

uDR

System Operator Manual

Digital Medical X-ray Imaging System

uDR 566i-A, uDR 566i-B

uExceed R002

51002504-08-202308-ENG

UNITED IMAGING

CE
0123

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Foreword

This manual provides instructions on the functions, operation methods, and daily maintenance methods of the system.

Audience

- Users of UIH systems.
- UIH training and customer service engineers.
- UIH marketing personnel.
- Authorized distributors of UIH.

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1.1 About this manual

This manual provides information on safety, system components, system operations, and maintenance and repair.

To be able to operate this system safely and effectively, users must have the required expertise and be familiar with the contents of this manual.

Before operating this system, carefully read through this manual and pay particular attention to all the information in the chapter “Safety”.

Personnel mentioned in this manual include:

- Responsible party: The entity that is accountable for the use and maintenance of the equipment.
- User: Personnel authorized to operate the system.
- Patient: Person who receives the exam. Both male and female patients are called "the patient".
- Customer service engineers: Installation, maintenance, and repairing personnel authorized by UIH.

1.2 About this system

The Digital Medical X-ray Imaging System can provide various digital radiography solutions. The workflow of each radiography is unique, so the Digital Medical X-ray Imaging System can be configured according to specific needs. This system has a wide range of application. It can be used for imaging of various body parts such as heads, chests, abdomens, limbs, bones, and soft tissue.

This system has the following features for your convenience:

- Fast imaging, high image quality, and image adjustment tools that are easy to use.
- A large number of protocols for clinical radiography are predefined and a large number of user interfaces are provided.

1.2.1 System features

- The system has the free FPD mode, which you can use for bedridden patients or patients in wheelchairs.
- You can use functions in the image processing system such as patient administration, patient registration, exam, image viewing, and filming to complete your tasks easily.
- The system is equipped with a large digital flat panel detector that can be used in various situations. Different types of grids are available for the radiographic requirements of different source to image receptor distances.

1.2.2 Optional components

- Your system may not have some optional components. Some optional components have multiple specifications to choose from.
- If you need more functions, please contact UIH Customer Service Center.
- If the operation guidelines and technical instruction of some optional components are not mentioned in this manual, you can refer to the user manuals of these optional components.
- Before using any third-party assembly or optional part, you should acquire UIH's approval for compatibility.

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1.3 Clinical application

Intended purpose

uDR 566i-A/ uDR 566i-B Digital Medical X-ray Imaging System is intended to acquire X-ray images of the human body by a qualified technician, examples include acquiring two-dimensional X-ray images of the skull, spinal column, chest, abdomen, extremities, limbs and trunk. The visualization of such anatomical structures provide visual evidence to radiologists and clinicians in making diagnostic decisions. This device is not intended for mammography.

Intended patient population

In principle, uDR 566i-A/ uDR 566i-B Digital Medical X-ray Imaging System can be used for examining all types of patients without restriction. The exposure of human to ionizing radiation must always be medically justified, especially when used on pediatric patients, children and youth. All procedures using ionizing radiation should be used with caution or be avoided altogether. However, the final decision lies with the attending clinician and radiologist.

Intended Users

In order to safely and effectively operate this system, the user must undergo strict training before using this system. User training must include contents related to basic technical knowledge of the system, system safety operations and software operation. The user must be familiar with the potential dangers and safety guideline principles.

The personnel operating the system must know basic knowledge about medical image and system operation, such as radiology examination procedures, and basic principles and features concerning images.

In addition, the user must read and understand the contents of the operation manual，and observe local regulations to safely and effectively operate this system.

Indication

Digital Medical X-ray Imaging System is one of current imaging modalities being applied in radiology to form images of the anatomy of the body. The visualization of such anatomical structures provide visual evidence to radiologists and clinicians in making diagnostic decisions. The device is not directly applicable to indications.

Medical Condition

Producing X-ray image for detecting soft tissue, organ and bone pathologies is the main clinical application of Digital Medical X-ray Imaging Systems.

Clinical benefit

uDR 566i-A/ uDR 566i-B Digital Medical X-ray Imaging System can acquire consistent high quality two-dimensional digital X-ray images of the human anatomy. The system’s high image quality will improve accuracy of diagnosis, and low radiation dose will reduce the radiation injury risk of the patient and operator.

Contraindication

No specific contraindication is incurred for the system. Use the system with care for patients sensitive to radiation.

Limitations

This device is not intended for use in performing mammography.

Applied parts

Radiographic table, BuckyWall stand, flat panel detector are the applied parts.

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1.4 Personnel training and qualifications

⚠WARNING

Authorized professionals shall be familiar with the standards concerning radiological protection, and shall have received training.

⚠WARNING

Safety training shall be included in the trainings on operations.

In order to safely and effectively operate this system, the user must undergo strict training, fully understand the contents of this manual, and abide by local laws and regulations. Operation of this system by personnel that have not been trained may result in personal injuries, system damages, or misdiagnosis.

- User training must cover contents related to the basic technical knowledge and safe operations of this system to help users familiarize themselves with potential risks and safety guidelines.
- The accompanying manuals of the system are the basis for training. Be sure to read them carefully before operating the system.
- Emergency simulations are recommended while you study this manual. Take appropriate measures in such simulations.
- This equipment can only be used by trained and qualified professionals such as professionally trained doctors, radiologic technologists, and technicians so as to avoid personnel injury or equipment damage caused by insufficient knowledge.

⚠WARNING

Only trained customer service engineers authorized by UIH can install and maintain the system or replace parts.

⚠WARNING

The personnel for system installation, maintenance, and repair must be trained on system risks and safety knowledge.

⚠WARNING

When installing or maintaining the system or when replacing the spare parts, the customer service engineers must abide by the safety requirements. Any violation of the safety requirements may lead to severe injuries or death.

UIH provides technical support for this system. In case of any problem, please contact UIH Customer Service Center.

- Telephone: 0086 400-686-6088

- E-mail: services@united-imaging.com

Website: http://www.united-imaging.com

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1.5 Text conventions

Text	Convention
Items in a list	"■" symbol
Sub-items or list items in a table	"♦" symbol
One-step operation	"▶" symbol
Steps within operating sequences	Numbers
Elements in the user interface (such as buttons, window titles, and menu items)	Bold font
Cross references	Blue font
File names, paths, and inputs that the user provides	Monospaced font
Keystrokes	"<>" symbol

Help information with a single item:

Help information.

Help information with multiple items:

- **Help information 1.**
- **Help information 2.**

1.6 Disclaimers

This manual describes the system features to the greatest extent, including its functions, options, and accessories. This manual is provided for your convenient use of the system only and may be updated in a future version. UIH reserves the right to change the information in this manual at any time without prior notice.

This manual only describes product features. The actual configuration may vary.

The photos, graphics, screenshots and images in this manual are for illustration only. Please refer to the actual system appearance and software interfaces. The hospital and patient names in this manual are fictitious. Any similarities to actual persons or hospitals are purely coincidental. Configuration names mentioned in this manual, such as names of the driver, network nodes, and database, may be different from those in the actual clinical scenarios.

Using third-party accessories or assemblies may reduce the product performance or level of safety. Please use accessories or assemblies approved by UIH.

As the designer and manufacturer, UIH is responsible for its products only when the repair, maintenance, and installation are performed by UIH, or by personnel or organizations expressly authorized by UIH.

UIH shall not take any responsibility for system safety, reliability, or any other issues arising out of:

- Wrong operations, improper maintenance, or unapproved modifications due to non-compliance with the manual instructions.
- Use of third-party accessories, assemblies, or any other auxiliary components without the approval or authorization of UIH.

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1.7 Glossary

Glossary	Description
X-ray tube current	Electric current of the electron beam incident on the target of an X-ray tube. Usually, the X-ray tube current is expressed by its mean value in milliamperes (mA).
X-ray tube voltage	Potential difference applied to an X-ray tube between the cathode and the anode. Usually, X-ray tube voltage is expressed by its peak value in kilovolts (kV).
X-ray tube assembly	The assembly of the X-ray tube housing and the tube.
X-ray source assembly	The assembly of the X-ray tube assembly and the collimation system.
Exposure parameters	Parameters that will affect the imaging result, usually including X-ray tube voltage (kV), X-ray tube current (mA), exposure time (ms), and current–time product (mAs).
Exposure mode	X-ray exposure is determined by three high-voltage parameters: X-ray tube voltage (kV), X-ray tube current (mA), and exposure time (ms). Combinations of different controllable parameters and the automatic exposure control (AEC) technique form different exposure modes.
Acquisition system	An acquisition system consists of a source, a receptor, and associated equipment on the path of the X-rays. ♦ The source includes the high-voltage generator, the X-ray tube assembly, and the collimator. ♦ The receptor is a wireless digital flat panel detector (FPD), radiographic cassette, or imaging plate. ♦ The associated equipment is the AEC ionization chamber.
Motorized motion	Movement driven by motors.
Ionizing radiation	Radiation consisting of directly or indirectly ionizing particles or a mixture of both, usually excluding ultraviolet radiation.
Current–time product	In medical radiology, quantity of electricity resulting from the loading of an X-ray tube, expressed in milliampere seconds, as the product of the mean X-ray tube current in milliamperes and the duration of the loading in seconds.
Centering	Aligning the center of the X-ray beam vertically with the center of the detector.
Radiation protection	Requirements, measures, means, and methods for protecting human beings from or minimizing the hazards of ionizing radiation.
Additional filtration	Quality equivalent filtration due to added filters and other removable materials in the raidation beam which are between the radiation source and the patient or a specified plane.

Glossary	Description
High-voltage generator	Combination of all components for control and production of the electrical energy to be supplied to an X-ray tube, usually consisting of a high-voltage transformer assembly and a control assembly.
Inherent filtration	Quality equivalent filtration due to the irremovable materials through which the radiation beam passes before emerging from a radiation source assembly or from components thereof.
Focal spot	Area on the surface of the anode that intercepts the beam of accelerated particles.
Density	Based on the sensitivity of the selected flat panel detector, the sensitivity is adjusted within a certain range.
Sensitivity	Sensitivity of the flat panel detector to X-rays.
Detector	The detector includes a photoconductor that records the X-radiation and converts it to a digital image.
Manual motion	Movement driven by manpower.
Tracking	When the X-ray source assembly or the detector moves, the other follows so that they are always aligned. If tracking goes beyond the allowable movement range, tracking stops.
System information	System information includes feedback from system modules on states and system parameters, as well as judgement and calculation information of the system control module. System information can be messages, warnings, errors shown to users or technical information written in logs.
Movement of system components	System components can move in three directions: ♦ X-axis: Parallel with the ground and perpendicular to the BWS bucky. ♦ Y-axis: Parallel with the ground and the BWS bucky. ♦ Z-axis: Vertical to the ground.
Automatic motion	Movement to a specific position that is driven by motors.
Automatic centering	When the operator holds down the Automatic Centering button, the flat panel detector and the X-ray source assembly moves automatically to the centering position if the centering and safety conditions are met.
Automatic exposure control	In an X-ray equipment, mode of operation in which one or more loading factors are controlled automatically in order to obtain at a pre-selected location a desired quantity of radiation.
Free FPD	Performing exposure at any location with a radiation receptor such as a portable flat panel detector.

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1.8 Abbreviations

Abbreviation	Full form
AE	Application Entity
AEC	Automatic Exposure Control
AWS	Acquisition Workstation
BWS	Bucky Wall Stand
CAN	Controller Area Network
CoCo	Control Box
CTC	Critical Traceable Component
DICOM	Digital Imaging and Communications in Medicine
DNS	Domain Name System
DVI	Digital Visual Interface
EMC	Electromagnetic Compatibility
FPD	Flat Panel Detector
GCHW	Geometry Control Hardware
GCU	Geometry Control Unit
HIS	Hospital Information System
HMI	Human Machine Interface
HU	Heat Unit
IQQA	Image Quality Quality Assurance
MPPS	Modality Performed Procedure Step
PACS	Picture Archiving and Communication System
PDU	Power Distribution Unit
RHA	Rotation about the Horizontal Axis
RIS	Radiology Information System
RoHS	Restriction of Hazardous Substances
RVA	Rotation about the Vertical Axis
SCU	System Control Unit
SC	System Cabinet
SID	Source to Image Receptor Distance

Abbreviation	Full form
SOD	Source to Object Distance
TCP/IP	Transmission Control Protocol/Internet Protocol
TS	Tube Stand
TUI	Touch User Interface
UPS	Uninterruptible Power Supply

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2 Safety

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2.1 Overview

Read all the safety information in this manual. Pay special attention to the safety notes marked with "Danger", "Warning", "Caution", and "Notice" and be familiar with the safety measures, so as to prevent safety incidents.

⚠WARNING

Safety training shall be included in the trainings on operations.

⚠CAUTION

The customer should train the staff (users, janitors, etc.) on the potential risks of the system and the safety requirements on a regular basis.

NOTICE

In case of any serious incident that has occurred in relation to this device, please send a report to UIH Customer Service Center and the local competent authority.

UIH shall not bear any legal responsibility for undesirable consequences caused by users' failure to follow the instructions in this manual.

2.1.1 Safety level definitions

"DANGER", "WARNING", "CAUTION", and "NOTICE" are defined as follows:

"DANGER": Failure to follow these instructions will cause personal death or serious injury.

"WARNING": Failure to follow these instructions could cause personal injury or serious damage to the equipment or other property.

"CAUTION": Failure to follow these instructions may cause slight personal injury or potential damage to the equipment or other property.

"NOTICE": Provides additional information to notify users of the potential risk for personal safety or property protection directly or indirectly.

Format of the safety information:

⚠DANGER

Safety information – risks and possible consequences.

- Safety information – preventive measures.

⚠WARNING

Safety information – risks and possible consequences.

- Safety information – preventive measures.

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⚠CAUTION

Safety information – risks and possible consequences.

- Safety information – preventive measures.

NOTICE

Safety instructions to be followed.

2.1.2 Symbols and labels

Warning safety signs and symbols must be permanently and securely attached to the equipment or other appropriate areas.

NOTICE

The safety labels must be firmly attached and legible, and must comply with local laws and regulations.

2.1.2.1 Safety labels

Table 2-1 Instruction symbols

Label	Description	Position
	Refer to instruction manual/ booklet	Close to the location that prompts the user

Table 2-2 Warning symbols

Label	Description	Position
	General warning sign	Position requiring warning
	Warning, electricity	Close to high voltage
	Warning, ionizing radiation	Protection door and covers of the X-ray tube
	Warning, laser beam	Component surfaces
	Laser beams description	Near the linear laser localizer of the collimator
	Do not remove the cover	Radiographic table
	Warning, crushing of hands	Position where hand is easily squeezed
	Warning, watch out for pinch	Position where foot is easily squeezed
	Warning, to prevent tripping	Surface of an easily tripped component
	Warning, hot surface	Close to the hot component

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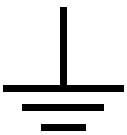
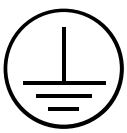
Table 2-3 Prohibition symbols

Label	Description	Position
	No stepping on surface	Surface of component where stepping is forbidden
	No heavy load	Surface of easily broken parts
	Load-bearing limit (15 kg)	BWS bucky and handles of the bucky wall stand
	Load-bearing limit (250 kg)	Fixed radiographic table

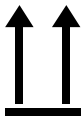
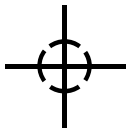
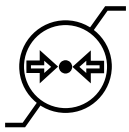
Table 2-4 Classification and indication of equipment

Label	Description	Position
	Type B applied part	Bucky wall stand and radiographic table
	CCC mark	Components with CCC certification
	EEE separate collection mark	System nameplate or packing case

Table 2-5 Electricity and electronics safety

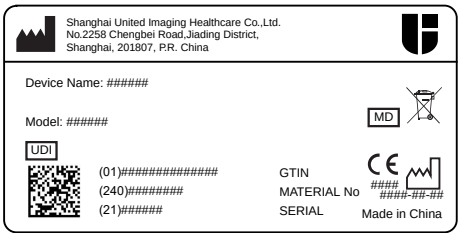
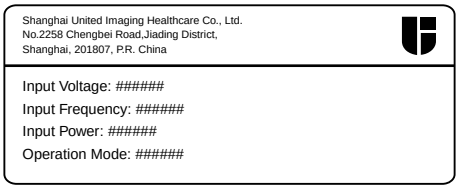
Label	Description	Position
	Earth (ground)	Near the earth point
	Protective earth (ground)	Connection point of protective earth conductor
	ESD Protective	Near the components free of ESD test

2.1.2.2 Packaging labeling

Label	Description	Position
	Fragile, handle with care	Packing case
	This side up	Packing case
	Keep dry	Packing case
	Center of gravity	Packing case
	No stacking	Packing case
	Temperature limit	Packing case
	Date of manufacture	Packing case
	Recycling	Packing case
	Atmospheric pressure limit	Packing case

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2.1.2.3 Product labels

Label	Description
 (not for the U.S.A.)	Device label
	Specification label
	Patent label

2.2 Radiation safety

This Digital Medical X-ray Imaging System complies with IEC 60601-1-3 General Requirements for Radiation Protection in Diagnostic X-ray Equipment. Radiation protection must meet local regulations on radiation safety. Protective equipment must be provided. At a location that is at a safe distance away, the radiation dose is within the safe range.

When this system is performing a scan, the X-ray tube produces X-rays. X-rays are produced only when the system is powered on and is performing a scan. There will be no X-ray when a scan has ended or the system is shut down.

⚠WARNING

- The system must only be used in the specified site with radiation protections.
- Do not use devices other than this system in the scanning room.

The settings on the X-ray system are as follows:

- The X-ray tube only starts working and generates X-rays after the specific scanning protocols are selected and started.
- There is an interlock between the scanning room door and the X-ray exposure switch. The X-ray can only be generated when the scanning room is closed.
- The radiation warning light turns on when the scan starts.

⚠WARNING

Authorized professionals shall be familiar with the standards concerning radiological protection, and shall have received training.

⚠WARNING

Excessive exposure to radiation will cause personal injuries.

- Improper radiation protection in the scanning room can cause harm to operators or other personnel. Necessary radiation protection measures must be taken.

⚠WARNING

X-ray radiation hazard.

- Before exposure, make sure that there is no unauthorized personnel in the scanning room.
- Make sure that all necessary protective measures have been taken before each X-ray exposure.
- Do not expose hands, wrists, arms, or other body parts to direct X-rays when operating or maintaining X-ray equipment.
- Do not repair the equipment during patient examination.

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⚠CAUTION

Do not start X-ray exposure when there is people inside the scanning room or when the protection door is not closed.

⚠CAUTION

Before exposure, check whether the exposure parameters meet the clinical requirements. Adjust any inappropriate parameters in time.

Recommended principles of X-ray radiation protection:

- Time: The longer the exposure is, the greater the total absorbed dose will be. Minimize exposure duration. Reduce the time spent in radiation area as much as possible
- Distance: Radiation exposure is inversely proportional to the square of the distance from the radiation source. If the distance between a person and the radiation source (focal spot) is doubled, the exposure dose is reduced to one-fourth of the original dose. When an X-ray equipment is working, all personnel (except the patient) should be as far away from the X-ray source as possible. During an examination, the focal spot to skin distance should be increased as much as possible while the image quality meets the requirements of diagnosis.

2.2.1 Radiation protection for patients

Abide by relevant requirements on radiation protection to prevent patients from receiving excessive radiation and to reduce the radiation dose.

- To protect other parts of the patient's body from radiation, you should use other protective accessories in addition to the devices of this system such as the collimator.
- The minimum light field is usually used for alignment. Minimize the examination time to reduce the total radiation dose.
- Select the correct measurement field of ionization chamber to avoid accidental or excessive exposure to radiation.
- Place the region of interest as close to the flat panel detector as possible to reduce radiation and optimize the image quality.
- Keep the distance between the X-ray source and skin as long as possible, so as to minimize the absorbed dose of patient skin.
- Use protective plates or rubber covers with lead layers to protect gonads of patients during the image acquisition.
- Do not place any object between the patient and the flat panel detector. Otherwise, the image quality will be affected and the radiation dose received by the patient will be increased.
- Do not remove or modify any circuit that prevents unexpected X-ray exposure.

2.2.2 Radiation protection for operators

Abide by relevant requirements on radiation protection to reduce or avoid excessive radiation for operators.

- Sufficient shielding must be provided in the main protection layer to prevent the operators and other people from the main X-ray beam and scattered radiation. The main protection layer includes the walls, windows, doors, etc. Thickness of the shielding must be determined based on the expected operating parameters of the X-ray system.
- Keeping distance is the most effective protection against radiation. Avoid direct exposure to X-rays during work.
- If you have to stay in the scanning room during the exam, keep away from the radiation object and the X-ray tube assembly as far as possible.
- If you have to stay in the scanning room during the exam, take protective measures, such as using lead barriers, lead gloves, lead aprons, thyroid collars, etc. The protective devices must meet the national and local requirements for radiation protection.
- You can wear dosimeters to detect the absorbed radiation dose.

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2.3 Electrical safety

⚠WARNING

Part of the system components still carry voltage after the shutdown. To avoid electric shock, do not remove covers of the system.

⚠WARNING

Multiple socket-outlets provided with this system shall only be used for supplying power to equipment that is intended to form part of the system. Do not connect any equipment that has not been supplied as a part of this system to the system. Do not connect such equipment to the same multiple socket-outlet (MSO) with system components.

⚠WARNING

Do not press the System Off button during exposure. Otherwise the high-voltage generator will be damaged or the patient will receive extra radiation dose.

- Only qualified UIH customer service engineers that can use the tools correctly are allowed to install, calibrate, maintain, or modify the equipment.
- After the system is powered off, the high-voltage generator and UPS still carry voltage. Wait for 5 minutes before you clean, disinfect, or maintain the equipment.
- This equipment does not provide protection against ingress of water. Do not spill any liquid on the equipment.
- Do not move the system when it is running. Before you move the system, shut down the system and power it off. Make sure that all peripheral components of the system, such as the monitor, mouse, keyboard, and cables, are disconnected.
- Do not open covers of this system or remove the cables by yourself unless otherwise clearly stated in this manual.
- Work under safe voltage. If the voltage exceeds the safety limit, power off the system immediately.
- Make sure that protective earthing is correctly connected to prevent the leakage of dangerous voltage.
- Operators are prohibited from touching the patient and the system parts that carry voltage or parts that may carry voltage under single failure conditions at the same time.
- Do not use the system when any electrical or mechanical failure occurs, or when the protection circuit and facilities of the system are removed.
- To prevent potential difference of external equipment from exceeding safe voltage and causing electric shock, the patient table has a potential equalization earth terminal. Before the equipment is operated, the potential equalization conductor should be connected to the equipotential column.

2.4 Laser safety

This system is equipped with a linear laser localizer for positioning and quick locating.

⚠WARNING

If the linear laser localizer remains on for a long time, the cover and bulb will heat up. To avoid scalds, do not touch the cover.

⚠WARNING

Laser beams entering the eye can cause varying degrees of damage such as impaired vision or permanent blindness.

- Do not look directly at laser beams.
- During examination, turn the linear laser localizer off by sliding the laser cover to protect the patient's eyes.

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2.5 Mechanical safety

NOTICE

Select the correct screws and torques to avoid mechanical damages or property damages.

⚠WARNING

When the equipment moves, keep monitoring the equipment to prevent collisions or crushes.

⚠WARNING

- If associated equipment does not meet the safety requirements of this equipment, the safety level of the system may be degraded. Only original parts of this system or third-party parts approved by UIH can be used.
- Failure of any system component can degrade the safety level of the system. In such cases, stop operating the system immediately and contact UIH Customer Service Center.

- The system components may crush or collide with human body, causing system damages or personal injuries.
- The system components can move vertically or rotate. Only move the system components when there is no danger to the patient, operator, or any third party, and when there is no obstacles. Make sure that you and any third party are not within the path of the system before operation, and all objects within the path have been removed.
- When cables are found to be pulled, twisted, or worn during the system movement, stop the movement immediately and make adjustments. If the problem is unavoidable, please contact UIH Customer Service Center.
- Prevent body or clothing from getting stuck or clamped in the moving parts of the system.
- Damaged or missing components (such as wire ropes and washers) must be replaced with spare parts of the same model.

2.5.1 Abnormal movement

In case of abnormal system movements, press the E-Stop button closest to you immediately. You can release the E-Stop button only after the problem that causes the abnormal movements is found and solved. If the problem persists, please contact UIH Customer Service Center.

2.5.2 Collision protection

All components with motorized motion have a collision protection area. During motorized motion, the X-ray source assembly slows down when it moves into the collision protection area or patient protection area and stops when it reaches the electronic position limit.

The speed of manual motion is adjusted manually. You can see the prompt messages on the operation interface of the image processing system and adjust the motion speed accordingly.

2.5.3 Crushing hazards

Be aware of the gaps between moving parts and fixed parts to avoid squeezing fingers. Before you move any system component, make sure that the patient is not holding any part that may collide.

Prevent clothes from being caught in components. Otherwise, patients or operators may be injured or the system may be damaged permanently.

Pay attention to the crushing hazards near the moving components.

- The patient may be caught between the table top and the X-ray source assembly. When moving the table top or moving the X-ray source assembly downward, make sure that the patient will not be caught between the table top and the X-ray source assembly.
- The patient may be caught between the BWS bucky and the floor. When moving the BWS bucky downward, make sure that the patient will not be caught between the BWS bucky and the floor.

2.5.4 Areas with crushing hazards

The motion of the X-ray source assembly may cause personal injury in specific areas.

- Ensure that there are no obstacles within the motion range of the X-ray source assembly and table top.
- Ensure that the knee of the seated person is not under a vertically movable system assembly.

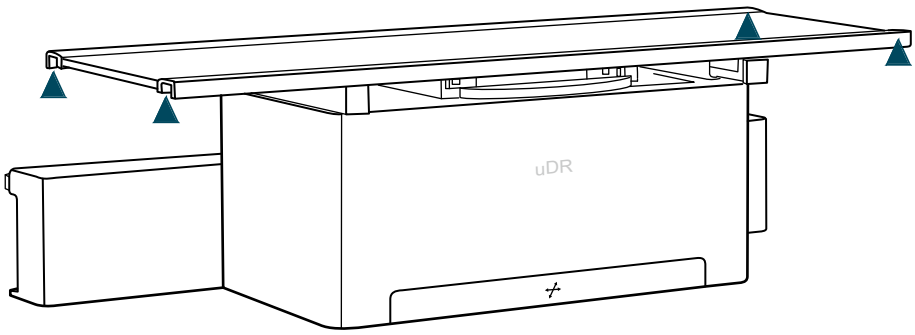


Figure 2-1 Dangerous areas on the fixed radiographic table

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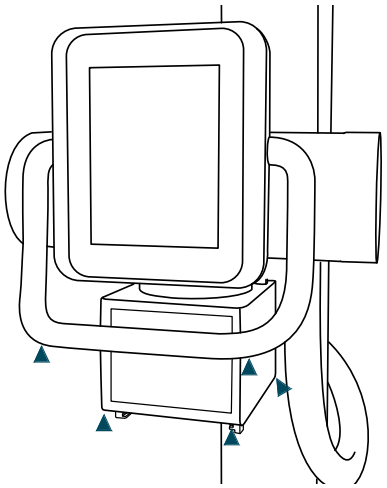


Figure 2-2 Dangerous area on the X-ray source assembly

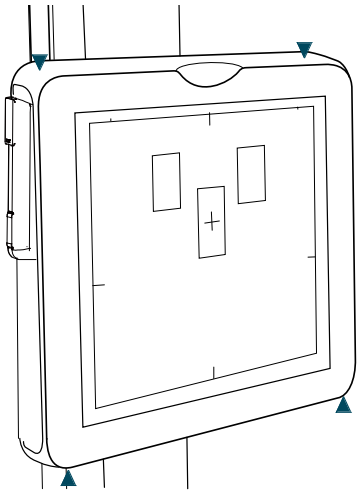


Figure 2-3 Dangerous areas on the bucky wall stand

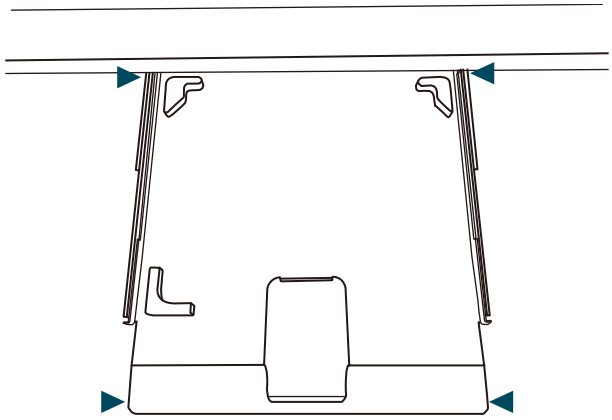


Figure 2-4 Dangerous area on the flat panel detector tray

2.6 Electromagnetic compatibility

This system complies with the standards for the electromagnetic compatibility of YY 0505. These standards stipulate the radiation level allowed by the equipment and the equipment immunity against external electromagnetic interference.


Non-ionizing electromagnetic radiation

This equipment must be installed and put into service according to the EMC information provided in the accompanying documents.

Portable and mobile RF communication equipment, such as mobile phones, may affect the normal operation of the system, causing serious personal injury or even death. Therefore, RF communication equipment must not be taken into the .

⚠WARNING

Other electronic devices in the working area should be turned off.

⚠WARNING

- The system must only be used in the specified site with radiation protections.
- Do not use devices other than this system in the scanning room.

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2.7 Fire and explosion safety

2.7.1 Fire protection

⚠WARNING

Prevent ingress of liquid into the system to prevent corrosion of components and short circuit.

NOTICE

Do not place containers with liquids, such as water cups and medicine bottles, on the equipment.

- Fire protection systems must be designed and installed on site. Make sure that the fire extinguisher is placed in an easily accessible position and that the operators are familiar with how to use it. Make sure that doctors and patients know the escape routes.
- It is the responsibility of the customer to actively communicate with the local fire department and establish fire emergency procedures to ensure that the fire department is familiar with the system and the site.
- A fire near or in the system may cause property loss, as well as burns, collisions, or gas poisoning to patients and operators.
- Ingress of conductive liquid into console components in use may cause short circuit and fire. Do not place any liquid or food on the console table or other components.
- In the event of a fire in electrical equipment, cut off the power supply immediately. The electrical appliances and cables on fire may carry voltage. This may cause spread of the fire and cause electric shocks when you try to put out the fire.

2.7.2 Fire extinguishing agent

NOTICE

Never use water for fire fighting. Fire extinguishers with carbon dioxide or difluorodibromomethane are recommended.

If the system cannot be shut down for special reasons or the power cannot be cut off due to other needs, you must use non-conductive fire extinguishing agents. For example:

- Carbon dioxide fire extinguisher
- 1211 fire extinguisher
- Difluorodibromomethane fire extinguisher

2.7.3 Explosion protection

⚠WARNING

Some anesthetic gases and disinfectant sprays are flammable and explosive, and can cause fire or explosion.

- ♦ If flammable and explosive gases and liquids (such as anesthetic gases and disinfection sprays) are used during combined treatment, be careful when using the equipment.

⚠WARNING

To avoid explosion, do not use this system in areas with explosion hazards.

This system is not suitable for use in the presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide. Detergent and disinfectant (including those used on patient bodies) may produce explosive gas mixtures. Please follow all relevant safety regulations.

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2.8 Image quality

2.8.1 Image quality

NOTICE

Image quality must be checked by qualified personnel to ensure that the image quality meets the standards for clinical diagnosis.

NOTICE

The monitor of the image processing system cannot be used for diagnosis. To view the images for diagnostic purpose, send the images to the diagnostic workstation or print the images on films.

Due to the aging and normal wear of system components, the quality of images acquired by the system decreases with the increase of use time.The image quality needs to be checked regularly.

The system can be connected to film printers that support the DICOM protocol and DX images.

2.8.2 Image orientation

Operators must ensure that the image orientation on the monitor or film is correct.

When free FPD is selected as the acquisition system, operators should check the image orientation.

⚠WARNING

- Flipping images may cause confusion on orientation, resulting in misdiagnosis.
- Users should use image flipping correctly, explain the images, and be responsible for the conclusions drawn based on the images.

⚠WARNING

Users should fill in the left and right labels correctly to prevent misdiagnosis. If necessary, use lead letters or other similar tools during acquisition.

2.8.3 Room lighting

Avoid reflection from windows, lights, and observation windows at the location where you use the monitor. Such reflection may affect image viewing and diagnosis.

2.9 Patient care

2.9.1 Visual contact with the patient

In the process of using this system, the visual and auditory contact with the patient must be kept continuously. The operator is responsible for ensuring the patient's safety by visually confirming the patient's position and using special protective equipment.

2.9.2 Components in contact with patients

The front cover of the BWS bucky, the upper and side handles of the bucky wall stand, and the fixed radiographic table are in frequent contact with patients, and should be maintained and cleaned properly.

2.9.3 Safety of patient positioning

Make sure that the weight of the patient is evenly distributed on the table top of the radiographic table, so as to avoid the risk of material deformation and personal injuries. Take the weight of the accessories into account, such as electronic devices, prostheses, implanted tubes, and plaster bandages.

Cracks may occur when the table top collides with hard objects. A broken table top of the radiographic table may result in injuries of the patient. If the table top is broken, contact UIH Customer Service Center immediately for checking, repairing, or replacement of the table top.

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2.10 Handling of emergencies

2.10.1 Emergency procedures

⚠CAUTION

Due to the complexity of the system, unavailability of the system due to abnormal external power supply, wear parts (for example the X-ray tube) approaching the end of their service life, accidental damage to parts, failure, or interference cannot be completely avoided. Before examination or treatment, emergency procedures should be formulated to deal with the above situations.

The system provides two types of buttons for emergency use: Emergency Stop (E-Stop) button and Emergency Power Off (EPO) button.

⚠WARNING

- Before starting the scan, make sure that there is no person or object within the movement area of the system.
- During system movement, closely observe the patient.
- In case of any emergency, stop moving the patient table or press the E-Stop button immediately.

⚠WARNING

Some system function failures may not be resolved in a short period of time, resulting in exam delay or interruption. You should consider establishing appropriate emergency procedures.

2.10.2 E-Stop button

E-Stop buttons are provided to stop all movements of the system in emergencies, so as to reduce damages to the system and personnel.



Figure 2-5 E-Stop button

⚠CAUTION

If the system is activated by accident or if it moves when you are not operating it, press the nearest E-Stop button immediately to prevent personal injury or component damage.

If abnormal system movements cause an emergency that endangers the patient, operator, or system, you should press the E-Stop button closest to you immediately.

- After the E-Stop button is pressed, all motor drives of the system are stopped, system movement stops immediately, and exposure is disabled.
- Information of the system status that causes the stop will be displayed on the monitor of the acquisition workstation.

Releasing the E-Stop button

- You can release the E-Stop button only after the problem that causes the abnormal movement is found and solved.
- To release the E-Stop button, rotate it clockwise. After it is released, the motorized motion and exposure can be restored.
- In the first 5 seconds after the E-Stop button is released, the system movement will be temporarily disabled when the system restarts. After that, the system movement returns to normal.

2.10.2.1 Locations

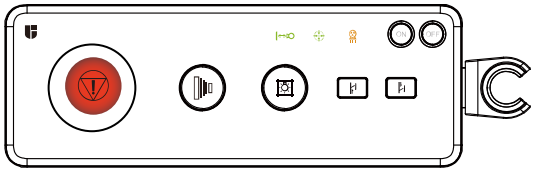


Figure 2-6 E-Stop button on the control box

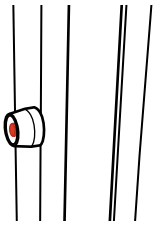


Figure 2-7 E-Stop button on the bucky wall stand

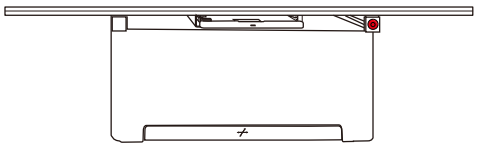


Figure 2-8 E-Stop button on the fixed radiographic table

2.10.3 Emergency Power Off button

- The Emergency Power Off (EPO) buttons are connected to the power distribution panel provided by the customer. The customer is responsible for installing the Emergency Power Off buttons.
- Once the Emergency Power Off button is pressed, power supply of the whole system will be cut off.
- This button should be used in case of emergencies such as fire and earthquake, so as to cut off the system power supply quickly. You can power on the system again after the faults and hazards are eliminated.

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2.11 Environment safety

This system was designed and manufactured according to the requirements of safety and environment protection. When none of the system cover is removed and the system is used correctly, this system will not cause harm to personnel or the environment.

A hazardous material is a substance that can ignite or cause an explosion, is toxic and harmful to health, or is corrosive or irritating. Before dealing with hazardous materials, you must be familiar with the relevant instructions to avoid causing environmental pollution or personal injury. The handling procedures must comply with local laws and regulations.

2.11.1 Disposal of radioactive wastes

Relevant components of the system must be recycled according to local laws and regulations or handled by the authorized personnel properly as stipulated by local waste collection stations. Never handle X-ray related equipment as general industrial or domestic wastes.

⚠CAUTION

- The flat panel detector is a precise instrument. Do not shake the flat panel detector violently or apply excessive loads to the flat panel detector.
- Do not use flat panel detectors with broken covers. Otherwise, it may cause environmental pollution. If there is particle leakage, put on protective gloves to collect the leaked particles, store the particles in a sealed container, and return them to the manufacturer.
- Do not expose the detector directly to X-ray beams.

⚠WARNING

If the X-ray tube is damaged, stop using the system immediately and contact UIH Customer Service Center.

2.11.2 Battery safety and recycling

The power supply or battery charger used for this equipment must comply with corresponding national and regional safety standards. Installation, use, and maintenance of batteries and rechargeable batteries should be carried out according to the requirements of the manual. Batteries must be replaced regularly to ensure operation safety.

⚠WARNING

Leakage of batteries may cause unacceptable risks.

- If the batteries will not be used for some time, remove the batteries.

NOTICE

Dispose of the batteries properly to prevent environmental pollutions. Do not put the batteries in the trash.

NOTICE

To avoid environmental pollution or personal injury caused by leaked particles containing hazardous materials, do not use the equipment if the battery is damaged.

Expired batteries and rechargeable batteries shall be recycled in accordance with the relevant national and regional laws and regulations.

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2.12 Equipment compatibility

⚠WARNING

If unapproved accessories are connected to the system, the system performance may be adversely affected, causing errors during the scanning and resulting in misdiagnosis.

- Only use approved accessories.

⚠WARNING

Only the third-party software that has been validated by UIH can be installed on the equipment.

NOTICE

Signal input parts and signal output parts of the system can only be connected to equipment specified in IEC 60601-1.

The information technology equipment connected to this equipment through interfaces must meet the requirements of IEC 60950-1.

Do not replace the graphics cards or the driver of graphics cards without permission.

2.13 Service life of the product

The expected service life of this product is 10 years.

After the product reaches its service life, it must be disposed of according to relevant laws and regulations. In case of any problems, please contact UIH Customer Service Center.

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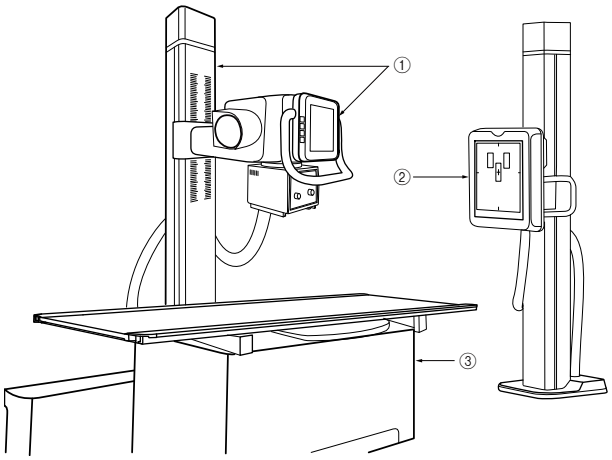
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3 System components

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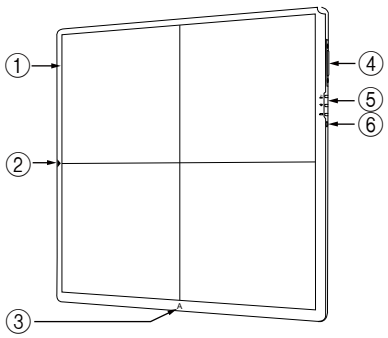
3.1 Components in the scanning room



No.	Component	Description
1	Components of the X-ray source assembly	Including: ♦ Guide rail on the tube stand ♦ Tube stand ♦ Cantilever of the X-ray source assembly ♦ Movement handle of the X-ray source assembly ♦ X-ray tube assembly ♦ Collimator ♦ Movement control buttons ♦ Angle indicator
2	Components of the bucky wall stand	Including: ♦ Bucky wall stand and handles ♦ BWS bucky
3	Components of the radiographic table	Including: ♦ Table frame ♦ Table bucky

3.1.1 Flat panel detector

The flat panel detector receives X-rays and convert them into images displayed on the image acquisition workstation.



No.	Component	Description
1	Effective imaging area	The solid line box marks the effective imaging area of the flat panel detector. The size if 427 mm × 427 mm. To reduce unnecessary radiation, the light field must not exceed the effective imaging area.
2	Sign for placement	Indicating the direction for installing the flat panel detector.
3	Label of FPD A or B	Distinguishing FPD A from B when there are two FPDs.
4	Cable port	Connecting cable.
5	State indicators	Showing the working state of the flat panel detector. ♦ shows the state of data transmission. ♦ shows the signal of wireless network. ♦ shows the battery level.
6	Power button	To turn the flat panel detector on, hold this button down till the state indicators light up.

- Although this equipment and some mobile RF communication equipment meet the requirements of regulations on applied radiation, the detector can still be interfered by other equipment, including portable and fixed RF communication equipment.
- The RF range of the detector is 2.4 GHz or 5 GHz. Operators must ensure that not too many other devices are running within this RF range. Otherwise, the remote signal transmission may be interrupted.

Related concepts
Page 2-9 Radiation safety

3.1.1.1 Online charging

When the flat panel detector is placed into the bucky correctly, the charging port on the detector is connected with the charging port in the bucky and charging starts.

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- When the flat panel detector is being charged, the charging state is shown in the System Status area  .
- Charging stops when the battery is fully charged.
- Charging stops when you pull the tray out.

3.1.1.2 Calibration

It is recommended that FPD calibration be carried out once every month.

For detailed operations, see the *Software Operator Manual*.

⚠CAUTION

If the flat panel detector is not calibrated after long time of use, the image quality will be degraded. Re-examination may be required, causing unnecessary radiation exposure.

⚠CAUTION

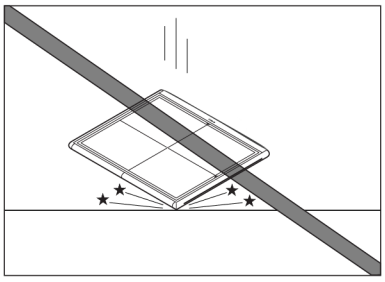
Do not start X-ray exposure when there is people inside the scanning room or when the protection door is not closed.

⚠WARNING

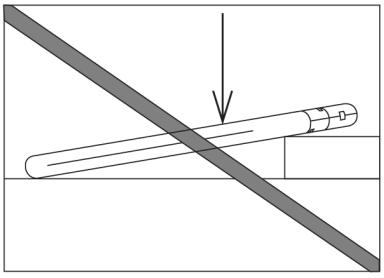
During examination or calibration, follow the requirements for radiation protection to reduce the harm of X-ray radiation on human bodies.

3.1.1.3 Precautions

Use the flat panel detector properly. To avoid affecting the image quality, do not knock or damage the flat panel detector.



When you use the flat panel detector or place it aside temporarily, always choose a flat and clean surface. Do not squeeze or bend the detector.



During exposure, make sure that there is no equipment around the flat panel detector that generates a strong magnetic field.

Ensure that the flat panel detector is used in an environment of the normal working ambient temperature. If the ambient temperature is too low and condensation is caused, wait for the condensate to evaporate before you start the X-ray exposure.

If the flat panel detector is damaged, stop using it.

To prevent the risk of infection, use disinfectant ethanol to wipe the surfaces that come into contact with the patient after you have used the flat panel detector.

When the image quality is degraded, the flat panel detector needs to be recalibrated. In order to ensure image quality and normal use of the flat panel detector, you should calibrate, check, and maintain the flat panel detector regularly.

⚠WARNING

Do not touch the detector with wet hands during use of the system, so as to avoid electric shock.

⚠CAUTION

- The flat panel detector is a precise instrument. Do not shake the flat panel detector violently or apply excessive loads to the flat panel detector.
- Do not use flat panel detectors with broken covers. Otherwise, it may cause environmental pollution. If there is particle leakage, put on protective gloves to collect the leaked particles, store the particles in a sealed container, and return them to the manufacturer.
- Do not expose the detector directly to X-ray beams.

NOTICE

- Do not spill liquids (such as water, blood, and chemicals) on the detector.
- Make sure that the detector is used in a normal working environment. If the ambient temperature is too low and condensation is caused, wait for the condensate to evaporate before you start the X-ray exposure.
- Be careful when using the detector to avoid impact, drop, or violent shaking. Otherwise, the detector may be damaged.
- Use a plastic bag to protect the detector when it is not in use.
- If the detector is not used for a long time, the battery may be over-discharged. Charge the battery completely at least once a month to avoid damage.

NOTICE

To avoid the necessity for additional exposure, confirm that the light field is within the coverage of the detector before you start the exposure.

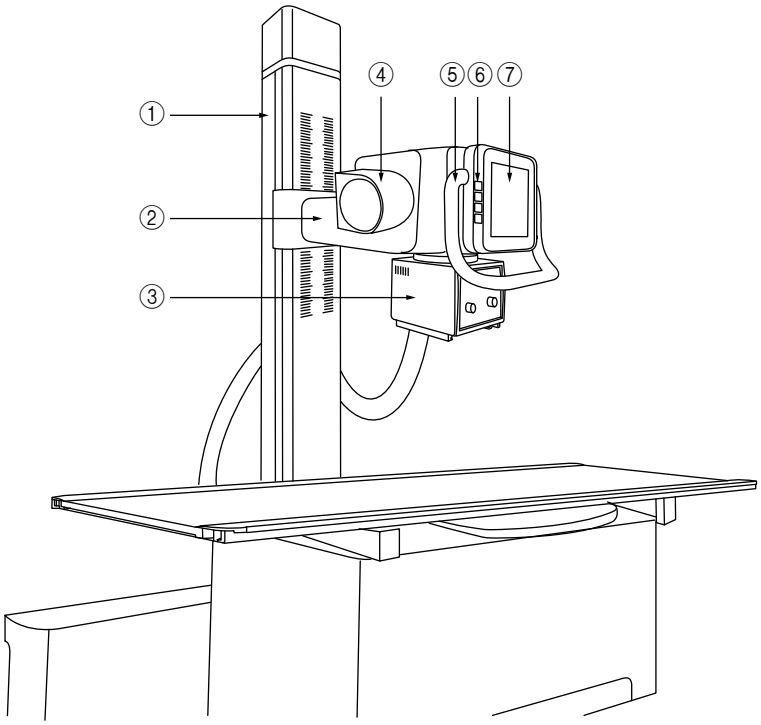
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Overheating of the detector may degrade its performance. Make sure that the vents are clear.

NOTICE
Keep the remote control and the flat panel detector away from heat or fire to avoid personal injuries and battery damage.

3.1.2 Components of the tube stand

3.1.2.1 Structure of the tube stand



No.	Component	Description
1	Stand	Supporting vertical movement of the X-ray tube assembly and collimator.
2	Cantilever	Supporting the X-ray tube assembly and collimator.
3	Collimator	Controlling the size of the radiation field.
4	X-ray tube assembly	Generating X-rays.
5	Handle	Hold the handle to manually move the X-ray source assembly.
6	Movement control buttons	Controlling the gantry's movement in different directions.
7	Angle indicator	Indicating the rotation angle of the X-ray tube about the Y-axis.

⚠WARNING

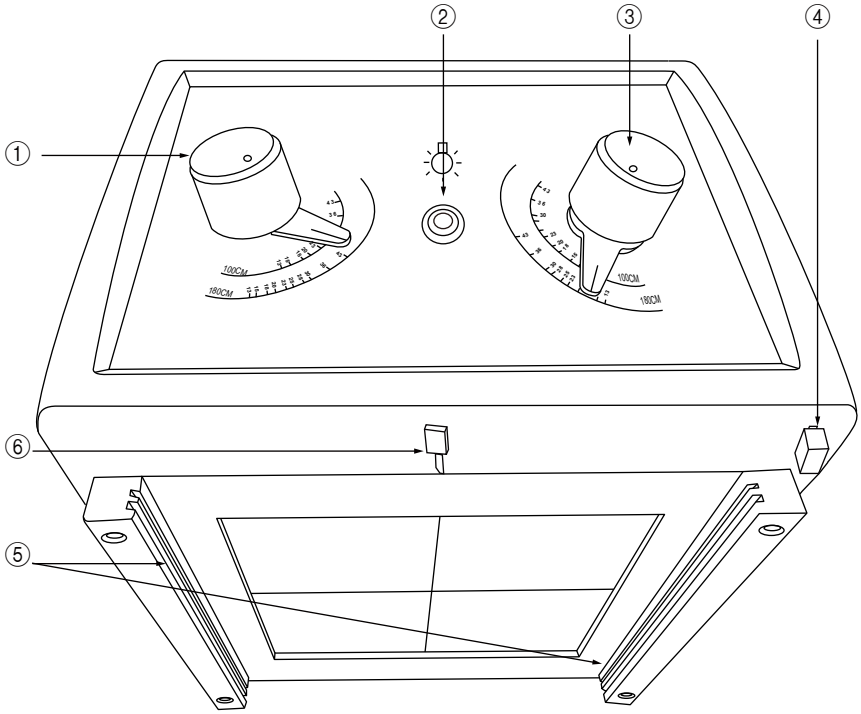
Do not add extra load to the X-ray source assembly. Extra load may damage system components. If the load falls, it may also cause personal injury to patients.

⚠WARNING

In extreme cases, the temperature of the X-ray tube assembly will rise. To avoid scalds, do not touch the X-ray tube housing.

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3.1.2.2 Collimator



No.	Component	Description
1	Field width adjustment knob	♦ Clockwise: Increasing width ♦ Counterclockwise: Decreasing width
2	Collimator Lights button	♦ Turning the light localizer and the linear laser localizer on or off ♦ The lights go off after 30 s
3	Field height adjustment knob	♦ Clockwise: Decreasing height ♦ Counterclockwise: Increasing height
4	Measuring tape	You can use the measuring tape to measure the distance from the focal spot of the X-ray tube to the FPD surface, i.e. the source to image receptor distance (SID).
5	Guiding slot for accessories	Accessories can be inserted along the guiding slot.
6	Linear laser localizer and laser cover	The linear laser localizer is used to mark the central line of the X-ray field. You can use the laser cover to block the laser. ♦ To turn the linear laser localizer off, slide the laser cover toward the slots for additional filters. ♦ To turn the linear laser localizer on, slide the laser cover in the opposite direction.

⚠WARNING

If the linear laser localizer remains on for a long time, the cover and bulb will heat up. To avoid scalds, do not touch the cover.

When you adjust the collimator manually, please pay attention to the size of the radiation field. An overly large radiation field will generate excessive radiation, causing unnecessary harm to patients.

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3.1.2.3 Movement control buttons of the X-ray source assembly

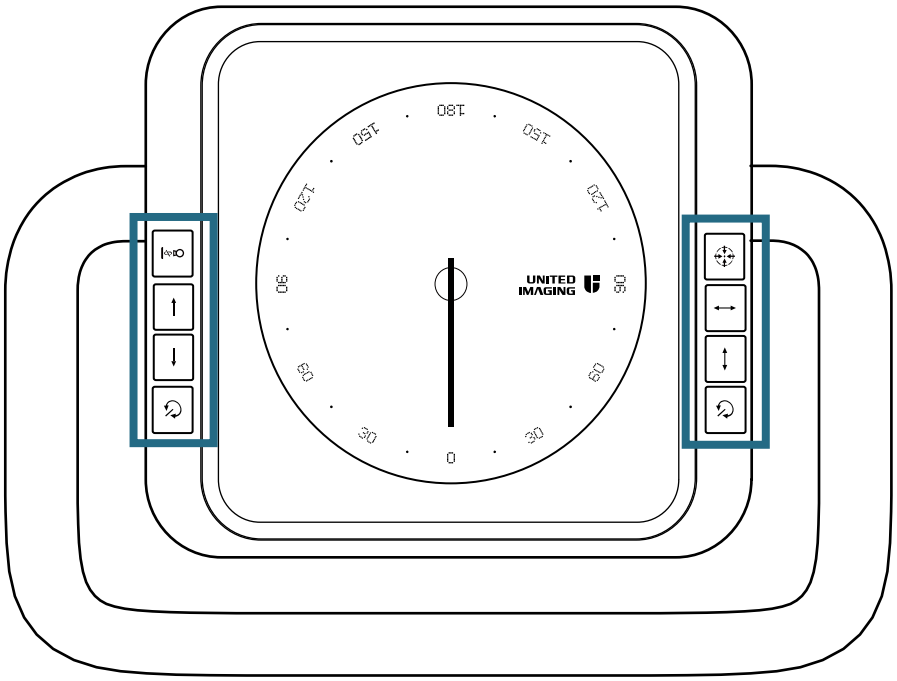


Figure 3-1 X-ray source assembly (front)

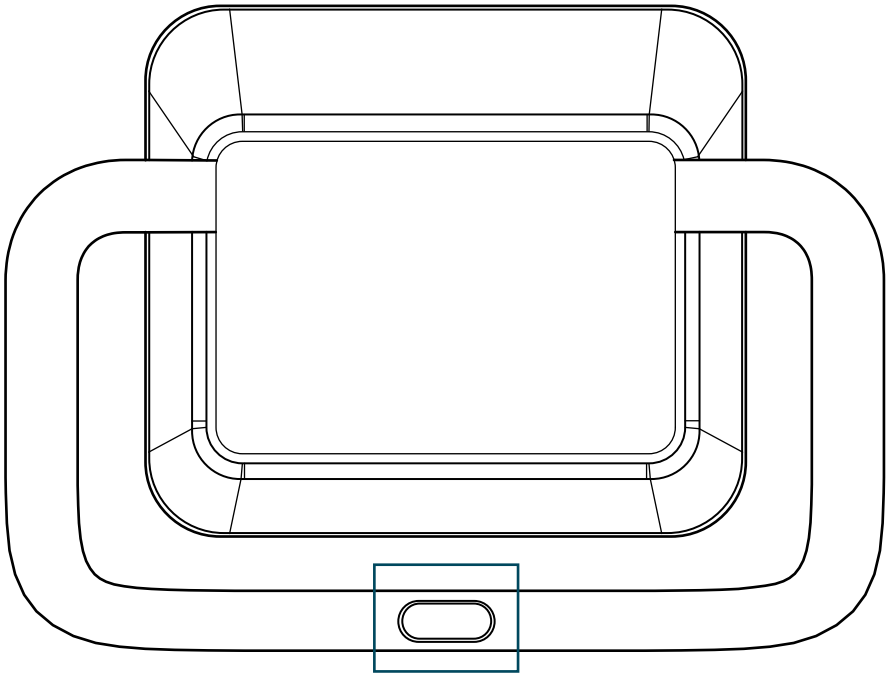


Figure 3-2 X-ray source assembly (back)

Button	Name	Description
	Tracking Release button	Press this button to deactivate the tracking of the X-ray source assembly and the table bucky.
	Automatic Centering button	Hold down this button to align the X-ray source assembly with the BWS bucky. At the same time, the tracking of the X-ray source assembly and the BWS bucky is activated.
	Move Up button	Press and hold this button to move up the X-ray source assembly.
	Move Down button	Press and hold this button to move down the X-ray source assembly.
	Longitudinal Release button	Hold down this button and grasp the handle of the X-ray source assembly to move the X-ray source assembly along the X-axis.
	Vertical Release button	Hold down this button and grasp the handle of the X-ray source assembly to move the X-ray source assembly along the Z-axis.
	RHA Release button	By holding down this button, you can hold the handle of the X-ray source assembly and rotate it about horizontal axis (RHA).
	Floating button	Hold down this button and grasp the handle of the X-ray source assembly to move the X-ray source assembly horizontally or vertically.

You can refer to the icons on the movement control buttons for direction when RHA of the X-ray source assembly is 0°. If the X-ray source assembly has been rotated about horizontal axis, please interpret the direction indications correctly.

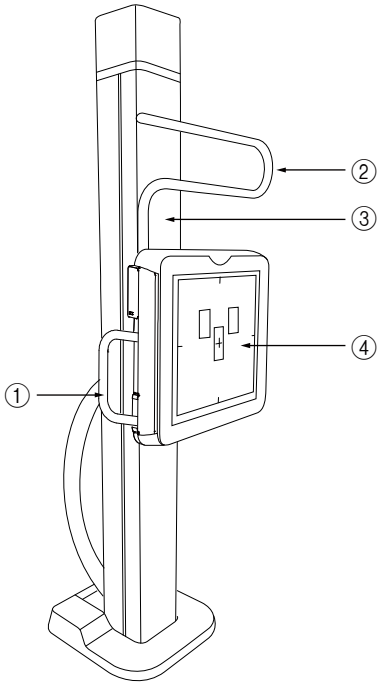
3.1.3 Bucky wall stand

The bucky wall stand holds the BWS bucky and other components and enables the movement of the BWS bucky.

You can adjust the height of the bucky according to the body part to be scanned.

Bucky wall stand

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No.	Component	Description
1	Side handles (both sides)	Patients can hold the side handles during positioning.
2	Patient stretch grip	Patients can hold the patient stretch grip during positioning.
3	Stand	The stand supports the BWS bucky.
4	BWS bucky	The bucky includes the front cover, the flat panel detector, the slot for grids, the movement control buttons, and the handle.

Precautions:

- Do not sit or place objects on the BWS bucky.
- Do not pull the side handles with excessive force.

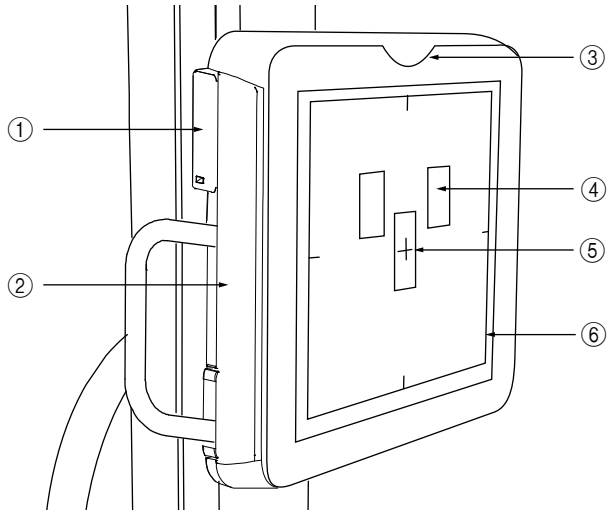
⚠WARNING

Install the handle correctly to prevent personal injury or component damage during use of the handle.

⚠WARNING

- The maximum load capacity of the bucky wall stand is 15 kg. To prevent personal injury or component damage, do not add load that is not for the intended use.
- If the drive chains of the BWS bucky are broken, stop the movement immediately and contact UIH Customer Service Center.

3.1.3.1 BWS bucky

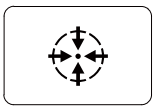
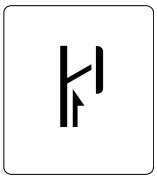
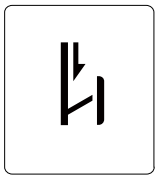
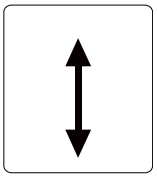


No.	Component	Description
1	Movement control buttons (both sides)	Controlling the movement of the BWS bucky and the X-ray source assembly.
2	Slot	Inserting the flat panel detector and the grid.
3	Jaw slot	Supporting the jaw of the patient so that the lungs can be scanned completely.
4	Measuring field of the ionization chamber	Sensing area of automatic exposure control. You can choose from the three measuring fields or combine them.
5	Center crosshair	Used to check whether the focal spot of the X-ray tube assembly is aligned with the center of the detector.
6	Effective imaging area	The solid line box marks the effective imaging area of the flat panel detector. To reduce unnecessary radiation, the light field must not exceed the effective imaging area.

3.1.3.2 Control panels

There are control panels on both sides of the BWS bucky for movement control.

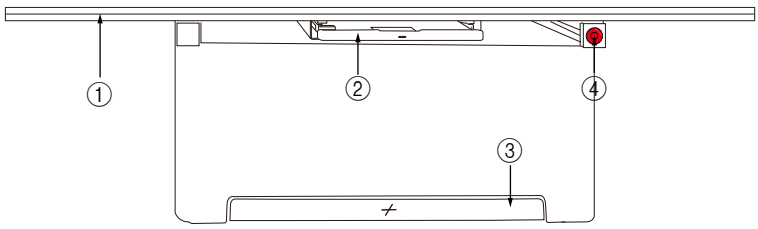
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Button	Name	Description
	Automatic Centering button	Hold down this button to align the X-ray source assembly with the BWS bucky. At the same time, the tracking of the X-ray source assembly and the BWS bucky is activated.
	Tracking Release button	Press this button to deactivate the tracking of the X-ray source assembly and the BWS bucky.
	Bucky Up button	Hold down this button to move the BWS bucky up. If the button is released during the motion, the bucky will stop.
	Bucky Down button	Hold down this button to move the BWS bucky down. If the button is released during the motion, the bucky will stop.
	Vertical Release button	Hold down this button and grasp the handle of the BWS bucky to pull the bucky up and down.

3.1.3.3 FPD tray

The handle of the FPD tray is at the bottom on the side of the BWS bucky and is marked with a "PULL" sign.

3.1.4 Fixed radiographic table

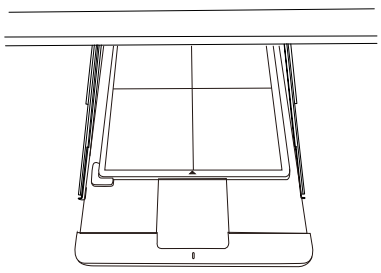


No.	Component	Description
1	Table top	Used in exams for lying position. It can move along the X-axis and the Y-axis.
2	Table bucky	Function of the table bucky: ♦ Carry the flat panel detector. ♦ Charge the flat panel detector. ♦ Move horizontally along the X-axis. The handle of the table bucky has an infrared sensing function. It unlocks automatically after you grab on the handle so that you can move the table bucky manually.
3	Table top floating switch	Unlock the table top so that it can be moved.
4	E-Stop button	Once you press this button, the motorized motion of the system stops immediately, but manual operations are allowed. The motorized motion will be resumed after the E-Stop button is released.

3.1.4.1 Table bucky

The table bucky is under the table top. It holds components such as the flat panel detector and the grid.

There is an infrared sensor on the handle of the table bucky. You can move the table bucky freely.



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3.2 Components in the control room



No.	Component	Description
1	Accessories of the image processing workstation	Including: ♦ Host monitor ♦ Diagnostic monitor ♦ Mouse and keyboard
2	Control box	The control box is used to switch the system on or off, control system movement, and perform exposure.
3	Host of the image processing workstation	The host supports the entire examination workflow from patient registration to filming.

NOTICE

Do not send the same movement commands to the system simultaneously from the scanning room and from the control room.

3.2.1 Control box

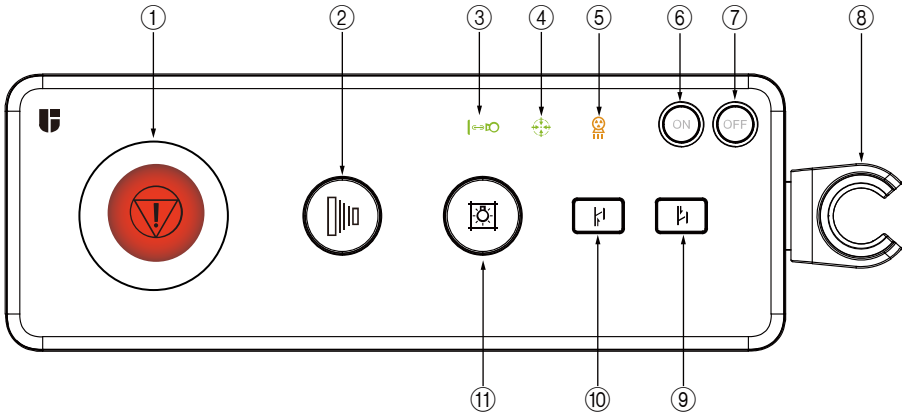


Figure 3-3 Control box

No.	Name	Description
1	E-Stop button	In emergencies, press the E-Stop button to stop all motorized motion of the system. Exposure will be disabled after this button is pressed. Only release this button after making sure that the system status is normal.
2	Exposure button	Hold down this button until you hear the prompt tone to perform exposure.
3	Tracking indicator	♦ Green light: Tracking is activated. ♦ Light off: No response for tracking.
4	Automatic Centering indicator	♦ Green light: Aligned. ♦ Light off: Not aligned.
5	X-ray exposure indicator	The yellow light turns on during the exposure.
6	System On button	The gantry and acquisition workstation start up after this button is pressed. When the system has been started up, the light of the System On button stays on.
7	System Off button	The system shuts down after this button is pressed. Then all the indicators on the control box go off.
8	Exposure hand switch holder	It is used to hold the exposure hand switch.
9	Bucky Down button	Hold down this button to move the BWS bucky down. If the button is released during the motion, the bucky will stop.
10	Bucky Up button	Hold down this button to move the BWS bucky up. If the button is released during the motion, the bucky will stop.
11	Collimator Lights button	Press this button to turn on or off the collimator lights.

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3.3 Device connection

Conventional printers, laser printers, and barcode scanners can be connected to this equipment.

The printers should support DICOM 3.0 protocol.

The barcode scanner Motorola LS2208 is recommended.

4 System operations

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4.1 System startup

4.1.1 Inspection before system startup

1. Check the system for obvious damages.
2. Make sure that no object will interfere with movement of system components.

4.1.2 Starting up the system

Before you start:
Complete the routine function check.

► Press the System On button on the control box.

Result:

♦ The system is started up.

4.1.3 Logging on to the computer system

1. Start the system.
   ♦ After system startup, the login interface is displayed.
2. Enter the username and password.
   ♦ In case of emergencies, select **Emergency Login**. Under such circumstances, some functions may be disabled.

⚠CAUTION

Keep your username and password safe and private to prevent losing or leaking them and to prevent unauthorized operations. If there is any problem, contact UIH Customer Service Center or the system administrator.

3. Click **Login**.
   ♦ Change the password after logging in for the first time.

ⓘ
- **The interface displayed for users with different permissions may be different.**
- **Only one user account is allowed to log on to the system at a time. To log in to another account, log out of the current account first or switch the account.**

4. Run system self-test.
   ♦ You can perform scans only after the self-test is passed.
   ♦ Contact UIH Customer Service Center if the self-test fails.

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4.2 Patient preparation

4.2.1 Registering patients from RIS

► In the Patient Administration interface, select a RIS patient and double-click the study.

Scenario	Action
Protocol match with RIS has been completed.	Protocols are matched automatically and the Exam interface opens.
Protocol match with RIS has not been completed.	Select the acquisition mode and protocols, and then click **Exam** to open the Exam interface.

4.2.2 Registering local patients

⚠WARNING

The clinical protocols proposed by manufacturer and preloaded on equipment constitute recommendations to be applied directly to optimize operation, the user can set customize protocols according to their different scenarios.

1. Click the **PR** icon .
   - ♦ The Patient Registration interface is opened.
2. Enter the patient information.
3. Select protocols.
4. Click **Exam**.
   - ♦ The Exam interface is opened.

4.2.3 Registration of existing patients

Information of pre-registered patients and patients with completed studies is recorded in the system.

There is no need to enter the information again for an existing patient. You can save time by searching for the patient information and loading it.

4.2.3.1 Registering pre-registered patients

1. Select a pre-registered study from the study list of the Patient Administration interface.
2. Double-click the study or click **New Study**.
   - ♦ Or right-click the study and select **New Study** in the context menu.

Result:

- ♦ The Patient Registration interface is opened.

4.2.3.2 Registering patients with completed studies

1. Select a completed study from the study list of the Patient Administration interface.
2. Click **New Study** or **Repeat Study**.
   - ♦ Or right-click the study and select **New Study** or **Repeat Study** in the context menu.

Result:

- ♦ The Patient Registration interface is opened.

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4.3 Adjusting system position

4.3.1 Flat panel detector in bucky

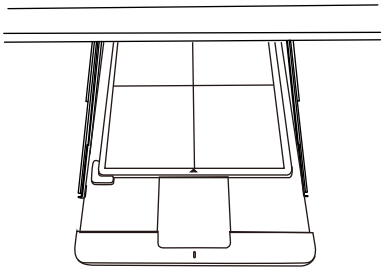


Figure 4-1 Flat panel detector in table bucky

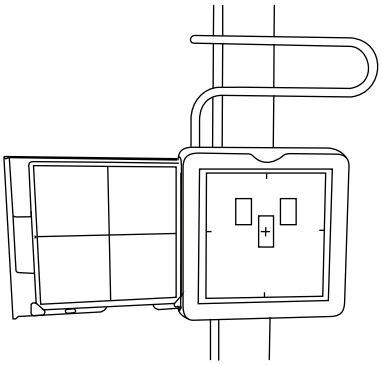
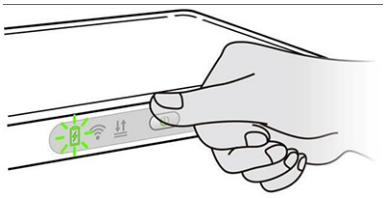


Figure 4-2 Flat panel detector in BWS bucky

4.3.1.1 Starting up the system

► Hold down the power button till the power indicator lights up.



4.3.1.2 Inserting the flat panel detector

1. Pull the tray out.
2. Hold the flat panel detector with both hands.
3. Align the flat panel detector with the slot on the tray according to the arrow. Insert the flat panel detector downward into the slot.
4. Push the tray into the bucky till it is locked in place.
   - ♦ After the detector is properly inserted, a detector charging icon appears at the top right corner of the System Status area.
   - ♦ For a system that is equipped with double FPDs, exposure will not be allowed if no detector is installed successfully.

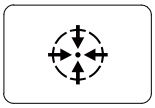
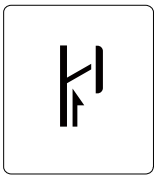
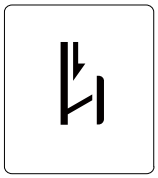
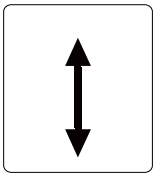
4.3.1.3 Removing the flat panel detector

1. Hold the handle of the bucky tray and pull the tray out till it cannot be pulled anymore.
2. Pull the flat panel detector out.
3. Push the tray into the bucky till it is locked in place.

4.3.2 Adjusting the height of the BWS bucky

You can use the movement control buttons to adjust the height of the bucky wall stand. You can only press one button at a time. A second button that you press at the same time will not function.

- Manual: You can use the release buttons on the side of the BWS bucky to manually adjust its height.
- Motorized: You can use the movement control buttons on the side of the BWS bucky to adjust its height.

Button	Name	Description
	Automatic Centering button	Hold down this button to align the X-ray source assembly with the BWS bucky. At the same time, the tracking of the X-ray source assembly and the BWS bucky is activated.
	Tracking Release button	Press this button to deactivate the tracking of the X-ray source assembly and the BWS bucky.
	Bucky Up button	Hold down this button to move the BWS bucky up. If the button is released during the motion, the bucky will stop.
	Bucky Down button	Hold down this button to move the BWS bucky down. If the button is released during the motion, the bucky will stop.
	Vertical Release button	Hold down this button and grasp the handle of the BWS bucky to pull the bucky up and down.

When there is no detector inside the BWS bucky, you cannot move the bucky vertically.

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⚠WARNING

When the patient is pressed against the BWS bucky, especially when the patient's jaw is placed in the jaw slot, do not adjust the height of the BWS bucky. Also, pay attention to any tracking movement of the bucky caused by movement of the X-ray source assembly.

⚠CAUTION

When the BWS bucky moves, the balance weight on the bucky wall stand moves accordingly. Watch your hands.

4.3.3 Using radiographic table

4.3.3.1 Moving the table top

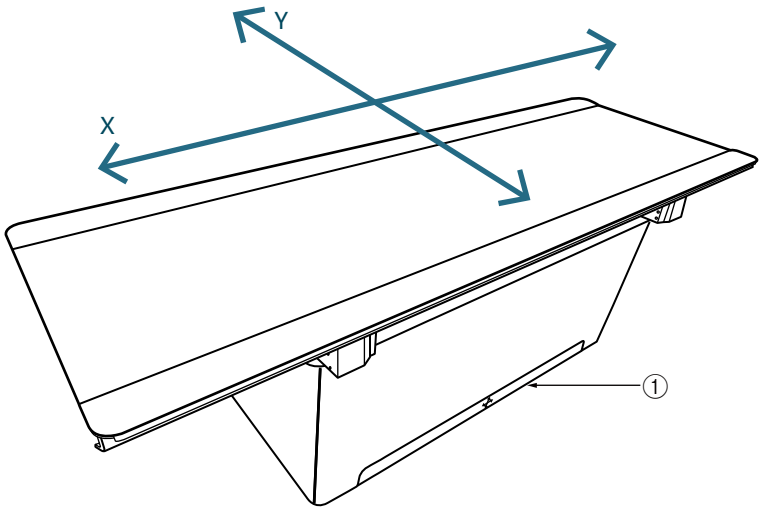


Figure 4-3 Coordinate axes and directions of table top movement

1. Push the table top floating switch with your foot to enable table top movement along the X-axis and the Y-axis.
2. Push the table top with your hands.

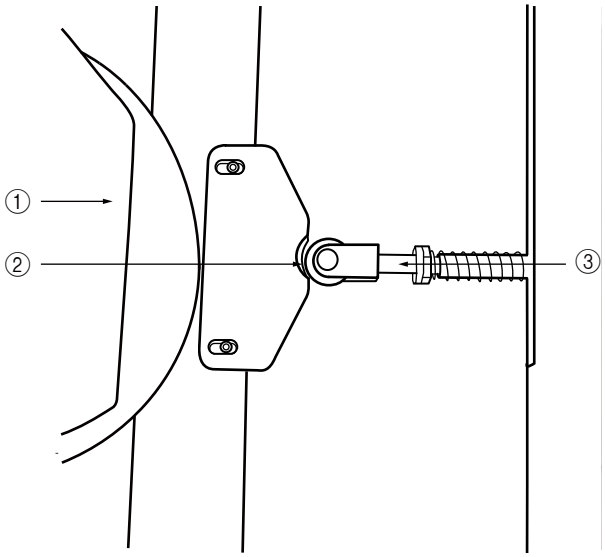
4.3.3.2 Moving the table bucky manually

The infrared induction device that controls horizontal movement of the table bucky is on the handle of the table bucky.

1. Hold the handle of the table bucky.
   - ♦ A beep is heard and the table bucky is unlocked.
2. Move the table bucky manually to the left or right.
3. Release the handle of the table bucky.
   - ♦ Another beep is heard and the table bucky is locked.

4.3.3.3 Table bucky tracking

The table bucky and the tube stand can be connected through a rod and move together.



1. Tube stand
2. Slot
3. Tracking rod

Turning tracking on:

- Move the tube stand along the X-axis. When the tube stand passes the detent of the table bucky, the tracking rod connects with the slot and tracking starts.

Turning tracking off:

- When the tube stand moves along the X-axis to a position that is out of the X-axis movement range of the table bucky, tracking is turned off.
- Pull the tracking rod outward to disable tracking.
- Press the Tracking Release button. The table bucky is locked and tracking is turned off.

⚠WARNING

- Before any movement, make sure that no part of the patient's body is stretched outside the table top, so as to prevent patient injury.
- Make sure that the table top is locked when the patient gets on or off the table.
- Keep an eye on the patient, especially for patients who are abnormally calm or agitated.

4.3.4 Positioning the X-ray source assembly

You can use the movement control buttons to move the X-ray source assembly. You can only press one button at a time. A second button that you press at the same time will not function.

Before moving the X-ray source assembly, make sure that there is no person or object in the path.

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⚠WARNING

When the X-ray tube is moved to a lateral side or the back of the stand, check the position of the detector before exposure to avoid personal damage caused by improper exposure.

⚠WARNING

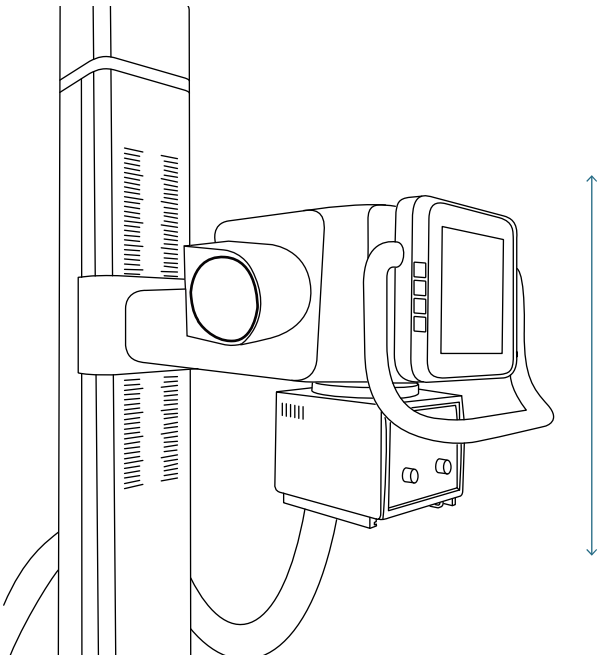
While rotating the X-ray source assembly, be aware of the gaps between the moving parts and the detents to avoid squeezing fingers.

⚠WARNING

No exposure is allowed during system movement.

4.3.4.1 Height adjustment

You can adjust the height of the X-ray source assembly by using the movement control buttons.



Manual adjustment

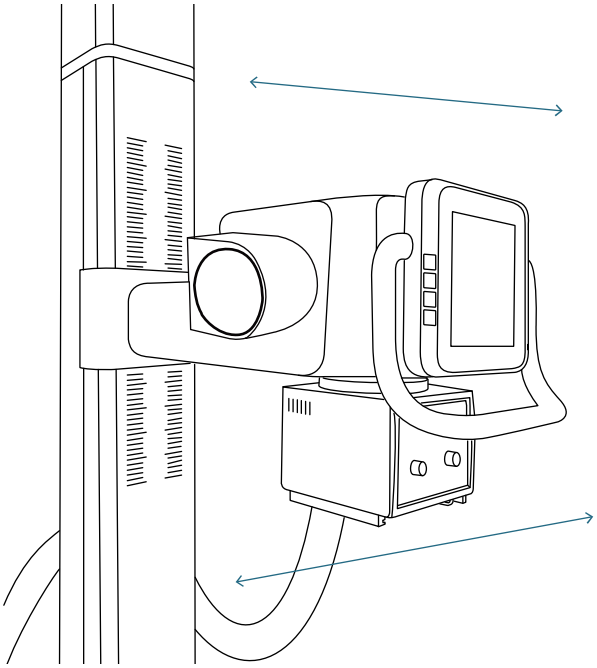
1. Hold the handles of the X-ray source assembly with both hands.
2. Hold down the Vertical Release button [↕] to enable vertical movement.
3. When the X-ray source assembly reaches the target position, release the button.

Motorized movement

1. Hold down the Move Up button ↑ to move the X-ray source assembly up.
2. Hold down the Move Down button ↓ to move the X-ray source assembly down.
3. When the X-ray source assembly reaches the target position, release the button.

4.3.4.2 Longitudinal adjustment

You can adjust the longitudinal position of the X-ray source assembly by using the movement control buttons.

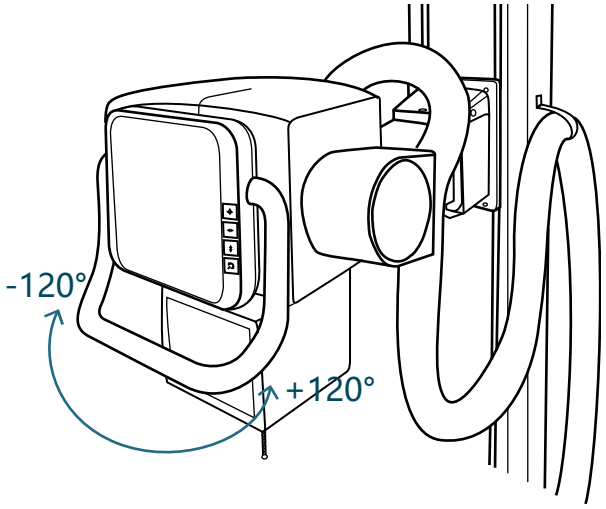


1. Hold the handles of the X-ray source assembly with both hands.
2. Hold down the Longitudinal Release button ↔ to enable longitudinal movement.
3. When the X-ray source assembly reaches the target position, release the button.

4.3.4.3 Rotation about the horizontal axis

You can rotate the X-ray source assembly about the horizontal axis by using the movement control buttons.

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- The X-ray source assembly can rotate from -120° to +120° about the horizontal axis, with detents at the -90°, 0°, and +90° positions.
- Slow down when the X-ray source assembly approaches a detent. Release the button when you feel the X-ray source assembly is completely engaged in the detent without shaking.

1. Hold the handles of the X-ray source assembly with both hands.
2. Hold down the RHA Release button  to enable RHA rotation.
3. When the X-ray source assembly reaches the target position, release the button.

4.3.4.4 Rotation about the vertical axis

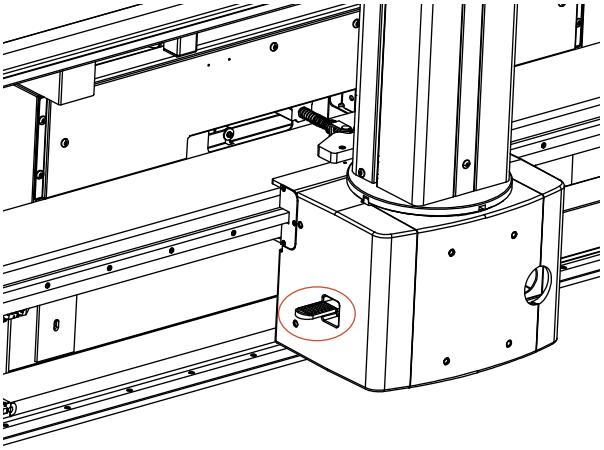
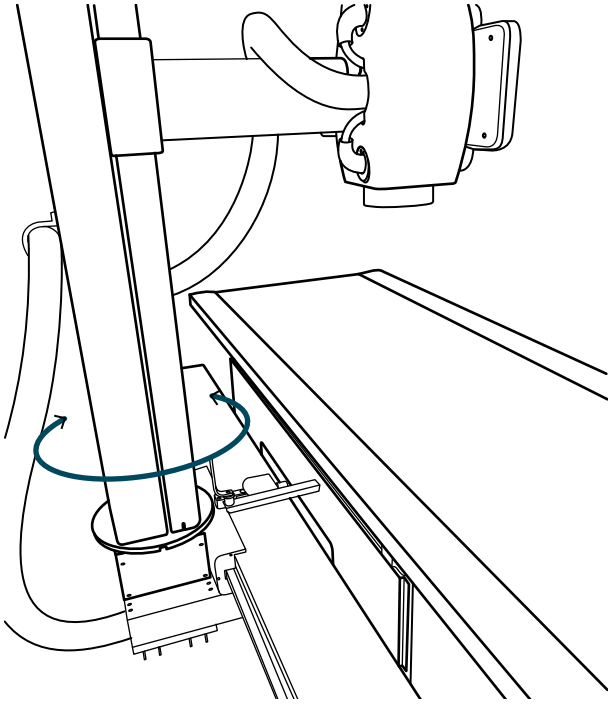


Figure 4-4 Tube stand pedal



You can step on the tube stand pedal, which is on the left of the tube stand, and manually rotate the tube cantilever to move the X-ray source assembly to the target position.

- The X-ray source assembly can rotate from -90° to +180° about the vertical axis, with detents at the -90°, 0°, +90°, and +180° positions.
- When the RVA angle of the X-ray source assembly is +180°, it is convenient for patients who have difficulty in moving to receive exam on the mobile table.

⚠WARNING

While rotating the X-ray source assembly, be aware of the gaps between the moving parts and the detents to avoid squeezing fingers.

⚠WARNING

When the X-ray tube is moved to a lateral side or the back of the stand, check the position of the detector before exposure to avoid personal damage caused by improper exposure.

4.3.4.5 SID measurement

You should check frequently whether the SID displayed by the system is consistent with the SID measured with the measuring tape on the collimator.

- There is a gap of 7.0 cm ± 0.1 cm between the table top and the detector in the table bucky. Therefore, this gap should be added to the reading of the measuring tape.
- There is a gap of 4.27 cm between the front cover of the BWS bucky and the detector in the BWS bucky. Therefore, this gap should be added to the reading of the measuring tape.

SID range:

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- Fixed radiographic table: 35 cm – 120 cm
- Bucky wall stand (standard installation): 110 cm – 290 cm

The scale on the front of the tube stand shows the SID range for lying exams. When you measure the SID for a lying exam, read the scale at the top edge of the cover of the tube cantilever.

4.3.5 Using collimator

4.3.5.1 Adjusting the light field

⚠WARNING

If the linear laser localizer remains on for a long time, the cover and bulb will heat up. To avoid scalds, do not touch the cover.

1. Press the Collimator Lights button to turn the light localizer on.
   - ♦ The light localizer goes off automatically 30 s after operations are finished.
2. Adjust the light field.
   - ♦ Rotate the field width adjustment knob, which is on the left, counterclockwise to enlarge the radiation field. Rotate it clockwise to reduce the radiation field.
   - ♦ Rotate the field height adjustment knob, which is on the right, clockwise to enlarge the radiation field. Rotate it counterclockwise to reduce the radiation field.

4.3.5.2 Size of the light field

You can use any standard ruler to measure the size of the light field. If the measured size is inconsistent with the size displayed by the system, please contact UIH Customer Service Center.

When the SID is 100 cm

- Minimum size of the radiation field: 2 cm × 2 cm
- Maximum size of the radiation field: 43.5 cm × 43.5 cm

When you adjust the collimator manually, please pay attention to the size of the light field. An overly large light field will generate excessive radiation, causing unnecessary harm to patients.

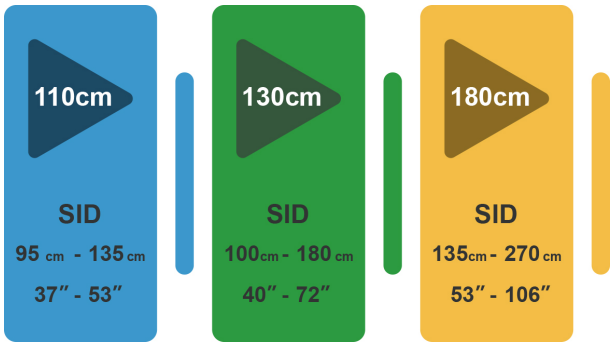
4.3.6 Grid

The purpose of choosing and replacing the grid is to meet the requirements of radiographic exams of different body parts. You need to choose the grid according to the actual conditions of the exam.

You should check the matching status of the grid before the exposure to prevent excessive radiation dose received by the patient caused by the unmatched grid.

Take the grid out in a pediatric exam where the body part is thinner than 10 cm to reduce the exposure dose.

There is an SID label on the front side of each grid, indicating which SID is the grid used for.



- When the SID in the exam is 95–135 cm, use the grid for SID 110 cm.
- When the SID in the exam is 100–180 cm, use the grid for SID 130 cm.
- When the SID in the exam is 135–270 cm, use the grid for SID 180 cm.

⚠WARNING

Users shall not replace the grid by themselves. If the grid requires replacement, contact UIH Customer Service Center.

⚠WARNING

Gently handle the grid to prevent it from falling and being damaged.

⚠WARNING

- Choose a grid that meets the clinical needs so that the image quality will not be affected and exposure dose of the patient will not increase.
- For an oblique projection (the X-rays and the flat panel detector form a certain angle), remove the grid. Using a grid will affect the image quality.
- If a connection error of the grid is reported, make sure that you are using the correct grid and try inserting it again.

NOTICE

Do not squeeze the grid when you replace, remove, or insert it.

4.3.6.1 Installing the grid

1. Hold the handle of the bucky tray tightly and pull the tray out till it cannot be pulled any further.
2. Align the grid with the slot, with the label side facing the X-ray source assembly, and insert the grid into the slot.

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3. Push the grid to the end till it is locked in place.

4.3.6.2 Removing the grid

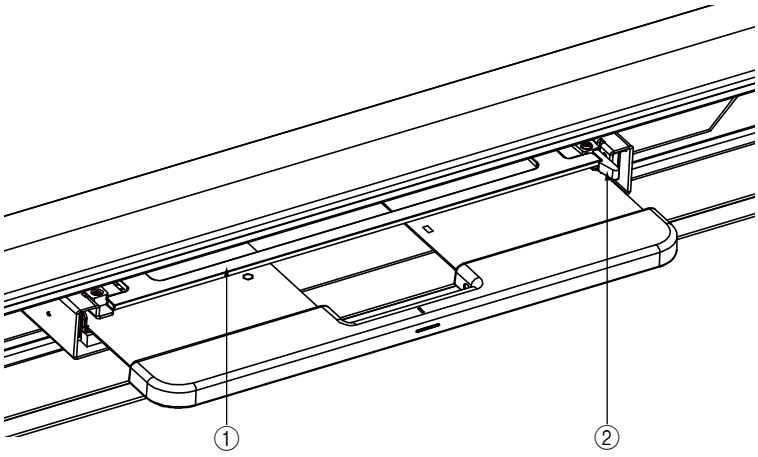
⚠WARNING

- Support the grid when removing or installing it to prevent it from falling and being damaged.
- Insert the grid into the correct slot.

⚠WARNING

- Watch your hands when removing or installing the grid.
- Do not put hands into the slot for the grid.

1. Unlock the grid.



1. Grid 2. Snap fit

- Push the grid gently into the BWS bucky to unlock the grid.
- Push the snap fit on the table bucky outward to release the grid.

2. Pull the grid out while keeping it parallel with the bucky.
3. Store the grid in the designated place.

4.3.7 Centering

You can align the focal spot of the X-ray tube with the center of the flat panel detector by using the movement control buttons.

You can only press one button at a time. A second button that you press at the same time will not function.

4.3.7.1 Flat panel detector in BWS bucky

Manual positioning

1. Check the position of the FPD.
2. Rotate the X-ray source assembly until RVA is 0°.
3. Rotate the X-ray source assembly until RHA is +90° (BWS on the right) or -90° (BWS on the left).
4. Turn the light localizer and the linear laser localizer on.
5. Move the X-ray source assembly vertically until it is at the same height as the BWS bucky.
6. Adjust the light field so that the edges of the light field are parallel with the edges of the detector.
7. Adjust the light field of the X-ray source assembly so that it coincides with the edges of the detector.

Automatic positioning

1. Select an appropriate radiographic protocol on the host monitor or on the touch user interface.
2. Check the position of the FPD.
3. Rotate the X-ray source assembly until RVA is 0°.
4. Rotate the X-ray source assembly until RHA is +90° (BWS on the right) or -90° (BWS on the left).
5. Hold down the Automatic Centering button so that the X-ray source assembly moves vertically till it is centered.
   - ♦ When you release the button or any resistance is detected, the automatic movement stops.
6. When the X-ray source assembly is centered, the centering indicator lights up.

4.3.7.2 Flat panel detector in table bucky

1. Check the position of the table bucky.
2. Rotate the X-ray source assembly until RVA is 0°.
3. Rotate the X-ray source assembly until RHA is 0°.
4. Turn the light localizer and the linear laser localizer on.

Result:

- ♦ When tracking is turned on, the center of the detector is aligned with the focal spot of the X-ray tube and the detector follows the movement of the X-ray tube.

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4.3.7.3 Flat panel detector in free mode

NOTICE

When the X-ray tube or the flat panel detector is tilted during the exposure, consider the effect of image geometric distortion on clinical diagnosis.

1. Check the position of the FPD.
2. Adjust the position of the X-ray source assembly in the X-axis, Z-axis, RVA, and RHA.
3. Turn the linear laser localizer on and align the laser with the crosshair at the center of the detector.

4.4 Patient positioning

Check radiation protection. Install necessary radiation protection devices on the patient.

You can give the patient instructions on positioning in the scanning room or in the control room.

4.4.1 In the scanning room

1. Instruct the patient to sit down, lie down, or stand according to the body part to be examined.
2. Determine whether external support is needed, for example nurses, other radiologic technologists, parents of young patients, and patient auxiliary devices.
   - ♦ If no external support is needed, position the patient according to the protocol.
3. Place the flat panel detector as close to the target body part as possible.
4. Adjust the patient and the light field so that the target body part is at the light field center.

4.4.2 In the control room

► Talk with the patient, who is in the scanning room, through the intercom system at the console and give instructions on positioning and breathing.

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4.5 Checks before exposure

Before exposure, make sure that the tube and the flat panel detector are centered.

⚠CAUTION

Before exposure, check whether the exposure parameters meet the clinical requirements. Adjust any inappropriate parameters in time.

1. Click **Exam** to go to the Exam interface.
2. Check the exposure parameters. Adjust them if necessary.
   a. Adjust the patient information and exposure parameters on the image processing system in the control room.
   b. Check again whether the acquisition system information and position information displayed on the image processing system are correct.
3. Check whether the exposure indicator (OK ring) on the host monitor lights up.

4.6 Performing exposure

4.6.1 Precautions for exposure

Before the exposure, make sure that both the patient and the system are ready, and the X-ray exposure indicator (OK ring) turns green.

To ensure image quality, do not use materials that cause high attenuation of X-rays (such as lead and tungsten) in radiography.

⚠CAUTION

Before exposure, check whether the exposure parameters meet the clinical requirements. Adjust any inappropriate parameters in time.

If the image acquisition fails due to the problem of FPD signal during the exposure, see *Technical Instruction* for troubleshooting.

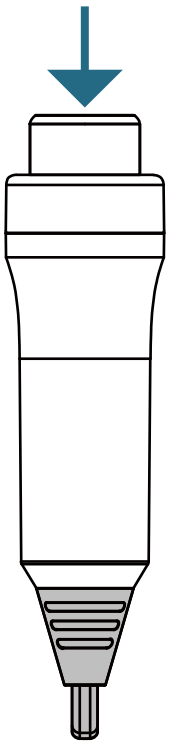
4.6.2 Using the exposure hand switch

⚠WARNING

If the exposure hand switch remains half-pressed for a long time, the X-ray tube may overheat and the service life of the tube may be reduced.

1. Half-press the Exposure button to prepare for exposure.

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2. Fully press the Exposure button until you hear the prompt tone.
3. Release the Exposure button 2 seconds after the prompt tone ends.
4. After exposure, place the exposure hand switch into its holder.

4.6.3 Using the control box for exposure

Before you start:
Exposure is allowed only when the system is ready and the X-ray exposure indicator (OK ring) is green.

1. Hold down the Exposure button on the control box, and you will hear a prompt tone.
2. Release the Exposure button 2 seconds after the prompt tone ends.

4.7 Viewing images in the Exam interface

4.7.1 Loading exposure images

The acquired images are displayed in the Image Display area of the Exam interface after the exposure.

NOTICE
Use of any unapproved monitor may lower the display quality or cause display errors. Any non-compliant operation will adversely affect the display quality of the monitor.

► Click the image to be loaded to the Image Display area from the image list on the right.

4.7.2 Rejecting images

You can reject images that are incorrect or do not meet the requirements.

1. Click the image to be rejected in the image list.
2. Click **Reject** and select a reason from the Reason for Rejection drop-down list.
   - ♦ When **Other Failures** is selected, you can enter the reason in the text box below.
3. Click **Confirm**.

Result:

- ♦ The symbol "×" appears on the upper right corner of the rejected images in the image list. Rejected images will be deleted when you open the Review&Filming interface, and will not be automatically archived to a server or be printed.

4.7.3 Restoring images

The rejected images can be restored.

1. Click the rejected image to be restored in the image list.
2. Click **Restore** on the image.
3. Click **Yes** in the confirmation dialog box that pops up.

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4.8 Image post-processing

1. Click **Review&Filming** to open the Filming interface.
2. Optional: Adjust the image layout in the Filming interface.
3. Optional: Adjust the image noise, tissue equalization, contrast ratio, etc. in the Filming interface.

4.9 Ending the exam

4.9.1 Finishing the exam

1. Click **Finish**.
2. Click **Confirm** in the dialog box to finish the exam.
   - To pause the exam and go to the Patient Administration interface, click **Suspend**.
   - To return to the Exam interface, click **Cancel**.

4.9.2 Archiving images

1. Click **Auto Archiving**.
2. Select a PACS server.
   - Enable Auto Archiving: Images are archived automatically after the exam is finished. When automatic archiving is enabled, the horizontal line on **Auto Archiving** is blue. When automatic archiving is disabled, the horizontal line is gray.
   - With E-film: The E-films selected for printing will be archived.
3. Click **OK**.

4.9.3 Printing films

1. Select the images to be printed.
2. Set the printing parameters, including orientation, image display mode, and size.
3. Set the number of copies.
4. Click **Print**.

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4.10 Shutting down the system

Before you start:

- Make sure that there is no scan in progress.
- Make sure that data of the completed scans have been saved.

NOTICE
♦ Follow the instructions in this manual to shut down the system. ♦ Do not forcibly power off the system during normal operation. Otherwise, the system may be damaged.

Users should shut down the system once a week.

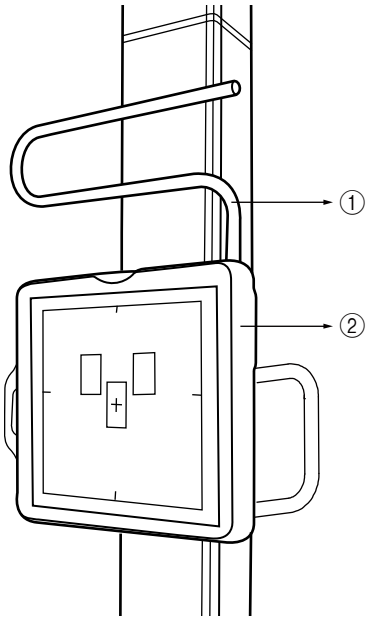
1. Click the UIH icon at the top right corner of the interface and select **Shutdown**.
2. Confirm that the system has been shut down.

5 System accessories

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5.1 Patient stretch grip of the BWS bucky



1. Patient stretch grip
2. BWS bucky

5.1.1 Scenario

The patient stretch grip on the BWS bucky can assist the patient in positioning.

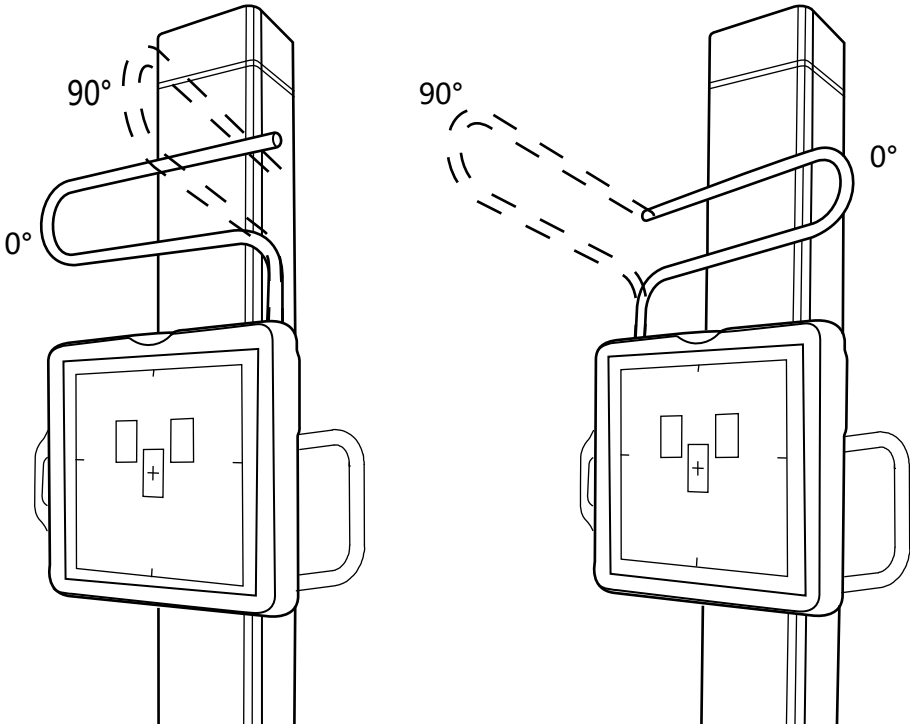


Figure 5-1 Installation on the right (left figure) and installation on the left (right figure)

It can be installed at the following positions on the left or right side on the top of the BWS bucky:

- 0°: For anterior-posterior examination.
- 90°: For lateral examination.

5.1.2 Prohibited use

Patients must not put all their body weight on the patient stretch grip of the BWS bucky.

Do not hang heavy objects on the patient stretch grip of the BWS bucky.

Do not use the patient stretch grip of the BWS bucky to pry objects.

5.1.3 Installation and removal of the patient stretch grip

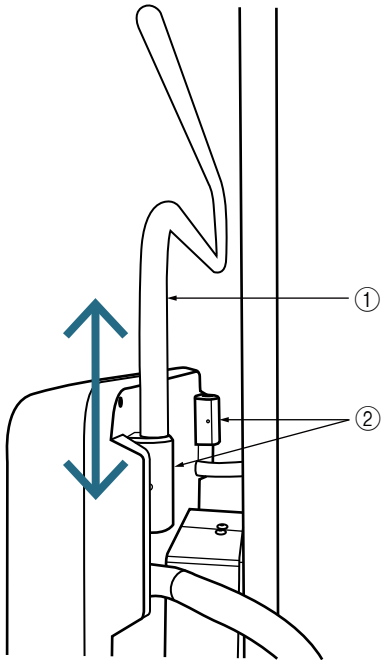
⚠WARNING

- The maximum load capacity of the bucky wall stand is 15 kg. To prevent personal injury or component damage, do not add load that is not for the intended use.
- If the drive chains of the BWS bucky are broken, stop the movement immediately and contact UIH Customer Service Center.

⚠WARNING

Be careful while installing or removing the patient stretch grip of the BWS bucky to prevent fingers from being stuck between the patient stretch grip and the BWS bucky.

The patient stretch grip can be installed on the left or right on top of the BWS bucky.



1. Patient stretch grip
2. Socket

5.1.3.1 Installation

1. Align the patient stretch grip with the socket.
2. Insert the patient stretch grip vertically.

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5.1.3.2 Removal

1. Hold the patient stretch grip with both hands and pull it out.
2. Put the patient stretch grip in a specified storage place.

5.2 Additional filters

You can use additional filters to reduce the exposure radiation dose, especially when exposing children to X-rays. You can choose additional filters of 0.1 mmCu or 0.2 mmCu.

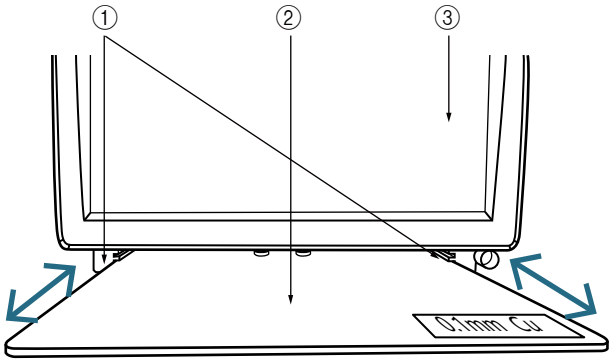


Figure 5-2 Position of the additional filter

1. Slots for additional filter
2. Additional filter
3. Collimator

NOTICE

Use additional filters reasonably. Improper use of additional filters may reduce image quality.

5.2.1 Installing additional filters

► Insert the additional filter along the slots from the front of the collimator and push the filter horizontally to the end.

5.2.2 Removing additional filters

1. Pull the additional filter out along the slots horizontally.
2. Place the additional filter safely in the storage device.

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5.3 Diagnostic monitor

An additional diagnostic monitor can be added to this system.

Model	Dimensions	Brightness	Resolution
G22SP+	21.3 inches	1900 cd/m²	1600 × 1200

5.4 Barcode scanner

5.4.1 Parameters

Parameter	Description
Power supply	Internal or external power supply (based on the type of the scanner).
Voltage and current	Voltage is 5 V +/- 10%. Current is normally 130 mA. The maximum current is 175 mA.
Laser level	Class II
Light source	650 nm visible laser diode
Scan type	Two-way
Minimum reflection difference	20%
Front-back swiveling	2° ± 65°
Left-right swiveling	3° ± 60°
Tilting	1° ± 30°
Rated scanning distance	For 100% U.P.C./EAN symbols, the scanning distance is from direct contact to 17 inches/43 cm.
Working environment	Operating temperature: 0°C to 50°C Storage temperature: -40°C to 70°C Relative humidity: 5% to 95% (no condensation) The device can be used in a normal office or production lighting environment or under sunlight.

5.4.2 Using the barcode scanner

You can register patients with a handheld barcode scanner.

1. Click the Patient Registration button  in the Patient Administration interface.
2. Click the patient ID text box, delete the original patient ID, and position the cursor to the patient ID text box.
3. Aim the scan window at the barcode label and press the scanner's button.
   - Aim the scan window at the barcode on the front. If the angle of the barcode relative to the scanner is too small, patient information may not be read.
   - The laser beam must cover the entire label. If only part of the label is scanned, the patient information cannot be read.
4. Complete the input.

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6 Repair, maintenance, and disposal

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6.2 Cleaning and disinfection....6-4
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6.1 Maintenance

Routine maintenance of the system must be carried out in accordance with the requirements of laws and regulations to ensure the safe and stable operation of the equipment, improve the reliability of the system, reduce the failure rate of the equipment, prolong the service life of the equipment, ensure the image quality, and ensure the safety of patients, operators, and others.

Maintenance includes tests and maintenance performed by users, as well as maintenance performed by personnel who can perform such maintenance according to the service agreement or UIH service purchase order or who are explicitly authorized by UIH.

⚠WARNING
Do not maintain any parts when the patient is present.

Please see *Technical Instruction* for details about system installation and maintenance.

6.1.1 Preventive maintenance

The user must check the system regularly. In case of failure or other abnormal situations, the user must shut down the system and contact the UIH Customer Service Center.

System operation can be resumed only after all problems are solved. Using faulty components will cause safety hazards such as exposure to high dose radiation.

Interval	Item	Checking method
Every day	Ambient conditions	Check whether the ambient conditions meet the requirements.
Every day	Exit passageway	Check whether the exit passageway is clear of obstacles.
Every day	System covers	Check whether the covers are complete without damages.
Every day	Labels and warning signs	Check whether the labels are damaged or lost.
Every day	Indicators	Check whether the indicators work properly.
Every day	E-Stop button	Check whether the buttons work properly.
Every day	Control box	Check whether it is undamaged and works properly.
Every day	Angle gauge	Check whether it is undamaged and works properly.
Every week	All cables and terminals	Check whether they are undamaged.
Every month	Image quality	Check whether the image quality meets the clinical requirements.
Every month	FPD calibration	Calibrate the flat panel detectors.

6.1.2 Recording results

Record the process and results of preventive maintenance, including the following information:

- Type and scope of work.
- Detailed modification of rated values or working area.
- Date and operator signature.

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6.2 Cleaning and disinfection

⚠CAUTION

To ensure safe and effective system operation and prevent cross infections, the parts that come into contact with patients must be cleaned and disinfected regularly according to local laws and regulations. In case of special circumstances, clean and disinfect the components whenever needed.

⚠WARNING

Turn off the system power supply before cleaning the equipment or using disinfection sprays.

⚠WARNING

Prevent ingress of liquid into the system to prevent corrosion of components and short circuit.

⚠CAUTION

Operators must wear gloves during cleaning and disinfection.

NOTICE

- Shut the system down and cut off the power supply before cleaning and disinfection.
- Make sure that the floor of the exam room and the equipment surfaces are completely dry before using the equipment.

ⓘ

- **When using the commercially available cleaning agents, please follow the manufacturer's instructions.**
- **Use commercially available disinfectant, and follow the manufacturer's instructions.**
- **Do not use corrosive cleaning agents.**
- **Do not use any hard and sharp tools (for example, knives or tweezers) to clean up the residue. Otherwise, the components will be damaged.**

6.2.1 Cleaning

6.2.1.1 Precautions

⚠WARNING

Do not use sprays to clean the rooms with medical equipment. Ingress of the sprays may cause electrical short circuits, metal corrosion, or other damage to the equipment.

NOTICE

- Do not use alcohol to clean the Acrylic parts of the gantry covers, UIH logo, control panels, and LCD screens.
- Only use alcohol to clean the relatively dirty parts of the covers.

NOTICE

When cleaning covers, make sure that no liquid gets inside the covers.

Clean all contaminated parts and all areas that the patient may or has come into direct or indirect contact with.

Only use a piece of damp cloth moistened with mild cleaning agent to wipe glazed parts or aluminum surfaces. Then use a piece of dry linen-free cloth to wipe them clean.

6.2.1.2 Cleaning the covers

The covers include the gantry covers, table covers, and the control box covers.

1. Power off the system.
2. Use a piece of soft cloth (such as gauze and non-woven fabric) slightly moistened with water or mild cleaning agent to wipe the covers of the components.
   - Wipe the contaminated parts and surrounding areas for two or three times.
3. After using cleaning agent, use a piece of soft cloth slightly moistened with water to wipe the cleaned areas for two or three times.
4. Use a piece of clean soft cloth to dry the covers.

6.2.1.3 Cleaning furniture

1. Use a soft cloth moistened with commercially available neutral detergent to wipe the surface of furniture.
2. Use a piece of clean soft cloth to dry the furniture.

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6.2.1.4 Cleaning the monitors

1. Power off the system.
2. Use a piece of soft cloth (such as gauze and non-woven fabric) slightly moistened with water to clean the monitors.
   - ♦ Clean up the fingerprints left on the monitors regularly.
   - ♦ Do not spray liquids onto the monitors.
   - ♦ Do not scratch the monitors.
   - ♦ If water drops onto the monitors, wipe off the water immediately.
3. Use a piece of clean soft cloth to dry the monitors.

6.2.2 Disinfection

6.2.2.1 Precautions

⚠WARNING

Do not use any disinfectant that contains strong chlorine or is highly corrosive.

- ■ You can sanitize all system components (including optional accessories and cables) only by wiping them.
- ■ Spray disinfectant is not recommended, because spray can penetrate the equipment and damage the electronic parts.

6.2.2.2 Disinfecting the scanning room

1. Cut off the system power supply. Wait till the equipment cools down.
2. Use plastic sheet to completely cover the system.
3. Spray the disinfectant.
4. Only after all the disinfectant spray in the air has settled can you remove the plastic sheet and wipe the system.

6.2.2.3 Disinfecting the covers and the handles

1. Power off the system.
2. Use a piece of soft cloth slightly moistened with 75% alcohol to wipe the covers and the handles.
   - ♦ After disinfection, wait for some time before starting up the system.

6.2.2.4 Flat panel detector

► Use a piece of soft cloth slightly moistened with 75% alcohol to wipe the housing of the flat panel detector.

- ♦ To prevent the risk of infection, clean and sterilize the surface that comes into contact with the patient.
- ♦ It is recommended to use a waterproof non-woven cover as a barrier between the flat panel detector and the bleeding patient, or use a plastic sleeve to prevent contamination on the surface of the flat panel detector.

6.2.2.5 Disinfecting monitors

1. Power off the system.
2. Use a piece of soft cloth slightly moistened with 75% alcohol to clean the monitors.
   - ♦ Do not spray liquids onto the monitors.
   - ♦ Do not scratch the monitors.

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6.3 Disposal

Medical equipment is a special kind of products. After the product reaches its service life, it should be disposed of according to relevant laws and regulations. Users shall contact UIH Customer Service Center for recycling when the service life of the product expires. Please handle hazardous materials correctly.

Table 6-1 Hazardous materials in the product

Component	Hazardous material					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent chromium (Cr(VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
Plastic covers	O	O	O	O	O	O
Plastic components	X	O	X	O	X	X
Metal covers	O	O	O	O	O	O
Metal parts	X	O	O	O	O	O
Circuit board assemblies	X	O	O	O	X	X
Cables	X	O	O	O	O	O
Liquids	O	O	O	O	O	O
Batteries	O	O	O	O	O	O

This table is prepared in accordance with SJ/T11364.

O indicates that the content of the hazardous materials in all homogeneous materials of the component is below the limit requirements specified in the GB/T 26572 standard.

X indicates that the content of the hazardous materials in at least one homogeneous material of the component exceeds the limit requirements specified in the GB/T 26572 standard.



The electronic information products sold within the territory of the People's Republic of China must be marked with this label, and the numbers in the label represent the environment-friendly service life of the products under normal use conditions.

7 Technical data

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7.1 Equipment classification based on safety levels

Table 7-1 Equipment classification based on safety levels

Classification	Safety feature
According to the type of protection against electric shock	Class I equipment
According to the degree of protection against electric shock	Type B applied part
According to the degree of protection against ingress of water	Equipment without protection against ingress of water
According to the degree of safety of application in the presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide	Equipment not suitable for use in the presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide
According to the mode of operation	Continuous operation

7.2 Requirements for the mains supply

⚠WARNING

Multiple socket-outlets provided with this system shall only be used for supplying power to equipment that is intended to form part of the system. Do not connect any equipment that has not been supplied as a part of this system to the system. Do not connect such equipment to the same multiple socket-outlet (MSO) with system components.

NOTICE

- The customer is responsible for the site power supply.
- UIH should check whether the site power supply meets the requirements before the system is transported to the site.
- If the site power supply cannot meet the requirements of this system, the customer should contact the local electric power department for installing the suitable power supply. The installation of the power distribution equipment must comply with local laws and regulations.

Table 7-2 Requirements for the mains supply

Parameter	Nominal value	Allowable error
Voltage and phase	♦ Three-phase AC ♦ 380 V AC, 400 V AC, 440 V AC	±10%
Rated frequency	50 Hz, 60 Hz	±1 Hz
Imbalance among three phases	N.A.	2%
Internal resistance of the power supply	≤ 0.15 Ω	N.A.
System input power	♦ uDR 560i-A, uDR 566i-A: 95 kVA ♦ uDR 560i-B, uDR 566i-B: 120 kVA	N.A.

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7.3 Ambient conditions

7.3.1 Requirements for operating environment

Table 7-3 Requirements for operating environment

Parameter	Operating conditions
Ambient temperature	+10°C to +40°C
Relative humidity	30%–75% (no condensation)
Atmospheric pressure	700–1060 hPa

7.3.2 Requirements for transport and storage

⚠WARNING

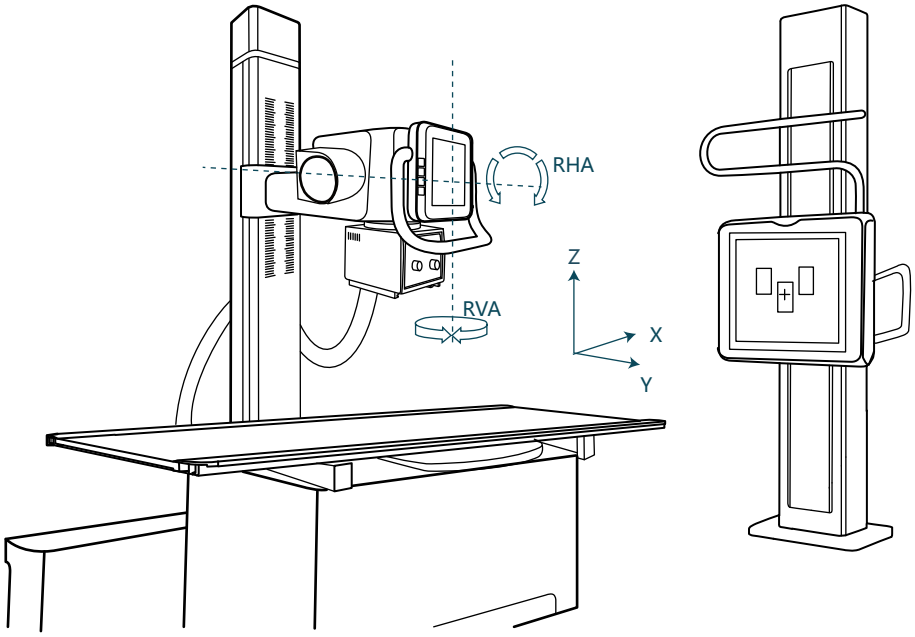
The system must be stored in a warehouse with controllable temperature and humidity to prevent harms caused by the changes of weather and the dust in the environment. Make sure that there is no corrosive substance such as acid or alkali around.

Table 7-4 Requirements for transport and storage conditions

Parameter	Storage conditions	Transport conditions
Temperature	-20°C to +60°C	-20°C to +60°C
Humidity	10%–90% (no condensation)	10%–90% (no condensation)
Atmospheric pressure	700–1060 hPa	700–1060 hPa

7.4 System performance

7.4.1 Coordinate axes and directions



Name	Description
Z-axis	Vertical to the ground. The positive direction points upward.
X-axis	Perpendicular to the Z-axis and parallel to the longitudinal axis of the fixed radiographic table.
Y-axis	Perpendicular to the Z-axis and to the longitudinal axis of the fixed radiographic table.
RHA	Rotation of the X-ray source assembly about the Y-axis with the focal spot of the X-ray tube as the center. When the X-ray beam is emitted downward vertically, the RHA angle is 0°. When the X-ray source assembly is rotated counterclockwise toward the angle indicator, the RHA angle is positive.
RVA	Rotation of the X-ray source assembly about the Z-axis with the stand as the center. When the cantilever of the X-ray source assembly is parallel to the Y-axis, the RVA angle is 0°. When the X-ray source assembly is rotated clockwise (looking down from above), the RVA angle is positive.

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7.4.2 Parameters of component movement

Component	Parameter	Range
X-ray tube assembly	Rotation about the vertical axis (RVA)	≥ 270° (deviation: ±5%)
	Rotation about the horizontal axis (RHA)	≥ 240° (deviation: ±5%)
Tube stand	X-axis movement	≥ 1400 mm (deviation: ±5%)
	Z-axis movement	≥ 1200 mm (deviation: ±5%)
Bucky wall stand	Z-axis movement	≥ 1500 mm (deviation: ±5%)
Fixed radiographic table	Y-axis movement	≥ 240 mm (deviation: ±5%)
	X-axis movement	≥ 950 mm (deviation: ±5%)
	X-axis movement of the tray	≥ 500 mm (deviation: ±5%)

7.4.3 Parameters of imaging chain components

7.4.3.1 High-voltage generator parameters

Parameter	Value	
Maximum output power and loading conditions	50 kW @ 100 kV, 500 mA	65 kW @ 130 kV, 500 mA
Nominal output power and loading conditions	50 kW @ 100 kV, 500 mA, 0.1 s	63 kW @ 100 kV, 630 mA, 0.1 s
Tube voltage range	40–150 kV Deviation: ±10% or less	
Tube current range	10–630 mA Deviation: ±20% or less	10–800 mA Deviation: ±20% or less
Loading time range	1–10,000 ms Deviation: ±(10% + 1 ms) or less	
Current–time product range	0.4–1000 mAs Deviation: ±(10% + 0.2 mAs) or less	
Maximum output power loading parameters	125 kV, 400 mA 100 kV, 500 mA 79 kV, 630 mA	130 kV, 500 mA 81 kV, 800 mA 103 kV, 630 mA
AEC minimum radiation time	5 ms	
Range of automatic exposure	5–500 ms (kV + AEC mode)	
	10–630 mA (kV + mA + AEC mode)	10–800 mA (kV + mA + AEC mode)

Note: Adjustment to the tube current, current–time product, and loading time of the high-voltage generator complies with the R'10 standard.

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Table 7-5 Maximum output power of the high-voltage generator with different tube currents

Tube current (mA)	50 kW configuration		65 kW configuration	
	Maximum voltage (kV)	Maximum output power (kW)	Maximum voltage (kV)	Maximum output power (kW)
200	150	30	150	30
250	150	37	150	37
320	150	48	150	48
400	125	50	150	60
500	100	50	130	65
630	79	50	103	65
800	N.A.	N.A.	81	65

7.4.3.2 Parameters of X-ray tube assembly

Parameter	X-ray tube assembly (XRR-3331X)	X-ray tube assembly (E7876X)
Manufacturer	Toshiba	Toshiba
Tube model	XRR-3331	E7876
Tube housing model	XH-121	XH-121
Nominal focal spot value (IEC 60336)	♦ Large focal spot: 1.2 mm ♦ Small focal spot: 0.6 mm	♦ Large focal spot: 1.2 mm ♦ Small focal spot: 0.6 mm
Nominal tube voltage	150 kV	150 kV
Permanent filtration (@ 75 kV)	0.9 mmAl	1.3 mmAl
Allowed additional filtration (@ 75 kV)	0.4 mmAl – 1.5 mmAl	0.4 mmAl – 1.5 mmAl
Target angle	12°	12°
Material of the anode target	Rhenium tungsten molybdenum alloy	Rhenium tungsten molybdenum alloy
Weight	About 16 kg	About 16 kg
Leakage technique factors	150 kV, 3.4 mA	150 kV, 3.4 mA
Nominal anode input power (at 0.1 s)	50 Hz ♦ Small focal spot: 20 kW ♦ Large focal spot: 50 kW 60 Hz ♦ Small focal spot: 22 kW ♦ Large focal spot: 54 kW 180 Hz ♦ Small focal spot: 32 kW ♦ Large focal spot: 78 kW	50 Hz ♦ Small focal spot: 20 kW ♦ Large focal spot: 50 kW 60 Hz ♦ Small focal spot: 22 kW ♦ Large focal spot: 54 kW
Anode heat content	210 kJ (300 kHU)	163 kJ (230 kHU)
Maximum heat dissipation of the anode	870 W (1226 HU/s)	750 W (1056 HU/s)
X-ray tube assembly heat content	900 kJ (1250 kHU)	975 kJ (1.354 MHU)
Maximum continuous heat dissipation	180 W (250 HU/sec)	196 W (272 HU/sec)
Cooling method	Natural cooling or air cooling	Natural cooling or air cooling

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7.4.3.3 X-ray tube assembly (XRR-3331X)

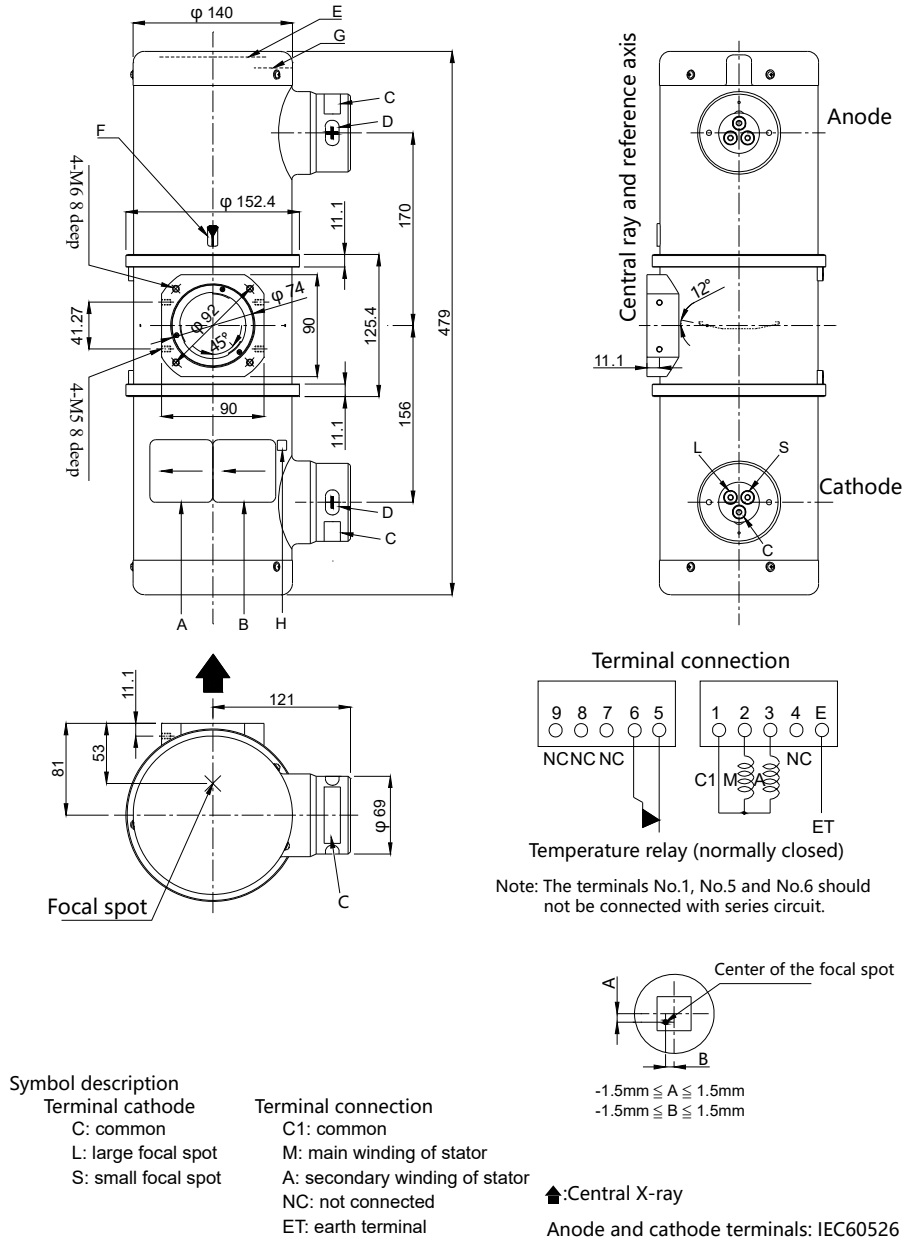


Figure 7-1 X-ray tube assembly (XRR-3331X)

Table 7-6 Rated values of the rotary anode motor

	Starting		Running	
Power frequency (Hz)	180_c	60	18_c0	60
Input power (W)	1100	910	83	83
Voltage $(V)_a$	220	130	60	40
Current (A)	5.7	7.8	1.6	2.3
Minimum speed increase $(S)_b$	1.2	0.8	-	-
Capacitor (μF)	6	44	6	44
Minimum braking time $(s)_c$	3 / 90 V (DC)			

a: The voltage applied at each time must not exceed 110% of the specification values listed above.

b: The starting time listed in the driver feature table is the time required from zero to high speed. The time required from low speed to high speed (as for repeated fluoroscope and radiography) equals 2/3 of the listed time. The maximum speed increase and decrease may reach 110% of the specification values listed above

c: Applicable to high-speed situations.

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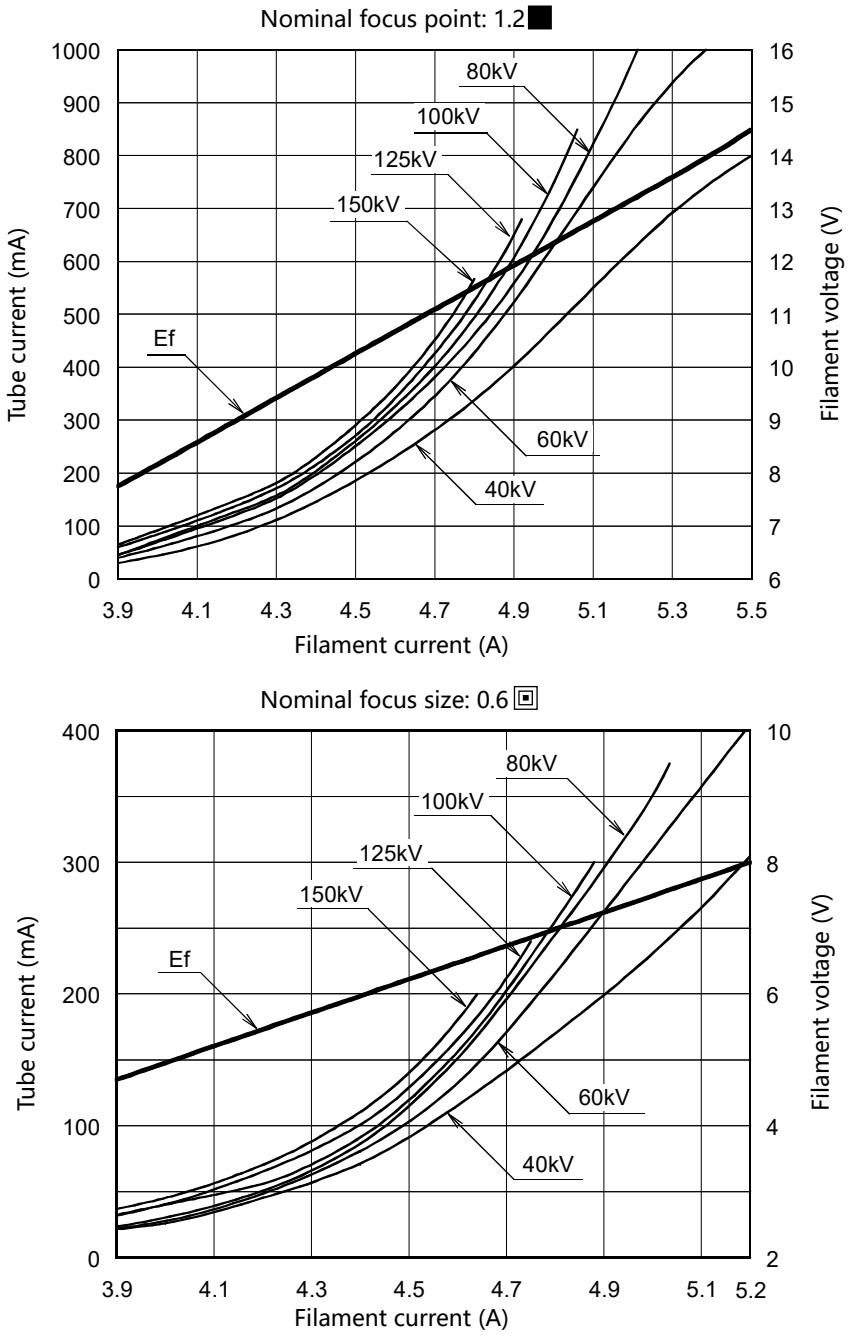


Figure 7-2 Characteristics of filament emission

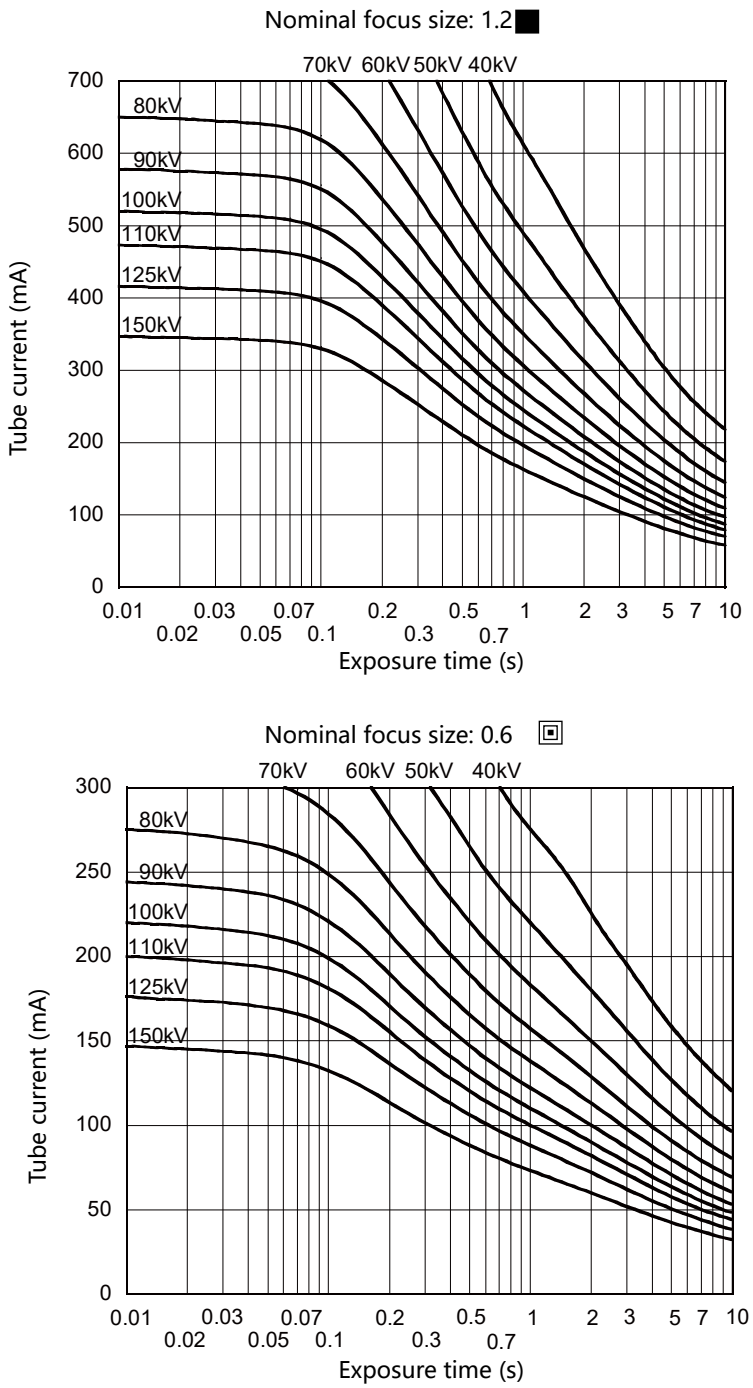


Figure 7-3 Maximum rated values (stator drive frequency: 50 Hz)

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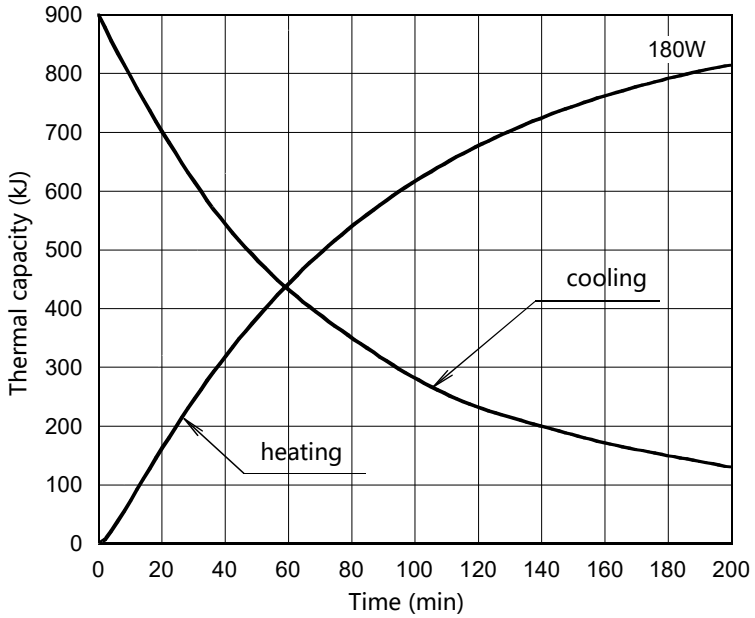


Figure 7-4 Heating and cooling curves of the X-ray tube assembly

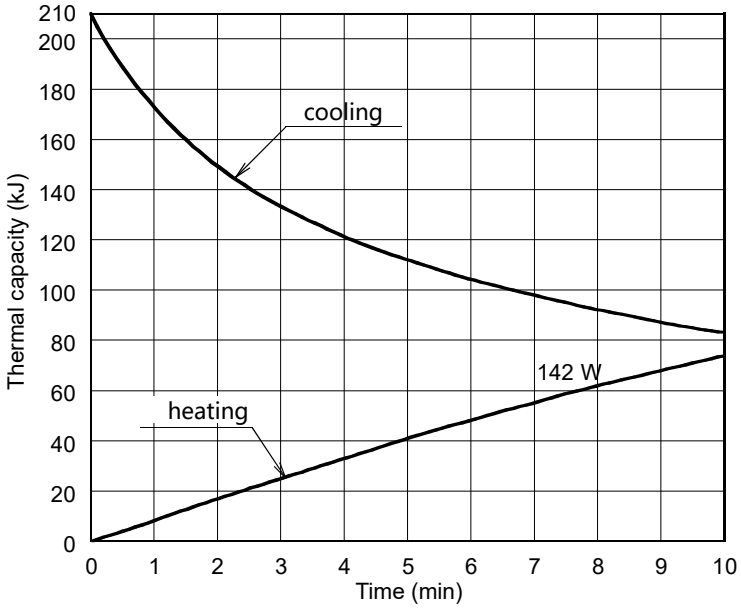


Figure 7-5 Heating and cooling curves of the X-ray tube anode

7.4.3.4 X-ray tube assembly (E7876X)

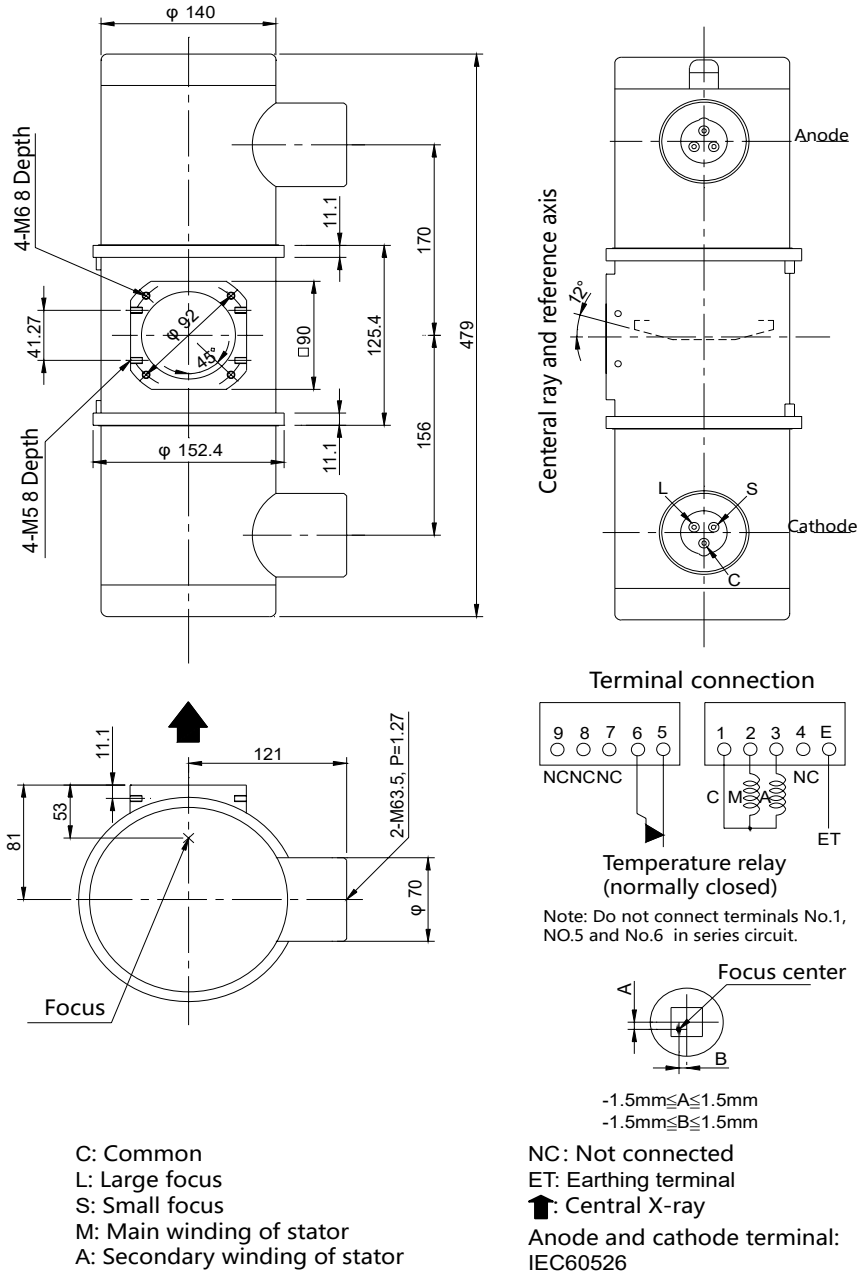


Figure 7-6 X-ray tube assembly (E7876X)

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Table 7-7 Rated values of the rotary anode motor

Parameter	Starting	Running
Power frequency (Hz)	50/60	50/60
Input power (W)	1450	80
Voltage (V)[a]	240	58
Current (A)	6.5	1.5
Minimum speed increase (s)[b]	0.6	N.A.
Capacitor (µF)	24	24

- a: The voltage applied at each time must not exceed 110% of the specification values listed above.
- b: The maximum speed increase and decrease may reach 110% of the specification values listed above.

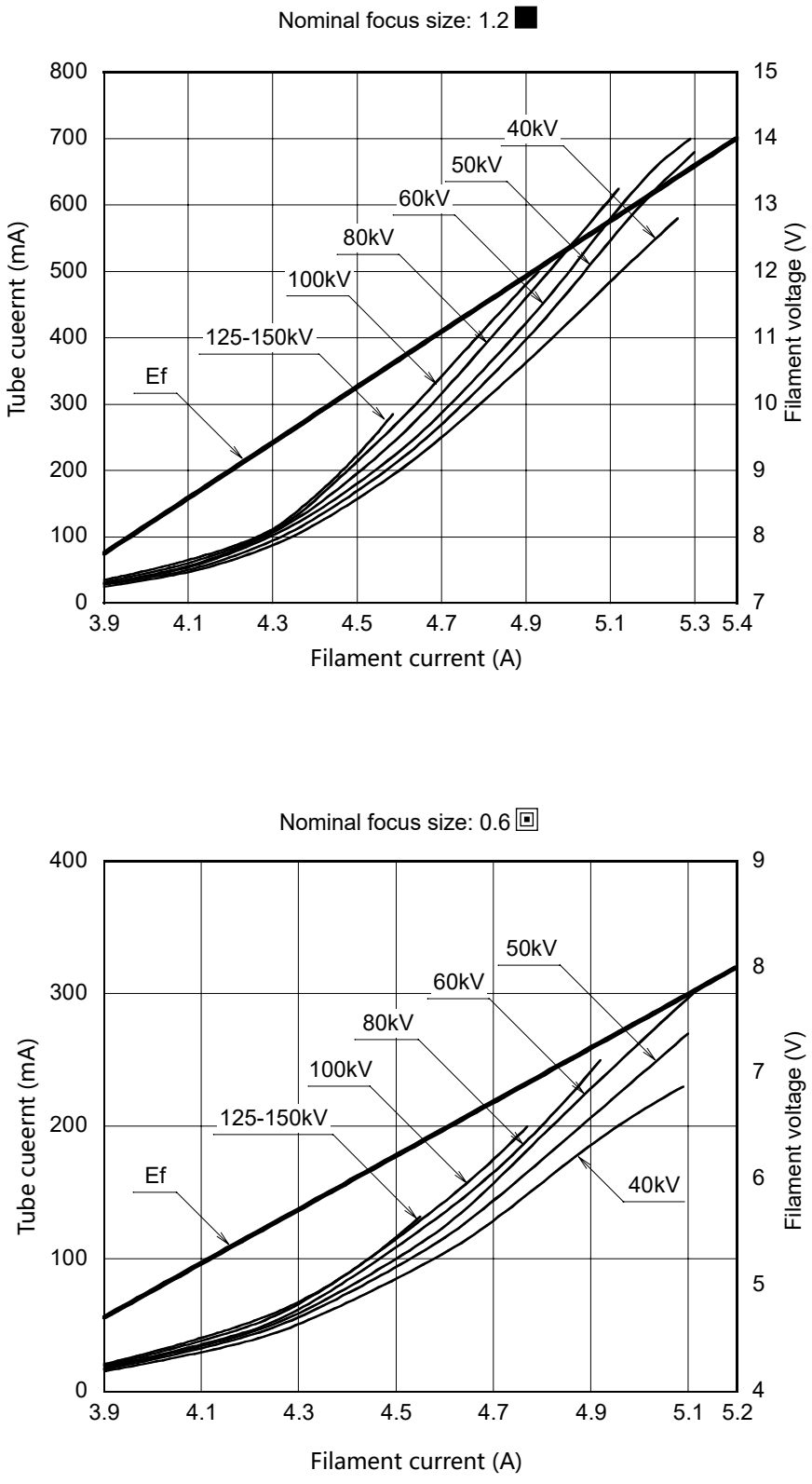


Figure 7-7 Characteristics of filament emission

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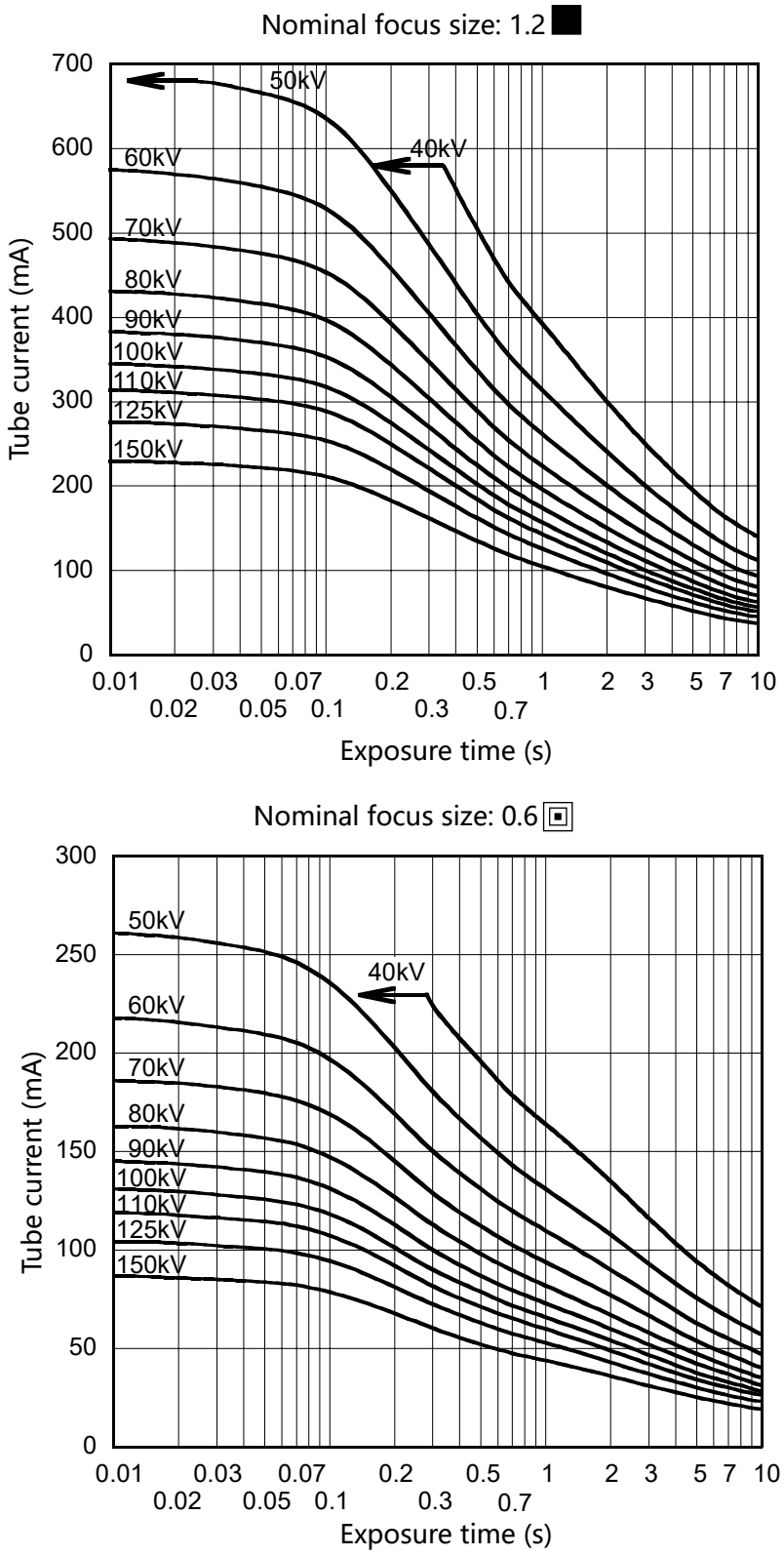


Figure 7-8 Maximum rated values (stator drive frequency: 50 Hz)

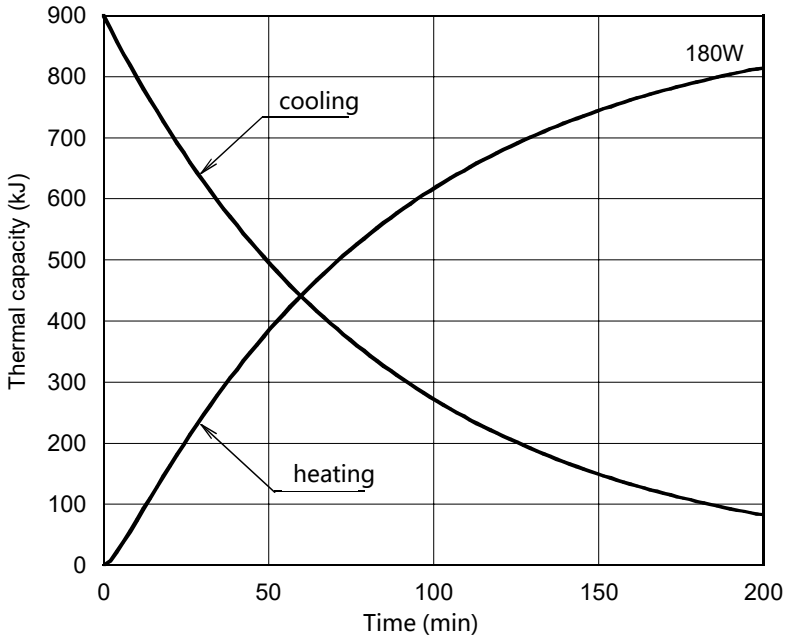


Figure 7-9 Heating and cooling curves of the X-ray tube assembly

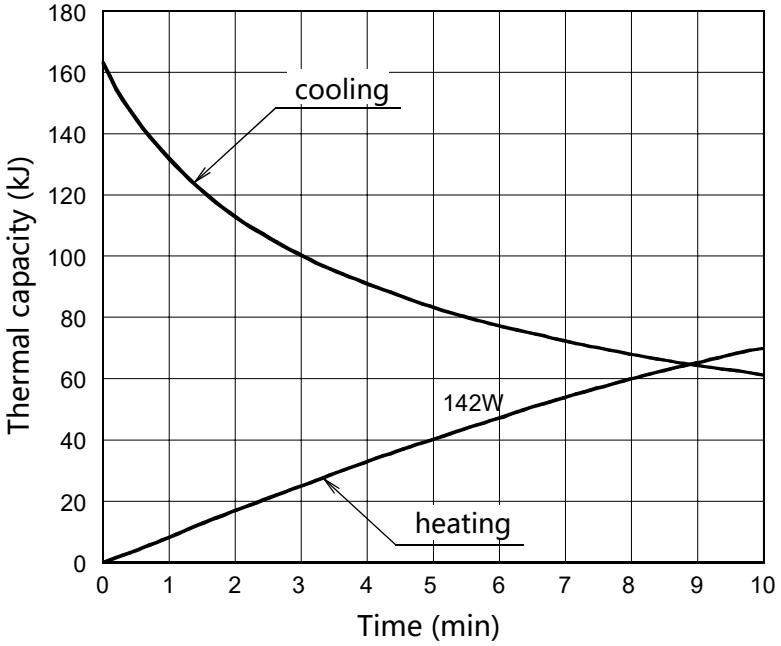


Figure 7-10 Heating and cooling curves of the X-ray tube anode

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7.4.3.5 Collimator parameters

Parameter	Value
Average luminance	≥ 180 l X @ 100 cm SID
Light field control mode	Manual
Light field duration	30 s
Inherent filtration	1.0 mmAl
Input power	24 V DC
Minimum radiation field	≤ 2 cm × 2 cm @ 100 cm SID

7.4.3.6 Grid

SID (cm)	Grid ratio	Grid density	Type
110	10:1	40 lines/cm	Focused grid
130	8:1	40 lines/cm	Focused grid
180	10:1	40 lines/cm	Focused grid

7.4.3.7 Flat panel detector

Table 7-8 Parameters of the flat panel detector

Parameter	Value
Product	Mars1717V-VSI
Scintillator	Cesium iodide or amorphous silicon
Pixel matrix	3072 × 3072
Effective imaging area	427 mm × 427 mm
Maximum spatial resolution	3.6 lp/mm
Data transmission	Wireless
Detective quantum efficiency @ 2.294 μGy	0.660 (spatial resolution: 0 lp/mm) 0.621 (spatial resolution: 0.5 lp/mm) 0.600 (spatial resolution: 1.0 lp/mm) 0.400 (spatial resolution: 1.5 lp/mm) 0.353 (spatial resolution: 2.0 lp/mm) 0.228 (spatial resolution: 2.5 lp/mm) 0.130 (spatial resolution: 3.0 lp/mm) 0.051 (spatial resolution: 3.5 lp/mm)

7.4.3.8 AEC information

Table 7-9 AEC information of DR

Parameter	Value
AEC minimum radiation time	5 ms
Deviation of the tube voltage	≤ 8%
Deviation of the tube current	≤ 20%
Range of automatic exposure	♦ kV + AEC mode: 5–1000 ms ♦ kV + mA + AEC mode: ♦ When the maximum output power of the high-voltage generator is 50 kW: 10–630 mA ♦ When the maximum output power of the high-voltage generator is 65 kW: 10–800 mA

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7.4.3.9 Image processing system

Table 7-10 Image processing system

Parameter	Value
Hard disk of the acquisition workstation	≥ 500 GB
Processor	Frequency: ≥ 2.5 GHz. Dual-core or above.
RAM	≥ 8 GB
Operating system	Windows 10 64-bit or other compatible versions
Power supply	665W
Host monitor	♦ Size: 21.5 inch ♦ Color ♦ Resolution: 1920 × 1080 ♦ Luminance: 170 cd/m^2 (for preview) Optional: ♦ Size: 21.3 inch ♦ Black and white ♦ Resolution: 1600 × 1200 ♦ Luminance: 1900 cd/m^2
Keyboard	USB port, supporting Chinese and English
Mouse	USB port

The host uses products with CCC certificate or products that comply with the information security standards of GB 4943.

Table 7-11 Data interfaces

Data type	Health data	Equipment data
Transmission protocol	TCP/IP communication protocols based on DICOM standard	TCP/IP communication protocols
Storage format	DICOM format	Not applicable

7.4.3.10 X-radiation field range

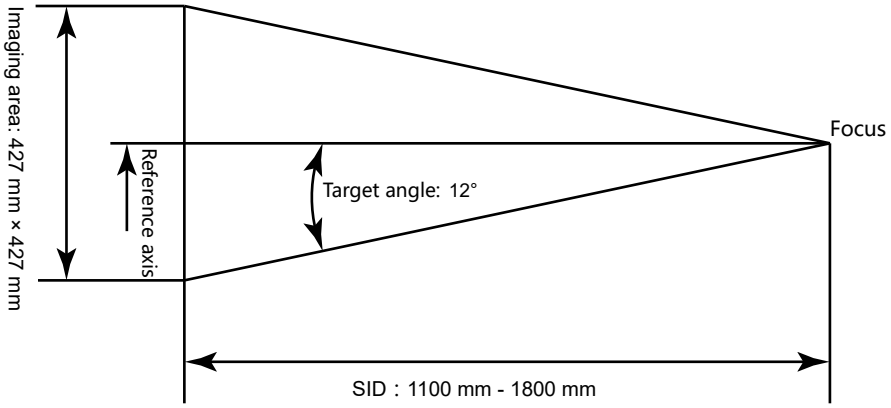


Figure 7-11 Radiation field range of the bucky wall stand

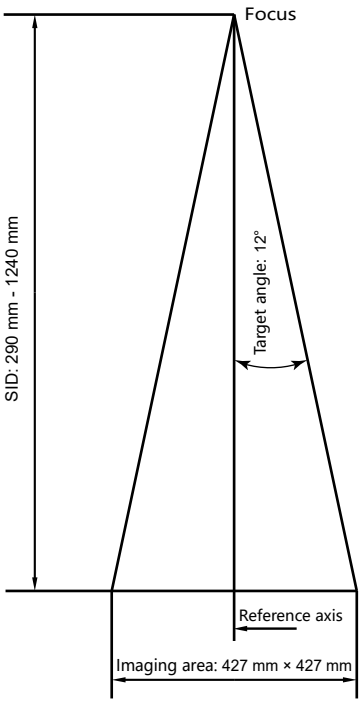


Figure 7-12 Radiation field range of the fixed radiographic table

7.4.3.11 Validation of AEC function

Choose phantoms of different thicknesses and their corresponding tube voltages according to the following table, select S400 as AEC sensitivity, and perform the exposure test. Record the exposure parameter mAs displayed on the Exam interface. The error of the mAs value should not exceed 20% of the standard values in the table below.

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Phantom thickness (cm)	kV value	mAs value
15	75	19.5
15	85	10.5
20	110	8.7

7.4.4 Parameters of components

Table 7-12 Bucky wall stand

Parameter	Description
Maximum load	15 kg
Grid	Pluggable
Ionization chamber	Standard
Surface X-ray absorption rate of the bucky	0.5 mmAl

Table 7-13 Fixed radiographic table

Parameter	Description
Height from the table top to the floor	680 mm
Dimensions of the table top	842 mm × 2300 mm
Locking control of the table top	Foot switch
Maximum load of the table top	250 kg
Refractive absorption rate of the table top	0.7 mmAl
Ionization chamber	Standard
Grid	Pluggable

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