

OBJECT SCAN

User Manual

RUG-410-EN
Rev. 2.0

This user manual contains information for appropriate use of RAYCAN Object Scan.

The operator must read this manual carefully before using the product.

The operator must follow instructions and safety regulations described in the user manual to prevent any injury to the operator and the patient or damage to the product.

Caution (US only): This product must only be sold to dentists or oral health professionals as stated by the federal law.

Copyright Ray Co., Ltd.

Publication number: RUG-410-EN Rev. 2.0 (Revised Mar. 27, 2018)

This manual is subject to change without prior notice.

For further inquiries, contact your sales representative or customer service of manufacturer.



Ray Co., Ltd.

332-7, Samsung 1-ro, Hwaseong-si, Gyeonggi-do, 445-330, Korea

Phone: +82-31-605-1000 Fax: +82-2-6280-5534

Customer service center: +82-1566-1526

www.raymedical.com

Contents

1	Introduction	5
1.1	Purpose	5
1.2	Features	5
1.3	Minimum System Requirements	6
1.4	Recommended System Requirements	7
1.5	Components	8
2	Precautions	9
2.1	Precautions before use	9
2.2	Precautions before using the Impression scan	9
2.3	Precautions before using the Model and Bite scan	11
3	Installing the Software	13
3.1	Installing the RAYDENT Connect and Converter	13
4	How to use RAYSCAN Object Scan	15
4.1	Object Positioning (RAYSCAN $\alpha+$, RAYSCAN α)	15
4.1.1	Impression (Maxilla, Mandible) Positioning	15
4.1.2	Model (Maxilla, Mandible) Positioning	17
4.1.3	Bite Positioning	18
4.2	Object Scanning (RAYSCAN $\alpha+$)	19
4.2.1	Configuration of Object Scan PC Screen	19
4.2.2	Configuring Object Scan Touch Screen	20
4.2.3	Acquisition Mode Description	21
4.2.4	Object Scan Acquisition	22
4.3	Object Scanning (RAYSCAN α)	25
4.3.1	Configuration of Object Scan PC Screen	25
4.3.2	Configuring Object Scan Touch Screen	26
4.3.3	Acquisition Mode Description	27
4.3.4	Object Scan Acquisition	28
4.4	Object Calibration Procedure	31
4.4.1	Preparation of Calibration Materials	31
4.4.2	Object Scan Calibration PC screen	32
4.4.3	Image Acquisition	33
4.4.4	Calibration	35
5	How to use RAYDENT Connect	36

OBJECT SCAN Contents

5.1	RAYDENT Connect screen configuration	36
5.1.1	Main screen	36
5.1.2	Configuration screen	37
5.2	STL Converting	38
5.3	STL Editing	39
5.4	Changing configuration	40
5.4.1	Language Setting	40
5.4.2	Setting Server IP	41
5.4.3	Setting Patient Name Format	42
6	The operation of RAYDENT Converter	43
6.1	The screen composition of RAYDENT Converter	43
6.1.1	The starting screen	43
6.1.2	Edit mode	44
6.1.3	Align mode	46
6.1.4	Setting	47
6.2	How to run RAYDENT Converter	48
6.2.1	How to run RAYDENT Converter by independently	48
6.2.2	How to run a program via RAYDENT Connect	53
6.3	Edit mode	55
6.3.1	Rotation, move, and rescale of object	55
6.3.2	Type of Object	56
6.3.3	Brush	57
6.3.4	Inspection	60
6.3.5	Cut	63
6.3.6	Separate	64
6.3.7	Export	68
6.4	Align mode	69

1 Introduction

1.1 Purpose

To convert CT slice image of object acquired in Object Scan protocol of RAYSCAN system to 3D mesh data and use it for prosthesis and implant design.

1.2 Features

- Impression, Model, Bite, etc. Object for prosthetic / implant design can be taken with CT.
- You can check the images acquired from RAYSCAN System.
- Acquire Object Scan Image can be converted into 3D mesh object and saved as STL file.
- Edit the desired area in the converted object and save it as STL file.
- Saved STL files can be used by 3rd party open platform CAD software programs.

1.3 Minimum System Requirements

Items	Specification
CPU	2GHz or faster 64-bit (x64) Dual Core processor
RAM	4GB RAM or more
HDD space	50GB HDD or more
Resolution	1024 X 768 or more
Video	OpenGL 3.2 or higher graphics device <ul style="list-style-type: none"> - Intel 3rd Generation Core i Series(Ivy Bridge) or higher - AMD E-Series or A-Series APU - NVIDIA GeForce 400 Series Graphic Memory 1GB or more - AMD Radeon HD 5000 Series Graphic Memory 1GB or more Up to dated graphic driver for above graphic devices
Network	10/100 Mbps
Operating System	Microsoft Windows® 7 x64 Microsoft Windows® 8 x64 Microsoft Windows® 10 x64

1.4 Recommended System Requirements

Items	Specification
CPU	2GHz or faster 64-bit (x64) Quad Core processor
RAM	8GB RAM or more
HDD space	100GB HDD or more
Resolution	1280 X 800 or more
Video	OpenGL 3.2 or higher graphics device <ul style="list-style-type: none"> - Intel 4th Generation Core i Series(Haswell) or higher - AMD E-Series or A-Series APU - NVIDIA GeForce 600 Series Graphic Memory 2GB or more - AMD Radeon HD 7000 Series Graphic Memory 2GB or more Up to dated graphic driver for above graphic devices
Network	10/100 Mbps
Operating System	Microsoft Windows® 7 x64 Microsoft Windows® 8 x64 Microsoft Windows® 10 x64



Performance may deteriorate if programs run in duplicate according to the computer specifications.

1.5 Components

Items	Figure	Q'ty (EA)
Object Scan Tray	 A black, circular, textured tray with a central circular depression and four small feet. A clear plastic lid is shown to the left.	1
Sponge Disc	 A thick, circular, black foam disc.	2
RAYDENT Converter Installation (USB)	 A white USB drive with the 'Ray' logo.	1
RAYDENT Converter License Dongle Key	 A purple USB drive with the 'Ray' logo.	1
Impression Holder	 A black, multi-ported plastic holder for dental impressions.	1
Impression Support	 A black, rectangular plastic support with a central slot and four legs.	1

2 Precautions

2.1 Precautions before use

- The RAYSCAN user manual may differ depending on models of the product. For inquiries about products and manuals, please contact your sales representative or Ray Customer Service of manufacturer.
- Before running RAYSCAN, please make sure that the license for Object Scan is activated. If license is not activated, you cannot use Object Scan for RAYSCAN.

2.2 Precautions before using the Impression scan



Impression must use plastic tray. Metal tray might not converted properly to 3D mesh data.

- Position the body of Impression in the middle of mid-sagittal line.



OBJECT SCAN 2 Precautions

- The impressed surface should face toward the mirror on the column.



- Impression body should be positioned vertically while acquiring the image.



Handle with care of the body of Impression while acquiring the image.

2.3 Precautions before using the Model and Bite scan

- When using the Model and Bite scan, insert a sponge disc in the tray and scan an object on it.



- When inserting the sponge disc into the tray, check that the sponge disc is fully inserted. If it is not, the surface of the sponge disc will not be level.



OBJECT SCAN 2 Precautions

- When placing an object on the tray, ensure that the object is centered on the sponge disc.



- When placing an object on the tray, place anterior incisors in the front of the mirror.



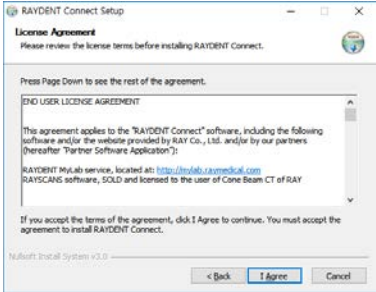


3 Installing the Software

Installing the RAYDENT Connect and Converter program.

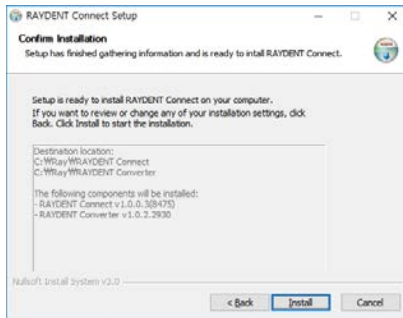
3.1 Installing the RAYDENT Connect and Converter

Note Do not plug License Dongle Key into PC before installing RAYDENT Connector and Converter program. License Dongle Key may not work properly.

No.	Figure	Description
1	 <p>RAYDENT_Connect_Converter_Setup.exe</p>	Run RAYDENT_Connect_Converter_Setup.exe.
2	 <p>RAYDENT Connect Setup</p> <p>Welcome to RAYDENT Connect Setup</p> <p>Setup will guide you through the installation of RAYDENT Connect.</p> <p>It is recommended that you close all other applications before starting Setup. This will make it possible to update relevant system files without having to reboot your computer.</p> <p>Click Next to continue.</p> <p>Next > Cancel</p>	Select [Next >] button.
3	 <p>RAYDENT Connect Setup</p> <p>License Agreement</p> <p>Please review the license terms before installing RAYDENT Connect.</p> <p>Press Page Down to see the rest of the agreement.</p> <p>END USER LICENSE AGREEMENT</p> <p>This agreement applies to the "RAYDENT" Connect" software, including the following software and/or the website provided by RAY Co., Ltd. and/or by our partners (hereafter "Partner Software Application").</p> <p>RAYDENT MxLab services, located at: http://mxlab.raymedical.com</p> <p>RAYSCANS software, SOLD and licensed to the user of Cone Beam CT of RAY</p> <p>If you accept the terms of the agreement, click I Agree to continue. You must accept the agreement to install RAYDENT Connect.</p> <p>Nullsoft Install System v3.0</p> <p>< Back I Agree Cancel</p>	Confirm the license terms and select the [I Agree] button.

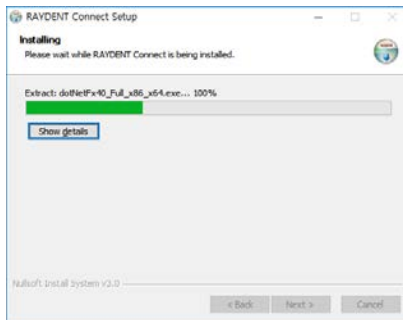
OBJECT SCAN 3 Installing the Software

4



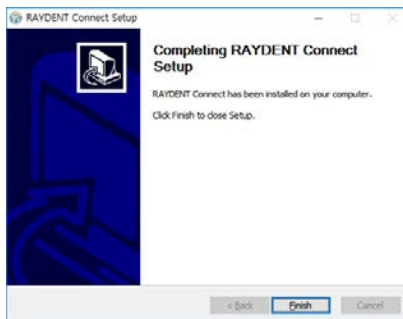
Check the installation information and select the [Install] button to start the installation.

5



Installation in progress.

6



Installation complete. Click the [Finish] button to finish the installation.

Note



There are three types of license depending on the function. For additional licensing inquiries, please contact your distributor or customer support.

- 1) SW1 license: Object scan protocol is activated on the device.
- 2) SW2 license: SW1 + Option selection function that is automatically converted to STL after scanning is activated.
- 3) Dongle key: SW2 + STL editing function is activated.

4 How to use RAYSCAN Object Scan

4.1 Object Positioning (RAYSCAN $\alpha+$, RAYSCAN α)

4.1.1 Impression (Maxilla, Mandible) Positioning

No.	Figure	Description
1		<p>Remove the normal chinrest and add on the Object Scan Tray.</p>
2		<p>Insert the Impression body into the holder. Be aware of the direction and press all the way to the end.</p> <p>Position the body of Impression in the middle of mid-sagittal line.</p> <p>CAUTION: Handle with care of the body of Impression while insert and remove from the holder.</p>

3



Place the holder to the guide holes.

4





Verify the impressed surface faces toward the mirror on the column.



Use the supporters on the bottom of the Impression holder to adjust the height.



4.1.2 Model (Maxilla, Mandible) Positioning

No.	Figure	Description
1	 The top photograph shows a white dental scanner with a clear chinrest. The bottom photograph shows the same scanner with a black circular Object Scan Tray mounted on the chinrest area.	<p>Remove the normal chinrest and add on the Object Scan Tray.</p>
2	 The top photograph shows a yellow dental model being placed on a black sponge disc. The bottom photograph shows the model fully seated on the sponge disc on the scanner's tray.	<p>Place the anterior incisors of model on a sponge disc in the front of the mirror.</p> <p>CAUTION: When placing the model on the sponge disc, be careful not to get it out of the sponge disc.</p>

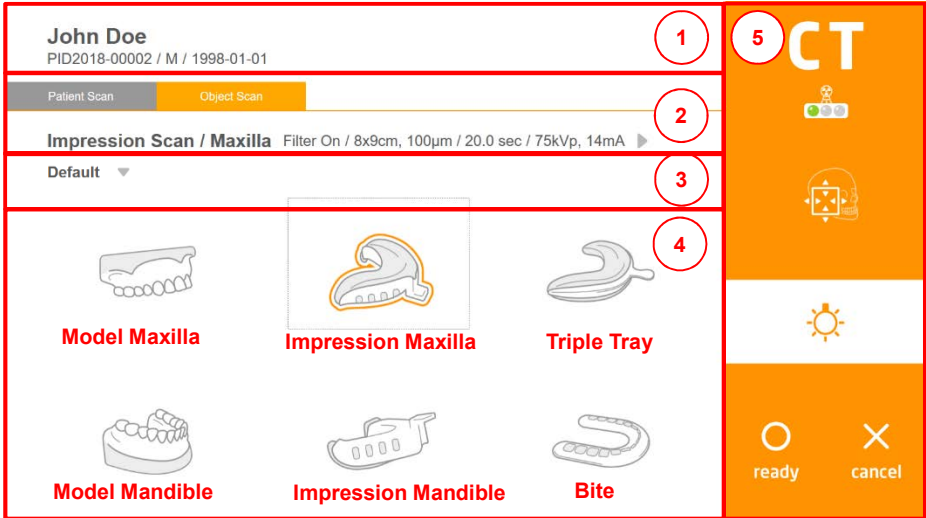
4.1.3 Bite Positioning

No.	Figure	Description
1	 The top photograph shows a white dental scanner with a clear chinrest. The bottom photograph shows the same scanner with the chinrest removed and a black circular Object Scan Tray placed on the mirror.	<p>Remove the normal chinrest and add on the Object Scan Tray.</p>
2	 The top photograph shows a red bite block being placed on a black sponge disc. The bottom photograph shows the bite block fully seated on the sponge disc.	<p>Place the anterior incisors of bite on a sponge disc in the front of the mirror.</p> <p>CAUTION: When placing bite on the sponge disc, be careful not to get it outside the sponge disc.</p>

4.2 Object Scanning (RAYSCAN α+)

4.2.1 Configuration of Object Scan PC Screen

Select CT modality on the RAYSCANS screen then click [Object Scan] tab on the top.

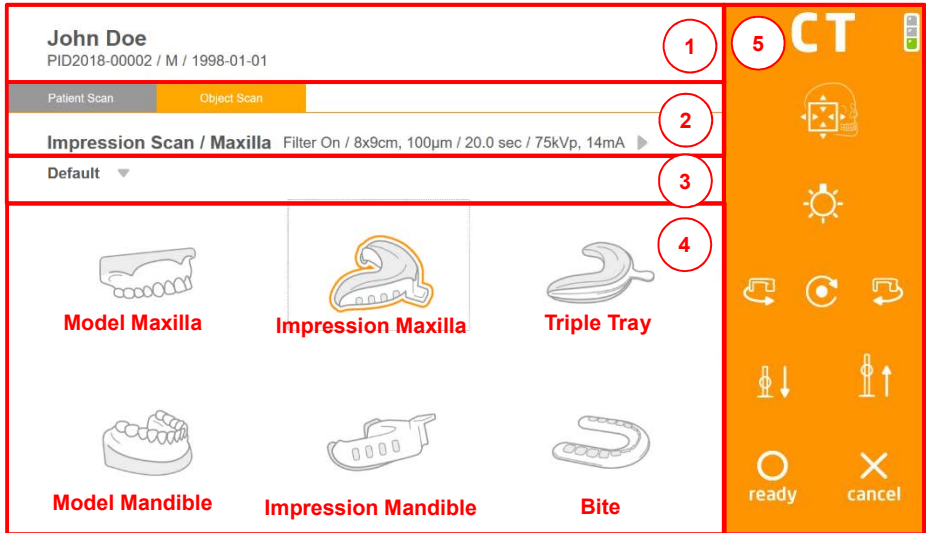


No.	Item	Description
1	Patient Info	Patient name, ID, gender, date of birth, etc. are displayed.
2	Acquisition Info	Select either Patient Scan or Object Scan. The selected acquisition mode and conditions are displayed.
3	Cal data	When acquiring Impression image, you can select calibration data of the impression materials.
4	Acquisition Mode	Select the acquisition mode.
5	Device Control	Tube temperature indicator, radiation indicator, positioning beam On/Off, ready/cancel. Note: Refer to the RAYSCAN α+ user manual for details.

OBJECT SCAN 4 How to use RAYSCAN Object Scan

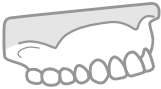





4.2.2 Configuring Object Scan Touch Screen

Selecting the CT modality on RAYSCAN screen, click [Object Scan] tab on the top.



No.	Item	Description
1	Patient Info	Patient name, ID, gender, date of birth, etc. are displayed.
2	Acquisition Info	Select either Patient Scan or Object Scan. The selected acquisition mode and conditions are displayed.
3	Cal data	When acquiring Impression image, you can select calibration data of the impression materials.
4	Acquisition Mode	Select the acquisition mode.
5	Device Control	Tube temperature indicator, radiation indicator, positioning beam On/Off, ready/cancel. Note: Refer to the RAYSCAN α+ user manual for details.


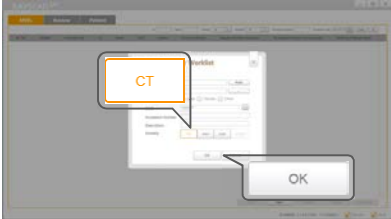


4.2.3 Acquisition Mode Description

No.	Figure	Description
1		<p>Model Maxilla</p> <p>Acquire maxilla plaster model images.</p>
2		<p>Model Mandible</p> <p>Acquire mandibular plaster model images.</p>
3		<p>Impression Maxilla</p> <p>Acquire the image of the impression made in the maxilla.</p>
4		<p>Impression Mandible</p> <p>Acquire the image of impression made in the mandible.</p>
5		<p>Impression Triple Tray</p> <p>Acquire the image of impression made in the triple tray.</p>
5		<p>Bite</p> <p>Acquire the image of Bite.</p>

OBJECT SCAN 4 How to use RAYSCAN Object Scan

4.2.4 Object Scan Acquisition

Refer to “4.1 Object Positioning (RAYSCAN α+, RAYSCAN α)” to accurately acquires images.

No.	Figure	Description
1		Select the modality work list (MWL) and then select the [New] button to register a new patient.
2		On the MWL screen, select the scan type as [CT] and click the [OK] button.
3		Select the created information in the list and click the [Scan] button on the lower right corner.
4		Confirm patient information and select [OK] button to go to acquisition step.

5



On the CT modality screen, select the Object Scan tab and select the desired impression, select the calibration data.

Note: Refer to the RAYSCAN user manual for Patient Scan.

Caution: When scanning impression, if impression material and calibration data do not match, there may be a problem in STL converting.

6



Press the [ready] button on the console PC or touch monitor to rotate the device to the position for acquisition. Selecting the [cancel] button cancels acquisition and moves to the standby screen.

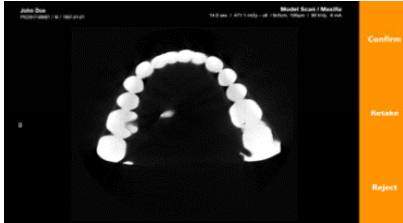
7



When the exposure switch is lit green, press the button until the acquisition is complete.

Note: Push the button until you hear a beep. If you release the button in the middle of exposure, the acquisition might stop. In case of an emergency, take your hand off the exposure switch.

8



When exposure is finished, select either [Confirm/Retake/Reject] buttons.

Confirm: Save the image and move to the acquisition list screen and standby.

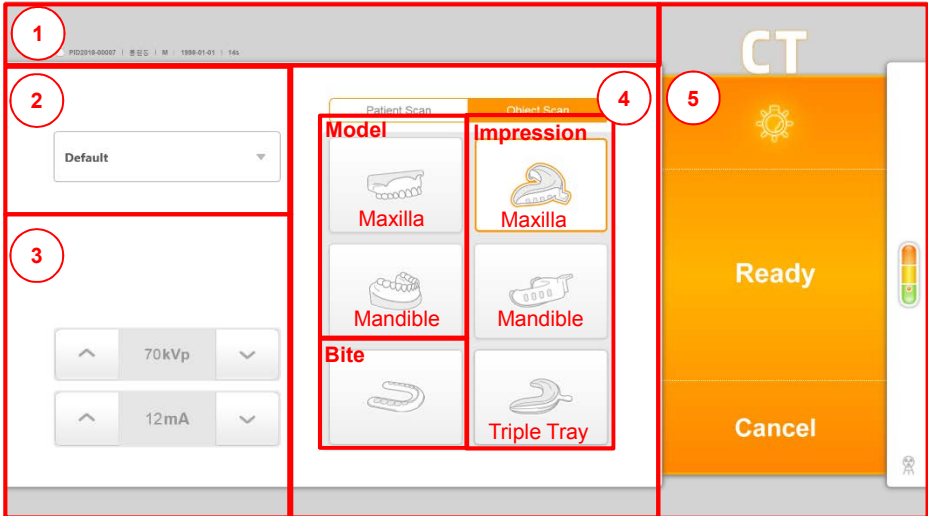
Retake: Automatically moves to the patient information screen and resumes.

Reject: Saves images with deletion information, moves to shooting list screen, and waits.

4.3 Object Scanning (RAYSCAN α)

4.3.1 Configuration of Object Scan PC Screen.

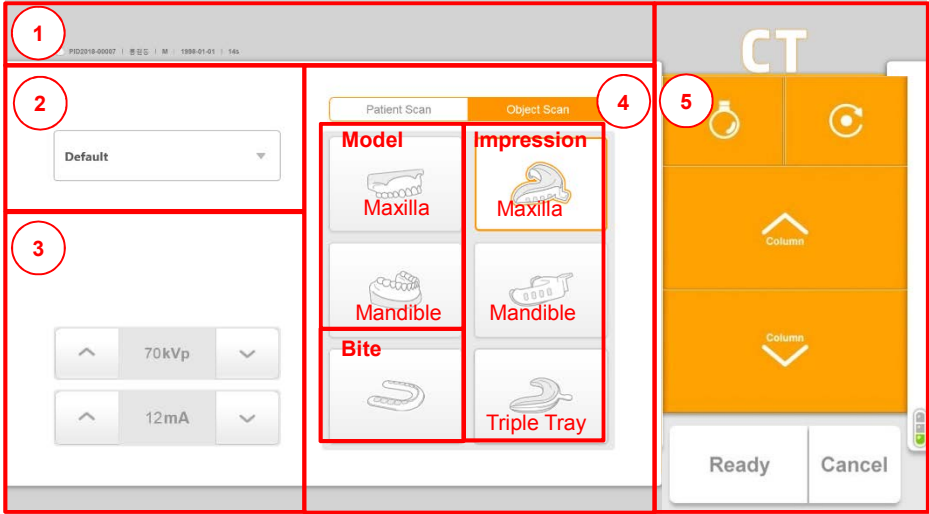
Select CT modality on the RAYSCAN screen then click [Object Scan] tab on the top.



No.	Item	Description
1	Patient Info	Patient name, ID, gender, date of birth, etc. are displayed.
2	Cal data	When acquiring Impression image, you can select calibration data of the impression materials.
3	Acquisition Info	The selected acquisition mode and conditions are displayed.
4	Acquisition Mode	Select the acquisition mode.
5	Device Control	Tube temperature indicator, radiation indicator, positioning beam On/Off, Ready/Cancel. Note: Refer to the RAYSCAN α user manual for details.

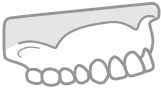





4.3.2 Configuring Object Scan Touch Screen

Select CT modality on the RAYSCAN screen then click [Object Scan] tab on the top.



No.	Item	Description
1	Patient Info	Patient name, ID, gender, date of birth, etc. are displayed.
2	Cal data	When acquiring Impression image, you can select calibration data of the impression materials.
3	Acquisition Info	The selected acquisition mode and conditions are displayed.
4	Acquisition Mode	Select the acquisition mode.
5	Device Control	Tube temperature indicator, radiation indicator, positioning beam On/Off, Ready/Cancel. Note: Refer to the RAYSCAN α user manual for details.


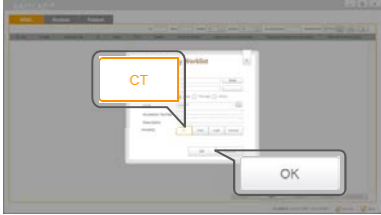


4.3.3 Acquisition Mode Description

No.	Figure	Description
1		<p>Model Maxilla</p> <p>Acquire maxilla plaster model images.</p>
2		<p>Model Mandible</p> <p>Acquire mandibular plaster model images.</p>
3		<p>Impression Maxilla</p> <p>Acquire the image of the impression made in the maxilla.</p>
4		<p>Impression Mandible</p> <p>Acquire the image of impression made in the mandible.</p>
5		<p>Impression Triple Tray</p> <p>Acquire the image of impression made in the triple tray.</p>
6		<p>Bite</p> <p>Acquire the image of Bite.</p>

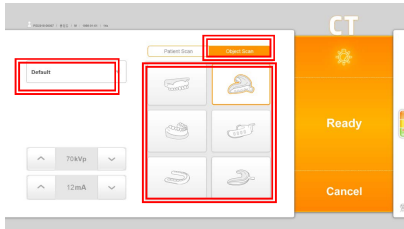
OBJECT SCAN 4 How to use RAYSCAN Object Scan

4.3.4 Object Scan Acquisition

Refer to “4.1 Object Positioning (RAYSCAN α+, RAYSCAN α)” to accurately acquires images.

No.	Figure	Description
1		Select the modality work list (MWL) and then select the [New] button to register a new patient.
2		On the MWL screen, select the scan type as [CT] and click the [OK] button.
3		Select the created information in the list and click the [Scan] button on the lower right corner.
4		Confirm patient information and select [OK] button to go to acquisition step.

5

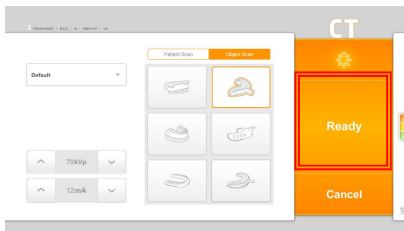


On the CT modality screen, select the Object Scan tab and select the desired mode (protocol). When scanning impression, select the calibration data.

Note: Refer to the RAYSCAN user manual for Patient Scan.

Caution: When scanning impression, if impression material and calibration data do not match, there may be a problem in STL converting.

6



Press the [Ready] button on the console PC or touch monitor to rotate the device to the position for acquisition. Selecting the [Cancel] button cancels acquisition and moves to the standby screen.

7



When the exposure switch is lit green, press the button until the acquisition is complete.

Note: Push the button until you hear a beep. If you release the button in the middle of exposure, the acquisition might stop. In case of an emergency, take your hand off the exposure switch.

8



When exposure is finished, select either [Confirm/Retake/Reject] buttons.

Confirm: Save the image and move to the acquisition list screen and standby.


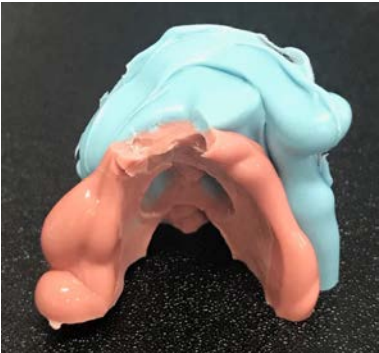
Retake: Automatically moves to the patient information screen and resumes.

Reject: Saves images with deletion information, moves to shooting list screen, and waits.

4.4 Object Calibration Procedure

When scanning impression body and perform STL converting, proceed with Object scan calibration. If the impression material is changed or added, the calibration should proceed.

4.4.1 Preparation of Calibration Materials

No.	Figure	Description
1		<p>Prepare the impression with Lightbody material to calibrate.</p> <p>Note: As shown in the figure on the left, a mixture of Heavybody and Lightbody should be used as the calibration material. If only one material is used, calibration data will not be extracted.</p>
2		<p>Remove the impression from the tray and cut about 2 cm from the end.</p> <p>If there is no impression using Lightbody material, use Putty to make a small container shape, then insert Lightbody material and harden it, cut it in half and make it similar to impression.</p>

OBJECT SCAN 4 How to use RAYSCAN Object Scan

3



Place the Sponge Disc on the Object Scan Tray and place the trimmed impression on top of the Sponge Disc.


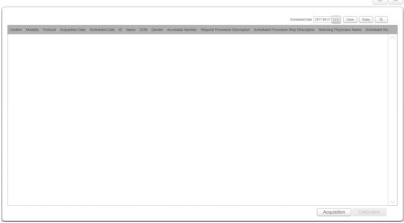


Note: The calibration material must be placed on the Sponge Disc in accordance with the Impression exposure direction.

4.4.2 Object Scan Calibration PC screen




No.	Figure	Description
1	Search bar	Searches for MWL lists.
2	Results list	It shows the retrieved result. However, the image must be captured with patient ID for Object Calibration. Only impression protocol is output in search result.
3	Button	Acquire the Object Scan image for calibration, or performs calibration. For details, refer to "4.4.4 Calibration".

4.4.3 Image Acquisition

No.	Figure	Description
1		<p>Run ObjectScanCalibration on the desktop.</p>
2		<p>Click the [Acquisition] button.</p> <p>Note: The [Acquisition] button is only active on the Workstation with the Object Scan license activated.</p>
3		<p>Scanner is running.</p> <p>Note: The acquisition screen is automatically entered.</p>
4		<p>Select the impression protocol in the Object Scan item.</p>

OBJECT SCAN 4 How to use RAYSCAN Object Scan

5




The screenshot shows the RAYSCAN software interface. At the top, it displays 'John Doe' and 'P102019-00000 / M / 1998-01-01'. Below this, there are tabs for 'Patient Scan' and 'Object Scan'. The main area shows 'Impression Scan / Maxilla' with technical details: 'Filter On / Bidcom, 100µm / 20.0 sec / 75kVp, 14mA'. There are several icons representing different dental models. On the right, there is a large orange 'CT' button with a gear icon. Below it is a smaller orange button with a 'ready' label and a 'cancel' label, both enclosed in a red square.

Click the [ready] button to prepare for scanning.

Note: Place the object for calibration in this step.

6




The diagram shows a hand holding a probe. An orange arrow points down to the button on the probe, indicating where to press.

After the green light on the exposure switch has been illuminated, continue to press the switch until scanning has been completed.

Note: Take care not to release the button during scanning as doing so will stop the scanning process. Maintain audio and visual contact with the patient and x-ray unit during exposure. If the c-arm stops moving during exposure, or moves in an erratic way, release the exposure button immediately.


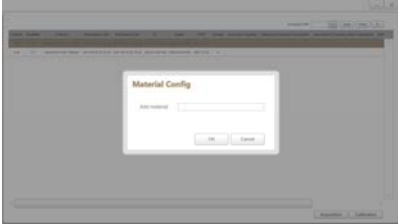

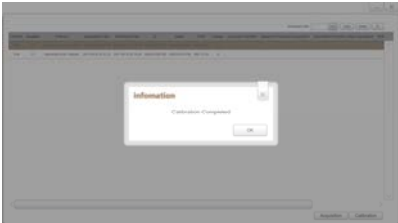
7



The screenshot shows the RAYSCAN software interface after scanning is completed. The main area is mostly blank, with a progress bar at the bottom. There are 'Back' and 'Cancel' buttons at the bottom right.

When scanning is completed, the screen returns to the initial screen.

4.4.4 Calibration

No.	Figure	Description
1		<p>Select the scanned item and click the [Calibration] button.</p>
2		<p>The Material Config screen is displayed.</p> <p>If nothing is registered, only new addition items will be output, and then you can select and update existing material type.</p> <p>Note: Material names can only be in English, and special characters and spaces are not allowed. Numbers are only available after the English alphabet.</p>
3		<p>Proceed with calibration.</p>
4		<p>When the calibration is completed, a completion message is displayed.</p>

5 How to use RAYDENT Connect

5.1 RAYDENT Connect screen configuration

5.1.1 Main screen

RAYDENT Connect Ver. 1.0.0.6

Order Information

OrderID 20180001 Order Ray Client Ray Patient John Doe Technician - Scan Part Both

My Data

Today 3 days 1 week 1 month 3 months 1 year Search by ID or Name

Patient ID	Patient Name	Date Time	Protocol	Type
PID2017-00001	John Doe	2018-01-26 18:41	Impression Scan / Triple	DICOM
PID2017-00002	Jane Doe	2018-01-04 09:34	Impression Scan / Maxillary	DICOM
		2017-12-04 09:55	Impression Scan / Maxillary	DICOM
		2017-12-02 17:13	Impression Scan / Triple	STL
		2017-12-02 05:30	Bite Scan	STL
		2017-01-04 18:41	Impression Scan / Mandible	DICOM
		2017-01-04 18:41	Bite Scan	DICOM

Convert to STL

No.	Items	Description
1	Order list	Display the order information list.
2	Image retrieval	Patient images can be viewed according to the search conditions.
3	Patient list	Display the patient list.
4	STL list	Display the STL and image list.
5-1	[Convert to STL]	The selected object image can be converted to STL by RAYDENT Converter program.
5-2	[Edit STL]	The selected STL file can be edited with the RAYDENT Converter program.

5.1.2 Configuration screen

The screenshot shows a 'Configuration' dialog box with three main sections, each highlighted with a red box and a circled number:

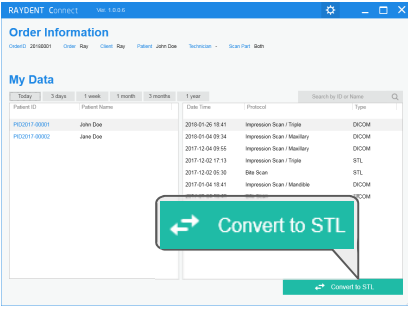

- 1** Language: A dropdown menu currently showing 'English'.
- 2** Server: A text input field containing '127.0.0.1' and a blue 'Verify' button.
- 3** Patient Name Format: A dropdown menu currently showing 'Last First Middle'.

At the bottom of the dialog, there are two buttons: 'Save' (blue) and 'Cancel' (grey).

No.	Items	Description
1	Language setting	Setting the language displayed in the program.
2	Server setting	Setting the server address to import image information.
3	Patient Name Format	Setting the format to enter the patient name.

5.2 STL Converting

When a user selects DICOM image, it interworks with RAYDENT Converter in order to convert object scan image to STL.

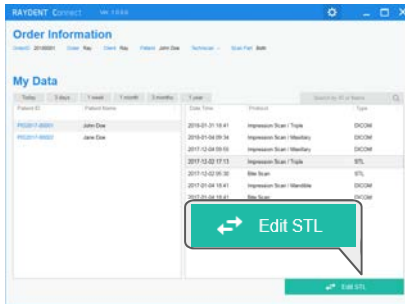
No.	Figure	Description																																			
1	 <p>The screenshot shows the RAYDENT Connect interface. At the top, there's a navigation bar with 'Order Information' and 'My Data'. Below 'My Data', there's a table with columns: Patient ID, Patient Name, Date Time, Protocol, and Type. The table contains several rows of data. A green callout box with a double-headed arrow points to a 'Convert to STL' button located at the bottom right of the table area.</p> <table border="1" data-bbox="188 606 595 710"> <thead> <tr> <th>Patient ID</th> <th>Patient Name</th> <th>Date Time</th> <th>Protocol</th> <th>Type</th> </tr> </thead> <tbody> <tr> <td>PC0017-00001</td> <td>John Doe</td> <td>2016-01-26 18:41</td> <td>Impression Scan / Triple</td> <td>DICOM</td> </tr> <tr> <td>PC0017-00002</td> <td>Jane Doe</td> <td>2016-01-04 09:34</td> <td>Impression Scan / Maxillary</td> <td>DICOM</td> </tr> <tr> <td></td> <td></td> <td>2017-10-04 09:05</td> <td>Impression Scan / Maxillary</td> <td>DICOM</td> </tr> <tr> <td></td> <td></td> <td>2015-10-02 17:13</td> <td>Impression Scan / Triple</td> <td>STL</td> </tr> <tr> <td></td> <td></td> <td>2017-10-04 09:30</td> <td>Bite Scan</td> <td>STL</td> </tr> <tr> <td></td> <td></td> <td>2017-01-04 18:41</td> <td>Impression Scan / Mandible</td> <td>DICOM</td> </tr> </tbody> </table>	Patient ID	Patient Name	Date Time	Protocol	Type	PC0017-00001	John Doe	2016-01-26 18:41	Impression Scan / Triple	DICOM	PC0017-00002	Jane Doe	2016-01-04 09:34	Impression Scan / Maxillary	DICOM			2017-10-04 09:05	Impression Scan / Maxillary	DICOM			2015-10-02 17:13	Impression Scan / Triple	STL			2017-10-04 09:30	Bite Scan	STL			2017-01-04 18:41	Impression Scan / Mandible	DICOM	<p>Click [Convert to STL] button after selection of STL for conversion.</p> <p>When a user selects Object Scan image which can be converted to STL, the button of [Convert to STL] would be activated.</p> <p>The order information of Scan Part is:</p> <p>Upper: Select an image of Maxillary.</p> <p>Lower: Select an image of Mandibular.</p> <p>Both: Select an image of Triple object or three images such as Bite, Maxillary, and Mandibular.</p>
Patient ID	Patient Name	Date Time	Protocol	Type																																	
PC0017-00001	John Doe	2016-01-26 18:41	Impression Scan / Triple	DICOM																																	
PC0017-00002	Jane Doe	2016-01-04 09:34	Impression Scan / Maxillary	DICOM																																	
		2017-10-04 09:05	Impression Scan / Maxillary	DICOM																																	
		2015-10-02 17:13	Impression Scan / Triple	STL																																	
		2017-10-04 09:30	Bite Scan	STL																																	
		2017-01-04 18:41	Impression Scan / Mandible	DICOM																																	
2	 <p>The screenshot shows the RAYDENT Converter interface. It features a 3D rendering of a dental arch, showing the upper and lower teeth in a light gray color. The interface includes a toolbar on the left side with various icons for manipulation and a top navigation bar.</p>	<p>The RAYDENT Converter program will be called automatically and can convert to STL.</p>																																			

5.3 STL Editing

When a user selects STL, it interworks with RAYDENT Converter in order to edit STL file.

No.	Figure	Description
-----	--------	-------------

1



Click [Edit STL] button after selection of STL for edit.

When a user selects STL file which can be edited to STL, the button of [Edit STL] would be activated.

The order information of Scan Part is:

Upper: Select an image of Maxillary.

Lower: Select an image of Mandibular.

Both: Select an image of Triple object or three images such as Bite, Maxillary, and Mandibular.

2

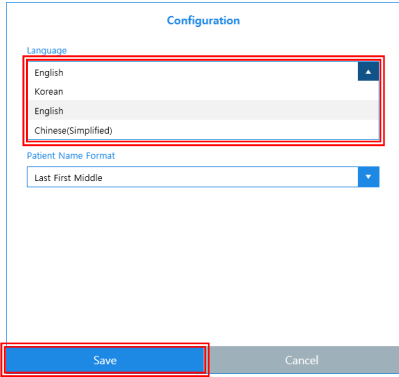
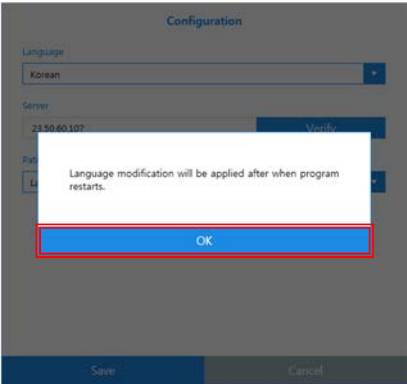


The RAYDENT Converter program will be called automatically and can edit of STL file.

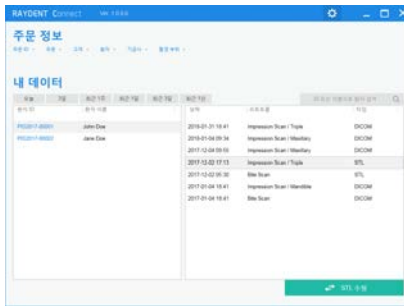
5.4 Changing configuration

Changing the configuration of the program.

5.4.1 Language Setting

No.	Figure	Description
1		<p>Change the language setting. Select the desired language and click the [Save] button.</p> <p>Note: Cannot be changed when called by the RAYDENT Designer program.</p>
2		<p>Click the [OK] button to restart the program automatically.</p>

3



Make sure the changed language.

5.4.2 Setting Server IP

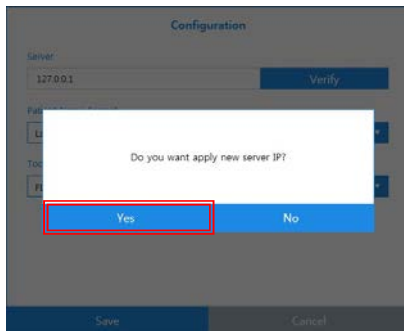
No.	Figure	Description
-----	--------	-------------

1



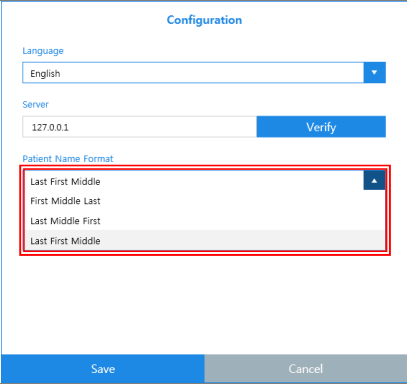
Set server to import image information. Input server IP, then click [Verify] button. Verify the validity of the server.

2



Click [Yes] button to apply the server IP.

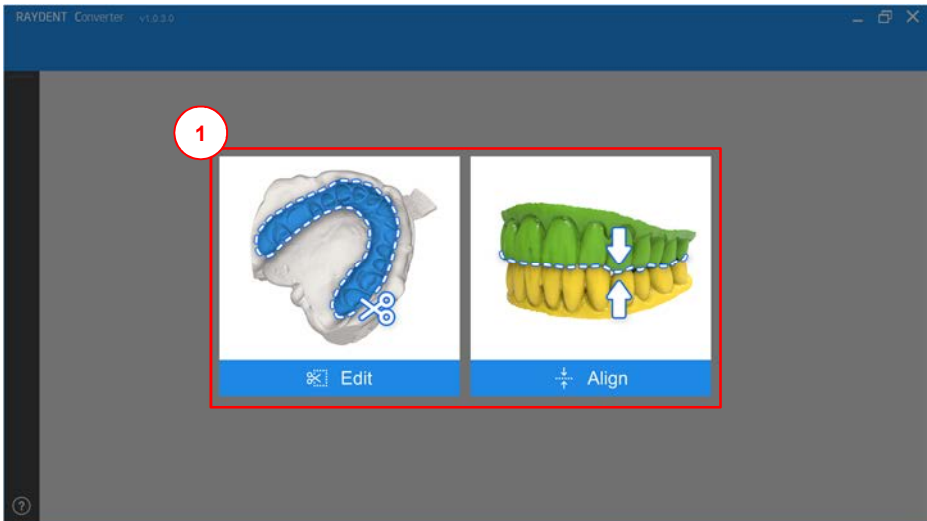
5.4.3 Setting Patient Name Format

No.	Figure	Description
1	 The screenshot shows a 'Configuration' dialog box with three sections: 'Language' (set to English), 'Server' (127.0.0.1 with a Verify button), and 'Patient Name Format'. The 'Patient Name Format' dropdown menu is open, showing four options: 'Last First Middle', 'First Middle Last', 'Last Middle First', and 'Last First Middle'. The first option is highlighted. The dialog has 'Save' and 'Cancel' buttons at the bottom.	<p>Select the formatting of display of patient name. Select the format. Images will be listed in the order of the format.</p> <p>Formats are as follows: [First Middle Last] [Last Middle First] [Last First Middle]</p>

6 The operation of RAYDENT Converter

6.1 The screen composition of RAYDENT Converter

6.1.1 The starting screen

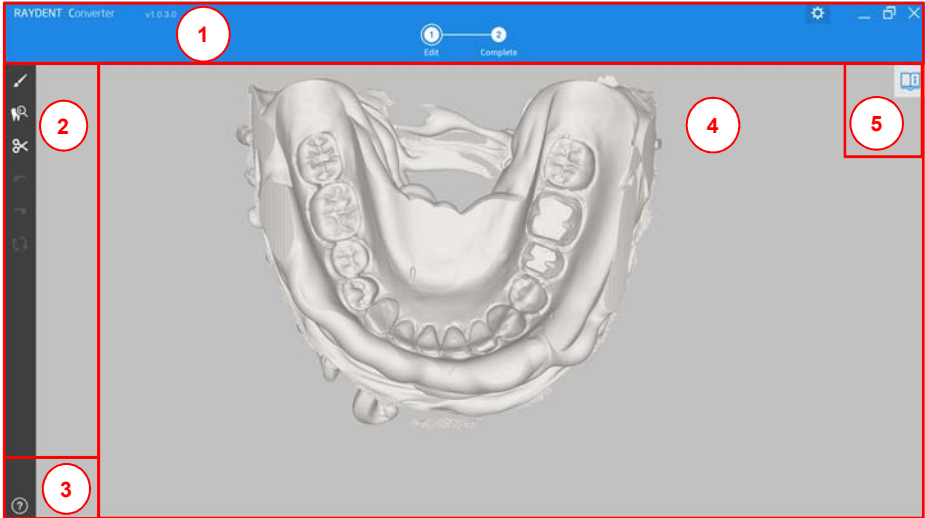


No.	Items	Description
1	Mode selection	When a program runs without other program's call the window of mode selection would appear. Do select a mode you want.

OBJECT SCAN 6 The operation of RAYDENT Converter

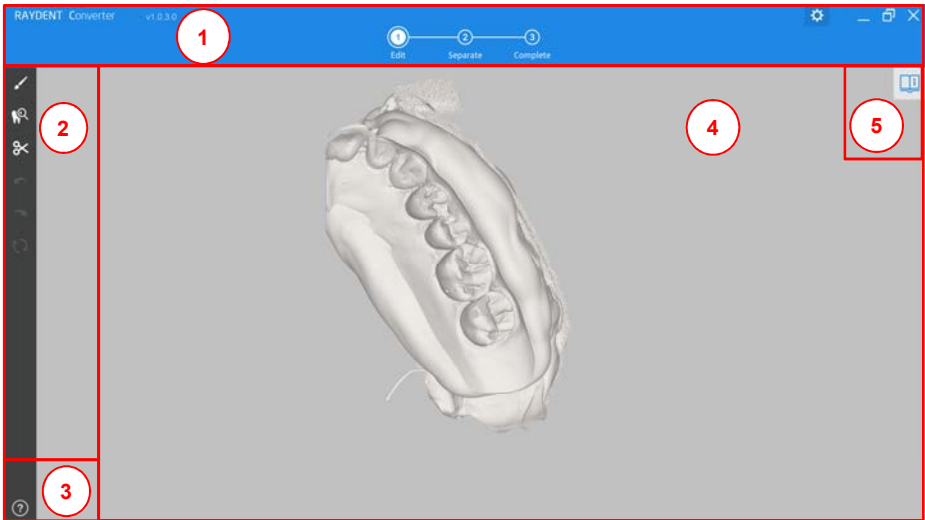
6.1.2 Edit mode

6.1.2.1 Single object



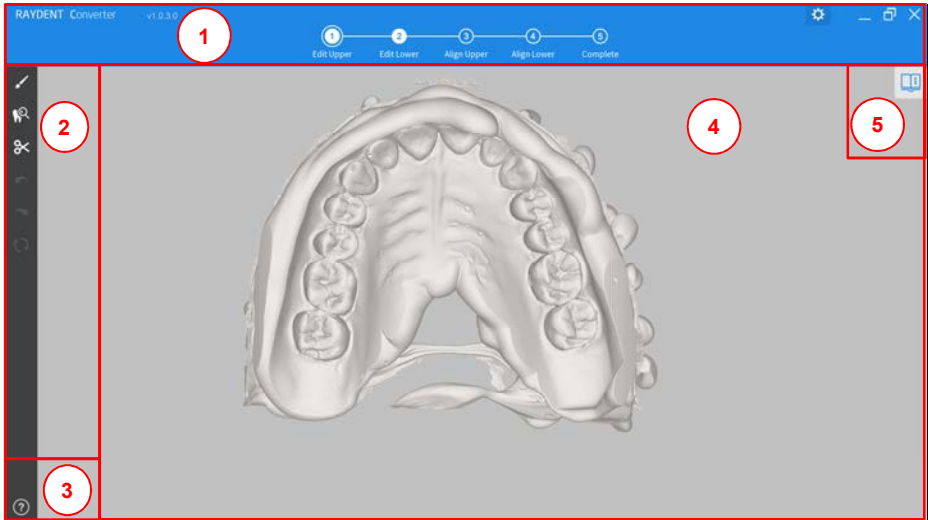
No.	Items	Description
1	Move a step	There are two steps. The first step supports works all of the editing tasks. The second step supports works exporting of a modified object.
2	Toolbar	The brush tool provides the clipping function about a selection area. The inspection tool provides the filling function about a hole in an object. The cut tool provides the cutting function about a part of an object and removes its cut area.
3	Help	It would appear it when a user pressed the [?] button with the left button of a mouse.
4	Display Object	It is displaying a converted 3D mesh object.
5	Tool guide	It would appear the summarized description about the selected tool.

6.1.2.2 Triple object



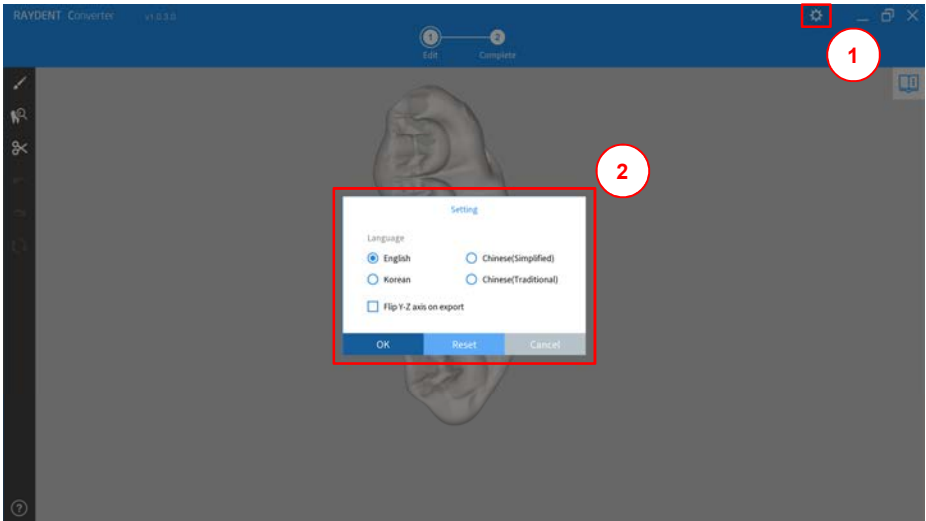
No.	Items	Description
1	Move a step	There are three steps. The first step supports works all of the editing tasks. The second step supports works of separation. The third step supports works exporting of a modified object.
2	Toolbar	The brush tool provides the clipping function about a selection area. The inspection tool provides the filling function about a hole in an bject. The cut tool provides the cutting function about a part of an object and removes its cut area.
3	Help	It would appear it when a user pressed the [?] button with the left button of a mouse.
4	Display Object	It is displaying a converted 3D mesh object.
5	Tool guide	It would appear the summarized description about the selected tool.

6.1.3 Align mode



No.	Items	Description
1	Move a step	There are five steps. The first and second steps support works all of the editing tasks about each object. The third and fourth steps support works of aligning between each object and bite object. The fifth step supports works exporting of a modified object.
2	Toolbar	The brush tool provides the clipping function about a selection area. The inspection tool provides the filling function about a hole in an object. The cut tool provides the cutting function about a part of an object and removes its cut area.
3	Help	It would appear it when a user pressed the [?] button with the left button of a mouse.
4	Display Object	It is displaying a converted 3D mesh object.
5	Tool guide	It would appear the summarized description about the selected tool.

6.1.4 Setting





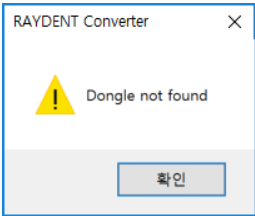
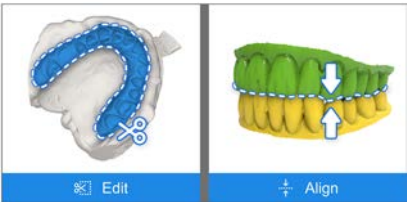
No.	Items	Description
1	Setting Button	When press [Setting] button, the setting window would appear on a screen.
2	Setting Window	Can set a shown language on screen. If set [Flip Y-Z axis on export], a STL file would be saved after flipping with Y-Z axis.

6.2 How to run RAYDENT Converter

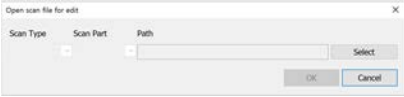
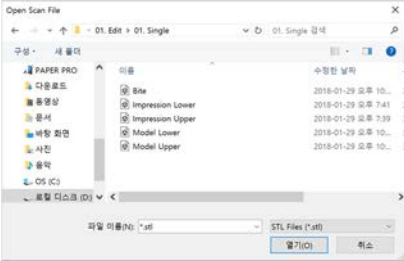

It can be converted and loaded a data which is a CT such as Impression, Model, and Bite captured by the protocol of object scan on the RAYSCAN system.

6.2.1 How to run RAYDENT Converter by independently

It can run by independence a program and convert to 3D mesh data when a DICOM data captured by the protocol of object scan on the RAYSCAN system has been saved in a computer storage already.

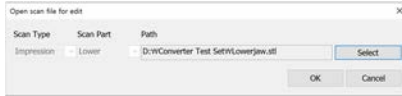
No.	Figure	Description
1		<p>Insert a license dongle key provided with the RAYDENT Converter program to a PC.</p>
2		<p>Run a program to use a shortcut on a screen.</p>
3		<p>If there is no dongle key on a computer and run a program, the warning message, which is 'Dongle not found', would appear on a screen. However, if there is a connected dongle key on a computer already, please attempts to contact a seller or customer support center.</p>
4		<p>Select a mode you want. It would be working a program in a selected mode you choose.</p>

6.2.1.1 Edit mode

No.	Figure	Description
1		<p>Can choose one object in edit mode. It would appear a file selection window when a user presses a select button.</p>
2		<p>Press an [Open] button after choosing one file you want.</p>
3		<p>It is showing red text on a path if it is not proper object file.</p>

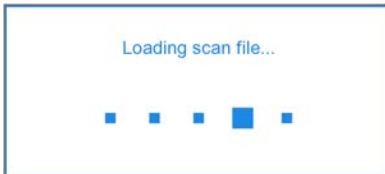
OBJECT SCAN 6 The operation of RAYDENT Converter

4



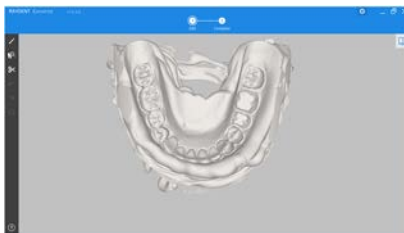
Press an [OK] button if everything is ok.

5




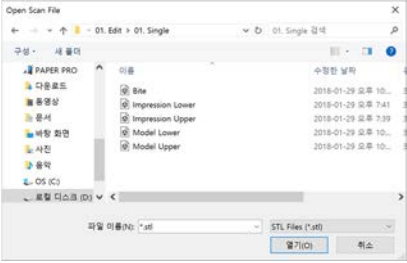
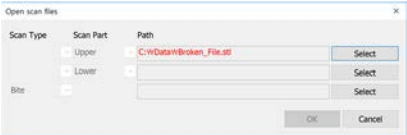
It is loading selected objects to 3D mesh data.

6



It is shown a converted 3D mesh data on a screen.

6.2.1.2 Align mode

No.	Figure	Description
1		<p>Has to select three objects in an align mode. It would appear a file selection window when a user presses each [Select] button.</p>
2		<p>Press an [Open] button after choosing one file you want.</p>
3		<p>It is showing red text on a path if it is not proper object file.</p>

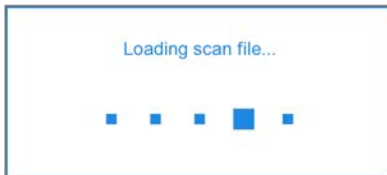
OBJECT SCAN 6 The operation of RAYDENT Converter

4



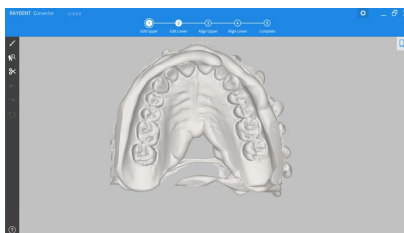
Press an [OK] button if everything is ok.

5



It is loading selected objects to 3D mesh data.



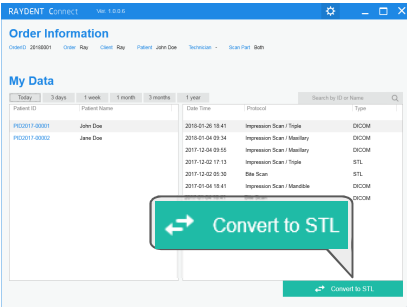
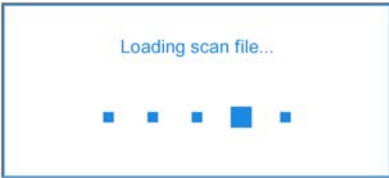
6



It is shown a converted 3D mesh data on a screen.

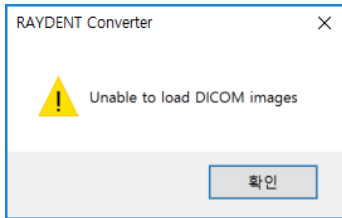
6.2.2 How to run a program via RAYDENT Connect

It can run via RAYDENT Connect by searching a CT image and convert it to 3D mesh data when a DICOM data captured by the protocol of object scan on the RAYSCAN system has been saved in a RAYSCAN Server already.

No.	Figure	Description
1		<p>Insert a license dongle key provided with the RAYDENT Converter program to a PC.</p>
2		<p>Run a program to use a shortcut on a screen.</p>
3		<p>It is activated [Convert to STL] button when a user selects an object scan file.</p> <p>If a user presses this button, the RAYDENT Converter would be run.</p>
4		<p>It is converting a selected object scan data to 3D mesh data.</p>

OBJECT SCAN 6 The operation of RAYDENT Converter

5



If there is no DICOM file captured by the protocol of object scan or there is a damaged DICOM file, the warning message, which is 'Unable to load DICOM images', would appear on a screen.

However, if there is a DICOM file captured by the protocol of object scan, please attempts to contact a seller or customer support center.

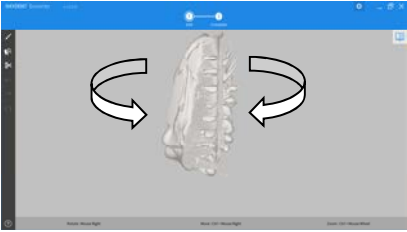
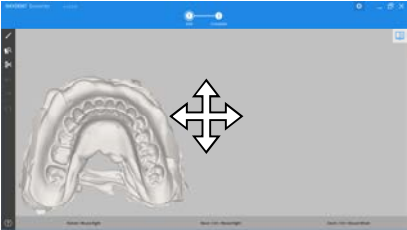

6



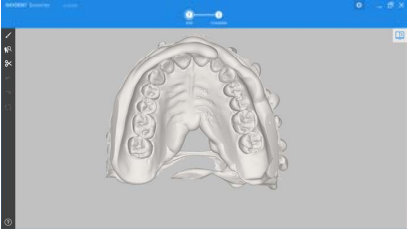


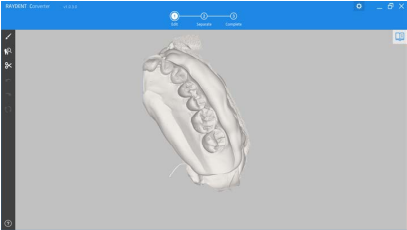
It is shown a converted 3D mesh data on a screen.

6.3 Edit mode

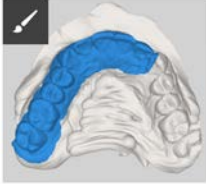

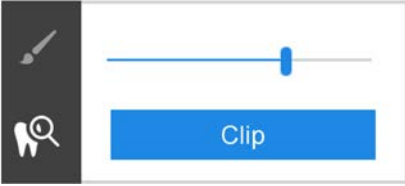
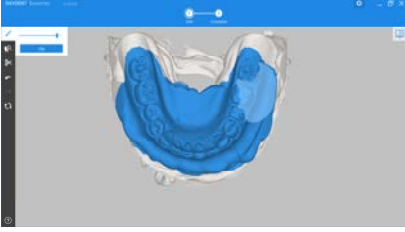
6.3.1 Rotation, move, and rescale of object

No.	Figure	Description
1		<p>Can rotate an object when a user moves a mouse everywhere holding the right button.</p>
2		<p>Can move an object when a user moves a mouse everywhere holding the right button and Ctrl key.</p>
3		<p>Can rescale an object when a user moves a mouse wheel holding the Ctrl key.</p>

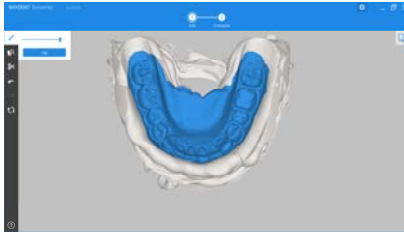
6.3.2 Type of Object

No.	Figure	Description
1		It is loaded with up way when a user opens maxillary data such as Impression and Model scan.
2		It is loaded with down way when a user opens mandibular data such as Impression and Model scan.
3		It is loaded with up way when a user opens Bite scan.
4		It is loaded with up way when a user opens Triple scan.

6.3.3 Brush

No.	Figure	Description
1	 <p data-bbox="286 544 482 564">Select brush and clip object.</p>	<p data-bbox="620 427 1009 488">When select tool guide, can check the summarized description of brush tool.</p>
2		<p data-bbox="620 660 1009 794">It would appear a possible selection region on an object on a screen when a user moves mouse point on an object after choosing brush tool.</p>
3		<p data-bbox="620 948 1009 1046">It can change a brush size when a user spins mouse wheel or moves a bar control in brush control region.</p>
4		<p data-bbox="620 1219 1009 1318">It would be selected when a user moves the mouse holding the left button on an object.</p>

5



It would be released selection when a user moves the mouse holding both the left button and CTRL key on an object.

6



When select [Undo] button, can undo previous completed task such as selection, and unselection.

7



When select [Redo] button, can redo previous canceled task such as selection, and unselection.

8



When select [Reset] button, reset task would work. It cannot be undoing.

9



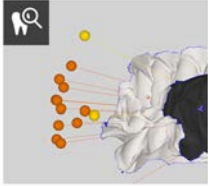

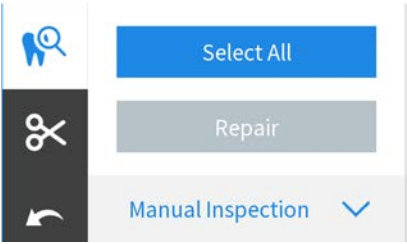
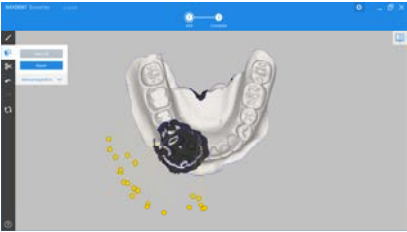
When select [Clip] button after all selection, clipping task would be progressed.

10

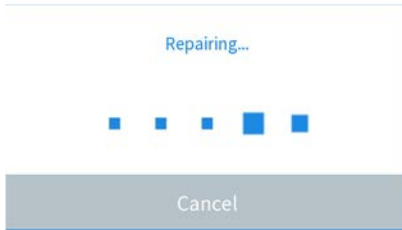


Can check the clipped object.

6.3.4 Inspection

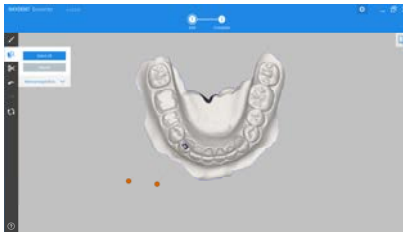
No.	Figure	Description
1	 <p>Inspect and repair defects.</p>	When select tool guide, can check the summarized description of inspection tool.
2		It would appear the control point of inspection if an object on a screen has holes when a user chooses the tool of inspection.
3		Can select all control point of inspection automatically when a user presses [select all] button.
4		It is not recommended to select tooth region and margin region when a user select inspection point manually.

5



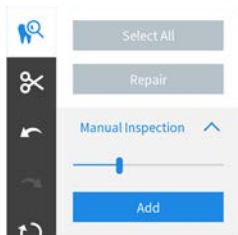
It runs when a user presses [repair] button after a user's selection of inspection regions.

6



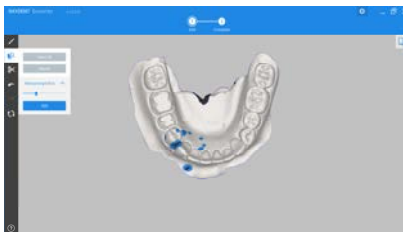
It can be repeated the same action if there are some holes in an object on a screen.

7



It can select to undefined area through the manual inspection tool.

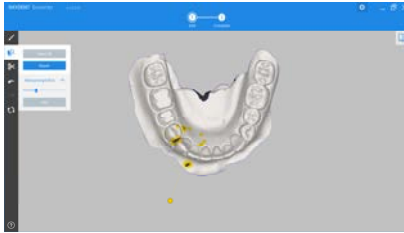
8



It can select the part of needed repairing with the brush tool.

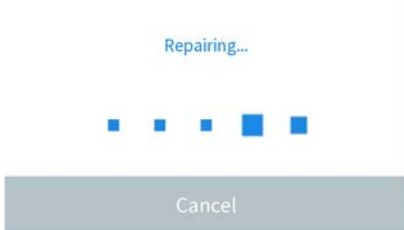
OBJECT SCAN 6 The operation of RAYDENT Converter

9



Select [Add] button after choosing some parts of needed repairing.

10



When select [Repair] button after all selection, repairing task would be progressed.




11



Can check the repaired object.

6.3.5 Cut

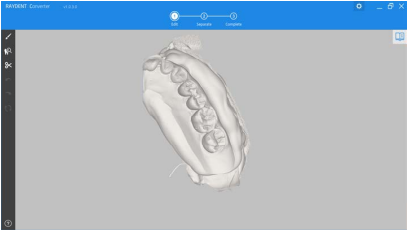
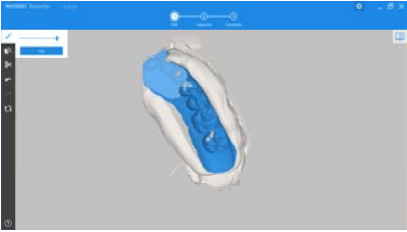

It provides a function of cutting to an object after its object would be edited by some tools such as clipping and inspection.

No.	Figure	Description
1		<p>It can use a function when a user presses [Cut] button on the toolbar on the left side of a screen.</p>
2		<p>It would appear a line on a screen when a user moves the mouse with holding the left button on the mouse. At this time, should move a line to the target area, which wants to remove it, of an object on a screen.</p>
3		<p>It would remove some parts of an object based on a line of position on a screen when a user releases the mouse button. If needs to edit more, can repeat the same process again.</p>

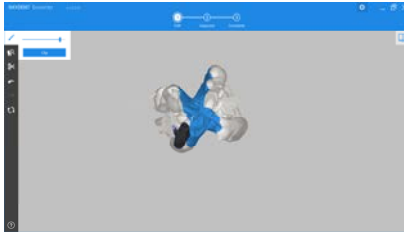
OBJECT SCAN 6 The operation of RAYDENT Converter

6.3.6 Separate

If it is a triple object, it provides a function of separating each part such as maxillary and mandibular after its object would be edited by some tools such as clipping, cutting, and inspection.

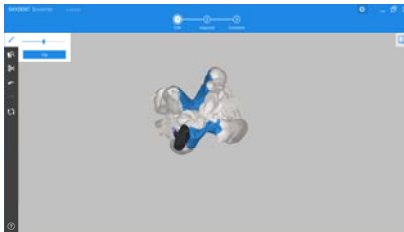
No.	Figure	Description
1		It can only work on the Triple object to separate to maxillary and mandibular.
2		Select an occlusal surface with brush tool.
3		Select another occlusal surface with brush tool after rotating the Triple object.

4



Check the Triple object after rotating it to be sure selected areas are not connected between maxillary and mandibular.

5



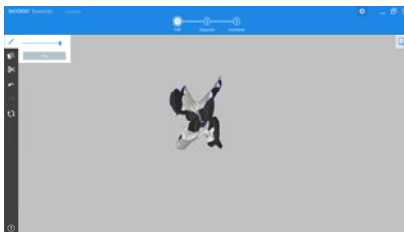
Release a connection area with brush tool if there is connected between maxillary and mandibular.

6



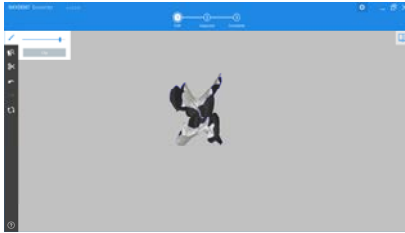
Clipping task would be working when a user click [Clip] button after selecting both maxillary and mandibular.

7



If needs editing again, it can do with variety tools such as inspection tool and cutting tool.

8



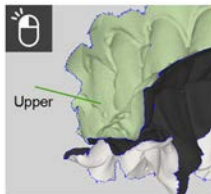
It is activated the Separate Step after the Triple object prepared for splitting each part.

9



Move to the Separate Step for splitting both maxillary and mandibular.

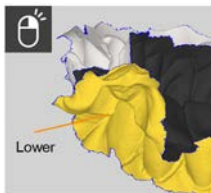
10



Select upper.

Select a maxillary with pressed the left button of mouse. If it is selected to all parts of the object, this mean that there is connection point between maxillary and mandibular. Come back to 4th step and remove connection point.

11



Select lower.

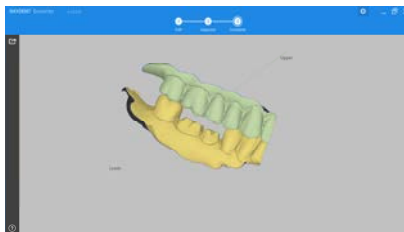
Select a mandibular with pressed the right button of mouse.

12



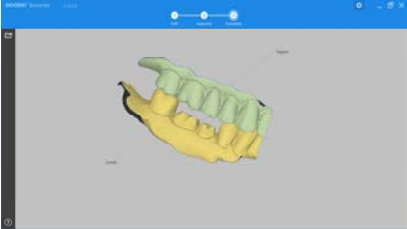
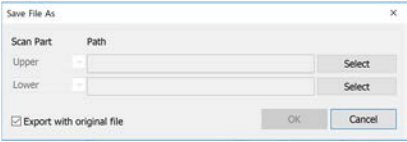
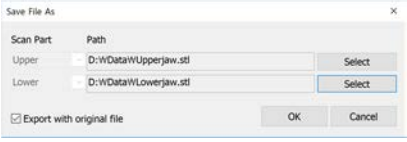
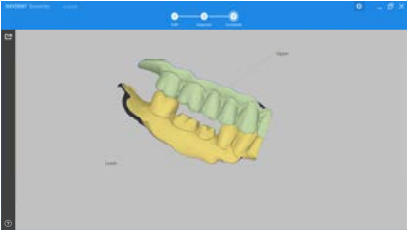
When moves to the Complete Step after selecting each part, splitting task would be progressed.

13



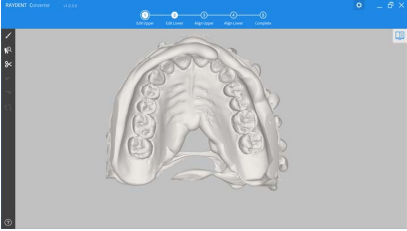
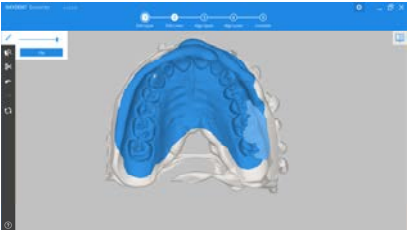

Do export task in order to save the result of splitting both maxillary and mandibular.

6.3.7 Export

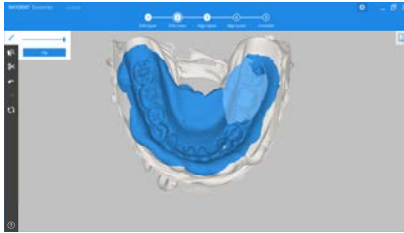
No.	Figure	Description
1		When a user wants to save the result edited, moves to last step in step control on the top side of a screen and presses 'export' button in toolbar on the left side of a screen.
2		If there are over two objects to save, it would appear the window of setting path. Has to set each object's path with press 'select' button.
3		When a user presses 'save' button after selection of path for an object, each object would have been exported to each target path. If a user set [Export with original file], the original file will be also exported with.
4		Can edit continuesly after exporting action.

6.4 Align mode

It provides align mode between upper and lower objects to use three objects such as upper, lower, and bite.

No.	Figure	Description
1		Load all of the objects.
2		Should edit of upper object.
3		Move to next step, 'Edit Lower', in step control on the top side of a screen after completed edit of upper object.

4



Should edit of lower object.

5



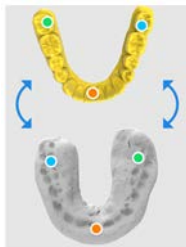
Move to next step, 'Align Upper', in step control on the top side of a screen after completed edit of lower object.

6



There are three window in align step. The top window provides of result of aligning, and below two windows would appear Upper object and Bite object to set initial position in each object on a screen for aligning.

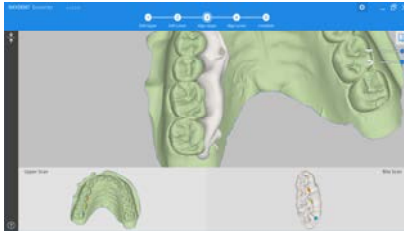
7



Select three points to align the objects.

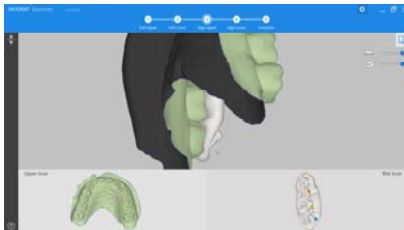
When a user attempts to set initial position for aligning between two objects, has to set each position step by step to object. If it is not set with the right position, each object cannot be aligned perfectly.

8



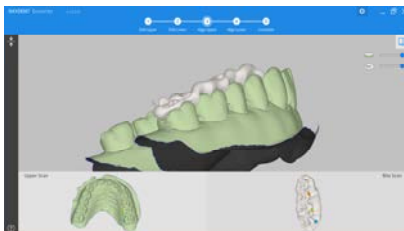
When a user wants to align, presses [Align] button in toolbar on the left side of a screen.

8



When it is not aligned with the right position, a user can reset of the initial position. In order to release a selected initial position, select again and attempts to set another position.

9



Move to next step, 'Align Lower', in step control on the top side of a screen if there is no problem after align between both objects. However, if needs to fix, retry from 6th step.

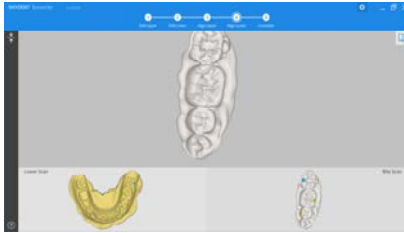
10



Set initial position in each object with the same steps like [Align Upper].

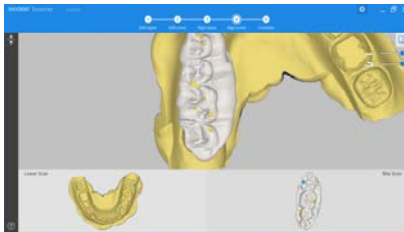
OBJECT SCAN 6 The operation of RAYDENT Converter

11



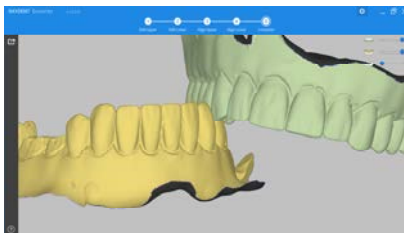
When a user wants to align, presses 'align' button in toolbar on the left side of a screen.

12



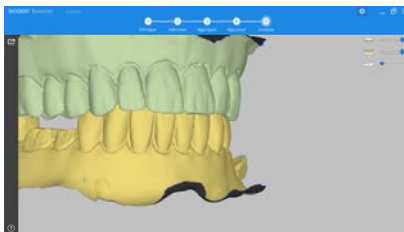
Move to next step, 'Complete', in step control on the top side of a screen if there is no problem after align between both objects. However, if needs to fix, retry from 11th step.

13



It would appear of the result of align on a screen. However, if needs to fix, retry from 6th step.

14



If there is no issue, do 'export' sequence.

RAYSCAN

2018 Ray Co., Ltd. All rights reserved.