EN

HDX WILL

ECO-X Series

eco-X

USER MANUAL

Digitally signed by SACHDEV TATIANA
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Reason: MoldSign Signature
Location: Moldova
MOLDOVA EUROPEANĂ

UM – EC(CE) – 18 (rev.0.3)

Chapter 1. Will Start

This chapter describes the overall characteristics of the product, product configuration and various precautions.

■ Information you need to know before reading the notation

The content of this manual is subject to change without notice in order to improve the product performance.
The manufacturers and distributors are not responsible for the damages and accidents caused by the negligence of the user in connection with the equipment. So please make sure to follow the procedures and precaution carefully. Also, we notify that the information contained herein may different according to the specifications of the product. The following notation is used in this product and manual for the safe and effective use.

Manual Name: eco-x User Manual (UM–EC(CE)–18)

Release date and version no: DEC. 2021 v.0.3

1.1 Symbol

■ Symbols in this manual

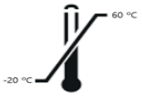
	**Useful information or information you need to know when using this product**
	**The content contains the important instruction or warnings when using the product. If you ignore it, serious problems such as product failure or damage can be caused.**
	**The content includes the safety instructions or warnings when using the product. Failure to observe this would lead to serious problems to the patients or users.**
	**Do not reuse. Disposable product.**

■ Symbols on Product Labels (with attachments)

	Radiation hazard
	General Warning Sign Consult accompanying documents
	Caution: high voltage
	Equipment with type B applied parts
	Protective earth (ground)
	Laser Caution
	Refer to instruction manual/booklet
	Allowable temperature range during transportation and storage
	Humidity limitation

	Date of Manufacture
SN	Serial number
	Manufacture
CE 0197	CE marking with N.B no.
EC REP	Authorized Representative in the European Community
	WEEE mark, This symbol indicates that electrical and electronic equipment must not be disposed of as unsorted municipal waste and must be colle c ted separately.

■ Symbols on the Transport Package

	This way up
	Fragile, handle with care
	Keep dry, The package should not get rained on.
	Allowable temperature range during transportation and storage
	Humidity limitation
	Atmospheric pressure limitation
	Don’t stacking

1.2 Radioactivity Protection Policy

IMPORTANT	**HDX WILL complies with the Radiation Safety and Protection Act that is regulated by Korea Food and Drug Administration (MFDS), and the users must comply with the Radiation Safety and Protection Act the country and the relevant authorities define.**

1. This product shall be installed and operated at the location that is prescribed or permitted by the agency.
2. While capturing, the operator/user must wear the protective gear (lead apron, barriers, or etc.), and must provide the protective way to the patient.
3. The operator/user of workstation and X-ray shall stay properly behind the shielded permanent wall.
4. Since children and pregnant women are vulnerable to radiation exposure, should discuss with doctor for capturing.
5. When capturing the image, the operator/user must stay more than 2m away from the facility outside the equipment as specified by the law.
6. In case of emergency situation, the operator/user must continuously check the status of patients and equipment while capturing.
7. If any abnormal behavior occurs during the operation of the device (such as noise, odors, smokes, or etc.), the operator/user must stop and power off the device immediately.

NOTE	**Please note that using this product around volatile environment, or environment where it has high risk of explosion or near flammable chemical substances can be very dangerous.**

1.3 Manufacturer Liability Policy


NOTE

The Manufacturer Liability Policy and responsibility for the safe usage of the equipment applies only under the following conditions.

1. In case the equipment was installed by manufacturer personnel or qualified authorized personnel
2. In case that the equipment was installed under proper conditions and precautions were taken in accordance with the installation guide
3. In case genuine components approved by the manufacturer/seller were used.
4. In case that maintenance/repair was done by manufacturer personnel or qualified authorized personnel
5. In case the equipment was properly used in accordance with the instruction manual
6. In case the breakdown of equipment was caused by the customer's fault

1.4 Training and Service Supply Policy

1. We provide the training of user manual to operators for using the device safely and efficiently. The user shall refer all contents in user manual and must use for the intended purpose.

2. For first purchase of the product, we provide the constant period of training, and provide additional training and service upon the customer's request.

3. To keep the quality and safety of the product, we provide the regular-base maintenance upon the request.

4. Please contact our service center or supplier when the training and service is required.

5. Do not disassemble, repair, or/and remodel unless acquired the qualification from the manufacturer.

1.5 Qualifications of Operating Personnel

1. The system may only be operated by properly skilled or trained personnel.

2. Qualification:
Personnel undergoing education or training, or who are using the device as part of general training may only operate the device under the constant supervision of the experienced personnel.

3. To operate the device, the operator must:
   - have read and understood the instructions
   - be familiar with the fundamental structure and functions of the device
   - be able to recognize the irregularities in the functioning of the implement the appropriate measures when necessary

1.6 Environmental Risks and Disposal

When the product's life span runs out, some materials and liquids of the product must be disposed at the appropriate disposal center, and all disposal process must follow the procedure of each country. Especially, shall pay attention to the device contains the following materials and/or components:

. Tube-head:	dielectric oil, lead, copper, iron, aluminum, glass, tungsten
. Control Panel:	Iron, copper, aluminum, glass-resin, non-biodegradable plastic material
. Column, Rotating Arm and Connectors:	Iron, lead, aluminum, copper, glass-resin, non-biodegradable plastic material
. Digital sensor:	Iron, lead, copper, integrated electronic components
. Others:	non-biodegradable plastics, iron and aluminum

1.7 Applied Standard and Law

'eco-x series' is designed to meet the following standard and law.

- IEC60601-1
- IEC60601-1-3
- IEC60601-1-6
- IEC60601-2-63

Chapter 2. Precaution

This chapter describes the precaution for using the product safely.
Please acquaint before using, and follow the instruction.

2.1 Safety Precautions before Using Product

This content contains the precaution for users regarding the fire and electric, mechanical safety accident.
So please read carefully before use.

1. The responsibility for proper use and management of product is on the operator/user.
2. For the safety of user and patient, please read the instruction carefully before using the product.
3. This instruction, procedure, and precautions must be complied.
4. If there is product malfunction or unstable status, please give a restrained use. Please use after inspection through the Customer Support Center that headquarters and the company specified.
5. Please note that pouring liquid such as water and drinks, or the external impact can cause the electrical and mechanical abnormalities which can lead to accident, fire, and equipment failure.
6. It is important to keep the equipment clean at all times because the dust may cause a malfunction of equipment. Please use at 10℃~40℃ and store at 0℃~40℃.
7. The installed product shall not be changed or modified randomly. If the modification is necessary, please contact HDX WILL to consulate.
8. Additional multiple socket or extension cord shall not be connected.
9. Only part of ME SYSTEM or product converting with ME SYSTEM shall be connected.
10. WARNING: To avoid the risk of electric shock, this equipment must be connected to a supply main with protective earth.

◆ **Interference with electronic devices**

Use of wireless mobile phones and similar devices in the vicinity of this system is prohibited. Use of devices compliant with EMC standards in close proximity can lead to unintended activities due to electromagnetic interference.

◆ **Risks of electromagnetic fields**

If system is intended for use on patients having an “Implantable Cardiac Pacemaker” or “Implantable Defibrillator”, the user is obligated to notify patients having such devices of the X-ray exposure on to the transplanted part of the “Implantable Cardiac Pacemaker” or the “Implantable Cardiac Pacemaker” or “Implantable Defibrillator” and emit X-ray only for short duration if possible.

2.2 Precautions while Using Product

This content contains the precaution for the proper usage of the product.
So please acquaint carefully before use.

1. For the safety of user and patient, please read the instruction carefully before using the product.

2. Please check the status of the product before using' the power of computer cables, or etc.

3. All operations on products must be run in a stopped condition. If you control during operation, it can cause a malfunction or failure or accidents.

4. Excessive continuous capture can cause overheating of X-ray generator. Please follow the recommended cooling time.

5. This product is precision medical electronic equipment; therefore keep water, moisture, and dirt away from the device.

6. In case of emergency such as malfunction or noise, please press the emergency stop button immediately. After block the power, please inform our Customer Service Center to solve issue.

2.3 Precautions for Patients

1. The glasses, hairpin, oral devices, dentures, or etc. shall be removed before using this product. Especially, the metal materials can cause the difficulty of diagnosis or distortion.

2. X-ray exposure can cause the malfunction of devices for For the patient with "Implantable Cardiac Pacemaker" or "Implantable Defibrillator", they must notify their condition to the doctor.

3. Please wear the protective clothing to avoid the unnecessary radiation expose.

Chapter 3. General overview

This chapter describes the overall characteristics of the product, product configuration, and various precautions in more detail.

3.1 Product Features

- This product uses X-Ray to easily obtain CT, panoramic, cephalometric, and model scan images. This product is 4 in 1 digital specialized medical equipment that offers everything you need in the diagnosis and analysis.

- This product is equipped with a circuit breaker for protecting a circuit from over-current occurs to // main power switch side.

- This product is for the diagnostic purposes that provide high-resolution digital 3D images.

- This product provide up to FOV 160mm x 90mm three-dimensional pictures.

- Software that is included in this product provides preliminary simulations and a variety of function for the dental implant procedure.

- This product provides panoramic image when capturing CT image.

- This product provides features such as the range of X-Ray exposure unit and Scout View to avoid unnecessary retake and obtain accurate images.

- This product provides the voice announcement and message to notice the operating condition for the user or patient.

- Depending on the patients of this product, equipment sets a variety of suitable conditions for patient.

- This product supports DICOM 3.0 Format.

3.2 Intended Use

'eco-x series' is 4 in 1 digital equipment that provides CT, Panoramic, Cephalometric, and Model Scan images by using X-Ray scan. It provides 2D images for diagnosing cranial bone tissue including adult and pediatric teeth, jaw, or etc. Also it provides 3D images by reconstructing images acquired by capturing cervical bone and occipital regions.
In addition, 'eco-x series' is used as diagnosis for general and/or orthodontic treatment, and also is intended to use for ENT (Ear, Nose, and Throat) and dentomaxillofacial diagnosis.

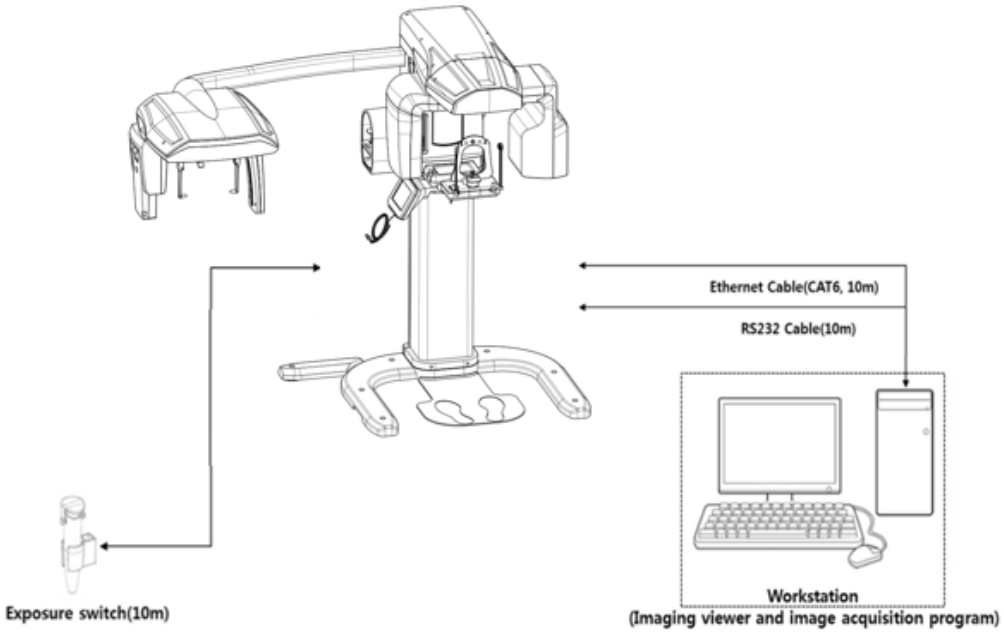
3.3 Contraindication

Do not use the product for following purpose.

- Caries diagnosis, especially for proximal lesions
- Scan the cartilage structures
- Scan the soft tissue with X-ray

3.4 Composition of Product

eco-x series



3.4.1 The Hardware configuration

- The machine body (transportation, installation ca be provided separately for the convenience of customers)
- Workstation (contains key board, mouse, and monitor)
- License key (provides USB memory)
  - 1 image viewer program

  (However, if you do not purchase a program that our companies provides, or integrate programs for convenience, the quantity can be changed or not provided at all.)
- User manual

NOTE	**The configurations of this product are subject to change without notice to improve the performance of the product.**

3.4.2 The Software configuration

- Patient Image Management Program and 2D Viewer Program
- Capture Program (Image Acquirement Program)
- 3D Viewer Program (Option)

(However, if you do not purchase a program that our companies provides, or integrate programs for convenience, the quantity can be changed or not provided at all.)

These configurations of this software are subject to change without notice for product's performance, efficiency of use, and improvement. In addition, an additional individual purchase is possible and the software will not be provided for free.

3.5 The eco-x model series

3.5.1 Model classification

The 'eco-x series' is classified according to the following options.

MODEL	CT, Cu filter Thickness	MODE			
		CBCT	Model Scan	PANO	CEPH (SCAN)
eco-x	0.2mm	●	●	●	-
eco-x-s		●	●	●	●
eco-x ai	0.5mm	●	●	●	-
eco-x-s ai		●	●	●	●

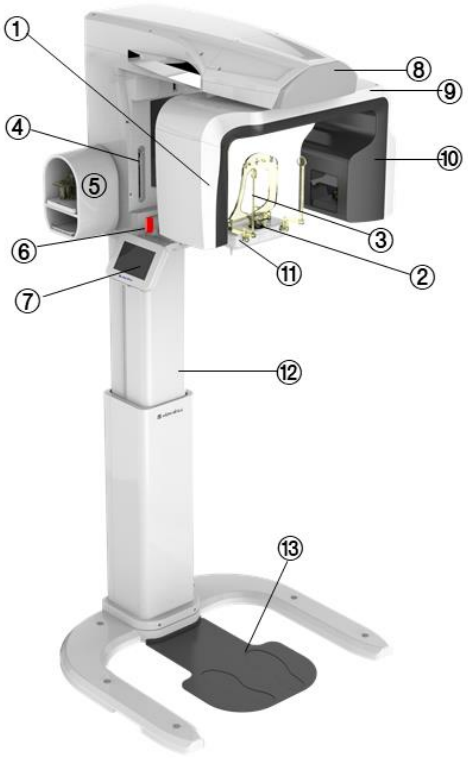
3.5.2 CT FOV(field of View) size

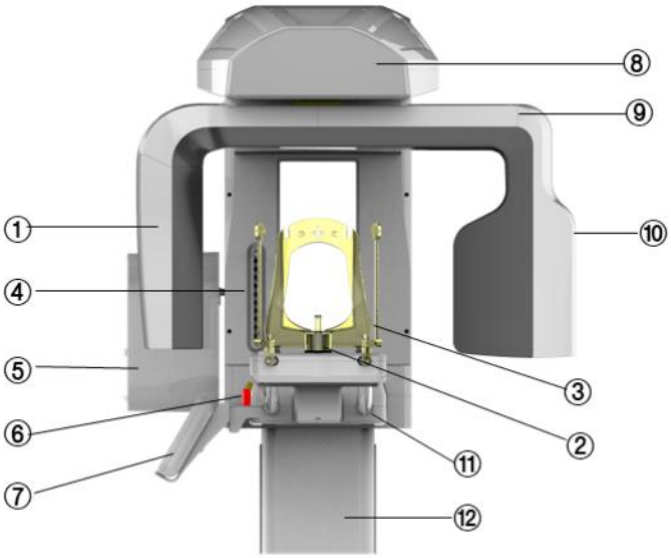
CT FOV(Field of View) option of 'eco-x series' is as blow.

	For Adult	For Child
1 axis collimator	16x9 / 12x9	10x8
4 axis collimator	Min. 3x3 - Max. 12x9	

3.6 Product Structure and Function

3.6.1 eco-x, eco-x ai





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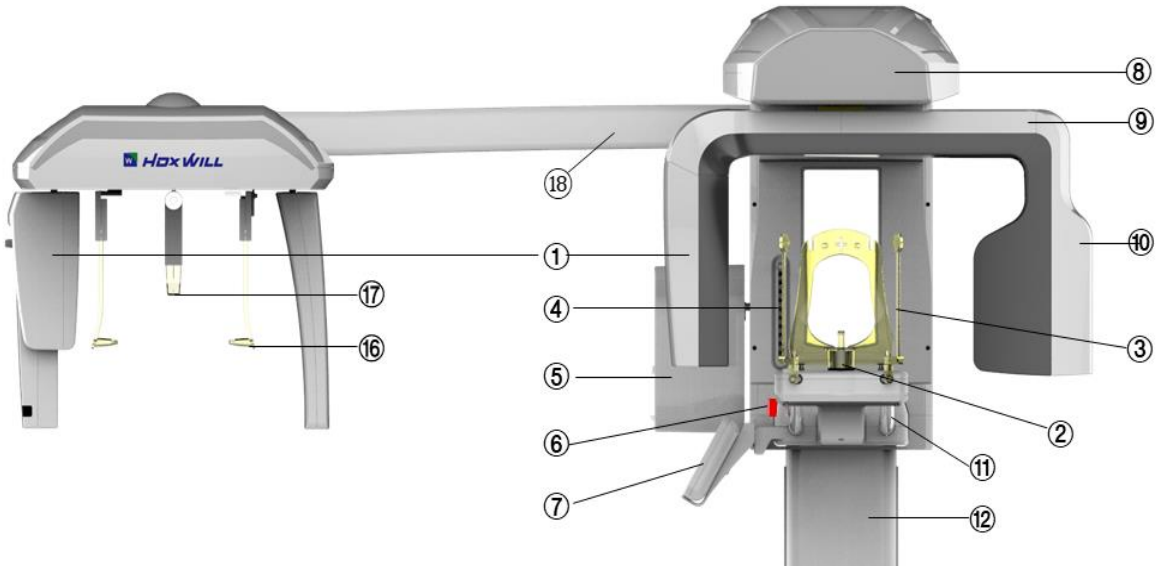
No.	Name		Function
1	X-ray detector		Sensing element for acquiring X-ray (digital sensor)
2	Installation Part	Chinrest	Align patient's position by fixing patient's chin (detachable)
3		TEMPLE SUPPORT	Support patient's temple
4	Guide laser		Laser beam for aligning patient
5	Component storage outbox		Outbox that can hold 'Components of positioning'

6	Emergency stop button	Button to stop the equipment immediately for safety in an emergency situation
7	Touch panel	Provide an interface for setting up the capturing conditions and operating environment
8	X-ray exposure indicator lamp	Lamp that determines the X-ray irradiation status (Irradiation: Yellow, Un-irradiation/Ready mode: Green)
9	Rotating Unit	Rotating unit for scanning
10	X-ray Generator	X-ray exposing area
11	Handle frame	Fix patient's position while capturing X-ray
12	Sliding column	Column that moves up and down to align the patient
13	Foot step	Step to align the patient
14	Exposure switch	Switch to expose X-ray
15	Image processing unit	PC, monitor, keyboard, mouse

3.6.2 eco-x-s, eco-x-s ai



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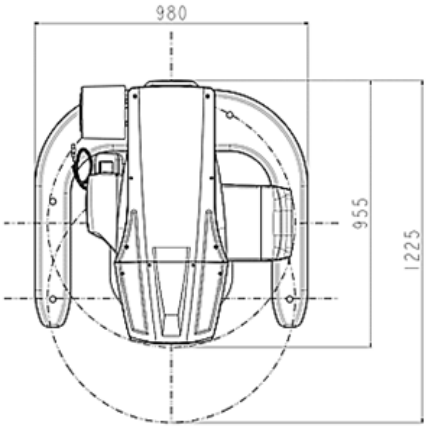
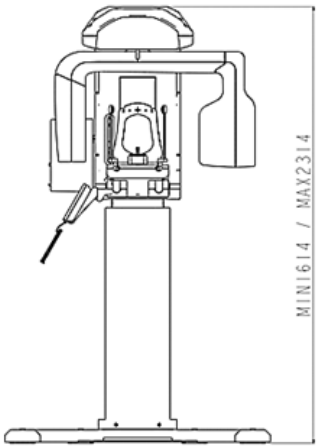
No.	Name		Function
1	X-ray detector		Sensing element for acquiring X-ray (digital sensor)
2	Installation Part	Chinrest	Align patient's position by fixing patient's chin (detachable)
3		TEMPLE SUPPORT	Support patient's temple
4	Guide laser		Laser beam for aligning patient
5	Component storage outbox		Outbox that can hold 'Components of positioning'
6	Emergency stop button		Button to stop the equipment immediately for safety in an emergency situation
7	Touch panel		Provide an interface for setting up the capturing conditions and operating environment
8	X-ray exposure indicator lamp		Lamp that determines the X-ray irradiation status (Irradiation: Yellow, Un-irradiation/Ready mode: Green)
9	Rotating Unit		Rotating unit for scanning
10	X-ray Generator		X-ray exposing area
11	Handle frame		Fix patient's position while capturing X-ray
12	Sliding column		Column that moves up and down to align the patient
13	Foot step		Step to align the patient
14	Exposure switch		Switch to expose X-ray
15	Image processing unit		PC, monitor, keyboard, mouse
16	Installation Part	EAR ROD	Support patient's ear during cephalo mode
17		NASAL ROD	Align the patient's position during cephalo mode
18	Ceph arm		Supporter for cephalo part

3.7 Product Specification

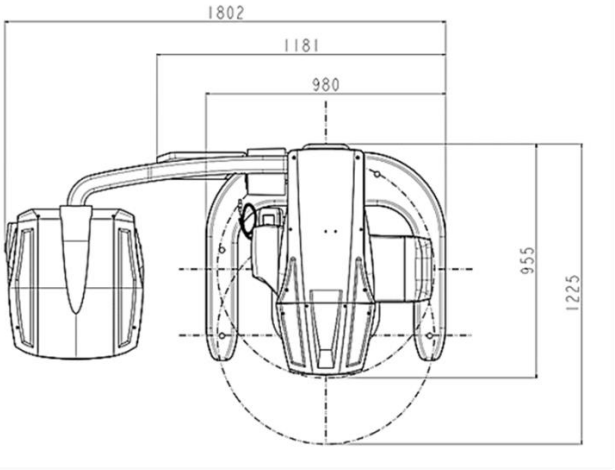
3.7.1 eco-x, eco-x ai

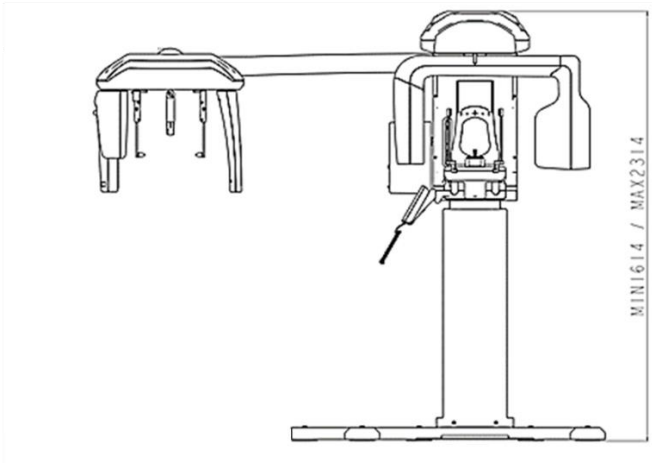




No.	Item	Detail
1	Dimensions (W x D x H)	980 mm × 1225 mm × 2314 mm
2	Weight	178kg

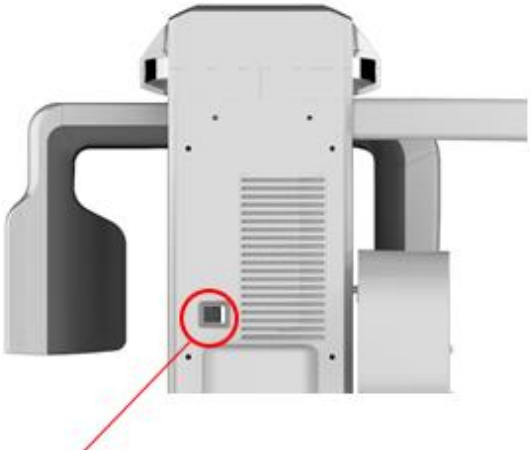
3.7.2 eco-x-s, eco-x-s ai





No.	Item	Detail
1	Dimensions (W x D x H)	1802 mm × 1225 mm × 2314 mm
2	Weight	211kg

3.8 Power Switch



Power switch

Power switch is located behind the movable column. When the machine is on, the touch panel power will be one.
Also, to determine whether the machine operates properly, it will progress the self-inspection.

If the machine is not operated for long time, turn off the device to extend the life span of eco-x series.

3.9 Emergency Stop Button

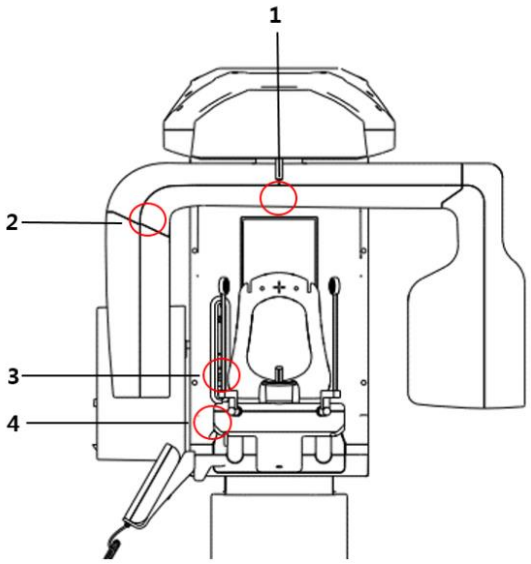
Emergency stop button

Emergency stop button is located next to the touch panel. Press the button for emergency situation.

When the Emergency stop button is pressed, the equipment and X-ray irradiation will be stopped immediately.

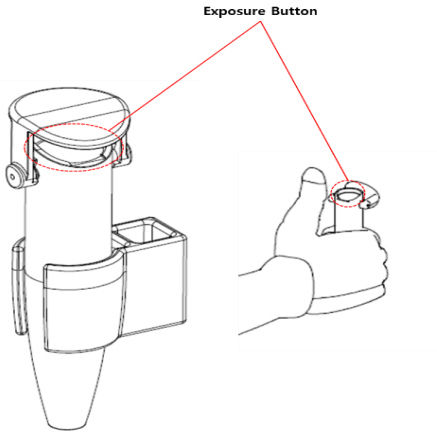
Turn on the equipment power when you want to operate the equipment again.

3.10 Laser Beam for Alignment of Patient



1. Mid-sagittal plane laser beam (front) : CT/PANO
2. CT horizontal laser beam (Lateral)
3. CT vertical laser beam (Lateral)
4. Canine laser beam (Lateral)

3.11 Exposure Switch



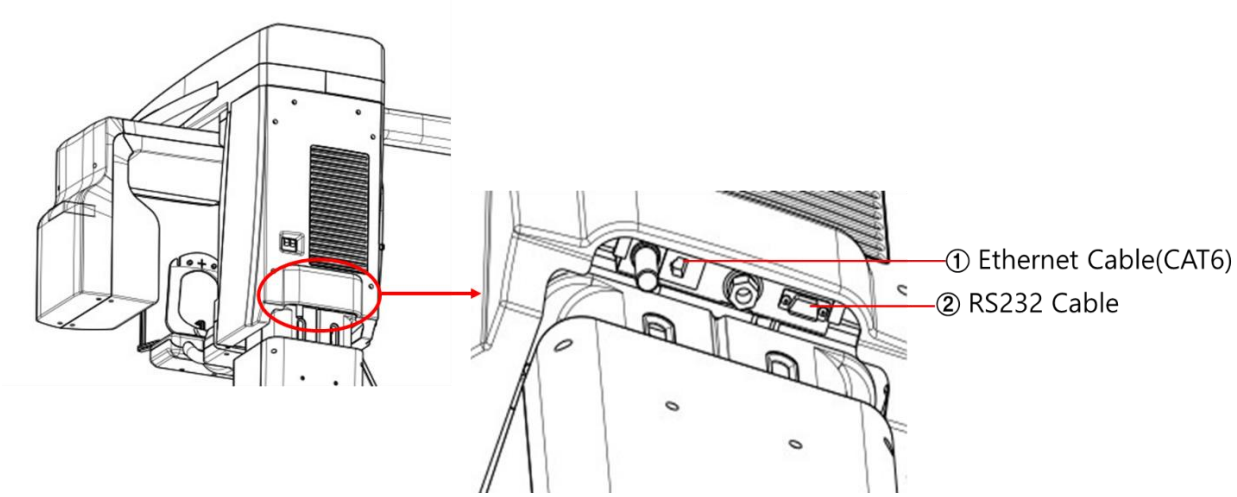
X-ray irradiates when pressing the X-ray exposure switch and the color of the lamp on the equipment changes its color from green to orange.

In order to acquire X-ray image, X-ray exposure switch must be pressed until the X-ray exposure completes. If you release the X-ray exposure switch, image acquisition and X-ray exposure will be stopped.

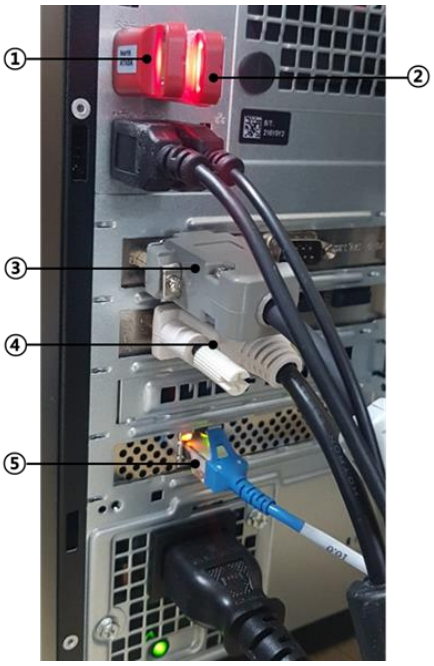
X-ray exposure switch can be mounted on the wall

3.12 Image Signal Input / Output

▪ Device part:



▪ PC part:



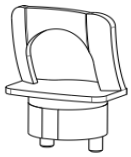
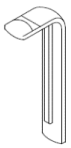
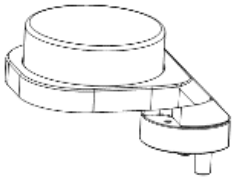
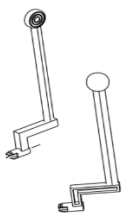
No.	Item
1	Eco-X Program License Key
2	3D Viewer License Key(option)
3	RS232 Cable
4	Monitor Output Cable
5	Ethernet Cable(CAT6)

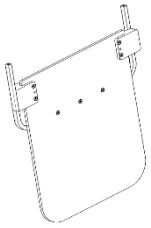
NOTE

Cable connecting part can alter depending on the PC.

3.13 Components of Positioning

The following components can alter depending on the option.
Chin rest shall be selected properly depending on the FOV and the patient's teeth condition, and shall be used after installing on the device. Bite block of Chin rest shall be used with hygiene cover, and must be replaced when capturing the new patient. Used hygiene cover must be disposed for the same patient also.

Name	Image	Note
CHIN REST_NORMAL PANORAMA		-
CHIN REST_TMJ_O		-
CHIN REST_ NONE		-
CHIN REST_ ENT		-
CHIN BITE		-
SCAN PLATFORM		OPTION
EAR ROAD		-

HEAD REST		-
CARPUS PLATE ASSAY		OPTION

NOTE

The component feature can be differ depending on the option choice.
Also, it is subject to change without notice in order to improve the product performance.

Chapter 4. Software Overview

4.1 PC system requirements

Operating system: more than 'Windows 7'
HDD: more than 500GB
RAM: more than 4GB
CPU: more than Intel Pentium G5400
Slots: PCIe X16 slot, more than 1EA
PCIe X1 slot, more than 1EA
Display: Min, resolution 1600*900
Network: speed more than 1.0gbps

IT- network connection

- Connecting this product to other equipment or programs not provided by the manufacturer may cause problems in the use of the device.

- Do not install and use a separate program on the PC system. This can bring a load on the network.

- When changing the network settings that were set when the equipment was first installed, new risks may arise. Therefore, when changing the network settings, check the network connection before using the equipment.

- Network settings may change after program reinstallation or device upgrade, so check the network connection before using the device.

- Network settings can only be changed by an authorized service technician.

We recommend that you use an antivirus program that can protect your network environment. This will help prevent problems such as data loss that may occur due to unintentional network connections.

4.2 Will-Master (Patient Image Management Program)

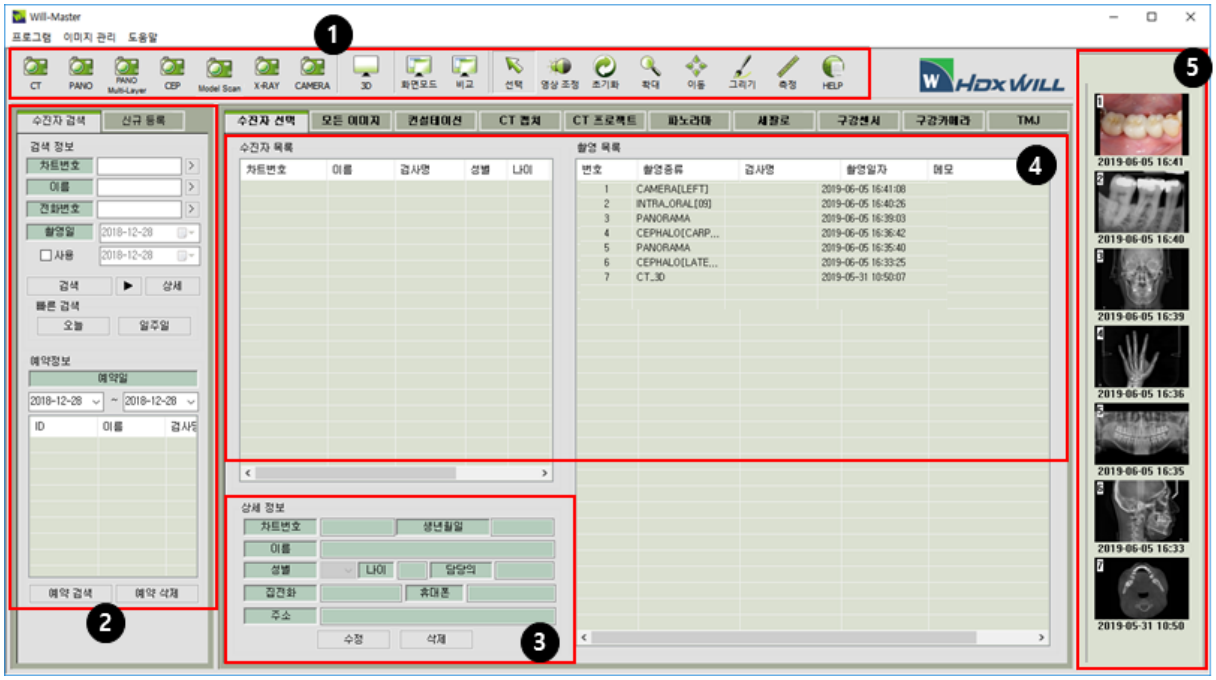
Will-Master is a patient management program used with the product of HDXWILL.
Users can acquire and manage the X-ray images by calling the capturing program, depending on the capture mode provided by the DENTRIα Series.

Will-Master has the following key features:

- 2D viewer, image analysis and patient information management
- 2D image management
- 3D image management
- DICOM 3.0 Format
- PACS interwork

4.2.1 Program Configuration

The above is Will-Master program window.



No.	Name	Function
1	Toolbar	Provide functions such as image capture mode, image adjustment, measurement, and drawing for the diagnosis
2	Search	Patient search for capture and verification
3	Patient's information	Shows the information of selected patient
4	Patient / Image List	Shows the registered patient and its image list

5	Thumbnail	Shows all the preview of selected patient

The content of this manual is subject to change without notice in order to improve the product performance.

4.2.2 Program Function

For specific program menu and function, please refer the section 'Will-Master USER Manual'.

4.3 EcoX-Capture

4.3.1 Capture Range and Position by Capture mode

1) CBCT mode

Capture mode for acquiring CT image.
Enable to select the preferable range of capture among below and acquire image.

① Dental Arch
② Nose
③ Ear
④ Free FOV (Option)

2) Panorama mode

Capture mode for acquiring Panoramic image.
Enable to select the preferable range of capture among below and acquire image.

① Teeth
② TMJ

3) Cephalo mode

Capture mode for acquiring Cephalometric image.
Enable to select the preferable range of capture among below and acquire image.

① LA
② Frontal(PA)
③ Carpus
④ Waters View
⑤ SMV

4) Model scan mode

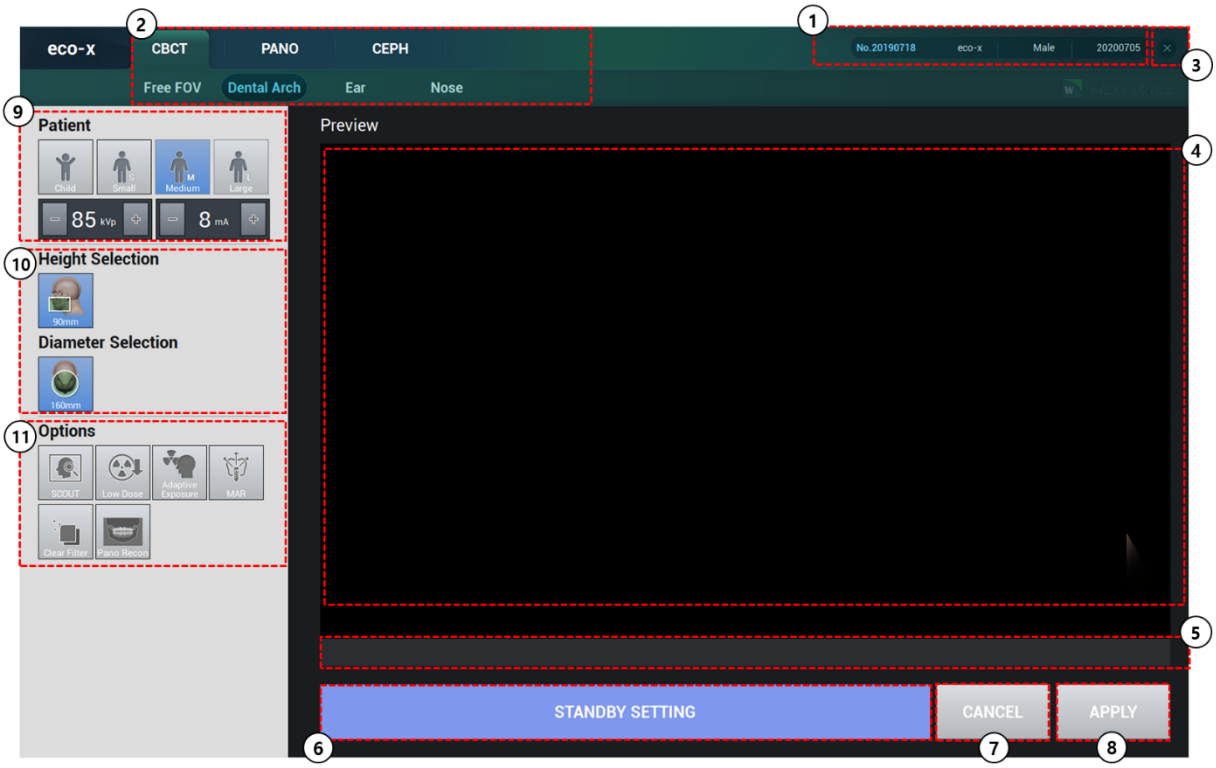
Capture mode for acquiring Cephalometric image.

Enable to select the applicable material of model among below and acquire image.

① Impression scan

② Stone model scan

4.3.2 Program feature



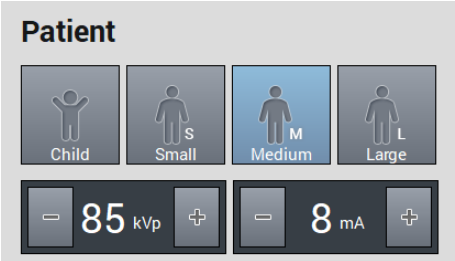
No.	Name	Functions
1	Patient's information	Provides the information of registered patient's for capture
2	Capture mode	Selecting tab for capture mode and position, and shows the status
3	Shut-down	Close the program
4	Preview	Provides the setting and position of selected image for preview
5	Guide Message Window	Provides the device motion or process
6	Process bar	Shows the capture or reconstruction process in bar
7	CANCEL	Cancels all setting mode
8	APPLY	Command the equipment to be ready depending on the value set.
9	Tube current / Tube voltage	Select the appropriate mode from 4 types (child, small, medium, large) to set the saved tube current / tube voltage. Select +, - button to set manually

10	Set the capture area	Select the detailed area by mode
11	Image option	Select option for capture

4.3.3 Select the Capture type

1) CBCT mode, Panorama mode, Cephalo mode

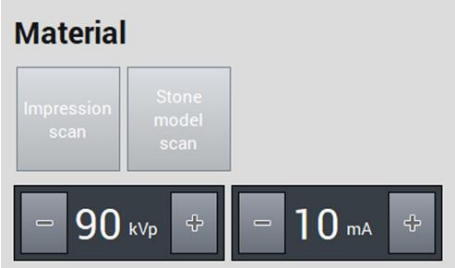
Patient and Body Type Selection



- Select child or adult by patient type
- Select from Small/Medium/Large by patient's body type
- Display the default value of tube current / tube voltage by the selection
- Enable to change the value of tube current / tube voltage by +/- button

2) Model scan mode

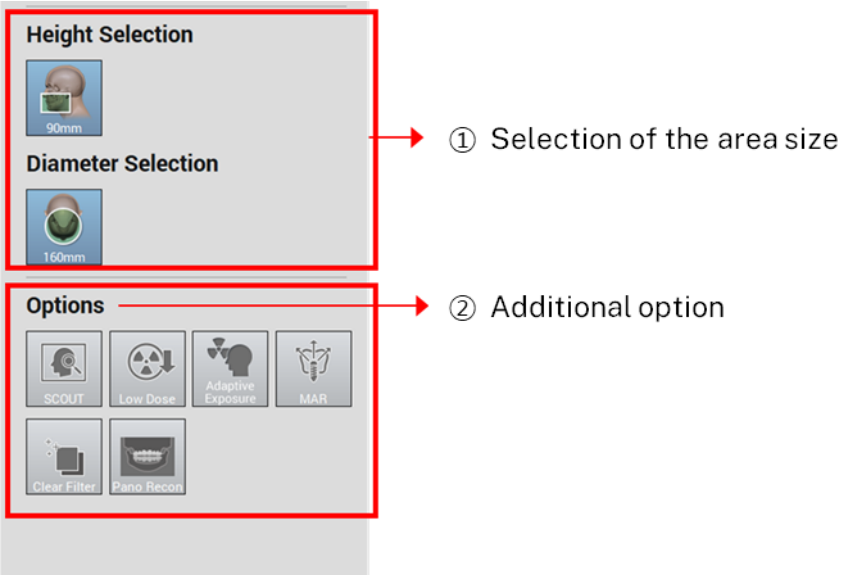
Select the type by material



- Select impression scan, Stone model scan
- Display the default value of tube current / tube voltage by the selection
- Enable to change the value of tube current / tube voltage by +/- button

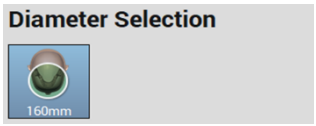
4.3.4 Options for each Capture mode

1) CBCT mode



① Select the area size

Display the capture height information



Display the diameter of FOV (X,Y)
(display the capture size according to the capture mode)

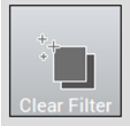
② Additional Option

SCOUT:
Check the alignment of patient before getting the X-ray image

Low Dose:
To minimize the radiation dose to the patient

Adaptive exposure control (AEC):
*Adjust the mA value to minimum dose depending on the head shape and the direction of capture

MAR (Metal Artifact Reduction):
Reduce metal artifacts during image reconstruction



Clear Filter:
Minimize image noise during image reconstruction

Pano Recon:
Reconstructed from CT capture image to panoramic image
(If present, you can choose Off, Single Layer, Multi Layer)

* Adaptive exposure control (AEC) function is equivalent to Automatic control system.

NOTE

Additional Option features may vary depending on the configuration selected by the user.

The configuration of this software is subject to change without notice to improve the performance of the product.

2) Panorama mode

① Selection of the area type

② Additional option

① Select the area type

Select the area from 'Teeth' to acquire the image

② Additional Option

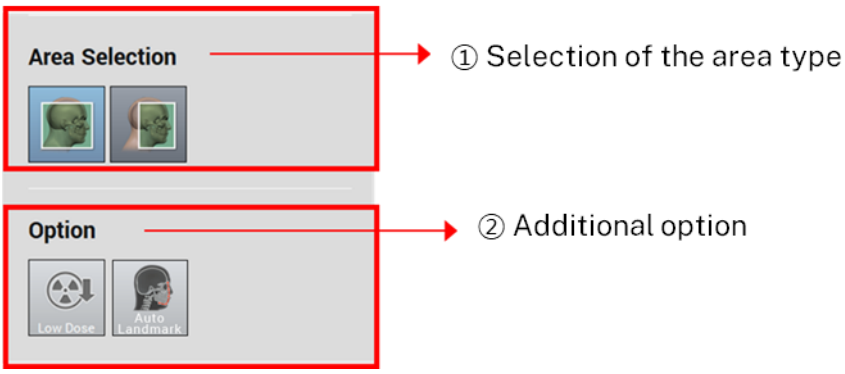
Auto Focus:
To get a clearer image

Low Dose:
To minimize the radiation dose to the patient

Multi-Layer:
Enable to get multiple images of the interest area with slightly different focus. You can select a sharper image.

NOTE	**Additional Option features may vary depending on the configuration selected by the user.** **The configuration of this software is subject to change without notice to improve the performance of the product.**

3) Cephalo mode



① Area Selection

On Lateral capture mode, select the area by Large area, Small area

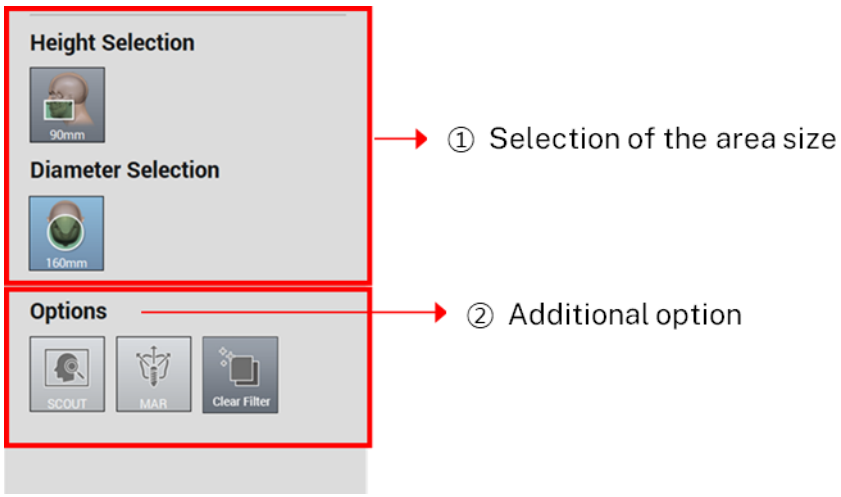
② Additional Option

Low Dose:
To minimize radiation dose to the patient

Auro Landmark:
After capturing image, automatically forms the landmark

NOTE	**Additional Option features may vary depending on the configuration selected by the user.** **The configuration of this software is subject to change without notice to improve the performance of the product.**

4) Model scan mode



① Select the area size

Display the capture height information

Display the diameter of FOV (X,Y)
(display the capture size according to the capture mode)

② Additional Option

SCOUT:
Check the alignment of patient before getting the X-ray image

MAR (Metal Artifact Reduction):
Reduce metal artifacts during image reconstruction

Clear Filter:
Minimize image noise during image reconstruction

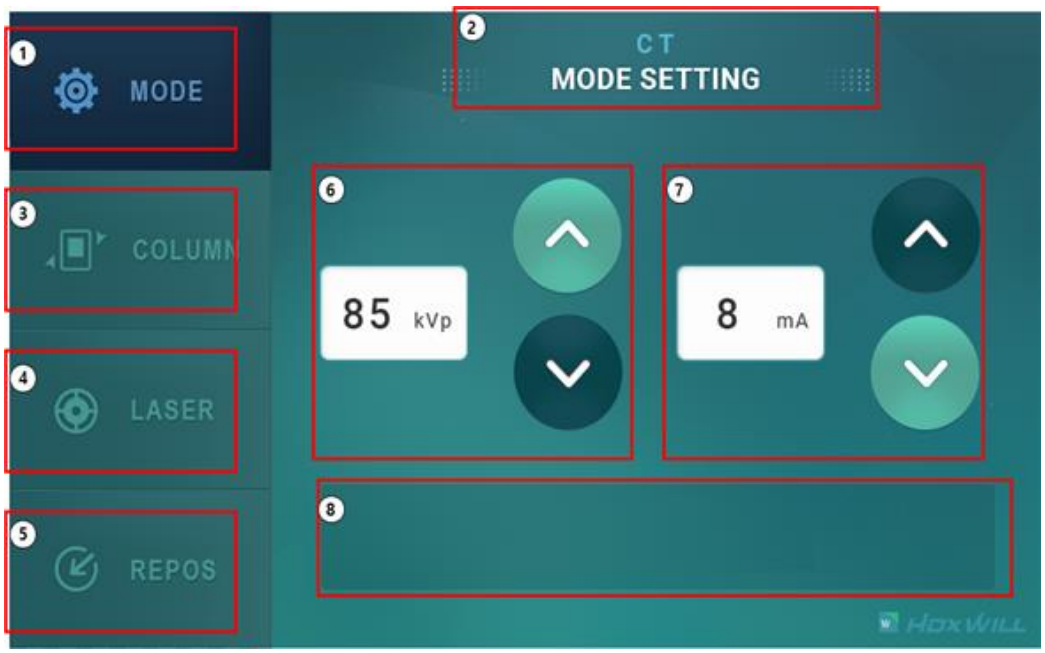
NOTE

Additional Option features may vary depending on the configuration selected by the user.

The configuration of this software is subject to change without notice to improve the performance of the product.

4.4 EcoX-Touch

4.4.1 Program Configuration

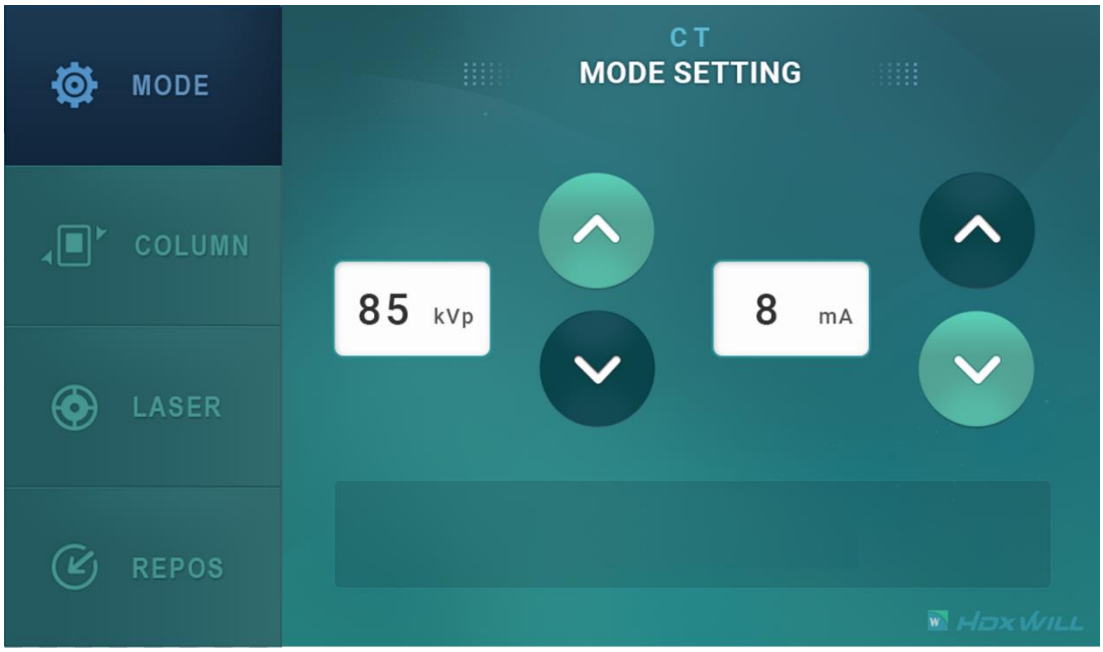


No.	Name	Function
1	Mode	Display the patient and device information
2	Mode condition	Display the selected mode (CT, Model Scan, PANORAMA, CEPHALO)
3	Column	Adjust the column Up / Down
4	Laser	Turn on the laser beam for Align the Patient Set Canine sensor On/Off
5	REPOS	Initialize the device position
6	Tube voltage	Display the tube voltage(kVp) info and enable to set the value with Up/Down button
7	Tube current	Display the tube current(mA) info and enable to set the value with Up/Down button
8	Information Window	Display the operation or capturing process

4.4.2 Program Function

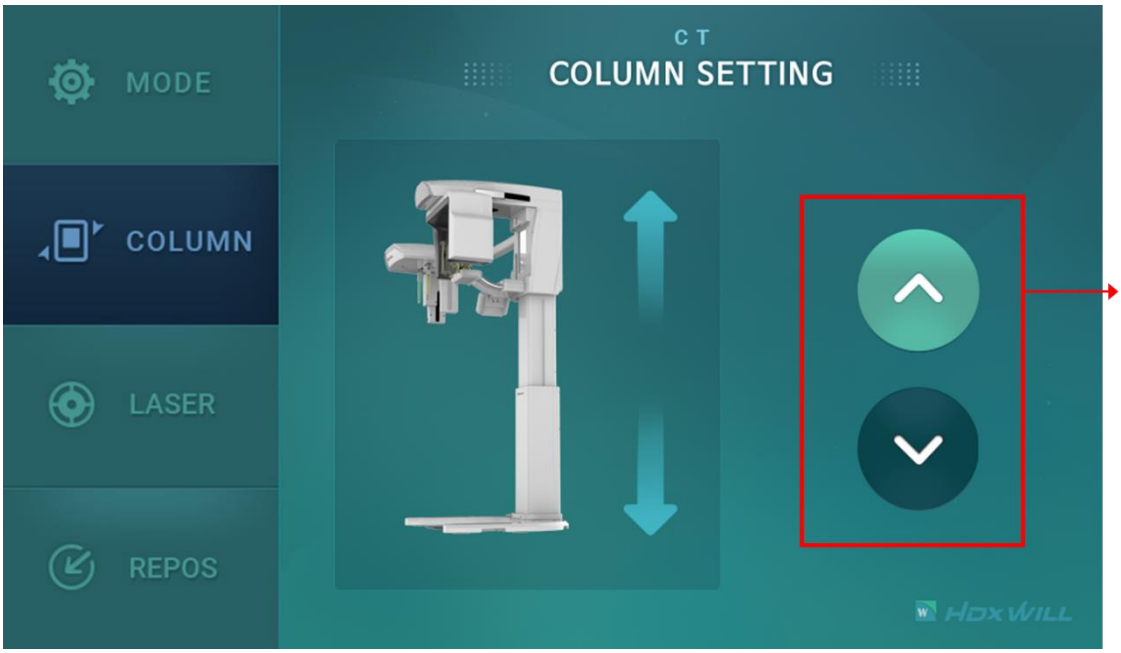
1) MODE

Display the information of patient and device



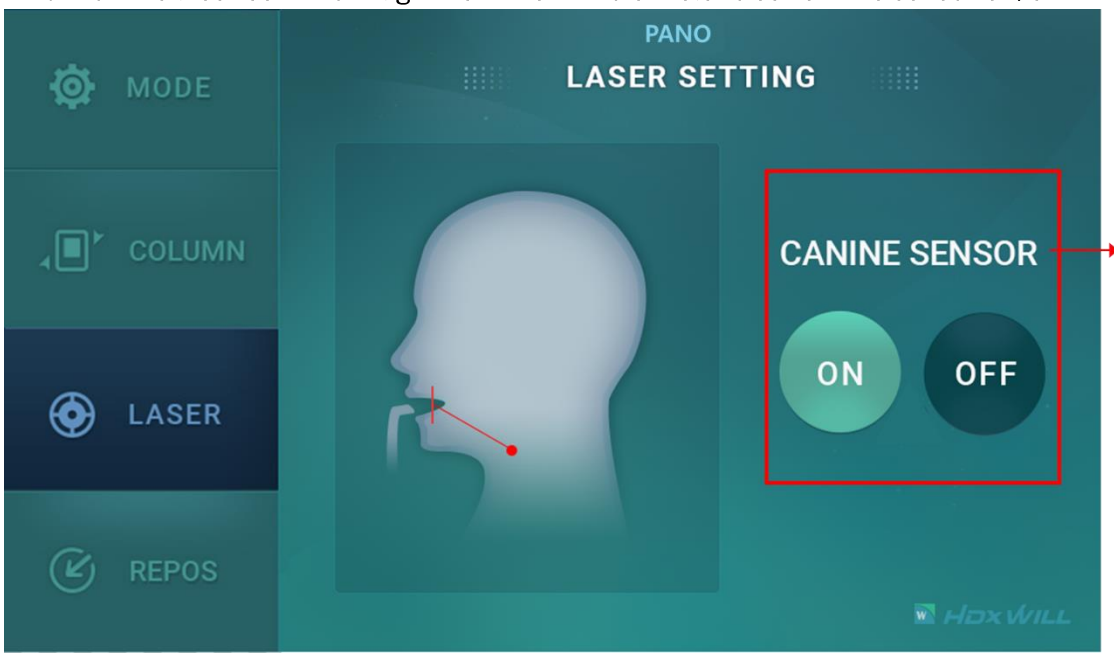
2) COLUMN

Depending on the patient's height, adjust the height of column Up/Down



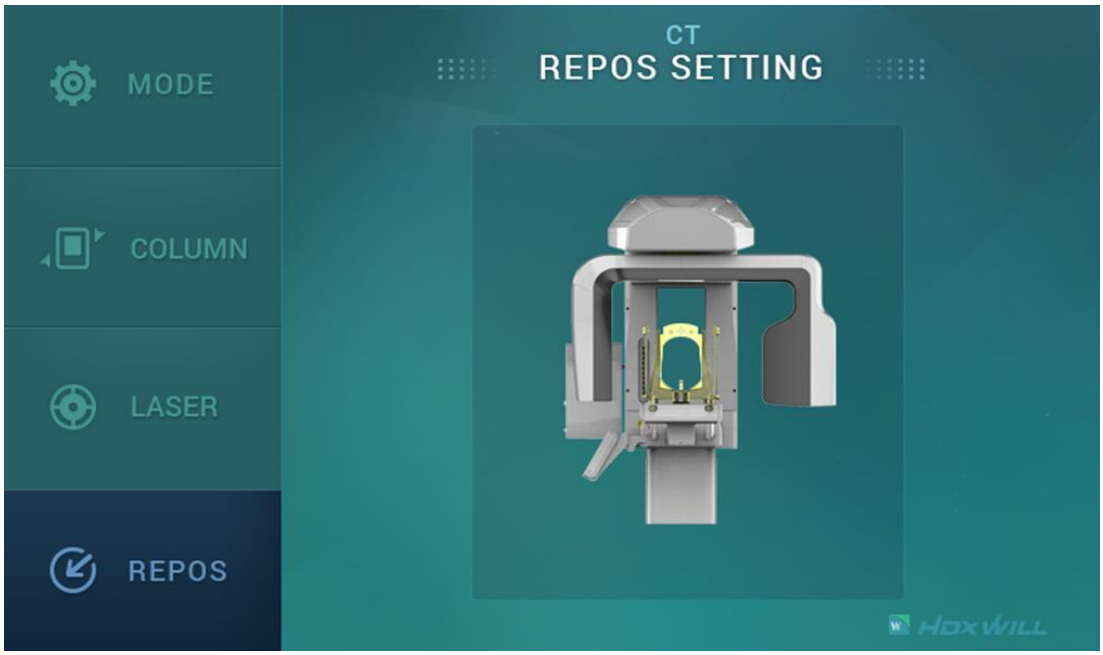
3) LASER

Turn on the laser beam for Align the Patient and enable to set Canine sensor On/Off



4) REPOS

Initialize the device position



4.5 Default Value by Modes (Tube Voltage, Tube Current)

* The exposure values will automatically change to correspond with the selected patient size and image resolution. The preset exposure values are average values and they are only meant to guide the user. If necessary, you can change the preset values.

Note. Always try to minimize the radiation dose for patient

Unit: Tube voltage/Tube current (kV/mA)

Patient Type		CT	Pano	Ceph
Child	Child	80kV / 7mA	85kV / 7mA	85kV / 7mA
Adult	Small	80kV / 8mA	85kV / 8mA	85kV / 8mA
	Medium	85kV / 8mA	85kV / 10mA	85kV / 10mA
	Large	85kV / 10mA	90kV / 10mA	90kV / 10mA

For age under 13 (≤ 13), Child will be automatically selected, and Medium will be selected for others.

You can manually adjust the tube current and tube voltage by selecting the + and- buttons.
Adjustment range of load conditions:

- **Tube voltage: ± 5 kVp**
- **Tube current: ± 1 mA**

Always try to minimize radiation dose to the patient.

4.6 Scan Time by Modes

4.6.1 Adult Patient (Small/ Medium/ Large)

<table>
<tr><th colspan="4">Mode</th><th>Normal</th><th>Low dose</th></tr>
<tr><td rowspan="3">CT</td><td colspan="3">Dental Arch</td><td rowspan="3">24 s</td><td rowspan="3">8 s or
12 s (Option)</td></tr>
<tr><td colspan="3">Nose</td></tr>
<tr><td colspan="3">Ear</td></tr>
<tr><td rowspan="5">PANO</td><td colspan="3">Full Arch</td><td>14 s</td><td>7 s</td></tr>
<tr><td colspan="3">Bitewing</td><td>8 s</td><td>6 s</td></tr>
<tr><td colspan="3">Bitewing Right (or Left)</td><td>4 s</td><td>3.2 s</td></tr>
<tr><td rowspan="2">TMJ</td><td colspan="2">With Open & Close</td><td>6 s</td><td>3.2 s</td></tr>
<tr><td colspan="2">With only one
of Open/ Close</td><td>3.2 s</td><td>1.7 s</td></tr>
<tr><td rowspan="3">CEPH*</td><td rowspan="2">LA</td><td colspan="2">large area</td><td>8 s</td><td>4s</td></tr>
<tr><td colspan="2">small area</td><td>6 s</td><td>3.2 s</td></tr>
<tr><td>Frontal(PA)/
Carpus/
Waters View/
SMV</td><td colspan="2">large area</td><td>8 s</td><td>4s</td></tr>
</table>

4.6.2 Child Patient

<table>
<tr><th colspan="4">Mode</th><th>Normal</th><th>Low dose</th></tr>
<tr><td rowspan="3">CT</td><td colspan="3">Dental Arch</td><td rowspan="3">24 s</td><td rowspan="3">8 s or
12 s (Option)</td></tr>
<tr><td colspan="3">Nose</td></tr>
<tr><td colspan="3">Ear</td></tr>
<tr><td rowspan="5">PANO</td><td colspan="3">Full Arch</td><td>12.7 s</td><td>6.5 s</td></tr>
<tr><td colspan="3">Bitewing</td><td>6 s</td><td>4 s</td></tr>
<tr><td colspan="3">Bitewing Right (or Left)</td><td>3.2 s</td><td>2.2 s</td></tr>
<tr><td rowspan="2">TMJ</td><td colspan="2">With Open & Close</td><td>4 s</td><td>2.2 s</td></tr>
<tr><td colspan="2">With only one
of Open/ Close</td><td>2.2 s</td><td>1.2 s</td></tr>
<tr><td rowspan="3">CEPH*</td><td rowspan="2">LA/</td><td colspan="2">large area</td><td>6 s</td><td>3.4 s</td></tr>
<tr><td colspan="2">small area</td><td>3.4 s</td><td>2.6 s</td></tr>
<tr><td>Frontal(PA)/
Carpus/
Waters View/
SMV</td><td colspan="2">large area</td><td>7 s</td><td>3.7 s</td></tr>
</table>

* Frontal (PA)/ Carpus/ Waters View/ SMV: Only large area is measured in this mode.

Chapter 5. How to Operate

This chapter describes procedures and features. In order to use the product more efficiently, please read this chapter carefully.

5.1 Preparing for Shooting

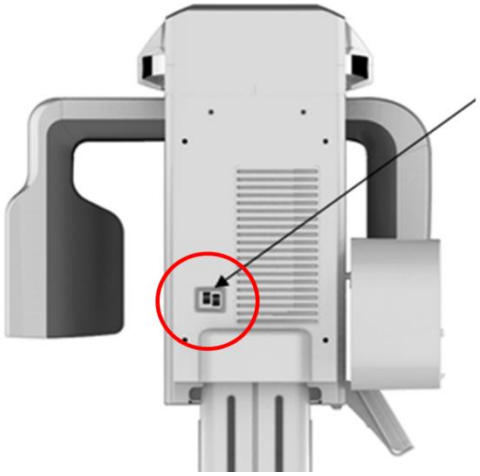
Before turn on the system, please proceed or check the below:

- Please run the connected PC after turning on the power.
  The device will automatically run the trial operation for each driving parts during initial start.
- While device is operating, please do not proceed any control through PC.
- Please check if there is no malfunction while the device is in preparing mode.
- Please check whether the connected PC boots and operates properly.
- Please check the connection of other irradiated switch and cables.

CAUTION	**To avoid the safety accident, please make sure to check if there is any water, drinks, debris, or cargo around the product before turning the power on.**

5.2 Switching on the Device

1) Before turning on the power, check whether the system is correctly connected and installed.
(Check the connection status between the equipment and the PC)

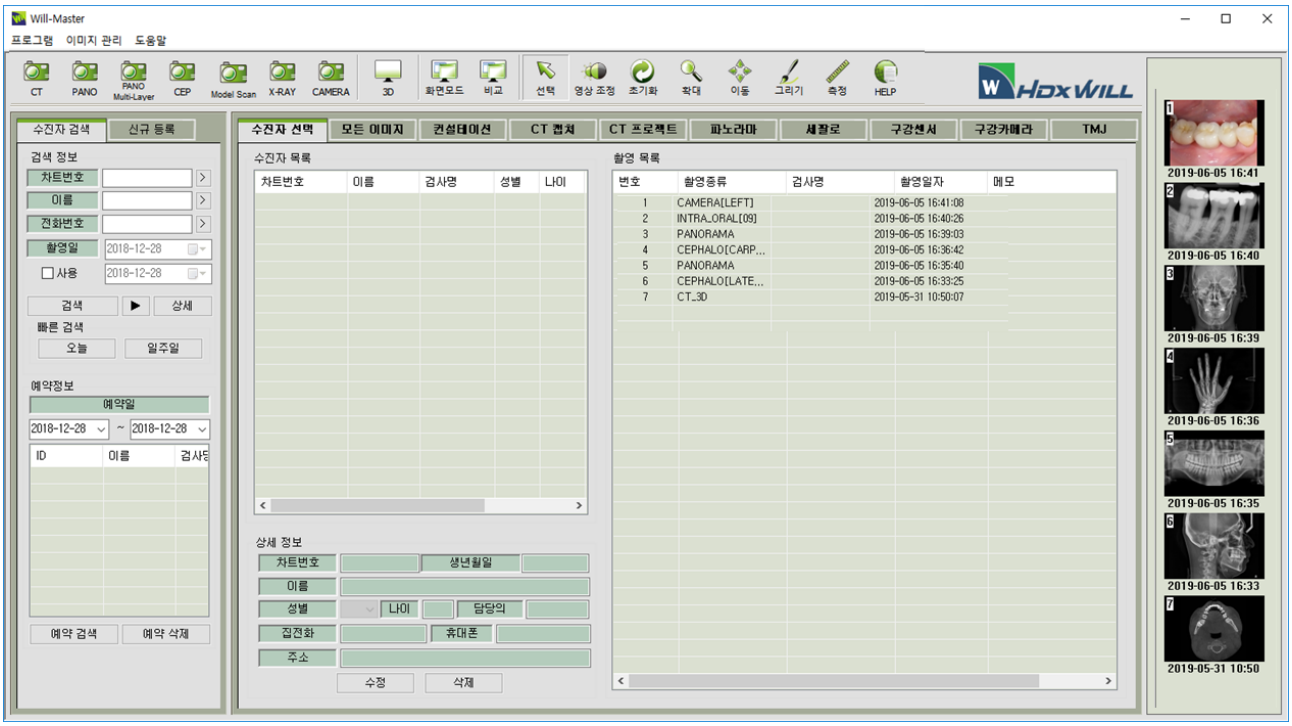


2) Press On switch on the behind of device to turn on the equipment.

CAUTION	Maintain the equipment temperature at a room temperature while using equipment. Do not Align the Patient near the equipment while the equipment is initializing.

5.3 Running the Will-Master Program

Double click Will-master icon on Desktop to operate Will-Master.
When the program operates properly, the following window will appear.



NOTE	For specific structure or function of program, please refer '4.1 Will-Master' or 'WILL-MASTER User Manual'.

NOTE	Depending on the model and option of 'eco-x series', each capturing mode can be different.

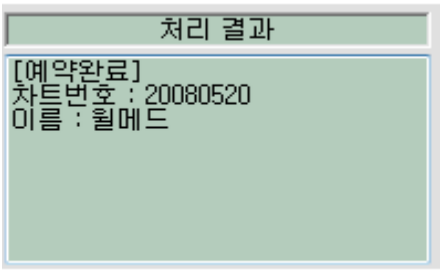
5.3.1 Patient Registration

To capture the new image or export the image for new patient, patient registration is necessary first.

1) When you click ① from the patient search window, patient's registration screen will be displayed.

2) On ② blank area, enter patient's information and click [Accept].
- Chart number and name (* parts) are required to fill out.
- Chart number is the unique number for patients which cannot be duplicated.
- Following characters cannot be used for the chart number.
  (\ / : * ? \" <> | space)

3) After registration, the result will be displayed on ③



NOTE	Please refer "5.3.2 Search Patients" if the patient has already been registered.

5.3.2 Search Patients

To capture or check the existing image, search and select the applicable patient.

1) On the left image, click ①, then search window will be displayed as left image.

2) On ② [Chart No.], click [>] button to display virtual keyboard for entering the chart number.

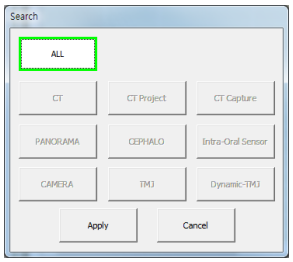
[Virtual Keyboard]

[Type 1]

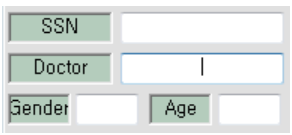
[Type 2]

3) To choose the examination date, check ③ and select possible date range.

4) Use ④ '▶' button to search by the specific captured image type.



5) Click button ⑤ to show detailed search function. (Toggle function).



6) Use the quick search button for a particular condition. It is very convenient search with the button click.

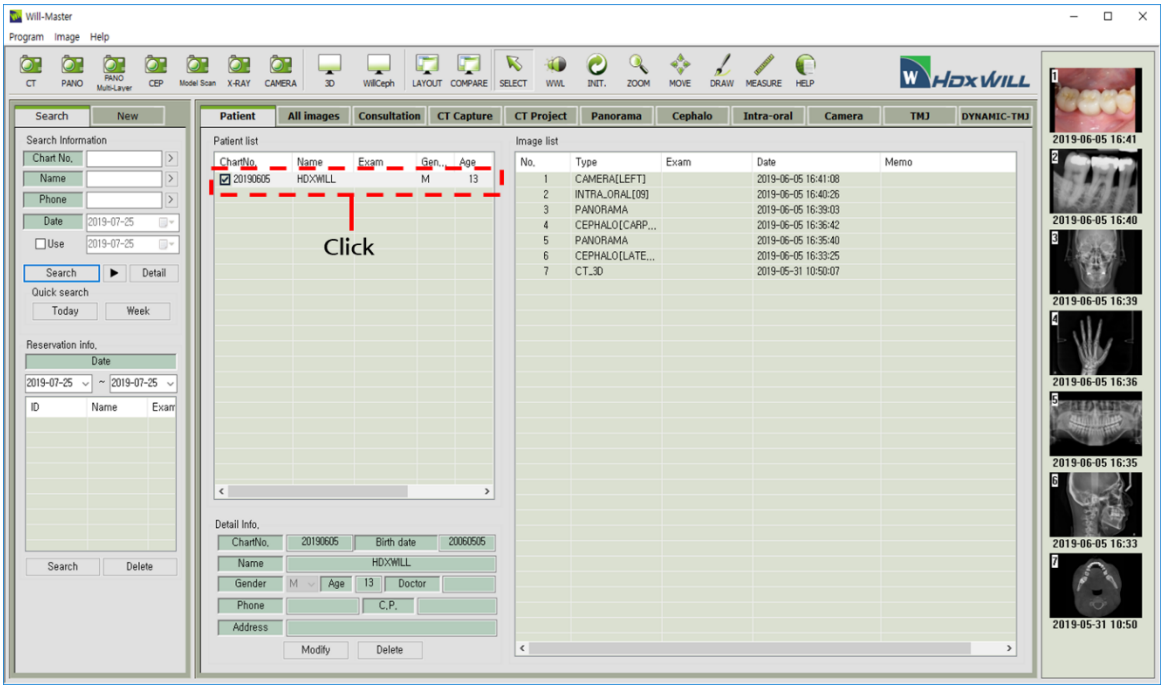
Today: Enter the new day, search for image taken patients
Week: Search for patients during the last week

NOTE

“*” typed in chart number and name means all letters.
For example, if “1*” is typed in "Chart No.", all result starting with "1” will be shown.
“*Doe” is typed in "Name", all result ending with "Doe” will be shown.

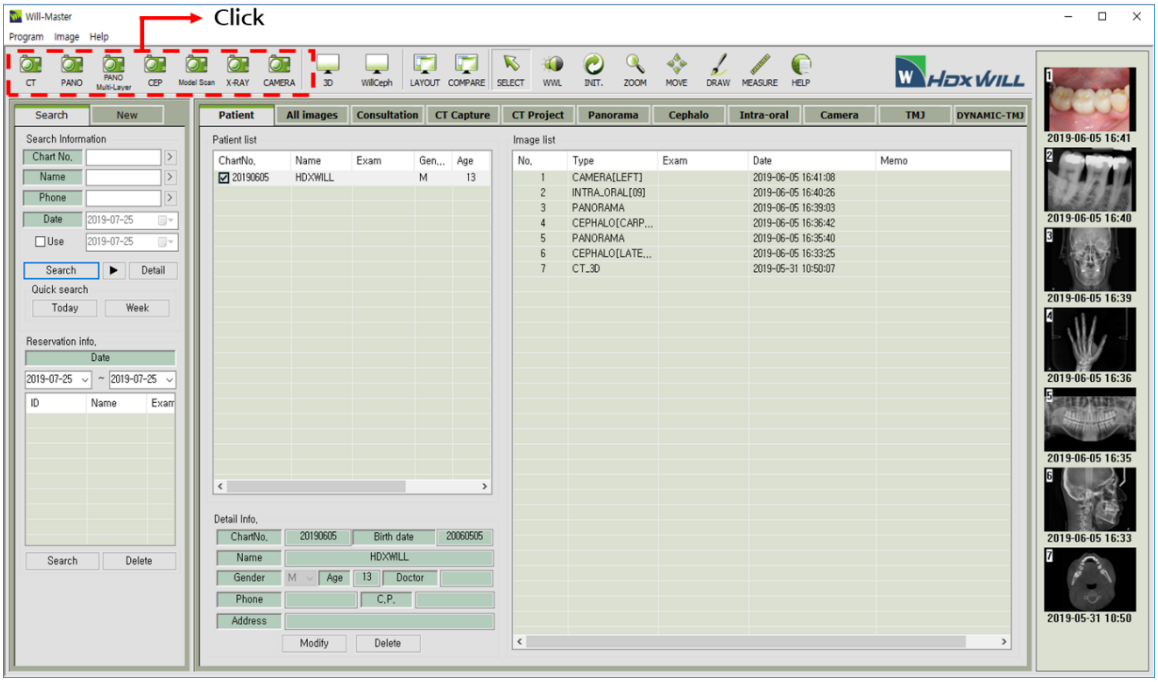
5.3.3 Select Patient

Once the patient registration and search is completed, select the patient on Will-Master program.

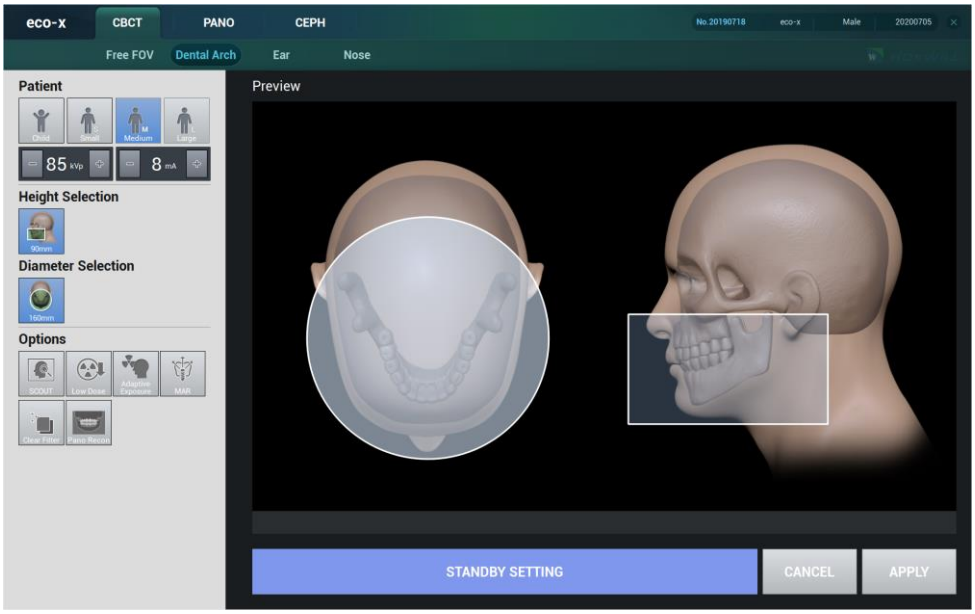


5.4 Open the Capture Program

1) On Will-Master, select the applicable capture mode(CT, PANO, CEPH).



2) Depending on the selected capture mode, EcoX-Capture interface will be run.
(The image below is the one that run when selecting CBCT)



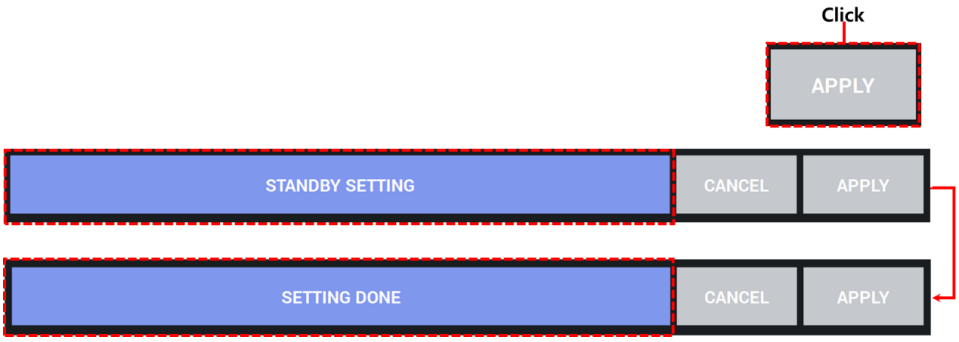
5.5 Select the Capture Mode

1) After selecting the capturing mode, select the specific applicable area to capture.

2) Select the patient type and body type.

3) After select the capturing area, click the selection by mode to finish capturing preparation.

4) After finishing all preparation for capturing, click ‘APPLY’.



5) When click APPLY, progress bar will change to 'STANDBY SETTING'.
When the setting is completed, progress bar will change to ‘SETTING DONE’.

6) After completing setting, align the patient.

NOTE	For the manual of each capture mode, refer ‘4.3 EcoX-Capture’ or Chapter 6 Select CBCT Mode, Chapter 7 Select Panorama Mode, Chapter 8 Select Cephalo Mode for each modes.

5.6 Align the Patient

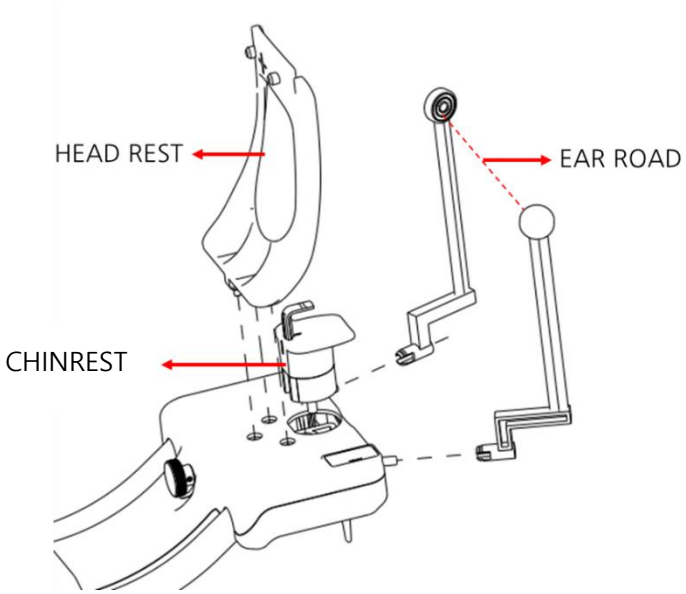
5.6.1 Checklist before Align Patient

1) Install the accessories

① To ensure the proper alignment of the patient, make sure that the accessories are installed as follows.

② Install the suitable FOV (optional) chinrest depending on the patient's dental condition.

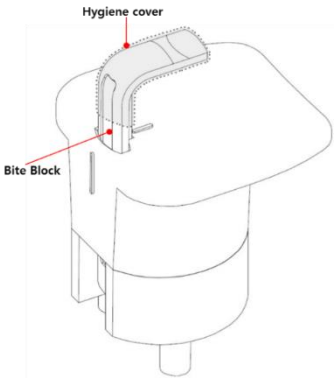
For edentulous patient, remove the bite.



NOTE	When the installation is not correct, it can cause the patient's movement and this can result the distortion in image.

2) Check the Bite block

When using the Bite Block on the CHINREST, please cover it with a Hygiene cover.
When capturing the new patient, exchange the Hygiene cover.



CAUTION	The hygiene cover for the bite block is intended for single use only. Always replace the hygiene cover for each patient. Do not re-use.

5.6.2 Align the Patient

1) If the patients are wearing glasses, earrings, hairpins, oral appliances, dentures (false teeth), or etc. must be removed.

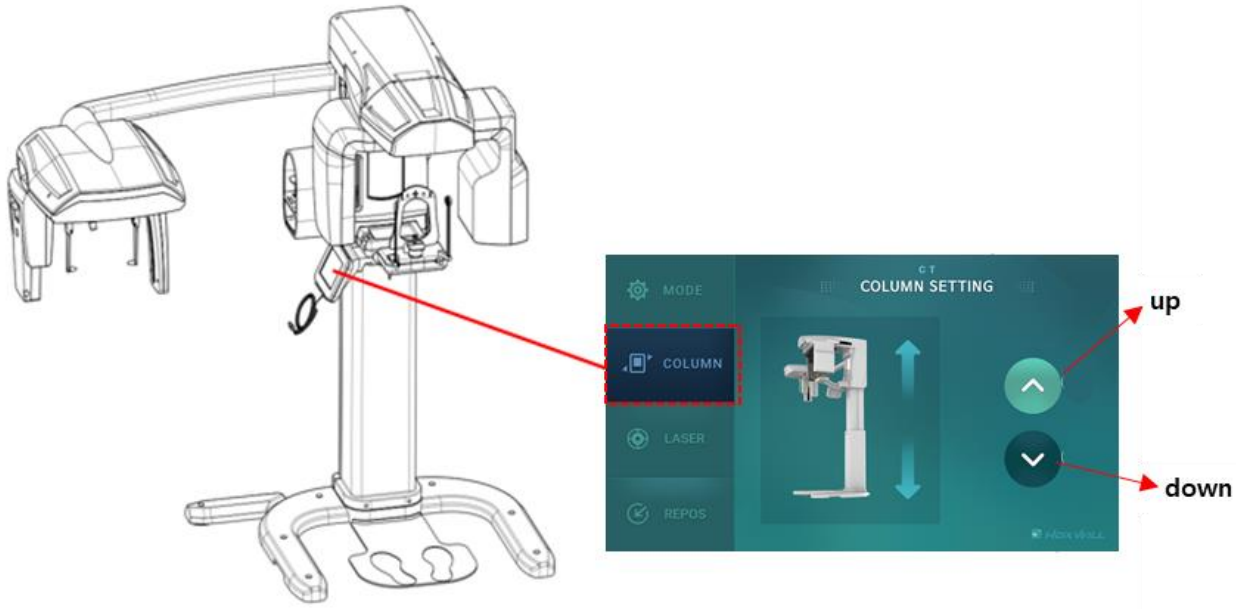
CAUTION	Metals give a significant impact on the images and it will cause the result of retake.

2) In order to prevent unnecessary radiation exposure to the patient, please let them wear protective clothing.

3) Install the suitable FOV (optional) chinrest depending on the patient's dental condition.

NOTE	For selecting each chinrest mode, please refer the contents of 'Align the Patient' from Chapter 6 to 8. For edentulous patient, Use the Chinrest instead of the bite block.

4) Align the patient in front of the equipment. Considering the patient's height, adjust the column height with touch panel or key pad (Up/Down) to allow patient to put the chin on the chin rest.



NOTE	If it is unable to adjust column height due to patient's condition, place the patient on the chair or wheel chair to adjust the height.

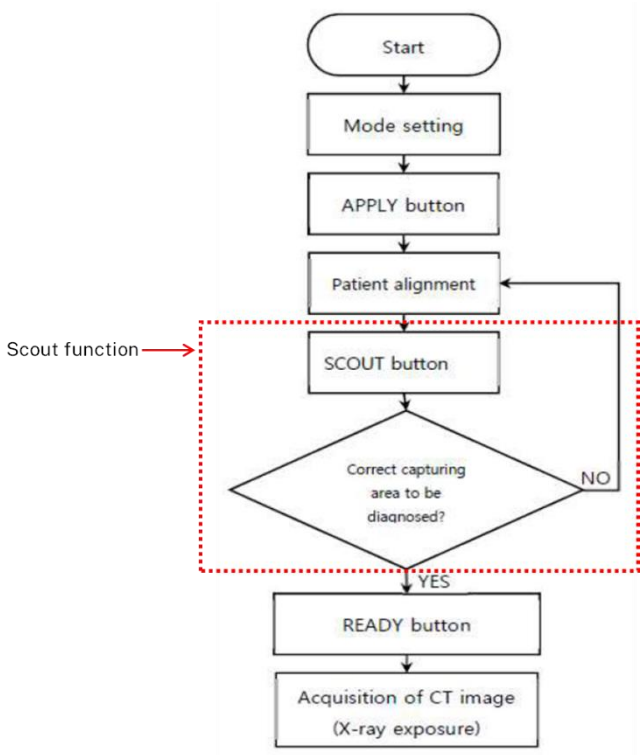
CAUTION	**Please be careful since a patient positioned in the unit may injure due to the moving parts.**

5) For each capturing mode, the way of aligning the patient is different. Please refer the contents of 'Align the Patient' from Chapter 6 to 8.

6) When finishing the alignment of patient on each capturing mode, press Ready button to prepare the capture.

5.6.3 Acquiring SCOUT Image (Option)

If you want to check the X-ray exposing area, use SCOUT function to check the image.
After checking the image, re-Align the Patient for the best location.

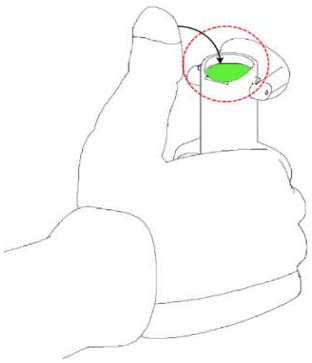


NOTE	While aligning the patient and operating the equipment, please pay attention to the patient's movement.

5.7 X-ray Exposure and Image Acquisition

1) When ready to capture, close the X-ray room door, and press READY button to move the equipment to the X-ray exposure standby status.

CAUTION	The operator should expose X-ray outside of the shield room. DO NOT operate the PC during exposure. Failure to comply this instruction may cause the malfunction.



2) Press the X-ray exposure switch to acquires the image.

CAUTION	Be sure to constantly monitor the patient and the equipment during capture. If any problem occurs, remove your hand from the X-ray exposure switch. To improve the image quality, please warn patient not to move unnecessarily.

3) While radiating X-ray, the image on the left will appear on the screen.

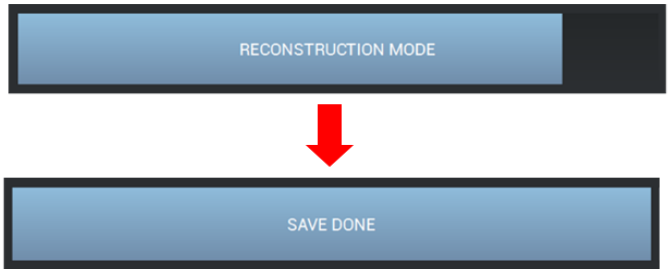
While X-ray is exposing, the progress bar and the LED on the equipment will change its color to orange.

4) The lamp on the equipment lights green during READY status, and it changes to orange when X-ray starts exposing.

5) When capturing is completed, the equipment will stop. Move the patient from the equipment after it completely stop.

CAUTION	If you move the patient before the equipment completely stops, it may cause a serious accident.

6) When the image reconstruction and save is completed, ‘SAVE DONE’ message will be appear on ‘EcoX-Capture’ program.



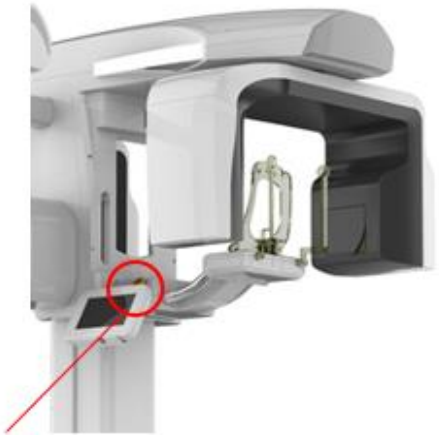
7) After closing ‘EcoX-Capture’ program, check the reconstructed image on Will-Master.

NOTE

If installation is not done properly, it can cause the image distortion due to the patient’s movement.

CAUTION

If any problem occurs, remove your hand from the X-ray exposure switch and press the emergency stop button to power off the equipment.

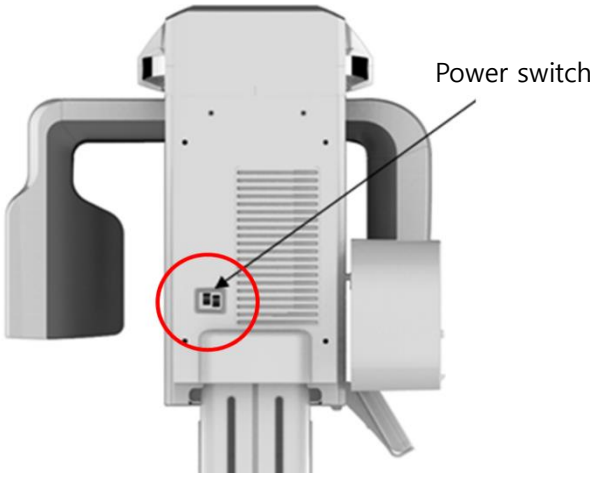


Emergency Stop button

After shutting down the equipment power, move the patient to the safe location. Turn the equipment power back on after fixing the problem.

5.8 Finish Capturing (End the System)

1) Press 'REPOS' button on the touch panel to initialize the device position.



2) Press the power switch on the behind of device to turn off the device.

3) Turn off all programs that are used on PC.

4) Shut down the workstation.

On Window Desktop, 'Start >Power> Shut Down> OK' to shut down the PC.

5) Check if the power of both device and PC workstation is off.

NOTE	When not using the device for a long time, please turn off the power of device to expand the span of eco-x series

Chapter 6. CBCT Mode

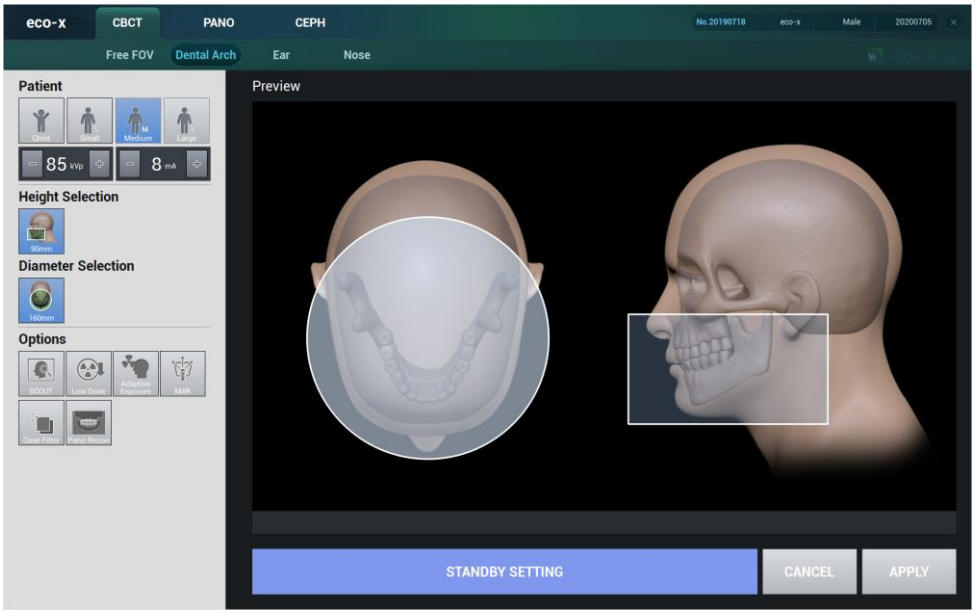
This chapter describes procedures how to capture the image with CT. In order to use the product more efficiently, please read this chapter carefully.

6.1 How to capture the image with CT

6.1.1 Setting detail the capture mode

1) Click the CBCT capturing program in the Will-Master program to activate the following screen.

2) Select the detailed area to be captured.

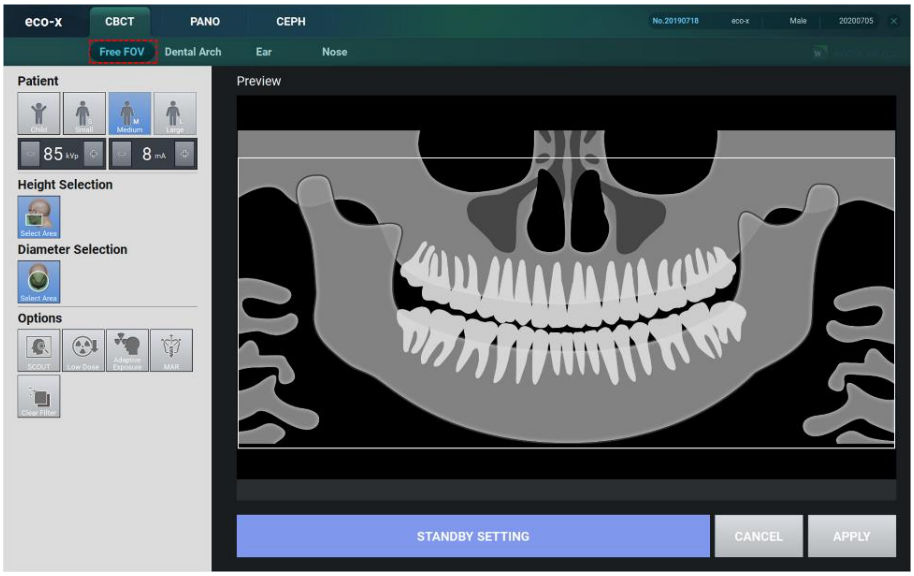


NO.	Capture part	Details
1	Free FOV (OPTION)	Select the FOV size manually
2	Dental Arch	Capture whole teeth arch
3	Ear	Capture the ear
4	Nose	Capture the nasal cavity

6.1.2 Setting detail the 'Free FOV'

1) Select 'Free FOV' mode on the CBCT mode.

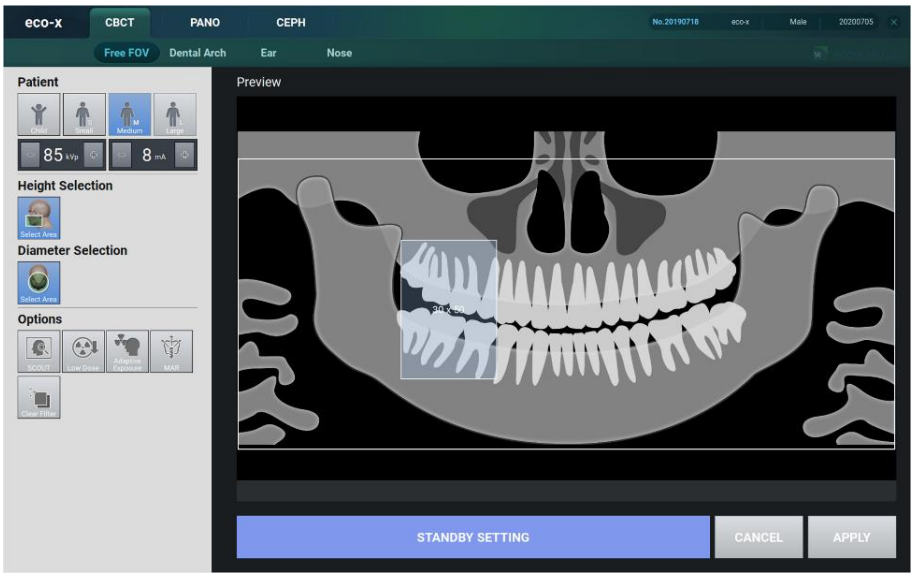
Then the preset image is displayed as shown below.



NOTE

In the case of a registered patient,
if there is a previously captured panoramic image, the panoramic image of the patient is displayed on the screen instead of the preset image.

2) Select the CT area you want to capture by dragging & dropping in the preset image. The selected CT area is the FOV size. (If you drag and drop, the selected area is displayed as a box of a different color, as shown below.)



NOTE

Minimum size of FOV (field of view) is 30 ㎜ x 30 ㎜.

3) After selecting the FOV area, click the 'APPLY' button to setting.

6.1.3 Select patient condition

1) Select from 4 types of buttons (Child, Small, Medium, Large) depending on the appropriate patient condition.

NOTE	**For age under 13 (≤ 13), Child will be automatically selected, and Medium will be selected for others.**

2) It is possible to select the suitable tube voltage / tube current value manually by selecting +, - button.

Adjustable resolution: - Tube voltage: ± 5 kVp
- Tube current: ± 1 mA

6.1.4 Setting Detailed Option

Please refer to **4.3 EcoX-Capture> 4.3.4 Options for each capture mode** for detailed option.

6.1.5 APPLY

- After setting, select APPLY button to move the device
- Click APPLY button for the setting value.

NOTE	**Stand away from the device as it rotates or moves while it is ready.**

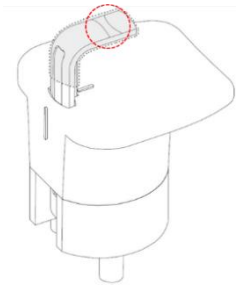
NOTE	**Click APPLY to convert the process bar to 'STANDBY SETTING'. When setup is complete, the progress bar changes to 'SETTING DONE'. Please arrange the patient after setting up.**

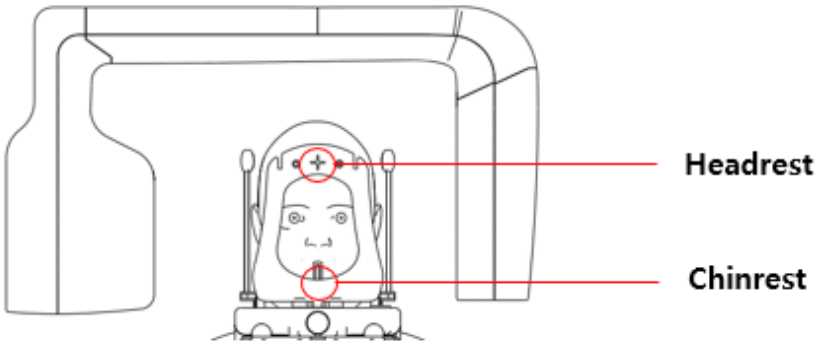
6.2 Align the Patient

1) Install an appropriate chinrest according to dental conditions and capturing area (options). Select OCCLUSAL or MANDIBLE depending on the capturing location.

NOTE	**In case of edentulous jaw patient, remove the bite block before using chin rest.**

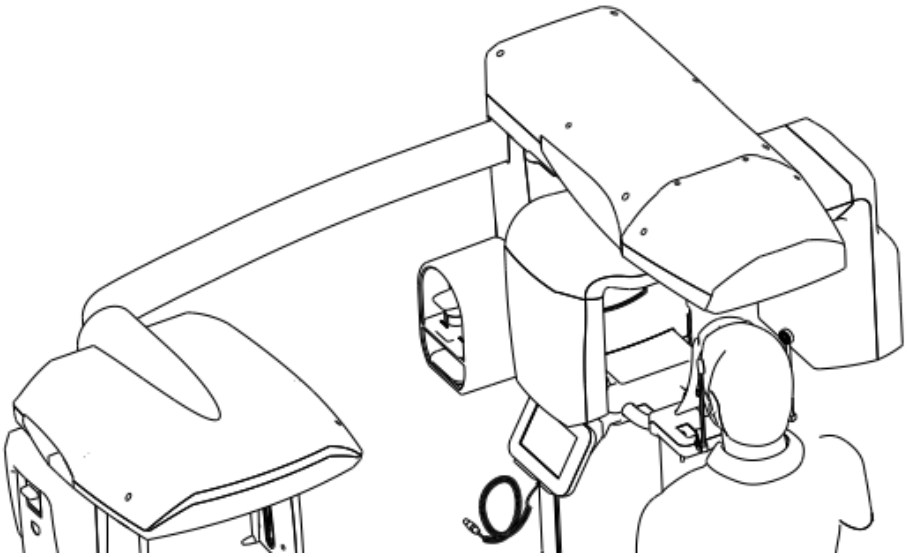
2) Lightly attach the forehead and chin to the headrest and Chinrest.



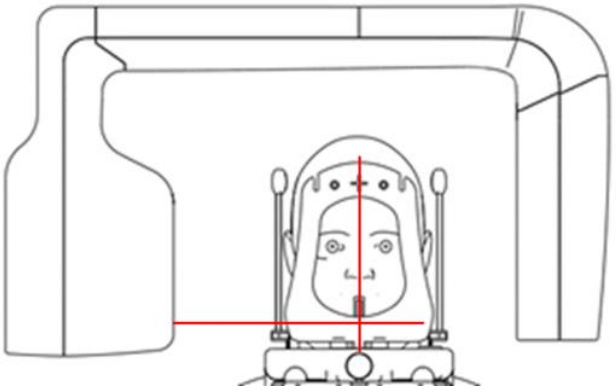


CAUTION	**Please guide the patient to close naturally to the chinrest, as he or she might get hurt if he or she sticks too tightly to the chinrest.** **Incorrect Align the Patient not only results in excessive X-ray exposure (the closer to the generator) but also in re-capturing.**

3) Make sure that the patient can hold the patient handle and position comfortably.

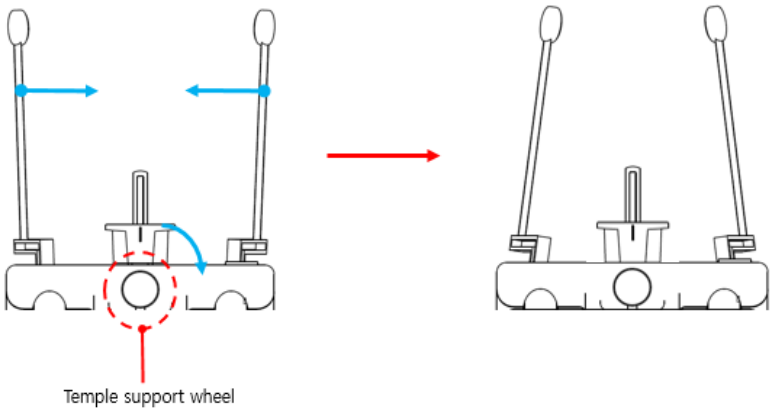


4) Using the touch LCD remote control panel or the LAMP button in the capturing program, turn on the laser beam for the Align the Patient.



5) Straight the patient's head as the front vertical beam locates the center of the face.

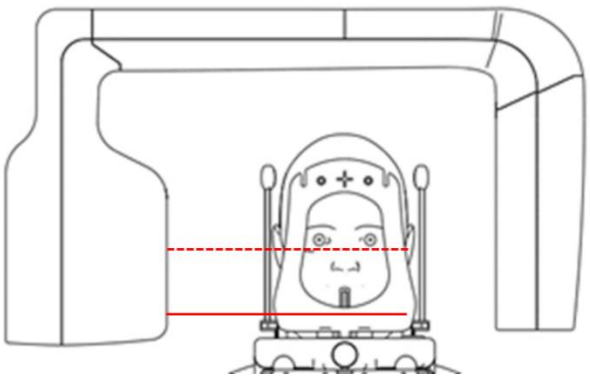
When the Align the Patient is completed, turn the Temple support wheel to fix the patient's head.



NOTE	If the laser beam is switched off before the Align the Patient is completed, the laser beam can be switched on by pressing the 'laser' button on the touch panel. For more information, see '4.3 EcoX-Touch > 4.3.2 Program Functions'.

CAUTION	Be careful not to allow laser beams to be irradiated to the patient's eyes. It may damage the vision of the patient.

6) Using the beam (top, bottom) to verify the lateral horizontal irradiation and vertical laser beam, verify that the patient's capturing area is within the range that you actually want to take.



NOTE	You can see the area by moving Lateral Horizontal irradiation beam 9cm for adult and 8cm for pediatric from the bottom.

7) How to change capturing area
- If the capturing location is not correct, replace the chinrest to change the patient's capturing area.

8) When Align the Patient is complete, press the Ready button to allow the equipment to prepare for capturing.
Use the SCOUT function if you want to check the area before X-ray capturing.

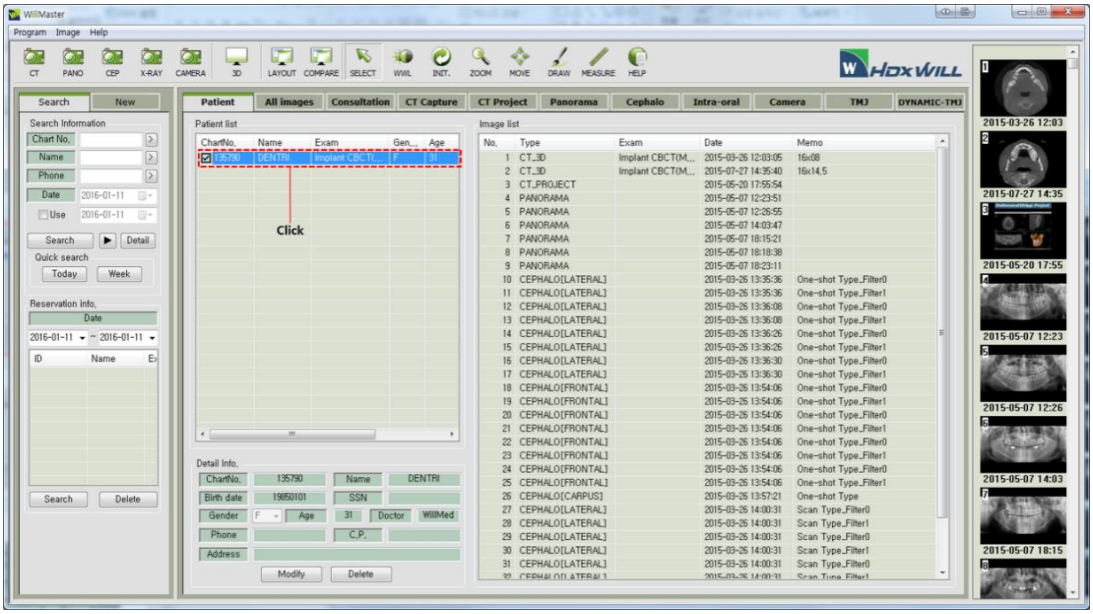
NOTE	See 5.8.3 Acquiring a SCOUT Image for detailed usage of the SCOUT function.
CAUTION	Be careful not to move the patient to improve image quality.

6.3 X-ray Exposure and Image Acquisition

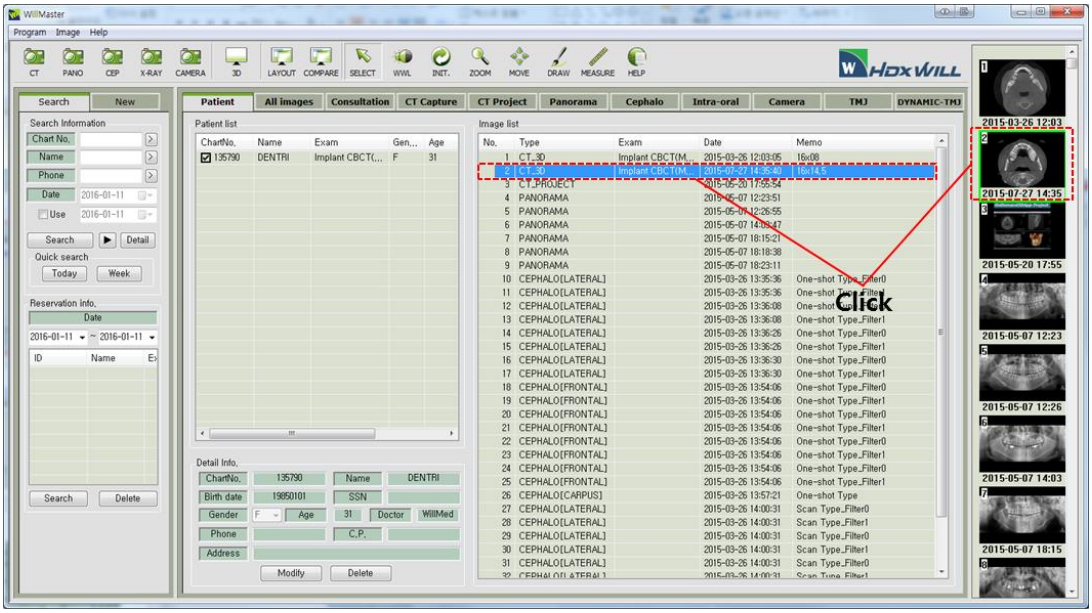
For more information, see 5.9 X-ray Exposure and Image Acquisition in the previous chapter.

6.4 CT Image Check

1) Click the list in the patient list of Will-Master to update the image list.



2) Double-click the image you want to see from the image list, or double-click an image in the thumbnail list.



NOTE

If you activate Single Layer or Multi-Layer in the option, panorama images created in CT images are stored together.

3) When the image loading is completed, it is possible to check 3D capture image.

- 3D capture image program (option)

① Will3D

② OnDemand3D

③ InVivoDental

NOTE

The options available to customers may vary depending on the country-specific sales rights.

Chapter 7. Panorama Mode

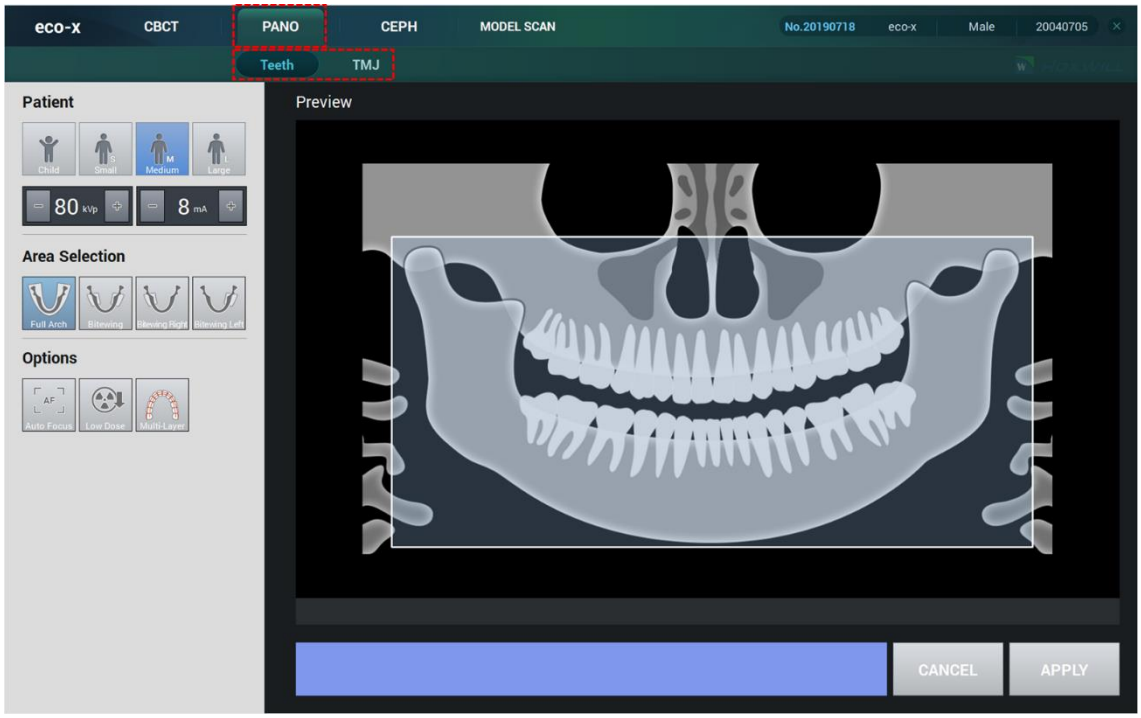
This chapter describes procedure of PANORAMA capture and functions. In order to use the product more efficiently, please read this chapter carefully.

7.1 Setting Capture Mode

7.1.1 Setting detail mode

1) Click the Panorama capturing program in the Will-Master program to activate the following screen.

2) Select the detailed area to be captured.



NO.	Capture part	Function
1	Teeth	Teeth capture mode
2	TMJ	TMJ capture mode

7.1.2 Selecting patient mode

1) Select the appropriate button for patients depending on the body type and age: Child, Small, Medium, Large.

NOTE	**When entering patient information in the Will-Master program, patients in age of 13 or less (≤ 13) will be automatically selected as Child, and the rest will be selected as Medium.**

2) Set the Tube voltage/ Tube current, depending on the patient type. You can manually select the suitable Tube Voltage/Tube Current using +, - buttons.

Adjustable resolution:
- Tube voltage: ± 5 kVp
- Tube current: ± 1 mA

7.1.3 Setting Detailed Option

Please refer to **4.3 EcoX-Capture> 4.3.4 Options for each capture mode** for detailed option.

7.1.4 APPLY

- Click the 'APPLY' button in the capture program when is ready.

- Click the APPLY button to prepare the equipment with the value set.

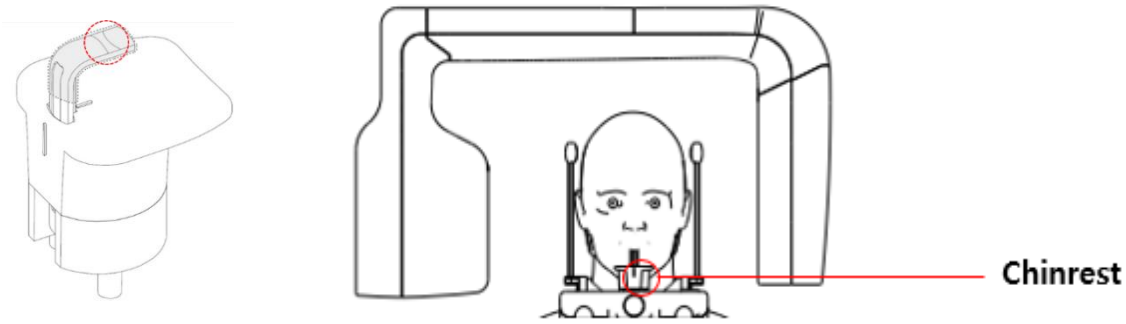
NOTE	**Do not stand close to the equipment as it can be rotated or moved while it is being prepared.**

NOTE	**Click ‘APPLY’ to convert the process bar to 'STANDBY SETTING'. When setup is complete, the progress bar changes to 'SETTING DONE'. Please arrange the patients after setting up.**

7.2 Align the Patient

7.2.1 Align the Patient on panorama mode

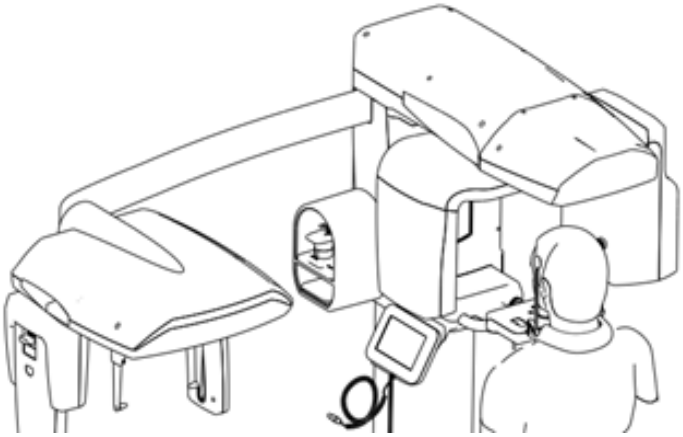
1) With the headrest removed as shown, lightly attach the forehead and chin to the chin rest.



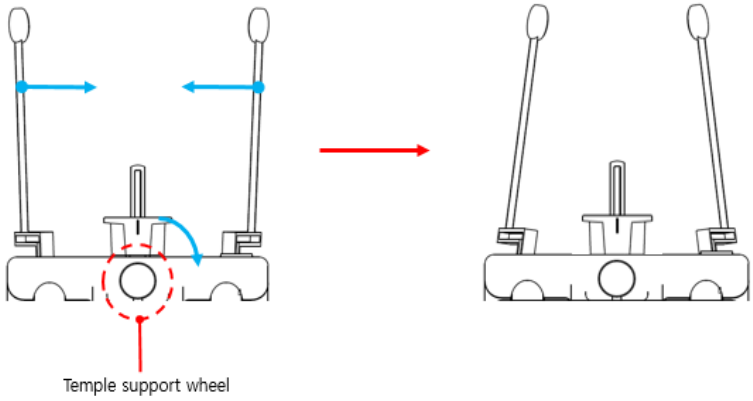
NOTE	For edentulous patient, remove the bite block and use the chinrest.

CAUTION	Please guide the patient to close naturally to the chinrest, as he or she might get hurt if he or she sticks too tightly to the chinrest. Incorrect Align the Patient not only results in excessive X-ray exposure (the closer to the generator) but also in re-capturing.

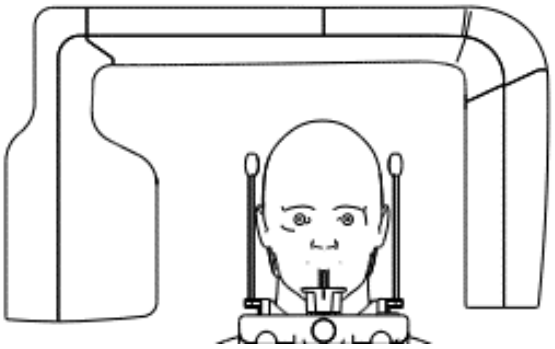
2) Make sure that the patient can hold the patient handle and position comfortably.



3) When the Align the Patient is complete, rotate the Temple support wheel so that the head of the patient can be fixed.



4) Using the touch LCD remote control panel or the LAMP button in the capture program, turn on the laser beam for the Align the Patient.

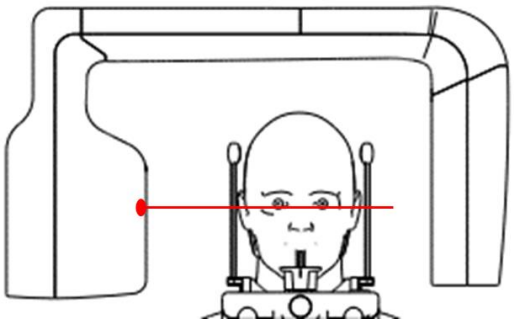


5) Straighten the head of the patient so that the front vertical beam is centered on the face of the patient, and turn the temple support lever to hold the patient's head.

NOTE	If the laser beam is switched off before the Align the Patient is complete, the laser beam can be switched on by pressing the 'laser' button on the touch panel. For more information, see 4.4 EcoX-Touch > 4.4.2 Program feature

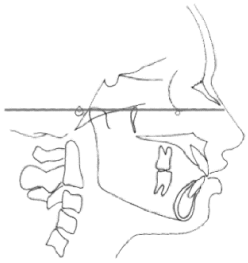
CAUTION	Be careful not to allow laser beam to be irradiated by the patient's eyes. It may damage the vision of the patient.

6) Align the patient so that Frankfurt plane light beam is located on the head of the patient as shown.



NOTE

• The operator checks the Frankfurt plane light beam and adjusts the position of the head of the patient to be correctly located.

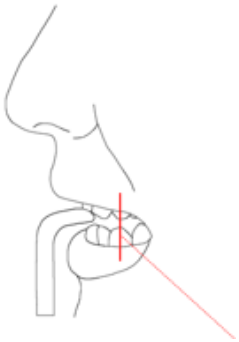


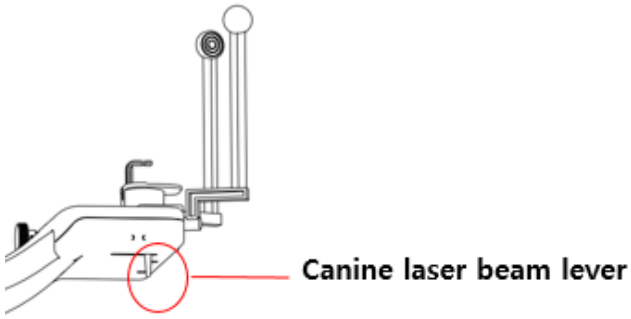
• The Frankfurt plane is the plane that connects the lowest point of the eye and the top of the entrance of the external auditory meatus.

NOTE

• It is adjustable for Frankfurt plane beam.

7) When using a canine laser beam (dogtooth beam), adjust the canine laser beam lever so that I can be aligned in the canine position of the patient.





NOTE

• It is adjustable for Canine laser beam.

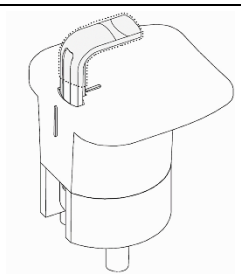
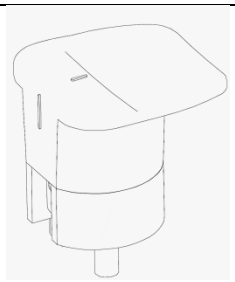
NOTE

You can ON/OFF the canine laser beam on the touch panel.
(The initial setting of canine sensor is OFF, and it can be altered by operator.)

For more information, see 4.4 EcoX-Touch > 4.4.2 Program Functions.

CAUTION

Set the canine sensor according to the type of chinrest below.
If it is not set up, the exact image cannot be acquired.

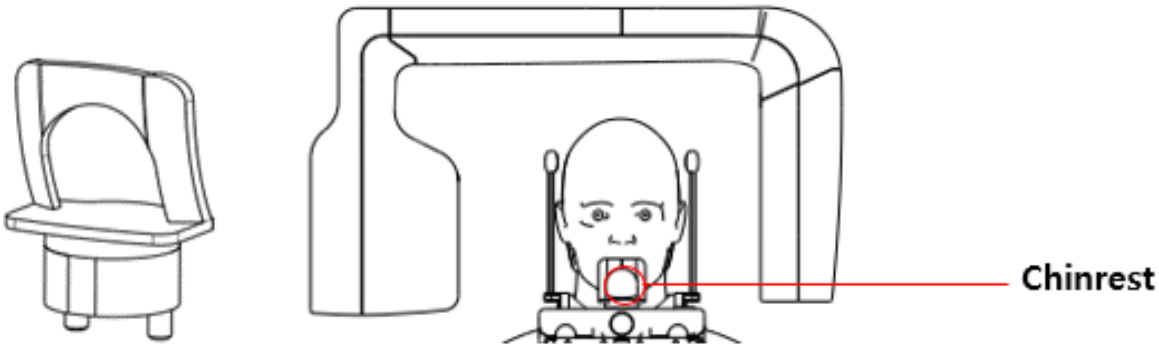
CHIN REST			
Canine Sensor Mode	**ON / OFF**	**ON**	**ON**

8) Instruct the patient to touch his/her tongue to the roof of the mouth.

7.2.2 TMJ Mode Align the Patient

TMJ capture mode has an Open/Close mode depending on the mouth shape of the patient.
Close capture mode must be taken first before Open capture mode.

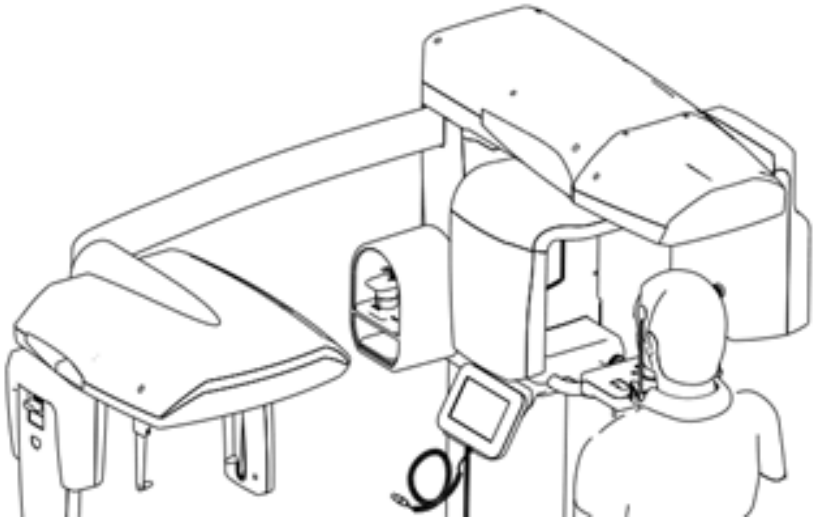
1) Lightly attach the patient's philtrum to TMJ chinrest as shown.



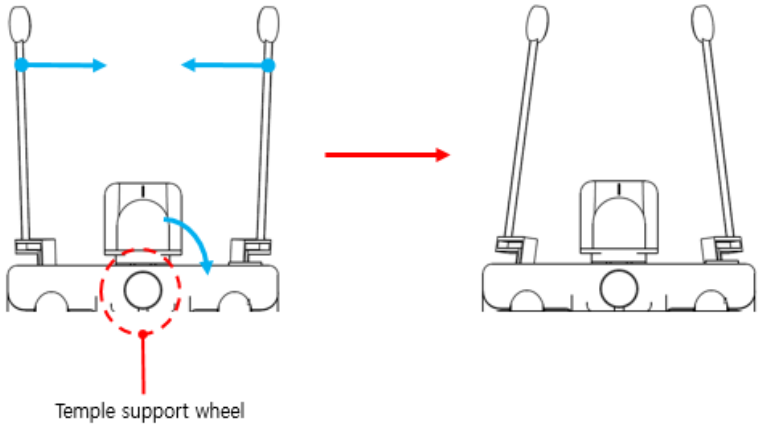
CAUTION

Always use a dry cloth to remove foreign substances from the chinrest before using it on the patient.

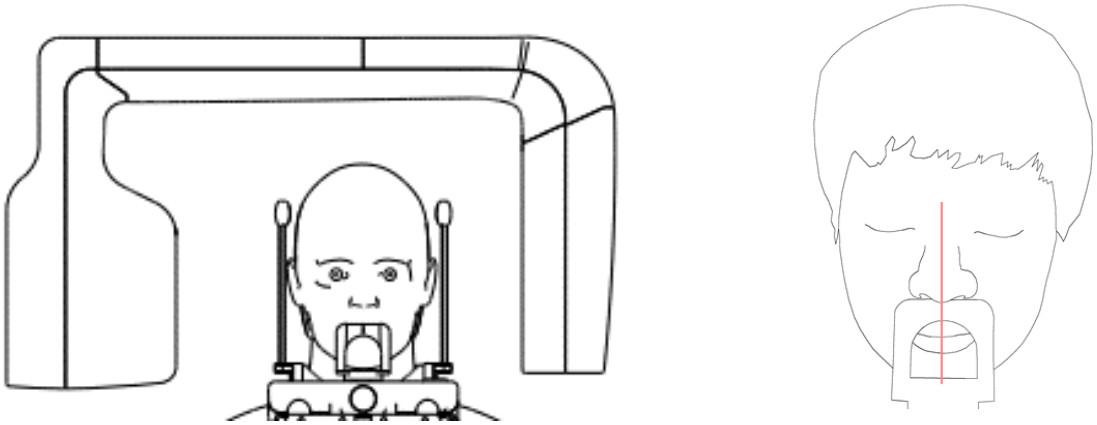
2) Make sure that the patient can hold the patient handle and position comfortably.



3) When Align the Patient is completed, make the patient's head to be fixed by turning the Temple support wheel.



4) Turn on the Align the Patient laser beam by using Touch LCD remote control panel.



5) Make the laser beam be located on the center of patient's face, and fix the head by using temple support lever.

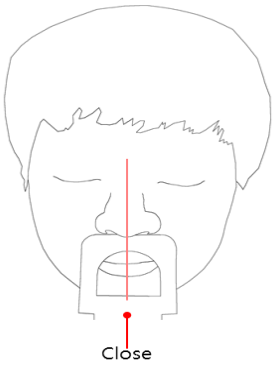
- If the Laser beam is not located in the center of patient's face, asymmetrical images can be captured.

NOTE	If the laser beam is switched off before the Align the Patient is complete, the laser beam can be switched on by pressing the 'laser' button on the touch panel. For more information, see 4.3 EcoX-Touch > 4.3.2 Program Functions.

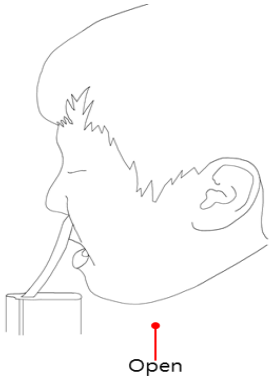
CAUTION	Be careful not to allow laser beam to be irradiated to the patient's eyes. It may damage the vision of the patient.

6) Align the patient so that the head can be located in TMJ capture mode as shown. (Proceeded in Close - Open order.)

Close:
1st capture mode of TMJ. Make the patient close his/her mouth and place the philtrum onto the TMJ Chinrest.



Open:
2nd capture mode of TMJ. Make the patient open his/her mouth and place the philtrum onto the TMJ Chinrest.



NOTE	**When capturing the TMJ images with only one of the Close or Open mode, align the patient according to the desired mode.**

7.3 X-ray Exposure and Image Acquisition

7.3.1 PANORAMA

For more information, see 5.7 X-ray Exposure and Image Acquisition.

7.3.2 TMJ

1) For more information, see 5.7 X-ray Exposure and Image Acquisition.
2) When the first capture is complete, the equipment stops and the images taken are seen.

Then you will be asked if you want to proceed with the second capture.

NOTE	After the first capture, click the 'SAVE' button to save the image if you do not want to take the second capture.

3) If the second capture is carried out, direct the patient to open his/her mouth and re-align the patient (see 7.2.2 TMJ mode Align the Patient).

4) Click the 'READY' button when the Align the Patient is complete.

5) Press the exposure switch to perform the second capture.

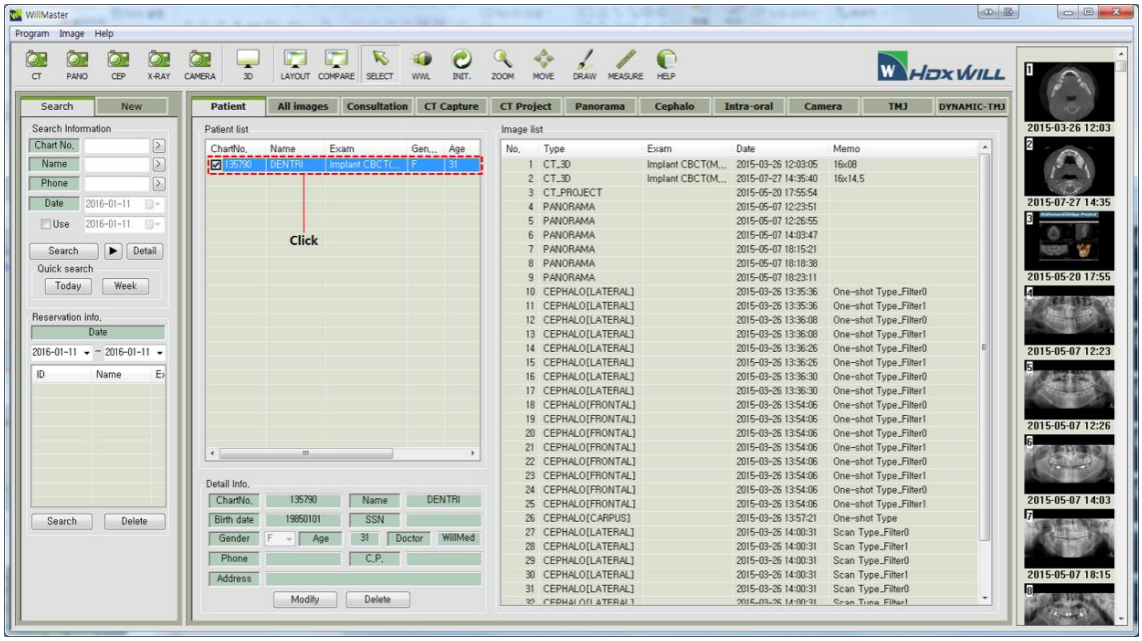
6) Once the second capture is complete, the equipment stops. Move the patient after the equipment has stopped completely.

CAUTION	If the patient moves before the equipment completely stops, it can cause serious accidents.

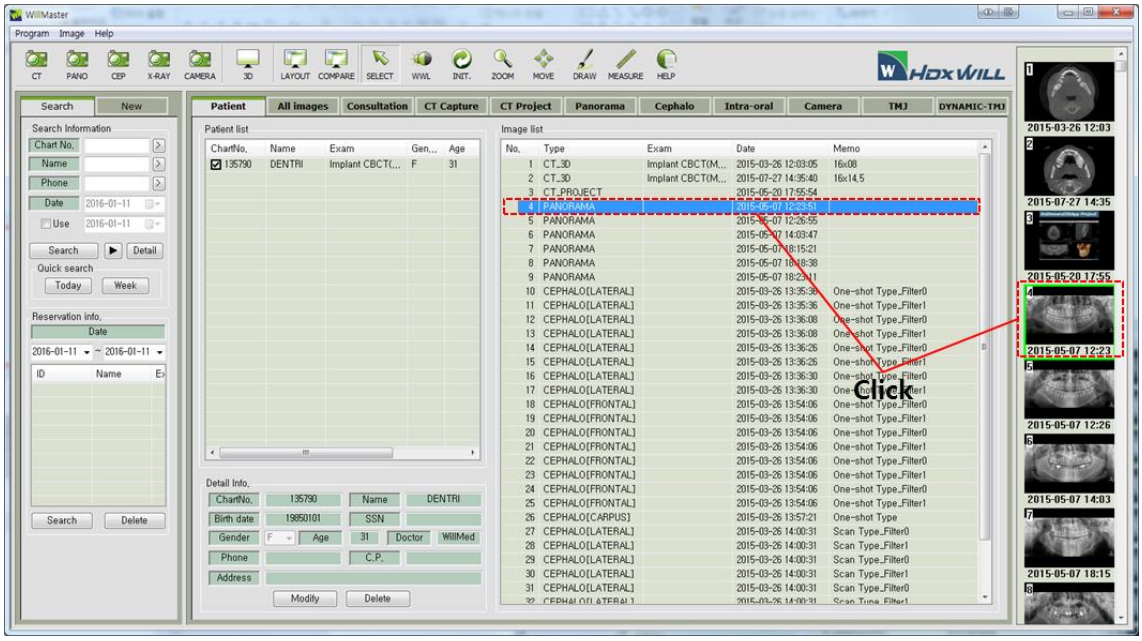
7) When the image reconstruction is complete, select the image with the arrow below, and click the ‘SAVE’ button to save the captured image..

7.4 Panorama Image Check

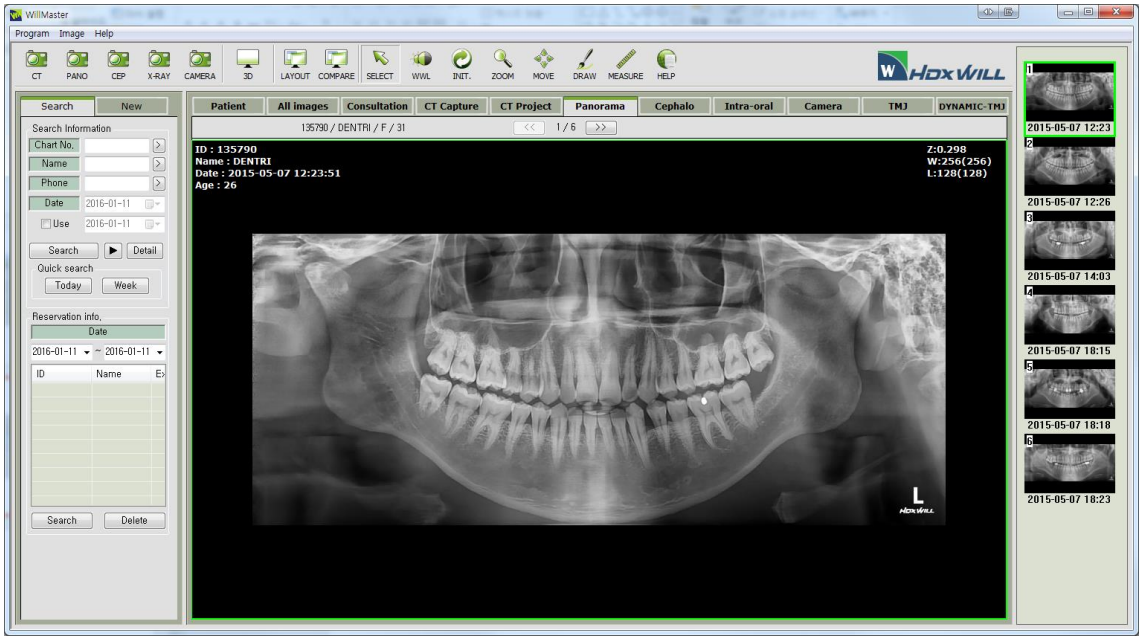
1) Click the patient on the patient list of Will-Master program in order to update the image list.



2) Double-click the image you want to see from the image list, or double-click an image in the Thumbnail list.



3) The selected image is shown as below.



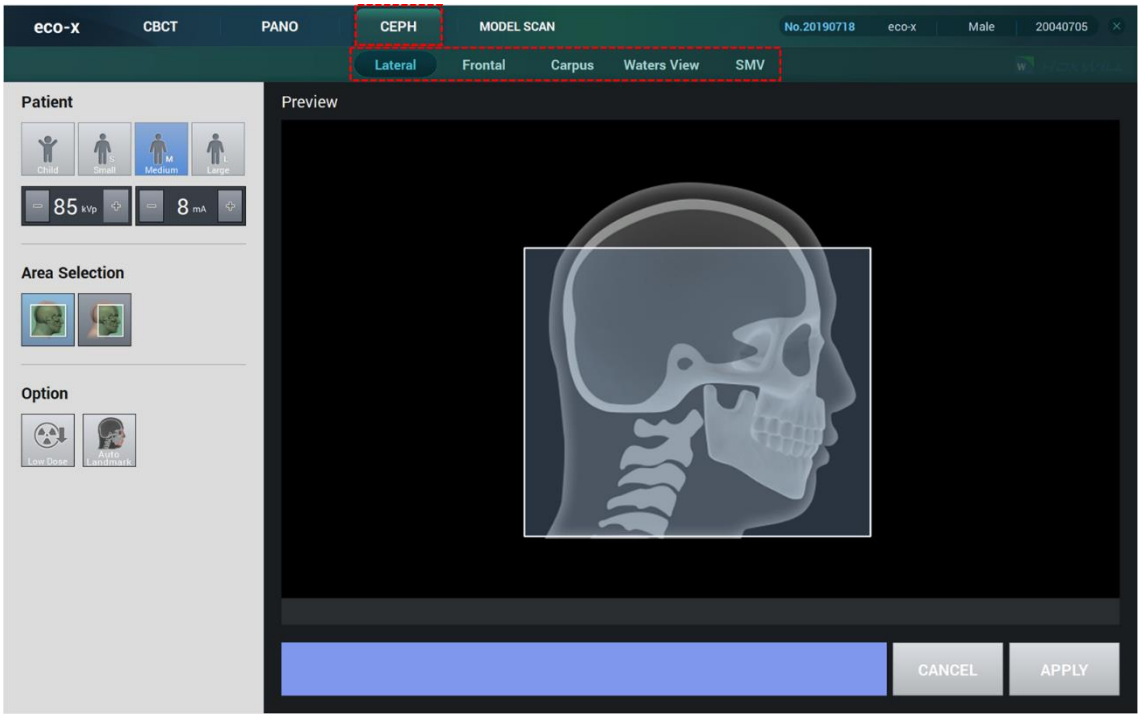
Chapter 8. Cephalo Mode (option)

8.1 Setting Capture Parameters

8.1.1 Setting detailed mode

1) Click the CBCT capturing program in the Will-Master program to activate the following screen.

2) Select the detailed area to be captured.



NO.	Capture part	Description
1	Lateral	Lateral view capture mode
2	Frontal	Frontal view capture mode
3	Carpus	Carpus capture mode
4	Waters view	Waters view capture mode
5	SMV	SMV (Sub-Mento Vertex) capture mode

8.1.2 Selecting Patient Type

1) Select the appropriate button for patients depending on the body type and age: Child, Small, Medium, Large.

NOTE	**Patients in age of 13 or less (≤ 13) will be automatically selected as Child, and the rest will be selected as Medium.**

2) You can manually select the suitable Tube Voltage/Tube Current using +, - buttons depending on the patient type.

Adjustable resolution:
- Tube voltage: ± 5 kVp
- Tube current: ± 1 mA

8.1.3 Setting detailed option

Please refer to **4.3 EcoX-Capture> 4.3.4 Options for each capture mode** for detailed option.

For exposure time by detailed capture mode, see **4.6 Scan time by mode**.

8.1.4 APPLY

- Click the 'APPLY' button in the capture program when all the capture preparation is ready.

- Click the ‘APPLY’ button to prepare the equipment with the value set.

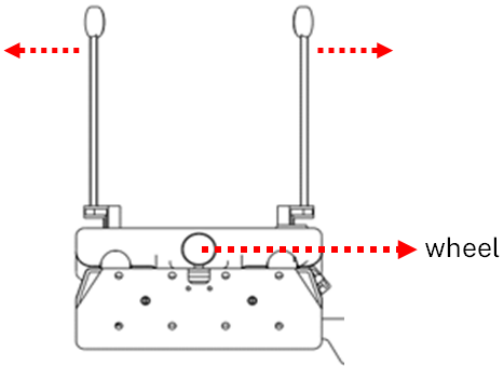
NOTE	**Do not stand close to the equipment as it can be rotated or moved while it is being prepared.**

NOTE	**Click APPLY to convert the process bar to 'STANDBY SETTING'.** **When setup is complete, the progress bar changes to 'SETTING DONE'.** **Please arrange the patient after setting up.**

8.2 Align the Patient

8.2.1 Align the Patient I in LATERAL mode

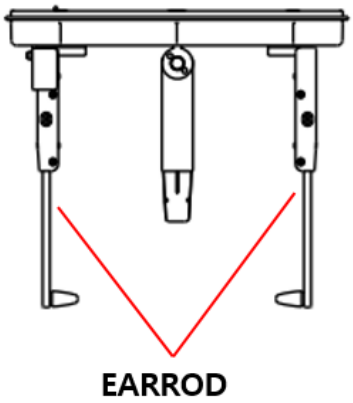
1) Remove the chinrest and rotate the TEMPORT wheel to open the template support as much as possible.

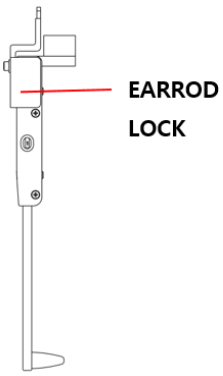


CAUTION

If you capture without adjusting the Chinrest and Temple support, the Chinrest and Temple support appear in the image and may not be able to accurately diagnose.

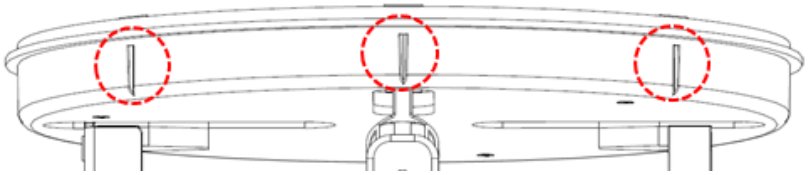
2) Turn the disc to LATERAL mode, and then widen the interval between the two ear rods.
: Press and hold the earrod lock button and move it to adjust the ear load Interval.





NOTE

If the earrod is not in Lateral mode, hold the earrod and turn it to rotate the disc.
The disc is grooved every 45°, so it is supposed to be caught in the Lateral and Frontal mode.



3) If the patient is standing in front of the equipment, press the earrod lock button and adjust it to the patient's ears.
When aligning the patient, make sure that both shoulders are level and that the patient is standing up comfortably.

4) Position the nasal rod on the patient's nose bone. The height of the nasal rod can be adjusted.

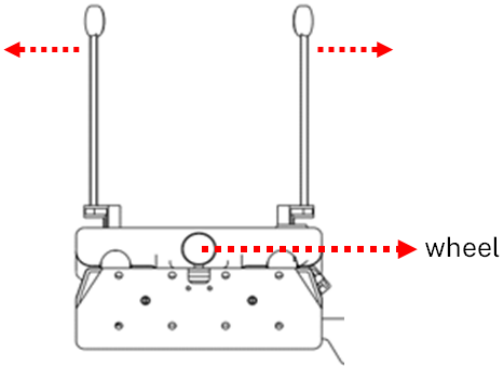
5) When Align the Patient is complete, press the Ready button to make the equipment ready for capture.

CAUTION	Adjust slowly to fit patient's ears as there is a risk of injury if the earrod is too narrow.

NOTE	In order to obtain the best images, be careful not to move the patient during capturing.

8.2.2 Align the Patient in FRONTAL(PA) mode

1) Remove the chinrest and rotate the TEMPORT wheel to open the template support as much as possible.

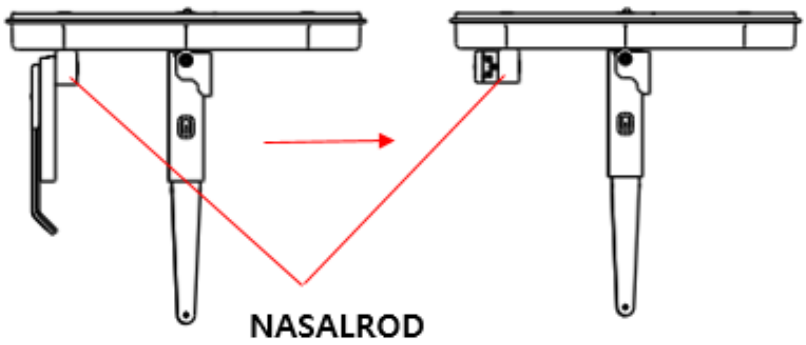


CAUTION	If you capture without adjusting the chinrest and Temple support, the chinrest and Temple support appear in the image and may not be able to diagnose accurately.

2) Turn the disc to Frontal mode, and then widen the interval between the two ear rods.

: Press and hold the earrod lock button and move it to adjust the ear load Interval.

3) Hold the Nasal rod and raise the Nasal rod as shown below to prevent it from appearing in the image.



4) If the patient is standing in front of the equipment, press and hold the earrod lock button and adjust it to the patient's ears.

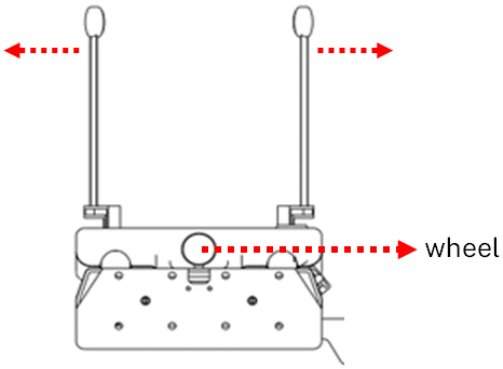
When aligning the patient, make sure that both shoulders are level, and keep his/her neck up to stand comfortably.

5) When Align the Patient is complete, press the Ready button to make the equipment ready for capturing.

CAUTION	Adjust slowly to fit patient's ears as there is a risk of injury if the earrod is too narrow.
NOTE	In order to obtain the best images, be careful not to move the patient during capturing.

8.2.3 Align the Patient in CARPUS mode

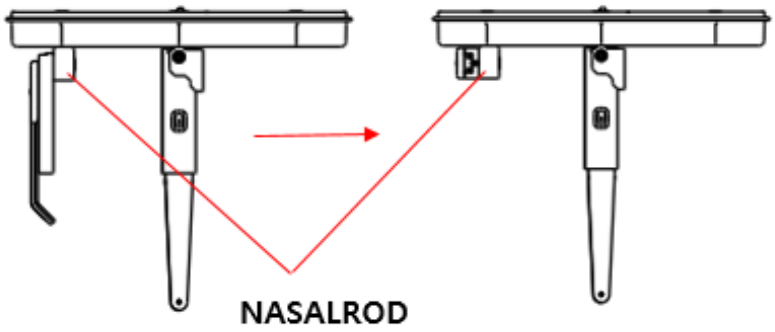
1) Remove the chinrest and rotate the TEMPORT wheel to open the template support as much as possible.



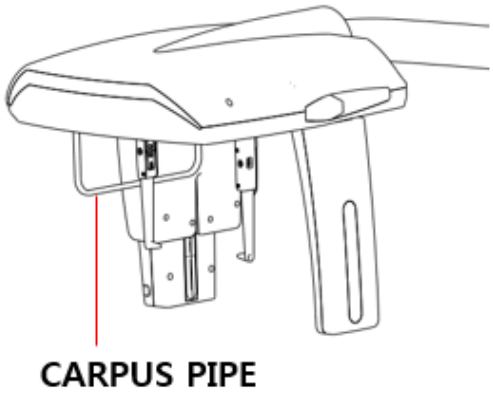
CAUTION	If you capture without adjusting the chinrest and Temple support, the chinrest and Temple support appear in the image and may not be able to diagnose accurately.

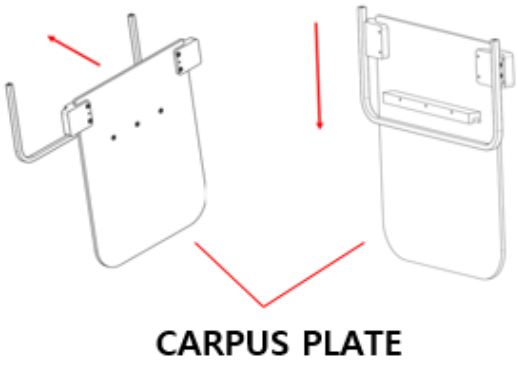
2) Turn the disc to Frontal mode, and then widen the interval between the two ear rods.
: Press and hold the earrod lock button and move it to adjust the ear load Interval.

3) Hold the Nasal rod and raise the Nasal rod as shown below to prevent it from appearing in the image.

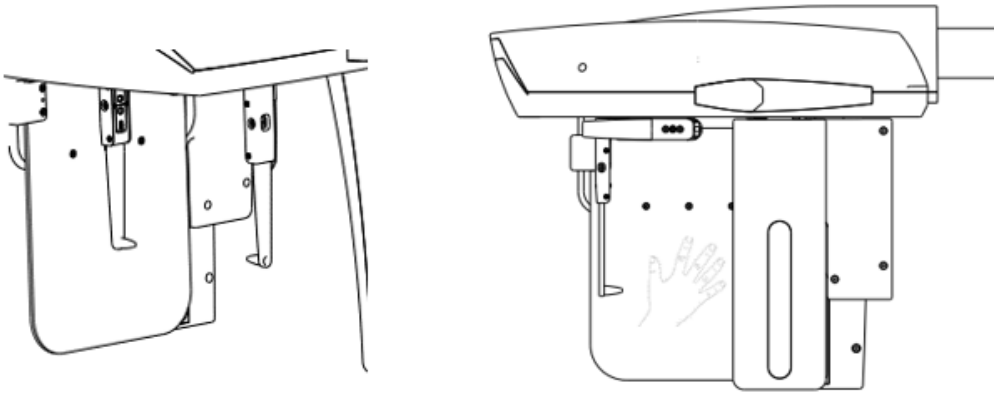


4) If the CARPUS plate is not fitted, install the pipe groove of the CARPUS plate in line with the CARPUS pipe line as shown below.





5) Place hands on the detector in a flat position so that the fingers do not bend as shown below.

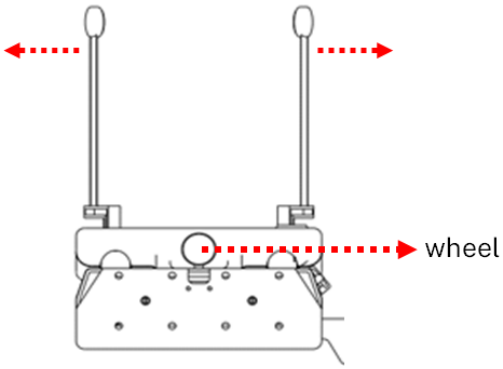


6) When the Align the Patient is complete, press the ready button to place the equipment ready for capturing.

NOTE	In order to obtain the best images, be careful not to move the patient during capturing.

8.2.4 Align the Patient in Waters View mode

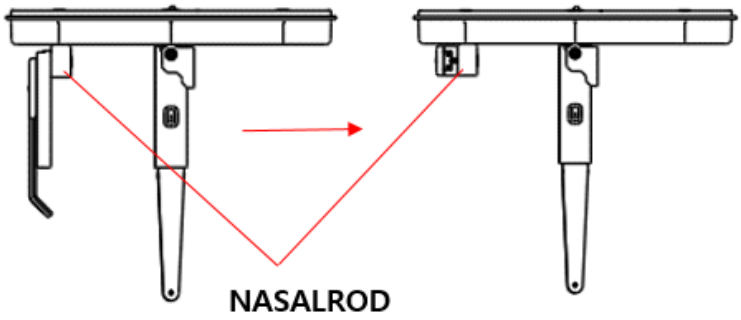
1) Remove the chinrest and rotate the TEMPORT wheel to open the template support as much as possible.



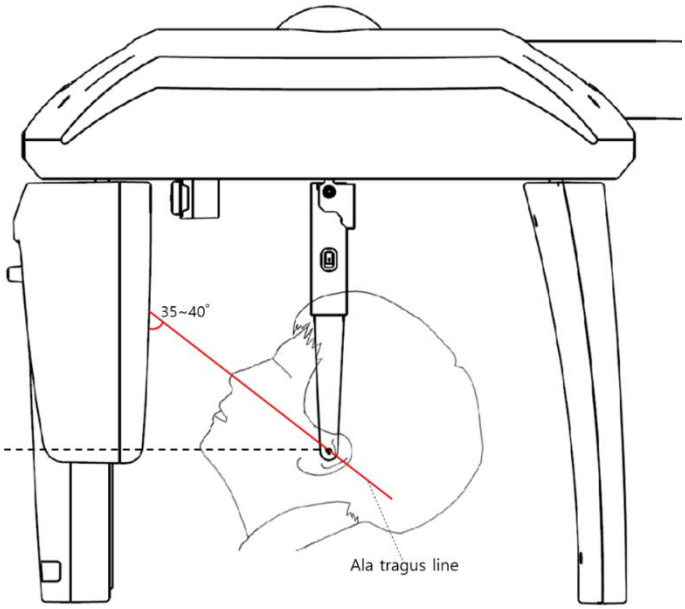
CAUTION	If you capture without adjusting the chinrest and Temple support, the chinrest and Temple support appear in the image and may not be able to diagnose accurately.

2) Turn the disc to Frontal mode, and then widen the interval between the two ear rods.
: Press and hold the earrod lock button and move it to adjust the ear load Interval.

3) Hold the Nasal rod and raise the Nasal rod as shown below to prevent it from appearing in the image



4) With the patient's mouth closed, align the patient so that Ala tragus line is tilted between 35~40 ° as shown in the image below.



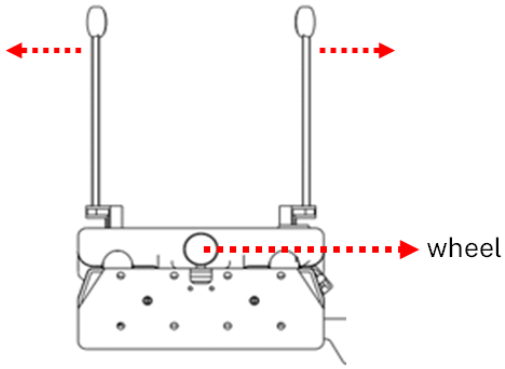
CAUTION	Adjust slowly to fit patient's ears as there is a risk of injury if the earrod is too narrow.

5) When Align the Patient is complete, press the Reday button to bring the equipment ready for capturing.

NOTE	In order to obtain the best images, be careful not to move the patient during capturing.

8.2.5 Align the Patient in SMV mode

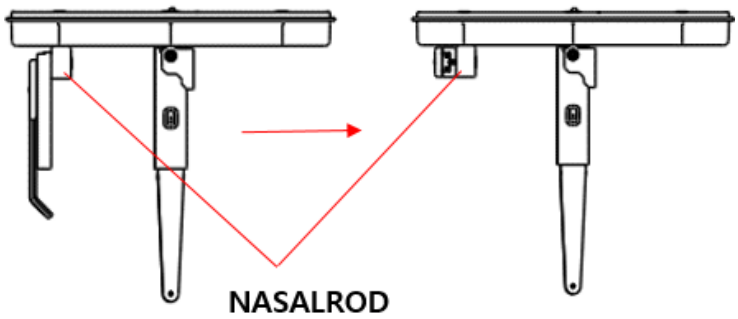
1) Remove the chinrest and rotate the TEMPORT wheel to open the template support as much as possible.



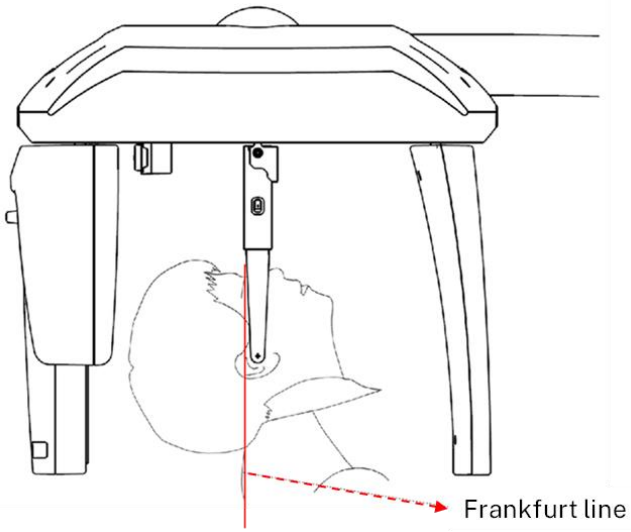
CAUTION	If you capture without adjusting the chinrest and Temple support, the chinrest and Temple support appear in the image and may not be able to diagnose accurately.

2) Turn the disc to Frontal mode, and then widen the interval between the two ear rods.
: Press and hold the earrod lock button and move it to adjust the ear load Interval.

3) Hold the Nasal rod and raise the Nasal rod as shown below to prevent it from appearing in the image.



4) Align the patient so that the Frankfurt line is vertical to the floor with the patient's mouth closed and head back safely.



CAUTION	Adjust slowly to fit patient's ears as there is a risk of injury if the earrod is too narrow.

5) When Align the Patient is complete, press the Reday button to bring the equipment ready for capturing.

NOTE	In order to obtain the best images, be careful not to move the patient during capturing.

8.3 X-ray Exposure and Image Acquisition

For more information, see '5.7 X-ray Exposure and Image Acquisition'.

8.4 Cephalo Image Check

For captured image, see 'WILL-MASTER user manual> chapter 5 View the Image'.

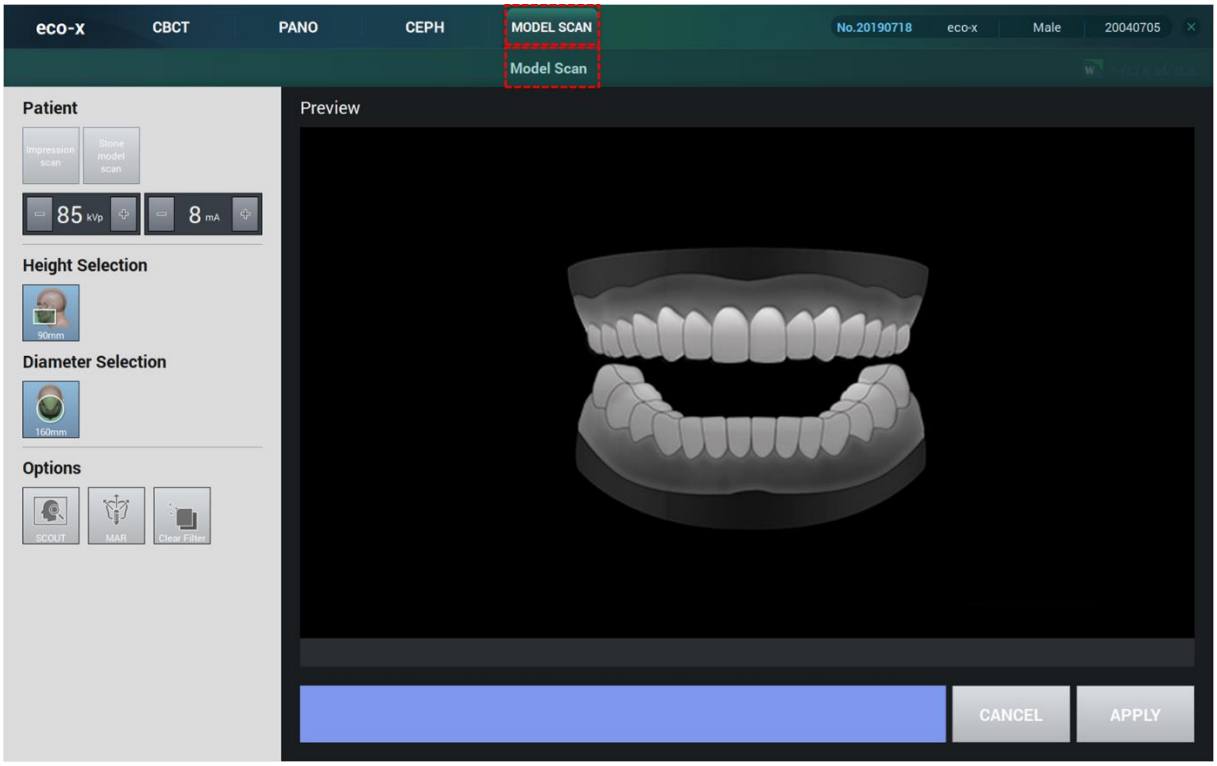
Chapter 9. Selecting MODEL SCAN Mode (option)

9.1 Setting Capturing mode

9.1.1 Setting detailed mode

Select Study Model in detailed mode setting.
1) Click the Model Scan program in the Will-Master program to activate the following screen.

2) Select Study Model in detailed mode setting.



9.1.2 Selecting type

Select the tube voltage and current depending on the material and thickness of the 3D model.
Set it referring to the table below.

Material Type	Impression scan	Stone model scan
Tube voltage/ Tube current	70kVp/ 6mA	90kVp/ 10mA
Model Example		

9.1.3 Setting detailed options

For detailed options, see **Chapter 4. Software Overview> 4.3.4 Options for each Capture mode**

9.1.4 APPLY

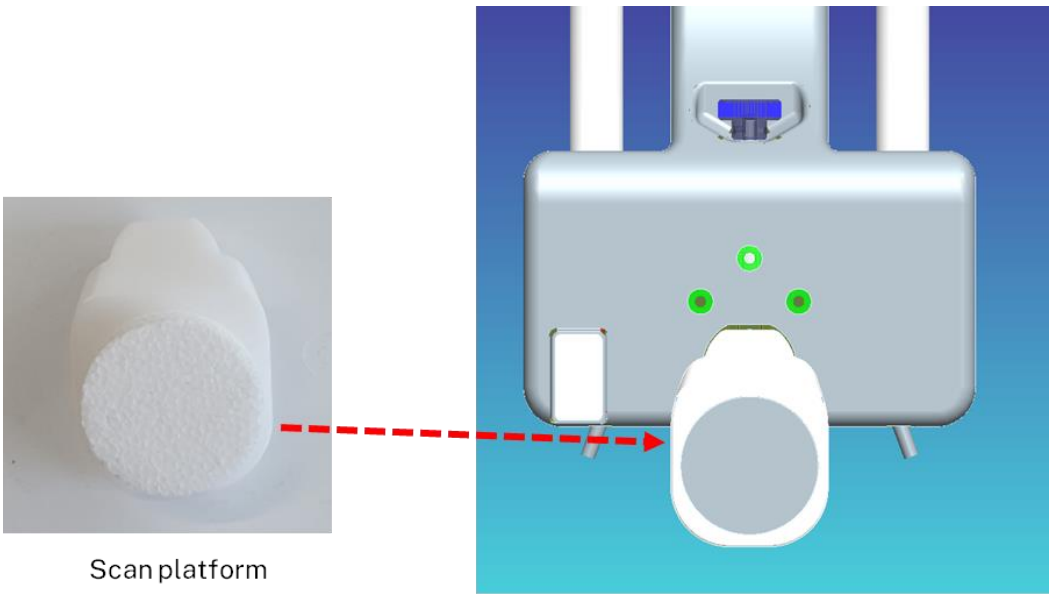
- Click the 'APPLY' button in the capture program when all the preparation is ready.
- Click the APPLY button to prepare the equipment with the value set.

NOTE	**Do not stand close to the equipment as it can be rotated or moved while it is being prepared.**

NOTE	**Click APPLY to convert the process bar to 'STANDBY SETTING'. When setting is complete, the progress bar changes to 'SETTING DONE'. Please arrange the patient after setting up.**

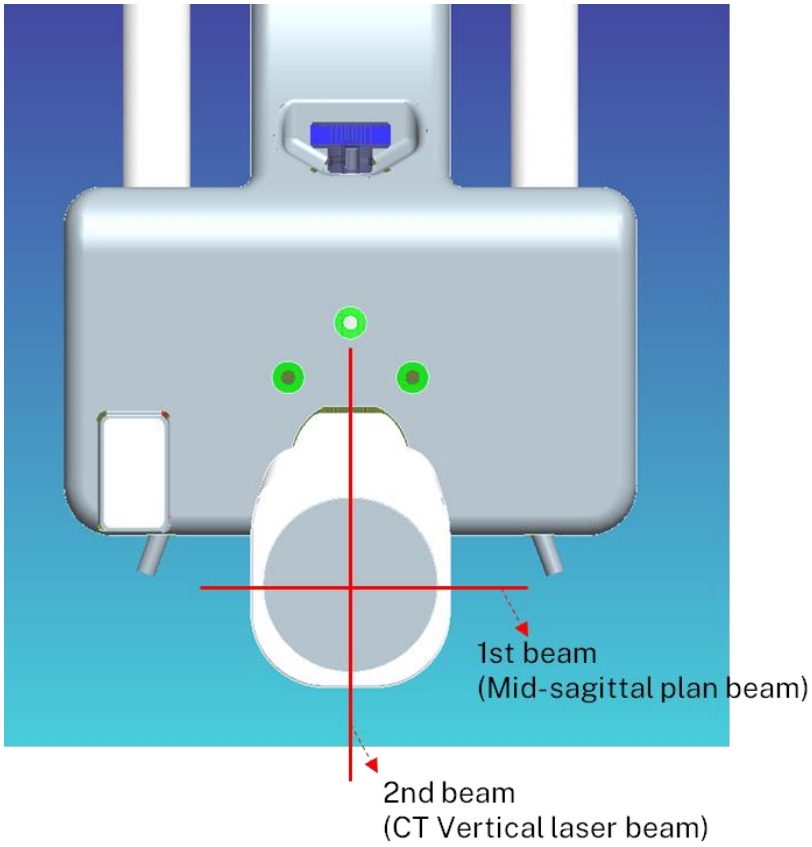
9.2 3D Model Alignment

1) Set the ‘scan platform’ as below. (The scan platform is an optional item.)



Scan platform

2) Place the 3D Model on the scan platform center. The Center is placed where the 1st and 2nd beams intersect as shown in the picture below.



NOTE	If the laser beam is switched off before the Align the Patient is complete, the laser beam can be switched on by pressing the 'laser' button on the touch panel. For more information, see '4.4 EcoX-Touch> 4.4.2 Program function'.

9.3 Model Image Check

For Image Save and Check, see '6.4 CT Image Check'.

Chapter 10. Trouble shooting

This chapter describes the problems and solutions that may arise from using the product.

10.1 Product Failure and Action

In the event of failure of product, please identify the items below and take action. If failure is not resolved or the symptoms are repeated, make sure to receive customer support service through the manufacturers or vendors.

● **If the equipment does not work**	
Cause	**Action**
The power plug is missing.	The power plug should be plugged into the specified outlet.
The power switch is turned off.	Turn the power switch of the equipment to 'ON' state
Equipment is being initialized.	Wait until the equipment is initialized, and try again.
Not connected to the dedicated computer.	Check the status of the connection between equipment and computer cable.
Others	Turn off the power and contact manufacturer or vendor's customer support.

● **If the X-Ray exposure switch does not work**	
Cause	**Action**
Program is not a state of READY.	Check the READY status in the program and then try again.
X-Ray exposure switch cable is loose.	Check the status of the connection between equipment and X-Ray exposure switch cable.
X-Ray exposure switch failure	Turn off the power and contact manufacturer or vendor's customer support center

● **If the Touch Panel does not work**	
Cause	**Action**
Equipment is being initialized.	Wait until the equipment is initialized, and try again.
Operate the touch panel with we hands.	Wipe the water off the hand and touch panel and try again.

● **If the equipment does not shoot**	
Cause	**Action**
Equipment is being initialized.	Wait until the equipment is initialized, retry.
X-ray is not exposure..	Check if X-ray irradiation indicator lamp turns yellow during normal operation.
	If there is no problem with the yellow light, please turn off the power and contact customer support center..
Not connected to a dedicated computer.	Check the status of the connection between equipment and computer cable. (Be sure to check the visual network cable connection.)

Others	Turn off the power and contact manufacturer or vendor's customer support

Be sure to check the product before turning it on or before capturing, as water, beverages, foreign matter, and any load of cargo may cause a safety accident.

10.2 Maintenance

10.2.1 How to store

1) It is important to keep the equipment clean at all times because dust may cause a malfunction of the equipment.

2) Please use the equipment at 10℃ ~ 40℃, and store at 0℃ ~ 40℃.

3) Please use the equipment at the humidity of 20~75%, store at the humidity of 5% ~ 95%.

4) Please use and store the equipment at the atmospheric pressure of 500~1060hPa.

5) Equipment must be placed and stored on the flat ground.

10.2.2 Regular Maintenance

1) Sanitary management should be performed regularly for handle frames and bites that require patient contact.

2) Check that the cables connected to the equipment are OK.

3) Lightly rub the surface with a dry towel.

When cleaning with liquid, do not use it as it may flow into the equipment.

4) Contact the manufacturer and vendor if you notice any problems.

※ Unauthorized disassembly and repair products are not warranted.

WILL-MASTER User Manual

(OPERATOR'S MANUAL)

Chapter 1. Configuration and Login

This chapter describes how to log in to WILL-MASTER.


NOTE

Privacy Protection

To protect your privacy, the Will-Master has the following features:
1. When creating a password, you must set at least two of the following characters:

English, Numeric, and Special Character.

2. Limit system access when password input is incorrect more than 4 times.

3. We recommend that you reset your password every six months.

4. Data such as user's account, access date, contact information, processed information, and performance are stored for one year.

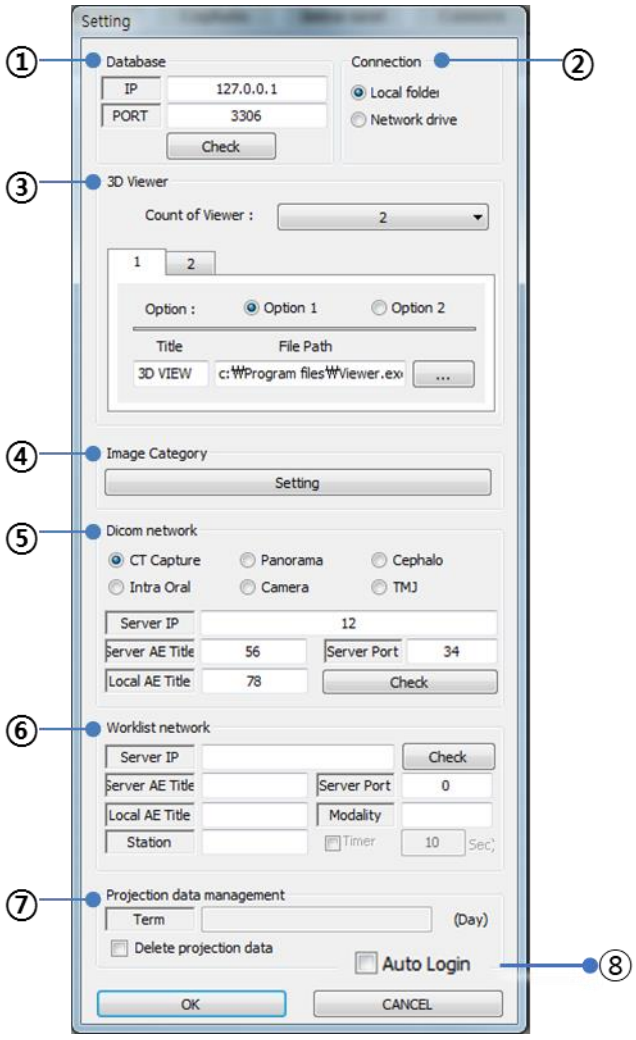

NOTE

The above privacy features are optional and may vary in configuration depending on your choice.

1.1 Configuration

Double-click the Will-Master icon on your wallpaper.
Or select Will-Master in [All Programs-[HDX WILL]-[WillMaster] to start the program.

If it is not a server PC, the following configuration window will appear on the first run because the program's configuration is not correct.
(It will not appear if the Setting was done before.)



① Database:
After entering the IP and Port, click check to check the connection.

② Connection:
Select the connection method of the image file in the group. Select [Local folder] for server PC or [Network Drive] for client PC.

③ 3D Viewer:
Run three-dimensional viewer and external programs in a group.
(You can add up to five additional options, depending on the name and characteristics of the program you call.
You can change the name that appears on the external icon.)

(1) Count of Viewer: Add an external program. (you can add up to five)
(2) Option: Selective specifications can be set depending on the type of external program.
(3) Title: Set the name that appears on the external icon.
(4) File Path: Select the program path.

④ Image Category:
Select an image category to show. Click the Setting button to select only those categories.

⑤ DICOM network:
Enter the information of PACS worklist, and click 'Check' to confirm connection

⑥ Worklist network:
Enter the information in the worklist and click 'Check' button to confirm connection.

⑦ Project management:
Set the retention period of the patient's projection data (RAW file) that you captured.

⑧ **Log in management:**

Set to automatically log in when running Will-Master.
When the configuration is completed, click the OK button to save the setup information. If all information is correct, the login window appears.

1.2 Login

With granted ID/Password, log in by typing.

The ID remembers information that was previously entered and shows automatically. If you do not have stored information, public ID, [will] will appear.

CAUTION	**If the password is wrong 5 times, the access will be restricted**

Save:

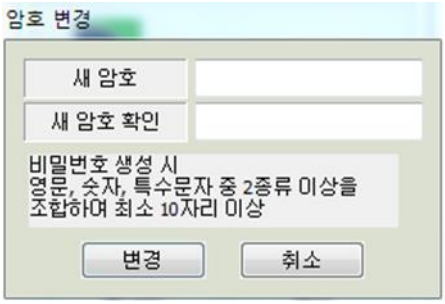
When check of 'Save' box, remember your current password entered. The password will be displayed automatically next time you login.

Auto Login:

If you check the [Auto Login] box, currently entered password will be remembered, and it will be logged in automatically next time you log in.

Change:

If the last successful login ID is not public ID [Will], the [CHANGE] button will be activated.

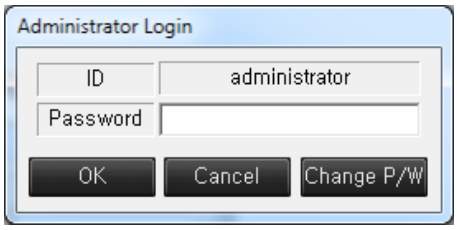


Enter the [New Password] and [Confirm New Password] and click the [ACCEPT] button, then the password will be changed and logged in automatically.

1.3 User Manager Setup

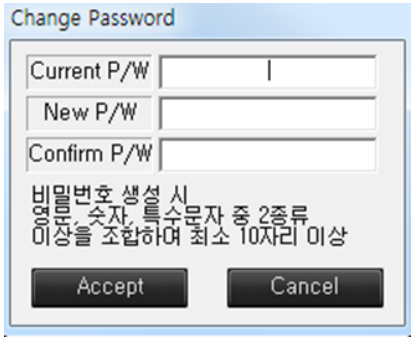
Using Administrative program, users can set Users Management and Server Environments.
Select [My Computer]-[C:]-[Will-Master]-[UsersManager.exe] to start the program.

1.3.1 Administrator Login



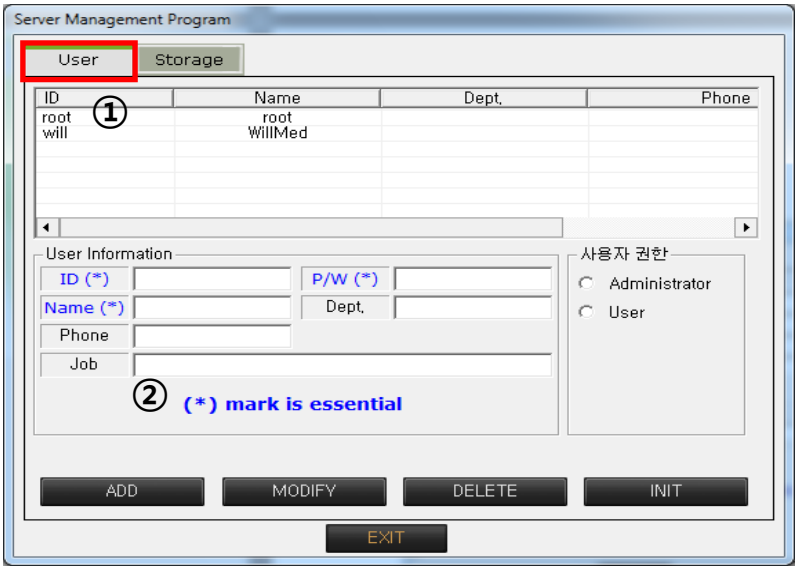
Upon initial installation, the user's ID is fixed as "administrator" and the password is set as "1". For security purposes, it is highly recommended that you change your password when you use.

1.3.2 Changing the Administrator Password



When you click the [Change Password], [Change Password] window appears. Enter [Current password], [New password], [Confirm New password], and then click OK. Then, your password will be changed and automatically logged in.

1.3.3 User Management



Add User:
Enter user's information (required fields are labeled with *), and then click [ADD] button.

Changing the User's Information:
Clicking on item ①, the user's information will be displayed on item ②. Modify the information and click [MODIFY].

Deleting a User:
Click the item ① and click the [DELETE] button.

Initialization Information:
By clicking the [INIT.] button, all the items in ② will be initialized.

NOTE

User's Rights

There are two user's privileges [Administrator privileges] and [General authority]. Users with administrator privileges can delete information, change information, and store information, but users with the general authority are only available to view the information. If you do not set the user's privileges when you add a user, your privilege sets as [General authority].

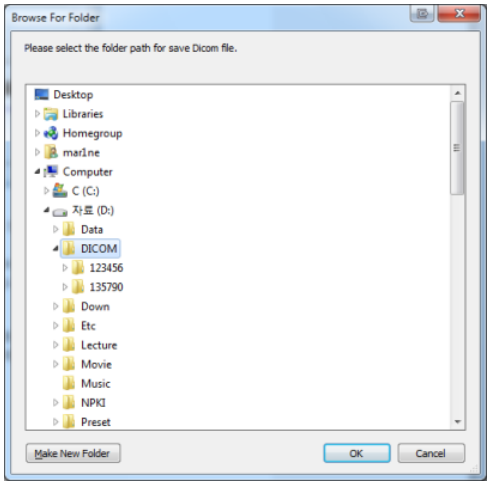
CAUTION

Root account for setting up the Database management should not be deleted.

1.3.4 Staorage Management

This is a tab for setting up how to import image files.
[Local Folders] group information is used when you have your own image file (In other words, this information is useful only to the server).
[Network Drive] group information is used when you need to access the images through the network. (All except the server PC will use this information)

Local Folders:
From the window that appears by clicking the [Folder select], select the top-level folder and click OK.
Clicking [Create a new folder] helps to create a new subfolder under the currently selected folder.



Network Drive:
Enter the paths, access ID, password and click [Check] to determine whether it is connected or not. Once all the settings are completed, click [Save] button to save the settings.

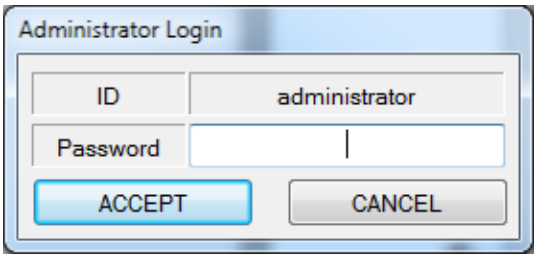
Hospital Name:
Enter the name of the hospital that will be included in the DICOM header.

1.4 Backup Manager Setting

Using Data backup programs, files and databases can be backup and restored. Select [My Computer]-[C:]-[Will-Master]-[BackupManager.exe] to start the program.


BackupManager

1.4.1 Administrator Login



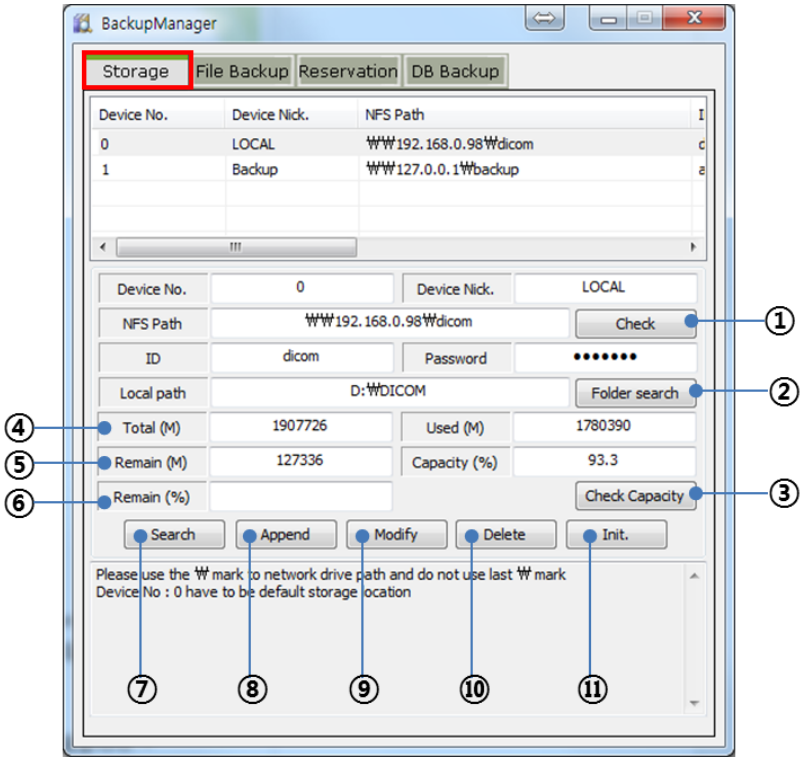
Log in by entering changed administrator password at [1-3] User Manager. (If you did not change, the initial password is “1”)

1.4.2 Storage Device

Set primary storage and backup storage device information.
Set local information and NFS (Network File System) information. It is okay to set one type of information, if you set both two types of information, local information will take precedence.

CAUTION

The Will-Master is set internally to use the primary storage device as the device number “0”. It must be set.



① **Check**:
Use NFS information to check the connectivity.

② **Folder search**:
Examine the local folder..

③ **Check Capacity**:
Determine the capacity of local folder or NFS.

④ **Total**:
Shows the total capacity of storage devices.

⑤ **Remain(M)**:
Show available capacity of the storage device.

⑥ **Remain(%)**:
Manage the maximum available memory of storage as a percentage. (Recommended 95%)

⑦ **Search**: Shows the list of currently set up information extracted from the DB.

⑧ **Append**: Enter the entered information in DB.

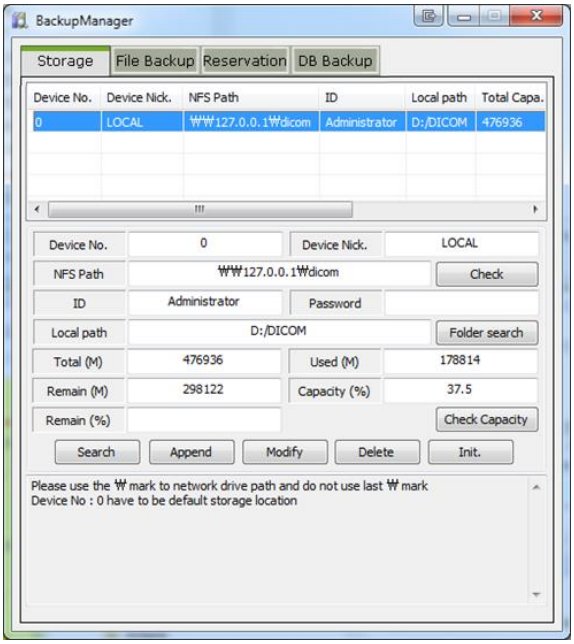
⑨ **Modify**: Modify the information appears when you click on the list, then, DB information is modified.

⑩ **Delete**: Click on the list and click this button, the DB information will be deleted.

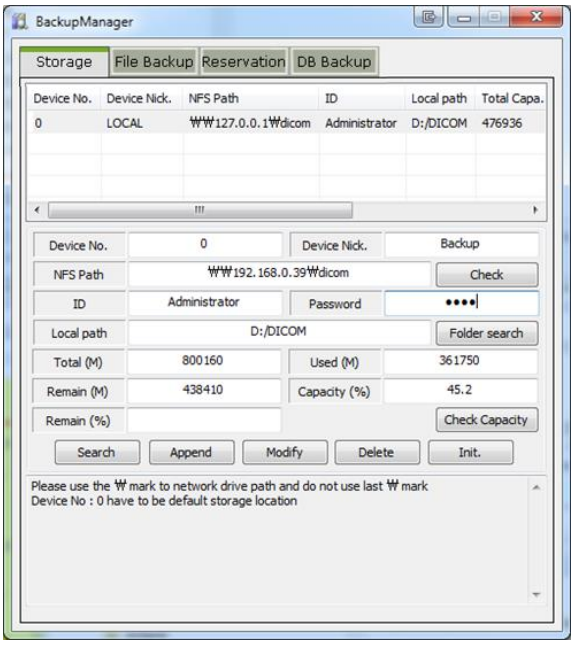
⑪ **Init.**: Makes the information box empty.

NOTE	**If you enter the Remain(%)[Check capacity] during the back up, it determines the amount used, and you cannot use more than its capacity.**

(For example, the basic storage device settings)

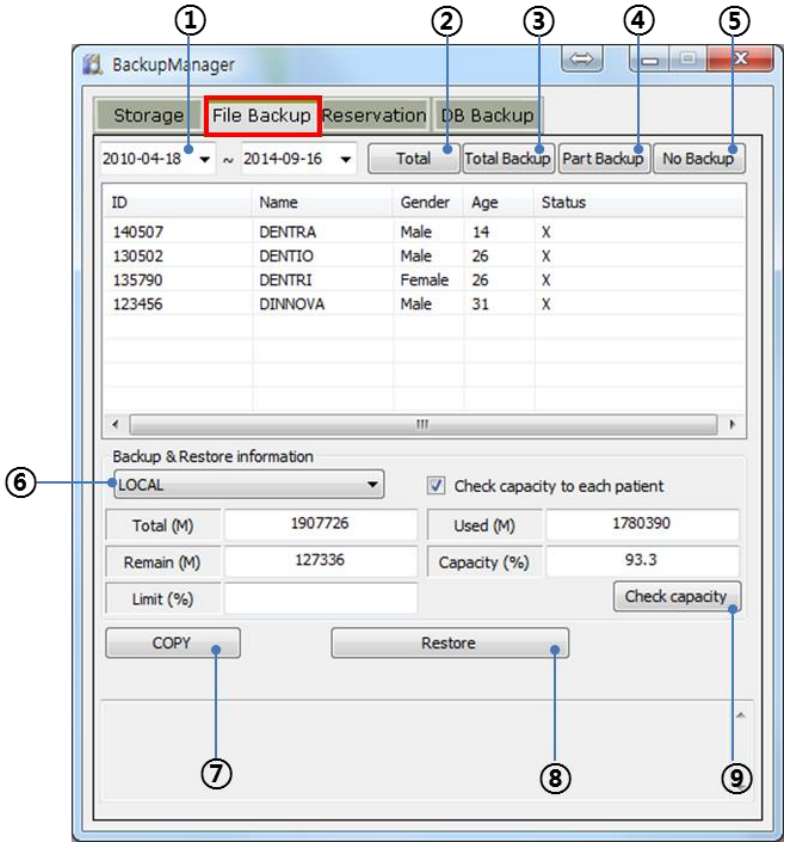


(For example, other storage device settings)



1.4.3 File Backup

1) Backup to PC



① Date:

Assign the final examination date.

② Total:

Regardless of back up, search all examinations.

③ Total Backup:

Search for examinations that have been backed-up.

④ Part Backup:

Search for examinations that have been partially backed-up.

⑤ No Backup:

Search for examinations that have not been backed-up.

⑥ Device List:

Specify the location to be backed-up or restored. When you select the device number “0”, the restore operation is performed, and the backups are performed for a number of other.

⑦ COPY:

Copy the examination file.

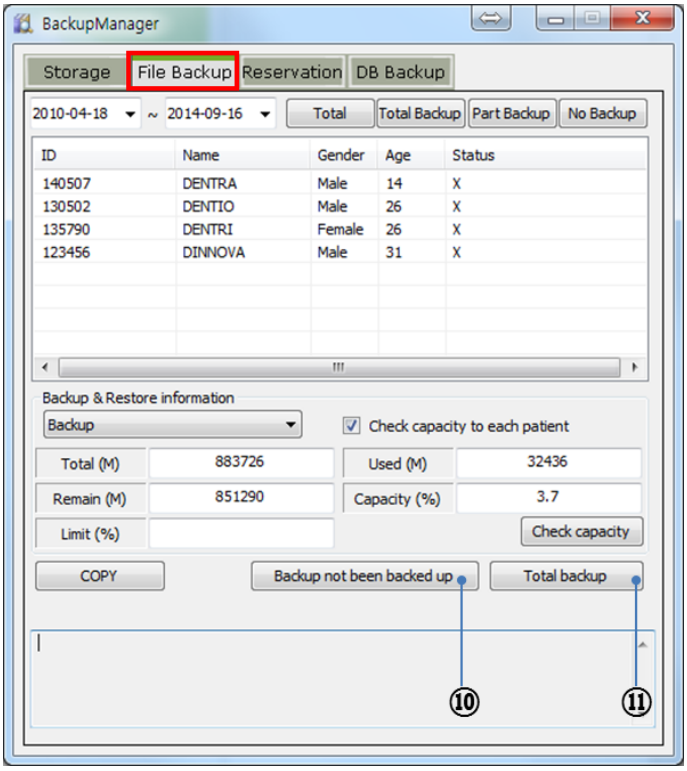
⑧ Restore:

Restore backed-up examination as device number “0”.

⑨ Check capacity:

Determine the available capacity.

2) Backup to External Storage Device



⑩ Backup not been backed up:

Backs up files that have not been backed up.

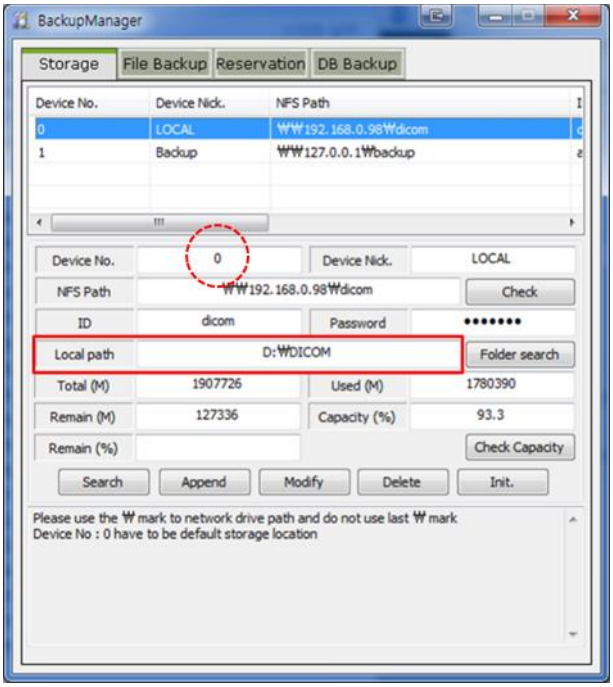
⑪ Total backup:

Backup for selected patient's files regardless of whether backed-up or not.

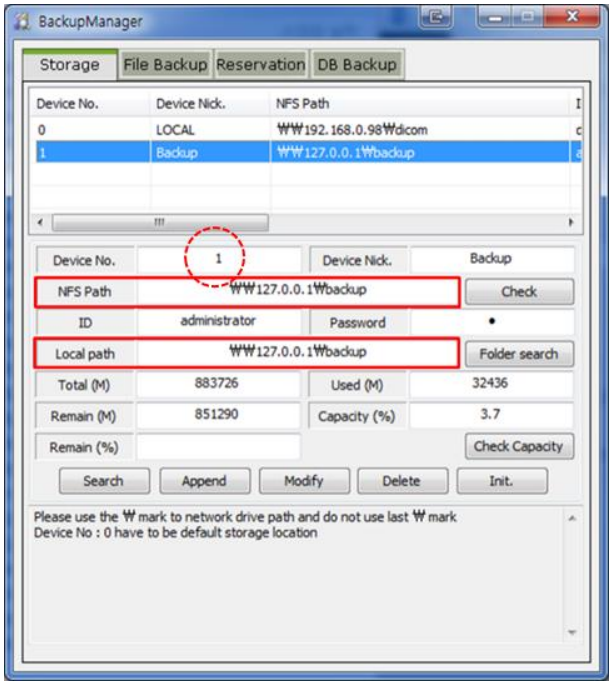
CAUTION	**During file backup or restore, any programs other than Backup Manager program should not be operated, and the file should not be moved or coped as well.**

1.4.4 Automatic backup

1) How to set up Automatic backup



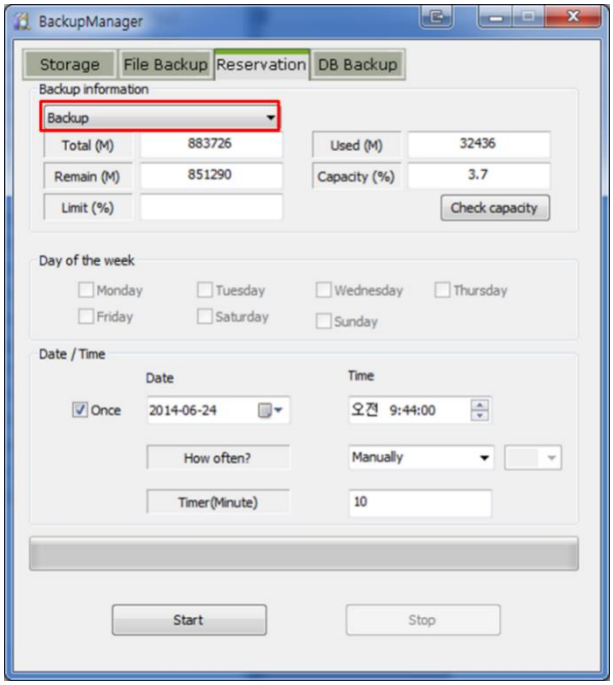
① Check the Local path in the Device No.0.
(specify the folder path where your images are being stored).



② Specify the Backup path in the Device No.1
(path to save the back-up image).

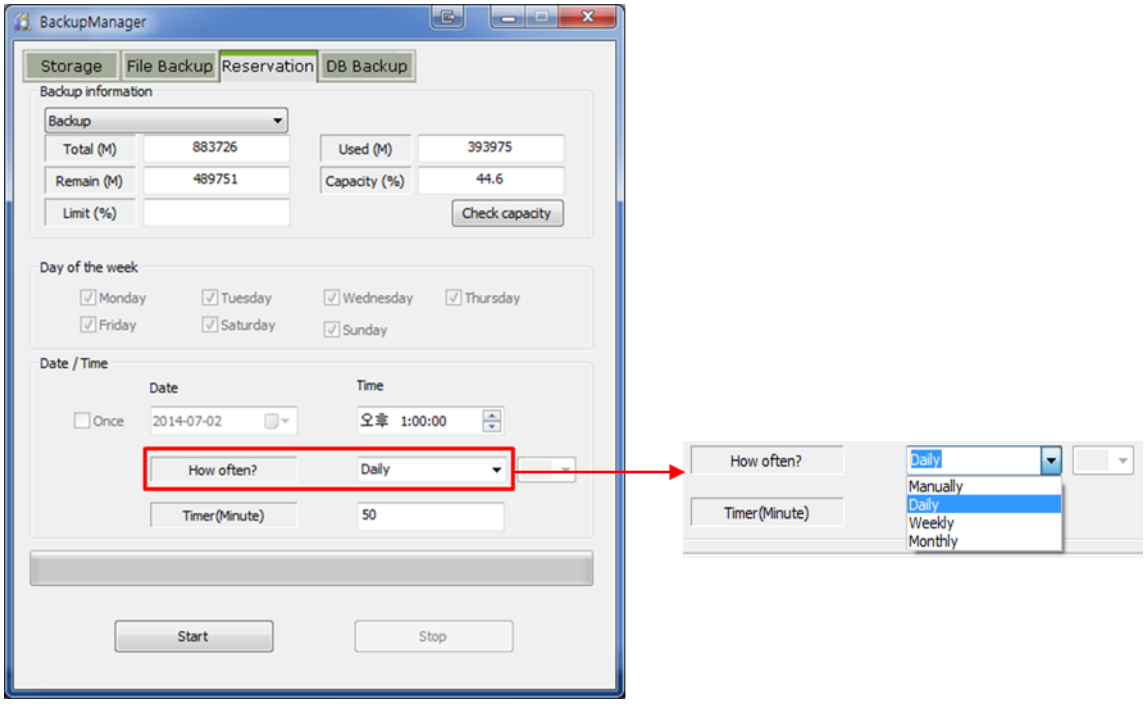
If you want to backup in the server PC, enter the Local Path.
If the backup path is Network, set the NFS Path and the Local Path to Mode Network path.
(ex :\\192.168.0.84\Backup)

③ Select the Backup location in the Reservation tab.

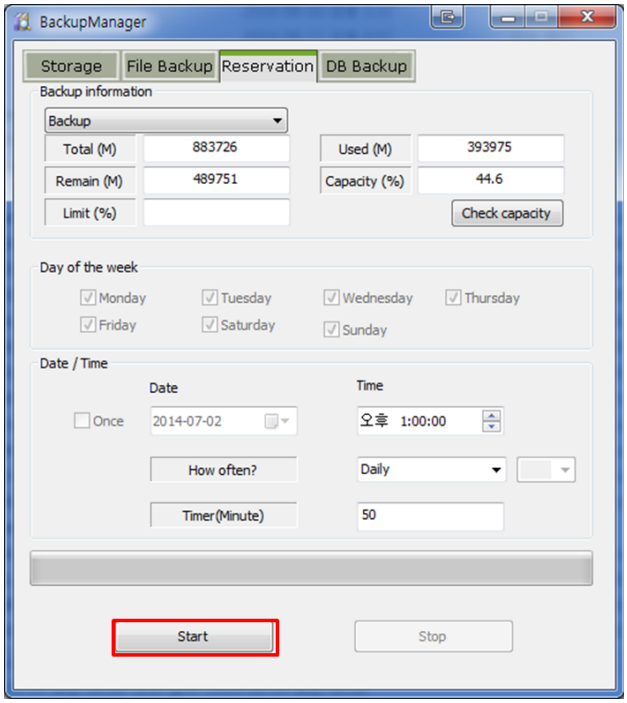


④ Select the backup type.

Set the backup cycle. (Daily, Weekly, Monthly)
If you select 'Manually', periodic backup is not performed.

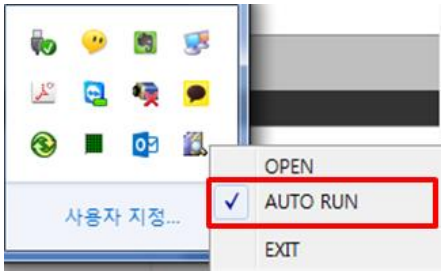


⑤ Click the Start button to proceed with the backup.

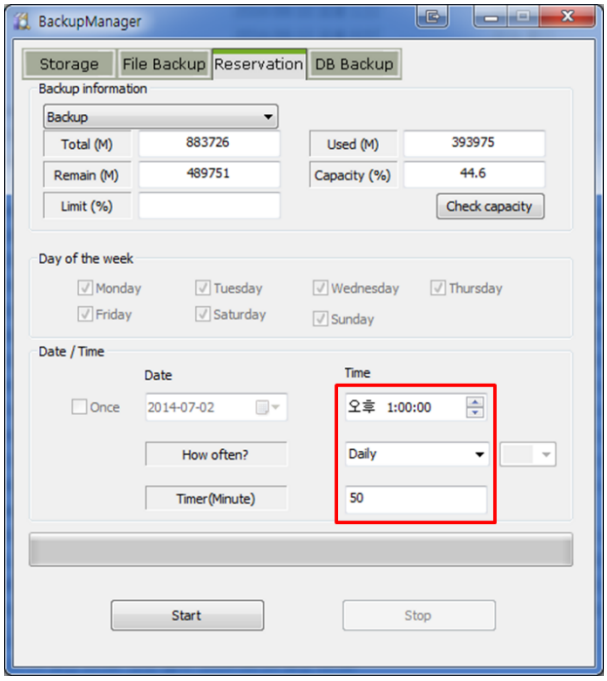


ex) Automatic backup every day at 1:00 for 50 minutes.

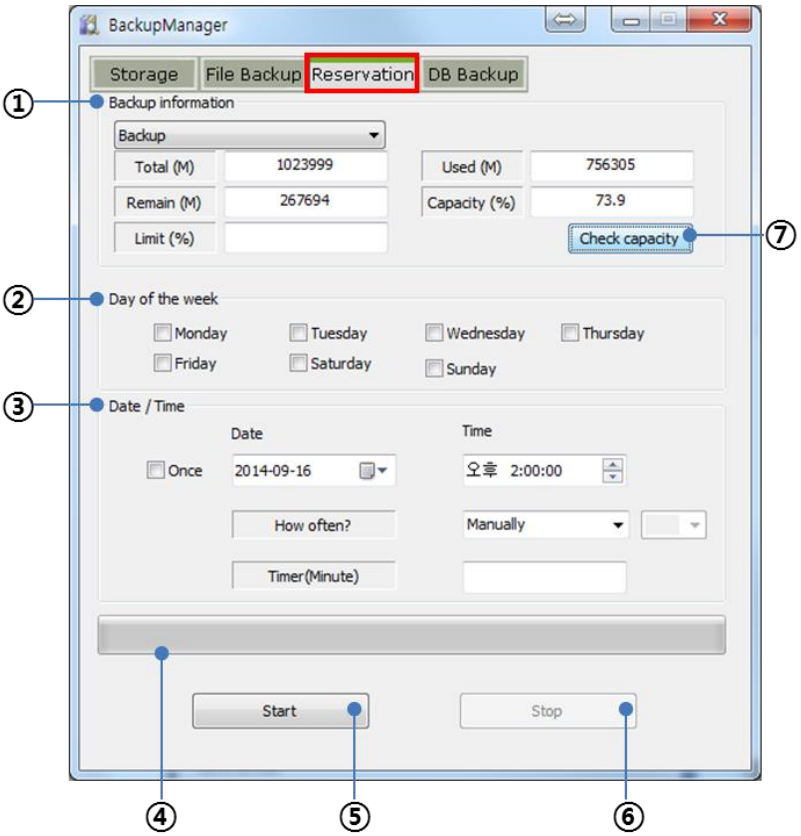
① Select Daily.
② Set the start time in the Time (Backup start time)
③ Enter 50 in the Timer.
④ Check the AUTO RUN in the Trace area.
(Automatically starts the BackupManager program at startup of Windows)



⑤ Proceed with the backup by clicking the Start button.



2) How to reserve the backup



① **Backup Information:** [Specify the backup location set in the [Storage].

② **Day of the week:** Set the day of the week you want to back up.

③ **Date / Time:** Set the date and time.

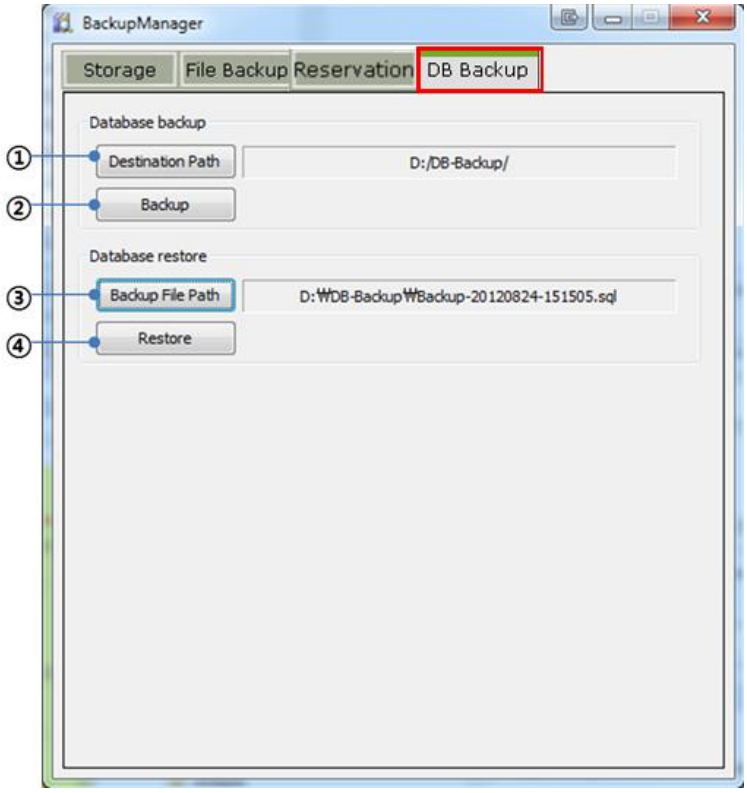
④ **Progress:** Indicate the progress of the backup.

⑤ **Start:** Apply the settings and start the automatic backup.

⑥ **Stop:** Stop the automatic backup.

⑦ **Check capacity**: check the capacity of the external hard drive.

1.4.5 Database Backup



① **Destination Path:** Specify the location for the backed-up DB.

② **Backup:** Backup DB.

③ **Backup File Path:** Specify the DB backup files to be restored.

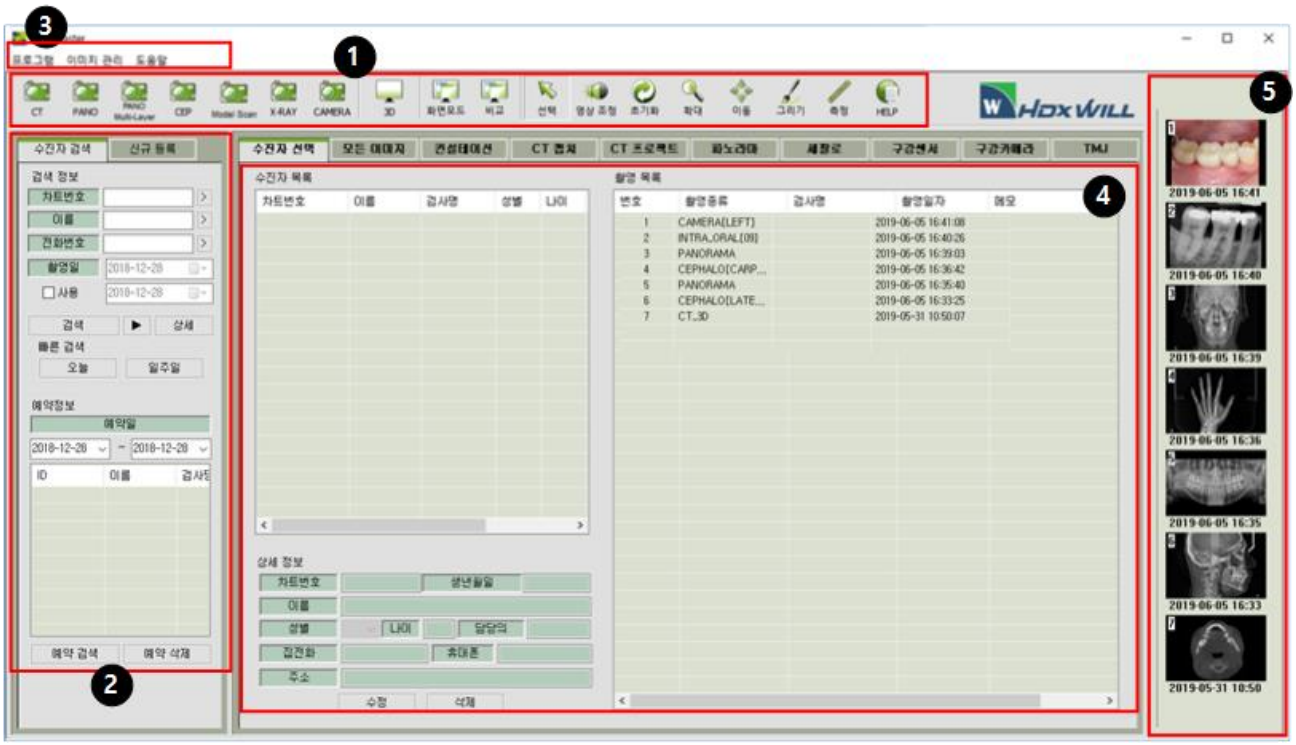
④ **Restore:** Restore selected DB backup files.

Chapter 2. Structures of WILL MASTER

This chapter describes the configuration of WILL MASTER.

2.1 Will-Master Structure

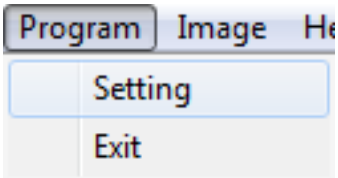
Following is the screen of the Will-Master.



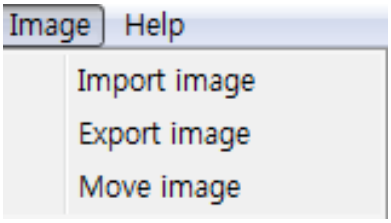
① **Main Tool Bar**
The main toolbar is provided in the form of the buttons (frequently used functions in the program).

② **Search Patients and the New Registration**
Provides the functions to search for existing patients or register new patients. For details of usage, please see [4. Patients Management].

③ **Main Menu**
Contains [Program] and [Image Management] menu.



- Setting : Please refer to the 1-1..
- Exit : Exit the program.



- Import image: Recall images from the local PC and adds currently selected patient..
- Export image: Store patient's currently selected images on the local PC.
- Move image: Image of currently selected patient is moved to the other patient's position.

④ **View a list of patients and images**

Shows the list of search results [② Search Patients] and patient's captured images.

Main working area of Will-Master

⑤ **Thumbnail Area**

Shows the thumbnails of captured images.

Chapter 3. Main Toolbar

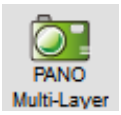
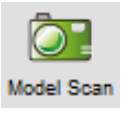
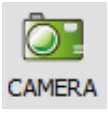
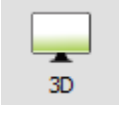
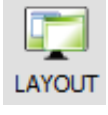
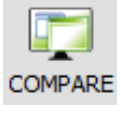
This chapter describes the function of WILL-MASTER in more detail.

3. Main Toolbar

Frequently used functions in Will-Master are provided in the form of buttons.
Some of buttons contain the submenus.

Buttons have the following features.

For more features, refer to [7. Image Processing] and [8. Draw Overlay].

	Start capturing the selected patient's dental CT.
	Start capturing the selected patient's panorama..
	Start capturing the panorama to acquire Multi-layer images of the selected patient. (Optional).
	Start capturing the selected patient's cephalo
	Start capturing the selected patient's model scan.
	Start capturing the Sensor of the selected patients.
	Start capturing the oral camera of the selected patients.
	Execute 3D image viewer and the external program. (Options can be added up to 5).
	Select the screen layout.
	Possible to compare patient's different images on the same screen.

	Select an image, drawing installed, and the measurement objects.
	Adjust the contrast of the selected image.
	The state such as contrast, zoom, and image adjustments reverts to its initial state.
	Image zoom in/out. If you right click on image, the part you right click gets enlarged..
	It is used to move the location of image when magnified image is not displayed on a screen.
	Draw overlay on the images Types of overlays are the arrows, rectangles, circles, polygons, text, implant, save, etc.
	Measures the length and angle of image. Measuring the length is only available in the DICOM image which contains the measurement information.
	Request the remote support.

Chapter 4. Patients Management

This chapter describes how to register and manage patients.

4.1 Patients Registration

4.1.1 Patient Registration

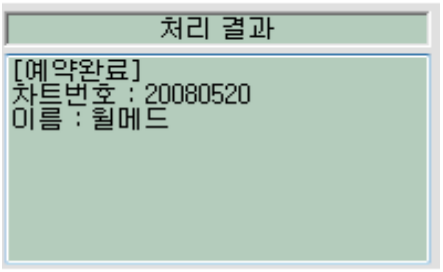
First, patients must be enrolled in order to capture a new image or receive an external image input.

1) When you click on ①'New registration' from the patient search window, patient's registration screen will be displayed.

2) Enter patient's information on ② and click on [ACCEPT] button.

- Filling out the chart number and name (* parts) are required.
- Chart number is the unique number of patients which cannot be duplicated.
- Click on the [Search] button to see if it is available from the final check. (\ / : * ? \" <> | space)

3) When you enter patient's information and click on [ACCEPT] button, the final processing results are displayed on the ③ area.



NOTE

If patient already registered, refer to the "5.3.2 Search Patients".

4.1.2 Search Patients

To capture the new images or check the existing captured images, you first must search patient and select the appropriate patient.

1) In the patients search box, click on ①'Search for patient' to display the search window.

2) In ② Chart No.[Chart number] input window, click the mouse scroll button or > button to activate the virtual keyboard, and input the chart No. through the virtual keypad & keyboard.

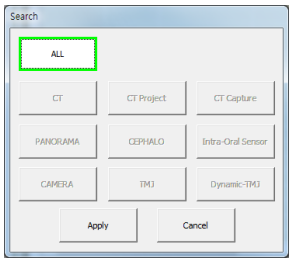
[Virtual keypad]

[Type 1]

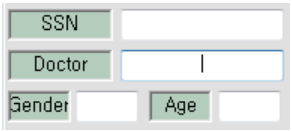
[Type 2]

3) If you tick ③ box, below search information will be added to make more detailed search

4) Click the ④ ▶ button to search the patient by captured image type



5) If you click on the [detail] button, search information will be added to make more detailed search (Feature called, Toggle)



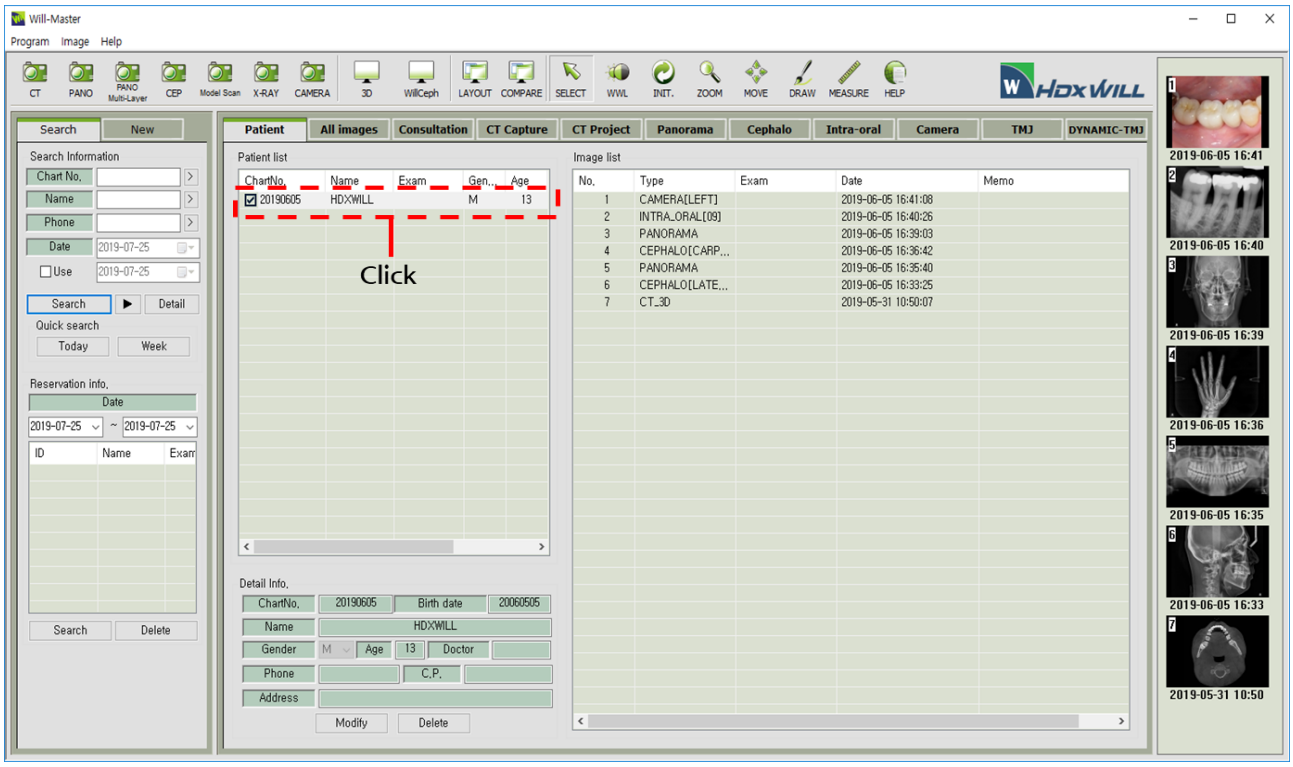
6) Use the Quick Search button for a particular condition. It is very convenient search with the click of a button.

Today: Enter the new day, search for image taken patients.
Week: Search for patients during the last week.

NOTE	The"*" in the chart number or name means all letters. If tying "1*"in the chart number, it means all chart number starting with "1".

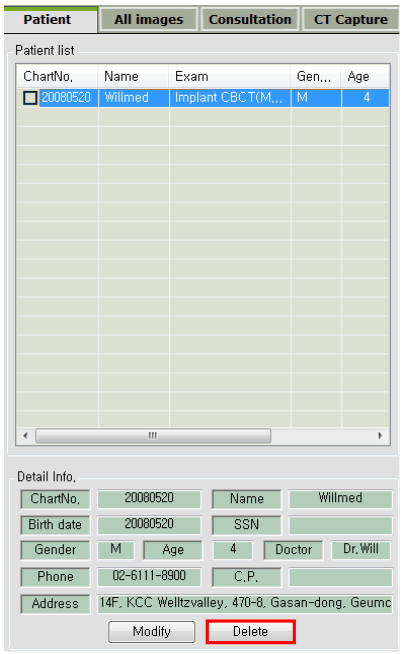
4.1.3 Patient Selection

After completing the patient registration or search, select the applicable patient on Will-Master program.



4.2 Deleting Patients

[Select Patient] tab from the [List of Patient], select the patient that you want to delete and click 'Delete'.



NOTE

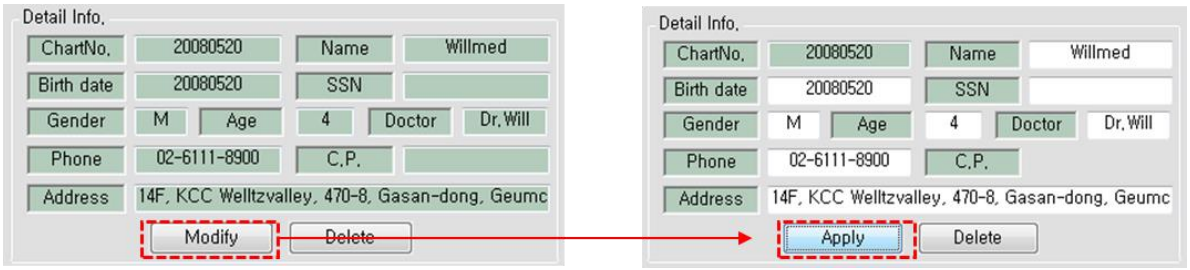
If you delete the patients, DB and captured image data is deleted and the deleted images cannot be recovered. Only an administrator can delete.

4.3 Patient Edit Info

1) [Patient] tab from the [Patient list], select the patient that you want to modify the information.

2) Click 'Modify' button. Then, the mode changes to modify information.

3) When you modify the information and click 'Apply' button, a successful message will be displayed.



NOTE

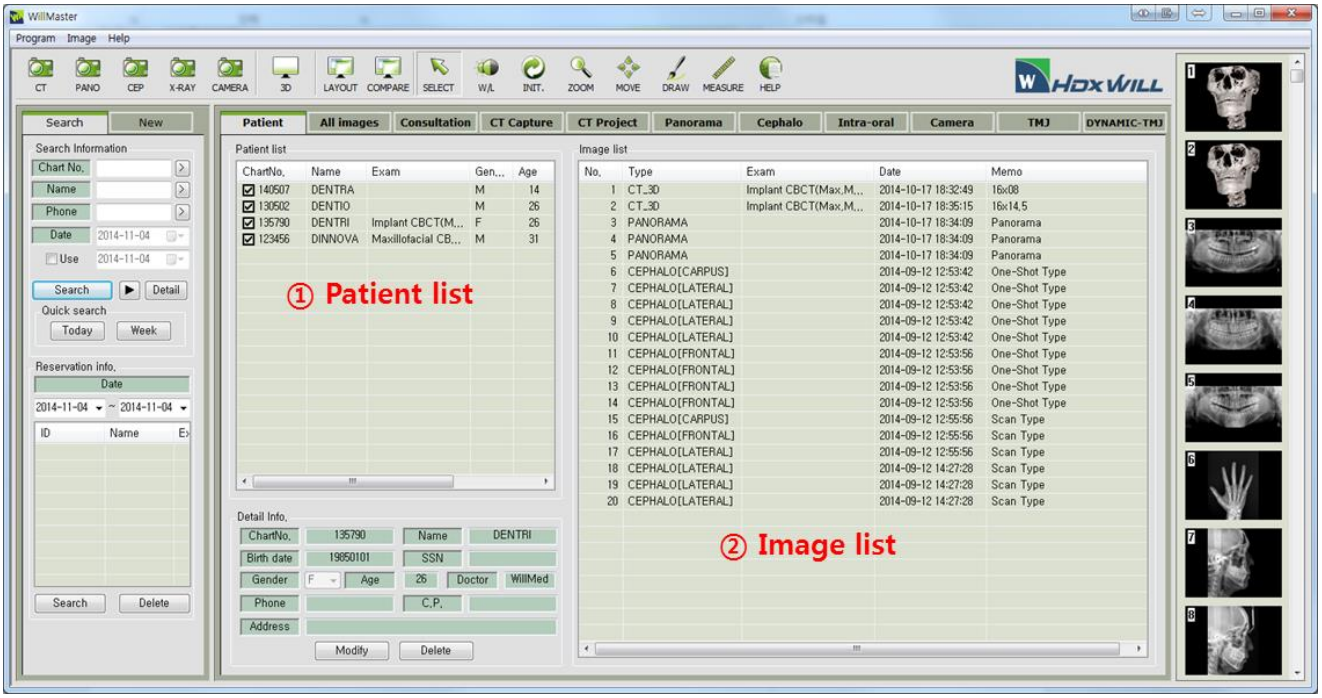
It is allowed only administrator to modify patient's information.

Chapter 5. View the Image

This chapter describe how to view the taken or inserted images.

5. View the Image

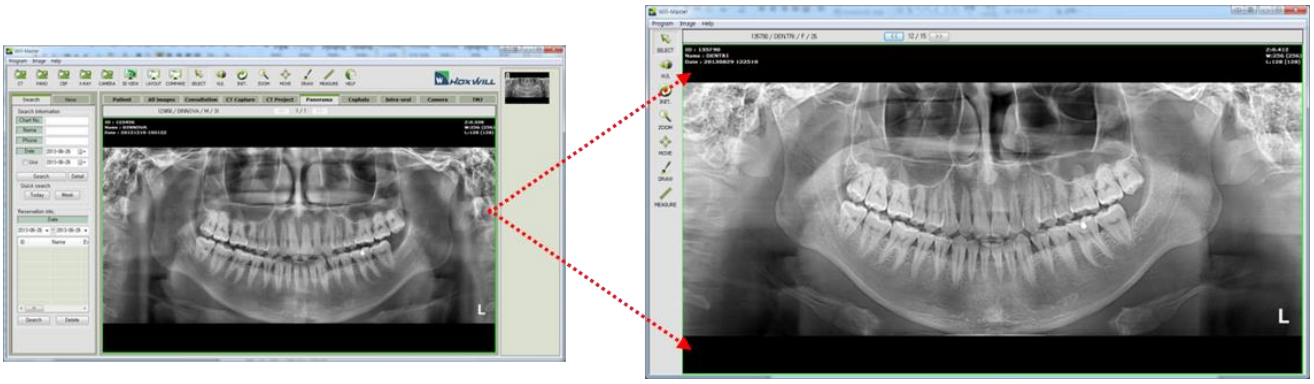
The patients that meet the search criteria are displayed in [Patient] tab from the [Patient list].



1) ① Select [Patient List]. If the corresponding patient's captured list exists, it will appear in the [Captured image List] of ②.

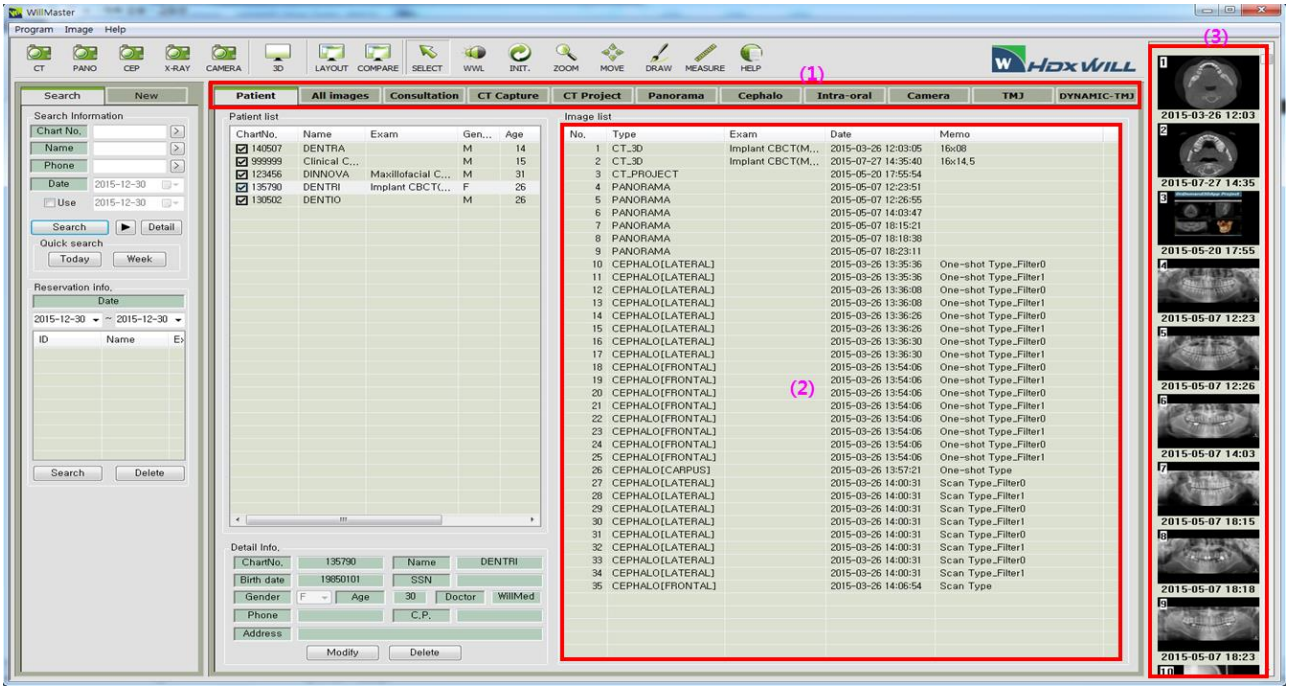
2) The captured image will be loaded by double-clicking.

3) When the captured image is loaded, click the mouse scroll button or F11 key to change to the Large Screen mode.



5.1 View Existing Image

When you double click on a patient's item and if there is any existing image taken, the image will be loaded.



NOTE	**Other tasks are prohibited while the image is loading.**

5.1.1 Viewing Image

Three methods are provided in order to check the thumbnails of images.

(1) Select the tab that images belongs.

(2) Double clicking on an item from the image list, the image moves to the corresponding tab.

(3) Double clicking on the thumbnail images, the image moves to the corresponding tab.

5.1.2 Call the 3D Viewer or Outside interfaces

In order to analyze the taken CT images as 3D viewer, two ways are provided.

(1) Select the [CT 3D] item from the [Capture List] and click on the [3D View] button.

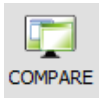
(2) Double click on the [CT 3D] on the thumbnail.

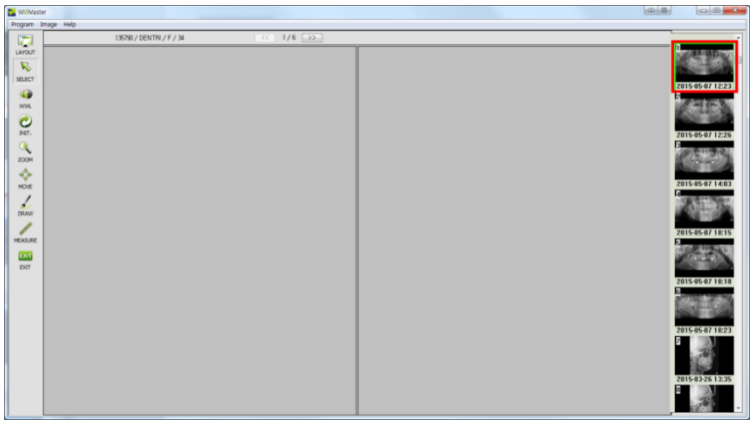
The following item is the three-dimensional shape of CT 3D thumbnail.

5.2 Image Comparison

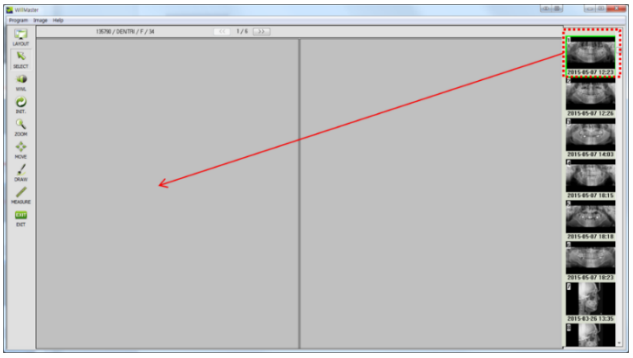
Compare patient's captured images by selecting the [COMPARE] button on the toolbar.

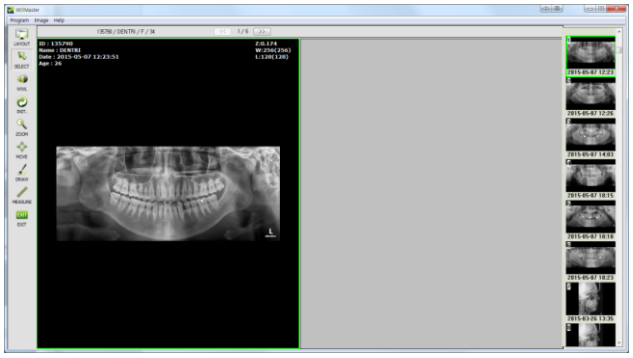
1) Select the [COMPARE] button on the toolbar.



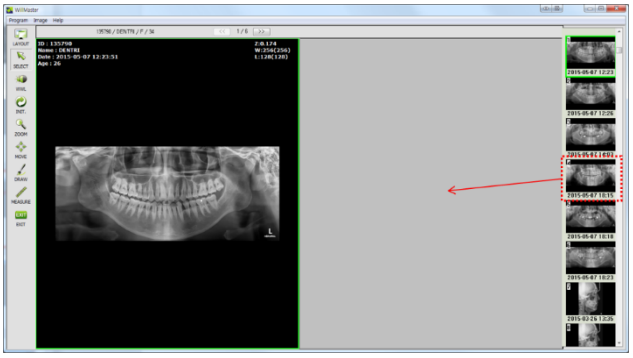


2) Left click on an image to be compared from the thumbnail, and drag it to the area where you want to place the image, and then release it.

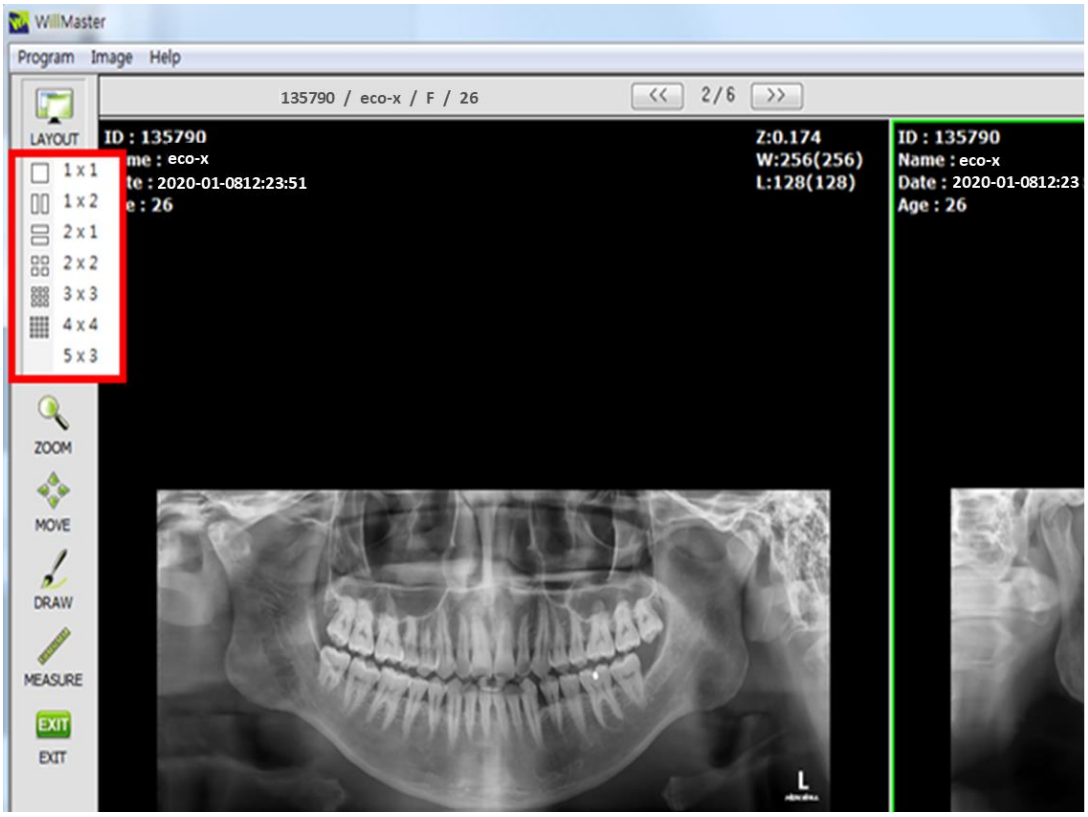


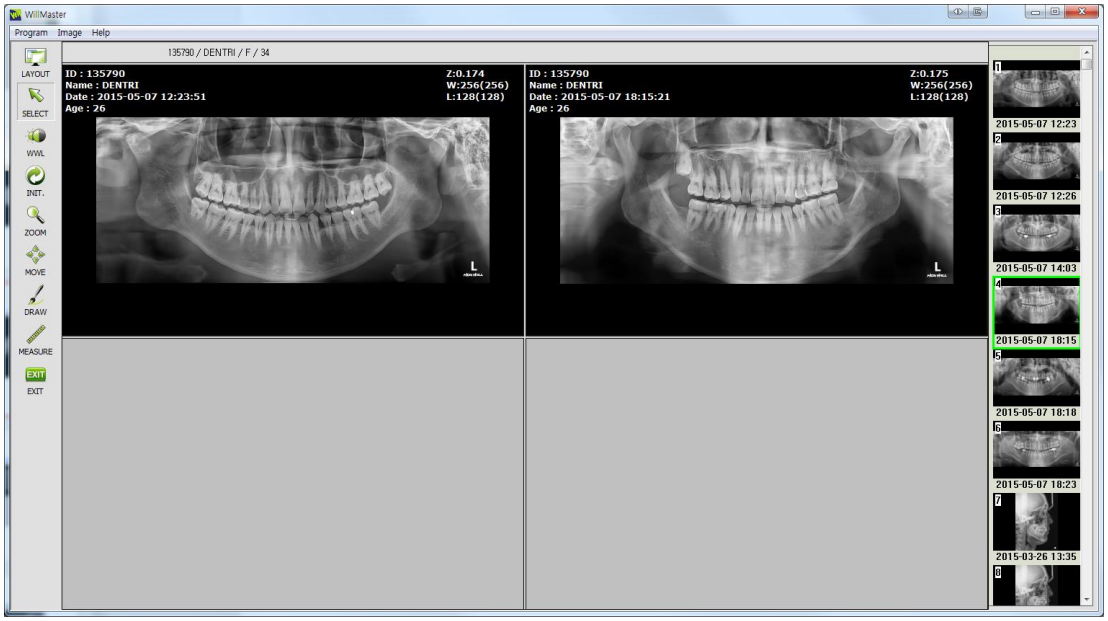


3) Move the second image in the same way as the first image.

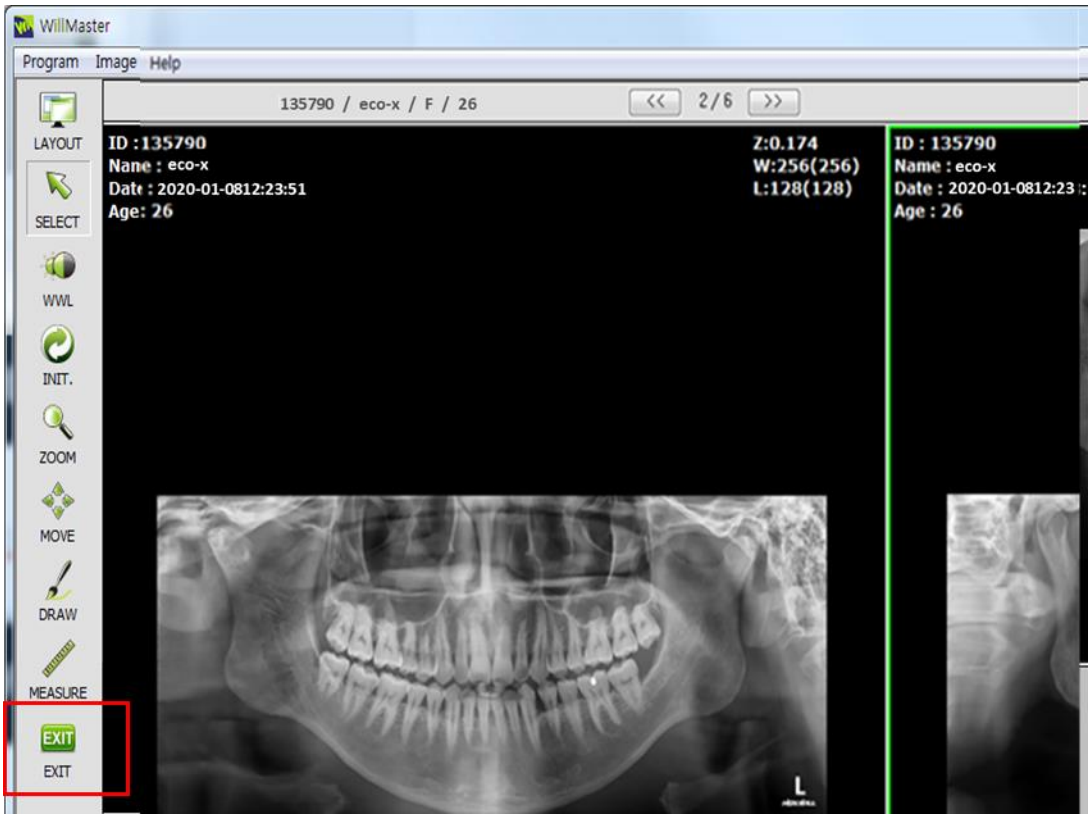


4) If you want to compare multiple images more than two images, select the appropriate [LAYOUT].



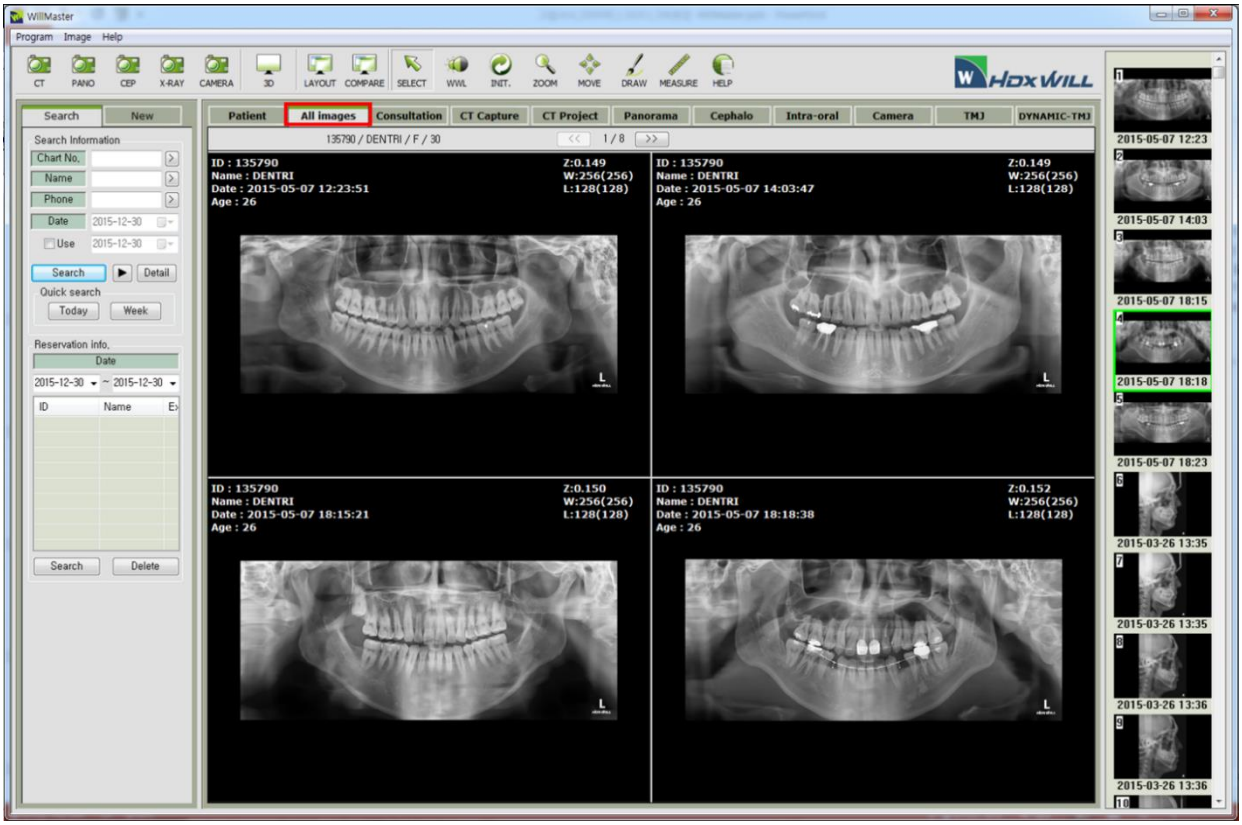


5) Click the EXIT button, or mouse wheel to exit the Compare mode.



5.3 All Images

All images except for CT images appear in the [All Images] tab.



1) Moving pages

You could move the page in one of three ways:

① Click the direction button. (<< >>)

② Click the image and use the mouse wheel

③ Click the thumbnail images

2) Changing the layout

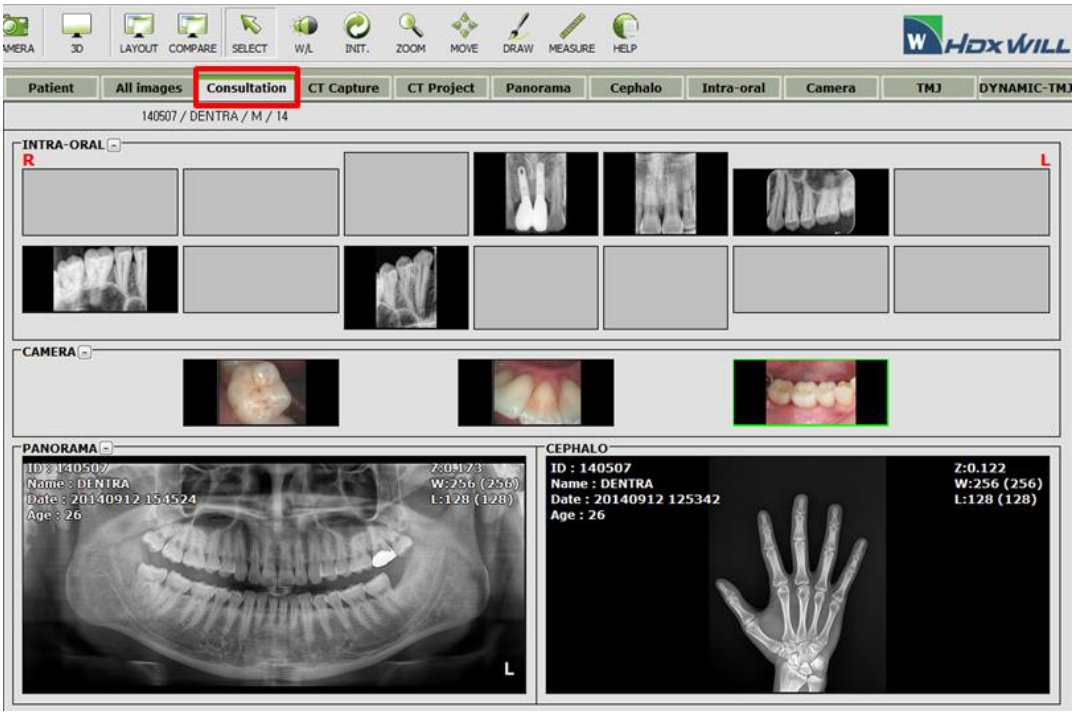
You could change the layout in one of belows:
There are two ways to change the layout.

① Change the layout in the toolbar.

② Double click the image (the current layout and 1X1 toggle)

5.4 Consultation

Provides features which can check various types of images in one screen.



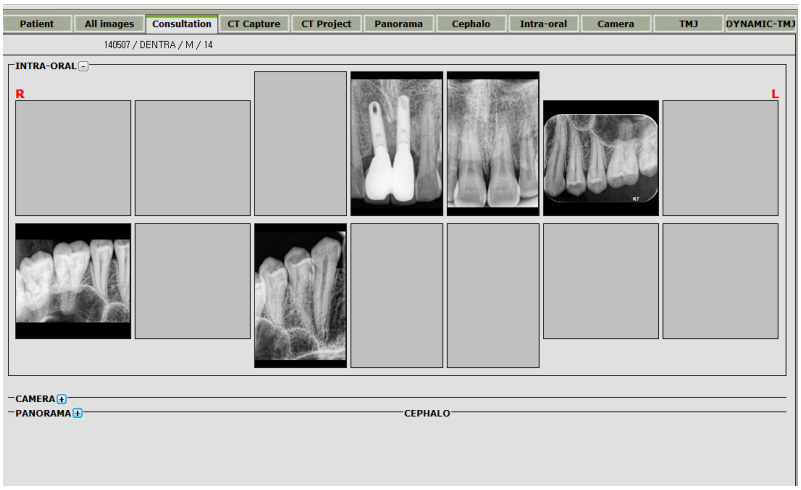
When you select the [Consultation] tab the first, the thumbnail on the right side of the screen does not appear.
When you click the left image, image of that kind appears on the thumbnail and you can see different images of the same kind using the mouse wheel.
To move to the images of that kind, double click the images (For example, moving to a panoramic image by double clicking [Panorama] tab)

If the position of the teeth is incorrect, you may want to move the position by clicking the left mouse button and dragging it to its new location.

5.4.1 Zoom in/out by Image type

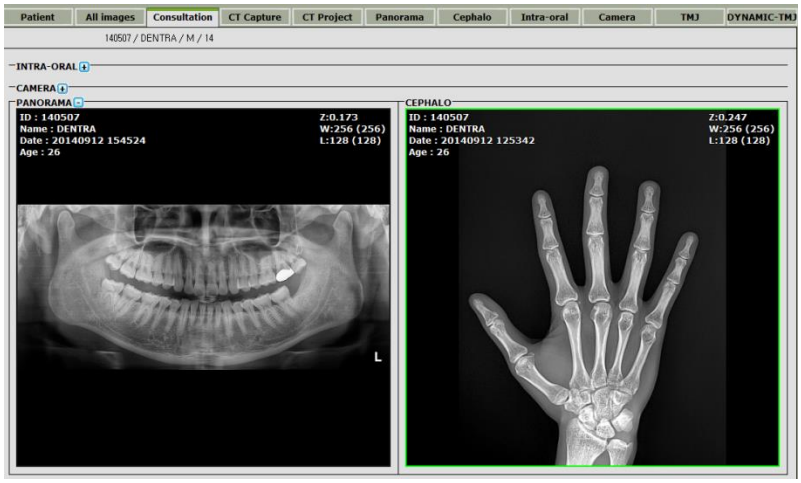
Image can be zoomed in/out by using -, + buttons next to the INTRA-ORAL, CAMERA, PANORAMA in the Consultation tab.

(1) Enlarged INTRA-ORAL Image



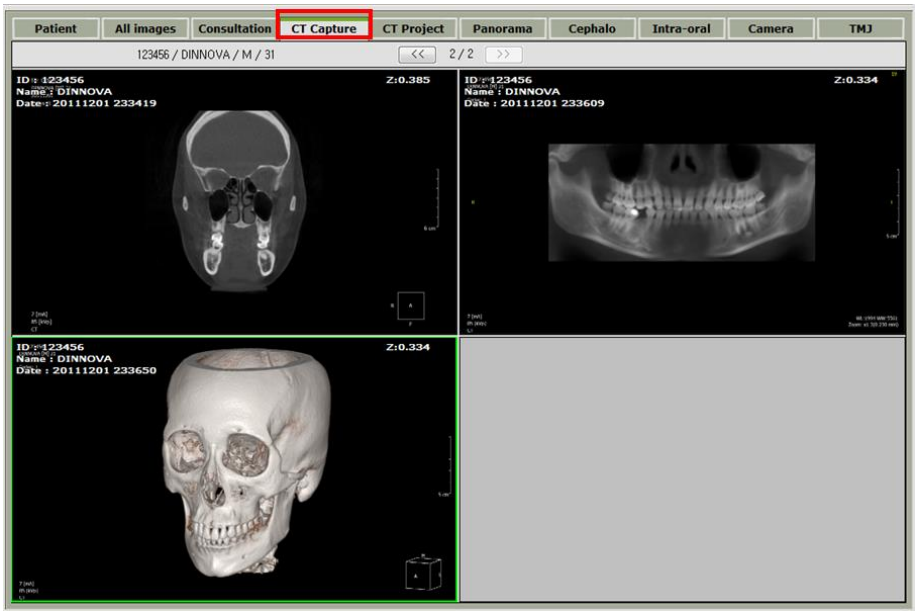
(2) Enlarged CAMERA Image

(3) Enlarged PANORAMA & CEPHALO Image



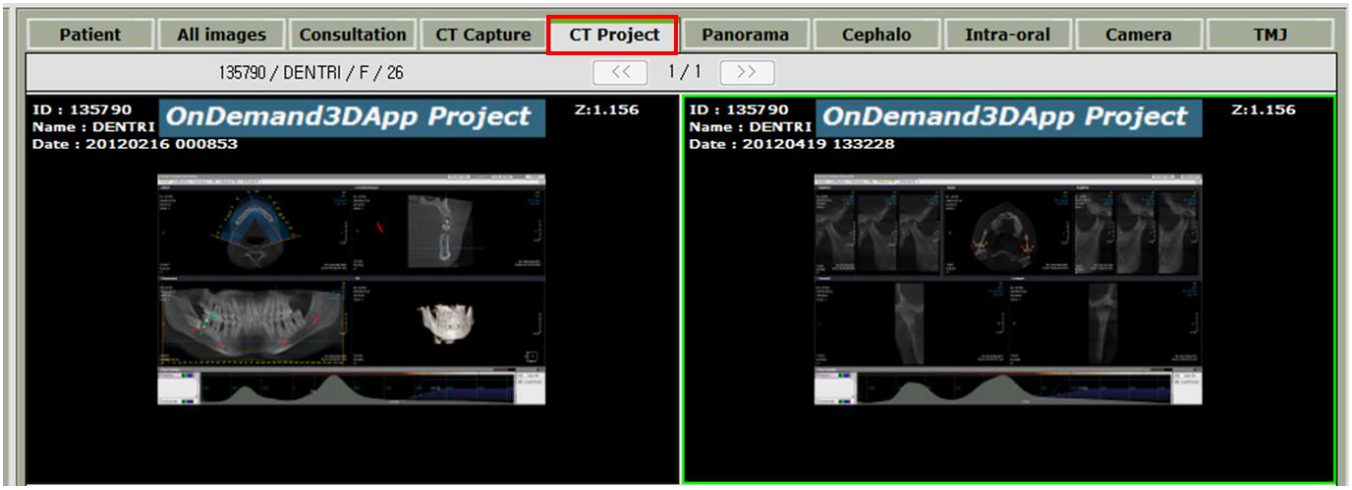
5.5 CT Capture

Shows a single CT image captured in the 3D viewer.



5.6 CT Project

Shows the saved project file in the 3D viewer.



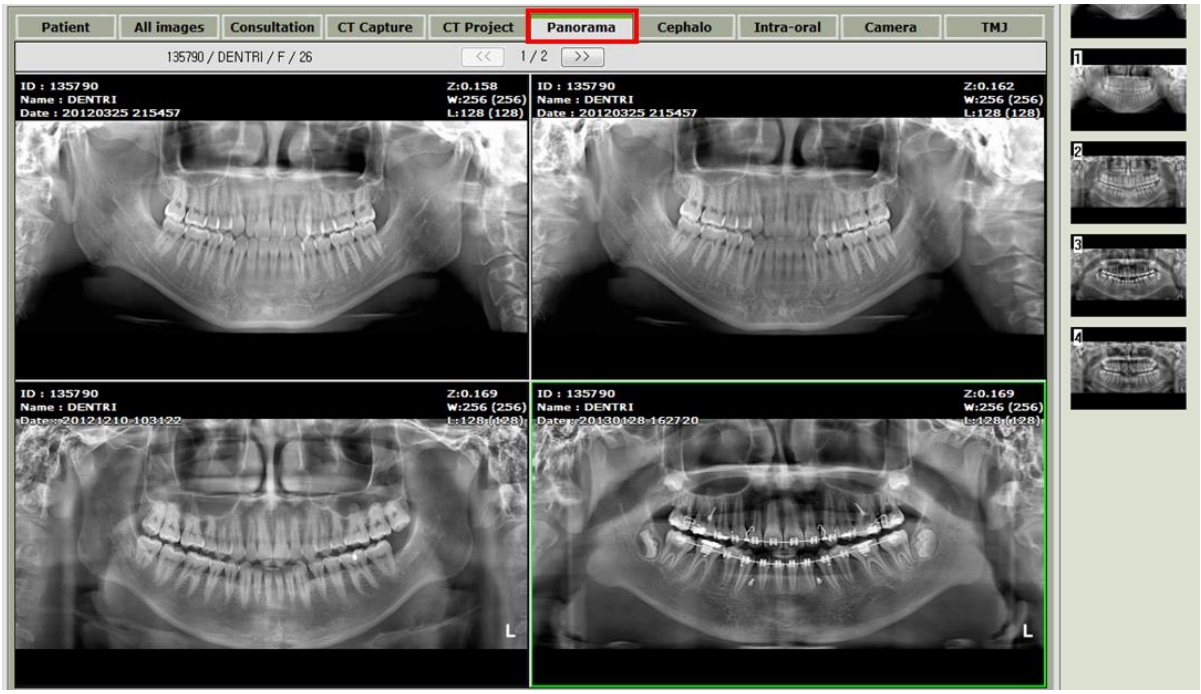
There are two ways to open a project file in the 3D viewer.

(1) Double click the thumbnail of the project from [All Images] or [CT Projects] tab.

(2) Select the CT project on the image list of the [Patient] tab and click on the [3D View] button at the toolbar.

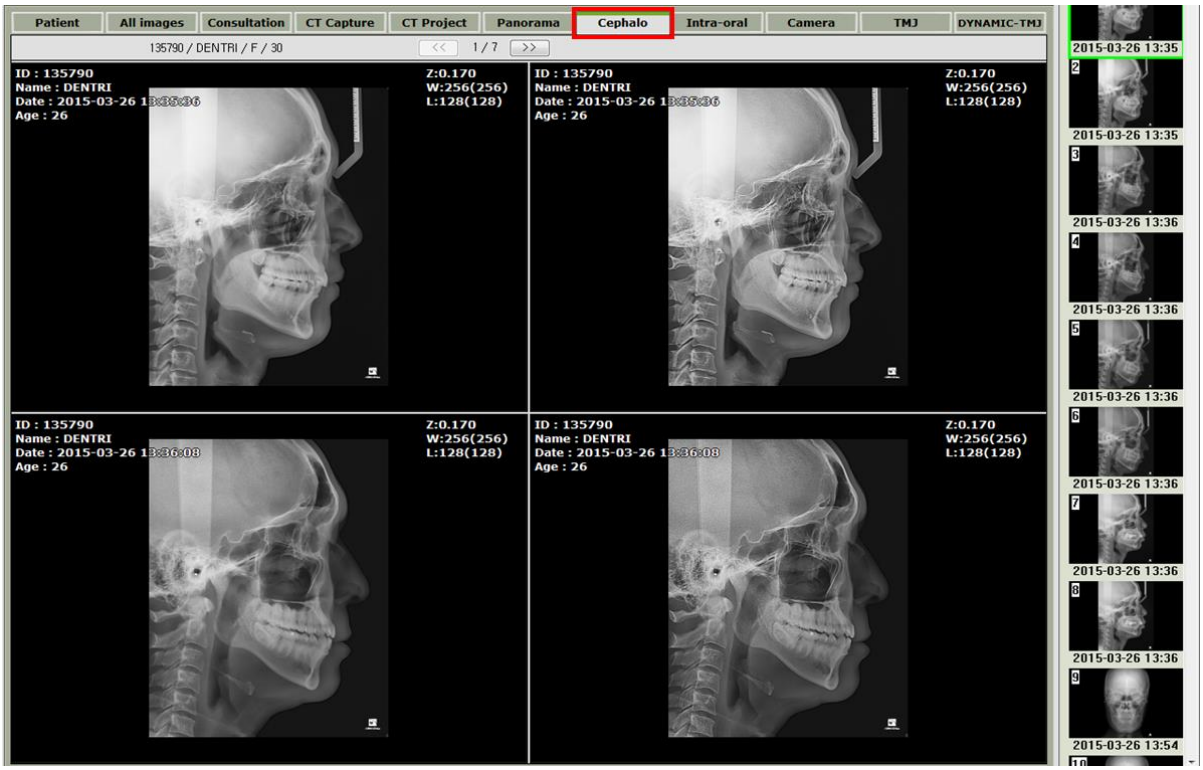
5.7 Panorama

Shows only the panorama images that is selected from patient's images.



5.8 Cephalo

Shows only the cephalo images that is selected from patient's images.

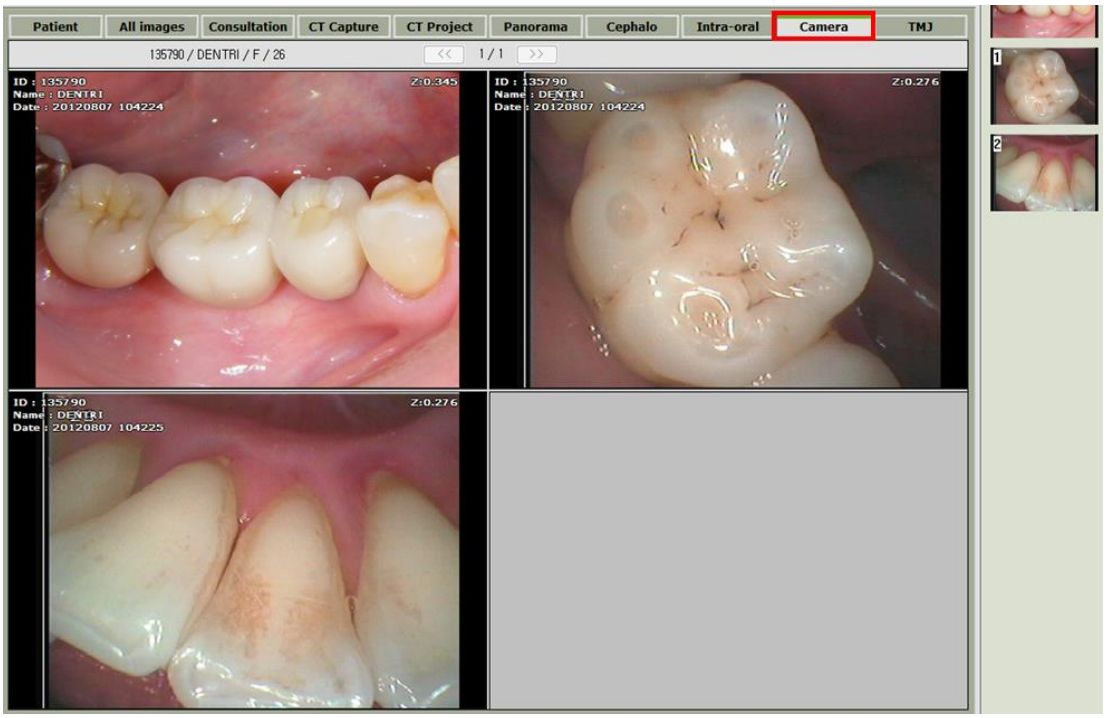


5.9 Intra-Oral

Shows the image that is specified by the oral sensor of the selected patient's image.

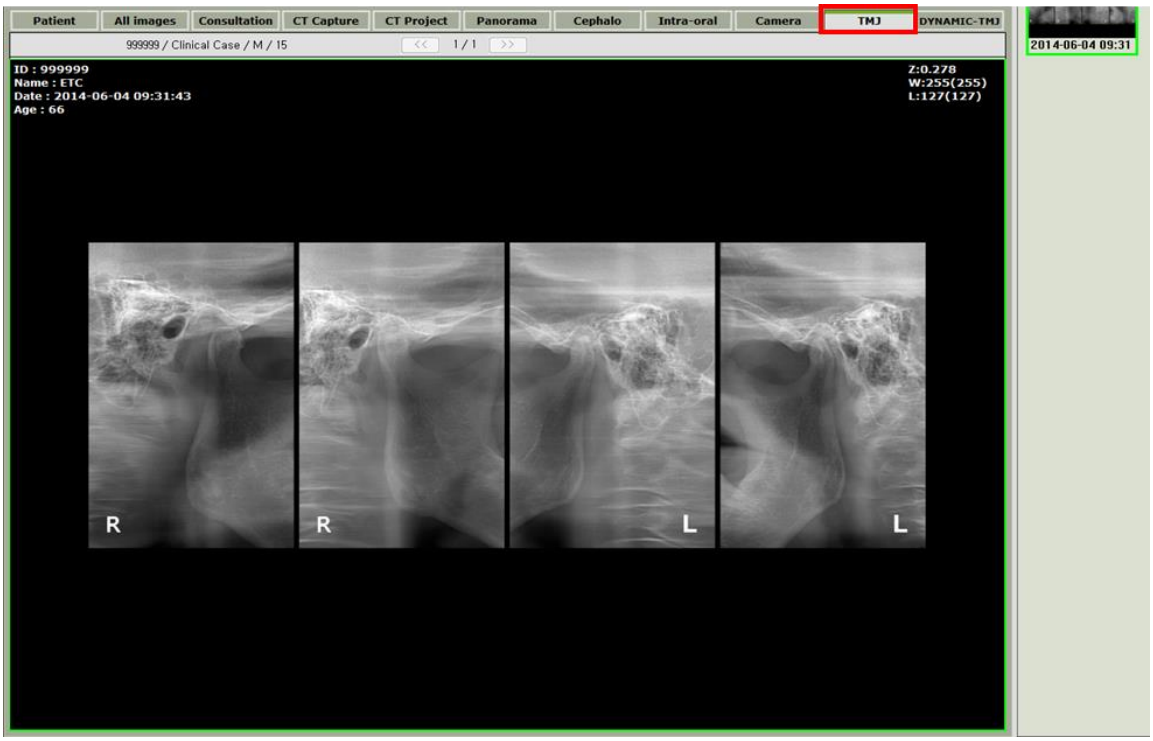
5.10 Camera

Shows the image that is specified by the oral camera of the selected patient's image.



5.11 TMJ

Shows TMJ images of patient.



5.12 DYNAMIC-TMJ

Show images specified by the DYNAMIC-TMJ from the selected patient's image.

Chapter 6. Image Management

This chapter explains how to import and export captured images.

6. Image Management

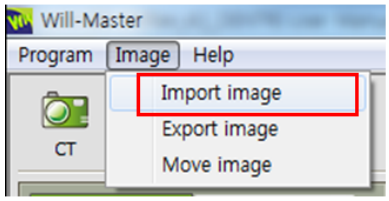
Save currently selected patient's image as DICOM and other formats (Image Export), or include external images in patient's image (Import Image).

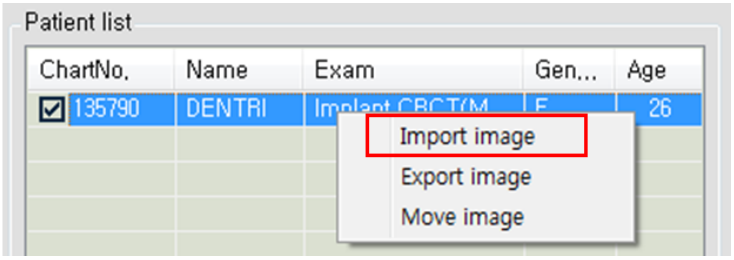
Can use the pop-up menu, [Image] or [Patients], from the Main Menu.

6.1 Import Images

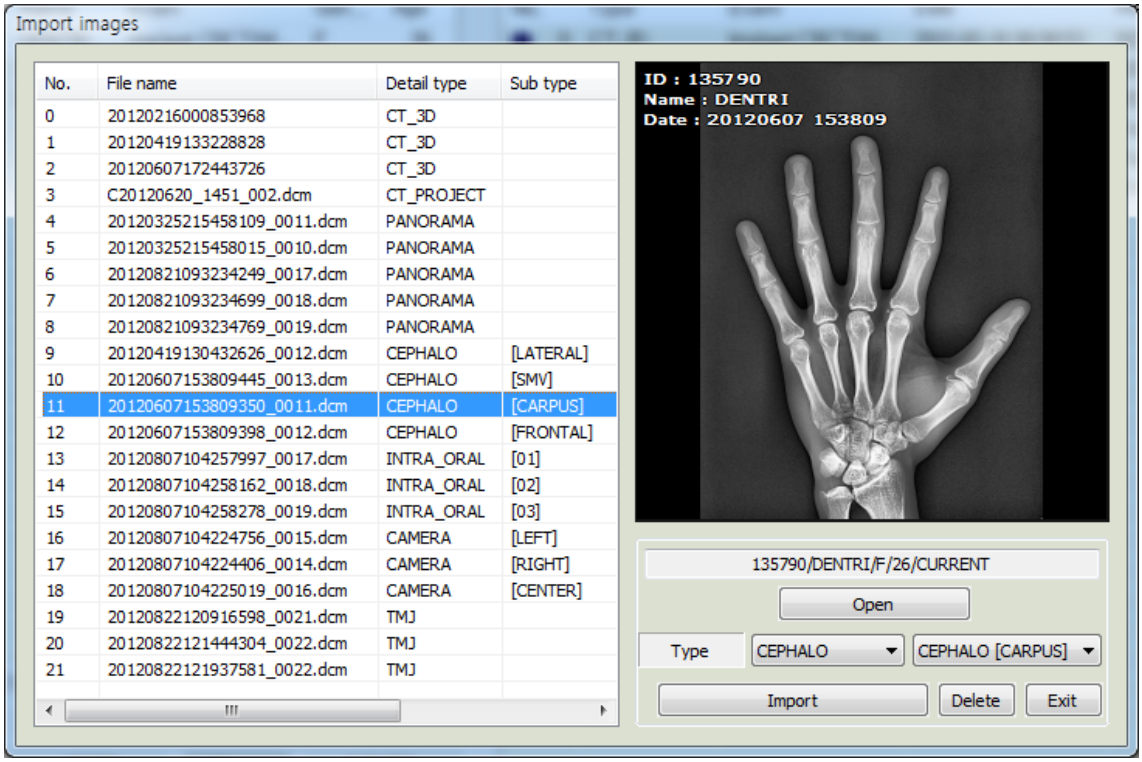
1) Select a patient to enter the image from the [Patients].

2) Select [Import Images] menu.



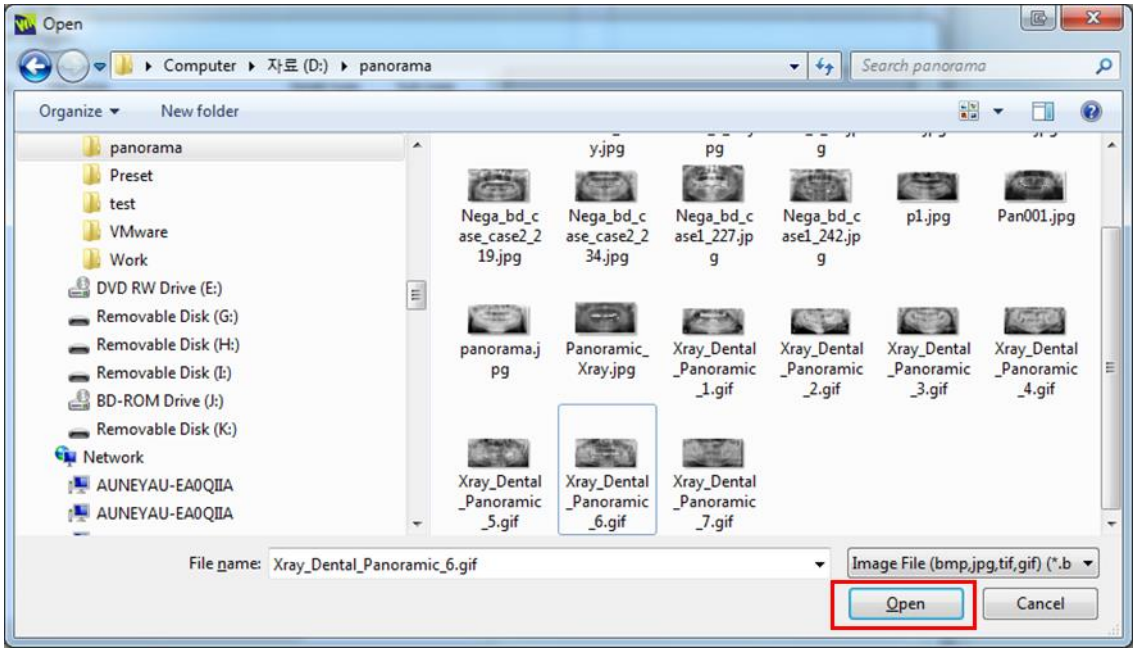


If you click an item in the list on the left, image will be displayed on the right.

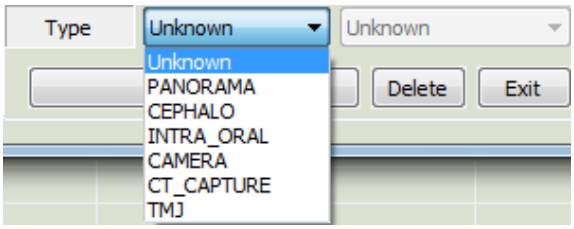


3) Click on the [Open File] button.

Select the type of image as [File Type]. Select the new image that will be entered, and click on [Open] to add to the list.



4) You must select the type of image. When the desired image is selected, specify the image types and the type of details.



5) When you are finished with adding images, click on [ENTER] button to save your work.

6) The image can be deleted using pop-up menu and the [Delete] button.

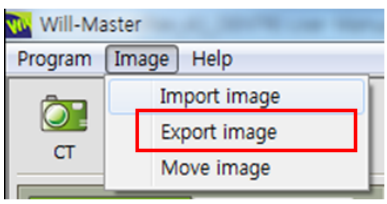
If you delete patient's currently loaded image, the image will be reloaded after (5) of the process.

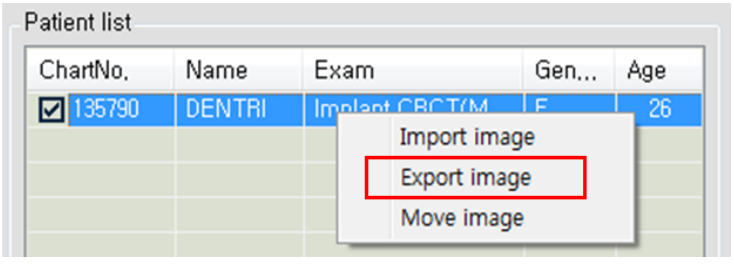
6.2 Export Image

6.2.1 Exporting using the menu

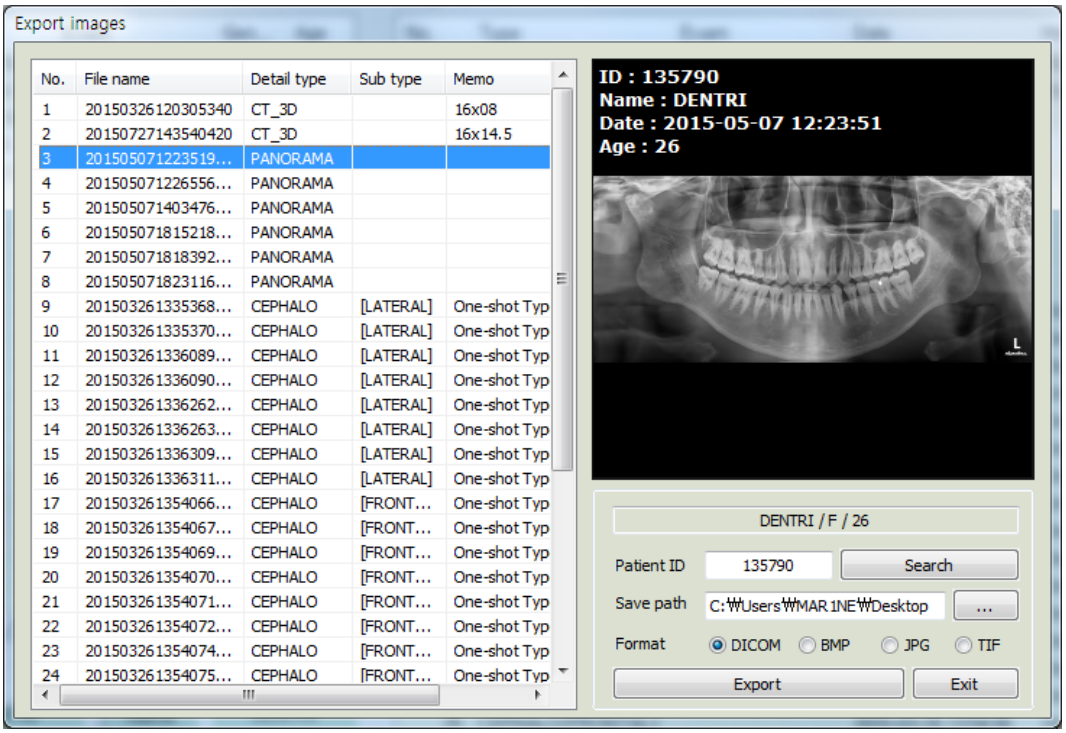
1) From the [Patient list], select the patient

2) Select the [Export image] menu
- You can use the pop-up menu in the Patient list and the Image of the main menu.





If you click an item in the list on the left, image will be displayed on the right.



3) From the list on the left, select the image you want to save.

4) Click the [Search] button to select where the image will be saved.

When you click an item in the list, the image is displayed on the right-had side.

5) From the list on the left, select the image that will be saved.

6) Click the [Search] button to specify the location of the image to be stored.

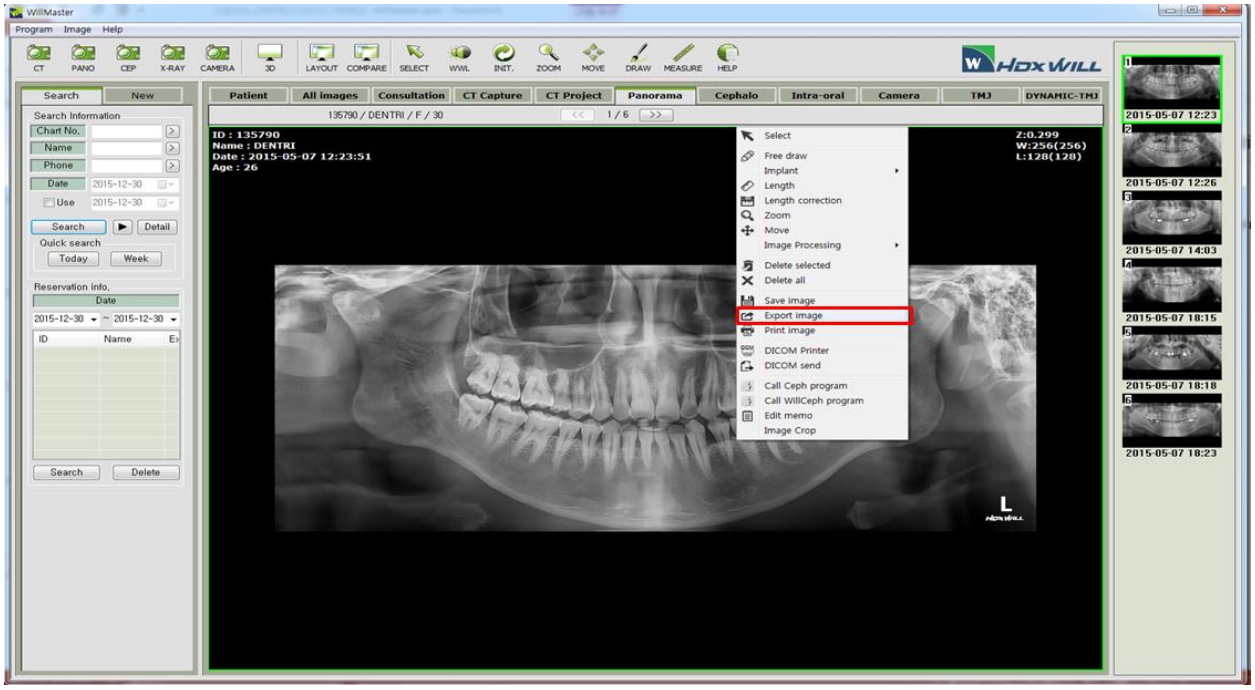
7) From the [Format], select the type of file where the image will be saved.

8) If you click on the [Export] button, selected image will be saved in the specified folder.

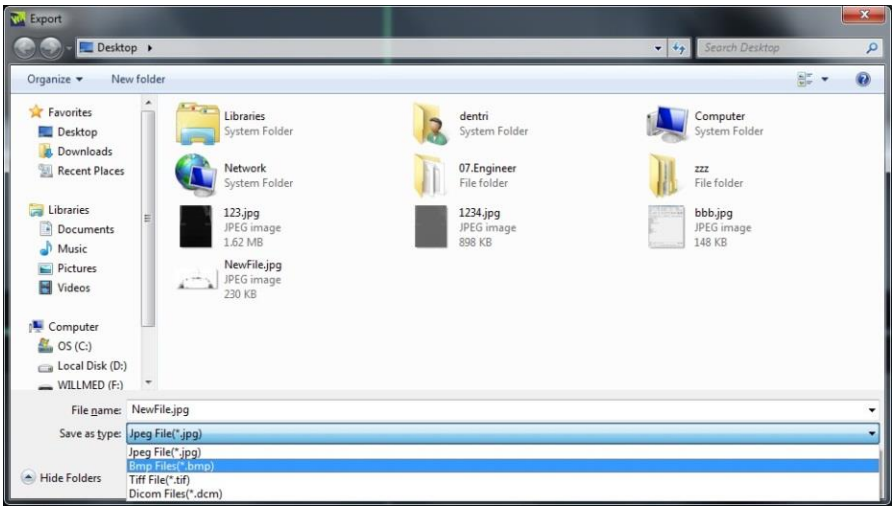
9) Enter patient's ID and click the [Search] button to change other patient's information.

6.2.2 Export from the screen mode

1) Click the right button on the output image to bring up a pop-up menu.



2) After selecting the [Export Image], select the file name and file format that will be saved.

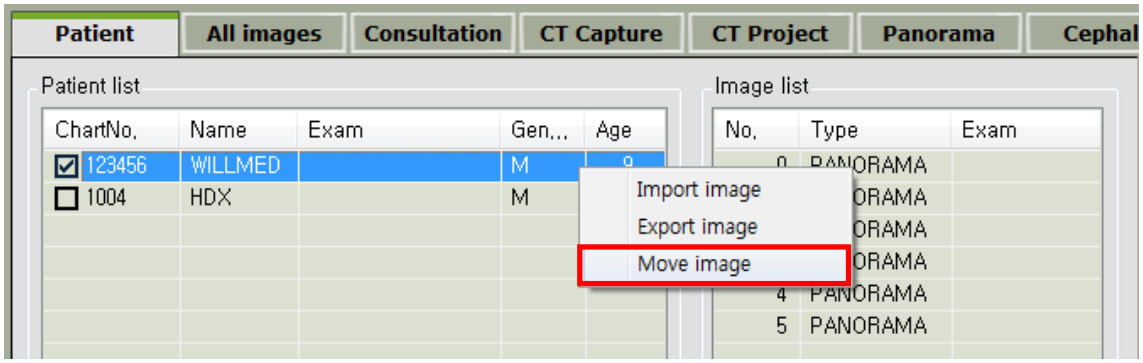


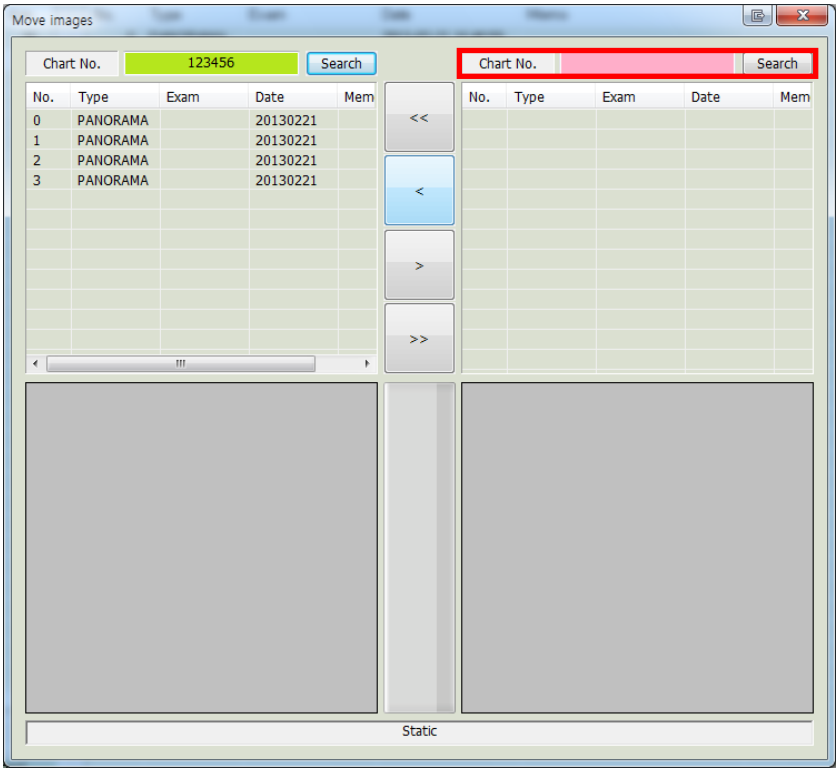
3) If you click the Save button, exporting of an image completes.

6.3 Move the image

6.3.1 Move using the Menu

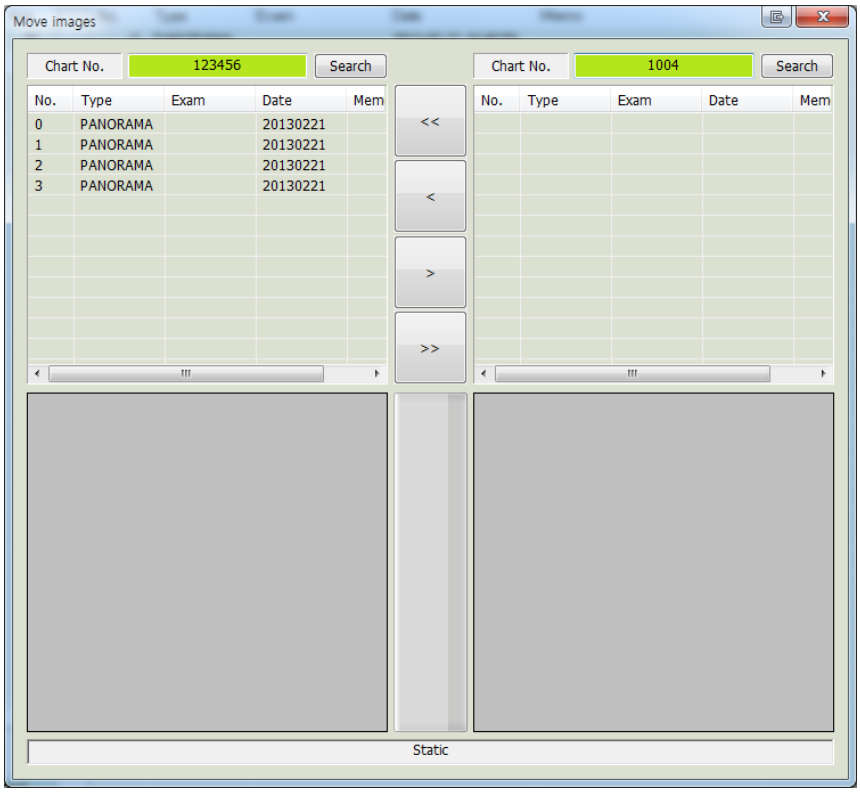
1) Right click on the 'Move Image' from the [Patient list].



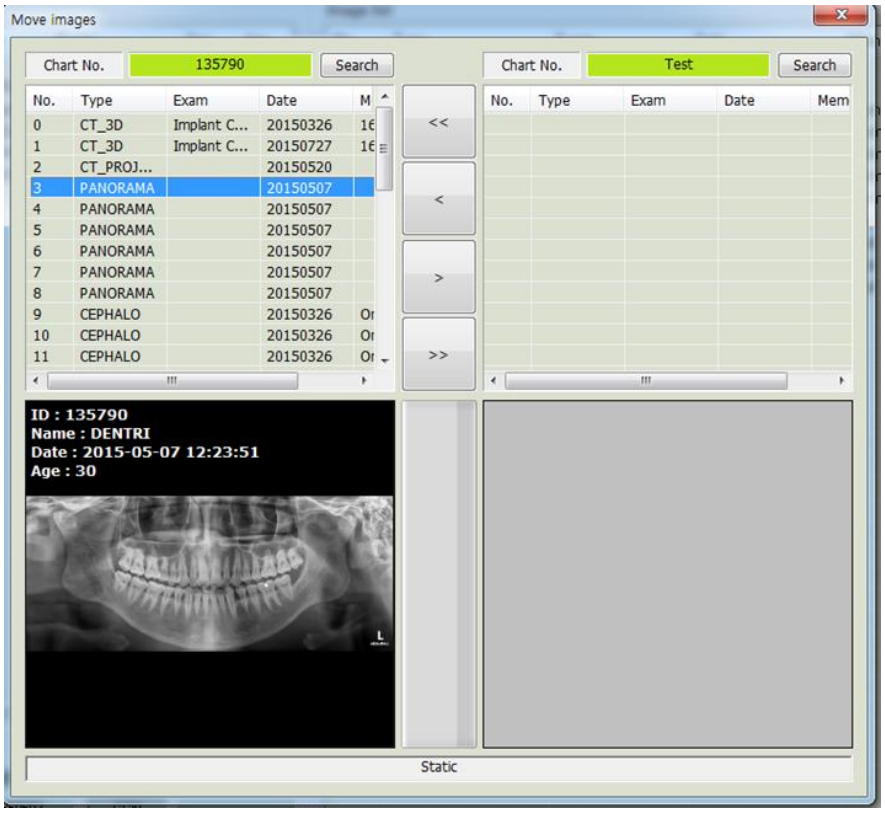


2) Enter the chart number of the patient to move the image.

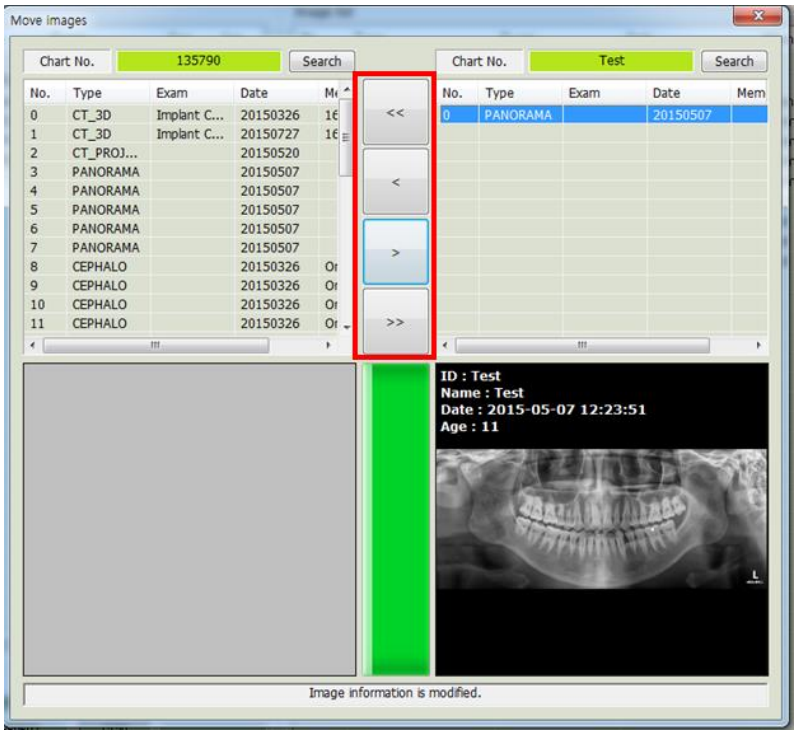
- After entering the chart number, click on the ENTER button or Search button, then the window turns green.



3) Select the image that will be moved from the list on the left.



4) When you click on the Move button, the image moves.



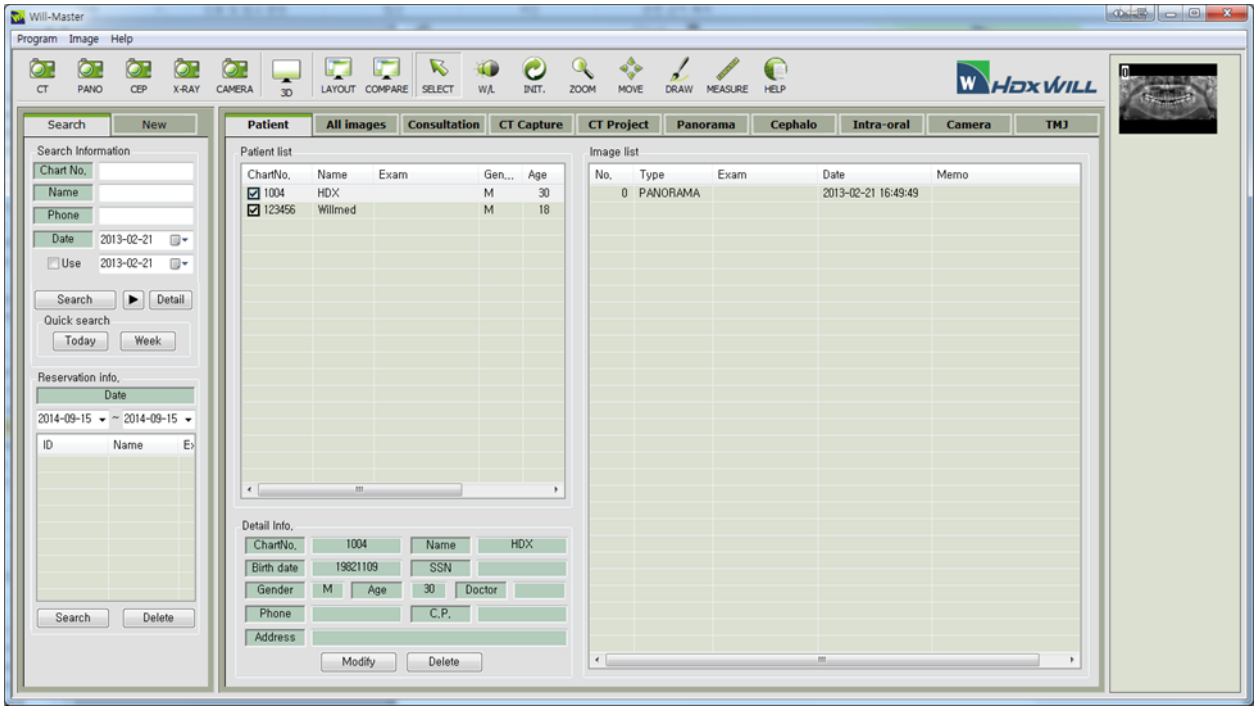
The whole image of patient on the right side moves to the patient on the left side

Selected image of patient on the right moves to the patient on the left

Selected image of patient on the left moves to the patient on the right

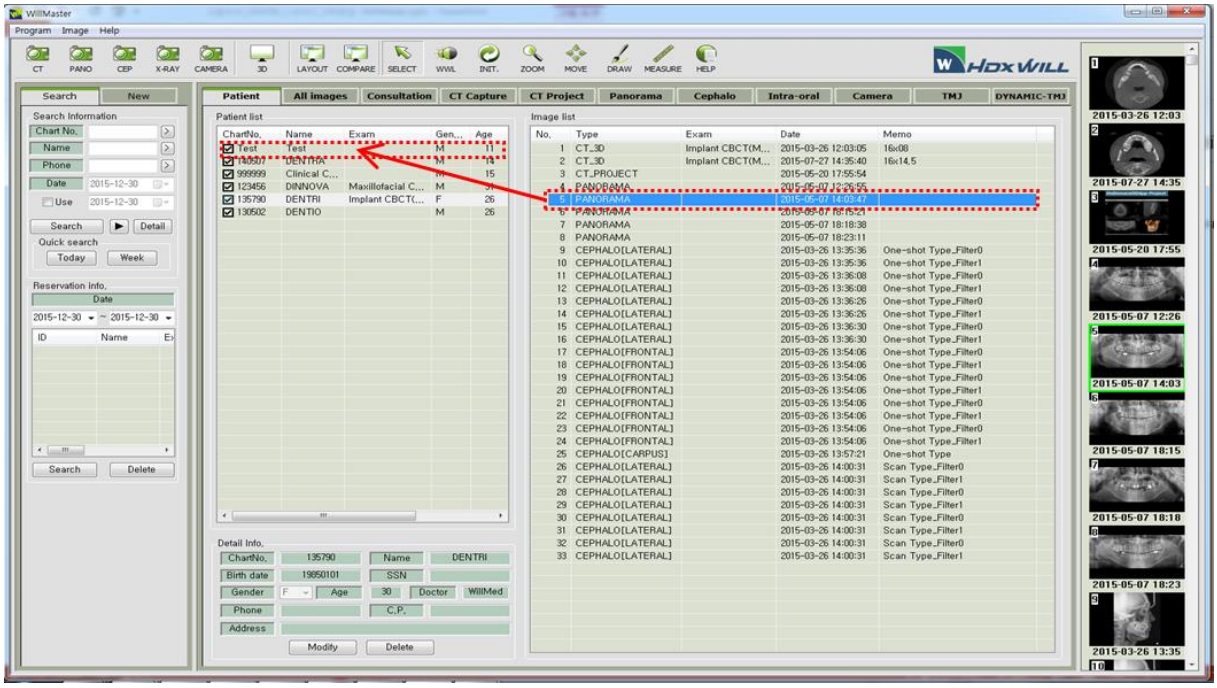
The whole image of patient on the left side moves to the patient on the right side.

5) Exit the 'Move' window, and check the moved images.

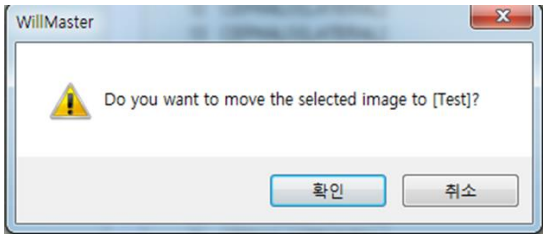


6.3.2 Move using the mouse drag

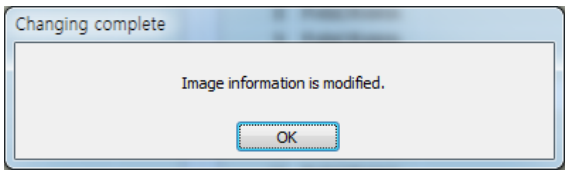
1) Select the image to be moved, and drag it to the patient in the patient list.

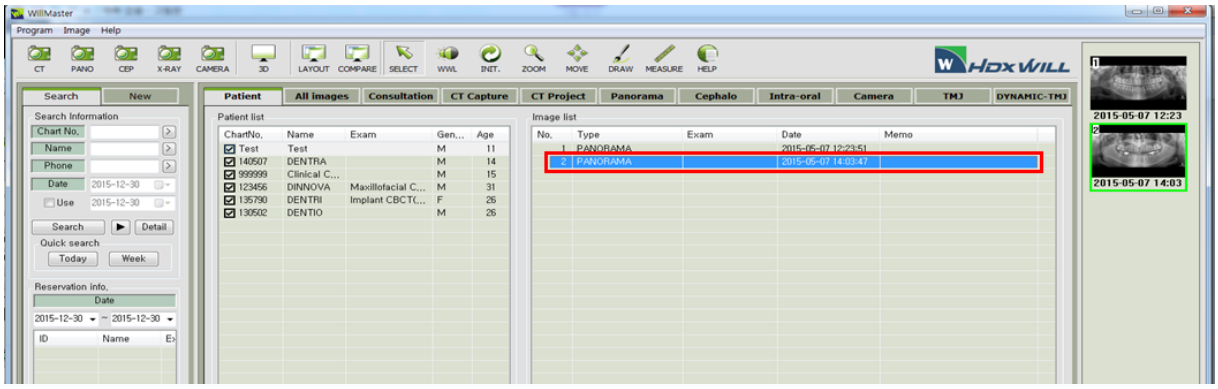


2) Click the OK button.



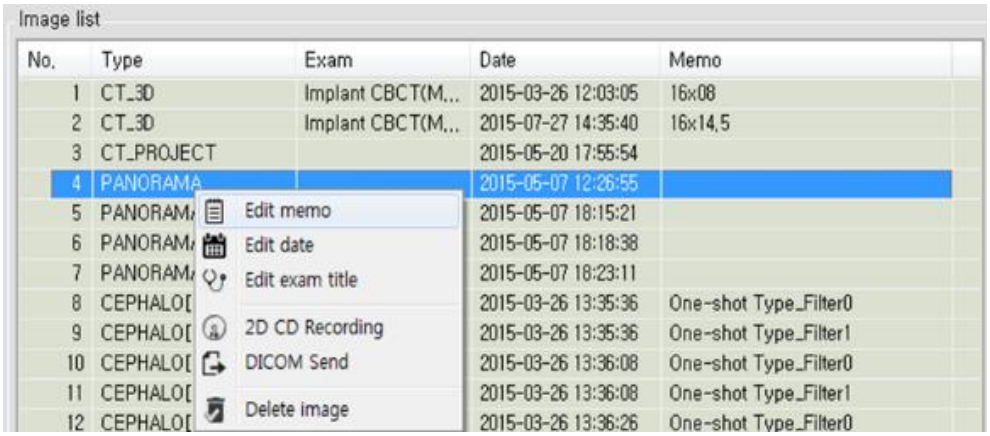
3) Once the move is completed successfully, the complete window appears, and you can see the moved image.



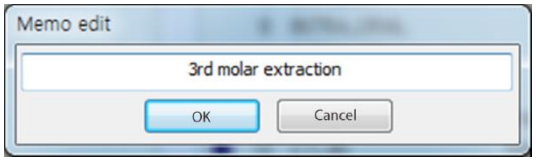


6.4 Image List Management

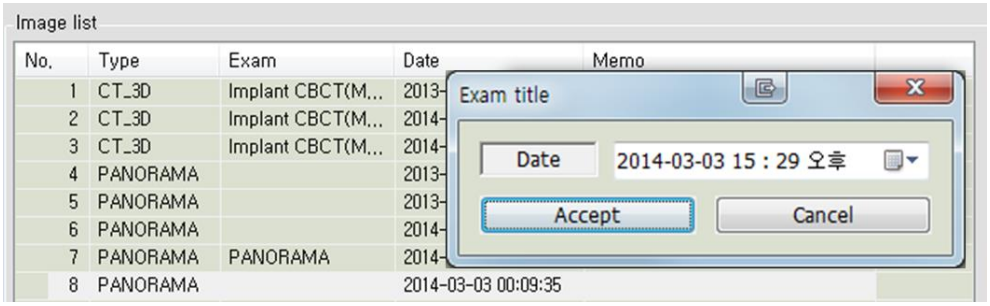
Simple memo and exam tile can be save for each capture list.
Select Edit memo, Edit date, and Edit exam title, pop-up menu of the capture list and in the window that appears, type memo, date, exam title.



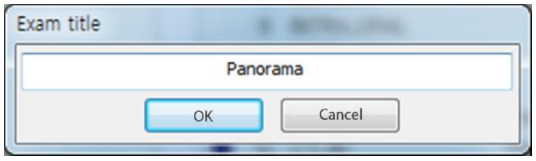
(1) Memo edit



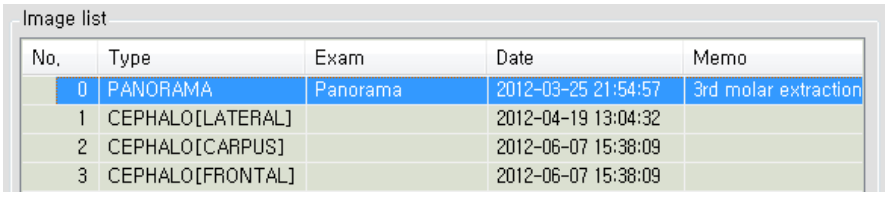
(2) Edit date



(3) Exam name edit

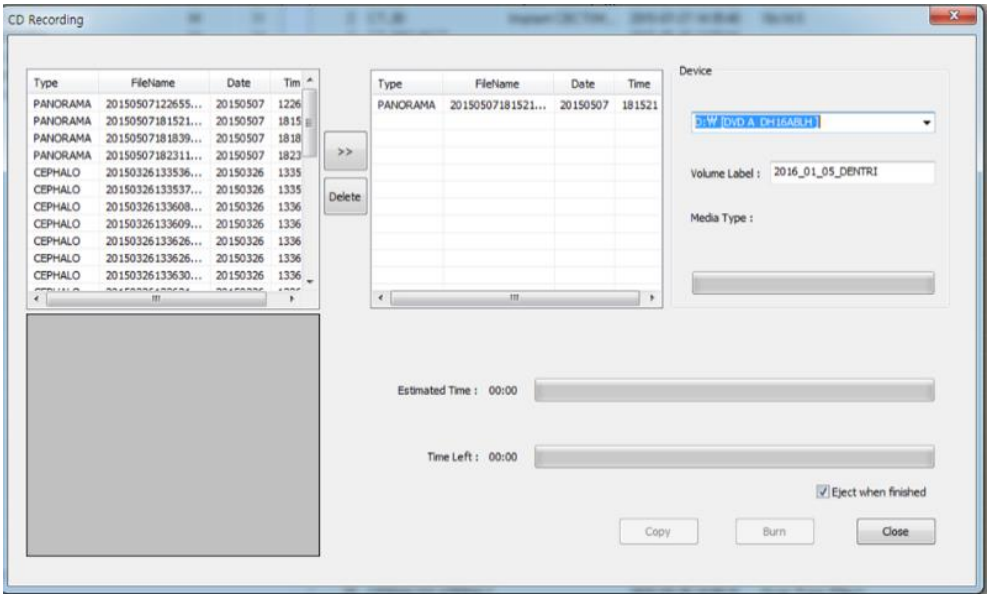


Press the [OK] button to apply each screen as shown below.



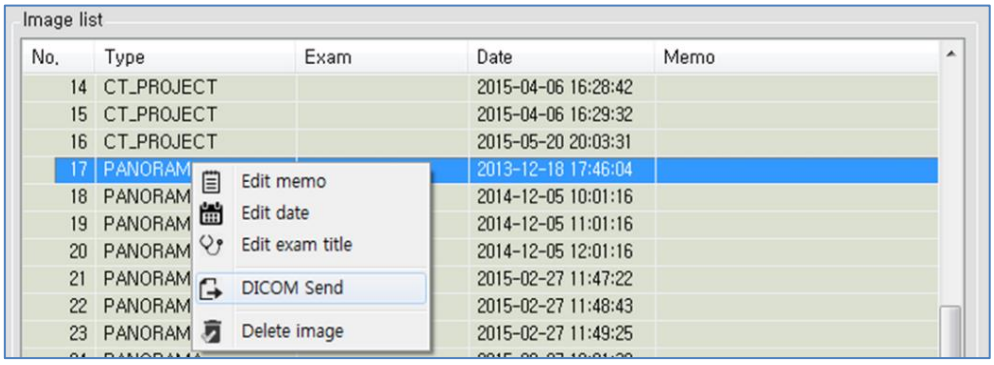
(4) 2D CD Recording

Copy the selected image to USB or CD.



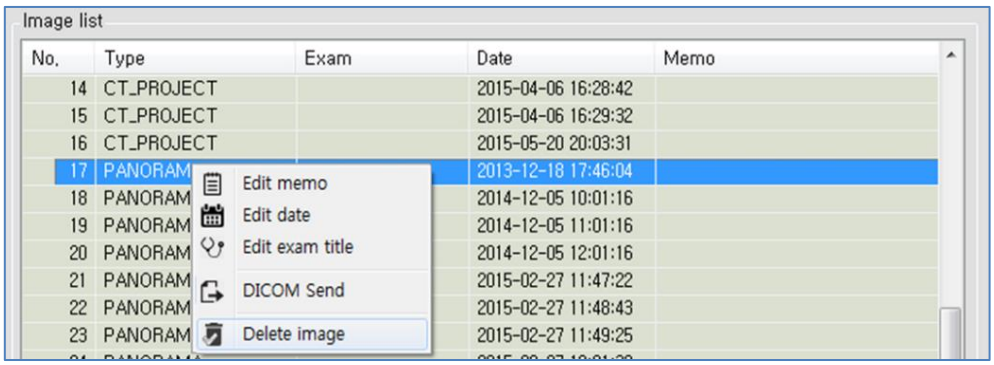
(5) DICOM Transfer

Transfer the image to the PACS by image type.



(6) Delete image

Select the image you want to delete and click the right mouse button, then click the [Delete image] button. Deleted images cannot be recovered, so must consider when deleting images.



Chapter 7. Image Processing

This chapter describes the features of revising images for better diagnosis.

7.1 Image Processing

To assist in the diagnosis, several image processing functions are available. Because images that went through image processing is temporary, you can save it permanently as well.

(1) Brightness/Contrast

When you click the button on the main toolbar on the left, the mode will be switched where you can change the brightness and contrast of images.
In this mode, you can change the brightness/contrast of images by dragging over the image vertically / horizontally.

> When adjust the image brightness

> When adjust the image contrast

(2) Initialization

All operations that were applied to the selected image such as brightness/contrast, zoom, and move will be invalidated.

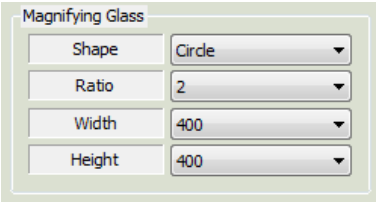
(3) Image Enlargement

The mode changes to adjust the magnification of the image. In this mode, the whole image or only a portion can be enlarged. When you drag the mouse down or up/ side to side, the entire image zooms in and zooms out. If you press and hold the right mouse button, the magnifying window appears that shows a portion of image magnifies.

NOTE

Capable to zoom in/zoom out the entire image regardless of the modes
Regardless of the modes, the image can be zoom in/zoom out using Shift + mouse drag.

The set value of the magnifying glass can be changed in the 'Draw Option' in Toolbar.



(4) Moving Image

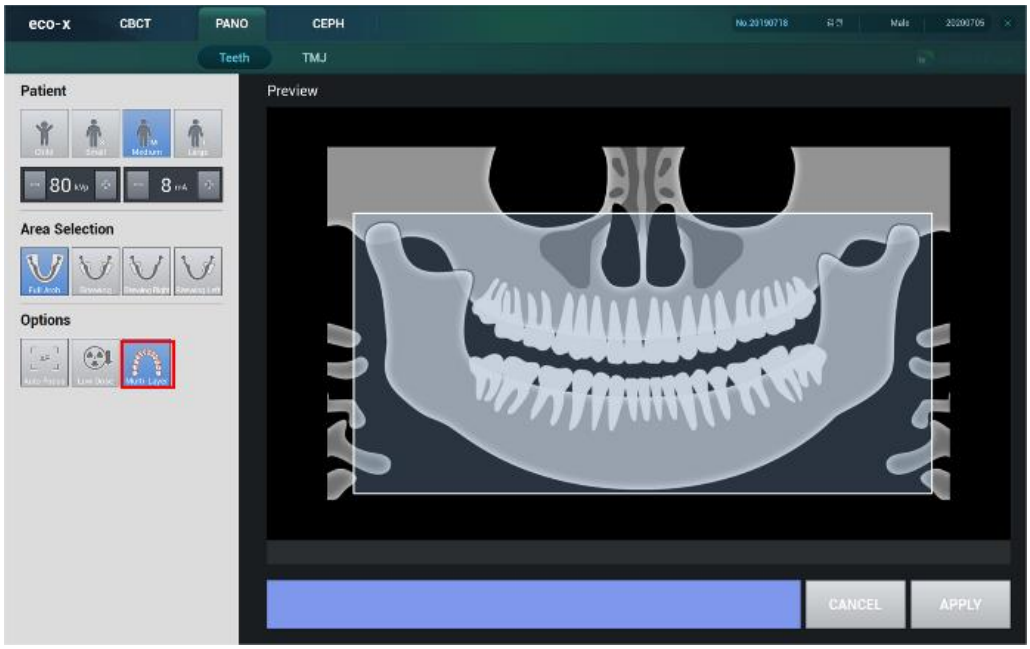
The mode changes to move images. When the entire image is magnified, it may not appear in one window. In this case, select the image mode and drag the mouse to see where the image does not appear on the screen.

7.2 PANO Multi-Layer

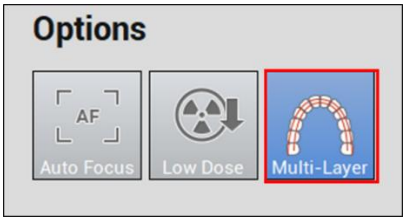
This function is to check the image which is focused in the desired area by users by changing the depth information in the panorama trajectory.

7.2.1 Image Capture

1) Select the 'PANO Multi-Layer' button on the Panorama capture program.



2) In the Pano shooting Program Options, select the Multi-Layer shooting option and take it.



NOTE

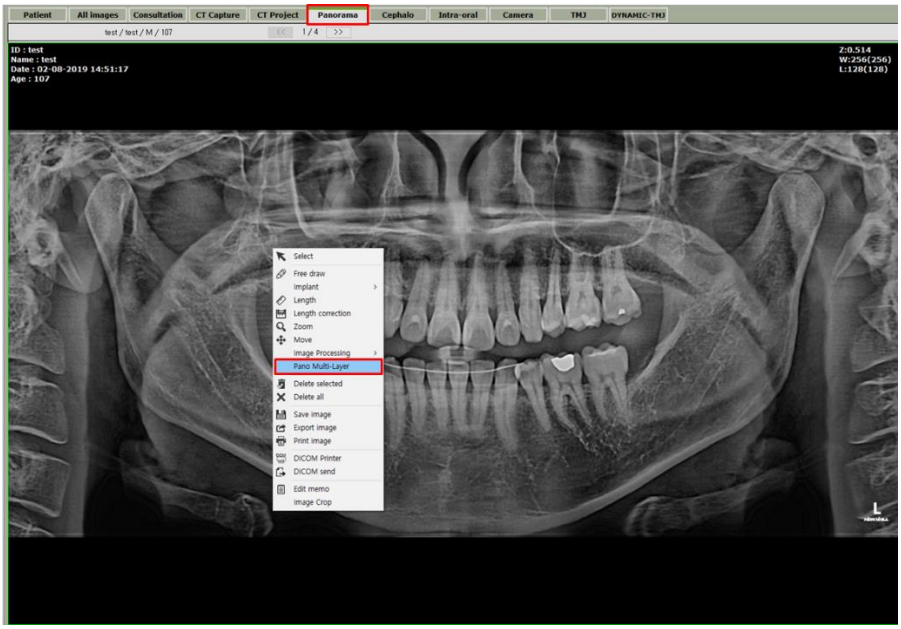
The method of capturing PANO Multi-Layer is the same with normal pano.
The PANO Multi-Layer function is provided as option.
PANO Multi-Layer icon is displayed on the top toolbar of Will-Master if the PANO Multi-Layer option is selected.

7.2.2 Check Multi-Layer image

PANO Multi-Layer function can be applied by selecting one of the following expressions as an option.

7.2.2.1 How to determine on the existing image (Option 1)

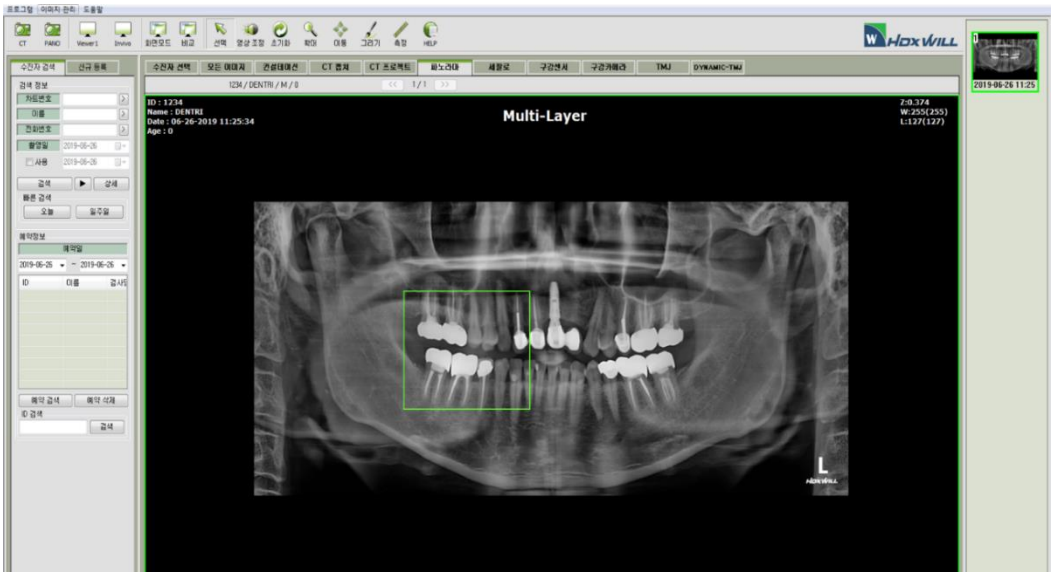
1) The pop-up menu is shown when to click the right button of the mouse on the image tap of Panorama. Select ‘Pano Multi-Layer’.



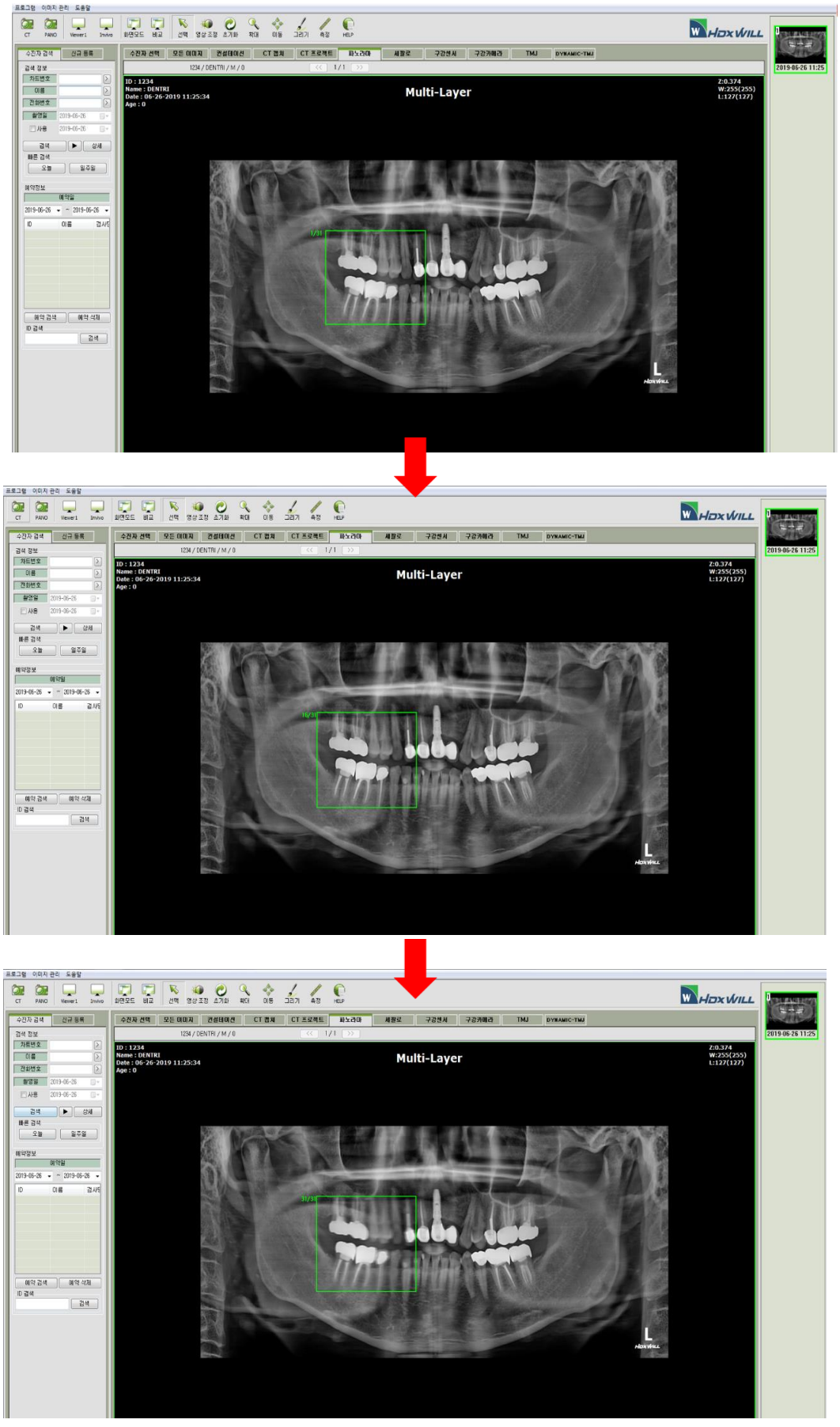
NOTE

The 'PANO Multi-Layer' button does not appear in images taken in normal panoramic mode.

2) Click and drag the left mouse button to set the interest area.



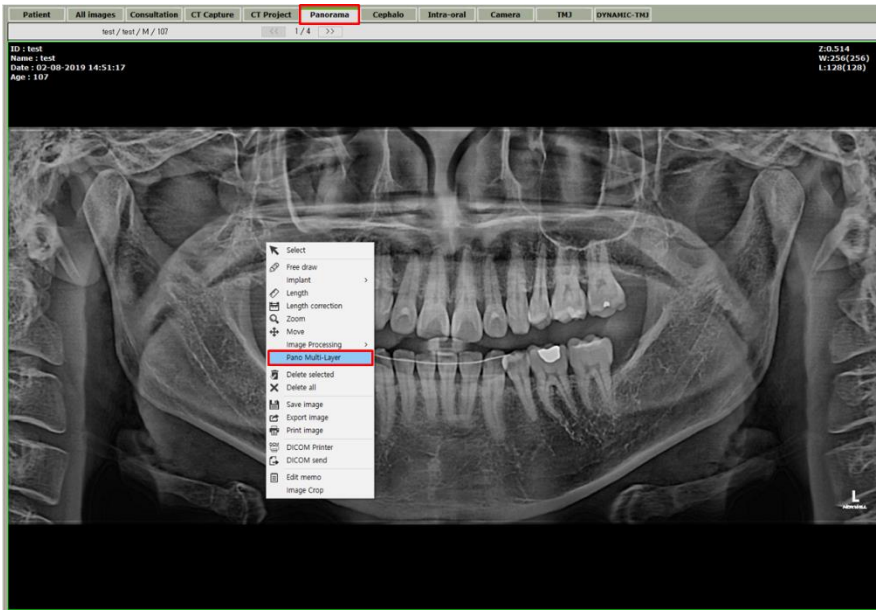
3) Check the Multi-Layer image by scrolling the mouse wheel on the interest area.
The focus of the image of the area is changed as shown below.



4) If you select the image with the best focus and click outside the interest area, the interest area display disappears and the image is saved..

7.2.2.2 How to determine on the Pop-up window (Option 2)

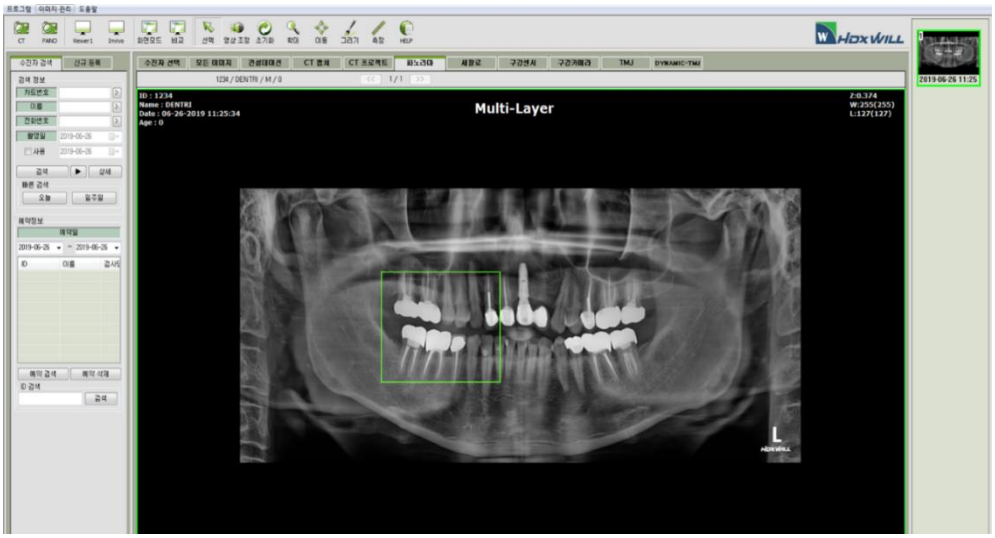
1) The pop-up menu is shown, when to click the right button of the mouse on the tap of the panorama image. Select ‘Pano Multi-Layer’ from the menu.



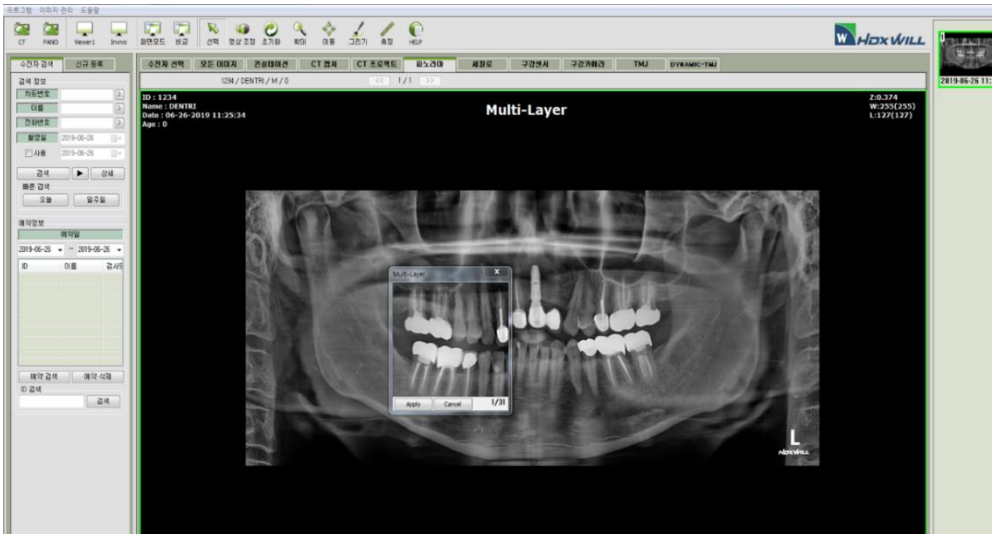
NOTE

The 'PANO Multi-Layer' button does not appear on images shot in the normal panorama mode.

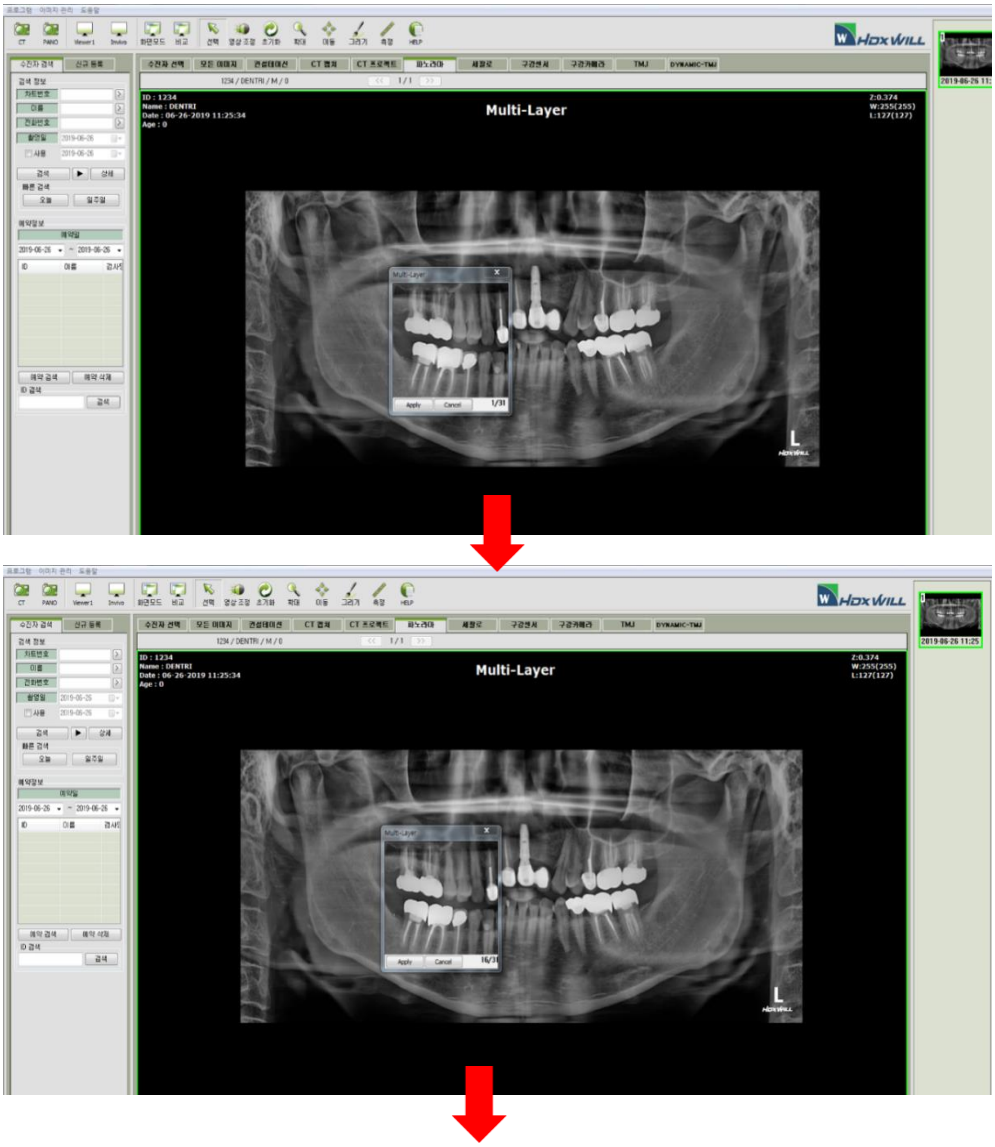
2) Click and drag the left mouse button to set the interest area that you want to see.

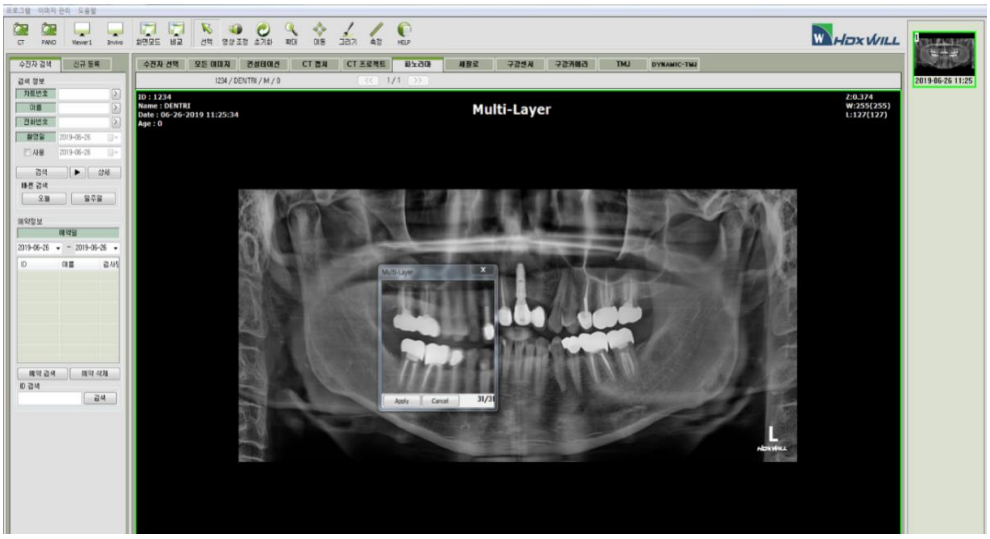


3) The pop-up window appears on the image as below.

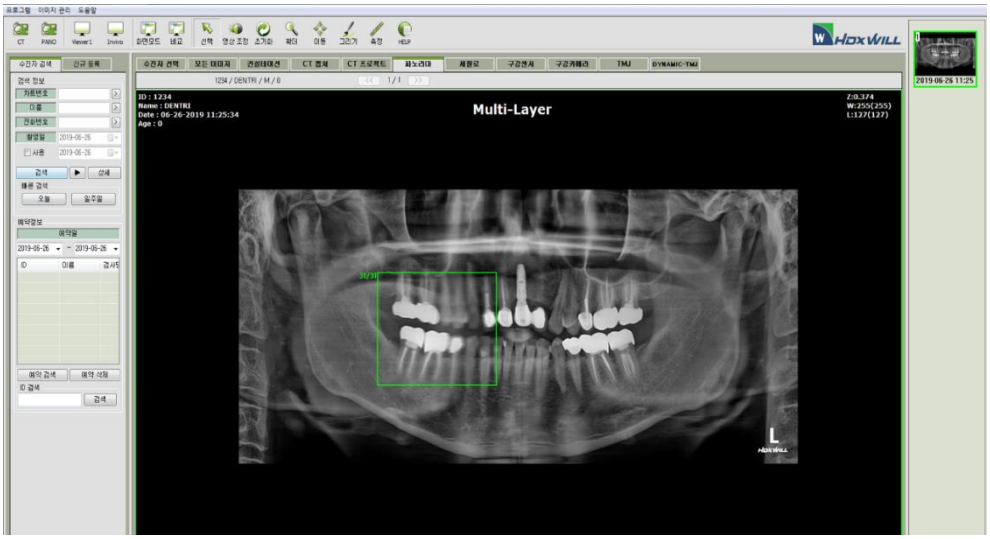


4) Check the Multi-Layer image by scrolling the mouse wheel on the pop-up window.
The focus changes on the image of interest areas as below.



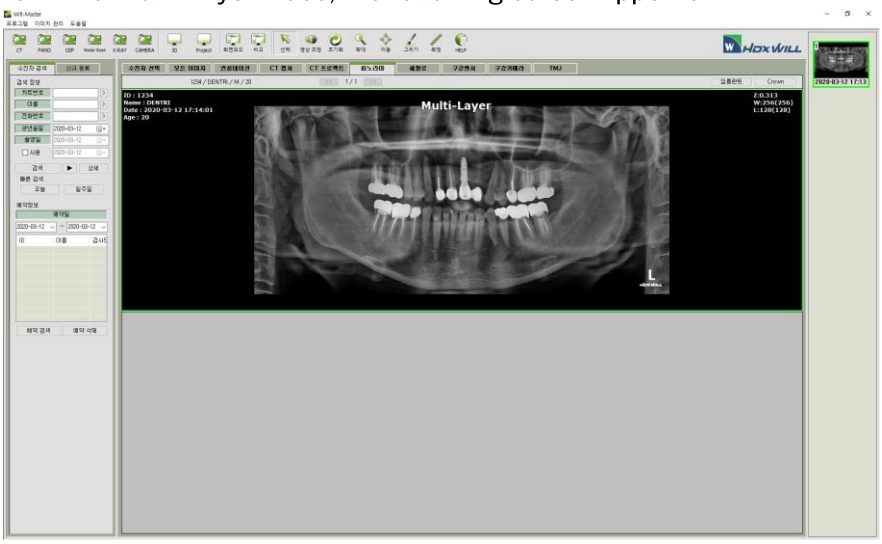


5) If you click [Apply] button, The selected image is applied to the existing image.

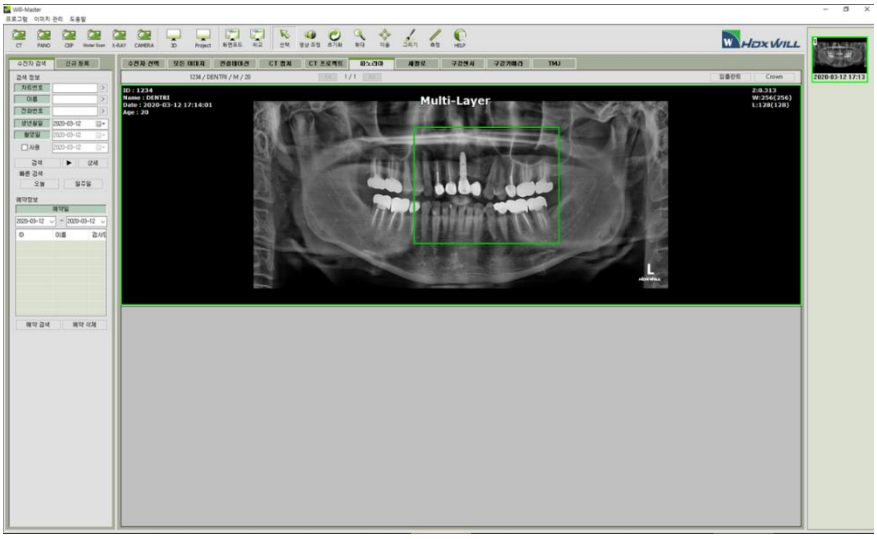


7.2.2.3 How to determine on the separated window (Option 3)

1) If you select the PANO Multi-Layer video, the following screen appears.

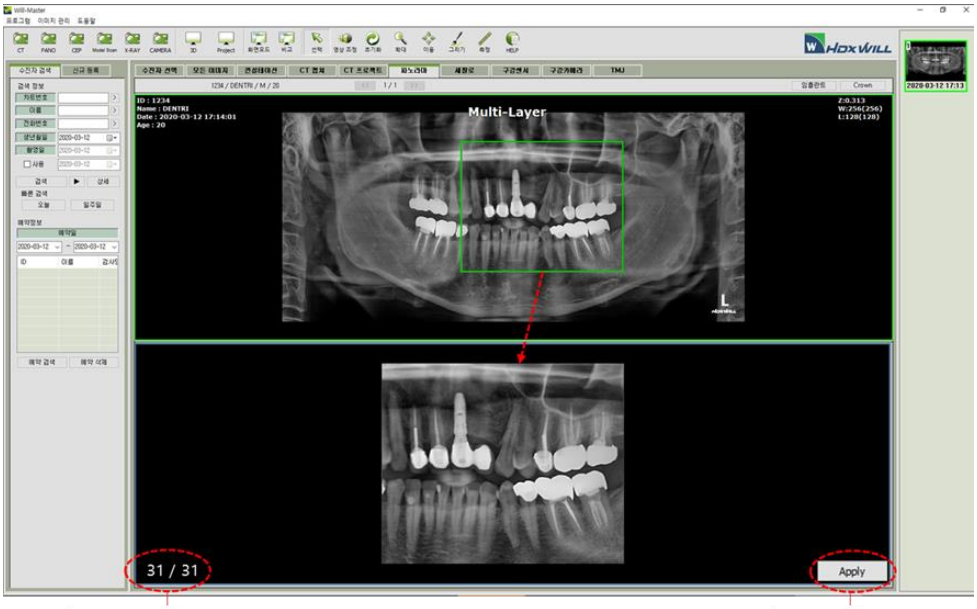


2) Click and drag the left mouse button to set the interest area that you want to see.

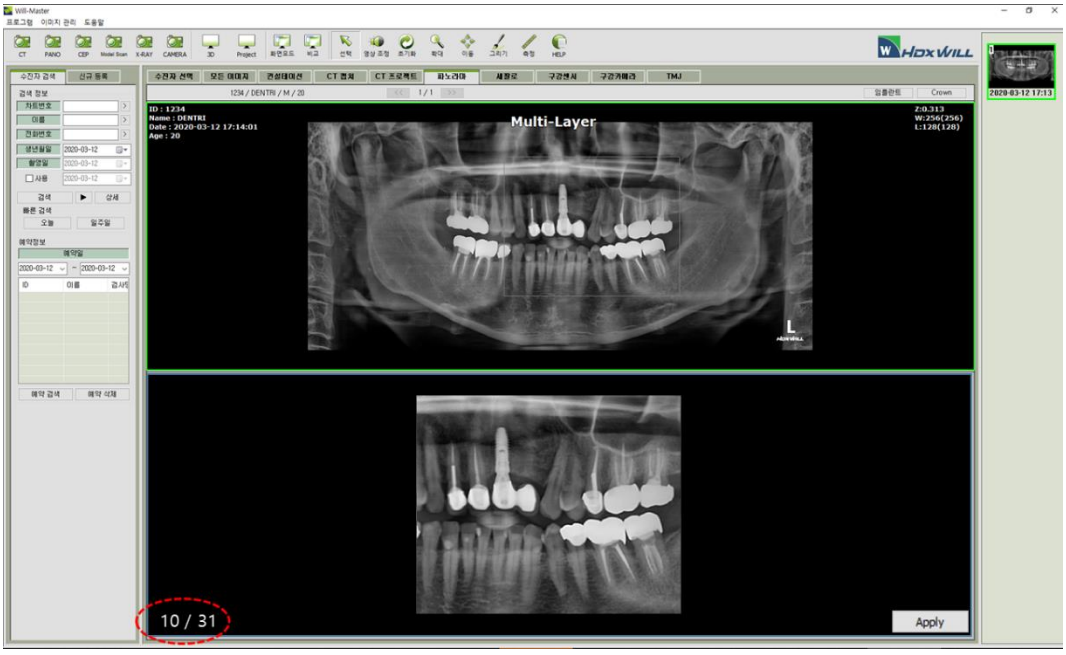


3) The selected area appears at the bottom of the screen.

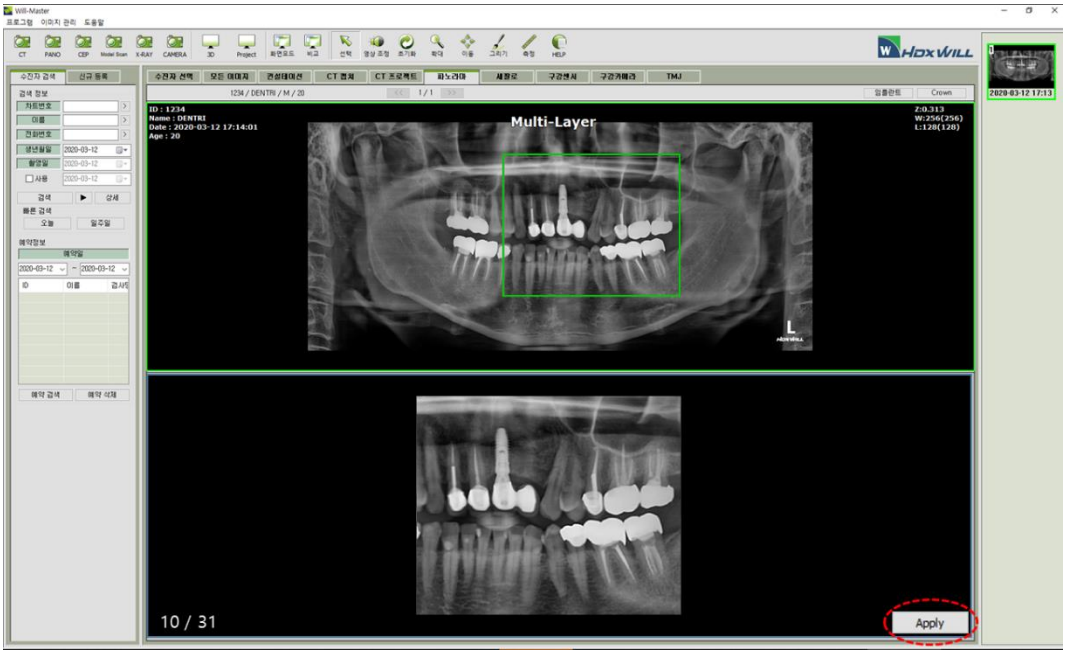
At this time, the total number of images obtained with the Pano Multilayer and the Apply button also appear at the bottom of the screen.

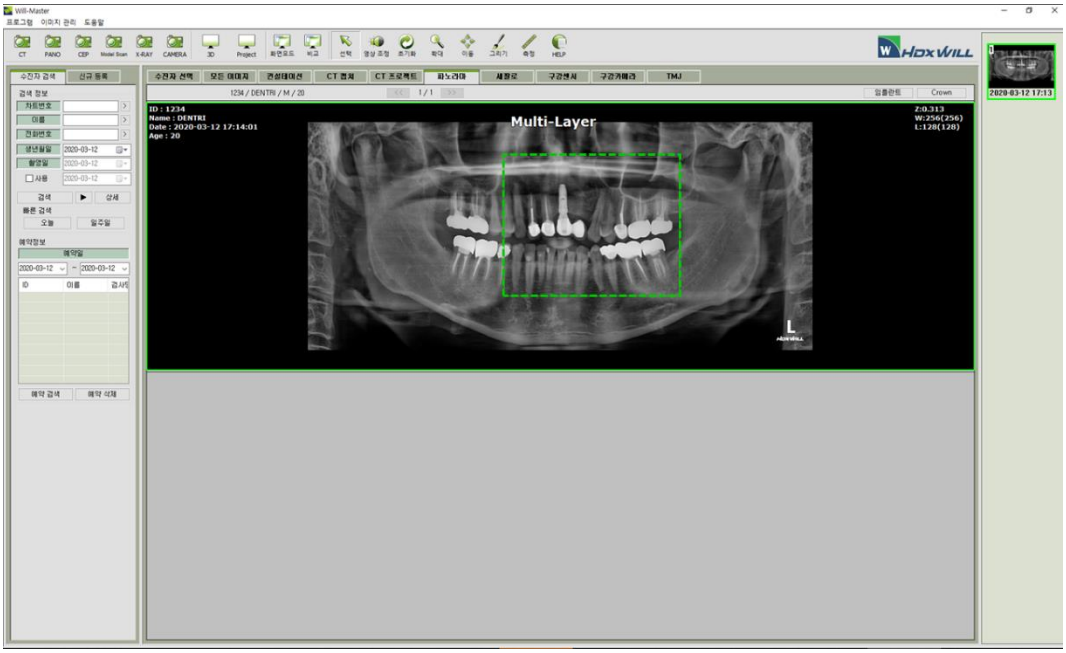


4) Check the Multi-Layer image by scrolling the mouse wheel on the bottom window.
Select the best focused image.



5) If you press the'Apply' button, the image of the interest area in the top window is changed to the selected image. (When the images are combined, the surrounding images are added to the boundary for natural image processing.)



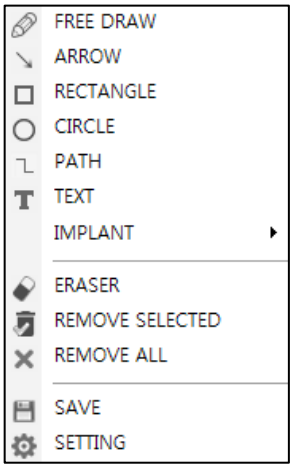


Chapter 8. Draw Overlay

This chapter describes the useful features that aid in the diagnosis.

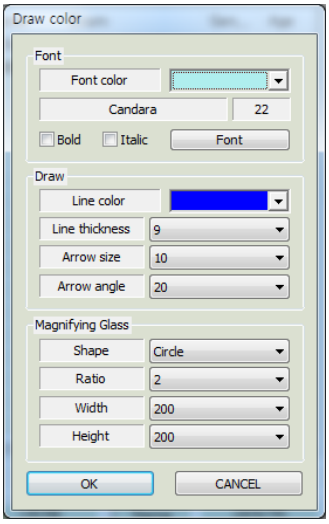
8. Draw Overlay

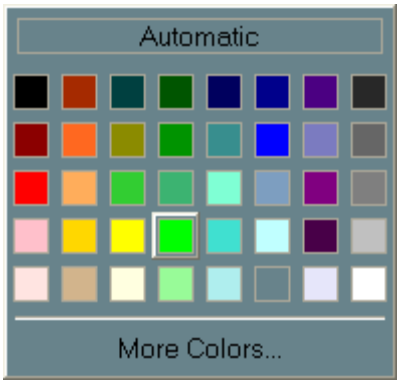
Will-Master provides the drawing overlay mode that includes arrows, rectangles, circles, free-draw, etc.
Once you select the mode, it maintains.



8.1 Setting

You can set the Lines, text size, and color.



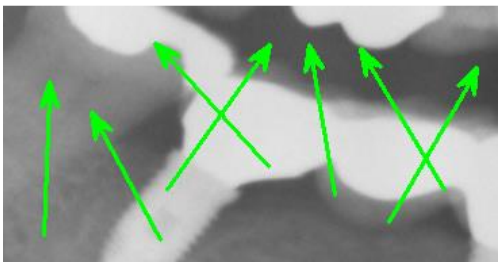


When you click the color combo, the selection box appears on the right side. Click the desired color.

Click the [OK] button when you are done selecting. Saved overlay settings will be saved and will be applied in the overlay later.

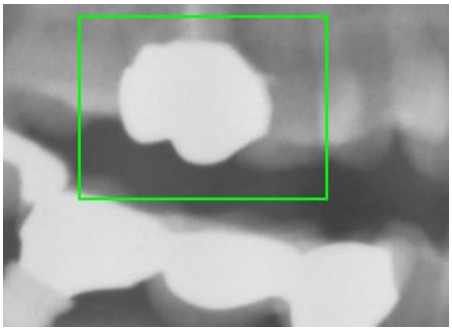
NOTE	**The color of the font is only applied in the text.** **The text that is used like the lines does not get affected.**

8.2 Arrow



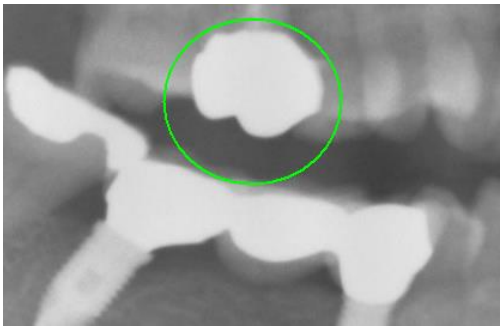
The mode changes where you can draw an arrow on the image.
Click the mouse and drag on the image from one point to another. If you release the mouse button at the final position, an arrow appears

8.3 Rectangle



The mode changes where you can draw a square on the images
Click the mouse and drag on the image from one point to another. If you release the mouse button at the final position, square appears.

8.4 Circle



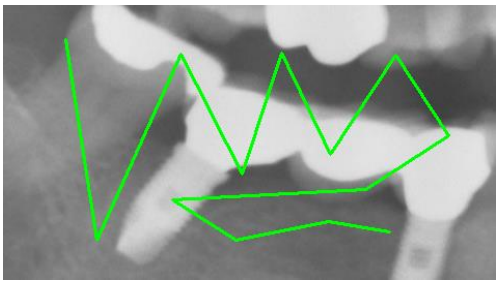
The mode changes where you can draw a circle on the images
Click the mouse and drag on the image from one point to another. If you release the mouse button at the final position, circle appears.

8.5 Free-Draw

The mode changes where you can draw for Free-draw.
At one point, click on image and drag, the trajectory of movement is drawn. Release the mouse button at the final position.

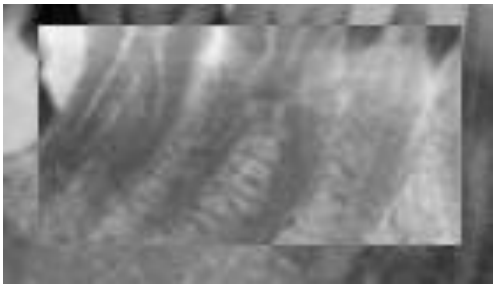
8.6 Path (Polyline)

The mode changes where you can scribble.
Click the vertices with the mouse on images and double-click at the last point. Polyline that connects all the clicked point is inserted.



8.7 Text

The mode changes where you can enter text.
Drag an area with the mouse to enter text, the selected area will be highlighted.

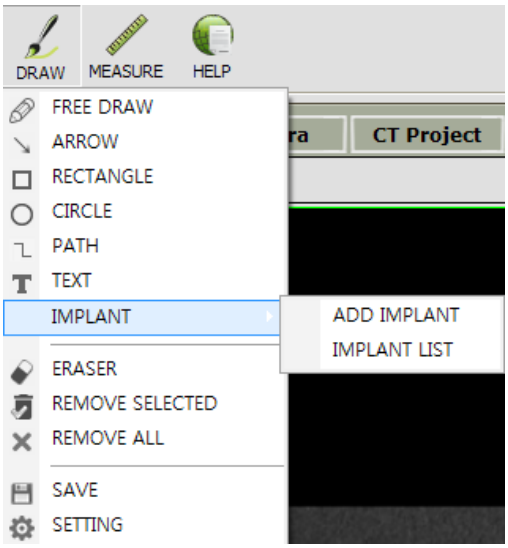


When you release the left mouse button, the selected area will be replaced with the text input mode.
When the mode is switched, you can enter text.

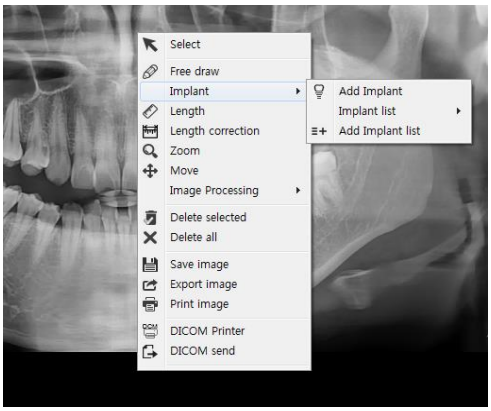
8.8 Implant

The mode will be changed to insert implant on the image.
There are two methods for adding an implant.

1) To add an implant from the toolbar, click the DRAW button.



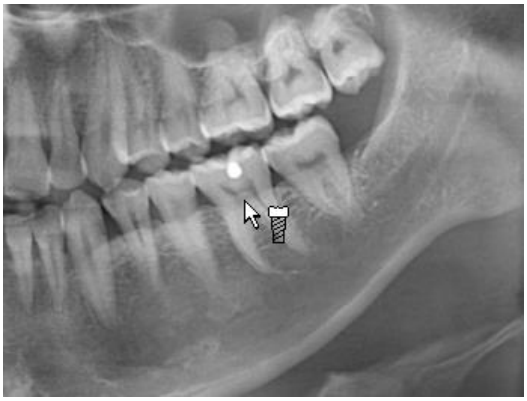
2) To add an implant on the image, click the right mouse button on the image.

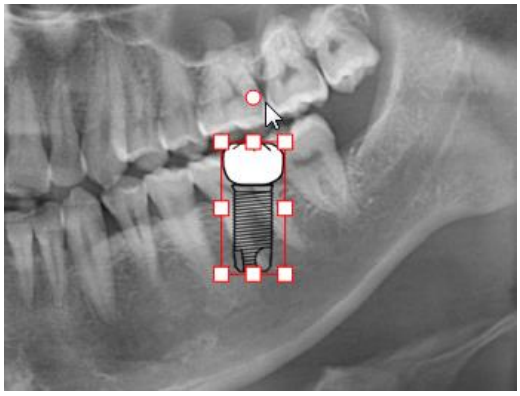


8.8.1 Check Multi-Layer image

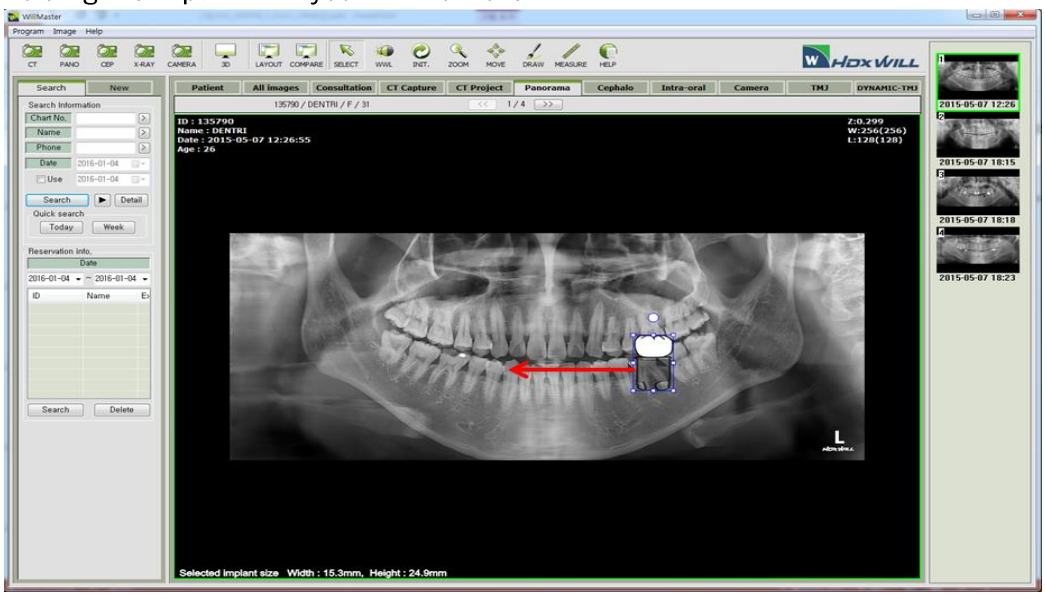
1) Click 'Add Implant'

2) Click and move the mouse cursor to the location where you want to insert the implant on the image.

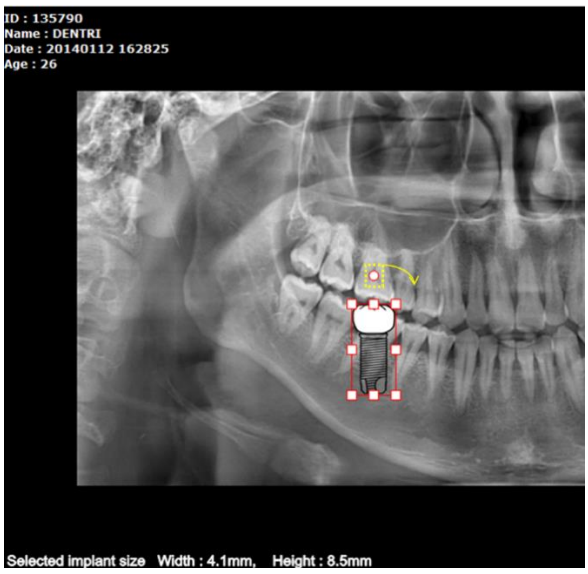


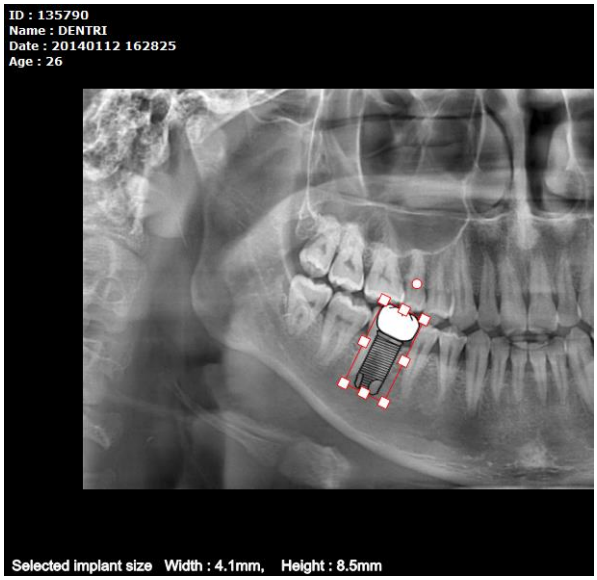


3) Select and drag the implant that you want to move.

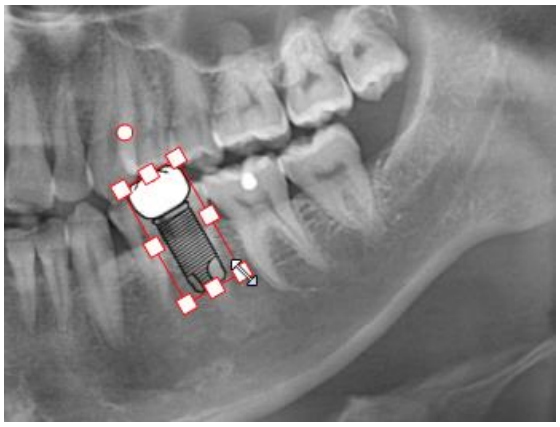


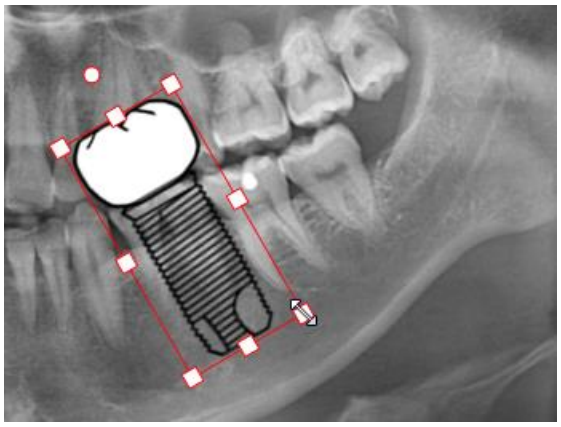
4) Implant can be rotated by turning the implant after selecting the point on the implant that you want to rotate.





5) Select the implant that will be deleted, then press the Delete button on the keyboard, the implant will be deleted.



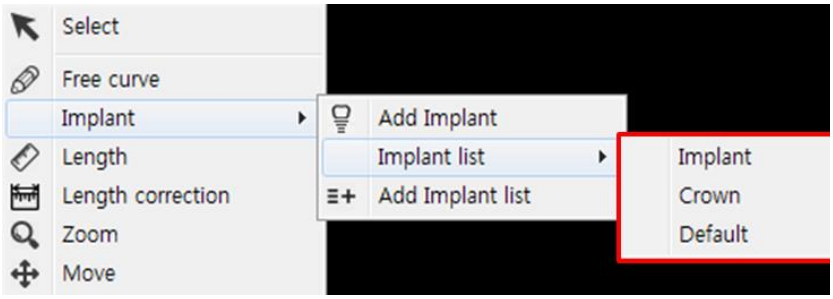


6) If you choose the implant, the length of the selected implant will be displayed in the lower left corner.

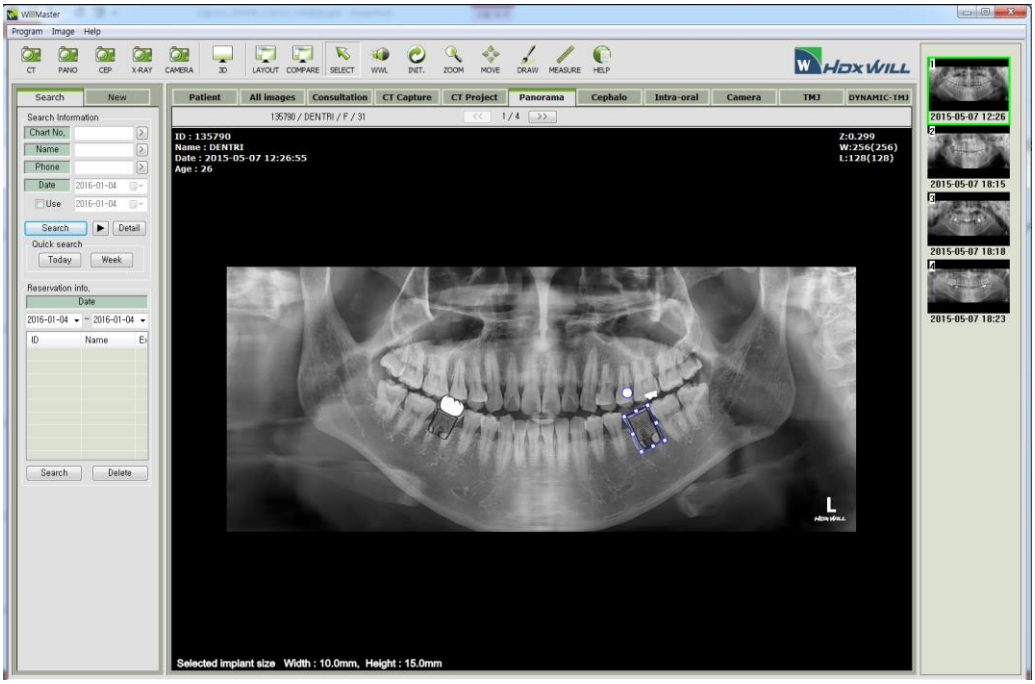
7) Select the implant that will be deleted, then press the Delete button on the keyboard, the implant will be deleted.

8.8.2 Implant list

1) Click Implant list button.



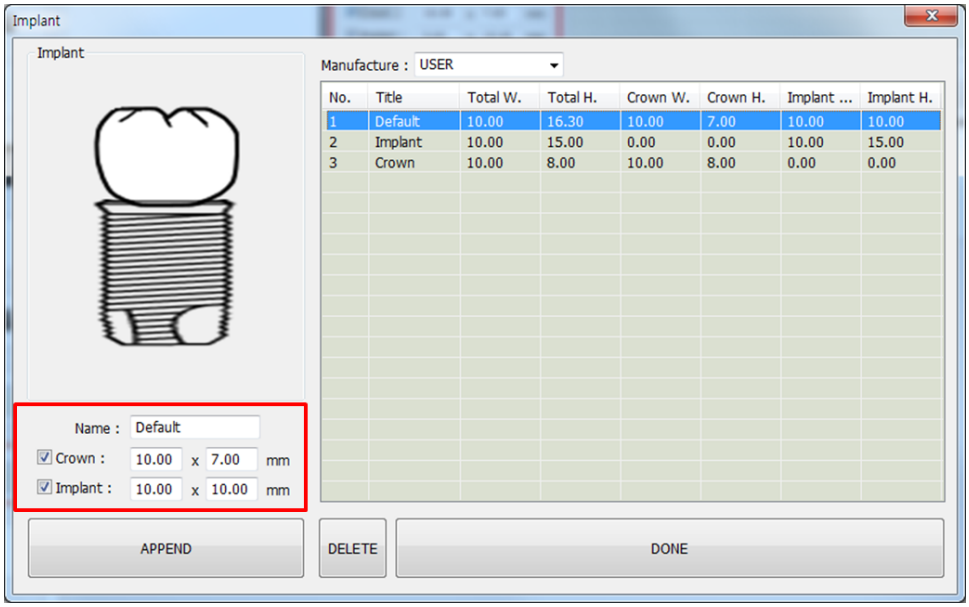
2) The user can add Implant list that the user saved before.



8.8.3 Add Implant list

1) Click Add Implant list button.

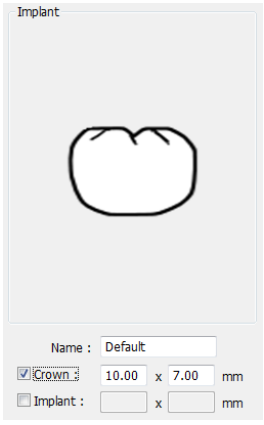
2) User can enter length of Implant and add it to list.



NOTE

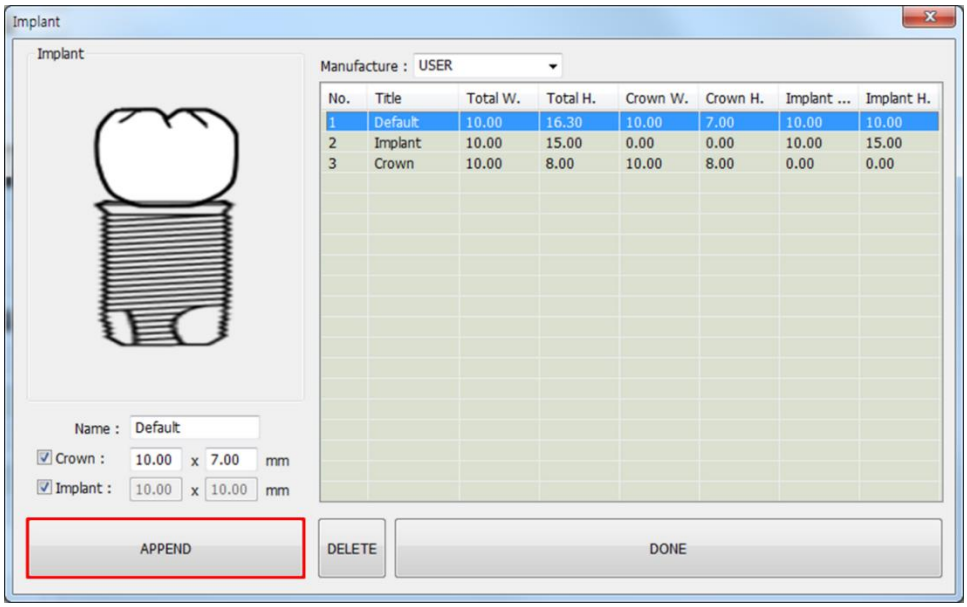
If user deselect crown or implant, the user can add crown without implant or implant without crown.

- When selecting implant only

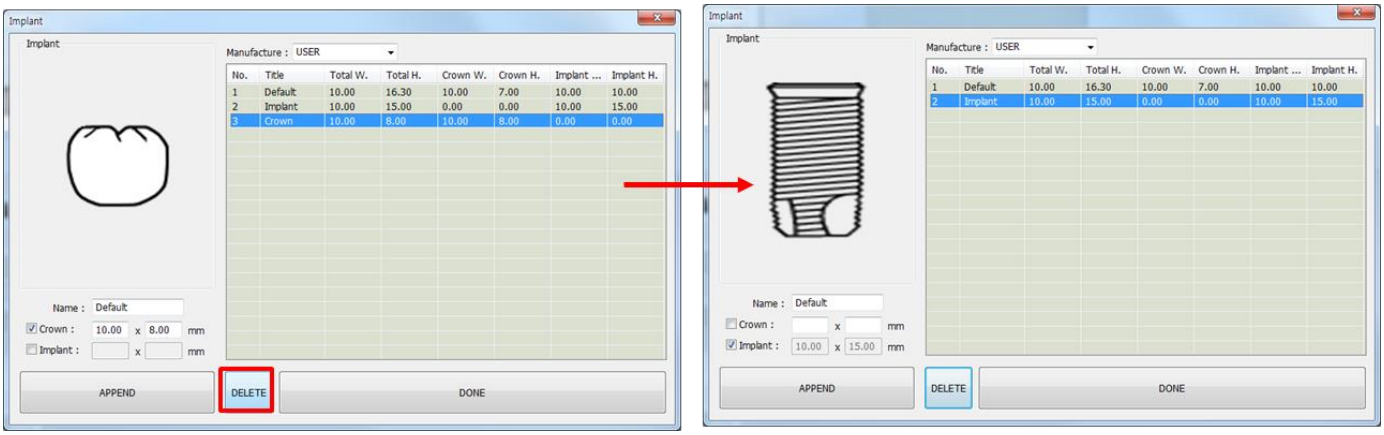


- When selecting crown only

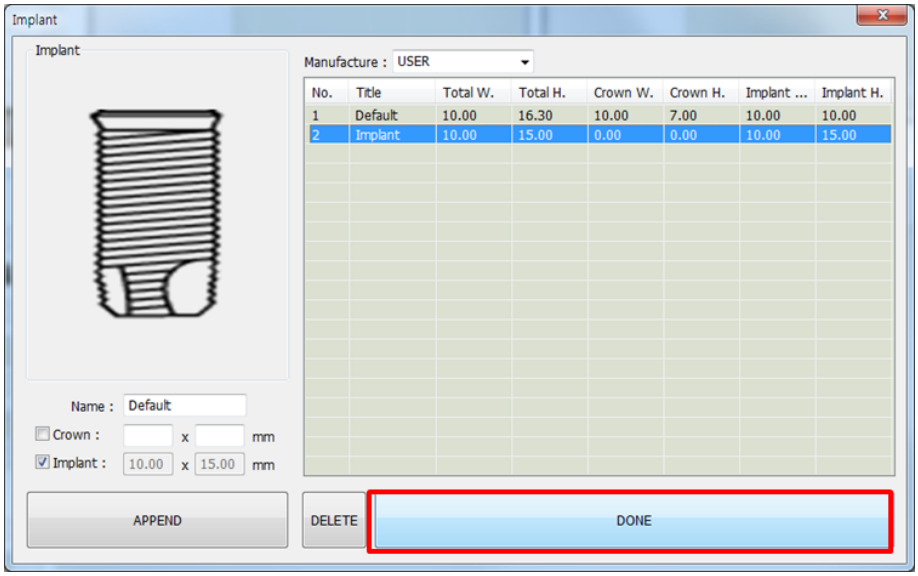
3) Add the implant on the list by clicking the APPEND button.

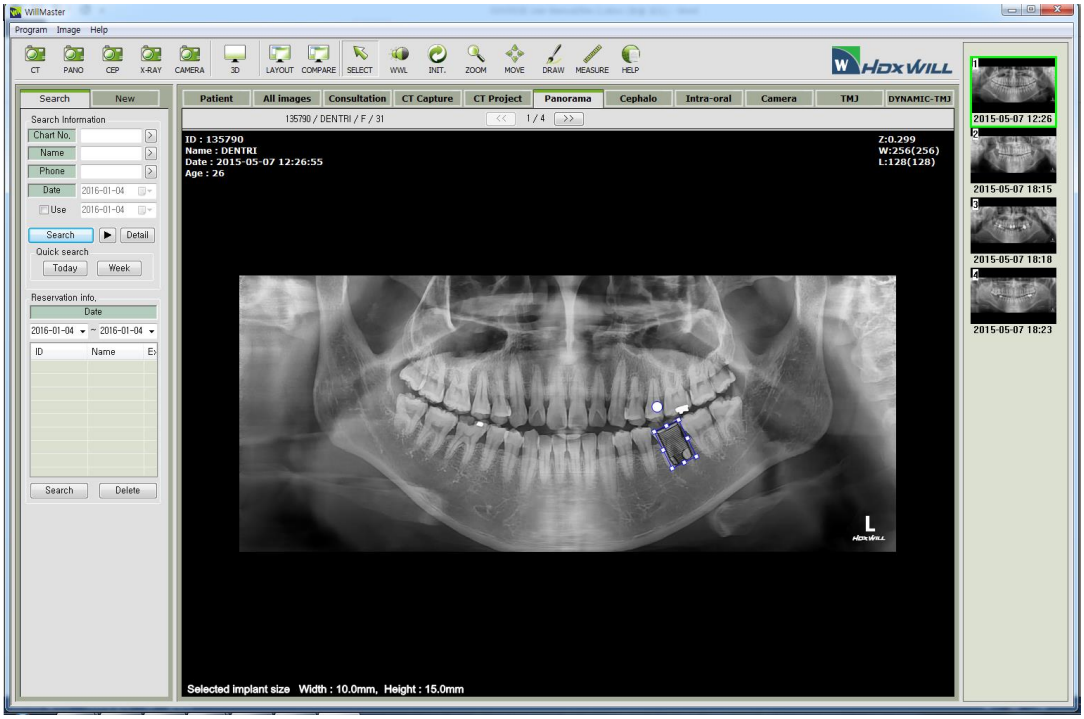


4) Select the implant you want to delete, and click the DELETE button to remove the implant from the list.



5) Select the implant to be applied, and click the DONE button to exit the implant list window. When you add a new implant, you can add the applied implant.

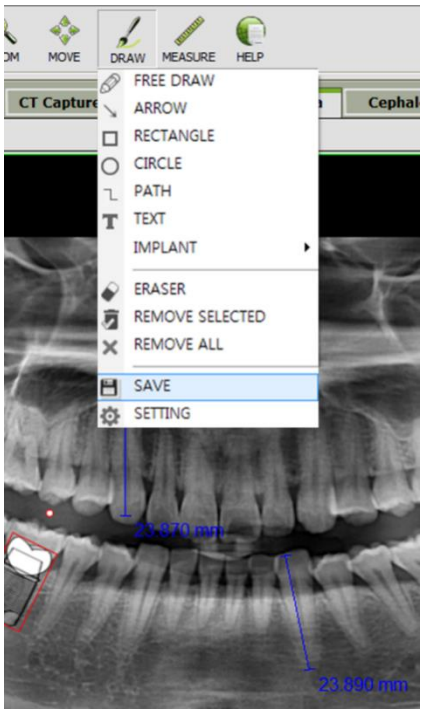




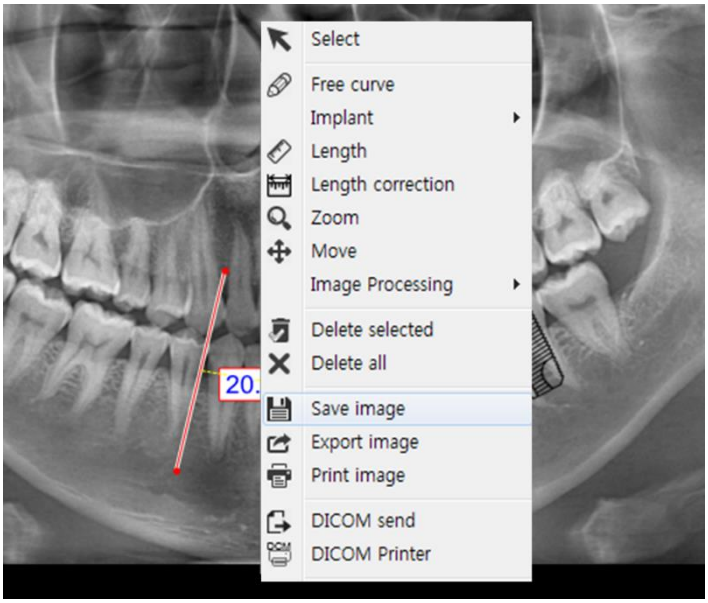
8.9 Save

If you select the [Save] button in the presence of overlay, the new image with overwritten overlay will be saved.

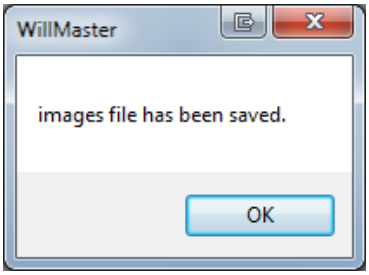
1-1) Draw icon in the toolbar and select the [Save] button to save the image.

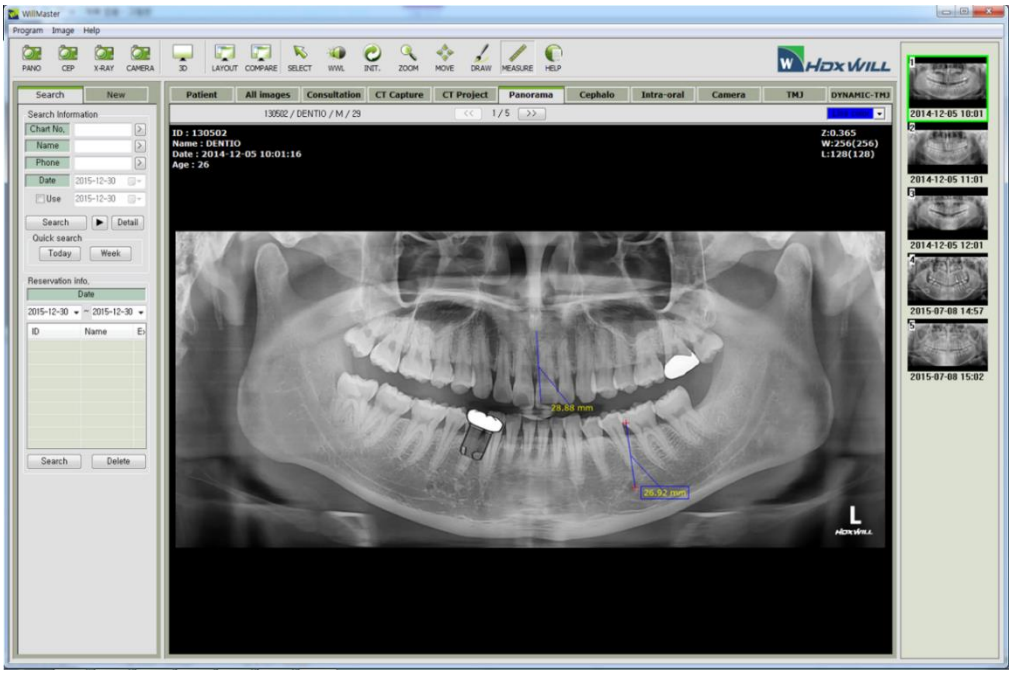


1-2) Click the right mouse button and select the [Save image] to save the image.



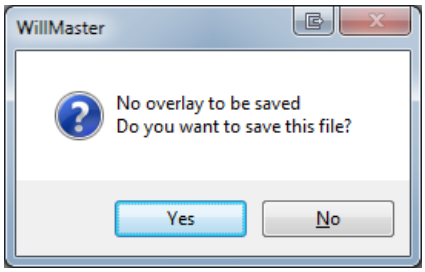
2) When saving is completed, the window appears,and you can check the save image.





NOTE

If the overly object does not exist, the window appears to confirm whether to save the file or not.



8.10 Delete selected

Currently selected overlay object will be deleted

8.11 Delete All

All overlays that exist on the selected image will be removed

8.12 Overlay operation

Features to edit the input overlays

NOTE

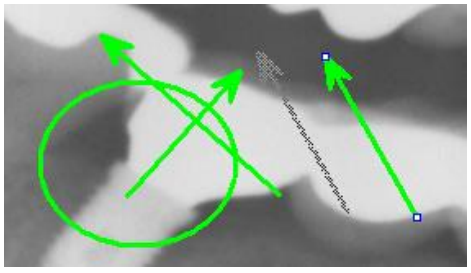
1) Select one overlay object
When you click the input overlay, the overlay objects that exist on the clicked point is selected. (Zones and control points (white squares) are displayed in the selected overlay)
2) Select the overlay object in a certain area In the selection mode, drag the mouse to specify the range, all the overlays that exist are selected within the specified range.

8.13 Select Overlay

1) Delete Overlay
With overlay selected, press the [Delete] button on the keyboard.

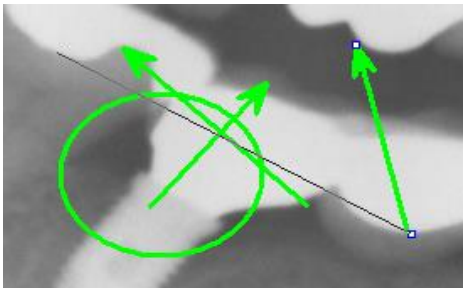
2) Move the Overlay

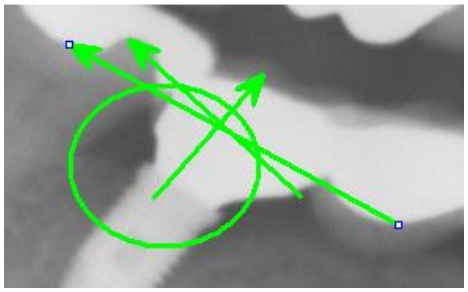
With the overlay object selected, drag the object (the mouse pointer must be accurately located over a line or letter). When you release the left mouse button, an overlay object will be placed in its final location.



3) Change the size of the overlay

Drag the control points of the selected overlay objects. When you release the left mouse button, the overlay will change its size to the final location



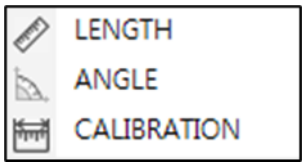


Chapter 9. Image measurement

This chapter describes the features to measure length and angle.

9. Image Measurement

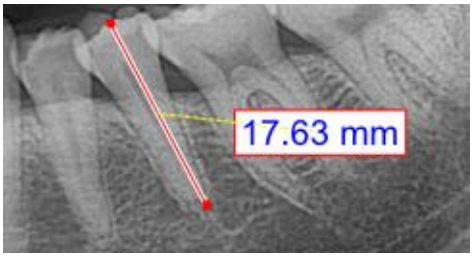
Provides the features to measure length or angle of images.



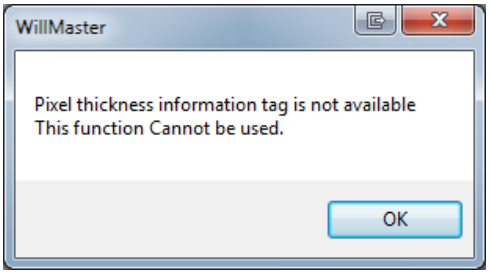
9.1 Length

This mode is for measuring the length between two points.

When you click and drag the mouse from one point to another point, the length information is displayed. If you release the mouse button at the last point, the final information of the length is displayed.



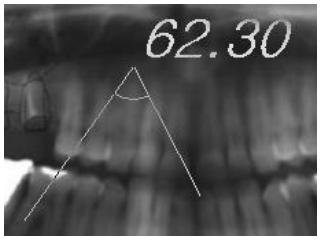
This function is only available in the presence of the pixel length information. If the pixel length information does not exist, the following warning window will pop up and will not be able to use this function.

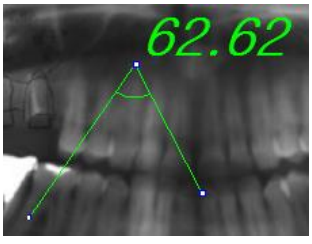


9.2 Angle

This mode is for measuring the angles among three points of the image

Click the mouse on one point that will be the center point and click again on one end. When you move the mouse without clicking, the angle of three points will be displayed. If you click the mouse, the final angle information about the final angle will be displayed.

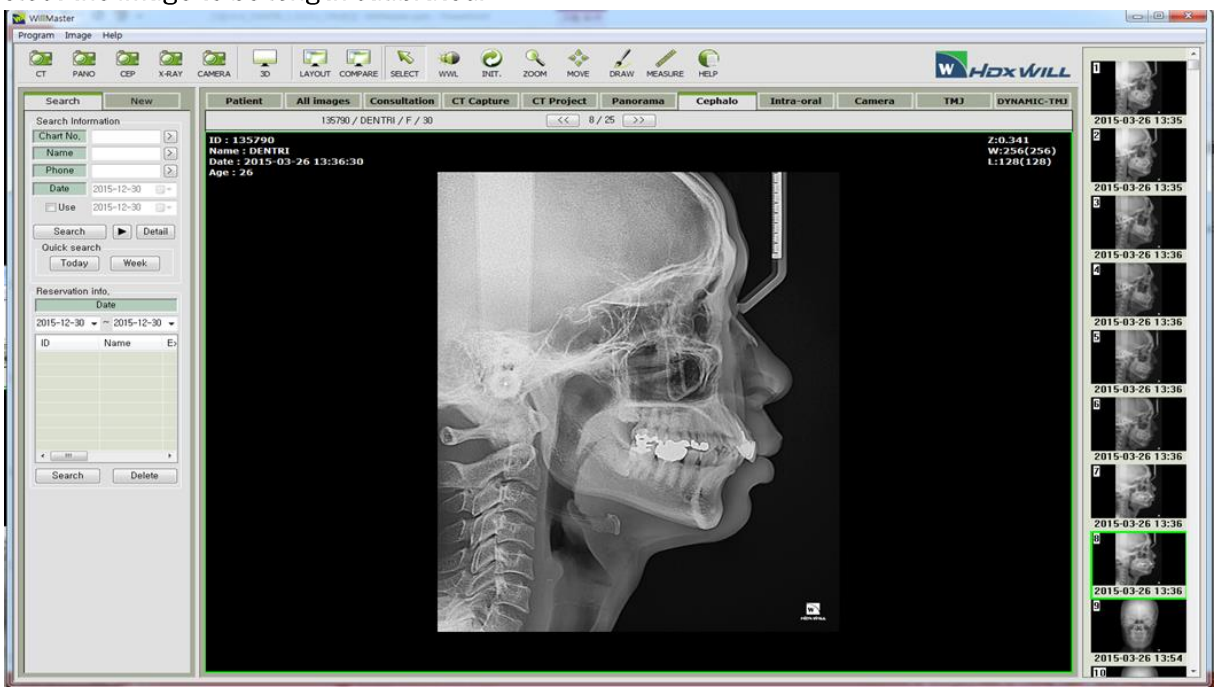




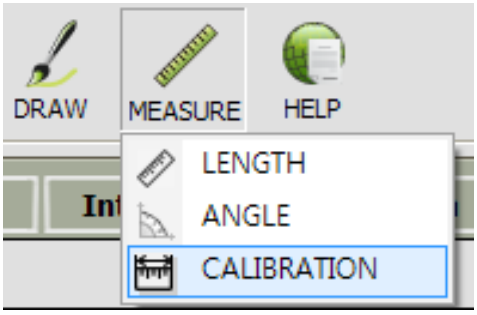
9.3 Calibration of Length

This function allows you to measure length by adjusting the length in an image that has no length information, or if the measurement results are uncertain because the length information is incorrect in the image.

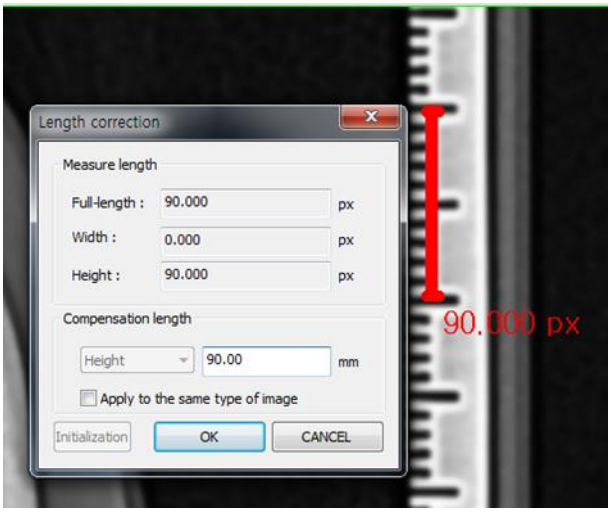
1) Select the image to be length calibrated.



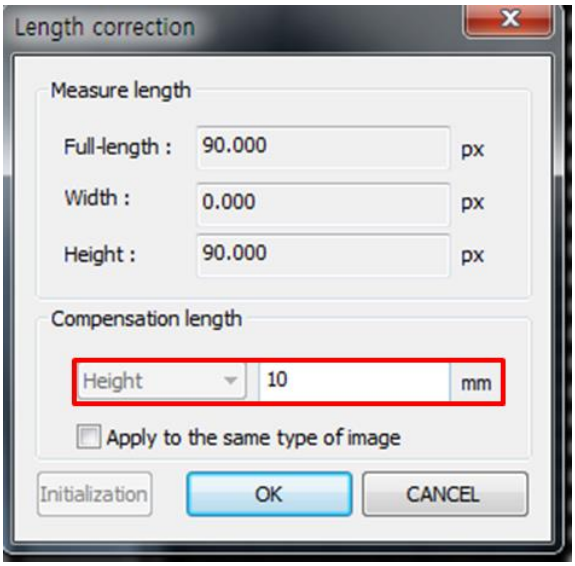
2) Select the CALIBRATION in the MEASURE of toolbar.



3) Open the Length correction window by clicking on the image of start point and end point for the length calibration.



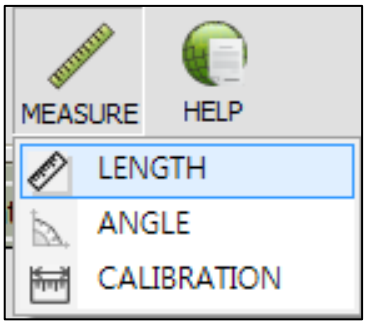
4) Record the measured length in mm.



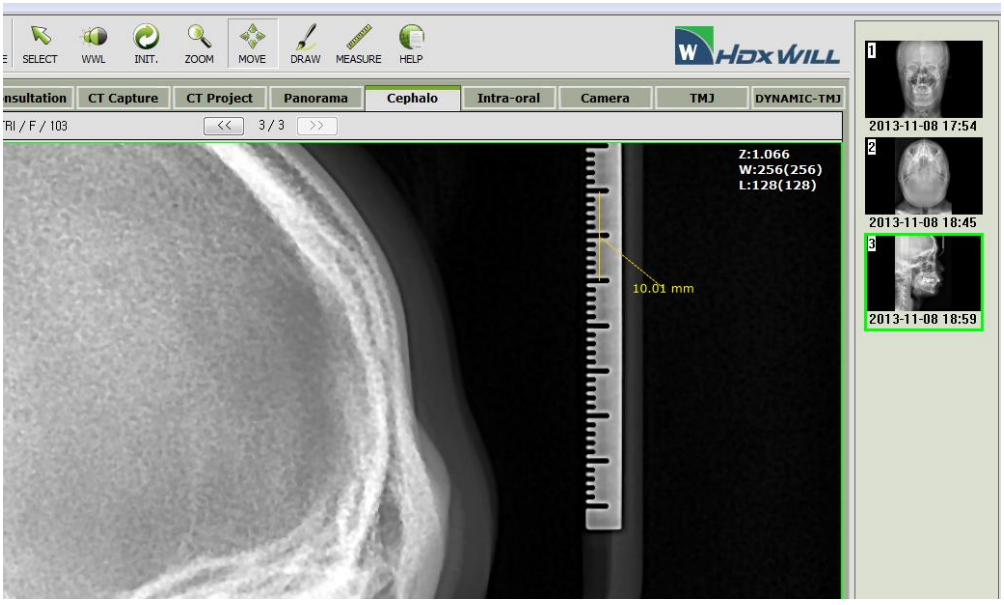
NOTE

Check on the [Apply to the same type of image] to change all the length information of image in the same category. Click the [Initialization] button to change back to the previous length information.

5) Select the LENGTH in the MEASURE.

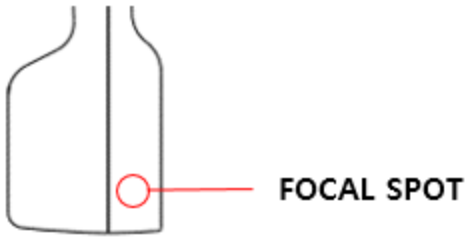


6) Check the calibrated length.



Appendix A

■ Technical Specification

▪Model designation	eco-x, eco-x-s, eco-x ai, eco-x-s ai	
▪Rated mains voltage	100-120 / 200-240 VAC	
▪the frequency, in hertz	50 Hz / 60 Hz	
▪Rated power	2.2 kVA (90 kV)	
▪Permissible fluctuation	± 10%	
▪Apparent resistance of supply mains	Max. 0.5 ohms	
X-ray tube assembly		
▪X-ray tube	OX/115-05	
▪Target angle	15°	
▪Focal spot size acc. to IEC60336, measured in the central X-ray beam	0.5 mm	
▪Marking of focal spot:		
▪Permanent filtration according to IEC 60522;	0.5mmAl (IEC 60522)	
▪Total filtration of X-ray tube assembly:	PANO, CEPH: >2.5mmAl CBCT: >2.5mmAl + 0.2mm Cu (Option, ≥5.3mmAl at 75kV) or >2.5mmAl + 0.5mm Cu (Option, ≥13.2mmAl at 75kV)	
▪Anode material:	Tungsten	
▪range of X-ray tube voltage settings	60kV ~ 90kV± 8 %	
▪range of X-ray tube current settings	4mA ~ 10mA± 10 %	
▪range of irradiation time settings (±(5%+50ms))	CBCT	8 s or 12 s(Optional specifications) 24 s
	Panorama	14 s or less

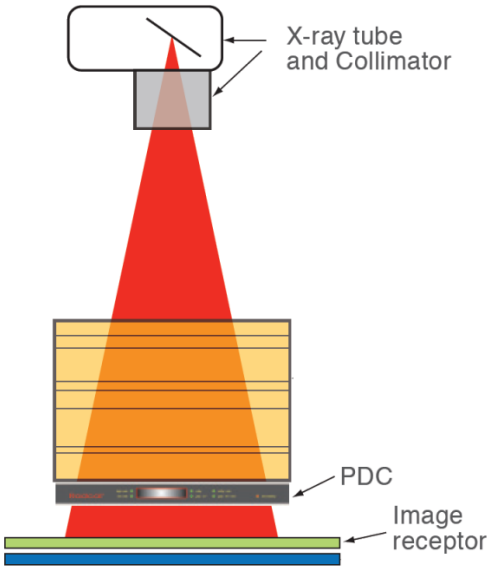
	Cephalo (option)	8 sor less
▪ Accuracy of Adaptive exposure control	± 10 %	
▪Reproducibility of Adaptive exposure control	± 10 %	
▪Power output of tube assembly	Nominal anode input power at 0.1 s (DC) 2000W	
▪ Reproducibility of the RADIATION output	CV: <0.05	
▪High voltage generation frequency	>40 kHz	
▪Cooling conditions	10 minutes after taking one shot (CT)	
Geometry		
▪Source-skin distance	> 150 mm (Pano, CT), > 450 mm(Ceph)	
▪Source Image distance	FXDD-0606CA	CT: 577mm Pano: 577mm
	Xineos-2301	Ceph: 1596mm
Detector		
▪Detector type	FXDD-0606CA	TFT:a-Si(CSI)
	Xineos-2301	CMOS
▪Pixel size (㎛)	FXDD-0606CA	119
	Xineos-2301	99
▪A/D (bits)	FXDD-0606CA	16
	Xineos-2301	14
▪ Sensor Front Panel Attenuation Value	Less than 0.2mm of aluminum equivalent (information for reference only)	
▪Class I device Degree of protection against electric shock	Type B device 	
▪Degree of protection against ingress of water	Ordinary equipment (without protection against ingress of water)	
▪Year of manufacture	(on the rating plate)	
▪Operating mode	Continuous operation of intermittent load	

▪Transport and storage condition (Environment)	1) Temperature: 0℃~ 40℃ 2) Relative humidity: 5% to 95%, non-condensation 3) Atmospheric pressure: 500 hPa to 1060 hPa	
▪Admissible operating condition (Environment)	Temperature: 10℃ ~ 40℃ Relative humidity: 20% to 75% Atmospheric pressure: 800 hPa to 1060 hPa	
▪Dimensions (W × D × H) (relative tolerance ±5 %)	eco-x, eco-x ai	980 mm × 1225 mm × 2314 mm,
	eco-x-s, eco-x-s ai	1802 mm × 1225 mm × 2314 mm,
▪Weight (relative tolerance ±10 %)	eco-x, eco-x ai	178 kg
	eco-x-s, eco-x-s ai	211 kg
External supply mains recommendation		
▪ 100~120V	20A or higher / Time lag	
▪ 200~240V	12A or higher / Time lag	

If the X-ray unit has been stored at temperatures below +10℃ for more than a few hours, Sufficient time must be allowed for the unit to reach room temperature before connecting Power.

■ DAP Table

1. Measurement method



- Image receptor dose measurement.

1) Power-on PDC(Patient Dose Calibrator).

2) Prepare the DAP TEST Equipment (PDC) at the image recaptor location as shown above and proceed with the test air kerma condition.

3) Conduct the test according to the survey conditions for each selectable mode, and the maximum and minimum inspection conditions for the tube voltage, tube current, and tube voltage, as indicated in the result.

4) When the system detects radiation, the display automatically displays the dose or dose zone generation rate.

2. Result value (Unit : mGy·㎠)

Test Equipment Information			
DAP Meter	Manufacturer	Model	S/N
	Radcal	PDC-01	15-00001
Dose tolerance(±50%)			

1) CBCT

FOV size: adult 16*9, Child 10*8

- Shooting Condition : Dental Arch (Cu filter 0.2mm)

Patient type	Adult			Child		
mA / kVp	4	7	10	4	7	10
60	118.7	222.5	326.3	61.9	142.8	208.9
75	253.7	502.7	733.3	145.3	320.6	466.1
90	441	914.3	1332	241.1	578.5	842.4

- Shooting Condition: Dental Arch(Cu filter 0.2mm) with **Low Dose option**

Patient type	Adult			Child		
mA / kVp	4	7	10	4	7	10
60	50.7	96.7	141.8	28.7	63.7	92.8
75	109.1	216.4	316.1	65.3	139.6	204.1
90	197.5	390.3	570.2	112.9	250	364.9

- Shooting Condition: Dental Arch (Cu filter 0.5mm)

Patient type	Adult			Child		
mA / kVp	4	7	10	4	7	10
60	29.4	69.1	102.2	17.1	41.8	62.5
75	97	214.6	313.8	58.8	131.5	193.2
90	195.3	462.3	674.5	119.8	287.7	421.3

- Shooting Condition: Dental Arch(Cu filter 0.5mm) with **Low Dose option**

Patient type	Adult			Child		
mA / kVp	4	7	10	4	7	10
60	13.3	30.3	44.7	7.8	18.6	27.3
75	42.7	92.7	135.1	26	56.4	83
90	89.7	196.5	288.6	55.9	122.3	179.7

2)Panorama

-Shooting Condition : Full Arch mode

Patient type	Adult			Child		
mA / kVp	4	7	10	4	7	10
60	58.8	98.9	143.4	41.9	70.7	102.6
75	98.1	165.4	239.9	70.5	118.5	171.9
90	149.1	250.8	363.4	107.3	180.1	260.8

- Shooting Condition: Full Arch mode with **Low Dose option**

Patient type	Adult			Child		
mA / kVp	4	7	10	4	7	10
60	28.9	49.2	71.8	21.2	36.1	52.5
75	49.1	82.7	120.4	36.1	60.8	88.3
90	74.8	126.1	182.3	54.8	92.1	133.7

3) Cephalo

- Shooting Condition : Lateral mode / Large area

Patient type	Adult			Child		
mA / kVp	4	7	10	4	7	10
60	10.8	17.5	27.1	8.15	13.21	20.47
75	18.4	34.2	49.2	13.92	25.88	37.23
90	28.0	52.2	74.2	21.18	39.44	56.11

- Shooting Condition: Lateral mode /Large area with **Low Dose option**

Patient type	Adult			Child		
mA / kVp	4	7	10	4	7	10
60	5.52	8.95	13.87	4.21	6.82	10.57
75	9.43	17.53	25.22	7.18	13.36	19.21
90	14.35	26.72	38.01	10.93	20.36	28.96

NOTE

The DAP results of each combinations are displayed at the bottom of the Touch panel and the bottom of the Capture program.

■ Air Kerma measurement

Test Equipment Information		
Manufacturer	**Model**	**S/N**
RaySafe	X2 R/F	249137
Dose tolerance(±50%)		

1) CBCT

- Shooting Condition: Dental Arch (Cu filter 0.2mm)

Patient type	Adult			Child		
mA / kVp	**4**	**7**	**10**	**4**	**7**	**10**
60	0.5	1.2	1.8	0.5	1.2	1.8
75	1.2	2.7	3.9	1.2	2.7	3.9
90	2.1	4.8	7.0	2.1	4.7	6.9

- Shooting Condition: Dental Arch (Cu filter 0.5mm)

Patient type	Adult			Child		
mA / kVp	**4**	**7**	**10**	**4**	**7**	**10**
60	0.163	0.3736	0.544	0.162	0.365	0.534
75	0.501	1.097	1.601	0.491	1.081	1.576
90	1.031	2.356	3.435	1.012	2.327	3.394

2) Panorama

- Shooting Condition: Full Arch mode

Patient type	Adult			Child		
mA / kVp	**4**	**7**	**10**	**4**	**7**	**10**
60	2.0	3.2	4.4	1.4	2.3	3.3
75	3.0	4.8	7.2	2.4	3.8	5.2
90	4.5	7.5	10.2	3.2	5.5	7.2

3) Cephalo

- Shooting Condition: Lateral mode /Large area

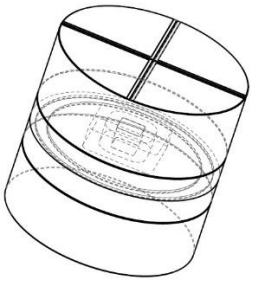
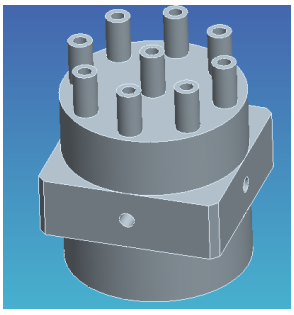
Patient type	Adult			Child		
mA / kVp	4	7	10	4	7	10
60	0.06	0.09	0.16	0.04	0.07	0.13
75	0.10	0.17	0.28	0.07	0.11	0.20
90	0.15	0.25	0.44	0.10	0.17	0.30

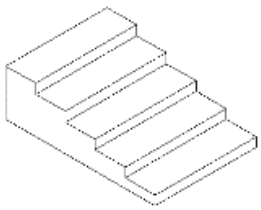
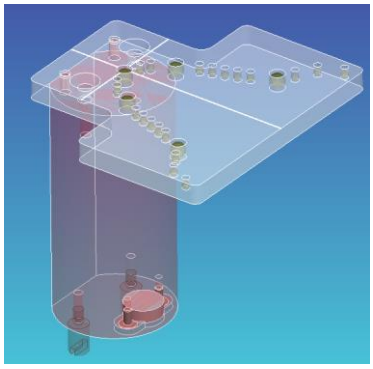
■ User Performance test for Quality maintenance

In order to ensure the operational safety and functional reliability of your product, you as the system owner should let the staff of the agency or purchasing office carries out the quality assurance testing at the place where the product was installed. (At least once a year)
The quality assurance testing is carried out by the service engineer with professional knowledge who belongs to the agency or purchasing office.

1. Test materials

The phantom(s) used for quality assurance purposes will be provided to the user free of charge.

Name	Appearance	Function
① **Phantom platform**		Supporter for DVT Phantom
② **DVT Phantom***		Tool for QA within the full range of Cone Beam CT(CBCT) 3D imaging equipment
③ **Tripod**		Used as a pedestal to level the Phantom platform or to suppout phantom
④ **CT Phantom**		Tool for checking vertical and horizontal alignment

⑤ **Stair Phantom**		Tool for checking vertical and horizontal alignment
⑥ **Ball phantom**		Tool for checking vertical and horizontal alignment

***DVT phantom description**

- Technical Specifications

① Spatial resolution: Line spread function

② Size: Ø16cm

③ Height: 4 disc setup (2x 2cm, 1x 5cm, 1x 6cm -15cm cylinder total)

④ Standard test objects: PMMA / Air / PVC

⑤ Material equivalents: Soft tissue / Free Air / Bone

- Measure Parameters

① Nyquist Frequency (NF)

② Voxel Values

③ Contrast

④ Noise

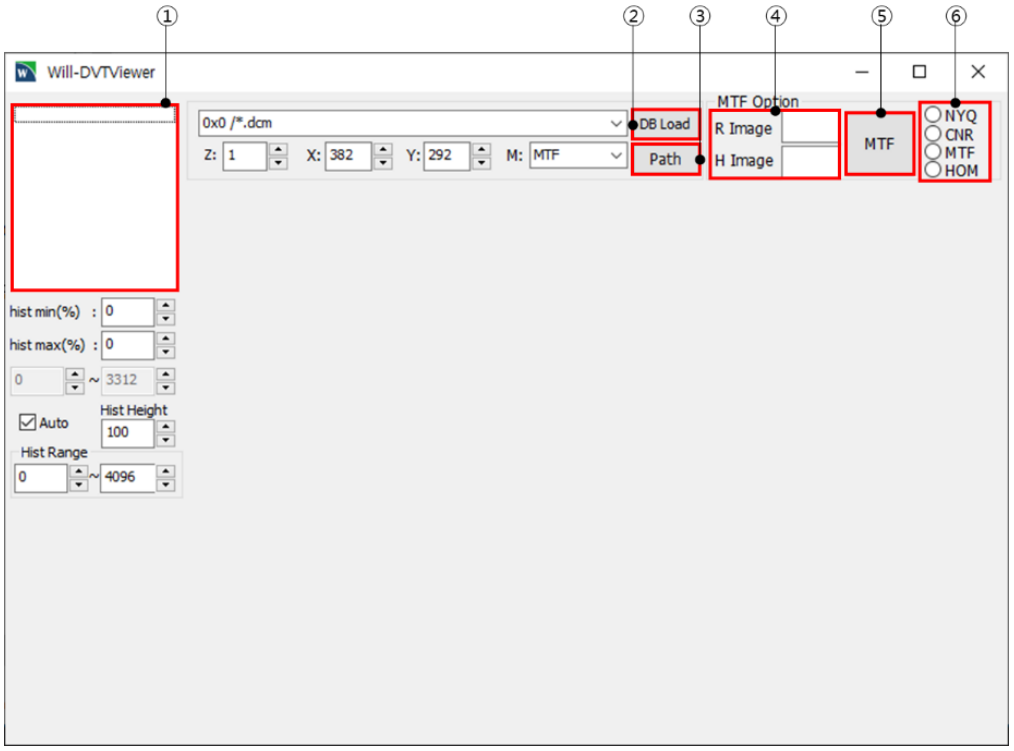
⑤ Contrast-to-Noise Ratio (CNR)

⑥ Homogeneity / Image Uniformity

⑦ Modulation Transfer Function (MTF) at 10 % and 50 %

2. Perform QA software

2.1 Description of Initial screen/ UI Configuration



① Image list

② Load a CT image of a phantom in the Will-Master DB

③ Load an image on a local path

④ Resolution/Homogeneity Image select edits

⑤ MTF Dialog output

⑥ Nyquist, Contrast-to-Noise Indicator, Homogeneity, Modulation Transfer behavior mode selection

NOTE

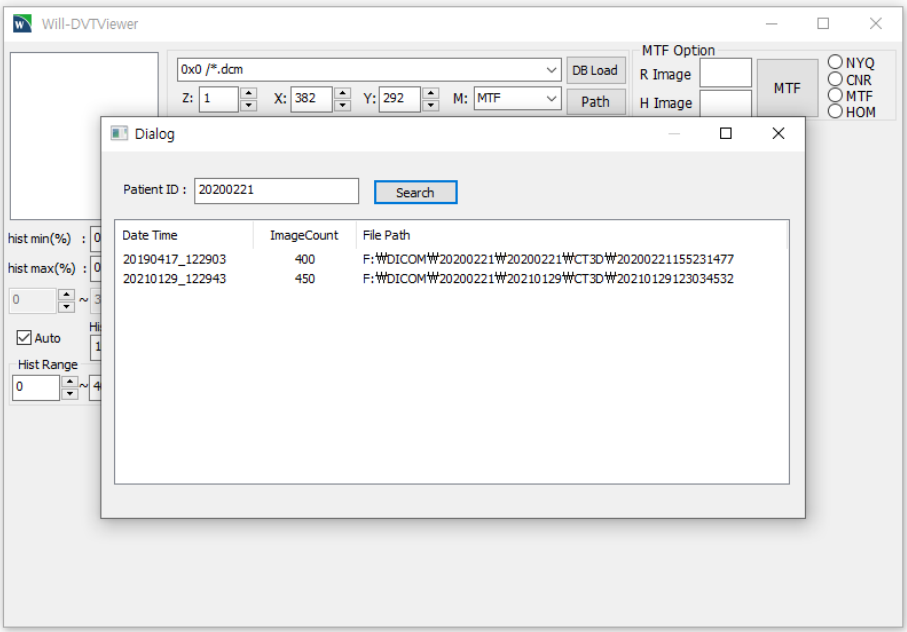
This program performs quality verification of Dental 3D, Cone Beam CT equipment. The detailed procedure of the test is in accordance with DIN Standard 6868-161.

Test using the Will-DVTViewer.exe program in the Will-Master folder

2.2 Details

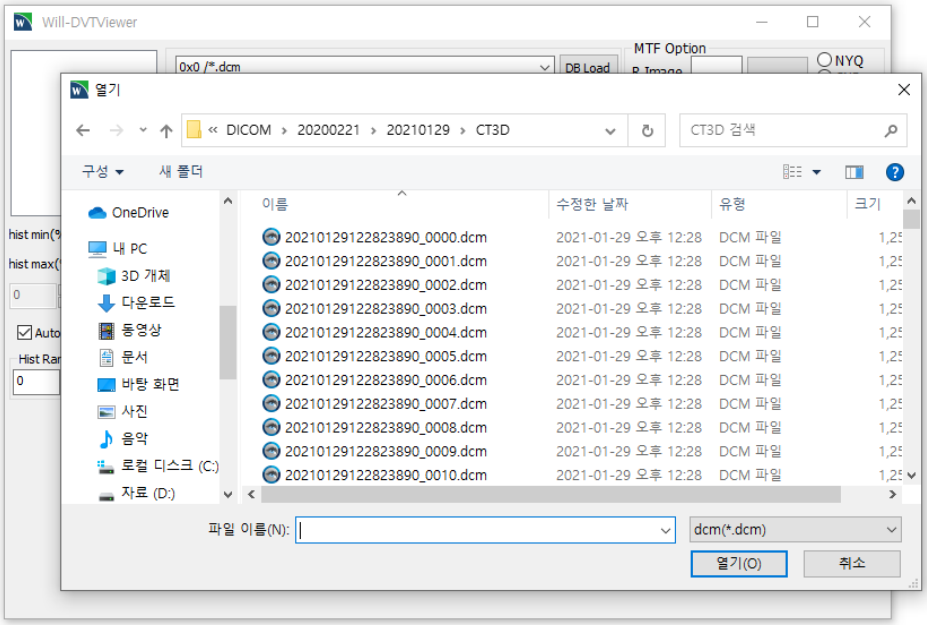
① Load of DB image

- You can import the CT image to be searched by searching with Will-Master Patient Chart No.



② Load an image on a local path.

- You can import an image on the local path.

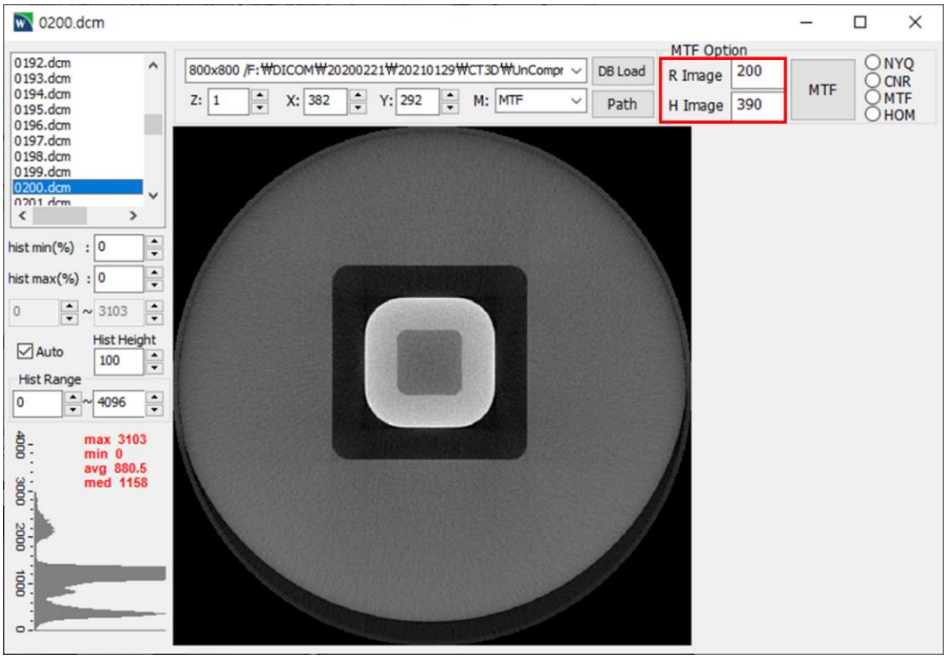


NOTE

R image should be the image where the phantom is positioned as far as possible in the center and the angle is not changed.

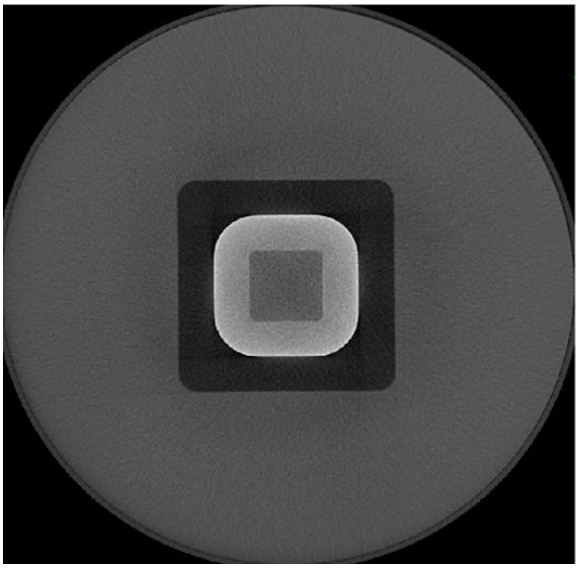
③ Resolution Image/Homogeneity Image selection

- Find appropriate resolution and homogeneity images on the image list, Enter each image slice number in the R image / H image window.

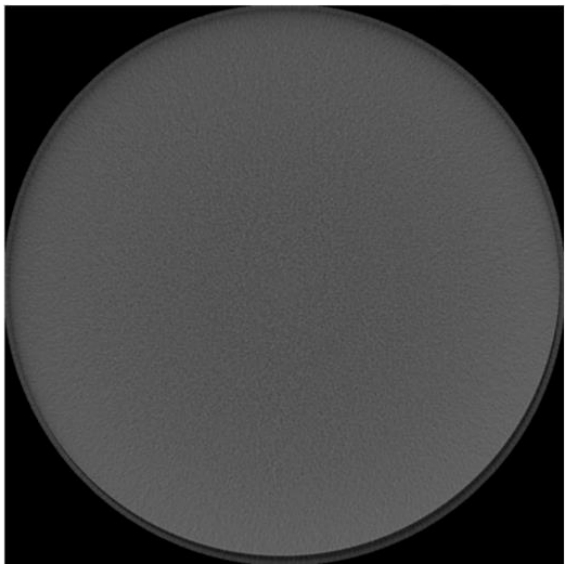


Find appropriate resolution and homogeneity images on the image list,

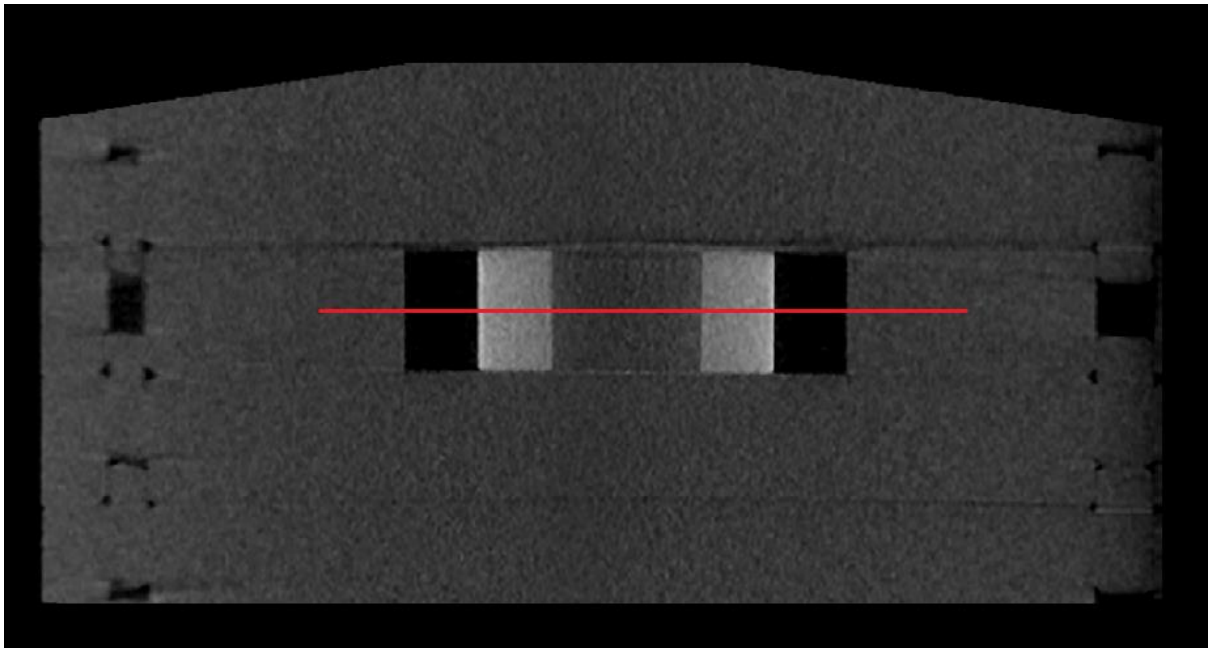
Enter each image slice number in the R image / H image window.



-R Image Example -



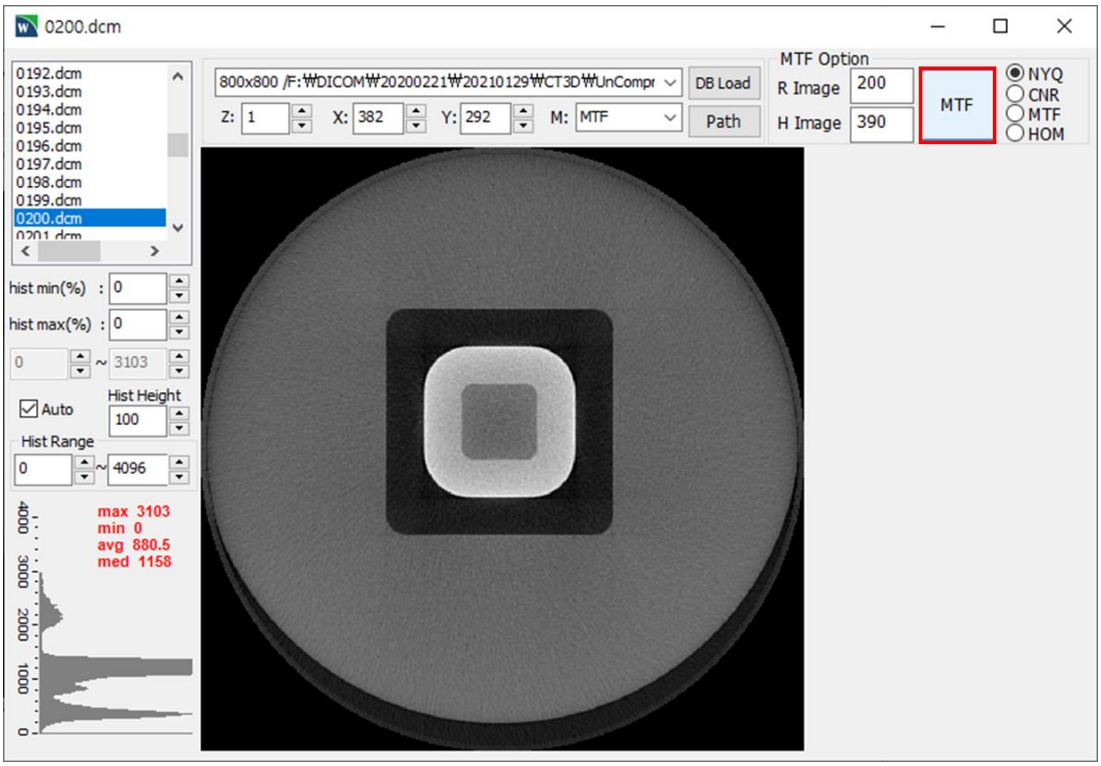
-H Image Example -

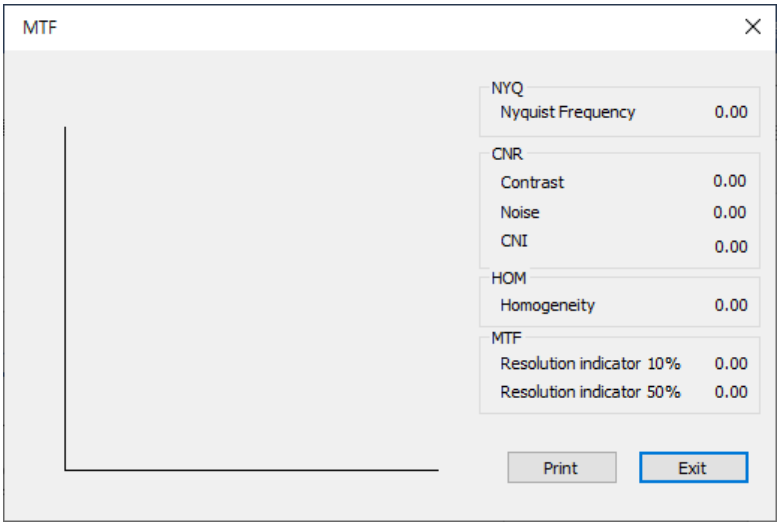


R Image specifies the slice located at the center of the CT image.

④ Getting values of Resolution/Homogeneity

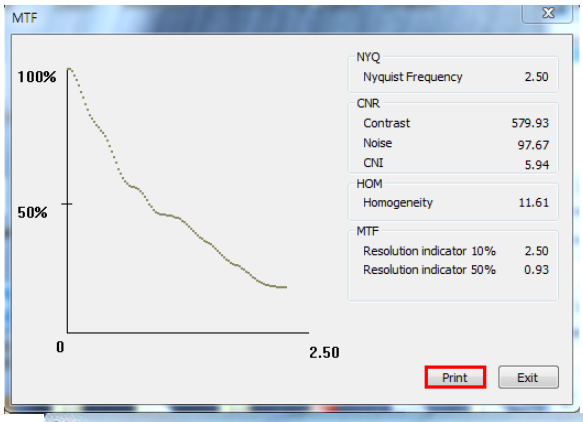
- Press MTF button to call MTF dialog.



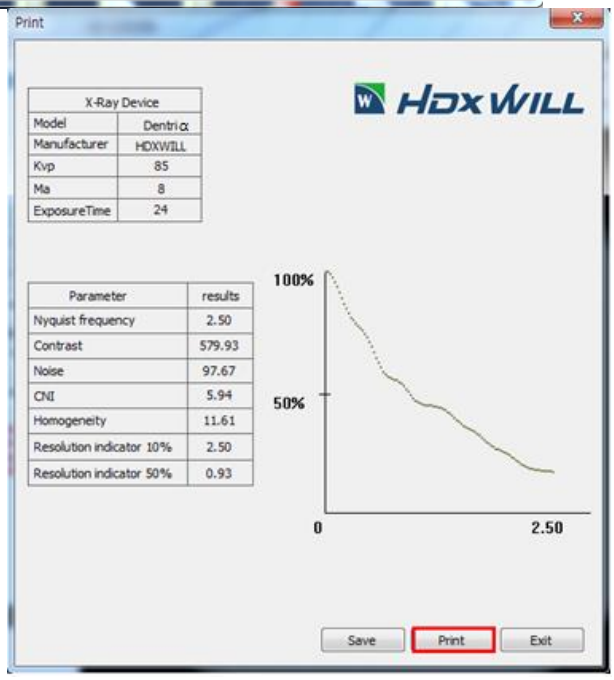


> MTF Dialog

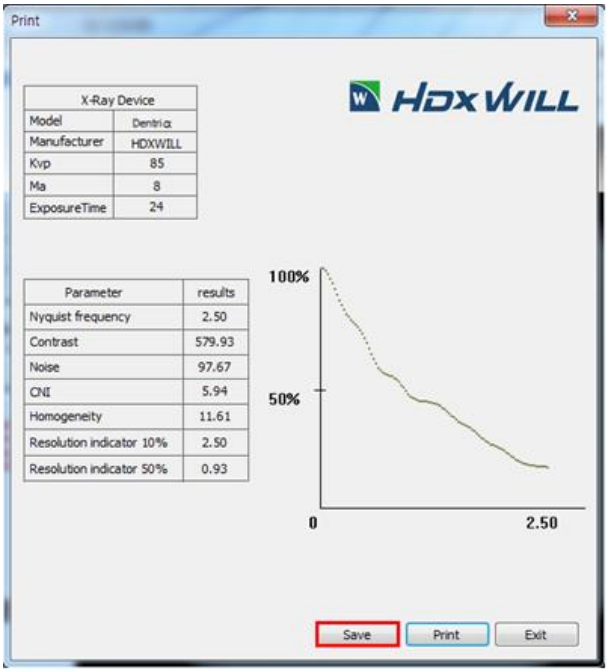
⑤ Output result value



① Click the print button in the MTF Dialog.



② Print Dialog will be printed and print out again.

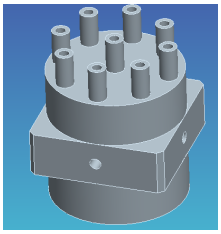


③ You can save the result as a file by pressing the Save button.

3. Setting before test

3.1 CT H_OFFSET Check

① Place CT Phantom on the provided tripod.



② Align using vertical and horizontal lasers such that the phantom is in line with center of rotation.

③ Select a Dental Arch, 0.2 voxel, 70kV, 10mA scan protocol in the CT scan program

④ Check whether there is no noise on the reconstructed image using 3D Viewer program as shown in figure 1 that there is no noise on the circle image of phantom.

Example)

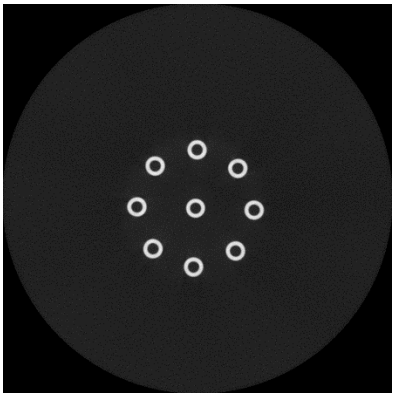


Figure1. Normal image

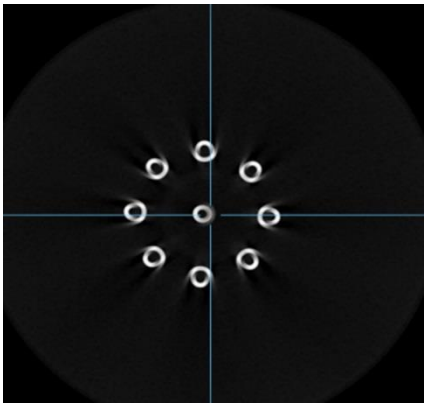


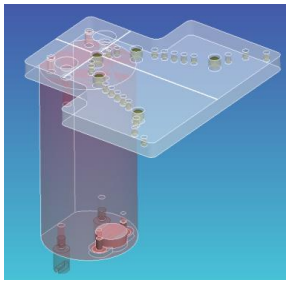
Figure 2. Abnormal image

NOTE

If the circles are uneven as shown in the picture below, modify the H_Offset value to fine the correct value.

3.2 CT center check

① Place Ball Phantom.



② Align using vertical and horizontal lasers such that the phantom is in line with center of rotation.
③ Select a Dental Arch, 0.2 voxel, 70kV, 10mA scan protocol in the CT scan program
④ Acquire the scan
⑤ Check whether the reconstructed image using 3D Viewer program is located in center as shown in the figure 1 that the image of ball phantom is located in center.

Example)

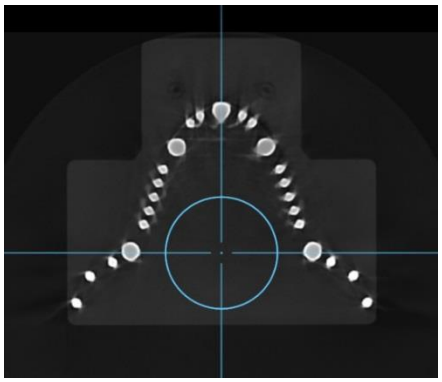


Figure1. Normal image

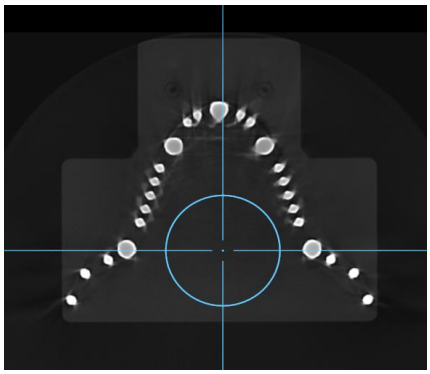


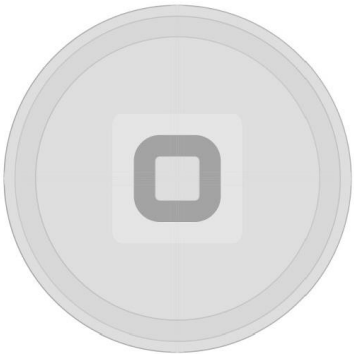
Figure 2. Abnormal image

NOTE

If the reconstructed image is abnormal as shown in figure 2, Adjust the handle frame angle.

3.3 DVT Phantom setting

① Place DVT Phantom on the provided platform.



② Align using vertical and horizontal lasers such that the phantom is in line with center of rotation.

③ Select a Dental Arch, 0.2 voxel, 85kV, 8mA scan protocol in the CT scan program.

④ Acquire the scan.

Example

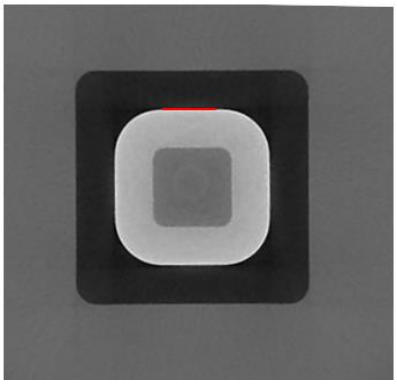


Figure1. Normal image

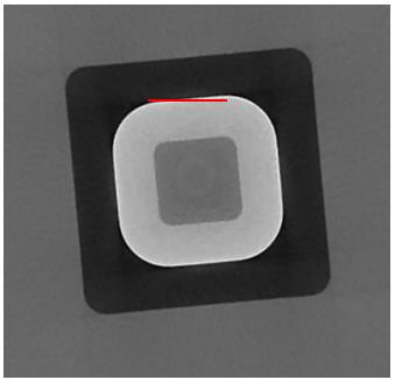


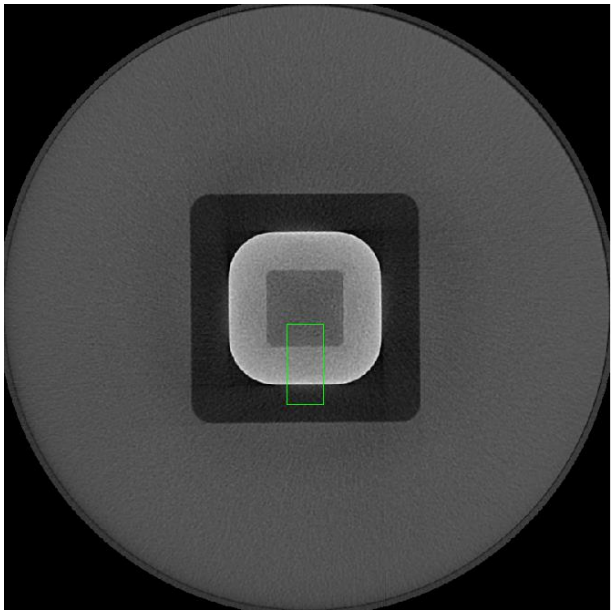
Figure2. Abnormal image

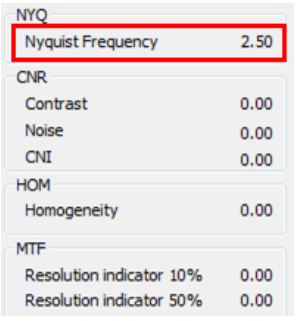
⑤ Image analysis using QA software.

NOTE	If the reconstructed image is abnormal as shown in figure 2, realign the DVT phantom.

4. Performance test method

4.1 Nyquist Frequency (NF) Test



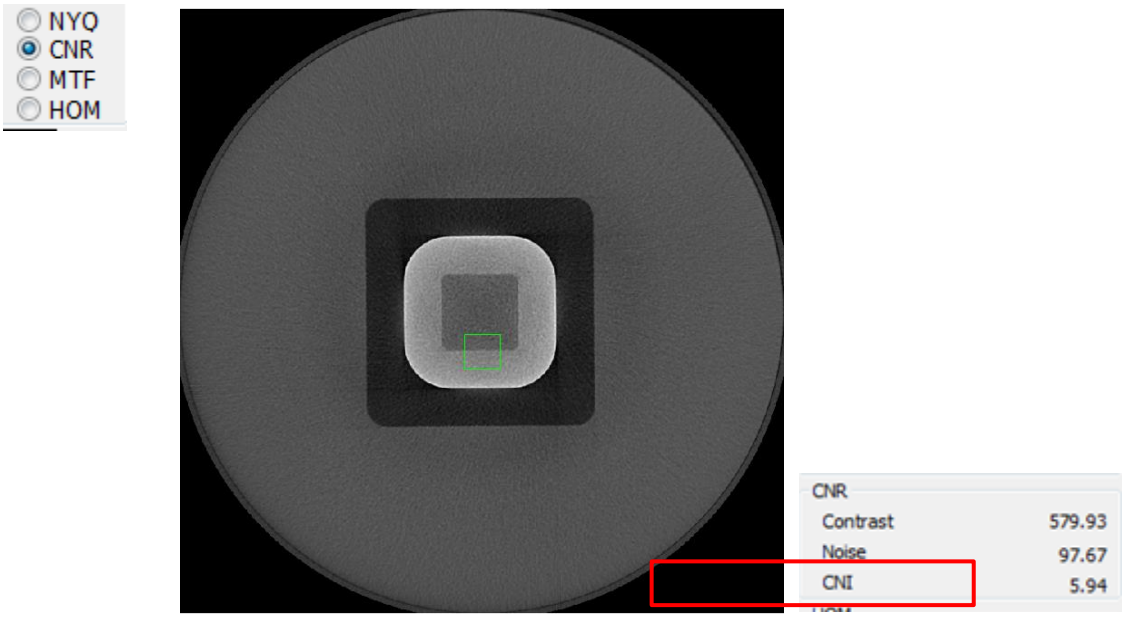


① Select the NYQ radio button, and then specify the area with the mouse so that all three areas can be come in as shown on the screen.

② You can check the NYQ item Nyquist Frequency value in the MTF Dialog.

- Criteria: 2.5 ±5%

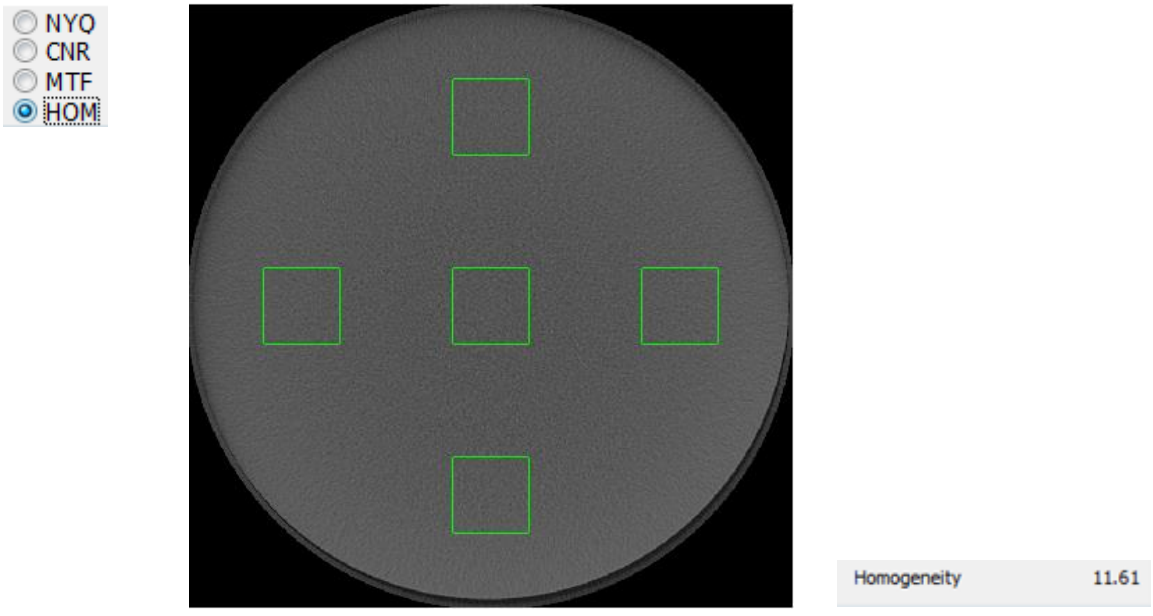
4.2 Contrast-to-Noise Ratio (CNR)



① Select the CNR radio button, and then specify the area with the mouse so that two areas can be selected as shown on the screen.
② Make sure it is modified the value of the MTF Dialog CNR.
- Contrast is the error value with other material areas.
- Noise is the standard deviation in the same material.

- Criteria: >5

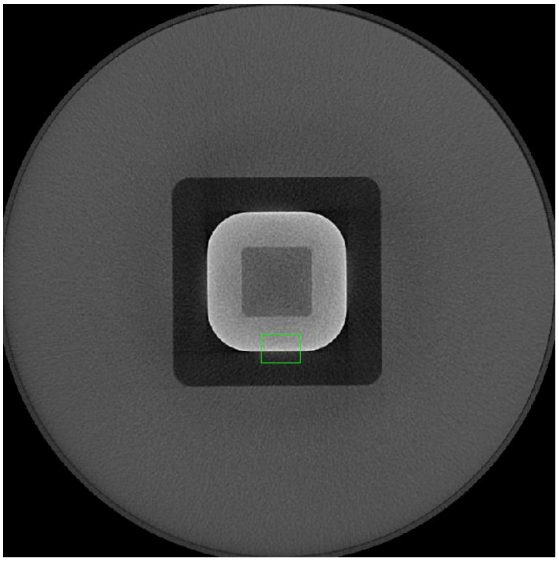
4. 3. Homogeneity / Image Uniformity



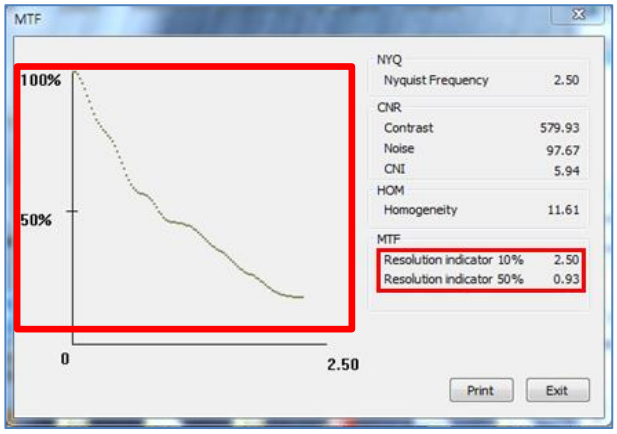
① Pressing the HOM radio button will convert the screen to the image entered in H image, and you can check the value in the MTF Dialog HOM item.

- Criteria: >5

4.4 Modulation Transfer Function (MTF) at 10 % and 50 %



① Select the MTF radio button, and then specify the area with the mouse so that two areas can be selected as shown on the screen.



② Make sure the value changes by graph and MTF item in the MTF Dialog.

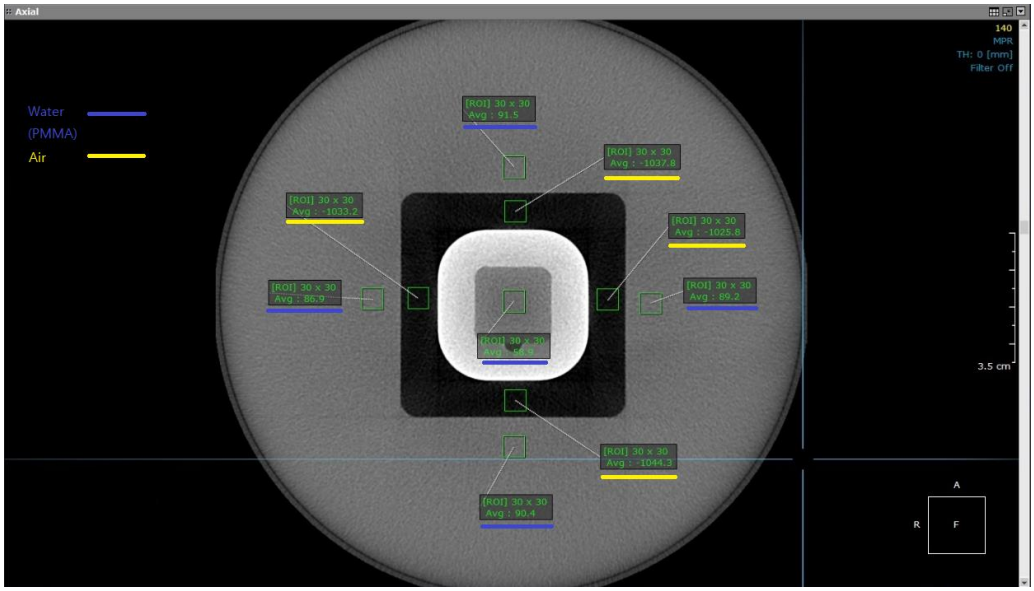
- Criteria: Resolution indicator 10%: >1.00

NOTE	When specifying the resolution area, it should be done at the bottom of the phantom image.

4.5 The Mean CT Number

① Use 3D Viewer program, select one image on the axial view as shown in the figure1 to measure the mean CT number.

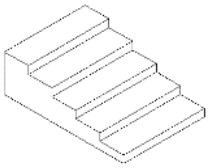
② Use the Region Tool in the 3D Viewer program to define a 6x6mm^2(30 X 30pixels) region of interest (ROI) in PMMA, Air within the DVT phantom.



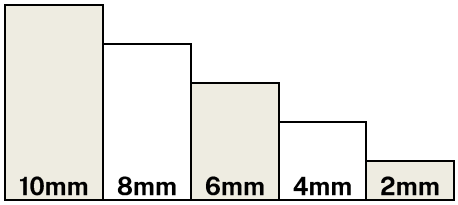
③ Note result of the Mean CT Number measurement.
Criteria: PMMA(Tissue) 0±150 HU, Air -1000 ±150HU, PVC(Bone) 990 ±150HU

4.6 Tomographic section thickness

① Place Stair Phantom on the provided platform.



② Place Stair Phantom on the provided platform
③ Align using vertical and horizontal lasers such that the phantom is in line with center of rotation.
④ Select a Dental Arch, 0.2 voxel, 70kV, 10mA scan protocol in the CT scan program
⑤ Acquire the scan.
⑥ Measure the 2, 6, 10 mm in length in the reconstructed “Stair Phantom” image by using 3D Viewer program.



Height for stairs

⑦ Note result of section thickness (2mm, 6mm, 10mm)

- Criteria: Make sure the deviation of measured value is within ±1.0 mm.

■ Error Message

In the event of abnormal operation, immediately stop using the device and call HDX WILL Corp. After-Sales
Dept. If it is not possible to locate or eliminate the problem using this section, or if the dysfunction is still present, switch off the device and call HDX WILL Corp. After-Sales Dept.

Caution, refer to accompanying documentation.

No	Malfunction	Causes	Solutions
[ERR-000]	Environment setting file is unavailable	Environment setting file does not exist.	Check the presence of setting file
[ERR-001]	Patient information is Incorrect. Program will be automatically closed.	Patient's information transferred to the capture program is incorrect.	Check if the program has execute in the Will-master
[ERR-002]	Failed to connect to the detector.	Cannot connect to the detector	Check the ethernet cable and the detector power cable
[ERR-003]	Serial connection is failed. Please check the serial connection Program will be automatically closed.	Cannot communicate with the equipment.	Check the serial cable and the use of the Port
[ERR-004]	Equipment does not respond. Please turn the power back on.	The equipment is not responding	Check the connection status of the serial cable
[ERR-005]	Equipment has been rebooted. Please exit the capture program, and re-execute the program again.	Equipment has been rebooted. Please exit the capture program, and re-execute the program again.	Check the connection status of the power cable
[ERR-006]	Initializing equipment failed. Please contact the Service team.	Equipment Initialization failure error	Check the Log file because the settings of the equipment are incorrect.
[ERR-007]	Capture mode setting has been failed. Please contact the Service team.	Mode setting failure for capture	Axis of the equipment did not move.

No	Malfunction	Causes	Solutions
[ERR-008]	Capture has unusually stopped. Do you want to retake?	Capture has unusually stopped.	Fail to acquire image or the switch has released during capturing.
[ERR-010]	Map setting has been failed. Please re-execute this program. If the problem persists, contact you representative.	Cannot generate the map file	Check the cables and signals associated with the trigger.
[ERR-011]	Sensor is disconnected. Remove the sensor and place it back on, then re-execute the program. If the problem persists, contact our representative.	Cannot connect to the detector.	Check the sensor and the power of the equipment.
[ERR-012]	Image processing failed.	Reconstruction and image processing failure.	Check if the original image is properly saved. Check the graphics drives for operation in task manager.
[ERR-013]	**[GEN_ERROR]**	Generator failure. **[GEN_ERROR_21] kV value over!** **[GEN_ERROR_22] mA value over!** **[GEN_ERROR_23] Overvoltage Error in Standby State!** **[GEN_ERROR_24] Overcurrent Error in Standby State!** **[GEN_ERROR_25] Preheat Error in Standby State!** **[GEN_ERROR_26] Preheat Error in Ready State!** **[GEN_ERROR_27] Overvoltage Error in Exposure State!** **[GEN_ERROR_28] Undervoltage Error in Exposure State!** **[GEN_ERROR_29] Overcurrent Error in Exposure State!** **[GEN_ERROR_30] Undercurrent Error in Exposure State!** **[GEN_ERROR_31] Exposure Time Over Error!** **[GEN_ERROR_32] Preheat Time Over Error!** **[GEN_ERROR_33]Temperature Over Error!**	Check for generator error code symptoms and contact manufacturer for error code.

No	Malfunction	Causes	Solutions
		[GEN_ERROR_34] DV Setting Error! **[GEN_ERROR_35] DA Setting Error!** **[GEN_ERROR_36] System Communication Error!** **[GEN_ERROR_37] Interlock Error!**	
Will-master			
[ERR-100]	Serial number is not correct. Please contact with service engineer Please contact with service engineer.	Serial number is not correct.	Request the new serial key to the manufacturer
[ERR-101]	Login failed. Please checkyour password.	Login failed Check your ID and password	Check the ID and password
[ERR-102]	This function needs administrator privilege. Current user does not have the administrator privilege.	Logged-In ID has user authority.	Change the authority for the ID
[ERR-103]	The following characters cannot be used for the Chart number. \ / : * ? " <> | space	The following characters cannot be used for the Chart number.	The following characters cannot be used for the Chart number. \ / : * ? " <> | space
[ERR-104]	Please enter the patient Chart No.	The Chart number is not entered.	Enter the Chart number
[ERR-105]	Please enter the patient name.	Patient's name is not entered.	Enter the name.
[ERR-106]	Please enter the date of birth.	Patient's date of birth is not enter.	Enter the patient's date of birth.
[ERR-107]	This Chart No. is already Existed. Please enter another Chart No.	Patient's chart number already exists.	Change the chart number and try again.
[ERR-108]	Database connection does not work.	Cannot connect to the DB.	Make sure that the DB is running or verify the IP and Port.
[ERR-109]	Cannot connect to network shared folder [NFS]. Please check the setting.	Cannot connect to the NFS.	Check the share settings in the file system. Verify the network IP settings and the file system path.

No	Malfunction	Causes	Solutions
[ERR-110]	Please select the patient.	Executing the capture program without selecting the patient.	Select the patient in the patient list and try to execute the capture program again
[ERR-111]	Capture has started. Duplicate shooting is not allowed	Duplicate capture program.	Make sure that the program is currently running. If the program is running, exit the program and run it again.
[ERR-112]	Pixel thickness information tag is not available This function Cannot be used.	Length information does not exist	Enter the length information of the image.
[ERR-113]	Images loading failed.	Image loading failure.	Check if the file exists in the file system. Check if the NFS path is accurate.
[ERR-114]	Cannot connect with dicom server.	Cannot connect to the PACS	Check the entered PACS information is correct.
[ERR-115]	Server does not allow to connect.	Cannot connect to the server when using the DICOM transferring and DICOM print function	Check the entered PACS information and DICOM printer information
[ERR-116]	Work-list server is not working.	Cannot connect to the work-list	Check the entered work-list information.

■ Revision history

Revision no.	Details	Rev. date
0.0	Initial creation	2020.06.01
0.1	Add the language type	2021.01.10
0.2	Add the QC performance test	2021.06.25
0.3	Change the AR of EC	2021.11.08

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