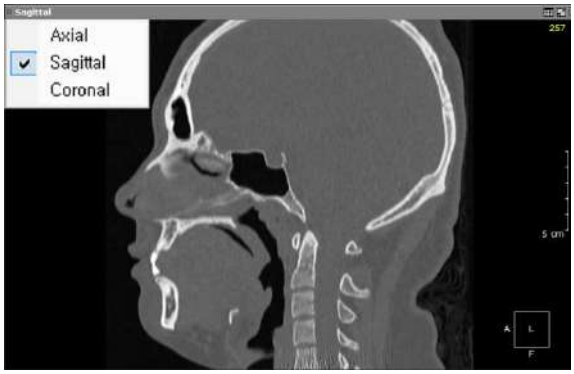


Fig. 138 Change pane orientation and redraw oblique slice

3D Tools. Use the 

feature to view inner contours. This feature automatically clips the 3D volume, either in octants or planes.

Plane. The areas masked in red on the MPR images on the right side of the screen indicate the plane currently removed on the [3D] pane. Use the yellow line to view different areas. The green and orange circles shown on the 3D volume can also be used to view different regions. Use the orange circle in a rotating motion to pan, or use the green circle to simply move to another region of interest.

Fig. 139 Plane mode in [3D Tools]

Octant. The [Octant] mode functions in the same way but in octants. Use the blue reference lines on the MPR images to view different regions or simply rotate the 3D volume.

Fig. 140 Octant mode in [3D Tools]

Measure List. Each measurement is added to the list upon being placed on the slice, and double-clicking on an entry will jump to the slice where the measurement is placed.

Fig. 141 Double-click on an entry in the [Measure List] to jump to the slice with the measurement.

7.4 Segmentation Tools

One of the main functions of the 3D module is [Segmentation], used to create new objects out of a 3D volume. The volume information (either in cubic centimeter or millimeter units) of the segmented object is automatically calculated when the [Segmentation] function is used.

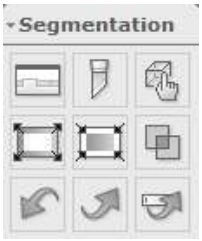


Fig. 142 [Segmentation] menu

Function	Description	Function	Description
	Show [Object Mask Tool] dialog.		Show/hide mask overlay.
	Use [Sculpt] tool.		Undo action.
	Use [Pick] tool.		Redo action.
	[Expand] object mask.		Reset all masks.
	[Shrink] object mask.		

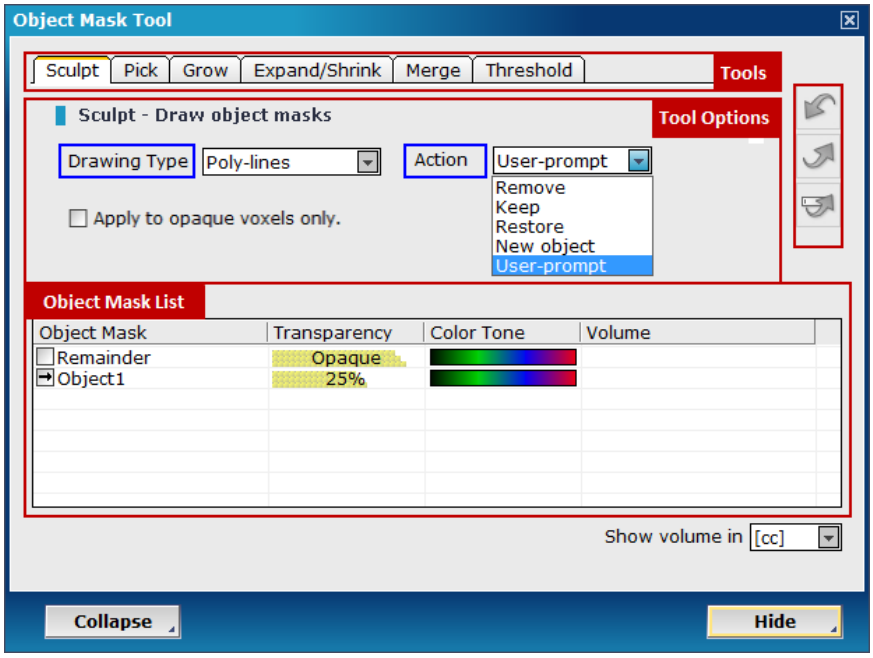


Fig. 143 The [Object Mask Tool] dialog will be displayed when a segmentation tool is selected

Press Show List to see object mask list and volume information, or press Collapse to hide the section, as shown in Fig. 143 & 144.

The following are the action choices available to the user regarding the segmented object.

Action	Description
Remove	Remove masked area
Keep	Keep masked area
Restore	Restore masked area
New object	Set masked area as new object
User-prompt	Prompts user with action choice after segmentation

The main segmentation tools are [Sculpt], [Pick], [Grow] and [Expand/Shrink].

Sculpt (Draw Object Masks)

The [Sculpt] function allows users to draw up a region and create a new object mask. Users have three options for [Drawing Type]: [Poly-lines], [Closed polygon] and [Smart pen].

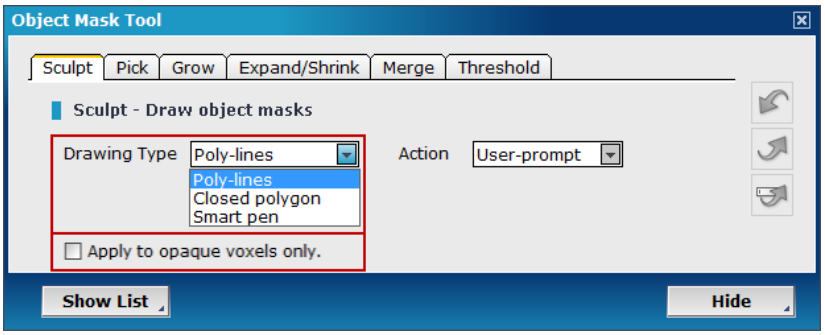
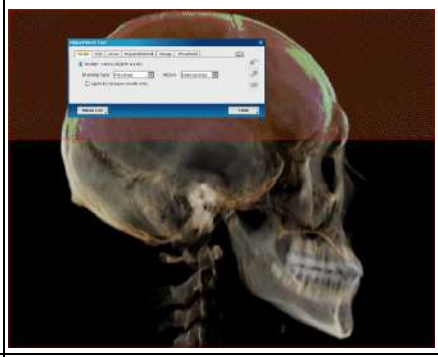
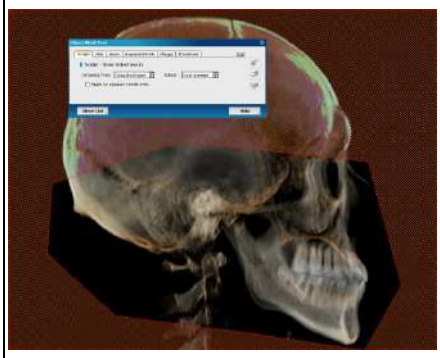


Fig. 144 [Sculpt] tool options

Select [Drawing Type] of choice, the [Action] to perform and draw mask to proceed with segmentation.

Drawing Type	Description	
Poly-lines		Use poly-lines (continuous lines composed of one or more line segments) to draw mask area. Click along desired path and double-click to finish.
Closed polygon		Use a closed polygon to draw mask area. Click once on each corner to create a polygon of desired shape and double-click to finish.

Smart pen		The [Smart Pen] calculates similar voxel qualities such as opacity levels and creates a path following alongside the user's mouse cursor. Choose a starting point, click once to start, and double-click to finish.

The [Apply to opaque voxels only] option should be checked if the segmentation tool is to be applied to opaque threshold areas only. See the difference of removing a segmented region with this option checked (left image) and unchecked (right image) below.

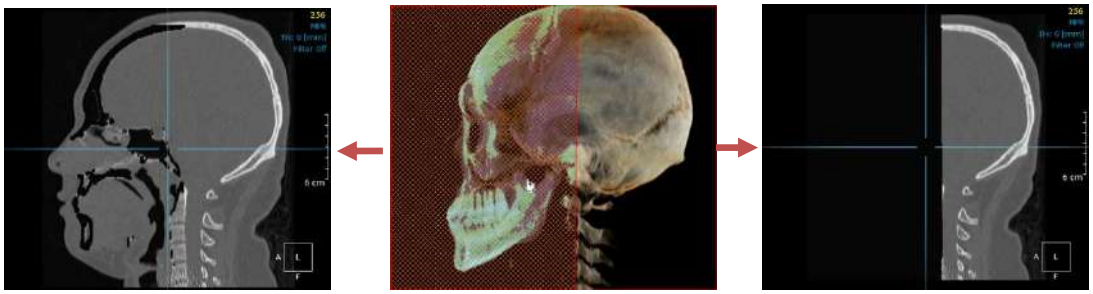


Fig. 145 Left [Apply to opaque voxels only] - checked; Right – unchecked

Fig. 146 Example: Segmentation of a tooth using [Sculpt - Smart Pen]

Segmented objects can then be given color masks for differentiation, as shown above in the segmented tooth and root example. To do this, use the original [Segmentation] menu or the object mask list provided on the fine-tuning bar, right-click on the object's [Color Tone] section, and choose a color of choice. The same can be done with [Transparency] settings.

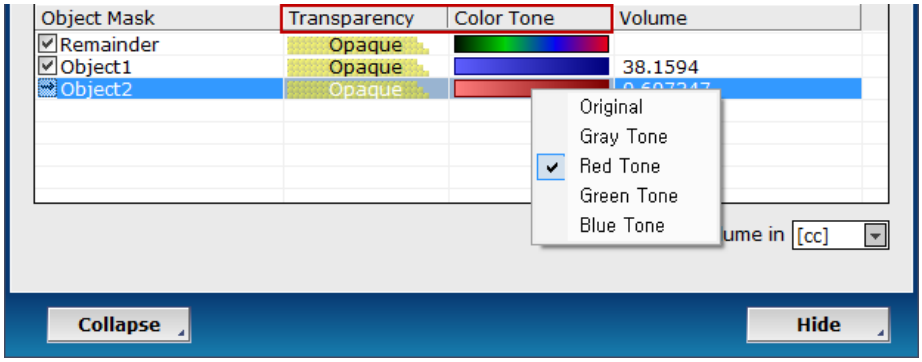


Fig. 147 Choose [Color] and [Transparency] masks

Volume information of segmented object will also be visible in the [Volume] section.

Pick (Select Connected Regions)

The [Pick] function creates object masks by automatically selecting and segmenting connected regions. There are two ways the software calculates connected areas: using either opacity or threshold values.

Using Opacity. Opacity values will be determined by the 3D volume. In other words, the opacity settings in the [Fine Tuning] bar will determine which regions are connected to which. After selecting this tool, click on the area to be segmented and the [Detect Type] prompt will appear. Select either [Surface Center], [Solid Center] or the hollow [Airway Center] and then select points on the 3D volume to indicate where and which areas should be segmented.

Solid Center → Bone
Surface Center → Skin and soft tissue
Airway Center → Air and skin

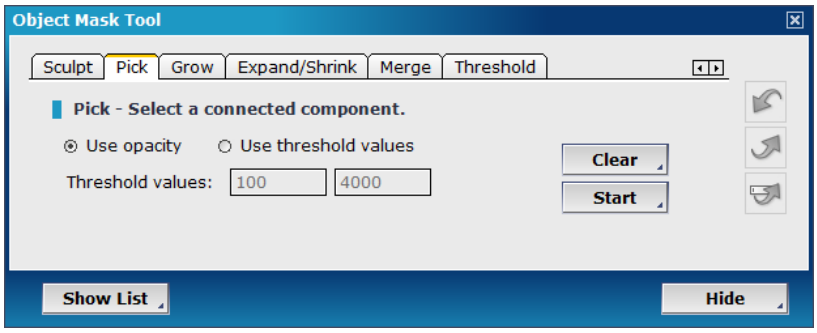


Fig. 148 Use opacity values to [Pick] object

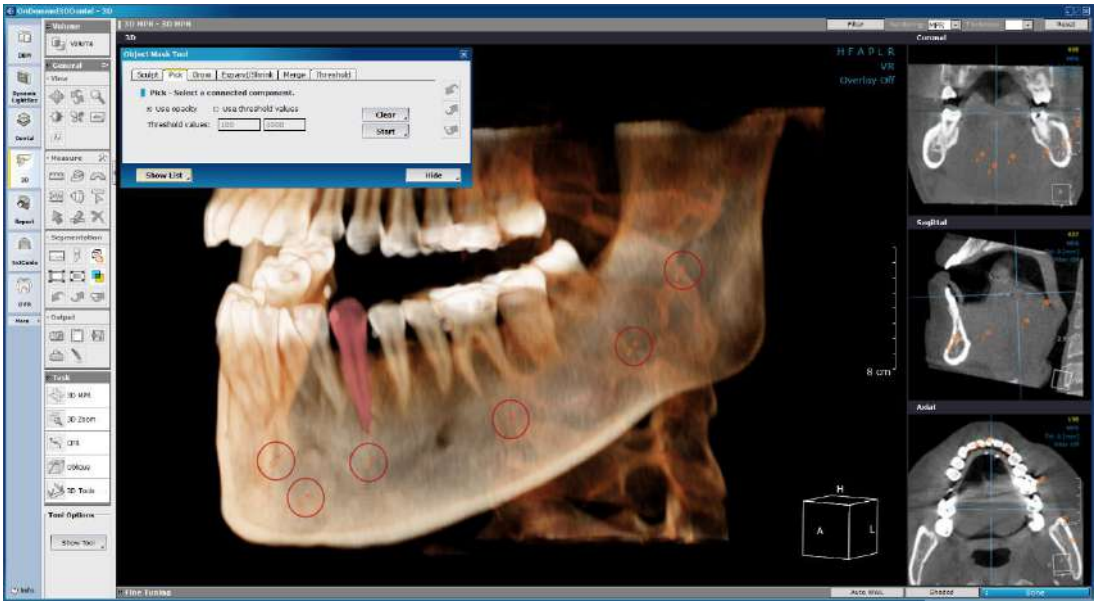


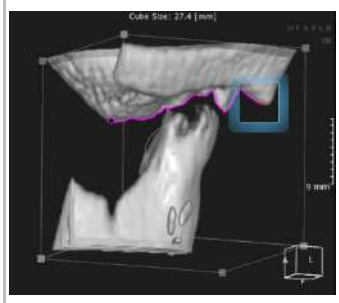
Fig. 149 Place benchmark points (shown in orange) along mandible

To segment the mandible for example, users should pick [Surface Center] as the [Detect Type] and then click along the mandible (shown above).

When done selecting, press [Start] and OnDemand3D will automatically segment the region.

TIP

For full skull volumes, please make sure to first disconnect the mandible from any tissue that is connecting it to other regions such as the condyle area.



An example of this can be seen left. The connected tissue is separated using the [Sculpt – Smart Pen] tool in [3D Zoom] mode for closer observation.

This technique might also not work well for patient CT data that have the patient with a closed mouth, as the upper and lower teeth will be picked up as connected regions when the teeth are too close together.

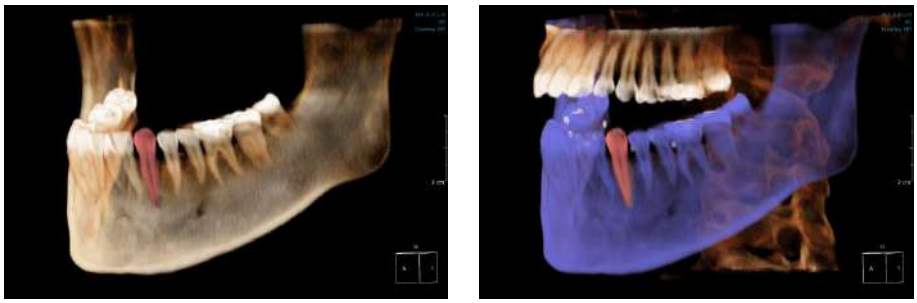


Fig. 150 Color-coded objects after segmentation

Using Threshold Values. Input the threshold parameters, click a few times on the region of interest and click [Start] to start 'picking' connected regions that are within the chosen parameters.

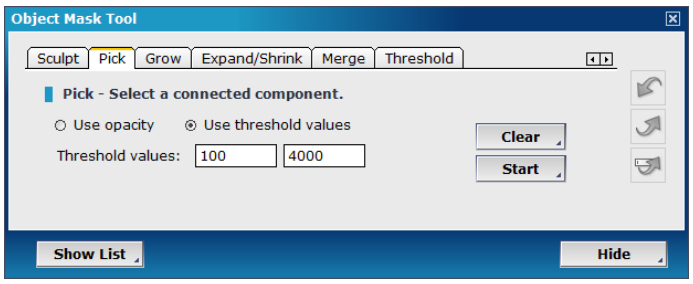


Fig. 151 Input appropriate threshold parameters and press [Start]

Grow

The [Grow] function is characterized as having a 'region growing' function that calculates the starting point's density, opacity, etc. to find voxels with similar values and mask the connected regions together.

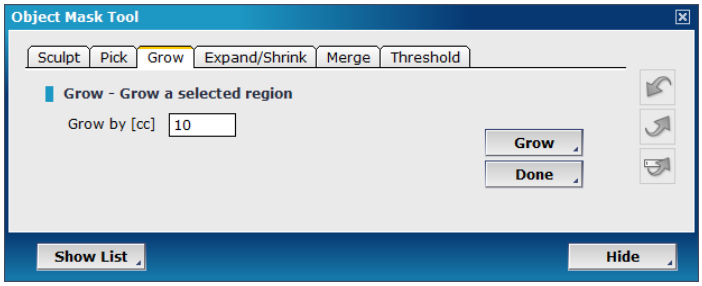


Fig. 152 Users are able to input a [Grow by] value in cubic centimeter units

Step 1: Go to [Grow] from the [Object Mask Tool] dialog shown in the image above, input a [Grow by] value in cubic centimeter units, and pick a few benchmark points on any of the panes.

Benchmark points can be placed at any time during the growing process, not just at the start.

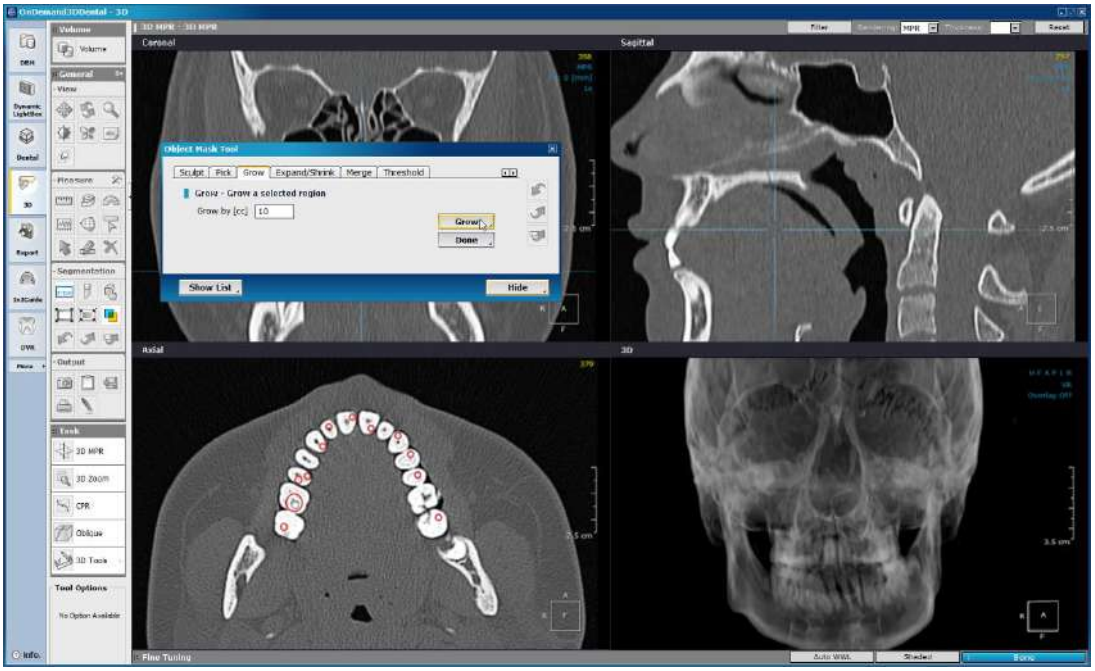


Fig. 153 Arbitrarily place benchmark points (shown circled in red)

Step 2: Click  to start growing the mask area.

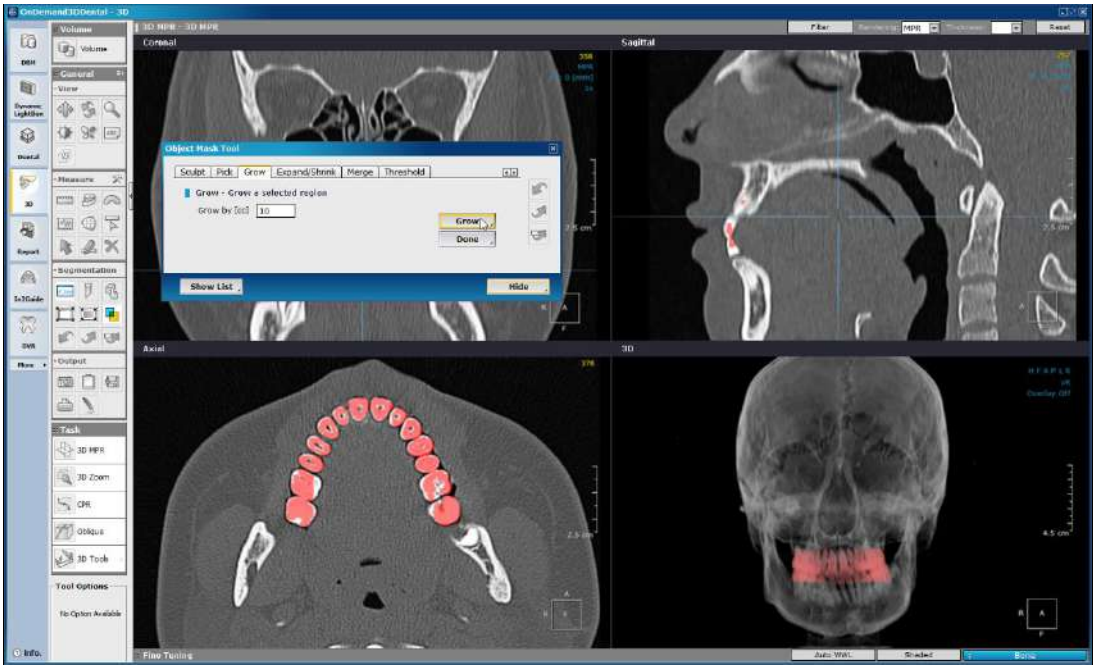
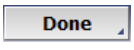


Fig. 154 The mask should grow according to the user's input in cubic centimeters

Click  to undo and input a different value if needed.

Step 3: [Grow] mask until satisfied and press  to choose action and finish.

Feel free at any time to go to different slices and pick additional benchmark points.

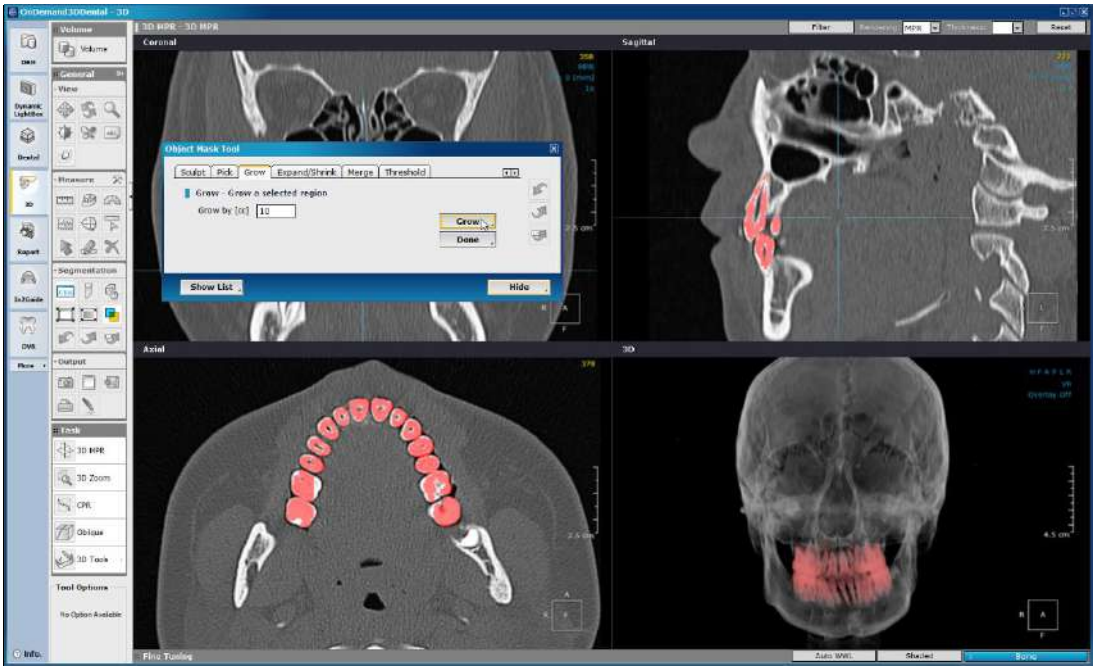


Fig. 155 Adjust mask area whenever needed by inputting different values or use the [Expand/Shrink] mask function (see next section for instructions)

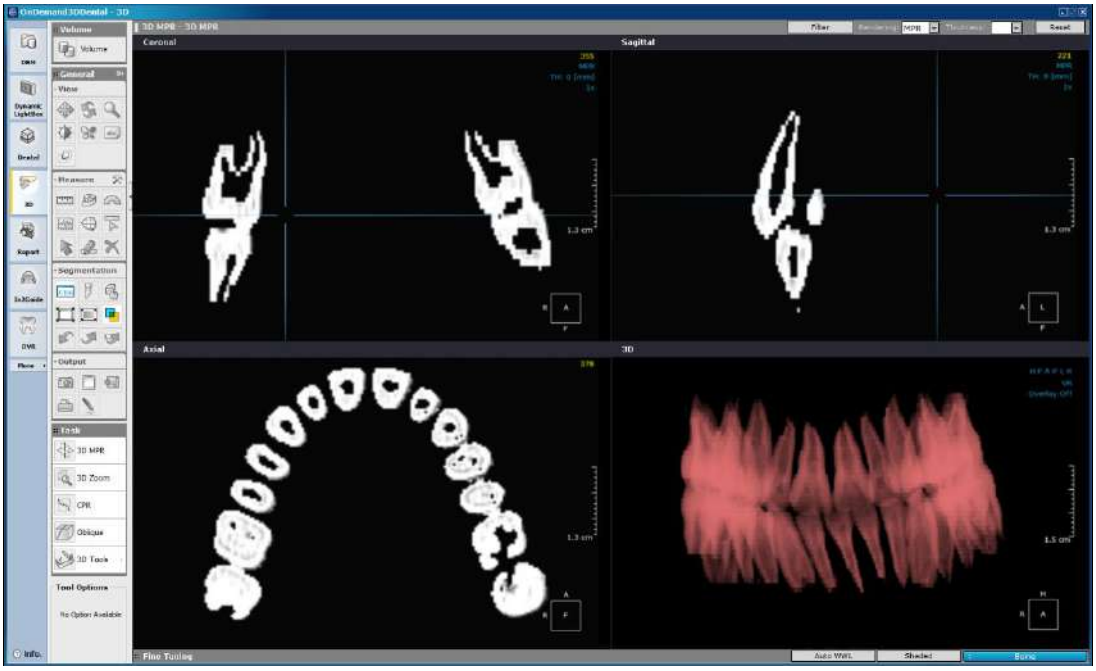


Fig. 156 Newly created object mask shown with a red color mask and MPR images

Final Result: The action selected was [New object], which sets the segmented object as a new and separate object mask. To see remainder, simply check [Remainder] as shown in Fig. 157.

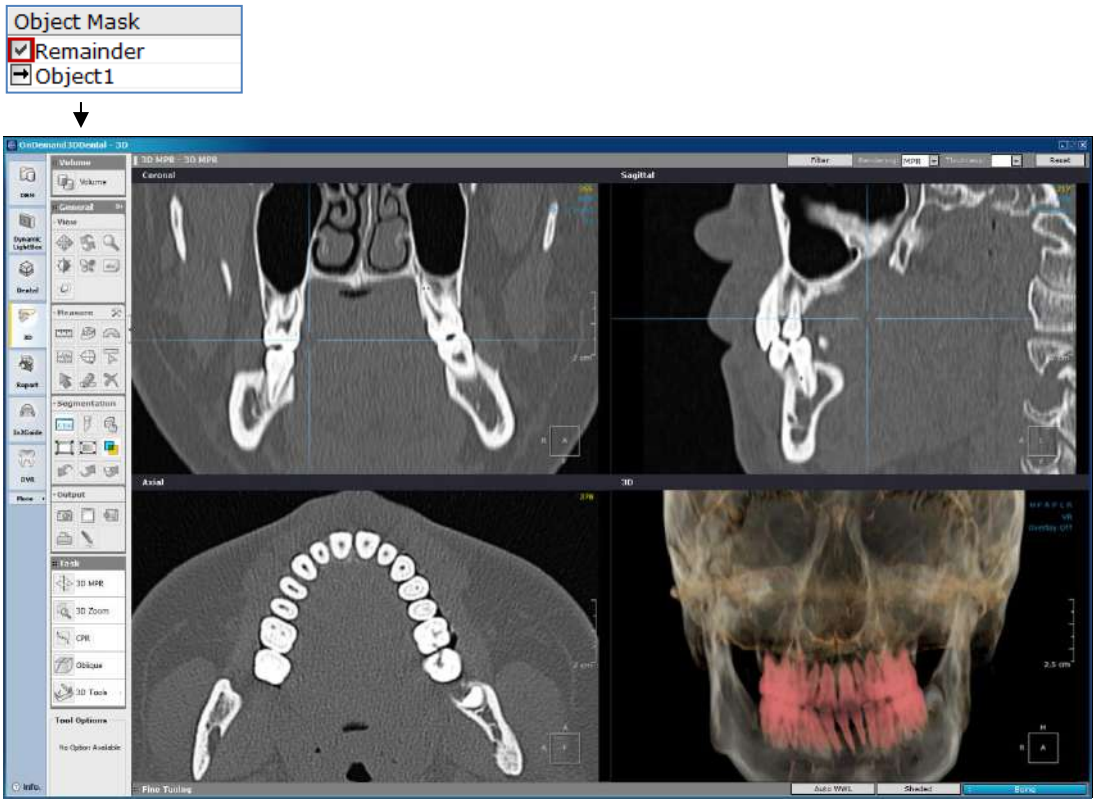


Fig. 157 Add color mask to new object for differentiation

Expand & Shrink

The [Expand/Shrink] tool is used to enlarge or shrink object masks by voxels. The [Grow] tool uses the starting point's specific properties to find and expand the masked area by voxel similarities; but the [Expand/Shrink] tool only expands or shrinks the object masks by voxel values.

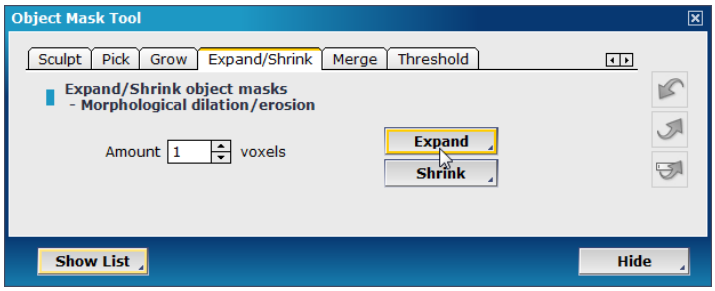


Fig. 158 Input voxel amount to expand the object mask by

Example: [Expand/Shrink] and [Grow]

The following is a method of using the [Expand/Shrink] tool in conjunction with the [Grow] tool.

Step 1: Go to the [Grow] tab on the [Object Mask Tool] dialog, input cubic centimeter value, and arbitrarily pick benchmark points on desired region.

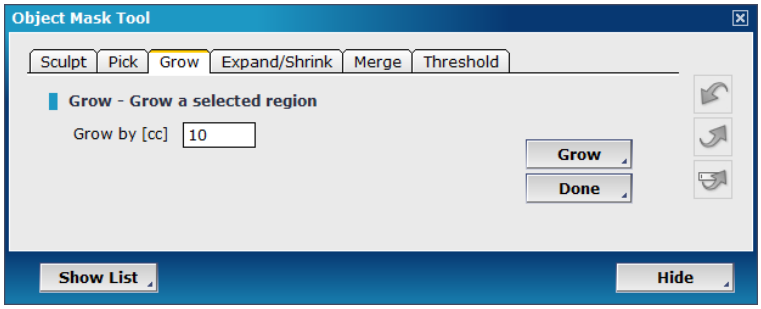


Fig. 159 Start with the [Grow] tool

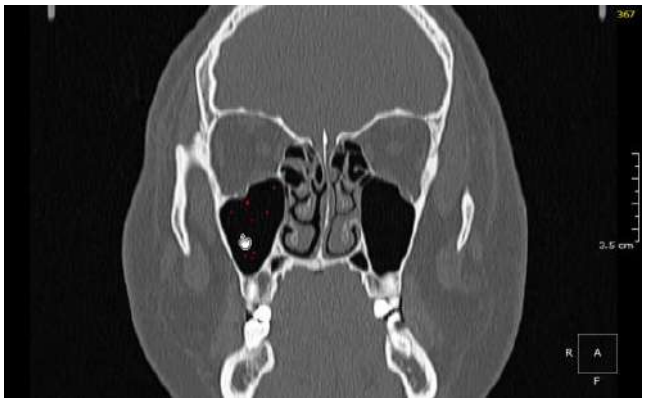


Fig. 160 Starter points can be selected on any of the panes available

Step 2: Click  to start the object mask growing process.

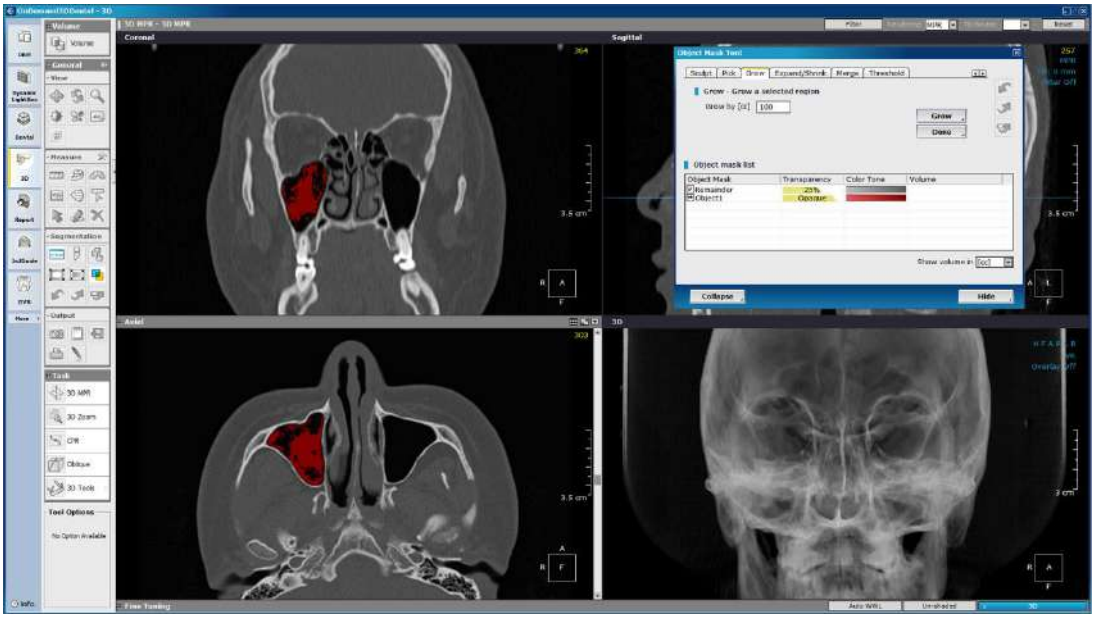


Fig. 161 The object mask will stop growing if there is too much of a difference in voxel values

Step 3: Go to the [Expand/Shrink] tab on the [Object Mask Tool] dialog, input value in voxel units and press  or  whenever necessary to expand or shrink the object mask.

Then go back to the [Grow] tab and alternate between the two whenever necessary.

Fig. 162 Use the [Expand] tool if needed

Fig. 163 [Grow] until object mask covers desired area

Step 4: When satisfied with the selected area, click Done and the [Mask Operation] prompt will appear. Select the desired action to execute.

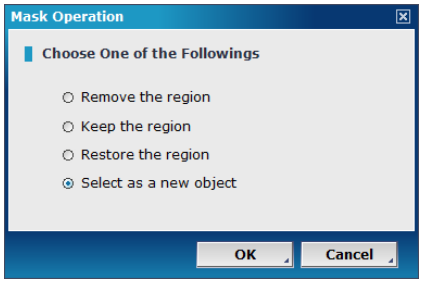


Fig. 164 Choose action to proceed with on the [Mask Operation] tool

Final results: After choosing [Select as a new object], the new object was then given a new fine tuning preset value for better observation (shown below).

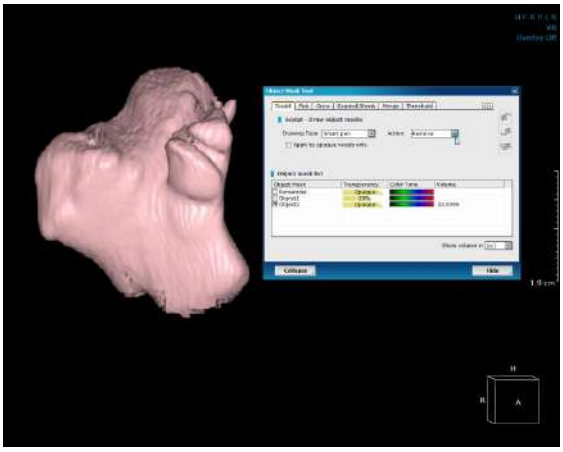


Fig. 165 The newly created object shown alongside its volume information

Merge. Select object masks from the list and merge them using the [Merge] tool.

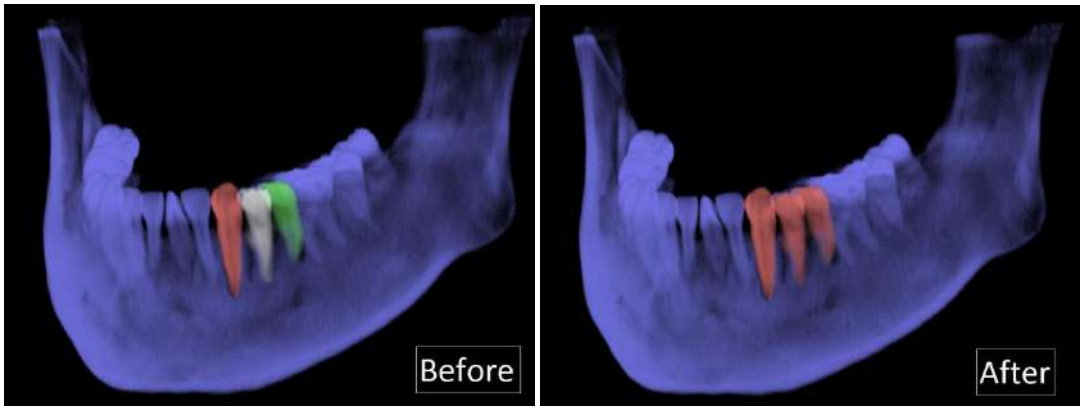


Fig. 166 (Left) Four separate object masks before merging; (Right) After merging

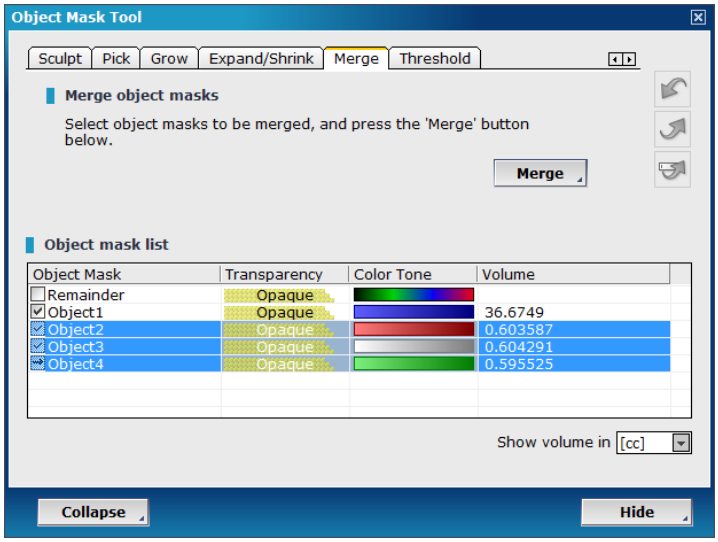


Fig. 167 Select object masks from list and press [Merge]

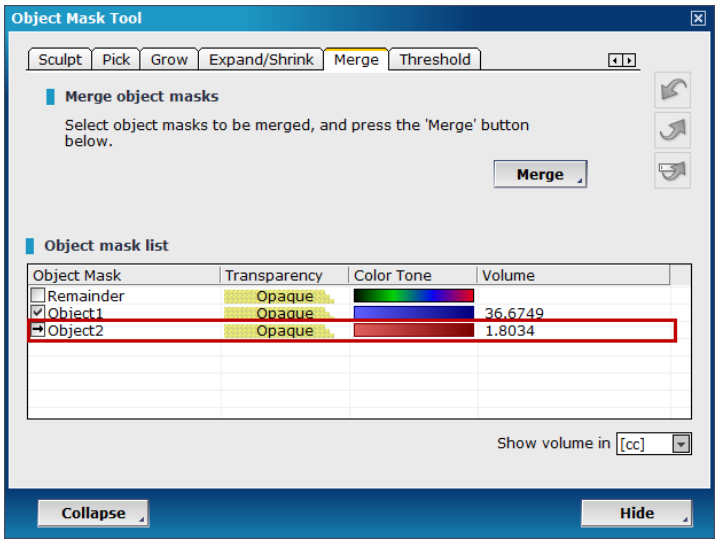


Fig. 168 Object mask list and volume information are renewed after merge is complete

Threshold. Use the [Threshold] tool to segment out objects within certain parameters. Input lower and upper threshold values, select [Action] and click [Start] to segment.

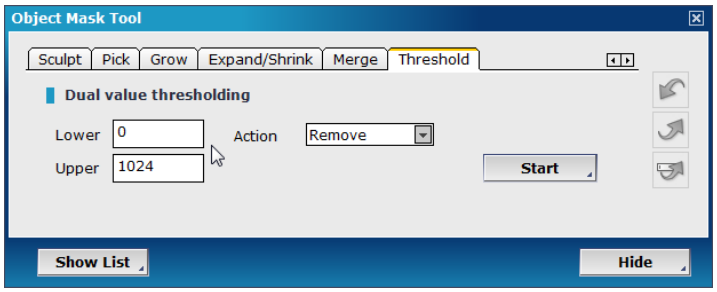


Fig. 169 Input lower and upper threshold parameters and select [Action]

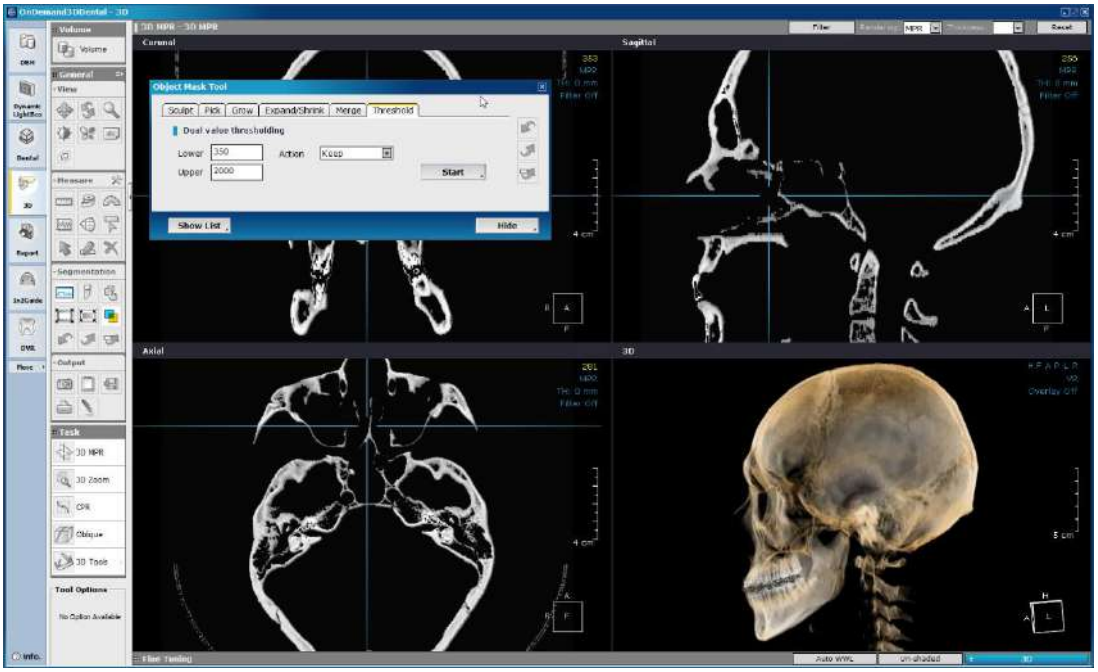


Fig. 170 The threshold range was set as 350 to 2000 to isolate the hard tissue

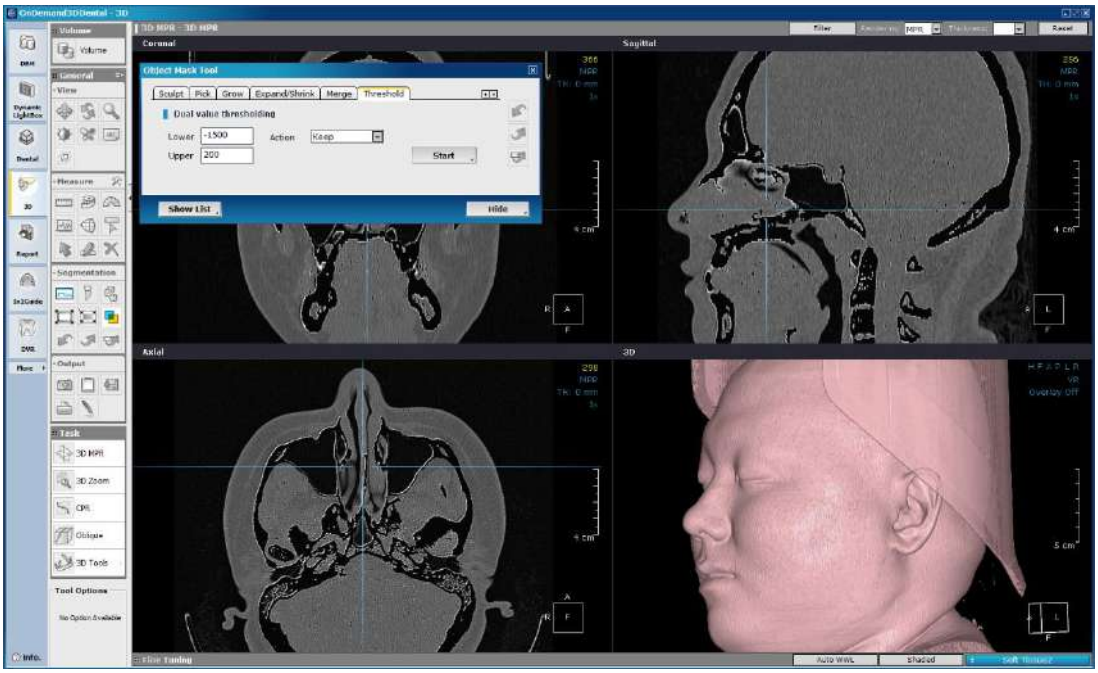


Fig. 171 The threshold range was set as -1500 to 200 to keep the soft tissue intact

The [Threshold] tool is also recommended for airway segmentation.

7.5 Export as STL

OnDemand3D™ allows for object masks to be exported out as STL data. The following is a step by step guide on how this is achieved.

Step 1: Go to the object mask list provided on the [Fine Tuning Bar].

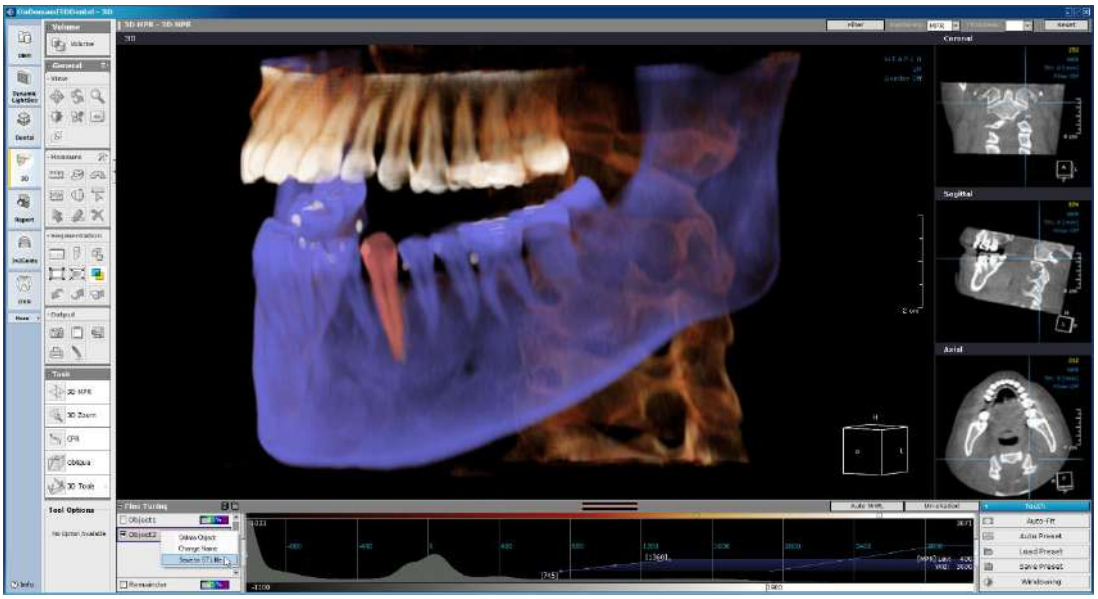


Fig. 172 Double-click on the gray [Fine Tuning] bar to expand if needed

Step 2: Right-click on desired object mask and select [Save to STL file] as shown in Fig. 173.

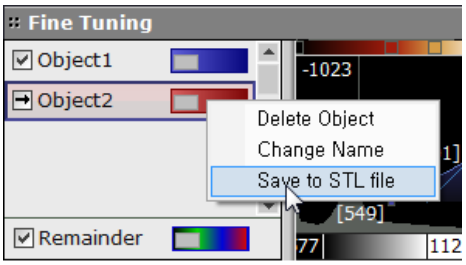


Fig. 173 Select [Save to STL file]

Step 3: Choose [Surface Generation] settings and press OK .

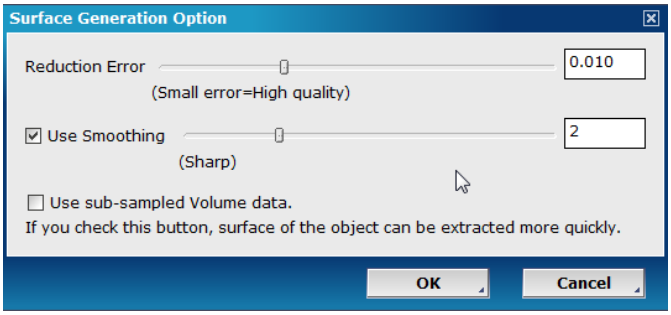


Fig. 174 Use the slider controllers provided to set error and smoothing configurations

Step 4: Select a file destination and name the file.

Step 5: Go to DBM and import in the STL data to view directly on OnDemand3D™'s [Surface Mesh Viewer].

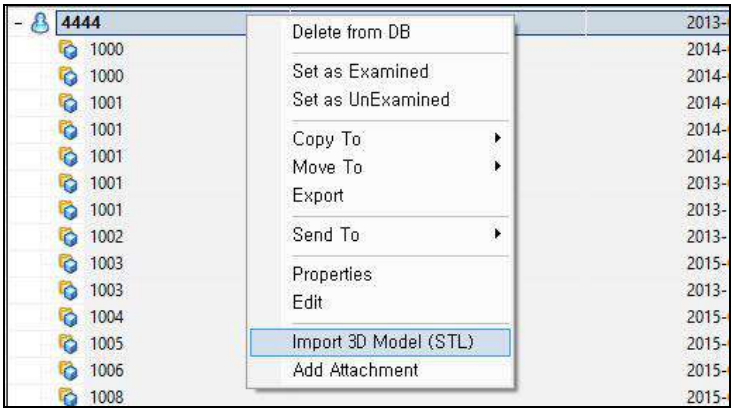


Fig. 175 From DBM, select a patient study and choose [Import 3D Model (STL)]

Select file to import and press [OK].

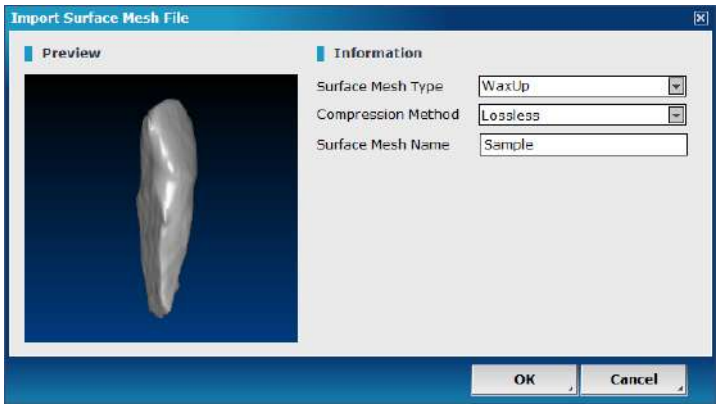


Fig. 176 Input surface mesh type, compression method and name in the preview dialog

Final step: After the STL is imported, simply double click and the [Surface Mesh Viewer] will open up as shown below. In DBM, surface mesh data appear with the  icon under the appropriate patient study.

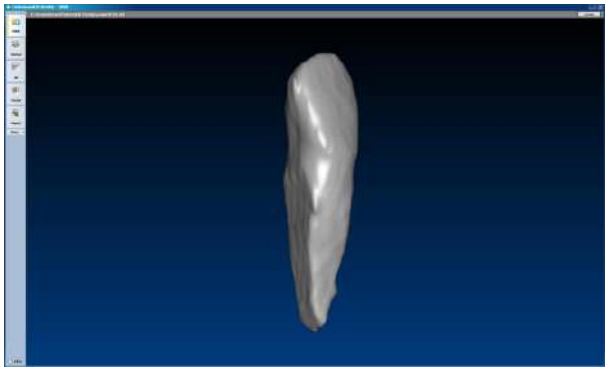


Fig. 177 The extended functions of rotating, zooming and panning are available

8 Report

The Report module is for users who want to quickly create a simple report. The Report module supports the extended functions of capture, save, convert, and print reconstructed images from OnDemand3D™. In addition, it lets the user export the created report as an HTML formatted document for viewing on any computer.

Images 'captured' from other modules with the  tool can be accessed here.

8.1 Layout

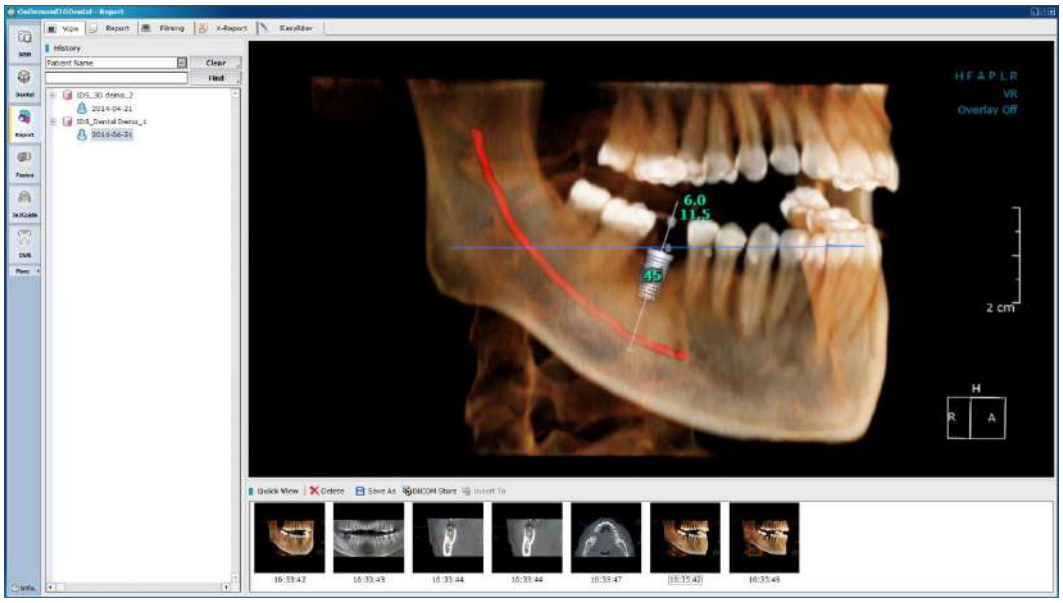


Fig. 178 View previously captured images by patient and date on the Report [View] layout

The user will be able to switch between modes using the tab buttons at the top of the screen, shown below.

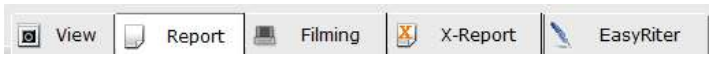


Fig. 179 Select mode for [Report]

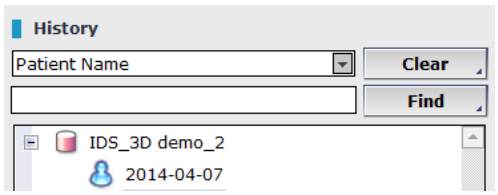


Fig. 180 Search through [Capture] history

The user's history of captured images are saved and stored in the [History] section, through which the user can search by date, patient ID and patient name.

When a folder is selected in the [History] section, the user will be able to see a preview of the images contained in the [Quick View] section as shown in Fig. 181. In the [Quick View] sections, users will be able to [Delete], [Save], [Store images as DICOM], and [Insert] selected images into the report. Simply dragging and dropping images into image slots on the report will work too.

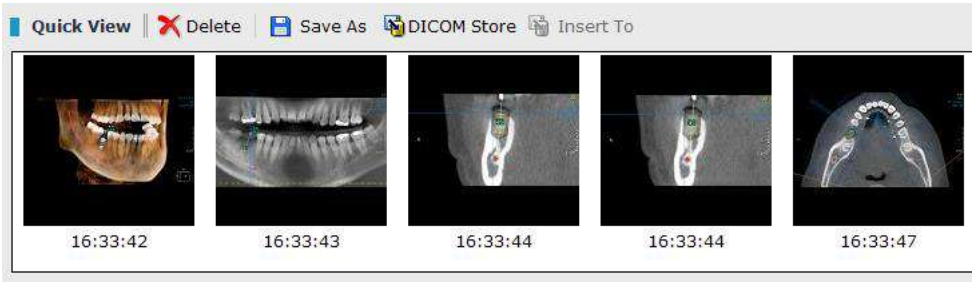


Fig. 181 Report [Quick View]

8.2 Report

Use the [Report] tab for basic reporting using captured images.

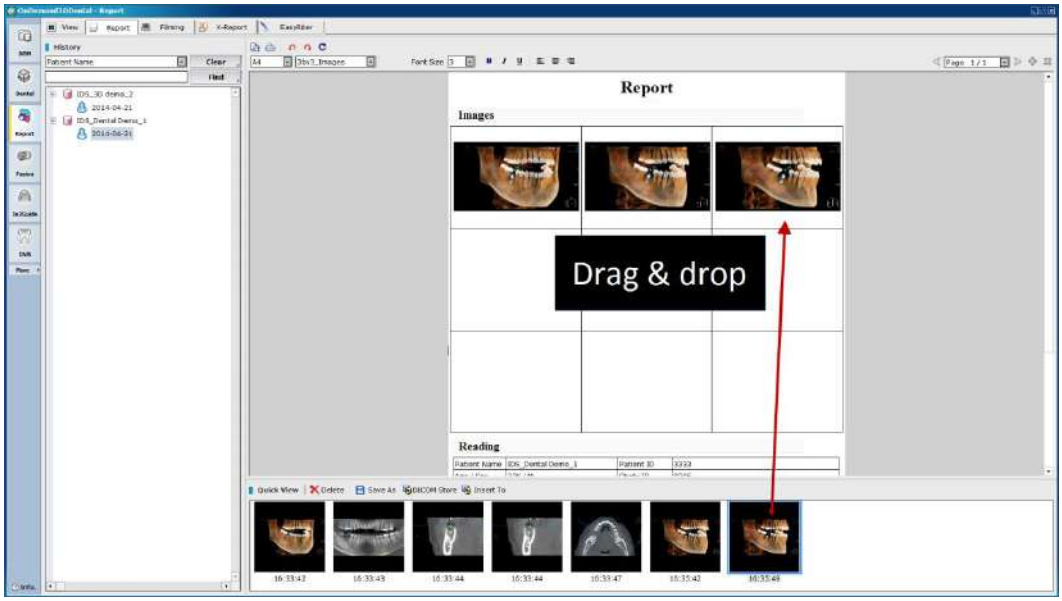
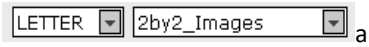


Fig. 182 Users will be able to work on basic reports using captured images on the [Report] tab

OnDemand3D™ provides the following tools for reports.

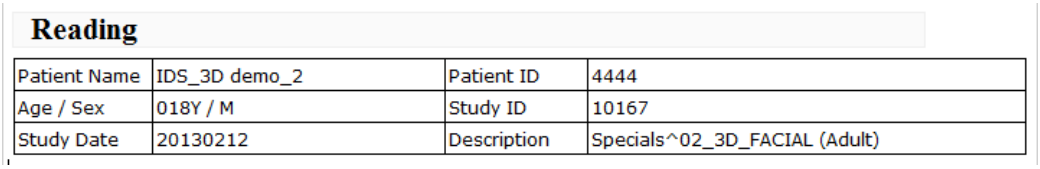
Fig. 183 [Report] tools

Tool	Description	Tool	Description
	[Export] as HTML.		Preview and [Print] report.
	[Undo] last action.		[Redo] last action.
	[Refresh].		

Select paper size for the report and the image layout using the 

and set font size, text styles, and text alignment.

The [Reading] section will be automatically populated with patient information when captured images are inserted into the Report, as can be seen below.



Reading

Patient Name	IDS_3D demo_2	Patient ID	4444
Age / Sex	018Y / M	Study ID	10167
Study Date	20130212	Description	Specials^02_3D_FACIAL (Adult)

Fig. 184 All of the information above can be edited if necessary

8.3 Filming

This mode allows users to choose an image layout and print out DICOM on film using a DICOM Printer. Drag and drop captured images onto the template layout and print.

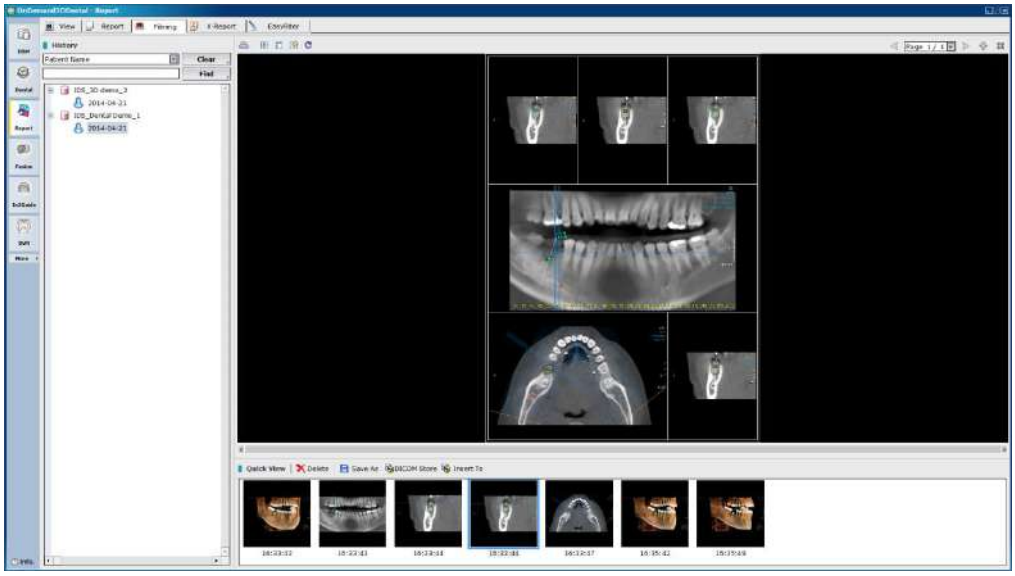


Fig. 185 Use the tools provided and drag and drop images onto the template

Tool	Description	Tool	Description
	[Print]		Change [Layout]
	[Merge] cells		[Clear] selected cell or all cells if nothing is selected
	[Clear All]		

8.4 Printer Options

Users will see the following dialog when they click [Print]. Select your medium type and the scale of the report to paper. [Fit to Size] will automatically resize the report to fit the paper, while [True Size], the default setting, will print the report in its original size. Choose [User Scale] to manually set.

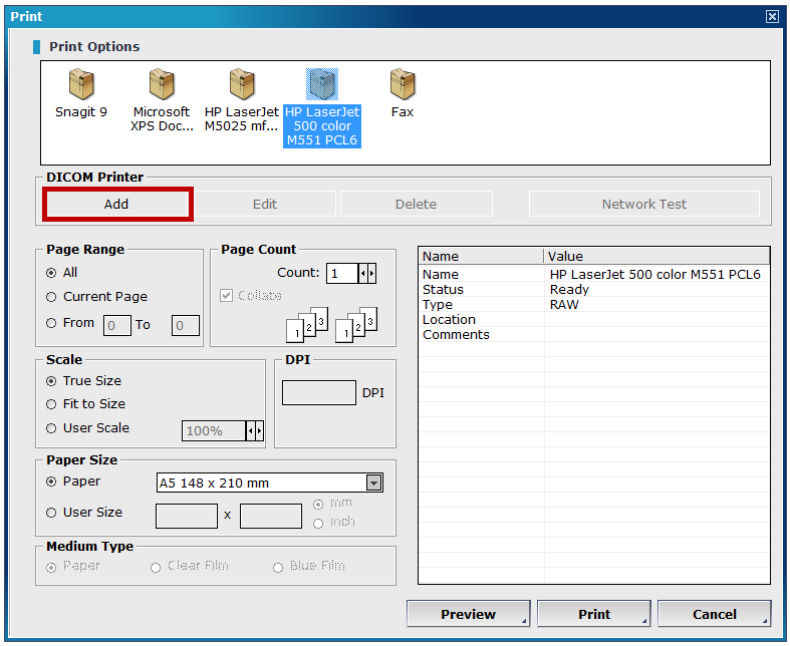
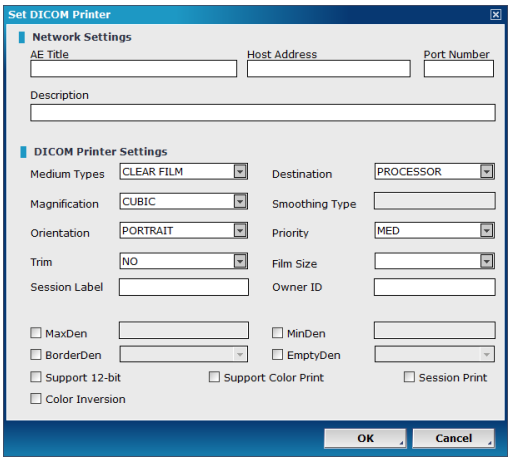


Fig. 186 [Printer] options

Press Add, shown in red above, to add a new DICOM printer.



Manually enter network and DICOM printer information, such as [Host Address] and [Port number].

Choose a page range, page count and size scale preferences. Users will also be able to choose between paper, clear film and blue film for their [Medium Type].

Fig. 187 Add printer information

9 X-Report

X-Report provided by OnDemand3D™ is based on XML, while basic reports generated with the Report module are based on HTML. This makes it a much more advanced option for users who would like to create their own custom templates to increase efficiency and ease.

Custom templates created using X-Report Template Designer, detailed in the second part of this chapter starting on page 106 (☞ ***Section 7.2: X-Report Template Designer***), can be accessed from any module on OnDemand3D™. Users will be able to easily insert images onto the report using simple drag and drop motions. X-Report also supports real-size printing and can be exported as PPT, HTML or PDF files.

9.1 X-Report Tool

Load patient data onto any module, press  from [Output Tools] and click  in the [Local Report] window, as shown below.

Fig. 188 Create new report with template

To make customized templates using [X-Report Template Designer], please refer to page 106 (☞ ***Section 7.2: X-Report Template Designer***).

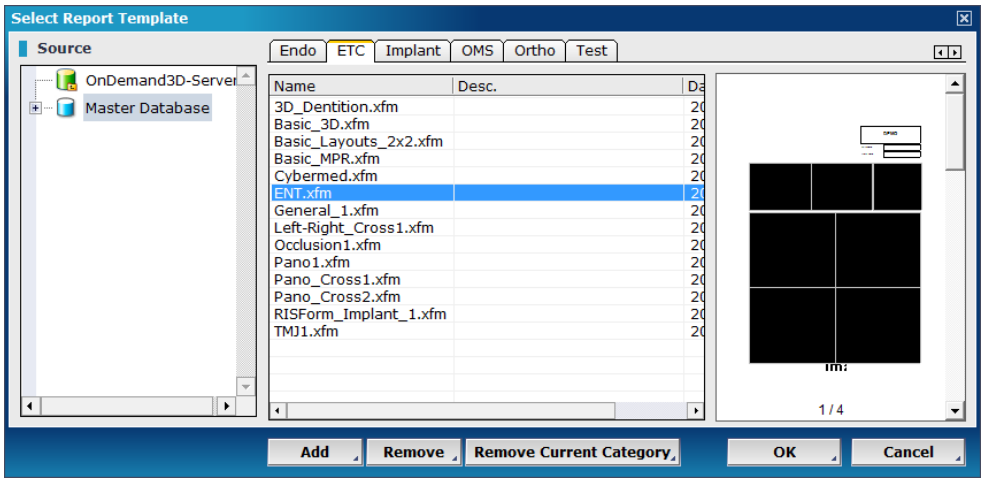


Fig. 189 Template files are saved as XFM data

To add X-Report templates in XFM format saved on the computer, users can also choose to [Add].

Select a template from the desired category and press [OK] to see it generated in the [Local Report] window as shown in Fig. 190.

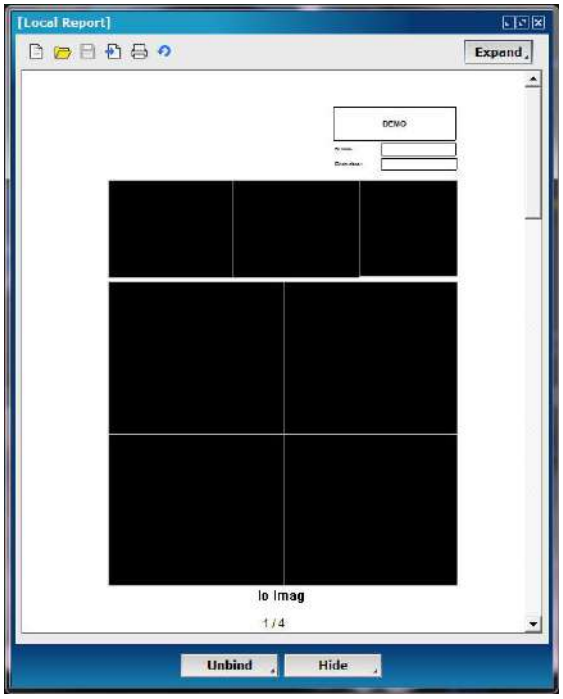


Fig. 190 New [Local Report] window is created

Tool	Description	Tool	Description
	[New]		[Open]
	[Save] as XFM.		[Export] as PDF, HTM, PPT, etc.
	[Print]		[Reset] template

Icon	Description
Expand	[Expand] window for more tools. See pages 104 (☞).
Bind	When using templates with 'bound' information, press to apply. See page 108 (☞).
Hide	[Hide] window.

Inserting Images. To insert images, simply drag and drop from the screen onto image boxes on the report. For cross-sectional images, OnDemand3D™ allows for inserting a series of images into the report at once. Users can do this by simply changing the layout of the [CrossSectional] pane to show more images and dragging the first image into the report. The image boxes after it will automatically fill.

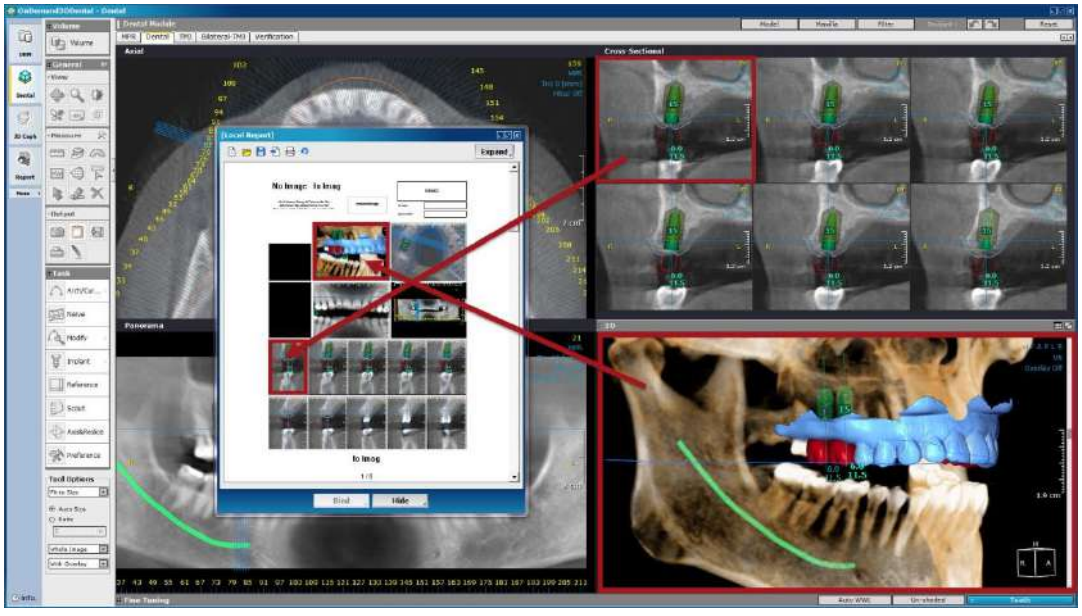


Fig. 191 Simply drag and drop images onto image boxes on the [Local Report] window

Another way to import a series of images is to click on the images wanted to select and then to drag the first image in. The selected images following will automatically fill in. When a cross-sectional image is selected, users will see a light gray check mark on the image.

Tool options. Users also have tool options for this function, as can be seen below the [Task Tools] section in Fig.192.

Fig. 192 Tool options

This image options menu contains settings specifically for the X-Report window. Select here, if the images to be dragged in are to be 'True Size', 'Shown Size' or 'Whole Image'.

As seen on pane

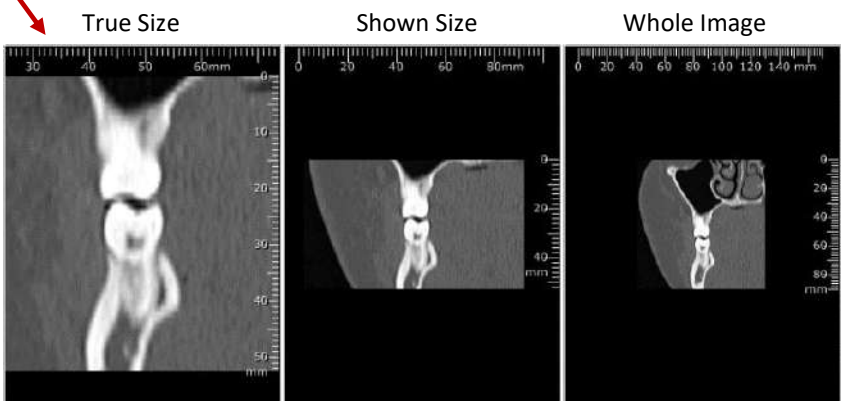


Fig. 193 Comparison of original image in pane and images in X-Report with different options selected

[True Size] – the image will true to its original size.
[Shown Size] – the image will be the same size as shown in the actual OnDemand3D™ pane.
[Whole Image] – the whole image will resized to fit the image box.

The [Overlay Font] settings refer to the text settings of the image being dragged and dropped.
[Image Only] – imports the image without any overlays, annotations or reference lines.
Overlays include: patient information, scan details, directional displayer, slice number, directional indicators (R/L or B/L), reference lines, and outline/plane/MPR overlays.
[Only Annotation] – displays only measurements, notes, Hash line & numbers and reference lines without patient information, scan details and direction displayer.
[Automatic, 8, 10, 12, 14, 16] – only change the font size of the patient information, scan details, slice number, directional indicators (R/L or B/L).
Annotation and Hash number font size need to be changed in the [Annotation Settings] which can be accessed with the [Tool Settings] icon in the top-right corner of the *Measure* section of the Tools on the sidebar. Please refer to ***(☞ 4.1 General Tools: Annotation Settings)*** for more information.

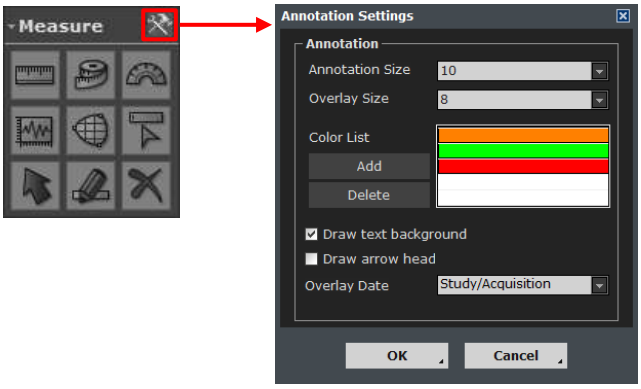


Fig. 194 [Annotation Settings]

[Expand] window. [Expand] the window using the Expand icon and utilize the basic editing tools to finish the report. The editing tools provided will be similar to the ones in [X-Report Template Designer]. Users will be able to delete or add pages to the template alongside with adding a new template to the current one. Add in additional image boxes and edit the text in the report.

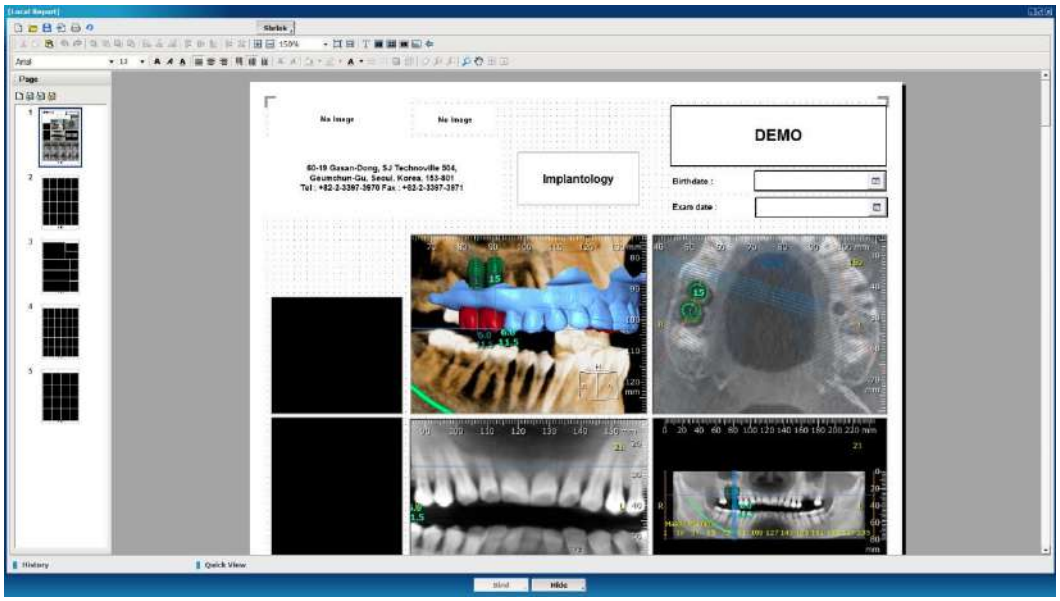


Fig. 195 Expanded [X-Report] window

Scale options for the image boxes can again be edited in this window. Use the icon to scale an image to [Real Size], or icon to scale the whole image to fit the window. Click on the icon and drag up or down on an image to zoom in and out. To pan an image, use the icon provided.

Fig. 196 Tools for editing text on X-Report

Additional tools for editing provided on X-Report are as follows:

	Zoom to fit screen		Set line width
	Zoom to fit width		Set line style
	Bring to the very front		Add shadow effect
	Send to the very back		Add 3D effect
	Bring to front		Image layout
	Send to back		Ruler Overlay

Save X-Report. Click  and provide details such as name, keywords, comments and whether to use password protection, as shown in Fig. 197. Saved reports can be accessed from DBM under the patient series, shown as XFM data. Double click and open with X-Report to edit.

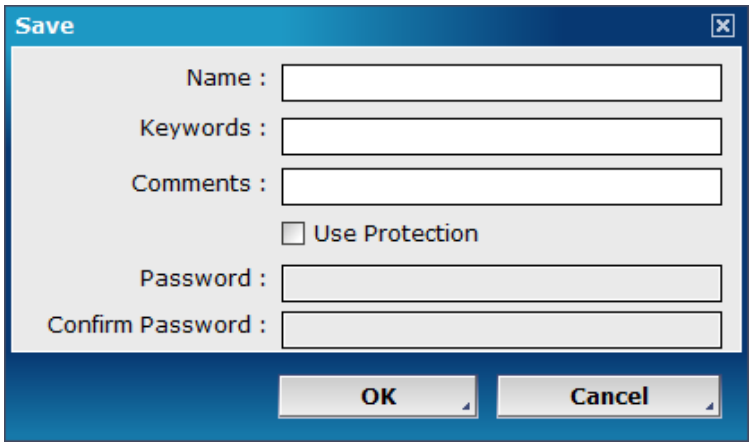
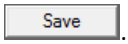


Fig. 197 Save X-Report

Export X-Report. Reports can then be exported as either PPT, JPG, HTM, or PDF data. Simply click  , select file destination along with file format, input name and press  .

Print X-Report. Select  to print report. Please refer to page 100 (☞ ***Subsection: Printer Options***) for more on printing options.

9.2 X-Report Template Designer

Design your very own custom templates using X-Report Template Designer. Create specialized report styles for each patient's needs and increase the efficiency of writing a report. To start X-Report Template Designer in Windows, press [Start] → [All Programs] → [OnDemand3DDental] → [X-Report Template Designer] as shown below.

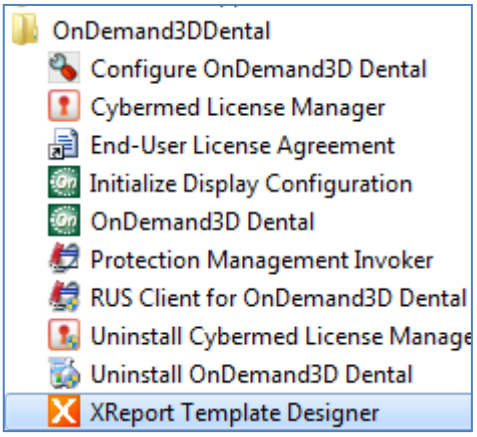


Fig. 198 Run X-Report Template Designer from the Start menu

X-Report Template Designer provides functions to create and manage report templates. Based on XML, X-Report makes it possible to bind data elements such as patient ID, name, sex and etc. to a control. Please read further for more information.

Layout

X-Report Template Designer is composed of a number of menu selections on both sides of the screen, an editing toolbar at the top, and a simple and straightforward look.

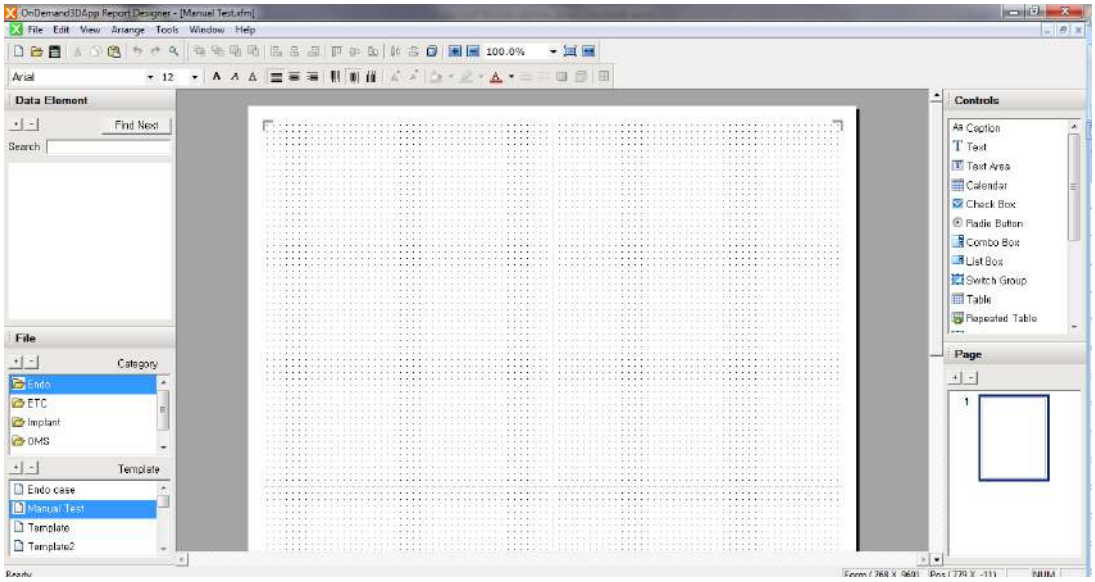


Fig. 199 [OnDemand3D Report Designer] layout

Tools

The tools included in X-Report Template Designer are similar to tools found on general word processors. Please refer to page 105 (☞ ***Table: Additional tools***) for more info.

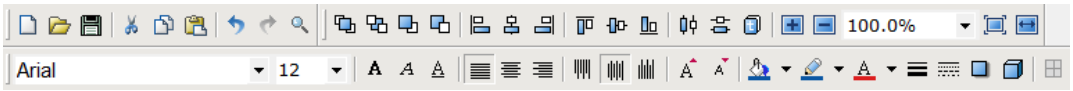


Fig. 200 Editing toolbar provided on X-Report Template Designer

Create new template. Press or go to [File] → [New], input file name, paper size and paper orientation information in the [New File] dialog and users will see a screen similar to Fig. 199. Another way to create a new file is to click the [+] icon in the 'Template' section at the bottom left corner of the screen.

Users can manage their report templates using the [+] and [-] icons provided in the 'File', 'Data Element' and 'Page' sections. Press [+] to add, and press [-] to delete. Add any number of categories and templates to the template database and organize them for easier access.

Save template. To save the current template, click in the toolbar or select [Save] from the [File] menu.

Load template. Double click on a template in the 'File' section or click from the toolbar.

Adding Controls

After a new template has been added and opened, users can simply drag and drop controls from the [Controls] section on the upper right side of the screen.

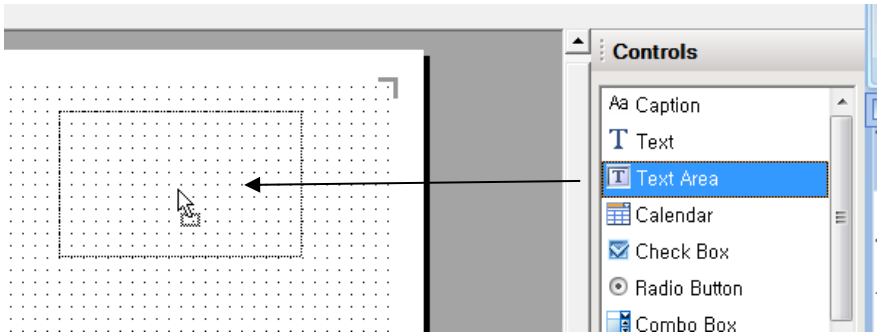


Fig. 201 Drag and drop controls onto template

After the controls are dragged in, resize and re-position as needed. Users are provided with a grid for easier positioning, which will not be visible on the actual report template. To configure grid settings, go to the [View] menu and set preferences.

Right-click on any control or double-click and choose [Properties] to change settings such as fill and border color, text style or effects such as shadow and 3D.

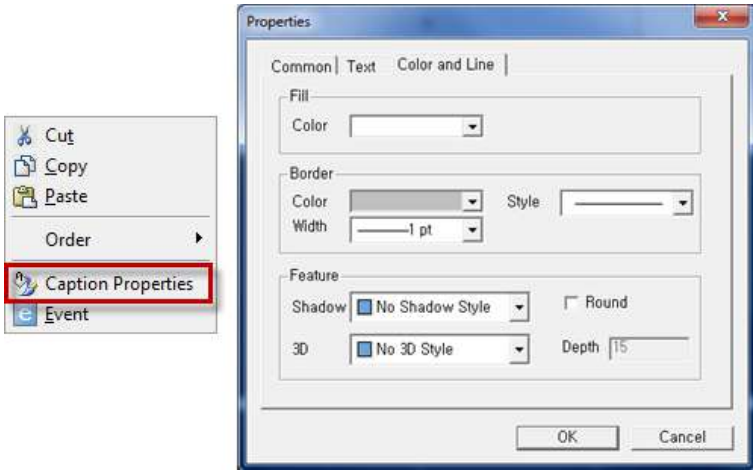


Fig. 202 [Properties] window

Drag to position and align controls or use the alignment tools provided on the upper toolbar.

	Align left
	Align center
	Align right
	Align to top
	Align vertical center
	Align to bottom
	Equal width
	Equal length
	Change tab order
	Zoom in/out

Data Element Binding

Combine controls with data elements such as the patient ID, name, sex and even images. If a control is bound, the corresponding information will be automatically entered from the DICOM data when the user writes a report.

Loading Data Elements. Data elements are saved in XSD file format. Click the [+] icon from the [Data Element] section on the upper left side of the screen, choose [Local XSD] and open the [XReportDICOM.xsd] file. This file contains the header information of DICOM data such as the patient ID, name and etc.

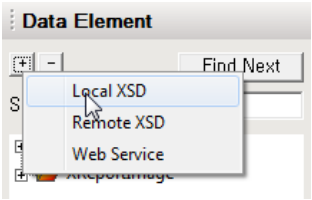
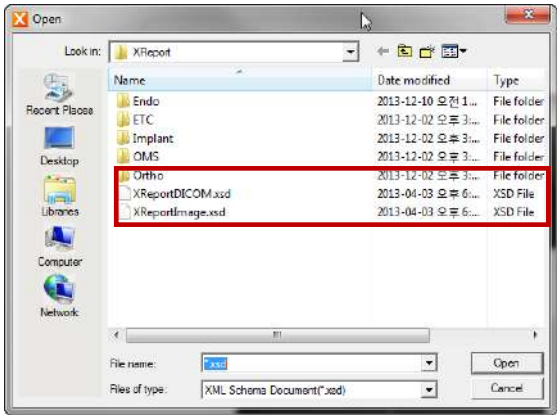


Fig. 203 Importing XSD data



Binding Data Elements. Drag a data element from the menu and drop into a control on the report. The two will be automatically bound. Bound controls will have a small comment on the upper right corner, such as PatientComments, while controls that have not been bound will have a sign indicating none.

Controls

Create custom templates using the controls provided and bind them to data elements for easier and simpler reporting.

Caption. Create a box to display text labels. Click inside the box and enter text. Right-click and choose [Properties] or double-click to change settings.

Fig. 204 Caption [REPORT SAMPLE]

Text. Create a box for inputting single-line text. To set a default text to display, go to the [Properties] menu and in the [Data and Option] tab, enter the default text to display. Fig. 205 shows two text boxes.

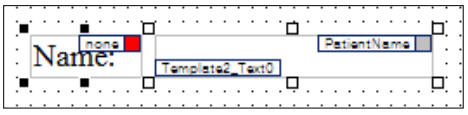


Fig. 205 Default value: [Name:]

One showing a default value of [Name:] while the other one has been bound to the data element [PatientName].

Text Area. Create a multi-line text box.

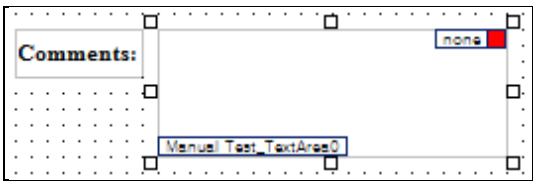


Fig. 206 More than one line of text can be input into a [Text Area]

Calendar. Create a pop-up style calendar box. Calendar boxes can also be bound to the [PatientBirthDate] data element.

Fig. 207 For easier input of dates

Check Box. A check box may be used to answer a yes or no value or for a basic checklist as shown below. Drag in check boxes and click to edit the labels.

Any number of items can be selected in a checklist, and the user can also set it up so that some of the check boxes are checked in default with the [Data and Options] tab in [Properties].

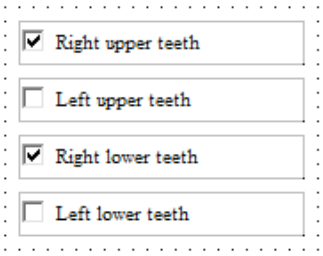


Fig. 208 Create a simple checklist

Radio Button. Create a group of choices where only one item can be selected. Users will be prompted to put in their radio button values in the [Insert Radio Button] dialog, as shown Fig. 209. Use the [Add] button to add in new values and [Modify], [Remove] or [Move up] if necessary. Select the default value as well, and as shown in Fig. 209 , it will be set as the first choice.

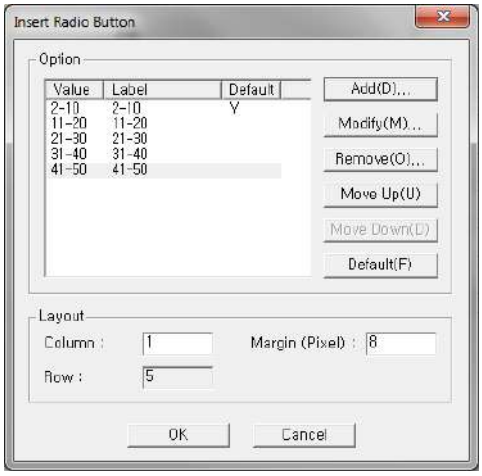


Fig. 209 [Insert Radio Button] dialog

Combo Box. Create a [Combo Box] control that can be used to present a list of options in the form of a drop-down menu.

List Box. Create a [List Box] to present a scrollable list of text items. To insert items, double click and go to the [Data and Option] tab.

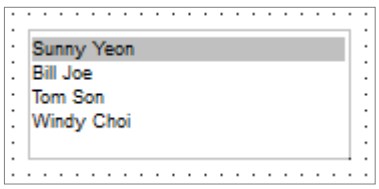


Fig. 210 Creating a [List Box]

Switch Group. Add a control that allows for switching between tabs. Enter a different control or different menu options for each tab.

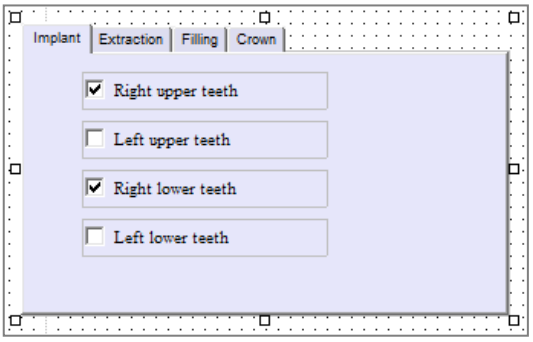


Fig. 211 Create a [Switch Group]

Table. Create a table and click to enter text. Each cell can be bound to a data element. Dragging a data element folder of choice into the report and choosing [Table] will automatically create a table with the bound data elements, as shown in Fig. 212.

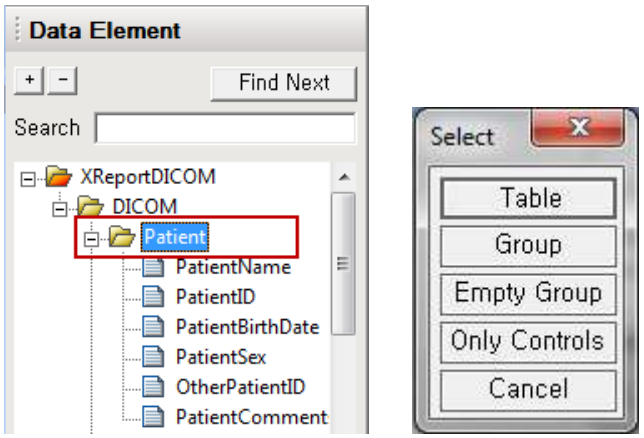


Fig. 212 Creating a data element [Table]

Repeated Table. Create a table with rows that can be repeatedly added onto the table along with the information contained. Drag the control onto the report and follow the same steps as with a [Table]. Go to [Properties] and on the [Data and Option] tab, choose the number of rows to be 'repeatable'.

name	relation	id	role
JB Lee	r1	jblee	admin
JY Kim	r2	jykim	none
SY Lee	r1	sylee	
KW Kim	r3	kwim	

Fig. 213 [Repeated Table]

[Repeated Tables] on the actual report will include a small  beside a table row. Click on it and choose where to insert the additional row.

Repeated Groups. Create a group for repeated table elements as shown below.

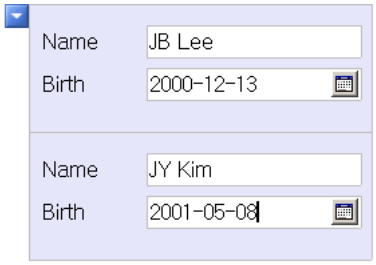


Fig. 214 [Repeated Group]

Picture. Create a picture box to be used for company logos, patient photos and etc.

Fig. 215 [Picture] box

Image. Create an image box to display an image.

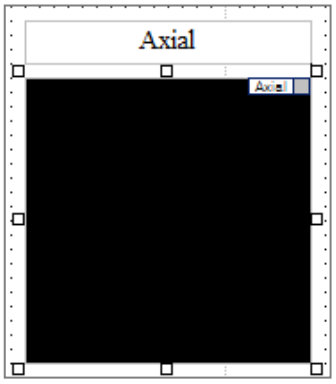


Fig. 216 [Image] box bound to data element [Axial]

Multiple Image. Create an image box to display multiple images from OnDemand3D™ by inserting different images into each cell.

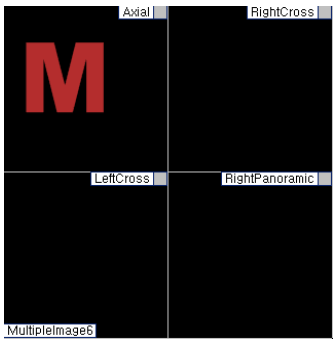


Fig. 217 [Multiple Image] box

To change the layout of an image box, use the  in the upper toolbar.

Series Image. Create an image box to display a series of images from OnDemand3D™ Dental. With this, the user would only have to drag the first image in, and the others will fill up automatically.

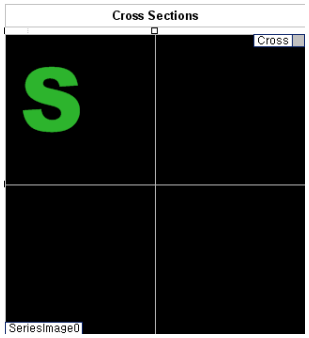


Fig. 218 [Series Image] box

To switch from [Multiple Image] control to [Series Image] control and vice versa, simply right click on the image and click [Switch to Series Image Control] as shown below.

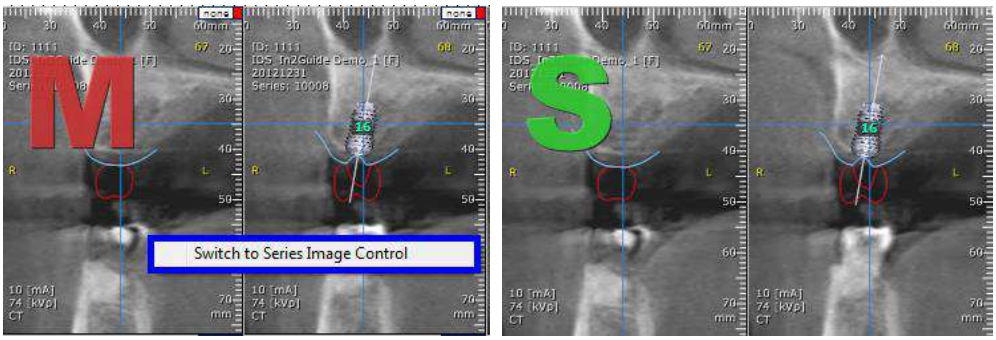


Fig. 219 Switching from [Multiple Image] on the left to [Series Image] on the right

Group. Create a group box to group together several controls, as shown in Fig. 220. Users can also drag a data element folder into the report an select [Group], which will automatically create a group of controls already bound with data elements.

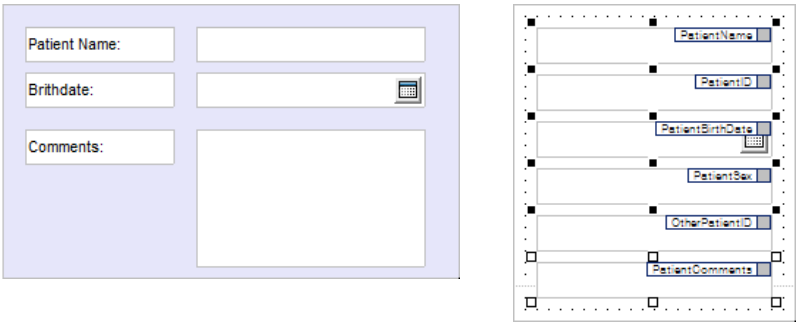


Fig. 220 Automatically generate a [Group] of controls

Managing Pages

Add or delete pages using the [+] and [-] icons provided and drag and drop pages to change the order.

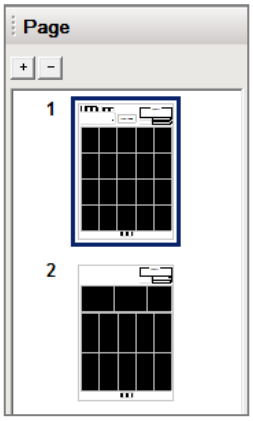


Fig. 221 [Page] section

10 In2Guide (Optional)

In2Guide™ utilizes OnDemand3D's powerful 3D engine to create a 3D volume from DICOM data for an intuitive way to plan a surgery. User can find everything needed for implant surgery from an accurate simulation of the patient's data to marking the nerve and placing implant fixtures. Then turn the virtual planning data into a real custom made surgical template with depth and angle control by ordering directly from In2Guide™. High quality surgical templates are shipped and received within days of ordering.

10.1 Layout

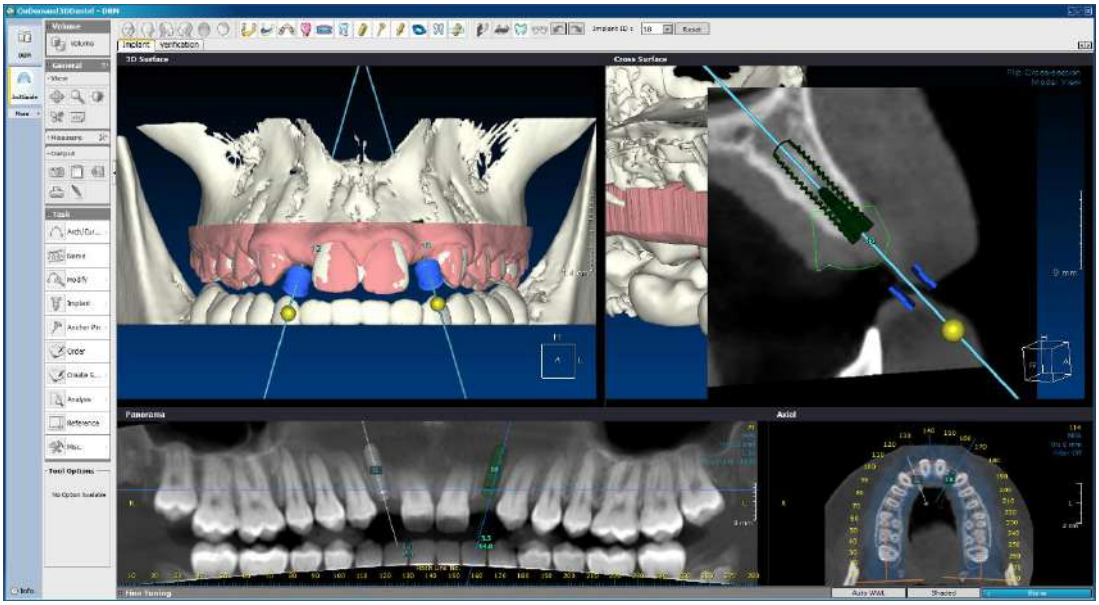


Fig. 222 In2Guide™ implant planning layout

Orientation Tools. Change the orientation of the patient in 3D surface.

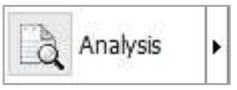
	Anterior		Posterior
	Right		Left
	Head		Foot

Tools. Features display on/ off buttons.

	Patient		Radiographic Guide
	Surgical Template		Antagonist
	Head		Implant
	Anchor		Abutment

	Sleeves		Tooth Number
	Implant Information		Wax up
	Cross		Axial
	Contour		Occlusion Analysis

10.2 Task Tools

Function	Description
	Draw an arch/curve to obtain a Cross Surface and Panorama image. Either pick points manually or use the [Arch Wizard] for automated arch generation.
	Allows user to mark important nerves.
	Allows user to adjust the [Nerve], or [Arch/Curve].
	Start implant planning and simulation.
	Select and place an anchor pin.
	Once planning is complete, click to place your order.
	Import or export planning from Project Files.
	Shown as a gray line. It represents the currently selected area in the Axial, Cross Surface and Panorama panes.
	Set up basic preference for In2Guide™.

Arch/Curve. From the Axial view, click on a starting point and click through the arch and draw a curve. Once the arch/curve drawing is complete, double click to create a panoramic image.

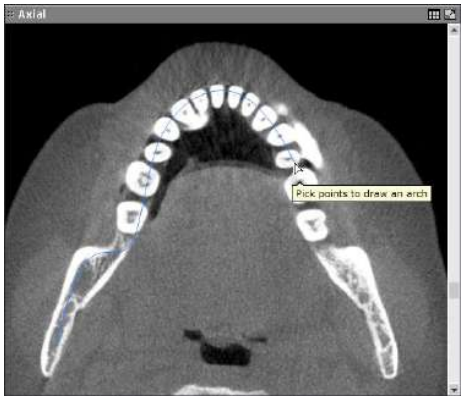


Fig. 223 Drawing an arch on the Axial pane

Nerve. To mark the inferior alveolar nerve, draw a nerve line on the panoramic image. Choose [Nerve] from [Task Tools] and click along the nerve path from either the Axial, Cross surface or Panorama panes. Double click to finish drawing, and the nerve will be automatically highlighted. To start over, press [Esc] on your keyboard.

Fig. 224 Drawing along the nerve path

TIP	The most widely used pane for drawing along the nerve path is the [Panorama] pane. The optimal level of slice thickness, same as the image above, is 10 mm. However, the more accurate but slower method is to use the [Cross Surface] pane.

To draw using the [Cross Surface] pane, select [Nerve] from the [Task Tools] menu and click on a starting point in the [Cross Surface] pane as shown in Fig. 225. Scroll to navigate between slice images and click on the next connecting point. The same process can be repeated on the [Axial] pane.

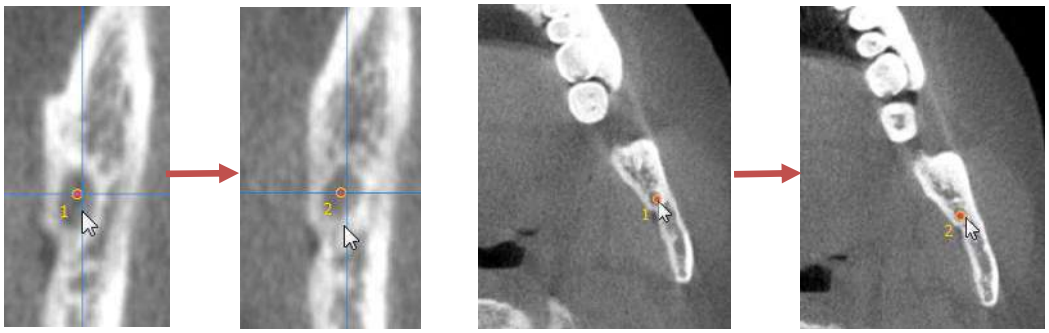


Fig. 225 Drawing nerve path in the Cross Surface and Axial panes

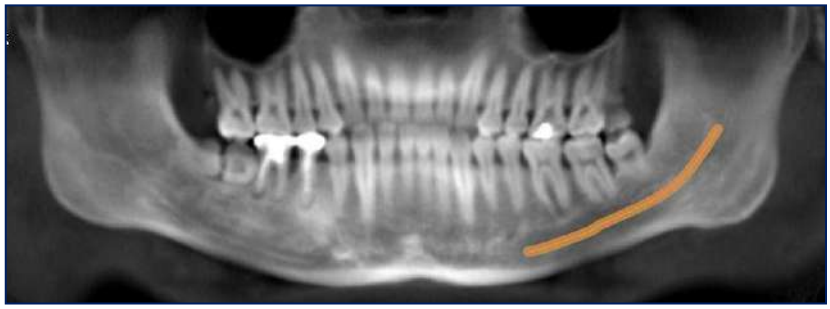


Fig. 226 Results as shown in [Panorama] view

After the nerve is drawn, the marked nerve path will be highlighted and visible in all of the panes on the layout. The color and visibility can also be set in the [Preferences] menu in the [Task Tools] section.

Modify. This tool enable user to make modifications to the drawn nerve path or the arch/curve. As shown below, the points along the path can now be manipulated.

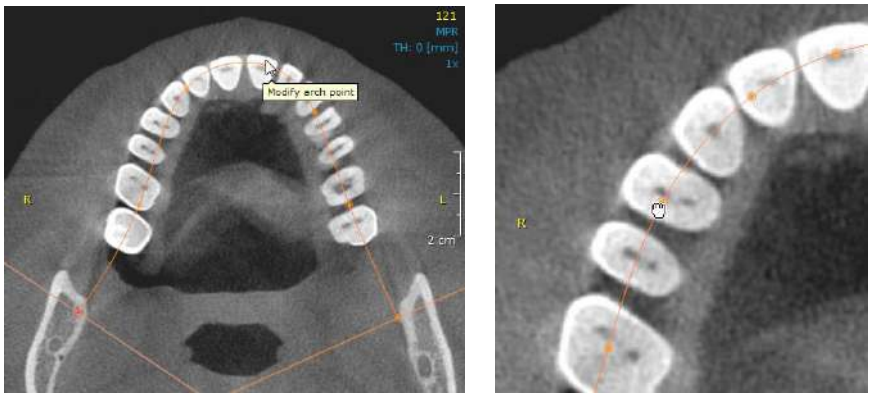


Fig. 227 Modify arch/curve in [Axial] view

Reposition control points one by one or move the entire arch/curve. Users can also right-click and insert additional control points, delete selected control points, or delete the whole arch/curve.

The same goes for nerve paths.

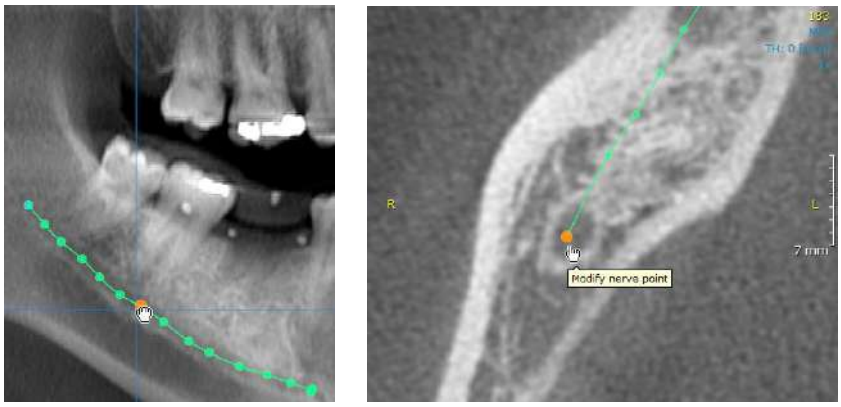


Fig. 228 Modify nerve markers as shown on [Panorama] (left) and [Axial] (right) panes

Press [Esc] when finished.

Implant. In2Guide™ allows implant planning and surgery simulation. OnDemand3D™'s Leafimplant library includes real-size implant fixtures and abutments from all major manufacturers. Some of the analysis tools available on this tab are [Bone Density Graph] and [Angle].

Function	Description
Pick & Place	Pick implant fixture from library and place.
Place	Place a previously selected implant.
List	View properties of the placed implants.
Abutment	Provides an abutment library.
Bone Density	Displays bone density information inside and surrounding the implant in graphs and color maps.
Deviation	Calculate the deviation between two implants.

Pick and Place. The Leafimplant Library provides the user with Manufacturers list, Product Lines List, Preview window and section where the individual implant models are to be selected from.

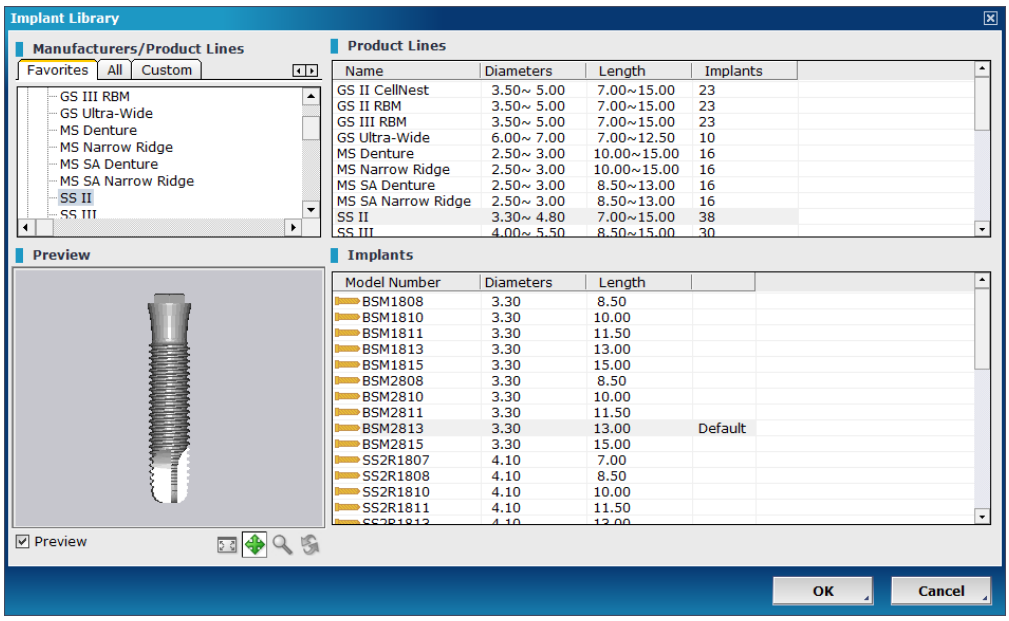


Fig. 229 [Implant Library] window

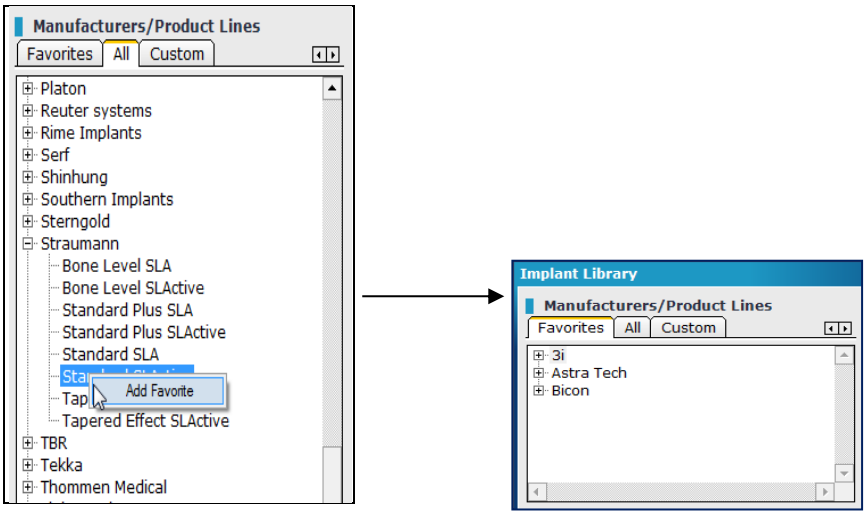


Fig. 230 Add to favorites

In the 'Manufacturers' section, the user will find three tabs: [Favorites], [All], and [Custom]. To add a product line or implant to [Favorites], right click and choose [Add Favorite].

Users can also create their own implants by going to the [Custom] tab and clicking on 

. In the [New Implant] window shown in Fig. 231, input the naming and parameter settings of the new implant and press [OK].

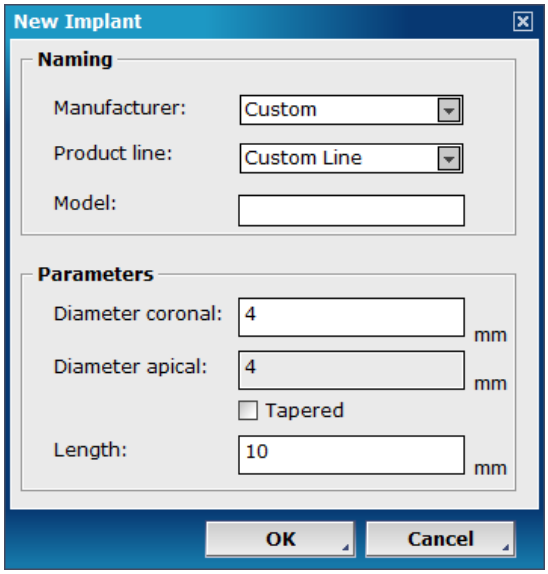


Fig. 231 Create custom implants

Place. To place an implant fixture, click on the area where the virtual implant is to be placed and select the corresponding tooth number. The default tooth numbering system can be changed in the [Preference] menu when needed.

After the implant fixture has been inserted, users can adjust and reposition accordingly in all of the panes provided. Simply click and drag.

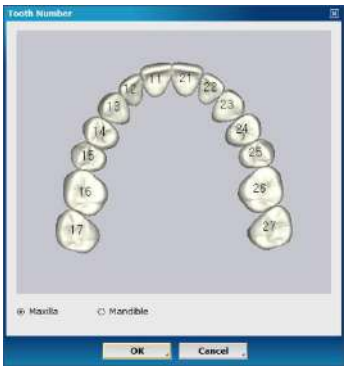


Fig. 232 Tooth Number

List. This tool provides information on all of the currently placed implants including implant ID, apical/coronal diameters, and the length of each implant. User can choose to [Show], [Hide], [Remove] or [Locate] the implant.

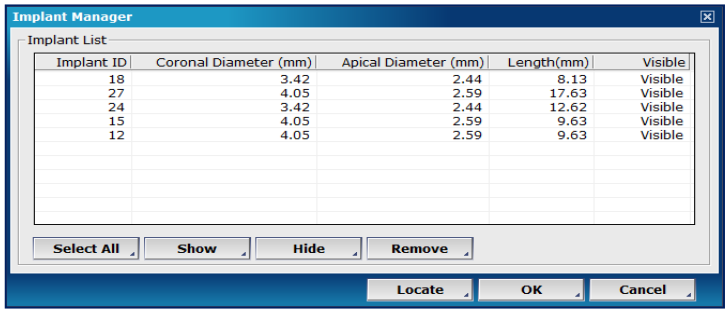


Fig. 233 [Implant Manager]

Abutment. For aesthetically driven implant planning and results, In2Guide™ provides an abutment list from major manufacturers. Once the implant has been placed, right click on the implant and select [Abutment] from the options. If the library does not include abutments of a particular manufacturer, the custom abutment window will appear and users can enter custom values.

Bone Density. This tool is used to generate a graph displaying the bone density relative to the implant in Hounsfield units. Outside the implant refers to the bone density of outer 2mm diameter of implant. Inside the implant refers to the bone density of inner diameter of the implant. Please note that the density value is based on Hounsfield units. Depending on the CT manufacturer, these values may vary. Users will be able to see bone density information of both the inside and outside of the implant fixture. [Thickness] refers to the thickness of the shell around the implant that is used to gather bone density values.

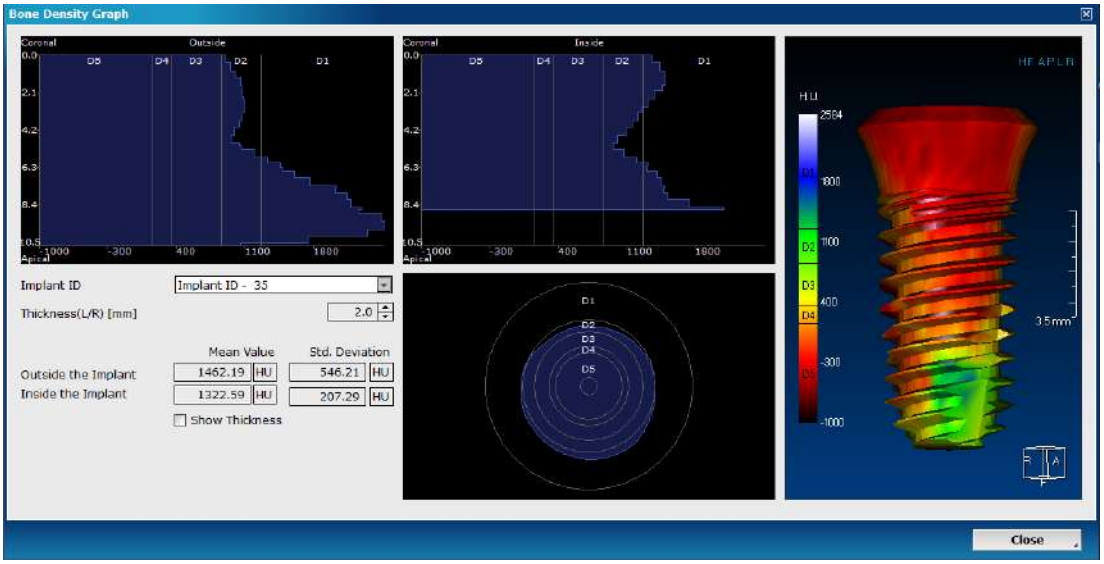


Fig. 234 Bone density information shown in graph and color map form

Lekholm and Zarb Scale	Lower bound	Upper bound
D1	More than 1250 HU	
D2	850 HU	1250 HU
D3	350 HU	850 HU
D4	150 HU	350 HU
D5		Less than 150 HU

WARNING	The D1 – D5 values are based on Medical CT values. Cone beam CT values may differ. In addition, please be warned that HU values are not completely reliable when it comes to CBCT scans.

Deviation. This tool is used to calculate the Angle, Global, Lateral, Depth Deviation between any two implants that are placed. Simply select two implants to be compared.
(For implants that need to be placed parallel, an easier option may be to right click on an implant that has already been placed and from the menu option selected [Copy Implant].)

Anchor Pin. Anchor pins are used to fixate the template in the patient's mouth. In2Guide™ provides two types of anchor pins, Ø1.5 / 15.5 mm (Short Anchor) and Ø1.5 / 20.0 mm (Long Anchor).

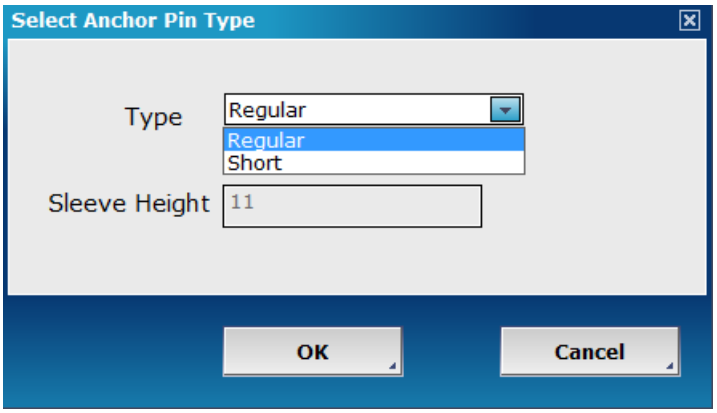


Fig. 235 Select anchor pin type

Place the anchor pin by scrolling through slices and finding an appropriate area for an anchor pin. Place the anchor pin by clicking on the Cross Surface view. Once the anchor pin is placed, drag the yellow sphere at the end of the anchor pin to change the angle. Place the anchor pin 4-5 mm into the bone. Please allow enough room between the anchor pin and the implants. Make sure there are no collision between implants, no collision between sleeves and no collision between implants and anchor pin. Collisions are displayed in red and a warning message will appear when submitting the order.

Fig. 236 (a) Collision between implants (b) Collision between sleeves (c) Collision between implants and anchor pin

Order. Save work as a Project File and continue with the order process. Click on the 

button located in the Task menu to start processing order.

Reference. The point where the two gray lines cross is called the [Reference] point and this is shown in the [Cross Surface] pane. For a closer look, users can first choose [Reference] from [Task Tools] and then click on Panorama or Axial pane. It is recommended that this tool be used before an implant fixture is placed.

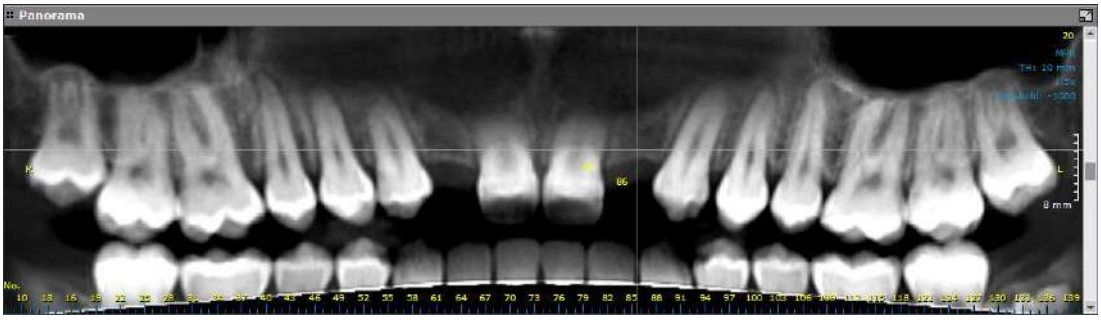


Fig. 237 Reference lines in Panorama pane

Misc. Set up basic preferences.

Wax up. Click on the Wax Up button to load the virtual wax up.

Scout. Click on the orange box to adjust the height and the range of the axial slice. This will change the height of the Panorama view. Default height is set at 90 mm.

Axis & Reslice. Modify the axis of 3D volume from three different views – axial, 3D and Coronal. Modification of the axis changes the axial slices and will reset the Arch/ Curve information. Once changes are made with this tool re-drawing the Arch/ Curve is required.

Preference. Most of the software preferences are set in this menu and saved for all future projects. As can be seen below, the [Preferences] menu has three tabs: [View], [Settings], and [Color]. In the default **[View]** tab, users will be able to set preferences for whether they want to be able to see hash lines, nerve segments, implant safety cylinders and etc.

In the **[Settings]** tab, users will find more advanced settings such as the default radius of the nerve in millimeters and tooth numbering system settings. To change the colors of curves, nerves and reference lines, please refer to the **[Color]** tab.

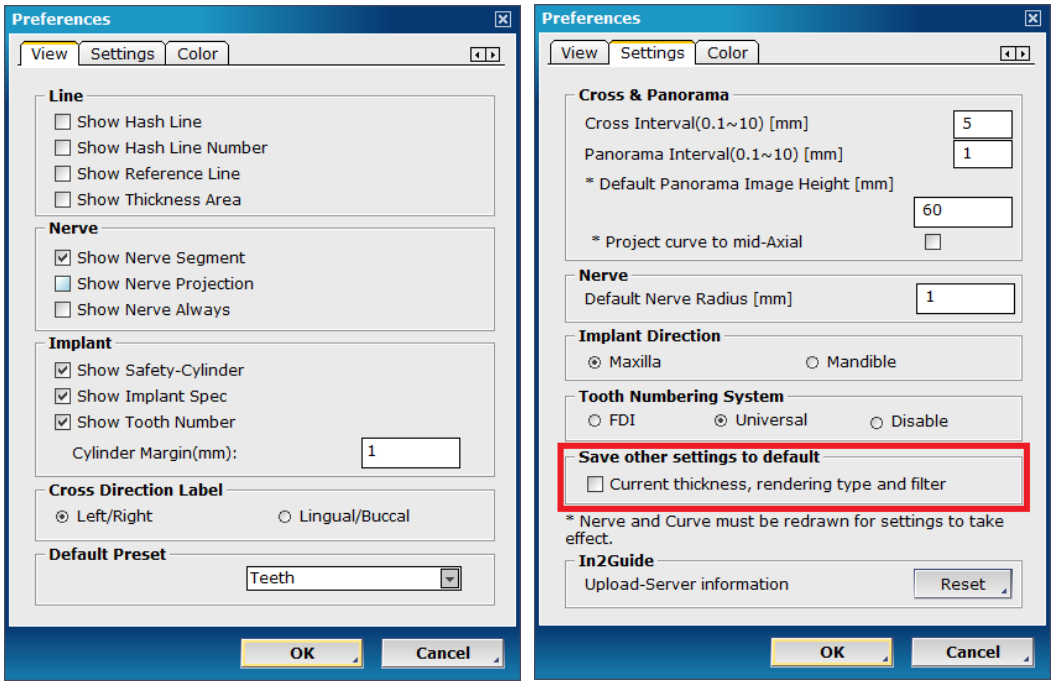


Fig. 238 Dental [Preferences]

INFO	Checking **[Save other settings to default]**, shown above in red, will save the user's current settings of thickness (e.g. Panorama thickness), rendering mode (MIP, minIP, VR) and filters (1x, 2x) to the user's default settings. **For changes related to the arch and nerve to take effect, users will have to redraw [Arch/Curve] and/or [Nerve].

Select Kit. Before completing the final step, select the appropriate surgical kit. Each surgical template is fabricated according to the surgical kit manufacturer's specifications. Surgical kit selection can be changed later during treatment planning.

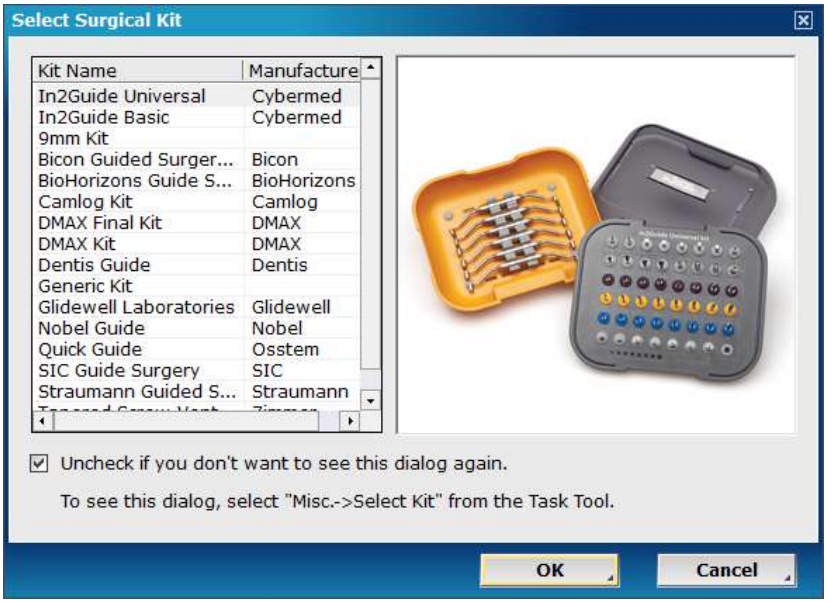
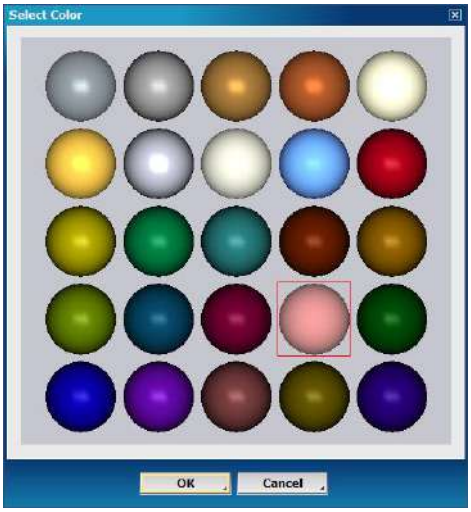


Fig. 239 Select surgical kit

3D Model. For an aesthetically driven planning, virtual wax- ups, stone model scans or any other STL files can be imported onto patient data as 3D objects. Click the 

and then 

button to load the STL file. Display color and options can be changed.



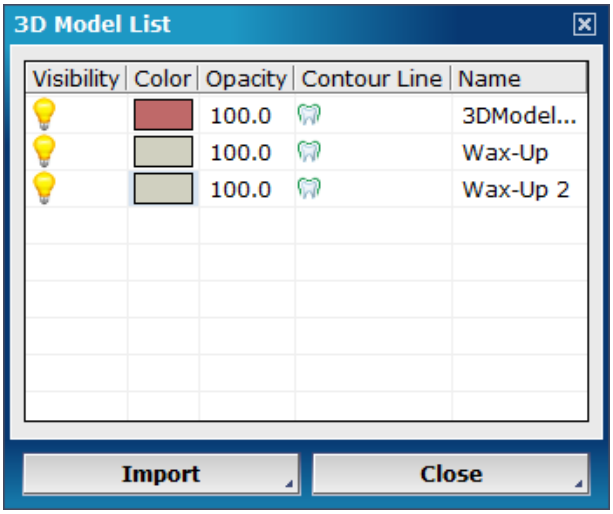


Fig. 240 Select 3D Model Color and adjust visibility, color and contour line

INFO	Color .PLY 3D model files can also be used when importing a 3D Model.

10.3 Workflow for Stone Model CT

Step 1: Select Case

This option will change the default direction of the implants being placed.

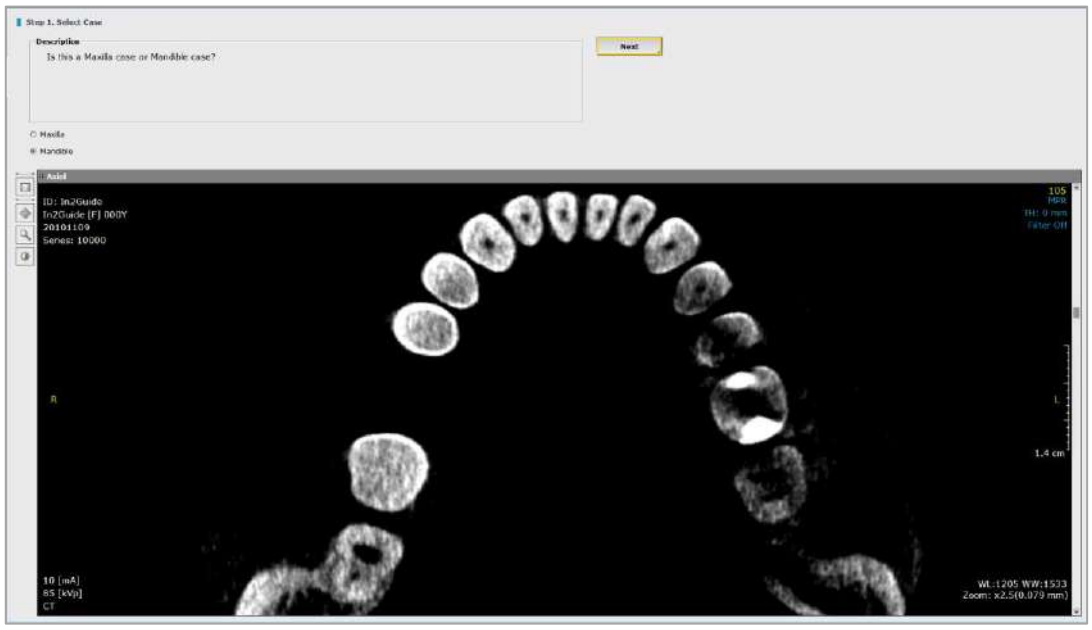


Fig. 241 Maxilla/Mandible Selection

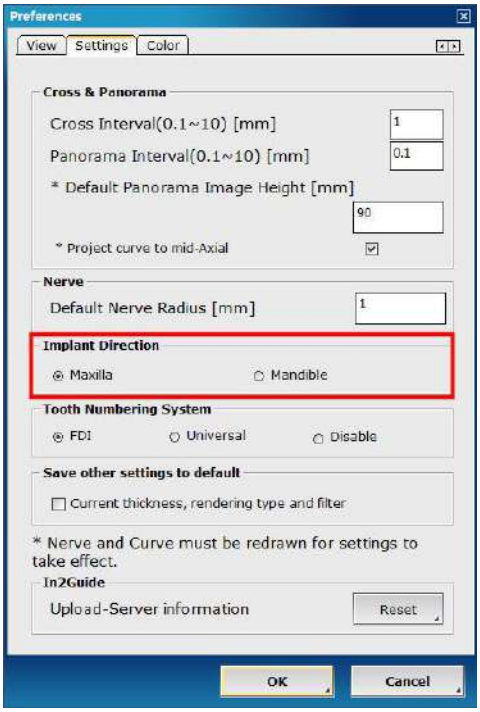


Fig. 242 Select implant direction in Preference

User can change this option later during treatment planning from Preference in Misc.

Step 2: Select Dataset

In2Guide™ supports various technologies in digital dentistry from traditional Dual Scan method to Optical Scan based guidelines.

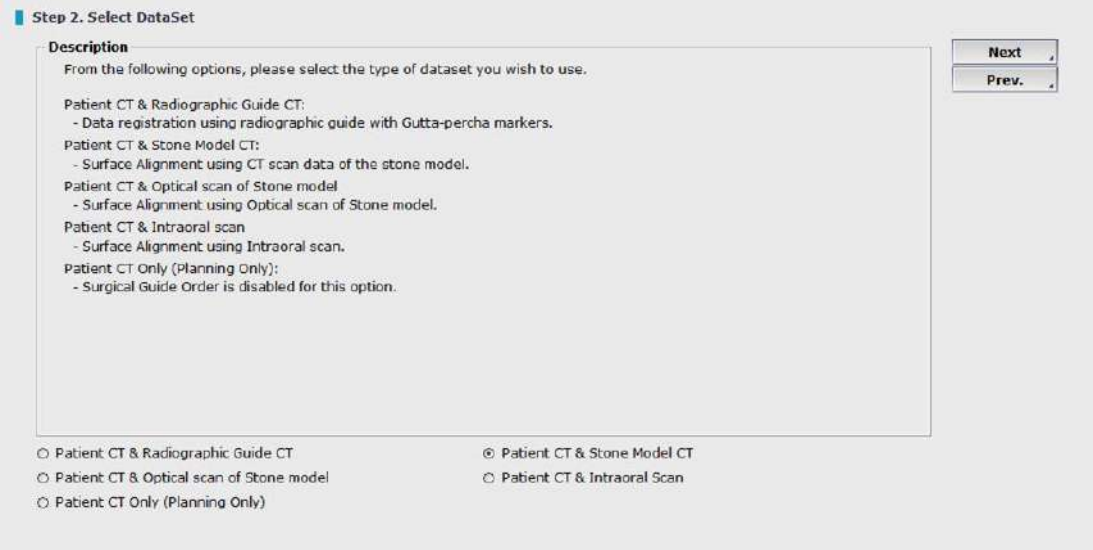


Fig. 243 Select the type of dataset for implant planning

Step 3: Set New Axis

Changing the data axis and orientation may be needed for several different reasons such as to correct mispositioned scan or to re-align data. However, changing the original axis may cause issues with planning import/ export functions and should be used only if needed. Hence, we recommend that the user click on Next button and proceed to the next step.

Fig. 244 Change the axis and orientation for mispositioned scan or re-aligning the data

Step 4: Generate Patient Surface

This is an essential step for In2Guide™. The patient data is first generated in 3D rendering mode. Once the appropriate density (threshold) value is set, the data is processed again to extract the patient's bone surface information. This allows the software to operate fast and stable.

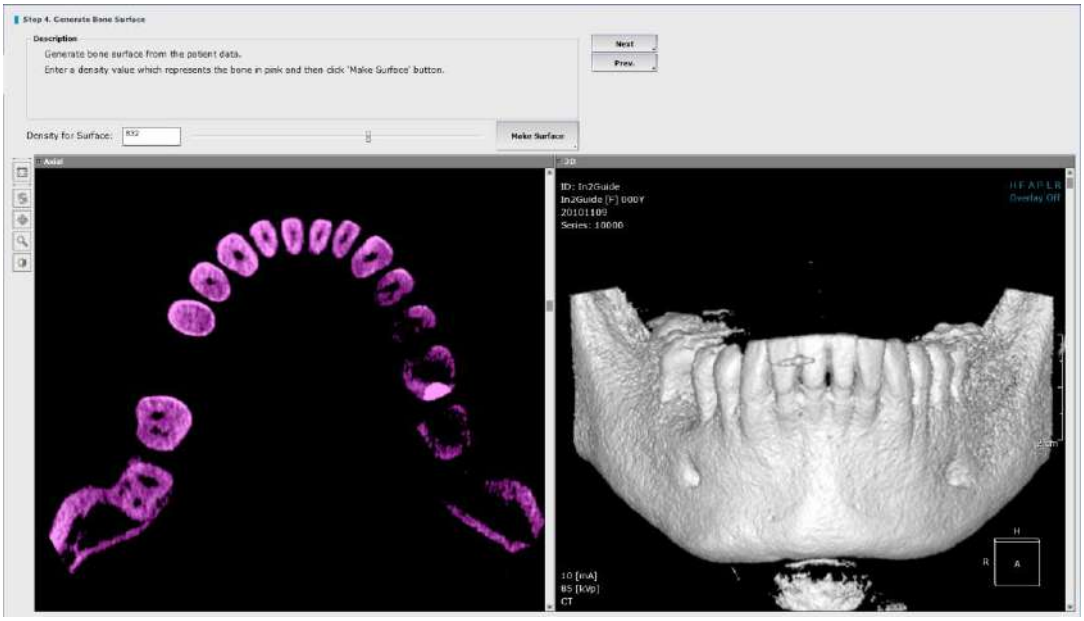


Fig. 245 Generate surface for patient data

Density for surface

Adjust the density (threshold) setting to create a clear image of the patient.

1. Scroll the density bar left and right to adjust the density value.

2. Click on [Make Surface] button to generate the patient bone surface

Once the surface has been generated click on [Next] button to proceed.

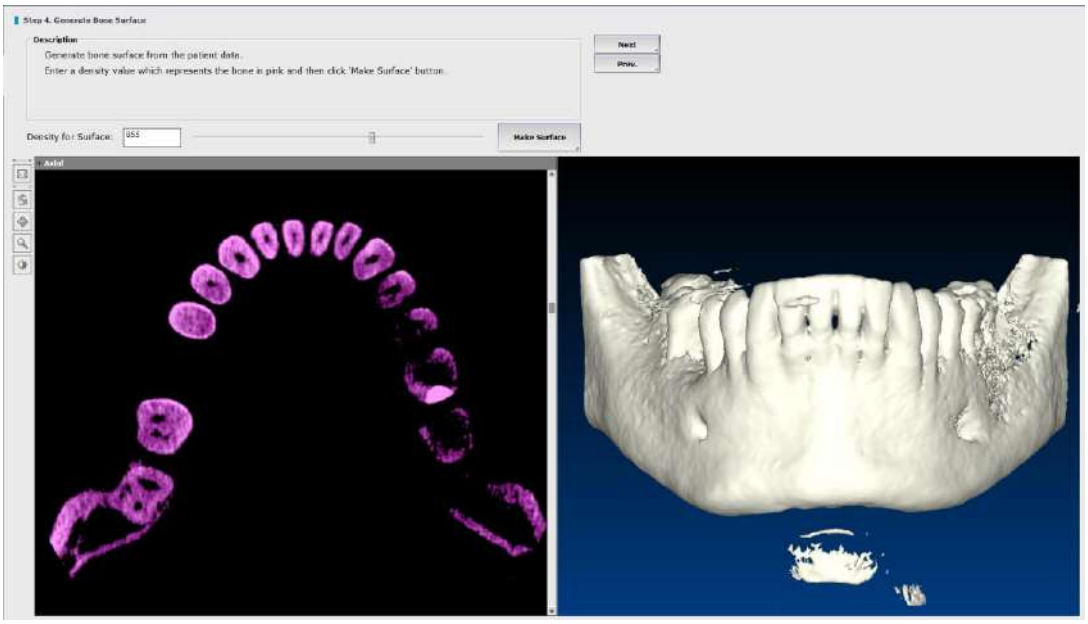


Fig. 246 Patient bone surface has been generated successfully

Step 5: Load Second Data

Select and load the CT data of stone model. Make sure that the data has been imported to Master database.

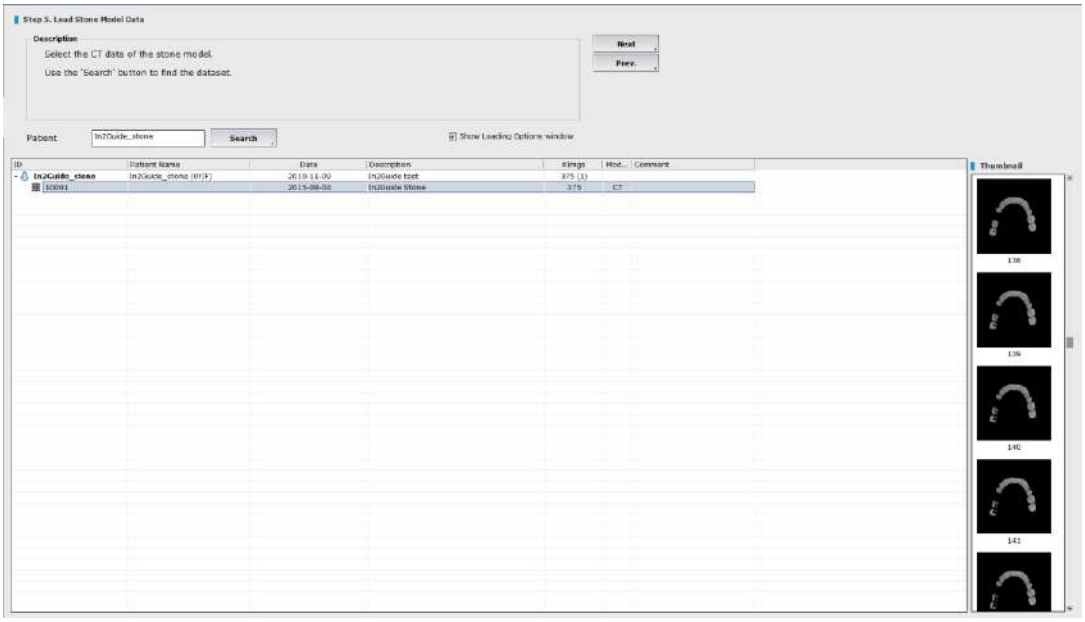


Fig. 247 Select CT data for stone model

Step 6: Generate Stone Model Surface (Stone Model CT)

Adjust the density (threshold) settings to create a clear image of the patient.

1. Scroll the density bar left to right to adjust the density value.

2. Click on [Make Surface] button to generate the stone model surface.

The final surgical template is designed based on the stone model. Therefore, it is important that the surface is generated correctly. Setting the density too high or too low can affect the final fit of the surgical template.

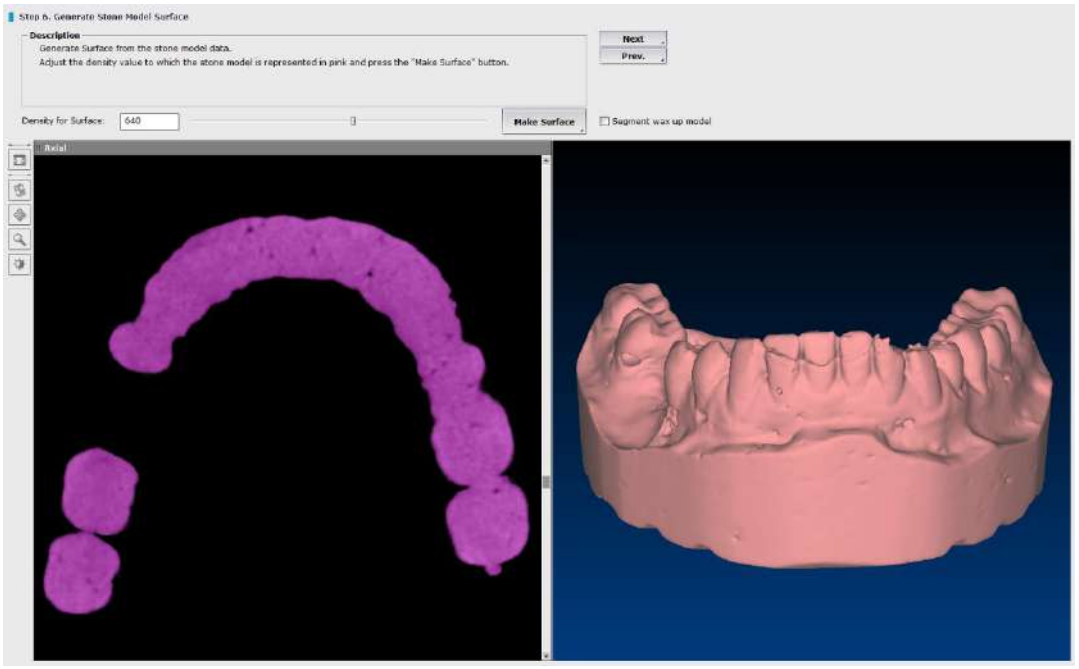


Fig. 248 Stone model surface has been generated

Optional: If there is a physical wax up on the stone model, click on the “Segment wax up model” checkbox and click [Next].

Step 7: Draw Arch/Curve

This step is to create the panorama image that will be used in the next step and during planning. Draw straight on the image as Arch/ Curve button is selected by default. Click on a starting point, click along the arch and then double click to finish drawing. Alternatively, click on 

to generate arch automatically. Arch can be modified or re-drawn later during treatment planning.

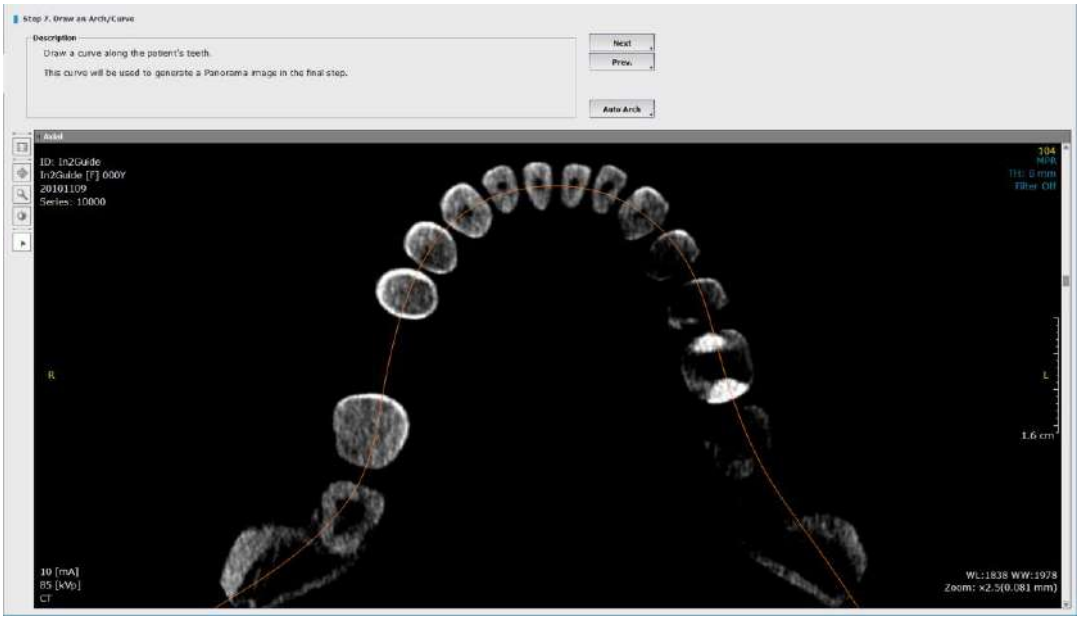


Fig. 249 Double click the left mouse button to complete the arch drawing

Step 8: Initial Registration for Smart Align

This step is to align the axis and merge the stone model data to the patient data. The final surgical template is designed on top of the stone model data. Therefore, it is critical to have an accurate merge.

Start by placing the red, yellow and green dots on the corresponding areas from both sets of data. Use the Zoom tool for a bigger image and more accurate placement of the dots.

TIP	- Avoid areas with scatter - Place dots on cusp tips if possible - At least one dot on molar/ premolar - Place dots in a triangular shape

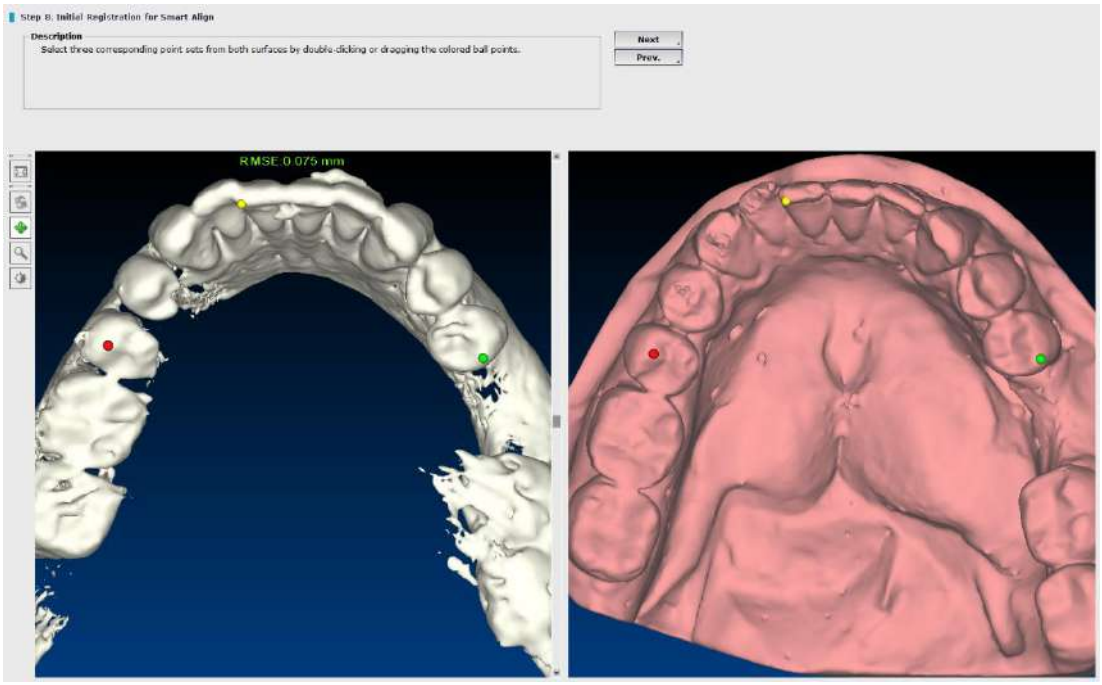


Fig. 250 Dots are placed in a triangular pattern with RMSE of 0.075mm

For a successful align, the RMSE (Root Mean Square Error) must be under 1.000 (mm) in order to achieve accurate results. The RMSE value will change to green once the placement of the dots are accurate enough for surgical template manufacturing. If not, it will be shown in red. In general, RMSE under 0.200 (mm) is recommended for best results.

In some instances, the patient data might have too much scatter and may cause difficulty to align properly. Cybermed provides optional support for data merging on more difficult cases. Service fees apply.

Based on the three dots placed during the previous step, the software will calculate the surface information and merge the stone model data with the patient data. Click [Next] to proceed to the next step.

Step 9: Points collection for smart align

Scatter, noise or insufficient data points may cause Smart Align to fail. In such cases, use the spray tool to collect additional data points. The point collection tool is located on the left side of the window. The spray can icon  is for additional points and the eraser icon  is for removing points. The aligned data accuracy is shown with a color map. Areas marked in red indicate that the stone model is outside the contour of the CT data and the blue is inside the contour.

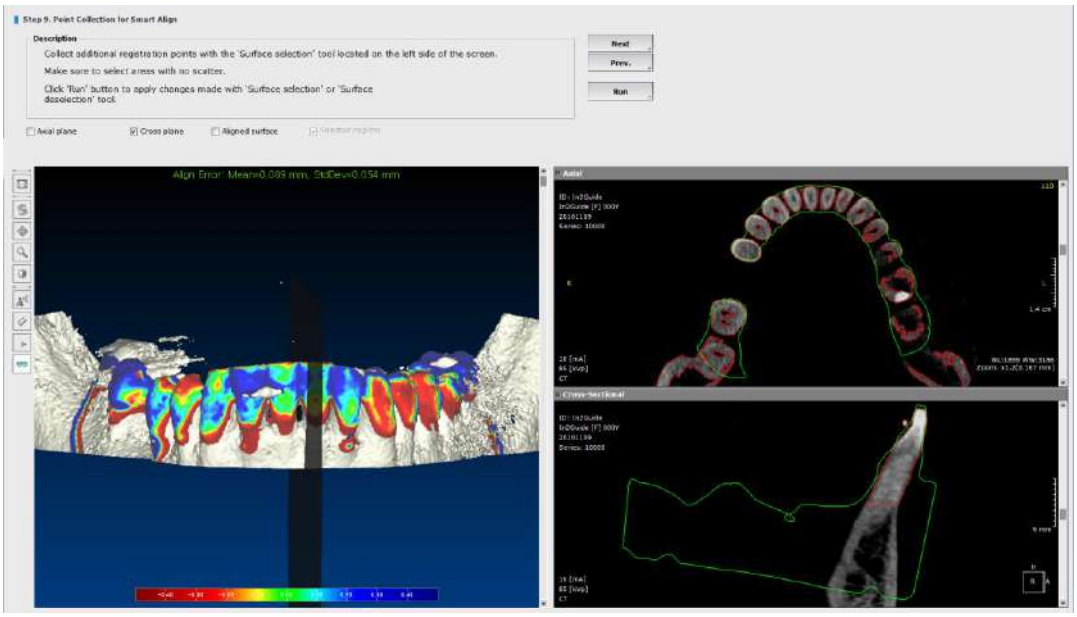
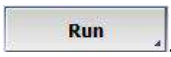


Fig. 251 Collects point for smart align

Press  [Surface Selection], adjust the spray diameter and click on the additional surface areas where there is no scatter or noise. Points will show up in blue. Select the  [Surface Deselection] tool and click on the areas where points need to be removed. Once the changes have been made click 

.

The green line on the cross sectional pane represents the stone model, red line is the contour of the CT data and can also represent the physical wax up. The contour should be checked by scrolling through the cross section and making sure that the stone model is tightly in contact with the teeth. Any gaps, spaces or irregularities may lead to a poor fitting surgical template.

Step 10: Complete Registration

Once the contour is checked and the case is ready for planning, click [OK] to complete the registration.

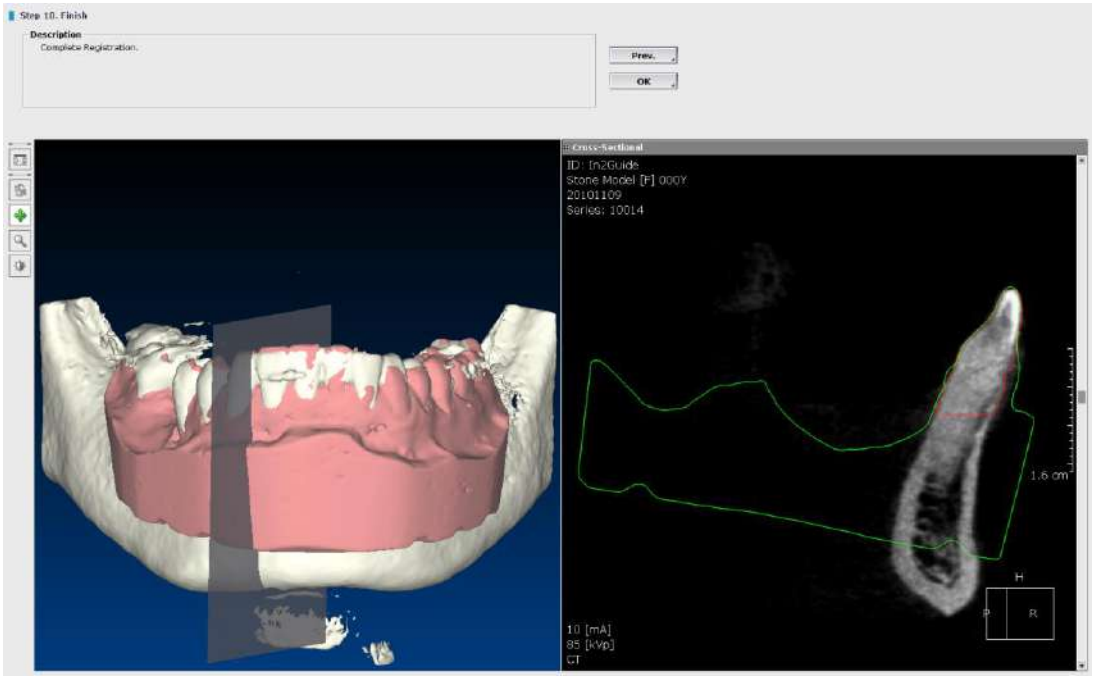


Fig. 252 Registration is completed

10.4 Workflow for Radiographic Guide

Step 1: Select Case

This option will change the default direction of the implants being placed.

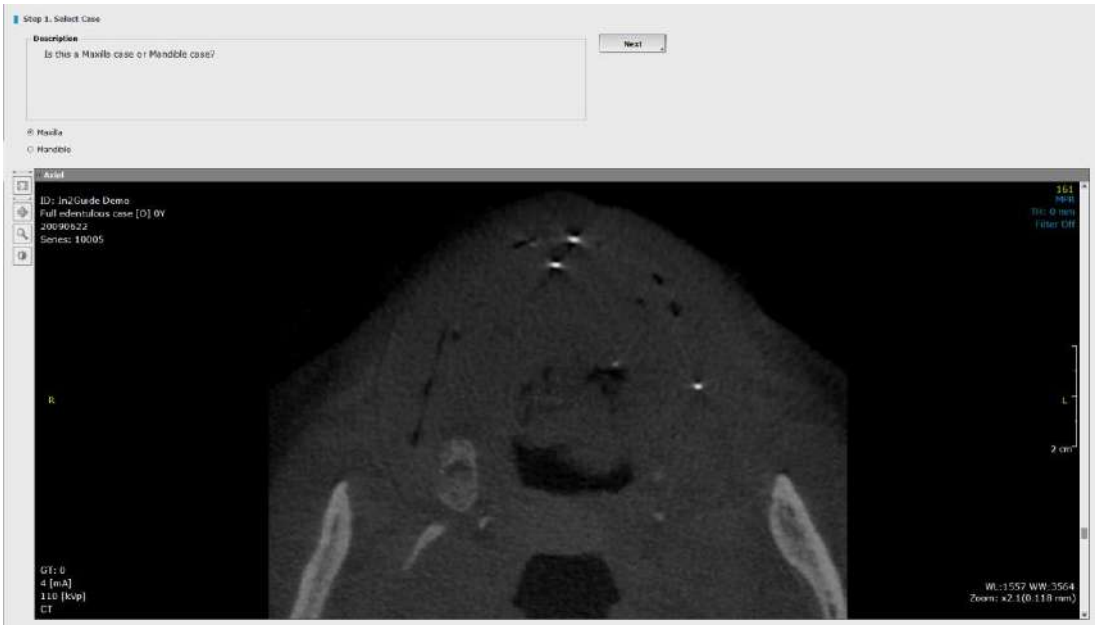


Fig. 253 Maxilla/Mandible Selection

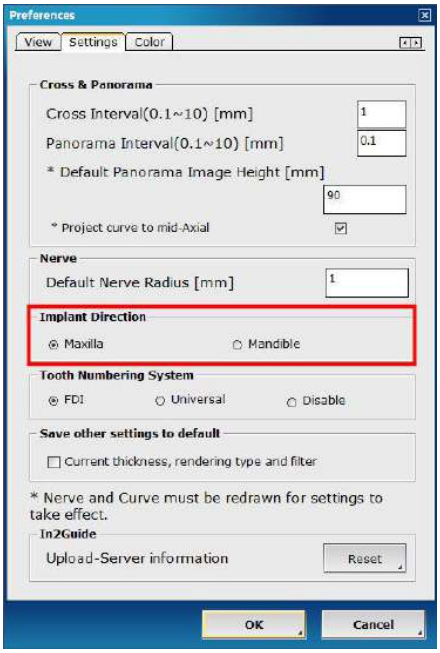


Fig. 254 Select implant direction in Preference

User can change this option later during treatment planning from Preference in Misc.

Step 2: Select Dataset

In2Guide™ supports various technology in digital dentistry from traditional Dual Scan method to Optical Scan based guidelines.

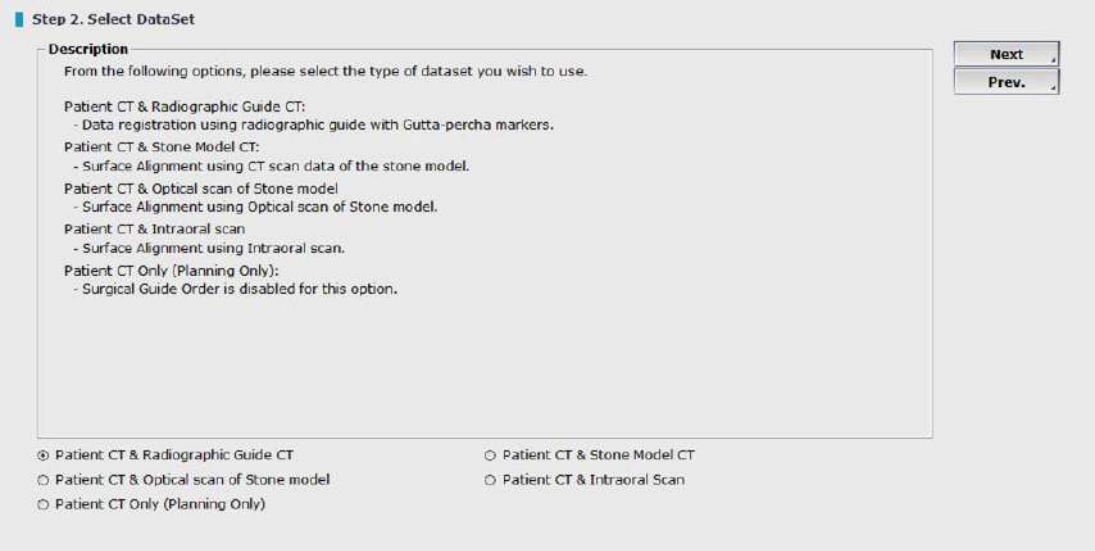
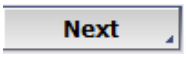


Fig. 255 Select the type of dataset for implant planning

Step 3: Set New Axis

Changing the data axis and orientation may be needed for several different reasons, such as to correct mispositioned scan or to re-align data. However, changing the original axis may cause issues with planning import/ export functions and should be used only if needed. Hence, we recommend that the user click on 

button and proceed to the next step.

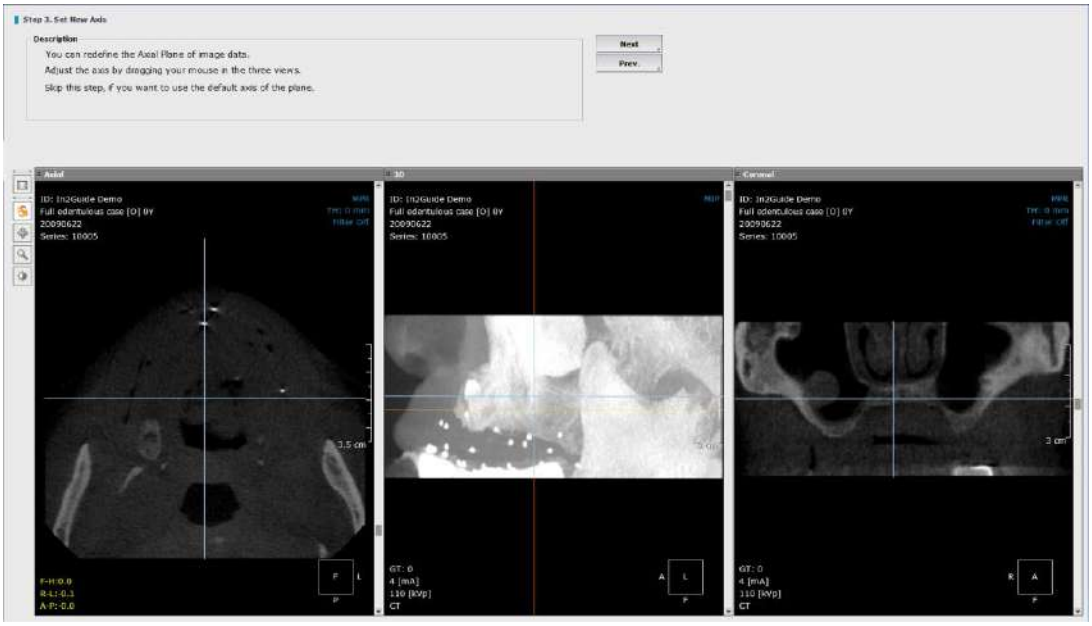


Fig. 256 Change the data axis and orientation for mispositioned scan or to re-aligning data

Step 4: Generate Patient Surface

This is an essential step for In2Guide™. The patient data is first generated in 3D rendering mode. Once the appropriate density (threshold) value is set, the data is processed again to extract the patient bone surface information. This allows the software to operate fast and stable.

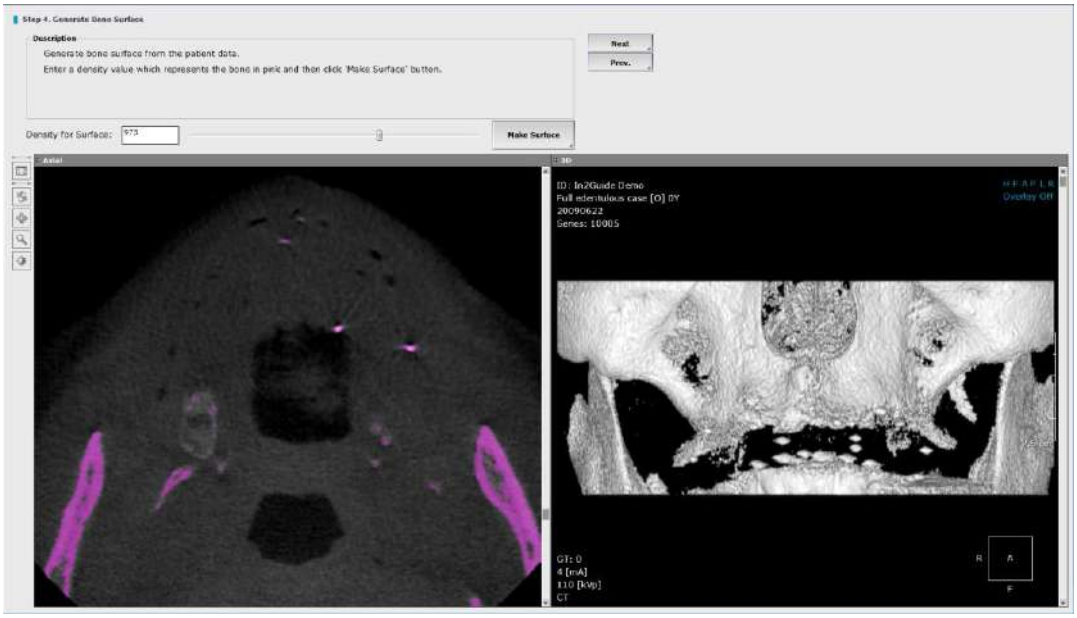


Fig. 257 Generate surface for patient data

Density for surface

Adjust the density (threshold) setting to create a clear image of the patient.

1. Scroll the density bar left and right to adjust the density value.

2. Click on [Make Surface] button to generate the patient surface

Once the surface has been generated click on [Next] button to proceed.

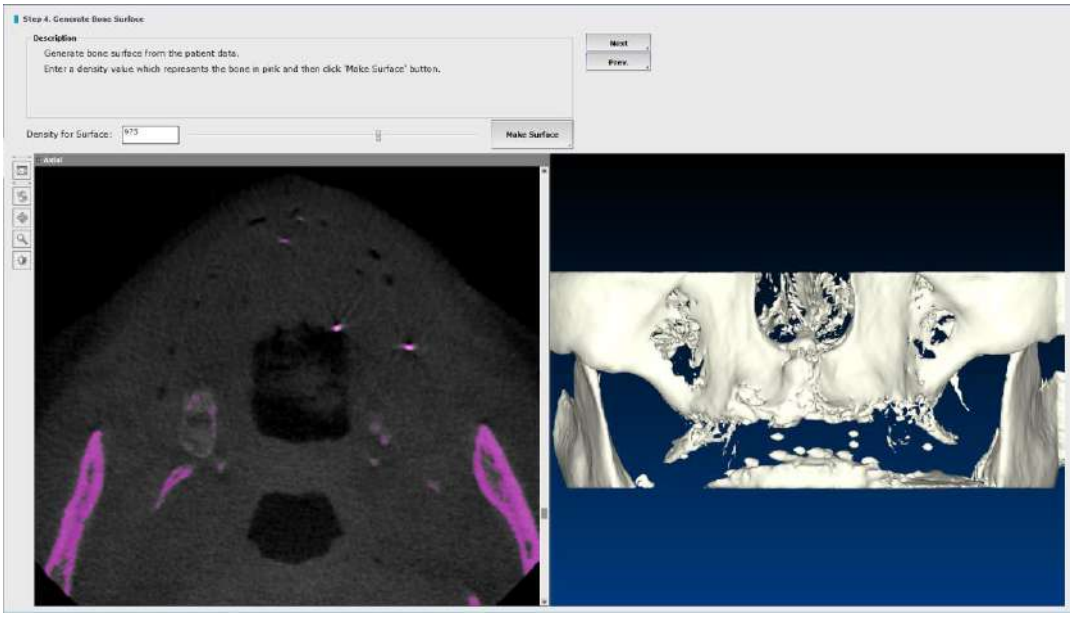


Fig. 258 Patient surface has been generated successfully

Step 5: Load Second Data

Select the radiographic guide data and make sure the data has been imported to Master Database.

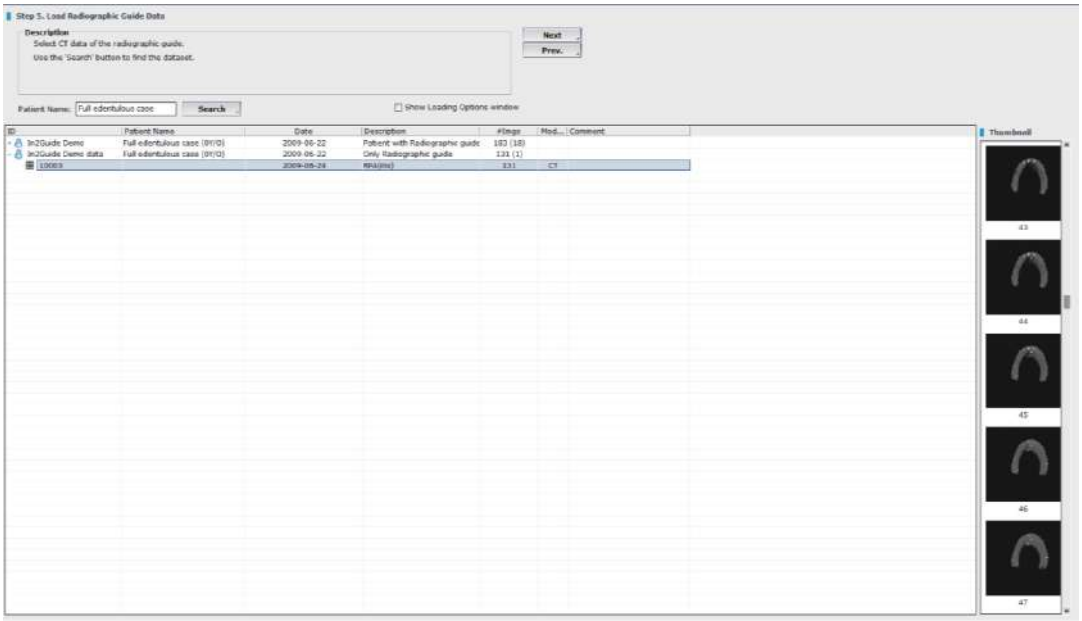


Fig. 259 Select the Radiographic CT data

Step 6: Generate Radiographic Guide surface

Adjust the density (threshold) settings to create a clear image of the patient.

1. Scroll the density bar left to right to adjust the density value.

2. Click on [Make Surface] button to generate the surface.

The final surgical template is designed based on the radiographic guide. Therefore, it is important that the surface is generated correctly. Setting the density too high or too low can affect the final fit of the surgical template.

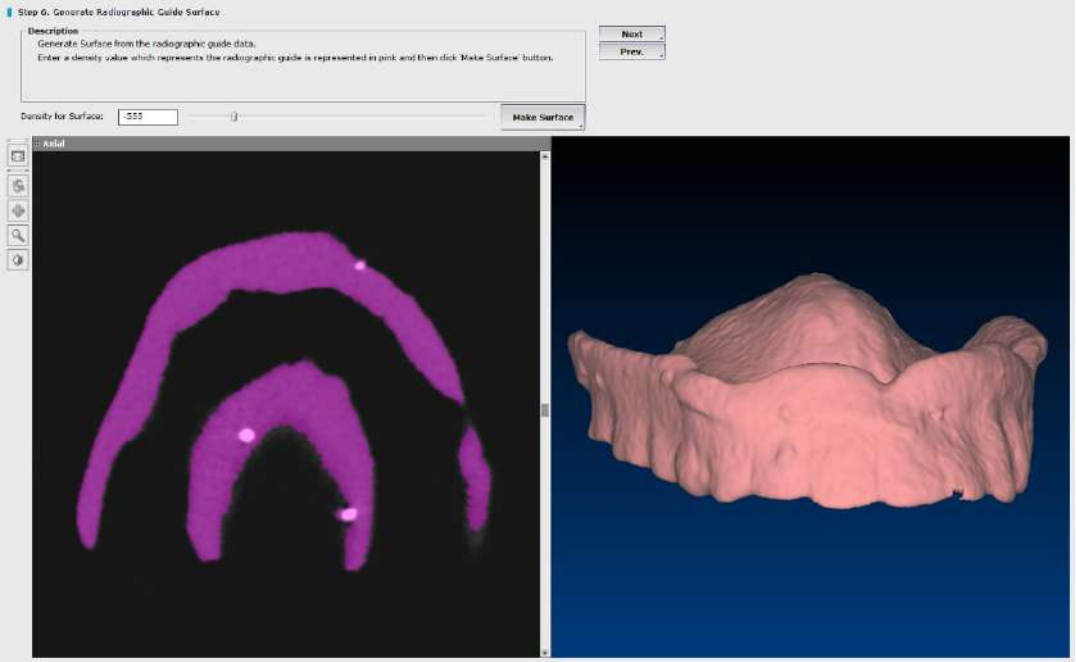


Fig. 260 Generates radiographic guide surface

Step 7: Registration of surface

Click on  button for automatic registration. If registration fails, try to adjust the settings as follow.

- Density of marker: 2000~4000
- Sphere index of marker: 0.1 ~0.3
- Min. marker volume: 2~4
- Max. marker volume: 5~7

At least 5 markers must have a positive match (in green color) in order to proceed. Once the user has a positive match click on [Next]. Be sure not to adjust the markers manually if the automatic registration fails. In such cases, it is mostly likely that either the CT scan was taken incorrectly or the radiographic guide was fabricated wrong. Please do not proceed with such cases and consult with one of our technicians.

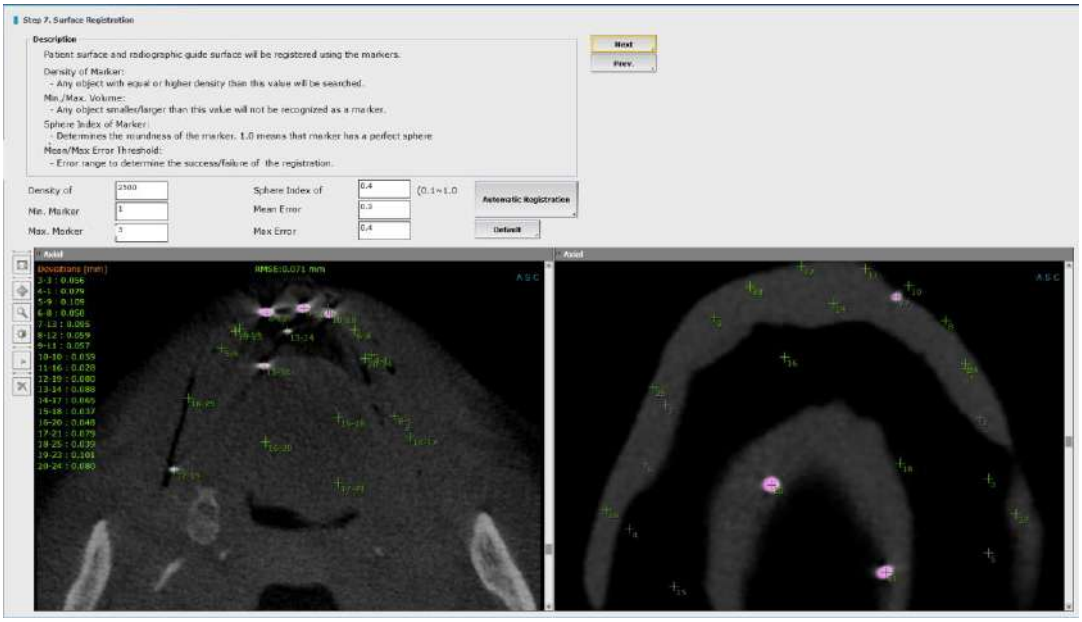


Fig. 261 Registering patient surface and radiographic guide surface by using the markers

Step 8: Draw Arch/Curve

The step is to create the panorama image that will be used in the next step and during planning. Draw straight on the image as Arch/ Curve button is selected by default. Click on a starting point, click along the arch and then double click to finish drawing. Click on  to generate arch automatically. Arch can be modified or re-drawn later during treatment planning.

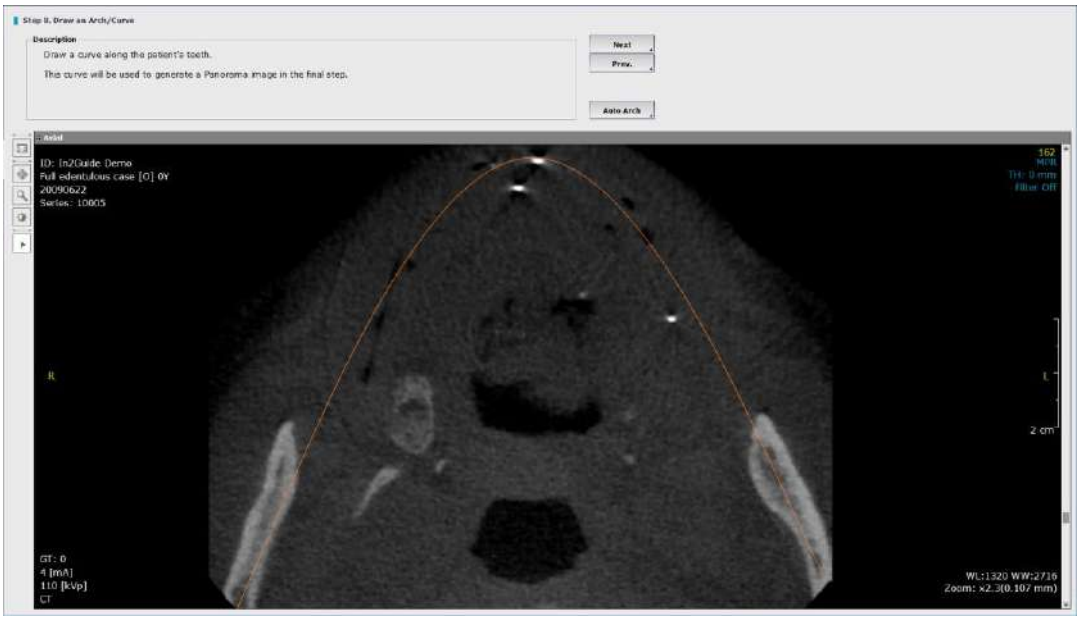


Fig. 262 Draw a curve along the patient's teeth

Step 9: Check contour and complete registration

The green line on the cross section indicates the radiographic guide. The contour should be checked by scrolling through the cross section and making sure that the radiographic guide is tightly in contact with the teeth. Any gaps, spaces or irregularities may cause the final design of the template not to fit properly in the patient's mouth. Once the contour is checked and the case is ready for planning, click [Next] button.

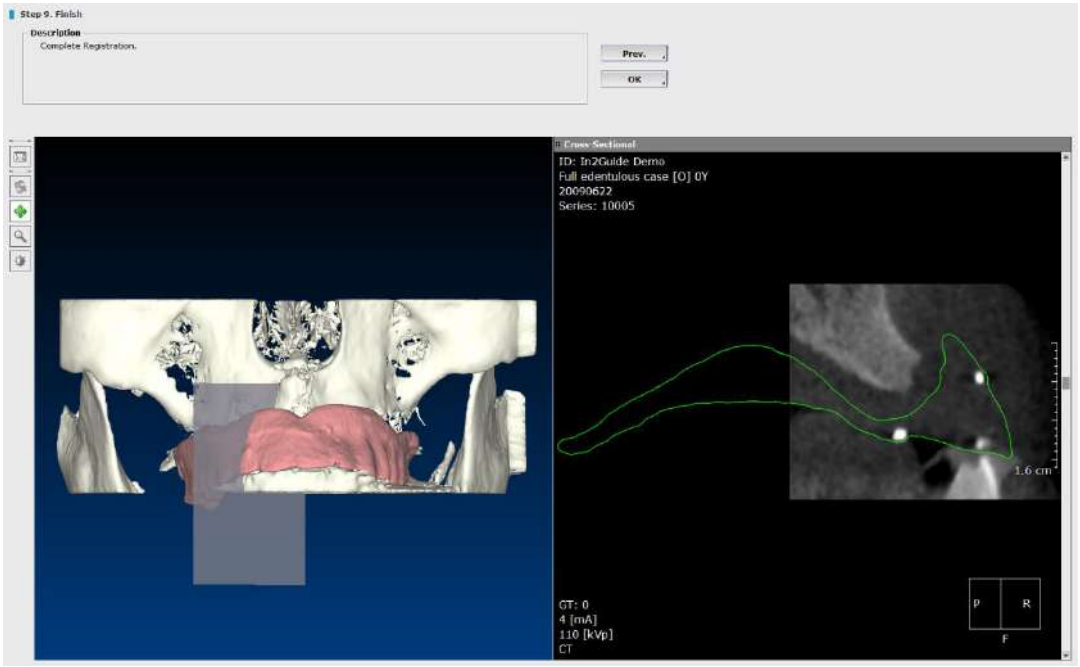


Fig. 263 Registration is complete

10.5 Workflow for Intra Oral

User can apply this workflow for Intra-oral scan data or Optical scan of stone model data.

Step 1: Select Case

This option will change the default direction of the implants being placed.

Fig. 264 Maxilla/Mandible Selection

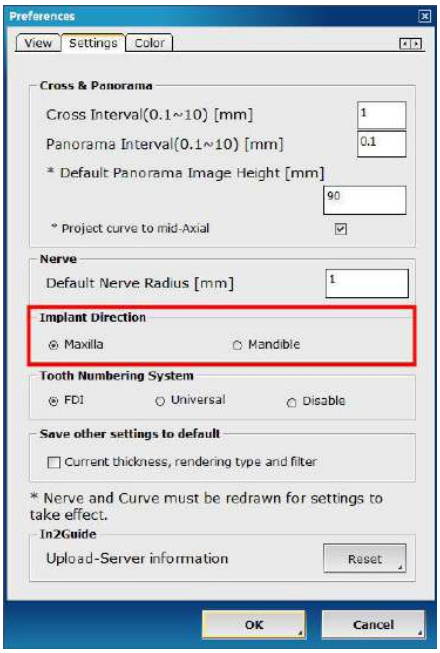


Fig. 265 Select implant direction in Preference

User can change this option later during treatment planning from Preference in Misc.

Step 2: Select Dataset

In2Guide™ supports various technology in digital dentistry from traditional Dual Scan method to Optical Scan based guidelines.

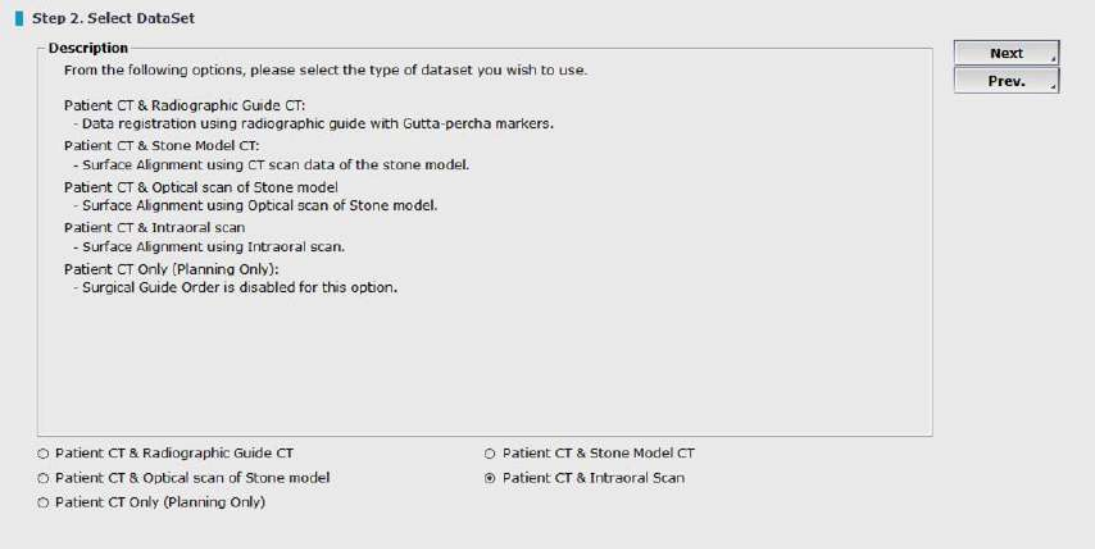
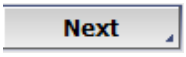


Fig. 266 Select the type of dataset for planning

Step 3: Set New Axis

Changing the data axis and orientation may be needed for several different reasons, such as to correct mispositioned scan or to re-align data. However, changing the original axis may cause issues with planning import/ export functions and should be used only if needed. Hence, we recommend that the user click on  button and proceed to the next step.

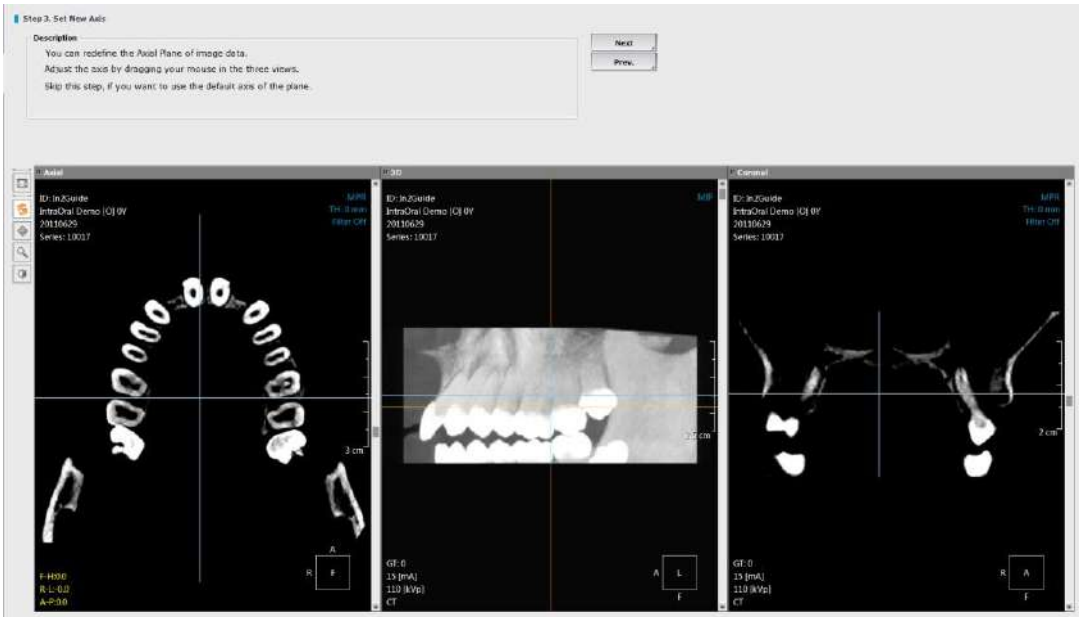


Fig. 267 Change the data axis and orientation for mispositioned scan or to re-aligning data

Step 4: Generate Patient Surface

This is an essential step for In2Guide™. The patient data is first generated in 3D rendering mode. Once the appropriate density (threshold) value is set, the data is processed again to extract the surface information. This allows the software to operate fast and stable.

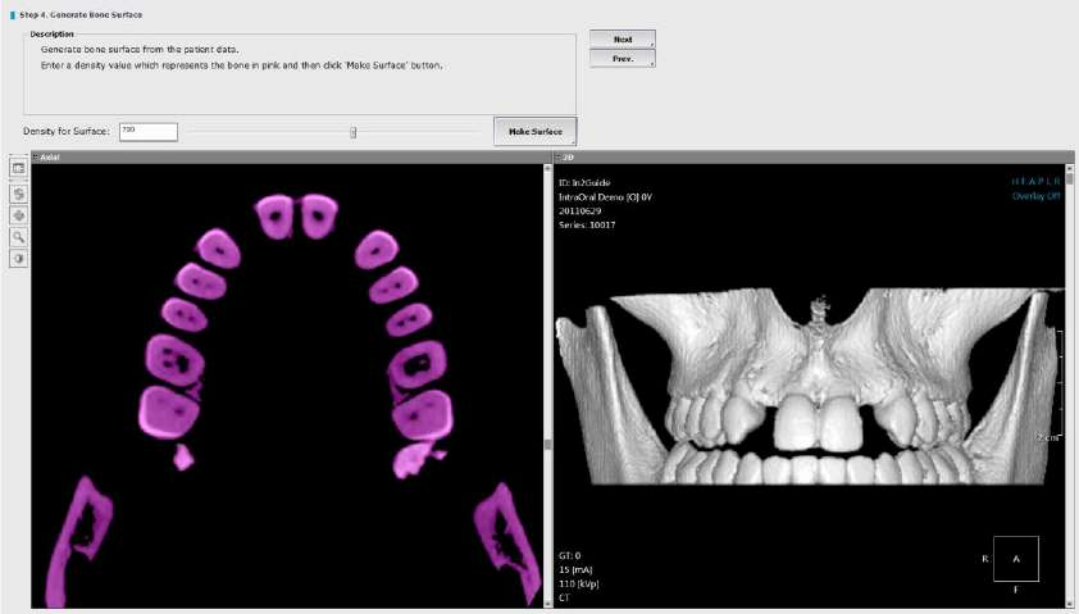


Fig. 268 Generate surface for patient data

Density for surface

Adjust the density (threshold) setting to create a clear image of the patient.

1. Scroll the density bar left and right to adjust the density value.

2. Click on [Make Surface] button to generate the patient surface

Once the surface has been generated click on [Next] button to proceed.

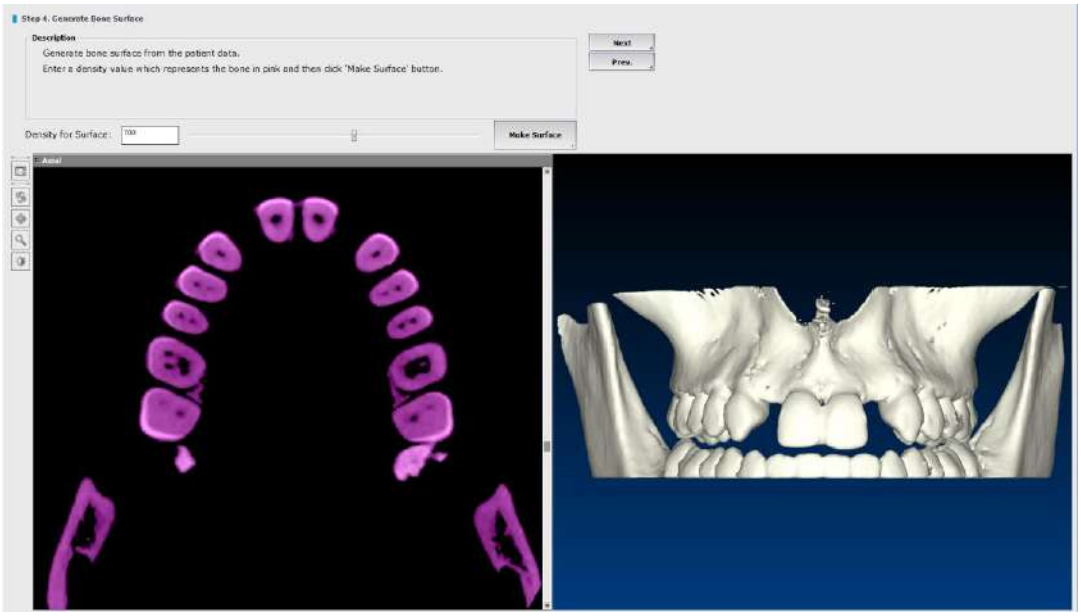


Fig. 269 Patient surface has been generated successfully

Step 5: Load Second Data

Click on […] button located on upper side of the window and browse for the STL file created from an optical scan of the intra-oral scan data.

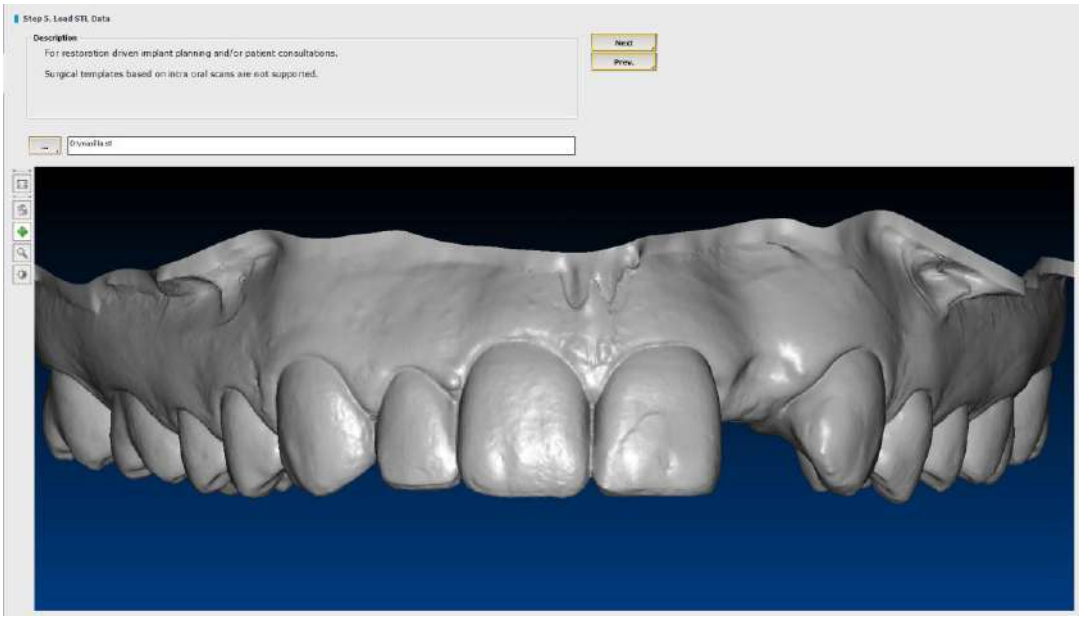


Fig. 270 Optical scan data of patient maxilla

INFO

Color .PLY 3D model files can also be used as a secondary dataset.

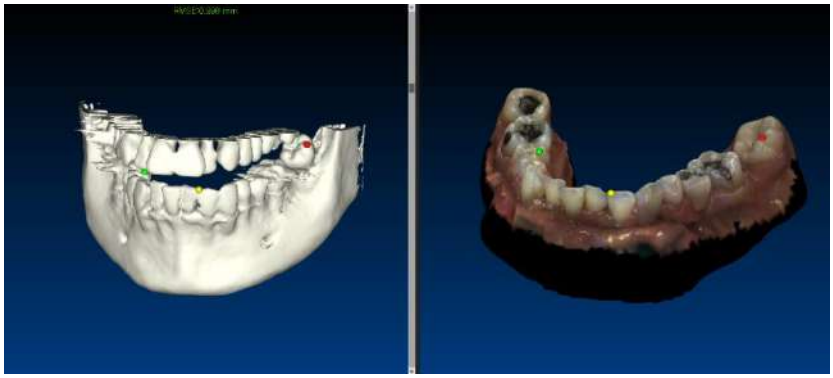


Fig. 271 Initial Registration for Smart Align using Color .PLY 3D model file

Step 6: Draw Arch/ Curve

The step is to create the panorama image that will be used in the next step and during planning. Draw straight on the image as Arch/Curve button is selected by default. Click on a starting point, click along the arch and then double click to finish drawing. Click on 

to generate arch automatically. Arch can be modified or re-drawn later during treatment planning.

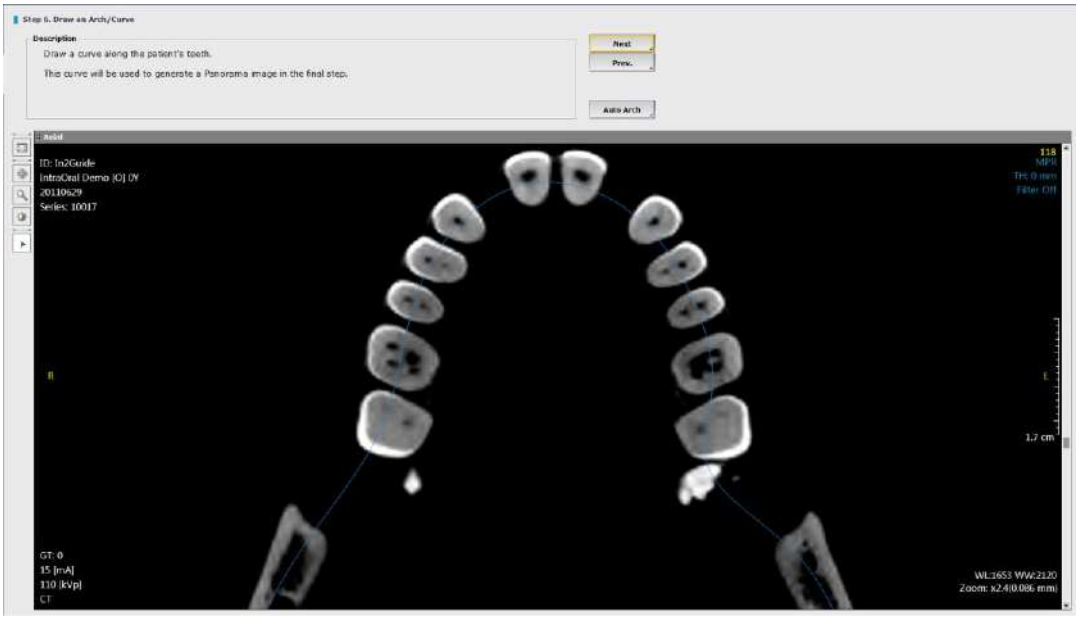


Fig. 272 Press Auto Arch or Double click the left mouse button to complete the arch drawing

Step 7: Initial Registration for Smart Align

This step is to align the axis and merge the stone model data with the patient data. The final surgical template is designed on top of the STL data. Therefore, it is critical to have an accurate merge.

Start by placing the red, yellow and green dot on the corresponding areas from both sets of data. Use the Zoom tool for bigger image and more accurate placement of the dots.

TIP	- Avoid areas with scatter - Place dots on cusp tips if possible - At least one dot on molar/ premolar - Place dots in a triangular shape

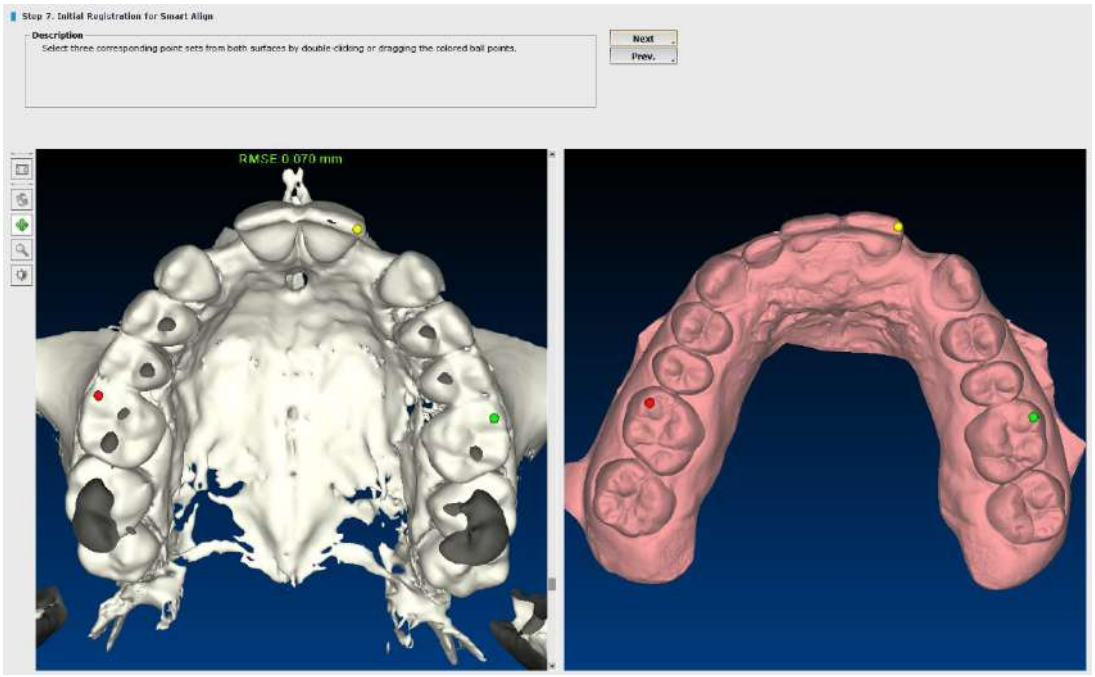


Fig. 273 Dots are placed in a triangular shape with RMSE of 0.070 mm

For a successful align, the RMSE (Root Mean Square Error) must be under 1.000 (mm) in order to achieve accurate results. The RMSE value will change to green once the placement of the dots are accurate. If not, it will be shown in red. In general, RMSE under 0.200 (mm) is recommended for best results.

In some instances, the patient data might have too much scatter and may cause difficulty to align properly. Cybermed provides optional support for data merging on more difficult cases. Service fees apply.

Based on the three dots placed, the software will calculate the surface information and merge the stone model data with the patient data. Click [Next] to proceed to the next step.

Step 8: Point collection for Smart Align

Scatter, noise or insufficient data points may cause Smart Align to fail. In such cases, use the spray tool to collect additional data points. The point collection tool is located on the left side of the window. The spray can icon  is for additional points and the eraser icon  is for removing points. The aligned data accuracy is shown with a color map. Areas marked in red indicates that the stone model is outside the contour of the CT and the blue is inside the contour.

Fig. 274 Smart align for patient data and STL model

Press  [Surface Selection], adjust the spray diameter and click on the additional surface areas where there is no scatter or noise. Points will show up in blue. Press  [Surface Deselection] tool and click on areas where points need to be removed. Once the changes have been made, click 

.

The green line on the cross section indicates the STL data. The contour should be checked by scrolling through the cross section and making sure that the stone model (STL data) is tightly in contact with the teeth. Any gaps, spaces or irregularities may lead to a poor fitting surgical template.

Step 9: Complete registration

Once the contour is checked and the case is ready for planning, click [OK] to complete the registration.

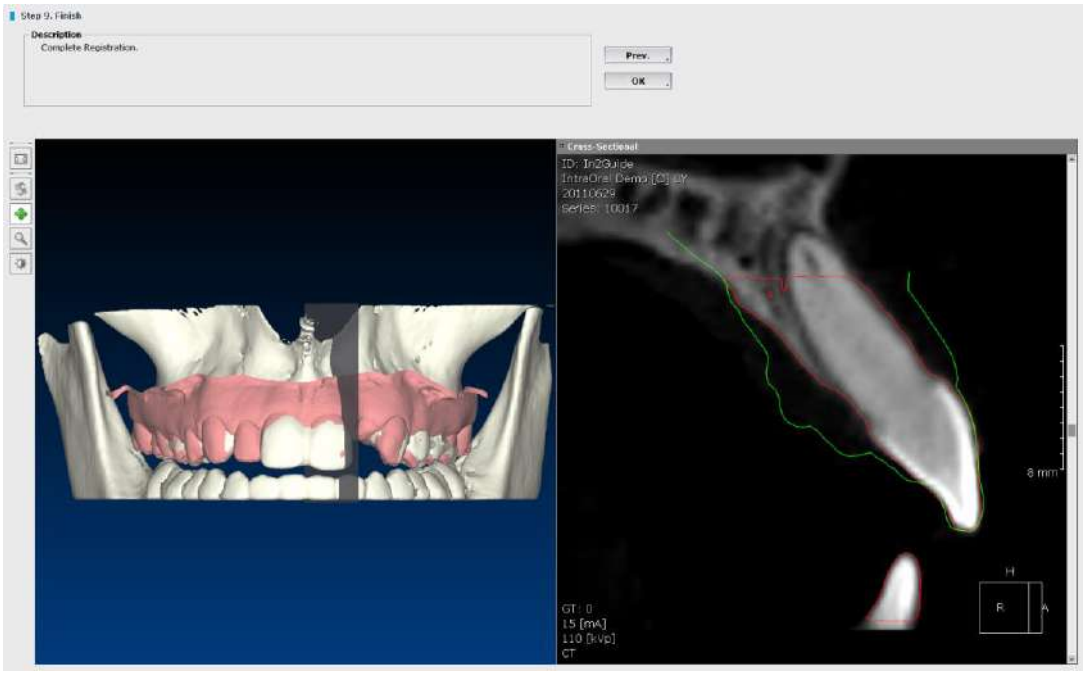


Fig. 275 Registration is completed

10.6 Select Surgical Kit

Before completing the final step, select the appropriate surgical kit. Each surgical template is fabricated according to the surgical kit manufacturer's specifications. Surgical kit selection can be changed later during treatment planning.

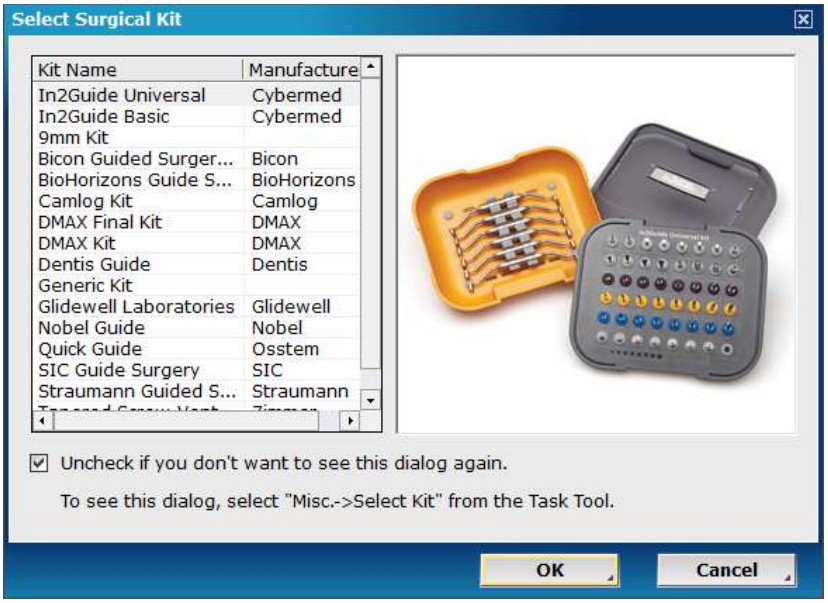


Fig. 276 Select a surgical kit

10.7 Implant Planning

Instructions and methods for implant planning as well as the verification steps are explained below.

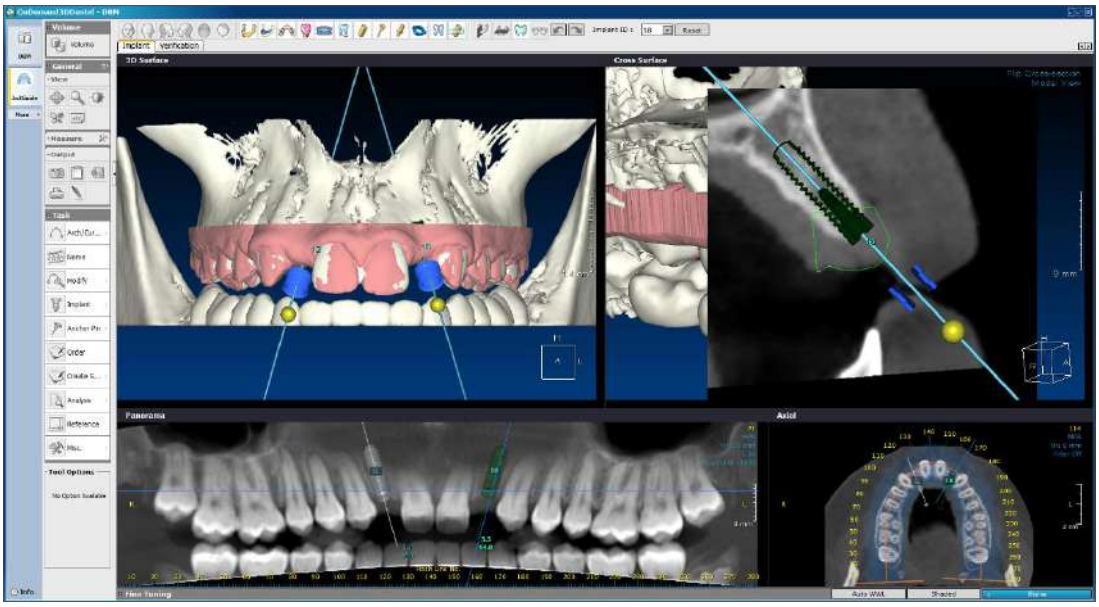


Fig. 277 Implant planning and verification

Step 1: Click on the [Reference] from Task Tools and pick a reference location for the implant to be placed on the Panorama view.

Step 2: Select [Nerve] from Task Tools and mark the nerve. Initial nerve tracing will ensure an accurate case planning.

Step 3: Select [Ruler] from the Measure Tools. Measure the length and width of bone area where an implant will be placed on the Cross Surface view.

Step 4: From Task tools, select [Implant] followed by [Pick & Place] and choose the implant to be used for implant simulation.

Step 5: Click on the Cross Surface or Panorama view, choose [Implant Number] and the implant will be placed on the referenced location. Drag the yellow sphere at the end of the implant to adjust the angle. Click on the center of the implant and adjust it to the right position.

Step 6: Select [Anchor Pin] from the Task Tools and place the anchor pin by clicking on Cross Surface. Drag the yellow sphere at the end of the anchor pin to adjust the angle. Click on the center of the anchor pin and adjust it to the right position

Note: Anchor pin can only be placed from the Cross Surface view and should be placed 4-5mm into the bone.

Step 7: Click on [Verification] tab located at the top left corner. The [Verification] tab is for verifying the placement of simulated implants. An [Implant Cross] and [Implant Parallel] panes are included in this layout for a much more precise planning.

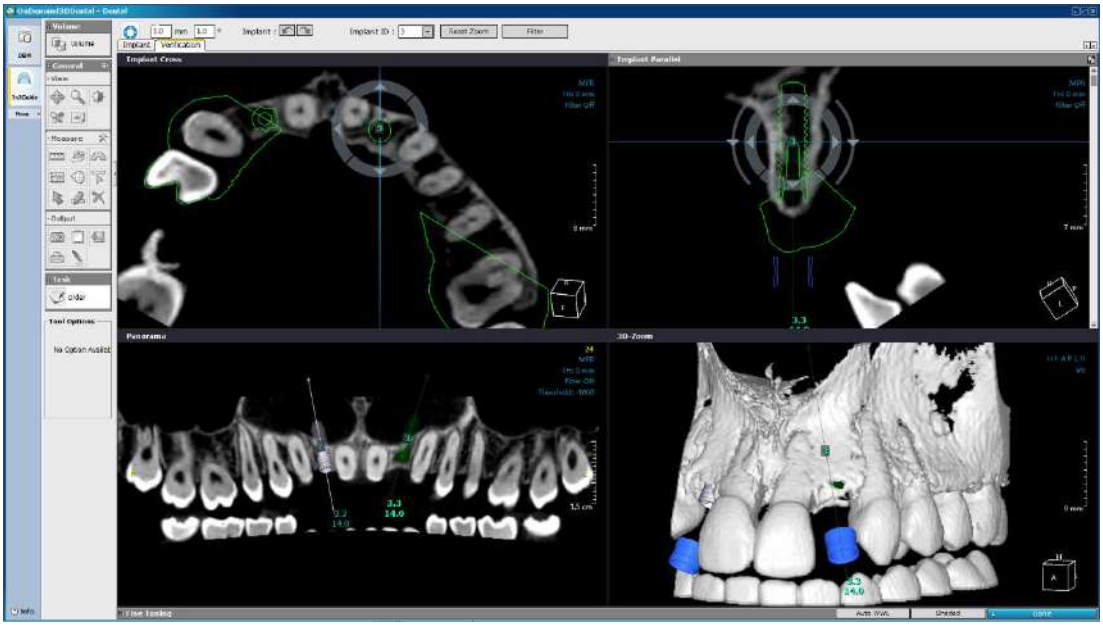


Fig. 278 [Verification] layout

To access [Verification] with a specific implant fixture, the user can click on an implant first on the [Implant] tab and then click on the [Verification] tab or simply right-click on an implant and select [Verification].

For more than one implants, users can switch between them using the implant ID on the provided toolbar located above the four panes, as shown below.

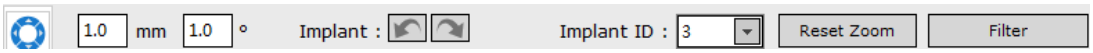
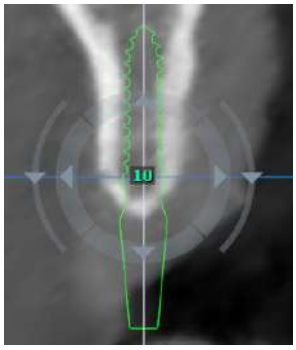


Fig. 279 [Verification] Toolbar



The  icon shown above refers to the reorientation of implants. The user will be able to see four arrows surrounding the selected implant, and two arrows outside for precise rotations in the [Implant Parallel] pane.

The distance the implant is moved in each direction by one click, and degrees the implant is rotated by one click can all be set using the 

settings. Any changes made can also be reversed using the 

icons.

Fig. 280 Reorientation

Step 8: Drag the blue line on the implant and rotate it to check if the implant is properly placed. Adjust the angle and position of the implant. (Implant Parallel view provides an implant-centric view).

Step 9: Once planning is complete, click on  [Save Project] button from Output tools.

Step 10: Click on the 

button on the Task menu to start processing your order.

10.8 Order Surgical Template Online

In2Guide™ surgical template are manufactured globally under strict in-house manufacturing to ensure the highest level of quality and accuracy. In2Guide™ follows all regulations set across the globe to ensure a smooth delivery to our customers. Based on user's location, order will be placed automatically to the closest order server or manufacturing facility.

Log in

When clicking [Order] button, user will be directed to the order page where login is required. First time user will have to sign up in order to continue with the order. For existing users who have already signed up, enter email address under ID and password to continue with the order.

Fig. 281 Login page for In2Guide service

Sign up

Click on Sign up to create a new account. Please read through the terms and conditions of the website and check the box if you accept these terms and conditions. Please make sure that all the required fields are filled out correctly and all fields displayed below must be up-to-date as we will use this information to contact you if needed for the uploaded case. User information can be modified under My Account

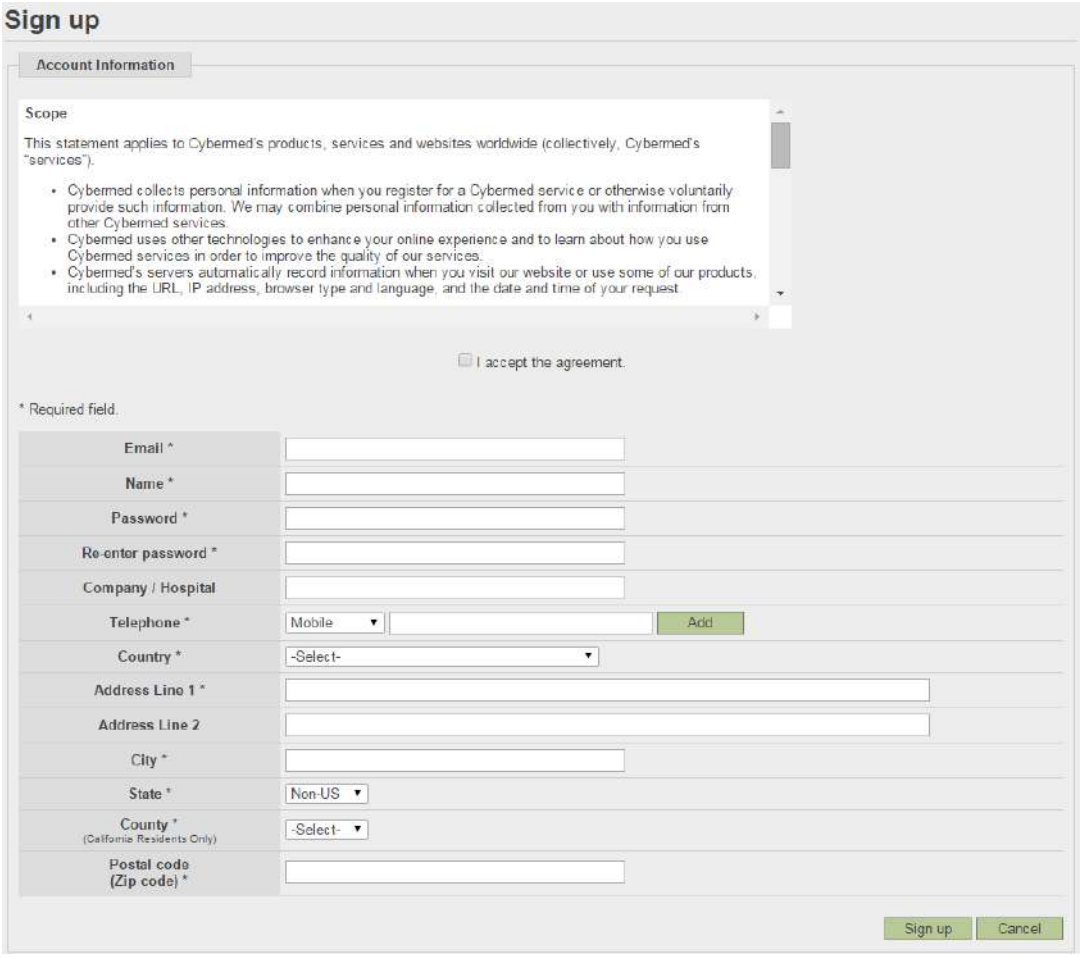


Fig. 282 Fill in sign up page to create an account

Request Form

Before submitting the order, preview your order form to make sure all information is correct.

Shipping Address

Enter the shipping address for delivery of the surgical template. Please check with your local distributor or contact customer support to make sure delivery is available in your country as different custom's regulations and restrictions may apply.

Shipping Method

Select which delivery service you prefer. Rush and overnight delivery options are available at additional cost.

Surgery Information

Verify the surgery information and make sure everything is correct.

- Implant manufacturer and model
- Implant diameter and length
- Surgical kit and sleeve type
- Drill length

DICOM Information

A single slice image of your planning that includes patient information is shown in the order request form. Click on the slice to automatically launch OnDemand3D Dental and load the case. You can also view the final surgical template before delivery.

Added Items

Add additional items needed for surgery to your cart. Simply select the item and quantity and click 

. The total will be calculated and added to your payment at the checkout.

Additional Services

Select any additional services requested and performed.

- SR Registration
- Optical Scan
- Virtual Waxup
- Denture Duplicate
- Bone Reduction Surgical Template (USA only)

Specific comments

Please add any information that is necessary or helpful for case.

- Surgery date
- Medical concerns or issues
- Special delivery request

Confirm order

Before finalizing your order, review the order one last time.

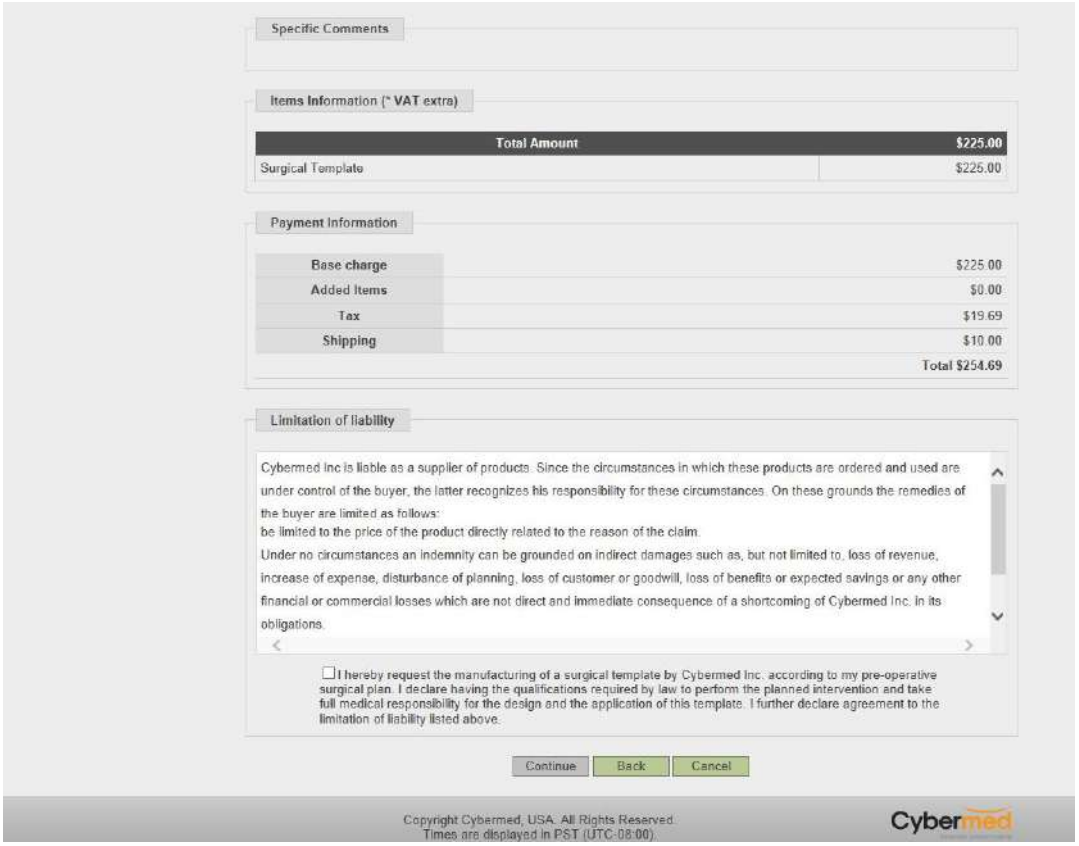


Fig. 283 Confirm order

Payment options

Payments can be made via credit card, direct debt or personal checks (USA only). Click on the [Checkout for Credit Card] button and enter your credit card information.

Fig. 284 Payment form for credit card

Safe and Secure

All payments are processed through a secure server and your personal information is stored safely.

Complete control over your orders

Email notifications are sent to your email each time the order proceeds through a production stage. To check the status of your order go to

- USA http://us.in2guide.com
- Europe http://eu.in2guide.com
- Korea http://kr.in2guide.com
- Australia http://order.in2guide.com.au

11 Fusion (Optional)

Fusion is a visualization tool that utilizes an advanced registration technique to superimpose or stitch image data regardless of modalities such as CT, MRI and PET. The Fusion layout consists of MPR images of the Primary, Secondary and Fused patient data. Images reconstructed with Fusion can then be resliced as new DICOM data.

To launch, select two series of data using the [CTRL] or [Shift] keys.

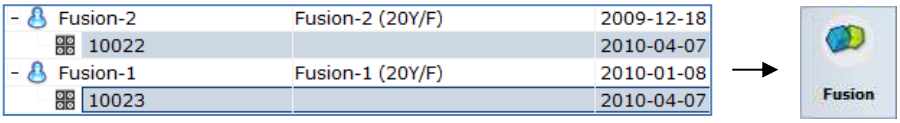


Fig. 285 Select two series at once

Click the [Fusion] icon on the module bar, once again select the two sets of data from the [Loading Options] dialog and press [OK].

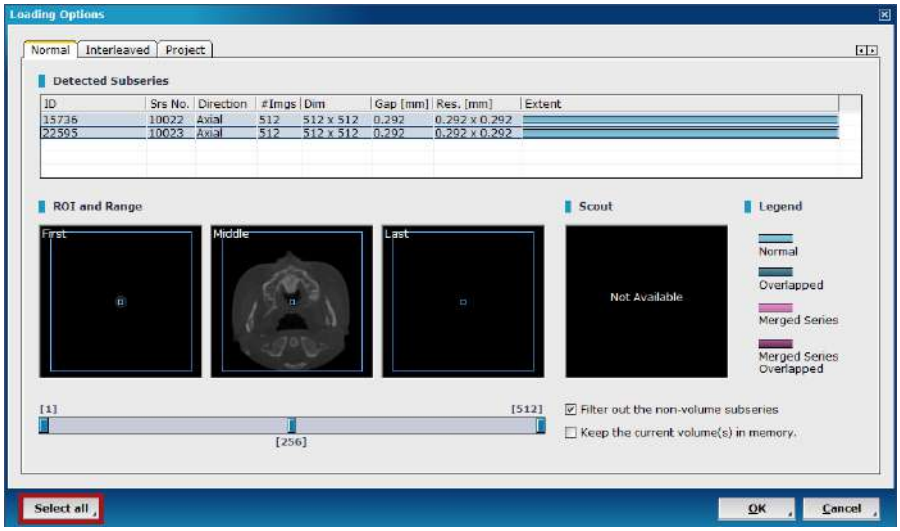


Fig. 286 Reselect both data from [Loading Options] using either [Shift] or [Select All] (shown in red)

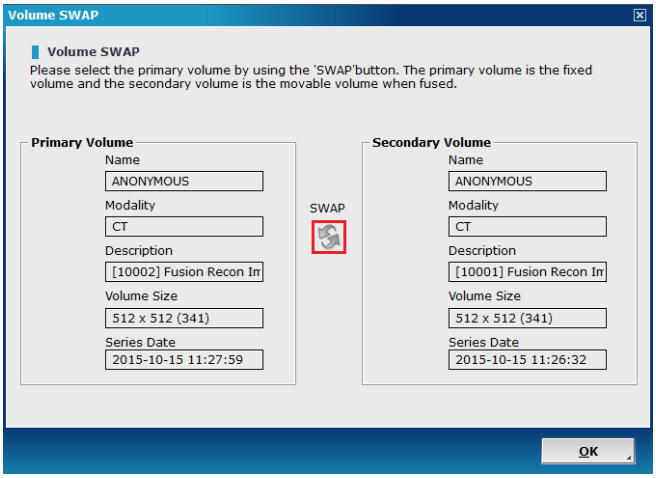


Fig. 287 Swap primary and secondary volumes if necessary using the  icon.

11.1 Layout

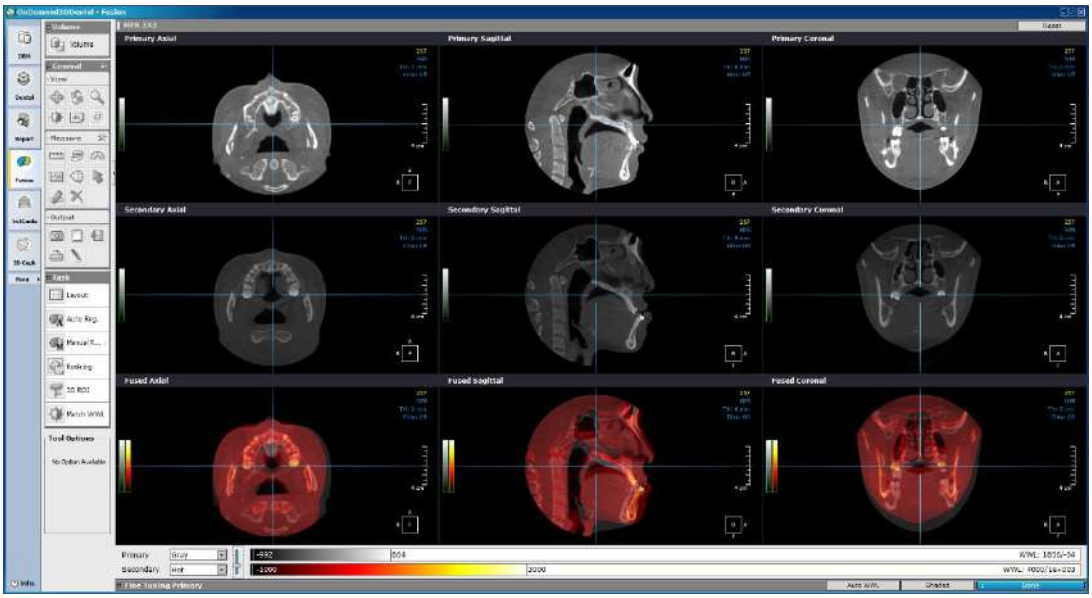


Fig. 288 The Fusion module default layout consists of primary (top), secondary (middle) and fused MPR images (bottom)

At the bottom of the layout, users will see a fine tuning bar for both primary and secondary data.

Fig. 289 Configure color and intensity settings for the primary and secondary MPR images

Use the slider controller, shown in red on the image above, to set the ratio of visibility for both data.

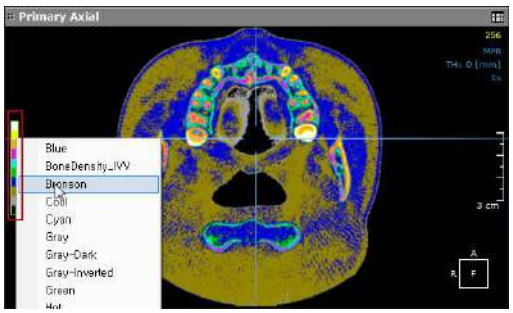


Fig. 290 Color settings can also be accessed by clicking the color bar shown above in red, provided along the left margin of each MPR pane

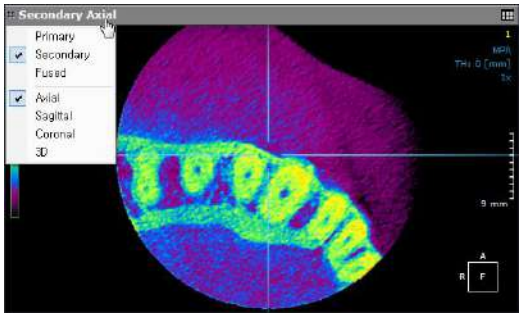


Fig. 291 Change pane orientation settings by clicking on the upper left corner of any pane

11.2 Task Tools

Users will be provided with the following tools on Fusion:

Fig. 292 Fusion task tools

Layout. The default layout of Fusion includes primary MPR images at the top, secondary MPR images in the middle and fused images at the very bottom. To change the layout, click on the 

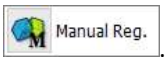
tool and select a display of choice from the [Choose Layout] window.

Fig. 293 Choose desired layout from either the [Head] or [Whole Body] tab

Auto Registration. The 

automatically registers volume data using voxel information. The technology behind Fusion, known as MI or Mutual Information, calculates the statistical dependence between two volumes, the intensity and correlation values of entropy and compares the difference in the entropy of the sum of individual images and the joint entropy of combined images to fuse data together.

See next sections on superimposition and stitching for instructions on the correct use of this tool along with the workflow involved.

Manual Registration. If images fail to match due to a wide difference between the positions of the two images or if automatic registration is taking too long, users can match images manually by clicking 

.

Function	Description
	• The Secondary image can be manipulated, while the Primary image position remains fixed. (However the Primary image can be manipulated from the Fusion pane). • The View tools (Pan, Rotate and Zoom), Scroll bar (Slice Number) and Cross-Line manipulation's (Center drag, Rotate, Change Thickness) effect on the Primary and Secondary panes are synchronized. *Note: Sync On mirrors the functionality of Manual Registration as found in previous versions of OnDemand3D.*
	• Both the Primary and Secondary can be manipulated independently of each other. • The View tools (Pan, Rotate and Zoom), Scroll bar (Slice Number) and Cross-Line manipulation (Center drag, Rotate, Change Thickness) can be used independently on the Primary and Secondary panes. *Note: Turning off "Sync Off" will automatically synchronize the Secondary pane's View with the Primary pane's View, however any image movement changes will be retained.*

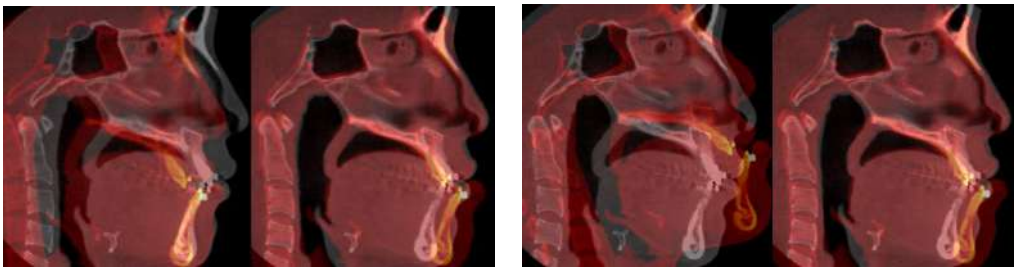


Fig. 294 Click and drag to reposition (left); Use mouse-wheel to slightly rotate the image (right)

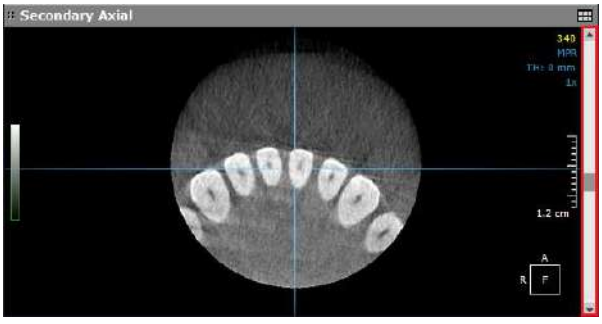


Fig. 295 Hovering over the pane will reveal a *scrollbar* on the side. Manipulating this *scrollbar* changes the slice number viewed.

Fig. 296 *Degree of Rotation* can be set at the top-right of the Title bar during Manual Registration only.

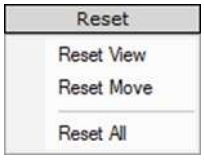


Fig. 297 Reset Button at the top-right of the Title bar.

Reset View: Resets the *View* changed by Pan, Rotation and Zoom tools.

Reset Move: Resets *Image Position* changes made via Manual Registration.

Reset All: Resets *Image Position* and *View* changes made.

Reslicing.

The fused set of data can be converted into DICOM format and saved in the user's database or remote server. To do this, choose 

from [Task Tools] and the following menu will pop up.

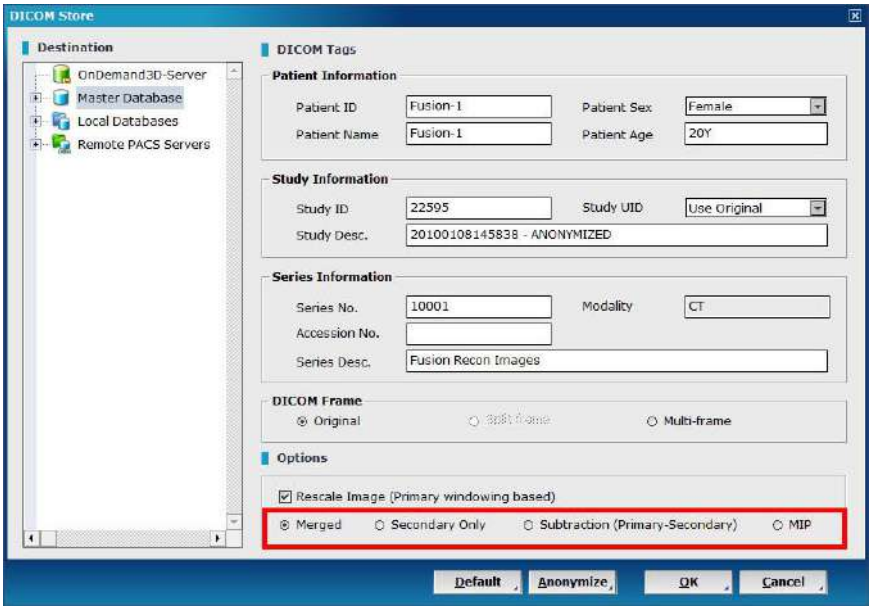


Fig. 298 Reslice data using the [DICOM Store] dialog

Users will be able to input different patient, study or series information in the fields provided. To anonymize the data, press 

and the DICOM will be automatically renamed as 'Anonymous'. In the [DICOM Frame] section, choose whether to keep the original frame settings or whether to convert to either split-frame or multi-frame.

The [Options] menu section presents the user with the following choices to reslice the fused DICOM data:

Function	Description
Secondary Only	Save the secondary data only, as realigned to the primary data.
Merged	Primary and secondary image data are merged and saved.
Subtraction	Reslice the data as a subtraction of the secondary from the primary.
MIP	The overlapping regions of the two data are saved.

3D ROI. Select 

and an ellipsoid outline overlay in blue will appear on the MPR images, while the statistical data related to the pixel values inside of the ellipsoid will be displayed in the [3D ROI Information] window. While this tool is being used, the maximum value of the current secondary volume and the slider controller for adjusting the threshold can be accessed at the top right corner of the screen.

Use the exterior control points to drag in/out and resize the ellipsoid and the point in the center to reposition.

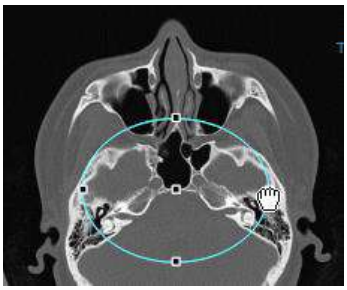


Fig. 299 Adjust region of interest by resizing and repositioning

Match WWL

Once primary and secondary volumes aligned using Manual/Auto Registration, select 

to automatically match the secondary volume WWL to the primary volume WWL. To save secondary volume with the adjusted WWL settings, save the volume as a new DICOM with the help of [Reslicing] tool and make sure [Rescale Image (Primary windowing based)] and [Secondary Only] are checked in the [Options], before pressing [OK]

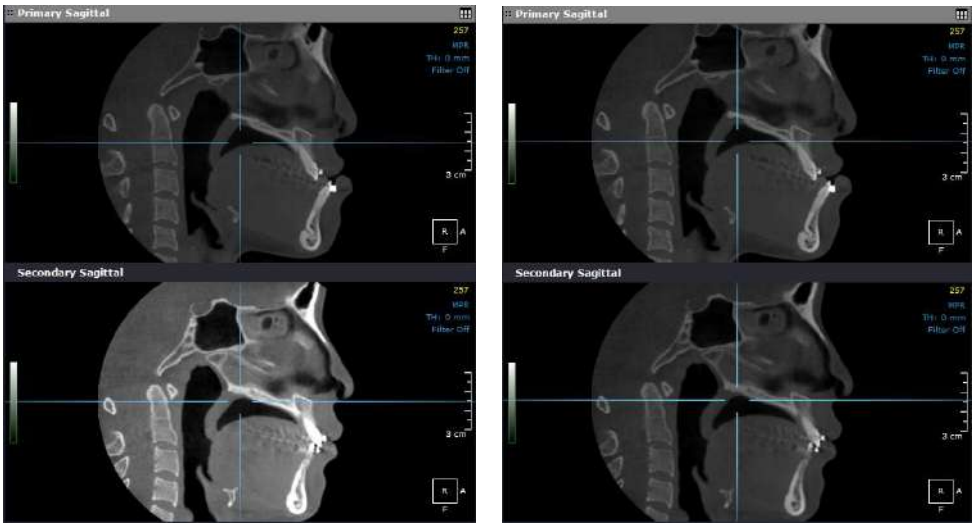


Fig. 300 Before and after [Match WWL]

11.3 Superimposition

Superimpose post-operation and pre-operation patient data using Fusion's registration technology to draw comparisons for post-operation analysis. The following is a step by step guide on how this can be achieved.

Step 1: Launch both data from DBM using the [Ctrl] or [Shift] keys to select both as shown below. Reselect the data from the [Loading Options] dialog.

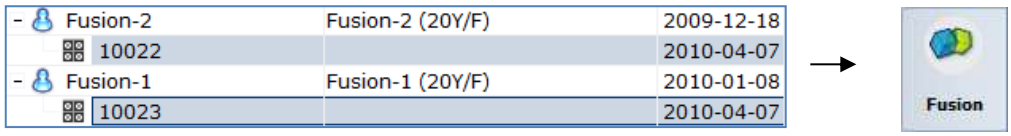


Fig. 301 Select two series at once

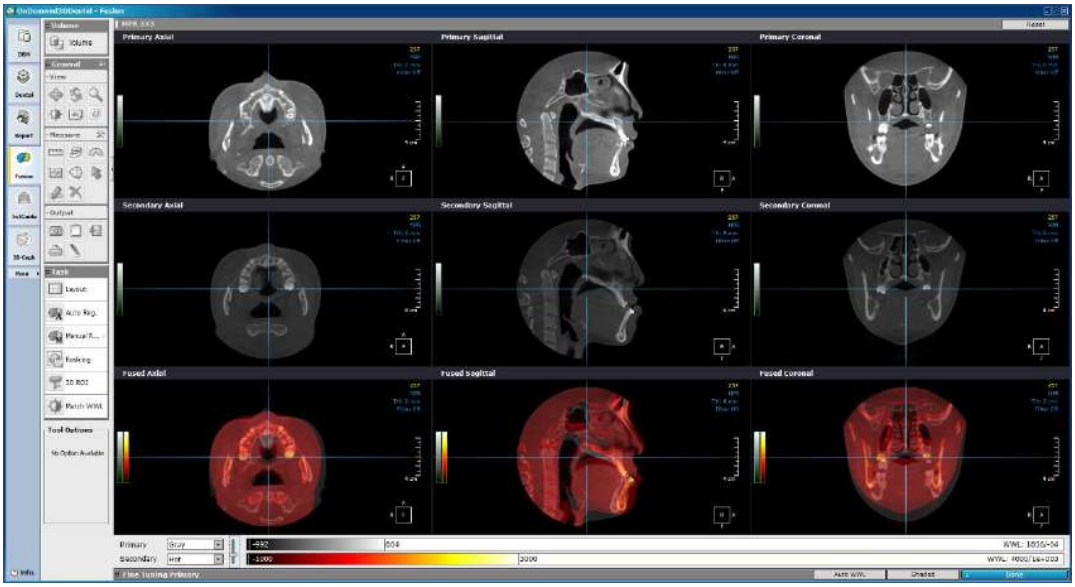


Fig. 302 Fusion module layout

Step 2: Change layout, color and windowing settings to suit needs.

Step 3: Start superimposition.

For bigger sized data, make sure to draw a volume of interest (VOI) overlay over the area that involves as little anatomic change as possible for the patient's pre-operation and post-operation data. This will ensure the highest accuracy for the superimposition.

Click  from [View Tools] and adjust the volume of interest by dragging in the sides as shown below.

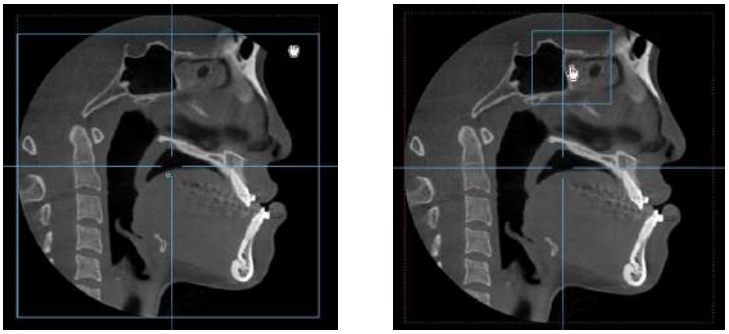


Fig. 303 Drag in each side on the MPR panes provided and use the small square in the middle of the [VOI] overlay to reposition if necessary.

Step 4: Click 

to start automatic registration.

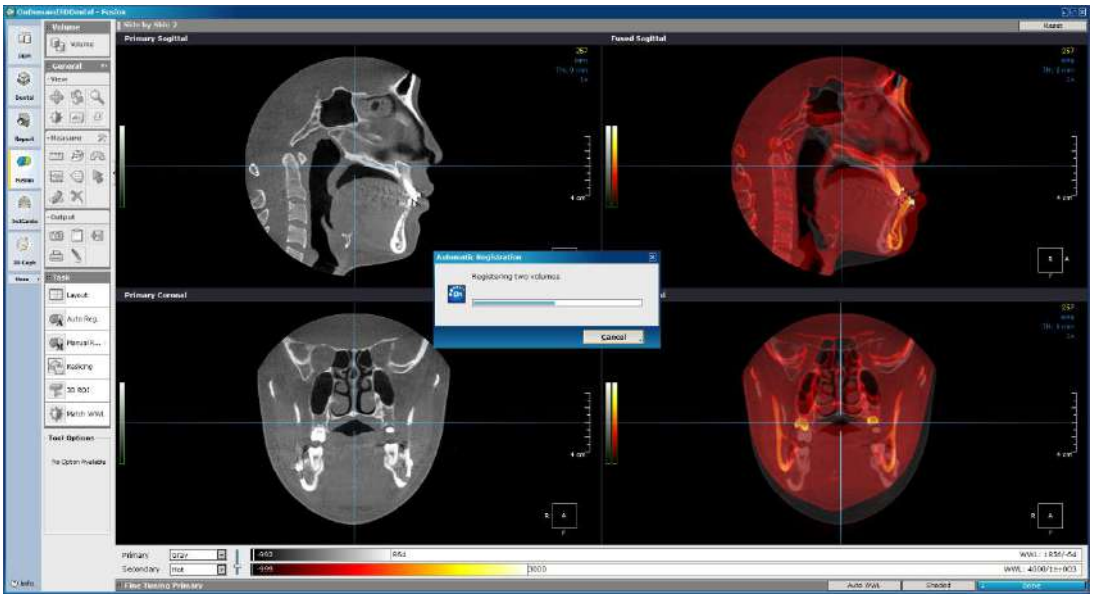


Fig. 304 Registering the two volumes

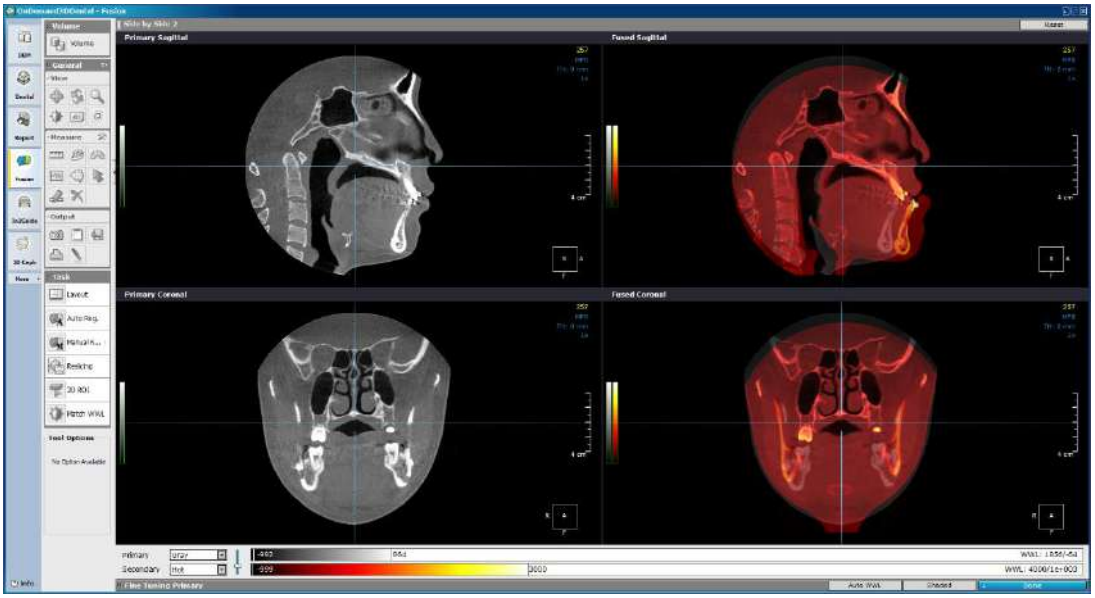
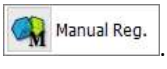


Fig. 305 After successful superimposition

Click  again to hide the [VOI] outline.

Step 5: If necessary, proceed with manual registration by clicking 

.

Final step: Press 

to reslice data with new patient information and select options to save the data as either [Merged], [Subtraction], [MIP] or [Secondary Only].

11.4 Stitching

The Fusion module has the capability to stitch together small FOV data using the same advanced technology used for superimposition. To stitch together more than two sets of data, simply stitch the data two at a time and reslice them as [Merged].

The following is a step by step guide on how to stitch a number of small FOV data.

Step 1: To start, select the data to stitch from DBM as shown below and select both data from the [Loading Options] dialog again.

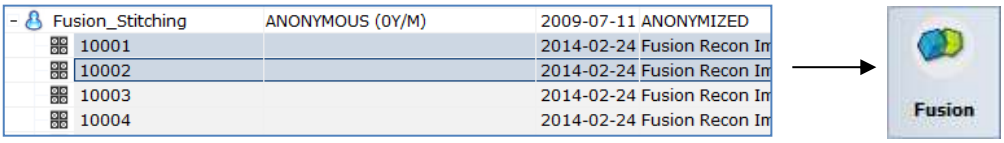


Fig. 306 Select the first two data series to stitch

Step 2: Change layout, color and windowing settings to suit needs.

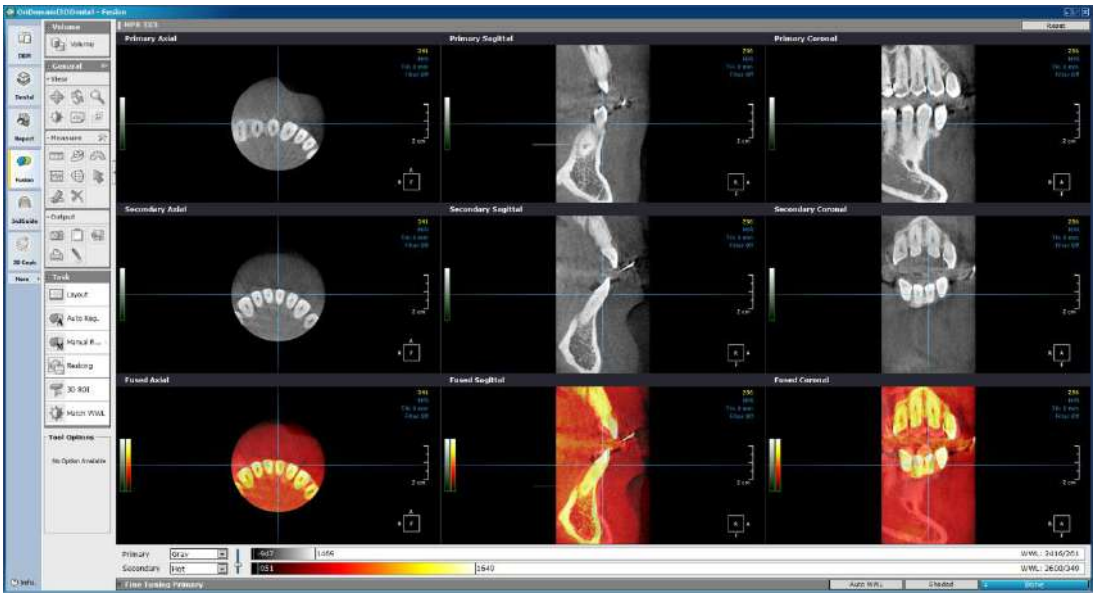
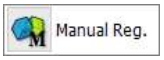


Fig. 307 [Layout] was changed to [3 x 3], and windowing preferences were set

Step 3: Click on 

and first roughly align the secondary data to the primary.

Click and drag to move and use mouse-wheel to rotate secondary data.

Fig. 308 The secondary image is roughly aligned to the primary

Step 4: Click on 

to automatically match the secondary volume WWL to the primary volume WWL.

Step 5: Press 

to proceed with automatic registration

Fig. 309 The two data are automatically aligned using voxel information

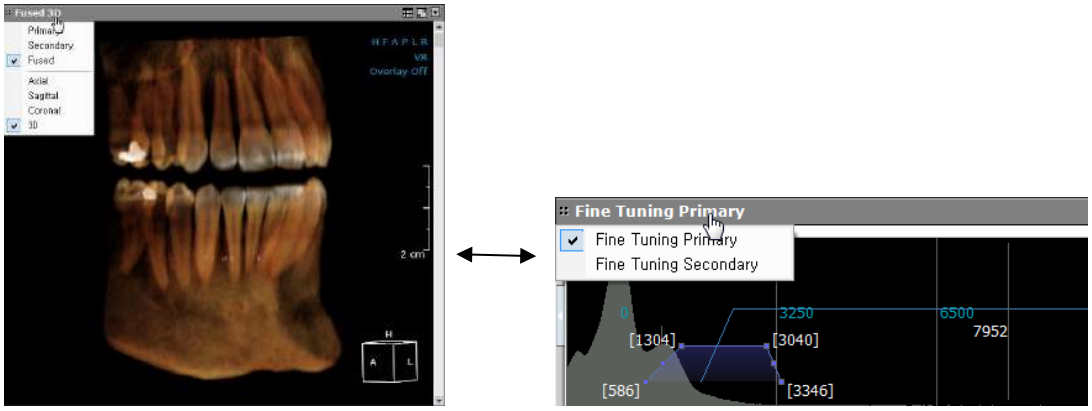


Fig. 310 (Left) Check results in 3D view by clicking on the upper left corner of a pane and selecting [3D]; the [Fine Tuning] settings of both the primary and secondary can be set as shown above (right)

There will be no obvious outlines on the 3D volume after merging is complete.

Step 6: Use the 

tool to reslice data using [Merged] option.

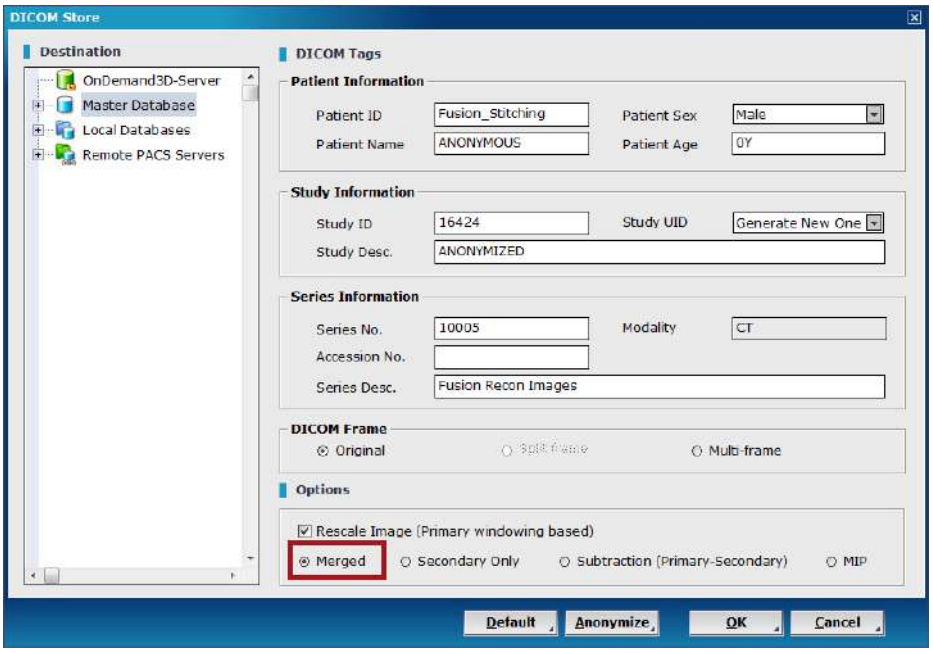


Fig. 311 Input new DICOM tag information if necessary, select [Merged] and press [OK]

Step 7: Stitch the remaining data using the method prescribed above and merge.

Final results: Open up the final stitched DICOM from DBM.

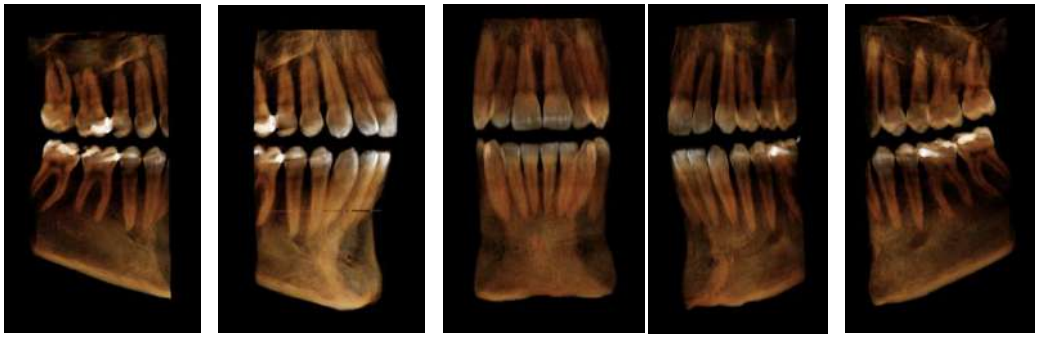


Fig. 312 All five separate data before stitching

Fig. 313 Final results as shown on the [DVR] module

12 3D Ceph (Optional)

3D Ceph calculates the relative functions between points, lines, and planes in a three-dimensional setting to provide more precise and accurate values. The user can define the points, lines, planes and functions in accordance to their needs.

The user can also do a superimposition of two sets of image data, such as pre and post-operation data to analyze results as well as use a 2D photo for 3D volume mapping or generate a 2D X-ray for patient consultation. For workflow and instruction related to superimposition on 3D Ceph, please refer to the last part of this section *(☞ Section 9.5 Dual Volume).*

12.1 Layout

The 3D Ceph layout consists of MPR and 3D views along with an additional menu (shown in red below) which includes tools such as [Mode] and [View Direction].

Fig. 314 3D Ceph layout

12.2 Workflow

The workflow of the 3D Ceph module starts with loading patient data and setting the orientation axis using [Reorientation] mode.

See chart below for the needed workflow.

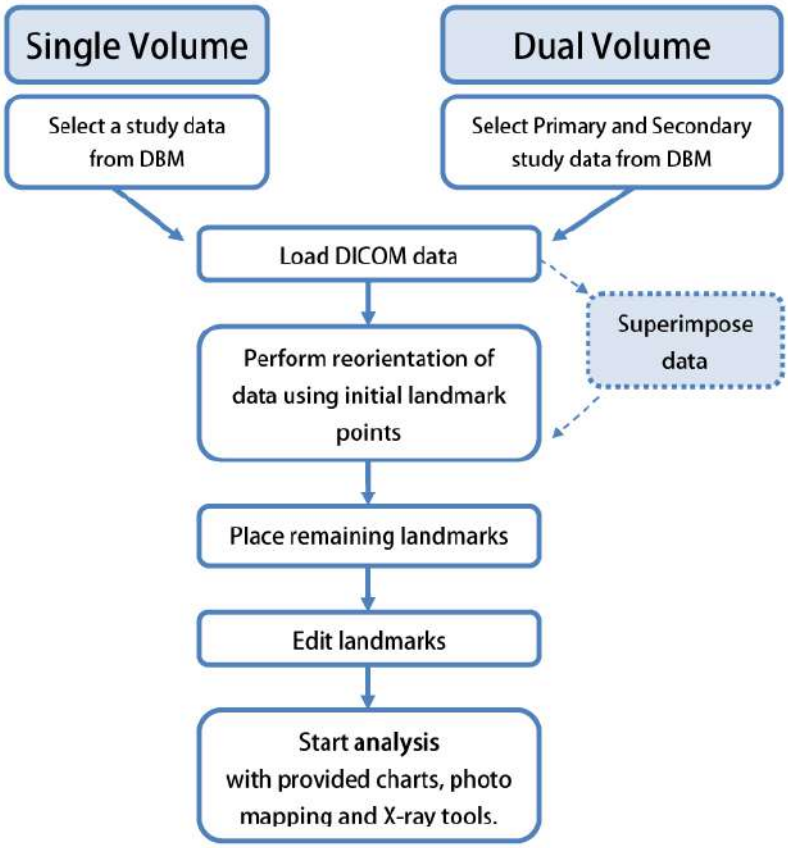


Fig. 315 3D Ceph workflow chart

The four modes provided on 3D Ceph can be seen in their appropriate order of usage.

Fig. 316 From left to right: [Reorientation], [Tracing], [Edit] and [Display].

12.3 Single Volume

The following is a representation of the user's workflow when using a single volume for cephalometric analysis. Please refer to page 185 *(☞ Section 9.5: Dual Volume)* for workflow related to using two volumes of data.

As seen in Fig. 316 the first step in 3D Ceph is [Reorientation].

Reorientation

Using this tool, set the orientation axis of the 3D volume. Click on  and 

from [Task Tools]. Select preferred reorientation method from the [Select Reorientation Method] dialog.

Orientation Method	Landmarks
FH plane based method (4 landmarks)	**N** (Nasion), **L Or** (Left Orbitale), **R Or** (Right Orbitale), **R Po** (Right Porion)
UOP method (5 landmarks)	**N** (Nasion), **L FZP** (Left Frontozygomatic Point), **R FZP** (Right Frontozygomatic Point), **R Or** (Right Orbitale), **R Po** (Right Porion)

According to preferred reorientation method, place necessary landmark points in their proper location by referring to the description shown beneath the mouse cursor. Click to place the landmark, and if necessary, reposition using the green **[x]** provided on the MPR panes for precision.

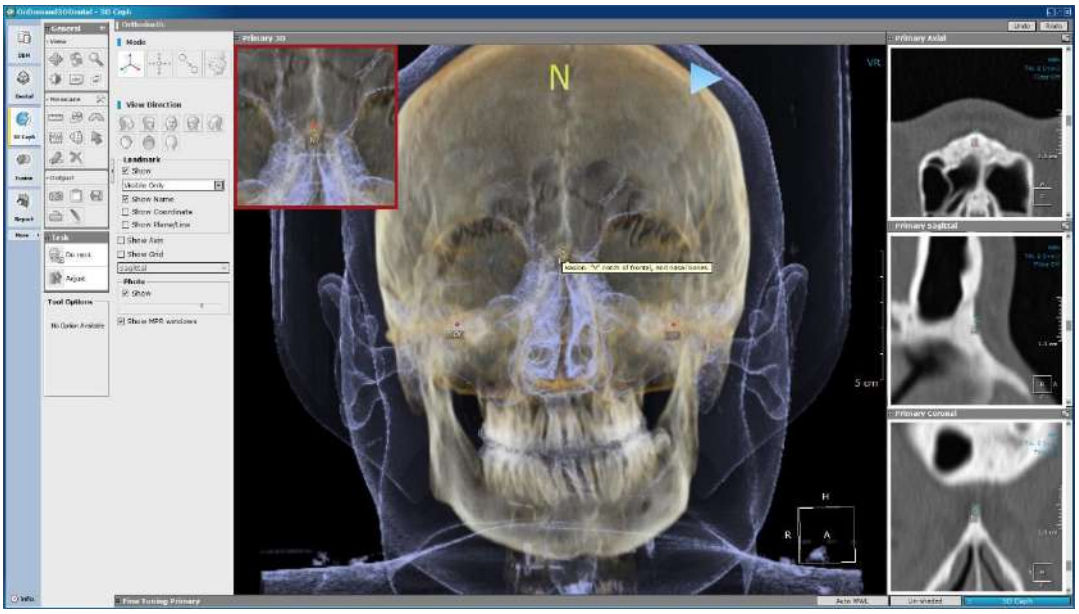


Fig. 317 Place landmark points with the help of zoom image (highlighted in red) and MPR images (highlighted in white)

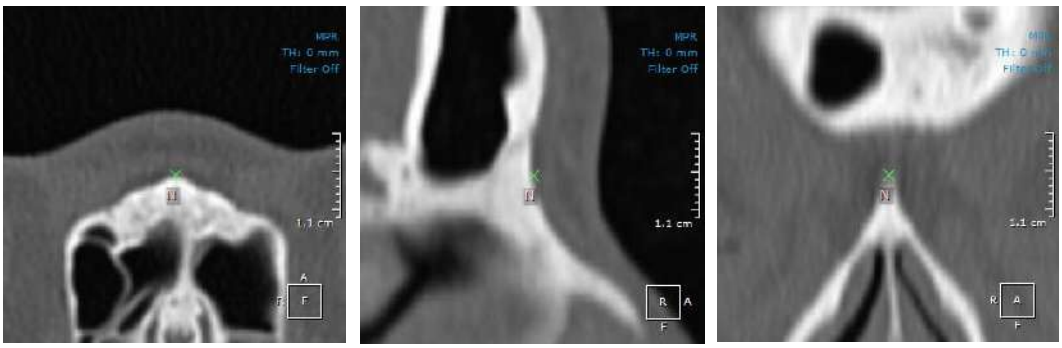


Fig. 318 The landmark can also be adjusted using the green **[x]** shown on the MPR images

After placing a landmark, click on the blue arrow to proceed to the next landmark point. When finished, the auto reorientation process will progress.
If needed, adjust the orientation axis manually, using the [Adjust orientation] dialog shown in Fig. 319.

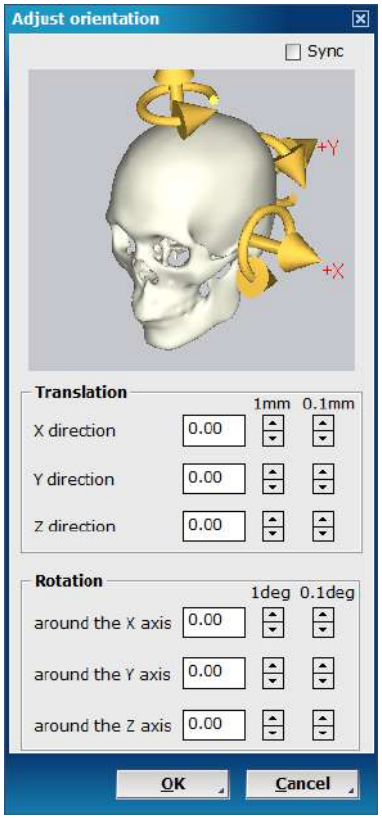


Fig. 319 [Adjust orientation] dialog

Tracing

After orientation, click [OK] when prompted to continue onto tracing or simply click  to place remaining landmarks using the 3D and MPR images provided. Use the Undo and Redo buttons at the top right corner of the layout if needed.

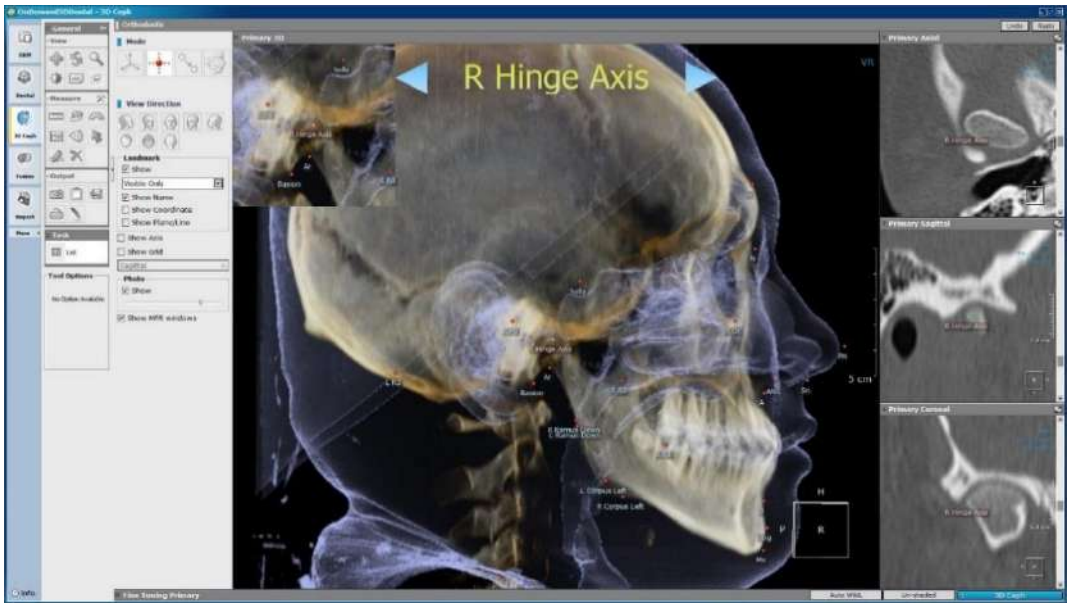


Fig. 320 Tracing the right hinge axis

Go to 

for a full list of landmark points, and erase points whenever necessary.

INFO	To change the order, remove unnecessary or add custom landmark points, refer to Fig. 332 ***(☞ Subsection: Settings)*** for 2D, and Fig. 336 ***(☞ Subsection: Landmark DB)*** for 3D landmarks.

Edit

To start editing landmark positions for higher accuracy, press  and use the 

menu provided, which is sorted in alphabetical order, to go over points one by one. Simply clicking on a landmark to edit will also work. Red landmark points will appear yellow when in editing mode.

Display

The  mode shows the defined landmarks, lines and planes.

Fig. 321 3D Ceph task tools can be accessed from [Display] mode

When initial tracing is done, users can use the [Tools] section for analysis.

12.4 Tools

The following are task tools provided in 3D Ceph.

Chart. The 

tool displays the analysis values calculated using the landmark points. OnDemand3D™ offers 'Dr.Cho's Analysis' by default. To add or remove analysis methods, please refer to Fig. 336 ***(☞ Subsection: Landmark DB).***

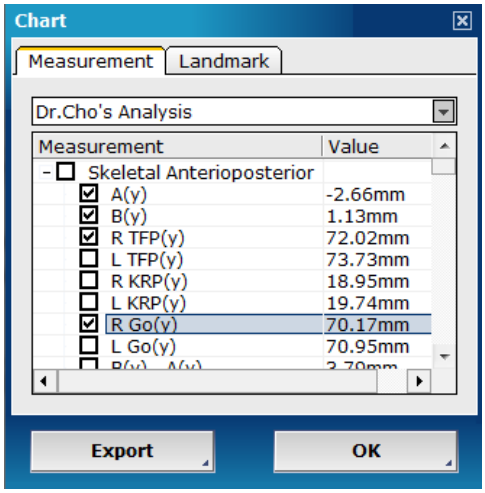


Fig. 322 Analysis values in mm

Check or uncheck analysis values to view on the 3D volume.

Click 

to export analysis results as either a text file or an excel spreadsheet.

List. The 

tool displays landmark points and their appropriate coordinates.

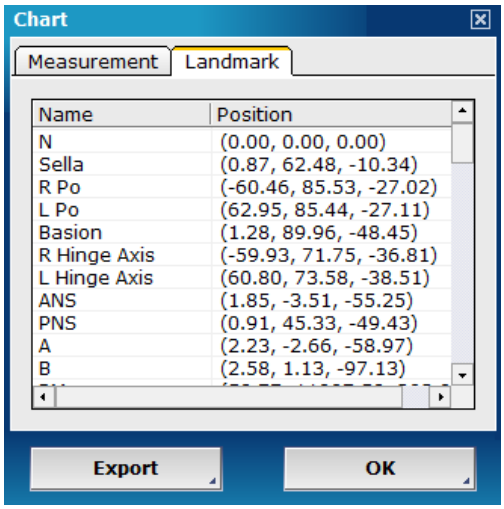


Fig. 323 Landmark coordinates can also be exported

Photo. Allows users to map a patient photograph to the 3D volume. Click 

and the [Extract Surface] dialog should appear. Set the ROI (region of interest) on the axial image shown using the blue outline. Adjust the HU (Hounsfield unit) threshold values using the bar provided until the area highlighted pink covers the patient's skin surface. Scroll the axial pane to make sure all areas are covered.

Click 

to render a surface area model of the patient. After the 3D image is generated, make adjustments if necessary and press [OK] to continue onto the next stage.

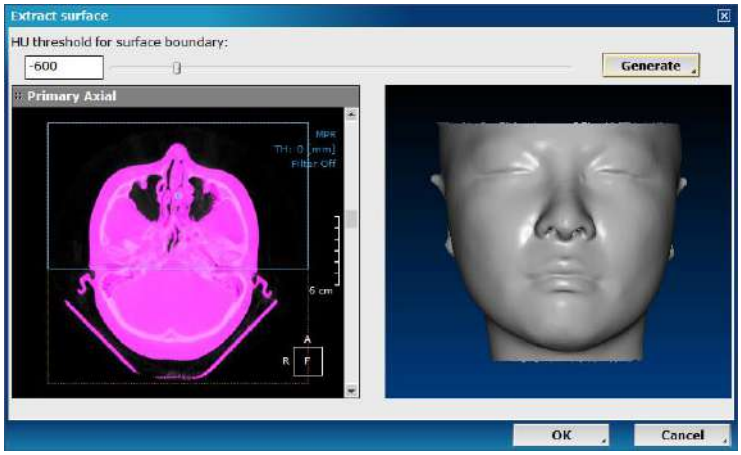


Fig. 324 Adjust HU threshold for a surface model

Direct path to the patient's photo and place the two orange circles directly over the patient's pupils.

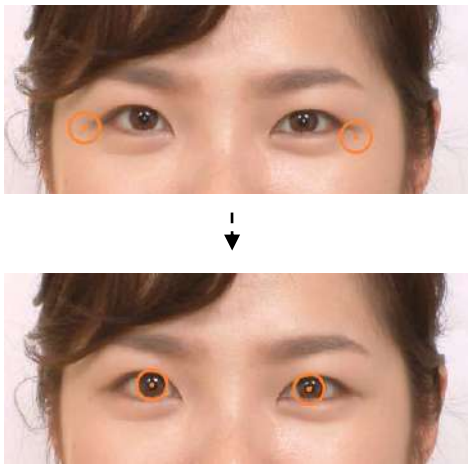


Fig. 325 Place the orange circles over the patient's pupils

Click Next.

Pick at least four corresponding points on the photo and the surface model. When a point is chosen on either data, the area is enlarged and shown in the [Image Zoom] pane. The edges of the eyes, the mouth, or the center of the nose are recommended for the best mapping results.

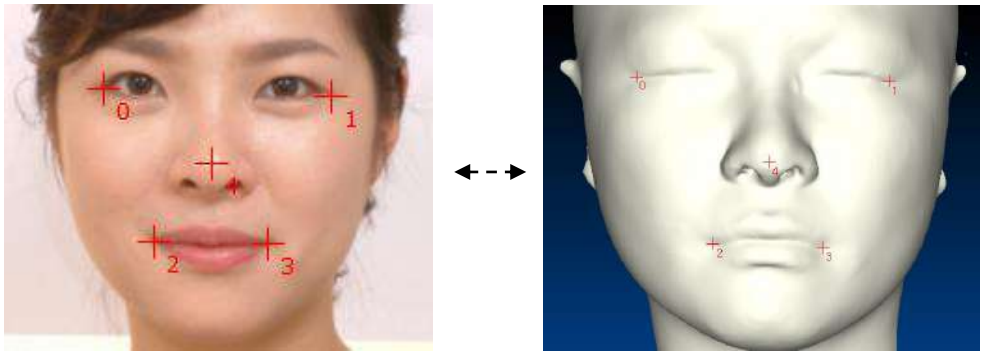


Fig. 326 Place corresponding points to map photo onto patient data

INFO	Use the enlarged images in the [Image Zoom] pane on the right side of the screen to place the points, not the actual images.

After placing at least four points, click Next.

In the next stage use the  or  tools provided to remove unnecessary areas or any distortion.

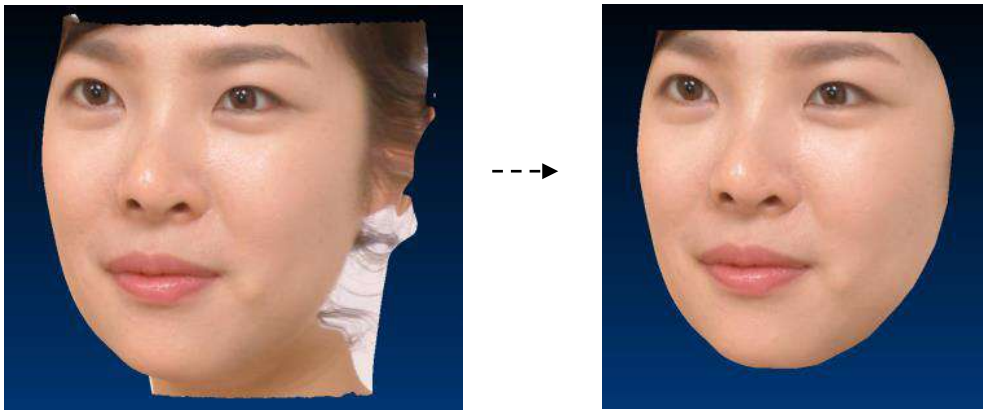


Fig. 327 Use the provided tools to get rid of unnecessary areas

Verify the final image and click [OK] to finish mapping and return to the main window.

Fig. 328 The opacity levels and visibility of the photo can be adjusted using the slide bar provided (highlighted in red)

Make X-Ray. First, set preferences for X-ray image generation using the [Preference] menu from [Task Tools]. Please refer to page 182 *(☞ Subsection: Preference)* for more instructions.

After preferences have been set, click 

. After the [Select Position] dialog appears, choose desired X-ray orientation and click [OK] to start generating the X-ray image. The four orientations provided are [Lateral], [Frontal], [SMV], and [Panoramic].

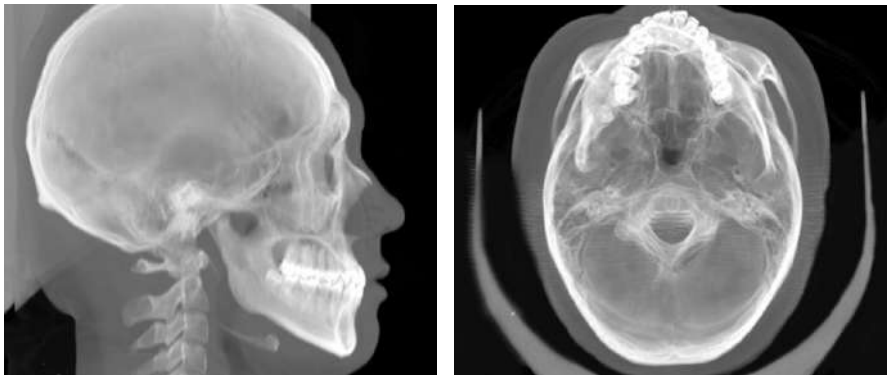


Fig. 329 Lateral and SMV X-ray images generated using 3D Ceph

For panoramic X-rays, a [Draw Arch] dialog appears. First, set the threshold values for the panorama and draw an arch on the axial pane provided. Set the ROI in the sagittal pane and press [OK] after verifying.

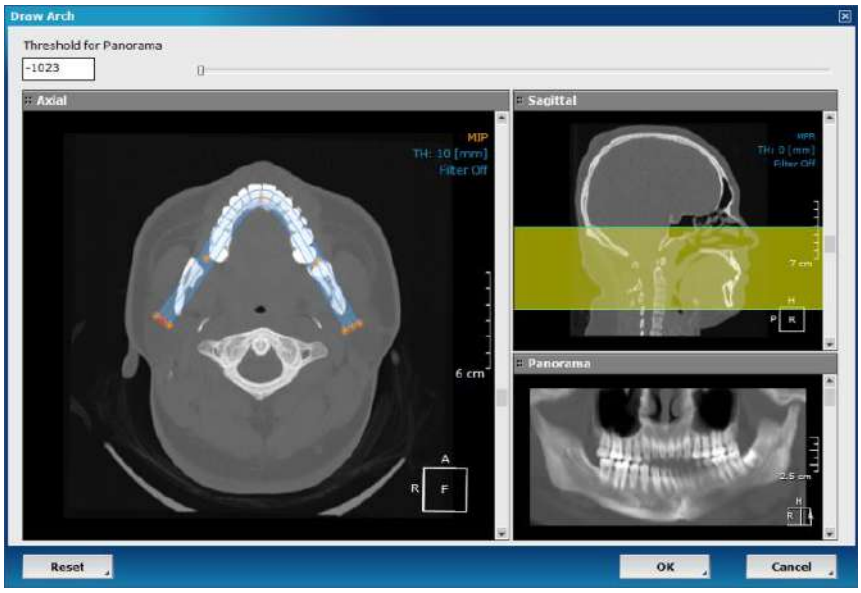
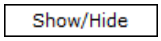


Fig. 330 Generate a panoramic X-ray image by drawing an arch

In X-ray mode, users are able to generate the soft tissue profilography as well as the polygonal chart of the patient. Use the 

along the top right corner of the screen to show or hide landmark points on the 2D image. Use the 

in the top right corner of the screen or filter option in the top right corner of the [XRay Image] pane to adjust filter of the 2D image.

2D Chart. Click on 

to view a polygonal chart based on different analysis methods. Select preferred analysis method from the drop down menu provided. The available analysis methods available are as follows: COGS, Downs, Jarabak, Kim, McNamara, Ricketts and Steiner.

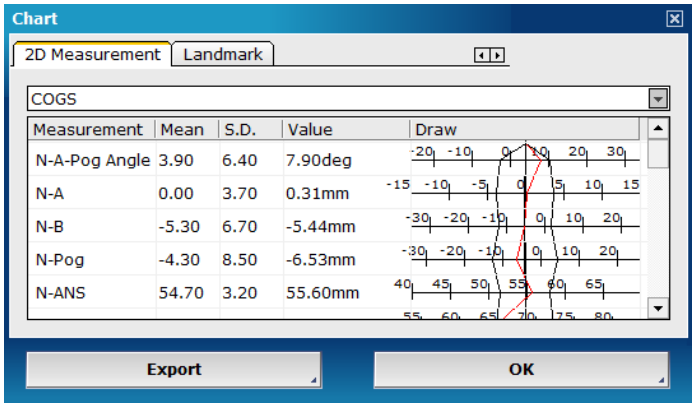


Fig. 331 Select a preferred analysis method and [Export] if necessary

Export. The generated X-ray image can then be exported using the 

task tool provided. The allowed formats are JPEG and DICOM.

Settings. Click 

to view the [Analysis Management] dialog, shown below.

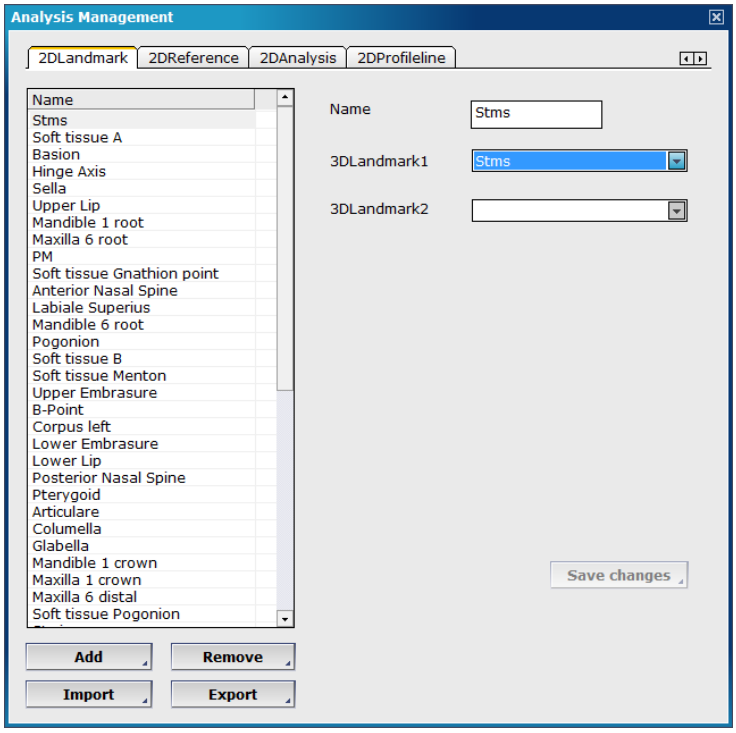


Fig. 332 2D analysis settings

The four tabs included are [2DLandmark], [2DReference], [2DAnalysis] and [2DProfileline].

Names of landmarks, references, analyses and profileline are listed with their corresponding details and settings. To make changes to existing values, simply select a different option and click 

.

Other options:

Function	Description
Add	Add a value (landmark, reference, etc.) to the list. For landmarks, set corresponding 3D landmarks.
Remove	Remove value.
Export	Landmarks can be exported as OLF (Ortho Landmark File), while analyses are saved in OAF (Ortho Analysis File) format and a profilography as an Ortho Profileline File.
Import	Import files in OAF and OLF format to add to library.

Bilateral TMJ. As its name suggests, this view generates a bilateral view of the patient's TMJ cross sections. Click on 

and use the 

to draw out a polygonal shape over the patient's condyle. The TMJ views will be generated according to the arch/curve drawn, so use the 

to modify the arch/curve if necessary.

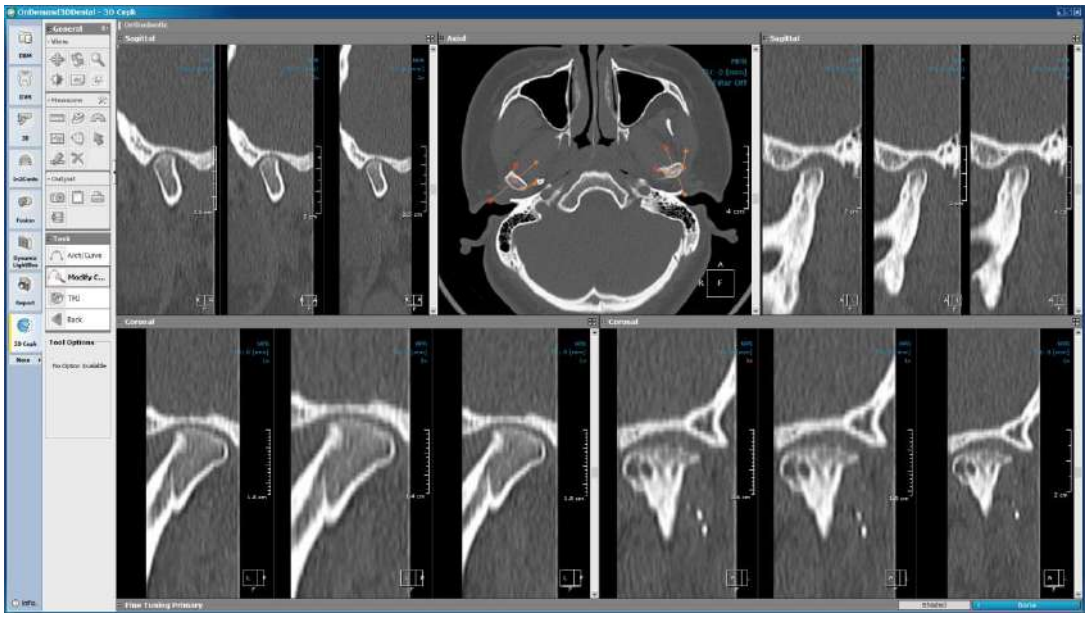


Fig. 333 Bilateral TMJ layout

TMJ. [TMJ] creates a singular view of one condyle, unlike [Bilateral TMJ].

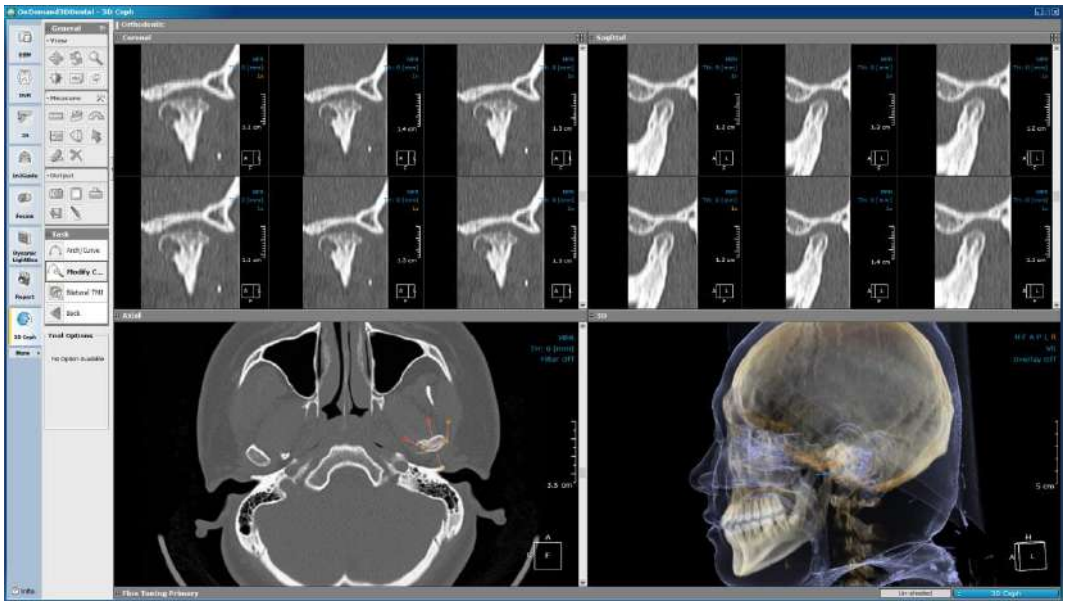


Fig. 334 TMJ view on 3D Ceph

Preference. Click 

from [Task Tools] to set options for X-ray generation.

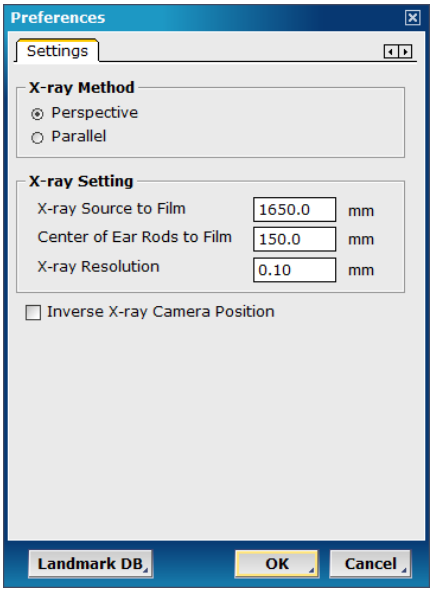


Fig. 335 3D Ceph preferences

Function	Description
Perspective	After reorientation, if Right Porion (R Po) landmark is traced, the X-ray image is generated from the coordinates set by the R Po (X, Z),
Parallel	The X-ray image is generated using various parallel rays instead of a set coordinate.
X-ray Source to Film	If the X-ray method is chosen as [Perspective], the user can adjust the distance the X-ray source to the film. (Range: 1000 – 2000 mm / Default: 1650 mm)
Center of EarRods to Film	If the X-ray method is chosen as [Perspective], the user can adjust the distance from the center of the EarRods to the film. (Range: 10 – 300 mm / Default: 150 mm)
X-Ray Resolution	The resolution of the X-Ray in mm/pixel. (Range: 0.05 – 1 mm / Default: 0.50 mm) *Note: The smaller the resolution, the higher the quality & the larger the image*
Inverse X-ray camera position	Inverse X-ray camera position. (E.g.: lateral is set left to right instead of right to left)

Landmark DB. Click on Landmark DB on the bottom left corner of the [Preference] menu to define landmarks, references and analysis methods in the user's library, as well as their relations, such as distance and angle.

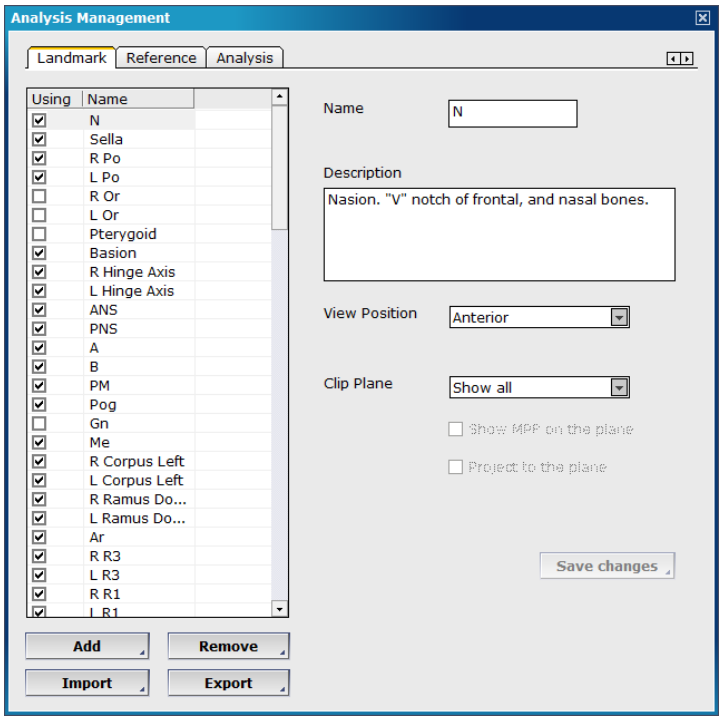


Fig. 336 3D landmarks, references, and analyses

Click and drag landmarks to change order of appearance or uncheck to exclude. Changes can be made to the description, view position and clip plane settings of each landmark, and saved using the Save changes button provided.

Similarly to the 2D analysis settings on page 180 *(☞ **Subsection: Settings**)*, users can add their own landmark points, references and analysis methods using the Add button or remove

unwanted ones using Remove. The information needed to add a landmark, reference or analysis method differs, as shown in Fig. 338.

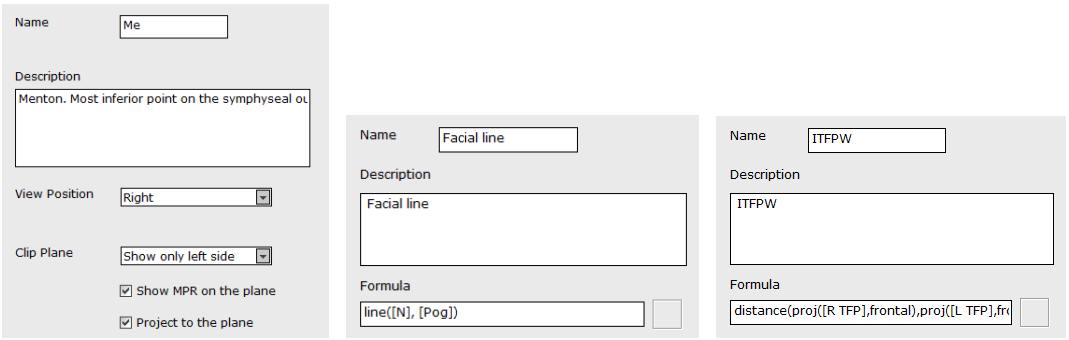


Fig. 337 Landmarks (left) require view position and clip plane settings, while references (middle), similarly to analyses (right) require a description and a formula to match. Please refer to ***(☞ Appendixes B and C)*** for more information on formulas used in 3D Ceph for both 2D and 3D cephalometric analyses.

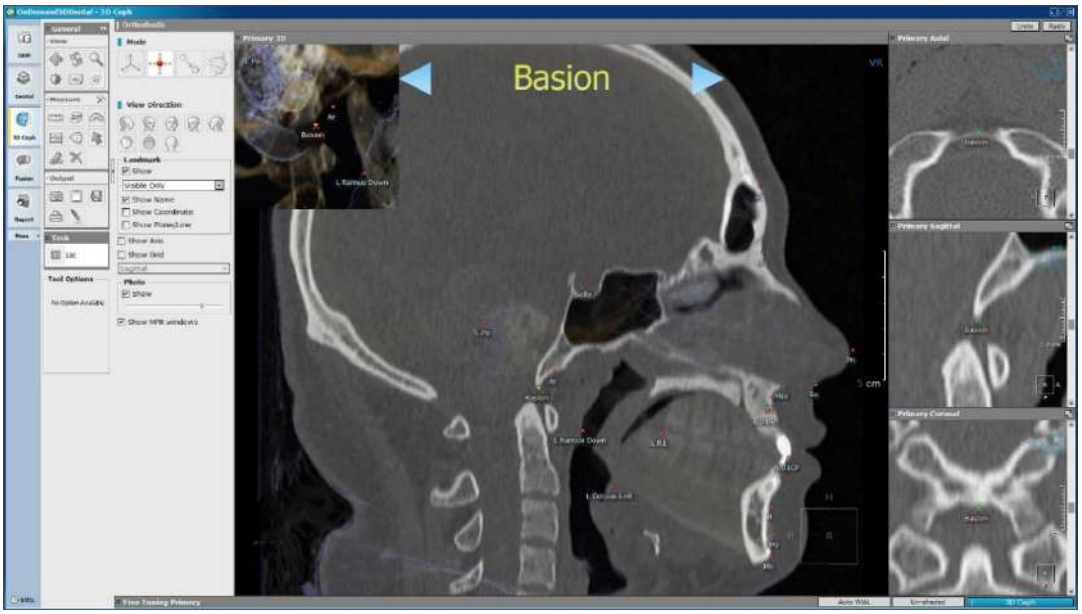


Fig. 338 For landmarks that are seen better on MPR panes, the software shows an MPR overlay on top of the 3D volume. When inputting custom landmarks, the user can use the [View Position] and [Clip Plane] (see Fig. 338) settings to set the corresponding landmarks' ideal visualization settings

Users can also use the Import and Export buttons import and export landmark point, reference and analysis information as OLF or OAF data.

Additional Tools

View Direction

Fig. 339 Select preferred viewing direction

Landmark

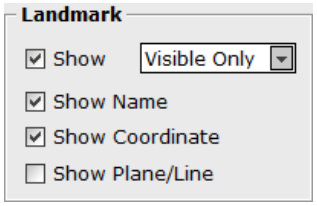


Fig. 340 Landmark

Options for landmarks include [Show All] or [Show Visible Only], as well as settings such as the visibility of the names, coordinates and plane/lines of traced landmark points.

Visibility Settings

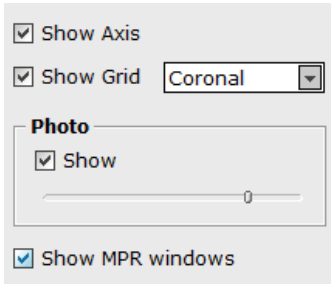


Fig. 341 Set visibility of axis, grid, photo and MPR

Choose to view the axis or grid and the grid orientation.

If the user uses photo mapping, the transparency settings of the photo can be set using the slide bar provided.

The MPR windows can also be hidden if necessary.

Clip Plane

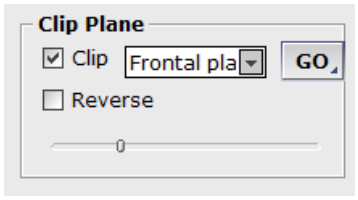


Fig. 342 Clip a plane on 3D Ceph

The [Clip plane] tool allows the user to clip certain planes on the 3D volume according to the tracing done by the user.

Select a plane to clip from the drop down menu. To clip the other side of the plane, check [Reverse].

Click 

to view from an adjusted camera angle and use the slider bar to further adjust the position of the plane.

Fusion Scale

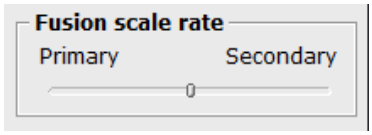


Fig. 343 The scale rate of the two volumes

In case two sets of volume data were loaded onto 3D Ceph, the user can adjust the scale of Primary to Secondary data using the slider bar.

12.5 Dual Volume

3D Ceph can be used to superimpose two sets of data and perform cephalometric tracing. The following is the workflow associated with loading two volumes of data onto 3D Ceph.

First, select two sets of data from DBM, as shown in Fig. 344.

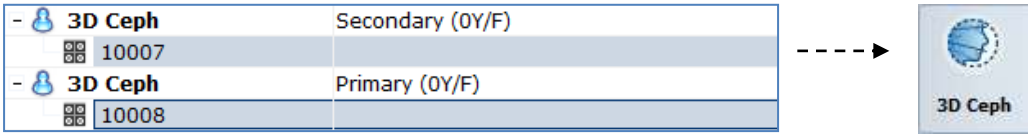


Fig. 344 Select two sets of data using the [Ctrl] key

In the [Loading Options] window, make sure to reselect both data and press [OK].

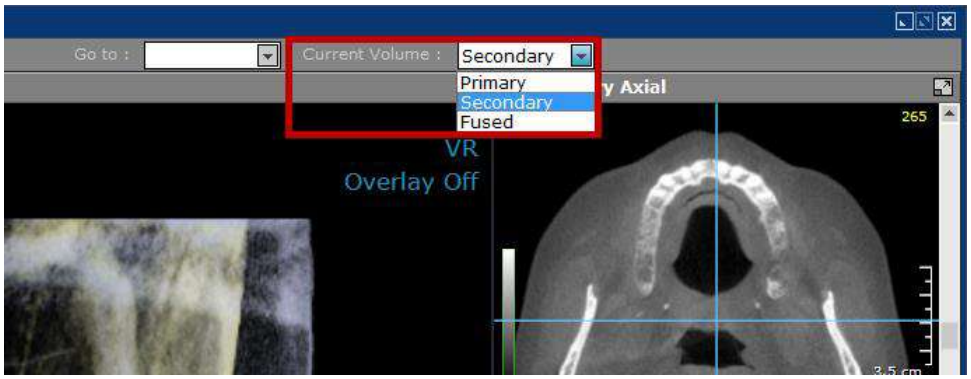


Fig. 345 The software will load the primary data first, allowing the user to switch between primary and secondary using the menu provided on the top right corner. After superimposition, users will also be able to switch to Fused mode.

Press 

to launch the Fusion wizard, as shown below.

Fig. 346 Set which data is Primary and which is Secondary; SWAP if needed

Click 

to proceed with manual registration.

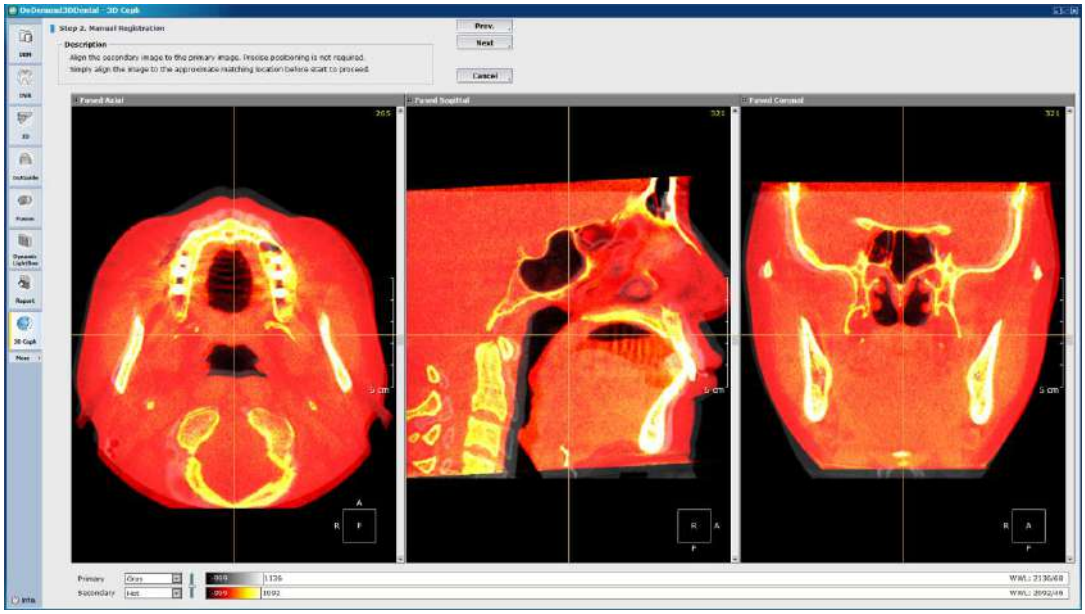


Fig. 347 Use mouse to align; drag or scroll to rotate

Drag Secondary data and use mouse scroll to rotate to align the two volumes.

Click Next again and set the VOI (volume of interest) of the data. The VOI is needed for automatic registration. Adjust the size of VOI box using the axial, sagittal and coronal panes provided. It is recommended to place the VOI in an area of little change, such as the Nasion or Sella.

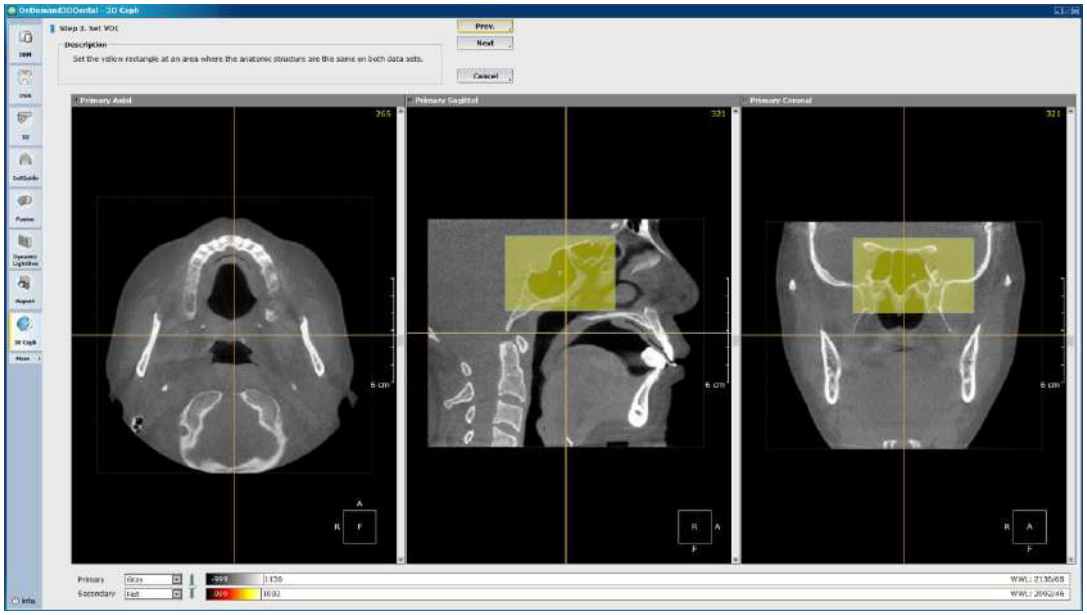


Fig. 348 Set VOI over an area of little change for highest accuracy

TIP	Auto registration will take more time if the VOI is set over a large area and the accuracy of the registration is affected if the area is set too low.

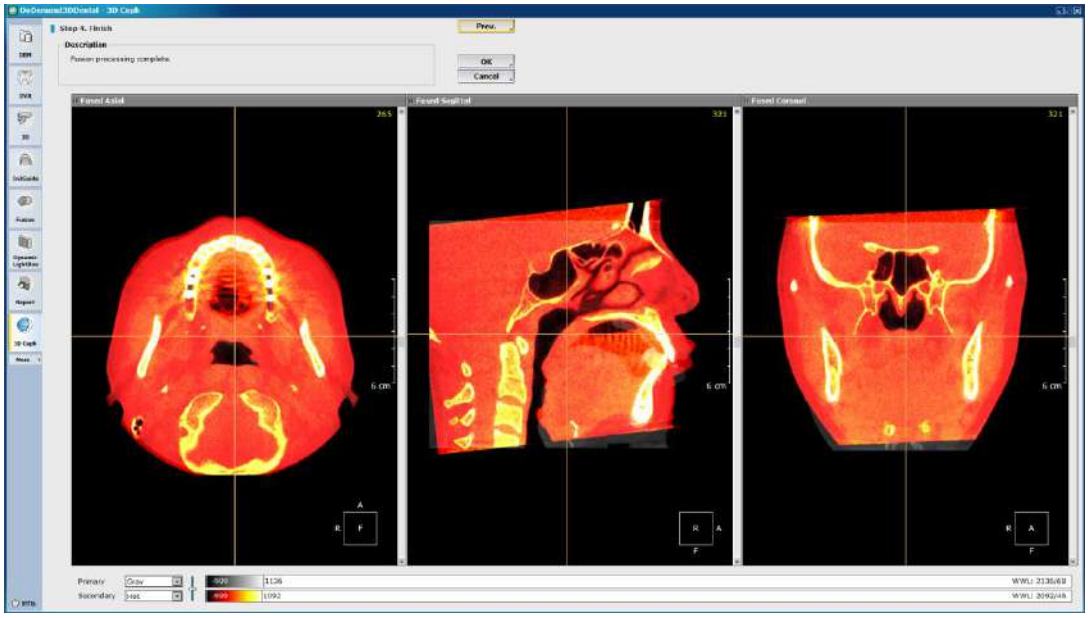


Fig. 349 Automatically registered data

Click Next to proceed with automatic registration and press OK to finish. Users can also go over previous steps with the Prev. button if necessary.

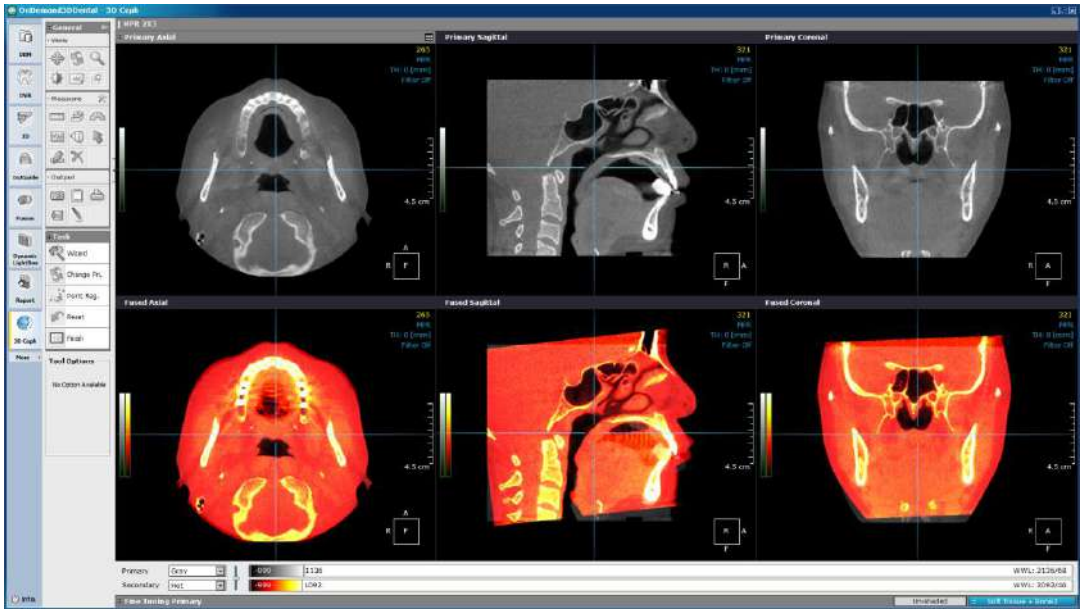
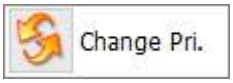
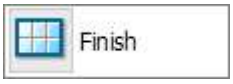


Fig. 350 MPR 2x3 view is generated

The following task tools are available:

Function	Description
	Return to the Fusion wizard.
	Swap Primary and Secondary data.
	Register the two sets of image data using reference points. Landmarks can be used as reference points.
	Reset the orientation of the two sets of image data.
	Finish and go back to 3D Ceph mode.

Click [Finish] to go return to the 3D Ceph main layout.

Proceed with [Reorientation] and [Tracing] as shown starting on page 172 *(☞ Subsection: Reorientation).*

To trace, users can first trace landmarks on the Primary data and click 

from [Task Tools] to copy them onto the Secondary data.

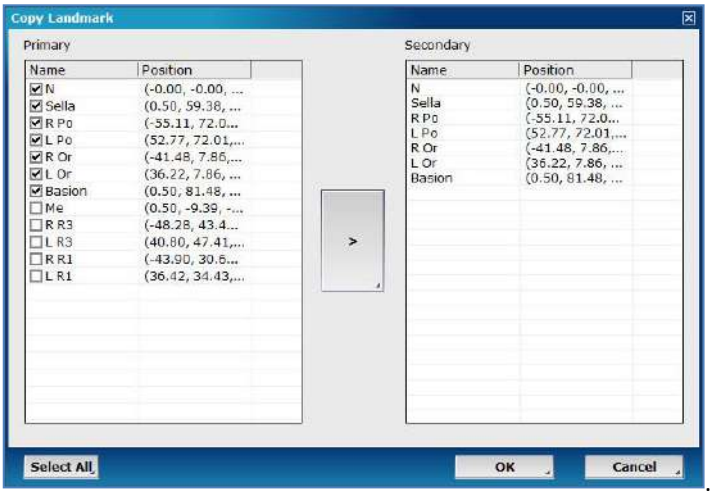
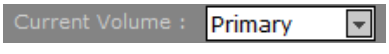


Fig. 351 Check landmarks and use the [>] button to copy over to the Secondary data

To trace on the Secondary data, simply use the 

on the top right corner of the layout and select [Secondary]. Landmarks on the Secondary data can also be copied onto the Primary data.

After the user has reached the  mode, the [Current Volume] can be changed to [Fused] to see superimposed data.

Measurement Formulas

Please refer to pages 219 and 226 *(☞ **Appendixes B for 3D formulas*** and ☞ ***Appendix C for 2D formulas)*** for more information.

13 XImage (Optional)

Integrated database management is a mouse-click away in OnDemand3D™ with the simple and powerful XImage module. Both 2D and 3D data stored in OnDemand3D are integrated into one layout and organized according to modality. XImage has direct acquisition capabilities and can be configured to interface with a variety of devices ranging from X-Ray units to Intraoral sensors. Upon importation, common image files are automatically converted into DICOM format (.dcm) for transmitting to PACS. Support functions such as a selection of customizable Filter Presets along with a variety of image manipulation and measurement tools are also provided.

13.1 Layout

The default layout of XImage consists of eight sections, containing different modalities, for organizing and viewing patient data.

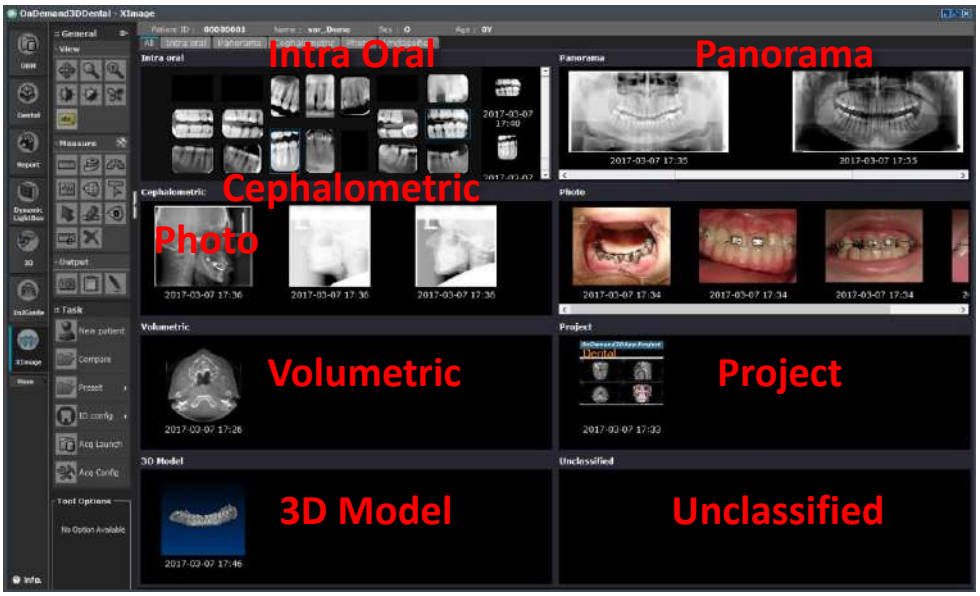


Fig. 352 Each section shown (labeled in red)

The user can view all modalities or view an individual modality by selecting the corresponding tab.

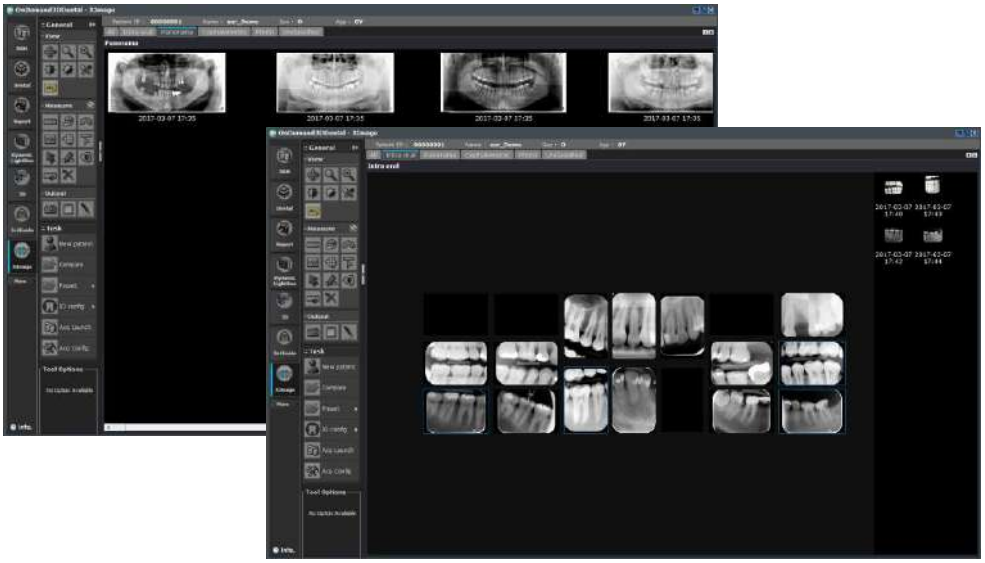


Fig. 353 Intra Oral and Cephalometric tabs shown

Intra oral.

XImage includes a specialized view for Intra Oral data that includes a number of functions unique to this modality section.

Upon first opening a study with a collection of Intra Oral images in XImage, the images will appear as a “stack” in the most upper-left imagebox. *Selecting* an imagebox containing a “stack” will show the contents in the side panel. After each image has been dragged and dropped to the correct location, the allocated locations will be retained upon opening the same study again in XImage.

Fig. 354 Entering New Patient information

Right-Click Menu. The right-click menu for Intra Oral contains 2 extra functions (Acquisition, Diagnosis). Please refer to ***(☞ 13.4 Additional Tools: Acquisition (Sensor/Scanner))*** and ***(☞ 13.4 Additional Tools: Diagnosis)*** for more information.

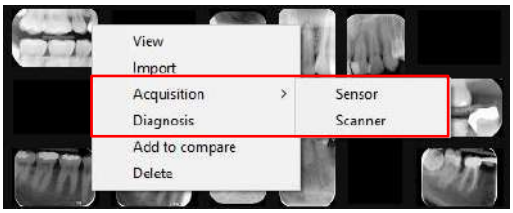
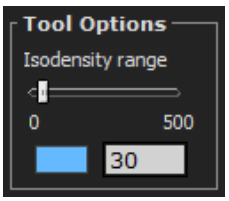
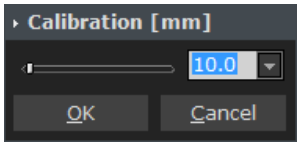
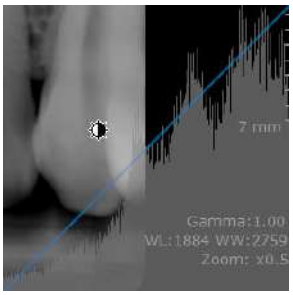
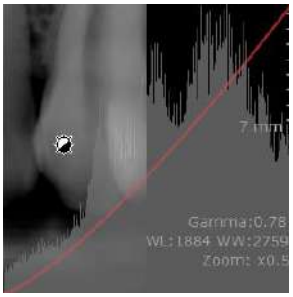


Fig. 355 Right-Click menu for Intra Oral

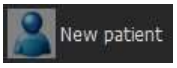
13.2 Tools

The XImage module has five additional special tools in the general section, and four task tools available for use.

Function	Description
	**Magnification.** Hover over region of interest to magnify. Right click to lock the virtual magnifying glass in place. 
	**Isodensity**. Select a range from [Tool Options] and the image will highlight areas with the same density. Choose a different color by clicking on the colored rectangle beside the density range value. 
	**Calibration**. Use the calibration tool to measure a distance between two points and input a corresponding value (mm) for calibration. X-Image will adjust accordingly. 
	**Windowing.** Manipulate the windowing of the image by dragging the cursor and the line's curve will change along with a real-time visual update of the image. The image's histogram and Gamma/Windowing levels will appear in the bottom-right when this tool is activated. 
	**Gamma.** Manipulate the gamma levels by dragging the cursor and the line's curve will change along with a real-time visual update of the image. The image's histogram and Gamma/Windowing levels will appear in the bottom-right when this tool is activated. 

13.3 Task Tools

New Patient.

The 

tool is used for creating a new patient study as preparations for tasks such as an acquisition.
After clicking [Save], XImage's contents will become blank and any previously selected study will be ignored. The new patient study will not be added to the DBM until data is acquired or imported.

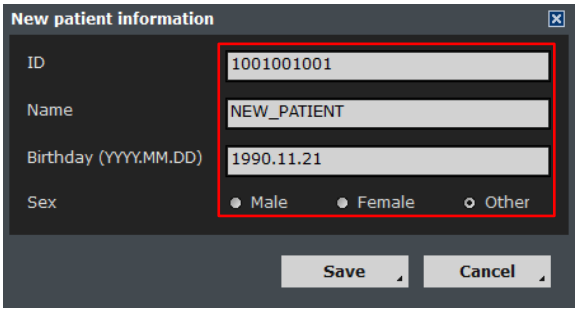


Fig. 356 Entering New Patient information

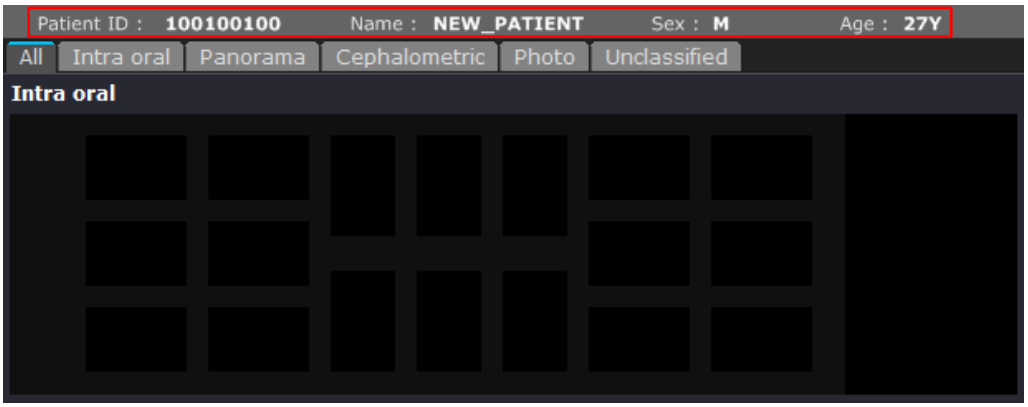


Fig. 357 After creating New Patient, a blank study with no data and the New Patient information

Compare (Compare Viewer).

The [Compare Viewer] can be used to view and compare images from different modalities and even different studies during a single active session. Images need to first be added to the [Compare Viewer] library by using the right-click menu [Add to compare]. Please refer ***(☞ 13.4 Additional Tools: Add to compare)*** for more information.

Opening the [Compare Viewer] by clicking the 

button. The user can compare the images in the library either one by one or side by side by holding [CTRL] or [SHIFT] and selecting a range of images in the side panel with the mouse. Deselecting the images will return to the previous view.
To remove an image from the library, right-click the side panel and select [Delete] or [Delete All].
A selection of Filters are also provided to visually enhance the images upon need.

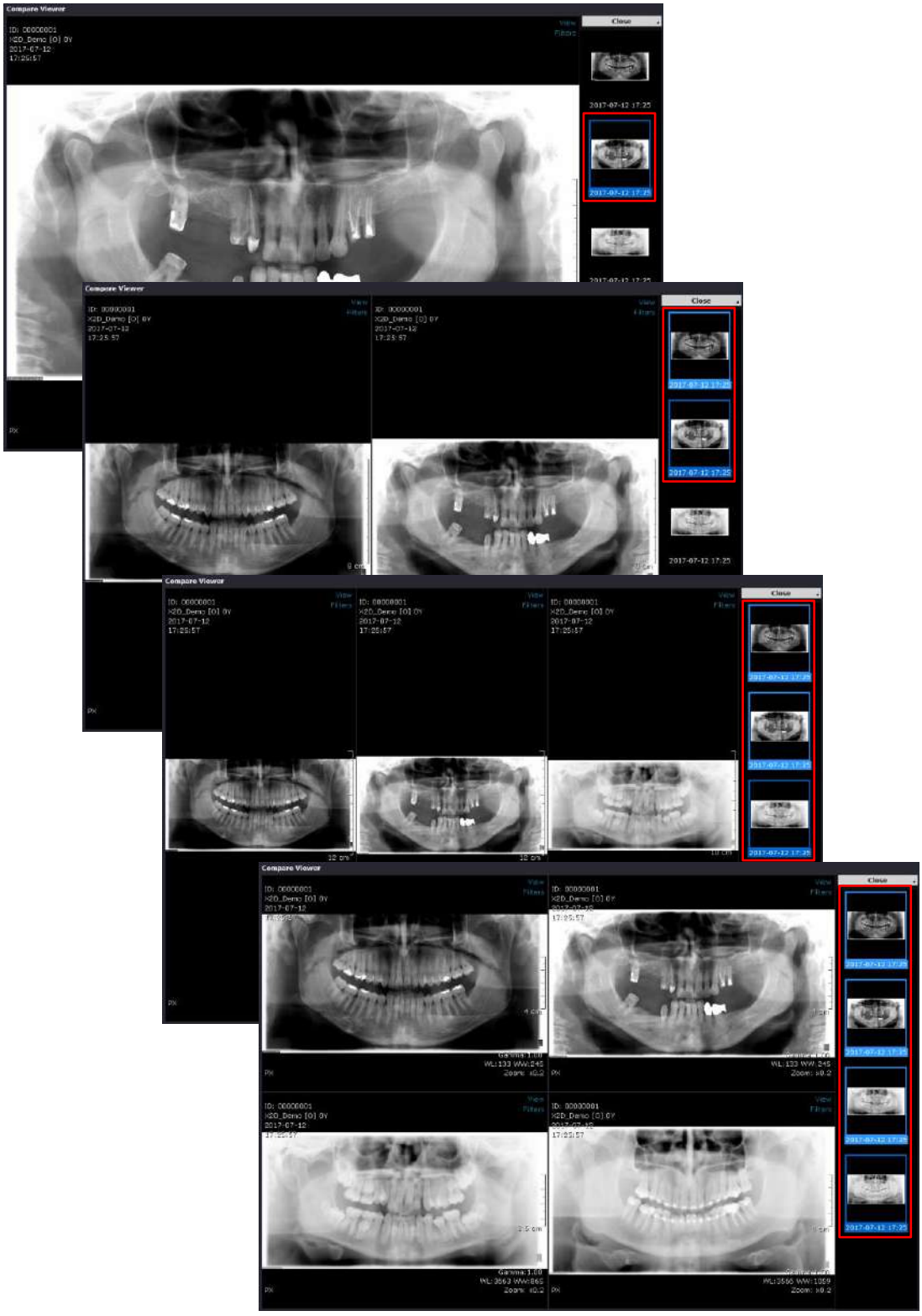


Fig. 358 Compare Viewer – window divides as more images are selected to be compared side by side.

TIP	All general tools and functions such as pan, zoom and rotate (for 3D models only) will work on the [Compare Viewer] and the [Original Viewer] along with measurement tools such as [ruler] and output tools such as [XReport] and [Capture].

Preset (Intra oral, Panorama, Cephalometric).

The 

tool is a powerful center to view the application of multiple filters, customize filter levels, preview and then apply filters by default to the Intra oral, Panorama, Cephalometric modalities.

Simply move the filters between the [Filters used] and [Filters available] sections on the left section, by using the  buttons.

For each filter, up to 3 Parameters can be changed which alters the filter's visual effect (the available range of each Parameter is shown in the section to the right).

Use the 

button to see a comparison of before and after the application of the Filter/s, and 

to add the filter/s to the default view of the specific image modality.

Each modality (Intra oral, Panorama, Cephalometric) has its own section that can be accessed by selection on the Task Tools menu or by the tabs above the lower section of the Preset Setting window.

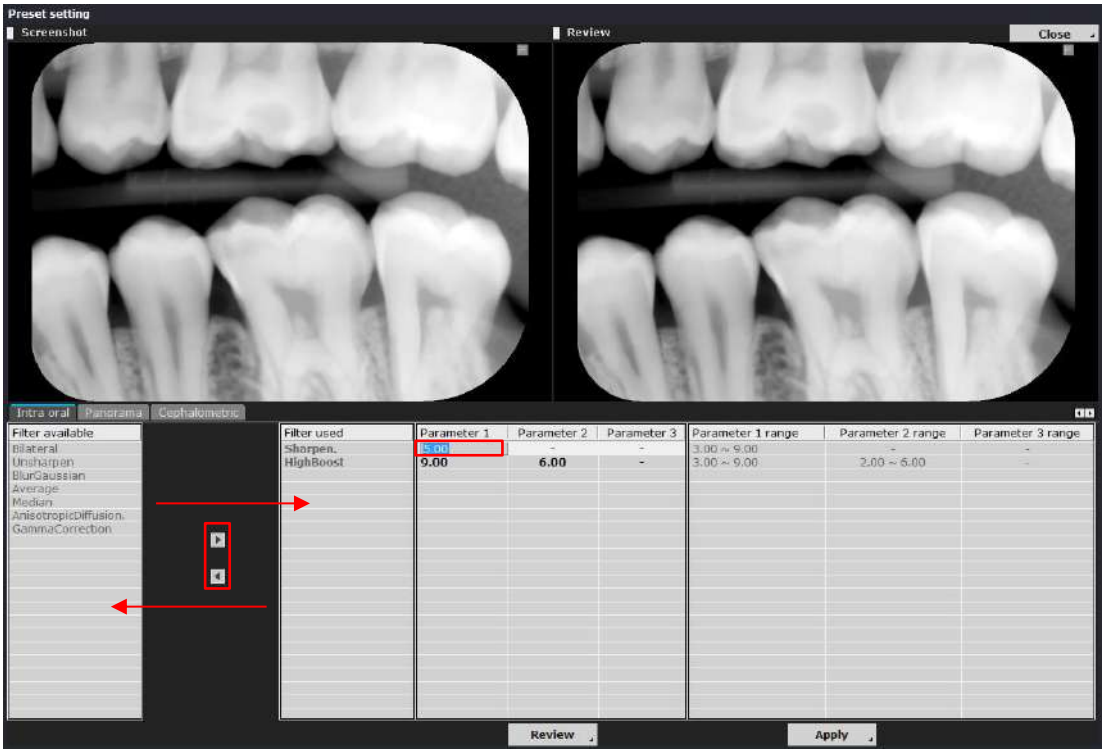


Fig. 359 Preset Setting layout

Fig. 360 Preview after pressing [Review] button

IO Config.

Click 

to configure:

Scanner. Intraoral Scanner is configured by entering the IP address of the Scanner unit. The IO Scanner acquisition process is activated by selecting [Acquisition]>[Scanner] fron the right-click menu on the Intra Oral pane or tab in XImage.

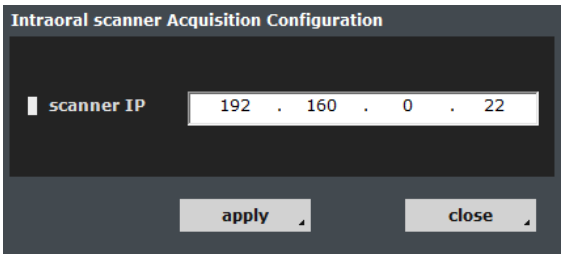


Fig. 361 Intraoral Scanner Acquisition Configuration by IP address

Acq Launch.

After a path to the Launcher program has been set up using the [Acquisition Configuration] tool, simply click 

to launch the program for data acquisition.

Fig. 362 OnDemand3D™ executes the Launcher Program to jumpstart the acquisition

Acquisiton Configuration.

Configure OnDemand3D™ to directly acquire from imaging devices using the 

tool. There are two main protocols to choose from.

TWAIN. XImage makes use of TWAIN, an "applications programming interface (API) and communications protocol that regulates communication between software and digital imaging devices" such as image scanning devices.

The configuration for this protocol is shown in the image below. Detected TWAIN protocol devices will be listed in the [Device Information] section, and the user will be able to allocate devices to the appropriate sections using the [Select Device] menu.

Input width and height calibration info for the device if needed.

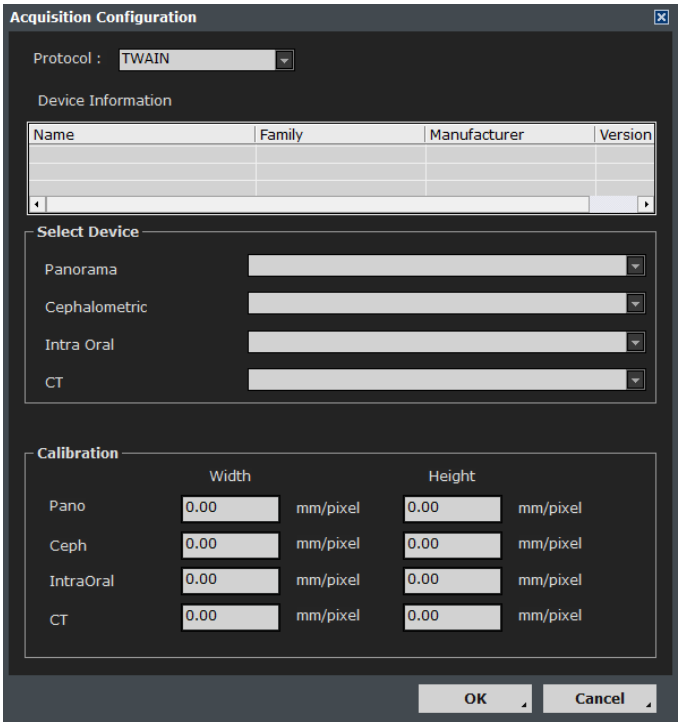


Fig. 363 Fill in information to set up

Launch. Another option is to use [Launch] to integrate OnDemand3D™ with a launcher. Choose the equipment manufacturer and set up the launch file path. Then set up image path designations.

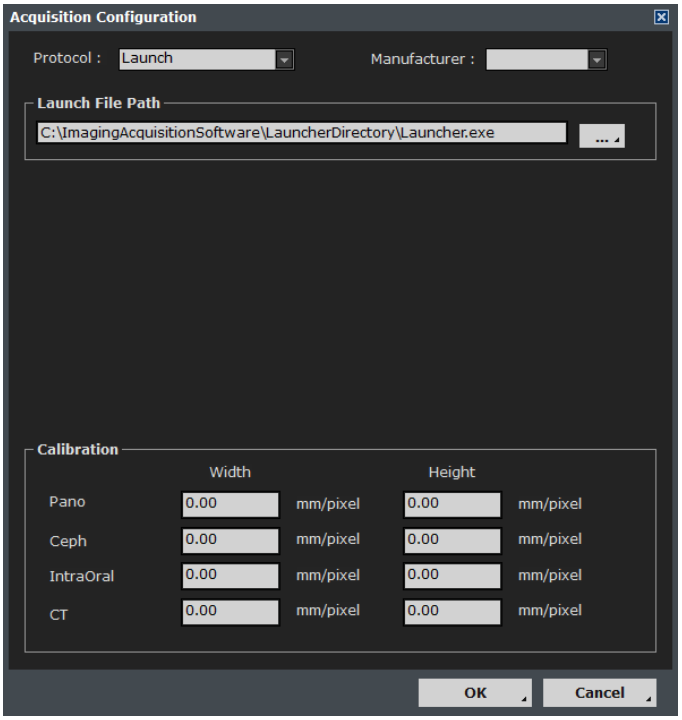


Fig. 364 Select Manufacturer and set up launch file path

When the launcher program processes images and saves them in a designated folder, OnDemand3D™ acquires them using the paths set up by the user.

13.4 Additional Tools

View (Original Viewer)

Opens the Original Viewer with all images that are highlighted in blue, by “toggle” style selection. Viewer (Original Viewer) can be activated by right-clicking and selecting View or double-clicking an image.

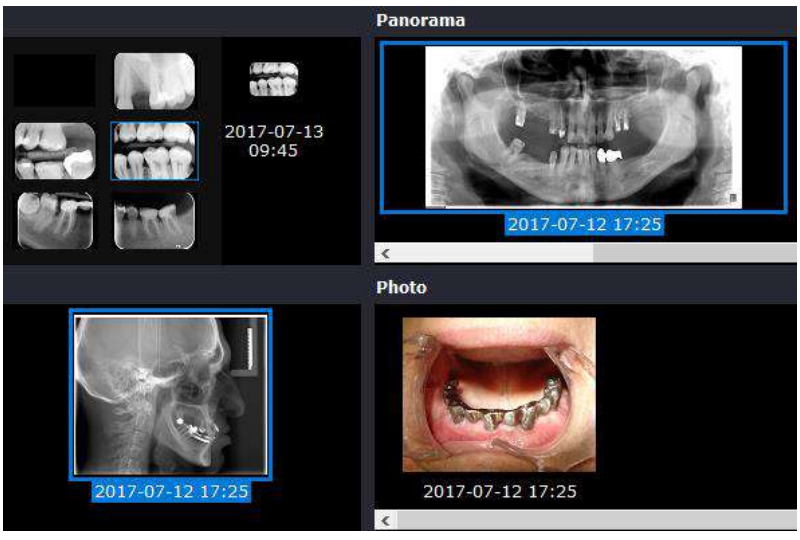


Fig. 365 All selected images that are highlights in blue are added to the Original Viewer

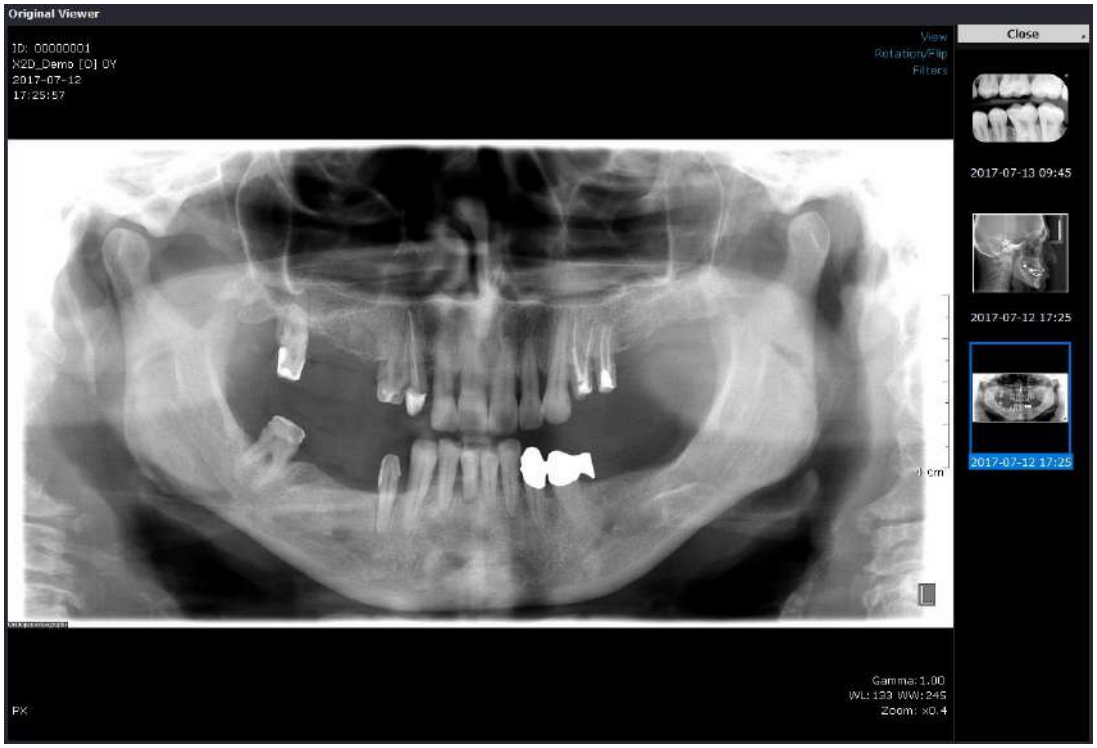


Fig. 366 Original Viewer with one image selected

TIP	The same Side by Side comparison method used for *Compare (Compare Viewer)* can be used for *View (Original Viewer).*

Import

Use the Import tool to add any additional patient data such as image (DCM, JPG, BMP, PNG, TIF) and 3D Model (STL, PLY, PCM) to the study. Any image or 3D Model that is imported with XImage is wrapped in a DICOM header and saved as standard DICOM (.dcm) format that can be transmitted to an external PACS.

Acquisition (Sensor/Scanner) [Intra Oral only]

Acquisition imports Intra Oral image/s into the same Intra Oral imagebox that the right-click was activated from.

To begin an Intra Oral acquisition, right-click and selected [Acquisition] then [Sensor] or [Scanner] according to the desired method of acquisition (as seen below).

Fig. 367 Acquisition menu for Intra Oral (right-click)

Please refer to ***(☞ 13.6 Acquisition Procedures: Sensor/Scanner [Intra Oral only])*** for more instructions.

INFO	Currently the only Sensors and Scanners with full compatibility support are *Ray Medical RIOSensor* and *RIOScan*.

Diagnosis [Intra Oral only]

Right-clicking on an Intra Oral image and selecting Diagnosis will show a Viewer with the original imager in the center, surrounded by 8 images embossed from different directions.

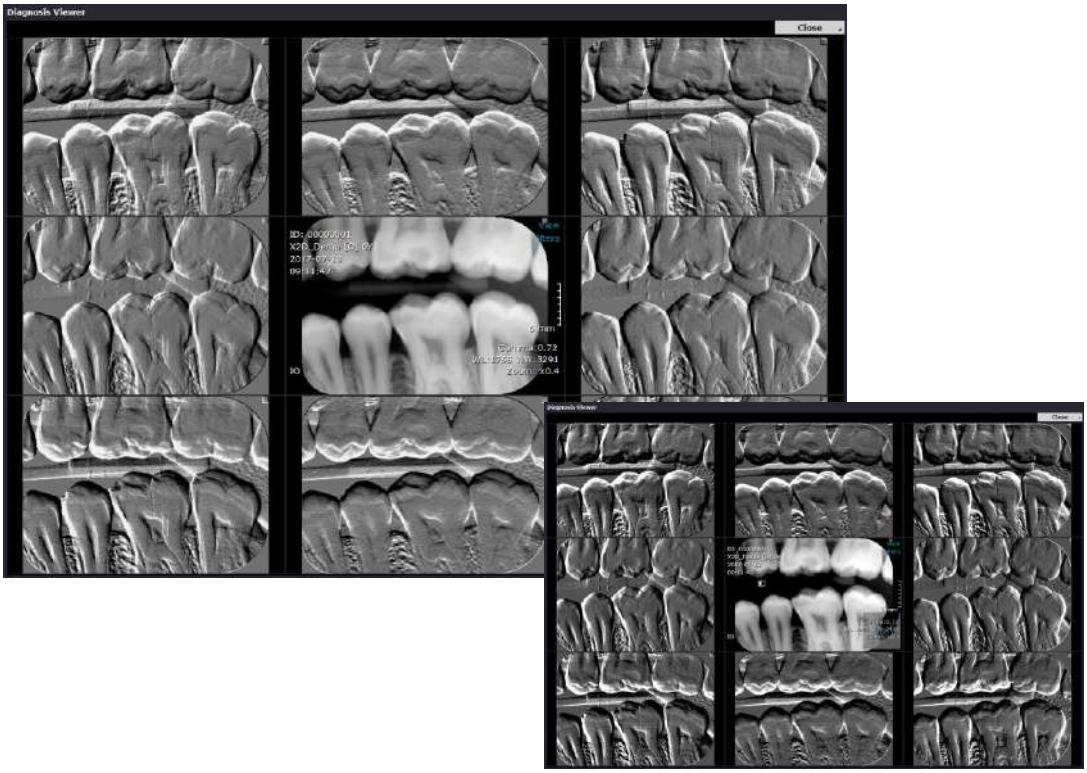


Fig. 368 Diagnosis view with embossed images

TIP	Using the Windowing & Gamma tool on the main image affects the embossing levels of the surrounding images.

Add to compare

Adds the image to the [Compare Viewer] library for viewing. Multiple images from different modalities and even different studies can be added to the library during a single active session. Only the specific image that is right-clicked is added and the previously selected images designated by the highlighted border are ignored. The [Compare Viewer] itself can be opened from the 

Task Tool button.

Please refer to ***(☞ 13.5 Compare Viewer: Compare data from different studies)*** for more instructions.

Delete

Permanently delete image from patient study.

Other

Image Options. In the top right corner of both Viewers are a set of Image option menus to aid and enhance the user's vieweing experience.

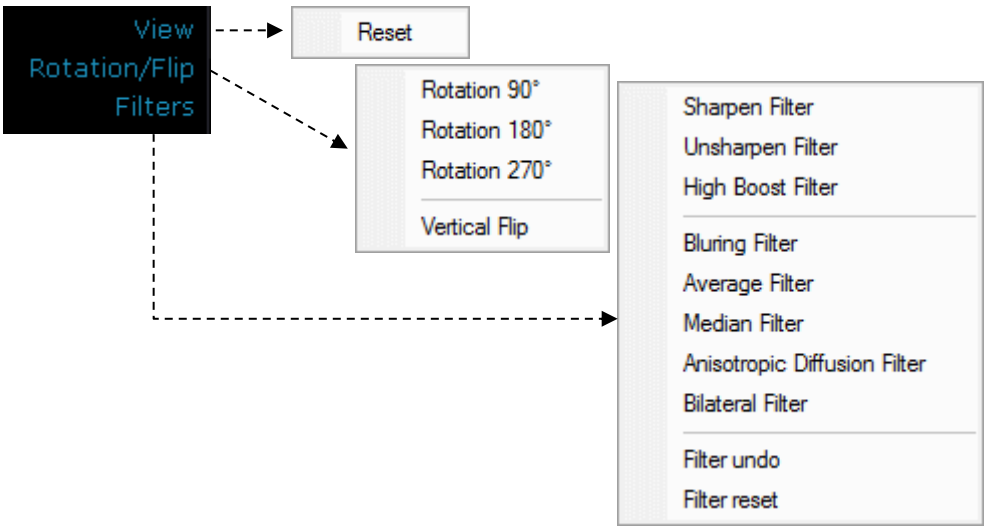


Fig. 369 Image options and available menus

3D Model Viewing. 3D Models can be viewed with Original Viewer or Compare Viewer. Double click on a 3D Model to open up the [Original Viewer] in XImage, or use the right-click menu [Add to compare] and then proceed to open the Compare Viewer with the 

Task Tool button.

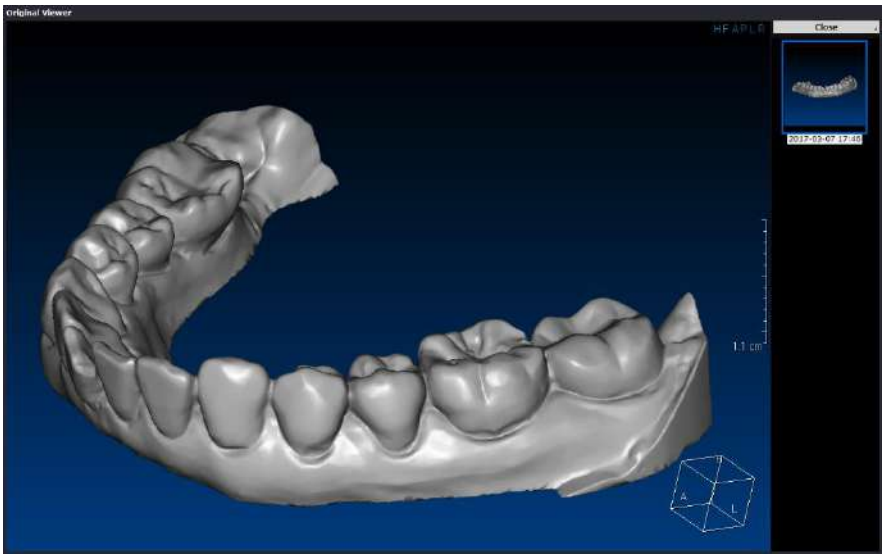


Fig. 370 3D Model mesh in [Original Viewer]

13.5 Compare Viewer: Compare data from different studies

Step 1: Open first study and Add to compare

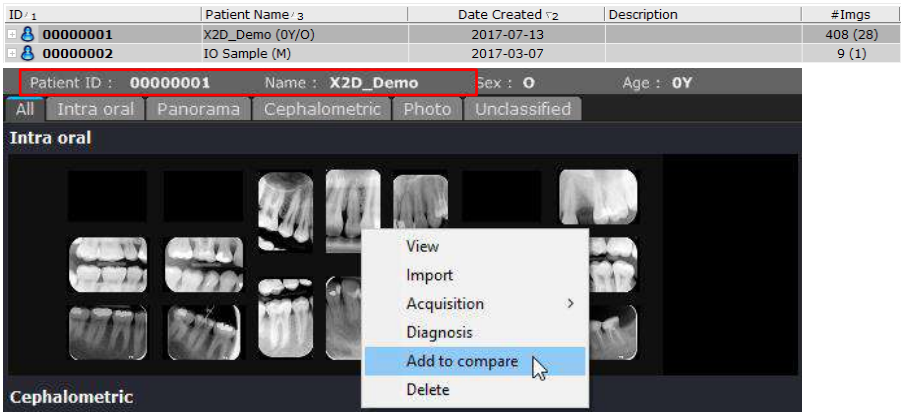


Fig. 371 First study (Patient ID: 00000001)

Step 2: Open second study and Add to compare

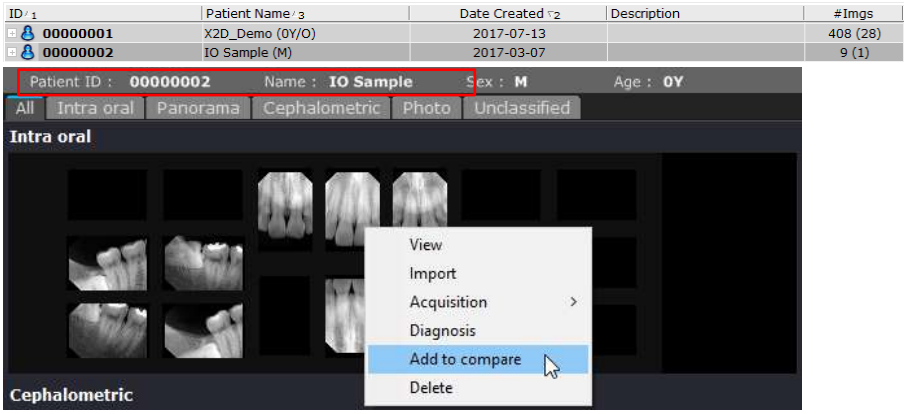


Fig. 372 Second study (Patient ID: 00000002)

Step 3: Select Compare (Compare Viewer) from Task Tools

Step 4: Use Compare Viewer to view and compare data

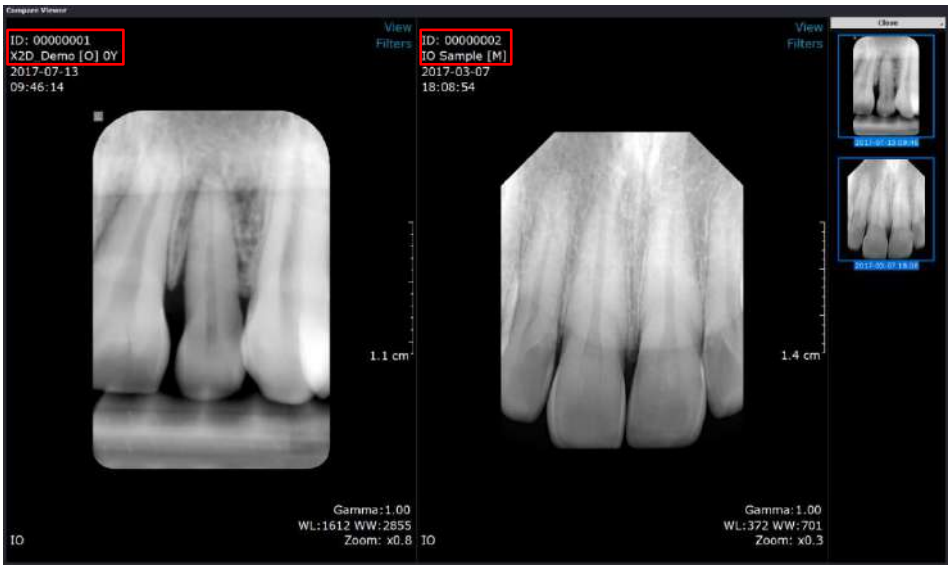


Fig. 373 Comparison of data from the 2 different studies

13.6 Acquisition Procedures: Sensor/Scanner [Intra Oral only]

Sensor Acquisition.

1) Click [Prepare device] button to begin taking an X-ray.
2) When an X-ray is captured, the image is displayed on screen.
3) You can capture multiple images continuously (dotted arrow).
4) When acquisition is complete, click [Cancel device] button.

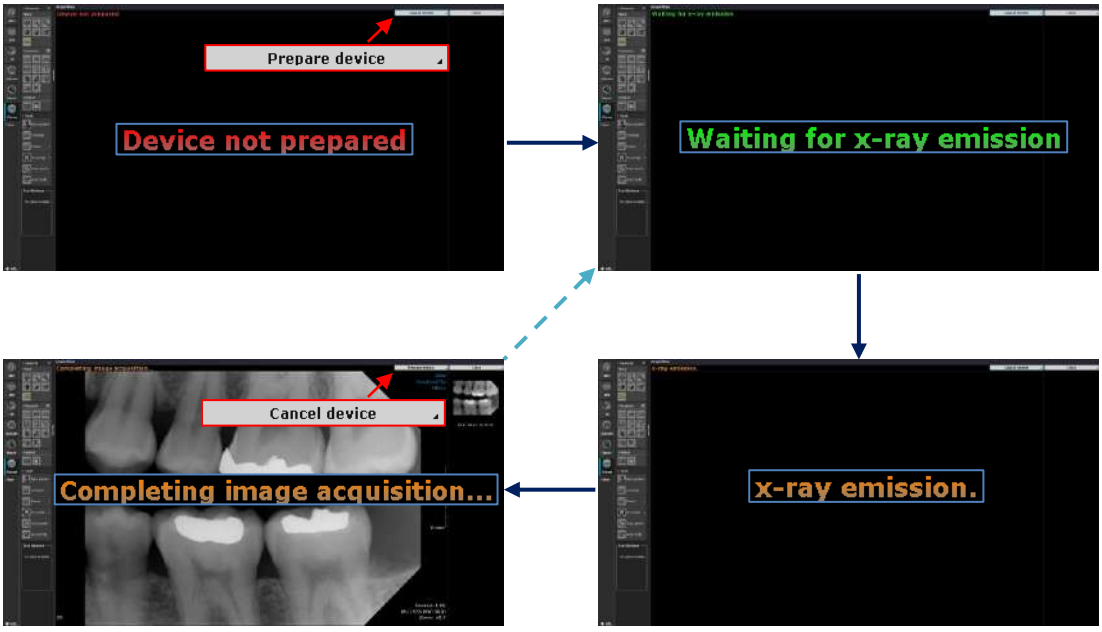


Fig. 374 Sensor Acquisition procedure (dotted arrow represents continuous acquisition)

Scanner Acquisition (Scan).

TIP	Before Acquisition, the Scanner first needs to be configured with the Task Tool button. 

1) Top left corner displays the configured scanner's IP address.
2) Prepare the scanner by clicking the [Scan] button.
3) When “Ready to scan” is displayed, scan the imaging plate with the scanner.
4) The image is displayed on screen when it is scanned.
5) You can scan multiple imaging plates continuously (dotted arrow).
6) When acquisition is complete, click [Stop scan] button.
   (*Should also be stopped on the scanning device)

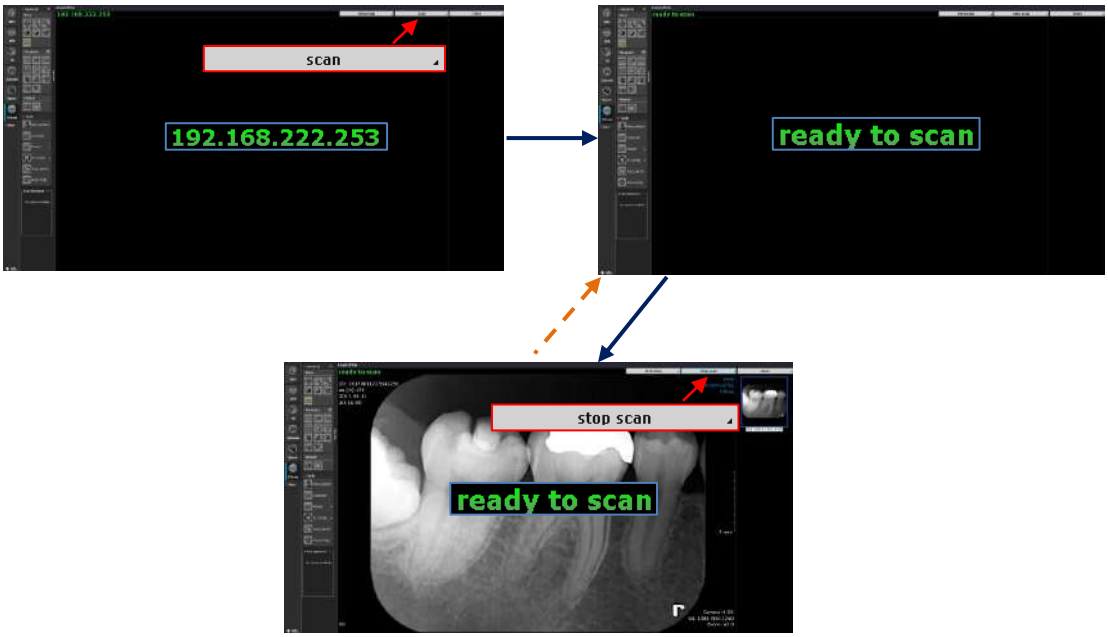


Fig. 375 Scanner Acquisition procedure for Scan (dotted arrow represents continuous acquisition)

Scanner: Browse and Get Image (Quick Scan).

Quick Scan accesses the images stored on the device from a previous scan (independent from XImage invoked acquisition) and allows XImage to browse and save these scans.

1) Click [browsing] button to begin *Quick Scan*.
2) After scan has completed, thumbnails of the available images will be displayed in the lower panel (horizontally).
3) Select the desired image/s and click [Get selected] to save the image/s from Quick Scan to XImage.
4) Once the selected image/s have been saved, they will be displayed in the left panel (vertically).

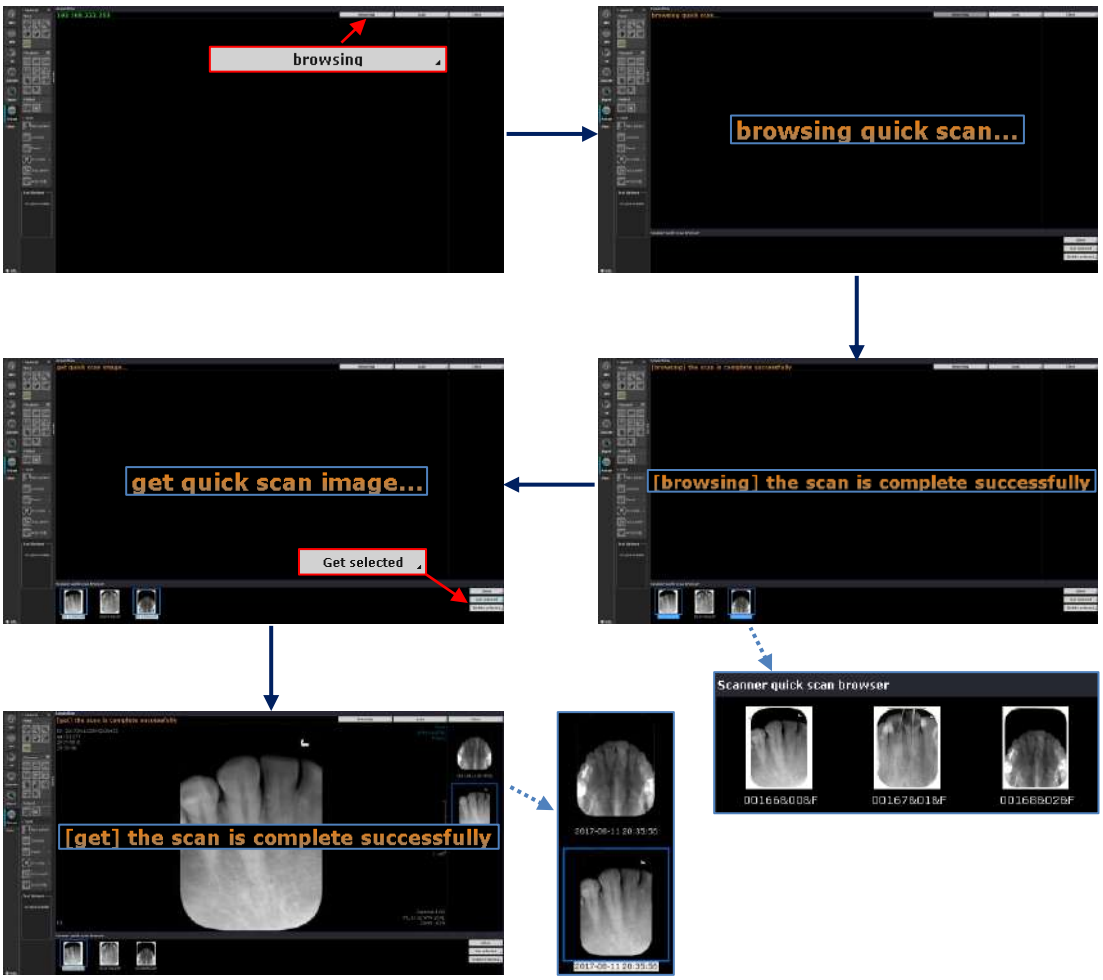


Fig. 376 Browse and Get image procedure for QuickScan

Scanner: Delete Image (Quick Scan).

1) After saving, select the desired image/s and click the [Delete selected] button.
(*Scan will remain on the device if it is not deleted)

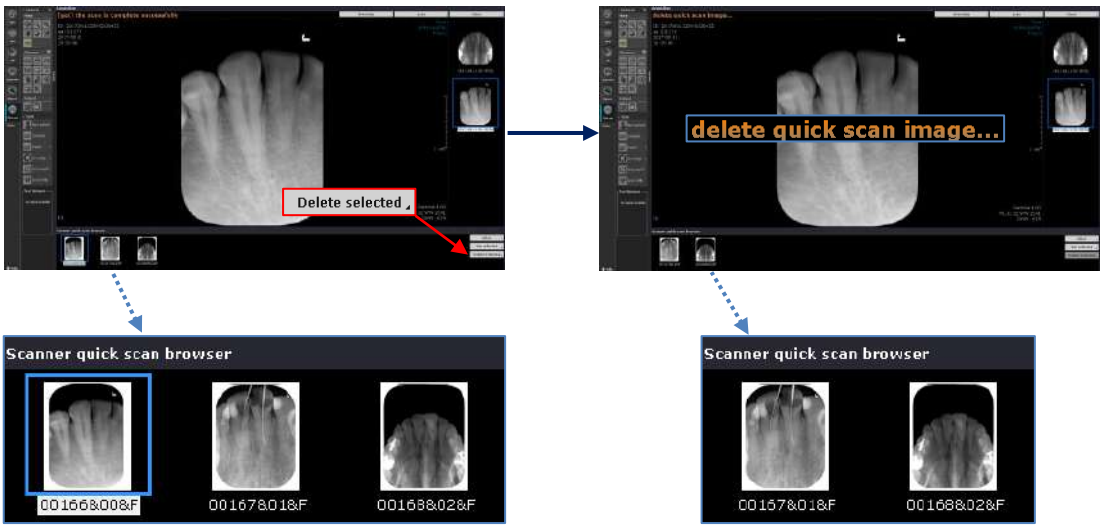
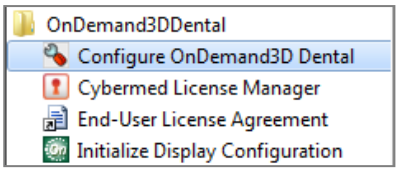


Fig. 377 Image deletion procedure for QuickScan

14 Other Utilities

14.1 OnDemand3D™ Dental Environment Settings

Go to [Start] menu -> OnDemand3DDental -> Configure OnDemand3D Dental to make changes to the Environment Settings of OnDemand3D™ Dental.



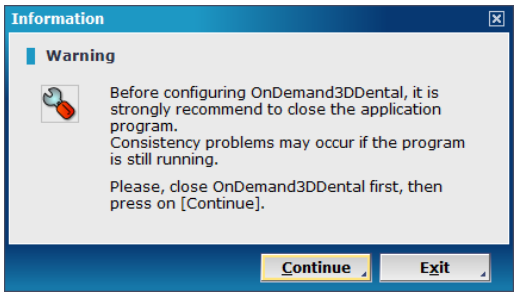


Fig. 378 Make sure the application is closed before continuing

There are a total of five menu options available in the Environment Settings window: [Database Engine], [DICOM Settings], [DBM], [Miscellaneous] and [MPR Options].

Database Engine

Configure Database Engine. The default database engine for OnDemand3D™ Dental is MDE (Microsoft Database Engine). Users have the option to switch to MS-SQL. Unless the contents in the [Master Database] exceed 2GB, it is recommended to use MDE.

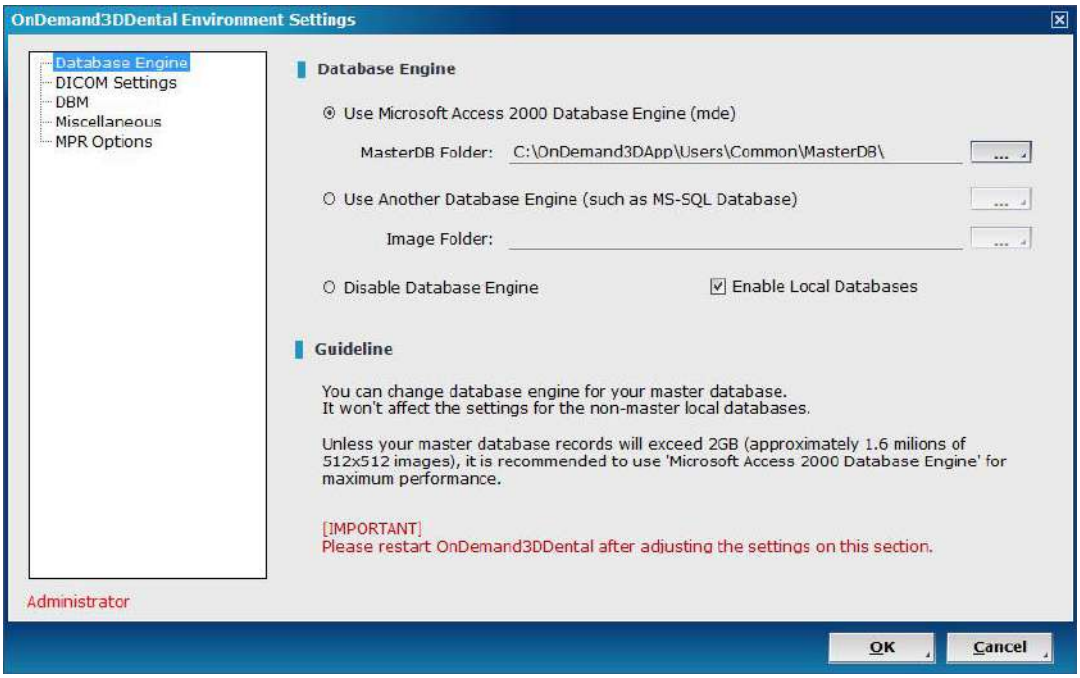


Fig. 379 [Database Engine] settings

Function	Description
Use Microsoft Access 2000 Database Engine (mde)	The default database engine for OnDemand3D™ Dental is MDE (Microsoft Database Engine). Users have the option to switch to MS-SQL. Unless the contents in the [Master Database] exceed 2GB, it is recommended to use MDE.
Use Another Database Engine (such as mS-SQL Database)	To switch database engine: • Install MS-SQL Server (Express) software • Create a new Database for OnDemand3D™ Dental in the MS-SQL Server (Express) • Select second option [Use Another Database Engine (such as MS-SQL Database)] • Create a path to the database in the MS-SQL Server (Express).
Disable Database Engine	Click to disable default data source - [Master Database]. In case default data source - [Master Database] is disabled, make sure to enable [Start to OnDemand3D Gate Server] see page 209 (☞ ***OnDemand3D™ Dental Environment Settings: DBM).*** To set [OnDemand3D-Server] as the data source.
Enable Local Databases	Local databases are enabled by default. Uncheck to disable.

DICOM Settings

Configure DICOM SCP and log storage settings.

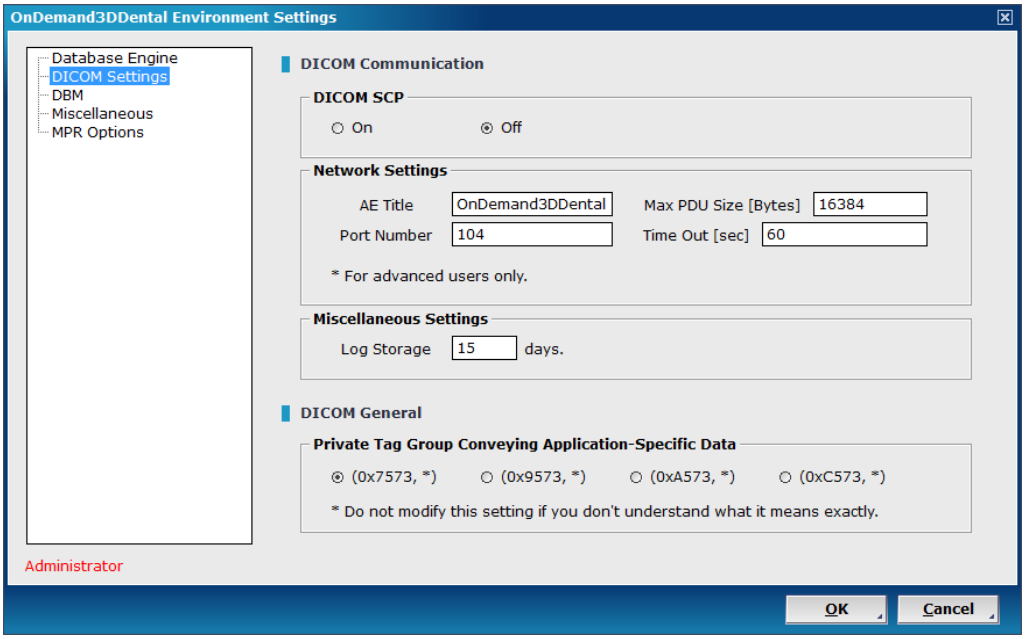


Fig. 380 Configure DICOM settings

Function	Description
DICOM SCP	Turn on/off the DICOM SCP process. DICOM SCP is off on default.
Network Settings	DICOM SCP settings: AE Title, Max PDU Size, Port Number, and Time Out.
Miscellaneous Settings	Set Log Storage days.
Private Tag Group Conveying Application-Specific Data	Binary address of private tag group conveying Application-Specific Data.

DBM

Configure settings for the DBM module.

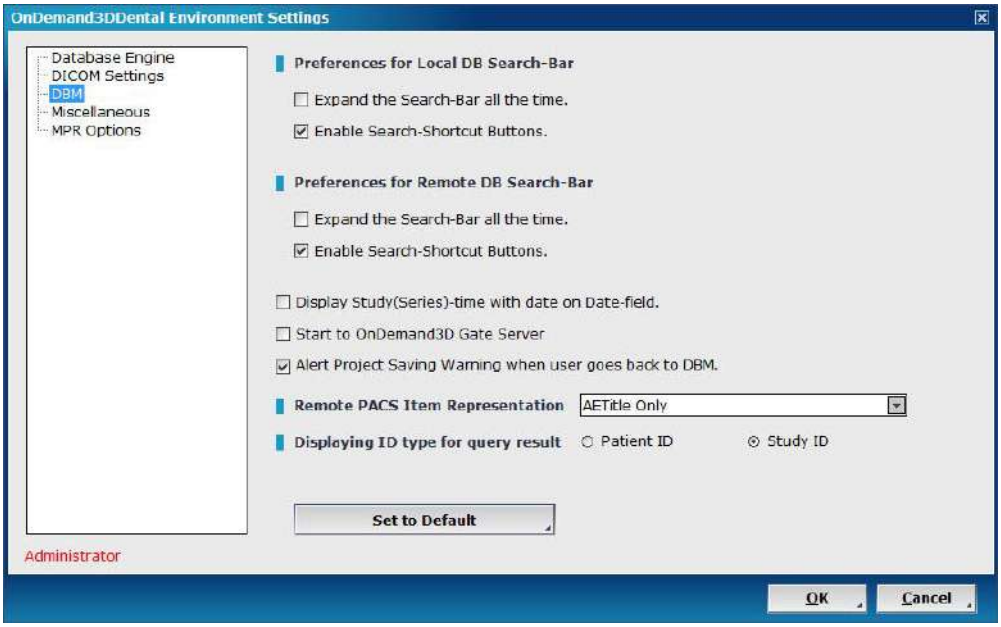


Fig. 381 DBM module settings

Users can set their preferences for their local and remote database UI using the menu above.

Function	Description
Expand the Search-Bar all the time.	Set the search bar to be expanded all the time when OnDemand3D™ Dental is run.
Enable Search-Shortcut Buttons	Enable search shortcuts and select how many to display.

Display Study(Series)-time with data on Date-field	Display date only or display date with time in DBM.
Start to OnDemand3D Gate Server	Set default data source for OnDemand3D™ Dental. The default data source is [Master Database]. If this field is checked, [OnDemand3D-Server] will be set as the data source.
Alert Project Saving Warning when user goes back to DBM	Enable [Save this Project?] alert message when user clicks on DBM while still working on a different module.
Remote PACS Item Representation	AETitle Only / Description Only / AETitle + Description
Displaying ID type for query result	'ID' in query results refers to either Patient ID or Study ID.

Press Set to Default to go back to original settings.

Miscellaneous

Configure miscellaneous GUI (Graphical User Interface) settings.

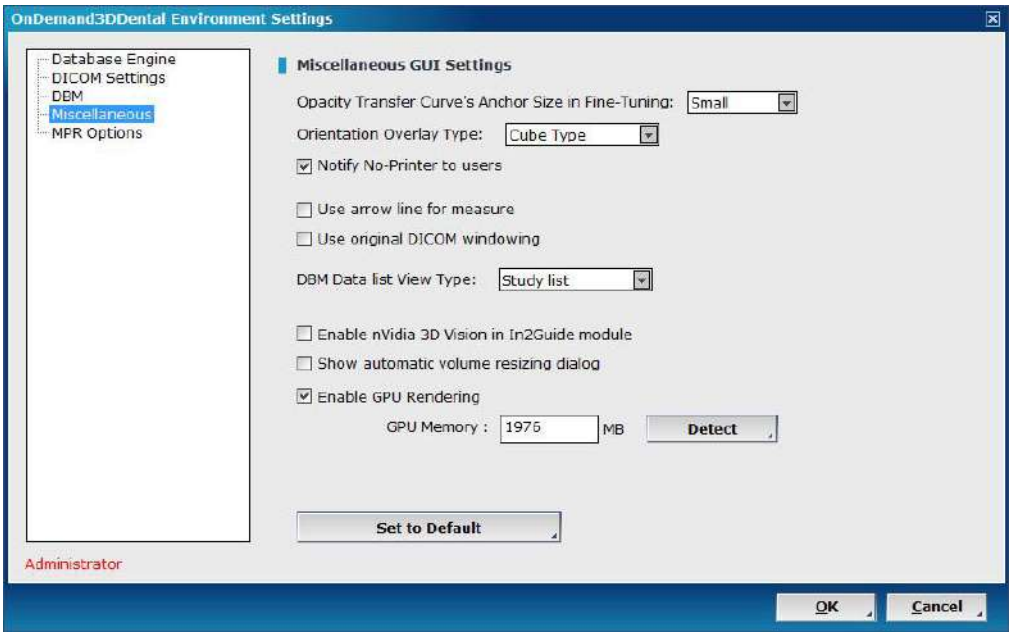


Fig. 382 [Miscellaneous] configuration

Function	Description
Opacity Transfer Curve's Anchor Size in Fine-Tuning	Adjust the Opacity curve anchor point size. Small / Middle / Large
Orientation Overlay Type	Orientation overlay in 3D view. • Cube Type (**H F A P L R** mark on each side) • Arrow Type (X, Y, Z coordinate lines)
Notify No-Printer to users	Display [No-Printer] warning message in Report module when Printer is not set.
Use arrow line for measure	Enable/disable arrow shaped annotations for measurements.
Use original DICOM windowing	Use original WL (Window Level) and WW (Window Width) values
DBM data list View Type	Select whether to view by patient or study.
Enable nVidia 3D Vision in In2Guide module	Click to enable nVidia 3D Vision, an option for the In2Guide module.
Show automatic volume resizing dialog	Display volume resizing warning message when loading big size data.
Enable GPU Rendering	Turn on/off GPU Rendering. GPU is disabled by default. Check to enable GPU rendering. Click Detect to calculate available video memory on hardware. Warning appears when GPU is low.

Press Set to Default to go back to original settings.

MPR Options

Configure settings for MPR images, such as slice thickness, slice thickness limit and image size limits.

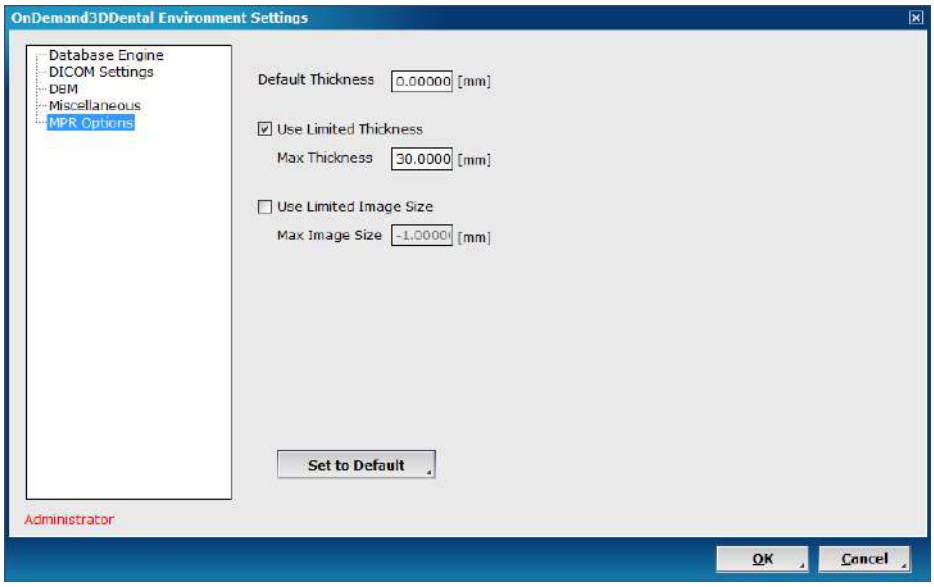


Fig. 383 MPR options

14.2 Initial Display Configuration

Users can set preferences for multi-monitor use by going to [Start] menu -> [OnDemand3DDental] -> [Initialize Display Configuration].

To modify the default layout click on the monitor icons. Users will be able to enable or disable screens and set one screen to display rows and columns by selecting [Modify Layout].

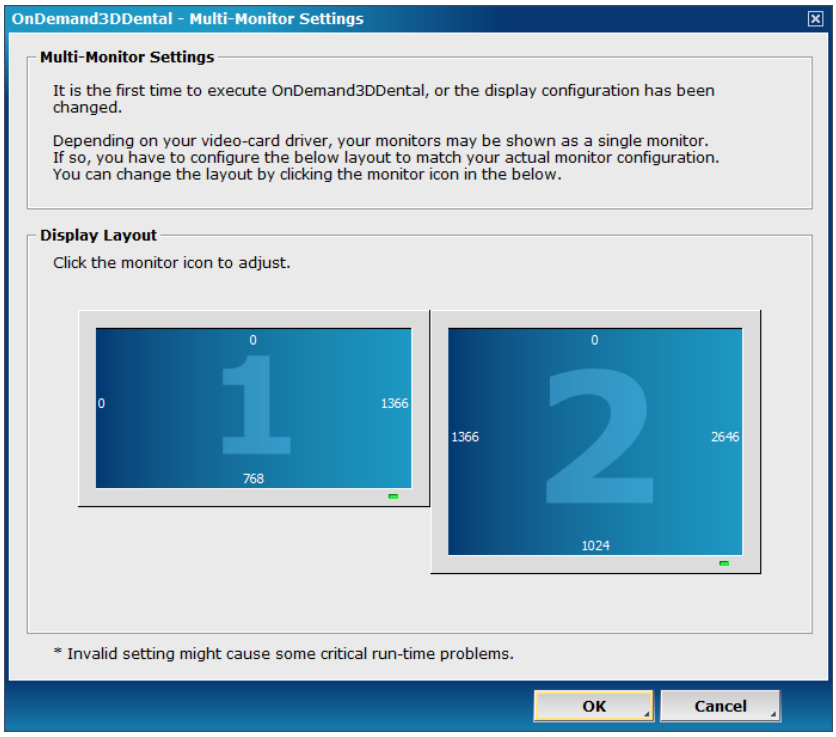


Fig. 384 Multi-monitor settings

Appendix A: Fine Tuning

The 3D renderings on OnDemand3D™ are based on the [Fine Tuning] settings of density range, color, and opacity. The [Fine Tuning] bar can be found along the bottom of the screen. Tap the gray [Fine Tuning] bar to expand or shrink.

Fig. 385 The [Fine Tuning] bar

A.1 Object List

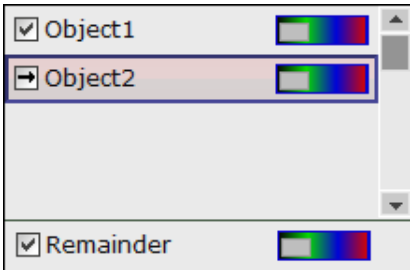


Fig. 386 The [Object List] displays the objects in the 3D volume. Users will be able to rename, delete the object by right-clicking. Also click on the color bar and change color and transparency settings if needed.

Change [Color Tone] and [Transparency]. Click once on the color bar beside object name and the user will be prompted with a pop-up menu. The default settings are [Opaque] for transparency and [Original] for color tone.

[Save] and [Load] Object Items. Object list items can be saved as MKL (Mask List Files) data with the  icon and loaded using the  icon right beside it.

A.2 Fine Tuning Functions

Manually adjust settings using the Color (upper), Fine Tuning (middle) and Windowing (bottom) bars.

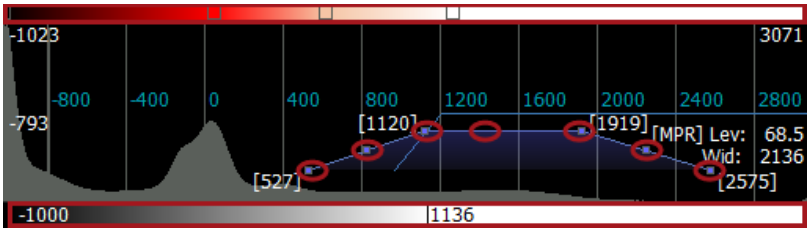


Fig. 387 [Color], [Fine Tuning] and [Windowing] bars

Fine Tuning Bar. The [Fine Tuning] bar in the middle represents density and opacity levels. The X axis defines density values and the Y axis defines opacity values. Any of the points circled in red

in the above image, can be used to drag and make changes to the trapezoid-like shapes, which represent the X, Y axis values.

Right-click on an opacity setting (trapezoid), and see the following menu:

Function	Description
Add Opacity	Add an Opacity setting (trapezoid).
Delete Opacity	Delete selected Opacity setting.
Edit Opacity	Edit selected Opacity setting.
Duplicate Opacity	Duplicate current Opacity setting.
Load from Preset	Load from a previously saved Opacity settings.
Save to Preset	Save current Opacity settings as a Preset.
Auto-Fit	Auto-fit to display the whole [Fine Tuning Bar].
Load ColorMap	Load a previously saved Color Map to apply to current Opacity settings
Save ColorMap	Save the current Color Map as a Preset.

Fig. 388 Additional options

Color Bar.

The [Color Bar] adjusts the color settings of the corresponding opacity levels. Click on the rectangular control points to make adjustments to the color applied to a certain density value; or right-click anywhere on the Color Bar and select [Add Color Here] to add color to the current location on the [Opacity Bar]. The user can also delete color masks, load and save color maps.

To load a color map, right-click on the [Color Bar], choose [Load Color Map] and select a color map of choice from the provided menu.

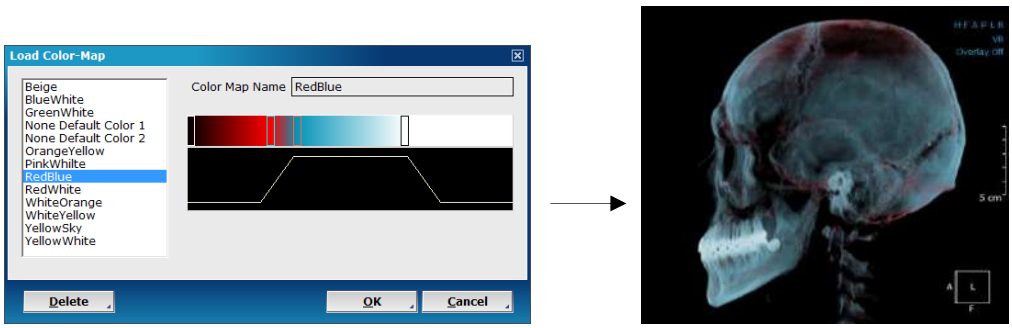


Fig. 389 Object given [RedBlue] color mask

Windowing Bar.

The [Windowing Bar] adjusts the windowing settings of the 2D panes. Click on the bar and drag it to adjust windowing settings. Maximum and minimum values of the windowing settings are shown in the [Windowing Bar]

A.3 Preset Menu

Click the default 

icon to select a different preset. The following dialog should pop up.

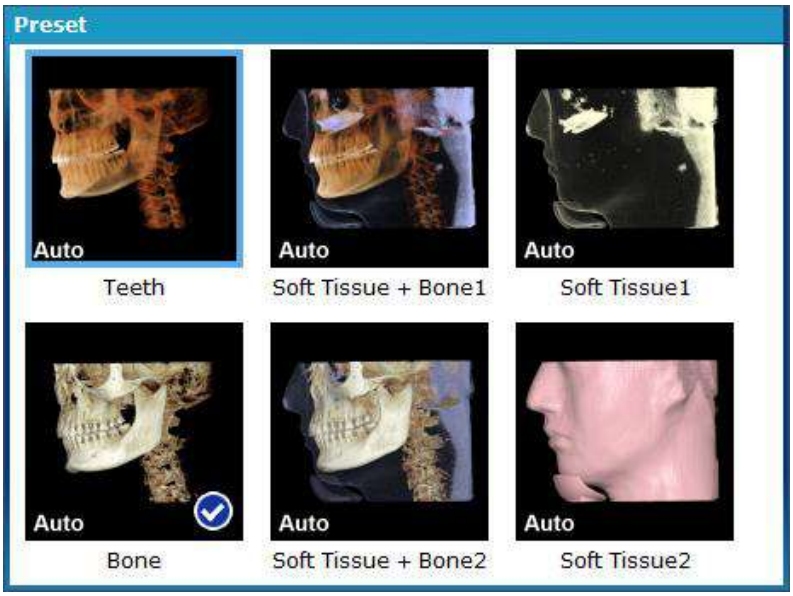


Fig. 390 Select from one of the default presets provided for instant visualization

The presets available by default can be seen applied below in Fig. 391.

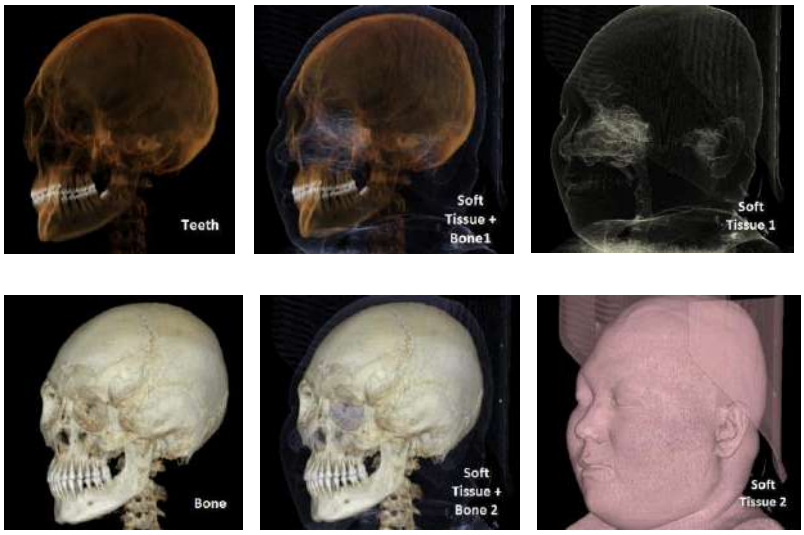


Fig. 391 Comparison of rendering types

A.4 Preset Options Menu

For easier access, users are provided with a quick preset menu for volume rendering options on OnDemand3D™.

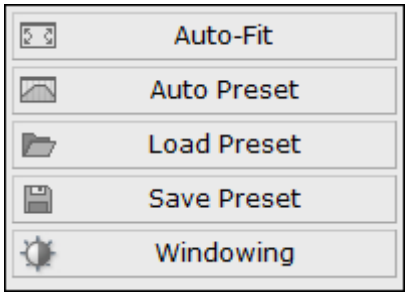


Fig. 392 [Preset Menu]

Auto-Fit. Pressing [Auto-Fit] will shrink the Fine Tuning Bar to be displayed in its entirety, minimizing the need to scroll back and forth.

Auto Preset. Pressing [Auto Preset] will automatically calculate and set appropriate opacity and density values for the chosen rendering type.

Load Preset. Use this tool to load a previously saved preset. The [Choose Opacity Preset] dialog will appear as shown below. Users will be able to load a preset from OnDemand3D™'s library of presets categorized by CT manufacturers, or from the user's own [User Defaults].

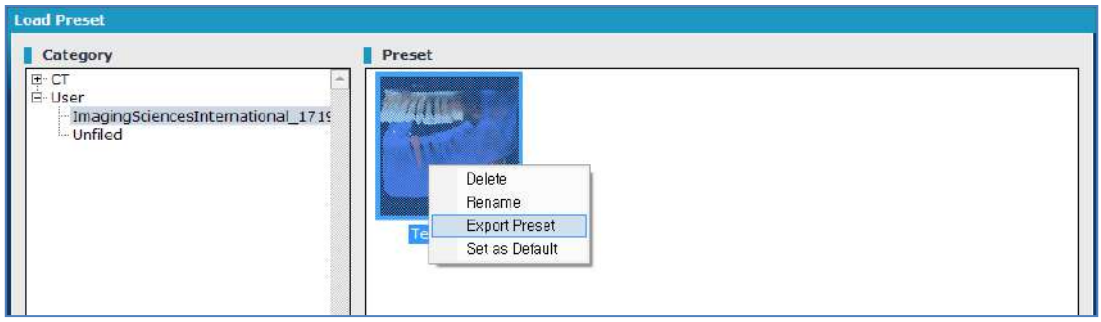


Fig. 393 [Load Preset] dialog

To select a preset, simply click and press [OK].

The user is also able to delete, rename export or set presets as default by right-clicking. New categories and modalities can also be added by simply right-clicking on a category, shown on the left side of the window.

Save Preset. Pressing this will create a new preset with the current fine-tuning value. Use the [Save Preset] window shown in Fig. 394 and give the preset a name, and include a screenshot for easier access. Users will be able to select between a few screenshot options which also include 2D panes.

If the preset is [Set as Default], the same fine tuning values will apply to all data opened on OnDemand3D™ taken with the same equipment as the current preset.

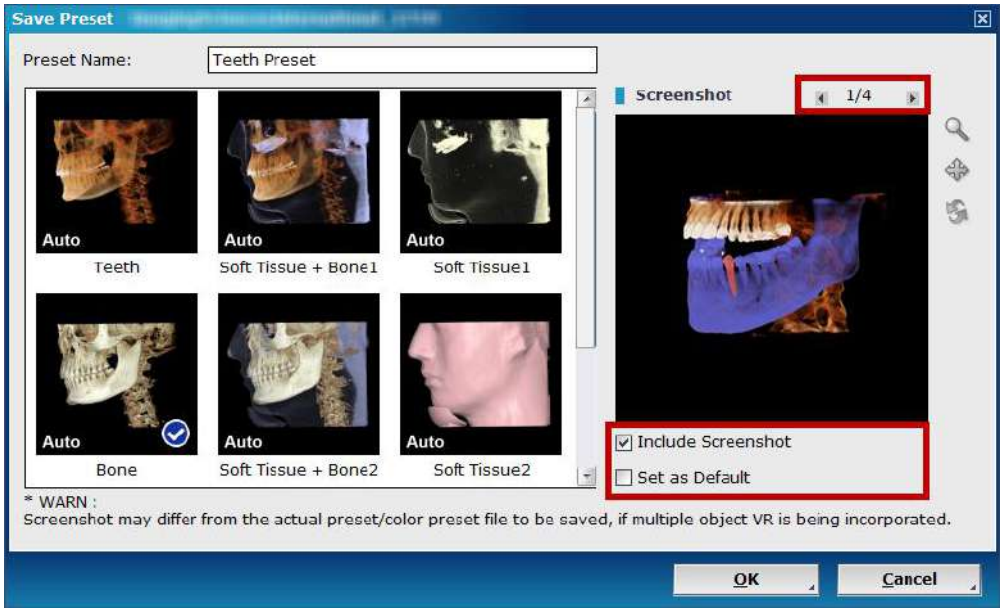


Fig. 394 Give the preset a name and include a screenshot for easier access

Presets saved this way are saved in the [User] category of [Load Preset] and the [User] folder in [C://OnDemand3DDental/Preset]. Each CT equipment model is assigned a separate folder and presets are saved as LPF data in corresponding folders, as shown below.

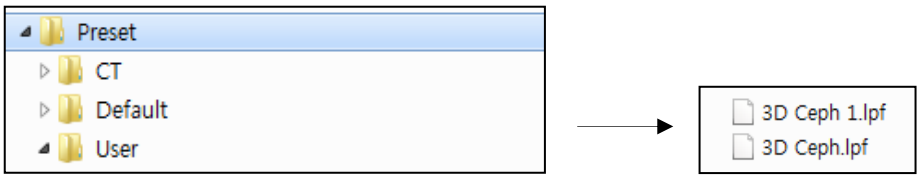


Fig. 395 CT equipment and saved preset files

Scroll down in the [Preset] window, and the user will see saved presets, as shown below.

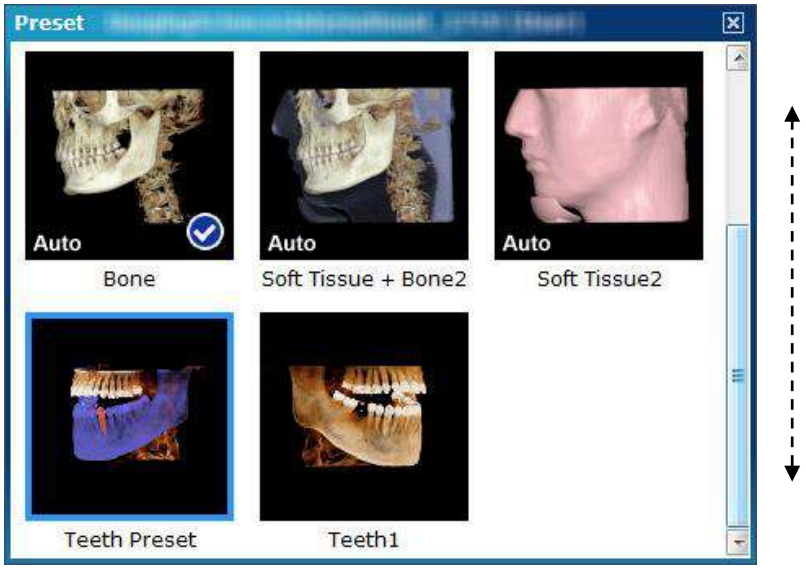


Fig. 396 A new preset shortcut is created

Windowing. The [Windowing] button offers windowing presets available on OnDemand3D™, organized by modalities, as shown below in Fig. 397.

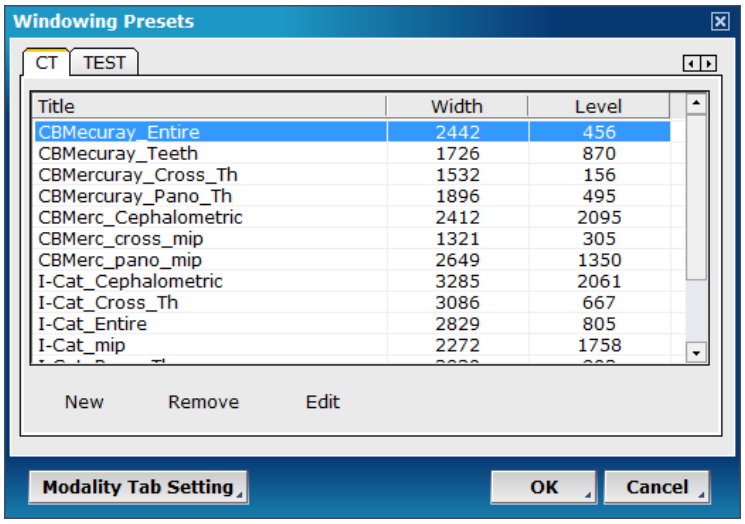


Fig. 397 Available windowing presets for CT images

The extended functions of New, Remove, and Edit.

To add more tabs/modalities to [Windowing Presets], select Modality Tab Setting, input windowing width and leveling and press [OK].

A.5 Additional Options

Auto Windowing. The Auto WWL button will automatically calculate and adjust the 2D image windowing levels and widths.

Image Shading. For shaded images, press Shaded. The difference between shaded and unshaded volume images can be seen below in Fig. 398.

Fig. 398 Unshaded (left) and Shaded image (right)

Appendix B: 3D Ceph Formulas

B.1 Motivation & Background

The main objective of cephalometric programs is to provide accurate analysis results according to the defined functions (distance, angles, etc.). However, previous programs have made it difficult to modify or add new analyses. Doctors had to read through difficult and long explanations of measurement definitions such as **"Measurement D refers to the distance of the point A projected on the sagittal plane from the point between the points B and C."**

If these functions are described in a formula, doctors would be able to easily figure out what the measurements stand for. The example mentioned above can be expressed as **"distance (proj[A], sagittal), mid([B], [C])."** Lines and planes can also be defined by formulas. The **FZ line** is **line ([R FZP], [L FZP])** and the **NFZ plane** is **plane ([N], [R FZP], [L FZP])**. Please refer to ☞ ***Appendix B.3 Syntax Details*** to learn more about syntaxes.

Analyses can be divided into two main groups. The first is landmarks, and the second is formulas. For an easier understanding, formula refers to the reference and measurement. Reference refers to the elements that can be reused, and the measurement refers to the elements that are shown as results of the analysis. The user can define lines and planes in the [Reference] tab, and in turn these will be usable for measurements.

Currently OnDemand3D™ App offers "Dr. Cho's Analysis" as a default analysis, and the measurements are represented as formulas. The user can also modify or add new analysis formulas using the explanations provided in this appendix chapter.

B.2 Examples

For a better understanding of formulas, refer to the examples and descriptions of "Dr. Cho's Analysis." (Please assume that all the Landmark points have been placed in the 3D volume image.) For a detailed description and a more accurate definition of the formulas, please refer to ☞ ***Appendix B.3 Syntax details*** listed in the next section.

- **FZ line: line([R FZP], [L FZP])**
  The straight line that passes R FZP and L FZP.
- **R NFZ line : line(proj([N], sagittal), proj([R FZP], sagittal))**
  The line that passes the projection of the N point in the sagittal plane and the projection of the R FZP point in the sagittal plane.
- **NFZ plane: plane([R FZP], [L FZP], [N])**
  The plane that passes R FZP, L FZP, and N.
- **Midsagittal plane: plane([N], [NFZ plane], frontal)**
  The vertical plane of the NFZ plane and the frontal plane that passes the N.
- **Occlusal plane : plane(mid([R U1CP], [R L1CP]), mid([R U6CP], [R L6CP]), mid([L U6CP], [L L6CP]))**
  The plane that passes the point between the R U1CP and R L1CP, the point between the R U6CP and R L6CP, and the point between the L U6CP and L L6CP.

- **R Maxillary Oblique plane: rotate([MxS plane], line([ANS], vector(0, 0, 1)), 45)**
  The MxS plane rotated by 45 degrees to the vertical direction of the ANS.
- **A(y) : [A](y)**
  The Y value of Landmark A.
- **B(y) – A(y) : [B](y)-[A](y)**
  The difference between the Y value of B and the Y value of A.
- **SNA : angle(proj([Sella], sagittal), proj([N], sagittal), proj([A], sagittal))**
  The angle between the point of the Sella projected on the sagittal plane, the N point projected on the sagittal plane, and the A point projected on the sagittal plane.
  The (proj[N], sagittal) is the point that measures the angle.
- **MxBW : distance(proj([R KRP], [MxF plane]), proj([L KRP], [MxF plane]))**
  The distance between the R KRP point projected on the MxF plane and the L KRP point projected on the MxF Plane.
- **Mx / CB WR : [MxBW] / [CBW]**
  MxBW value / CBW value.
- **R U1VD : distance([R U1CP], [Maxillary plane])**
  The distance between the R U1CP and the Maxillary plane.
- **R L6SP : diff([Pog](y), [R L6CP](y))**
  The difference between the Y value of the Pog and the Y value of the R L6CP
  The Abs([Pog](y)-[R L6CP](y)) formula shows the same result.

B.3 Syntax Details

The syntaxes are optimized to increase readability. The purpose for this is to allow first time users to easily learn the formulas.

I. Referencing

The sections grouped together by parentheses refer to the Landmark, Reference, or Measurement already defined. Therefore the Landmark, Reference, or Measurement name can be inserted within the parentheses.

- **[name]**
  For example, if the Landmark is set as N, A, and B, the C line should be added in the [References].
- **line([N], [A])**
  The Measurement can be also be set in the following formula.
- **distance([B], [C line])**
  This formula has the same meaning as the formula distance ([B], line([N], [A])).

II. Defining a landmark

A Landmark means a point in a 3D setting that has a defining name. The user can simply set a name to define a Landmark. The user can also find the point between two points, or find a rotated point within an angle.

- **mid(landmark, landmark)**
  A point between two landmark points.
- **proj(landmark, line)**
  A new landmark projected on a line.

- **proj(landmark, plane)**
  A new landmark projected on a plane.
- **rotate(landmark, line, angle)**
  A landmark rotated on a line in relation of the angle.
- **intersect(line, line)**
  An intersection between two lines.

For example:

- **mid([N], [A])**
- The landmark point between N and A.
- **mid(mid([N], [A]), [B])**
- The point between N and A and the point B
- **proj([N], [A line])**
  The point of N projected on the A line.
- **proj([N], [A plane])**
  The point of N projected on the A plane
- **proj(mid([N], [A]), [A line])**
  The point between N and A projected on the A line

rotate([N], [A-vertical], -45)
The N point rotated in a -45 degree according to the A vertical line.

III. Defining lines

A line is generally known as a straight line that passes two points in a 3D setting. However, in 3D Ceph module, the lines used here include direction. The reason for this is to more accurately represent which angle is being calculated.

There are various ways to define the lines. The user can define a line passing two landmark points, or a line passing two planes.

- **line(landmark, landmark)**
  A line that passes two landmark points. The direction of the line is from the first landmark to the second landmark.
- **line(plane, plane)**
  A line that passes two planes. The direction is set randomly.
- **line(landmark, vector)**
  A line that passes one point in the direction of the vector
- **proj(line, plane)**
  A line projected on a plane. The direction follows the direction of the plane.
- **rotate(line, line, angle)**
  A second line rotated to the angle of the first line. The direction follows the direction of the second line.
- **! line**
  A line in the opposite direction.

For example:

- **line([N], [A])**
  A line that passes the points N and A.
- **! line([N], [A])**
  A line that passes the points A and N
- **line([A plane], [B plane])**

The line that passes the A plane and B plane

- **proj(line([N], [A]), [C plane])**
  A line that passes the N and A points projected in the C plane
- **rotate([B line], [A-vertical], 23.2)**
  The B line rotated 23.2 degrees according to the A-vertical line

IV. Defining a plane

A plane is defined by a point in a flat plane and a perpendicular vector. There are various ways to define a Plane.

- **plane(landmark, landmark, landmark)**
  A plane that passes three landmark points.
- **plane(landmark, plane, plane)**
  A plane that passes a single landmark point in two planes
- **plane(landmark, landmark, plane)**
  A plane that passes two landmark points in a single plane
- **plane(landmark, landmark, line)**
  A plane that passes two landmark points and is parallel to a single line.
- **plane(landmark, plane)**
  A plane that passes one landmark point and is parallel to a single plane
- **rotate(plane, line, angle)**
  A plane rotated according to the angle of a line
- **axial** or **horizontal**
  A plane that passes (0, 0, 0) and has a perpendicular vector of (0, 0, 1).
- **sagittal**
  A plane that passes (0, 0, 0) and has a perpendicular vector of (0, 1, 0).
- **coronal** or **frontal**
  A plane that passes (0, 0, 0) and has a perpendicular vector of (1, 0, 0).

For example:

- **plane([N], [A], [B])**
  A plane that passes the points N, A, and B.
- **rotate([A plane], [B-vertical], 90)**
  The A plane rotated in a 90 degree angle according to the B-vertical line.
- **plane([A], axial)**
  A plane that passes the A point and is parallel to the axial plane

V. Defining a vector

A vector represents the direction and size in a 3D setting. The definitions are as follows:

- **vector(x, y, z)**
  The vector in the x, y, and z direction. x, y, and z are shown as numbers.
- **vector(line)**
  The vector in the direction of the line.
- **vector(plane)**
  A normal vector of a plane.

For example:

- **vector(23, -45.2, 0)**
  A vector from (0, 0, 0) to (23, -45.2, 0).

VI. Distance

The Distance is a Measurement value commonly used when calculating results. It can represent the distance between two points, or the z value of a certain landmark point. The definitions are as follows:

- **distance(landmark, landmark)**
  The distance between two landmark points.
- **distance(landmark, line)**
  The shortest distance between a landmark and a line.
- **distance(landmark, plane)**
  The shortest distance between a landmark and a plane.
- **landmark(x)**
  The x value of a landmark point.
- **landmark(y)**
  The y value of a landmark point.
- **landmark(z)**
  The z value of a landmark point.

For example:

- **distance([N], [A])**
  The distance between the points N and A.
- **distance([N], line([A], [B]))**
  The shortest distance between N and the line A and B.
- **distance([A], axial)**
  The distance between the point A and the axial plane.
- **[A](x)**
  The x value of point A.
- **proj([A], sagittal)(y)**
  The y value of the A landmark projected on the sagittal plane.

VII. Angle

The angle is another value commonly used in analyses. The user can find the angle between two lines or the angle of three points. The angle is defined by two straight lines, and the angle is defined by the direction of the lines. Therefore, the user has to use the value for the opposite line (! line) to find the desired angle. The definitions are as follows:

- **angle(line, line)**
  The angle between two lines.
- **angle(line, plane)**
  The angle between a line and a plane
- **angle(landmark, landmark, landmark)**
  The angle between three points.
  The middle landmark acts as the point to calculate the angle.

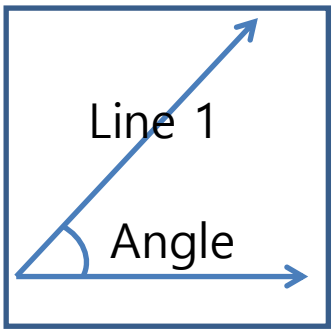


Fig. S Angle measurement

For example:

- **angle([A line], [B line])**
  The angle between line A and B
- **angle([A line], ! [B line])**
  The opposite angle between line A and B.
- **angle([A line], frontal)**
  The angle between the A line and the frontal plane.
- **angle([A], [B], [C])**
  The angle between the line that pass between point A and B, and the line between point B and C.

VIII. Ratio

The ratio stands for the ratio of the values, and shows the ratio of the distance or the angle.

- **distance / distance**
  The ratio between the two distances.
- **angle / angle**
  The ratio between the two angles.

For example:

- **distance([A], [B]) / distance([B], [C])**
  The distance ratio between A,B and B,C.
- **[A Angle] / [B Angle]**
  The ratio between angle A and angle B.

VIII. Operators

The user can not only calculate the distance between two points, but also calculate the absolute value, or the sum or difference of two values. The definitions are as follows:

- **distance + distance**
  The sum of two distances.
- **distance – distance**
  The difference between two distances.
- **abs(value)**
  The absolute value of a distance, angle, or ratio.
- **diff(value, value)**
  The absolute difference value between two values.
- **-value**
  The value shown with the opposite sign (+ is shown as -, and vice versa).

For example:

- **distance([A], [B]) + distance([A], [C])**
  The sum of the distance of A,B and A,C.
- **abs(distance([A], [B]) – distance([A], [C]))**
  The absolute difference value of the distance of A,B and A,C.
- **diff(distance([A], [B]), distance([A], [C]))**
  The absolute difference value of the distance of A,B and A,C.
- **-distance([A], [B])**
  The distance between A and B, shown in a negative value.

Appendix C: 2D Ceph Formulas

C.1 Background

A 2D analysis only uses (x, y) coordinates for analysis, unlike a 3D analysis which use Landmarks, Lines, and Planes (x, y, z). Therefore, only Landmarks and Lines are used in the 2D analysis. A Vector can be defined and utilized, but since it cannot be represented in a 2D setting, Vectors cannot be defined independently.

C.2 Syntax Details

The Syntaxes are optimized to increase readability. The purpose for this is to allow first time users to easily learn the formulas, as well as allow the users to quickly understand that the Measurements stand for after learning the Formulas.

I. Referencing

The sections grouped together by parentheses refer to the Landmark, Reference, or Measurement already defined. Therefore the Landmark, Reference, or Measurement name can be inserted within the parentheses.

- **[name]**
  For example, if the Landmark is set as N, A, and B, add a line C in the [References].
- **line([N], [A])**
  The Measurement can also be set in the following formula.
- **distance([B], [C line])**
  This formula has the same meaning as the formula distance ([B], line ([N], [A])).

II. Defining landmarks

A Landmark means a point in a 2D setting that has a defining name. The user can simply set a name to define a Landmark. The user can also find the central point between two points, or find a rotated point within an angle.

- **point(x, y)**
  A new landmark defined by inputting the (x, y) coordinates.
- **mid(landmark, landmark)**
  A new landmark defining the middle of two landmark points.
- **proj(landmark, line)**
  A new landmark line projected on a line.
- **rotate(landmark, landmark, angle)**
  A landmark rotated on a line in relation of the angle.
- **intersect(line, line)**
  An intersecting point between two lines.

For example:

- **mid([N], [A])**
  A new landmark point between N and A.
- **mid(mid([N], [A]), [B])**
  The point between B and between landmarks N and A.
- **proj([N], [A line])**
  The point N projected on the line A.
- **proj(mid([N], [A]), [A line])**

A new landmark point between N and A projected on line A

- **rotate([N], [A-vertical], -45)**
  The point N rotated in -45 degrees according to the vertical line A.

III. Defining lines

A line is generally known as a straight line that passes between two points in a 2D setting. However, in 3D Ceph module, the lines used here include direction. The reason for this is to more accurately represent which angle is being calculated.

There are various ways to define the lines. The user can define a line passing two landmark points, or a line rotated according to a defined landmark.

- **line(landmark, landmark)**
  A line passing two landmark points. The direction of the line is from the first landmark to the second landmark.
- **line(landmark, vector)**
  A line passing a landmark point and in the direction of the vector.
- **rotate(line, landmark, angle)**
  A new line rotated to the angle of the landmark point. The direction of the line is not affected.
- **! line**
  A line with going the opposite direction.
- **X axis**
  A line that passes (0, 0) and heads in the direction of the (1, 0) vector.
- **Y axis**
  A line that passes (0, 0) and heads in the direction of the (0, 1) vector.

For example:

- **line([N], [A])**
  A line that passes the landmark points N and A.
- **! line([N], [A])**
  A line that passes the landmark points A and N.
- **rotate([B line], [A], 23.2)**
  The B line rotated 23.2 degrees according to the point A.

IV. Defining a vector

A Vector represents the direction and size in a 2D setting. The definitions are as follows:

- **vector(x, y)**
  The vector in the x, y direction, represented in numbers.
- **vector(line)**
  The vector in the direction of the line.

For example:

- **vector(23, -45.2)**
  A vector from (0, 0) to (23, -45.2).

V. Distance

The Distance is a Measurement value commonly used when calculating results. It can represent the distance between two points and the definitions are as follows:

- **distance(landmark, landmark)**
  The distance between two landmark points.
- **distance(landmark, line, left)**
  The distance between a landmark and a straight line (shown in + if the landmark and line is on the left, shown in – if the landmark and line is on the right).
- **distance(landmark, line, right)**
  The distance between a landmark and a straight line (shown in + if the landmark and line is on the right, shown in – if the landmark and line is on the left).
- **distance(landmark, line)**
  The shortest distance between a landmark and a line.
- **landmark(x)**
  The x value of a landmark point.
- **landmark(y)**
  The y value of a landmark point.

For example:

- **distance([N], [A])**
  The distance between the points N and A.
- **distance([N], line([A], [B]))**
  The shortest distance between point N and the line that passes A, B.
- **[A](x)**
  The x value of point A.
- **proj([A], sagittal)(y)**
  The y value of point A projected on the sagittal plane.

III. Angle

The Angle is another value commonly used in finding the results of a measurement. The user can find the angle between two lines or the angle of three points. The angle is defined by two straight lines, and the angle is defined by the direction of the lines. Therefore, the user has to use the value use the formula (! Line) to make the line face the opposite direction to calculate an angle. The definitions are as follows:

- **angle(line, line)**
  The angle between two straight lines.
- **angle(landmark, landmark, landmark)**
  The angle between three landmark points. The middle landmark acts as the point to calculate the angle.

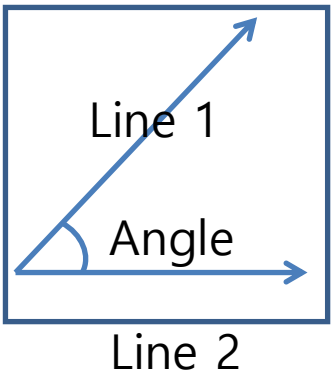


Fig. T Angle measurement

For example:

- **angle([A line], [B line])**
  The angle between line A and B
- **angle([A line], ! [B line])**
  The opposite angle between line A and B.
- **angle([A], [B], [C])**
  The angle between the line that passes point A, B, and the line that passes point B, C.

IV. Ratio

The Ratio stands for the ratio of the values, and shows the ratio of the distance or the angle.

- **distance / distance**
  The ratio between two distances.
- **angle / angle**
  The ratio between two angles.

For example:

- **distance([A], [B]) / distance([B], [C])**
  The distance ratio between A,B and B,C.
- **[A Angle] / [B Angle]**
  The ratio between Angle A and Angle B.

VIII. Operators

The user can calculate the distance between two points as well as calculate the absolute value, the sum, or difference of two values. The definitions are as follows:

- **distance + distance**
  The sum of two distances.
- **distance – distance**
  The difference to two distances.
- **landmark + landmark**
  The sum of two landmark points.
- **landmark – landmark**
  The difference of two landmark points.
- **landmark * value**
  The landmark multiplied by the value.
- **landmark / value**
  The landmark divided by the value (non-zero).
- **abs(value)**
  The absolute value of a distance, angle or ratio.
- **diff(value, value)**
  The absolute difference value between two values.
- **-value**
  The value shown with the opposite sigh (+ is shown as -, and vice versa).

For example:

- **distance([A], [B]) + distance([A], [C])**
  The sum of the distance of A,B and A,C.
- **abs(distance([A], [B]) – distance([A], [C]))**
  The absolute difference value of the distance of A,B and A,C.

- **diff(distance([A], [B]), distance([A], [C]))**
  The absolute difference value of the distance of A,B and A,C.
- **-distance([A], [B])**
  The distance between A, B, shown in a negative value.
- **[A]+ [B]**
  A new landmark point created by adding the x,y values of point A and B.

Appendix D: Uninstalling OnDemand3D™

For users who are updating OnDemand3D™, it is recommended to uninstall any previous versions before proceeding. Please proceed to read below for instructions on how to uninstall on occasions where it is needed, such as changing the language of the software.

Step 1: Close the software if it is open.

Step 2: Go to [Start] menu -> [OnDemand3DDental] - [Uninstall OnDemand3D Dental] as shown below.

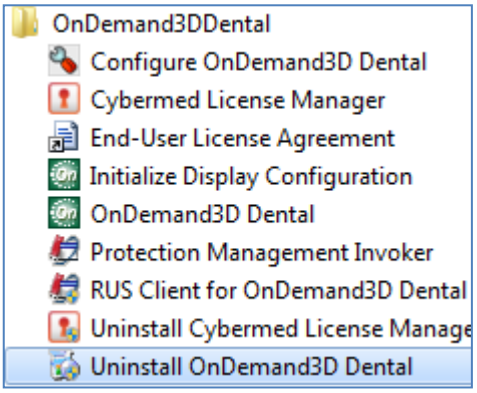


Fig. 399 Select to start the uninstallation process

Last step: Wait and confirm.

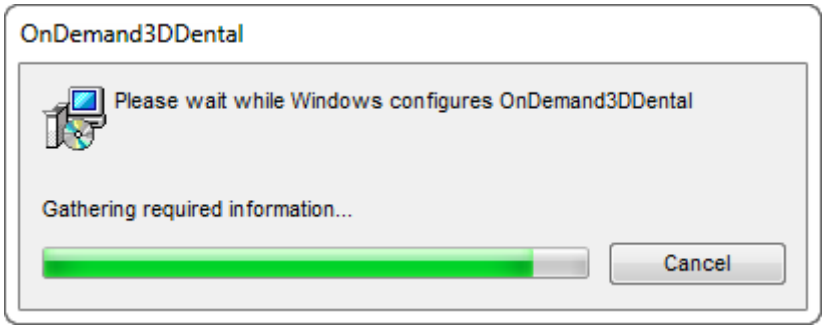


Fig. 400 The process should take less than a minute

INFO	Please note that the OnDemand3D™ folder in [Local Disk (C:)] is not deleted when the software is uninstalled, hence the user will not lose any data during this process and can reinstall and use OnDemand3D™ as needed.

Appendix E: Data Back Up and Restoration

E.1 Data Backup

We recommend that user takes the precaution of regularly backing up the patient data to ensure against data loss and destruction. User can manually back up the data at any time.

Please follow the steps below for data backup.

Step 1: Go to [Start] menu → [All Programs] → [OnDemand3D Dental] → [Configure OnDemand3D Dental].

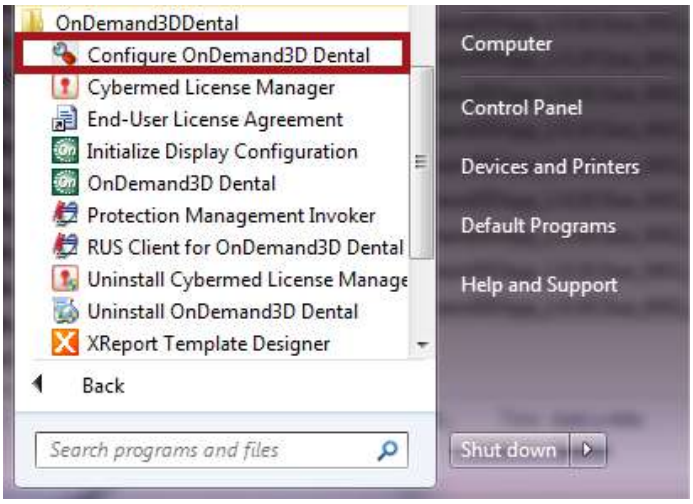


Fig. 401 [Configure OnDemand3D Dental] in the [Start] menu

Step 2: Open [Configure OnDemand3D Dental] and check [MasterDB] folder path

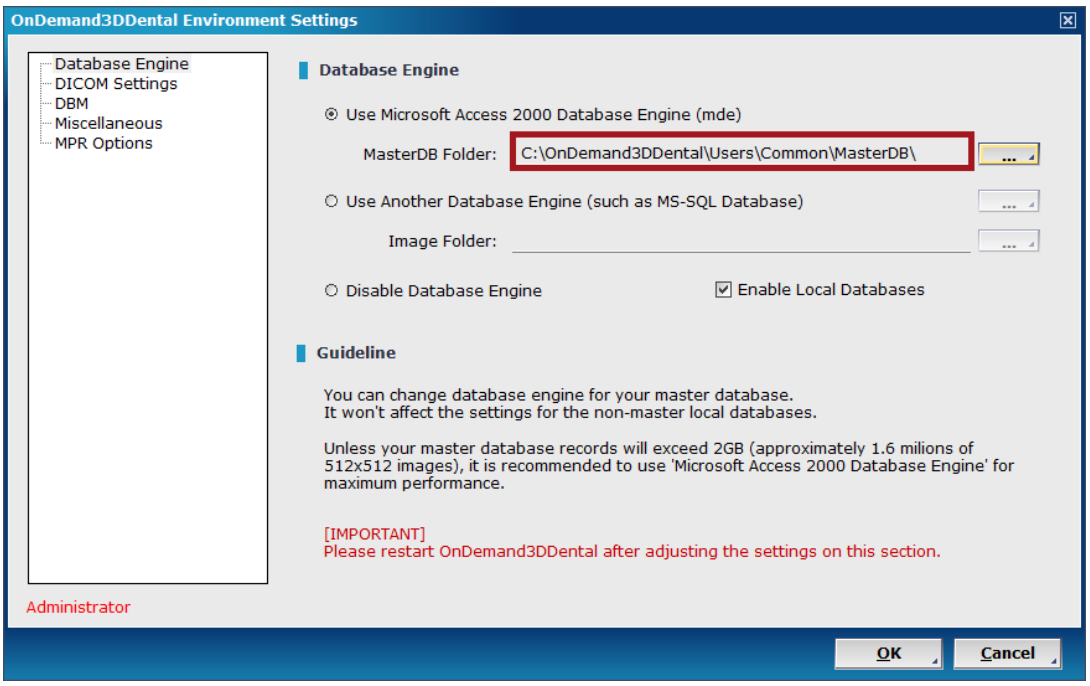


Fig. 402 [MasterDB] folder path

Step 3: Locate [MasterDB] on your computer.

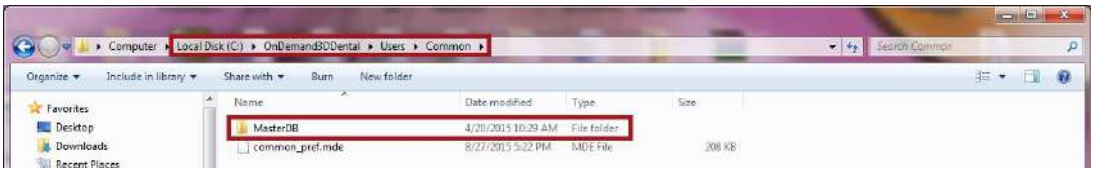


Fig. 403 [MasterDB] location on the workstation

Step 4: Make a copy of Master DB folder where patient data is being saved to a new location.

INFO	We recommend that you don't back up the data to the same hard disk where the initial MasterDB is stored.

E.2 Data Restoration

User can change the existing [MasterDB] path to a new location or restore backed-up data as follows.

Step 1: Launch [Start] → [All Programs] → [OnDemand3D Dental] → [Configure OnDemand3D Dental].

Step 2: Click ... and choose new location for [MasterDB] folder

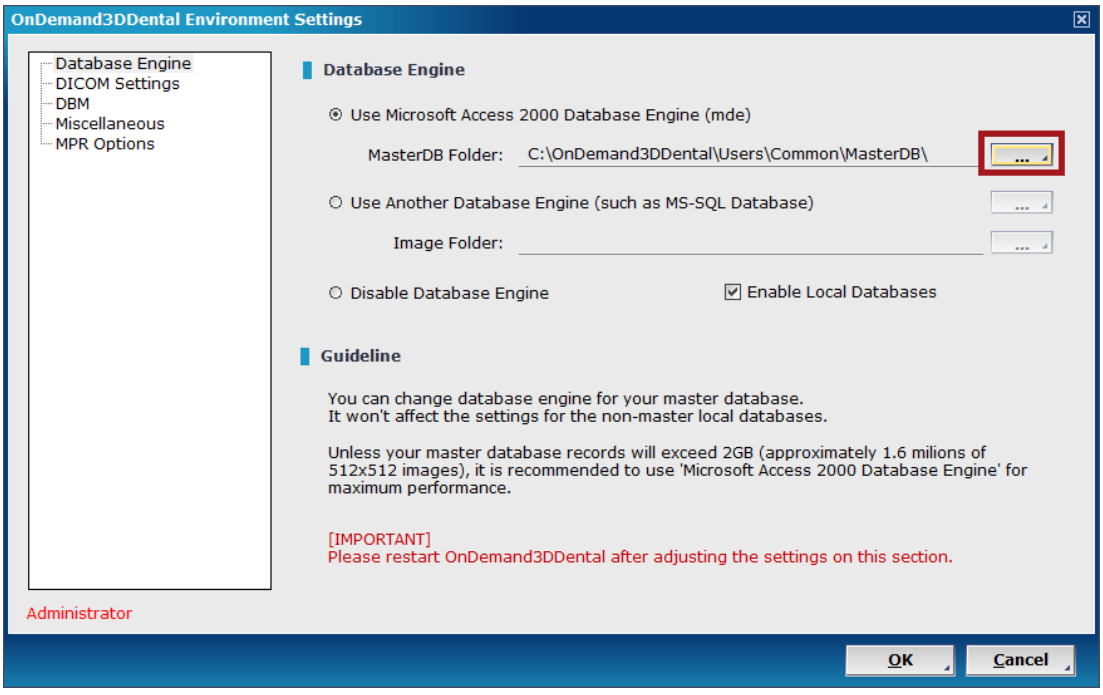


Fig. 404 Choose location for [MasterDB] folder

Step 2: Confirm the new database creation by selecting "Yes".

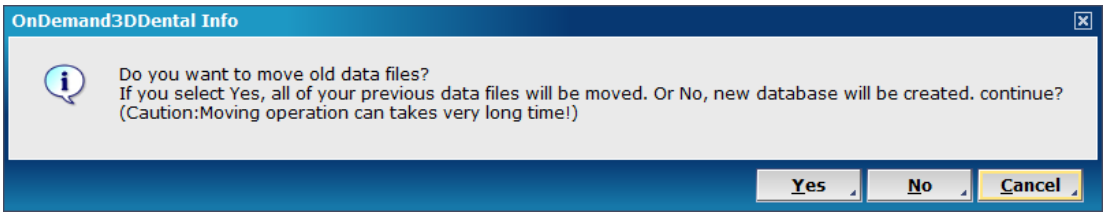


Fig. 405 OnDemand3DApp info dialog

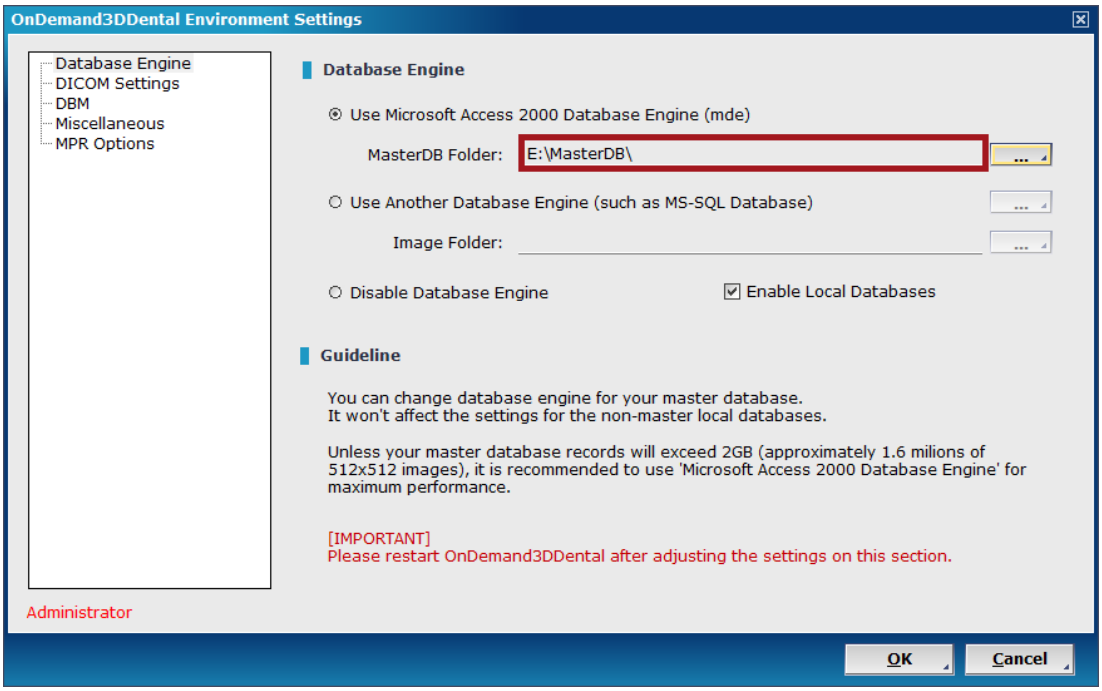


Fig. 406 New [MasterDB] folder path

Appendix F: Troubleshooting & Contact Us

F.1 FAQs

Q1: I installed the OnDemand3D™ and the Leaf Implant library, but OnDemand3D™ does not install properly.

A1: The user must be logged in as the Admin in their computer to properly install OnDemand3D™. Please check the OnDemand3D™ version number and contact local distributor or Cybermed Inc. about any concerns regarding installation.

Q2: After installation, I start the program and the message "Can't Read the User Information Database" appears and the program does not start.

A2: This happens when the software cannot read the user database because the user is not logged in on the computer as the Admin. Please log in the computer with the Admin account.

Q3: OnDemand3D™ was working properly before, but now it does not work.

A3: OnDemand3D™ uses a HASP key lock to check if the user has permission to use OnDemand3D™ App. Please check if the HASP key is properly installed.

Q4: Some of the buttons on the OnDemand3D™ are cut off and do not show up in my computer monitor. What should I do?

A4: Please check if the computer monitor resolution is set lower than the recommended resolution of 1024 x 768. If the resolution is set lower, some of the buttons on OnDemand3D™ are not displayed in the monitor. The user can change the font size in the computer settings to view all of the buttons. The font size change does not affect the software in any way.

For more FAQs and solutions, please visit our website at www.ondemand3d.com.

F.2 Contact Us

If the user is experiencing problems or has any inquiries at all, please follow the steps below for a quicker and more efficient way to get a solution.

Step 1: Take screenshots or try and capture the issue in any way possible. Most importantly, please include error messages, or log files.

Step 2: Click 

on the bottom left corner of OnDemand3D™ to see version number. If possible, capture the [Information] window as it is and include it in the e-mail. If not, please send us the **version number** currently in use, **environment** (network or single workstation) **operating system** (Windows 7, SP1, 64-bit, English) and **license information** (dongle or serial key, etc.)

Step 3: If possible, please check if the problem can be reproduces will different types of data from different workstations.

Step 4: Write us an e-mail at info@ondemand3d.com with all captured images and required information trying to be as detailed as possible and walk us through the process that caused the problem.

The more information the user provides, the quicker the solution will be.

Appendix G: Shortcut keys

G.1 General

- Key Operation on Image Pane

Key	Operation
	Overlay On / Off
	Cancel or Stop the current function
	Delete selected annotation/measurement
	Launch DBM
	Show or Hide all DSI(Dynamic Sensitive Item)
	Launch Window Preset Dialog in any module
	Capture selected pane without overlay action
	Minimize or Maximize selected pane
	Launch QLB dialog in any module

- Key Operation on Fine Tuning

Key	Operation
	Overlay On / Off

G.2 DBM Module

- Key Operation for Patient Study

Key	Operation
F5	Refresh Search List
+ − or Enter ↵	Perform same as “+ button” in Patient list (Double click)
Insert	Launch DLB
Esc	Deselect from Patient list or clear value from Search box
Delete	Delete patient list

G.3 3D & Dental Module

- Key Operation on MPR Image Pane

Key	Operation
	Move to Next Slice
	Move to Next Slice
	Move to Previous Slice
	Move to Previous Slice
	Move to Next Slice
	Move to Previous Slice (by 1/10 slices)
	Move to Next Slice (by 1/10 slices)
	Move to First Slice
	Move to Last Slice
	Implant Undo (Dental Tab)
	Implant Undo (Dental Tab)
	A/S/C Position Dlg open (Slice Direct Move) (Only on 3D Module)

- Mouse Left Button Operation on Image Pane

Key	MPR	3D / 3D-Zoom	Endoscopy
	Zoom In	Zoom In	Zoom In
	Pan	Pan	Pan

- Mouse Right Button Operation on Image Pane

Key	MPR	3D / 3D-Zoom	Endoscopy
	Windowing	Object Rotation	Rotation
	Zoom Out	Zoom Out	Zoom Out
	Zoom	Zoom	Zoom
	Auto Windowing		

- Mouse Wheel Operation on Image Pane

Key	MPR	3D / 3D-Zoom	Endoscopy	CPR
	Move to Next/ Previous Slice	Rotate 3D Image (by 30 degrees)	Backward and forward movement	Scroll through
	Move to Next/ Previous Slice (move by 1/10)	Rotate 3D Image (by 30 degrees)	Backward and forward movement (3 times faster)	Scroll through (3 times faster)
	Move to Next/ Previous Slice (move by 1/10)	Rotate 3D Image (by 30 degrees)	Backward and forward movement (3 times faster)	Scroll through (3 times faster)

G.4 Report Module

- Key Operation for Reporting

Key	Operation
	Delete selected image from Thumbnail
	Refresh Database or History

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Caution

1) The Medical Imaging Processor Unit should be used by experienced personnel only.

- Check if the Imaging Storage Device has enough disk space.
- Check if the Imaging Storage Device, Imaging Analysis Device, and Imaging Output Device are turned on.

2) Users must logon with their own user ID and password.

- Do not save or delete the medical image while operating on it.
- Please use a function with caution if the user does not fully understand the function.
- Do not turn off the power or forcibly close the program while it is running.

3) When done with the Medical Imaging Processor Unit, please adhere to the following cautionary measures:

- Close all images used.
- Log off the program.
- Do not turn off the power to the Imaging Storage Device even if finished.
- Keep the device in a dry and room temperature environment.

	When used in large networks such as hospitals, Cybermed Inc. recommends using antivirus software to protect the system. For better security, using an intranet will minimize exposure to computer viruses.

Please contact local distributor or Cybermed Inc. by phone or e-mail if any problems occur while installing or operating OnDemand3D™ software.
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END OF MANUAL

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