

# **RAYFace**

**3D Scanner**

**Model: RFS200**

## **User Manual**

RUG-3623-EN

Rev. 1.0



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This user manual contains information on the appropriate use of RAYFace.

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 damage to the product.

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This manual is subject to quality upgrade and specification change without prior notice.

For further inquiries, contact customer service of manufacturer.

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# Contents

|                                                       |           |
|-------------------------------------------------------|-----------|
| <b>1 User Manual Introduction .....</b>               | <b>6</b>  |
| 1.1 Related Terms .....                               | 6         |
| 1.2 Symbols .....                                     | 6         |
| 1.3 Safety Information .....                          | 7         |
| 1.4 System Symbols .....                              | 7         |
| 1.5 Precautions for Installation .....                | 8         |
| 1.6 Precautions for Use .....                         | 9         |
| 1.7 Precautions for Power Connection .....            | 9         |
| 1.8 Precautions for Cleaning the Product .....        | 11        |
| 1.9 Label .....                                       | 11        |
| <b>2 Product Introduction .....</b>                   | <b>13</b> |
| 2.1 Usage .....                                       | 13        |
| 2.2 Intended use .....                                | 13        |
| 2.3 Components .....                                  | 13        |
| 2.4 Sections and Functions (Scanner Body) .....       | 14        |
| 2.5 Sections and Functions (Calibration Kit) .....    | 15        |
| <b>3 Installation .....</b>                           | <b>17</b> |
| 3.1 Installation Environment .....                    | 17        |
| 3.1.1 Installation Setting .....                      | 17        |
| 3.1.2 Working Environment .....                       | 18        |
| 3.2 System Requirements .....                         | 19        |
| 3.3 Maintenance .....                                 | 20        |
| 3.3.1 Maintenance .....                               | 20        |
| 3.4 Product Installation .....                        | 21        |
| 3.4.1 Fix both left and right arms of main body ..... | 21        |
| 3.4.2 Connect Power .....                             | 22        |
| 3.4.3 Power On and Off .....                          | 23        |
| 3.4.4 Connect to Network .....                        | 23        |
| 3.4.5 Network Setting Configuration .....             | 24        |
| 3.4.6 Connect to PC .....                             | 25        |
| 3.4.7 Assemble Calibration Kit .....                  | 26        |
| 3.4.8 Proceed with Calibration .....                  | 27        |

|                                                 |                                       |           |
|-------------------------------------------------|---------------------------------------|-----------|
| 3.5                                             | Software Installation .....           | 28        |
| 3.6                                             | RAYFace Screen Composition.....       | 30        |
| 3.7                                             | Register Scanner.....                 | 31        |
| 3.8                                             | Server Registration.....              | 34        |
| 3.8.1                                           | RAYScan Server Registration.....      | 34        |
| 3.8.2                                           | RAYFace Server Registration.....      | 37        |
| 3.9                                             | Linked Program Registration .....     | 39        |
| <b>4</b>                                        | <b>Operating Software.....</b>        | <b>42</b> |
| 4.1                                             | Register Subject .....                | 42        |
| 4.2                                             | Capture .....                         | 43        |
| 4.2.1                                           | Capture .....                         | 43        |
| 4.2.2                                           | Capture Options .....                 | 46        |
| 4.3                                             | Captured Data Management.....         | 50        |
| 4.3.1                                           | Validate Captured Data .....          | 50        |
| 4.3.2                                           | Unreconstructed Data Management ..... | 52        |
| 4.3.3                                           | Reconstructed Data Management .....   | 54        |
| 4.3.4                                           | Move Captured Data .....              | 58        |
| 4.3.5                                           | Export Captured Data.....             | 59        |
| 4.3.6                                           | Import Captured Data.....             | 61        |
| 4.3.7                                           | Deleted Data Management.....          | 64        |
| 4.4                                             | Settings .....                        | 66        |
| 4.4.1                                           | General Settings .....                | 66        |
| 4.4.2                                           | Device Settings .....                 | 74        |
| <b>5</b>                                        | <b>Status Indicator .....</b>         | <b>80</b> |
| 5.1                                             | RAYFace Indication .....              | 80        |
| <b>Appendix A. Product Specifications .....</b> |                                       | <b>81</b> |
| <b>Appendix B. Messages .....</b>               |                                       | <b>82</b> |
| <b>Appendix C. Regulations .....</b>            |                                       | <b>90</b> |

# Introduction

# 1

# 1 User Manual Introduction

The following user manual contains not only a specific step-by-step guide on how to use RAYFace (referred to as “the product”), but also the basic information regarding the product.

- 1) Please keep this manual for future reference.
- 2) Please read the safety regulations before using the product.
- 3) The pictures on the user manual might differ from actual ones depending on the option and model of the product.
- 4) The screenshot on the user manual might differ from actual ones depending on the software version of the product.

## 1.1 Related Terms

Some terms used in this manual may be used interchangeably as follows.

- 1) RAYFace is a software to operate RAYFace.
- 2) “Scanner” refers to the main body of RAYFace.
- 3) Left scanner, center scanner, and right scanner refers to the 3 cameras of RAYFace.

## 1.2 Symbols



Warning

Indicates a hazardous situation that, if the instructions are not followed, could result in death or serious injury.



Caution

Indicates a hazardous situation that, if the instructions are not followed, could result in minor or moderate injury.



Indicates information considered important but not hazardous.

### 1.3 Safety Information

The following safety information must be read and understood before using the product. Please check the safety precautions to use it safely and correctly. Improper use of the product may cause bodily injury or death.



Warning

The owner of the product must ensure that all precautions, safety measures and maintenance procedures are performed.



Warning

Use only genuine parts approved or provided by the manufacturer in this product. Service and repairs due to equipment failure caused by not using genuine products are not covered under the warranty.



Warning

Do not modify or alter the device unless authorized by the manufacturer.

### 1.4 System Symbols

The symbols used in the device.



CE Mark.



UL Mark.



RCM Mark.



Power symbol.



Device serial number.



The symbol indicates that the product may include industrial waste materials.



Do not look into the beam. (This product is classified as Risk Group 2 (RG2) of IEC 62471-5).

## 1.5 Precautions for Installation



Warning

Risk of electric shock or fire

- Do not install the product in humid or dusty place or where moisture can accumulate.
- Do not put candles, lighters, etc. on the product or install the product near heating appliance.
- Do not use the product near flammable sprayer or substances.
- Do not install the power cord where it is difficult to remove.



Caution

Risk of malfunction, equipment failure, or bodily injury

- Install the product on a safe and flat surface with no risk of falling.
- Do not install the product in a place exposed to direct sunlight or ultraviolet (UV) light.
- Do not install the product where vibration or strong shock might occur.
- Install the product in a place that meets the operating temperature conditions.
- Use the product at temperature between 10°C to 35°C / 50°F to 95°F.
- Install the product in a well-ventilated area to allow heat release from the product for cooling.
- Do not install near an object that generates a magnetic field such as motor.
- Do not turn the product upside down or lay it down when moving.
- Remove the power cord after pressing the power button to turn it off when moving.
- Do not install in a place where there is a strong light directly to the front of the product.
- Do not install in a place where there is a strong light directly to the subject's face or background.
- Install where there is a normal white fluorescent light or LED light.
- When installing near a window, cover the window with blinds or curtains.

- Install it 10cm away from the end of the table.



Caution

Leaving a BATTERY in an extremely high temperature surrounding environment can result in an EXPLOSION or the leakage of flammable liquid or gas.

A BATTERY subjected to extremely low air pressure that may result in an explosion or the leakage of flammable liquid or gas.

Risk of fire or explosion if the battery is replaced by an incorrect type. Dispose of used Batteries according to the instructions.

- Use appropriate for the Storage environment and Operation environment conditions of the product.

## 1.6 Precautions for Use



Caution

Risk of malfunction, equipment failure, or bodily injury

- Do not place heavy objects on top of the product.
- Do not disconnect the power cord during operation.
- If used in a manner not specified by the manufacturer, the protection function may be impaired.
- The recommended illuminance level for the subject location is 500 ~ 1,500 Lux.
- Do not look into the beam. This product is classified as Risk Group 2 (RG2) of IEC 62471-5.

## 1.7 Precautions for Power Connection



Warning

Risk of electric shock or fire

- Do not use loose power outlets or damaged power cord.
- Do not touch the power cord with wet hands.
- Grasp the power cord and pull to disconnect, and avoid pulling out of the cable line.
- Remove the power cord during a thunderstorm.

- Do not place objects (chemicals, water containers, and little metallic objects such as tweezers) near the product.
- Remove the power cord if the product emits strange sound, smell, or smoke and contact the seller.
- Use with a rated voltage.
- Use an outlet (or multi-outlet) with a ground terminal that meets the rated voltage/current.
- Do not bend excessively or damage the power cord.
- Remove the power cord when the product is not in use for an extended period of time.

## 1.8 Precautions for Cleaning the Product



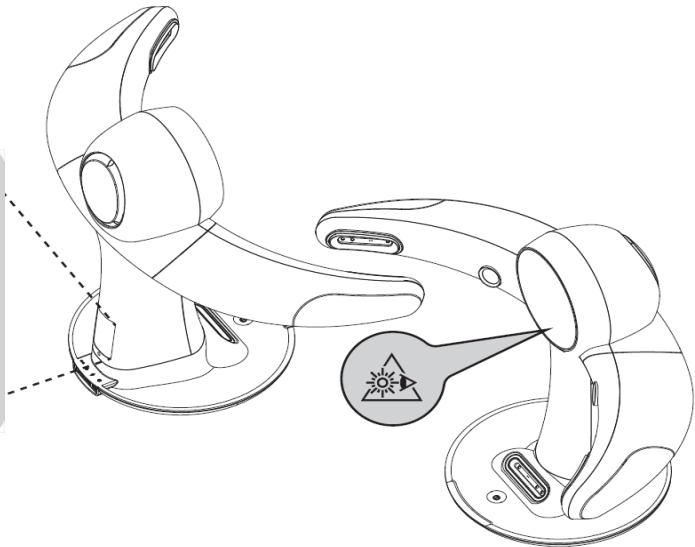
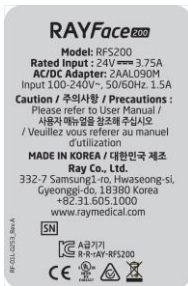
Warning

Risk of electric shock or fire

- Remove the power cord when cleaning the product.
- Use soft, lint-free cloth when cleaning. Soak it with a little bit of water to clean the product, and be careful not to get water on the inside.
- Use after removing any dust or water from the power cord pin.
- Do not use thinner, alcohol, benzene, or other chemical products to clean the product. Color or outer appearance of the product can be altered due to chemicals.

## 1.9 Label

The location of the label and mark on the product.



# Product Introduction

# 2

## 2 Product Introduction

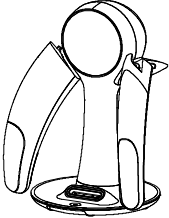
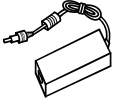
### 2.1 Usage

RAYFace is a scanner that uses the onboard cameras to scan images of the subject's face in all directions simultaneously and reconstruct the scanned data to create a 3D model. The 3D face data obtained from RAYFace is used for various modeling tasks.

### 2.2 Intended use

This product is a scanner which creates a 3D model by photographing a human face with multiple cameras.

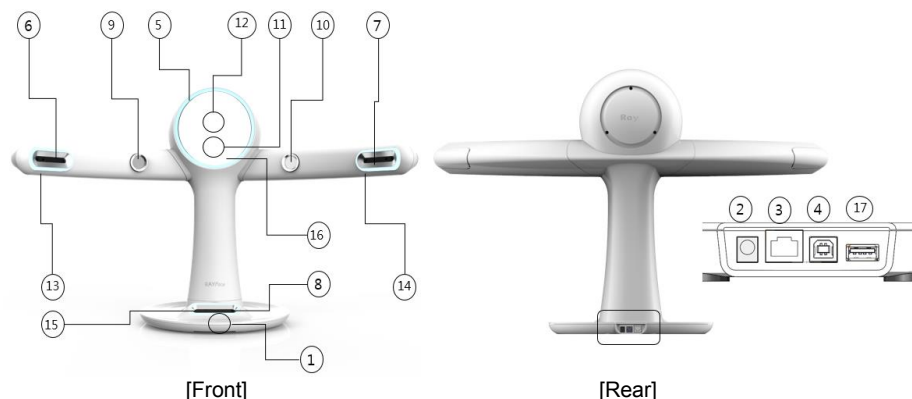
### 2.3 Components

|                                                                                    |                                                                                    |                                                                                    |                                                                                    |                                                                                   |
|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
|   |   |   |   |  |
| Scanner body                                                                       | AC Adapter                                                                         | Power Cord                                                                         | Quick Guide                                                                        | Screwdriver,<br>Screws                                                            |
|  |  |  |  |                                                                                   |
| Calibration body                                                                   | Calibration base                                                                   | LAN Cable                                                                          | USB Cable                                                                          |                                                                                   |



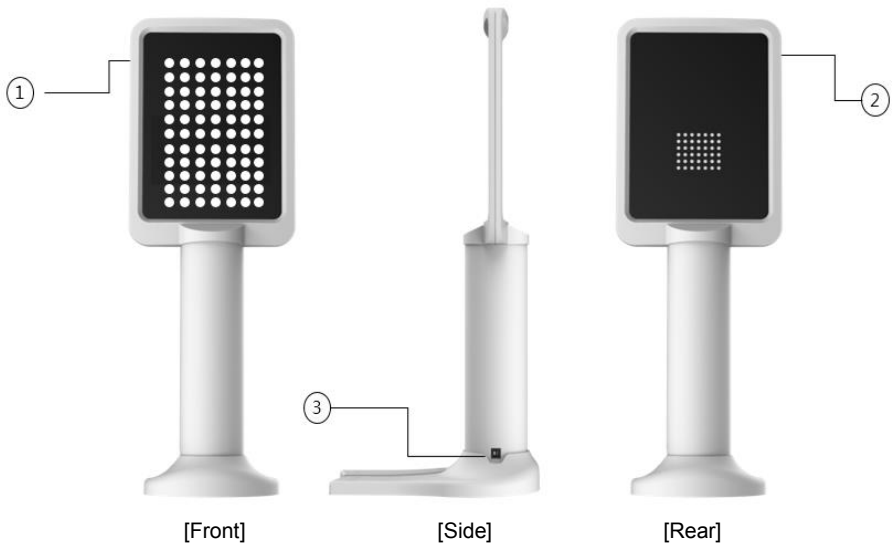
Actual components may look different from pictures shown above. Depending on the option purchased or region, the type, quantity, and packaging of the components provided may look different from the contents of this manual. For inquiries regarding the components, contact Ray Customer Service or your local distributor.

## 2.4 Sections and Functions (Scanner Body)



| Items |                             | Description                                                                                                                                                                                                                                                  |
|-------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1     | <b>Power Switch</b>         | Main power On/Off switch.                                                                                                                                                                                                                                    |
| 2     | <b>DC IN Port</b>           | Terminal to connect the AC adapter plug. Connect one side of the power cord to the AC adapter before connecting to the outlet.<br><b>Attention: The power cord type may differ depending on the region.</b><br><b>Warning: Do not use other AC adapters.</b> |
| 3     | <b>PC Port</b>              | Port for the RAYFace setup during installation.                                                                                                                                                                                                              |
| 4     | <b>Ethernet Port (RJ45)</b> | Port to connect an ethernet cable.                                                                                                                                                                                                                           |
| 5     | <b>Status Indicator</b>     | LED to indicate the equipment status.                                                                                                                                                                                                                        |
| 6     | <b>Left Camera</b>          | Camera to scan an image from the left.                                                                                                                                                                                                                       |
| 7     | <b>Right Camera</b>         | Camera to scan an image from the right.                                                                                                                                                                                                                      |
| 8     | <b>Bottom Camera</b>        | Camera to scan an image from the bottom.                                                                                                                                                                                                                     |
| 9     | <b>Teeth Cam L</b>          | Camera to scan the left side of the teeth.                                                                                                                                                                                                                   |
| 10    | <b>Teeth Cam R</b>          | Camera to scan the right side of the teeth.                                                                                                                                                                                                                  |
| 11    | <b>DLP Projector</b>        | Projector to project a Scan Pattern.                                                                                                                                                                                                                         |
| 12    | <b>Face Cam</b>             | Camera to scan an image from the front.                                                                                                                                                                                                                      |
| 13    | <b>Left Light</b>           | LED lighting for a subject's left side of the face.                                                                                                                                                                                                          |
| 14    | <b>Right Light</b>          | LED lighting for a subject's right side of the face.                                                                                                                                                                                                         |
| 15    | <b>Bottom Light</b>         | LED lighting for a subject's lower side of the face.                                                                                                                                                                                                         |
| 16    | <b>Mirror</b>               | Mirror where a subject can check his or her appearance.                                                                                                                                                                                                      |
| 17    | <b>Calibration Port</b>     | Port to connect the Calibration kit.                                                                                                                                                                                                                         |

## 2.5 Sections and Functions (Calibration Kit)



| Item |                       | Description                                                                        |
|------|-----------------------|------------------------------------------------------------------------------------|
| 1    | Face Cam Cal Pattern  | Panel that calibrates the cameras, front and rear panels are used for calibration. |
| 2    | Teeth Cam Cal Pattern |                                                                                    |
| 3    | Main Body Port        | Terminal to connect to RAYFace main body.                                          |

# Installation

# 3

## 3 Installation

### 3.1 Installation Environment

#### 3.1.1 Installation Setting

The product should be installed on a level surface within 1° of inclination and on a table capable of stably supporting a weight of 44 lb(20 kg) or more and an area of 20 in x 20 in(50 cm x 50 cm) or larger.



Caution

Remove the power cord after pressing the power button to turn the product off when moving the device.

### 3.1.2 Working Environment

- 1) Do not install the product in a place exposed to direct sunlight or ultraviolet (UV) light.
- 2) Use the product at room temperature between 10°C to 35°C / 50°F to 95°F.
- 3) Do not install near a wireless apparatus or mobile device that generates electromagnetic interference.
- 4) Do not move the product during operation.
- 5) Do not put the product under severe shock.



Caution

Be sure to follow installation setting and working environment. If not, scan error and equipment damage may occur.

### 3.2 System Requirements

| Desktop                 |                             |                             |
|-------------------------|-----------------------------|-----------------------------|
| Item                    | Minimum Requirements        | Recommended Requirements    |
| <b>CPU</b>              | Intel Core i5-10600         | Intel Core i7-10700         |
| <b>RAM</b>              | 16GB                        | 32GB                        |
| <b>GPU</b>              | NVIDIA GeForce RTX 2060 6GB | NVIDIA GeForce RTX 3070 8GB |
| <b>Storage</b>          | 1TB SSD                     | 1TB SSD                     |
| <b>Monitor</b>          | 1920 X 1080                 | 1920 X 1080                 |
| <b>USB</b>              | 1 x USB port 2.0            | 1 x USB port 2.0            |
| <b>LAN</b>              | 1Gbps Ethernet              | 1Gbps Ethernet              |
| <b>Operating System</b> | Microsoft Windows® 10 x64   | Microsoft Windows® 10 x64   |
|                         | Microsoft Windows® 11 x64   | Microsoft Windows® 11 x64   |

| Laptop                  |                             |                             |
|-------------------------|-----------------------------|-----------------------------|
| Item                    | Minimum Requirements        | Recommended Requirements    |
| <b>CPU</b>              | Intel Core i5-10500H        | Intel Core i7-10800H        |
| <b>RAM</b>              | 16GB                        | 32GB                        |
| <b>GPU</b>              | NVIDIA GeForce RTX 2060 6GB | NVIDIA GeForce RTX 3070 8GB |
| <b>Storage</b>          | 1TB SSD                     | 1TB SSD                     |
| <b>Monitor</b>          | 1920 X 1080                 | 1920 X 1080                 |
| <b>USB</b>              | 1 x USB port 2.0            | 1 x USB port 2.0            |
| <b>LAN</b>              | 1Gbps Ethernet              | 1Gbps Ethernet              |
| <b>Operating System</b> | Microsoft Windows® 10 x64   | Microsoft Windows® 10 x64   |
|                         | Microsoft Windows® 11 x64   | Microsoft Windows® 11 x64   |

3.3 Maintenance

As described in the description, the user must conduct periodic maintenance. It is the user's responsibility to maintain the product in order to prevent potential problems.

3.3.1 Maintenance

| Period               | Description                                                                                 |
|----------------------|---------------------------------------------------------------------------------------------|
| Initial Installation | After initial installation, proceed with calibration by using the provided calibration kit. |
| Daily                | Make sure there are no foreign substance obstructing the camera lenses.                     |
| Before Scanning      | Make sure the LED lighting are turned on.                                                   |
| Monthly              | Proceed with calibration every month or when relocating the equipment.                      |



A periodic maintenance will prevent degradation of image quality. Degradation of image quality could be the result of problems such as damage in product itself.

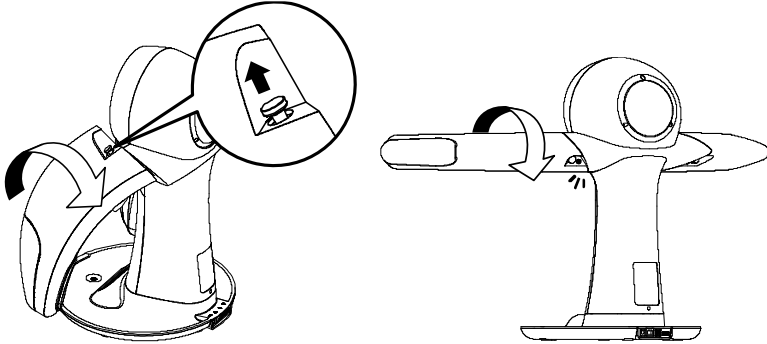


Do not throw away the packaging after the installation. For warranty service, the product must be brought into the service center in its original packaging.

### 3.4 Product Installation

#### 3.4.1 Fix both left and right arms of main body

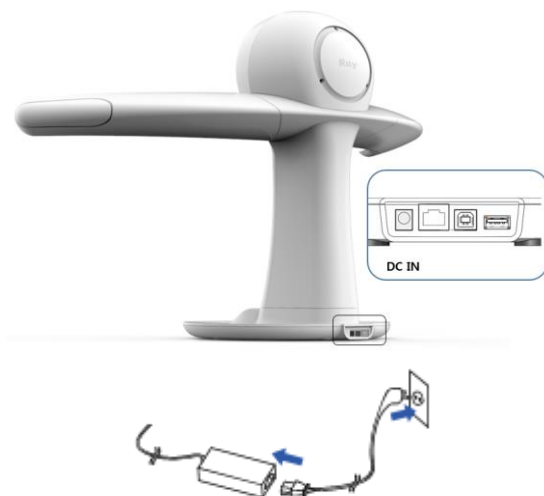
Take out the main body from the packaging, place it on the table, rotate the arm, and prepare as shown in the figure below.



While pulling each plunger handle, rotate the left and right arms slowly. When you hear a click, the arms are locked horizontally.

### 3.4.2 Connect Power

For the initial installation, make sure that the power outlet conforms to the AC adapter specifications. Connect the power cord and AC adapter, as shown in the following figure.



Please contact your local distributor if the product and the enclosed power cord are different from those used in your region.

Use the AC adapter and the power cord provided with the product. If not, it may result in product damage.

### 3.4.3 Power On and Off

Press and hold the main power switch for 2 seconds to power up.

Press and hold the main power switch for 4 seconds to power down.



### 3.4.4 Connect to Network

Connect the RAYFace to a computer (or network) using a network cable, as shown in the following figure.



Refer to "4.4 Settings" about network setting.

### 3.4.5 Network Setting Configuration

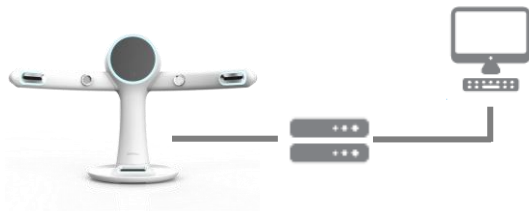
RAYFace provides various network environments, as shown in the following figures.

- 1) Direct connection between computer and RAYFace.



When connecting the computer and RAYFace directly, set a static IP address on the computer. The IP address applied to the computer should be set differently from RAYFace.

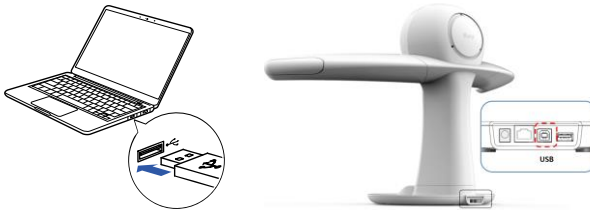
- 2) Connect to a computer through a router.



Network connection of RAYFace can be connected and checked on RAYFace. Refer to “4.4 Settings” for related information.

### 3.4.6 Connect to PC

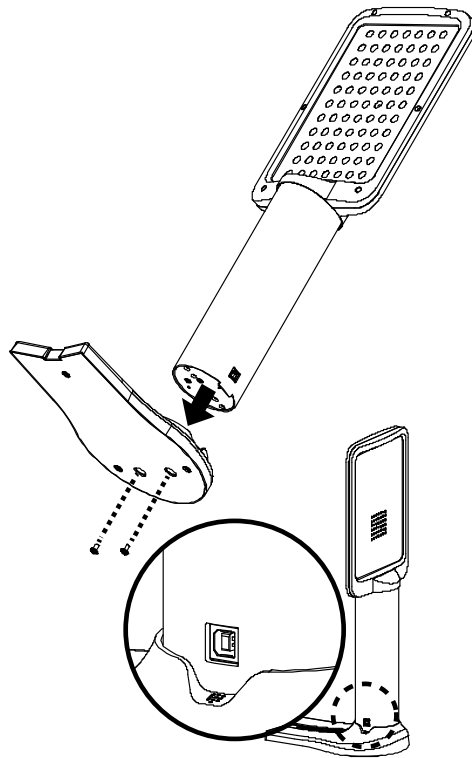
IP information can be modified by connecting RAYFace to a PC using a USB cable as shown in the figure below.



The USB cable only needs to be connected for modifying IP information.

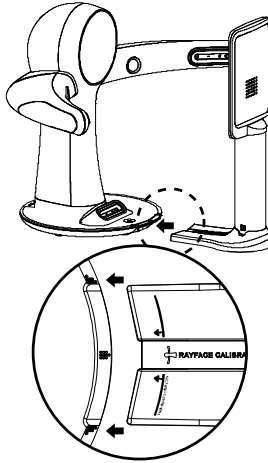
3.4.7 Assemble Calibration Kit

Assemble the calibration kit by using the included screws and screwdriver.



### 3.4.8 Proceed with Calibration

After placing the assembled Calibration Kit in front of the RAYFace, insert it into the front of the base and align it in the correct position.



Caution

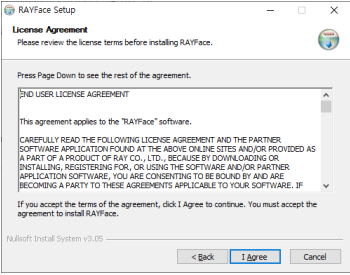
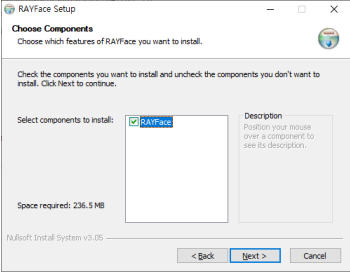
Make sure to insert the calibration base correctly until the printed side is not visible.

Connect the calibration port on the back of the RAYFace to the port of the calibration kit with the included UBS cable to prepare for calibration and then proceed with calibration.

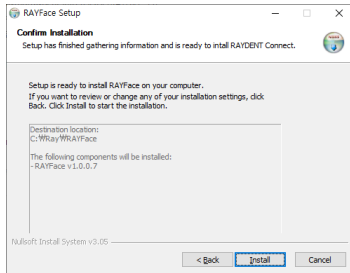


3.5 Software Installation

You can download the RAYFace installation software by accessing <https://www.rayteams.com/>. Refer to the guide as shown below to complete the installation.

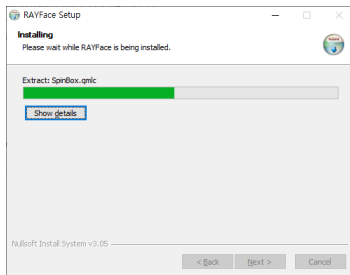
| No. | Figure                                                                                                          | Description                                                                                                                                                                                                                  |
|-----|-----------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | <br>RAYFace_v1.0.0.5_Setup.exe | Install the RAYFace software by running the installation file. At this time, a warning window will pop up asking if the user continues the installation on the user administration account. Click [Yes] button and continue. |
| 2   |                                | Click [Next] button to continue the installation process.                                                                                                                                                                    |
| 3   |                               | Click [I Agree] button when asked about license agreement. Installation cannot continue if the user does not agree.                                                                                                          |
| 4   |                              | Click [Next] button to continue the installation process.                                                                                                                                                                    |

5



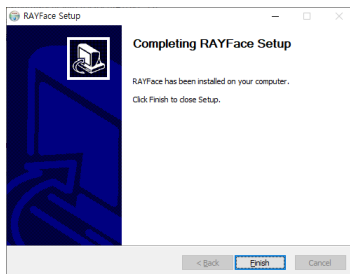
Once the initial set up for the installation has been completed. Click [Install] button to continue the installation process.

6



Wait until the RAYFace installation has been completed.

7



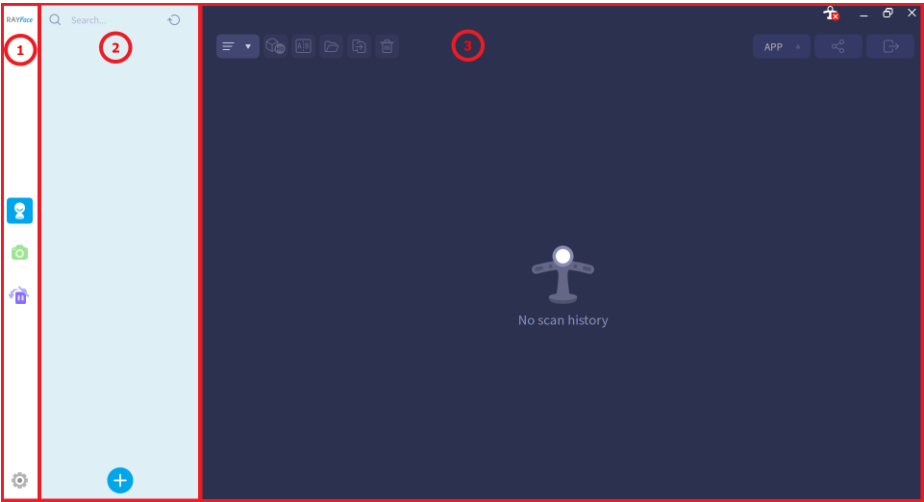
Click [Finish] button to close the setup page.

8



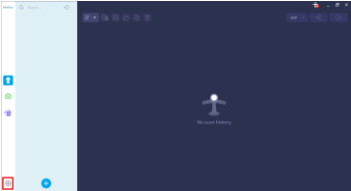
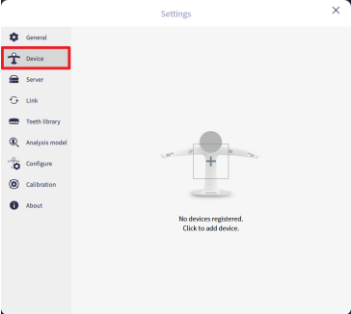
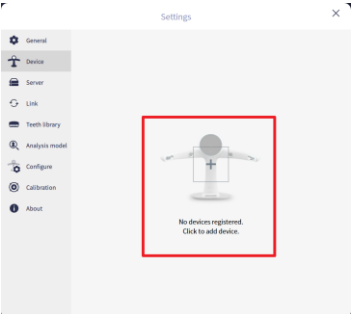
RAYFace icon is created on the desktop.

3.6 RAYFace Screen Composition



| No. | Item         | Description                                           |
|-----|--------------|-------------------------------------------------------|
| 1   | Menu         | Subject list, acquisition, settings, etc. can be set. |
| 2   | Subject list | Subject list can be viewed and managed.               |
| 3   | Image list   | Subject's scanned images are shown.                   |

### 3.7 Register Scanner

| No. | Figure                                                                              | Description                                                                                                                         |
|-----|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| 1   |    | <p>Connect RAYFace and PC with the provided USB cable.</p>                                                                          |
| 2   |    | <p>Execute the software and click [  ] button.</p> |
| 3   |   | <p>Go to [Device] tab.</p>                                                                                                          |
| 4   |  | <p>Click [+] button and [Add device] window will pop up.</p>                                                                        |

5

Add device

COM Port

COM4

Connect

Search

Device name

RAYFace200

Product serial

Hardware serial

Hardware version

Firmware version

Network type

☐ Static ☐ DHCP

IP address

Subnet Mask

Gateway

Save

Cancel

In the [Add device] window, select the COM port connected to the scanner and click the [Connect] button.

If your PC has multiple COM ports, click the [Search] button to find the COM port connected to the scanner.

6

Error

There is no COM Port available on the computer.

Check the USB cable connection between the device and computer.

OK

If there is no COM port connected to the PC, the message will be displayed.

7

Error

Unable to search COM Port connected with the device.

Check the USB cable connection between the device and computer.

OK

If the PC does not have a COM port connected to the scanner, the message will be displayed.

8

Error

Unable to get scanner serial number.

Firmware is not responding.

Verify the COM Port is selected properly.

Restart the device if the COM Port is correct.

If the problem persists, contact your sales representative.

OK

If you select a COM port that is not connected to the scanner and click the [Connect] button, the message will be displayed.

9

[Connect] button will load the scanner information.

Modifying the network settings and clicking the [Save] button saves the network settings to the scanner and registers the scanner to the PC.

10

In case of updating the scanner's firmware, you can update the firmware after registering the scanner.

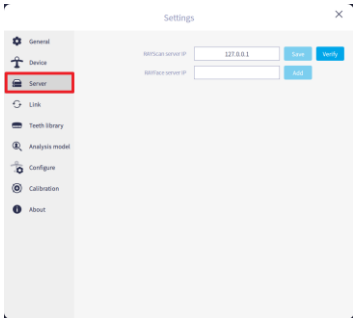
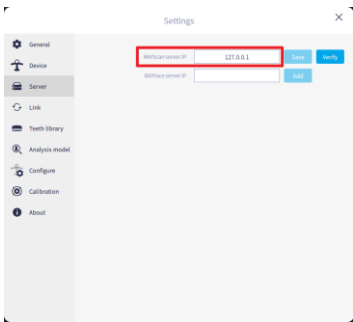
11

When the scanner is registered, the information will be displayed.

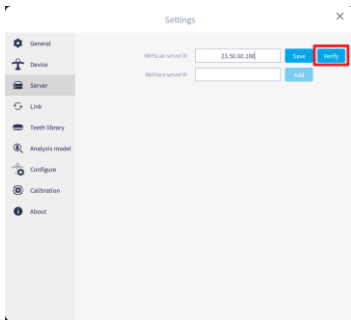
### 3.8 Server Registration

#### 3.8.1 RAYScan Server Registration

When using RAYScan CBCT, the user can register the server in order to import the CT data and Object Scan data and merge them with Smile Scan data.

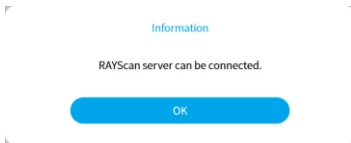
| No. | Figure                                                                              | Description                                                                                                                 |
|-----|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| 1   |    | Start the Program and press [  ] button. . |
| 2   |   | Move to [Server] menu. .                                                                                                    |
| 3   |  | Enter the RAYScan server IP address in the [RAYScan server IP] entry section.                                               |

4



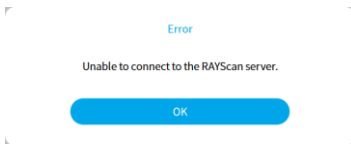
Once the RAYScan server IP address has been entered, click on [Verify] button to confirm if the server is able to connect.

5



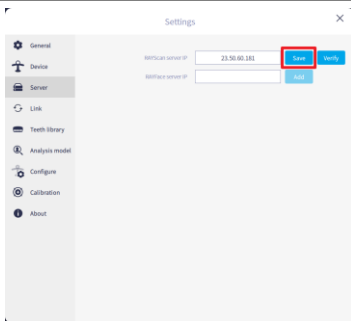
When RAYScan server is able to connect with the inserted information, the pop up window as shown on the left will appear.

6



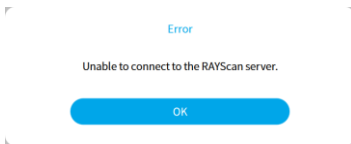
When RAYScan server is not able to connect with the inserted information, the pop up window as shown on the left will appear.

7



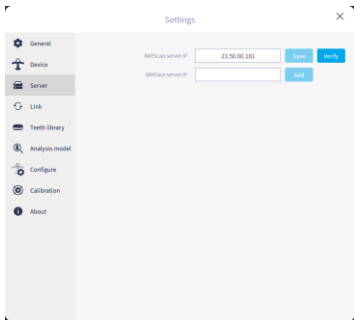
Enter the RAYScan server IP address and press the [Save] button to store the IP address.

8



When the faulty IP address has been entered the pop up window as shown on the left will appear.

9



When the correct IP address for the RAYScan server has been entered and [Save] button has been pressed, the RAYScan server IP address will be stored.

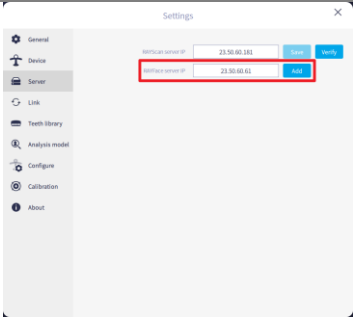
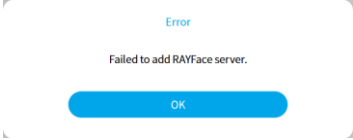
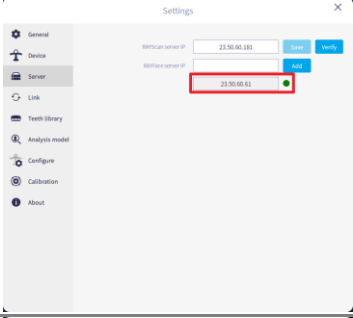
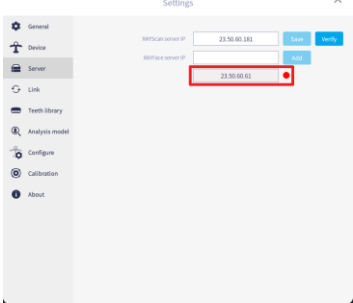
### 3.8.2 RAYFace Server Registration

Any 3D facial scan data captured by RAYFace can be shared with the other PCs connected to the same network. The PC where the RAYFace device is connected and 3D face scanning occurs is hereafter defined as the RAYFace server. Any PC on the same network where the device is not connected and 3D face scanning does not take place is defined as RAYFace client.

Any shared data are copied and synced between the server and client. Hence any data that are synced on the RAYFace client can be reconstructed on the client or merged with other data to create a project file. Any modified data are also synced between the registered client and server PCs. Synced data are reclassified as an archival data after a predetermined amount of time, and sync will be deactivated on that data on the client PC and will be moved to server PC's archive folder. Archived data can be accessed either from the client or server PC and re-synced if the user wants to access the data.

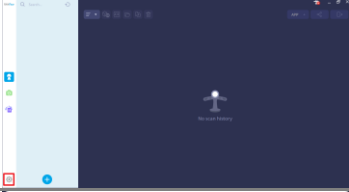
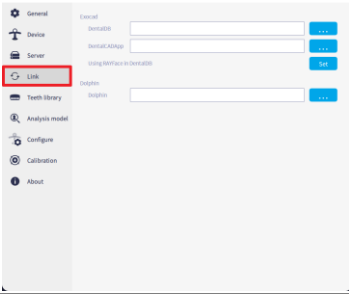
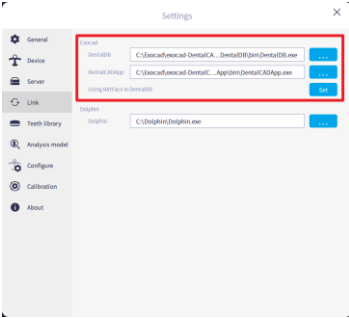
In order to ensure the robust data sync, prevent simultaneous data modification/deletion, and to ensure trouble-free archiving, the data modification can only take place when RAYFace server where the data was created is connected to the network. If the RAYFace server is not connected to the network, the data are locked in a read-only mode and cannot be modified.

If there are multiple RAYFace servers in the network, RAYFace servers connected to each device can be registered individually. For example, if there are RAYFace server A and B, on each client PCs the server A and B has to be registered individually, and since server A considers server B to be a client and vice versa, server A needs to register server B as a server, and server B needs to register server A as a server.

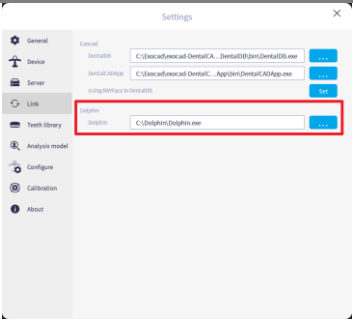
| No. | Figure                                                                              | Description                                                                                                                         |
|-----|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| 1   |    | Enter the RAYFace server IP address, and press [Add] button.                                                                        |
| 2   |    | If the entered RAYFace server cannot be connected, the pop up window as shown on the left will appear.                              |
| 3   |   | Once the RAYFace server connects, it will be added to the server list and the connection status icon will appear as a green button. |
| 4   |  | If the registered RAYFace server does not connect, the connection status icon will appear red.                                      |

### 3.9 Linked Program Registration

3rd party software can be linked to transmit data from RAYFace.

| No. | Figure                                                                             | Description                                                                                                                                                                                                                                                                                                                                                                                               |
|-----|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   |   | Start the program and press the [  ] button. .                                                                                                                                                                                                                                                                           |
| 2   |   | Move to [Link] menu.                                                                                                                                                                                                                                                                                                                                                                                      |
| 3   |  | For Exocad integration, set the path for [DentalDB] and [DentalCADApp]. Once the path has been designated, RAYFace utilizes the DentalDB to create a case and save data.<br><br>Once the [Using RAYFace in DentalDB] menu has been utilized, a menu named [Scan with RAYFace] will be added to DentalDB, and this will enable case to be created within DentalDB and then start RAYFace to take the data. |

4



Assign the path for Dolphin. Once the path has been assigned, the user can start Dolphin with the data created under RAYFace.

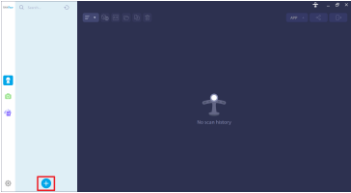
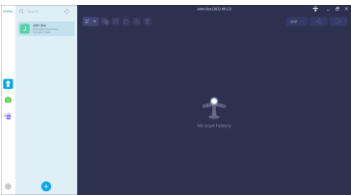
# Operating Software

# 4

## 4 Operating Software

### 4.1 Register Subject

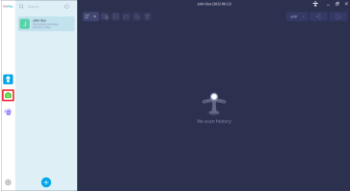
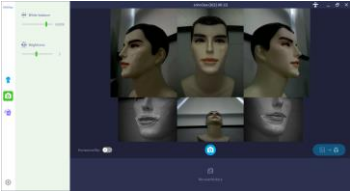
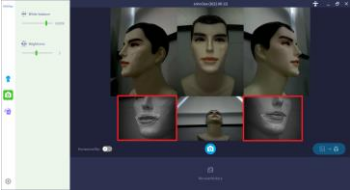
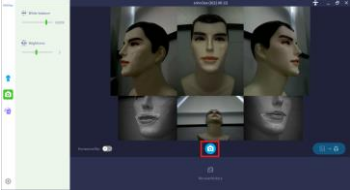
A user can register subjects.

| No. | Figure                                                                             | Description                                                                                                                                 |
|-----|------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| 1   |   | Clik [  ] button to enter the subject registration screen. |
| 2   |   | Enter ID, name, DOB (Date of Birth), gender and click [OK] button.<br>Refer to '4.4.1.2 Name Format' for details about capture options.     |
| 3   |  | A subject has been registered.                                                                                                              |

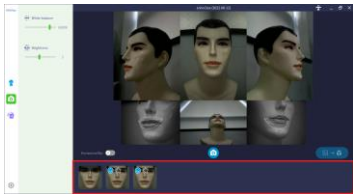
## 4.2 Capture

You can capture a subject and set up the options.

### 4.2.1 Capture

| No. | Figure                                                                              | Description                                                                                                                                                                                                                                                     |
|-----|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   |    | Select a subject to capture and click [  ] button.                                                                                                                            |
| 2   |    | Preparing the capture.                                                                                                                                                                                                                                          |
| 3   |    | When the scanner is ready, the lights will be turned on and live view is displayed.                                                                                                                                                                             |
| 4   |  | Adjust the subject's position.<br>Keep your head straight and look at the top of the front camera. Adjust the position of the mouth so that it is centered on the camera at the bottom left and right.                                                          |
| 5   |  | After adjusting the subject's position and setting the capture options, press [  ] button to capture.<br>Refer to '4.2.2 Capture Options' for details about capture options. |

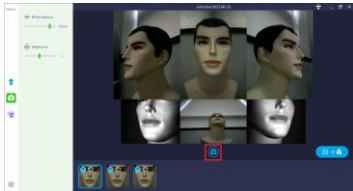
6



Capture until the subject's natural expression is captured.

After clicking the [  ] button, the scanner captures and transfers the data to the PC. The capture lists and transfer status are displayed at the bottom.

7



When you select a capture list, the selected capture data is displayed.

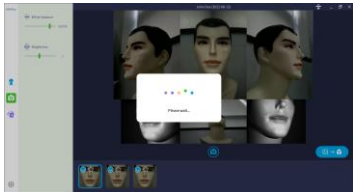
Click [  ] button to return to the live view for more captures.

8



Select the capture data and press [  ] button to reconstruct the captured data into a 3D model.

9



Wait for the reconstruction to complete.  
The waiting time depends on your PC specifications.

10

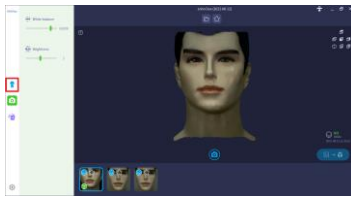


When reconstruction is complete, the 3D model is displayed.

Click [  ] button to return to the live view for more captures.

Double-click the reconstructed data in the capture list to display the 3D model.

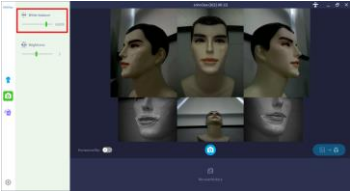
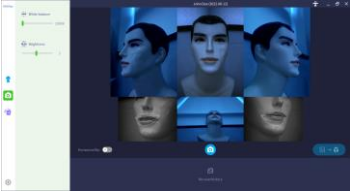
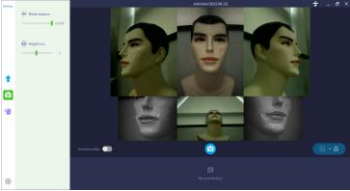
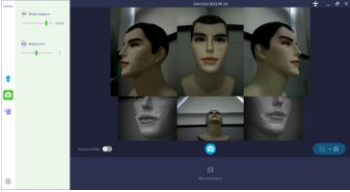
11



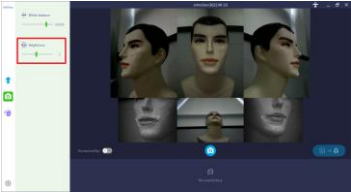
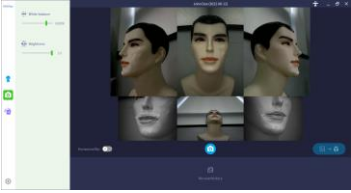
Upon completion of capture, click [  ] button to return to the list of subjects.

4.2.2 Capture Options

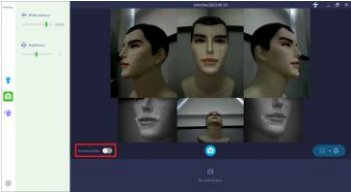
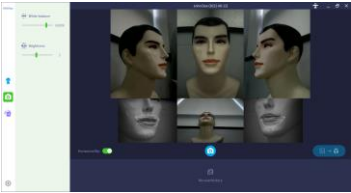
4.2.2.1 Adjust White Balance

| No. | Figure                                                                             | Description                                                                                                                                                                      |
|-----|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   |   | You can adjust the color temperature of photos under [White balance] option.                                                                                                     |
| 2   |   | As the color temperature decreases, the photo turns bluish.<br>If the ambient light uses a red color, lowering the color temperature can neutralize the ambient light color.     |
| 3   |   | As the color temperature increases, the photo turns reddish.<br>If the ambient light uses a blue color, increasing the color temperature can neutralize the ambient light color. |
| 4   |  | In general (e.g. fluorescent lamp), set within the range of 5600~5800K.                                                                                                          |

4.2.2.2 Adjust Brightness

| No. | Figure                                                                            | Description                                                                     |
|-----|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| 1   |  | You can adjust the brightness of the scanner's light under [Brightness] option. |
| 2   |  | Adjust the brightness based on the ambient light.                               |

4.2.2.3 Horizontal Flip (Live View)

| No. | Figure                                                                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   |  | <p>Under [Horizontal flip] option, you can flip the live view horizontally.</p>                                                                                                                                                                                                                                                                                                                                                                                            |
| 2   |  | <p>The camera position does not change even if it is flipped left to right.</p> <p>On the left, images captured from the left camera are displayed and the same on the right camera.</p> <p>When flipped left to right, each image is displayed inverted left/right and displayed in a mirror image.</p> <p>The [Horizontal flip] option is applied only in the live view screen. Except live view, all captured data are displayed with [Horizontal flip] turned off.</p> |

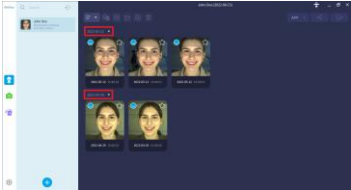
4.2.2.4 Bookmark

| No. | Figure                                                                            | Description                                                                                                                                                |
|-----|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   |  | Among the scan data, you can bookmark scanned photos. Bookmarks are also displayed in the subject list and if a photo is bookmarked, it cannot be deleted. |
| 2   |  | You can bookmark a photo in both the scan list and 3D view.                                                                                                |

4.3 Captured Data Management

A user can validate, export and delete the subject's captured data.

4.3.1 Validate Captured Data

| No. | Figure                                                                              | Description                                                                                                                                                              |
|-----|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   |    | Select a subject to display the related data.                                                                                                                            |
| 2   |    | Captured data is grouped by date.                                                                                                                                        |
| 3   |    | Click a date to shrink or expand the data display.                                                                                                                       |
| 4   |  | By clicking the [  ] button, you can set a filter to view only the desired scan data. |

5

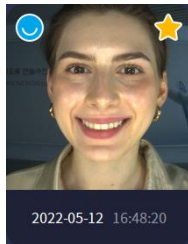
In the first column, specify the period to retrieve the scan data.

In the second column, specify the condition of the scan data.

In the third column, specify the scan type of data.

In the fourth column, specify the bookmark condition.

6

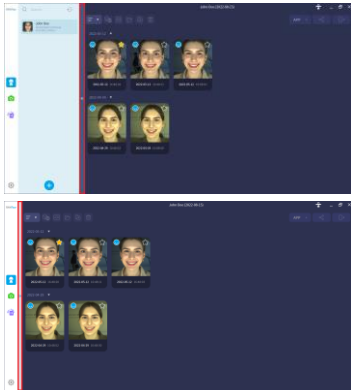


You can change the bookmark status by clicking the   buttons for each scan

data.  means that it is bookmarked.

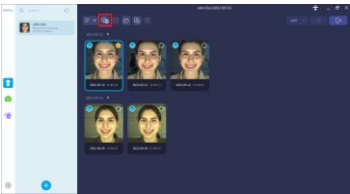
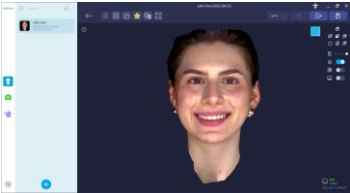
You cannot delete bookmarked data.

7

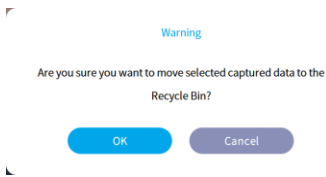


The subject list can be hidden. If you hover the mouse on the right side of the subject list, a button to hide and show the subject list is displayed.

4.3.2 Unreconstructed Data Management

| No. | Figure                                                                              | Description                                                                                                                                                                                                                                                                                                                                                |
|-----|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   |    | <p>Select a unreconstructed-capture data and click [  ] button to initiate 3D reconstruction.</p> <p>Unreconstructed data is permanently deleted after a certain period of time.</p> <p>Refer to '4.4.1.1</p> <p>General Settings' for details about capture options.</p> |
| 2   |    | <p>3D reconstruction in progress.</p>                                                                                                                                                                                                                                                                                                                      |
| 3   |   | <p>3D reconstructed data will be displayed.</p>                                                                                                                                                                                                                                                                                                            |
| 4   |  | <p>Click [  ] button to open the path that the original data is stored. The original data is used to import the captured data from another computer.</p> <p>Refer to '4.3.6 Import Captured Data' for details about capture options.</p>                                |
| 5   |  | <p>Click [  ] button to delete captured data.</p>                                                                                                                                                                                                                       |

6

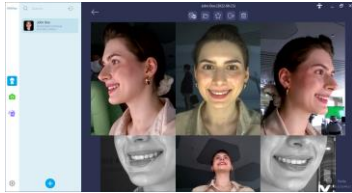


Deleted data can be permanently deleted or restored from recycle bin.

When all the data of the subject is permanently deleted, the subject is also deleted.

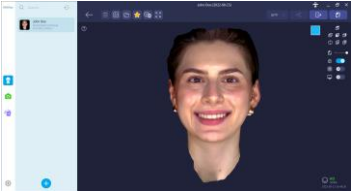
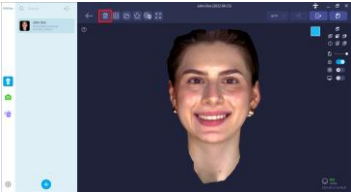
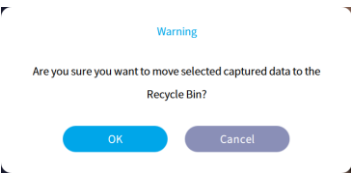
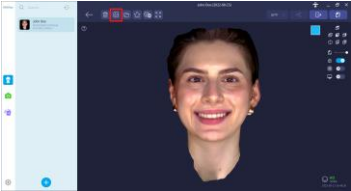
Refer to '4.3.7 Deleted Data Management' for details about capture options.

7

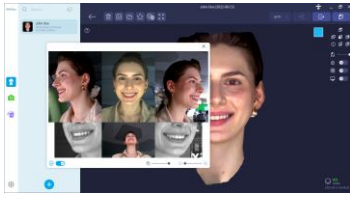


Double-clicking on the unreconstructed data allows one to view the captured data.

4.3.3 Reconstructed Data Management

| No. | Figure                                                                              | Description                                                                                                                                                                                                                                   |
|-----|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   |    | Double-click on a reconstructed data to display the 3D reconstructed data.                                                                                                                                                                    |
| 2   |    | 3D reconstructed data is displayed.                                                                                                                                                                                                           |
| 3   |    | Click [  ] button to delete captured data.                                                                                                                   |
| 4   |   | Deleted data can be permanently deleted or restored from recycle bin.<br>When all the data of the subject is permanently deleted, the subject is also deleted.<br>Refer to '4.3.7 Deleted Data Management' for details about capture options. |
| 5   |  | You can check the scanned image by clicking [  ] button.                                                                                                   |

6



If there is a problem with the 3D reconstructed data, open the image and check the subject's posture and position.

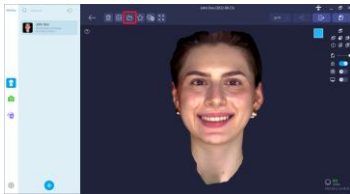
7



You can adjust the overall size and transparency of the acquisition window, and hide and show the positioning guide.

You can check the image by zooming in/out by using the [Mouse Scroll Wheel] and move the image by dragging it while holding the [Left Mouse Button].

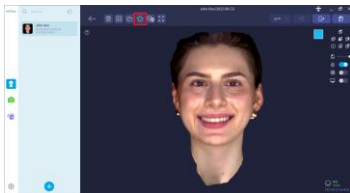
8



Click [  ] button to open the path that the original data is stored. The original data is used to import the captured data from another computer.

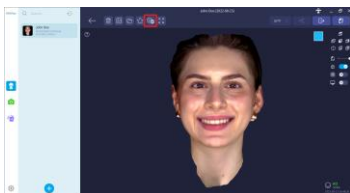
Refer to '4.3.6 Import Captured Data' for details about capture options.

9



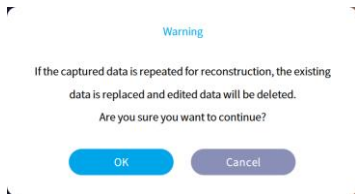
You can bookmark the scanned data by clicking the [  ] button.

10



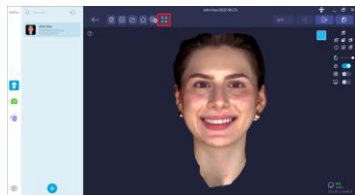
You can redo the 3D reconstruction by clicking the [  ] button.

11



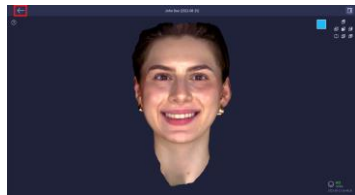
If you do 3D reconstruction again, the current data is deleted and reconstructed again. Clicking [OK] repeats the reconstruction.

12



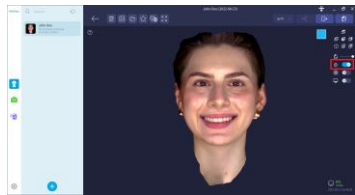
If you feel that the screen is narrow, you can expand it by hiding the subject list, or clicking the [  ] button to switch to full screen.

13



Click the [  ] button to exit full screen.

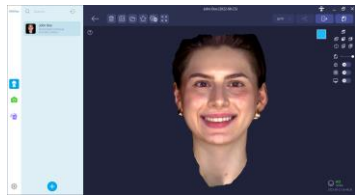
14



You can switch between perspective and orthographic views by clicking the [  ] button.

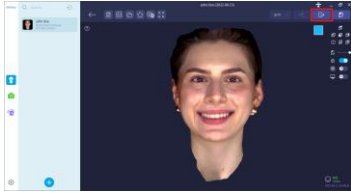
Perspective view shows things that are far look small and those that are near look large. It looks similar to what you see in a photo or human vision.

15



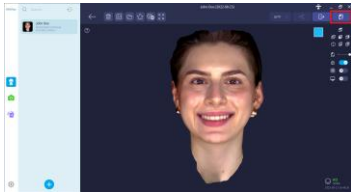
Orthographic view has no size difference between far and near objects. It is used in the scan data alignment menu.

16



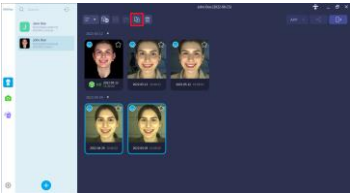
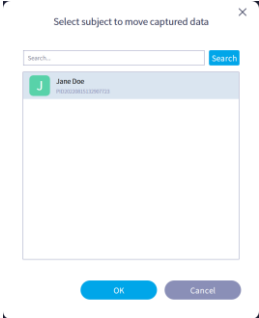
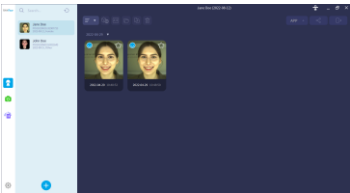
You can save the reconstructed image by clicking the  button.

17

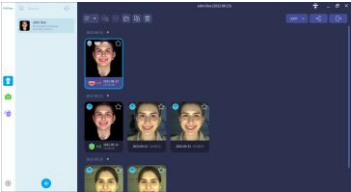


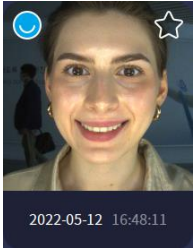
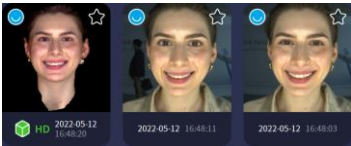
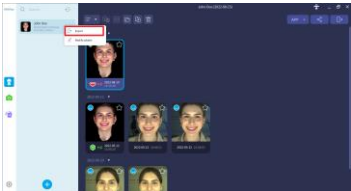
You can enter data alignment menu by clicking the  button.

4.3.4 Move Captured Data

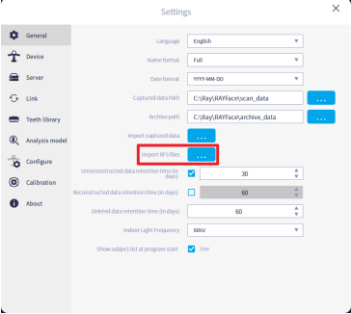
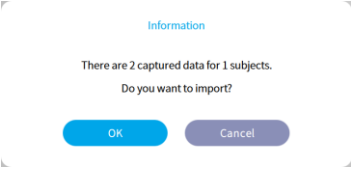
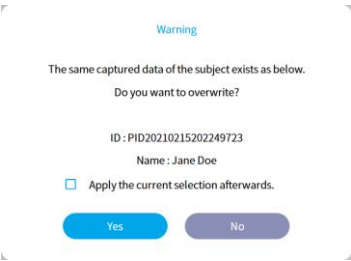
| No. | Figure                                                                              | Description                                                                                                                                            |
|-----|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   |    | If you select the wrong subject, you can move the scan data to another subject.                                                                        |
| 2   |    | Select the scan data that you want to move and click the [  ] button. |
| 3   |   | Select the subject for whom you want to move the scan data to.                                                                                         |
| 4   |  | The scan data has been moved to the designated subject.                                                                                                |

4.3.5 Export Captured Data

| No. | Figure                                                                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   |    | Select the data that you want to export and click the  button.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 2   |    | <p>Specify the path to save the data and name the data.</p> <p>You can select only the data you want to save by using the checkbox next to each data.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 3   |  | <p>You can export in a STL, OBJ and PLY file format.</p> <p>Select an OBJ or PLY file when exporting smile and scout images to a file including the color information.</p> <p>For OBJ and PLY files including texture files, MTL, PNG (or BMP, JPG, JPEG) files of the same name are created. For OBJ and PLY files, the MTL and PNG file names are already recorded inside the files, so if the file name is modified after exporting, the texture information cannot be read and the color information is not loaded. If you need to change the file name, specify it when exporting from RAYFace.</p> <p>When you save an OBJ or PLY file including a texture file, if you specify its file name in</p> |

|   |                                                                                     |                                                                                                                                                                                                                                                                                                                                                               |
|---|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   |                                                                                     | <p>Korean, Chinese, Japanese, etc., you may not be able to open it in an external CAD program. If you export to use in an external CAD program, make sure to specify its file name in English.</p>                                                                                                                                                            |
| 4 |    | <p>RFS file stands for RAYFace project file. After exporting, it can be used when importing scan data from RAYFace installed in another PC. Refer to 4.3.6 Import Captured Data for how to import the captured data.</p>                                                                                                                                      |
| 5 |    | <p>When you export the unreconstructed scan data, you can save the RFS file to a specified path and with a specified name.</p>                                                                                                                                                                                                                                |
| 6 |    | <p>When multiple scan data are specified and exported, the each scan data of RFS file is saved in the specified path. Each RFS file name cannot be specified and is saved as name_ID_scantime.rfs file.</p>                                                                                                                                                   |
| 7 |  | <p>You can export all the scan data of the subject at once. Select a subject, right-click and click the [Export] menu to save it in the specified path and under the specified name. When you export a subject, the entire scan data of the subject is saved as one RFS file. At this time, the scan data of the subject in the recycle bin is not saved.</p> |

4.3.6 Import Captured Data

| No. | Figure                                                                              | Description                                                                                                                                                                                                                                                                                                                                             |
|-----|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   |    | You can import an exported RFS file in the [Import RFS files] menu.                                                                                                                                                                                                                                                                                     |
| 2   |    | If you select the RFS file, it check the scan data included in the RFS file.<br>Selecting [OK] imports the scan data.                                                                                                                                                                                                                                   |
| 3   |   | Retrieve the name and ID of the subject from the captured data and register the subject in the list.<br>The name is registered only the full name and a separated name (First and Last) will not be registered.<br>'Today' is the default for DOB (Date of Birth) and 'Other' is for gender while register a new subject. DOB and gender can be edited. |
| 4   |  | If data conflicts (ID and/or name) due to captured at the same time during import, warning window pops up asking whether you would want to overwrite the data with previous data.<br>This can occur if you import captured data on the same computer or if the data already exists.                                                                     |

5

Information

Subjects with the same ID but different names are found to import.  
Enter a new ID.  
ID : PID20210215202249723  
Name of subject to import : Jane Doe  
Registered name of subject : John Doe  
New ID  Auto  
OK Cancel

If a subject with the same ID but a different name is imported, the ID of the subject will be changed during the process.  
The ID can be automatically generated or entered manually.

6

Settings

General

Device

Server

Link

Teeth library

Analysis model

Configure

Calibration

About

Language: English

Source format: Full

Date format: YYYY-MM-DD

Captured data path: C:\Ray\BIM\RayFace\_data

Device path: C:\Ray\BIM\RayFace\_data

Import captured data

Import WTI data

Unconstructed data retention time (in days): 30

Reconstructed data retention time (in days): 60

Unlinked data retention time (in days): 60

Indoor light frequency: 50Hz

Show subject list at program start: ☒ true

You can import captured data from another computer in the [Import captured data].

7

Error

This path cannot be set to save captured data.  
OK

You can run in to this error where captured data cannot be imported from the selected path.

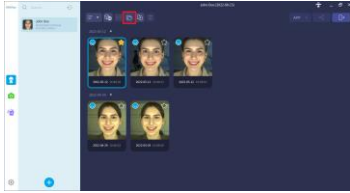
8

Information

There are 2 captured data for 1 subjects.  
Do you want to import?  
OK Cancel

If you specify a folder that captured data is included, the data will be searched in the specified folder.  
Click [OK] to import the captured data.

9

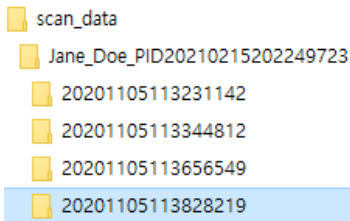


In order to import captured data, all files are required in the original save path.

In the original save path, the pre-reconstructed data (captured data) and post-reconstructed data exist.

In order to access the original save path, select the subject and click [Open captured data folder].

10



Captured data is saved under Scan\_Data > path by subject > path by captured time.

To import only specific captured data, copy and import the path by acquisition date/time.

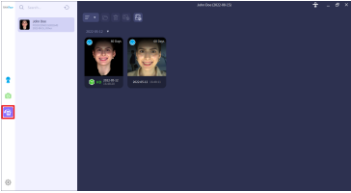
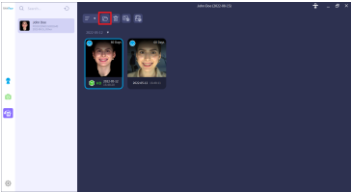
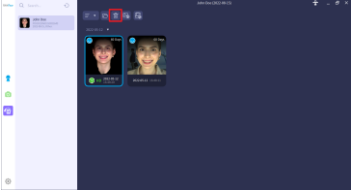
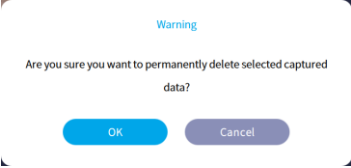
To import the entire captured data of a specific subject, copy and import the path by each subject.

To import the entire captured data, copy and import the data path.

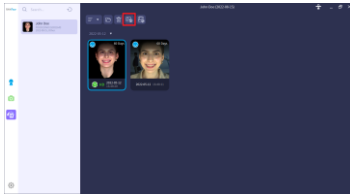
Exported data that has been processed in subject's menu cannot be used for import.

Make sure to go to [Open captured data folder] and copy the data path.

4.3.7 Deleted Data Management

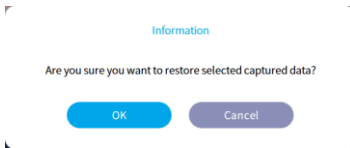
| No. | Figure                                                                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   |    | <p>Click [  ] button to move to the recycle bin.</p> <p>A list of the subjects with deleted data is displayed and the deleted data of the subject is displayed.</p> <p>For deleted data, the remaining period until permanent deletion is displayed. After the certain period, the captured data will be permanently deleted.</p> <p>Refer to '4.4.1.1</p> <p>General Settings' for details about capture options.</p> |
| 2   |    | <p>Select the deleted data and click [  ] button to open the path where the deleted original data is stored.</p>                                                                                                                                                                                                                                                                                                       |
| 3   |   | <p>Select the deleted data and click [  ] button for permanent delete.</p>                                                                                                                                                                                                                                                                                                                                            |
| 4   |  | <p>Click [OK] button to proceed with permanent delete.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                              |

5



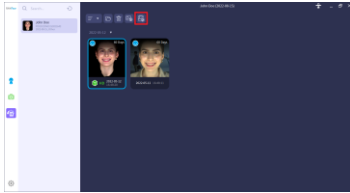
Select the deleted data and click [  ] button to restore the data.

6



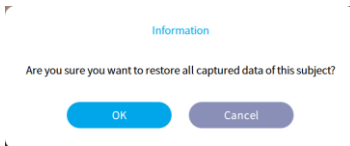
Click [OK] button to proceed with restoring the selected data.

7



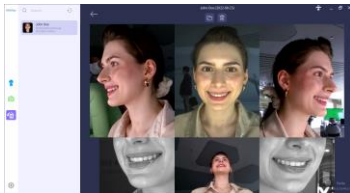
Click [  ] button to restore all deleted data of the subject.

8



Click [OK] button to proceed with restoration of all deleted data.

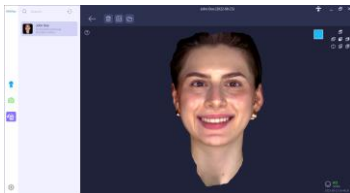
9



Captured data can also be examined in the recycle bin.

Double-click on the unreconstructed data to display the captured data.

10



Double-click on the reconstructed data to display the reconstructed model.

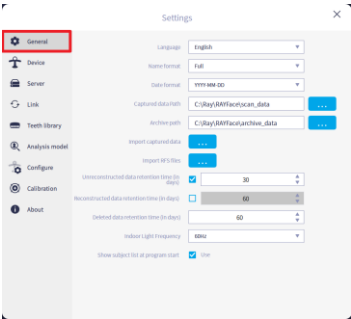
You may only view the smile data even though other data used in superimposition may be present.

4.4 Settings

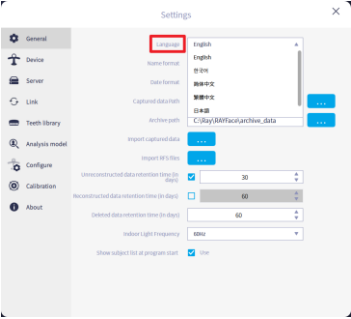
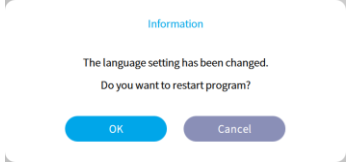
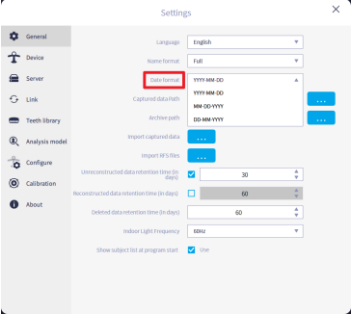
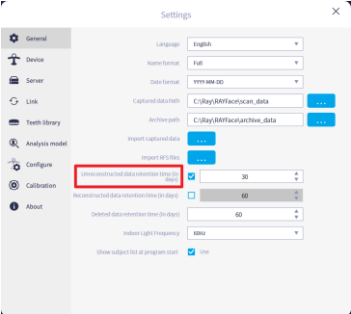
A user can change various settings of RAYFace, IP address, update firmware.

4.4.1 General Settings

Set the language, name format, data retention time, data path and import captured data.

| No. | Figure                                                                            | Description                                                                                                                      |
|-----|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| 1   |  | Run the RAYFace software and click [  ] button. |
| 2   |  | Go to [General] tab.                                                                                                             |

4.4.1.1 General Settings

| No. | Figure                                                                              | Description                                                                                                                                                                                                                                                                                                            |
|-----|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   |    | Go to [Language] and select your preference in the list.                                                                                                                                                                                                                                                               |
| 2   |    | Confirmation window is displayed for the change.<br>Click [OK] and the RAYFace will restart automatically.                                                                                                                                                                                                             |
| 3   |   | Go to [Date Format] and select your preference in the list.                                                                                                                                                                                                                                                            |
| 4   |  | Go to [Unreconstructed data retention time] and set the retention period of data that has not been reconstructed into a 3D model among the captured data.<br><br>Data that has not been reconstructed as a 3D model among the captured data will be permanently deleted after a specified period to reduce disk usage. |

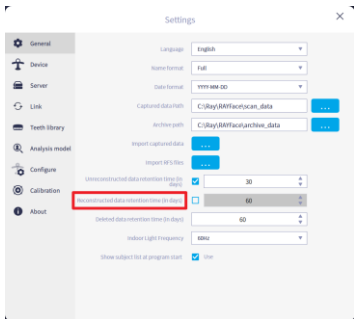
You can specify from 14 to 60 days (Default: 30 days). If the check box is left unchecked, any unreconstructed data will not be deleted.

Go to [Reconstructed data retention time] and set the retention period of data that has been reconstructed into a 3D model among the captured data.

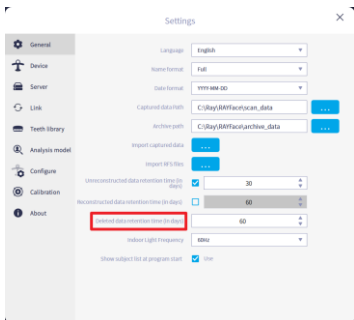
Data that has been reconstructed as a 3D model among the captured data will be permanently deleted after a specified period to reduce disk usage.

You can specify from 30 to 90 days (Default: 60 days). If the check box is left unchecked, any reconstructed data will not be deleted.

5



6

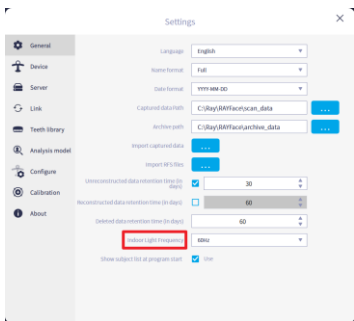


Go to [Deleted data retention time] and set the retention period of data that has been deleted.

The deleted captured data is not permanently deleted and moved to the recycle bin. After the specified time as set, the data will be deleted permanently.

You can specify from 30 to 90 days (Default: 60 days).

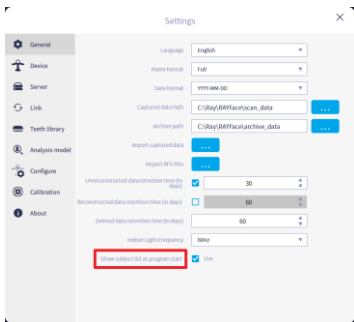
7



You can set indoor light frequency in [Indoor Light Frequency] option. When RAYFace is installed, it is automatically set between 50Hz and 60Hz according to the country setting of the operating system.

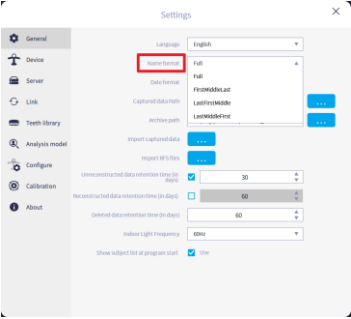
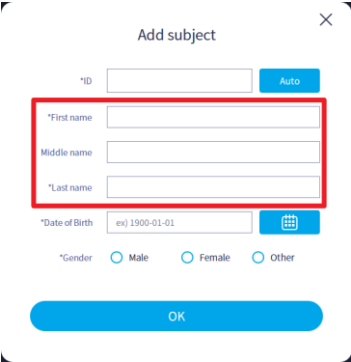
If the operating system's country setting is different from the actual one, you have to set it according to the country's mains power supply specifications.

8

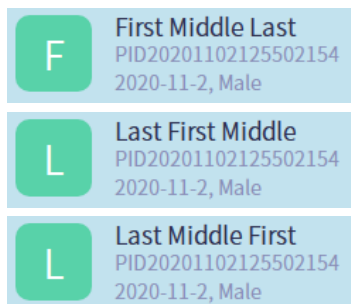


If you set [Show subject list at program start] option, the full list of subjects are displayed when RAYFace starts. If the option is left unchecked, the list of registered subjects is not visible, and you have to search for the subject that you want to select.

4.4.1.2 Name Format

| No. | Figure                                                                             | Description                                                                                                                    |
|-----|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| 1   |   | Go to [Name Format] and select your preference in the list.                                                                    |
| 2   |   | [Full] option allows to enter full name of a subject.                                                                          |
| 3   |  | [FirstMiddleLast] [LastFirstMiddle] [LastMiddle First] option allows the user to enter subject's name in a specified brackets. |

4



If the First, Middle and Last name are entered separately, the name is displayed according to the current language setting.

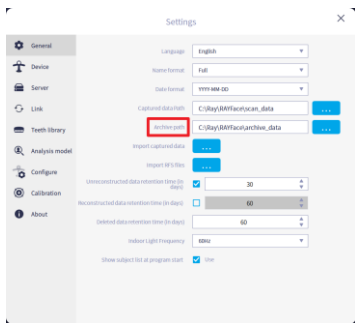
If you change the name format, the display changes according to the changed format.

If you change the name format to [Full], the display changes according to the format at the time of entering a name.

4.4.1.3 Captured Data Path

| No. | Figure | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   |        | <p>[Captured data path] option allows the user to change the data save path for RAYFace server and client sync data.</p> <p>Changing the path only affects the local PC where this option has been utilized, this does not affect the data save path for other synced PCs in the network.</p> <p>Click [Search] button and specify the path to change.</p>                                                                                                                                                                                                                                                                               |
| 2   |        | <p>The sub-path of path cannot be designated as a new save data path.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 3   |        | <p>In order to maintain the consistency of captured data management, all captured data of a subject are saved in the same path.</p> <p>Therefore, if the data path has been changed, the additional captured data of existing subjects will continue to be saved in the previous path. Only newly registered subjects' captured data will be saved in the new path.</p> <p>In order to save the additional captured data of the existing subjects in the changed path, all saved captured data must be moved to the new path.</p> <p>If you click [Yes] button, all saved captured data will be moved to the new path automatically.</p> |

4



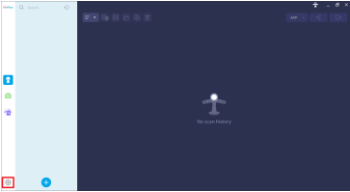
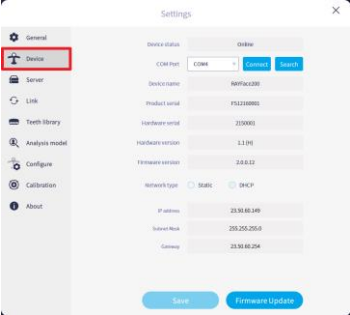
[Archive path] option allows the user to change the data save path for the data which only resides in RAYFace server as an archival data and are not synced.

Changing the path only affects the local PC where this option has been utilized, this does not affect the data save path for other synced PCs in the network.

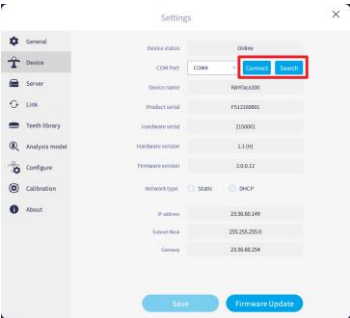
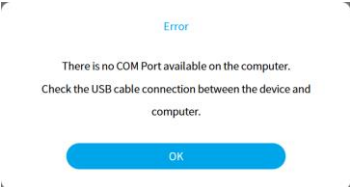
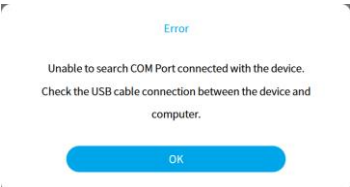
Click [Search] button and specify the path to change.

4.4.2 Device Settings

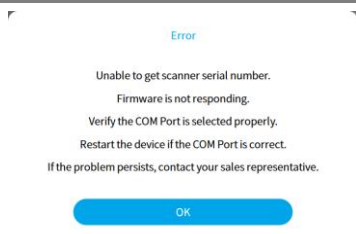
A user can change the scanner's IP address and update the firmware.

| No. | Figure                                                                            | Description                                                                                                                      |
|-----|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| 1   |  | Run the RAYFace software and click [  ] button. |
| 2   |  | Go to [Device] tab.                                                                                                              |

4.4.2.1 IP Address Settings

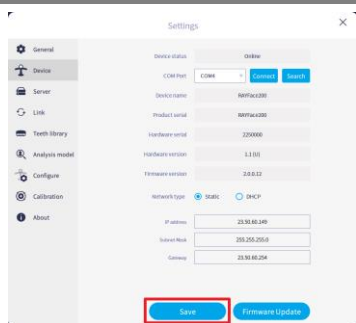
| No. | Figure                                                                              | Description                                                                                                                           |
|-----|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| 1   |    | Connect RAYFace and computer with provided USB cable.                                                                                 |
| 2   |    | Select the COM port and click [Connect] button.<br>Click [Search] button to find the COM port if the computer has multiple COM ports. |
| 3   |   | If there is no COM port connected to the computer, this message will appear.                                                          |
| 4   |  | If the computer does not have a COM port connected to RAYFace, this message will appear.                                              |

5



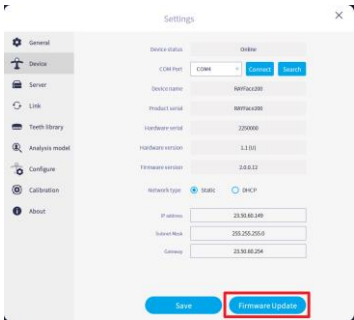
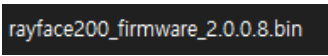
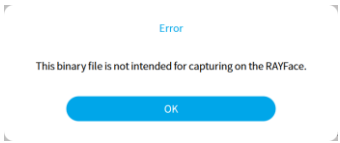
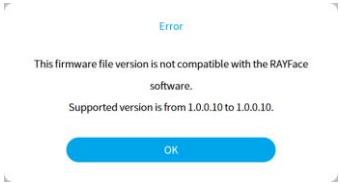
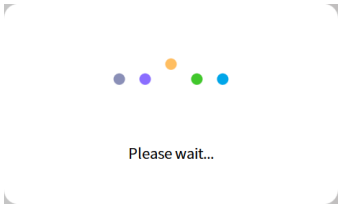
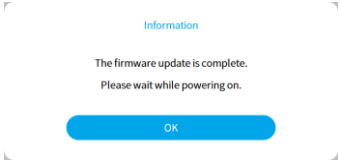
If the selected COM port is not connected to RAYFace, this message will appear.

6

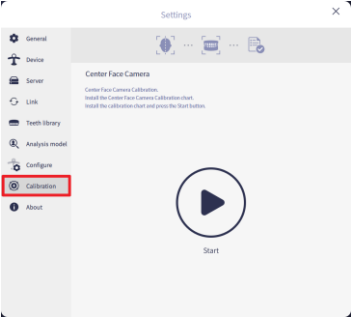
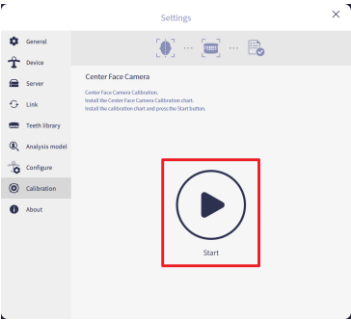
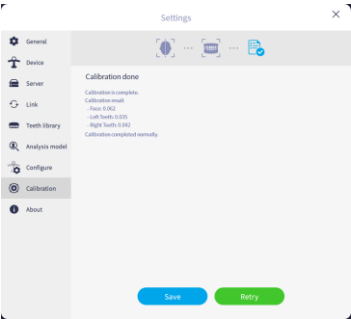


Click [Connect] button to load the scanner information. Modify the network settings and click [Save] button to save the network settings.

4.4.2.2 Firmware Update

| No. | Figure                                                                              | Description                                                                             |
|-----|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1   |    | Click [Firmware Update] button.                                                         |
| 2   |    | Select the firmware file of RAYFace.                                                    |
| 3   |    | If the selected file is not the firmware file of RAYFace, this message will appear.     |
| 4   |   | If the selected file does not support the version of RAYFace, this message will appear. |
| 5   |  | Selecting the correct firmware file starts the firmware update.                         |
| 6   |  | When the firmware update is complete, the RAYFace restarts automatically.               |

4.4.2.3 Calibration

| No. | Figure                                                                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   |    | <p>Go to [Calibration] menu.</p> <p>After installing the calibration target, connect the USB A type port on the back of the scanner body and the USB B type port on the calibration kit.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 2   |    | <p>Click [Start] button, calibration will start.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 3   |  | <p>When calibration target scanning is finished, calibration is automatically calculated.</p> <p>When all the calibration values are within the reference value (0.1), the calibration result is automatically saved in the device.</p> <p>If the calibration value is out of the reference value, the calibration result is not automatically saved in the device. In this case, proceed with calibration again after confirming that the calibration target is installed correctly, that there is no damage to the calibration target, that the pattern of the calibration target is all within the camera's field of view, and that there is no strong ambient light around the cameras.</p> |

# Status Indicator

# 5

## 5 Status Indicator

### 5.1 RAYFace Indication

| No. | Figure                                                                              | Description                                                                                                                                              |
|-----|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   |    | LED status indicator is located at the front mirror of RAYFace.                                                                                          |
| 2   |    | <p>[Yellow]</p> <p>It indicates the booting state.</p>                                                                                                   |
| 3   |   | <p>[Blue]</p> <p>It indicates that the scanner is ready to shoot, after the booting completes.</p>                                                       |
| 4   |  | <p>[Red]</p> <p>Please restart RAYFace, there is a connection error with the device. If the problem persists, please contact your local distributor.</p> |

## Appendix A. Product Specifications

| Item                         | Description                                                                                             |
|------------------------------|---------------------------------------------------------------------------------------------------------|
| <b>Dimension (W x H x D)</b> | 808 x 390 x 552 mm / 31.8 x 15.3 x 21.7 in.                                                             |
| <b>Weight</b>                | 9.5 kg / 20.9 lbs                                                                                       |
| <b>Connectivity</b>          | Ethernet , USB                                                                                          |
| <b>White LED CCT</b>         | 5700 K                                                                                                  |
| <b>AC adapter</b>            | Input: 100-240V~, 50/60Hz, 1.5A<br>Output: 24Vdc, 3.75A                                                 |
| <b>Operation environment</b> | Temperature: 10 ~ 35 °C / 50 ~ 95 °F<br>Humidity: 20 ~ 80 %<br>Atmospheric pressure: 800hPa ~ 1060hPa   |
| <b>Storage environment</b>   | Temperature: -10 ~ 50 °C / 14 ~ 122 °F<br>Humidity: 10 ~ 90 %<br>Atmospheric pressure: 800hPa ~ 1060hPa |

## Appendix B. Messages

| Message                                                   | Cause                                                            | Guide                                                                                                                                   |
|-----------------------------------------------------------|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Currently installed cameras contain unsupported firmware. | A camera that is not supplied by the manufacturer is installed.  | Contact your sales representative to replace the camera.                                                                                |
| The camera is not recognized.                             | The USB cable connected to the camera is disconnected.           | Open the back cover and confirm that related cables are connected properly. If the problem persists, contact your sales representative. |
| The camera is connected via USB 2.0.                      | The USB cable connected to the camera is not securely connected. | Open the Back cover and confirm that related cables are connected properly. If the problem persists, contact your sales representative. |
| A problem occurred while configure camera options.        | There is a problem with the camera while preparing to capture.   | Restart the device.<br>If the problem persists even after restart, contact your sales representative.                                   |
| There is a problem with the camera while powering on.     | There is a problem with the camera while preparing to capture.   | Restart the device.<br>If the problem persists even after restart, contact your sales representative.                                   |
| There is a problem with the camera connection.            | There is a problem with the camera while preparing to capture.   | Restart the device.<br>If the problem persists even after restart, contact your sales representative.                                   |
| Unable to initialize the cameras.                         | There is a problem with the camera while preparing to capture.   | Restart the device.<br>If the problem persists even after restart, contact your sales representative.                                   |
| Unable to reconstruct the captured data in 3D model.      | Captured without a subject.                                      | Verify the subject has been captured properly.                                                                                          |

| Message                                                         | Cause                                                                                                     | Guide                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Unable to reconstruct the captured data in 3D model.            | The scanned data has been corrupted.                                                                      | If captured data cannot be found or if the subject was properly captured and the scanned data has been corrupted. This data cannot be recovered. Capture again.                                                                                                                                                                                                                                            |
| Unable to acquire 3D information of the subject.                | Captured without a subject.                                                                               | Verify that subject has been captured properly.                                                                                                                                                                                                                                                                                                                                                            |
| Capture is not in progress.                                     | An error occurred while preparing to capture.                                                             | Leave the capture mode and try again.                                                                                                                                                                                                                                                                                                                                                                      |
| Invalid captured data.                                          | There is a problem with the camera while preparing to capture.                                            | Restart the device.<br>If the problem persists even after restart, contact your sales representative.                                                                                                                                                                                                                                                                                                      |
| A capture is in progress on another computer.                   | A capture is in progress on another computer.                                                             | Unable to capture at the same time while capturing is in progress on another computer. Exit the capturing mode on another computer and try again.<br><br>If capturing is not in progress on another computer, RAYFace may have abnormally terminated. In this case, it takes up to 5 minutes for the RAYFace to disconnect from the scanner.<br><br>If the same error message appears, restart the device. |
| Firmware version of the scanner is not compatible with RAYFace. | Currently installed firmware version on RAYFace scanner is not the version supported by RAYFace software. | Update the scanner firmware.                                                                                                                                                                                                                                                                                                                                                                               |

| Message                                                                                               | Cause                                                                      | Guide                                                                                                              |
|-------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| Wrong update file has been loaded.                                                                    | There is a problem with the firmware binary file.                          | Retry to update the firmware.<br>If the same error message appears, download the firmware binary file again.       |
| A problem occurred while updating firmware.                                                           | An error occurred while updating firmware.                                 | Restart the device.<br>If the problem persists even after restart, contact your sales representative.              |
| This firmware file version is not compatible with the RAYFace software.                               | The selected firmware binary file is not the version supported by RAYFace. | Select the firmware binary file of the version supported by RAYFace.                                               |
| This binary file is not intended for capturing on the RAYFace.                                        | The selected file is not RAYFace firmware binary file.                     | Select the proper firmware binary file of RAYFace.                                                                 |
| Unable to connect to device.                                                                          | The IP setting has been changed or the network cable is disconnected.      | Check the network cable connection and IP settings.                                                                |
| Invalid network address format.                                                                       | The IP address, netmask and gateway address format is incorrect.           | Set a correct IP address, netmask, and gateway address format.                                                     |
| The IP address entered conflicts with other devices.                                                  | The IP address specified as static IP is being used on another device.     | Change the IP address.                                                                                             |
| Unable to get IP address from DHCP server.                                                            | There is no DHCP server accessible from RAYFace.                           | Check the network connection and make sure it is connected to the DHCP server.                                     |
| The default gateway is not on the network segment (Subnet) defined in the IP address and subnet mask. | The gateway is not on the same network as the IP address.                  | The IP address and gateway must be on the same network defined by the netmask.<br>Check the network configuration. |

| Message                                                 | Cause                                                                                    | Guide                                                                                                                                                                                                                                           |
|---------------------------------------------------------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Gateway is not on the same network with the IP address. | The gateway is not on the same network as the IP address.                                | The IP address and gateway must be on the same network defined by the netmask.<br>Check the network configuration.                                                                                                                              |
| Invalid IP address.                                     | The IP address format is incorrect.                                                      | The IP address format is not in the format (xxx.xxx.xxx.xxx) or the first digit is over 223.<br>Enter a valid IP address.                                                                                                                       |
| Invalid subnet mask.                                    | The netmask format is invalid.                                                           | The netmask format is not in the format (xxx.xxx.xxx.xxx) or contiguous.<br>Enter a valid netmask.                                                                                                                                              |
| Invalid subnet mask.                                    | The netmask format is invalid.                                                           | The netmask format is not in the format (xxx.xxx.xxx.xxx) or contiguous.<br>Enter a valid netmask.                                                                                                                                              |
| A problem occurred during serial communication.         | There is a problem with the scanner firmware.                                            | Update the scanner firmware.<br>If the problem persists even after the firmware update, contact your sales representative.                                                                                                                      |
| Firmware is not responding.                             | No response from the scanner firmware to the serial port.                                | Check and see if the serial port has been properly connected to the scanner.<br>If the serial port is properly connected to the scanner, restart the scanner.<br>If the problem persists even after restart, contact your sales representative. |
| Unable to open the COM port.                            | The specified serial port is open by another program or the cable has been disconnected. | Check and see if there are other programs using the specified serial port.<br>Check on the serial port connection between the computer and the scanner.                                                                                         |

| Message                                                                    | Cause                                                                           | Guide                                                                                                                                    |
|----------------------------------------------------------------------------|---------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| A problem occurred during serial communication.                            | There is a problem with the scanner board installed on the RAYFace.             | Update the scanner firmware.<br>If the problem persists even after the firmware update, contact your sales representative.               |
| A problem occurred during device setup.                                    | There is a problem with the scanner board installed on the RAYFace.             | Update the scanner firmware.<br>If the problem persists even after the firmware update, contact your sales representative.               |
| Settings cannot be saved because the device is in use on another computer. | A capture is in progress on another computer.                                   | Unable to change the IP address while capture is in progress on another computer.<br>Exit the capture on another computer and try again. |
| Unable to initialize the network device.                                   | There is a problem with the scanner board installed on the RAYFace.             | Restart the device.<br>If the problem persists even after restart, contact your sales representative.                                    |
| Unable to save the network settings.                                       | There is a problem with the scanner board installed on the RAYFace.             | Restart the device.<br>If the problem persists even after restart, contact your sales representative.                                    |
| Unable to save the file with specified path.                               | The path where the captured data is saved has been selected as the export path. | Unable to export to the path where the captured data is saved.<br>Choose another path.                                                   |
| Unable to move the captured data to the new path.                          | A problem occurred while moving the captured data to the changed path.          | Check whether there is enough space in the changed captured data path and the file can be written.                                       |

| Message                                                       | Cause                                                                                                | Guide                                                                                                            |
|---------------------------------------------------------------|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| This path cannot be set to save captured data.                | The path where the current captured data is saved is selected as the new save path.                  | The path in which the current captured data is saved cannot be designated as a new path.<br>Choose another path. |
| Unable to load captured data.                                 | A problem occurred when copying to the captured data path while importing data.                      | Make sure that there is enough space in the captured data path and the data is accessible.                       |
| Captured data cannot be imported from the selected path.      | The path where the captured data is saved has been selected as the import path.                      | Unable to import from the path where the captured data is saved.<br>Choose another path.                         |
| There is a problem with the database.                         | There is a problem with RAYFace's database and the list of subjects and scan data could not be read. | Contact your sales representative.                                                                               |
| A problem occurred during communication with calibration kit. | The calibration kit was not connected to RAYFace.                                                    | Please connect or reconnect the calibration kit to RAYFace and restart the device.                               |
| The calibration cycle has been exceeded.                      | Too much time has passed since the last calibration. .                                               | Please re-calibrate RAYFace. .                                                                                   |
| No scanner calibration was performed.                         | RAYFace has not been calibrated.                                                                     | Please calibrate RAYFace.                                                                                        |

| Message                           | Cause                                                                                                           | Guide                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Calibration failed.               | Calibration kit scan image is not sufficient for the calibration or the scanning of calibration kit has failed. | Please confirm whether the calibration kit has been connected to the device properly, calibration kit has been attached properly, inspect if there are any damages to the calibration kit, see if the target pattern on the calibration kit appears within the capture area, see if there are any strong ambient light source, see if there are any objects obstructing the camera, and finally once it is all set, calibrate RAYFace again. |
| Calibration results are not good. | Calibration kit scan image is not sufficient for the calibration.                                               | Please confirm whether the calibration kit has been attached properly, inspect if there are any damages to the calibration kit, see if the target pattern on the calibration kit appears within the capture area, see if there are any strong ambient light source, see if there are any objects obstructing the camera, and finally once it is all set, calibrate RAYFace again.                                                            |
| Cannot lock scan data.            | Cannot connect to the RAYFace server where the scan data has been created.                                      | Please confirm whether the registered RAYFace server is running on the network. Please check if there are any unregistered RAYFace servers on the network.                                                                                                                                                                                                                                                                                   |
| Data has been modified.           | Data has been modified on a different PC in the network.                                                        | Please go back to the patient list screen and refresh the data.                                                                                                                                                                                                                                                                                                                                                                              |
| Data is in sync.                  | Scan/modified data stored on a different PC in the network is being synced.                                     | Once the sync has been completed please refresh the data.                                                                                                                                                                                                                                                                                                                                                                                    |

| Message                                      | Cause                                                          | Guide                                                                                                                               |
|----------------------------------------------|----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Unable to connect to the RAYScan server.     | Could not connect to the RAYScan server IP as entered.         | Please confirm if the correct IP address for the RAYScan server has been entered, and confirm RAYScan server is operating properly. |
| Unable to add RAYFace server.                | Could not connect to the RAYFace server IP address as entered. | Please confirm if the correct IP address for the RAYFace server has been entered, and confirm RAYFace server is operating properly. |
| Check if the program exists in the set path. | Wrong program path has been assigned.                          | Please check and confirm whether the correct path has been assigned.                                                                |
| No link program path specified.              | Linked program path has not been assigned.                     | Go to Settings > Link menu and set the program path.                                                                                |
| The maxilla does not exist.                  | Project data lacks maxillary dentition scan data. .            | The linked program requires a maxillary dentition scan data. Please import the data in question and restart the software. .         |
| The CT does not exist.                       | Project data lacks CT scan data.                               | The linked program requires a CT scan data. Please import the data in question and restart the software. .                          |

## Appendix C. Regulations

### Product Disposal (Refer to wastes collection systems by countries)



This symbol on the product, component to document, indicates that it should not be disposed of with other household wastes when disposing of the product. Please cooperate to promote the continuous recycling of resources by separating and recycling the product from others to avoid environmental harm and check the terms of the purchase agreement. This product and electrical component should not be mixed with other commercial waste.

### Electromagnetic compatibility



When using the product, consider the electromagnetic compatibility (EMC) requirements and electrostatic discharge (ESD) safety measure.

#### FCC NOTICE

This equipment has been tested and found to comply with the limits for a class “A” digital device, pursuant to Part 15 of the FCC rules.



These limits are designed to provide reasonable protection against harmful interference. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their expense.



It is prohibited to use cell phone, other mobile devices, or other wireless devices near the product. Even products that does not correspond with EMC regulations may have an indirect effect on the machine, which could result in unintentional action by the product.



Through static electricity, from user or the subject, the product could get damaged, or result in unintentional action by the product. Please follow the procedure to remove static from the body. Static can be removed by touching the ground or metal objects.



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