

uDR

System Operator Manual

Digital Medical X-ray Imaging System

uDR 780i，uDR 780i Pro，uDR 760i

uExceed R002

51000789-09-202309-ENG

UNITED IMAGING

CE
0123

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Printed in China

Foreword

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

Audience

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

Revision records

Version	Description
01	2018-01, release version 1
02	2018-11, release version 2
03	2019-04, release version 3
04	2020-10, release version 4
05	2021-12, release version 5
06	2023-01, release version 6
07	2023-03, release version 7
08	2023-05, release version 8
09	2023-09, release version 9

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1 Introduction

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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 Clinical application

Indications for use

The uDR 780i digital medical X-ray imaging system is intended for use by a qualified/trained doctor or technician on both adult and pediatric subjects for taking diagnostic radiographic exposures of the skull, spinal column, chest, abdomen, extremities, and other anatomic sites. Applications can be performed with the subject sitting, standing, or lying in the prone or supine position. Not for mammography.

uDR 780i Pro & uDR 760i digital X-Ray imaging system are intended to use by a qualified/trained doctor or technician on both adult and pediatric subjects for taking diagnostic radiographic exposures of the skull, spinal column, chest, abdomen, extremities, limbs and trunk. Not for mammography.

Application scope

- Suitable for the radiography of the skull, spinal column, chest, abdomen, extremities, and other anatomic sites of subjects at all ages who need radiography.
- Suitable for radiological examination in all the large, medium and small-sized hospitals.

Contraindication

There is no specific contraindication. However, for radiation-sensitive population (for example pregnant women, children and infants), you must be very familiar with the examination indications.

Applied parts

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

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1.3 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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1.4 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.**

1.5 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 drivers, 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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1.6 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.
Electronic detent	Electronic stop positions in the X-axis and Y-axis directions are provided for the tube ceiling stand to ensure accurate SID values, supine lying position, and lateral lying position.
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.

Glossary	Description
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.
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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1.7 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
DAP	Dose Area Product
DOA	Defect on Arrival
DR	Digital Radiography
DVI	Digital Visual Interface
EMC	Electromagnetic Compatibility
FPD	Flat Panel Detector
GCHW	Geometry Control Hardware
GCU	Geometry Control Unit
GEN	HV Generator
HIS	Hospital Information System
HU	Heat Unit
MPPS	Modality Performed Procedure Step
PACS	Picture Archiving and Communication System
PCB	Printed Circuit Board
PDU	Power Distribution Unit
RHA	Rotation about the Horizontal Axis
RIS	Radiology Information System
RVA	Rotation about the Vertical Axis
SCU	System Control Unit
SC	System Cabinet

Abbreviation	Full form
SID	Source to Image Receptor Distance
SOD	Source to Object Distance
TCP/IP	Transmission Control Protocol/Internet Protocol
TCS	Tube Ceiling 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.

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

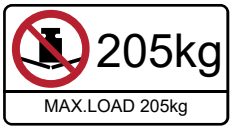
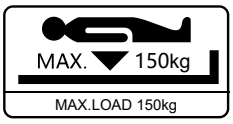
Table 2-2 Warning symbols

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
	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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Label	Description	Position
	Warning, mind your legs	Locations where legs may be squeezed

Table 2-3 Prohibition symbols

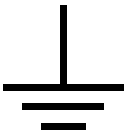
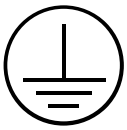
Label	Description	Position
	No sitting	Surface of component where sitting is forbidden
	No stepping on surface	Surface of component where stepping is forbidden
	No heavy load	Surface of easily broken parts
	Load-bearing limit (15 kg)	BWS bucky and handles of the bucky wall stand
	Load-bearing limit (25 kg)	Stitching stand
 (for the U.S.A. only)	Load-bearing limit (204 kg)	Stitching stand
	Load-bearing limit (205 kg)	Stitching stand
	Load-bearing limit (150 kg)	Mobile table
	Load-bearing limit (250 kg)	Radiographic table
 (for the U.S.A. only)	Load-bearing limit (320 kg)	Radiographic table

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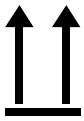
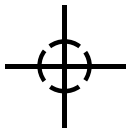
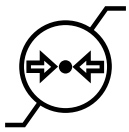
Table 2-4 Classification and indication of equipment

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

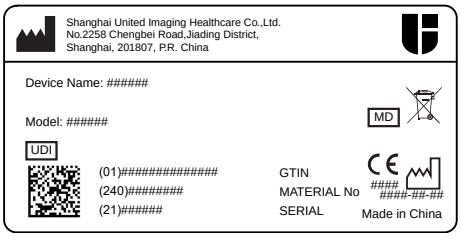
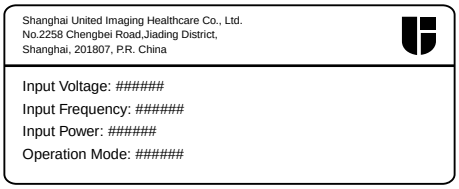
Label	Description	Position
	Earth (ground)	Near the earth point
	Protective earth (ground)	Connection point of protective earth conductor
	ESD Protective	Near the components free of ESD test

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 60601-1-3general 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 door is closed.
- The radiation warning light turns on when the scan starts.
- Exposure will be interrupted when the scanning room door is opened.

⚠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 the protection door of the exam room is not closed.

⚠CAUTION

Before exposure, check whether the exposure parameters meet the clinical requirements. Adjust any inappropriate parameters in time. Otherwise, the patient may be exposed to excessive radiation dose due to repeated exposure.

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 connect other additional multiple socket-outlets or extension cables to the system.

⚠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.

⚠WARNING

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.

NOTICE

Connect the external cables nearby and keep the cables on the ground to protect users from being tripped by the cables.

- 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.

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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.

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.

NOTICE

Be aware of the gaps between moving parts and fixed parts to avoid squeezing fingers.

⚠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.

⚠CAUTION

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.

- 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.
- 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.
- Do not apply excessive force after the system motion is disabled when the chains or wire ropes break. Otherwise, the system may be damaged. Please contact UIH Customer Service Center.

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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

⚠CAUTION

When users are in the collision protection area, operate the system with caution to prevent collisions, which may cause mechanical damages or personal injuries.

A collision protection area and electronic position limits are designed for components with motorized motion such as the tube ceiling stand and the bucky wall stand.

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 and stops when it reaches the electronic position limit. If motorized motion is still needed, move the system to other directions.

The collision protection of motorized motion is controlled by software. For example, when the distance between the X-ray source assembly and the table top is within 15 cm, the TUI and the interface of the image processing system will display the message "Entering collision area. Pay attention to the gantry position ".

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

During motorized vertical motion of the tube ceiling stand or bucky wall stand, the component will stop automatically if the driver detects any force greater than 200 N. Please be careful to avoid any collision with patients or operators during vertical movement of the system.

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.

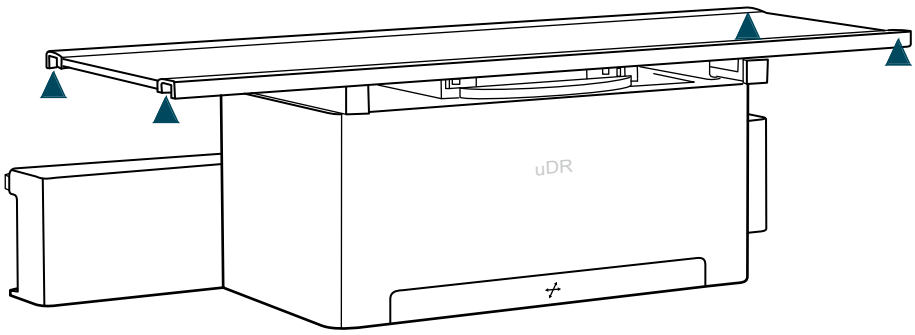


Figure 2-1 Dangerous areas on the fixed radiographic table

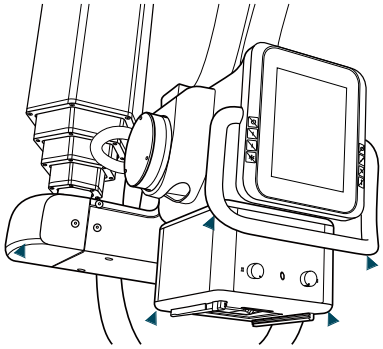


Figure 2-2 Dangerous area on the X-ray source assembly

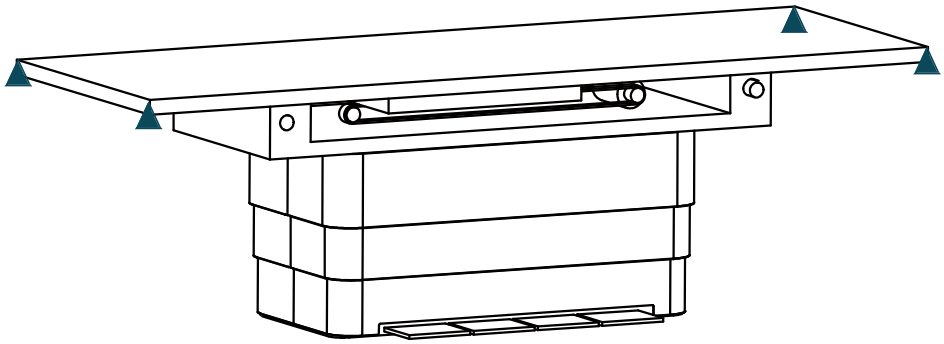


Figure 2-3 Dangerous collision area on the elevating table

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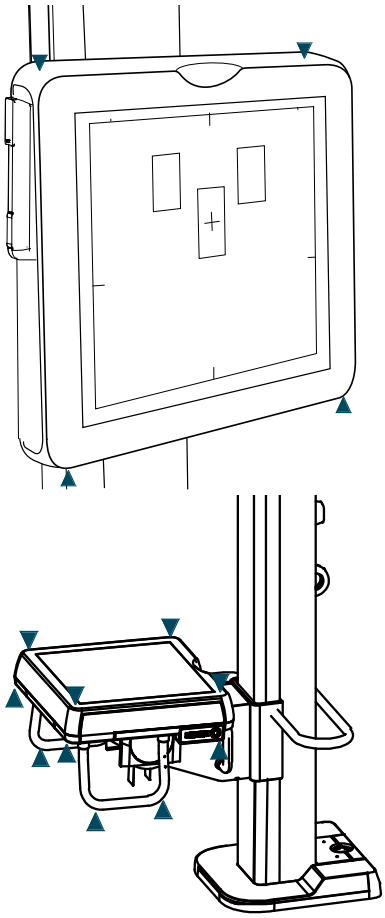


Figure 2-4 Dangerous area on the bucky wall stand

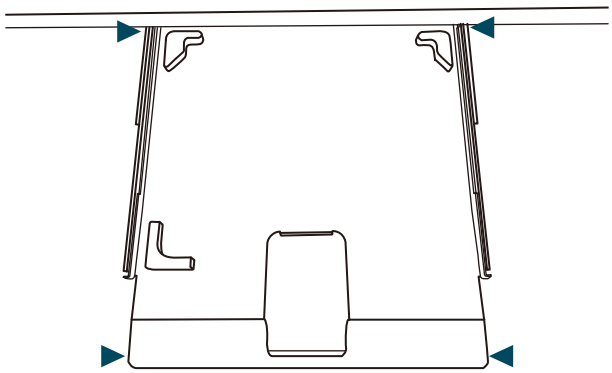


Figure 2-5 Dangerous area on the flat panel detector tray

2.6 Electromagnetic compatibility

This system complies with the standards for the electromagnetic compatibility of IEC 60601-1-2. 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.

⚠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 monitor 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 2-6 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

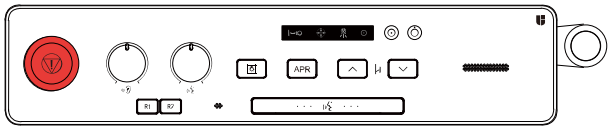


Figure 2-7 E-Stop button on the control box

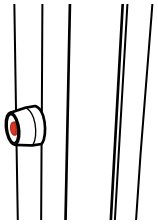


Figure 2-8 E-Stop button on the bucky wall stand

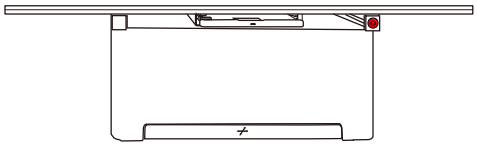


Figure 2-9 E-Stop button on the fixed radiographic table

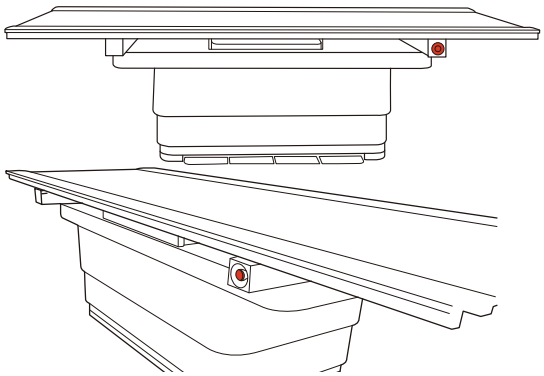


Figure 2-10 E-Stop buttons on the elevating table (2 buttons)

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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.

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.

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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.

NOTICE

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

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

2.12 Equipment compatibility

Any non-conforming components in the system may result in degraded system safety performance. If any non-conforming component is found in the system, stop using the system and contact UIH Customer Service Center.

⚠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 62368-1.

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

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2.13 Service life of the product

The expected service life of this product is 10 years.

After the service life expires, the product should be handled according to relevant laws and regulations. In case of any problems, contact UIH Customer Service Center.

3 System components

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3.1 System overview

This system provides a solution for digital medical X-ray radiography. This system supports radiographic examinations of adults and children and 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.

The workflow of this system can help you complete examinations quickly and accurately.

- Digital flat panel detectors can be used for patients who cannot walk such as bedridden patients and patients in wheelchairs.
- You can position patients quickly and accurately with the automatic movement functions.
- The workstation provides functions of the whole workflow: patient administration, patient registration, exam, review, and filming.

This system provides three types of acquisition systems: table, bucky wall stand, and free FPD.

- The radiographic table supports X-ray radiography for patients in lying position and sitting position.
- The bucky wall stand supports X-ray radiography for patients in standing position and sitting position.
- The free FPD supports X-ray radiography of different body parts.

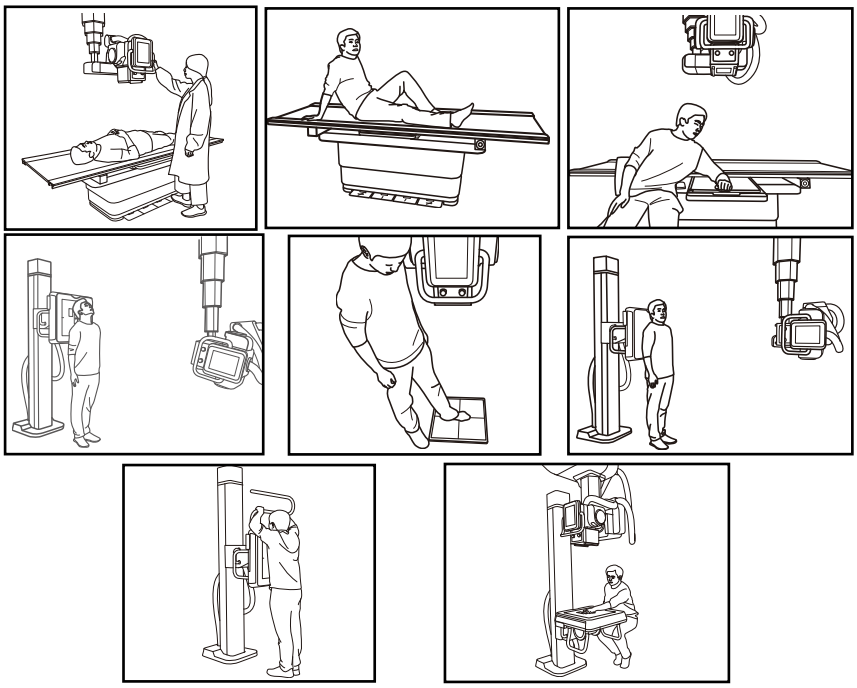
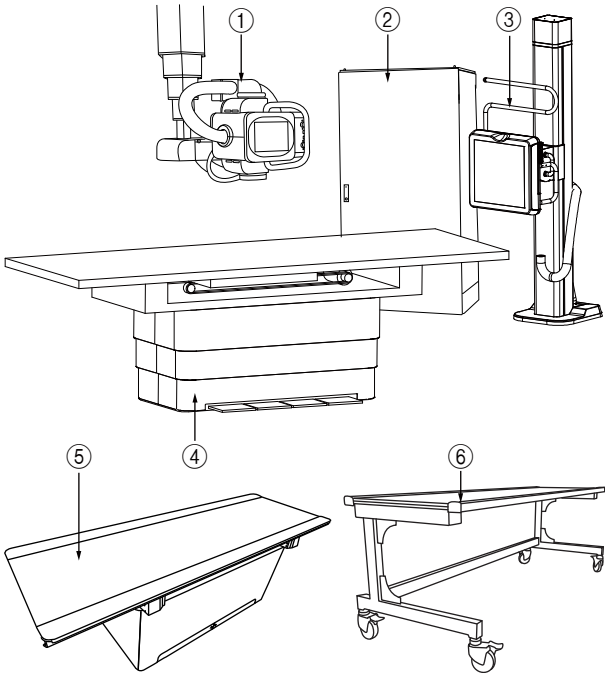


Figure 3-1 Examples of application scenarios

3.2 Components in the scanning room



No.	Component	Description
1	Components of the tube ceiling stand	Supporting movement of the X-ray source assembly.
2	System cabinet	Holding the high-voltage generator and the power distribution unit.
3	Components of the bucky wall stand	Supporting X-ray radiography for patients in standing position and sitting position.
4	Components of the elevating table	Supporting X-ray radiography for patients in lying position and sitting position. The elevating table is not available to all models.
5	Components of the fixed radiographic table	Supporting X-ray radiography for patients in lying position and sitting position. The fixed radiographic table is not available to all models.
6	Mobile table	Supporting X-ray radiography for patients in lying position and sitting position. The mobile table is not available to all models.

3.2.1 Tube ceiling stand

The tube ceiling stand supports movement of the X-ray source assembly in different directions.

- The slide guides on top enable the horizontal movement of the X-ray tube assembly and collimator along the X-axis and the Y-axis.
- The telescope column enables the vertical movement of the X-ray tube assembly and collimator along the Z-axis.

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- The X-ray tube assembly can rotate about the horizontal axis (RHA) and about the vertical axis (RVA).

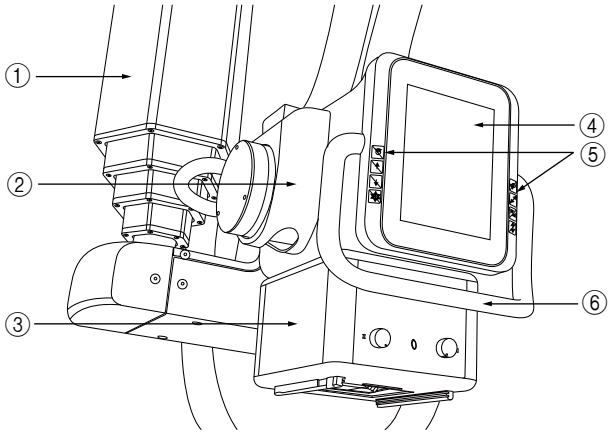


Figure 3-2 Structure of the tube ceiling stand

No.	Component	Description
1	Telescope column	Supporting vertical movement of the X-ray source assembly.
2	X-ray tube assembly	Generating X-rays.
3	Collimator	Adjusting the size of the radiation field.
4	Touch user interface (TUI)	Adjusting gantry position and setting acquisition parameters.
5	Movement control buttons	Controlling movement of the X-ray source assembly.
6	Handle	Hold the handle to manually move the X-ray source assembly.

⚠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.

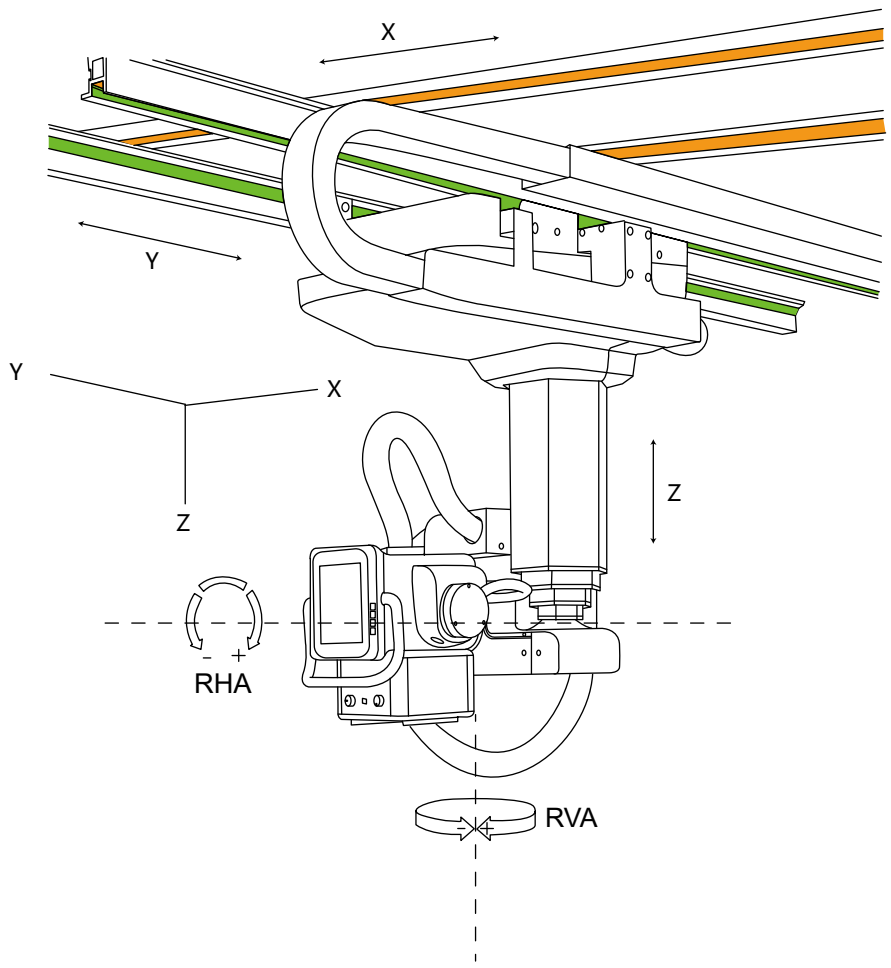
- A damaged tube ceiling stand is a potential hazard to patients and operators. If the tube ceiling stand is faulty and moves unexpectedly, please contact UIH Customer Service Center immediately.
- If the tube ceiling stand cannot move smoothly, do not force it to move. Please contact UIH Customer Service Center.

- Do not hang or place objects on the tube ceiling stand. Excessive load on it will damage the equipment. The maximum load that the cantilever of the tube ceiling stand can bear is 40.5 kg.
- The cantilever of the tube ceiling stand can support the weight of the following objects:
  - Maximum weight of the X-ray source assembly and its support: 23 kg
  - Maximum weight of the collimator: 9.5 kg
  - Weight of the covers and handle: 4 kg
  - Weight of the touch user interface (TUI): 1.5 kg
  - Maximum weight of accessories: 1 kg

3.2.1.1 Movement description

⚠WARNING

No exposure is allowed during system movement.



- Movement directions:
  - X-axis: Longitudinal movement.
  - Y-axis: Transverse movement.

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- ♦ Z-axis: Vertical movement.

- Rotation directions:
  - ♦ RHA: Rotation about horizontal axis.
  - ♦ RVA: Rotation about vertical axis.
- You can use the movement control buttons, handles, and touch user interface (TUI) to control the movement and rotation of the tube ceiling stand.
  - ♦ The touch user interface (TUI) shows information such as source to image receptor distance (SID) and rotation angle of the X-ray source assembly.
  - ♦ When you need to move the X-ray source assembly for a long distance, first rotate the X-ray source assembly and move it to the height of your elbow.

⚠WARNING

Do not adjust the position of the X-ray source assembly by holding the cantilever. Otherwise, your fingers may be stuck.

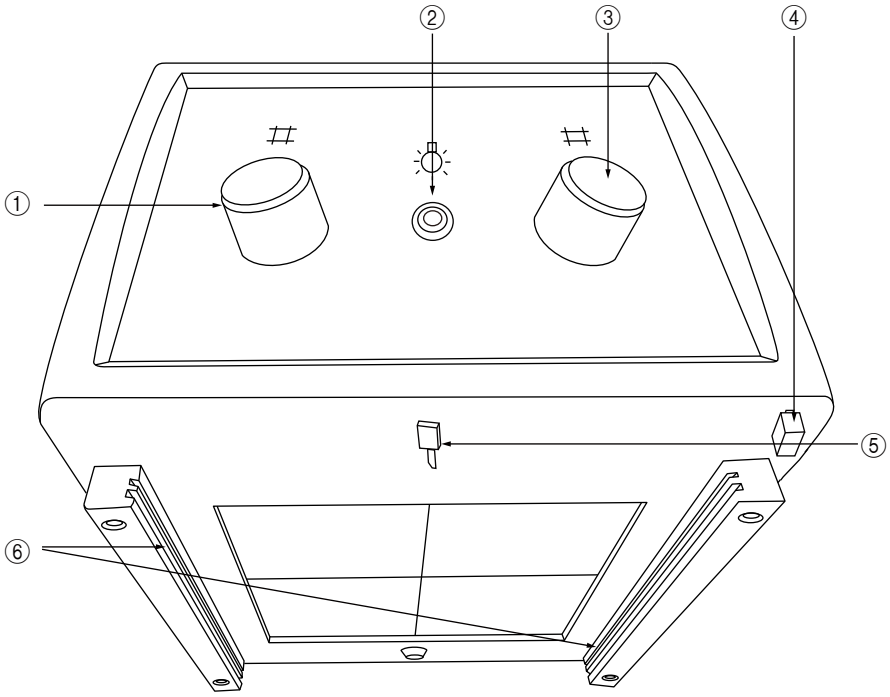
3.2.1.2 Electronic detents

For the tube ceiling stand, there are electronic detents at the commonly used SID positions along the X-axis. Commonly used SIDs include 110 cm, 150 cm, 180 cm, 200 cm, and 300 cm.

The electronic detent on the Y-axis is at the position where the X-ray source assembly and the BWS bucky are centered.

To enable or disable an electronic detent, please contact UIH Customer Service Center.

3.2.1.3 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.

Inherent or additional copper filtration

In pediatric applications, use of appropriate copper filtration can harden the X-rays to improve image quality.

- Improper setting of the filtration value can lead to degradation of image quality. Please check whether the value is appropriate when you adjust the filtration value.
- To avoid degradation of image quality, please carefully adjust parameters of exposure, LUT, enhancement, noise reduction, etc. after you have adjusted the filtration value.

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Collimator lights

When you turn the collimator lights on, both the light localizer and the linear laser localizer are turned on.

The light localizer marks the range of the radiation field. The linear laser localizer marks the center of the light field center.

The light localizer will be turned on automatically in the following scenarios.

- The user manually set the size of the light field.
- The TCS or the BWS moves.
- The centering mode is modified.
- Automatic centering is completed.
- The system has moved to the standing position.
- The system has moved to the lying position.
- The system has finished tracking movement.

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: 45 cm × 45 cm

If the automatic centering function fails to align the focal spot of the X-ray tube with the center of the detector, please contact UIH Customer Service Center.

3.2.1.4 Touch user interface

Touch user interface

A touch user interface (TUI) is provided to display patient information and the system state. You can also select protocols and set the acquisition parameters.

Interfaces on the touch user interface are as follows:

- Patient Information interface
- Positioning Information interface
- Exposure Parameters interface
- Stitching interface (optional)

When the RHA angle of the X-ray tube assembly exceeds ±45°, the display orientation of the touch user interface switches from portrait to landscape.

Operations on the touch user interface are synchronized in the image processing system on the control room monitor.

After no operation is performed on the system for 15 minutes, the touch user interface enters the standby mode and the screen display turns off. In case of any operations, the touch user interface exits the standby mode immediately.

Interface layout

The Positioning Information interface is taken as an example to introduce the touch user interface.

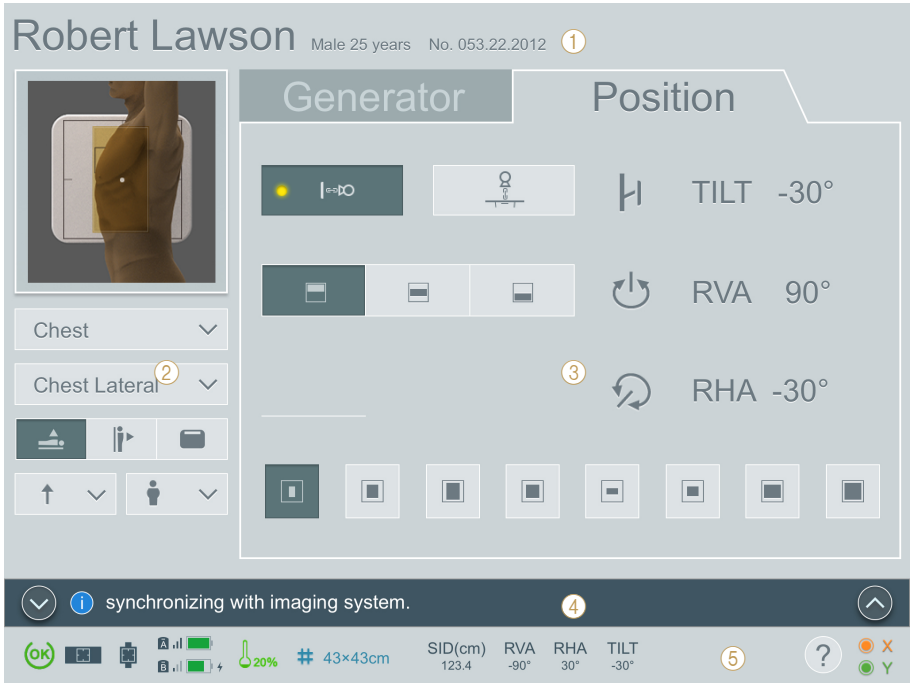


Figure 3-3 Touch user interface

No.	Name	Function
1	Patient Information Display area	Displaying the basic information of the current patient.
2	Protocol Information area	Displaying the protocol and illustration for the current patient. You can set the acquisition system and protocol information.
3	Exam Settings area	Displaying the exposure parameters and the patient positioning information. You can switch between the tabs. If the stitching exam is available, you can press the button at the top right corner to switch to the stitching setting interface.
4	Information Display area	Displaying system information during the exam.
5	System Status area	Displaying the system state under the current exam.

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Positioning Information interface

In the Positioning Information interface, you can set the parameters of patient positioning and view the movement status and exam status of the system.

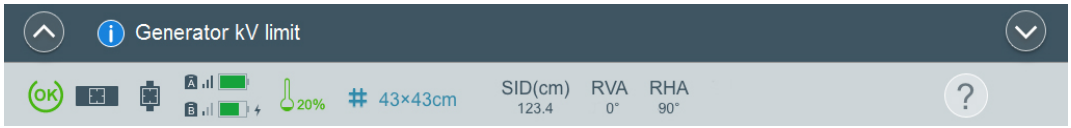
Icon	Description
	Displaying and setting the examined body part and age group of the patient.
	Displaying and setting the exam protocol.
	Displaying and setting the acquisition system. ♦ Bucky wall stand  . ♦ Fixed radiographic table  . ♦ Free FPD  .
	Displaying and setting the patient size. After the patient size is changed, the exposure parameters change accordingly. ♦ Large  . ♦ Medium  . ♦ Small  .
	Displaying and setting the orientation of lying position. ♦ Head up (default)  . ♦ Head down  . ♦ Head left  . ♦ Head right  .
	Displaying the angle when the angle of rotation about the vertical axis (RVA) of the X-ray source assembly is 0°.
	Displaying the angle of rotation about the horizontal axis (RHA) of the X-ray source assembly in real time.
	Displaying the tracking status of the X-ray source assembly and the table bucky.
	Displaying and switching the tracking status of the X-ray source assembly and the BWS bucky. Tracking can be activated only when the system is centered.

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Icon	Description
	Displaying the alignment status of the X-ray source assembly and the BWS bucky, including top, center, and bottom. ♦ Top: The upper edge of the radiation field is aligned with the upper edge of the effective receiving area of the flat panel detector. ♦ Center: The center of the radiation field is aligned with the center of the effective receiving area of the flat panel detector. ♦ Bottom: The lower edge of the radiation field is aligned with the lower edge of the effective receiving area of the flat panel detector.
	Adjusting the size of the light field of the collimator. From left to right: 20 × 25, 25 × 20, 25 × 30, 30 × 25, 35 × 35, 35 × 43, 43 × 35, 43 × 43.

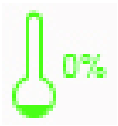
System Status area

The System Status area shows the state of system connection and the state of the components during the exam.



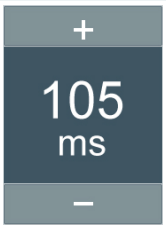
Icon	Description
	You can press the information bar to view the information. ♦ Slide up and down for quick browsing. ♦ Press the information bar again to close the information list.
	Exposure state. ♦ Exposure allowed  . ♦ Exposure not allowed  .
	Detector state. ♦ In the table bucky  . ♦ In the BWS bucky  .
	Detector battery state. If there are two detector, they are displayed as FPD A and FPD B respectively.  Battery level when not charging. ♦ Red: Battery is too low. Exposure is not allowed. ♦ Orange: Battery is low. Exposure is allowed. ♦ Green: Battery is sufficient. Exposure is allowed.  Battery level when charging. ♦ Red: Charging. Battery is too low. Do not take the detector out. ♦ Orange: Charging. Battery is low. Exposure is allowed. ♦ Green: Charging. Battery is sufficient. Exposure is allowed.

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Icon	Description
	Heat content of the X-ray tube assembly. ♦  : Heat content of the X-ray tube assembly is not detected. ♦  : Heat content of the X-ray tube assembly is normal. ♦  : Heat content of the X-ray tube assembly exceeds the normal range. Please reduce or stop the exposure. ♦  : Heat content of the X-ray tube assembly is seriously out of the range. Please stop the exposure immediately.
	Current size of the light field.
	Current source to image receptor distance (SID).
	Angle of rotation about the vertical axis (RVA) of the X-ray source assembly.
	Angle of rotation about the horizontal axis (RHA) of the X-ray source assembly.
	Opening the Help interface. ♦ After the Help interface is opened, the icon  turns blue, and blue borders appear in the interface. All items are disabled temporarily. You can press any item to display the corresponding description. ♦ Press  again to exit the Help mode.

Exposure Parameters interface

The exposure mode and exposure dose of the current study are displayed in the Exposure Parameters interface.

Icon	Description
	Select the exposure mode and adjust the parameters. When AEC mode is on, you can adjust the measuring fields, sensitivity, and density of the ionization chamber manually.
	Select the large focal spot or small focal spot.
	Adjust the tube voltage. ♦ Press "+" or "-" to increase or decrease the tube voltage. ♦ Hold down "+" or "-" to quickly adjust the tube voltage.
	Adjust the tube current. ♦ Press "+" or "-" to increase or decrease the tube current. ♦ Hold down "+" or "-" to quickly adjust the tube current.
	Adjust mAs. ♦ Press "+" or "-" to increase or decrease mAs. ♦ Hold down "+" or "-" to quickly adjust mAs.
	Adjust the exposure time. ♦ Press "+" or "-" to increase or decrease the exposure time. ♦ Hold down "+" or "-" to quickly adjust the exposure time.
	Select the sensitivity. When AEC mode is on, you can select the sensitivity.
	Select the density. When AEC mode is on, you can select the density. You can scroll down to display more content in the drop-down list.

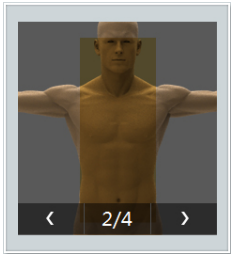
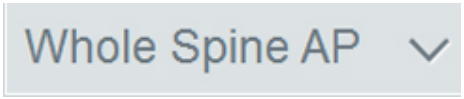
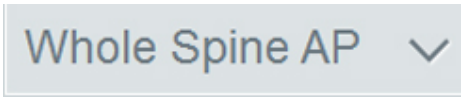
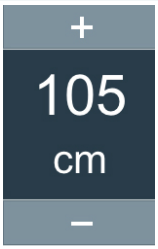
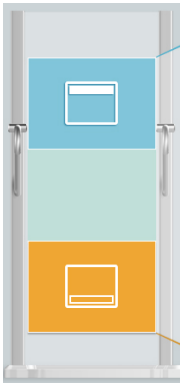
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Icon	Description
	Select the measuring fields of the ionization chamber. When AEC mode is on, you can select the measuring fields of the ionization chamber. You can scroll down to display more content in the drop-down list. Default setting of the ionization chamber is available for the protocols in AEC mode. You can select the measuring fields based on actual needs. ♦ Left  . ♦ Middle  . ♦ Right  . ♦ Left and middle  . ♦ Left and right  . ♦ Middle and right  . ♦ Left, middle, and right  .
	You can press **Reset** to restore all parameters of the selected protocol to the default values.

Stitching interface (optional)

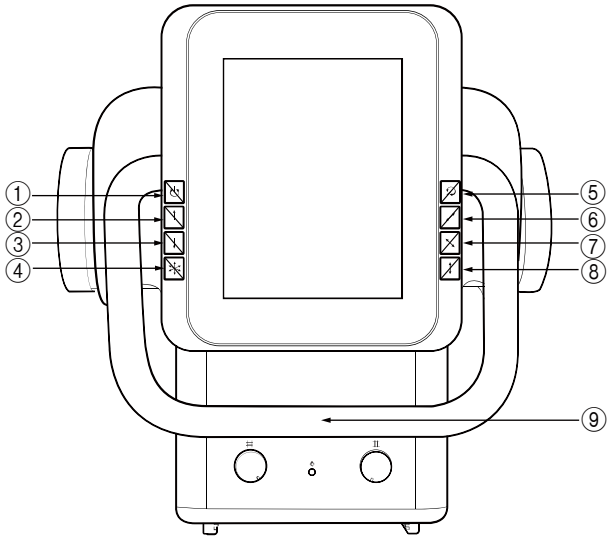
When a stitching protocol is selected, the stitching button  is displayed at the top right corner of the Positioning Information interface, Exposure Parameters interface, and Stitching interface.

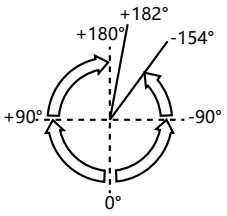
- Press  in the Positioning Information interface or Exposure Parameters interface to open the Stitching interface.
- Press  in the Stitching interface to open the Positioning Information interface and the Exposure Parameters interface.

Icon	Description
	Displaying the protocol and illustration. You can use the left and right arrows to switch between the frames and set the exposure parameters for each frame.
	Displaying and setting the stitching procedure.
	Displaying and setting the stitching protocol.
	Displaying the information on stitching.
	Displaying and setting the TOD. ♦ Press "+" or "-" to increase or decrease TOD. ♦ Hold down "+" or "-" to quickly adjust TOD.
	Setting the stitching area. Orange indicates that the position has not been set. Blue indicates that the position has been set. ♦ Rotate the X-ray tube to align the upper edge of the light field with the upper end of the exposure range, and then press the button of the upper end  . ♦ Rotate the X-ray tube to align the lower edge of the light field with the lower end of the exposure range, and then press the button of the lower end  .

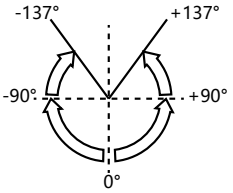
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3.2.1.5 Movement control buttons and handle



No.	Icon	Name	Description
1		RVA Release button	By holding down this button, you can hold the handle of the X-ray source assembly and rotate it about the vertical axis (RVA).  ♦ The rotation range is not less than 336°. ♦ There are detents at -180°, -90°, 0°, and +90°. ♦ You can read the angle on the angle indicator on the TCS. The scale unit is 15°. The error does not exceed ±2°. ♦ The TUI shows the RVA detent information of the X-ray source assembly. When the RVA is -90°, 0°, 90°, or 180°, the TUI shows the angle.
2		Move Up button	Press and hold this button to move up the X-ray source assembly.
3		Move Down button	Press and hold this button to move down the X-ray source assembly.
4		Floating button	By holding down this button, you can hold the handle of the X-ray source assembly and move it in the X-axis, Y-axis, and Z-axis directions.

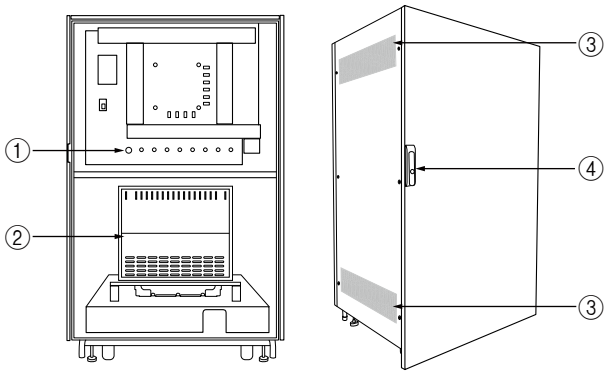
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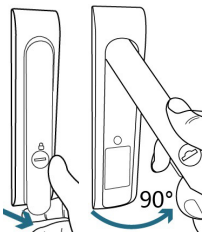
No.	Icon	Name	Description
5		RHA Release button	By holding down this button, you can hold the handle of the X-ray source assembly and rotate it about the horizontal axis (RHA).  ♦ The rotation range is not less than 270°. ♦ There are detents at -90°, 0°, and +90°. ♦ The TUI shows the RHA detent information and the angle of the X-ray source assembly.
6		Longitudinal Release button	By holding down this button, you can hold the handle of the X-ray source assembly and move it in the X-axis direction.
7		Transverse Release button	By holding down this button, you can hold the handle of the X-ray source assembly and move it in the Y-axis direction.
8		Vertical Release button	By holding down this button, you can hold the handle of the X-ray source assembly and move it in the Z-axis direction.
9	N.A.	Movement control handle	Hold down this button and grasp the handle of the X-ray source assembly to move the X-ray source assembly horizontally or vertically.

3.2.2 System cabinet

Functions of the system cabinet:

- Powering the system on and off.
- Supplying power to system components.
- Supporting Ethernet and CAN network communication with the network switch.



No.	Component	Description
1	Power indicators	From left to right: TUI power or reset button, SCB power indicator, logic power indicator, brake power supply, motor power supply, acquisition workstation power supply, detector power supply, collimator power supply, and mains supply indicator.
2	High-voltage generator	Providing the electricity required for generating X-rays.
3	Holes for heat dissipation	For ventilation and heat dissipation. Do not block the holes.
4	Door lock	Opening the system cabinet: Pull the handle out and rotate it counterclockwise by 90°.  Closing the system cabinet: Rotate the handle clockwise by 90° and press it.

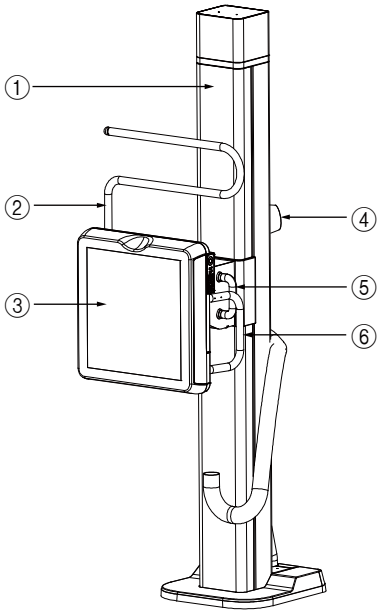
3.2.3 Bucky wall stand

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

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

The bucky wall stand can be used for standing exams, oblique exams, and lying exams.

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No.	Component	Description
1	Stand	The stand supports the BWS bucky.
2	Patient stretch grip	Patients can hold the patient stretch grip during positioning.
3	BWS bucky	The bucky includes the front cover, the flat panel detector, the slot for grids, the movement control buttons, and the handle.
4	E-Stop button (back)	Press the E-Stop button to stop any unexpected motorized motion.
5	Movement handle (both sides)	You can move the BWS bucky vertically by holding the movement handles and pressing the release buttons on the handles.
6	Side handles (both sides)	Patients can hold the side handles during positioning.

Precautions:

- Do not sit or place objects on the BWS bucky.
- Do not pull the side handles with excessive force.
- Patients must not stretch their legs under the tilted BWS bucky during sitting exams.

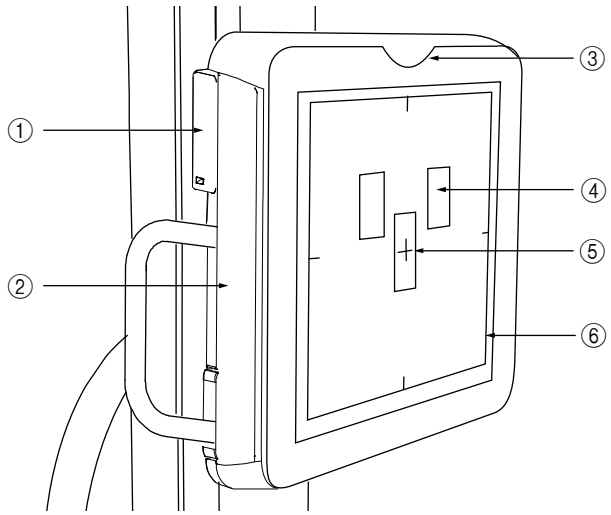
⚠WARNING

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.

3.2.3.1 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.

3.2.3.2 Control panels

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

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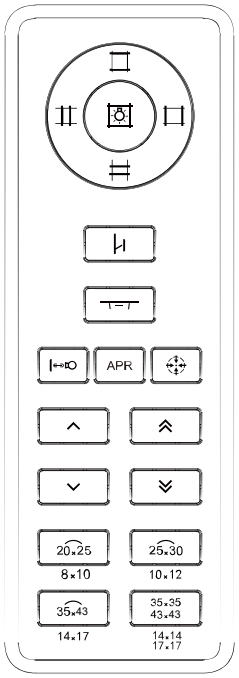
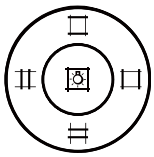
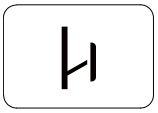
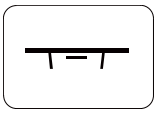
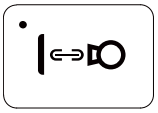
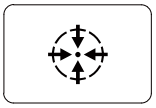
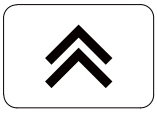
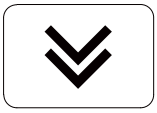
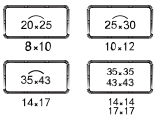


Figure 3-4 BWS control panels

Button	Name	Description
	Light field adjustment buttons	♦ Press the Collimator Lights button in the middle to turn on or off the collimator lights. ♦ Press the Field Height Increase button or Field Height Decrease button to increase or decrease the height of the light field. ♦ Press the Field Width Increase button or Field Width Decrease button to increase or decrease the width of the light field.
	Standing Position button	Hold down this button to move the gantry to the preset standing position. ♦ If the button is released during the gantry motion, the gantry will stop. ♦ Standing position: The light field center is aligned with the crosshairs on the BWS bucky.
	Lying Position button	Hold down this button to move the gantry to the preset lying position. ♦ If the button is released during the gantry motion, the gantry will stop. ♦ Lying position: The table bucky moves to the center of the table top, and the X-ray tube assembly moves to the position right above the table top. The light field center is aligned with the center of the flat panel detector.
	Tracking button	Tracking is activated when the system is aligned, and the indicator of this button turns on. To cancel tracking, press this button, and the indicator turns off.
	APR Position button	Select the acquisition protocol, and then hold down this button to move the gantry to the preset position. If the button is released during the gantry motion, the gantry will stop.
	Automatic Centering button	Hold down this button to move the gantry to the aligned standing position. If the button is released during the gantry motion, the gantry will stop.
	Slowly Move Up button	Hold down this button to move the BWS bucky up slowly.

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Button	Name	Description
	Slowly Move Down button	Hold down this button to move the BWS bucky down slowly.
	Fast Move Up button	Hold down this button to move the BWS bucky up fast.
	Fast Move Down button	Hold down this button to move the BWS bucky down fast.
	Preset light field buttons	Press the buttons to switch the light field of the collimator to the preset sizes. For example, 20 cm × 25 cm (8" × 10"), 25 cm × 30 cm (10"× 12"), 35 cm × 43 cm (14" × 17"), 35 cm × 35 cm (14" × 14"), 43 cm × 43 cm (17" × 17").

3.2.3.3 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.

3.2.3.4 Clinical application

In an exam for standing position, you can adjust the height and angle of the BWS bucky according to the patient's conditions and the body part to be scanned and choose an appropriate grid.

- Automatic Centering:

  When the patient is in standing position, automatic centering means aligning the center of the radiation field with the center crosshair on the BWS bucky.

  You can use the Automatic Centering buttons on the control panels, which are on both sides of the bucky wall stand, to center the gantry. The SID and the height of the BWS bucky can be configured. Please contact UIH Customer Service Center.

- APR Position:

  After selecting the protocol, you can use the APR Position button to move the gantry to the preset position for exam. After the gantry finishes moving, the X-ray tube assembly and the flat panel detector are centered and tracking is turned on.

- Standing Position:

  When the gantry is not at a position for standing exams, you can use the Standing Position button to move the X-ray tube assembly to the position for standing exams. After the gantry finishes moving, the X-ray tube assembly and the flat panel detector are centered and tracking is turned on.

- Lying Position:

  When the gantry is not at a position for lying exams, you can use the Lying Position button to move the X-ray tube assembly to the position for lying exams. After the gantry finishes moving, the X-ray tube assembly and the flat panel detector are centered and tracking is turned on.

- Tracking:

  After tracking is turned on, when you adjust the height of the BWS bucky, the X-ray tube assembly follows. The X-ray tube assembly and the BWS bucky will become centered automatically.

3.2.4 Elevating table

The elevating table carries the patient and can move vertically. You can adjust the height of the table and the position of the table top to facilitate exams. There are external pedals (optional) on the back of the table. You can use them to control the table movement from the back.

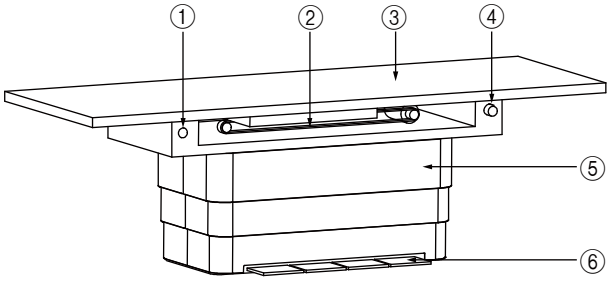
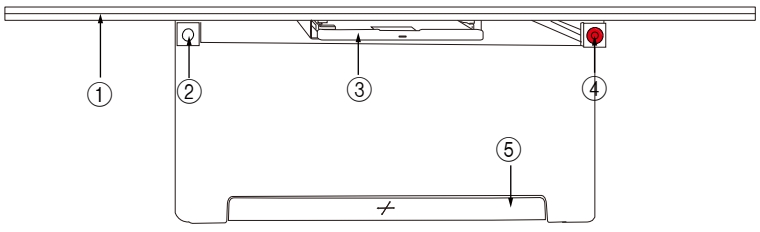


Figure 3-5 Structure of the elevating table

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No.	Component	Description
1	Automatic Centering button 	Press this button, and the X-ray source assembly will be moved above the radiographic table and the light field center will be aligned with the FPD center.
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	Patients lie on the table top for exams. The table top can move along the X-axis, Y-axis, and Z-axis directions.
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.
5	Table frame	Frame of the elevating table. It can extend and retract vertically.
6	Table top movement pedals	There are four table top movement pedals, which are used to unlock the table top or adjust height.

3.2.5 Fixed radiographic table

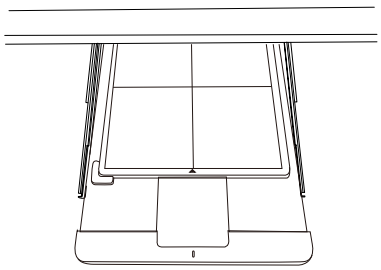


No.	Component	Description
1	Table top	Used in exams for lying position. It can move along the X-axis and the Y-axis.
2	Automatic Centering button	Press this button, and the X-ray source assembly will be moved above the radiographic table and the light field center will be aligned with the FPD center.
3	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.
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.
5	Table top floating switch	Unlock the table top so that it can be moved.

3.2.5.1 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.



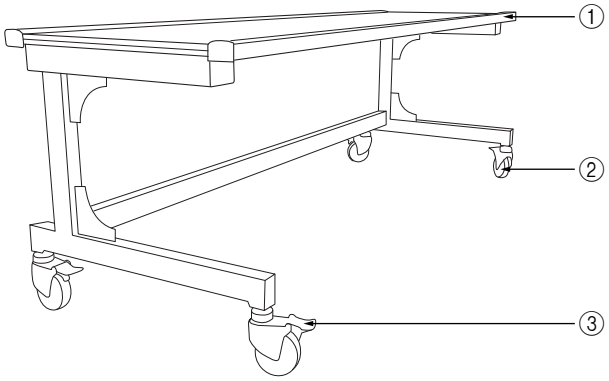
3.2.6 Mobile table

The mobile table carries the patient and supports exams in lying position.

To avoid damage to the mobile table, do not collide it with other components.

When the mobile table is used, lock the wheels before the exposure to prevent unexpected motions, which may cause injuries of the patient.

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No.	Component	Description
1	Table top	Supporting the patient in a lying or sitting exam
2	Mobile wheel	Moving the mobile table in any direction.
3	Wheel lock	Locking or unlocking the wheels.

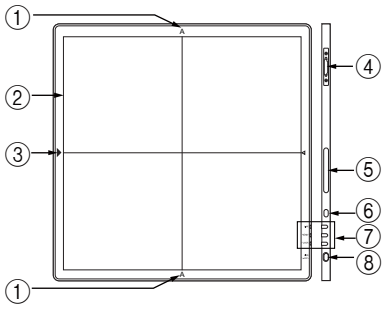
3.2.7 Flat panel detector

The flat panel detector is an important part of the imaging chain of the Digital Medical X-ray Imaging System.

The flat panel detector receives the X-rays emitted from the X-ray tube assembly and converts them into digital images that can be displayed on the display screen of the acquisition workstation, thereby assisting technicians or doctors with diagnosis.

The flat panel detector for this system can be used through wired connection or wireless connection. When the flat panel detector is used as a free FPD, you can acquire images using the wireless mode. When the flat panel detector is installed to the system, you can acquire images using the wired mode.

3.2.7.1 AS-401C



No.	Component	Description
1	Label of FPD A or B	Distinguishing FPD A from B when there are two FPDs.
2	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	Sign for placement	Indicating the direction for installing the flat panel detector.
4	Cable port	Connecting cable.
5	Wireless module	Transmitting image data through wireless communication.
6	Communication port	A communication port for connecting the flat panel detector.
7	State indicators	Showing the working state of the flat panel detector. ♦ LINK: Showing the state of registration, communication, and data transmission. ♦ READY: Showing the power state of the FPD B. ♦ POWER: Showing the power state of the FPD A.
8	Power button	To turn the flat panel detector on, hold this button down till the state indicators light up.

Where there are two flat panel detectors for the system, they are marked A and B respectively.

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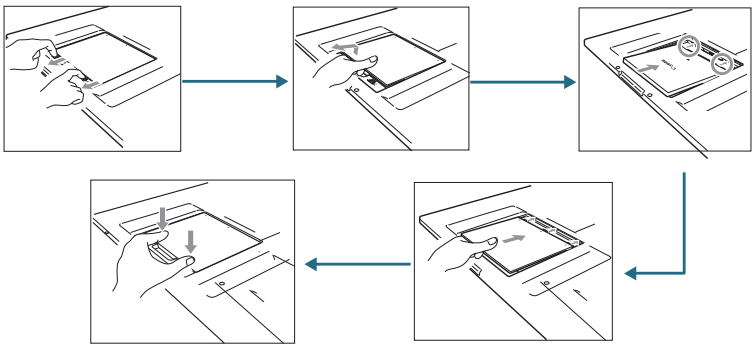
States of the flat panel detector

Table 3-1 FPD Status (AS-401C)

Detector status	LINK	POWER	READY
	Emerald	Blue	Green
Communication established	On	Steady on after FPD A is turned on	Steady on after FPD B is turned on
Communication not established	Off		
Registration of flat panel detector	Blinking		
Image data transferring	Blinking slowly		
Note: Blinking: The on/off state changes every second. Blinking slowly: The on/off state changes every 2 seconds.			

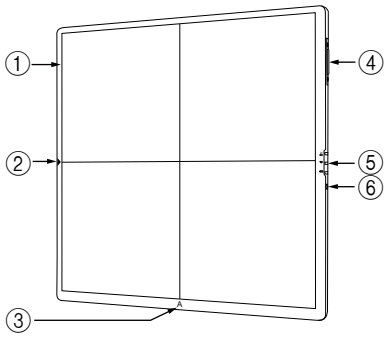
Installing the battery

This procedure only applies to flat panel detectors with removable batteries.



1. Place the flat panel detector on a flat surface. Push both clips with both hands to unlock the battery compartment cover.
2. Hold the edge of the cover and pull it upward to remove the it.
3. Take out a fully charged battery from the charger, align the pins on the battery with the sockets in the battery compartment, and insert the battery.
4. Align the tabs on the cover with the slots on the battery compartment and install the cover.
5. Press the front of the cover to lock it in place.

3.2.7.2 Mars1717XU-VSI



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.

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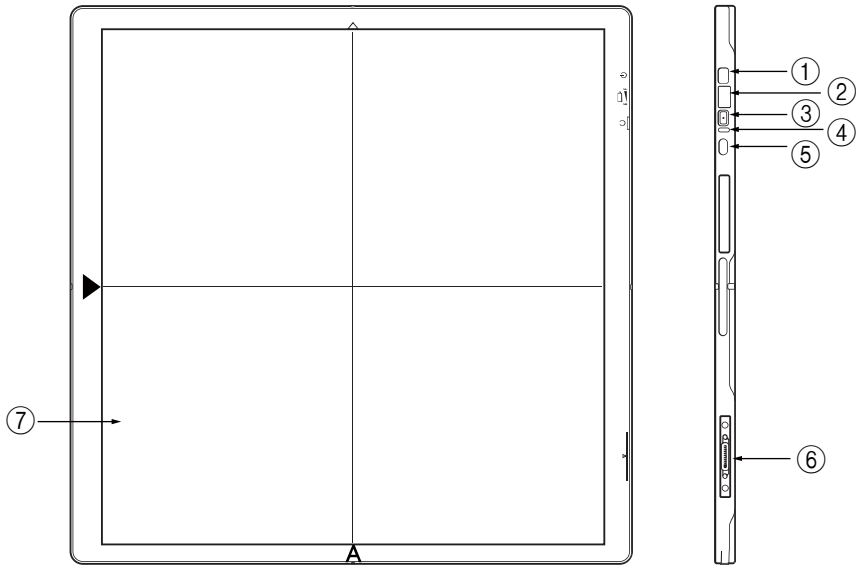
FPD indicators and states

Icon	Description
	Data transmission
	Battery level
	Wireless network signal

Table 3-2 FPD Status (Mars1717XU-VSI)

Indicator	Description
Battery level	Blinking orange: Battery level ≤ 30%. Blinking green: Battery level > 30%.
Wireless network signal	Steady blue: Wireless mode. Blinking blue: Wireless AP mode. Steady green: Wired mode.
Data transferring	Blinking green: Data transferring. Steady orange: Error.

3.2.7.3 AR-C4343W

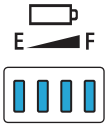
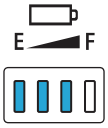
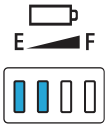
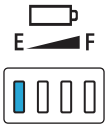
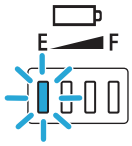


No.	Component	Description
1	Power button	This button is used to power on or off the FPD.
2	Power indicator	This indicator stays on when the power is on and displays the battery level.
3	Ready button	After this button is held down for over 1 second, the FPD switches from the Detector Selection status (Sleep status) to the Ready status.
4	Ready indicator	When this indicator is off, the FPD is recognized as FPD A. When this indicator is on, the FPD is recognized as FPD B.
5	Infrared communication port	This is the communication port for connecting the detector (registration/connection).
6	Cable port	This port is used for cable connection.
7	Effective imaging area	This area marks the effective imaging area and center position of the flat panel detector. The effective imaging area of the flat panel detector is 415 mm × 426 mm. To reduce unnecessary radiation, the light field must not exceed the effective imaging area.

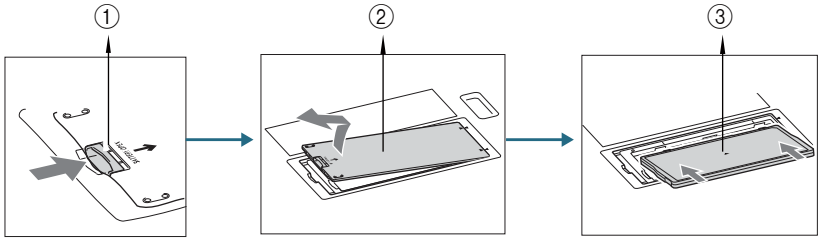
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States of the flat panel detector

Table 3-3 Detector battery state

Power indicator	Battery level
	100%–76%
	75%–51%
	26%–50%
	5%–25%
	0%–4%
When the battery level is between 0% and 4%, the power indicator blinks, and the FPD cannot be used for imaging.	

Installing FPD batteries



1. Lock
2. Battery cover
3. Battery

1. Press the lock to unlock it.
2. Lift and remove the battery cover.
3. Align the battery with the grooves on the battery compartment, and insert the battery.
4. Install the battery cover.

3.2.7.4 Battery charging

Battery charging only applies to AS-401C and AR-C4343W.

Remove the battery of the FPD and insert it into the battery charger for the FPD for charging.

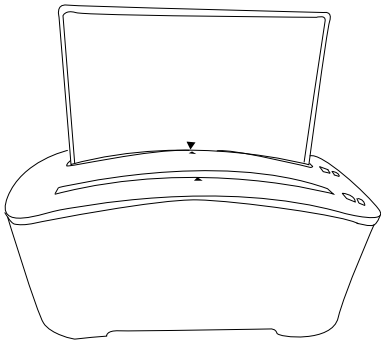


Figure 3-6 Battery charger for the FPD (BC-1A)

- During charging, the indicator on the charger base is blue.
- When charging is completed, the indicator becomes green.
- Place the battery in the specified location after you take the fully charged battery off.

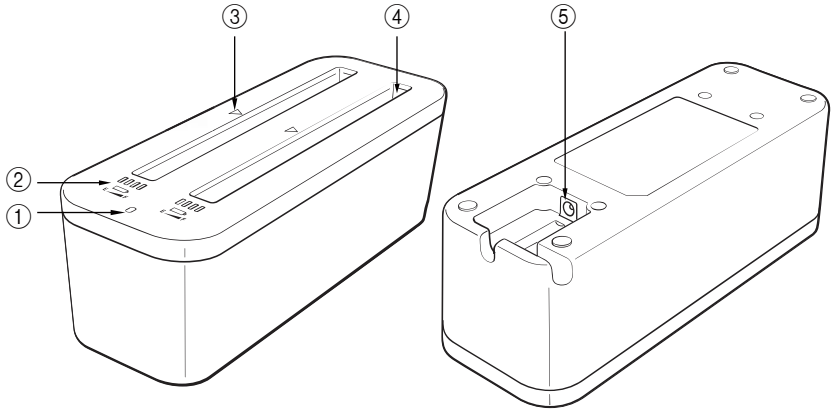


Figure 3-7 Battery charger for the FPD (BC-01)

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No.	Name	Description
1	Power indicator	The power indicator is on when the battery charger is connected to the power supply.
2	Indicator of charging status	Displaying the charging status of the FPD battery in the charging slot. The indicator is steady blue during battery charging.
3	Sign for placement	Indicating the direction for inserting the FPD battery.
4	Charging slot	The battery charger for the FPD consists of two charging slots. It can charge two FPD batteries at the same time.
5	DC port	Insert the cable of the AC adapter into this port, and insert the power cable into the AC power supply socket. The power indicator turns green and the device is ready for charging.

3.2.7.5 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.

- When the flat panel detector is being charged, the POWER indicator or the battery level indicator is green and 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.

3.2.7.6 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

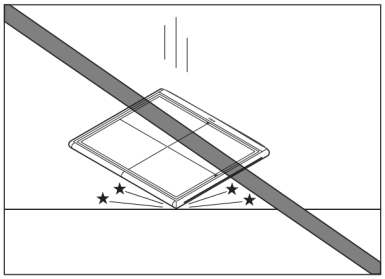
During examination or calibration, follow the requirements for radiation protection to reduce the harm of X-ray radiation on human bodies.

3.2.7.7 Precautions

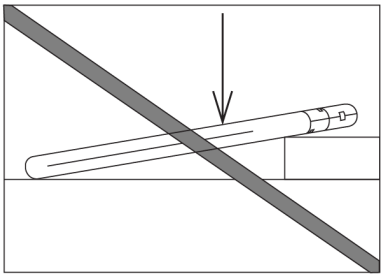
If the system has only one flat panel detector, check whether the flat panel detector has been placed on the bucky wall stand or on the table before exams.

If the system has two flat panel detectors, before you use a free FPD for exam, check which FPD you are using (A or B) and check the signal and battery level of the FPD.

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.

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⚠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.

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.

3.2.8 Ionization chamber

Automatic exposure control is available when there is the ionization chamber.

Choose the measuring fields according to your clinical needs.

⚠WARNING

When you select the measurement field of the ionization chamber, make sure that the target body part of the patient is in the measurement area, so as to avoid improper exposure.

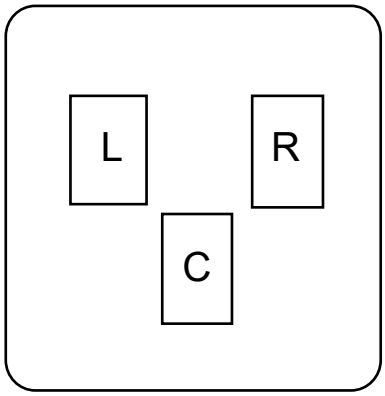
⚠WARNING

Avoid radiation from areas surrounding the measurement field of the ionization chamber so that the radiation does not terminate in advance, resulting in underexposure.

3.2.8.1 Automatic exposure control

Automatic exposure control (AEC) is available when there is the ionization chamber in the bucky wall stand or in the fixed radiographic table. With AEC, X-ray exposure can be controlled automatically to produce high quality images.

The automatic exposure control compensates the difference caused by factors such as the thickness of body parts and technical parameters (for example, kV, mA, SID, etc.), and the exposure is terminated automatically.



In the AEC mode, ms and mAs are selected automatically. You do not need to adjust them manually.

- Maximum mAs: 600 mAs. To adjust the maximum mAs for AEC, you can change the field "Backup mAs" in the protocol.
- Minimum irradiation time: 5 ms.

In the AEC mode, there are three measuring fields of the dose monitoring chamber: left (L), center (C), and right (R). Choose at least one measuring field according to your clinical needs: L, C, R, LR, LC, RC, or LCR.

You can select measuring fields and adjust exposure parameters on the image processing system. Or you can select measuring fields and adjust exposure parameters on the touch user interface.

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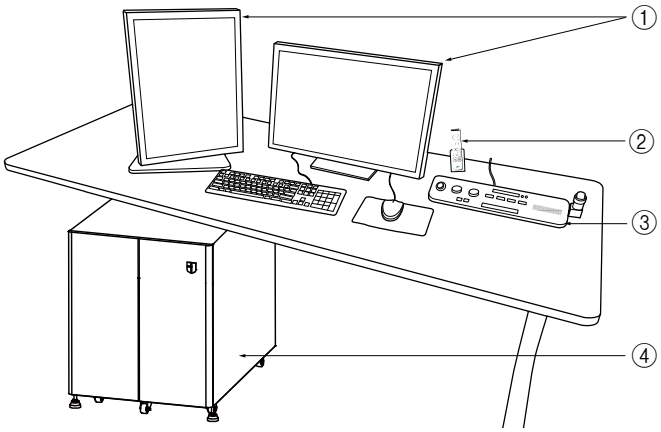
NOTICE

Make sure that the system is centered when automatic exposure control is selected to prevent excessive dose.

NOTICE

During AEC exposure, make sure that the target body part of the patient covers the selected ionization chamber and that the light field covers the body part and the ionization chamber, so as to avoid poor image quality due to insufficient dose reception on the flat panel detector.

3.3 Components in the control room



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

NOTICE

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

3.3.1 Remote control

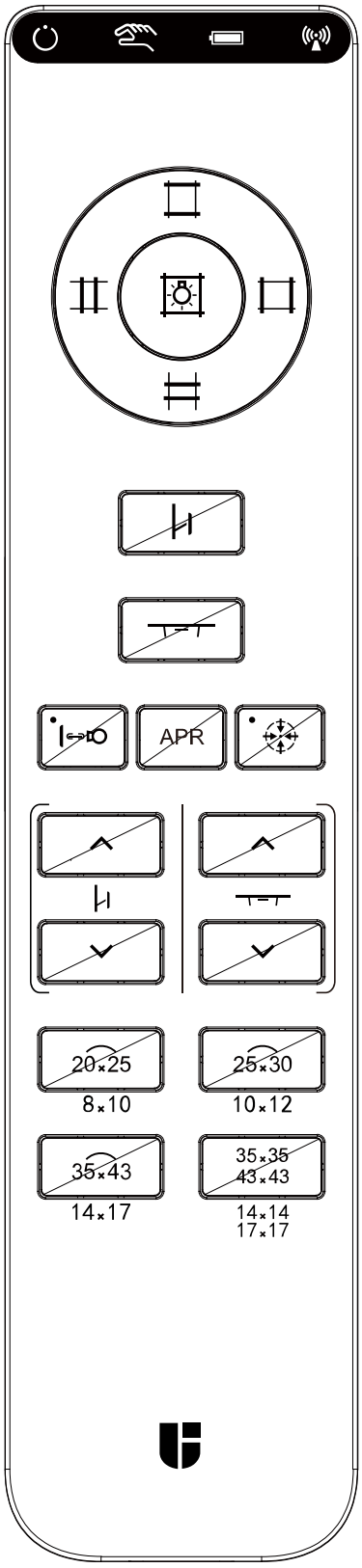
You can use the remote control to control the BWS and the TCS remotely while observing the patient.

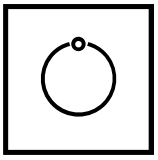
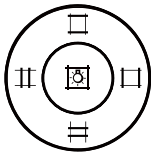
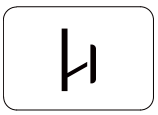
The remote control can be activated at a linear distance of 10 m–15 m from the TCS. If the remote control is out of the sensing range of the receiver, it may not be activated.

The battery and the charger of the remote control shall comply with IEC 60601-1.

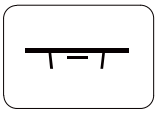
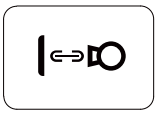
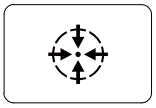
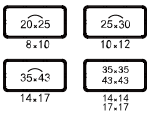
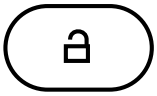
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3.3.1.1 Remote control

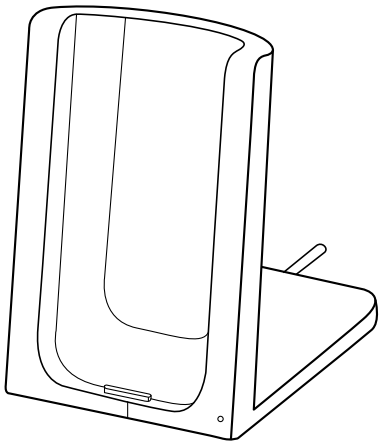


Icon	Name	Description
	Wireless status indicator	Green: The remote control is activated and working. Off: The remote control is not activated and is in the standby mode. Possible cause: ♦ The remote control is too far away from the wireless receiver. ♦ The wireless connection is disabled.
	Indicator of working state	Orange: A button on the remote control is pressed. Off: No operation.
	Indicator of charging status	Off: The remote control is disconnected from the charger and the battery has been fully charged. Green: The remote control is connected to the charger and the battery has been fully charged. Flashing red: The battery can last less than 4 hours and needs to be charged. Red: The remote control is connected to the charger and the battery is being charged.
	Wireless equipment label	The remote control may cause interference to equipment with this label.
	Light field adjustment buttons	♦ Press the Collimator Lights button in the middle to turn on or off the collimator lights. ♦ Press the Field Height Increase button or Field Height Decrease button to increase or decrease the height of the light field. ♦ Press the Field Width Increase button or Field Width Decrease button to increase or decrease the width of the light field.
	Standing Position button	Hold down this button to move the gantry to the preset standing position. ♦ If the button is released during the gantry motion, the gantry will stop. ♦ Standing position: The light field center is aligned with the crosshairs on the BWS bucky.

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Icon	Name	Description
	Lying Position button	Hold down this button to move the gantry to the preset lying position. ♦ If the button is released during the gantry motion, the gantry will stop. ♦ Lying position: The table bucky moves to the center of the table top, and the X-ray tube assembly moves to the position right above the table top. The light field center is aligned with the center of the flat panel detector.
	Tracking button	Press this button to turn tracking on or off. The tracking component is determined according to the selected acquisition system.
	APR Position button	Select the acquisition protocol, and then hold down this button to move the gantry to the preset position. If the button is released during the gantry motion, the gantry will stop.
	Automatic Centering button	Hold down this button to align the radiation field with the FPD. If you release the button, the gantry stops moving.
	Bucky Up button and Bucky Down button	Press the Bucky Up button to move the BWS bucky up. Press the Bucky Down button to move the BWS bucky down.
	Table Up button and Table Down button	Press the Table Up button to move the elevating table up. Press the Table Down button to move the elevating table down.
	Preset light field buttons	Press one of the buttons to apply the preset size of the light field.
	Unlock button	The Unlock button is on the back of the remote control. It can prevent false triggering of the remote control. To use the remote control, you need to press a button while holding down the Unlock button.

3.3.1.2 Charger



There is a rechargeable battery inside the remote control. To charge the remote control, insert it vertically into the charger.

Place the charger on a flat surface.

The remote control cannot be used while it is being charged.

Please charge the remote control every day after usage.

Do not use any other charging device except the charger provided by UIH.

3.3.1.3 Battery replacement

On the back of the remote control, you can slide the battery compartment cover off as indicated by the OPEN sign and replace the battery.

If you need to replace the battery, please contact UIH Customer Service Center.

3.3.1.4 Operating environment

Operating environment:

- Temperature: 10°C to 30°C
- Relative humidity: 30% to 75% (no condensation)
- Atmospheric pressure: 700 hPa to 1060 hPa

Storage conditions:

- Temperature: -20°C to +50°C
- Relative humidity: 10% to 80% (no condensation)
- Atmospheric pressure: 700 hPa to 1060 hPa

Voltage: 24 V DC

3.3.1.5 Precautions

The battery and the charger of the remote control comply with IEC 60601-1.

Do not place metal objects on the charger.

There is a lithium battery inside the remote control. Do not hit, collide, or violently dismantle the remote control.

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Only personnel authorized by UIH can replace the battery.

Charge the remote control when it is not in use to ensure sufficient battery level.

Do not use the remote control in a strong magnetic field.

- Although this equipment and some mobile RF communication equipment meet the requirements of regulations on applied radiation, the remote control can still be interfered by other equipment, including portable and fixed RF communication equipment.
- The RF range of the remote control is 2.4 GHz ISM (2.4 GHz – 2.483 GHz). Operators must ensure that not too many other devices are running within this RF range. Otherwise, the remote signal transmission may be interrupted.
- The remote control has the same serial number as the system.
- The remote control can only be used when you can see the patient position completely.
- Press an E-Stop button immediately if any unexpected movement occurs.
- The remote control is a portable RF device. There will be a magnetic field around the remote control and the charger.
- Life support equipment and cardiac pacemakers may fail due to interference of the magnetic field. Please make sure that the remote control or charger is more than 90 cm away from life support equipment or cardiac pacemakers.
- If the remote control interferes with other equipment, please increase the distance between the remote control and the equipment.

3.3.2 Control box

The control box in the control room is used to switch the system on or off, control system movement, interact with the patient, and perform exposure.

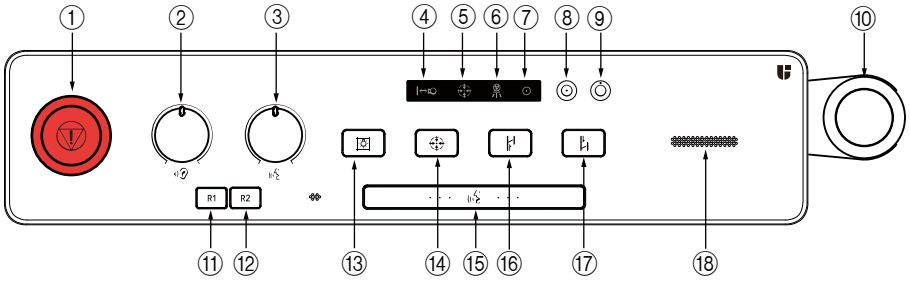


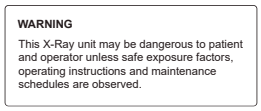
Figure 3-8 Control box (with intercom)

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	Speaker volume knob	Adjust the volume of the patient's voice. Turning the knob clockwise will increase the volume. Turning the knob counterclockwise will decrease the volume.
3	Microphone volume knob	Adjust the volume of your voice. Turning the knob clockwise will increase the volume. Turning the knob counterclockwise will decrease the volume.
4	Tracking indicator	♦ Green light: Tracking is activated. ♦ Light off: No response for tracking.
5	Automatic Centering indicator	♦ Green light: Aligned. ♦ Light off: Not aligned.
6	X-ray exposure indicator	The yellow light turns on during the exposure.
7	On/Off indicator	♦ Green light: System is on. ♦ Light off: System is off.
8	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.
9	System Off button	The system shuts down after this button is pressed. Then all the indicators on the control box go off.
10	Exposure hand switch holder	It is used to hold the exposure hand switch.
11	Record button 1	♦ Hold down this button and start speaking after the prompt tone. Release the button when the recording is completed. ♦ Press this button to play the latest recording.
12	Record button 2	♦ Hold down this button and start speaking after the prompt tone. Release the button when the recording is completed. ♦ Press this button to play the latest recording.

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No.	Name	Description
13	Collimator Lights button	Press this button to turn on or off the collimator lights.
14	Automatic Centering button	Hold down this button to move the system to the centering position and activate tracking.
15	Talk button	Press this button to speak to the patient.
16	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.
17	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.
18	Speaker	Play the voice of the patient.

The X-ray warning label is pasted on the control box to remind the user to pay attention to X-rays.



3.4 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.

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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 up 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.
   ♦ Customer service engineers can select **Service Login** and enter the service code.
   ♦ If domain users have been added, you can enter the domain name, username, and password to log in.

⚠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 first or switch account.**

4. Run system self-test.

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

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.

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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.

4.3 Adjusting system position

4.3.1 Using the flat panel detector

1. Press the power button on the flat panel detector to turn the flat panel detector on.
   - ♦ The indicator lights up after the flat panel detector is turned on.
2. Check the state of the flat panel detector in the Exam interface after the detector is connected to the system.
   - ♦ Approximately 20 seconds after the flat panel detector is connected to the system, the detector changes from the wireless mode to the wired mode.
3. After the exam is completed, remove the flat panel detector.
4. Press the power button to turn the flat panel detector off.
5. Take the battery out and place it at the specified location.
   - ♦ This step applies to flat panel detectors with removable batteries.

4.3.1.1 Flat panel detector in bucky

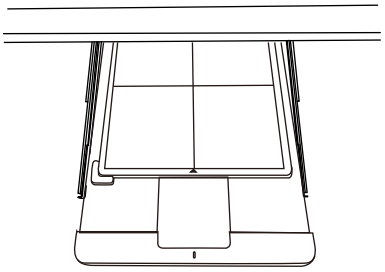


Figure 4-1 Flat panel detector in table bucky

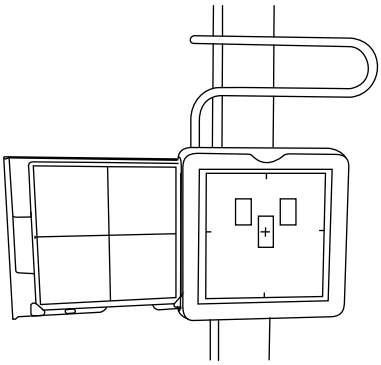


Figure 4-2 Flat panel detector in BWS bucky

4.3.1.2 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.

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- After the detector is properly inserted, a detector charging icon appears at the top right corner of the System Status area.

Result:

- After the flat panel detector is inserted, the charging indicators on both sides of the bucky light up.

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 TCS movement and X-ray tube assembly positioning

4.3.2.1 Longitudinal adjustment (X-axis)

1. Hold the handles of the X-ray source assembly with both hands.
2. Press the Longitudinal Release button  or press the floating button  .
   - The longitudinal direction is marked orange.
   - Movement along the X-axis is enabled.
3. When the X-ray source assembly reaches the target position, release the button.

4.3.2.2 Transverse adjustment (Y-axis)

1. Hold the handles of the X-ray source assembly with both hands.
2. Press the Transverse Release button  or press the floating button  .
   - The transverse direction is marked green.
   - Movement along the Y-axis is enabled.
3. When the X-ray source assembly reaches the target position, release the button.

4.3.2.3 Height adjustment (Z-axis)

Manual adjustment

NOTICE
Do not apply strong force when the vertical movement of the tube ceiling stand is blocked. Otherwise, there will be personal injuries or equipment damage.

1. Hold the handles of the X-ray source assembly with both hands.

2. Press the Vertical Release button or press the floating button .
   - ♦ Movement along the Z-axis is enabled.
3. When the X-ray source assembly reaches the target position, release the button.

Motorized adjustment

1. Press the Move Up button or the Move Down button .
2. When the X-ray source assembly reaches the target position, release the button.

4.3.2.4 Rotating the X-ray source assembly

Rotation about the horizontal axis (RHA)

WARNING

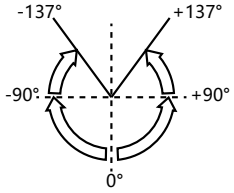
To avoid burns, do not touch the tube covers after continuous exposure.

WARNING

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

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.

- The X-ray source assembly can rotate about the horizontal axis (RHA) for no less than 270°, with detents at the -90°, 0°, and +90° positions.
- When the RHA angle of the X-ray source assembly is ±5° from -90°, 0°, or +90°, the X-ray source assembly automatically becomes engaged in the detent and stops.
- The touch user interface (TUI) shows the RHA detent information and the angle of the X-ray source assembly.
- Rotation angles of the X-ray source assembly when you face the touch user interface (TUI) with your line of sight perpendicular to the TUI:



.

1. Hold the handles of the X-ray source assembly with both hands.
2. Press the RHA Release button .

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3. When the X-ray source assembly reaches the target position, release the button.

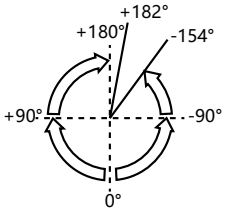
Rotation about the vertical axis (RVA)

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.

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.

NOTICE
The position accuracy of the X-ray source assembly may be reduced due to hardware wear or other reasons. To avoid image offset, always use the light localizer to check the alignment of the X-ray source assembly.

- The X-ray source assembly can rotate about the vertical axis (RVA) for no less than 336°, with detents at the -180°, -90°, 0°, and +90° positions.
- You can read the RVA angle on the angle indicator on the TCS. The scale unit is 15°. The error does not exceed ±2°.
- The touch user interface (TUI) shows the RVA detent information of the X-ray source assembly.
- RVA rotation angles of the X-ray source assembly (top view)



1. Hold the handles of the X-ray source assembly with both hands.
2. Press the RVA Release button  .
3. When the X-ray source assembly reaches the target position, release the button.

4.3.3 Moving the BWS bucky

4.3.3.1 Adjusting the height of the BWS bucky

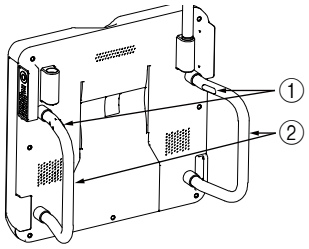
1. Hold the movement handles of the BWS bucky and hold down the release buttons on the handles.
2. Hold the handle and move the BWS bucky up or down along the stand.
   - ♦ The moving speed is proportional to the force that you use.

4.3.3.2 Adjusting the angle of the BWS bucky

⚠WARNING

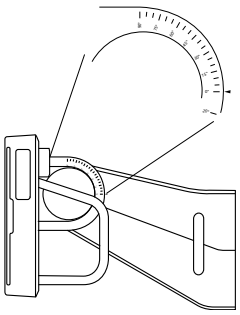
- The maximum load capacity of the bucky wall stand is 15 kg. To prevent personal injury or component damage, do not add load that is not for the intended use.
- If the drive chains of the BWS bucky are broken, stop the movement immediately and contact UIH Customer Service Center.

There are Tilt Release buttons on the side handles of the BWS bucky.



1. Tilt Release buttons
2. Side handles

1. Hold a side handle with one hand and hold down the Tilt Release button.
2. Hold the bottom of the BWS bucky with the other hand and tilt the bucky.
   - When the BWS bucky is vertical to the ground, the angle is 0°. When the BWS bucky is tilted upward, the angle is positive.
   - There are detents at the 90° position and the 0° position.
   - The BWS bucky can be tilted from -20° to +90°. You can see its tilting angle on the angle indicator.



4.3.3.3 Precautions

- To prevent collisions, the gantry will stop moving automatically when the X-ray tube assembly enters the collision protection area and there will be a collision alert.
- When the RVA angle of the X-ray tube assembly is not 0°, automatic movement is not available. You need to adjust the X-ray tube assembly to the 0° position manually.

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4.3.4 Using elevating table

4.3.4.1 Precautions

When positioning patients in wheelchairs, prevent the patients' legs from being squeezed by the table top while the elevating table moves down. In emergencies, press the E-Stop button immediately.

When the pressure exceeds 200 N, the elevating table stops moving.

When the table is at the extreme position, it will not be able to move vertically if force is not evenly distributed on its edges.

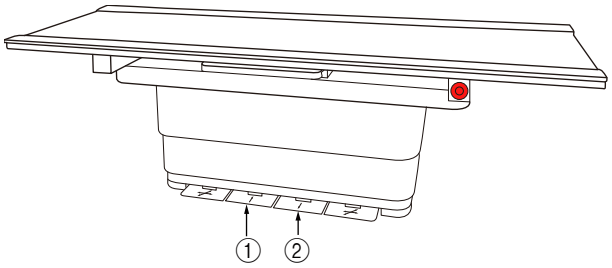
If you need to use a patient support device that is not a part of this system, you should consider the influence that the inherent X-ray absorption ratio of its material may have on image quality.

⚠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.

4.3.4.2 Adjusting the height of the elevating table

Table top movement pedals



1. Table Up pedal
2. Table Down pedal

Moving the table up

1. Step twice on the Table Up pedal and hold. The elevating table moves up along the Z-axis.
2. Release the pedal when the table reaches a certain height.

Moving the table down

1. Step twice on the Table Down pedal and hold. The elevating table moves down along the Z-axis.

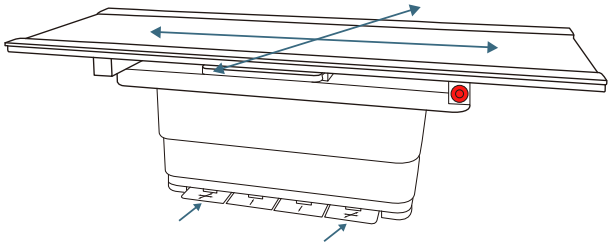
2. Release the pedal when the table reaches a certain height.

4.3.4.3 Moving the table top

The two sides of the table top are aluminum frames. The central area is the effective imaging area of the table top. During patient positioning, the body part to be scanned should be placed inside the effective imaging area and not cover the aluminum frames.

There is a sign on the table top that indicates the head direction. The patient's head should positioned as the sign indicates.

1. Step on any table top floating switch and hold.



2. Push the table top along the X-axis or Y-axis direction.
3. When the table top reaches a certain position, release the table top floating switch.

4.3.4.4 Automatic centering

When the system is not centered, users need to ensure the effectiveness of exposure and positioning.

SID of automatic centering can be configured. Contact UIH Customer Service Center for details.

► Press the Automatic Centering button on the table.

♦ The table bucky carries the flat panel detector horizontally to the table center and the X-ray source assembly moves so that its center is aligned with the center of the flat panel detector.

4.3.4.5 Tracking

Tracking is activated when the system is centered.

1. Step twice on the Table Up pedal or the Table Down pedal.
   ♦ The X-ray tube assembly moves vertically along with the elevating table. The SID remains unchanged.
2. Move the X-ray tube assembly horizontally along the X-axis.
   ♦ The flat panel detector moves horizontally along the X-axis following the X-ray tube assembly. During tracking, the X-ray tube assembly and the flat panel detector are always aligned.
3. Press the Tracking button on the touch user interface to turn tracking off.

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4.3.5 Using fixed radiographic table

4.3.5.1 Moving the table top

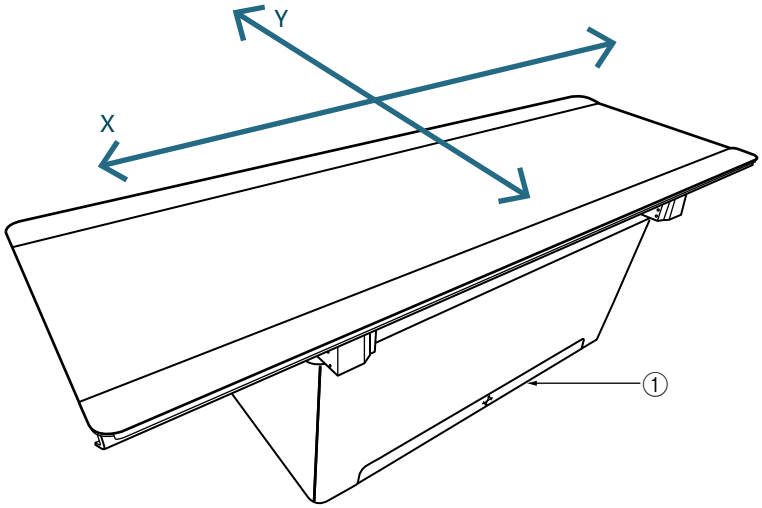


Figure 4-3 Coordinate axes and directions of table top movement

1. Table top floating switch

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.

4.3.5.2 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.

4.3.5.3 Automatic centering

When the system is not centered, users need to ensure the effectiveness of exposure and positioning.

SID of automatic centering can be configured. Contact UIH Customer Service Center for details.

► Press the Automatic Centering button on the table.

- ♦ The table bucky carries the flat panel detector horizontally to the table center and the X-ray source assembly moves so that its center is aligned with the center of the flat panel detector.

4.3.5.4 Tracking

Tracking is activated when the system is centered.

1. Move the X-ray tube assembly horizontally along the X-axis.
   - ♦ The flat panel detector moves horizontally along the X-axis following the X-ray tube assembly. During tracking, the X-ray tube assembly and the flat panel detector are always aligned.
2. Press the Tracking button on the touch user interface to turn tracking off.

4.3.6 Using the mobile table

Moving the mobile table to the target location by controlling the mobile wheels. After the patient has been accurately positioned, step on the wheel locks to prevent the table from moving.

Before you use the mobile table for the examination, make sure that the mobile table has been locked and that it will not move unexpectedly during the examination.

1. Step on the locks of the four wheels so that the mobile table will not move.
2. Lift the locks of the four wheels so that the mobile table can move in any direction.

4.3.7 Using collimator

4.3.7.1 Rotating the collimator

If the edges of the light field are not parallel to the edges of the fixed radiographic table, you can rotate the collimator about the vertical axis.

The rotation angle is ±90°. You can feel the detents at the ±45° and 0° positions.

NOTICE
After you have manually rotated the collimator, restore it to the 0° position in time. Otherwise, the radiation field may exceed the BWS bucky range, causing unnecessary radiation, or the image quality may be affected by inaccurate alignment.

1. Press the Light Localizer button on the collimator.
2. Turn the light localizer and the linear laser localizer on by pressing the Collimator Lights button on the collimator control panel, the remote control, or the control panels on the BWS bucky.
3. Hold the collimator and rotate it to the correct position according to the light localizer.
   - ♦ When you rotate the collimator, prevent the X-ray light field from exceeding the flat panel detector.
4. Turn the light localizer and the linear laser localizer off by pressing the Collimator Lights button on the collimator control panel, the remote control, or the control panels on the BWS bucky again.

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- Or the lights will go off automatically 30 seconds after they are turned on.

4.3.7.2 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.

There is a Collimator Lights button on the control panel of the collimator, on the remote control, and on the control panels of the BWS bucky.

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.

4.3.7.3 Measuring SID

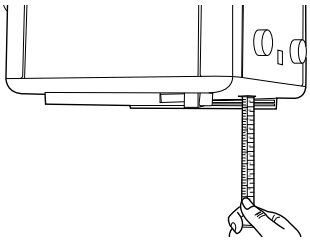
System measurement

When the X-rays are perpendicular to the FPD and the X-ray source assembly is rotated to RHA and RVA detents, the system can measure the SID and you can check it on the TUI.

If the conditions are not met, the TUI cannot show the SID value.

Measuring SID using measuring tape

► Use the measuring tape to measure the SID manually.



- There are two types of units on the measuring tape: inch and cm. Please read carefully.

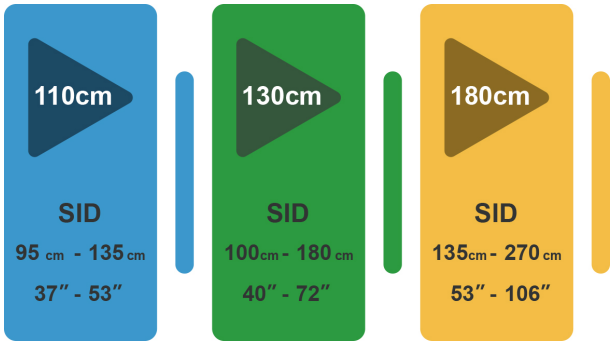
4.3.8 Grid

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.

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4.3.8.1 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 in the bucky as indicated by the arrow on the grid. Insert the grid into the slot.
3. Push the grid to the end till it is locked in place.

4.3.8.2 Removing the grid

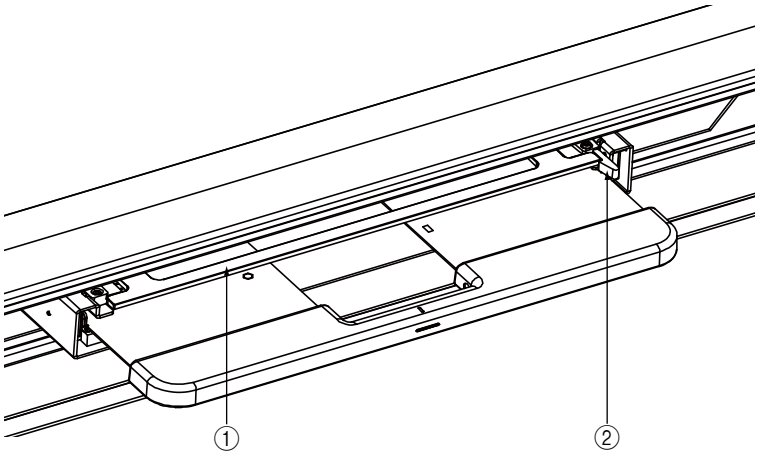
⚠WARNING

- 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 table 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.

4.3.9 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.

4.3.9.1 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. Turn the light localizer and the linear laser localizer on.
4. Move the X-ray source assembly vertically until it is at the same height as the BWS bucky.
5. Adjust the light field so that the edges of the light field are parallel with the edges of the detector.
6. 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.

4.3.9.2 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. Manually move the X-ray source assembly. Or hold down the Automatic Centering button or the Lying Position button so that the system moves to the target position automatically.

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- When you release the button or any resistance is detected, the automatic movement stops.

5. 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.

4.3.9.3 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. Otherwise, the patient may be exposed to excessive radiation dose due to repeated exposure.

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 touch user interface or 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 indicators (OK rings) on the touch user interface and on the host monitor light 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. Otherwise, the patient may be exposed to excessive radiation dose due to repeated exposure.

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

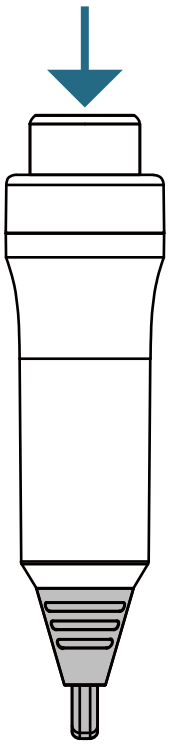
4.6.2 Using the exposure hand switch

⚠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 **OK**.

Result:

- ♦ 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.

It is recommended to shut down and start up the system once a week.

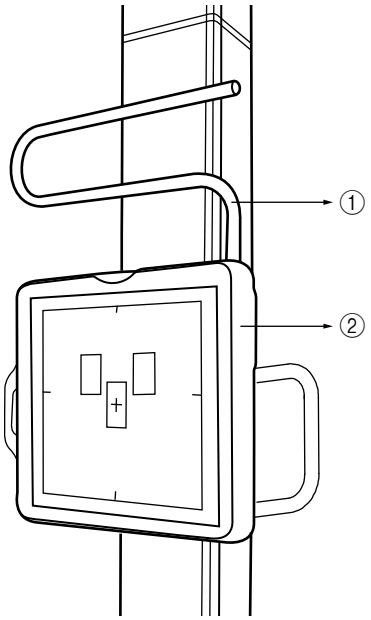
1. Click the UIH icon at the top right corner of the interface and select **Shutdown**.
2. Confirm that the system has been shut down.

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.

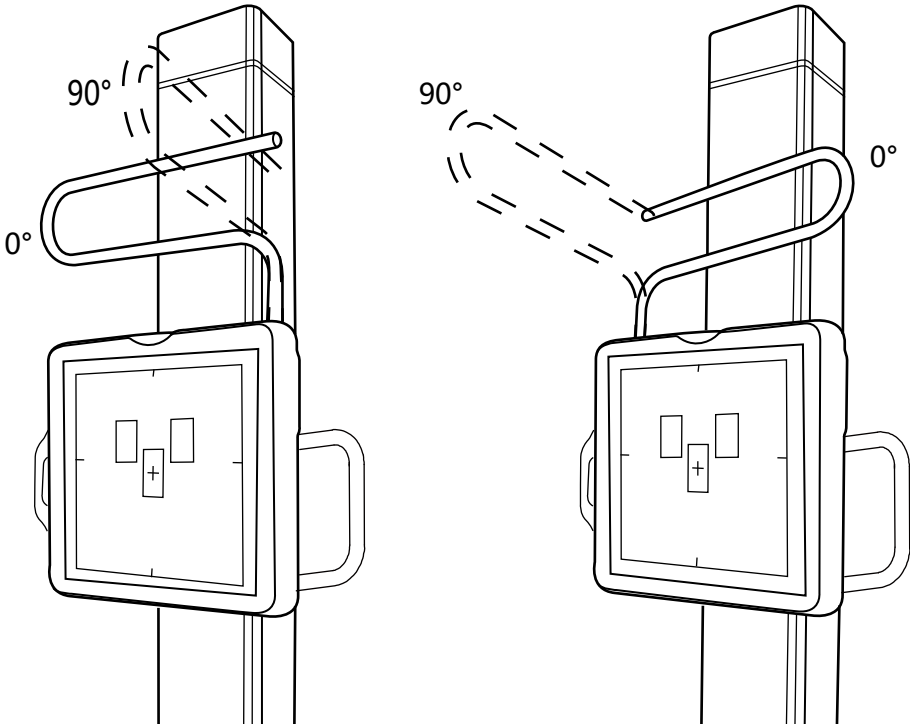
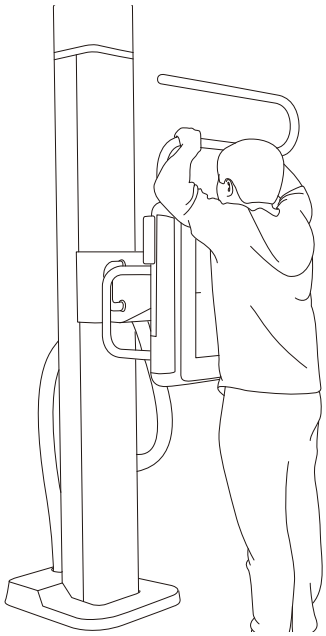


Figure 5-1 Installation on the right (left figure) and installation on the left (right figure)



⚠WARNING

Do not rotate the BWS bucky after the patient stretch grip has been installed.

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

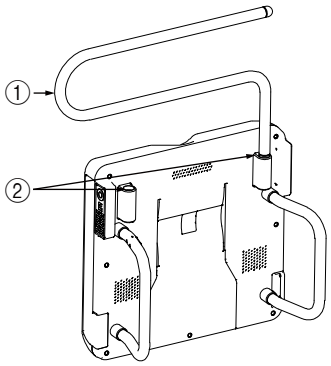
- The maximum load capacity of the bucky wall stand is 15 kg. To prevent personal injury or component damage, do not add load that is not for the intended use.
- If the drive chains of the BWS bucky are broken, stop the movement immediately and contact UIH Customer Service Center.

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⚠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

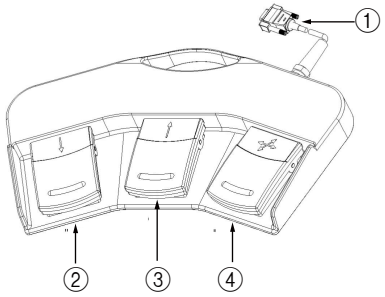
5.1.3.1 Installation

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

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.

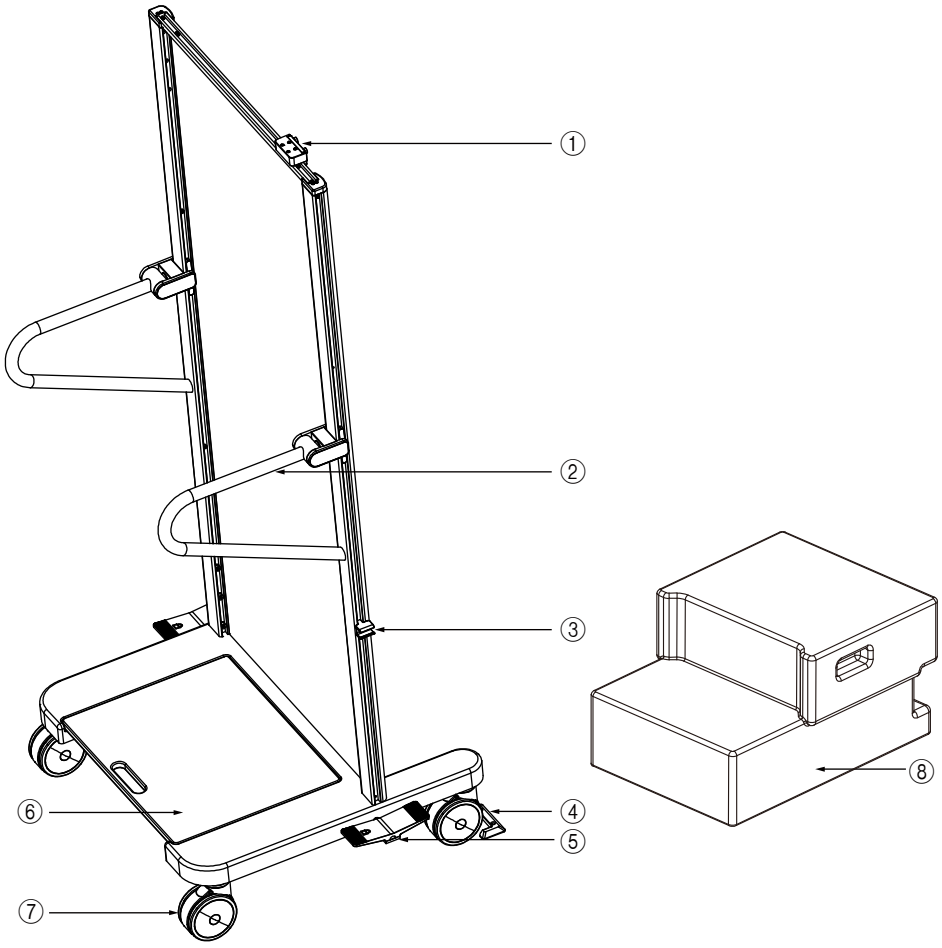
5.2 External pedals



No.	Name	Description
1	Cable	Connecting the pedals and the elevating table.
2	Table Down pedal	Step on the pedal twice and hold it down to move the elevating table down.
3	Table Up pedal	Step on the pedal twice and hold it down to move the elevating table up.
4	Table top floating switch	Step on the pedal twice and hold it down to unlock the table top.

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5.3 Stitching stand



No.	Component	Description
1	Measuring scale (optional)	The measuring scale hangs on the back of the stitching stand. When images are acquired with the use of the stitching stand, the scale appears on the images as well, so that you can check the scale in image stitching.
2	Handle	Patients can hold the handles during positioning. You can unlock the handle by lifting it and then adjust its height.
3	Hanger for base plate	Used for hanging the base plate.
4	Fastening slots	The casters of the stitching stand can be locked in the fastening slots so that the stitching stand will not move.
5	Locking pedal	When the locking pedal is horizontal, the stand is unlocked and can be moved. You can lock the stitching stand by stepping on the pedal toward  .
6	Base plate	Patients can stand on the base plate. Or you can remove the base plate.
7	Caster	Moving the stitching stand.
8	Step stool	You can use the step stool to perform exams for lower extremities. Place the step stool at where the base plate of the stitching stand was so that the patient can stand onto the stool.

5.3.1 Intended use

The stitching stand can assist the patient in positioning for stitching protocols.

NOTICE
If the stitching stand, step stool, or handle bears a load that exceeds the limit, it may break or topple, causing personal injuries or equipment damage.

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5.3.2 Specifications of the stitching stand

Parameter		Description
Attenuation equivalent		< 1.7 mmAl
Load capacity of the base		205 kg
Load capacity of the hand rest		25 kg
Step stool	Load capacity	250 kg
	Height	400 mm
	Weight	7 kg
Horizontal linear braking force		≥ 100 N

5.3.3 Placing the stitching stand

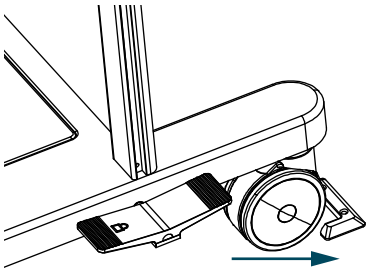
NOTICE

After the stitching stand is installed, it should not obstruct the stitching movement of the system.

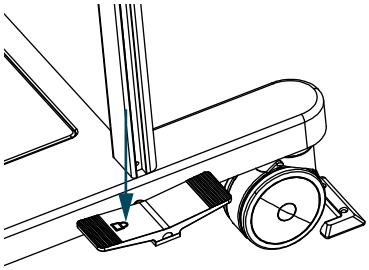
⚠CAUTION

The casters must be locked before the patient stands onto the stitching stand. Otherwise, the patient may fall down.

1. Move the stitching stand to the fastening slots.
2. Align the casters of the stitching stand with the fastening slots on the ground and push the stitching stand so that the casters are held in place.



3. Step on the locking pedals of the casters (toward ).



5.3.4 Adjusting the handles of the stitching stand

You can adjust the handles of the stitching stand according to your needs.

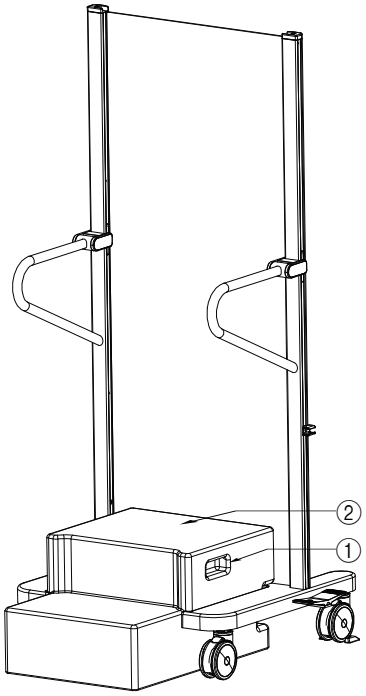
1. Lift the handle of the stitching stand.
2. Move the handle up or down.
3. Release the handle when it has reached the target position.

5.3.5 Using the base plate of the stitching stand

You can remove the base plate if the patient is too tall.

5.3.6 Using the step stool

You can use the step stool to perform exams for lower extremities. Sharp objects such as high heels and track spikes are not allowed on the step stool because they may damage the surface of the step stool.



1. Handle
2. Step stool

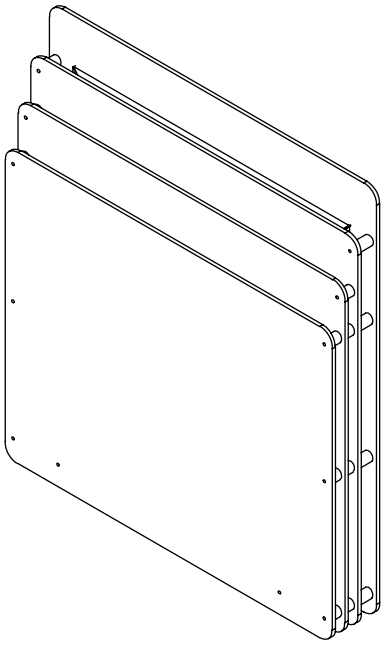
1. Remove the base plate.

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2. Hold the handles of the step stool with both hands and place the step stool at where the base plate was.
3. Adjust the position of the step stool.

5.4 Grid storage box

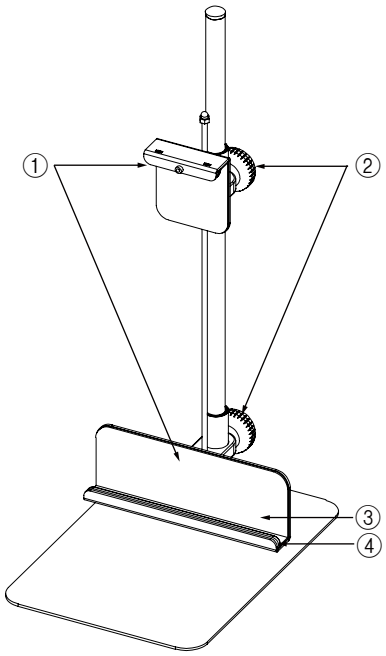
The grid storage box is used to store grids that are used with the X-ray system.



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5.5 FPD stand

The FPD stand is used to hold the flat panel detector during exams of a lateral lying position.



1. Holder
2. Knob
3. Slot for FPD
4. Slot for grid

1. Place the FPD stand on the table top.
2. Rotate the knob to adjust the position of the holder. Install the flat panel detector onto the holder.
   - ♦ Place the flat panel detector from right to left as indicated by the arrow on the front of the flat panel detector.
3. Insert the grid.
   - ♦ Insert the grid from right to left as indicated by the arrow on the front of the grid.
4. Adjust the holder and rotate the knob to fasten the flat panel detector.
5. Position the patient. Adjust the angle of the flat panel detector. Perform the exposure.

5.6 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

An additional 3M (G32SP+) diagnostic monitor can be added to this system.

Model	Dimensions	Brightness	Resolution
G32SP+	21.3 inches	1700 cd/m²	2048 × 1536

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5.7 Barcode scanner

5.7.1 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.

5.7.2 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.

6 Repair, maintenance, and disposal

6.1 Maintenance....6-2
6.1.1 Preventive maintenance....6-2
6.1.2 Recording results....6-3
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	Touchscreen	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 agent.**
- **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

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.

6.2.1.4 Touchscreen

1. Use a piece of soft cloth (such as gauze and non-woven fabric) slightly moistened with water to clean the touchscreen.
   - Fingerprints on the touchscreen need to be cleaned regularly.
   - It is forbidden to spray directly on the touchscreen.
2. Use a piece of clean soft cloth to dry the touchscreen.

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6.2.1.5 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 List of hazardous materials

Component	Hazardous material	Quantity
X-ray tube RAD-14	Lead	5.81 kg
	Oil	3.65 L
X-ray tube RAD-60	Lead	7.44 kg
	Oil	5.85 L
X-Ray tube E7254FX	Lead	4.6 kg
	Oil	3.7 kg
X-Ray tube XRR-3331X	Lead	3.2 kg
	Oil	3.2 kg
Generator 65 kW/80 kW	Oil	10.68 kg
Collimator FR0201	Lead	1.81 kg
Collimator FR0202	Lead	1.76 kg
Remote control	Lithium battery	1 pcs
Host	Lithium battery	1 pcs
Monitor	LCD	1 pcs
Diagnostic monitor (optional 1)	LCD	1 pcs
Diagnostic monitor (optional 2)	LCD	1 pcs
Grid (SID 110)	Lead	768 g
Grid (SID 130)	Lead	430 g
Grid (SID 180)	Lead	538 g
Patient table	Lithium battery of encoder	1 pcs
TUI	LCD	1 pcs
FPD AS-401C	FPD	1 pcs
	Battery	2 pcs
FPD AS-401G	FPD	1 pcs
	Battery	2 pcs
FPD Mars1717XU	FPD	1 pcs
	Lead	0.3 kg

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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, 480 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	♦ When the maximum output power of the high-voltage generator is 65 kW (uDR 780i): ≥ 106 kVA ♦ When the maximum output power of the high-voltage generator is 80 kW (uDR 780i): ≥ 120 kVA ♦ uDR 780i Pro-A, uDR 760i-A: ≥ 106 kVA ♦ uDR 780i Pro-B、uDR 760i-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
Temperature	+10°C to +30°C
Humidity	30%–75% (no condensation)
Atmospheric pressure	700–1060 hPa

7.3.2 Requirements for transport and storage

⚠WARNING

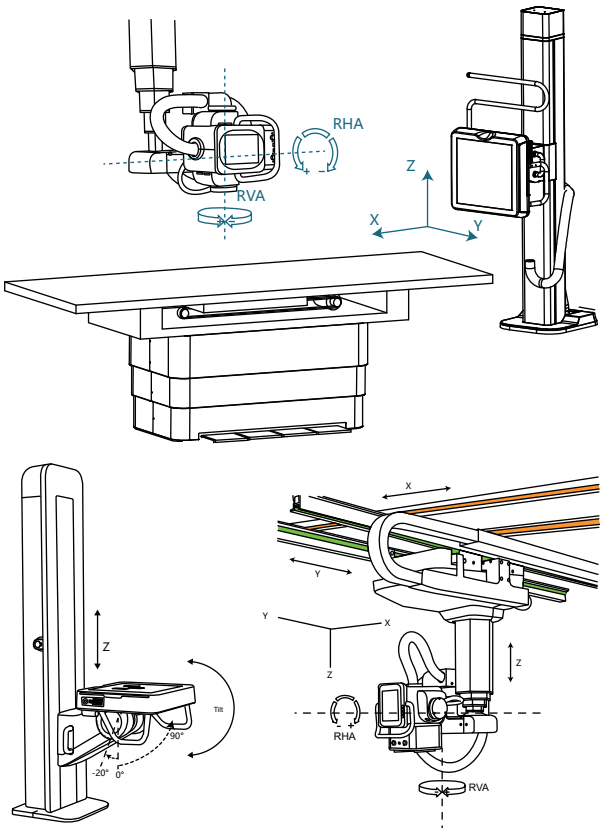
The system must be stored in a warehouse with controllable temperature and humidity to prevent harms caused by the changes of weather and the dust in the environment. Make sure that there is no corrosive substance such as acid or alkali around.

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 hPa – 1060 hPa

7.4 System performance

7.4.1 Coordinate axes and directions



Name	Description
Z-axis	Direction of vertical movement of the BWS bucky
X-axis	Perpendicular to the Z-axis and parallel to the longitudinal axis of the radiographic table.
Y-axis	Perpendicular to the Z-axis and to the longitudinal axis of the 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 touch user interface, the RHA angle is positive.
RVA	Rotation of the X-ray source assembly about the Z-axis with the intersection point of the telescope column and the cantilever as the center. When the touch user interface faces the same direction as the UIH logo on the cover of the carriage, the RVA angle is 0°. When the X-ray source assembly is rotated counterclockwise (looking down from above), the RVA angle is positive.
Tilt	Rotation of the BWS bucky about the horizontal axis with the intersection point of the bucky and the cantilever as the center.

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7.4.2 Parameters of component movement

Component	Parameter	Range
X-ray tube assembly	Rotation about the vertical axis (RVA)	≥ 336° (deviation: ±2°)
	Rotation about the horizontal axis (RHA)	≥ 270° (deviation: ±2°)
Tube ceiling stand	Z-axis vertical movement	≥ 1800 mm (deviation: ±5%)
	X-axis movement	♦ ≥ 3200 mm (deviation: ±5%) (optional) ♦ ≥ 2800 mm (deviation: ±5%) (standard)
	Y-axis movement	≥ 1900 mm (deviation: ±5%)
Flat panel detector on the bucky wall stand	Rotation	≥ 110° (deviation: ±2°)
	Z-axis vertical movement	≥ 1500 mm (deviation: ±5%)

7.4.3 Parameters of imaging chain components

7.4.3.1 High-voltage generator parameters

Parameter	Value	
Rated output power and loading conditions	63 kW @ 100 kV, 630 mA, 0.1 s	80 kW @ 100 kV, 800 mA, 0.1 s
Maximum output power and loading conditions	65 kW @ 130 kV, 500 mA	80 kW @ 100 kV, 800 mA
Tube voltage range	40–150 kV Deviation: ±10% or less	
Tube current range	10–800 mA Deviation: ±20% or less	10–1000 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	
AEC minimum radiation time	5 ms	
Range of automatic exposure	5–1000 ms (kV + AEC mode)	
	10–800 mA (kV + mA + AEC mode)	10–1000 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)	80 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	37.5	150	37.5
320	150	48	150	48
400	150	60	150	60
500	150	75	130	65
630	126	79.38	103	64.89
800	100	80	81	64.8
1000	80		N.A.	N.A.

7.4.3.2 Collimator parameters

Parameter	Value
Light field control	Manual + automatic
Inherent filtration	1.0 mmAl
Power supply	24 V DC/AC (±10%), maximum 4 A
Light field duration	1–60 s (configurable)
Minimum dimensions of the radiation field	≤ 2 cm × 2 cm @ 100 cm SID
Maximum dimensions of the radiation field	≤ 43.5 cm × 43.5 cm @ 100 cm SID
Additional filtration (optional)	0.1 mmCu, 0.2 mmCu, or 0.3 mmCu

7.4.3.3 Parameters of X-ray tube assembly

Parameter	RAD-14	RAD-60	XRR-3331X	E7254FX
Manufacturer	Varian	Varian	Toshiba	Toshiba
Tube model	RAD-14	RAD-60	XRR-3331	E7254
Tube housing model	Leo	Sapphire	XH-121	XH-121
Nominal focal spot value (IEC 60336)	♦ Small focal spot: 0.6 mm ♦ Large focal spot: 1.2 mm	♦ Small focal spot: 0.6 mm ♦ Large focal spot: 1.2 mm	♦ Small focal spot: 0.6 mm ♦ Large focal spot: 1.2 mm	♦ Small focal spot: 0.6 mm ♦ Large focal spot: 1.2 mm
Nominal tube voltage	150 kV	150 kV	150 kV	150 kV
X-ray tube assembly filtration (@ 75 kV)	≥ 2.5 mmAl	≥ 2.5 mmAl	≥ 2.5 mmAl	≥ 2.5 mmAl
Permanent filtration of X-ray tube (@ 75 kV)	0.5 mmAl	0.5 mmAl	0.9 mmAl	0.8 mmAl
Inherent filtration of X-ray tube (@ 75 kV)	≥ 1.5 mmAl	≥ 1.5 mmAl	≥ 1.5 mmAl	≥ 1.5 mmAl
Target angle	12°	12°	12°	12°
Material of the anode target	Rhenium tungsten molybdenum alloy	Rhenium tungsten molybdenum alloy	Rhenium tungsten molybdenum alloy	Rhenium tungsten molybdenum alloy
Weight (approximate)	17 kg	18.9 kg	16 kg	20 kg
Leakage technique factors	150 kV, 2.0 mA	150 kV, 4.0 mA	150 kV, 3.4 mA	150 kV, 5 mA
Nominal anode input power	♦ Small focal spot: 32 kW ♦ Large focal spot: 77 kW	♦ Small focal spot: 40 kW ♦ Large focal spot: 100 kW	180 Hz ♦ Small focal spot: 32 kW ♦ Large focal spot: 78 kW	180 Hz ♦ Small focal spot: 40 kW ♦ Large focal spot: 102 kW
Anode heat content	210 kJ (300 kHU)	300 kJ (400 kHU)	210 kJ (300 kHU)	285 kJ (400 kHU)

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Parameter	RAD-14	RAD-60	XRR-3331X	E7254FX
Maximum heat dissipation of the anode	180 W (250 HU/ sec)	1240 W (100 kHU/min)	870 W (1226 HU/s)	1180 W (1664 HU/s)
X-ray tube assembly heat content	900 kJ (1.3 MHU)	1111 kJ (1.5 MHU)	900 kJ (1.25 MHU)	950 kJ (1.339MHU)
Maximum continuous heat dissipation	200 W (278 HU/ sec)	216 W (300 HU/ sec)	180 W (250 HU/ sec)	200 W (278 HU/ sec)

X-ray tube assembly (RAD-14)

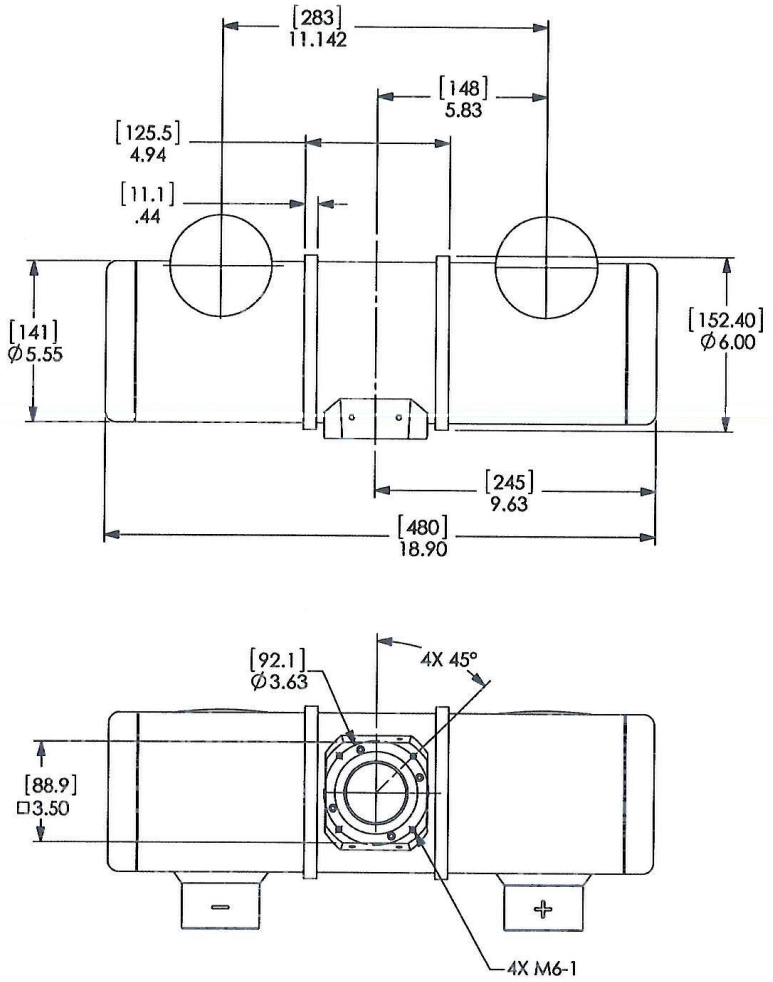


Figure 7-1 Dimensions of the X-ray tube assembly (RAD-14)

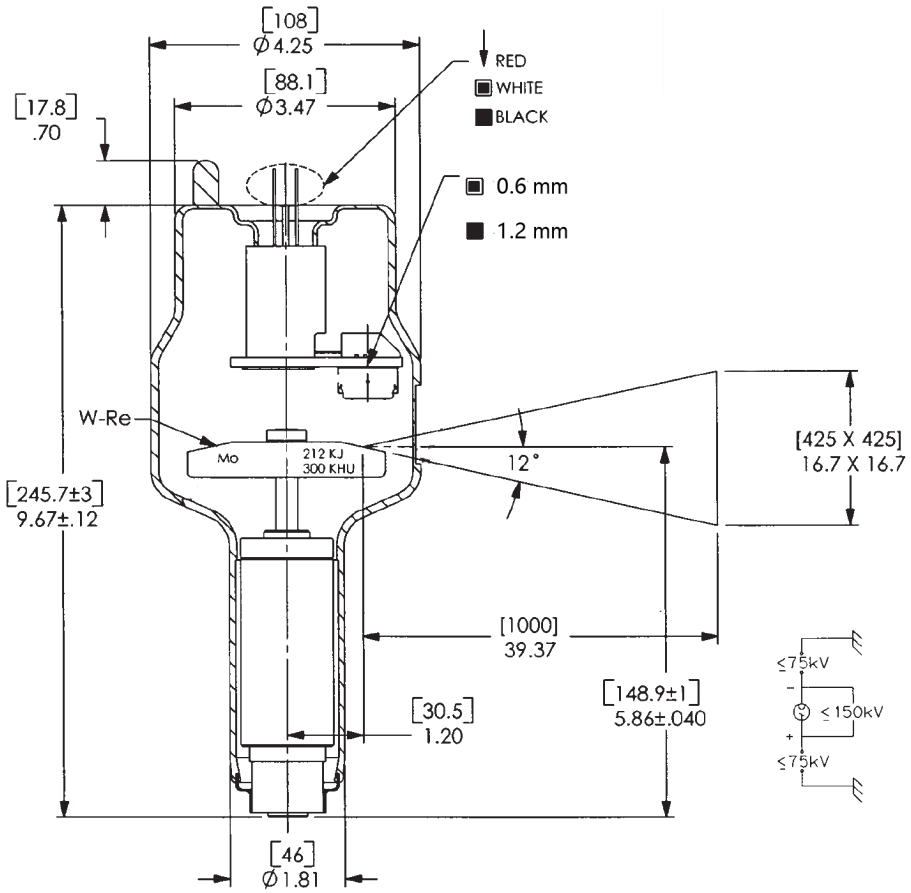


Figure 7-2 Dimensions of the X-ray tube (RAD-14)

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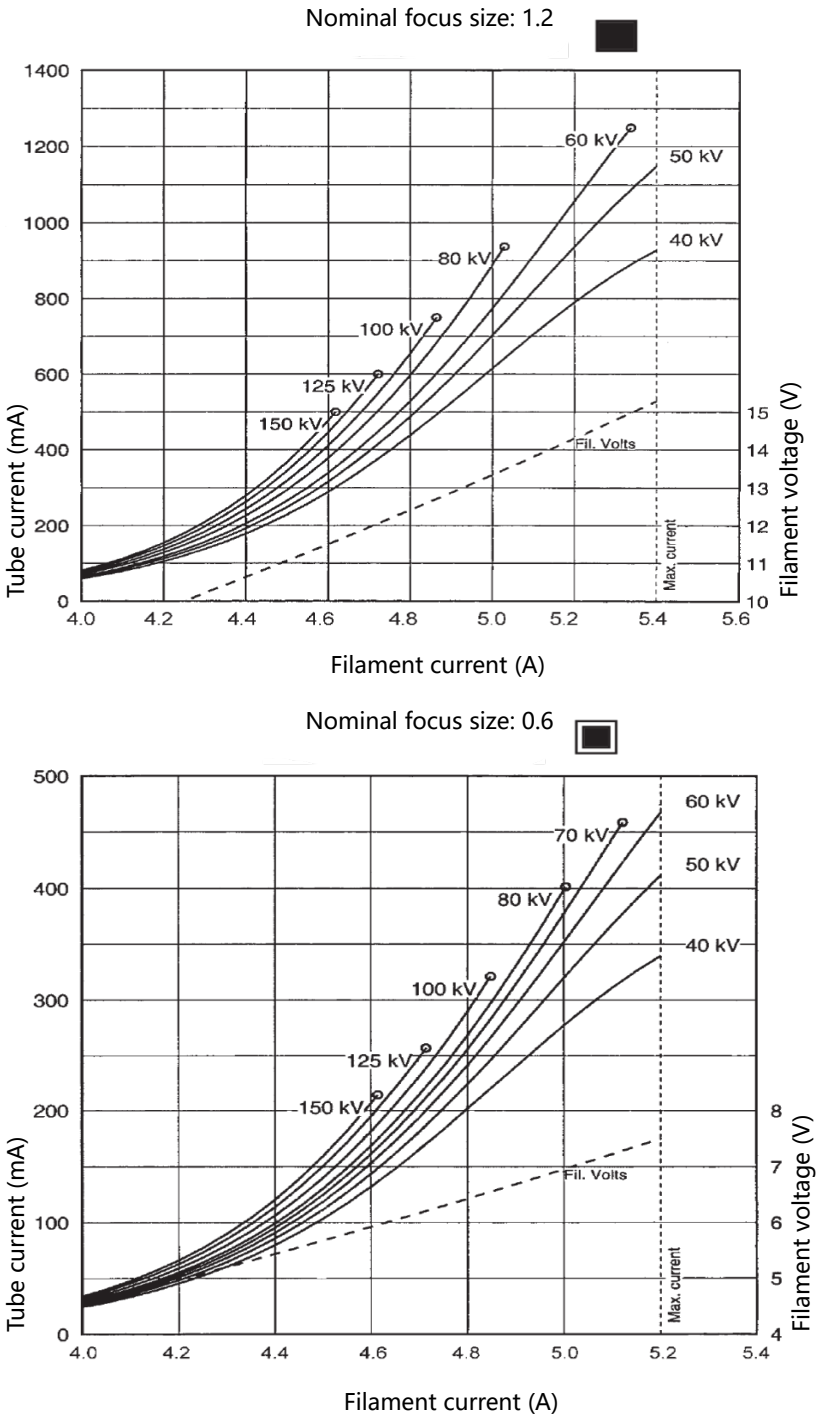


Figure 7-3 Characteristics of filament emission

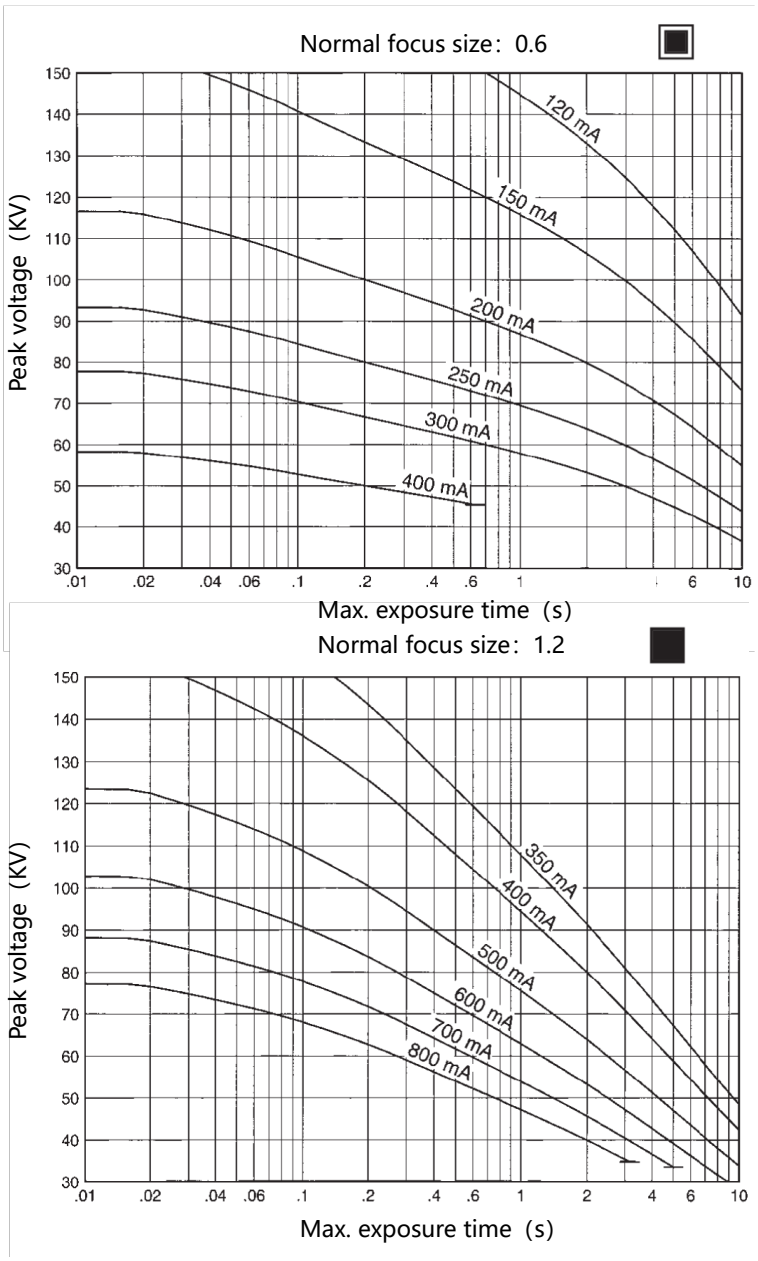


Figure 7-4 Maximum rated values (stator drive frequency: 60 Hz)

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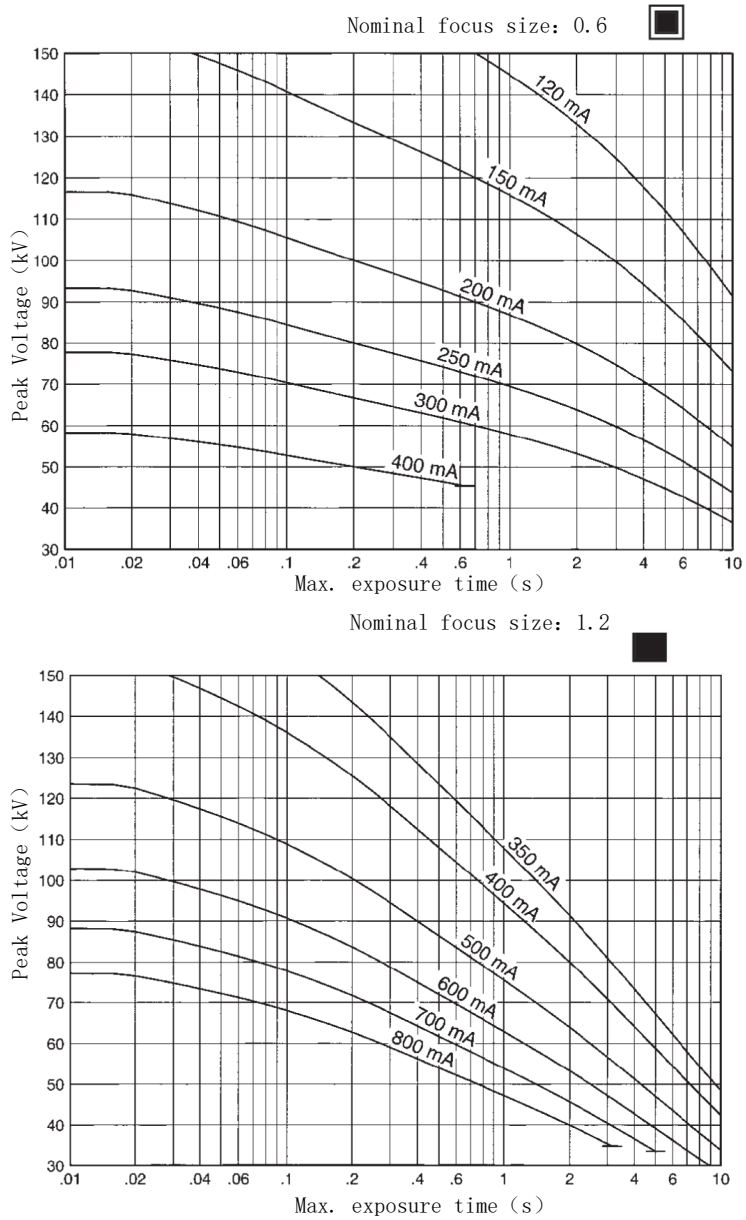


Figure 7-5 Maximum rated values (stator drive frequency: 180 Hz)

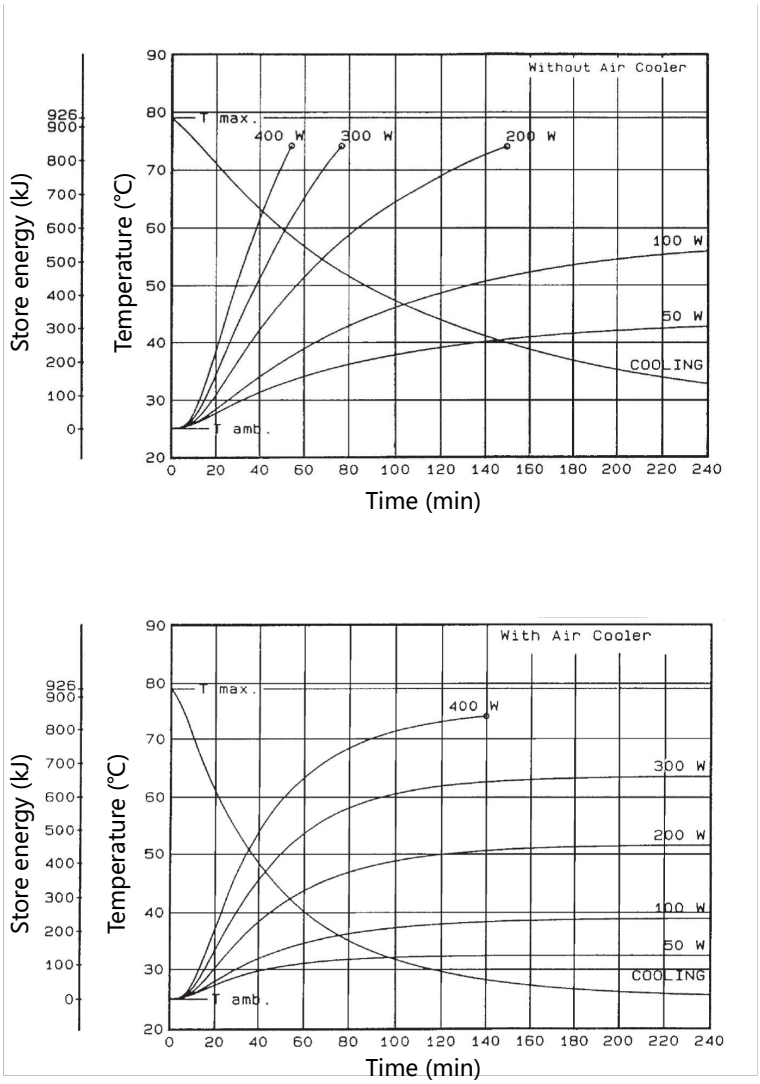


Figure 7-6 Heating and cooling curves of the X-ray tube assembly

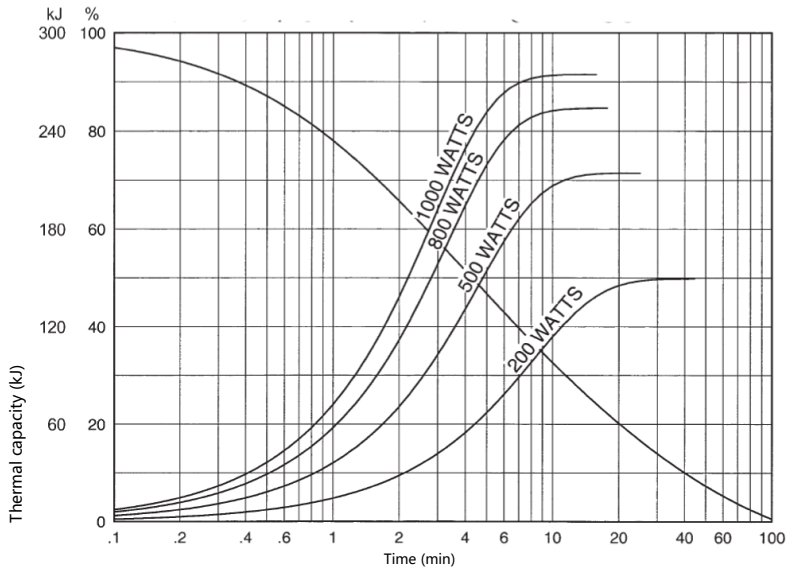


Figure 7-7 Heating and cooling curves of the X-ray tube anode

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X-ray tube assembly (RAD-60)

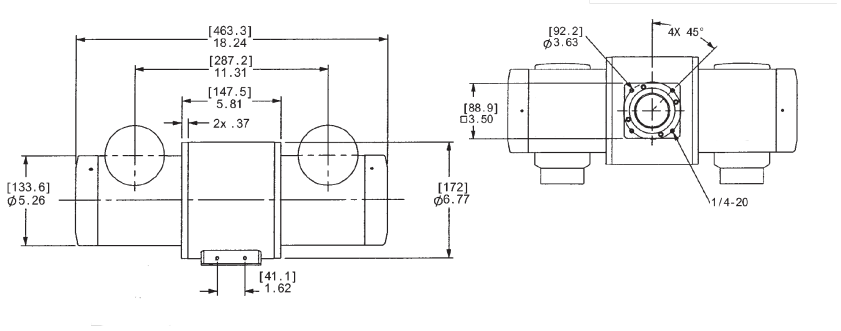


Figure 7-8 Dimensions of the X-ray tube assembly (RAD-60)

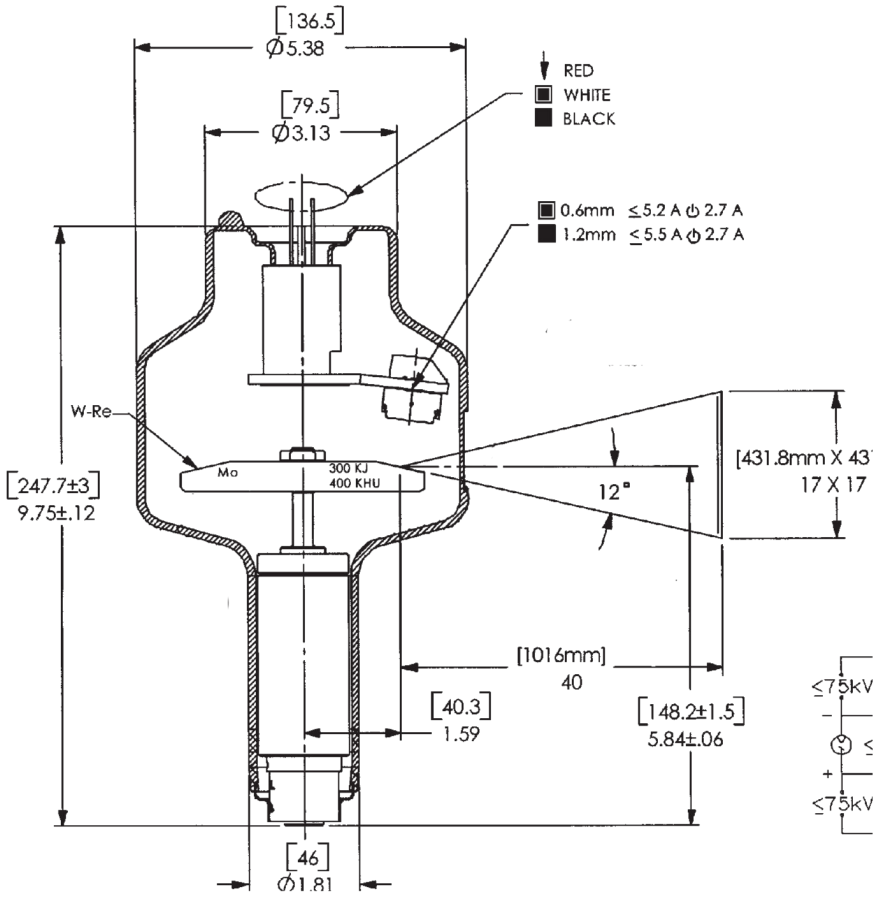


Figure 7-9 Dimensions of the X-ray tube (RAD-60)

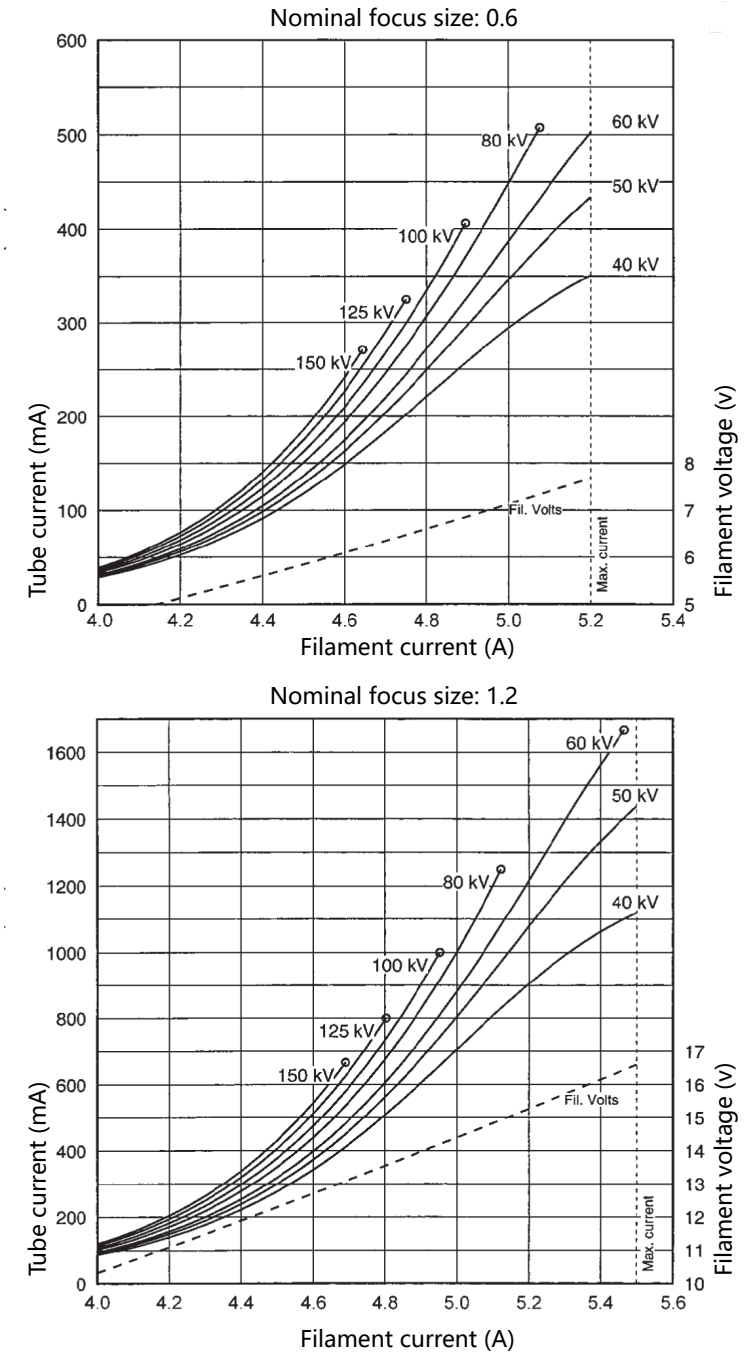


Figure 7-10 Characteristics of filament emission

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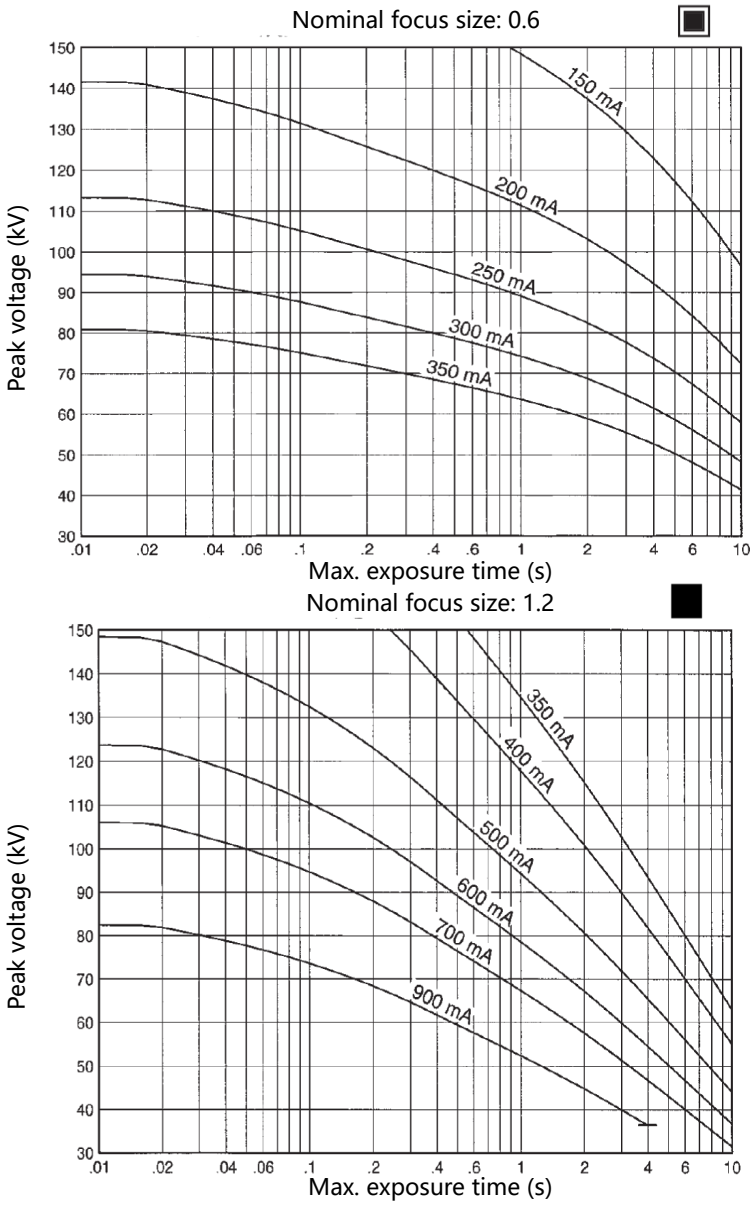


Figure 7-11 Maximum rated values (stator drive frequency: 60 Hz)

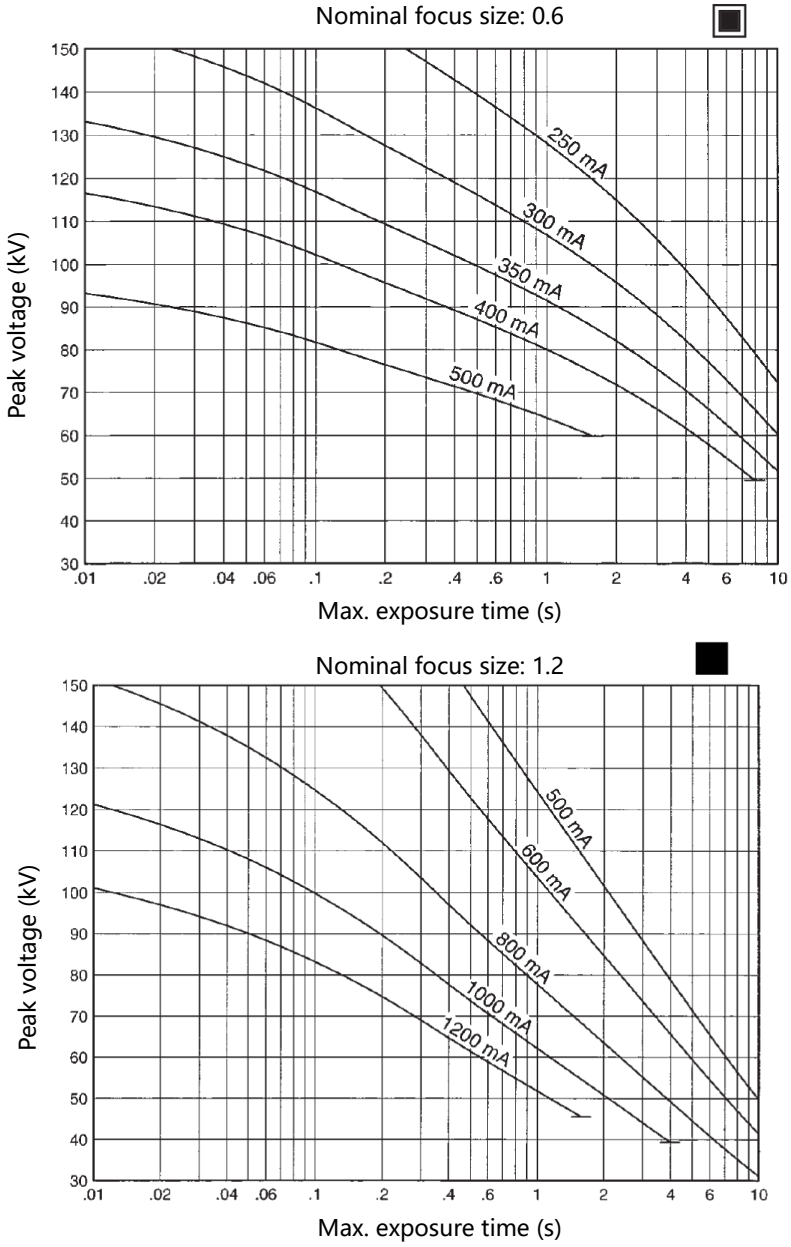


Figure 7-12 Maximum rated values (stator drive frequency: 180 Hz)

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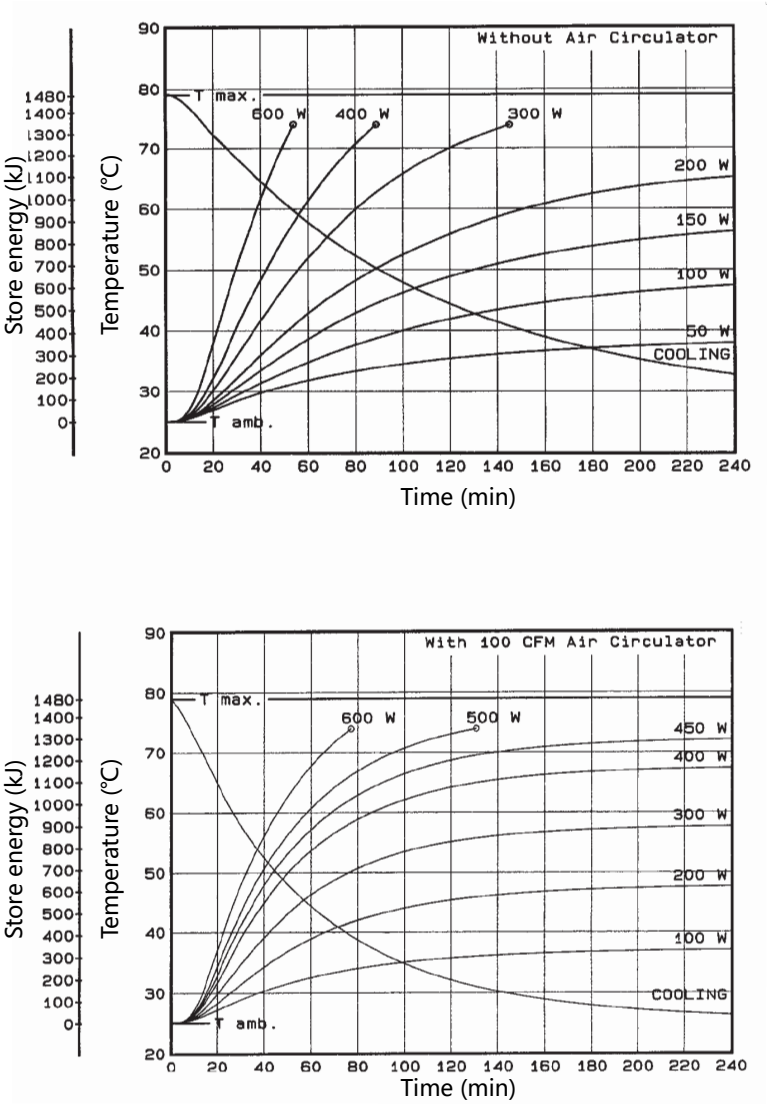


Figure 7-13 Heating and cooling curves of the X-ray tube assembly

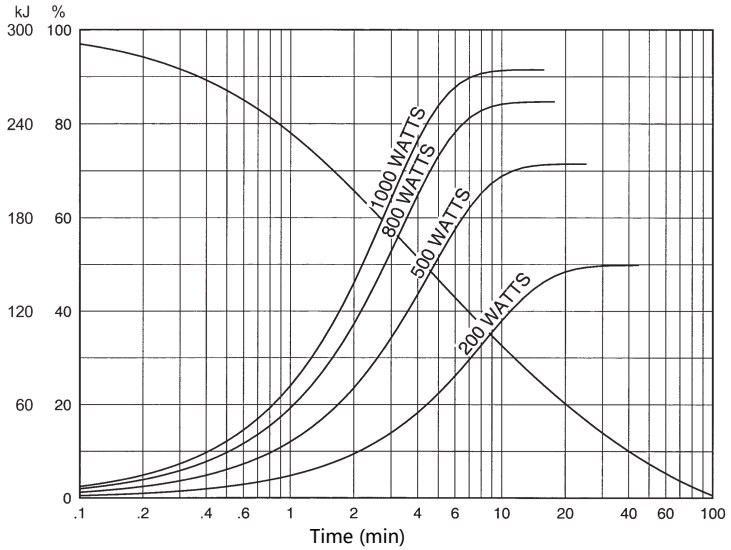


Figure 7-14 Heating and cooling curves of the X-ray tube anode

X-ray tube assembly (XRR-3331X)

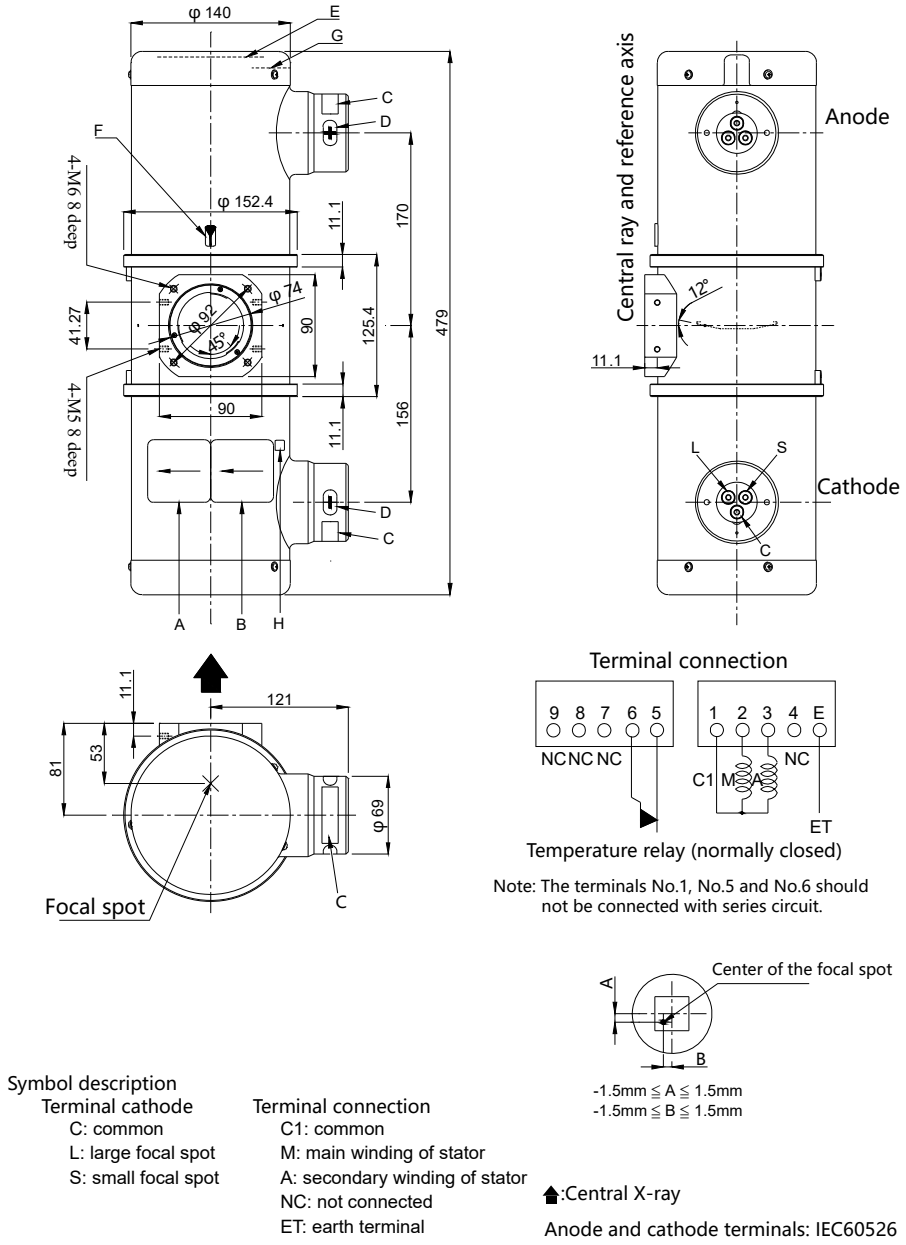


Figure 7-15 X-ray tube assembly (XRR-3331X)

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Table 7-6 Rated values of the rotary anode motor

Parameter	Starting		Running	
Power frequency (Hz)	180[c]	60	180[c]	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	N.A.	N.A.
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.

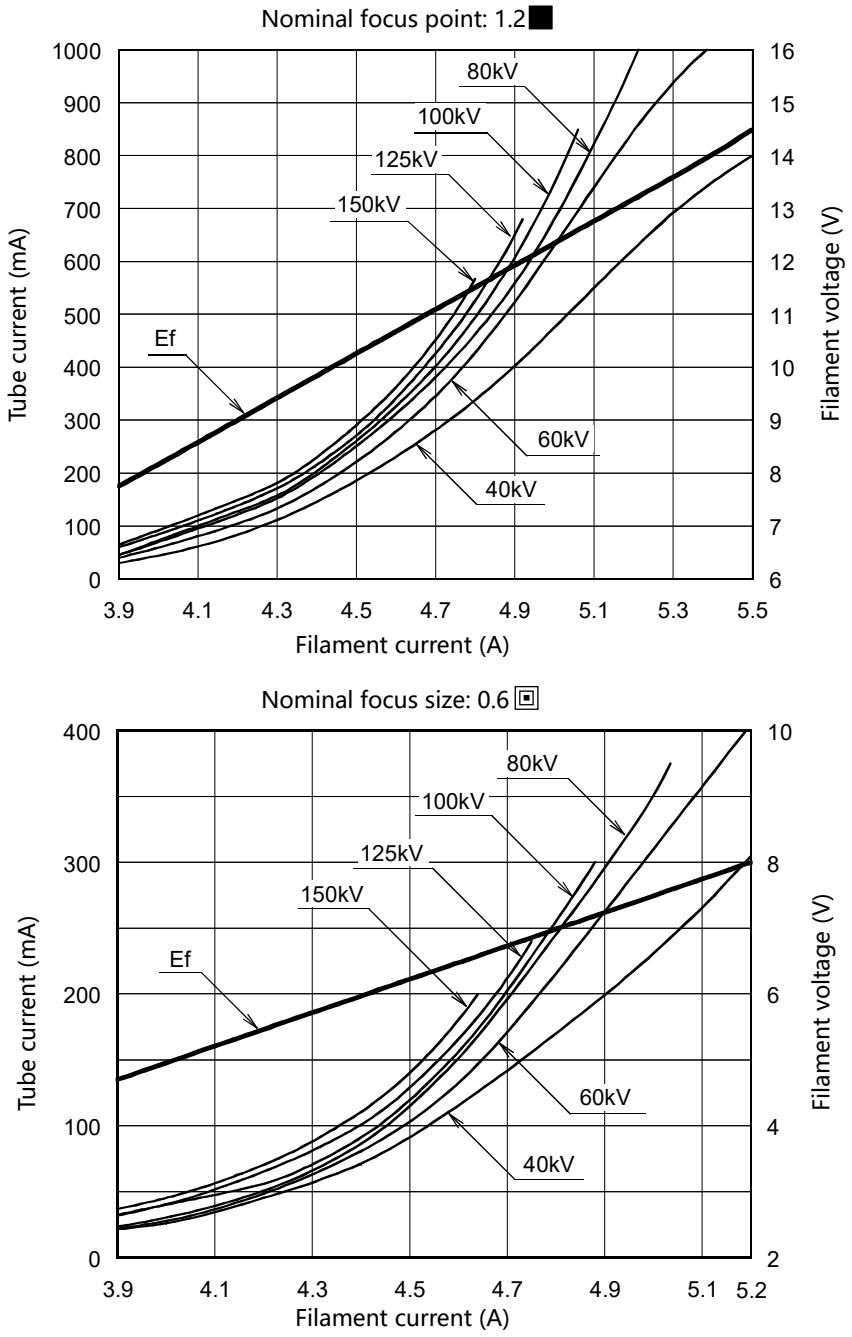


Figure 7-16 Characteristics of filament emission

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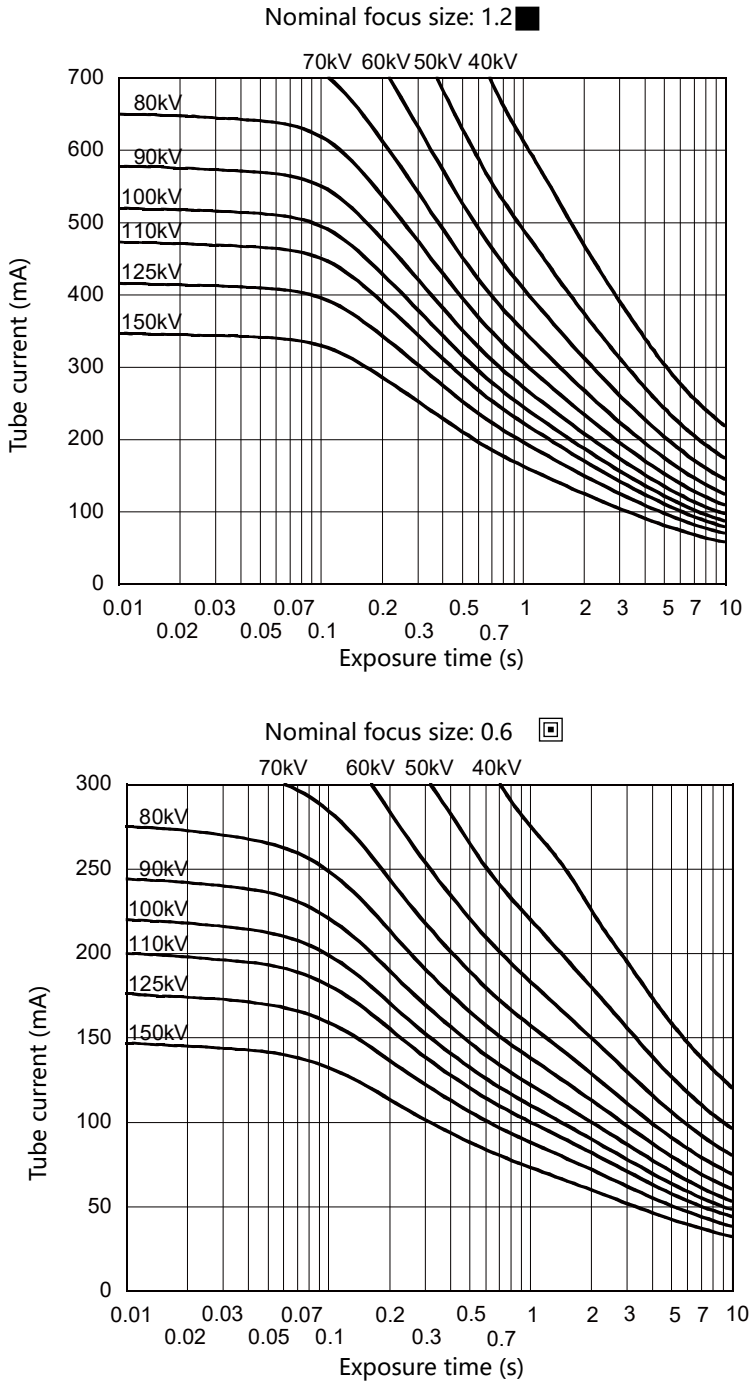


Figure 7-17 Maximum rated values (stator drive frequency: 50 Hz)

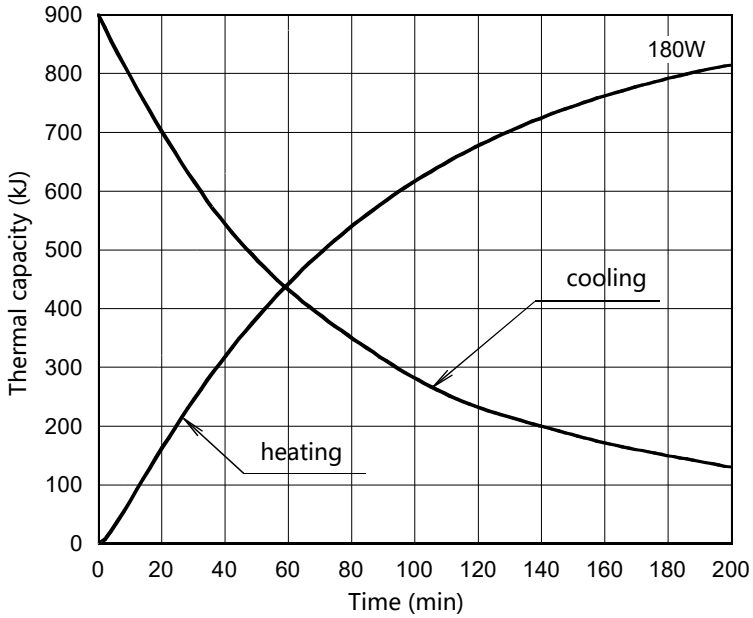


Figure 7-18 Heating and cooling curves of the X-ray tube assembly

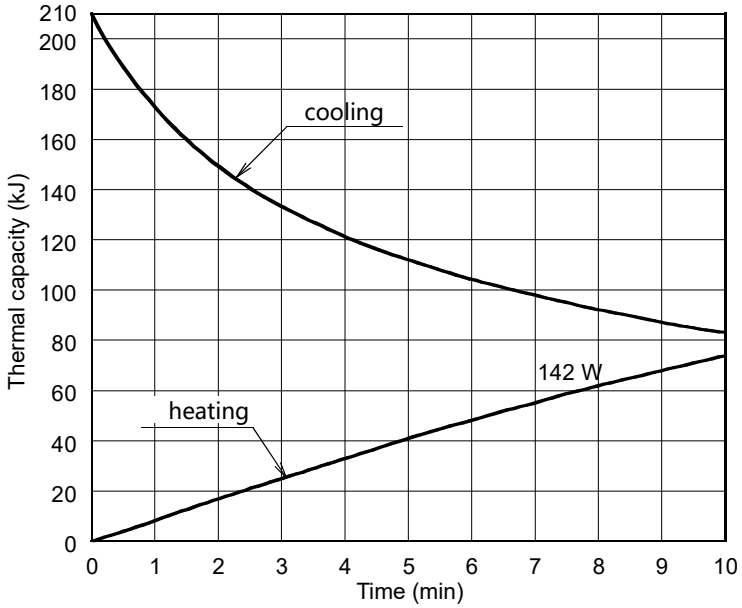


Figure 7-19 Heating and cooling curves of the X-ray tube anode

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X-ray tube assembly (E7254FX)

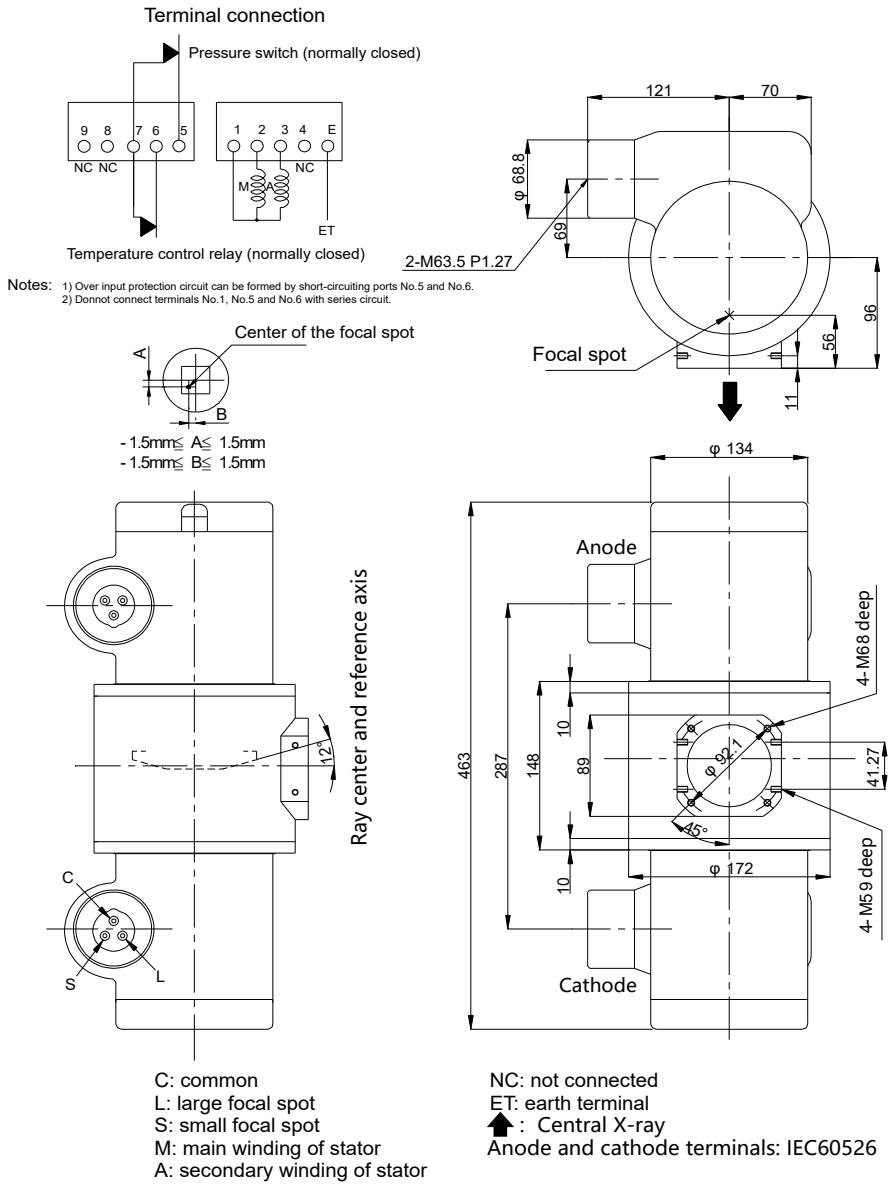


Figure 7-20 Dimensions of the X-ray tube assembly (E7254FX)

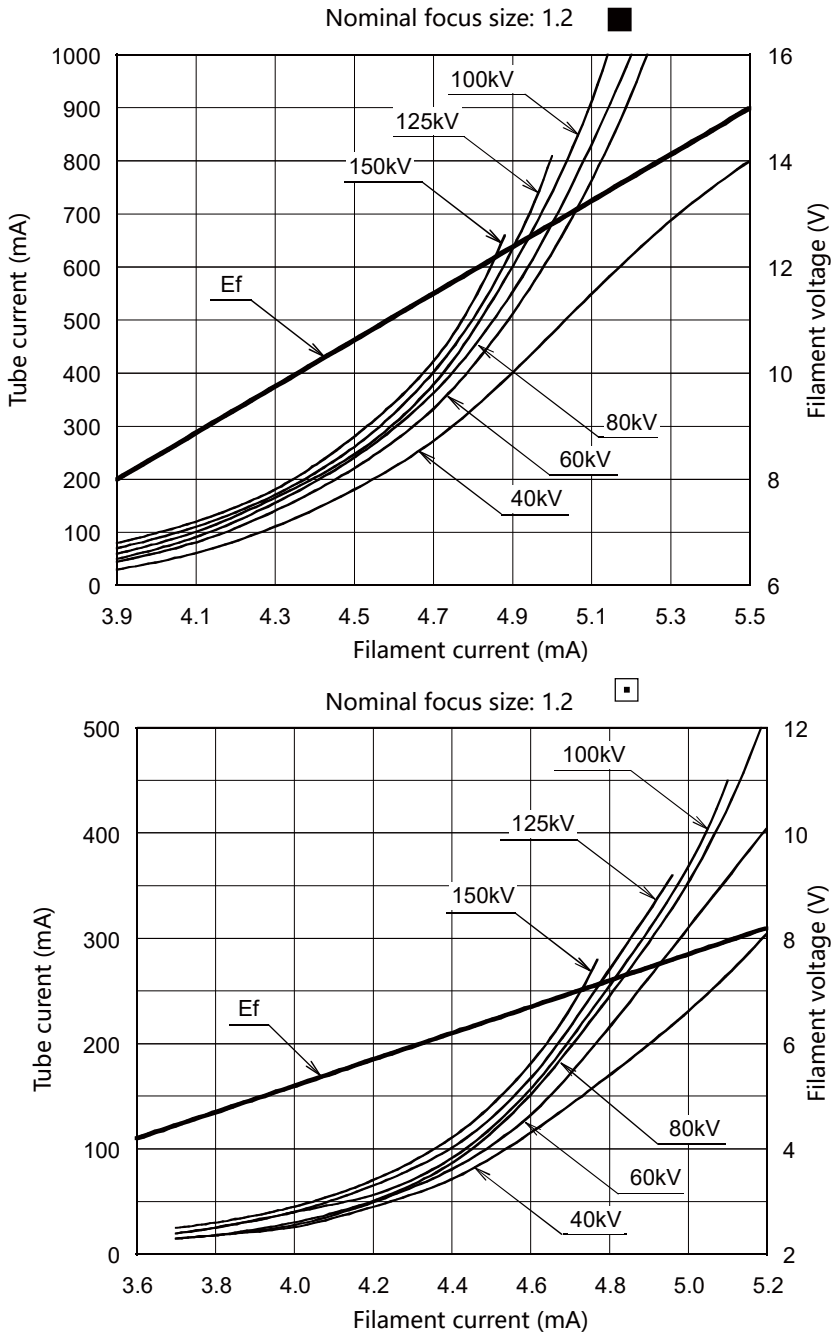


Figure 7-21 Characteristics of filament emission

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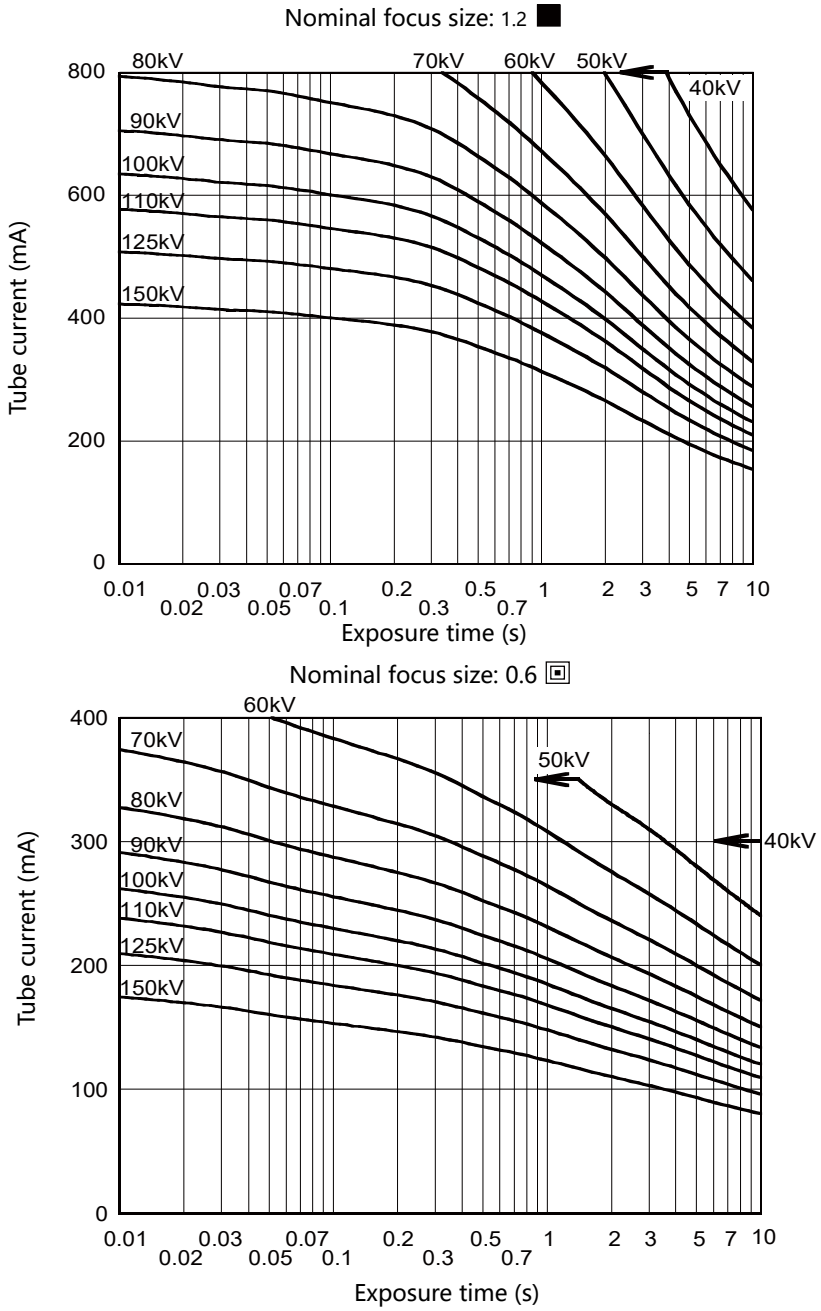


Figure 7-22 Maximum rated values (stator drive frequency: 60 Hz)

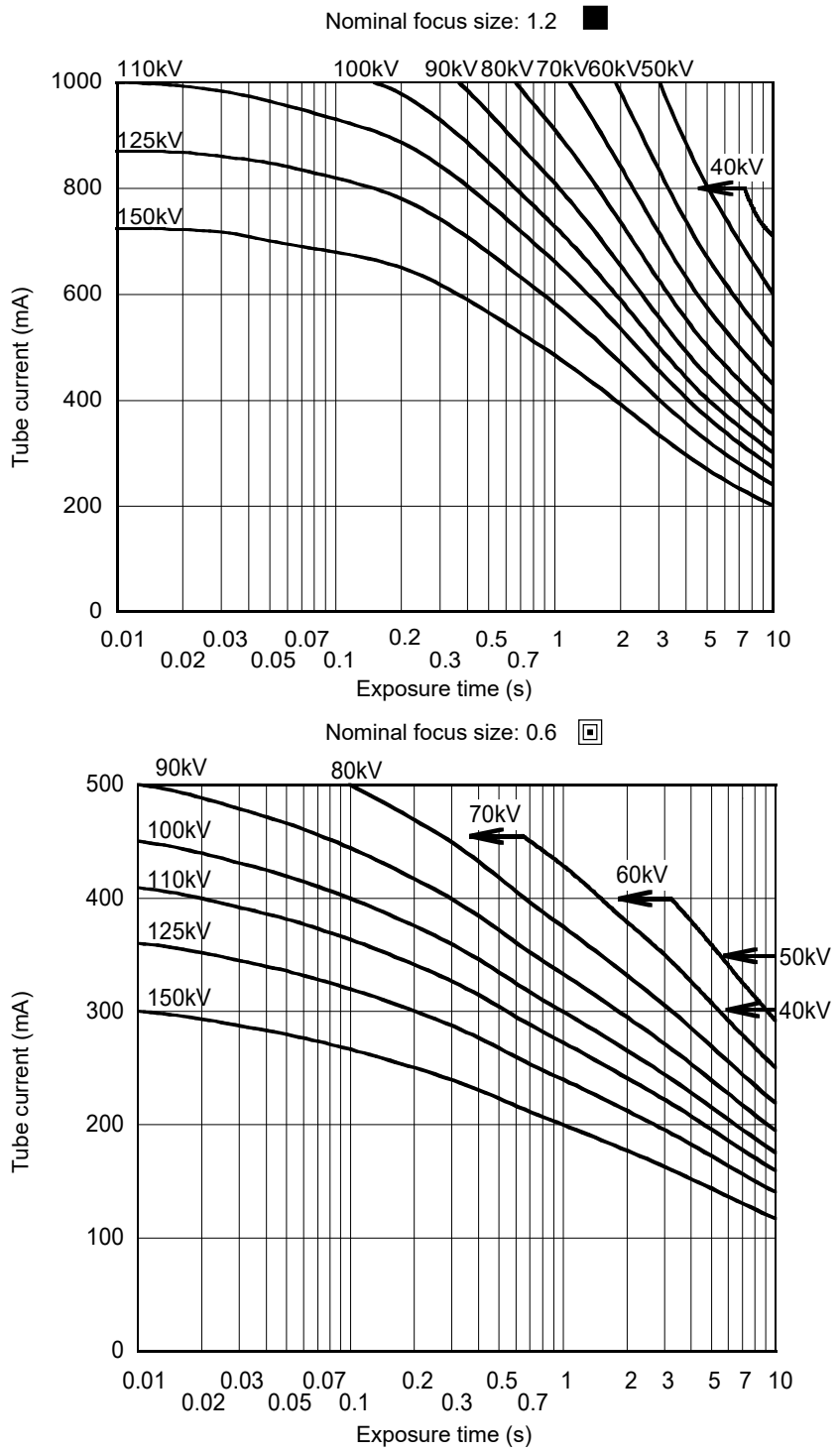


Figure 7-23 Maximum rated values (stator drive frequency: 180 Hz)

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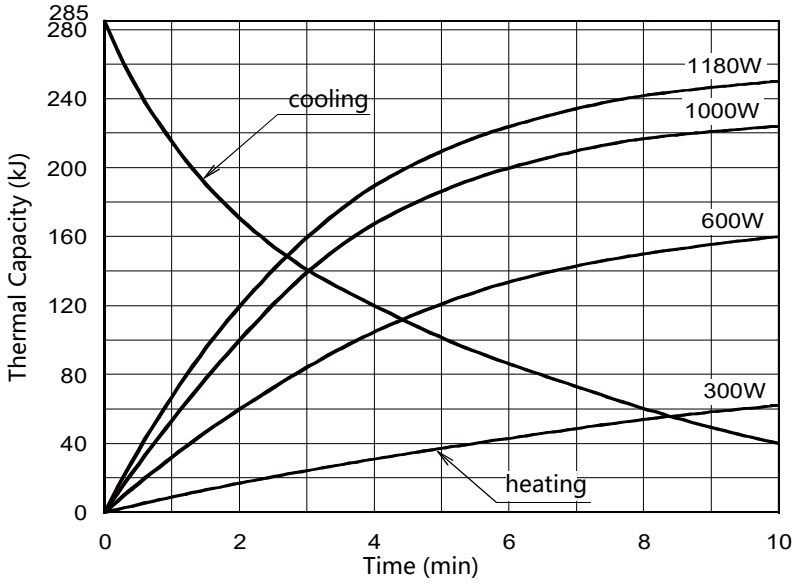


Figure 7-24 Heating and cooling curves of the X-ray tube assembly

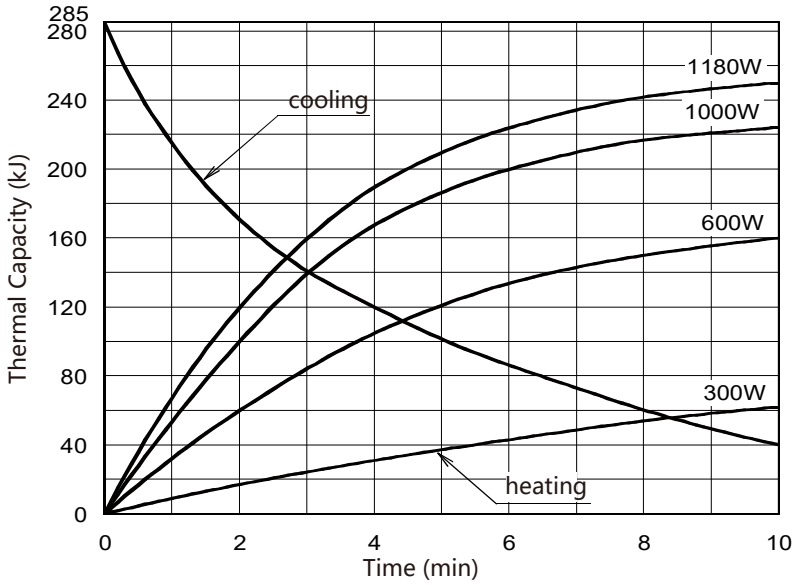


Figure 7-25 Heating and cooling curves of the X-ray tube anode

7.4.3.4 Grid

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

7.4.3.5 Flat panel detector

Parameter	AS-401C	AR-C4343W	Mars1717XU-VSI
Material	Cesium iodide/ amorphous silicon	Cesium iodide/ amorphous silicon	Cesium iodide/ amorphous silicon
Acquisition matrix	3320 × 3408	3320 × 3408	3072 × 3072
Imaging area	430 mm × 420 mm	415 mm × 426 mm	427 mm × 427 mm
Extreme spatial resolution	4 lp/mm	4 lp/mm	3.6 lp/mm
Data transmission	Wireless	Wireless	Wireless
Pixel size	125 μm	125 μm	139 μm
Detective quantum efficiency	0.6 (Deviation: < ±10%) @ 3 μGy 0 lp/mm	0.58 (Deviation: < ±10%) @3 μGy 0.5 lp/mm	≥ 0.65 @ 2.5 μGy 0 lp/mm

Table 7-7 Defective quantum efficiency_AR-C4343W and AS-401C FPD

Spatial frequency (lp/mm) @ RQA5	DQE @ 3 uGy (Typ.)
0.5	0.58
1	0.51
1.5	0.45
2	0.4
2.5	0.35
3	0.29
3.5	0.22

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Table 7-8 Defective quantum efficiency_Mars1717XU-VSI FPD

Spatial frequency (lp/mm) @ RQA5	DQE @ 2.5 uGy (Typ.)
0.5	0.53
1	0.45
1.5	0.40
2	0.30
2.5	0.25
3	0.20
3.5	0.10

7.4.3.6 Image processing system

Table 7-9 Image processing system

Parameter	Value
Hard disk of the acquisition workstation	≥ 1 TB
RAM	≥ 8 GB
Operating system	Windows 10 64-bit or other compatible versions
Power supply	665W
Host monitor	Applicable to uDR 780i: ♦ Size: 24 inch ♦ Color ♦ Resolution: 1920 × 1200 ♦ Luminance: 170 cd/m^2 Applicable to uDR 760i and uDR 780i Pro: ♦ Size: 21 inch or larger ♦ Resolution: 1920 × 1080 ♦ Luminance: 170 cd/m^2 Optional: ♦ Size: 21.3 inch ♦ Black and white ♦ Resolution: 1600 × 1200 ♦ Luminance: 1900 cd/m^2 ♦ Size: 21.3 inch ♦ Black and white ♦ Resolution: 2048 × 1536 ♦ Luminance: 1700 cd/m^2 ♦ Size: 23.8 inch ♦ Resolution: 1920 × 1080 ♦ Luminance: 600 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.

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Table 7-10 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

7.4.3.7 Reference axis

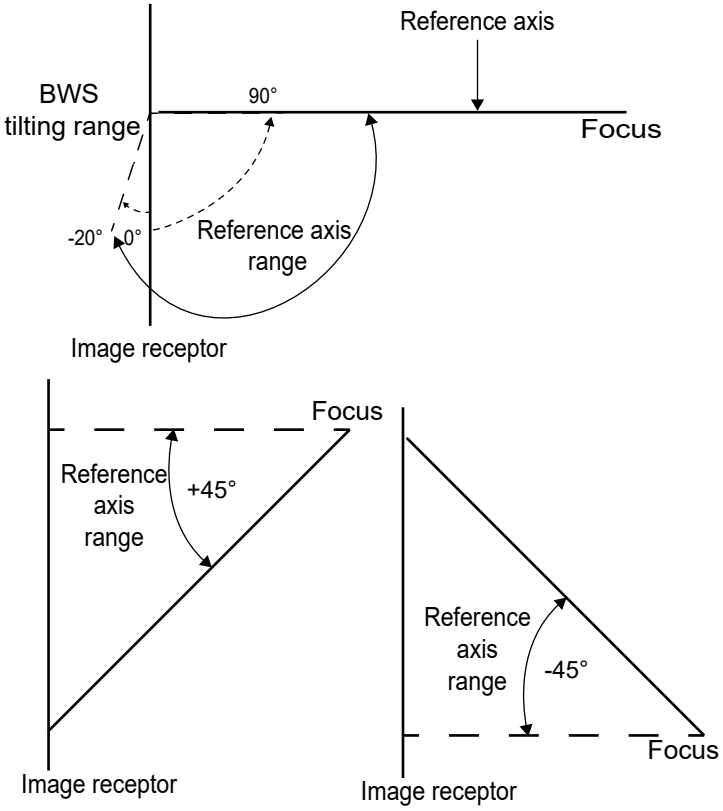


Figure 7-26 BWS reference axis

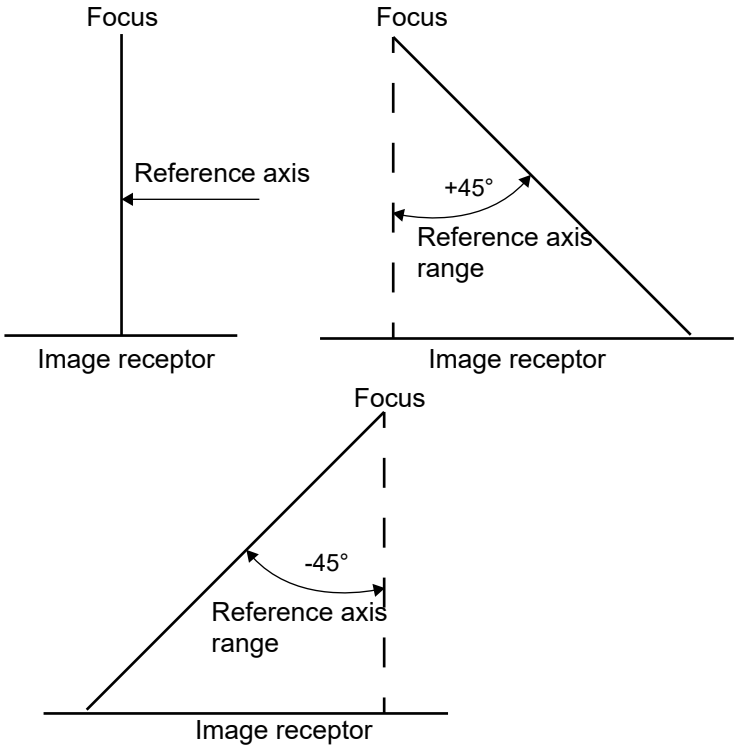


Figure 7-27 Radiographic table reference axis

7.4.3.8 X-radiation field range

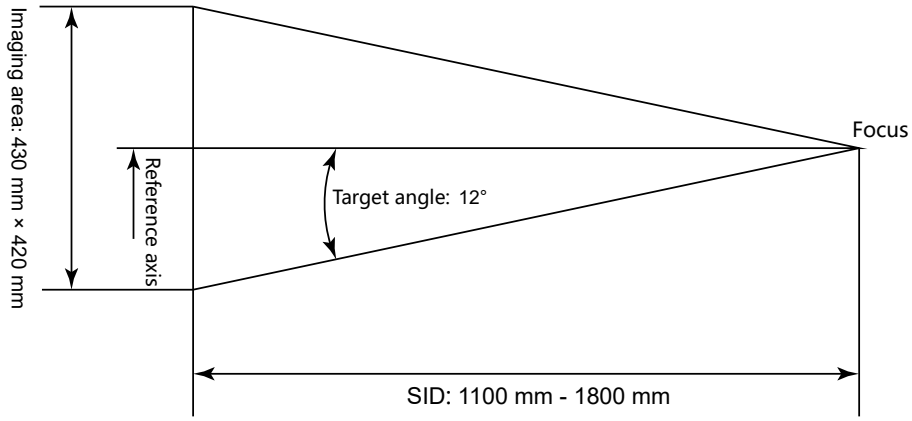


Figure 7-28 Radiation field range of the bucky wall stand

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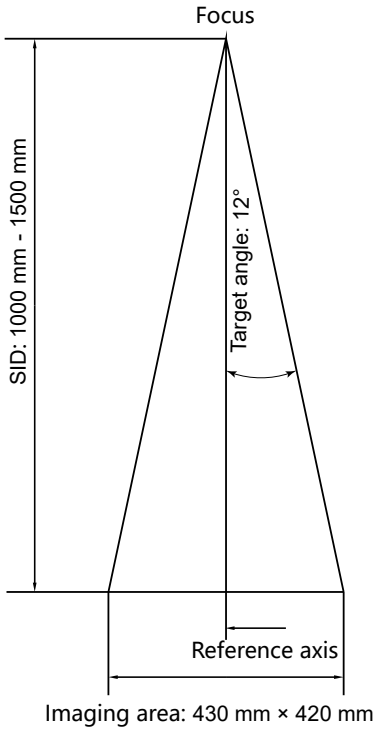


Figure 7-29 Radiation field range of the table

7.4.3.9 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.

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 7-11 Bucky wall stand

Parameter	Description
BWS bucky tilting mode	Manual
BWS bucky tilting angle	≥ 110° (deviation: ±2°)
Attenuation equivalent of the BWS bucky front cover	≤ 0.6 mmAl
BWS bucky Z-axis movement mode	Manual/Automatic
BWS bucky Z-axis movement range	≥ 1500 mm
BWS bucky Z-axis braking force	≥ 100 N
BWS bucky Z-axis starting force	≤ 50 N

Table 7-12 Elevating table

Parameter	Description
Maximum load	250 kg
Vertical movement range	498–880 mm
Effective radiographic area of the table top	≥ 600 mm × 1900 mm
Movement range of the table top	♦ X-axis: ≥ 800 mm ♦ Y-axis: ≥ 250 mm
X-ray absorption ratio of the table top	≤ 0.8 mmAl
Movement range of the FPD tray	Bucky movement range in the long axis: ≥ 670 mm

Table 7-13 Fixed radiographic table

Parameter	Description
Maximum load	250 kg
Height of the table	680 mm ± 20 mm
Effective radiographic area of the table top	≥ 600 mm × 1900 mm
X-ray absorption ratio of the table top	0.7 mmAl

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Table 7-14 Mobile table

Parameter	Description
Maximum load	150 kg
Height of the table	700 mm ± 20 mm
Effective radiographic area of the table top	≥ 510 mm × 1840 mm
X-ray absorption ratio of the table top	< 0.8 mmAl

C

control box

- System On button *4-3*

D

disinfection

- covers *6-6*
- handles *6-6*

distance *2-11*

P

personnel involved *1-2*

R

Requirements for the mains supply *7-3*

S

safety labels

- classification and indication of equipment *2-4*
- electricity and electronics safety *2-4*
- instruction symbols *2-4*
- prohibition symbols *2-4*
- warning symbols *2-4*

safety levels

- caution *2-3*
- notice *2-3*
- warning *2-3*

shielding *2-11*

system shutdown *4-28*

T

time *2-11*

V09

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