

uMC

Instruction for Use

Mobile C-arm X-Ray System

uMC 560i

uExceed R001

51001262-05-202211-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.

Product version

Product name	Product model	Software version
Mobile C-arm X-ray system	uMC 560i	uExceed R001

Audience

- Users of the Mobile C-arm X-ray system.
- UIH training and customer service engineers.
- UIH marketing personnel.
- Authorized distributors of UIH.

Revision records

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In case of any problem, please contact UIH Customer Service Center.

Telephone: 0086 400-686-6088

E-mail: services@united-imaging.com

Website: www.united-imaging.com

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1.1 About this manual

This manual applies to the mobile C-arm X-ray system developed by Shanghai United Imaging Healthcare Co., Ltd. You must observe safety instructions in this manual during operations and understand application functions of the system.

This manual describes the intended use, basic composition, software and hardware functions, and routine operation procedures of this system. It also provides safety knowledge and technical reference information required for the normal operation of the system, so as to instruct users to complete operations safely and effectively.

This manual gives an overview of interface distribution, configuration requirements, and main functions of the image acquisition workstation, including patient registration, patient study, patient administration, viewing, and filming.

Before operating the system, users or operators must carefully read through this manual and pay special attention to all information in the safety section so as to effectively and safely complete a series of operations. Do not use this system for any purpose other than the intended use.

This manual is only valid to the software version in compliance with relevant regulations and the latest release notes. This manual describes system features in detail, including its functions, options and all accessories. It aims to provide convenience for you and may be updated in future versions. UIH reserves the right to change information in this manual at any time without prior notice.

The original language of this manual is English. This manual is created, maintained, and authorized by UIH, and delivered together with products.

Personnel involved in this manual are described as follows.

Related personnel	Description
Responsible organization	The organization responsible for use and maintenance of the mobile C-arm X-ray system. A responsible organization can be a hospital, clinicians, or non-medical staff.
Operator	Personnel authorized to operate the equipment.
Patient	A patient who undergoes X-ray examination.
UIH customer service engineer	UIH installation, maintenance, and repair personnel.

1.1.1 Text conventions

This manual complies with a series of related text conventions which can help you better understand, quickly search for, and read related information.

- Parallel main items are indicated by the symbol "■".
- Single step items are identified by the symbol "▶" and multiple sequence step items are identified by numbers.
- Sub-items or coordinate items in tables are identified by the symbol "◆".
- In the electronic version of this manual, hyperlinks to relevant information are provided for further cross referencing.

- The user interface elements (for example button-tips, window titles, and menu texts) are identified in bold font.
- Keys of the keyboard are identified by the symbol "<>".

Expression of a single help information item:

> **Help information of the system.**

Expression of multiple help information items:

> - **Help information 1 of the system.**
> - **Help information 2 of the system.**

1.1.2 Application scope

- This manual describes all the configurations, components, assemblies, functions, and optional accessories of the related system; your system may not have all the functions.
- This system may be delivered with other operator manuals due to configuration differences. Please also refer to safety instructions, operation guidelines and daily maintenance descriptions in these manuals.

1.1.3 Graphical representation and number

- Any similarities between hospital or patient names used in this manual and the actual names of current organizations or persons are purely coincidental.
- Configuration names involved in this manual (for example, names of the drive, network node, or database) may be different from those in the actual clinical environment.
- All photos, diagrams, snapshots, and images in this manual are used as examples only. The actual system appearance and software UI shall prevail.
- Graphical representations in this manual may be different from the actual situations due to configuration differences, system configuration updates, as well as hardware/ software upgrade. The actual system appearance and software UI shall prevail.
- The snapshot capture may lead to image detail loss; therefore, images in this manual do not represent the actual image quality.
- All data in this manual is typical unless specific tolerance values are provided.
- Values displayed on the UI of the image acquisition workstation in this manual have no clinical significance. You should use protocol default values or values recommended by experienced application experts.

1.1.4 Laws and regulations

If there are relevant laws and regulations covering the use of the equipment, operators have to observe such laws and regulations.

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1.2 About this system

The mobile C-arm X-ray system, with clinical requirements fully taken into account, provides comprehensive clinical applications for users to cater to different clinical scenarios. This system provides a variety of exposure modes. It allows setting optimized APR parameters based on different radiography requirements, and conducts real-time fluoroscopy on the head, limbs, chest, lumbar spine, pelvis, and other body parts to obtain high-quality medical images. For special clinical scenarios, the system provides intelligent metal detection, motion detection, position detection, and other functions to better assist physicians with the diagnosis and treatment of patients.

The system has set up many default protocols to cover all anatomic sites in order to meet clinical requirements. These protocols are classified as Head, Extremities, Thorax, Lumbar, Pelvis and General.

Additionally, every protocol can be set by 3 different exposure modes as Pulse Fluoroscopy, Spot Fluoroscopy and Digital Radiography.

1.2.1 Intended use (for the U.S.A. only)

⚠ CAUTION

Federal Law restricts this device to sale, distribution and use by or on the order of a physician.

The uMC 560i is intended to provide digital imaging of patients during diagnostic and surgical procedures. Examples of clinical application may include orthopedic, pain therapy, neurological, pediatric examinations and critical care. The visualization of such anatomical structures assists the clinician in the clinical outcome. At the discretion of a physician, the device may be used for other imaging applications. This device does not support direct radiographic film exposures and is not intended for use in performing mammography.

1.2.2 Intended purpose (not available for the U.S.A.)

The intended purpose of this medical device is as follow:

uMC 560i is intended to provide digital imaging of patients during diagnostic and surgical procedures. Examples of clinical application may include, but are not limited to: orthopedic, pain therapy, neurological and critical care. The visualization of such anatomical structures assists the clinician with clinical decisions. This device does not support direct radiographic film exposures and is not intended for use in performing mammography.

1.2.3 Intended patient population

In principle, the uMC 560i can be used for examining all types of patients without restriction. The exposure of human to ionizing radiation must always be medically justified. Especially when used on pregnant women, adolescents, children, and pediatric patients, all procedures using ionizing radiation should be used with caution or be avoided altogether. However, the final decision lies with the attending physician or attending surgeon.

When using this system, the relevant applicable country specific requirements must be complied with.

1.2.4 Contraindications

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

1.2.5 Clinical benefit

The mobile C-arm X-ray system is widely used in surgical operations, particularly in orthopedic surgery, because it provides real-time visualization and accurate guidance during the surgical process and because it shortens operating time.

uMC 560i is intended to provide digital imaging for patients during diagnostic and surgical procedures. Examples of clinical application may include, but are not limited to: orthopedic, pain therapy, neurological and critical care. The visualization of such anatomical structures assists the clinician with clinical decisions.

1.2.6 Performance characteristics

uMC 560i uses newly technical to reduce radiation dose and ensure good image quality, such as CMOS detector, Pulse fluoroscopy exposure mode and Auto brightness stabilization. The analysis of risk management data pertaining to uMC 560i mobile C-arm X-ray system has been done to evaluate the risk/benefit profile of the system. The safety and performance of mobile C-arm X-ray system during proper clinical use is appraised.

1.2.7 Software information

Language

- Language of the user interface of this image acquisition workstation is optional: Chinese or English.
- In this manual, all menus, user interfaces, buttons, and prompts are in Chinese or English.

Copyright

The image processing system is under protection of the copyright law.

DICOM compliance

The software of the image acquisition workstation complies with the DICOM protocol.

The wireless network transmission protocol complies with the TCP/IP communication protocols.

The storage medium uses the DICOM standard-compliant image format.

The data interface complies with the DICOM standard and TCP/IP communication protocols.

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Supported software and application software

Supported software installed on this equipment includes Oracle MySQL Community Edition and CodeMeter.

The application software TeamViewer has been installed on this equipment.

Third-party software

You can only use the third-party software approved by UIH. UIH will provide corresponding follow-up services only in the case of written agreement. If you use software without the approval of UIH, UIH will take no responsibility accordingly.

1.3 Personnel qualifications and training requirements

Personnel using the equipment must get familiar with basic knowledge about medical imaging and system operations, including the radiographic examination procedure, and basic principles and characteristics of imaging. Users must undergo strict training, read through this manual in detail, and observe local regulations so as to safely and effectively operate this system. User training must cover the basic technical knowledge of this system and system safety operations. Users must be familiar with potential dangers and safety guideline principles. In addition, users are required to read through and comprehend the content of the operator manual.

System operations performed by personnel not trained properly may result in equipment damage, personal injuries, missed diagnosis, or misdiagnosis.

- The accompanying documents of the system are the basic materials for training. Read these materials carefully before operation.
- Operators must receive related training, and read this manual regularly after installation.
- It is recommended to perform emergency situation simulation and take appropriate measures in the process of studying this manual.
- For information about how to use this equipment, contact UIH Service Center.

⚠ WARNING

Operation permissions

- Users who failed the training on how to safely and efficiently use the equipment are forbidden to operate the equipment. Having unqualified personnel operate this equipment may lead to system damage, personnel injuries, or misdiagnosis.
- This equipment can only be operated by properly trained personnel with required professional knowledge, such as trained physicians or technicians.

- Operators must have enough knowledge to operate different X-ray imaging and diagnosis equipment, to avoid physical injuries or equipment damage due to lack of knowledge.
- Service engineers must have enough knowledge to maintain the X-ray equipment and the equipment described in this manual. Service engineers can obtain such knowledge through a variety of educational ways in conformity with local laws and regulations, including specific training on this equipment.

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1.4 Terms, acronyms and abbreviations

1.4.1 Terms

Term	Description
X-ray tube current	Refers to the electron-beam current that strikes an X-ray tube target.
X-ray tube voltage	Refers to the potential difference between the anode and cathode of an X-ray tube. It is generally represented with peak kilovolt (kV).
X-ray tube assembly	Refers to a tube assembly composed of an X-ray fuel tank and a tube core.
Collimator	Refers to a device restricting the size of the radiation field.
Work mode	The work mode includes pulsed fluoroscopy, pulsed spot fluoroscopy, and digital radiography.
Imaging chain system	Consists of an emission source, a receiver, and auxiliary equipment on the ray path. The emission source can be a high voltage generator or X-ray tube assembly. The receiver is a digital FPD.
Ionization radiation	Composed of either or both of direct and indirect ionizing particles. Generally, ionization radiation does not include ultraviolet radiation.
Current-time product	Refers to the electricity quantity generated when an X-ray tube is loaded in medical radiology. It is equal to the product of the average of X-ray tube current (in milliampere) and the loading duration (in seconds) and is usually expressed in milliampere seconds (mAs).
Centering	The center of an X-ray beam is vertical to the center of the digital flat-panel detector.
Radiation protection	Refers to the requirements, measures, means, and methods used to protect human beings from ionization radiation or to minimize the hazards of ionization radiation.
High voltage generator	Refers to a combination of components that control and generate X-ray energy. It usually consists of the high voltage transformer assembly and controller assembly.
Inherent filtration	Refers to the equivalent filtration generated by irremovable substances that an X-ray beam passes through before being emitted from an X-ray tube - collimator assembly or its components.
Focus	Refers to a point on the anode on which electrons are focused.
Digital flat panel detector	Includes a photoconductor, which records incident X-rays and converts them into digital images.
Manual	Refers to human-driven gantry movement.
Auto	The motor-driven gantry moves to a specified location.
Auto brightness stabilization	Enables the system images to reach a certain brightness standard within the allowable time range by means of automatic adjustment of kV and mA.

1.4.2 Abbreviations

Abbreviation	Full name
DAP	Does Area Product
DICOM	Digital Imaging and Communications in Medicine
DR	Digital Radiography
FOV	Field of View
FPD	Flat Panel Detector
LIH	Last Image Hold
OP	Organ Program
PDU	Power Distribution Unit
RIS	Radiology Information System
SID	Source to Image Receptor Distance
SOD	Source to Object Distance

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2 Safety

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2.1 Safety signs and symbols

2.1.1 Definition of safety level

This manual involves four levels of safety warning signs:

Before operating this equipment, users must read through and get familiar with all safety information involved in this manual, strictly observe safety information marked with the words "Danger", "Warning", "Caution", and "Note", and keep in mind various safety measures to prevent safety accidents.

"Danger", "Warning", "Caution", and "Note" are defined as follows in laws and regulations:

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

"Warning": Failure to follow these instructions may cause death or serious injury.

"Caution": Failure to follow these instructions may cause moderate or minor personal injury or potential damage to the equipment or other properties.

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

This chapter mainly describes operation safety information about this equipment in the following format.

⚠ DANGER

Safety information - risk factors and possible results.

- Safety information - preventive measures.

⚠ WARNING

Safety information - risk factors and possible results.

- Safety information - preventive measures.

⚠ CAUTION

Safety information - risk factors and possible results.

- Safety information - preventive measures.

NOTICE

Safety notes to be observed.

2.1.2 Safety symbols and labels

Necessary warning safety symbols or signs should be permanently attached to the equipment or other appropriate areas. Ensure that the signs are highly legible.

NOTICE

- Necessary warnings and safety signs should be fastened properly and are highly legible. In addition, observe local regulations.
- Safety signs in the manual should be consistent with the labels attached to hardware equipment of the system.

Table 2-1 Instruction symbols

Icon	Description	Usage and position
	Refer to the instruction instructions (Mandatory requirements)	This symbol indicates that operators must refer to the operation instructions. ◆ Console surface of the C-arm trolley body ◆ Above the aviation plug of the C-arm trolley body
	Caution	This symbol indicates that operators must refer to accompanying documents. ◆ Back of the monitor cart

Table 2-2 Warning symbols

Icon	Description	Usage and position
	Caution	This symbol indicates a warning position. ◆ Close to the high-voltage part
	Warning, dangerous voltage	This symbol indicates there is hazardous voltage on the component. ◆ Close to the high-voltage part
	Warning, ionization radiation	This symbol indicates the existence of radiation on the equipment. ◆ Upper surface of the monoblock
	Warning, laser beam	This symbol indicates the existence of laser equipment. ◆ Near the laser
	Warning, crushing hazard: hand	This symbol indicates the position where hand is easily squeezed. ◆ Console surface of the C-arm trolley below the horizontal support arm of the C-arm ◆ Next to the orbital position limit
	Laser description	This symbol indicates a description of the laser beam in the laser equipment. ◆ Near the laser

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Table 2-3 Equipment category and description

Icon	Description	Usage and position
	WEEE directive Recycling trash can sign	This symbol indicates that the equipment contains materials that may endanger the environment once disposed improperly. ◆ Back of the monitor cart
	Electrical and electronic products 10 years of environment protection	This symbol indicates the service life of electronic products in the equipment. ◆ Middle area in the horizontal direction of the C-arm trolley

Table 2-4 Electronic and electrical safety

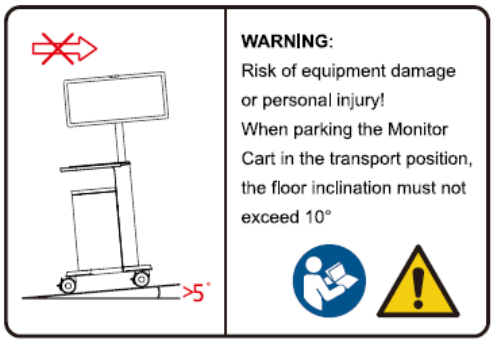
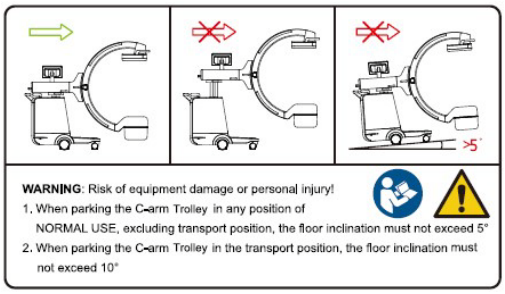
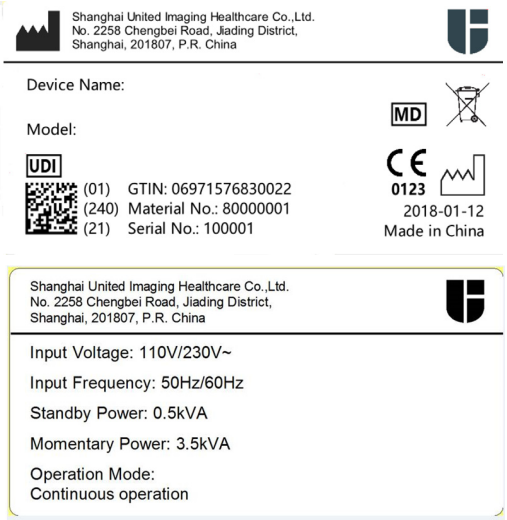
Icon	Description	Usage and position
	Equipotentiality	This symbol indicates an equipotential grounding cable connector. ◆ Near the equipotential pole of the C-arm trolley

Table 2-5 Positioning labels

Icon	Description	Usage and position
	◆	◆
	Auxiliary positioning	This symbol prompts users to perform positioning. ◆ Back of the detector

Table 2-6 Label

Icon	Description and position
	C-arm trolley weight ◆ One side of the C-arm trolley
	Type B applied part ◆ One side of the C-arm trolley

Icon	Description and position
	Displays cart transport location label ◆ On the top cover of the monitor cart
	C-arm trolley transport label ◆ C-arm horizontal support arm upper surface
	EU Representative Label ◆ One side of the C-arm trolley
For the U.S.A only 	System nameplate ◆ One side of the C-arm trolley

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2.2 Basic safety specifications

The operation safety of the equipment is maximized in the production design. Operators should strictly abide by all warning provisions, preventive measures, and operation instructions in this manual to prevent possible personal injuries and equipment damage arising from improper operations. In addition, users should be fully aware of potential safety hazards. Operators must strictly observe safety instructions in the manual when using this equipment.

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

Always abide by the following installation and operation instructions applicable to medical equipment:

- If the equipment encounters any electrical or mechanical fault, stop using it.
- This system can only be used with other equipment, components, assemblies, and spare parts provided and tested by UIH. In the event of failure, loss or personal injury caused by use of other equipment, components and assemblies that are not provided or tested by UIH, UIH will take no responsibility.
- If this equipment needs to be connected to other equipment, components or assemblies, but no available technical data shows that the equipment can be safely used with them, you must consult the manufacturer to ensure that the safety of patients, operators, or environment is not affected.
- This equipment needs to be correctly operated and routinely repaired and maintained, just as other technical equipment. For details, see "Cleaning and disinfection" on page 13-28.
  - No modification of this equipment is allowed.
  - UIH takes responsibility for the safety features of the product only when the repair, maintenance, and alternation are performed by UIH or the personnel expressly authorized by UIH.
  - UIH will take no responsibility for any faults, damage, or personal injuries incurred by the improper operation or maintenance of this equipment.
- If the equipment fails to work normally, be sure to contact UIH Customer Service Center.
- Do not remove or alter the hardware or software structure of the system in any way, unless there are relevant instructions in this manual.
- Do not touch a patient and the non-medical electrical equipment around the patient at the same time to prevent electric shocks. The non-medical electrical equipment includes the host and monitor of the image acquisition workstation, and barcode scanner.

2.3 Equipment classification

- According to the type of protection against electric shock: Class I equipment
- According to the degree of protection against electric shock: no applied part
- According to the degree of protection against ingress of water: equipment has no protection against ingress of water
- According to the degree of safety of application in the presence of flammable anaesthetic mixture with air or with oxygen or nitrous oxide: equipment not suitable for use in the presence of flammable anaesthetic mixture with air or with oxygen or nitrous oxide
- According to the mode of operation: continuous operation with intermittent loading

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2.4 Personal safety

Pay adequate attention to personal safety information to avoid personal injuries when using this equipment.

X-rays are potentially hazardous to human bodies. Radiologists or physicians can operate the equipment only after receiving training and getting an overall understanding of the functions, safety and emergency handling of the equipment. Before each examination, physicians or technicians must confirm the necessity of the examination, and take necessary protection measures to protect equipment operators and patients.

2.4.1 Radiation safety

This product meets the requirements of EU countries for radiation safety. Nevertheless, users should take necessary radiation protection measures to minimize the radiation dose received by operators and patients.

The unit is intended for procedures that may involve high skin doses when it is used as intended (mainly due to the long examination times), which presents a risk of radiation injury.

Therefore observe the following important notes in order to keep the dose absorbed by the patient as low as possible.

2.4.1.1 Routine protection

Time protection

The longer the radiation duration is, the greater the accumulated absorbed dose will be. Therefore, reduce the exposure time as much as possible. All personnel should minimize the duration at irradiated sites. Operators should confirm exposure conditions prior to exposure to avoid repeated exposure.

Distance protection

X-ray exposure is inversely proportional to the square of the distance to the X-ray source. If the distance between a person and the X-ray source (focus) doubles, the exposure intensity is reduced to one quarter of the original value. Therefore, keep all personnel (except patients) away from the X-ray source as much as possible during exposure. Increase the distance between the focus and skin during examination under the premise of meeting image quality requirements.

Shielding protection

Time protection and distance protection are subject to certain restrictions during X-ray diagnosis or treatment. A more effective measure is shielding protection. Users are responsible for protecting patients from unnecessary radiation and should pay special attention to gonads of adults. If a patient needs to be accompanied during scan, safety measures must be taken to shield radiation for the accompanying person. Lead shielding is an efficient method. To reduce radiation exposure, users can use lead s, lead rubber gloves, lead rubber aprons, lead glasses, lead shielding chairs, and lead protection vehi-

cles. Radiation protection walls can be also used to reduce radiation. For personal safety, system operators must abide by radiation protection specifications.

2.4.1.2 Protection suggestions

⚠ CAUTION

Radiation protection

- Before each X-ray exposure, be sure to take all necessary measures to protect against radiation.

Radiation protection for patients

To reduce or avoid excessive radiation exposure to patients in the operation room, observe related radiation protection regulations:

- To protect patients from radiation hazards, use other radiation protection accessories in addition to the existing devices of the system, such as the collimator.
- Use gonad shielding plates or lead-lined rubber hoods to protect patients' gonads from radiation during image acquisition.
- Always keep the distance between the X-ray source and the skin as long as possible, to reduce the dose absorbed through the skin of patients.
- Keep the examination time as short as possible to reduce the total radiation dose absorbed by patients and operators.
- Put the ROI close to the flat panel detector as much as possible to reduce the scattered radiation and optimize the image quality.
- Do not put any irrelevant object on the exposure path between a patient and the flat panel detector. Otherwise, the image quality is reduced and the dose of radiation exposed to patients is increased.
- Do not remove or alter any safety circuit that prevents the accidental triggering of X-rays.

Radiation protection for operators

To reduce or avoid excessive radiation to operators, observe related radiation protection regulations:

- Avoid direct exposure to X-ray beams during working. If this is unavoidable, take proper protective measures.
- If you need to stay in the operation room during the examination, wear protective clothing and gloves.
- Use lasers to reduce unnecessary radiation caused by incorrect position.
- Remove grids to reduce the radiation dose when thin body parts (such as limbs) of adults are irradiated.

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- Use a collimator to reduce the radiation dose.

2.4.1.3 Effective occupancy area

All examination types may be performed in the illustrated operating areas of the X-ray system.

Monoblock at vertical position

When monoblock is placed at vertical position, the effective occupancy area of this system is illustrated below.

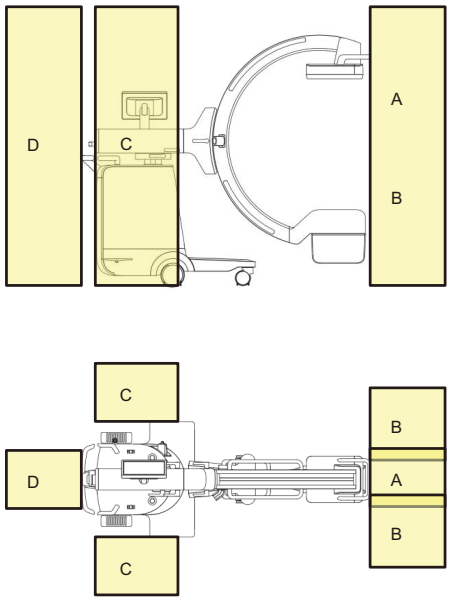


Figure 2-1 Effective occupancy area (Vertical)

Maximum scatter radiation in operating area

Scatter radiation in the main operating area according to EN 60601-1-3.

- Measurement A: Operating area A

Fluoroscopy 110 kV, 3.0 mA continuous, 18 cm x 18 cm at the entrance of image receptor; C-arm vertical, X-ray tube position down, with scattered radiation grid

- Measurement B: Operating area B

Fluoroscopy 110 kV, 3.0 mA continuous, 18 cm x 18 cm at the entrance of image receptor; C-arm vertical, X-ray tube position down, with scattered radiation grid

- Measurement C: Operating area C

Fluoroscopy 110 kV, 3.0 mA continuous, 18 cm x 18 cm at the entrance of image receptor; C-arm vertical, X-ray tube position down, with scattered radiation grid

- Measurement D: Operating area D

Fluoroscopy 110 kV, 3.0 mA continuous, 18 cm x 18 cm at the entrance of image receptor; C-arm vertical, X-ray tube position down, with scattered radiation grid

Table 2-7 Sheet of scatter radiation (Vertical)

Hight above the floor (cm)	Measure A (mGy/h)	Measure B (mGy/h)	Measure C (mGy/h)	Measure D (mGy/h)
10	0.18	0.27	0.064	0.002
20	0.20	0.26	0.066	0.002
30	0.23	0.28	0.061	0.002
40	0.22	0.28	0.061	0.003
50	0.22	0.27	0.058	0.003
60	0.20	0.23	0.056	0.003
70	0.19	0.20	0.055	0.003
80	0.31	0.29	0.059	0.004
90	0.48	0.42	0.070	0.003
100	0.58	0.54	0.096	0.004
110	0.64	0.58	0.110	0.003
120	0.67	0.60	0.120	0.003
130	0.67	0.60	0.130	0.005
140	0.62	0.59	0.140	0.005
150	0.57	0.58	0.150	0.004
160	0.53	0.53	0.150	0.005
170	0.48	0.48	0.160	0.005
180	0.43	0.43	0.160	0.007
190	0.39	0.38	0.140	0.015
200	0.34	0.34	0.140	0.015

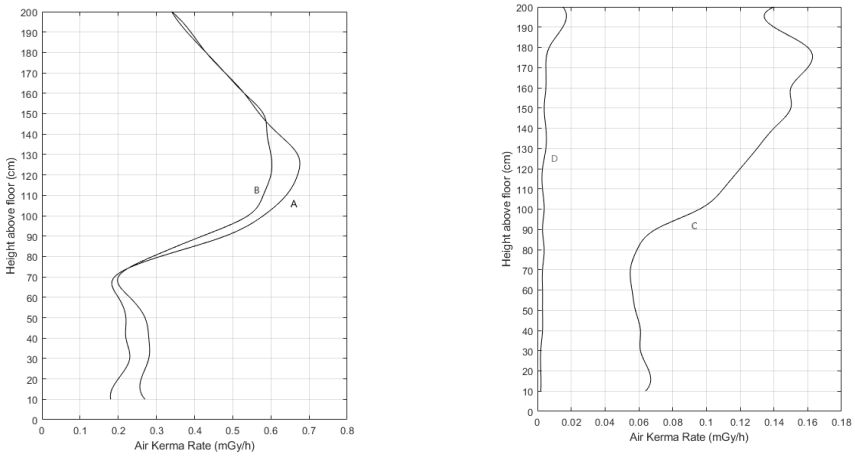


Figure 2-2 Line chart of scatter radiation (Vertical)

Monoblock at horizontal position

When monoblock is placed at horizontal position, the effective occupancy area of this system is illustrated below.

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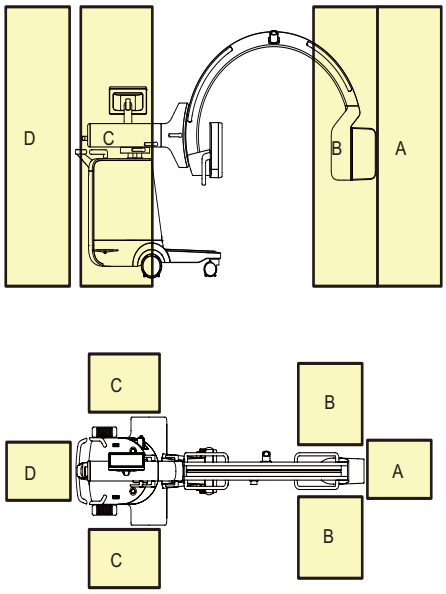


Figure 2-3 Effective occupancy area (Horizontal)

Maximum scatter radiation in operating area

Scatter radiation in the main operating area according to EN 60601-1-3.

- Measurement A: Operating area A

Fluoroscopy 110 kV, 3.0 mA continuous, 18 cm x 18 cm at the entrance of image receptor; C-arm horizontal, detector position lateral 90°, with scattered radiation grid

- Measurement B: Operating area B

Fluoroscopy 110 kV, 3.0 mA continuous, 18 cm x 18 cm at the entrance of image receptor; C-arm horizontal, detector position lateral 90°, with scattered radiation grid

- Measurement C: Operating area C

Fluoroscopy 110 kV, 3.0 mA continuous, 18 cm x 18 cm at the entrance of image receptor; C-arm horizontal, detector position lateral 90°, with scattered radiation grid

- Measurement D: Operating area D

Fluoroscopy 110 kV, 3.0 mA continuous, 18 cm x 18 cm at the entrance of image receptor; C-arm horizontal, detector position lateral 90°, with scattered radiation grid

Table 2-8 Sheet of scatter radiation (horizontal)

Hight above the floor (cm)	Measure A (mGy/h)	Measure B (mGy/h)	Measure C (mGy/h)	Measure A (mGy/h)
10	0.280	0.33	0.060	0.003
20	0.280	0.42	0.060	0.003
30	0.190	0.47	0.070	0.002
40	0.047	0.55	0.080	0.002
50	0.022	0.68	0.080	0.003
60	0.022	0.63	0.080	0.002
70	0.021	0.68	0.090	0.003

Hight above the floor (cm)	Measure A (mGy/h)	Measure B (mGy/h)	Measure C (mGy/h)	Measure A (mGy/h)
80	0.020	0.68	0.095	0.003
90	0.020	0.67	0.110	0.003
100	0.021	0.62	0.110	0.003
110	0.031	0.58	0.120	0.004
120	0.027	0.54	0.120	0.004
130	0.026	0.47	0.120	0.003
140	0.026	0.41	0.120	0.003
150	0.050	0.36	0.120	0.003
160	0.056	0.30	0.120	0.004
170	0.054	0.26	0.110	0.005
180	0.054	0.21	0.110	0.006
190	0.047	0.18	0.098	0.007
200	0.045	0.16	0.094	0.100

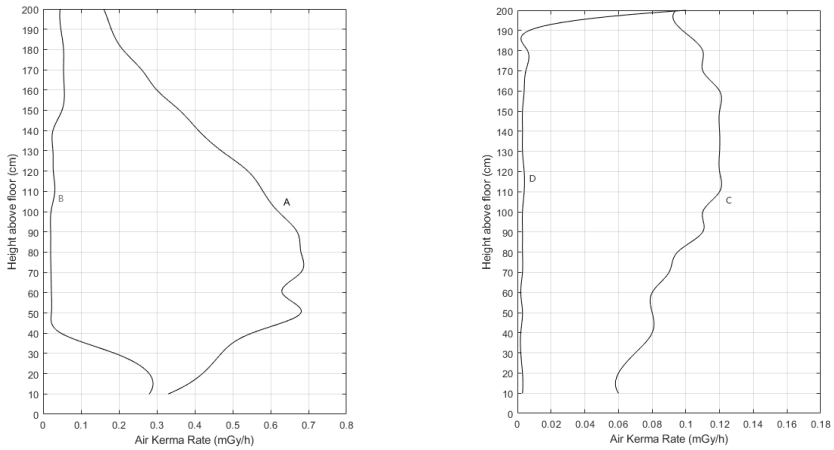


Figure 2-4 Line chart of scatter radiation (horizontal)

2.4.1.4 Radiation intensity distribution

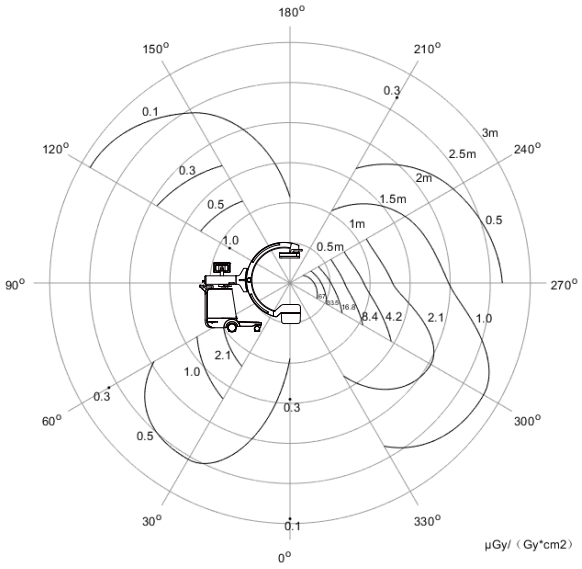
Test conditions:

- Radiation beams are horizontal or vertical.
- SID = 1075 mm.
- 25 cm × 25 cm × 25 cm. The PMMA is distributed symmetrically around the center of radiation beams. The PMMA surface is located at the patient reference point position.
- The size of the PMMA surface radiation field is 10 cm × 10 cm.
- The height of the drawn curves is 100 cm from the ground.
- Scattered ray distribution curves are measured under the 110 kV/5 mA continuous fluoroscopy conditions and the unit is μGy / (Gy cm²).

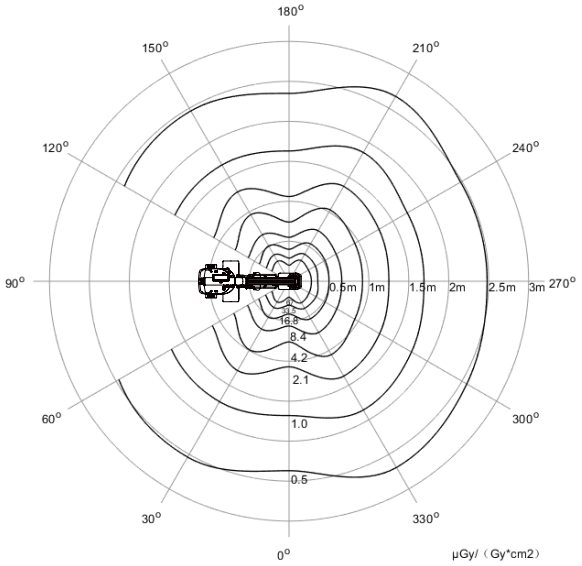
Radiation intensity distribution curves:

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- The height from the ground is 100 cm and X-ray beams are horizontal.



- The height from the ground is 100 cm and X-ray beams are vertical.



2.4.1.5 Residual radiation

- Loading factor: 110 kV, 17.5 mA
- Test area: 1 cm from the back of the FPD

No.	Radiation dose (?Gy/h)
1	3.571
2	4.112
3	6.402
4	8.938

No.	Radiation dose (?Gy/h)
5	3.951
6	2.669
7	5.528
8	3.884
9	6.618

2.4.2 Laser safety

This equipment is equipped with laser positioning lights for auxiliary positioning and fast positioning.

Do not look into the laser beam without eye protection. Otherwise, eye injuries may be incurred.



Complies with FDA performance standards for laser products except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007

Figure 2-5 Laser label

2.4.3 Electrical safety

This system is isolated from supply mains during normal operation. However, you shall pay attention to the cable wear or breakage to avoid electronic leakage.

⚠WARNING

Severe cable wear or breakage can cause electric leakage.

- Avoid cable wear, twisting, and excessive bending when handling or moving system components during use.

If a cable is pulled or twisted, or the cable surface is damaged during the system motion, stop using the system immediately and contact UIH Customer Service Center.

⚠WARNING

To avoid the risk of electric shock, this equipment must only be connected to a supply mains with protective earth.

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⚠ WARNING

Do not connect other electrical equipment or electrical equipment to the system.

2.4.4 Fire safety

The fire in or around the system may lead to great property damage, and result in burn, crash, and gaseous poisoning of patients and operators.

- Electrical equipment and cables on fire may be charged when the electrical equipment catches fire. In this case, cut off power immediately to prevent fire spread and electric shocks during fire extinction.
- Ensure that fire extinguishers are easily accessible, and operators are skilled in using them.
- Ensure that the physicians and patients are clear about the escape path.
- Fire protection safety facilities should be designed in the planning or building of the equipment room.

Fire extinguishing agent

If the system cannot be shut down for a special reason or the power supply cannot be cut off due to other needs, operators must select a non-conductive extinguishing agent to quench fire while the power is on, for example:

- Carbon dioxide fire extinguisher
- 1211 fire extinguisher
- Difluoro dibromomethane fire extinguisher

⚠ WARNING

Hazard of electric shocks

- It is prohibited to put out fire with water when the power is not cut off. Otherwise, there will be a risk of electric shocks.

2.4.5 Explosion safety

⚠ WARNING

Explosion hazard

- Do not use this system in an area with explosion risk.

Detergent and disinfectant (including those used on the patient's body) may generate explosive gas mixtures. Therefore, observe related safety regulations and refer to "Cleaning and disinfection" on page 13-28.

If flammable and explosive gases leak when the equipment is used, it is recommended to perform the following operations:

- Take effective measures to prevent gases from contacting the equipment.
- Do not shut down the system or remove the power plug. Do not operate the equipment.
- Evacuate related personnel and enhance ventilation.
- Do not use any electric doors or windows.
- Contact the local fire department when necessary.

2.4.6 Emergency handling

⚠ CAUTION

Due to complexity of the system, it cannot be avoided that the system is unavailable due to the abnormal power supply, the wearing part (such as X-ray tube) comes to the end of service life, the part accidental damage, system failure or external interference.

If an arising emergency endangers the safety of patients, such as the electrical movement cannot stop normally, the operators of the system shall press the nearest emergency stop button immediately.

NOTICE

Check the function of emergency stop buttons regularly to ensure that the emergency stop function works properly.

2.4.6.1 Function of the emergency stop buttons

- After an emergency stop button is pressed, the system stops the vertical motion and X-ray radiation.
- After the emergency stop button is rotated clockwise to release the button, the vertical motion and X-ray radiation of the system become normal.

2.4.6.2 Positions of the emergency stop buttons

Emergency stop buttons are located on the panel of the C-arm trolley.

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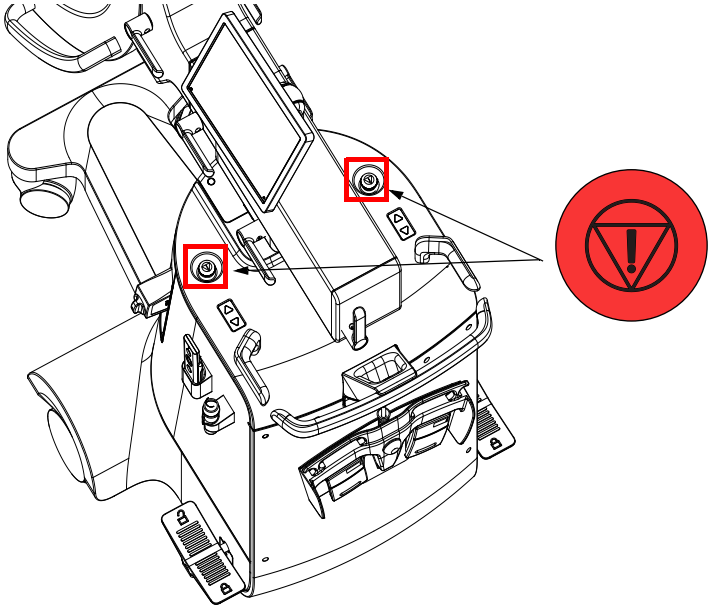


Figure 2-6 Positions of the emergency stop buttons

2.5 System safety

2.5.1 Mechanical safety

2.5.1.1 Motion safety

When system components are operated manually or automatically, pay attention to the manual and electric motion speeds to prevent collision, personal injuries, and system damage.

Prevent collision when the system is transferred for a short distance.

- System components can ascend, descend, rotate and move. Ensure that you and any third party are out of the scope of the system motion path before operating the system.
- System components can be moved only when their motion will not pose a hazard to patients, operators, or any third party and there is no obstacle on their moving paths.

2.5.1.2 Patient positioning safety

Armrests are mainly used for correct patient positioning. Use armrests for patient positioning and pay attention to the position of labels indicating the risk of pinching hands.

Prevent patient crushing during patient positioning.

- Pay attention to the risk of collision between moving components and surrounding fixed objects.
- Before moving system components, ensure that patients do not touch the system.

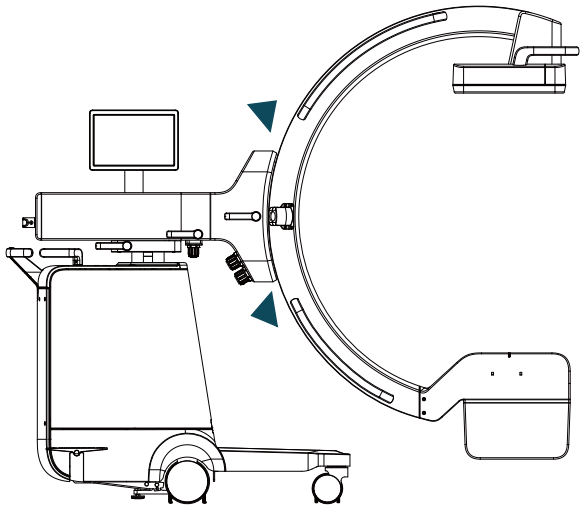


Figure 2-7 Potentially dangerous crushing and collision areas

2.5.2 Electromagnetic compatibility

- This system has been certified in accordance with the EU medical equipment electromagnetic compatibility standard.
- This system is safe to other equipment in electromagnetic compatibility.

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- According to the design, electronic equipment that meets electromagnetic compatibility requirements will not fail due to electromagnetic interference under normal operating conditions. However, if a high-frequency transmitter with high transmit power transmits radio signals near the equipment, there is a possibility that electromagnetic incompatibility may be incurred.
- Though this system complies with electromagnetic compatibility standard, if some high-frequency transmitters such as mobile phones or similar radio devices are used near the equipment, the radio signals generated from such devices may still affect the normal running of the system. Therefore, it is better not to use such radio devices near this equipment to eliminate possible interference.
- Under normal working conditions, interference generated by the system to other equipment or power grid does not exceed the specified value required in the standard.

⚠ WARNING

Electromagnetic compatibility

- It is not recommended to use other electronic devices within the specified operation area.

2.5.3 Equipment compatibility

The system described in this manual should not be used in combination with or replaced with other third-party software or devices without permission.

The use of any third-party accessory or assembly may degrade the product performance and security. Use a third-party accessory and assembly approved by UIH. When a third-party accessory or assembly is used on this equipment, UIH cannot guarantee the following two aspects:

- Performance, safety, and reliability of the third-party accessory and assembly.
- Potential risk to the human body and system.

UIH will take responsibility for the product only when the repair, maintenance, and alteration are performed by UIH or personnel officially authorized by UIH. UIH will not assume any responsibilities for the system safety, reliability, and any other features in the event of the following cases:

- Incorrect operation, improper maintenance, and infringing alterations caused by the failure to strictly observe this manual.
- Use of a third-party accessory or assembly without the official authorization of UIH.

⚠ WARNING

Hardware compatibility

- Any non-original assembly may result in the low quality image, incomplete image or even the wrong image, which will impact the diagnosis.

⚠ WARNING

Do not connect unauthorized assemblies to the system.

⚠ WARNING

Preventive measures

- When adding a function or altering the loaded configuration, ensure that all necessary preventive measures having current safety level are taken into full consideration.

⚠ WARNING

If the equipment needs to be altered, it is necessary to perform inspection and testing to ensure that the equipment can be used continuously and safely.

⚠ WARNING

Counterfeit software and hardware

- Using counterfeit software or hardware may lead to system failures and impose a threat to patients or the equipment.
- UIH will take no responsibility for the use of hardware and software not approved by UIH.

Signal input/output interface

Only equipment authorized by UIH can be connected to this system to ensure the operation safety of the system.

Equipment connected to this equipment through interfaces must pass relevant standard certification, for example:

- Information technology equipment must pass the IEC 60950 certification.
- Medical electrical equipment must pass the IEC 60601-1 certification.

2.5.4 Operation safety

2.5.4.1 Installation and network safety

The software installation and upgrade must be completed by UIH service engineers or engineers officially authorized by UIH.

The system can monitor the network status in case of network failures.

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⚠ WARNING

- When the host is connected to an external network or external medium, you should take information protection measures in advance to prevent data loss or attacks on the system.
- The unauthorized copying/installation of software is prohibited.
- It is prohibited for users to change the system settings without permission, for example, firewall.

⚠ CAUTION

System exception

- This equipment has certain requirements for system configuration. Therefore, installing the equipment on a public or personal computer may result in inadequate system performance and the failure of the system to work properly. For more details on configuration, see "Configuration performance" on page 15-22.
- If third-party software is used or the equipment is connected to an external network without the approval of UIH, a system exception may occur and the system may fail to work properly.
- Unauthorized operation, unauthorized alternation to a software/hardware system, or connection to a security-unauthenticated network system may damage the system.

- After installation and testing, users need to keep their login accounts and passwords confidential and change their passwords as required regularly.
- One or more backups must be kept for restoring the system (including the operating system and installation package) for system recovery.
- By default, windows firewall is enabled for LAN, home or job network at all time. If the firewall needs to be modified or disabled, contact UIH Customer Service Center.
- After installation, users need to regularly view license information to ensure its effectiveness. From 30 days before the expiration of the license, the system will pop up a warning prompt to remind users to renew the license. If the license needs to be renewed or the license information shows an exception, contact the UIH Customer Service Center in a timely manner.

⚠ WARNING

This equipment can be connected to the RIS, PACS, or other hospital information systems through a hospital's LAN. Do not connect it to the Internet directly.

2.5.4.2 Antivirus protection

The built-in Microsoft Security Essential (MSE) of this equipment can prevent malicious intrusion and protect data security.

When a computer is connected to a network system without security certification, the computer may be at the risk of being compromised by computer viruses or other destructive software. This system utilizes the MSE to prevent virus infection.

The anti-virus software runs by default to monitor and ensure the system security. It is recommended to check and remove viruses throughout the equipment regularly. UIH, based on the risk level evaluation, upgrades the system by using anti-virus security patches.

- MSE takes a series of measures to protect data security and prevent malicious intrusion of computer viruses.
- MSE can be configured to periodically scan files and data of the operating system and medical imaging post-processing system, in an effort to find and remove viruses.
- UIH customer service engineers can configure virus scanning policies based on service conditions.
- Data communication can be performed only through the defined methods. All unnecessary ports or channels are locked.
  - MSE performs virus detection on data transmitted to the medical imaging post-processing system.
  - MSE automatically scans and detects the USB flash drive inserted into the USB interface of the system.
  - MSE performs virus detection when you insert a USB flash drive into the system. If a virus is detected, a window pops up.
- MSE performs regularly scheduled scanning based on actual conditions of users. The system operation may be slightly slower during scanning and virus removal, but the normal operation of the system is not affected.
- The virus library needs to be upgraded in order to deal with new viruses. If the library is not updated regularly, MSE may be unable to find and prevent certain new types of viruses. UIH customer service engineers can help upgrade the virus library based on user requirements. Generally, it is not recommended that you upgrade the virus library by yourself. The virus library upgrade that does not pass strict testing may result in unpredictable problems and invalidate the product.

⚠ WARNING

This equipment is equipped with antivirus software. Users need to regularly check whether the antivirus software works properly. If not, contact UIH Customer Service Center.

2.5.5 Data security

Before the examination, confirm patient information (such as the name, age, height, and weight) and examination information (such as admission No. and study protocol) to ensure that correct information is acquired.

It is recommended to anonymously archive data to protect patient privacy.

To ensure the system and data security, you can disable the function of archiving data to USB flash drives or disable the USB interface of the host.

To ensure normal and safe operation of the system, do not install any software not authorized by UIH on the image acquisition workstation. Do not connect the equipment to a security-unauthenticated network.

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Back up and store various data in the system periodically. The system automatically monitors the available space of the disk and gives a warning when the available space reaches the threshold. Users need to archive data such as image and patient information to PACS, mobile storage device or CD/DVD, and clear the memory regularly to ensure the smooth examination. The user data backup must be performed before system upgrade.

When a failure occurs in the communication between the system and an external network, the system can still operate normally. In case of network disconnection when the system is communicating with another device, reconnect the device and re-perform the relevant data communications after the network recovery.

⚠ WARNING

This equipment provides a secure network transmission mode supporting information confidentiality (such as VPN) for remote service. The remote service may only be enabled with local user's confirmation.

NOTICE

Personal data is within the range of data protection. Please comply with the relevant laws and regulations.

⚠ CAUTION

Data loss

- Unsaved data or information may be lost when an unexpected power interruption occurs.
- If the power or electricity is interrupted unexpectedly during system operation, images and system data may be lost.
- If an unexpected power interruption occurs on the system without an UPS, images and system data may be lost.
- Prevent the computer from being stolen, otherwise the patient data is lost.

⚠ CAUTION

Network connection

- Connecting the system to an unknown network is in violation of authorized access, which may result in the risk of data leakage.
- When adding functions or modifying the current configuration, ensure that all necessary preventive measures are taken for the network security of the current level.

2.5.6 Cyber security administration

Technology and management measures are formulated and taken for the products (system) declared to ensure system secure and data secure. Only the authorized user can operate the system and get access to the protected data. The cyber security administrator shall be assigned to mange cyber security related function.

The integral cyber security strategies of products are as shown in the figure below, and specific measures include:

- Access control: The system provide access control function which can be enable in service software. The user can log in using the preset user name and password to view the data information in corresponding permission groups respectively, and perform the required operations., there are three default user groups which have different permission. The cyber administrator shall mange the permission of the different user groups. See "Basic operations" on page 5-14. The cyber security administrator is responsible for access control which is to manage the user groups and their permissions.
- Firewall: The system provides windows firewall which is enabled for LAN, home or job network at all time.
- Anti-virus software: see "Antivirus protection" on page 2-22.

2.5.7 Transportation protection

Before transportation, cut off the power of the equipment and then pack it. Make sure that the equipment is disconnected from all connected peripheral components of the system (including the monitor, mouse, keyboard, and cable), to ensure equipment safety during transportation.

Ensure that packing cases and the equipment/equipment components in the packing cases are fastened reliably during transportation, to avoid damaging the objects inside.

NOTICE
To ensure personal safety, wear proper safety articles such as safety shoes and protective gloves during unpacking and equipment installation.

2.5.8 Installation, maintenance and parts replacement safety

The installation, maintenance and parts replacement must be performed by trained and qualified personnel. The system maintenance and repair record shall be kept.

⚠WARNING
The electric shock may happen during installation, maintenance and repair of the system, which may lead to death or serious personnel injury. ◆ Make sure cut off the power during installation, maintenance and repair. ◆ Make sure the system grounding is correct before system power on. ◆ Do not connect mobile multiperture socket or extend cable to the system. ◆ Even the system power is cut off, the high voltage generator still have voltage. Wait for at least 5 minutes before system cleaning, disinfection and repair,

During parts replacement, UIH customer service engineer shall pay attention to the following:

- During replacement of FPD, MBK or collimator, the C-arm must be locked.

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- After replacement of MBK, the hot surface label must be pasted to the MBK.
- After replacement of MBK, the high voltage generator must be calibrated.
- The UIH customer service engineer shall make sure the MBK align with the FAP during periodic maintenance or parts replacement of MBK, FPD or collimator.

During periodic maintenance, UIH customer service engineer shall pay attention to the following:

- Check if any oil leak or damage of MBK, and check if the grounding cable is loosen and if th cable is damaged.
- Check and maintain the cable interface of high voltage cable and PDU regularly, to make sure there is no loosen, damage or fall off of cable interface.
- Check and maintain the movement parts, to avoid loud noise during system movement.
- Check and maintain the major heat dissipation device regularly, to avoid blocking the heat dissipation.
- Check and maintain the fasteners, to avoid possible malfunction. Especially the fasteners for C-arm, MBK, collimator, FPD.
- Check and maintain the mechanical transmission components such as pulley, bearing or chain.

During installation, maintenance and replacement, UIH customer service engineer shall pay attention to the following:

- Arrange the sequence of C-arm assembly, and use the assembly tools to protect the C-arm from falling.
- Use corresponding tools for installation, maintenance or replacement.
- Use corresponding torqued wrench.

2.6 Environmental safety

This system will not endanger people or the environment when it is used correctly.

2.6.1 Risks of radioactive waste disposal

Related components of the system must be recycled according to local laws and regulations, or properly disposed by authorized personnel by using the method of the local waste collection stations. Do not dispose of X-ray equipment as general industrial or household wastes.

⚠ WARNING

Hazardous substance leakage due to damage of the flat panel detector can cause environmental pollution.

- If a flat panel detector is damaged, stop using it immediately and check whether particles leak. If yes, collect leaked particles and put them in sealed containers for storage. Contact UIH Service Center and transfer the leaked particles to UIH for handling.

2.6.2 Disposal of biohazardous wastes from patients

Related personnel should dispose of medical wastes inside hospitals that are physically and chemically hazardous to people or animals and environments. Such wastes include radioactive wastes and corrosive liquid. Highly infectious medical wastes should be disinfected properly and then eliminated thoroughly. For details, see relevant laws and hospital regulations to avoid damages to the environment.

2.6.3 Battery safety and recycling

The specific power supply or battery charger used for this equipment needs to comply with related national and regional safety standards.

Install, use and maintain the batteries and rechargeable batteries according to this manual.

Batteries and rechargeable batteries with lifecycle expired must be recycled in accordance with relevant national and regional laws and regulations.

⚠ WARNING

Battery leakage, equipment damage!

- When the equipment is not used for long, take out the batteries to avoid the risk of liquid leakage.

Replace batteries regularly to ensure operation safety.

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Handle old batteries properly in an environmentally-friendly manner, for example, put them to a battery recycling bin.

NOTICE
If the equipment using batteries is not used for a period of time, take out the batteries.

2.6.4 Product disposal

The service life of the equipment is 10 years. Conduct daily maintenance on the system in accordance with this manual. If the operation period is much longer than the service life and normal operation frequency, you may need to conduct extra checks and repair in addition to daily maintenance. Inform UIH Customer Service Center in advance when necessary.

Medical equipment is a type of special product. After the product reaches its service life, it needs to be recycled and disposed in accordance with local laws and regulations. Users should contact UIH Customer Service Center for recycling after the product lifecycle expires. Handle harmful substances in an appropriate manner.

2.6.4.1 Disassembly and recycling

After the lifecycle of the product expires, if necessary, contact UIH Customer Service Center to handle the disassembly and recycling, or ask a qualified supplier for handling in accordance with local laws and regulations.

⚠ CAUTION
◆ Do not deliver damaged X-ray tube assemblies via postal services. Do not abandon X-ray tubes to the industrial or household waste. ◆ The X-ray tube sleeve of the system may contain beryllium and must be handled through appropriate channels. ◆ The system gantry has lead shielding material and must be handled through appropriate channels.

Do not dispose of this system together with general industrial or household waste. The X-ray tube contains potentially hazardous substances. Users are prohibited to disassemble it.

UIH allows you to dispose of this system in an appropriate way:

- A certified waste disposal company recycles reusable components to help reduce environmental pollution.
- The repair or return of the system equipment should be handled in strict accordance with relevant laws and regulations. If you have any questions, contact UIH Customer Service Center.
- For the sake of environmental safety, UIH requests that components replaced during maintenance should be recycled.

- UIH undertakes to protect the environment and natural resources, and encourages customers to dispose of this product in accordance with national laws and local regulations after the product lifecycle expires.

2.6.4.2 Other preventive measures

The repair or return of the system equipment should be handled in strict accordance with relevant laws and regulations. If you have any questions, contact UIH Customer Service Center. If any preventive measure conflicts with hospital regulations, the hospital regulations shall prevail.

The reuse of transportation packages should be considered in the design, in order to protect the environment and save resources.

Reusable parts of transportation packages should be recorded during actual product use.

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2.7 Compliance statement

This system complies with the requirements of the following standards and the regulations:

- Code of Federal Regulations, Title 21,Part 820-Quality System Regulation
- Code of Federal Regulations, Title 21,Sub chapter J-Radiological Health
- IEC 60601-1: General requirement for safety
- IEC 60601-1-3: General requirements for basic safety and essential performance- Collateral Standard: Radiation Protection in diagnostic X-ray Equipment
- IEC 60601-1-6: General requirements for basic safety and essential performance - Collateral standard: Usability
- IEC 60601-2-28: Particular requirements for the basic safety and essential performance of X-ray tube assemblies for medical diagnosis
- IEC 60601-2-43: Particular requirements for the safety and essential performance of X-ray equipment for interventional procedures
- IEC 60601-2-54: Particular requirements for the basic safety and essential performance of X-ray equipment for radiography and radioscopy
- IEC 62304 Medical device software - Software life cycle processes
- IEC 60601-1-2: General requirements for basic safety and essential performance - Collateral Standard: Electromagnetic disturbances - Requirements and tests
- US Federal Performance standard 21CFR 1020.30; 21CFR 1020.31; 21CFR 1020.32

2.8 Service life

The system service life is 10 years.

After the end of the service life, the system shall be disposed according to the related regulation and laws. If any question, please contact UIH Customer Service Center.

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3 Equipment overview

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3.1 System structure

The system consists of a C-arm trolley and a monitor cart. The following figure shows the structure of the system.

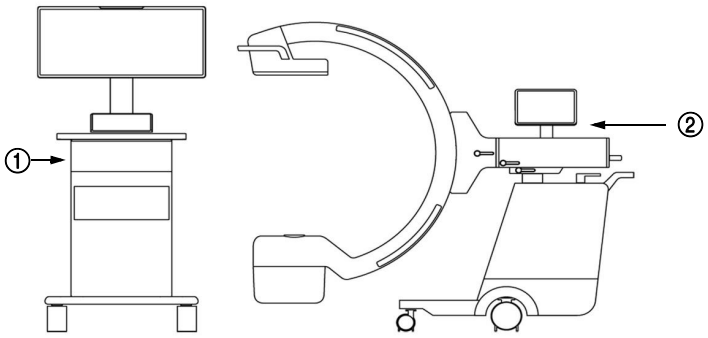


Figure 3-1 System components

1. Monitor cart
2. C-arm trolley

Monitor cart

The monitor cart is used for image display and processing.

The monitor cart is composed of a monitor, an X-ray radiation indicator, monitor, monitor cart touch panel, a work station, a power distribution unit, an uninterruptible power supply (optional), and the cart body.

C-arm trolley

The C-arm trolley is used for positioning and image acquisition.

The C-arm trolley is composed of a C-arm, an monoblock, a high-voltage generator, a grid, a collimator, a flat panel detector, a C-arm control panel, a C-arm trolley body, and other main parts.

3.2 C-arm trolley

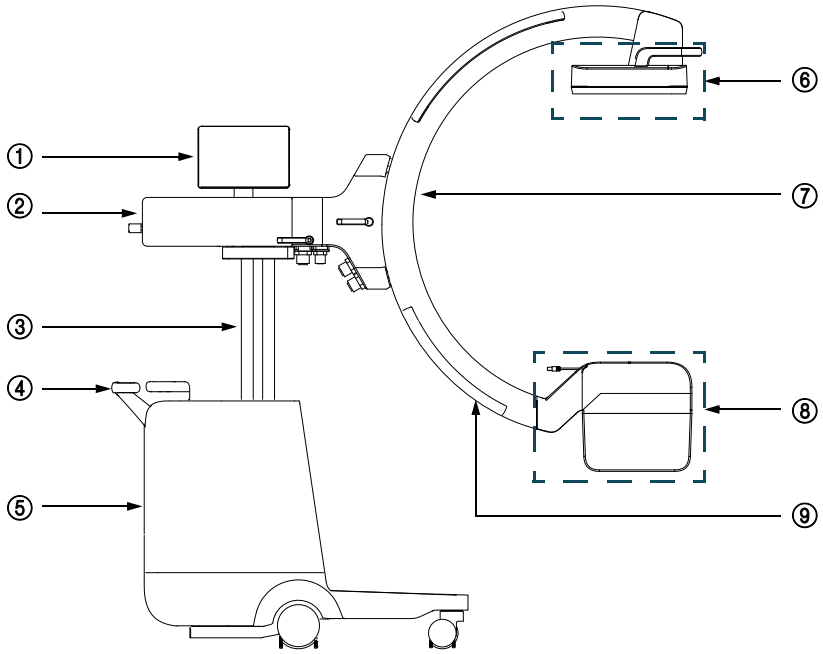


Figure 3-2 Structure of the C-arm trolley

No.	Name	Description
1	C-arm control panel	Allows setting study parameters, confirming the exposure state, and performing image post-processing.
2	C-arm horizontal support arm	Supports the C-arm.
3	Lifting column	Supports the vertical motion of the C-arm.
4	C-arm trolley armrest	Assists operators in moving the C-arm trolley.
5	C-arm trolley body	Supports the motion of the C-arm trolley.
6	Flat panel detector	Receives and converts X-rays into image signals.
7	C-arm	Assist patients with positioning.
8	Monoblock	Integrates the X-ray tube and part of the high-voltage generator to generate X-rays.
9	C-arm handle	Assists operators in moving the C-arm for positioning.

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NOTICE
The C-arm handle can bear the weight of 15 kg. Users should avoid supporting their own weight on the handle or hanging on the handle.

3.2.1 Control console of the C-arm trolley

The control console of the C-arm trolley has motion control buttons and an emergency stop button.

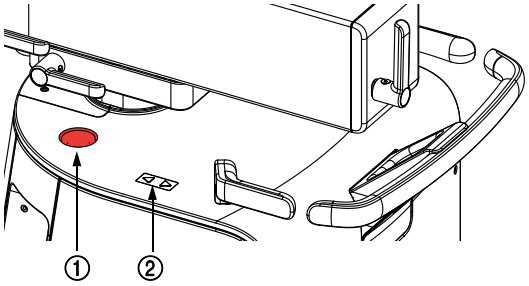


Figure 3-3 Control console of the C-arm trolley

No.	Name	Description
1	Emergency stop button	Handles emergencies. ◆ The system stops the vertical motion and X-ray radiation immediately after this button is pressed.
2	Vertical control buttons	Controls the vertical motion of the C-arm.

3.2.2 C-arm control panel

The control panel is a 12-inch touch panel.

The C-arm control panel displays real-time images and the system status displayed on the real-time screen, allows setting exam parameters, and performs image post-processing. Operators can wear sterile gloves to operate the control panel or the control panel can be placed in a sterile cover. The specification of control panel see "Control panel" on page 15-19.

3.2.3 Interface of the C-arm control panel

Operation controls on the C-arm control panel can be used to enter patient information, set exam parameters, and perform other operations.

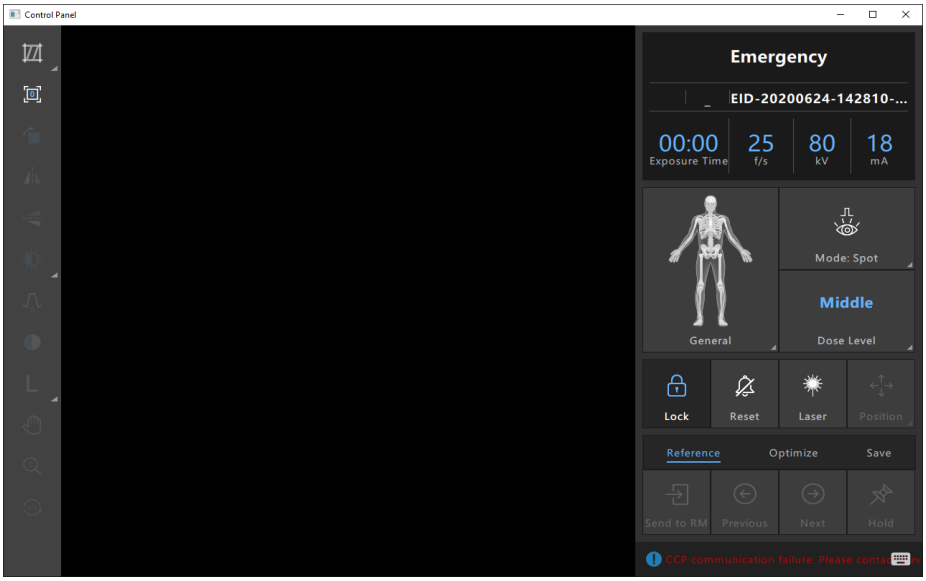


Figure 3-4 Interface of the C-arm control panel

Operation of C-arm control panel see "Control panel" on page 10-4.

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3.3 Monitor cart

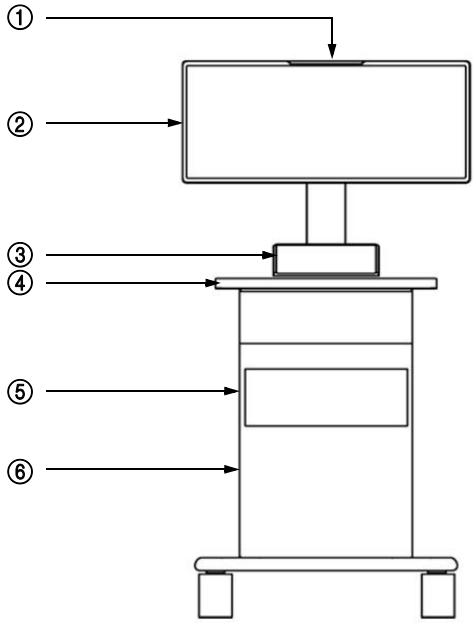


Figure 3-5 Structure of the monitor cart

No.	Name	Description
1	Radiation indicator	Displays the X-ray radiation status of the system by using different colors, to prompt operators to perform operations accordingly. ◆ No X-ray exposure: The indicator is off and is not displayed. ◆ Exposure in progress: The indicator glows orange.
2	Monitor	Displays patient images to assist operators with image processing. The display screen includes the reference screen on the right side and real-time screen on the left.
3	Monitor cart control panel	Displays the interface of the image acquisition system, and supports system control, fluoroscopy, exposure, and other operations.
4	Monitor cart armrest	Assists operators in moving the monitor cart from the front or both sides.
5	Printer (optional)	Prints patient images or dose reports.
6	Monitor cart body	Supports the motion of the monitor cart.

3.3.1 Monitor

The equipment is equipped with a 34-inch LCD, which is used to display real-time images and reference images so that task operations can be completed conveniently and fast.

The monitor consists of the left section and right section. The left screen (LM) is a real-time screen, which displays real-time images. The right screen (RM) is a reference screen,

which displays reference images. The specification of monitor see "Monitor" on page 15-19.

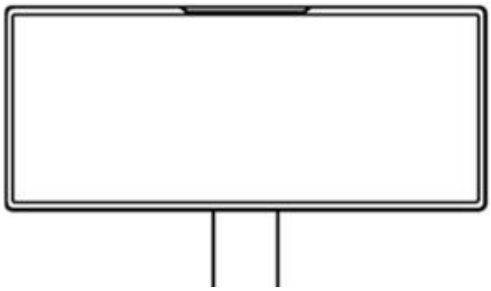


Figure 3-6 Monitor

3.3.2 Monitor cart control panel

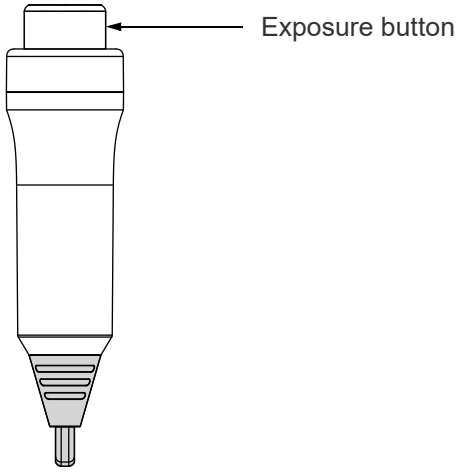
Monitor cart control panel displays real-time images and the system status and supports patient administration, exam, and other operations, just as the C-arm control panel does. The display on the monitor cart control panel is fully synchronous with that on the C-arm control panel except for motion control. Operation of C-arm control panel see "Control panel" on page 10-4. The specification of control panel see "Control panel" on page 15-19.

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3.4 Other components

3.4.1 Exposure hand switch

The system is equipped with a wired exposure hand switch to control the X-ray radiation.



3.4.2 Remote control

The optional Remote Control (RC) configured for the equipment is used for exposure, image saving, and low-dose selection.

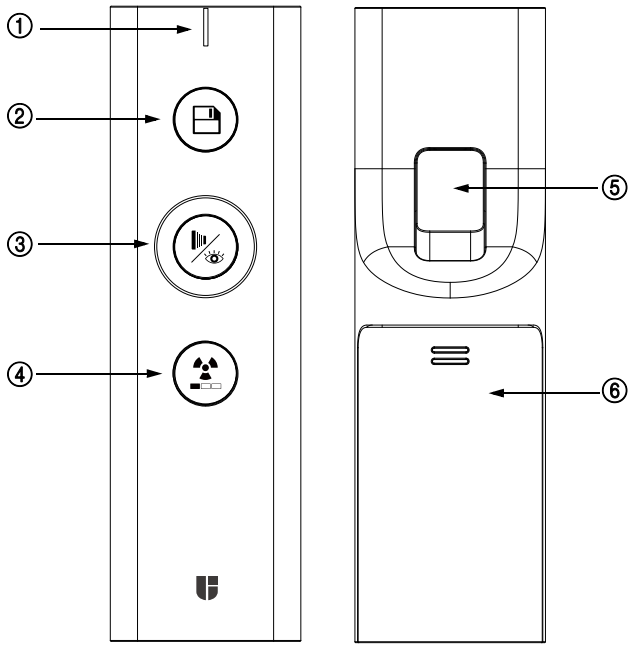


Figure 3-7 RC diagram

No.	Name	Description
1	Status indicator	Indicates the X-ray radiation status of the system. ◆ Green: The system is ready for X-ray radiation. ◆ Yellow: X-ray radiation is in progress. ◆ Flash: The battery is low.
2	Save button	Saves images.
3	Exposure button	Triggers the system exposure.
4	Low-dose switching button	Switches to the low-dose mode. ◆ A green indicator is on after the button is pressed.
5	Safety operation switch	Prevents the triggering of false exposure.
6	Battery cover	Used for battery replacement after removal.

3.4.2.1 RC matching

The RC holder is seated on the body of the C-arm trolley. See "C-arm trolley" on page 3-3.

In normal cases, the RC needs to be paired with the system when the RC is used for the first time.

1. Press the pairing button.
2. Press the save, exposure, and low-dose switching function buttons at the same time within 10s.
3. Wait for the RC pairing. All indicators are on after the pairing is complete.

The remote control distance is about 10 meters. The signal generated by the RC can penetrate equipment in the operation room, operators, and partially closed lead shielding rooms.

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3.4.2.2 Image saving

After image acquisition is complete, press the save button to save images.

3.4.2.3 Exposure

Use the RC to trigger exposure.

1. Press the safety operation switch at the rear of the RC to unlock the exposure function.
2. The green indicator on the RC is on. Press the exposure button to start exposure.
   - The yellow indicator is on during exposure, and will be off after the exposure ends.

NOTICE
Do not hold down the safety operation switch all the time to perform intermittent loading. That is, the exposure button and safety operation switch must be released between two loads so that the second load can be performed.

3.4.2.4 Low-dose mode switching

1. Press the low-dose switching button to switch to the low-dose mode.
   - When exposure is conducted in low-dose mode, this green indicator is on.
2. When this button is pressed again, the system switches to the normal dose mode and the green indicator is off.

3.4.2.5 Battery replacement

The RC is powered by batteries, which must be replaced regularly.

The RC is powered using two triple A batteries (AAA).

NOTICE
If the RC is not used within a period of time, remove the batteries.

3.4.3 Foot switch

The system is equipped with a wired foot switch to control X-ray radiation and save images. A wireless foot switch is optional.



Figure 3-8 Wired foot switch

No.	Name	Description
1	X-ray radiation pedal	Controls the X-ray radiation based on the selected X-ray radiation mode.
2	Save pedal	Saves images by default. ◆ If the system is configured for automatic save, perform automatic save after exposure. No need to step on the save pedal. ◆ If the system is not configured for automatic save, step on the save pedal to save image.

NOTICE

If the footswitch is not in use, put it back to the original place in a timely manner. Do not put the footswitch on the walkway or a place that can be easily trodden by mistake. Otherwise, false exposure may occur.

NOTICE

Though the multi-functional footswitch is water-proof, it may fail to function if it is immersed in liquids for a long time.

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4 System operations and positioning

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4.1 System start/shut-down

4.1.1 Starting the system

⚠ CAUTION

For system without UPS, force shutdown or abnormal power off of the system may result in corrupted hard disk data and software, lost images, slow subsequent startup due to file system checks, failure to startup requiring software re-installation, and loss of all saved images.

NOTICE

- Do not start the system by power supply obtained from other medical devices.
- Do not disconnect or reconnect the plug of C-M cable to the C-arm trolley socket if the system is startup, which may damage the system.

1. Connect the monitor cart to the C-arm trolley using the connecting cable.
2. Plug the power plug into a proper AC outlet and note that there should not be any obstruction around the outlet.
   - For power supply requirements, see "Power supply requirements" on page 15-2.
3. Press the startup/shutdown button  on the monitor cart to start the system.
   - The system will initiate self-test during the startup process.

4.1.2 Function and safety check

⚠ CAUTION

After system startup, confirm the status of indicators and the feedback of self-test, and perform function and safety check including display, movement, radioscopy, radiography and emergency stop. If the fault cannot be removed, please stop using the system and contact UIH Customer Service Center.

Check the following items after daily startup:

■ Check function of emergency stop button

Press the emergency stop button, the system stop movement, and related prompt message displays.

■ Check system movement

Check movement of C-arm trolley and monitor cart, C-arm movement, monitor rotation and C-arm control panel angle adjustment.

■ Check buttons, indicators, monitor and control panel

Check use of buttons, status of indicators and display of monitor and control panel are consistent with the intended purpose.

- Check feedback of self-test

Check there is no error during self-test.

- Check exposure

Check the exposure hand switch and foot switch can perform exposure normally.

4.1.3 Shutting down the system

1. Press the startup/shutdown button  on the monitor cart to shut down the system.
2. Wait until the system shut-down is completed, and unplug the power plug from the AC outlet when the shutdown indicator is off.

NOTICE
If the power plug is removed before the indicator of startup/shutdown button is turned off, internal components may be damaged.

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4.2 Equipment motion

4.2.1 Moving the C-arm trolley

⚠ WARNING

- Do not move the system on the slope more than 5°.
- If move on the slope, two personnel are required to move the system.
- Move the system slowly and steadily when on the slope or across the threshold.
- When moving the system, the angle of the system shall not exceed 10°.
- When not moving the system, the angle of the system shall not exceed 5°
- The angle of the monitor cart shall not exceed 10°.

NOTICE

Be careful not trip over the cable during system movement.

NOTICE

- Make sure to lock the wheels of the system and the brakes of C-arm when parking the system.
- Make sure to lock the brakes of C-arm before moving the C-arm trolley.

NOTICE

When moving over the threshold or obstacle, move the C-arm trolley and monitor cart slowly.

- Do not hit against the threshold or obstacle.
- It is recommended to install the slope guide when moving over the threshold or obstacle.

If the C-arm trolley needs to be moved, adjust the C-arm trolley to the homing position.

4.2.1.1 Homing position

- Reduce the lifting column to the 0 cm position.
- Collapse the C-arm and horizontal support arm to the 0 cm position.
- Adjust the orbital, angulation, and swivel positions to the 0° position.

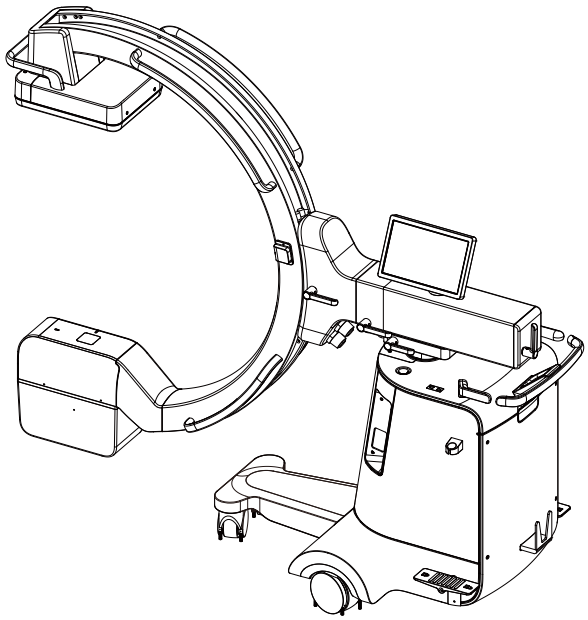


Figure 4-1 Homing position of the C-arm trolley

4.2.1.2 Motion operations

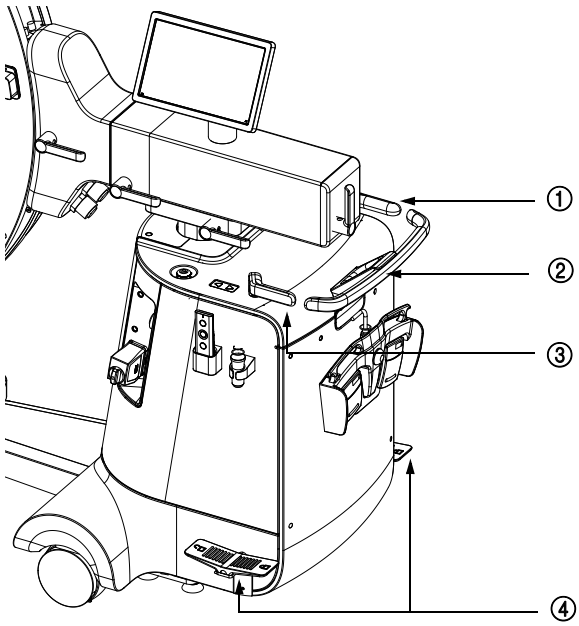


Figure 4-2 Armrest, steering lever, and brake pedal of the C-arm trolley

1. Right steering lever
2. C-arm trolley armrest
3. Left steering lever
4. Brake pedal (on both sides)

⚠ WARNING

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Improper movement of the C-arm trolley will cause collision or injuries of patients or operators.

- Before moving the C-arm trolley, ensure that there are no people or objects within the movement range of the C-arm trolley.
- When the C-arm trolley is moved to a hazard zone, slow down the motion to prevent crushing or collision with patients.

NOTICE

- Make sure the C-arm trolley is in homing position before moving the C-arm trolley.
- Do not move the C-arm trolley when the C-M cable is connected between the C-arm trolley and the monitor cart.

1. Release the brake pedals on both sides of the C-arm trolley.
2. Hold the C-arm trolley armrest to push the C-arm trolley.
   - After the brake pedals are released, the casters of the C-arm trolley can move freely.
3. After the C-arm trolley is moved to a specified position, use the left or right steering lever for accurate positioning.
4. Step on brake pedals to lock the C-arm trolley.

4.2.1.3 Locking and unlocking

There are lock and unlock marks on the brake pedal.

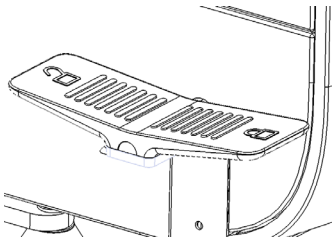
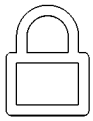


Table 4-1 Braking status

Status icon	Status name	Status description
	Lock	Step on the brake pedal to lock the motion of the C-arm trolley.
	Unlock	Step on the brake pedal to release the lock of the C-arm trolley and freely move the C-arm trolley.

4.2.2 Moving the monitor cart

If the monitor cart needs to be moved, adjust the monitor cart to the 0° position.

NOTICE
◆ When moving the monitor cart, do not crash into the monitor. Ensure that the monitor does not block the view. ◆ Do not move the monitor cart when the C-M cable is connected between the C-arm trolley and the monitor cart.

1. Unlock the brake pedals of the monitor cart.

The brake pedals on the four casters of the monitor cart need to be released simultaneously.

2. Hold the monitor cart armrest to push the monitor cart.
   - ◆ After the brake pedals are released, the casters of the monitor cart can be moved freely.
3. After moving the monitor cart to a specified position, step on the brake pedals to lock the monitor cart.

4.2.3 Precautions

⚠ WARNING
◆ Two people are required to move the system jointly when the system is moved on the upslope or downslope. ◆ Do not use the equipment on a titled place with the angle greater than 10°. ◆ Do not position or lock the system on a slope with a gradient greater than 5°. ◆ When the equipment is on a slope or moved on a slop, pay attention to the placement and loading of doors, drawers and shelves. ◆ When the equipment is moved through a slope or threshold, move the equipment steadily.

NOTICE
Be careful when moving the system to prevent tripping.

NOTICE
When the system is parked, ensure that the mobile casters of the cart body are locked.

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4.3 Monitor rotation

The monitor can be rotated horizontally to an optimum position so that images can be viewed conveniently.

1. Hold both sides of the monitor with hands.
2. Rotate the monitor horizontally to the required position.
   - The angle of the monitor is 0° when the monitor is on the front side of the cart. The monitor can be rotated in the range from -91° to 0° leftwards or in the range from 0° to 256° rightwards.

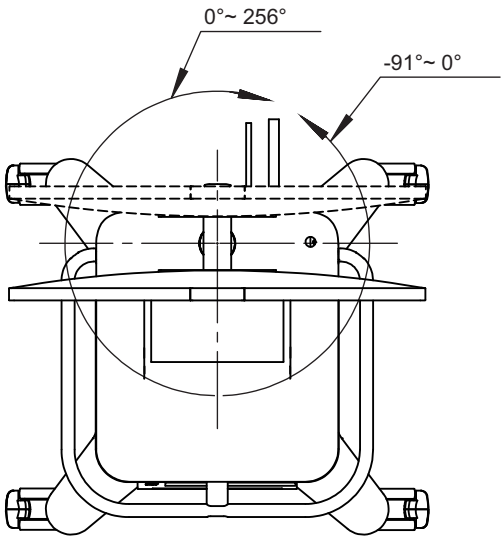


Figure 4-3 Rotating the monitor

4.4 C-arm control panel adjustment

The C-arm control panel can be adjusted to facilitate operations.

The monitor cart control panel is fixed on the table top and cannot be adjusted.

1. Hold both sides of the C-arm control panel with both hands.
2. Adjust the C-arm control panel to the required position.
   - The rotation range of C-arm control panel is ±110°.
   - Adjust the elevation angle of the C-arm control panel within the range of +20° to +30°.

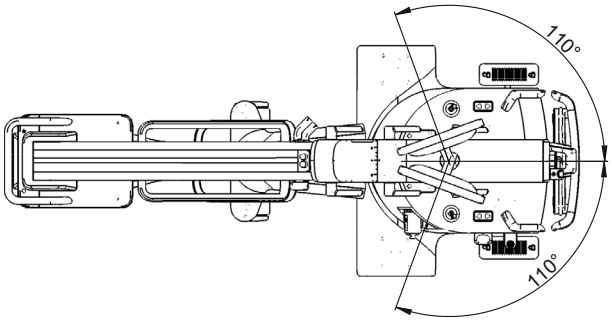


Figure 4-4 Rotating the C-arm control panel

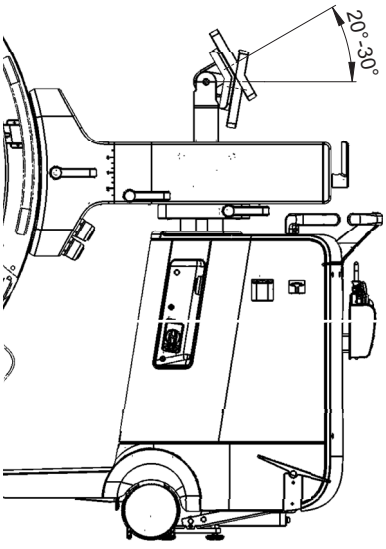


Figure 4-5 Adjusting the elevation angle of the C-arm control panel

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4.5 C-arm positioning

Exercise with caution when adjusting the C-arm positioning, and avoid colliding with patients or other objects.

⚠ WARNING

Improper C-arm positioning will cause collision with or injuries of patients or operators.

- Before positioning the C-arm, ensure that there are no people or objects within the movement range of the C-arm.
- When the C-arm is positioned to a hazard zone, slow down the motion to prevent crushing or collision with patients.

NOTICE

- When positioning the C-arm, never starting two or more brake handles at the same time to prevent equipment damage.
- Start the brake handle in one direction during movement, stop the brake handle after the equipment is moved to a specified position, and then start brake handles in other directions.

4.5.1 Orbital motion

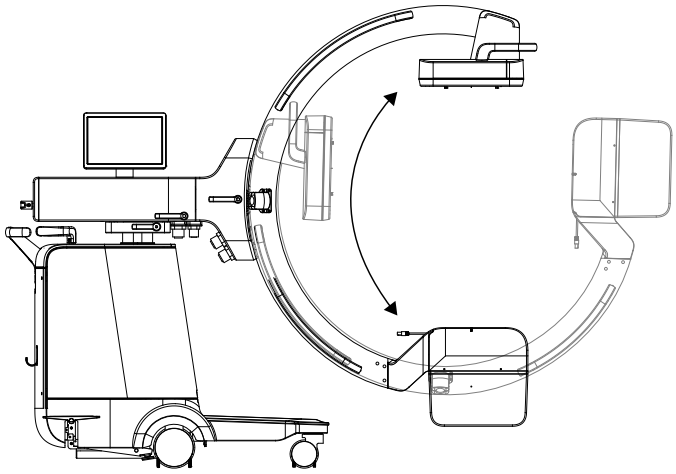
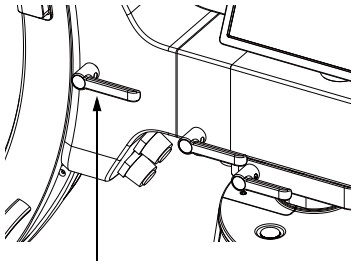


Figure 4-6 Orbital schematic diagram

Orbital motion refers to rotating the C-arm along the C-arm rail. The angle range of the orbital motion is from -50° to +90°.

1. Unlock the C-arm orbital handle.



2. Hold the C-arm handle to rotate the C-arm.
3. Lock the C-arm orbital handle after the C-arm is moved to a specified position along the C-arm rail.
   - The C-arm orbital handle is marked with the lock and unlock icons in gray.



Figure 4-7 C-arm orbital handle status

4.5.2 Angulation

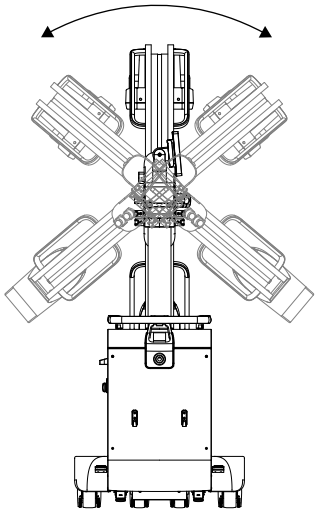
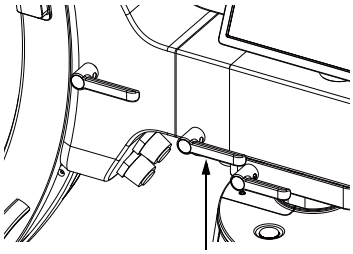


Figure 4-8 Angulation schematic diagram

Angulation refers that the C-arm is enabled to rotate around the center axis of the horizontal support arm. The angle range of angulation is from -225° to +225°.

1. Release the C-arm angulation handle.

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2. Hold the C-arm handle to rotate the C-arm.
3. Lock the C-arm angulation handle after the C-arm is rotated to a specified position.
   - The C-arm angulation handle is marked with the lock and unlock icons in blue.



Figure 4-9 C-arm angulation handle status

4.5.3 Vertical motion

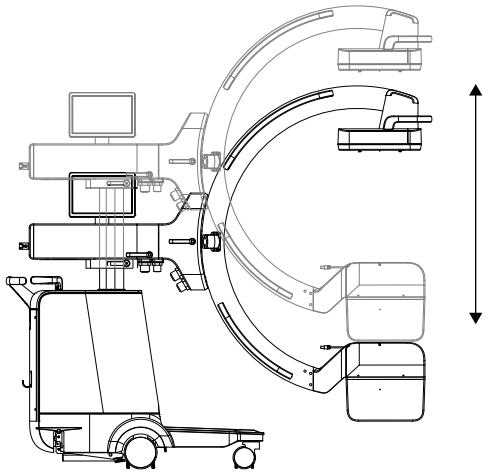


Figure 4-10 Vertical motion diagram

The entire C-arm and horizontal support arm can move vertically along the column. They can be vertically moved to a position as high as 420 mm.

The Up/Down control buttons on the C-arm control panel can be used to control the vertical motion of the C-arm.

1. Press the Up button △ or Down button ▽ to move the C-arm vertically.
   - The vertical control buttons of the C-arm are located on both sides of the control panel of the C-arm trolley.
2. After the C-arm is moved to a specified height, release the motion control buttons.

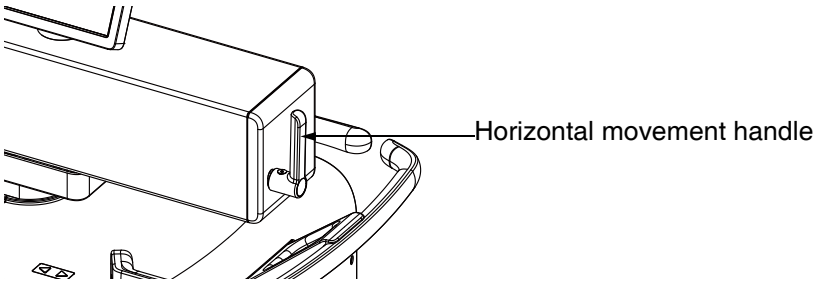
4.5.4 Horizontal motion

The C-arm and horizontal support arm horizontally moves along the horizontal axis. The motion range is not smaller than 200 mm.

1. Release the horizontal movement handle.
   - The horizontal movement handle is marked with the lock and unlock icons in green.



Figure 4-11 Horizontal movement handle status



2. Hold the C-arm handle to move the C-arm horizontally.
3. Lock the horizontal movement handle after the C-arm is moved to a specified position.

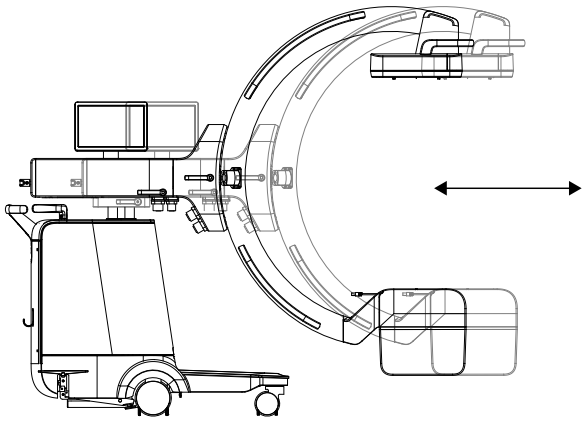


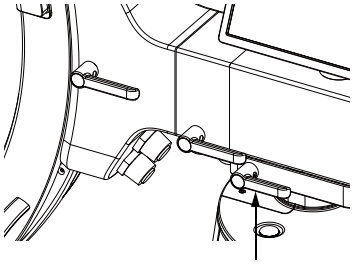
Figure 4-12 Horizontal motion

4.5.5 Swivel motion

The C-arm and horizontal support arm swing horizontally along the center axis of the column. The range of the swivel angle is ±10°.

1. Unlock the swivel handle.

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2. Hold the C-arm handle to swing the C-arm.
3. Lock the swivel handle after the C-arm is swung to a specified position.
   - The swivel handle is marked with the lock and unlock icons in orange.



Figure 4-13 Swivel handle status

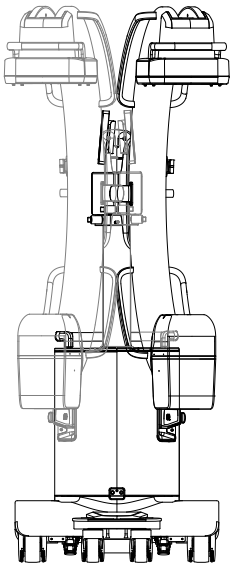
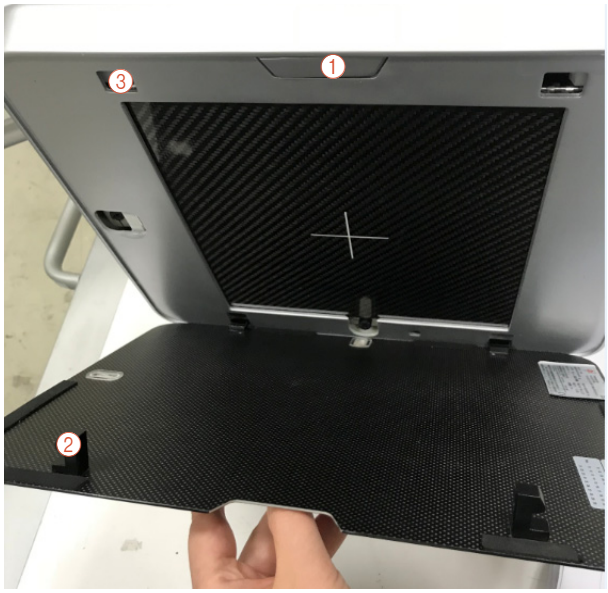


Figure 4-14 Swivel diagram

4.6 Installation/Removal of the grid



1. Silver button
2. Buckle
3. Slot

Installing the grid

1. Insert the two buckles under the grid into the slots.
2. Push the grid int he direction of the detector, ensure the two buckles above the grid are inserted into the slots.

Removing the grid

1. Press the Sliver button.
2. Pull the two buckles under the grid out of the slot and remove the grid.

NOTICE
When examining slight and thin bodies or parts, remove the grid to lower the dose and increase the contrast properly.

NOTICE
During installing/removing the grid. Pay attention to the inserting or pulling out of the buckles in order to avoid the improper operation and lead to the fracture of the buckle.

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4.7 Placing the sterile cover

A sterile cover must be used during examination to ensure the safety of the system and patients.

No sterile cover is provided for the equipment. Users should prepare the sterile cover independently.

The sterile cover is a three-piece sterile cover, which includes the sterile cover for the flat panel detector, sterile cover for the monoblock, and the sterile cover for the C-arm trolley.

⚠ WARNING

Patient infection

- Sterile covers must be used to ensure that operators perform operations aseptically, and avoid patient infection caused by contact with unclean equipment.

5 Image acquisition workstation

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5.1 Overview

The image acquisition workstation supports a complete set of workflow, which covers patient registration, patient administration, patient exam, viewing, reference image viewing, image post processing, image archiving, and printing.

Patient registration

Implements the registration, modification, and storage of patient information, and supports emergency registration in case of emergencies.

Patient administration

Provides a full set of patient data management solutions for users, and supports the following operations: data archiving, import, export, deletion, protection, modification, and study merge.

Patient exam

Provides a complete set of patient exam solutions for users, and supports the selection and adjustment of exam parameters and optimization parameters.

Displays the X-ray radiation status and system status on the control panels of C-arm trolley and monitor cart.

Reference image viewing

Supports image viewing, view, comparison, measurement, annotation, window width/level adjustment, zoom, pan, and rotation. The multi-level viewing window design for the image display area allows physicians to compare and conduct a contrast diagnosis on multiple series and print images.

5.2 Account-related operation

To ensure the data security and protect the patient's privacy, the user can log in using the preset user name and password to view the data information in corresponding permission groups respectively, and perform the required operations. Meanwhile, the user having administrator rights can manage accounts.

5.2.1 Account management

After the installation is completed, the default preset administrator account of the system is admin, and administrators can manage the user accounts. For example, they can add and delete an account, and modify permission groups etc.

The user can also set the administrator account or delete the default account. The user must log in the system and go to the service interface before performing these operations.

5.2.1.1 Login account

- After login with a different user name, the content displayed on the interface will somewhat vary with the current user's permission. The system automatically hides/grays the functional interfaces that the current user has no permission for use.
- When the user logs in the system with admin for the first time, the user should change the password as prompted by the system.
- The user should keep the user name and password properly to avoid affecting use due to failure to log in.

The user can log in the system with one account each time. If the user needs to log in the system with another account, the user must exit the current account or switch to another account.

1. After the system startup, the login interface pops up.
2. Enter the user name and password on the interface and click **Login** to access the system.
   - In case of emergency, users can select **Emergency login**. Under such circumstance, they do not need to enter the user name and password, but cannot perform some functions.
   - The service staff may select **Service engineer login**, and then enter the service password to log in the system.

5.2.1.2 Change password

1. Click the UIH icon at the top right corner of the interface, and a drop-down menu will pop up.
2. Click the current user name.
3. Click **Change Password**.
4. Change the password.
5. Click **OK**.

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5.2.1.3 Switch users

The system allows to create many user accounts, but only one user account at one time. If you have completed relevant operations and want to exit the current account, you can switch to another account.

1. Click the UIH icon at the top right corner of the interface, and a drop-down menu will pop up.
2. Click the user name in the drop-down menu.
3. Click **Switch Users**.

- **An account may belong to multiple user groups, and the study data that can be viewed after login is a collection of multiple user groups to which the account belongs.**
- **The users of the same user group have the same permission.**
- **After switching the account, if the new login account and the previous account belong to different user groups, the information involving patient identity in the archiving and printing etc. operations made using the previous account will be hided.**

4. Enter another user name and password.
5. Click **Login**.

5.2.1.4 Log off

If you have complete the operation, you can log off the system.

1. Click the UIH icon.
2. Click the user name in the drop-down menu. Click **Log off** in the drop-down menu to return to the Login interface.

5.2.1.5 Lock screen

If the there is no operation for more than 30 minutes, the system will lock the screen automatically, and the user need to login with password if continue the operation. The screen cannot be locked if in the exam interface. The time to lock screen can be configured in the service interface. If leave the monitor for a while, you can choose to lock the screen to protect the data from loss.

1. Click the UIH icon.
2. Click the user name in the drop-down menu. Click **Lock Screen** in the drop-down menu to return to the Login interface.
3. Enter the password, click **Login**, and continue the previous operation.

5.2.2 Manage the data permission

The data corresponding to the user group to which the current account belongs is displayed in the list. If the current account belongs to multiple user groups, the collection of data corresponding to multiple user groups will be displayed.

The user having the permission to modify the user group can set the user group to which the study data belongs to protect the patient's privacy data from being obtained by the unauthorized user and facilitate cooperative work between different users.

Set the data permission for the study list

For the existing data in the study list, the user can directly sets its user group.

1. Select specific data, click the right mouse button, and select **Edit User Group** in the pop-up context menu.
2. In the pop-up **Edit User Group** dialog box, set the user group for the study.
   - For the user having no permission to edit the user group, the interface will only display the user group to which the current study belongs, which is non-editable.
3. Click **OK** to complete the setting, and now the user group to which the study belongs in the study list is updated.
   - Click **Cancel**, and the settings made will not be saved.

- **The new study generated by splitting and merging the studies is set to the user group of the current user by default.**
- **The study list only displays the studies under the user group of the current user.**
- **The studies belonging to the Emergency user group is available to all users.**
- **Only the study whose user group is null can be set to the Emergency user group.**
- **An exam can belong to multiple user groups.**

- When the user selects multiple exams from the same user group at the same time, the user may set a user group for them uniformly.
- When the user selects multiple exams from different user groups at the same time, the **Edit User Group** in the context menu will be grayed out.

Set the permission to import data

- When the user imports new studies from external, for example, CD/DVD, USB, and PACS, they are set to belong to the user group of the current user by default.
- When the user imports studies under the local director, the studies are added to the user group of the current user by default.

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5.3 Interface distribution

After the image acquisition workstation is started, the real-time screen interface and reference screen interface are displayed by default.

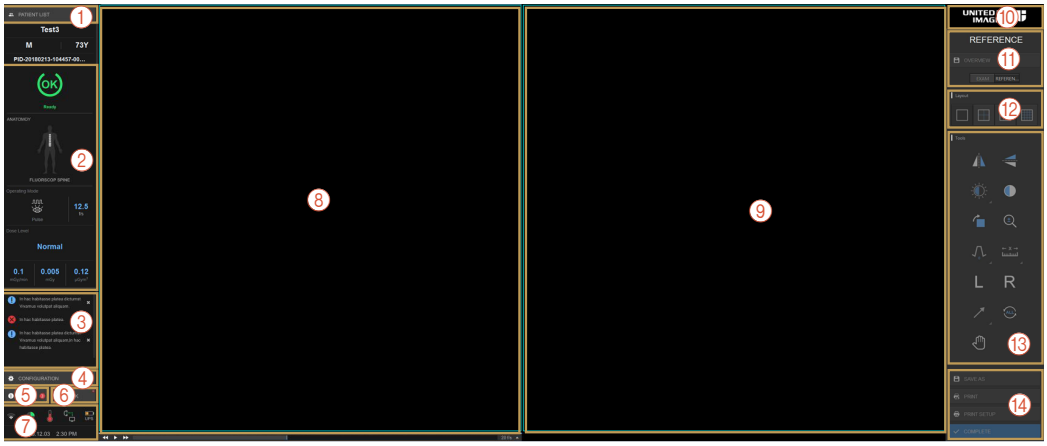


Figure 5-1 Function blocks on the main interface

1. Real-time screen — patient list entry
2. Real-time screen — exam parameter display
3. Real-time screen — error message
4. Real-time screen — user configuration
5. Real-time screen — system information
6. Real-time screen— task manager
7. Real-time screen — system status bar
8. Real-time screen— image display
9. Reference screen— image display
10. Reference screen — UIH icon
11. Reference screen— screen switch
12. Reference screen— image layout
13. Reference screen — image processing tools
14. Reference screen— functional buttons

5.3.1 Patient list entry

The patient list entry is located in the upper left corner of the real-time screen. Click the patient list button to rapidly switch to the patient administration interface.

5.3.2 Exam parameter display

The exam parameter display area is located on the left side of the real-time screen. The patient information, fluoroscopy or exposure status, application, body parts, work mode, and dose level are shown on the exam parameter display area.

After the patient is loaded to exam interface, and the exam parameters are set, the exam parameter display area will display the completed settings in real time on the exam parameter display area.

The does level explanations are as shown below:

- μGym^2: it represents the accumulated DAP value of current patient. It is refreshed once every second, and the value is displayed after the X-ray is loaded and keeps showing until the exam is completed. The value error is less than 35% when it is more than 25, 000 μGym^2.

- mGy: it represents the cumulative air kerma of patient entrance reference point. The patient entrance reference point see "Patient entrance reference point" on page 15-6. It is refreshed once every second, and the value is displayed after the X-ray is loaded and keeps showing until the exam is completed. The value error is less than 35% when it is more than 100 mGy.
- mGy/min: it represents the actual air kerma rate of patient entrance reference point. The patient entrance reference point see "Patient entrance reference point" on page 15-6. It is refreshed once every second, and the value is displayed after the X-ray is loaded and it turns to zero if the X-ray release is finished. The value error is less than 35% when it is more than 6 mGy/min.

5.3.3 Error message

The system provides a scrolling list for error messages and warning, such as the network connection information and memory usage.

If an error message prompt is triggered, perform troubleshooting to the error and solve the problem. Otherwise, the error message will be triggered repeatedly.

5.3.4 Configuration

5.3.4.1 Exam configuration

1. Click **Configuration** > **Exam** in the left bottom corner of the real-time screen.
2. Set the saved frames of cine and the maximum age of children.

The saved frames of recoding file is the preset frames before ending of pulsed fluoroscopy.

- **Saved Frames of Cine**: Increase or decrease the frames of recoding file for pulsed fluoroscopy mode.
- **Maximum Age Of Children**: the exam of patient with the age equal or less than the maximum age for children, will be configured as pediatric exam (only available for U.S.A) by default.

3. Check or uncheck the exam configuration items.
   - **Send and Save Image**: When the image for last exposure is saved, it will be sent to the reference screen automatically.
   - **Auto Play**: The automatic series play function can be configured. The function is enabled by default. After the function is enabled, real-time image series on the control panel and real-time screen are played automatically.
   - **Auto Save**: By default, LIH images are automatically saved. Users can view the LIH images from the image overview or patient administration interface.
   - **Auto Loop**: The loop playback series is enable by default. The real-time image series on the control panel and the real-time screen is displayed automatically and loop playback.

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4. Click **Save**.

5.3.4.2 Patient registration configuration

In patient registration configuration, the user can select which items to be displayed and filled in the patient registration interface.

1. Click **Configuration** > **Registration** in the left bottom corner of the real-time screen.
2. Select the mandatory patient registration items in the **Required** column.
   - The mandatory patient registration item is marked with a red asterisk in the patient registration interface. The mandatory item must be filled in, otherwise the patient registration cannot be completed.
3. Select the optional patient registration items in the **Visible** column.
4. Click **Save**. A save success prompt box is displayed.
5. Click **Confirm** to save patient registration settings.

5.3.4.3 Local print configuration

The local print setting is only for paper printer.

1. Click **Configuration** > **Print** in the left bottom corner of the real-time screen.
2. Select the printer.
3. Select the print settings.
   - **Anonymous**: Select whether the personal information XXX is shown on the printed paper.
   - **Image Text**: Select whether the image text is shown on the printed paper.
   - **Graphic Info.**: Select whether the image marks or graphic is shown on the printed paper.
   - **Copies**: Select how many copies to be printed.
   - **Layout**: Select the layout of printed pater.
4. Click **Save**.
5. Click **Confirm**.

5.3.4.4 Image text configuration

1. Click **Configuration** > **Image text** in the left bottom corner of the real-time screen.
2. Select the items to be displayed on the four corners of the image.
3. Click **Save**.
4. Click **Confirm**.

5.3.4.5 Filming configuration

The function is only applicable to film printer.

1. Click **Configuration** > **Filming** in the left bottom corner of the real-time screen.
2. Select the position to show the image information.

3. Select the font size of the image information.
4. Select the items to be printed on the film.
5. Click **Save**.
6. Click **Confirm**.

5.3.5 System information

Users can view system information, error messages and warnings.

▶ Click the **Tips** to display all the system status information.

Information in red, yellow, or white indicate different prompt levels. Errors are displayed in red, warnings are displayed in yellow, and system information are displayed in white.

- If the displayed information is incomplete, move the cursor over the information to display the complete information.
- Messages of the severe level or higher are repeatedly displayed in polling mode.

5.3.6 Task manager

Users can manage archive, import, and print tasks through the task manager.

5.3.6.1 Accessing the task manager

1. Click the **Task** button to display the task manager interface.
2. Select **Archive**, **Import**, or **Filming** from the drop-down list to switch among tasks.

5.3.6.2 Manage archive/import/filming task

- Select **Display Completed**. Completed archive tasks are displayed.
- Select an task in the waiting, stopped, or failed state and click **Restart** to start the task.
- Select an task in the processing or waiting state and click **Suspend** to pause the task.
- Select an task in the waiting, stopped, completed, or failed state and click **Delete** to delete the selected archive task.
- Select an task in the stopped state and click **Resume** to delete the selected archive task.
- Select an task in the waiting state and click **Prioritize** to prioritize the urgent task.

5.3.6.3 Exiting the task manager

▶ Click "×" in the upper right corner to exit the task manager interface.

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5.3.7 System status bar

Table 5-1 System status bar

Icon	Description	Icon	Description
	Network connection status		Status of connection between the C-arm mobile stand and the display cart
	Disk space		Heat capacity of the X-ray tube
	UPS power status (optional)		Grid connection status

Disk space

Disks are required during system running. The disk usage changes with the volume of saved data in the system.

The disk monitoring module of this equipment monitors the available disk space in the image storage area and supports two levels of threshold prompts.

- When the available disk space reaches the preset Level 1 upper limit that means the remaining capacity is less than 15% of the total capacity, the disk monitoring module displays an alarm in yellow, to remind users that the available disk space reaches the preset upper limit.
- When the available disk space reaches the preset Level 2 upper limit that means the remaining capacity is less than 8% of the total capacity, the disk monitoring module displays an error in red, to remind users that the available disk space reaches the preset limit and normal exposure will be affected.

Move the mouse over the icon to display the specific percentage of available disk space.

When the available disk space is low, clean up the disk in a timely manner.

5.3.8 Reference screen

See "Functional block of reference screen" on page 11-2.

5.4 UIH icon operations

Users can view system information, access the service interface, start remote control, enter into the protocol editor and access the online-help.

5.4.1 About

You can check the full version and release version of the system software.

1. Click the UIH icon in the upper right corner of the reference screen.
2. Select **About** from the drop-down list. The system information window is displayed, in which users can view the system information.

5.4.2 Service

NOTICE
You need to enter the corresponding user name and password to login to the Service interface. If the related service settings must be set and modified, please contact UIH Service Center.

When the user access control is disable

1. Click the UIH icon. The drop-down list pops up.
2. Select **Service** from the drop-down list. The service login interface is displayed.
3. Enter the password and press <Enter> to access the service interface.

When the user access control is enable

1. Click the UIH icon. The drop-down list pops up.
2. Select **Service** from the drop-down list.

5.4.3 Remote request

1. Click the UIH icon. The drop-down list pops up.
2. Select **Remote Request** from the drop-down list.
3. Record the computer ID and access code and send them to UIH Customer Service Center.

5.4.4 Protocol manager

5.4.4.1 Enter into the protocol editor

The users can view, add, delete or modify the protocol in the protocol editor. Only the user who has permission to modify protocol can access the protocol editor. The user can only do the operation related to corresponding permission.

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1. Click the UIH icon. The drop-down list pops up.
2. Select **Protocol manager** from the drop-down list.
   - If the user access control is enable, enter into the protocol editor directly.
   - If the user access control is disable, enter the password to enter into the protocol editor.

5.4.4.2 View the protocol

1. Select the **Clinical Application** > **Anatomical Region**.
   - The available protocol is shown.
2. Right click in the protocol list, select the display mode to **Tree** or **List**.

5.4.4.3 Add the protocol

If you need to add a new protocol, firstly create the protocol.

▶ Drag the available protocol to the **Protocol list**.

5.4.4.4 Delete the protocol

▶ Right click the available, and click **Delete**.

5.4.4.5 Create the protocol

1. Click  on the right upper corner of the protocol list.
2. Input the protocol name.
3. Select relate parameters.
4. Select the algorithm template and does template.
5. Click **Save**.
6. Click **Return**.

5.4.4.6 Protocol editor setting

BacuUp/Restore

1. Click **Setting** on the protocol editor.
2. Click **Backup** to Backup the database.
   - Up to three versions can be backup in the default path. The fourth version will replace the first one.
3. Select the database and click **Restore** to restore the database.
4. Click **Merger Database** and select the database to be merged to current database.

Protocol Management

You can import, export or search the protocol in the **Protocol Management**.

Default Protocol

You can view the protocols include the default protocol in the **Default Protocol**.

▶ Right click the protocol and select **Set Default Op** to set the protocol as default.

Algorithm Template

You can import, export or search the algorithm template in the **Algorithm Template** according to corresponding permission.

Does Template

You can import, export or search the algorithm template in the **Does Template** according to corresponding permission.

Collimator Template

You can import, export or search the algorithm template in the **Collimator Template** according to corresponding permission.

RIS Management

You can input the RisCode, code meaning and the coding scheme designator in the **RIS Management**. And import, export or search the RIS code.

APR MultLanguage

You can select the language in the drop-down list.

Password Management

You can change the password to enter into the Protocol Editor.

Other

You can view the software version. the database version and the APR data version.

5.4.5 Online Help

You can view the online-help of the system, including system introduction, system operation and software operation.

1. Click the UIH icon. The drop-down list pops up.
2. Select **Online Help** from the drop-down list.

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5.5 Basic operations

5.5.1 Using the mouse

The mouse is used to control the cursor (also known as mouse cursor or mouse pointer) displayed on the control panels of C-arm trolley and monitor cart.

- Move the mouse to relocate the cursor.
- Use mouse buttons to start system functions.

Table 5-2 Mouse functions

Mouse control	Function
Left mouse button	◆ Click the left mouse button to select an object. ◆ Click the left mouse button to start an application or function. ◆ Hold down the left mouse button and drag the mouse to rapidly turn and view image pages. ◆ Double-click the left mouse button to start an application or edit texts.
Right mouse button	◆ Click the right mouse button to display the context menu. ◆ Hold down the right mouse button and drag the mouse to zoom in/out images.
Left mouse button + right mouse button	◆ Hold down both mouse buttons and drag the mouse to pan an image.
Mouse scroll wheel	◆ Scroll the mouse scroll wheel to turn and view image pages as well as the study list.

- The cursor (pointer) on the screen moves with the mouse. The cursor shape may be different and depends on the current operation (for example, selection, pan, or text input).

NOTICE

The mouse is right handed by default. Users can change the mouse control to left-handed mode as required. After the change, the functions of the left and right mouse buttons are interchanged.

5.5.1.1 Clicking the mouse

Selecting one item from the list or the menu

1. Move the cursor over an object, for example a record in the study list area or an image in the viewing area.
2. Click the left mouse button to select the object.

Selecting multiple objects (excluding graphic objects) from the list or menu

1. Click the left mouse button to select an object.

2. Hold down <Ctrl> and click to select other objects.
3. Click a selected object to cancel the selection while holding down <Ctrl>.

Selecting a whole object block (excluding graphic objects) from the list or menu

1. Click the left mouse button to select an object.
2. Click to select another object. The selected object block will be canceled.

5.5.2 Using scroll bars

Scroll bars are used to scroll images and the item list. A scroll bar is a vertical or horizontal narrow bar containing a slider. The position of the slider indicates the position of the current image or item.

5.5.2.1 Vertical scroll bar

1. Move the cursor over a slider and click the left mouse button.
2. Drag the mouse to move the slider upward and downward to scroll the list.

Or

1. Click the left mouse button above the slider to scroll up the list.
2. Click the left mouse button below the slider to scroll down the list.

Or

1. Click the **up arrow** to scroll up the list.
2. Click the **down arrow** to scroll down the list.

5.5.2.2 Horizontal scroll bar

1. Move the cursor over a slider and click the left mouse button.
2. Drag the mouse to move the slider leftward or rightward to scroll the list.

Or

1. Click the left mouse button on the left of the slider to scroll the list leftward.
2. Click the left mouse button on the right of the slider to scroll the list rightward.

Or

1. Click the **left arrow** to scroll the list leftward.
2. Click the **right arrow** to scroll the list rightward.

5.5.3 Using the keyboard

Use the virtual keyboard to enter texts, numbers, and symbols in the system.

1. Click the virtual keyboard icon  in the lower right corner of the control panel to display the virtual keyboard.

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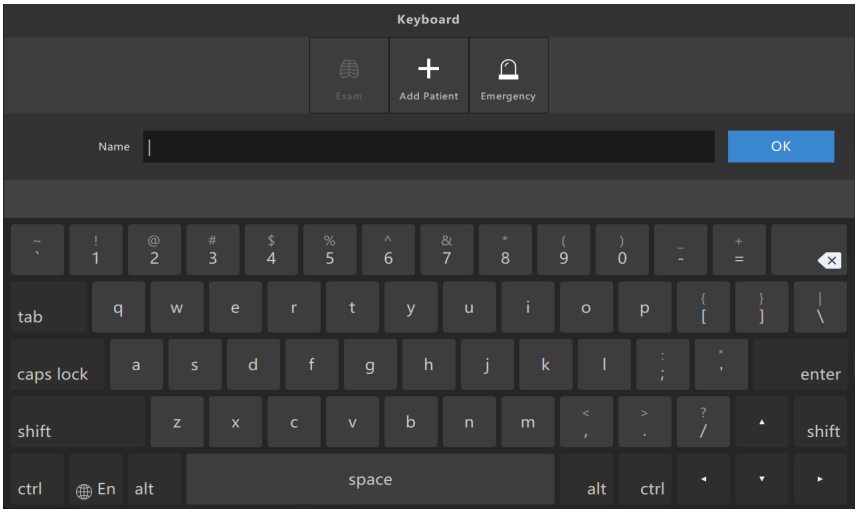


Figure 5-2 Virtual keyboard of the control panel

2. Click the **Back** button in the exam state to return to the patient exam interface.

6 Daily service configuration

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6.1 Overview

If system login control is enabled, only users with corresponding permissions can open the Service interface.

6.1.1 Opening the Service interface

1. Click the UIH icon at the top right corner of the user interface.
2. Click **Service** to open the Service interface.
   - If user access control is enabled, the Service interface is opened directly.
   - If user access control is disabled, the service key is needed to open the Service interface. If the service key is incorrect, please contact UIH Customer Service Center.

6.1.2 Introduction to the Service interface

Do not switch to other pages before the operations on the current page are finished. Otherwise, the ongoing operations may fail.

Table 6-1 Function of the Service interface

Item	Description
Configuration	Configuring the system, including common configurations, remote service configurations, application settings, DICOM configurations, and patient privacy and data security settings.
XuanYuan Service	Configuring the system, such as the units of length, weight, and dose.
Tools&Utilities	Operating on files and images, including file deletion, system tools, and other tools.
About	Viewing system information, such as the serial number, software version, and product number.

6.2 Configuration

The Configuration pages are used for system settings including language, network, remote connection, application information, DICOM information, and privacy and security.

The user can configure the system in the following two ways:

- Use Configuration Guidance. See "Configuration Guidance" on page 6-3. Configuration Guidance is recommended for the initial configuration after system installation.
- Use the Navigation Menu to switch to corresponding pages. After the configuration, click **Save**, and then click **Apply**.

NOTE

- **All configurations (except for the USB switch control configuration, which takes effect immediately) take effect only after clicking the Save and Apply buttons.**
- **The configurations will not take effect if the page is closed or switched before clicking the Save and Apply buttons.**
- **If an asterisk (*) is displayed in the Navigation Menu after clicking Save, it indicates that the configuration only takes effect after the system is restarted. After the system is restarted, the configuration takes effect and the * mark disappears.**
- **If the configuration only takes effect after the system is restarted, a dialog box will pop up after the user clicks Apply, asking the user to confirm.**

6.2.1 Configuration Guidance

1. Click **Open Guidance**.
2. On the Configuration Guidance page, select the items that need to be configured.
3. Click **Next**.
4. Follow the guidance to configure the selected items on different tabs.
5. Click **End**.
6. Click **Apply**.
7. Click **OK**.
   - The system restarts and the configuration takes effect.

6.2.2 Configuring the system

6.2.2.1 Local Preference Setting

Selecting the time zone

1. Click **System** > **Local Preference Setting** > **Time Zone**.
2. Select the time zone in the **Time Zone** drop-down list.
3. Click **Save**.

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Changing the time zone and time may cause the license to fail. Please set the time zone and time before importing the license.

Setting the system time

Modify Time is unselected by default. The settings of date and time appear only when Modify Time is selected.

1. Click **System** > **Local Preference Setting** > **Time**.
2. Select **Modify Time**. The confirmation dialog box pops up.
3. Click **Yes**, and the settings of date and time are displayed.
4. Set the date and time, and click **Save**. A confirmation dialog box pops up.
5. Click **Yes**.

Synchronizing the time

1. Click **System** > **Local Preference Setting** > **Time**.
2. Select **Server Time** and enter the IP address in **Server IP/HostName** to synchronize the system time with the server time.

Selecting the date format

1. Click **System** > **Local Preference Setting** > **Date Format**.
2. Select a date format.
3. Click **Save**.

Selecting the system language

1. Click **System** > **Local Preference Setting** > **Language**.
2. Select a language from the **Language** drop-down list.
3. Click **Save**.
   - Language setting takes effect only after the system is restarted.

6.2.2.2 Configuring the host network

Setting the network adapter

NOTICE
Avoid changing the IP address after system installation. Otherwise, it may cause errors in network connection or communication.

- **Parameters related to TCP/IP LAN should be set according to the network environment of the hospital.**
- **Configure the IP address of the hospital in the network adapter interface.**
- **Obtain a DNS Address Automatically is selected by default. In most cases, there is no need to manually configure the DNS.**
- **This configuration takes effect immediately after being saved.**

1. Click **System** > **TCP/IP LAN** > **Network Adapter**.
2. Enter the information of the network adapter.
3. Click **Save**.

Table 6-2 Items in the network adapter interface

Item	Description
Computer Name	Name of the host in the network. It is recommended to name the host based on the system serial number for easy distinction.
Network Adapters	The network adapter that the system is connected to.
IP Address	IP address.
SubNet Mask	Subnet mask.
Default Gateway	Default gateway address.
Domain	Domain.
Preferred DNS Server	Preferred DNS server address.
Alternate DNS Server	Alternate DNS server address.
Second IP	The user can set a second IP address based on actual needs.

A/B Plan

You can switch between the two plans of system Intranet to ensure network connection. Plan A is selected by default. When the system Intranet conflicts with the hospital network, you can switch to Plan B.

1. Click **System** > **TCP/IP LAN** > **A/B Plan**.
2. Select Plan A or B.
3. Click **Switch Plan** to switch between the plans. Click OK. The system restarts.
4. Click **Connection Test**.

When the connection status of the plan is true, you have switched the plan successfully

6.2.2.3 .Configuring site information

1. Click **System** > **Site Info**.
2. Check the system information (read only).
3. Check the Customer Service Center information (read only).

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4. Enter the customer information and the address.
5. Click **Save**.

Table 6-3 System information (read only)

Item	Description
*Serial Number	Serial number ◆ Serial number is used to identify each system. ◆ AE title in DICOM can also be used to identify the systems.
*Product Number	Product number ◆ Product number is used to differentiate modalities. Generally, there is no need to modify the product number.
Order Number	Order number ◆ The factory setting is used by default.
*System ID	System ID ◆ System ID is the unique identification number of the system. It can be found in service work orders.
Station Name	Station name ◆ Station name is used for the recognition by a third-party that connects to the system.

Table 6-4 Customer Service Center information (read only)

Item	Description
Region	The available maintenance center for remote service.
Name	Name of the service center.
Phone Number	Phone number of the service center.
Fax	Fax number of the service center.
E-Mail	E-Mail address of the service center.

Table 6-5 Customer information and the address

Item	Description
Contact Person	Name of the contact person of the hospital
Telephone	Telephone number
Institution Name	Institution name (also shown in the image text)
Institution Address	Institution address
Postal Code	Postal code of the institution
Institutional Department Name	Department name of the institution

Item	Description
City	The city where the institution is located
Country	The country where the institution is located

6.2.3 Remote service

6.2.3.1 Configuring remote service

- **The remote configuration takes effect immediately after being saved.**
- **If Upload ServiceCenter Status is changed from ON to OFF, all data to be or being uploaded will be deleted from the database.**

1. Click **Remote Service** > **Remote Config**.
2. Check the system information (read only).
3. Turn on or off the remote control switch.
4. Turn on or off the Upload to Service Center switch.
5. Click **Access VPN** to open the VPN configuration page.
6. Click **Test** to test the VPN connections and data uploading.
7. Click **Save**.

6.2.4 Configuring application information

6.2.4.1 Configuring service information

NOTICE

- To protect the system from viruses, make sure that the USB devices are scanned by the anti-virus software before being used. Or open the anti-virus software in the service interface to scan the USB devices. For use of the anti-virus software, see "Antivirus protection" on page 2-22.
- Turn off the USB switch after using the USB devices.

1. Click **Application** > **Service Setting**.
2. Turn on or off the USB switch (**USB Authority**).
   - Select ON to enable the use of USB devices.
3. Turn on or off the FTP switch.
   - Select ON to enable the FTP.
4. Turn on or off the Log Trace switch.
   - When ON is selected, R&D level logs can be generated for analysis and troubleshooting by R&D personnel.

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5. Click **Save**.

6.2.4.2 Setting user information

After a system upgrade, the location of the control panel is reset.

1. Click **Application** > **User Setting**.
2. Change the display of the control panel (**Panel Config**) in the interface.
   - Select **Left** and the control panels will be on the left.
   - Select **Right** and the control panels will be on the right.
3. Set the format of patient names (**Patient Name Config**).
   - Select a name format from the Name Format drop-down list.
   - Select a separator for names in the Delimiter drop-down list. For example, if **Space** is selected, the family name and given name will be separated by a space.
4. Set the report printer (Report Printer Config).
   - If Report Printer Config is unselected, there will be no **Print** button in the Report interface, and the reports cannot be printed.
5. Click **Save**.

6.2.4.3 Configuring LUT display

The user can configure the LUT display, such as adjusting brightness and contrast of images.

1. Click **Application** > **LUT Display**.
2. Change the display of the LUT in the interface.
   - Display LUT: Enable or disable LUT. This setting takes effect once it is selected.
   - Current LUT Name: The current LUT name.
   - Import LUT: The user can manually update LUT by selecting and importing the LUT file.
3. Click **Save**.

6.2.4.4 Image Disk Management

The user can configure the auto clean-up of the disk on this page.

Auto clean-up can be triggered either by time or by the remaining disk space.

Table 6-6 Image disk management settings

Item	Description
Data within (days)	Keep the data within the selected number of days.
Data not archived to	Keep the data that are not archived to the selected location.
Protected data	When this checkbox is selected, the protected data will be kept.

Item	Description
Confirm before clean-up	When this checkbox is selected, the system will always ask the user to confirm before cleaning up the data.
Enable auto clean-up	Select the checkbox to turn on auto clean-up.
Clean-up Mode	Two options are available: Time mode ◆ Schedule Time (Regular clean-up time): Clean up the disk at a specific time in the day. ◆ Schedule Date (Regular clean-up date): Clean up the disk every day or on specific day(s) of a week or month. Space mode ◆ Clean up the disk when the remaining disk space is less than the threshold. The default threshold is 10%.

6.2.5 Configuring DICOM information

6.2.5.1 Configuring archiving information

The user can configure PACS Archiving, DVD/USB and other nodes on this page.

Table 6-7 PACS archiving settings

Item	Description
Local AE	The AE name of system in the DICOM network.
Local Port	The DICOM service port of the system. It is "3333" by default.
Default Display Name	The default display name of the remote DICOM node for archiving. Select one from the configured Display Name list.
Timeout (Second)	DICOM communication timeout ("30" by default). The default timeout for connecting to PACS is 30 seconds. When timeout occurs, the connection stops and a message pops up.
Anto Archive With Graphics	Select the checkbox to include graphics in auto archiving.
Auto Restart	Always: Once the archiving fails, the system will keep restarting the archiving task till it succeeds. Custom: Customize the times for restart. Select this item to set the times of system restart in Auto Restart Count. Off: Turn off auto restart.

Table 6-8 DVD/USB archiving settings

Item	Description
DICOM Viewer	Select the checkbox to include the DICOM viewer during archiving.
USB Flash Supported	Select the checkbox to enable archiving to USB devices.

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Item	Description
Media GSPS Export Mode	Three options are available: Standard file: Export the graphics as independent files. Overlay: Save and export the graphics as DICOM tags in the DICOM files. Burn into pixel data: Save and export GSPS information as pixels in the original images. This will change the original data.

Setting other nodes

Other nodes can be added manually. Added nodes can be edited, deleted, or tested for characters.

Button	Function
Add	Adding an archiving node
Edit	Editing an archiving node 1. Click **Edit** next to a node, and the Archiving Edit window is displayed. 2. Editing the node information. The Archiving Edit window is mostly the same as the Archiving Add window. The Peer AE is read-only and cannot be changed. 3. Click **Confirm** to save the changes.
Delete	Deleting an archive node 1. Click **Delete** next to a node, and a confirmation dialog box pops up. 2. Click **Yes** to delete the node.
Validate	Validating a node 1. Click **Validate** next to a node. ◆ If the validation is successful, the SOP Class UID types supported by the PACS node can be viewed. Otherwise, the system displays "**Validate error**.
Test Character	Testing character set encoding 1. Click the **Test Character** button next to the character set encoding node. ◆ If the verification is successful, the system displays **Pictures uploaded successfully, please check on the PACS server**. ◆ Otherwise, the system displays **Pictures upload failed**, and the archiving connectivity needs to be verified.

■ Creating a new connection node

1. Click **Add** to open the Archiving Add window.

Table 6-9 Adding a PACS node

Item	Description
Display Name	The display name is the unique identification mark of the system.
Peer AE	Name of the new Peer AE.
Peer Port	Port of the node.
Peer IP/Hostname	IP address or host name of the node.

Item	Description
GSPS Export Mode	GSPS export mode ◆ See Table 6-8.
Character Supported	Select the character set based on the connected third-party device or the character sets supported by the system. The options include: ◆ ISO_IR 100 ◆ ISO_IR 192 ◆ GB 18030
IsSupport Chinese	Select **Yes** if ISO_IR 192 or GB 18030 has been selected in Character Set.
Interpolation Original Image	◆ It is only for archiving images to PACS. ◆ Non Interpolation: No interpolation. Select this item if cubic interpolation is used. ◆ Interpolation to 512: Changing the reconstruction matrix directly into 512 x 512. Select this item if linear interpolation is used or if the interpolation mode is unknown.
Set Archiving Status	Decide whether to change the status after data is archived to this node. ◆ If this option is unselected, the status of the data that are archived to this node will not become "PACS Archived".

NOTICE

It is recommended to obtain the character sets from RIS or PACS. If the character set cannot be confirmed, switch between Chinese and English character sets to send data to RIS or PACS.

2. Click **ADV Setting** to open the ADV Setting window.

Table 6-10 ADV Setting

Item	Description
Auto Storage Commitment	Automatic storage confirmation ◆ Whether the recipient automatically sends confirmation after archiving. The confirmation message can be sent asynchronously (ASYN) or synchronously (SYN).
Priority	Priority ◆ Priority for PACS node archiving. Options include **General** and **Prior**. If there are multiple nodes for archiving, the data will be archived to the nodes that have higher priority.
SOP Class UID Validate	Validating the unique identification number of SOP Class ◆ Click **Validate** to validate the SOP Class UID (image type) supported by the remote node.
Enable Compress	Whether to compress the images before archiving ◆ Select this checkbox to enable file compression.

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6.2.5.2 Configuring MPPS

MPPS (Modality Performing Procedure Step) is mainly used to communicate with RIS to update the status of the current study, for example, "In Progress" and "Completed". This aims to synchronize information with RIS.

Note: **Save MPPS Message** and **Auto MPPS** are linked. **Save MPPS Message** can be selected only when **Auto MPPS** is selected.

Item	Description
Local AE	Name of the DICOM AE of the system.
Default AE	Default AE name of the remote DICOM node. Set Default AE based on actual situations.
Time Out (Second)	DICOM communication timeout ("30" by default).
Save MPPS Message	Select this checkbox to save MPPS messages. It is unselected by default. Note: This option can be enabled during calibration or troubleshooting. Once it is selected, MPPS messages sent to external systems will be saved as local DICOM files for the convenience of data analysis.
Auto MPPS	Send MPPS messages automatically.

The configuration of new MPPS nodes is similar to that of PACS nodes. MPPS nodes can be added, deleted, or edited.

Operation	Description
Adding a node	1. Click **Add**. 2. Fill in each field, and click **Confirm** to save the node.
Editing a node	1. Click **Edit** next to a node, and the Edit window is displayed. ◆ Peer AE cannot be edited. 2. Click **Confirm** to save the node.
Deleting a node	1. Click **Delete** next to a node, and a confirmation dialog box pops up. 2. Click **Yes** to delete the node.
Validating a node	1. Click **Validate** next to a node. 2. Check the validation result. ◆ If the validation is successful, the SOP Class UID types supported by this node can be viewed. ◆ Otherwise, the system displays **Validate error**.

6.2.5.3 Configuring Worklist

The user can configure Worklist information and Worklist node information on this page.

1. In the **Worklist** section, configure the Worklist service information.

Item	Description
Worklist	Select the checkbox to turn on worklist query. ◆ Once it is turned on, the system will automatically query the study information of the remote RIS which provides Worklist services. ◆ Data from RIS will be displayed in the PA interface when RIS is selected as data source.
Refilter	Set whether to turn on the filter for repeated data. ◆ Select the checkbox to turn on the filter. The data obtained from the Worklist queries are compared with the data in local database, and repeated data will be deleted.
Modify	Set whether modifying the data from RIS is allowed. ◆ Once it is turned on, data from RIS can be selected in the PA interface and loaded to the PR interface for modification.
Force To Use Default Character	Set whether to use the default character set.
Default Character Set	Set the default character set. The options include "ISO_IR 100", "ISO_IR 192", and "GB18030".
Filter As Current AE	Send the AE name of the system to RIS. RIS sends the studies with this AE name back to the system.

2. Edit node information in the Worklist Service Node section.

Item	Description
Called AE (Remote)	AE name of the remote RIS node.
Calling AE (Local)	AE name of the local node.
IP/Hostname	IP address of the remote RIS node. Note: ◆ IP must be a string of the format "*.*.*.*" and each "*" must be a number between 0 and 255. ◆ The user will be informed if the format is wrong.
Port	Port of the remote RIS node.
Timeout (Second)	Query timeout. ◆ The allowed range is 30-180. Note: Timeout should be configured based on the network speed. If the network latency is high, Timeout can be set longer.
Modality	Select the equipment types of which the registration information needs to be acquired from RIS. ◆ Select **Other** to enter a customized value based on actual situations.
Refresh Frequency (Minute)	Automatic refresh interval.

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NOTICE
IP must be a string of the format "*.*.*.*" and each "*" must be a number between 0 and 255. In case of an error, a message in red will be displayed: "Please follow window IP rule, 1-223.0-254.0-254.0-254."

NOTICE
Timeout should be configured based on the network speed. There is no need to change the default setting of Timeout if validation has succeeded and the network latency is within 1 ms.

3. Click **Save** to save the configuration.

Validating the settings

After the configuration, all the information should be checked.

▶ Click **Validate** to check the connection.

6.2.5.4 Configuring printers

Configuring the DICOM printer

Item	Description
*Local AE	AE name of the local node.
*Timeout (Second)	Connection timeout.
Film Session Label	A common attribute of printers. It allows 64 characters at most.
Owner ID	A common attribute of printers. It allows 16 characters at most.

Configuring the filming printer

Item	Description
Clear Display (After Printing)	Clearing the list ◆ If the checkbox is selected, the list will be cleared automatically after printing.
Save E-Film (After Printing)	Saving E-films ◆ If the checkbox is selected, the E-films will be saved automatically after printing.
Auto Exit (After Printing)	Closing the interface automatically ◆ If the checkbox is selected, the Filming interface will be closed automatically after printing.
Clear Display (After Saving E-Film)	Clearing the display after saving E-films ◆ If the checkbox is selected, the images and data will be cleared automatically after clicking **Save E-film**.
Printer Filter	Filtering printers ◆ Filter option for the paper printer. The default setting is recommended. Select **ALL** (no filtering) or **Customer**. ◆ Note: "Customer" means that the filter can be defined by the user. "Connections\Local" is displayed by default. The user can enter "Connections\Local\Queued\DirectPrinting\Shared\EnableDevQuery\KeepPrintedJobs\WorkOffline\EnableBidi\RawOnly\PublishedInDirectoryServices\Fax\TerminalServer\PushedUserConnection\PushedMachineConnection". The items must be separated by the backslash (\).

Setting the Printer list

Button	Description
Add	Adding a printer 1. Click **Add**. 2. Edit the parameters. 3. Click **Confirm** to save the results.

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Button	Description
Edit	Editing a printer 1. Click **Edit**. 2. Edit the parameters. 3. Click **Confirm** to save the results.
Delete	Deleting a printer 1. Click **Delete**. 2. Click **Yes**.
Validate	Validating the settings ◆ Click **Validate** to check if the printer can be connected successfully.

Adding a printer

1. Click **Add** and set the parameters in the Printer Add window that pops up.

Table 6-11 Printer properties

Item	Description
PeerAE	The AE name of the printer. (Read only)
PeerPort	The service network port for the printer.
PeerIP/Hostname	The supported IP address and host name.
Description	Description of the printer. For example, "Kodak 14-inch film printer".
FilmSize	Size of the printed films. Multiple selections are allowed.
Default FilmSize	The default size of printed films.
Default Orientation	The default printing orientation. The options include **indicating landscape** (vertical) and **indicating portrait** (horizontal). The default orientation is **indicating landscape** (vertical).
Number of Copies	Number of copies to be printed.
Color Print	Select the checkbox to turn on colored printing.
ADV setting	Click to display the advanced settings for the printer.

2. Click the **ADV setting** button to edit advanced settings.

Table 6-12 Advanced printer setting

Item	Description
Film Destination Item	Adding the film destination
Film Destination	Selecting the film destination
Medium Type Item	Adding a film type
Medium Type	Film type ◆ There are options available by default, which cannot be deleted. It is allowed to add new options. ◆ The default setting is recommended.
DPI	Printing resolution

Item	Description
Enable LUT	Whether to enable processing the sent films based on the LUT curve.
Import LUT	Importing LUT ◆ Click **Browse**, select the LUT, and then click **OK**. Click **Import** to import the LUT.
Current LUT Name	The current LUT name ◆ Select LUT (CT/PT/MR/DX/MG/ALL) for different image types.

6.2.6 Configuring privacy and security

6.2.6.1 Configure system security options

1. Click **System Security Setting** in the **Privacy and Security** section.
2. Turn on the functions.
   - User Access Control: If you select this checkbox, usernames and passwords will be required for login.
3. Click **Save**.

6.2.6.2 Configuring audit trail

1. Click **Audit Trail Configuration** in the **Privacy and Security** section.
2. Configure the remote audit trail log server.

Table 6-13 Remote audit trail log server settings

Item	Description
Host Name/IP	Host name/IP address
Port Number	Host port number
Protocol	Select the upload protocol (TCP or UDP).
Encoding	Select the encoding method. UTF-8 is selected by default.
Remote Server Status	Status of the remote server.
Test Server	Testing the connection to the server.

3. Configure the local audit trail log storage settings.

Table 6-14 Local audit trail log storage settings

Item	Description
Repository Space (MB)	Storage space ◆ The default setting is 10,240 MB.

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Item	Description
Warning Level (%)	Warning threshold ◆ When the used space exceeds the warning level (90% by default), the system will alert the user.
Quota Limit (%)	Quota threshold ◆ When the used space reaches the quota limit (95% by default), the system will display an error message.

4. Configure the archiving of audit trail log.

Table 6-15 Audit trail log archiving settings

Item	Description
User Name	Username
Domain	System domain name
Password	Password
Position	The path for archiving files
Test	Testing network connectivity

5. Configuring the automatic deleting.

Table 6-16 Automatic deleting settings

Item	Description
Upload to Log Server	Whether to delete the audit trails that have been uploaded to the log server automatically. ◆ If the checkbox is selected, the audit trails that have been uploaded to the log server will be deleted automatically.
Archive to USB/Mapping Server	Whether to delete the audit trails that have been manually archived to the USB/Mapping server automatically. ◆ If the checkbox is selected, the audit trails that have been manually archived to the USB/Mapping server will be deleted automatically.

6. Click **Save**.

6.2.6.3 Viewing audit trail logs

1. Click **Audit Trail Viewer** in the **Privacy and Security** section.
2. Select a log to view the details in the display area on the right side.
3. Click **Display Raw XML** to view the log in XML format.

6.2.6.4 Managing audit trail logs

1. Click **Audit Trail Viewer** in the **Privacy and Security** section.
2. Search for audit trail logs based on the time period.

3. Select the archiving status and archive nodes of logs.
4. Turn on or off the Mapping server.
5. Select the audit trail logs, and then archive or delete the logs.

6.2.6.5 Managing user accounts and user groups

Adding a user account

After a user account is created, the username cannot be modified.

1. Click **User/Group Management** in the **Privacy and Security** section.
2. Click **Add** in the **User** tab.
3. Edit the user information in the **User Information** area.
   - For user information, see "User information" on page 6-19.
4. In the **Group Membership** area, select which user groups this account belongs to.
5. Click **OK**.

Table 6-17 User information

Item	Description
Login Name	It must be unique, with numbers or English letters only (30 characters at most).
First Name	The first name of the user.
Last Name	The last name of the user.
Input New Password	Enter a new password.
Confirm New Password	Repeat the new password.
User Cannot Change Password	If you select this checkbox, the user cannot change the password.
Lock User	You can deselect this checkbox to unlock the user when the user is locked. This setting cannot be changed when you add a new user.
Password Could Be Empty	Select the checkbox to allow empty passwords.
User_u	The account will have the User_u permissions.
Admin_u	The account will have the Admin_u permissions.

NOTICE
The newly created accounts cannot end with "_u".

Editing a user account

Accounts that end with "_u" are preset in factory and cannot be edited.

1. Click **User/Group Management** in the **Privacy and Security** section.

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2. Click **Edit** in the **User** tab.
3. Edit the user information in the **User Information** area.
   - For user information, see "User information" on page 6-19.
4. In the **Group Membership** area, select which user groups this account belongs to.
5. Click **OK**.

Deleting a user account

The username of a default user account ends with "_u". Default user accounts cannot be deleted.

1. Click **User/Group Management** in the **Privacy and Security** section.
2. Click **Delete** in the **User** tab.
   - The confirmation dialog box pops up.
3. Click **Yes**.

Table 6-18 User group permissions

Permission group	Permission name	Description
Security Settings	System Security Management	System safety management: turning on or off the function of privacy and safety
	Audit trail Configuration	Audit trail configuration
	User Management	User management: adding, deleting, or editing user accounts and user groups
	View Audit trail Messages	View audit trail messages
	Archive Audit trail Messages	Archive audit trail messages
	Delete Audit trail Messages	Delete audit trail messages
Archiving	Export data to PACS	Archive data to PACS
	Export data to USB, DVD or Network Storage	Archive data to a USB device, DVD, or network drive
Import	Import data from PACS	Import data from PACS
	Import data from USB, DVD	Import data from USB devices or DVDs
PA	Merge Study	Merge studies in the PA interface
	Protect Patient Data	Protect or unprotect studies in the PA interface
	Delete Patient Data	Delete studies in the PA interface
	Edit Patient Group	Edit the data group of the studies in the PA interface
Filming	Print of Film	Permission to print films

Permission group	Permission name	Description
System Tools	ExamWorkflow	Permission to configure exam workflow
	PRConfig	Permission to configure patient registration
	PrintSet	Permission to configure printers
	ImageText	Permission to configure image text
	Film Set	Permission to configure filming information
General Service Settings	Select/Unselect all	Select/Deselect all
	General Service Settings	General service settings
System Tools	Select/Unselect all	Select/Deselect all
	Image Text Config	Image text configuration
	Patient Regist Configuration	Patient registration configuration
	Auto Archiving Configuration	Automatic archiving configuration
	Preset Windowing Configuration	Preset the configuration of window width and window level
	Film Page Configuration	Filming configuration
	Patient Admin Configuration	Patient administration configuration
	Cross Line Configuration	Cross positioning line configuration
	Measure Property Configuration	Measurement property configuration
	View Layout Configuration	Review layout configuration
	Report Template Configuration	Edit report templates

Adding a user group

Only one administrator group is allowed.

1. Click **User/Group Management** in the **Privacy and Security** section.
2. Click **Add** in the **Groups** tab.
3. In the **Group Message** area, enter the name of the user group in the Group Name text box.
4. Select permissions for the user group in the Permissions area.
   - For user group permissions, see "User group permissions" on page 6-20.
5. Click **OK**.

Editing a user group

1. Click **User/Group Management** in the **Privacy and Security** section.
2. Click **Edit** in the **Groups** tab.
3. Edit the descriptions of the user groups.

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- For user group permissions, see "User group permissions" on page 6-20.

4. Click **Yes**.

Deleting a user group

Default user groups cannot be deleted.

1. Click **User/Group Management** in the **Privacy and Security** section.
2. Click **Delete** in the **Groups** tab.
   - The confirmation dialog box pops up.
3. Click **Yes**.

Configuring password rules

1. Click **Password Rules** in the **Privacy and Security** section.
2. Define the password rules.

Table 6-19 Passwords rules settings

Permission name	Description
Must include upper case	The password must contain uppercase letters.
Must include lower case	The password must contain lowercase letters.
Must include number	The password must contain numbers.
Must include special character	The password must contain special characters.
Must change after create	The original password must be changed after a new user account is created.
Minimum password length	Set the minimum password length. The default length is 6 characters.
Max Invalid Login Count	The maximum invalid login times. It can range from 3 to 100 (10 by default).

3. Click **Save**.

Configuring common settings

1. Click **Common Setting** in the **Privacy and Security** section.
2. Configure the emergency login settings in the **Emergency Mode** area.
   - **Enable emergency login**: Allowing emergency login.
   - **Enter user name while login**: Requiring username for emergency login.
   - **Re-enter user name before proceeding after not more than x examinations**: Setting the maximum number of scans after which the username must be entered again. It can range from 1 to 99 (5 by default).
3. Set the waiting time before the screen is locked in the **Lock System** area.
   - The default setting is 30 minutes. If the user does not operate the system in 30 minutes, the screen is locked automatically.

- The number can range from 0 to 999. 0 means that the system will not be locked automatically.

4. Click **Save**.

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6.3 XuanYuan Service interface

Table 6-20 Configuring workflow

Item	Function
UPS shutdown countdown Times	Setting the countdown of UPS after system power failure ◆ Only available for systems that are equipped with UPS. When system power failure occurs, UPS starts the countdown for system shutdown.
RIS Study ID display	Setting the source of patient ID ◆ Only available when the system is connected to PACS
Temperature Unit	Setting the temperature unit (reserved) ◆ Only available for systems that are equipped with DAP ◆ DAP temperature should be entered for the DAP calibration
DR noise reduction	Setting DR superimposed frame ◆ If the image quality cannot pass the test with the default value, increase the number of superimposed frames by setting this item to the maximum value, so as to achieve the best image quality ◆ Advantage: A larger number of images result in better image quality ◆ Disadvantage: As the exposure time increases, larger motion artifacts may appear
Length Unit	Setting the length unit
Weight Unit	Setting the weight unit
Laser (minutes)	Setting the illumination time for the laser light ◆ The illumination time for the laser light based on actual needs
Exposure Sound Switch	Switch for the exposure prompt tone ◆ The exposure prompt tone can only be switched off in the fluoroscopy mode.
Remote Exposure Switch	Switch for remote exposure ◆ When the wireless exposure foot switch is lost, deselect this item to disable the function of remote exposure, so as to prevent misoperation.
Dose Unit	Selecting the display mode of dose You can select to display a certain group or all groups of dose information on the real-time screen.

6.4 System tools

6.4.1 Deleting files

1. In the Service interface, click **Tools&Utilities** > **Delete Files**.
2. Select the files that need to be deleted, and then click **Delete**.
3. Click **OK**.

6.4.2 Extracting bug reports

In case of failures, you can quickly extract the bug reports and relevant logs for trouble-shooting in the bug report interface.

1. In the Service interface, click **Tools&Utilities** > **Bug Report**.
2. In **Log file name**, enter the name of the compressed file that will contain the extracted reports.
3. In **Contact**, enter the contact information of the person who found or reported the problem.
4. In **Description**, enter the description of the problem.
5. Set the **Start date** and **End date** to extract the reports within a certain period of time.
6. Set the details of the target file.
   - Select a data and information type from the drop-down list. General: Including UIH logs, service logs, Windows logs, DB logs, and Temp files. Crash: Relevant dump files. Database: Files related to the database.
   - Set the generated time of the information type.
7. Click **Save**.
8. Go to E:\UIH\TransformFTP, copy the compressed file, and send it back to UIH.
   - If Upload To ServiceCenter on the Remote Config page is turned on, the bug report will be automatically uploaded.
   - If there is no file in the folder, you can wait for some time and check again.

6.4.3 Anti-virus protection

▶ In the Service interface, click **Tools&Utilities** > **Anti-Virus** to open the anti-virus software.

- You can view the information of the anti-virus software, including name, version, and status.

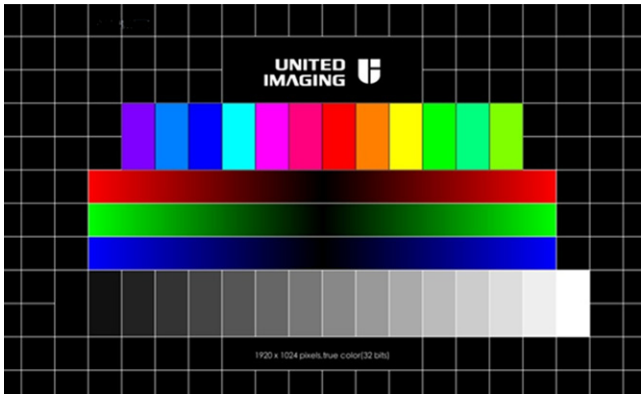
6.4.4 System tools

6.4.4.1 Calibrating the monitor

Calibrate the monitor to ensure the quality of image display.

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1. In the Service interface, click **Tools&Utilities** > **System Utilities** > **Calibrating the Monitor**.
   - The system starts calibrating the monitor.



2. Press <Esc> to exit the calibration interface.

6.4.4.2 Configuring printers

You can view and configure the printer and relevant information on this page.

1. In the Service interface, click **Tools&Utilities** > **System Utilities** > **Printer Config**.
2. View or configure the printer and relevant information.

6.4.4.3 Configuring a persistent route

The user can add persistent routes, and set the IP address, subnet mask, gateway and metric on this page.

1. In the Service interface, click **Tools&Utilities** > **System Utilities** > **Persistent Route Config**.
2. Click the **+** button to add a new persistent route.
3. Fill in IP, Subnet Mask, Gateway, and Metric, and then click **Save**.
   - Note: The user can click **Delete** to delete the selected persistent route.

6.4.4.4 Testing network connection

1. In the Service interface, click **Tools&Utilities** > **System Utilities** > **Network Connection Test**.
2. Enter the IP address, port, and other information of the network to be tested.
3. Click **Test** to start the test.
   - Click **Cancel** to close the window.

6.5 System information

▶ In the Service interface, you can click **About** to view the system configuration information.

- System Info: Serial number, product number, system ID, and dongle ID.
- Product Info: Specification Model (product modality), software name, released version, and full version.
- Software Version: The version of the system software.

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7 Rapid workflow

7.1 Exam flow chart 7-2

7.2 Workflow overview 7-5

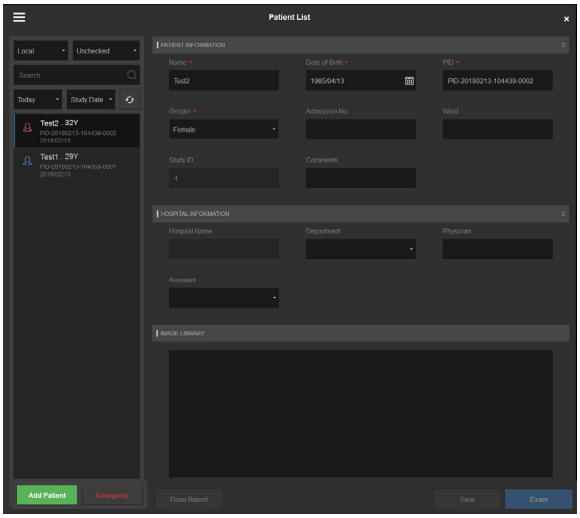
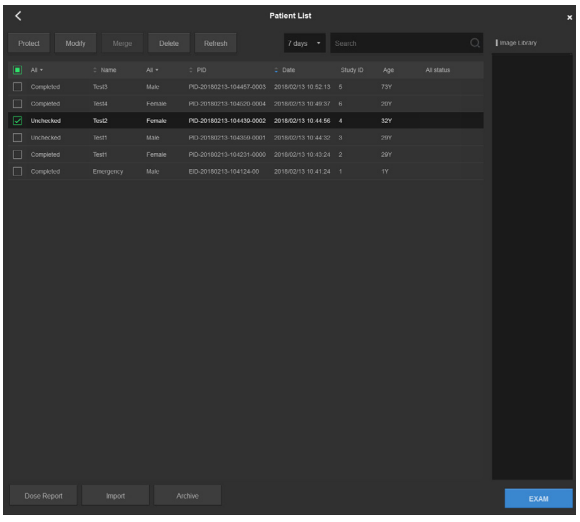
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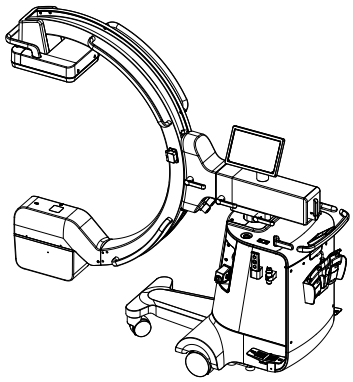
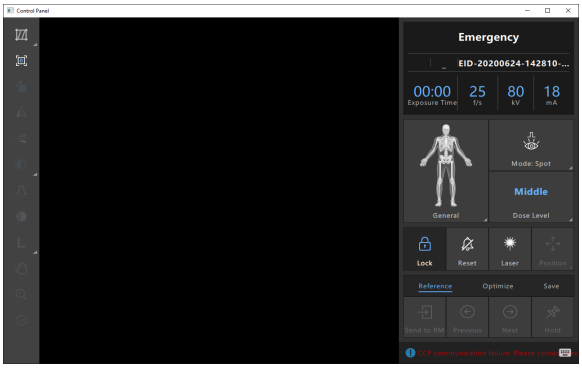
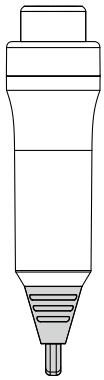
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7.1 Exam flow chart

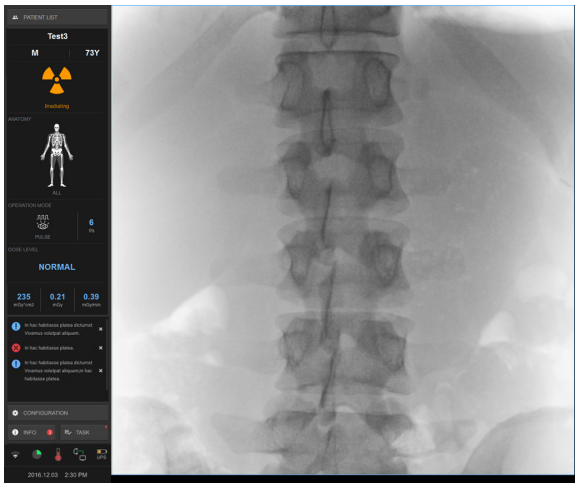
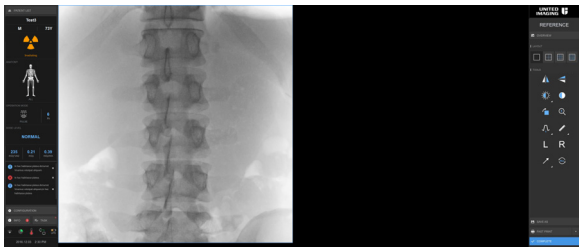
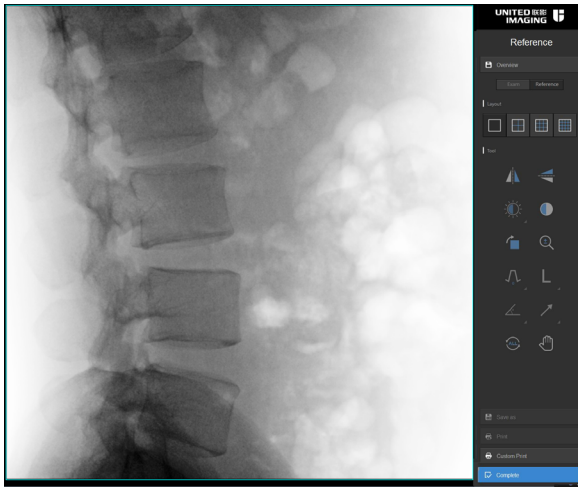
The equipment supports a series of workflows from "Patient Registration" and "Exam" to "Filming".

Table 7-1 Quick workflow

Steps	Diagram	Reference
Press the startup/ shutdown button to start the system		Please refer to "System start/ shut-down" on page 4-2.
Load a patient for examination	◆ Click **New Patient** to fill in the patient information. ◆ Click **Save** to save the patient information. ◆ The user can also click **Exam** to save the patient information and exam the patient. ◆ In case of emergency, the user may click **Emergency**, and replenish the patient information when the examination is completed. 	Please refer to "Patient registration" on page 9-1.
	◆ Select a patient from the study list. ◆ Click **Exam** to go to the examination. 	Please refer to "Entering the exam interface" on page 10-3.

Steps	Diagram	Reference
Position the C-arm trolley and C-arm position		Please refer to "System operations and positioning" on page 4-1.
Parameter setting		Please refer to "Setting exam parameters" on page 10-5 and "Setting optimized parameters" on page 10-13.
Exposure	◆ Taking the exposure hand switch as an example, exposure can also be performed using foot switch. 	Please refer to "Exposure X-ray radiation" on page 10-17.

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Steps	Diagram	Reference
Real-time image preview	◆ During radiation, the user can view the real-time image on the real-time screen. 	Please refer to "Real-time image display" on page 10-19.
Complete the examination	◆ Click **Complete** in the lower right corner to end the study and return to the Patient Registration interface. 	N.A
Set the reference image		Please refer to "Setting reference image" on page 10-27.

7.2 Workflow overview

7.2.1 Preparations

Before starting the system, move the equipment to the specified location and adjust the position as needed.

1. Move the C-arm trolley and monitor cart to the designated operation location.
2. Connect the connecting cable between the C-arm trolley and the monitor cart, and connect the power supply.
3. If necessary, place the foot switch in a proper position.
4. Rotate the monitor and adjust the angle of the control panel on the C-arm trolley according to the exam requirements.

⚠ WARNING

The system may not work properly due to heat radiation failure.

- Do not place any object to block the heat outlet during operation.

⚠ WARNING

Penetration of liquid into the machine may result in electric shock or cause damage to the machine.

- Do not place water cup or other container filled with liquid on the equipment during operation, so as to prevent the immersion of liquid in the overturned container.

7.2.2 Starting the system

▶ Press the startup/shutdown button to start the system.

7.2.3 Patient Registration

For new patients:

1. Enter patient information on the Patient Registration interface.
2. Click **Exam** to access the Exam interface.

For registered patients:

1. Select a patient to be examined from the patient list on the Patient Registration interface or the Patient Administration interface.
2. Click **Exam** to access the Exam interface.

7.2.4 Gantry location adjustment

1. Confirm that the system meets the patient exam requirements.

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- For example: Ensure the cleanness of accessible parts for patients, and check whether the aseptic cover is placed, etc.

2. Move the C-arm trolley to a proper position.
3. Adjust the position of the C-arm, such as orbital motion, angulation, vertical motion, horizontal movement and swivel motion. For details, see "C-arm positioning" on page 4-10.

NOTICE
Before positioning the C-arm trolley and C-arm, make sure that they will not collide with or crush operators and patients.

7.2.5 Patient positioning

Check the radiation protection for patients, and cover the necessary radiation protector on the patients.

7.2.6 Setting the exam parameters

1. Go to the Exam interface and set the application protocol and X-ray radiation parameters.
2. Set the exam optimization parameters based on actual needs.

For operations related to exam settings, please see "Setting exam parameters" on page 10-5 and "Setting optimized parameters" on page 10-13.

7.2.7 X-ray radiation

1. Unlock the X-ray radiation.
2. Perform the radiation using the exposure hand switch or foot switch.

⚠ WARNING
Hot tube may cause burns. - Continuous exposure leads to temperature increase of the tube. Do not touch the enclosure of the monoblock and prevent the monoblock from contacting the patients and other related personnel to avoid burns.

NOTICE
During the exposure process, make sure that there are no unrelated objects in the ray path; otherwise, the radiation dose exposed to patients may be increased.

7.2.8 View the image

NOTICE

The images on C-arm control panel and monitor cart control panel are for reference only, and are not intended for diagnostic purposes.

- We advise users to view diagnostic images only with the high-quality monitor provided on the monitor cart, and to view images neither on the C-arm trolley control panel nor on the monitor cart control panel.

During the X-ray radiation process, the real-time image is displayed on the real-time screen of the monitor on the monitor cart, on the C-arm control panels and on the monitor cart control panels. After the radiation is completed, the exposure image and LIH image is automatically sent to and displayed on the control panel of the monitor on the monitor cart.

Based on clinical requirements, perform basic processing on the image with the image processing tools. For detailed operations, see "Real-time image processing" on page 10-21.

▶ After confirming the image, click **Complete** to end the study.

7.2.9 Shutting down the system

▶ Press the startup/shutdown button to shut down the system.

7.2.10 Restarting the system

⚠ CAUTION

Force shutdown or abnormal power off of the system may result in corrupted hard disk data and software, lost images, slow subsequent startup due to file system checks, failure to startup requiring software re-installation, and loss of all saved images.

The system can be restarted due to system failure or power supply is interrupted.

After the restarting, the system operation can be recovered.

NOTICE

The patient's information won't be lost and exam can be recovered. For workflow instruction, see "Exam flow chart" on page 7-2

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8 Patient administration

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8.1 Overview

The equipment provides the patient data management function, which is mainly used for administrating and displaying study data that stored in the system.

- Sort the registered patient data by different criteria.
- Preview the study image of target patient.
- Perform tagging, protection and archiving and other functions on the study data.
- Modify or delete the study data.
- Select target data and load it into the relevant application.

8.1.1 Entering the patient administration interface

▶ Click ☰ on the patient registration interface to switch to the patient administration interface.

8.1.2 Functional Block

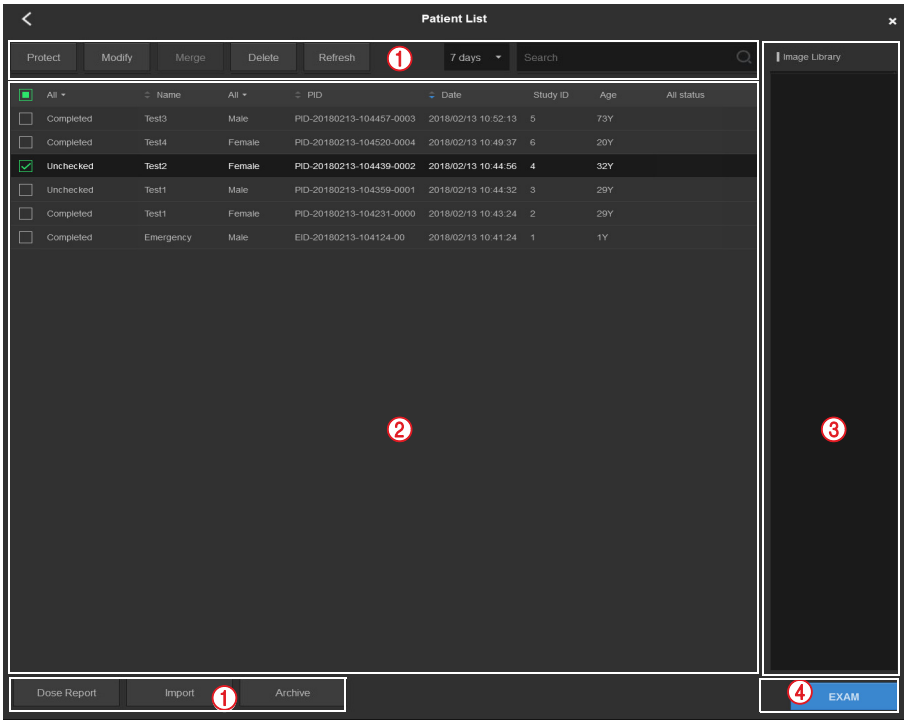


Figure 8-1 Patient Administration (PA) interface

No.	Functional Block	Description
1	Functional Operation area	Displays the function buttons, with which the user can administrate the patient information and data.
2	Exam List area	Displays the list of the patients registered for exam, for example, the patients to be examined, the patients suspended exam, the patients under examination and the patients have been examined.

No.	Functional Block	Description
3	Image Loading area	Displays the taken images and loads then into the Image Viewing interface.
4	Exam button	Loads a patient for exam.

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8.2 Importing the data

8.2.1 Importing the data from PACS

1. Click **Import** in the patient administration interface.
2. Select the PACS.
3. Select the patient data or the image data.
   - You can also search the data through key word.
4. Click **Import**.

8.2.2 Importing the data from mobile device

1. Connect the mobile device to the host.
2. Click **Import** in the patient administration interface.
3. Select the mobile device such as CD/DVD or USB.
4. Select the file of corresponding date.
5. Select the file containing the patient data.
   - The file contain the patient data and the image data.
6. Click **Import**.

8.3 Displaying the data

8.3.1 Refreshing the data

▶ Click **Refresh** to refresh the patient data in the study list.

8.3.2 Displaying and hiding the header

The information items in the column header of the patient list can be configured based on the data management demands.

1. Click the right mouse button anywhere in the column header of the study list to pop up the Study Information Item Configuration list.
2. Select the checkbox in front of the information item, and the information will appear in the study list.
3. Deselect the checkbox in front of the information item, and the item will not appear in the study list.

8.3.3 Adjusting the header length

1. Move the cursor to the right of a header till the cursor becomes a left-right arrow.
2. Drag the cursor to the left or right to adjust the header to a proper length, and then release the mouse button.

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8.4 Locating the data

8.4.1 Data sorting

Studies can be searched and ed using the search box.

The Exam Status, Gender, Study Date and other query items can be queried through the drop-down list box.

Take the Exam Date as an example.

1. Click the arrow icon to display the study date drop-down list.
2. Select **Today**, **7 Days**, **30 Days**, **90 days** or **ALL**, and the study data in the corresponding time period will be displayed in the study list area respectively.

NOTICE
On the Patient Registration interface, optional exam date includes **Today**, **2 days, 7 days**, **30 days and 90 days.**

NOTICE
Search is effective only when the Start Time is earlier than the End Time. If no time period is set, the system will display the study data in all time periods in the study list area by default.

8.4.2 Searching the data

The query box adopts fuzzy search and supports multi-keyword search. It is not case-sensitive during the search process.

1. Click the query box and type an appropriate search criterion.
   - Display the study list results based on the search criterion in real time.
2. Delete the search criterion to reset the query.

8.4.3 Sorting the data

Some items in the study list can be sorted based on actual needs.

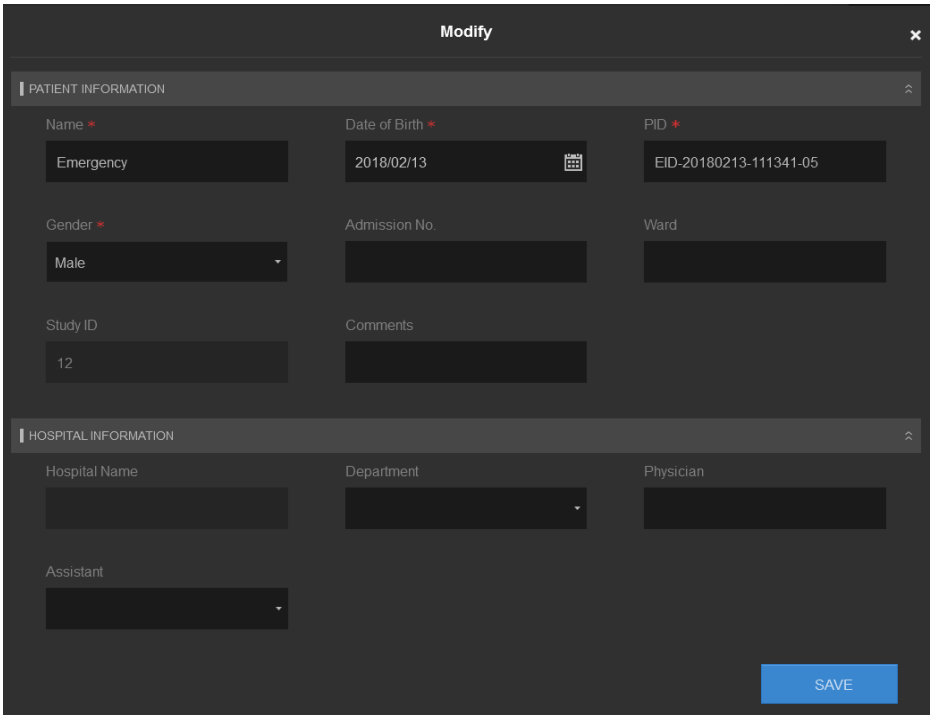
▶ Click the Sort button in the header of the information item.

- Click the up arrow to sort in ascending order.
- Click the down arrow to sort in descending order.

8.5 Managing the data

8.5.1 Modifying the data

1. Select the patient of which the data need to be modified.
2. Click **Modify** to pop up the Modification interface.



3. Modifying the corresponding data.
   - For patients who are to be examined, click **Save** to complete the data modification if the data is not printed or archived.
   - For patients who are under examination, click **Save** to pop up the **Modified by** window if the data is not printed or archived. Fill in the modifier in the pop-up **Modified by** window, and click **OK** to complete the data modification.
   - For patients of which the data is already printed or archived, click **Save as** to save another piece of patient data after modifying the information.

8.5.2 Deleting the data

When the following conditions are met, unnecessary data can be deleted to free up disk space.

- The data is not protected.
- The data is in a non-examination status.
- The data is not loaded to any application.

1. Select a piece of patient data from the Study List area.
2. Click **Delete** or right click on the patient data and then click **Delete**.
   - Complete the deletion operation according to the system prompts.

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- If the selected data is not archived, the system prompts that the deleted data contains unarchived data and cannot be restored after deletion.
- If the selected data is already opened in other applications, the user shall close the relevant applications firstly, and then attempt to delete.
- If the selected data is protected, the system prompts that the protected data cannot be deleted, and the user should cancel the protection before attempting to delete.

8.5.3 Merging the data

Multiple study items of the same patient (with the same name, gender and date of birth) who has been examined can be merged into a new study. The data can be merged when the following requirements are met.

- The patient is not under exam.
- The data is not loaded to any application.

1. If the patient name, gender, date of birth and patient ID are all the same, click the left mouse button to select multiple items of study data of the same patient in the Study List area.
2. Click the **Merge** button, or right click on patient data and then click **Merge** to merge the patient data directly.

or

1. If only the patient name and gender are the same, click the left mouse button to select multiple items of study data of the same patient in the Study List area.
2. Click **Merge**, or right click on patient data and then click **Merge** in the context menu to display the merge window.

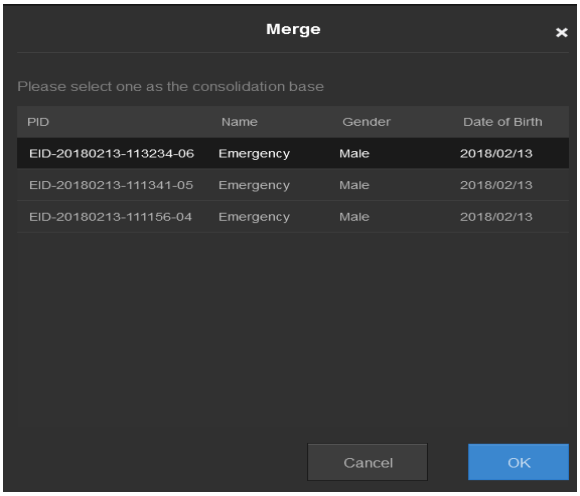
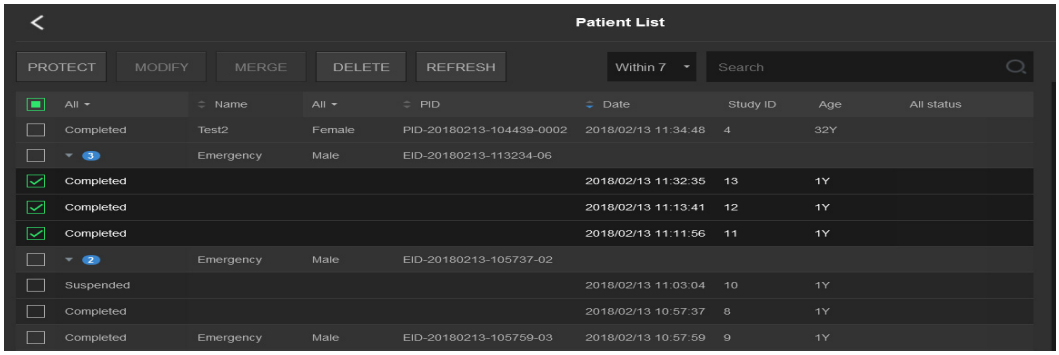


Figure 8-2 Merge window

3. Select a piece of study data as the criterion of merging.
4. Click **OK** to merge the patient data.

After merging, a piece of study with the same name as the original study appears in the Study List area, which contains the merged multiple pieces of study data.

▶ Click the extended button to display all the data.



NOTICE

The study data cannot be merged if it is protected or used by other applications, or not from the same patient.

8.5.4 Protecting/Unprotecting the data

In order to avoid misoperation, the data of a specific patient can be protected. The protected patient data cannot be deleted.

The patient data under protection can be unprotected and recovered to the status of being unprotected.

8.5.4.1 Protect

▶ Select the unprotected patient data, click **Protect**, and the patient data will be protected .

- The user can also click the right mouse button and select **Protect** in the context menu.

8.5.4.2 Unprotect

▶ Select the protected patient data, click **Unprotect**, and the patient data will be recovered to the status of being unprotected.

- The user can also click the right mouse button and select **Unprotect** in the context menu.

8.5.4.3 Save Worklist to local

1. Select one imported study in the worklist in the patient administration interface.
2. Right click the study and select **Save to Local**.
   - The patient in the worklist will be save in the local study list.

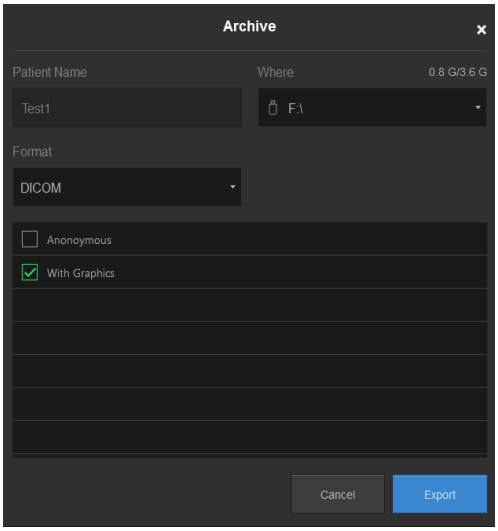
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8.6 Archiving the data

8.6.1 Archiving process

The user can archive the patient data via the **Archive** button.

1. Select a piece or multiple pieces of data from the Study List area.
2. Click **Archive** to pop up the archive window.
   - Or right click on the selected data to pop up the drop-down menu, and then select **Archive** to pop up the archive window.



3. Click to select the available paths for archiving.
   - Only the available archive devices, such as CD/DVD, USB, PACS, are displayed in the drop-down menu of the archiving path.
4. Select the image format, such as DICOM, JPEG, BMP, TIFF, and AVI.
5. Select the optional information of archived data.
   - Select **Anonymous** to hide the patient name when exporting patient data.
   - Select **With Graphics**, and the graphic information will be exported together with the archived data.
   - Select **DICOM reader**, and the DICOM reader will be imported to the CD/DVD or USE with the data.
   - Select the **DICOMDIR**, and the DICOMDIR information will be imported with the data.
6. Click **Archive**, and the selected data and optional information will be archived to the corresponding device.

8.6.2 Archiving management

The archived patient data can be viewed in the task manager, and the archiving task manager can centrally manage the archiving tasks, such as Start, Pause, and Delete. See "Task manager" on page 5-9 for details.

⚠ CAUTION

Data security

- It is prohibited to remove the corresponding receiving device when data is being exported. Otherwise, it will lead to export failure or data loss.

NOTICE

To protect the patient's privacy, the user may select not to export the patient information when exporting the patient data.

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8.7 Viewing the dose report

For the patient data of a patient who has been examined or of which the image is acquired, the patient's dose report is available for viewing.

1. Click **Dose Report** to pop up the Dose Report window.
   - The dose report shows the patient's basic information and dose information.
   - The dose information includes DAP, cumulative dose, and accumulation time.
2. Click **Achieve** to archive the dose reports.
   - Click **Fast Print** to print the dose report.

For the suspended exam, if it is started again, the dose report will be updated accordingly.

8.8 Loading to other applications

8.8.1 Loading to patient registration

1. Click  at the top right corner of the Patient Administration interface to switch to the Patient Registration interface.
2. Click  to display the patient registration information.

8.8.2 Loading a patient for examination

1. Select a patient to be examined from the patient list.
2. Click **Exam** to load to the exam interface.

Or

1. Select a patient of which the study is suspended from the patient list.
2. Click **Continue** to load to the exam interface.
   - Click the right mouse button, and select **Continue**.

Or

1. Select a patient who has been examined from the patient list.
2. Click **Repeat** to load to the exam interface.

8.8.3 Loading to image viewing

1. Select a patient of which the image information is acquired from the patient list.
2. Select an image from the image list on the right and double-click the image to enter the Image Viewing interface.

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9 Patient registration

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9.1 Overview

The equipment provides the function of manual registration of new patients.

On the Patient Registration interface, users can complete the following operations:

- Enter the patient info.
- Load the registered patient for examination.
- Perform emergency registration of patient.
- Perform fuzzy search of the registered patients.

9.1.1 Entering the patient registration interface

When the system is started, the image acquisition workstation automatically enters the Patient Registration interface.

If the patient is under examination, click **Patient List** in the upper left corner of the real-time screen to access the patient registration interface.

9.1.2 Functional block

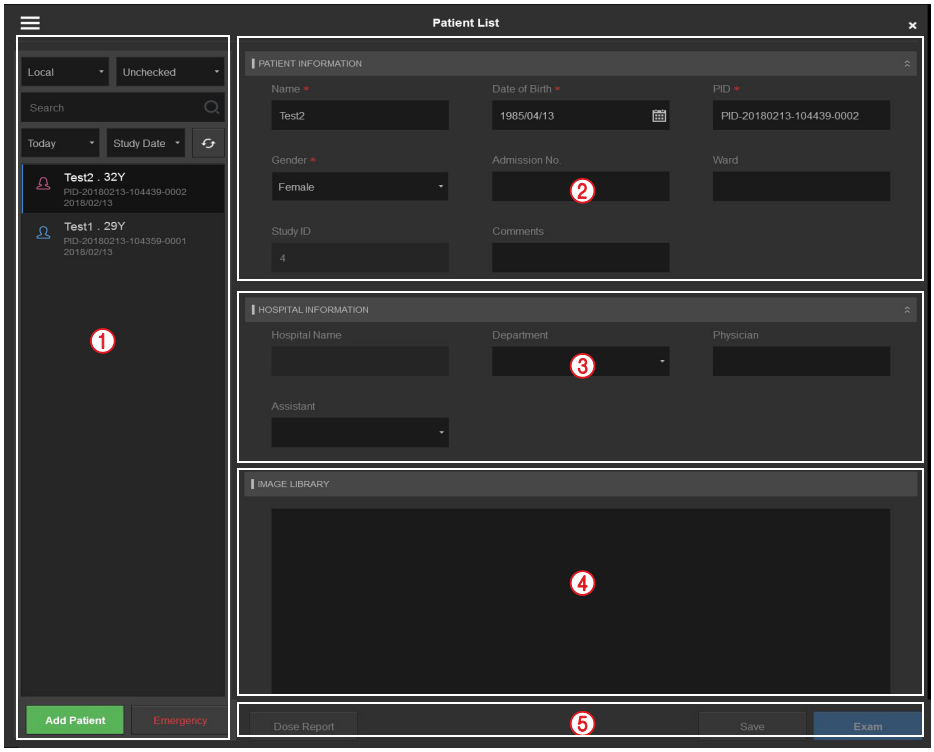


Figure 9-1 Patient Registration interface

No.	Functional Block	Description
1	Patient List area	Displays the patients registered in the current system, through which users can perform fuzzy search or query of patients.

No.	Functional Block	Description
2	Patient Info area	Displays or allows the input of basic patient information.
3	Hospital Info area	Displays or allows the input of hospital related information.
4	Image List area	Displays existing images of patient.
5	Functional Button area	Saves the image, loads the study, or displays the dose report.

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9.2 Registering a new patient

It is necessary to enter basic patient information before the operation.

Complete the information entry with the help of the virtual keyboard on the control panel.

9.2.1 Entering the basic patient information

The items to be filled in patient registration interface can be configured, see "Patient registration configuration" on page 5-8.

1. Click **Add Patient** on the patient list.
   - In the Patient Info area, click on the text box to fill in the patient's basic information, such as the Patient Name, Date of Birth, Gender, and Patient ID. The format of patient name can be configure in service software, see "Setting user information" on page 6-8.
   - The items marked with red asterisk "*" are mandatory.
2. Click on the Name input box and enter the patient name.
3. Enter the date of birth of the patient.
   - Click the Date of Birth input box and enter manually. The input format is YYYY / MM / DD.

Or

   - Click the Calendar control after the Date of Birth input box to display the Date Selection box.
4. Enter the Patient ID.
   - The patient ID is automatically generated by the system. The default format is PID-YYYYMMDD-HHMMSS-[0000-9999], which can also be changed manually.
5. Enter other information.
   - For example: Ward number and Remarks.

The text input box supports up to 64 characters. The name input cannot contain "\" and "^", other text boxes cannot contain "\", and only numeric characters are allowed to be entered in the numeric text box.

9.2.2 Entering the hospital information

The hospital name is displayed by the system by default.

1. Click the Department input box to manually enter the department information, or click the arrow icon of the input box to select the department information.
2. Click the Physician input box to manually enter the physician name.
3. Click the Assistant input box to manually enter the technician information, or click the arrow icon of the input box to select the operator.

The text input box supports up to 64 characters. The name input cannot contain "\", "^", other text boxes cannot contain "\", and only numeric characters are allowed to be entered in the numeric text box.

9.2.3 Completing the information entry

When the information entry of basic patient information and hospital information is completed, click **Save**. The patient will be saved as to be examined in the patient list on the left.

▶

Or

▶ Click **Exam** to save the patient information, and switch to the exam interface to load the patient information. Then, the patient information is displayed in the patient list on the left.

The required fields must be completely filled in; otherwise, the Save or Start Exam button is grayed out.

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9.3 Registering an urgent patient

If the hospital receives an emergency patient requiring immediate study and treatment, the emergency registration function should be used.

1. Click **Emergency** on the Patient Registration interface to automatically go to the Exam interface.
   - The patient name is automatically filled in as "Emergency", the gender defaults to "Male", and an emergency patient ID is automatically generated.
   - The patient registration ID is automatically generated by the system. The default format is EID-YYYYMMDD-HHMMSS-[00-99].
2. When the study is completed, return to the Patient Registration interface and supplement the relevant patient information.

9.4 Loading to Exam

9.4.1 Loading a patient to be examined

1. In the exam interface, click the study list.
2. Select a patient to be examined from the patient list.
3. Click **Exam** to go to Exam.

Or

1. Select a patient to be examined in the study list.
2. Click **Exam** to go to Exam.

9.4.2 Loading the patient has been examined

1. On the Exam interface, click the study list.
2. Select a patient who has been examined.
3. Click **Repeat** to go to Exam.

Or

1. Select a patient who has been examined in the study list.
2. Click **Repeat** to go to Exam.

9.4.3 Loading the patient of which the exam is suspended

1. On the Exam interface, click the study list.
2. Select a patient of which the exam is suspended.
3. Click **Continue** to go to Exam.

Or

1. Select a patient of which the exam is suspended in study list.
2. Click **Continue** to go to Exam.

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10 Exam

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10.1 Overview

After entering into Exam, users can set exam parameters, view radiation status and real-time images, browse reference images, and make some post-processing to assist the clinical diagnosis.

- On the C-arm control panel, set the basic and optimized parameters, and view the radiation status and the collected real-time images.
- The exam parameters and status are displayed on the real-time screen (LM screen).

10.1.1 Entering the exam interface

Through patient registration

▶ After patient registration, click **Exam** to go to the Exam interface.

Or

▶ Select a patient from the patient list of the Patient Registration interface or Patient Administration interface, and then click **Exam** to go to the Exam interface.

Or

▶ Click the **Emergency** on the Patient Registration interface to access the Exam interface.

Through patient administration

▶ Select a patient from the patient list of the Patient Administration interface, and then click **Continue** to go to the Exam interface.

Or

▶ Select a patient suspended exam from the patient list of the Patient Administration interface, and then click **Continue** to go to the Exam interface.

Or

▶ Select a patient completed exam from the patient list of the Patient Administration interface, and then click **Repeat** to go to the Exam interface.

When a new patient is loaded into the Exam interface, if a patient is being examined, the patient's examination will automatically end and be saved in the patient list as a suspended status.

10.1.2 Functional block

10.1.2.1 Real-time screen (LM screen)

Real-time screen description see "Interface distribution" on page 5-6.

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10.1.2.2 Control panel

The control panel of C-arm trolley and that of monitor cart are the same, and the display on them are same.

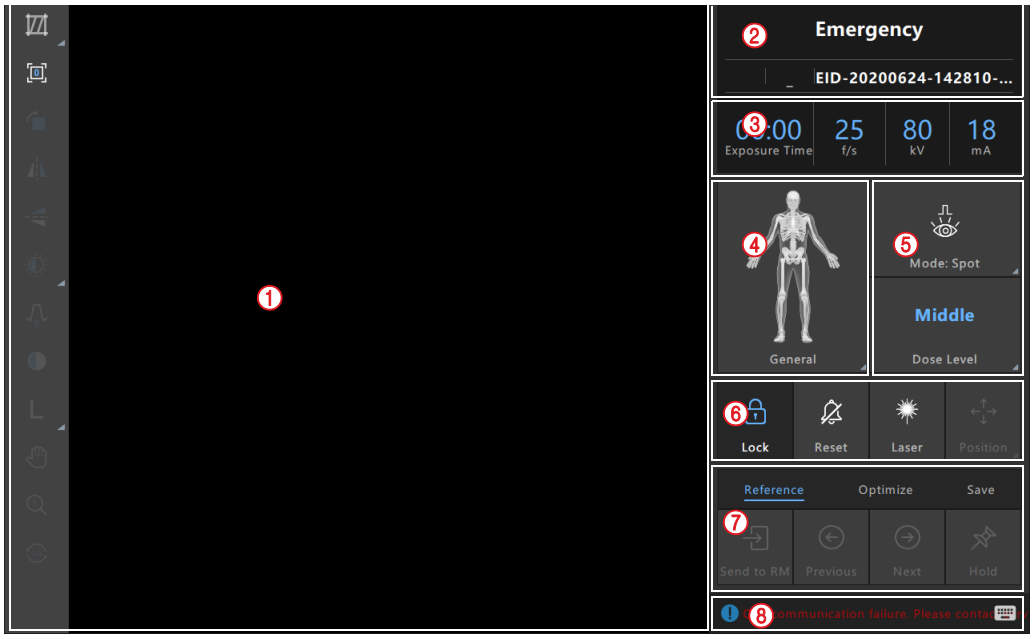


Figure 10-1 Exam interface on the control panel

No.	Functional block	Description
1	Image Display area	Displays the collected exam images.
2	Patient Info area	Displays the basic information of the current patient.
3	Radiation Status area	Displays the current system status.
4	Protocol Settings area	Sets the exam protocol.
5	Exposure Parameter Settings area	Displays and sets the parameters for the current exam.
6	Basic Settings area	◆ Unlock: Locks or unlocks radiation. ◆ Reset: Stops the warning tone of radiation. ◆ laser: Opens or closes the laser. ◆ Position: Adjusts the gantry position.
7	Integrated Functional area	◆ Reference Image: Sends to reference screen, previous series, next series, and lock the reference screen. ◆ Parameter Optimization: Sets optimized parameters for the current exam. ◆ Save: Saves images and prints image.
8	System Information area	◆ Calls out the virtual keyboard.

10.2 Setting exam parameters

User shall confirm the default parameters or the protocol is suitable, if not, please modify the exam parameters and the protocol according to the clinical requirements.

After entering into the Exam interface, set exam parameters according to the exam requirements. Check if the default setting is acceptable, if not, reset the exam parameters according to the clinical requirements.

Set exam parameters on the control panel of C-arm trolley or of monitor cart and the corresponding settings will be displayed in the exam parameter area on the real-time screen.

10.2.1 Selecting protocol

1. Click the skeleton icon to go to the protocol selection interface.
2. Select the protocol according to clinical requirement.

Device configurations and performance summary for imaging modes

Smaller LUT parameters will provide higher image contrast, while excessively small LUT parameters may lose some details in extremely high gray value area or extremely low gray value area. We provide a set of default Window Width and Window Level for better image visualization. Physician can adjust Window Width and Window Level according to their requirement. Narrower Window Width will provide higher image contrast. Smaller Window Level will provide brighter image.

The extremities are thinner than the other body parts which is prone to get high contrast image. Therefore, wider Window Width and larger LUT parameters should be set to ensure Extremities image.

Motion may occur when the Lumbar or Thorax image is acquired. To eliminate the motion artifacts, default pulse rate is higher.

To ensure the image quality of Soft tissue, more attention should be paid to the high gray area on images. Therefore, it is necessary to move the center of the window to the high gray area and adjust the width accordingly.

Table 10-1 Data sheet for imaging modes

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- Test condition: the dosimeter is located 30 cm above the detector, place a 20 cm PMMA with grid between the dosimeter and the detector.

Anatomy	Mode	X-ray parameter	Reference dose	Spatial resolution (lp/mm)	Imaging task
General	PULSE	81 kV 7.8 mA	5.09 mGy/min	≥ 2.5	Adjustable dose level and pulse rate, sequence imaging for most body part
	SPOT	81 kV 7.8 mA	10.14 mGy/min	≥ 2.5	Adjustable dose level, single imaging for most body part
	DR	70 kV 22 mAs	0.79 mGy	≥ 3.1	High quality but high dose rate, single imaging for most body part
Head	PULSE	81 kV 7.8 mA	5.09 mGy/min	≥ 2.5	Adjustable dose level and pulse rate, sequence imaging for Head
	SPOT	81 kV 7.8 mA	10.14 mGy/min	≥ 2.5	Adjustable dose level, single imaging for Head
	DR	70 kV 22 mAs	0.79 mGy	≥ 3.1	High quality but high dose rate, single imaging for Head
Extremities	PULSE	81 kV 7.8 mA	5.09 mGy/min	≥ 2.5	Adjustable dose level and pulse rate, sequence imaging for Extremities
	SPOT	81 kV 7.8 mA	10.14 mGy/min	≥ 2.5	Adjustable dose level, single imaging for Extremities
	DR	70 kV 22 mAs	0.79 mGy	≥ 3.1	High quality but high dose rate, single imaging for Extremities
Lumbar	PULSE	81 kV 7.8 mA	10.14 mGy/min	≥ 2.5	Adjustable dose level and pulse rate, sequence imaging for Lumber
	SPOT	81 kV 7.8 mA	10.14 mGy/min	≥ 2.5	Adjustable dose level, single imaging for Lumber
	DR	70 kV 22 mAs	0.79 mGy	≥ 3.1	High quality but high dose rate, single imaging for Lumber
Thorax	PULSE	81 kV 7.8 mA	10.14 mGy/min	≥ 2.5	Adjustable dose level and pulse rate, sequence imaging for Thorax
	SPOT	81 kV 7.8 mA	10.14 mGy/min	≥ 2.5	Adjustable dose level, single imaging for Thorax
	DR	70 kV 22 mAs	0.79 mGy	≥ 3.1	High quality but high dose rate, single imaging for Thorax

Anatomy	Mode	X-ray parameter	Reference dose	Spatial resolution (lp/mm)	Imaging task
Pelvis	PULSE	81 kV 7.8 mA	5.09 mGy/min	≥ 2.5	Adjustable dose level and pulse rate, sequence imaging for Pelvis
	SPOT	81 kV 7.8 mA	10.14 mGy/min	≥ 2.5	Adjustable dose level, single imaging for Pevis
	DR	70 kV 22 mAs	0.79 mGy	≥ 3.1	High quality but high dose rate, single imaging for Pelvis
Soft tissue	PULSE	81 kV 7.8 mA	5.09 mGy/min	≥ 2.5	Adjustable dose level and pulse rate, sequence imaging for Soft tissue
	SPOT	81 kV 7.8 mA	10.14 mGy/min	≥ 2.5	Adjustable dose level, single imaging for Soft tissue
	DR	70 kV 22 mAs	0.79 mGy	≥ 3.1	High quality but high dose rate, single imaging for Soft tissue

Table 10-2 Data sheet for pediatric imaging modes (only available for U.S.A)

- Test condition: the dosimeter is located 30 cm above the detector, place a 10 cm PMMA without grid between the dosimeter and the detector.

Anatomy	Mode	X-ray parameter	Reference dose	Spatial resolution (lp/mm)	Imaging task
General	PULSE	53 kV 2.6 mA	0.42 mGy/min	≥ 2.5	Adjustable dose level and pulse rate, sequence imaging for most body part
	SPOT	53 kV 2.6 mA	0.83 mGy/min	≥ 2.5	Adjustable dose level, single imaging for most body part
	DR	53 kV 3.2 mAs	0.037 mGy	≥ 3.1	High quality but high dose rate, single imaging for most body part
Head	PULSE	53 kV 2.6 mA	0.42 mGy/min	≥ 2.5	Adjustable dose level and pulse rate, sequence imaging for Head
	SPOT	53 kV 2.6 mA	0.83 mGy/min	≥ 2.5	Adjustable dose level, single imaging for Head
	DR	53 kV 3.2 mAs	0.037 mGy	≥ 3.1	High quality but high dose rate, single imaging for Head

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Anatomy	Mode	X-ray parameter	Reference dose	Spatial resolution (lp/mm)	Imaging task
Extremities	PULSE	53 kV 2.6 mA	0.42 mGy/min	≥ 2.5	Adjustable dose level and pulse rate, sequence imaging for Extremities
	SPOT	53 kV 2.6 mA	0.83 mGy/min	≥ 2.5	Adjustable dose level, single imaging for Extremities
	DR	53 kV 3.2 mAs	0.037 mGy	≥ 3.1	High quality but high dose rate, single imaging for Extremities
Lumbar	PULSE	53 kV 2.6 mA	0.83 mGy/min	≥ 2.5	Adjustable dose level and pulse rate, sequence imaging for Lumber
	SPOT	53 kV 2.6 mA	0.83 mGy/min	≥ 2.5	Adjustable dose level, single imaging for Lumber
	DR	53 kV 3.2 mAs	0.037 mGy	≥ 3.1	High quality but high dose rate, single imaging for Lumber
Thorax	PULSE	53 kV 2.6 mA	0.83 mGy/min	≥ 2.5	Adjustable dose level and pulse rate, sequence imaging for Thorax
	SPOT	53 kV 2.6 mA	0.83 mGy/min	≥ 2.5	Adjustable dose level, single imaging for Thorax
	DR	53 kV 3.2 mAs	0.037 mGy	≥ 3.1	High quality but high dose rate, single imaging for Thorax
Pelvis	PULSE	53 kV 2.6 mA	0.42 mGy/min	≥ 2.5	Adjustable dose level and pulse rate, sequence imaging for Pelvis
	SPOT	53 kV 2.6 mA	0.83 mGy/min	≥ 2.5	Adjustable dose level , single imaging for Pevis
	DR	53 kV 3.2 mAs	0.037 mGy	≥ 3.1	High quality but high dose rate, single imaging for Pelvis
Soft tissue	PULSE	53 kV 2.6 mA	0.42 mGy/min	≥ 2.5	Adjustable dose level and pulse rate, sequence imaging for Soft tissue
	SPOT	53 kV 2.6 mA	0.83 mGy/min	≥ 2.5	Adjustable dose level , single imaging for Soft tissue
	DR	53 kV 3.2 mAs	0.037 mGy	≥ 3.1	High quality but high dose rate, single imaging for Soft tissue

10.2.2 Setting radiation parameters

10.2.2.1 Selecting exposure mode

1. Click the **Exposure Mode** icon.
2. Select the operation mode, including DR, Pulse, and Spot.
   - DR mode
   - Pulsed fluoroscopy mode
   - Pulsed spot fluoroscopy mode
3. The Pulse mode has a default pulse rate but also supports custom settings.
   - To manually set the pulse rate, click the needed pulse rate value.

10.2.2.2 Adjusting dose

There are individual pediatric applications (only available for U.S.A) for each application group of the default application database.

1. Click the **Adjust Mode** icon.
2. Select the patient type as **Adult** or **Child** (only available for U.S.A).
3. Select the does level to **Low**, **Middle** or **High**.
4. Adjust the exposure parameter kV in necessary.

NOTICE
We suggest using the available special applications for pediatric use in the application database delivered with the system.

Low dose mode

Low dose mode is used to decrease the amount of radiation received by the patient and operator for procedures that do not require a high quality image. Without affecting the diagnosis, low dose mode can be used to collect preoperative and intraoperative localization images.

When low dose mode is activated, it will automatically decrease the calculated ABS or grey value to one-half. Because the gray value is proportional to the dose, using low dose will reduce the dose by 50% or more compared to standard dose levels, also it will degrade the image quality compared to images produced at the normal dose level.

Recommended dose selection

NOTICE
Using low dose may increase noise.

■ Adult

- Low: For smaller size patients or protocol with Extremities.
- Normal: For standard size patients.

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- High: For larger size patients.

■ Pediatrics (only available for U.S.A)

> **For pediatrics exam, see "Pediatric exam (only available for U.S.A)" on page 10-30.**

For pediatric age group definition, see "Pediatric age group" on page 10-30 for details.

- Low: For newborns and infants.
- Normal: For standard size children.
- High: For larger size children and standard size adolescents.

> **Adult function in exam mode is recommended for big size adolescents.**

The following air kerma rates are for general anatomy with Mag 0.

■ Test condition for adult air kerma rate: the dosimeter is located 30 cm above the detector, place a 20 cm PMMA with grid between the dosimeter and the detector.

■ Test condition for adult air kerma rate: the dosimeter is located 30 cm above the detector, place a 10 cm PMMA without grid between the dosimeter and the detector.

Table 10-3 Dose rate for adult and pediatrics (only available for U.S.A)

Mode	Dose level	Dose rate	
		Adult	Pediatrics
PULSE	Low dose	2.70 mGy/min	0.30 mGy/min
	Normal dose	5.09 mGy/min	0.42 mGy/min
	High quality	7.86 mGy/min	0.51 mGy/min
SPOT	Low dose	5.37 mGy/min	0.61 mGy/min
	Normal dose	10.14 mGy/min	0.83 mGy/min
	High quality	15.78 mGy/min	1.01 mGy/min
DR		0.79 mGy	0.37 mGy

■ Setting dose

Take dose choose procedures in adult examination for example.

■ DR mode

- Click the **Dose Choose** icon, and then adjust the dose, including auto mode and manual mode.
- Click **Edit**, and then manually adjust the kV value. The mAs value varies with the kV value.
- Click **Reset** to save the adjusted dose.

■ PULSE mode

In PULSE mode, adjust the dose. Both auto mode and manual mode are supported.

- In Auto mode, options includes Low dose, Normal dose, and High quality.

- In Manual mode, click **Edit**, and then manually adjust the kV value. The mA value varies with the kV value.
- Click **Reset** to save the adjusted dose.

■ SPOT mode

The dose in SPOT mode supports automatic adjustment only. Options include Low dose, Normal dose, and High quality.

Table 10-4 Parameters in different modes

Mode type		X-ray technical parameter	Typical value[1] of the reference dose	System control	Recommended application	Spatial resolution
PULSE (25fps)	Low dose	◆ kV: 40-110 kV ◆ mA: 0.1-30 mA	0.08 mGy/min	Auto: kV and mA values are automatically adjusted according to the gray value of the image. Manual: Users manually adjust kV and mA values.	Low dose fluoroscopic imaging	≥ 2.2 lp/mm
	Normal dose	◆ kV: 40-110 kV ◆ mA: 0.1-30 mA	0.16 mGy/min		Normal fluoroscopic imaging	≥ 2.5 lp/mm
	High quality	◆ kV: 40-110 kV ◆ mA: 0.1-30 mA	0.24 mGy/min		High definition imaging	≥ 2.8 lp/mm
SPOT	Low dose	◆ kV: 40-110 kV ◆ mA: 0.1-30 mA	0.5 mGy/min	Auto: kV and mA values are automatically adjusted according to the gray value of the image.	Low mA, ultra-low dose single image	≥ 2.2 lp/mm
	Normal dose	◆ kV: 40-110 kV ◆ mA: 0.1-30 mA	1 mGy/min		Low mA, low dose single image	≥ 2.5 lp/mm
	High quality	◆ kV: 40-110 kV ◆ mA: 0.1-30 mA	1.5 mGy/min		Low mA, low dose, and relatively clear single image	≥ 2.8 lp/mm

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Mode type	X-ray technical parameter	Typical value[1] of the reference dose	System control	Recommended application	Spatial resolution
DR	◆ kV: 40-110 kV ◆ mA: 0.1-30 mA ◆ ms: 50-1000 ms	2.5 mGy/min	Auto: kV and mA values are automatically adjusted according to the gray value of the image. Manual: Users manually adjust kV and mA values.	High mA and high quality single image	≥ 3.1 lp/mm

[1]the dosimeter is located 30 cm above the detector, use a 20 cm PMMA between the dosimeter and the detector.

NOTICE

Loading high dose mode for a long time may cause the risk of physical discomfort.

NOTICE

- Users should select the appropriate exposure mode according to the specific body type, gender, and age of patient.
- Other conditions being equal, the low-dose mode is more suitable for lean patients, the high-dose mode for obese patients, and the normal-dose mode for normal-sized patients.

NOTICE

When the same body part is examined, obese patients usually need higher doses than standard-sized patients to achieve a clinically desirable image, but excessive and long exposure may pose a risk to patients' health.

ⓘ ABS is ensured through factory testing. It can be stable during normal operations.

10.3 Setting optimized parameters

Set optimized parameters after the exam parameters are set.

These optimized parameters affect the quality of fluoroscopic imaging as follows.

■ Metal Optimization

When the metal optimization is enabled, the system will use this function for the next image acquisition. This function can reduce the impact of metal on image quality when there are large areas of metal in the region of interest.

■ Noise Reduction

The noise reduction function can reduce the noise level and improve the image quality. The noise reduction level on the UI is achieved by setting different noise reduction factor. The higher the noise reduction factor is used, the greater the noise suppression. If there are moving objects in the image, the higher the noise reduction factor is used the greater motion blurring.

■ Motion Detection

When the motion detection function is enabled, the system adjusts the noise reduction factor automatically. When there is obvious motion, in order to reduce motion blurring the noise reduction factor is reduced. When there is no motion, in order to achieve better image quality the noise reduction factor is increased.

10.3.1 Optimized parameter for metal

When there are a lot of metals in the FOV, this function can be activated to reduce the impact of metal on image quality.

▶ Click **Optimize** > **Metal** to activate the function. When it is activated, the icon turns blue.

- Click the **Metal** icon again to disable the function.

10.3.2 Optimized parameter for motion

When a moving object is examined, this function can be activated to reduce motion artifacts.

▶ Click **Optimize** > **Motion** to activate the function and optimize the motion artifacts in the images.

10.3.3 Optimized parameter for image noise

This feature can improve the Signal-to-Noise Ratio of images and reduce the noise of images.

1. Click **Optimize** > **Nosie**, and then the list of noise reduction level is displayed.
2. Select a noise reduction level from the list to filter the noise of images.

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10.4 Cine recording

This feature is only applicable for pulsed fluoroscopy mode, which enables users to save all images of radiography as a series.

1. Click **Save** > **Cine**.
2. Use the exposure hand switch or foot switch for exposure.
3. After exposure, the cine player is displayed in the image display area on the real-time screen.

The cine play see "Play the cine" on page 10-28.

10.5 Magnifying FOV

Magnifying FOV can be used to adjust the shooting FOV.

1. Click  to pop up the magnifying scale list.
2. Click to increase or decrease the scale of the FOV.
   - Options include Level 0, Level 1, and Level 2.

10.6 Adjusting collimator

The system provides the feature of adjusting collimator, including slot and square collimator, to reduce unnecessary X-ray radiation. Unnecessary radiation exposure to patients and doctors can be reduced by reasonably use of the collimator to control the radiation range. The collimator can be adjusted before and during X-ray radiation.

1. Click  to activate the feature.
   - The virtual collimator is displayed in the Display area.
   - The  shows the square collimator.
   - The  shows the slot collimator.
2. Adjust the square collimator and the slot collimator.
   - Dragging the green box can zoom in or out the square X-ray field.
   - Dragging the arrow on the yellow line can zoom in or out the slot X-ray field.
   - Dragging the rotating arrow on the slot collimator can rotate the slot X-ray field.
3. If you want to reset to the X-ray field original position, click .

10.7 Setting laser

The laser is controlled by setting the laser control.

1. Click **Laser** to activate the laser.
2. By default, the laser is on for 2 minutes and will then be automatically off. Click the laser icon again to close the laser.

NOTICE
The laser can be turned on or off before and during X-ray radiation.

NOTICE
Before laser positioning, the C-arm needs to be moved so that the center of the laser beam cross is exactly in the center of the exposed part. Therefore, the patient can avoid excess radiation.

⚠ **WARNING**
Laser hurts eyes. ◆ After the laser is on, do not look directly at the laser beam to avoid damaging the eyes.

Modify the duration of laser light

Only user has corresponding permission can modify the duration of laser light.

1. Click the UIH icon and select **Service**.
2. Click **XuanYuan Service**.
3. Click **Configuration** > **Workflow**.
4. Modify the **Laser (minutes)**.
5. Click **Save**.

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10.8 Gantry positioning

After setting the parameters before operation, adjust the gantry to a proper position.

10.8.1 Memory position (optional)

If necessary, users can refer to the memory position. The memory position function of the C-arm gantry is optional. To add this function, contact UIH Customer Service Center.

In the C-arm position area, the parameters of orbital, angulation, vertical, and horizontal are displayed successively.



1. Orbital position
2. Angulation position
3. Vertical position
4. Horizontal position

10.8.1.1 Adding memory position

To save the current gantry position of the C-arm to the memory position library, click **collect** to remember the current position.

By default, the system can remember 3 positions. To add more positions, do as follows:

1. Select a memory position that needs updating.
2. Adjust the gantry position.
3. Click **Collect** to generate a new memory position.

10.8.2 Adjusting C-arm position

1. Select a position in the preset position as a reference position.
2. Adjust the C-arm position. See "C-arm positioning" on page 4-10 for reference.
3. At the current C-arm position, set the parameters of orbital, angulation, vertical and horizontal successively.
   - Different colors indicate the deviations between the current position and the memory location.
   - Red indicates that the current position is away from the target position.
   - Yellow indicates that the current position is near the target position.
   - Green indicates that the current position is adjusted to the original position.

Gantry position memory is valid only to the current study of the current patient. If users exit or pause the study, the gantry memory position will be lost.

10.9 Exposure X-ray radiation

10.9.1 Performing X-ray radiation

After setting the C-arm trolley position, the X-ray radiation can be performed.

⚠ WARNING

X-ray radiation should be performed under the condition that the image can be observed. This can prevent the waste of radiation dose when the image quality cannot satisfy the requirements, and reduce the risk of multiple radiation loading.

10.9.1.1 Unlocking X-ray radiation

To guarantee safety, the X-ray radiation is locked by default after the system is switched on. Users need to unlock X-ray radiation before the radiation exposure.

▶ Click the unlock X-ray radiation icon to unlock X-ray radiation.

10.9.1.2 X-ray radiation

When the X-ray radiation indicator (OK ring) in the status area is green, it indicates that the X-ray radiation is ready, which can trigger X-ray or exposure.

NOTICE

When the X-ray radiation is in process, please pay attention that your vision is not covered by the monitor.

Perform X-ray radiation by using exposure hand switch

1. Press the X-ray radiation control button until he X-ray radiation tone is heard.
2. Release the X-ray radiation control button to complete the exposure.

Perform X-ray radiation by using Foot Switch

1. Step on the X-ray radiation pedal on the left of the foot switch to perform the X-ray radiation.
2. Release the X-ray radiation pedal on the left of the foot switch to complete the exposure.

10.9.1.3 X-ray radiation hibernation

To protect the service life of filament, the system is equipped with X-ray radiation hibernation mode. When the system has no X-ray radiation for more than 4 hours, the system turns into hibernation mode. The X-ray radiation cannot be performed during X-ray radiation hibernation.

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Activate the X-ray radiation

1. Press the exposure hand switch or the X-ray radiation pedal on the foot switch.
2. Press again for normal exposure.

10.9.1.4 Close the exposure sound

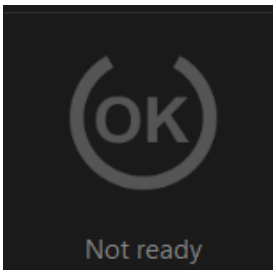
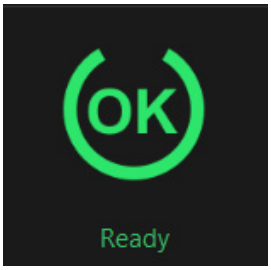
The user who has the permission can close the exposure sound during fluoroscopy.

1. Click the UIH icon and select **Service**.
2. Click **XuanYuan Service**.
3. Click **Configuration**> **Workflow**.
4. Change the setting of the **Exposure Sound Switch** to **off**.
5. Click **Save**.

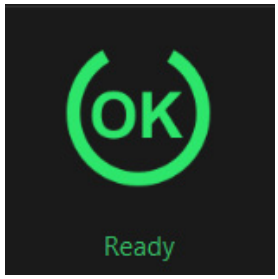
10.9.2 X-ray radiation status indication

NOTICE
If the X-ray radiation process is interrupted, users may restart the system to resume the examination for the patient.

- The ready status of X-ray radiation

Icon	Description
	Indicates that the system is not ready, and the X-ray radiation cannot be performed.
	Indicates that the system is ready, and the X-ray radiation can be performed.

- X-ray radiation status

Icon	Description
	Indicates that the X-rays are not radiated.
	Indicates that the X-rays are radiated.

- X-ray radiation time
- Frame rate
- The exam parameters of the current status



10.9.3 Stop the exposure waring sound

If the X-ray radiation is continued for more than 5 minutes, there is a exposure warning sound. If the X-ray radiation is continued for more than 10 minutes, the X-ray radiation will be stopped.

▶ Click **Reset** button on the control panel to stop the exposure warning sound.

10.10 Real-time image display

NOTICE

The images on C-arm control panel and monitor car control panel are for reference only, and are not intended for diagnostic purposes.

- We advise users to view diagnostic images only with the high-quality monitor provided on the monitor cart, and to view images neither on the C-arm trolley control panel nor on the monitor cart control panel.

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NOTICE
The monitor cart should always accompany the C-arm trolley.

During the X-ray radiation process, the real-time image is displayed on the real-time screen of the monitor on the monitor cart, on the C-arm control panels and on the monitor cart control panels.

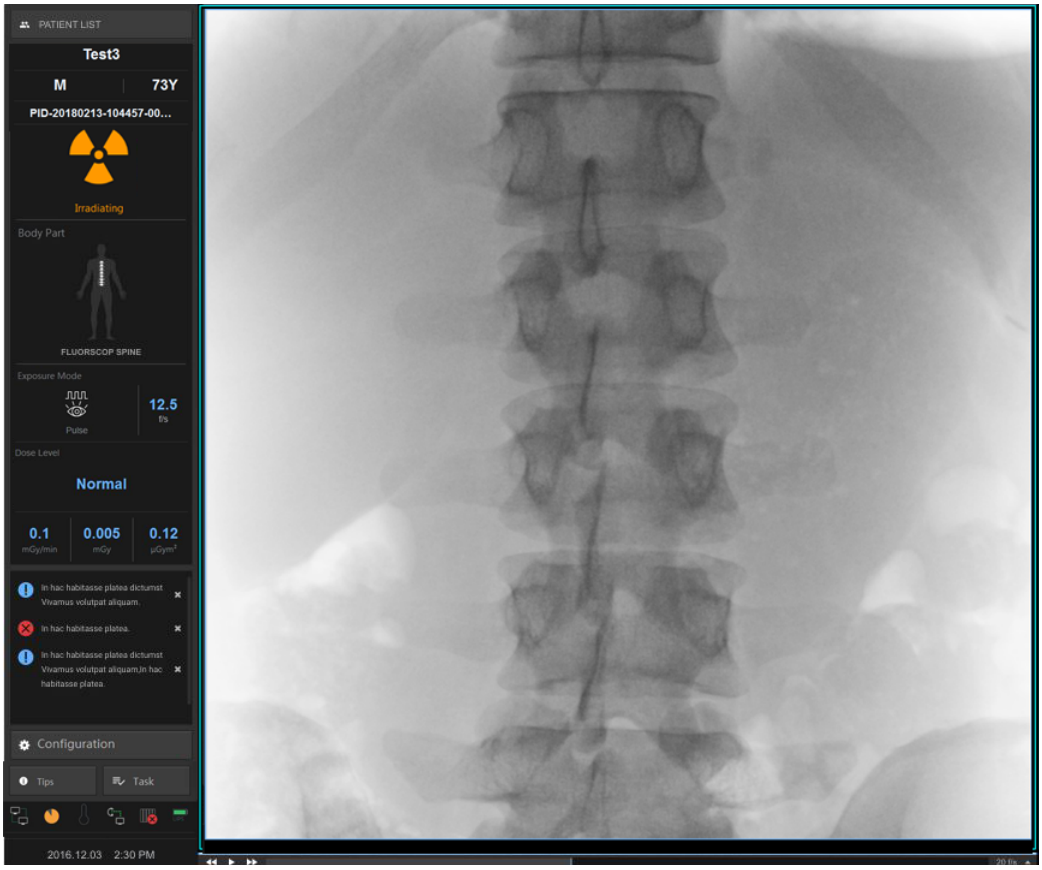


Figure 10-2 Real time image display (real-time screen)

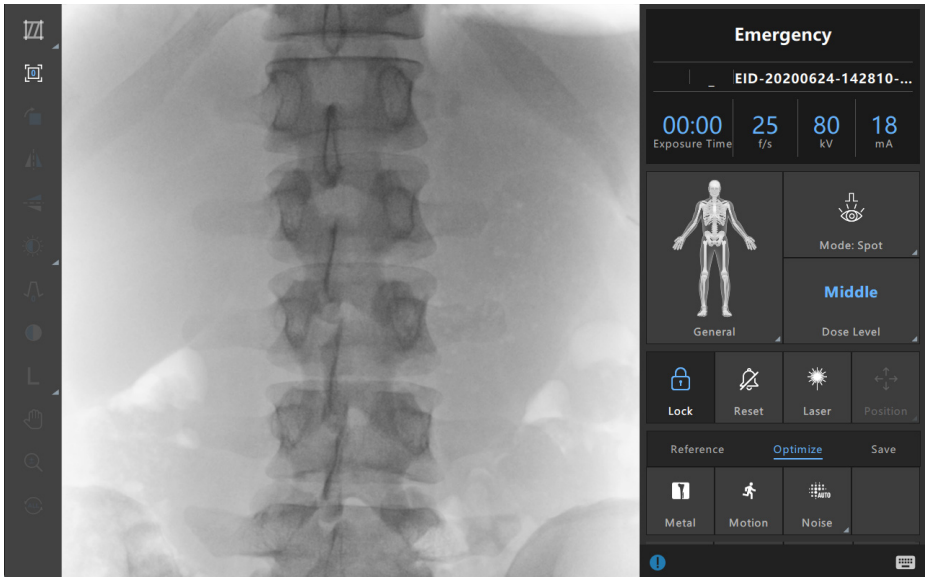


Figure 10-3 Image display (control panel)

10.11 Real-time image processing

After the radiation is completed, the exposure image and LIH image is automatically sent to and displayed on the control panels of the monitor cart and the C-arm trolley.

▶ On the control panels of the monitor cart and the C-arm trolley, select the necessary tools to process the real-time images.

10.11.1 Image rotation

1. Click the **Rotate** icon .
2. Use fingers to slide the image and rotate the image at a free angle.

10.11.2 Image flip

Vertical flip

▶ Click the **Vertical Flip** icon , and then the image is automatically and vertically flipped.

Horizontal flip

▶ Click the **Horizontal Flip** icon , and then the image is automatically and horizontally flipped.

10.11.3 WW/WL

▶ Click the **WW/WL** icon and select the adjusting mode from the drop-down menu.

Adjusting WW/WL

1. Click the arrow icon of the **WW/WL** icon , and then click .
2. In display area, move the fingers up or down and right or left to adjust the window width.

Reset WW/WL

▶ Click the arrow icon of the **WW/WL** icon , and click the  to restore the WW/WL to the status before adjustment.

Highlighting full gray scale range

▶ Click the arrow icon of the **WW/WL** icon , and then click  to balance the display of all tissues.

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Highlighting low gray scale

▶ Click the arrow icon of the **WW/WL** icon , and then click 

to highlight the display of bones.

Highlighting intermediate gray scale

▶ Click the arrow icon of the **WW/WL** icon , and then click 

to highlight the display of intermediate tissues.

Highlighting high gray scale

▶ Click the arrow icon of the **WW/WL** icon , and then click 

to highlight the display of soft tissues.

10.11.4 Edge enhancement

1. Click the **Edge Enhancement** icon .
2. Select a level for edge enhancement. The image display changes accordingly.

10.11.5 Inverse

▶ Click the **Inverse** icon . An image with the opposite light and dark is formed in the image display area.

10.11.6 Add marks

L

1. Click 

to add the L icon on the image.
   - L represents left.
2. After marking the image, select the L icon to move the icon.

R

1. Click 

to add the R icon on the image.
   - R represents right.
2. After marking the image, select the R icon to move the icon.

A

1. Click 

to add the A icon on the image.
   - A represents anterior.

2. After marking the image, select the A icon to move the icon.

P

1. Click  to add the P icon on the image.
   - P represents posterior.
2. After marking the image, select the P icon to move the icon.

H

1. Click  to add the H icon on the image.
   - P represents head.
2. After marking the image, select the H icon to move the icon.

F

1. Click  to add the F icon on the image.
   - F represents foot.
2. After marking the image, select the F icon to move the icon.

Arrow

1. Click **Arrow**  to display a painting brush icon in the display area. Click to determine the position of the arrow, and press the mouse button to draw an arrow line.
2. Release the mouse button to complete the arrow with text.
3. Click the middle of the arrow, and then press and hold the mouse button to move the arrow.
4. Delete or change font size of the text.
   - Right-click to display the drop-down list. Click **Delete Graphics** to delete the arrow.
   - Right-click to display the drop-down list. Click **Font Size** to increase or decrease the font size.

When Arrow is selected, adjustment points will be displayed at both ends of the arrow. Move the adjustment points to adjust the length and position of the arrow.

Text

1. Click the arrow icon to display the text icon . The cursor will turn into a "T" shape.
2. Click the mouse button on the part of the image that needs to be annotated to display the text input indicator.
3. After the input is completed, double-click the text to modify the content.
4. After the input is completed, move the cursor over the text. When a blue box appears, move the text.Delete or change font size of the text.
   - Right-click to display the drop-down list. Click **Delete Graphics** to delete the arrow.

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- Right-click to display the drop-down list. Click **Font Size** to increase or decrease the font size.

10.11.7 Custom measurement

⚠ CAUTION

Measurement

- Perform calibration before measurement. However, even if calibration has been performed, there are still many factors that might result in measurement error (for example human operation error), and the quasi image generated from the system cannot reflect the space information.
- Image measurement results should be used for reference only and should not be used as reliable results during diagnosis and treatment. Before making any decision based on these data, compare it with other information, such as the doctor's clinical experience and visual check results.

NOTICE

Custom measurement tools cannot be used for images imported locally.

Measurement calibration

1. Click  to display the measurement calibration dialog box.
2. Mark the length of the image to be calibrated.
3. Enter the calibration length.
4. Click **Confirm** to complete the calibration.

Distance

Before performing Distance measurement, perform measurement calibration to ensure the measurement accuracy.

1. Click  to display a painting brush icon in the display area. Press the mouse button to draw a straight line.
2. In the drawing process, the distance value (in mm) will be displayed next to the painting brush icon in real time.
3. Release the mouse button to complete the distance measurement.
4. Right-click and hold the button to separately move the straight line or distance value, which will be connected with a dotted line.
5. Select the straight line or distance value. Right-click to display the drop-down list. Click **Delete Graphics** to delete the straight line or distance value.

When the straight line is selected, adjustment points will be displayed at both ends of the straight line. Move the adjustment points to adjust the length and position of the line.

Angle measurement

1. Click  to display a painting brush icon in the display area. Click it to determine the vertex of the angle, and click it again to determine the two sides.
2. In the annotation process, the angle value will be displayed next to the Painting Brush icon in real time.
3. Release the mouse button to complete the angle measurement.
4. Left click and hold the button to separately change the angle text or angle value, which will be connected with a dotted line.
5. Select the angle text or angle value. Right-click to display the drop-down list. Click **Delete Graphics** to delete the angle text or angle value.

When the angle text is selected, three adjustment points will be displayed on the angle text. Move the adjustment points to adjust the position of the vertex and the size of the angle.

Four-point measurement

1. Click  to display a painting brush icon in the Display area. Click it to determine the positions of four points.
2. In the annotation process, the four-point measurement value will be displayed next to the Painting Brush icon in real time.
   - The four-point measurement value includes the length of each line, angle between two lines and length ratio of two lines.
3. Release the mouse button to complete the four-point measurement.
4. Left click and hold the button to separately move the four-point text or value, which will be connected with a dotted line.
5. Select the four-point text or value, and right-click to display the drop-down list. Then, click **Delete Graphics** to delete the four-point text or value.

10.11.8 Pan

▶ Click , and then drag and move the image to the desired position.

10.11.9 Zoom

▶ Click the , and then press and move the left of the mouse to zoom in and out the image

10.11.10 Image reset

The image returns to its initial state. The image layout remains unchanged.

1. Select an image.

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2. Click , and then click **Yes**.

10.12 Setting reference image

10.12.1 Browsing reference image

Browse the images on the RM screen.

1. Click **Reference** > **Sent to RM** icon to send the image to the RM screen on the right.
2. Click the **Previous** or **Next** icon to browse images in different pages.

When the reference image is locked, the Previous or Next icon is grayed out.

10.12.2 Locking reference image

If a real-time image needs to be compared with a reference image during the operation, users can lock the reference image to prevent the newly generated image from replacing the reference image.

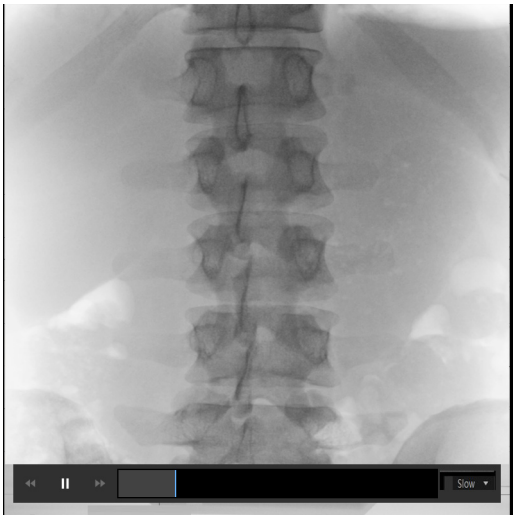
▶ Click the **Pin** icon  to lock the image in the current RM screen.

For detailed operations, see "Reference image viewing and printing" on page 11-1.

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10.13 Play the cine

In the fluoroscopy mode, the cine series will be displayed on the control panel or real-time screen.



- You can change the speed of the film.
-  Stop the play.
-  See next frame.
-  See last frame.
-  Continue the film.

10.14 Saving single frame image

If the **Send and Save Image** is checked in the exam configuration, when the image for last exposure is saved, it will be sent to the reference screen automatically. If not, save the image manually. See "Exam configuration" on page 5-7.

▶ After X-ray radiation, click the **Save** icon in the **Save** tab to save the current single frame image.

Or

1. Pause the playing in the process of cine play.
2. Click **Save** to save any of the single frame image in the pause status.

10.15 Local printing

▶ Click **Save** > **Print** in the lower right corner on the control panel.

- The image on the real-time screen will be printed.

Print the single frame of the film

1. Pause the playing in the process of cine play.
2. Click **Print** to print any of the single frame image in the pause status.

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10.16 Pediatric exam (only available for U.S.A)

10.16.1 Pediatric age group

- Newborn (neonate): from birth to 1 month of age
- Infant: greater than 1 month to 2 years of age
- Child: greater than 2 to 12 years of age
- Adolescent: greater than 12 through 21 years of age

Adult function in exam mode is recommended for big size adolescent.

10.16.2 Guiding principles

UIH strongly suggests reducing radiation dose to As Low As Reasonably Achievable (ALARA) in all patients, especially pediatric and small patients, whenever it is determined that an X-ray is necessary. X-ray is an extremely valuable tool for general diagnosing and surgery, but its use is not without risk. This chapter elaborates on how to reduce the radiation dose to the lowest level for children.

Radiation exposure is a concern in both adults and children. However, children are more sensitive to radiation than adults and have a longer life expectancy. Radiation risk is higher in young patients, as they have more rapidly dividing cells than adults. The younger the patient, the more sensitive they are.

WARNING

- Use special care when imaging patients outside the typical adult size range.
- Adult techniques and protocols can not be used on pediatric patients.

For more information of pediatric population imaging, please refer to:

- http://www.imagegently.org/Procedures/Digital-Radiography/Educational-Materials
- https://www.fda.gov/Radiation-EmittingProducts/RadiationEmittingProductsandProcedures/MedicalImaging/ucm298899.htm

These websites also provide additional information on how to optimize exam protocols:

- American College of Radiology (ACR): http://www.acr.org/
- Image Wisely: www.imagewisely.org
- American Association of Physicists in Medicine(AAPM): www.aapm.org
- Society of Pediatric Radiology (SPR): http://www.pedrad.org/
- National Cancer Institute (NCI): http://www.nci.nih.gov/aboutnci
- Image Gently: http://www.imagegently.com/
- Pediatrics X-ray imaging information on the FDA website: http://www.fda.gov/
- International Atomic Energy Association’s Radiation Protection of the Patients: rpop.iaea.org

10.16.3 Safety protection recommendations

We suggest using the available special applications for pediatric use in the application database delivered with the system. There are individual pediatric applications for each application group of the default application database. These default pediatric applications may be used for basis of the examination for all pediatric patients

It is recommended to remove the anti-scatter grid for all pediatric patients as well as all medical applications that are restricted to extremities.

In order to reduce the radiation dose to the lowest level for pediatric patients, the operator can take following safety protection measures:

- Only perform necessary exams.
- Position the C-arm over the area of interest, using the laser to aid improper positioning. This helps avoid extra positioning shots. For more information on laser, see "Laser" on page 12-3.
- Collimate as tightly as possible to the area of interest, taking care to exclude the eyes, thyroid, breast, and gonads, when possible.
- Minimize pediatrics dose
  - Perform only necessary fluoroscopic exams.
  - Limit imaging coverage to the anatomical region indicated to avoid unnecessary exposure.
  - Limit images requiring highest radiation dose to very specific procedures or steps.
- If using PULSE mode, choose a lower pulse rate according to the actual clinical needs.
- Use the Magnifying FOV feature when possible.
- When manually set the exposure parameters, check if the exposure parameters are in allowed range.
- Ensure that the equipment is checked regularly by a physicist or designee with appropriate skills.

NOTICE
Use of low dose mode will affect image quality.

10.16.4 Environmental and communication advice

Make a friendly environment and help children fell less scared.

- Put pictures of lovely animals on the wall.
- Play games.
- Explain the procedure to patient’s parents or guardian. Also, explain the procedure to patient depending on the patient age. So they know what to expect when they enter the operating room. This will improve cooperation and potentially less repeat studies and dose due to patient motion.

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10.16.5 Features and components for pediatrics exam

- The single most important thing you can do is to always use protocols in child age groups to avoid over exposure. Protocols based on patient age are installed on the system. There are two patient age groups available: Adult and Pediatric. UIH strongly recommends that you work with your Radiologist and Physicist to determine the lowest possible dose for the desired image quality. For more information on dose choose, see "Adjusting dose" on page 10-9.
- The system provides removable grid for pediatric exams. This aims to keep the radiation dose as low as reasonably achievable and ensure the image quality of the pediatric exam protocol. For more information on the removable grid, see "Installation/ Removal of the grid" on page 4-15.

NOTICE
A grid is recommended for the thickness of patient's body more than 10 mm, otherwise image quality may be compromised.

- During the pediatric patient exposure, the DAP will clearly record the corresponding dose information. Make sure that the dose for the pediatric patient exam complies with the ALARA principle. For more information on the DAP, see "DAP meter" on page 12-2.
- When there is obvious reduction of the image quality, the flat panel detector must be calibrated. Even if there is no obvious reduction of the image quality, it is still recommended that the flat panel detector should be calibrated every 180 days.

10.16.6 Workflow for pediatrics

Preparation

1. Connect the monitor cart to the C-arm trolley using the connecting cable.
2. Plug the power plug into a proper AC outlet and note that there should not be any obstruction around the outlet.
   - For power supply requirements, see "Power supply requirements" on page 15-2.
3. Press the startup/shutdown button  on the monitor cart table. to start the system
   - The system will initiate self-test during the startup process.
4. Remove the grid when performing examinations on pediatrics. See "Installation/ Removal of the grid" on page 4-15.

NOTICE
A grid is recommended for the thickness of patient's body more than 10 mm, otherwise image quality may be compromised.

Positioning gantry

1. Click **Laser** icon on the control panel to open the laser.

⚠ WARNING

Pediatrics exam should be more careful to avoid laser hurting eyes.

- After the laser is on, do not look directly at the laser beam to avoid damaging the eyes.

NOTICE

Before laser positioning, the C-arm needs to be moved so that the center of the laser beam cross is exactly in the center of the exposed part. Therefore, the patient can avoid excess radiation.

By default, the laser is on for 2 minutes and will then be automatically off. Click the laser icon again to close the laser.

2. Adjust the C-arm trolley to a safe and proper position to pediatrics. See "C-arm positioning" on page 4-10 for reference.
   - Imaging the patient lying face up on the table with the C-arm positioned perpendicular to the patient's left, and the image detector above the patient, as show in the following diagram.
   - Position the C-arm trolley to the left of the pediatric with the image detector over the area of interest.

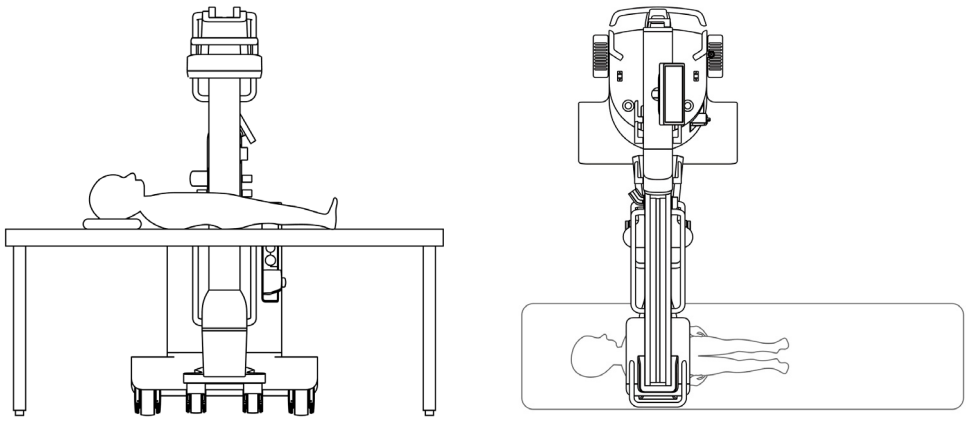


Figure 10-4 C-arm trolley position for pediatrics

Possible C-arm movements are:

- Orbital motion rotates the C-arm around the patient or table.
- Angulation motion tilts the C-arm at a pivot point on the horizontal cross-arm.
- Horizontal and swivel motion moves the C-arm horizontally across the table or patient.
- Vertical motion lifts the C-arm up and down over the patient or table.

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NOTICE
Do not bump into the pediatric or bed when C-arm moving vertically.

For each motion definition & schematic diagram, and detailed operations, see "C-arm positioning" on page 4-10.

3. Keep the flat panel detector as close as possible to pediatric.

Presetting collimator

To reduce unnecessary radiation dose during exposure, you should preset collimator before beginning the procedure.

1. Click  to enable collimator adjusting function on the control panel.
2. Adjust collimator and place the area of interest in the center of the image.
3. Perform X-ray radiation by using Pediatrics function with low dose.
4. Check the acquisition image.
   - Make sure the area of interest is located in the center of the image and is not covered by the collimator.
   - Make sure other anatomies are covered by the collimator.

Setting exam parameters

1. Select the protocol.
2. Select the patient type as **Child**.
3. Select proper dose according to the actual clinical situations. For pediatric age group definition, see "Pediatric age group" on page 10-30 for details.
   - Low: For newborns and infants.
   - Normal: For standard size children.
   - High: For larger size children and standard size adolescents.

Adult function in exam mode is recommended for big size adolescents.

4. Select operation mode.
   - If using Pulse mode, choose a lower pulse rate according to the actual clinical situations.
5. Set Magnify FOV. It is recommended to set Magnify FOV to Level 2.
6. Set optimized parameters according to the actual clinical situations.
   - Optimized parameter for metal
   - Optimized parameter for motion
   - Optimized parameter for image noise

Adjusting collimator

▶ Adjust collimator according to the actual clinical situations. See "Adjusting collimator" on page 10-14.

Performing X-ray radiation

See "Exposure X-ray radiation" on page 10-17.

Displaying real-time image

See "Real-time image display" on page 10-19.

Processing real-time image

See "Real-time image processing" on page 10-21.

Setting reference image

See "Setting reference image" on page 10-27.

Saving image

See "Saving single frame image" on page 10-29.

Local printing

See "Local printing" on page 10-29.

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11 Reference image viewing and printing

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11.1 Functional block of reference screen

The reference screen has three display modes, namely image browsing mode, image reference mode and image comparison mode.

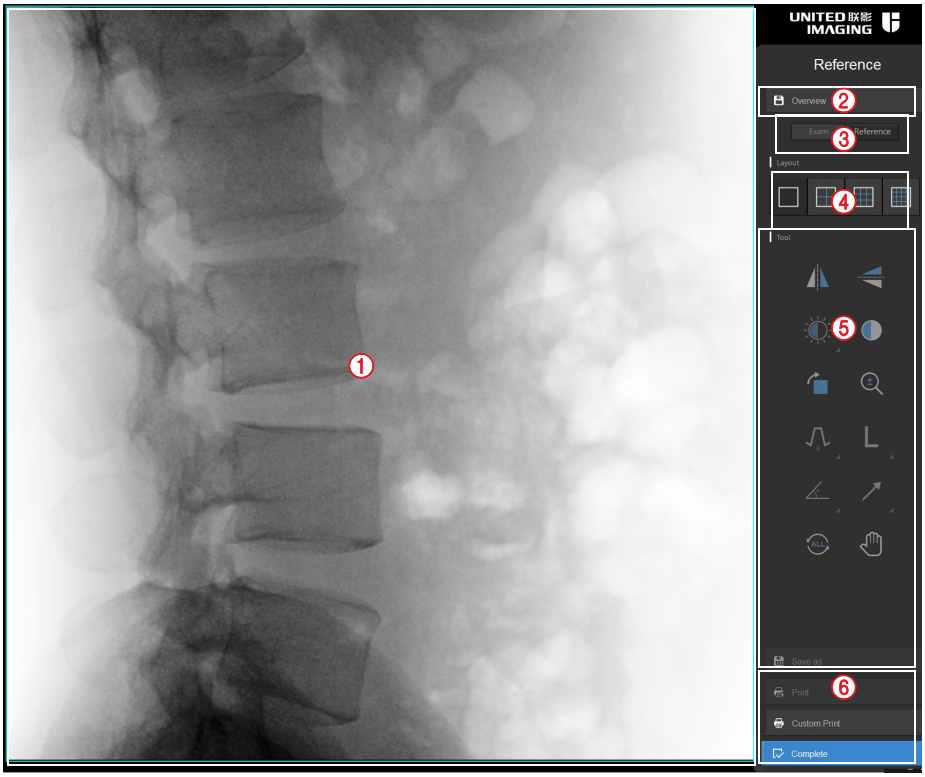


Figure 11-1 Reference screen interface

No.	Functional block	Description
1	Image Display area	Displays reference image.
2	Image Overview entrance	It is the entrance to image overview.
3	Image Processing Screen Switch	Switch between the image on real-time screen and reference screen for image processing.
4	Page Layout area	Sets layout of images.
5	Image Processing tool bar	The reference image is post-processed by image processing tools to help diagnosis.
6	Functional Button area	Switches to other functions such as save. printer and customer print.

11.2 Reference image browsing

11.2.1 Load reference Image

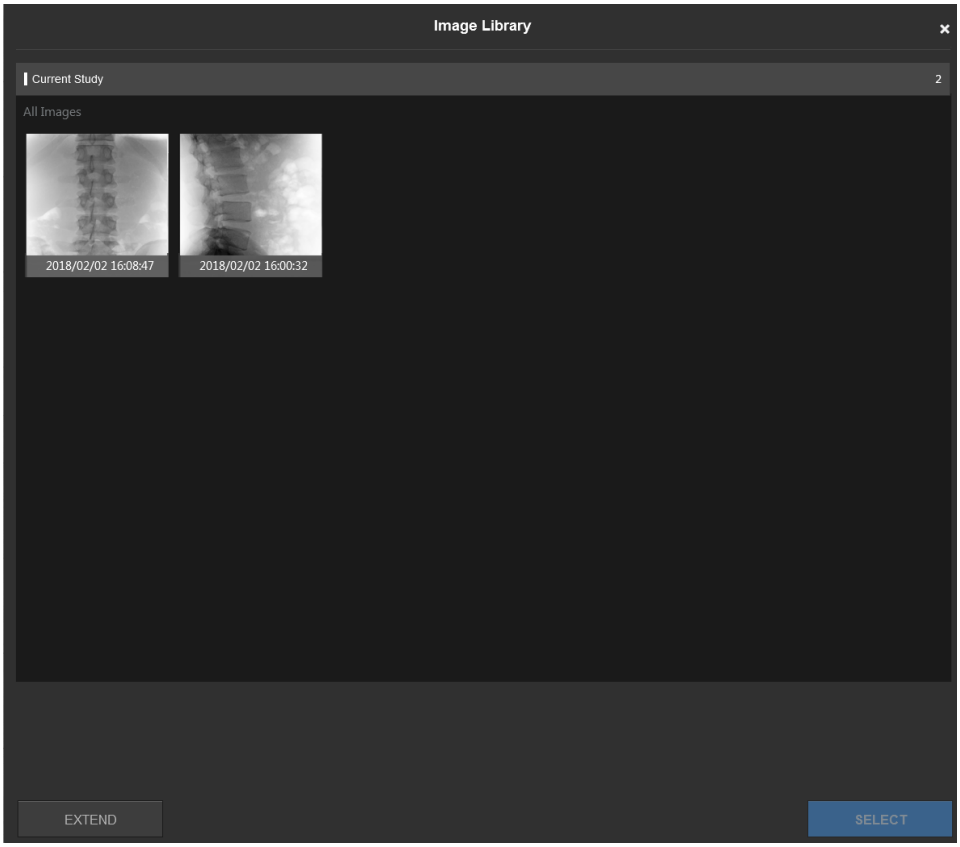
To load real-time images, do as follows:

1. After radiation, the captured real-time images are displayed on the control panels of C-arm trolley and monitor cart.
2. Click **Reference** > **Send to RM**. The image will be displayed in the image display area of the reference display.

For detailed operations, see "Setting reference image" on page 10-27.

If the collected images of the patient have been saved, do as follows:

1. Click **Overview** on the RM screen to pop up the image preview window.
   - All images about the patient collected through the current examination are displayed as thumbnails in the image preview window.



2. Double-click the selected thumbnail to load the image to the RM screen.

11.2.2 Setting layout of the images

▶ Click the corresponding image page layout icon to set the image layout in the image display area.

- The system provides four image layout presets, namely 1 × 1, 2 × 2, 3 × 3 and 4 × 4.
- The default layout is 1×1.

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11.2.3 Reference image processing

The image processing tools are the same as the image processing tools on the control panel. See "Real-time image processing" on page 10-21.

11.3 Save as

1. Select the image on the LM screen or RM screen.
2. Click **Save as** in the lower right corner on the RM screen to save the image.

11.4 Print

11.4.1 Paper print

The paper printer can be configured, see "Local print configuration" on page 5-8.

1. Select the image or images on the LM screen or RM screen.
2. Click **Print** in the lower right corner on the RM screen to print image through UIH printer (optional).

11.4.2 Film print

1. Select the image on the LM screen or RM screen.
2. Click **Custom Print** in the lower right corner on the RM screen.
3. Select the film printer (provided by user).
4. Select other information to be displayed on the printed film.
   - **Anonymous**: Select whether the personal information XXX is shown on the printed paper.
   - **Image Text**: Select whether the image text is shown on the printed paper.
   - **Graphic Info.**: Select whether the image marks or graphic is shown on the printed paper.
   - **Copies**: Select how many copies to be printed.
   - **Layout**: Select the layout of printed pater.
5. Click **Print**.

11.4.3 Multiple images print

1. Select the image on the LM screen or RM screen.
2. Click **Custom Print** in the lower right corner on the RM screen.
3. Select the printer.
4. Select other information to be displayed on the printed film.
   - **Anonymous**: Select whether the personal information XXX is shown on the printed paper.

- **Image Text**: Select whether the image text is shown on the printed paper.
- **Graphic Info.**: Select whether the image marks or graphic is shown on the printed paper.
- **Copies**: Select how many copies to be printed.

5. Select the layout of printed pater. Multiple images can be printed on one paper or on film.
6. Click **Print**.

11.5 Image comparison

11.5.1 Load images for comparison

The image comparison can only be performed on exam interface.

1. Click **Overview** on the RM screen.
2. Click **Extended** to display the expansion display.
3. Select images to be compared, click **Display on Left** or **Display on Right**, and the selected images will be sent to the corresponding image display area.
   - Post-processing operations can be performed on the images if needed. See "Reference image processing" on page 11-4 for details.
4. After completing the image comparison, click **Complete** in the upper left corner of the left display to exit image comparison.

11.5.2 Setting layout of the images

Select the LM screen or RM screen separately, and click different page layouts for adjustment. For detailed operations, see "Setting layout of the images" on page 11-3.

11.5.3 Comparison image processing

Images that are processed by image processing tools can be compared with the original ones on the RM screen.

1. Select an image to be processed.
2. Select the appropriate image processing tool in the image processing tool area on the right. For detailed operations, see "Reference image processing" on page 11-4.

11.6 Historical image browsing

11.6.1 Load existing image to image browsing interface

1. In the patient management interface, select an image to view.
2. Double-click the left mouse button to load the selected image into the image display area of the image browsing interface.

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11.6.2 Setting layout of the images

For details on the page layout operation of the image browsing interface, see "Setting layout of the images" on page 11-3.

11.6.3 Processing of image viewed

Post-processing operations can be performed on the image browsing interface. For details, see "Reference image processing" on page 11-4.

11.7 Complete examination

▶ Click **Complete** to complete the examination and return to the Patient Registration interface.

12 Optional accessories

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12.1 DAP meter

The system is equipped with DAP software, and the DAP meter is optional. The DAP meter parameters see "DAP meter technical properties" on page 15-20.

The DAP meter shall be calibrated annual by UIH service engineer or qualified engineer.

The following is the DAP correction process:

1. Set the generator to 100 kV.
2. Perform a stability test (self-test).
3. Adjust the collimator. It is recommended to adjust the collimator to the average field size (90 mm × 90 mm) of the DAP ionization chamber.
4. Determine the area of the reference point, and the reference point, that is, the flat entrance is placed at the dosimeter, and the irradiation area of the X-ray is received vertically, that is, the reference area. In order to accurately determine the area of the reference area, exposure or fluoroscopic imaging is recommended.
5. Place the dosimeter for calibration at the reference point.
6. Release radiation and record the value displayed on the dosimeter and the DAP.
7. Calculate the DAP value and if the DAP value is less than 35%, the calibration is complete.

NOTICE
The DAP measuring instrument needs regular maintenance every year, please contact the UIH Customer Service Center.

12.2 Laser

⚠ WARNING
Laser radiation, do not look directly at the beam of light.

The system is equipped with vertical and horizontal lasers (optional).

The laser produces a laser beam that can be projected onto the patient as a reference point for the X-ray image.

A vertical laser is used to indicate the center position of the image, and a horizontal laser is used to indicate the positive side position switching.

12.2.1 Position

12.2.1.1 Vertical lasers

The system is equipped with two sets of vertical lasers, totally four. There are a set of (two) lasers in the two sections of the flat panel detector and the monoblock.

- Among the two sets of lasers, one set of lasers is standard, and the other set is optional.
- The lasers are the flat-type, and each set of lasers form a cross-shaped projection to the patient's body surface, and the cross point is used to indicate the central axis of the X-ray beam.

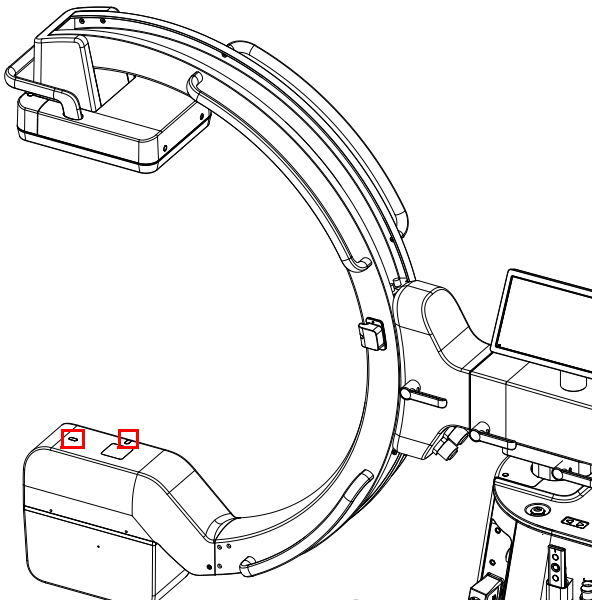


Figure 12-1 Vertical laser position (monoblock)

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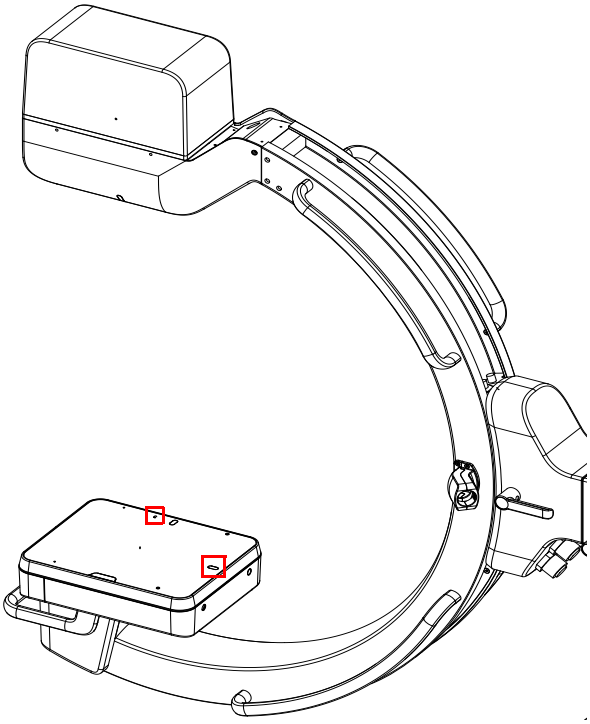


Figure 12-2 Vertical laser position (flat panel detector end)

12.2.1.2 Horizontal laser

The horizontal laser is located at the C-arm. The lasers are the plat-type and are projected onto the patient's body surface to indicate that the C-arm is slid from a positive position of 0° to a lateral position of 90° (other motion axes are unchanged), and the X-ray beam is projected.

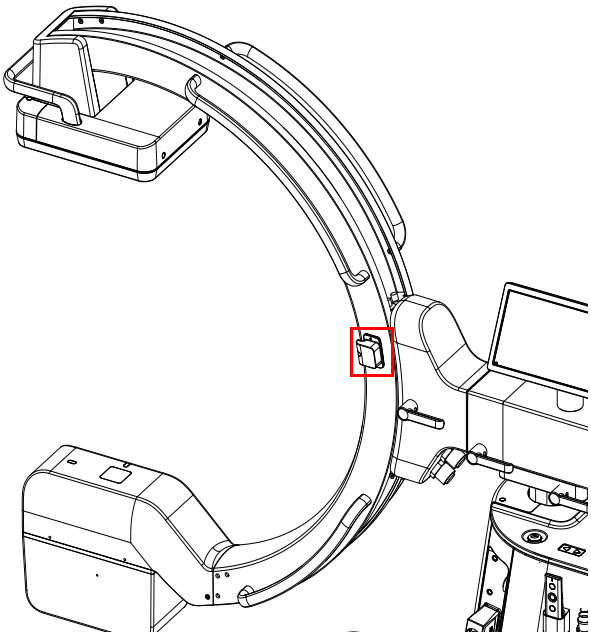


Figure 12-3 Position of Horizontal laser

12.2.2 Use

See "Setting laser" on page 10-15 for the use of lasers.

12.3 Wireless foot switch

The system provides an optional wireless foot switch, which has the same function as the wired foot switch.



Figure 12-4 Wireless Foot Switch

No.	Name	Description
1	Radiation pedal	Radiation control is performed according to the selected radiation mode.
2	Saving pedal	Save image by default.

NOTICE
Though the wireless footswitch is water-proof ipx8, it may fail to function if it is immersed in liquids for a long time.

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12.4 UPS

An uninterruptible power supply (UPS) can provide an emergency power supply when the main power supply is cut off. Installing the UPS can avoid data loss in the event of an abnormal power outage and can automatically save patient data before shutting down.

In the case of a power failure, the system is switched off. In order to prevent data/ image loss, an uninterruptible power supply (UPS) which carries out a controlled shutdown of the imaging system is installed in the monitor cart. The images from the last examination are saved.

If there is one, a hospital emergency power supply cuts in if the line power supply fails. However, this usually occurs with interruption and can take some time.

The system can be restarted as soon as the mains power supply is available or the emergency power unit is functioning. All the functions can be recovered in 2 min.

NOTICE
If there is no UPS, the image/data loss may occur in the event of an abnormal power outage.

NOTICE
If you find the leakage of the battery of UPS, contact the UIH Customer Service Center in time.

NOTICE
UPS shall be check for regular time.

12.4.1 Use

Table 12-1 Main parameters of UPS

Parameter	Description
Rated capacity	1 kVA / 0.9 kW
Input voltage	80 V AC - 280 V AC
Input frequency	50 Hz / 60 Hz ± 10 Hz
Input power factor	> 0.99 (full load)
Output voltage	230 V AC, 110 V AC
Output frequency	50 Hz / 60 Hz ± 0.05 Hz
Output power factor	0.9

NOTICE

- The UPS should be installed by trained UIH customer service engineers.
- UPS can only be connected to the image acquisition workstation, and must not be connected to other devices.

- If the main power supply fails, the UPS will start supplying power to the acquisition workstation with its battery. To avoid data loss, you should finish the examination and save data within 30 seconds.
  - Once the main power supply fails, the UPS starts a shutdown countdown. The system shuts down after the countdown ends.

NOTICE

The default countdown setting is 30 seconds. If you need the UPS to supply power for a longer time (120 seconds at most), contact the customer service engineers and ask them to modify the setting of the shutdown countdown.

NOTICE

When the system is powered by the UPS, you can only save images. No other operations can be performed.

- After the main power supply is restored, the UPS switches to the normal mode and is charged by the main power supply.

⚠WARNING

UPS failure or low battery level can lead to data loss. In such cases, contact the UIH Customer Service Center immediately.

12.4.2 Periodic check

According to the use condition of the UPS, the UPS needs to be checked regularly.

- If the use condition is good, it should be checked once every six months, or when the system is regularly maintained.
- If the use condition is normal or hostile, you need to add a filter and check it at least every 3 months.
- Regularly check the UPS to perform a discharge test on the battery and determine if the battery is in good condition, check the fan status, and check the output voltage. If there is a filter, it also needs to be cleaned. If you need to check the UPS, please contact the UIH Customer Service Center in time.

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12.4.3 Replace

Determine whether the UPS needs to be replaced according to the use of the battery to. The service life of the UPS is 5 years.

- If the battery is used normally, it is recommended to replace the UPS every 3 years to ensure the best condition of the battery.
- If the battery is abnormal, please contact UIH customer service engineers for replacement.

12.5 Printer

There two options for paper printer, the larger printer and the small printer. The parameters for printers see "Printer" on page 15-21.

The printer configuration see "Local print configuration" on page 5-8.

12.6 External drive

The external drive is optional for the system. Related parameters see "Removable optical drive" on page 15-21.

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12.7 Skin spacer

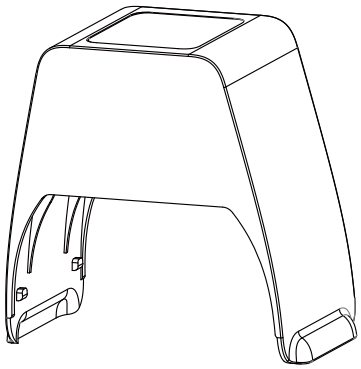


Figure 12-5 Skin spacer

Skin spacer (optional) is used to increase the distance of skin to X-ray focal spot, it can decrease the over radiation risk. Skin spacer can be installed on the MBK. When the skin spacer is attached, the source to skin distance is 30 cm. The skin spacer may be removed for special procedures. When removed, the source to skin distance is 20 cm.

The skin spacer can be clamped to the MBK and removed from MBK when necessary.

NOTICE

- Removing the skin spacer may result in increased radiation exposure to the patient. The skin spacer should only be removed on the instructions of a physician.
- Pay attention to avoid skin spacer falling off from the MBK, which may lead to personnel injury or system damage.
- Attach sterile cover to the skin spacer when system is in use.

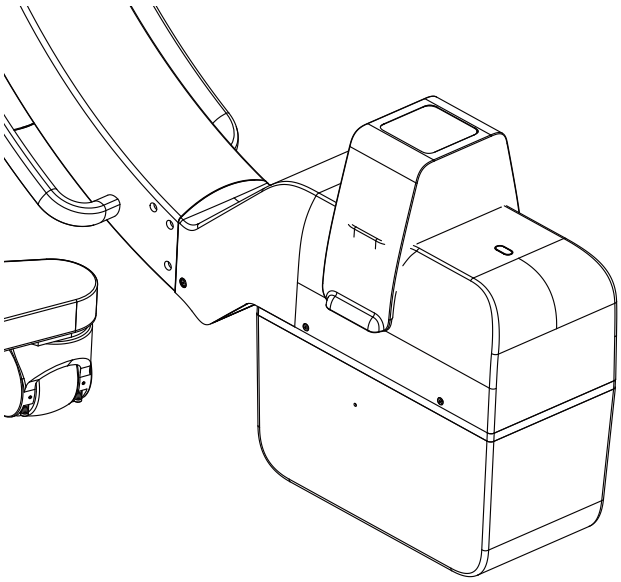


Figure 12-6 Skin spacer installation

13 Maintenance and quality assurance

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13.1 Maintenance

13.1.1 Overview

The service life of the equipment is 10 years. Conduct daily maintenance on the system according to this manual. If the operation period is much longer than the service life and normal operation frequency, you may need to conduct extra checks and repair in addition to daily maintenance. Please inform UIH Customer Service Center in advance when necessary. After the product reaches its service life, it needs to be disposed in accordance with relevant laws and regulations.

NOTICE
Professional maintenance and repair of the equipment must be performed by trained and qualified personnel.

NOTICE
Equipment maintenance and repair records must be archived and kept properly.

13.1.2 User maintenance

13.1.2.1 List of maintenance tools

No.	Name of tool
1	Hex key set
2	Phillips screwdriver set
3	Slotted screwdriver set
4	Open end wrench set

13.1.2.2 Routine maintenance

In order to ensure safe and stable operation of the equipment, improve system reliability, reduce equipment failure rate, extend equipment life, and ensure the quality of scanned images, users are obliged to perform routine maintenance on the system. Users need to take appropriate precautions in accordance with accident prevention regulations, medical product laws, and other regulations. According to the inspection tasks and the tools used, routine maintenance can be divided into three categories: preventive inspection, cleaning and disinfection, and system quality assurance.

In order to ensure the safe and effective operation of the system, the responsible person needs to perform the corresponding maintenance according to the recommended cycle in the following table.

Maintenance cycle	Maintenance task	Responsible person
Daily check	User document	Operator
	Console	Operator
	Ambient conditions	Operator
Weekly check	Emergency stop button	Operator
	Warning sign and system label	Operator
	Image quality	Operator

13.1.2.3 User responsibilities

Like other technical equipment, this medical system also requires:

- Correct operations
- Periodic inspection
- Periodic maintenance
- Timely repair

The usability and operational reliability of the system can be maintained only after these preventive measures above are taken. Users of the medical system are liable for taking these preventive measures in accordance with the accident prevention regulations, medical product laws, and other regulations. Maintenance includes the inspection performed by the user as well as the maintenance performed by the personnel authorized by UIH in the service agreement or UIH service order.

13.1.2.4 Safety check

The safety check includes functional and operational reliability and must be performed at least once every 12 months. The safety check is part of preventive maintenance in the UIH service agree and covers the following content:

- Visual inspect of the integrity of the system, whether there is visible damage, staining, device interference or wear that will affect operational safety.
- Testing the necessary monitoring, safety, display, and indication system.
- Measuring safety-related output parameters.
- Checking electrical safety and the internal power supply function.
- Performing other special technical tests for specific products in accordance with the accepted engineering practice standards.
- Performing other necessary tests specified by UIH.
- Recording results and filling in test reports.

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13.1.2.5 User check

In order to ensure the normal and safe operation of the equipment, it is necessary to carry out preventive inspection plans for the equipment and carry out regular maintenance, including cleaning of equipment components. Before exposure, the responsible organization must complete all necessary inspection tasks in accordance with the inspection plan to ensure the normal operation of the system.

Check gantry

- Check the movement status of the gantry to determine if the operation sound is normal.
- Ensure that the gantry enclosure is complete and that the indicators are normal.

Check the warning signs and system labels

- Check the ionizing radiation and laser warning signs. If any sign is lost or damaged, it should be replenished or replaced immediately.
- Check the labels on the system components. If a label is lost or damaged, contact the UIH Customer Service Center as soon as possible.

Users must check the X-ray system for visible defects (see the table below). If an operation failure or an exception deviated from normal operation responses occur, users must shut down the system and contact UIH Customer Service Center. The system operation can be restored only after the fault is rectified successfully. Using abnormal device will result in safety loopholes or unnecessary exposure.

Table 13-1 Daily inspection

Check item	Check method	Interval
Monitor cart wheel	After unlocking the brake of the monitor cart, check if the cart moves smoothly.	Every day
Monitor cart brake	After the monitor cart is locked by the brake, check if the cart can move.	
Power cable	Check the cable for wearing and tightness.	
Connection cable of C-arm trolley and monitor cart	Check the connection cable for wearing, and the interface pins for loosing or missing.	
Control panel	Check that if the control panel is sensitive, clean and not polluted.	
C-arm trolley wheel	After unlocking the C-arm trolley brake, check that if the cart can move smoothly.	
C-arm trolley brake	After the C-arm trolley is locked by the brake, check if the cart can move.	
C-arm trolley wheel direction control	After setting the direction, check that if the unit correctly controls the direction of the wheel without deviation.	
Hand switch	Ensure that the switch and cable are free of wearing.	
Wired foot switch	Ensure that the switch and cable are free of wearing.	
Wireless foot switch	Ensure that the foot switch is not worn.	
C-arm electric lifting	Ensure that the button is worn and is not stuck.	
C-arm emergency stop	When the button is pressed to make the C-arm move vertically, press the emergency stop button to check whether the vertical movement of the C-arm stops and whether the system displays the emergency stop information.	
C-arm brake	Ensure that the C-arm frame is fixed/sliding after the brake is locked/unlocked.	
Buzzer	Check if the buzzer sounds normally.	

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Table 13-2 Tasks of planned check

Check item	Check method	Interval
Grounding cable	Make sure that the ground has electrical continuity.	12 months
Connection cable of C-arm trolley and monitor cart	Make sure the connection cable is not worn, and the interface pins are not loosing or missing.	
Hand switch	Make sure that the switch and cable are not worn and that the hand switch button can function properly.	
Wired foot switch	Make sure that the switch and cable are free of wearing and the left and right pedals can function properly.	
Wireless foot switch	Make sure that the switch and cable are free of wearing and the left and right pedals can function properly.	

Some mechanical components in the X-ray system wear out during the long-term use.

Correct electromechanical settings and electronic equipment settings concern the functions, image quality, electrical safety, and radiation dose exposure to patients and medical staff.

We suggest that:

- Users should perform periodic inspection in accordance with the instructions in the table.
- UIH customer service engineer perform maintenance on the X-ray system at least once every year. More frequent maintenance is required if the workload of the X-ray system is heavier.

This can reduce the risks of hazards to patients and operators.

The maintenance agreement with UIH can help you better maintain the value and safety of your X-ray system. All necessary maintenance operations must be performed regularly including safety tests for hazard prevention and settings required for achieving the best image quality and minimum radiation dose. UIH will consider reaching an agreement with you on the maintenance interval in accordance with related regulations.

⚠ WARNING

System safety

- Faulty components that affect the safety of the radiography system must be replaced with original accessories.

13.1.2.6 Result recording

The service and repair process must be recorded in medical product logs, and the record should cover the following information:

- Type and scope of work
- Details about changes to rated values or work area
- Date and signatures of persons who perform the work

13.1.3 Periodic maintenance

The periodic maintenance must be performed by UIH customer service engineer or qualified and authorized personnel. The personnel perform maintenance must know the system, the maintenance method and related safety.

Table 13-3 Periodic maintenance items

Item	Description	Internal
System appearance	Check the if the appearance pf covers, cables, labels and buttons are damaged	Annual
E-stop button	Check the function of E-stop button	Annual
System handles	Check if the handles are loose and tighten the handles if necessary	Annual
Rubber supports for orbital roller assembly	Check if the rubber supports for orbital roller assembly are damage and replace the damage if necessary	Annual
Movement of C-arm trolley and monitor cart	Check if any resistance during movement	Annual
Steering of C-arm trolley	Check steering movement of C-arm trolley	Annual
Brake of C-arm trolley and monitor cart	Check the brake function of C-arm trolley and monitor cart	Annual
Damping force of C-arm control panel	Check the C-arm control panel can be fixed in certain position	Annual
C-arm manual and motorized movements	Check the horizontal, orbital, angulation and swivel movement	Annual
C-arm start-up force and braking force	Check the C-arm start-up force and braking force of horizontal, orbital, angulation and swivel movement can meet the requirement	Annual
Function of buttons and pedals	Perform button test to check the status of buttons and pedals	Annual
Exposure function	Check the exposure function	Annual
Lasers	Check alignment and function of lasers	Annual
Disk space	Check the disk space and clean the disk space if necessary	Annual
High voltage generator calibration	Perform high voltage generator calibration	Annual
FPD calibration	Perform FPD calibration	Annual
Accuracy of collimator window	Check the accuracy of the collimator window, perform collimator calibration if the accuracy cannot meet the requirement	Annual

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Item	Description	Internal
DAP calibration	Perform DAP calibration to software DAP (if the DAP meter is equipped, do not perform the software DAP calibration)	Annual
	Perform DAP calibration to DAP meter (optional)	
Lifting screw lubrication	Apply grease to the lifting screw (the grease must meet the requirement of UIH)	Annual

13.2 Quality assurance (QA check)

Complete the following QA checks prior to using the system.

NOTICE
Personnel performing these checks must be proper trained.

NOTICE
In general, QA item executors are users, usually the hospital. For details, see "QA check item, executor and frequency" on page 13-10. ◆ If you can't find a suitable third party to execute the QA program, you can also contact the UIH Customer Service Center to execute it for you.

13.2.1 QA check item, executor and frequency

These QA checks should be performed at the listed frequency. Extensive use warrants increasing the frequency of QA check. In addition, circumstance such as accidents during transport or exposure to excessive fluids may warrant that QA check be performed to verify operation of the equipment. Refer to each QA check section for details on when specific checks may need to be performed.

If problems are found during these checks, please contact UIH Customer Service Center.

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Table 13-4 QA check item, executor and frequency

QA check	Item	Executor	Frequency
Mechanical QA checks	Movement of the C-arm mobile stand such as pushing forward, turning, and braking	Users	Daily
	Vertical motion of the C-arm		
	Swivel motion and braking of the C-arm		
	Horizontal motion and braking of the horizontal support arm		
	Angular motion and braking around the center axis of the horizontal support arm		
	Orbital motion and braking along the rail		
	Rotation and flipping of the C-arm control panel		
	Fastening and removing the grid		
	Surface cleaning of the flat panel detector and tube cover		
	Monitor rotation		
	Movement of the monitor cart such as pushing forward, turning, and braking		
Electrical QA checks	Power indicator	Users	Daily
	System power-on and startup		
Emergency stop button QA check	Functionality of the emergency stop button	Users	Daily
Image quality QA checks	Checking image quality	Qualified medical physicists	Annually
	Checking X-ray filed range	Qualified medical physicists	
	Checking touch performance	Users	
	Image quality maintenance	UIH customer service engineers	
Radiation accuracy check	Checking tube voltage	Qualified medical physicists & UIH customer service engineers	Annually
	Checking tube current		

QA check	Item	Executor	Frequency
Radiation accuracy check	Checking tube current-exposure time product	Qualified medical physicists & UIH customer service engineers	Annually
	Checking the reproducibility and linearity		
	Checking the nominal values for half-value layer		
	Checking the maximum fluoroscopy entrance exposure rate		
	Checking the accuracy of patient entrance reference air kerma rate		
	Checking the accuracy of the cumulative patient reference air kerma		
	Checking DAP accuracy		
Collimator QA checks	Collimator self-test	Users	Monthly
	Zoom control of the square virtual collimator		Annually
	Zoom control of the slot virtual collimator		
	Rotation control of the slot virtual collimator		
	Image inspection at different positions		
laser QA checks	Laser self-test	Users	Annually
	Laser on/off control		
	Laser indication accuracy		

13.2.2 Mechanical QA check

Tools	Executor	Frequency
N.A	Users	Daily

1. Control the armrest and steering lever of the C-arm mobile stand to push forward and turn the C-arm mobile stand.
   - Observe whether the process is smooth without blocking.
2. Step on the brake pedal to brake the cart.
   - Make sure that the C-arm mobile stand is stopped.
3. Press the Up button △ or Down button ▽.
   - Check whether the system starts moving vertically.
   - Observe whether abnormal sound is generated.
   - Check whether the indication of the starting point is correct.

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4. Release the swivel brake handle and swivel the C-arm to the left and right position limits.
   - Observe whether the process is smooth without blocking.
5. Lock the swivel brake handle and swivel the C-arm again.
   - Make sure that the motion is locked.
6. Release the horizontal brake handle and control the C-arm to horizontally move to the front and back position limits.
   - Observe whether the process is smooth without blocking.
7. Lock the horizontal brake handle and control the horizontal support arm to move horizontally.
   - Make sure that the motion is locked.
8. Release the angulation brake handle and control the C-arm to perform the angulation motion to positive and negative position limits.
   - Observe whether the process is smooth without blocking.
9. Lock the angulation brake handle and control the C-arm to perform the angulation motion again.
   - Make sure that the motion is locked.
10. Release the orbital brake handle and control the C-arm to perform the orbital motion to the positive and negative position limits.
    - Observe whether the process is smooth without blocking.
11. Lock the orbital brake handle and control the C-arm to perform the orbital motion again.
    - Make sure that the motion is locked.
12. Rotate the C-arm control panel to the positive and negative position limits.
    - Observe whether the process is smooth without blocking.
    - Make sure that the control panel can be stably stopped at any position.
13. Flip the C-arm control panel to the upper and lower position limits.
    - Observe whether the process is smooth without blocking.
    - Make sure that the control panel can be stably stopped at any position.
14. Remove and install the grid.
    - Check whether the process is smooth.
15. Visually check whether the surface of the flat panel detector and the cover of the tube are clean, and clean it up in time if any.
16. Rotate the monitor to the positive and negative position limits.
    - Observe whether the process is smooth without blocking.
    - Make sure that the monitor can be stably stopped at any position.
17. Hold the armrest of the monitor cart to push forward and turn the monitor cart.
    - Observe whether the process is smooth.
18. Step on the brake pedal to brake the cart.
    - Make sure that the monitor cart is stopped.

13.2.3 Electrical QA check

Tools	Executor	Frequency
N.A	Users	Daily

1. Insert the power plug.
   - Make sure that the power indicator is steady green.
2. Press the power-on/off button.
   - Make sure that the power-on/off button indicator is steady green.
   - Make sure that the system is started normally.

13.2.4 Emergency stop button QA check

Tools	Executor	Frequency
N.A	Users	Daily

1. Press the Up/Down control buttons. The C-arm starts moving vertically.
2. Press the emergency stop button.
   - Make sure that the vertical motion is stopped.
   - Press the hand switch or step on the foot switch to verify that exposure cannot be performed.
3. Rotate the emergency stop button clockwise to reset it.
   - Make sure that the vertical motion is enabled.
   - Press the hand switch or step on the foot switch to verify that exposure can be performed.

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13.2.5 Image quality QA check

The following section is the QA check about the parameters, specifications, tests, tools, quality standards, acceptance limits and action limits.

- Performance checks should be carried out regularly.
- All tools must be calibrated before use.
- These checks must be performed under appropriately authorized, trained, qualified, certified, and/or licensed to use the system and to perform the required testing, we advised test by certified/licensed radiologic technologists and licensed medical physicists in X-ray imaging and evaluation. Typical professional medical physicist societies such as:
  - American Association of Physicists in Medicine: http://www.aapm.org
  - International Organization for Medical Physics: http://www.iomp.org
  - European Federation of Organizations for Medical Physics: http://www.efomp.org

If problems are found during these checks or if problems persist after suggested troubleshooting, contact a qualified service engineer or service provider to troubleshoot and repair the system.

13.2.5.1 Checking image quality

Tools	Executor	Frequency
IBA phantom	Qualified medical physicists	Annually

Check procedures

1. Place test device unit on the effective receiving area of flat panel detector according to DIN 6868-4 2007.
2. Boot up the system and create a new exam. Set the collimator size to maximum. Choose DR mode and set normal dose level. Hold the exposure hand switch until a radiation finish indicate beep, then check the image displayed on the monitor reference to Figure 13-1.

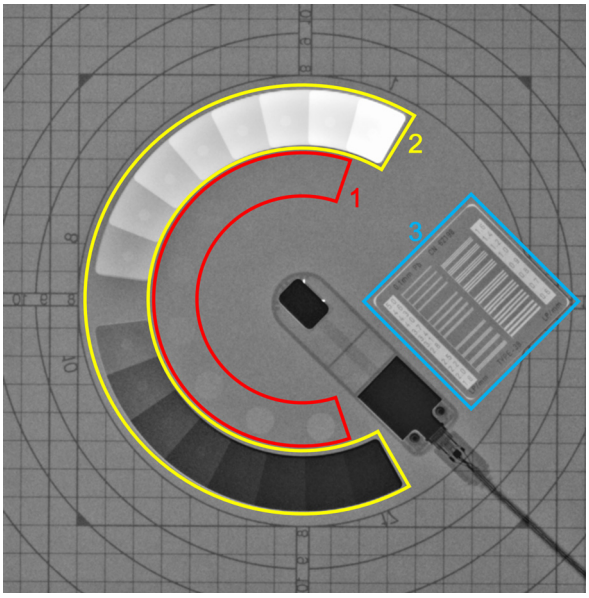


Figure 13-1 Checking image quality test result image display

Nominal specified values

- Mark 1 in Figure 13-1 shows contrast resolution: the testing result should be at most 4%.
  - Note: there are 8 low contrast circles on the phantom, to measure how many circles can be distinguished from the image (adjust the window width and window level is allowed). Typically, 3 circles for 5.6%, 4 circles for 4%, 5 circles for 2.8%, and 6 circles for 1.8%.
- Mark 2 in Figure 13-1 shows dynamic range: the testing result should be no less than 16 gray levels.
  - Note: there are 17 different gray levels on the phantom, to measure how many gray levels be clearly distinguished from the image.
- Mark 3 in Figure 13-1 shows spatial resolution: the testing result should be no less than 2.5 lp/mm.
  - Note: the spatial resolution can be read from the line pair card, to measure the line pairs which can be clearly separated.

Solution

▶ If you find the test results are out of the nominal specified values, please contact UIH Customer Service Center.

13.2.5.2 Checking X-ray field range

Reference to IEC 60601-2-54 203.8.102.6; 21 CFR 1020.32 (b)(64)(ii)(A).

Tools	Executor	Frequency
X-ray sensitive film	Qualified medical physicists	Annually

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Check procedures

1. Fix X-ray sensitive film at the four edge of the effective imaging area of the flat panel detector shown as Figure 13-2 below.



Figure 13-2 X-ray sensitive film test geometry

2. Make sure the collimator is open to maximum.
3. Take several exposures. And measuring the X ray field range.

Nominal specified values

▶ The deviation of the effective imaging area of receptor and radiation field on every side should be less than 1 cm.

Solution

▶ If you find the test results are out of the nominal specified values, please contact UIH Customer Service Center.

13.2.5.3 Checking touch performance

Tools	Executor	Frequency
N.A.	Users	As needed

Check procedures

▶ Click icon on the control panel with finger.

- For example, click PULSE icon on the control panel. The icon of pulsed fluoroscopy mode should be highlighted, indicating that the fluoroscopy mode is selected. And then click SPOT icon on the control panel. The icon of spot fluoroscopy mode should be highlighted, indicating that the spot fluoroscopy mode is selected.

Nominal specified values

▶ Immediate and accurate interaction.

Solution

▶ If you find the test results are out of the nominal specified values, please contact UIH Customer Service Center.

13.2.5.4 Image quality maintenance

Tools	Executor	Frequency
N.A.	UIH customer service engineers	Annually

To ensure optimum image quality, we recommend performing flat panel detector calibration at shorter interval.

Image quality QA maintenance should be done by UIH customer service engineers during maintenance work:

■ Annual maintenance

NOTICE

If you do not have a maintenance contract, please contact UIH Customer Service Center.

NOTICE

- It will reduce image quality due to incorrect calibration parameters.
- Risk of unnecessary radiation exposure due to incorrect calibration parameters

13.2.6 Radiation accuracy check

13.2.6.1 Checking tube voltage

Reference to IEC 60601-2-54 203.6.4.3.104.3; 21 CFR 1020.30(h).

Tools	Executor	Frequency
Dosimeter	Qualified medical physicists	Annually

Check procedures

1. Place the dosimeter in the center of the flat panel detector like Figure 13-3. Set dosimeter to "kV".

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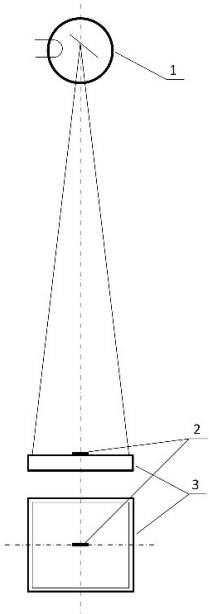


Figure 13-3 Checking tube voltage method

1. X-ray source assembly
2. Dosimeter
3. Flat panel detector

2. Create a new exam, choosing DR mode and setting exposure parameters 40 kV, and then take an exposure. Record measurements from dosimeter.
3. In DR mode, set exposure parameters 110 kV. Record measurements from dosimeter.
4. Choose PULSE mode and set exposure parameters 99 kV, then take an exposure more than 10 s. Record a stable measurement from dosimeter.
5. In PULSE mode, set exposure parameters 66 kV, then take an exposure more than 10s. Record a stable measurement from dosimeter.
6. Calculate and record deviation as follow:

   Deviation = | ((kV setting by user on control panel)/(kV measured)-1)| ×100

Nominal specified values

▶ The maximum deviation in every test group shouldn't exceed 10%.

- If the dosimeter does not display the value of kV, place dosimeter close to the X-ray source of tube and repeat the test procedures.

Solution

▶ If you find the test results are out of the nominal specified values, please contact UIH Customer Service Center.

13.2.6.2 Checking tube current

Reference to IEC 60601-2-54 203.6.4.3.104.4; 21 CFR 1020.30(h)(3).

Tools	Executor	Frequency
Dosimeter	UIH customer service engineers	Annually

Check procedures

1. Shut down the system, then connect the dosimeter to control circuit interface of the C-arm trolley to measure "mA".
2. Boot up the system and create a new exam. Choose PULSE mode and set exposure parameters 40 kV, then take an exposure. Record the mA value from dosimeter.
3. In PULSE mode, set exposure parameters 88 kV (the maximum mA which can be set by users will be chosen automatic). Record the mA value from dosimeter.
4. In PULSE mode, set exposure parameters 65 kV (it means a typical condition to expected use) in fluoroscopy manual mode. Record the mA value from dosimeter.
5. Calculate and record deviation as follow:

   Deviation = | ((mA setting by user on control panel)/(mA measured)-1)| ×100

Nominal specified values

▶ The deviation shouldn't exceed 20%.

Solution

▶ If you find the test results are out of the nominal specified values, please contact UIH Customer Service Center.

13.2.6.3 Checking tube current - exposure time product

Reference to IEC 60601-2-54 203.6.4.3.104.6; 21 CFR 1020.309(h)(3).

Tools	Executor	Frequency
Dosimeter	Qualified medical physicists	Annually

Check procedures

1. Shut down the system, then connect the dosimeter to control circuit interface of the C-arm trolley to measure "mAs".
2. Boot up the system and create a new exam. Choose DR mode and set exposure parameters 40 kV (it means the lowest mAs user can select), then take an exposure. Record the mAs value.
3. In DR mode, set exposure parameters 68 kV (it means the maximum mAs user can select), then take an exposure. Record the mAs value.
4. Calculate and record deviation as follow:

   Deviation = |((mAs setting by user on control panel)/(mAs measured)-1)| ×100

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Nominal specified values

▶ The deviation should not exceed 10% +0.2 mAs.

Solution

▶ If you find the test results are out of the nominal specified values, please contact UIH Customer Service Center.

13.2.6.4 Checking the reproducibility and linearity

Reference to IEC 60601-2-54 203.6.3.2.102; 21 CFR 1020.30(h)(3).

Tools	Executor	Frequency
◆ 4 mm Aluminum ◆ 45 mm Aluminum ◆ 26 mm Aluminum ◆ 42 mm Aluminum ◆ 40 mm Aluminum ◆ Dosimeter	UIH customer service engineers	Annually

Check procedures

1. Place a 4mm Aluminum filter on the X-ray source of collimator. Place the dosimeter on the center of flat panel detector to measure the value "Gy".
2. Create a new exam. Choose the DR mode and set exposure parameters 40 kV, 20 mA, 100 ms, and then take exposures for 5 times in an hour. Record the AIR KERMA in group A.
3. According to Table 13-5, change Aluminum filter and set the exposure parameters to get the test result of group B to group F.

Table 13-5 Check the reproducibility and linearly

Group	A	B	C	D	E	F
Tube voltage (kV)	40	110	55	88	55	88
Tube current (mA)	20	1	20	15	15	10
Irradiation time (ms)	100	320	320	200	320	200
Filter (mm Al)	4	45	26	42	26	40
Test No.	Measured AIR KERMA					
1						
2						
3						
4						
5						
Average value of AIR KERMA						

Group	A	B	C	D	E	F
Variation						
Coefficient of Variance(%)						

4. Calculate coefficient of variance as follow:

$$C = \frac{s}{\bar{X}} = \frac{1}{\bar{X}}\left[\sum_{i=1}^{n}\frac{(X_i - \bar{X})^2}{n-1}\right]^{1/2}$$

- s = estimated standard deviation of air kerma
- Xi = i^{th} observation sampled
- n = number of observations sampled

5. Calculate linearly of air kerma as follow:

$$\left|\frac{\overline{K_1}}{Q_1} - \frac{\overline{K_2}}{Q_2}\right| \leqslant 0.2\,\frac{\frac{\overline{K_1}}{Q_1} + \frac{\overline{K_2}}{Q_2}}{2}$$

- ($\overline{K_1}$) = average value of AIR KERMA of group E
- ($\overline{K_2}$) = average value of AIR KERMA of group F
- Q1= mAs of group E
- Q2= mAs of group F

Nominal specified values

- The coefficient of variation for group A, group B, group C and group D should not exceed 0.05.
- The linearly value for group E and group F should comply with the calculate formulas shown above.

Solution

▶ If you find the test results are out of the nominal specified values, please contact UIH Customer Service Center.

13.2.6.5 Check the nominal values for half-value layer

Reference to IEC 60601-2-54 203.6.3.2.103.2; 21 CFR 1020.30 (m)(1).

Tools	Executor	Frequency
Dosimeter	Qualified medical physicists	Annually

1. Place the dosimeter in the center of the flat panel detector. Make sure the collimator is open to maximum, and set dosimeter to "HVL".
2. Create a new exam. Set the exposure modes listed below, take exposure in manual mode, and record the values from dosimeter.

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3. Record the result in the blank of Table 13-6.

Table 13-6 Check the nominal values for half-value layer

Tube voltage (KV)	Minimum permissible first half-value layer (mm Al)	First half-value layer measured (mm Al)
40	0.4	
50	1.8	
60	2.2	
70	2.5	
80	2.9	
90	3.2	
100	3.6	
110	3.9	

Nominal specified values

▶ The first half-value layer measured should greater than or equal to the minimum permissible first half-value layer value which shown in Table 13-6.

Solution

▶ If you find the test results are out of the nominal specified values, please contact UIH Customer Service Center.

13.2.6.6 Check the maximum fluoroscopy entrance exposure rate

Reference to IEC 60601-2-43 203.6.3.102; 21 CFR 1020.32 (d)(1)(iii).

Tools	Executor	Frequency
◆ Lead plate ◆ Dosimeter	Qualified medical physicists	Annually or as needed

Check procedures

1. Place a lead plate with a thickness no less than 3 mm on the flat panel detector.
2. Place the dosimeter in the center of the X-ray field and 30 cm above the flat panel detector. Set dosimeter to "mGy/min".
3. Create a new exam. Set the exposure modes listed below, take an exposure and hold for more than 10 s, when the reading of dosimeter is stable read a maximum stable dose rate from the dosimeter.

Table 13-7 Check the maximum fluoroscopy entrance exposure rate

Mode	Dose Level	Entrance exposure rate (mGy/min)
PULSE	Normal dose	
PULSE	High quality	

Nominal specified values

▶ The maximum fluoroscopy entrance exposure rate should be less than 88 mGy/min.

Solution

▶ If you find the test results are out of the nominal specified values, please contact UIH Customer Service Center.

13.2.6.7 Check the accuracy of patient entrance reference air kerma rate

Reference to IEC 60601-2-43:2010 203.6.4.5; 21 CFR 1020.30 (h)(6)(i), 21 CFR 1020.32 (k)(4), 21 CFR 1020.32 (k)(6).

Tools	Executor	Frequency
◆ Dosimeter ◆ 20 cm PMMA	Qualified medical physicists	Annually

Check procedures

1. Create a new exam. Make sure the collimator is open to maximum.
2. Place the dosimeter 30 cm above the flat panel detector in the center of flat panel detector, and place 20 cm PMMA on the surface of flat panel detector.
3. Set the dosimeter to dose rate Gy/min.
4. Set the exposure modes listed below, take an exposure, when the reading of dosimeter is stable, record the dose rate displayed on monitor and record the dose rate displayed on dosimeter into below column.
5. Repeat step 4 for 3 times and record according to Table 13-8.

Table 13-8 Check accuracy of patient entrance reference air kerma rate

Times	Mode	Monitor Displayed Dose Rate (mGy/min)	Measured Dose Rate (mGy/min)	Deviation
1	Pulse			
2	Pulse			
3	Pulse			

6. Calculate and record deviation as follow:

   Deviation =|((Monitor displayed dose rate)/(Measured dose rate)-1)|×100

Nominal specified values

▶ The deviation should less than 35%.

Solution

▶ If you find the test results are out of the nominal specified values, please contact UIH Customer Service Center.

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13.2.6.8 Check the accuracy of cumulative patient reference air kerma

Reference to IEC 60601-2-43.6.4.5; 21 CFR 1020.30 (h)(6)(i), 21 CFR 1020.32 (k)(4), 21 CFR 1020.32 (k)(6).

Tools	Executor	Frequency
◆ Dosimeter ◆ 20 cm PMMA	Qualified medical physicists	Annually

1. Create a new exam. Make sure the collimator is open to maximum.
2. Place the dosimeter 30 cm above the flat panel detector in the center of flat panel detector, and place 20 cm PMMA on the surface of flat panel detector.
3. Set dosimeter to "Gy".
4. Set the exposure modes listed below, take an exposure, when the reading of dosimeter is stable, record cumulative patient reference air kerma displayed on monitor and record the cumulative patient reference air kerma displayed on dosimeter into column of Table 13-9 below.
5. Repeat step 4 for 3 times.

Table 13-9 Check the accuracy of cumulative patient reference air kerma

Times	Mode	Cumulative dose displayed on monitor (mGy)	Measured dose (mGy)	Deviation
1	PULSE			
2	PULSE			
3	PULSE			

6. Calculate and record deviation as follow:

Deviation = |((cumulative patient reference air kerma displayed on monitor)/(cumulative patient reference air kerma measured)-1)|×100

Nominal specified values

▶ The deviation should be less than 35%.

Solution

▶ If you find the test results are out of the nominal specified values, please contact UIH Customer Service Center.

13.2.6.9 Checking DAP accuracy

Reference to IEC 60601-2-43:203.6.4.5; 21 CFR 1020.32 (k).

Tools	Executor	Frequency
◆ Dosimeter ◆ cross lead ruler	Qualified medical physicists & UIH customer service engineers	Annually

1. Position the C-arm to put flat panel detector at the bottom and monoblock at the top.
2. Put a cross lead ruler on the center of flat panel detector and ensure the cross lead ruler edge is parallel with the side the monoblock.
3. Create a new exam. Set the Mag mode to "Level 1" on the control panel.
4. Take an exposure in auto pulse fluoroscopy mode, press the exposure hand switch and adjust the rectangular collimator size until all two opposite leaves are visible on monitor, then release the exposure hand switch.
5. Press the exposure hand switch until the scale value of the cross lead ruler is clear enough in the image, and then release the exposure hand switch. Read the scale value and calculate the side length of the whole X ray field, and record the side length value in column "Side length" with unit mm.
   - The semi-transparent part of leaves shall be considered. The measurement shall start and end at the middle of semi-transparent area when read scale value in the X ray image.
6. Take the cross lead ruler away and fix a dosimeter in the center of flat panel detector surface. Set the dosimeter to accumulated dose in Gy and reset the dosimeter to zero. Take an exposure in auto pulse fluoroscopy mode and hold the exposure hand switch for at least 10 seconds.
7. Record the DAP value (mGy*cm^2) displayed on the real-time screen in Table 13-10, then take an exposure for at least 20 seconds. After exposure finish, record the DAP displayed on monitor in column "DAP on monitor after exposure". Record the measured dose of dosimeter in Table 13-10. Reset the dosimeter after the measurement.
8. Calculate and record DAP estimated value on the real-time screen in Table 13-10.
9. Calculate and record DAP value deviation in Table 13-10.
10. Repeat Step 3 - Step 9 to measure and record DAP deviation of Mag Level 0 and Level 2 in Table 13-10.

Table 13-10 DAP value deviation calculation

Mag	Side length L (mm))	Measured does A of dosimeter (mGy)	DAP value B on the real-time screen before exposure (μGy*m^2)	DAP value C on the real-time screen after exposure (μGy*m^2)	DAP estimated value D[1)] on the real-time screen(μGy*m^2)	DAP value deviation[2)]

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Level 0						
Level 1						
Level 2						
Note: 1). D = C - B 2). DAP value deviation = $\lvert [D \times 1000/(A \times L^2)]-1 \rvert$						

Nominal specified values

▶ The deviation should be less than 35%.

Solution

If you find the test results are out of the nominal specified values, please check the accuracy of cumulative patient reference air kerma, refer to "Check the accuracy of patient entrance reference air kerma rate" on page 13-23. If the problem cannot be solved, please contact UIH Customer Service Center.

13.2.7 Collimator QA check

Tools	Executor	Frequency
N.A.	Users	Self-test: monthly Others: annually

1. Press the power-on/off button to start the system.
   - Verify the self-test sound generated by the lead shutters of the collimator.
   - Check whether abnormal noise is generated during self-test.
   - After the self-test is complete, check whether the virtual collimator functions properly.
2. Set the X-ray radiation mode to 50 kV pulsed fluoroscopy mode.
3. Enable the virtual collimator function, zoom the square virtual collimator to half of the entire display area, and take an image.
   - Check whether there is obvious deviation between the image edges and the four edges of the virtual collimator (greater than 1.5 cm on the control panel).
4. Enable the virtual collimator function, zoom in the rectangular virtual collimator to maximum, and take an image.
   - Verify that there is no shadow around the image.
5. Set the X-ray radiation mode to 50 kV pulsed fluoroscopy mode.
6. Enable the virtual collimator function, adjust the left lead shutter of the slot virtual collimator to half of the entire display area, and take an image.
   - Check whether there is obvious deviation between the image edges and the edges of the virtual collimator (greater than 1.5 cm on the control panel).
7. Enable the virtual collimator function, adjust the right lead shutter of the slot virtual collimator to half of the entire display area, and take an image.

- Check whether there is obvious deviation between the image edges and the edges of the virtual collimator (greater than 1.5 cm on the control panel).

8. Enable the virtual collimator function, adjust in the slot virtual collimator to maximum, and take an image.
   - Make sure that there is no shadow on both sides of the image.
9. Set the X-ray radiation mode to 50 kV pulsed fluoroscopy mode.
10. Enable the virtual collimator function, rotate the slot virtual collimator, and perform fluoroscopic imaging.
    - Check whether the lead shutters can be rotated at 360° without limitation.
11. Set the X-ray radiation mode to 50 kV pulsed fluoroscopy mode.
12. Move the C-arm to various position limits and take an image.
    - Make sure that there is no shadow around the image.

13.2.8 Laser QA check

Tools	Executor	Frequency
N.A.	Users	Annually

1. Press the startup/shutdown button.
   - Make sure that all the configured lasers will be on and then off at machine startup.
2. Select the laser function on the control panel.
   - Make sure that all the configured lasers are working.
   - Make sure that the lasers are off within the specified time (30 s by default).

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13.3 Cleaning and disinfection

In addition to regular maintenance, in order to ensure the safe and effective operation of the system, it is necessary to comply with the requirements of local laws and regulations for external cleaning and disinfection of equipment and components.

⚠ CAUTION

Cleaning inside the gantry can only be performed by the UIH Customer Service Center or agencies authorized by UIH.

13.3.1 Cleaning

NOTICE

The use of harsh detergent, liquid, or spray may lead to electronic damage and only the recommended materials can be used for cleaning and disinfection. Prevent any cleaning liquid from flowing into the system, for example, through air vents or gaps on the outer cover.

NOTICE

- Inadequate cleaning or disinfection may make people in contact get infected. Therefore, all contaminated component surfaces and all component surfaces that patients may contact or have already contacted should be cleaned and disinfected after each examination.
- Use only water or mild household cleaning solutions during cleaning.
- Use general surface disinfectant, acetaldehyde and/or amphiprotic disinfectant during disinfection.

When selecting detergent, pay attention to the following aspects:

Use water or mild household detergent only to clean the plastic surface. Using other detergent (such as high concentration alcohol) will lead to gloss loss and crack of the materials. Do not use any corrosive, soluble detergent or polish.

Observe the following principles during cleaning:

- Cut off the power supply before cleaning the system.
- Ensure that no water or other liquid enters the system to avoid short circuits and component corrosion in the electrical system.
- For components with aluminum or glazed surfaces, wipe them only with cloth moistened with mild detergent, and then clean them with dry linen-free cotton cloth.
- Wear proper protective gloves during cleaning and disinfection.
- Clean all contaminated components and all the parts that a patient may contact or has already contacted directly or indirectly.

System components that users can clean include: the gantry cover and the flat surface.

⚠ WARNING

Turn off the system power before cleaning the system to prevent electric shock.

⚠ CAUTION

The operator must wear appropriate protective gloves when cleaning and disinfecting.

Cleaning of enclosure

Steps for cleaning the cover and the flat surface:

1. Use a soft and lint-free cotton cloth to clean the surface of the gantry.
2. Use a soft cotton cloth dipped in water to wipe the logo and acrylic surface of the gantry cover.

NOTICE

Do not use cleaning products that are corrosive. Do not use a cleaning product if you are not sure about its property.

NOTICE

When cleaning the outer casing, be careful not to allow liquid to flow in or penetrate into the outer casing.

13.3.2 Disinfection

The disinfection methods must comply with related regulations and guidance principles pertaining to disinfection and explosion protection.

⚠ WARNING

Do not use corrosive, soluble or gas disinfectant.

Some system components, such as handles and flat panel detector, come into direct contact with the operator or patients, and need to be sterilized.

Equipment disinfection precautions

- Disinfect and sterilize only with a slightly damp soft cloth with a suitable disinfectant.
- Use a commercially available disinfectant and do not use a disinfectant containing alcohol or acetone. Follow the manufacturer's instructions.
- Do not use disinfectants containing alcohol or acetone.
- Do not sterilize parts by spraying, which may damage electronic components.
- Cut off all power supplies to the system before disinfection.

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- Disinfect all components of the system (including optional accessories and cables) by wiping them only.
- It is not recommended to use spray for disinfection as the disinfectant may enter the system.
- If an atomizer is used for indoor disinfection, shut down the equipment, and completely cover the equipment with plastic cloth after the equipment cools down. Remove the plastic cloth only after the disinfectant spray in the air is completely settled, and wipe the X-ray system for disinfection.

⚠ WARNING

Use disinfectant in accordance with this manual. Using non-recommended disinfectant may cause operator injuries and system damage.

13.3.3 Disinfection and cleaning suggestions

System cover

It is recommended to use water, 75% medical alcohol, or mild household detergent to disinfect and clean the system cover.

Air vents or cover gap

Keep the air vents of all the components well-ventilated.

Dust

Dust deposition on the motion components may affect the motion of system components. Therefore, clean up dust at the rail junctions on a regular basis.

Touch display

Clean up fingerprints left on the screen periodically. Do not spray directly on the touch display. Wipe the touch display only with clean and slightly damp cloth.

Monitor and keyboard

NOTICE

- Wear proper protective gloves during cleaning and disinfection.
- Using non-recommended detergent may lead to system damage.
- The LCD screen is very sensitive to mechanical damage. Therefore, avoid scratches and shock. Wipe off water droplets immediately. Long-term contact with water will lead to surface discoloration.

⚠ WARNING

Liquid flowing into the equipment may cause electric shock or damage.

- Do not drop any liquid directly onto the control display, display, or other surface.
- Do not use cleaners that contain bleach, ammonia or other abrasives or solvents.
- Do not use too much cleaning liquid when cleaning the equipment.

Remove dirt immediately. You can use clean and slightly damp cloth for cleaning.

- Be sure to use slightly damp cloth without detergent for cleaning.
- Dry the monitor and keyboard with soft cotton cloth.

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13.4 Troubleshooting

Table 13-11 System error list

Error	Solution
Emergency stop button is triggered	Check if the emergency stop button in pressed.
Tube temperature is too high. Exposure is prohibited in DR mode	Shutdown the system or wait for some time. The error will be eliminated after the tube temperature is decreased to normal level.
XNet communication failure: IAS communication failure. Please contact service engineers	Re-start the system. If not work, please contact UIH customer service engineer.
XNet communication failure: FCS communication failure. Please contact service engineers	
Abnormal IAS status. Please contact service engineers	
Abnormal FCS status. Please contact service engineers	
High voltage generator error. Please check the details information in the “INFO ”at lower-left direction	Perform exposure again. If the exposure cannot be performed, disconnect and re-plug the plug of C-arm trolley socket to restart the high-voltage generator.
Exposure is stopped unexpectedly: Abnormal IAS status. Please contact service engineers	Re-start the system. If not work, please contact UIH customer service engineer.
Exposure is stopped unexpectedly: Abnormal FCS status. Please contact service engineers	
Exposure is stopped unexpectedly: IAS preparation failure. Please contact service engineers	
Exposure is stopped unexpectedly: FCS preparation failure. Please contact service engineers	
Exposure is stopped unexpectedly: IAS preparation timeout. Please contact service engineers	
Exposure is stopped unexpectedly: FCS preparation timeout. Please contact service engineers	
Internal error of high voltage generator	Perform exposure again. If the exposure cannot be performed, disconnect and re-plug the plug of C-arm trolley socket to restart the high-voltage generator.
UPS is running. Please restore the power in time	Please check if the power cable connection is loosen.
C-arm trolley connection failed. Please try to reconnect the CM cable	Please check the connection of C-M cable between the C-arm trolley and the monitor cart.

Error	Solution
Failed to save Reference image	Re-start the system. If not work, please contact UIH customer service engineer.
Failed to save Review image	
Failed to save Exam image	
FPD initialization failure. Please contact service engineers	
Abnormal graphics card function. Please contact service engineers	
Internal error of high voltage generator. Please contact service engineers	Perform exposure again. If the exposure cannot be performed, disconnect and re-plug the plug of C-arm trolley socket to restart the high-voltage generator.
Encoder got disconnected. The lifting function is unavailable	Please contact UIH customer service engineer.
Insufficient disk space. Exposure is prohibited	Please clean the disk space.
CCP communication failure. Please contact service engineers	Check if the C-M cable between C-arm trolley and monitor cart is loosen. If not, and the error still exists, please contact UIH customer service engineer.
Printer communication error. Please contact service engineers	The printer is disconnected from the system. Check the power supply of the printer, and the USB cable connecting the printer and the host.
FPD calibration is expired, which may affect the image quality	Please contact UIH customer service engineer for FPD calibration.
C-arm trolley does not match the display trolley. Please check	There are several mobile C-arm X-ray systems on site. Please connect the C-arm trolley to its corresponding monitor.
Collimator initialization failure. Please try to restart or contact service engineers	Disconnect and re-plug the plug of C-arm trolley socket, if the error is still exist, please contact UIH customer service engineer.
For the current protocol, it is recommended to insert grid	Install the grid according to current protocol.
Print failed	Print again, if failed again, please contact UIH customer service engineer.
Under emergency registration mode, the number of exposures has reached the upper limit	Re-login the system.

Table 13-12 Monitor and control panel display error

Fault	Cause	Solution
After pressing the startup/ shutdown button, the control panels display only the UIH icon and the monitor does not turn on	The host is not started	Please contact UIH customer service engineer, remove and re-plug the host memory and video card with guidance.

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Fault	Cause	Solution
After pressing the startup/ shutdown button, the monitor cart control panel or C-arm trolley control panel displays only the UIH icon and the monitor turns on normally	The telecommunication cable for control panel is abnormal.	Please contact UIH customer service engineer.
After pressing the startup/ shutdown button, the control panels and the monitor do not turn on	The system power supply is abnormal.	Please confirm the indicator on the back of monitor turns on or not. If the indicator turns on, the internal power supply is abnormal or the startup/ shutdown button is damaged, please contact UIH customer service engineer; if the indicator does not turn on, the power supply is abnormal, please check the power socket.
After pressing the startup/ shutdown button, the control panels do not turn on but the monitor turns on normally	The power supply for control panel is abnormal.	Please contact UIH customer service engineer.
After pressing the startup/ shutdown button, the control panels turn on but the monitor does not turn on normally	The power supply or signal for monitor is abnormal	Please remove and re-plug the video input cable and power cable on the back of the monitor. If the problem is not solved, please contact UIH customer service engineer.
During system use, the monitor display get stuck and no operation is allowed	The system host failure	Please contact UIH customer service engineer, remove and re-plug the host memory and video card with guidance.

13.5 Damageable parts replacement

13.5.1 Damageable parts list

Table 13-13 Damageable parts list

S/N	Part name	Part model
1	Grid	JPI Grid-1000
2	Wire foot switch	MKF 2 1S/1S-MED GP26
3	Handle	/

13.5.2 Replacing the gird

The installation and removal of the grid see "Installation/Removal of the grid" on page 4-15.

13.5.3 Replacing the wire foot switch

1. Disconnect the wire foot switch from the system.
2. Connect the new wire foot switch to the system.

13.5.4 Replacing the handle

The replaceable handles include:

- C-arm orbital handle
- C-arm angulation handle
- Horizontal movement handle
- Swivel handle

The location and color mark for different handles see "C-arm positioning" on page 4-10.

1. Shutdown the system and disconnect the power.
2. Remove the bolts fastening the handle, and pull out the handle with a little strength.
3. Install the new handle, and tighten the bolts.
4. Paste the color mark to the handle.

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13.6 Disposal

NOTICE

- When dismantling the FPD, slide the C-arm to the position that the MBK is close to the C-arm trolley while the FPD is far form the C-arm trolley. If not, the C-arm will slide out to cause personnel injury or system damage.
- When dismantling the MBK, slide the C-arm to the position that the FPD is close to the C-arm trolley while the MBK is far form the C-arm trolley. If not, the C-arm will slide out to cause personnel injury or system damage.
- Two personnel are required for monitor dismantlement, one hold the monitor while the other one dismantle it.

Some components in the system contain hazardous materials that need proper disposal.

The following table provides the type, quantity, and location of hazardous materials in the system.

Table 13-14List of hazardous materials

Component	Hazardous material	Quantity
Monoblock	Lead	2.1 kg
	Oil	15.8 kg
Collimator	Lead	0.32 kg
FPD	Lead	1.367 kg
Grid	Lead	316 g
C arm trolley	LCD	1 pcs
Monitor cart	LCD	1 pcs
Host	Lithium battery	1 pcs
Monitor	LCD	1 pcs

14 Technical reference for system operation

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14.1 Overview

This chapter provides important safety information for the preparation of the system and the preparation process. Such information includes site requirements, system transportation security and so on.

The site requirements describe the necessary conditions for the operation of the system, including room layout, ground, power distribution, network, environment, lighting, radiation protection, transportation corridors and fire safety. Refer to "Site preparation" on page 14-4 for detailed requirements.

For system transportation conditions and safety precautions, please see "Transport and storage" on page 14-16.

14.2 Related responsibilities

14.2.1 UIH's responsibilities

- UIH is responsible for providing the site planning and building preparation materials required by this equipment to ensure the smooth installation and operation of the system.
- The Project Management Department of UIH is responsible for the acceptance and inspection of the site to confirm that it meets the system operation requirements.
- UIH is responsible for the transportation of the system and recycling of the packaging.
- UIH is responsible for the installation and commissioning to ensure the delivery of the system as required.

NOTICE
Transportation packaging sent to the site should be recycled if it is possible. If it is not recycled, it should be handled in accordance with the laws and regulations of the country or region where the equipment is installed.

14.2.2 Customer's responsibilities

- The customer is responsible for site preparation in accordance with the detailed site planning requirements provided by the Project Management Department of UIH. Site preparation must comply with local laws and regulations regarding safety, electrical, construction and radiation protection related to equipment installation, and must be performed by qualified designers and construction units.
- The customer is responsible for the quality of the equipment room and completes the site acceptance with UIH.
- The customer needs to support system commissioning after installation, and complete system status confirmation and acceptance.
- The customer is responsible for the use and daily quality control recording and archiving for inspection by relevant agencies.

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14.3 Site preparation

The user needs to provide the site conditions required for the system to function properly. The content listed in this section is for site planning and design reference only and cannot be used as a construction manual. Construction plans and drawings need to be issued by a qualified design company.

14.3.1 Operating environment requirements

In order to ensure the system can operate properly, the user needs to ensure that the corresponding operating environment requirements are met.

14.3.1.1 Temperature and humidity requirements

The temperature and humidity of the room must meet the following requirements see"Working environment" on page 15-2.

14.3.1.2 Dust-proof requirements

Ensure the storage environment of the system and the sanitation of the equipment room. Particles in the room entering the system may cause short circuits in the system board or battery pack.

14.3.1.3 Fire protection requirements

A fire inside or near the system may cause injury to the patient, operator, and property. Burning plastic can cause gas poisoning. In the event of a fire, immediately shut down the entire unit, i.e. disconnect the power supply.

14.3.1.4 Air conditioning requirements

Provide a suitable cooling device according to the system power to ensure an appropriate operating environment.

Considering the heating of the system, it is recommended to install vertical constant-temperature and -humidity air conditioning unit to maintain the site temperature and humidity.

At the same time, during the installation and operation of the system, it is necessary to monitor the temperature and humidity of the environment at all times. When maintenance is performed, it is necessary to pay attention to whether the environment meets the conditions for normal operation of the equipment. The indoor air conditioning unit needs to be equipped with a filter to reduce dust particles entering the room from the outside.

⚠ WARNING

Environmental parameters that exceed requirements may affect the normal operation of the system and image quality.

14.3.1.5 Vibration requirement

Vibration may affect the performance of the equipment. The site where the equipment is installed should be as far away as possible from the following sources of vibration: parking lots, roads, subways, trains, pumps, large motors, etc.

14.3.1.6 Noise requirement

There are two main sources of noise, one is the noise brought by the system during normal operation, which meets the standards of laws and regulations. And the other is the noise caused by the external environment. These noises are too large and can cause interference to patients and operators, which may affect the imaging effect. Therefore, it is necessary to control the surrounding noise and keep the environment as quiet as possible.

During the selection of the site, the surrounding noise of the site needs to be considered. After the site construction is completed, the noise level should be tested to ensure that it meets the requirements of national laws and local regulations.

14.3.1.7 Electromagnetic radiation requirements

Strong magnetic substances are not allowed near the system. Otherwise, the system may be interfered by the magnetic field and incorrect output signals are incurred. Using other cables and accessories in the system may result in the EMC failure.

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14.3.2 Component size and weight

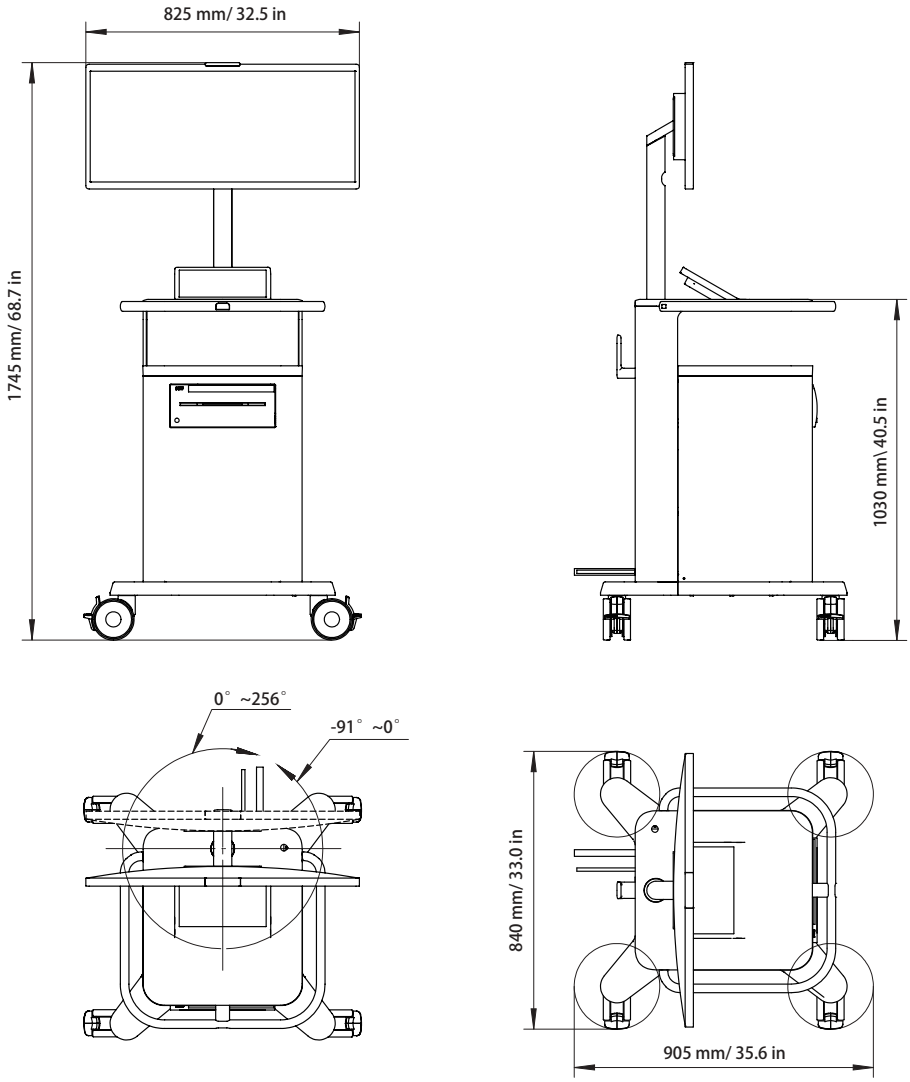


Figure 14-1 Three Views of Workstation Cart

Parameter	Value
Length	840 mm / 33.0 in
Width	905 mm / 35.6 in
Height	1,745 mm / 68.7 in
Weight	About 200 kg

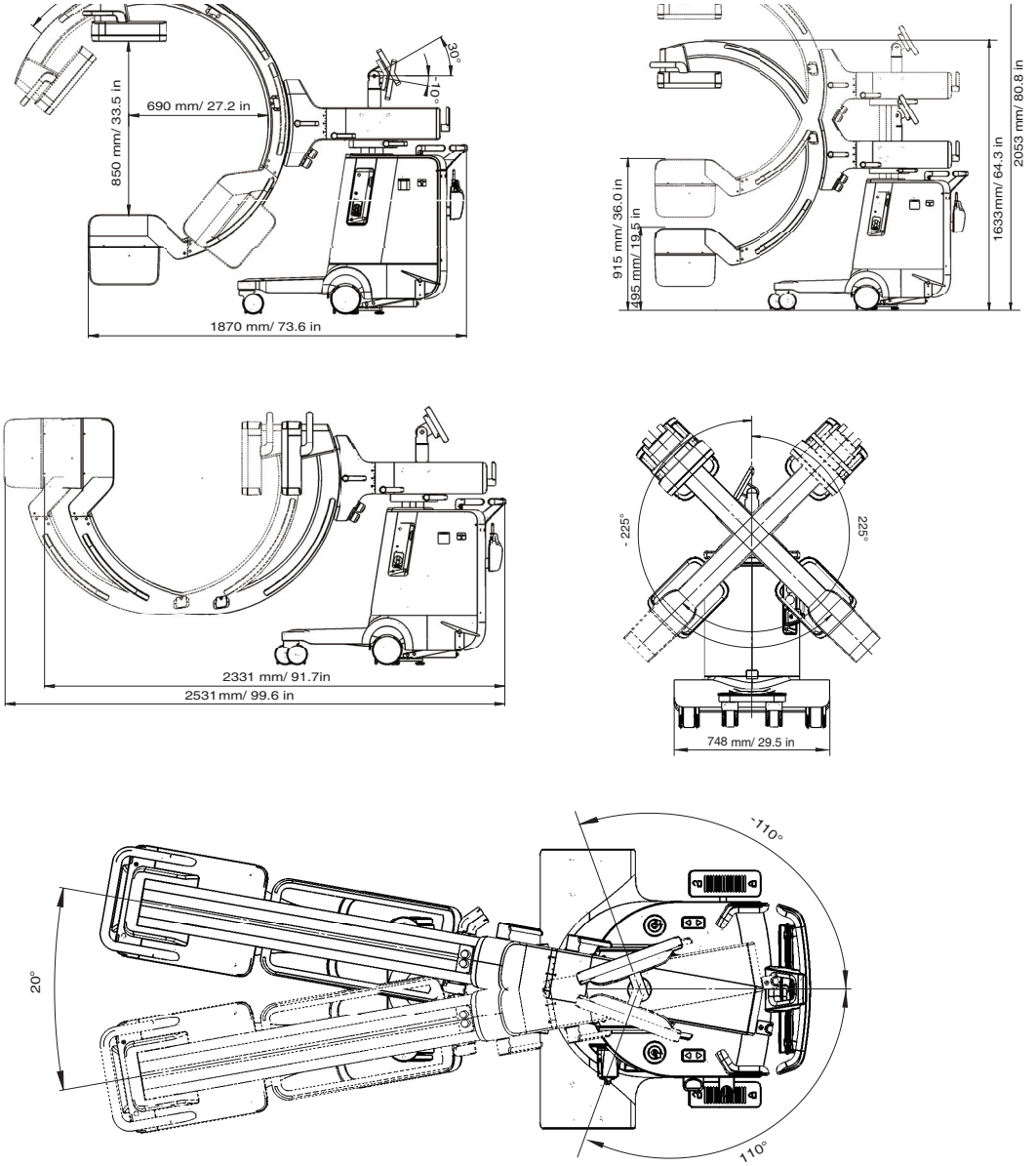


Figure 14-2 Three Views of C-arm trolley

Parameter	Value
Length	1,870 mm / 73.6 in
Width	748 mm / 29.5 in
Height	1,633 mm / 64.3 in
Weight	About 320 kg

14.3.3 Floor requirements

14.3.3.1 Floor level requirements

In order to ensure the installation of the equipment, the floor level of the operating room must be ensured and the floor surface is smooth. It is strongly recommended to maintain the level of the entire operating room floor.

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⚠ WARNING

A safe and reliable fixed examination couch is very important, and improper fixing method or environments may cause the couch to tilt.

14.3.4 Power requirements

14.3.4.1 Power supply requirements

The power supply conditions see "Power supply requirements" on page 15-2.

14.3.5 Network requirements

14.3.5.1 Communication purpose

- Connect to PACS for archiving images.
- Connect to RIS/HIS for obtaining patient examination information.
- Connect to a printer to print films.

NOTICE

To protect patient privacy and avoid the risks posed by PEMS, the system provides anonymous patient information when archiving images and printing films.

NOTICE

When an external network changes, the following may occur:

- When connecting to PACS, RIS/HIS, and printer, the system will prompt for a network connection failure.
- An error message appears on the system. The solution is to check if the network is changed.

14.3.5.2 Network configuration requirements

The external network needs to meet DICOM 3.0, which is also a technical requirement for security.

14.3.5.3 Standard protocol

- This equipment supports the TCP/IP network protocol.
- With the DICOM interface, it is 100M - 1000MB adaptive and can be connected with high speed Ethernet.
- This equipment must be connected by a RJ45 network cable.

- If the hospital plans to connect the equipment to the LAN in the hospital, the user must assign the PACS system, MPPS (if supported), Worklist/RIS configuration and printer host, control host and workstation IP, AE name, port, etc. The parameters need to be informed to UIH in advance to set the network parameters for the equipment.

14.3.5.4 Socket network port requirements

- The system can be connected to the external network through the control host.
- The user needs to provide an effective external network port and a suitable network cable. The standard network connection for the system is broadband.

14.3.6 Radiation protection requirements

Radiation is generated during system operation or testing. In order to protect the health of professionals and the public, appropriate radiation protection measures are needed.

⚠WARNING

Excessive radiation exposure will cause personal injury.

- Improper radiation protection can cause injury to operators or other personnel. Please install appropriate radiation protection.

⚠WARNING

All operators must receive radiation protection training.

⚠WARNING

Radiation protection is subject to the requirements of the local health and epidemic prevention authorities, mainly depending on the workload, the location of the equipment and the use of the surrounding houses.

Deterministic radiation effect

As per IEC 60601-1-3, 5.2.4.5 (A.2), deterministic radiation injury is possible if a radiation dose delivered to an organ or tissue exceeds a value of 1 to 3 grays.

With typical applications and proper use of the C-arm, there is no reason to expect such radiation injuries. It is assumed that the maximum fluoroscopic time will not exceed 20 minutes, depending on the application, and that the point of skin penetration will be 30 cm (50 cm maximum) away from the detector input.

Example: An accumulated fluoroscopic time of 20 minutes and a skin penetration dose of 20 mGy/min yields a dose of 400 mGy.

In the medical disciplines of vascular and cardiac surgery in particular, several applications require a significantly higher radiation time of up to 60 minutes.

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Example: When treating an abdominal aortic aneurysm (AAA) with the Endovascular Aortic Repair (EVAR) procedure, the administered radiation dose can exceed 1 Gy. The average radiation dose when using this method is usually less than 500 mGy.

For procedures with a longer than expected radiation time, we recommend varying the beam direction (oblique beam through orbital and/or angular rotation) during the course of the procedure. In addition, the system reports the beam duration that has already been applied (regardless of applied dose).

The skin penetration dose for various operating modes and under standard operating conditions can be estimated. For detailed, see "Patient entrance reference dose" on page 15-7

When changing the distance from the skin penetration point to the focus, please note that the skin dose decreases with the inverse square of the distance to the focus. This means that when the distance to the focus is halved, the skin penetration dose rate quadruples.

⚠ CAUTION

Remaining in hazardous area.Danger of inadvertent radiation.

- During radiation release, make sure you are in a location subject to as little radiation as possible.

14.3.7 Electromagnetic compatibility

Electromagnetic Compatibility (EMC) refers to the ability of a device or system to function properly as required in its electromagnetic environment, without generating electromagnetic interference intolerable to any device in its environment. Therefore, EMC includes two aspects: on one hand, the electromagnetic interference generated by the device in the environment during normal operation cannot exceed a certain limit; on the other hand, the device is immune to electromagnetic interference existing in the environment to a certain extent, known as Electromagnetic Susceptibility (EMS).

This equipment complies with requirements of the EMC certification of the U.S. Food and Drug Administration (FDA).

Special measures should be taken for medical electrical equipment to ensure electromagnetic compatibility. Portable and mobile RF communication equipment, such as mobile phones, may affect the normal operation of the medical electrical equipment in some cases. It may lead to death, serious injuries, or clinical misdiagnosis. Therefore, it is recommended not to take RF communication equipment (even it is powered off) to the operating room.

When the equipment is operated under normal working conditions, the functions of the equipment (including motion, exposure, charging mode, etc.) comply with electromagnetic compatibility (EMC) regulations.

Portable or mobile RF communication equipment such as cell phones and pagers, nearby radios, televisions, microwave transmission equipment or other radiological equipment may cause interfere with the functionality of the equipment, cause image degradation, or other performance impediments. These devices are recommended to kept away from this equipment.

⚠ WARNING

Use of accessories, transducers, or cables other than those specified with this equipment may result in increased emissions or reduced immunity of the equipment.

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Table 14-1 Cables information for EMC reference

Cable	Max. cable length, Shielded/unshielded		Number	Cable classification
Network Power Cable	650 CM	Unshielded	1 Set	Power
AC Supply Cable	650 CM	Unshielded	1 Set	Power
Signal Feedback Cable	650 CM	Shielded	1 Set	Control
Ethernet Cable	650 CM	Shielded	1 Set	Signal
Hand Brake Cable	300 CM	Unshielded	1 Set	Control
Foot Brake Cable	610 CM	Shielded	1 Set	Control

Important information regarding Electro Magnetic Compatibility (EMC)

MOBILE C-ARM X-ray SYSTEM needs special precautions regarding EMC and put into service according to the EMC information provided in the user manual; MOBILE C-ARM X-ray SYSTEM conforms to this IEC 60601-1-2:2014 standard for both immunity and emissions. Nevertheless, special precautions need to be observed:

- MOBILE C-ARM X-ray SYSTEM is intended used in Professional healthcare facility environment.

⚠ WARNING

Portable RF communications equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30 cm (12 inches) to any part of the MOBILE C-ARM X-ray SYSTEM, including cables specified by the manufacturer. Otherwise, degradation of the performance of this equipment could result.

- The use of accessories, and cables other than those specified by UNITED IMAGING, with the exception of accessories and cables sold by UNITED IMAGING of MOBILE C-ARM X-ray SYSTEM as replacement parts for internal components, may result in increased EMISSIONS or decreased IMMUNITY of the MOBILE C-ARM X-ray SYSTEM.

⚠ WARNING

Use of this equipment MOBILE C-ARM X-ray SYSTEM adjacent to or stacked with other equipment should be avoided because it could result in improper operation.

- When the AC input voltage is interrupted, the MOBILE C-ARM X-ray SYSTEM will shut down (except computer part that supported by UPS) and if the power supply restored, it should be recovered by operator manually, this degradation could be accepted because it will not lead to unacceptable risks and it will not result in the loss of basic safety or essential performance.

EMI compliance table

Table 14-2 Emission

Phenomenon	Compliance	Electromagnetic environment
RF emissions	CISPR 11 Group 1, Class A	Professional healthcare facility environment

NOTICE
The EMISSIONS characteristics of this equipment make it suitable for use in industrial areas and hospitals (CISPR 11 class A). If it is used in a residential environment (for which CISPR 11 class B is normally required) this equipment might not offer adequate protection to radio-frequency communication services. The user might need to take mitigation measures, such as relocating or re-orienting the equipment.

EMS compliance table

Table 14-3 Enclosure Port

Phenomenon	Basic EMC standard	Immunity test levels Professional healthcare facility environment
Electrostatic Discharge	IEC 61000-4-2	±8 kV contact ±2 kV, ±4kV, ±8 kV, ±15 kV air
Radiated RF EM field	IEC 61000-4-3	3 V/m 80 MHz-2.7 GHz 80% AM at 1 kHz
Proximity fields from RF wireless communications equipment	IEC 61000-4-3	Refer to Table 14-4
Rated power frequency magnetic fields	IEC 61000-4-8	30 A/m 50 Hz or 60 Hz

Table 14-4 Proximity fields from RF wireless communications equipment

Test frequency (MHz)	Band (MHz)	Immunity test levels Professional healthcare facility environment
385	380-390	Pulse modulation 18 Hz, 27 V/m
450	430-470	FM, ±5 kHz deviation, 1 kHz sine, 28 V/m
710	704-787	Pulse modulation 217 Hz, 9 V/m
745		
780		

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Test frequency (MHz)	Band (MHz)	Immunity test levels Professional healthcare facility environment
810	800-960	Pulse modulation 18 Hz, 28 V/m
870		
930		
1720	1700-1990	Pulse modulation 217 Hz, 28 V/m
1845		
1970		
2450	2400-2570	Pulse modulation 217 Hz, 28 V/m
5240	5100-5800	Pulse modulation 217 Hz, 9 V/m
5500		
5785		

Table 14-5 Input a.c. power port

Phenomenon	Basic EMC standard	Immunity test levels Professional healthcare facility environment
Electrical fast transients/burst	IEC 61000-4-4	±2 kV 100kHz repetition frequency
Surges Line-to-line	IEC 61000-4-5	±0.5 kV, ±1 kV
Surges Line-to-ground	IEC 61000-4-5	±0.5 kV, ±1 kV, ±2 kV
Conducted disturbances induced by RF fields	IEC 61000-4-6	3V, 0.15 MHz-80 MHz 6V in ISM bands between 0.15 MHz and 80 MHz 80% AM at 1 kHz
Voltage dips	IEC 61000-4-11	0% UT; 0.5 cycle At 0° , 45° , 90° , 135°, 180° , 225° , 270° and 315°
		0% UT; 1 cycle and 70% UT; 25/30 cycles Single phase: at 0°
Voltage interruptions	IEC 61000-4-11	0% UT; 250/300 cycles

Table 14-6 Signal input/output parts port

Phenomenon	Basic EMC standard	Immunity test levels Professional healthcare facility environment
Electrical fast transients/burst	IEC 61000-4-4	±1 kV 100 kHz repetition frequency
Conducted disturbances induced by RF fields	IEC 61000-4-6	3V, 0.15 MHz-80 MHz 6V in ISM bands between 0.15MHz and 80 MHz 80% AM at 1 kHz

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14.4 Transport and storage

14.4.1 Transport and storage environment

The transportation and storage environmental conditions see "Storage and transportation environment" on page 15-2.

NOTICE

- If the system needs to be stored before installation, it must be stored in a temperature and humidity controlled warehouse to avoid damage to the system caused by weather changes or ambient dust.
- Make sure there are no corrosive substances such as acid and alkali around.

14.4.2 Transport route

If an elevator needs to be used during transport, it is important to consider its size and load capacity. It is best to use a freight elevator for transportation.

14.4.3 Transport safety

During the packing, transportation and unloading process, the safety and warning signs on the package should be noted. Avoid hitting and tilting the box, which can cause damage to the system. When handling and installing certain parts of the system, the parts may be too heavy, which may cause personal injury. Such parts need to be transported using special tools.

⚠WARNING

During the handling process, if there is any debris in the transportation route, the person may trip over and the equipment may fall and get damaged. Before transportation, it is necessary to clean up the debris along the route.

When transporting the system, the following safety aspects need to be considered to ensure safety during this process.

- Please check the unloading site in advance and clean up all waste and obstacles in the site before uninstalling the equipment.
- When using a transport tool such as a lift, follow the tool operating instructions.
- Choose the safest and most direct route.
- Hire professional personnel to transport the equipment.
- When transporting the equipment on a cart, avoid the wheels. When the wheel is moving, do not put your hand under the equipment.
- To prevent damage to the equipment, always lift and lower the system components gently.

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15.1 Working conditions

15.1.1 Working environment

Parameter	value
Temperature	+ 10°C - + 40°C
Relative humidity	20% - 80% (non-condensation)
Barometric pressure	700 hPa - 1060 hPa

15.1.2 Storage and transportation environment

Parameter	Storage condition	Transportation condition
Temperature range	-10°C - +55°C	-10°C - +55°C
Relative humidity	10% - 90% (non-condensing)	10% - 90% (non-condensing)
Barometric pressure	700 hPa - 1060 hPa	700 hPa - 1060 hPa

15.1.3 Power supply requirements

- Input Voltage: single-phase, 100 / 110 / 120 / 127 / 200 / 230 / 240 VAC ±10%
- Power frequency: 50 Hz / 60 Hz ±1 Hz
- Max. impedance:
  - 230 V AC, 0.6 Ω
  - 110 V AC, 0.3 Ω
- Max. Power: 3.5 kVA

15.2 Electric power

15.2.1 Maximum output power

Maximum output power	Conditions
3.5 kW	◆ X-ray tube voltage: 100 kV ◆ X-ray tube current: 35 mA ◆ Loading time: 20 ms

15.2.2 Nominal output power

Nominal output power	Conditions
2.1 kW	◆ X-ray tube voltage: 100 kV ◆ X-ray tube current: 21 mA ◆ Loading time: 0.1s

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15.3 Loading factor control and display

Table 15-1 Loading factor

Acquisition mode	kV	mA	Pulse width	FPD entrance dose
Low dose	66	2.3	20 ms	9 nGy/f
Standard dose	64	4.1	20 ms	16 nGy/f
High quality	62	7.3	20 ms	23 nGy/f
DR	61	5.9	400 ms	700 nGy/f

- The attenuation body is a 25 mm aluminum film
- Flat panel detector dose error range: ±20%

15.3.1 X-ray tube voltage

- Adjustment range of the X-ray tube voltage in single-frame radiography mode and pulsed fluoroscopy mode: 40 kV to 110 kV
- Adjustment mode: automatic adjustment or manual adjustment (adjustment step: 1 kV)
- The deviation of the X-ray tube voltage is not greater than ± 5%.

PULSE	Low dose	When the X-ray tube current reaches 17.5 mA, the obtainable highest X-ray tube voltage is 110 kV.
	Normal dose	When the X-ray tube current reaches 17.5 mA, the obtainable highest X-ray tube voltage is 110 kV.
	High quality	When the X-ray tube current reaches 17.5 mA, the obtainable highest X-ray tube voltage is 110 kV.
SPOT	Low dose	When the X-ray tube current reaches 17.5 mA, the obtainable highest X-ray tube voltage is 110 kV.
	Normal dose	When the X-ray tube current reaches 17.5 mA, the obtainable highest X-ray tube voltage is 110 kV.
	High quality	When the X-ray tube current reaches 17.5 mA, the obtainable highest X-ray tube voltage is 110 kV.
DR		When the X-ray tube current reaches 14.5 mA, the obtainable highest X-ray tube voltage is 110 kV.

15.3.2 X-ray tube current

- Adjustment range of the X-ray tube current in pulsed fluoroscopy mode: 0.1 mA to 30 mA
- Adjustment mode: automatic adjustment or adjustment along with the tube voltage
- The deviation of the X-ray tube current is not greater than ±5%.

PULSE	Low dose	2 mA-17.5 mA; when the X-ray tube voltage reaches its highest value of 110 kV, the obtainable highest X-ray tube current is 17.5 mA.
	Normal dose	2 mA-22 mA; when the X-ray tube voltage reaches 88 kV, the obtainable highest X-ray tube current is 22 mA.
	High quality	2 mA-25 mA; when the X-ray tube voltage reaches 65 kV to 74 kV, the obtainable highest X-ray tube current is 25 mA.
SPOT	Low dose	2 mA-17.5 mA; when the X-ray tube voltage reaches its highest value of 110 kV, the obtainable highest X-ray tube current is 17.5 mA.
	Normal dose	2 mA-22 mA; when the X-ray tube voltage reaches 88 kV, the obtainable highest X-ray tube current is 22 mA.
	High quality	2 mA-25 mA; when the X-ray tube voltage reaches 65 kV to 74 kV, the obtainable highest X-ray tube current is 25 mA.
DR		2 mA-22 mA; when the X-ray tube voltage reaches 65 kV to 74 kV, the obtainable highest X-ray tube current is 22 mA.

15.3.3 Current-time product

- Adjustment range of the current-time product in single-frame radiography mode: 0.01 mAs to 30 mAs
- Adjustment mode: automatic adjustment or adjustment along with the tube voltage
- The deviation of the current-time product is not greater than ±(10% + 0.2 mAs).

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15.4 Dosimetric information

15.4.1 Patient entrance reference point

The system determines the patient entrance reference point as a point along the central X-ray beam axis between the focal spot and the center of the FPD entrance, which is 30 cm above the FPD surface. See Figure 15-1 for patient reference point.

Reference axis

The reference axis is from the center of the focal spot to the center of FPD, which is vertical to the FPD surface.

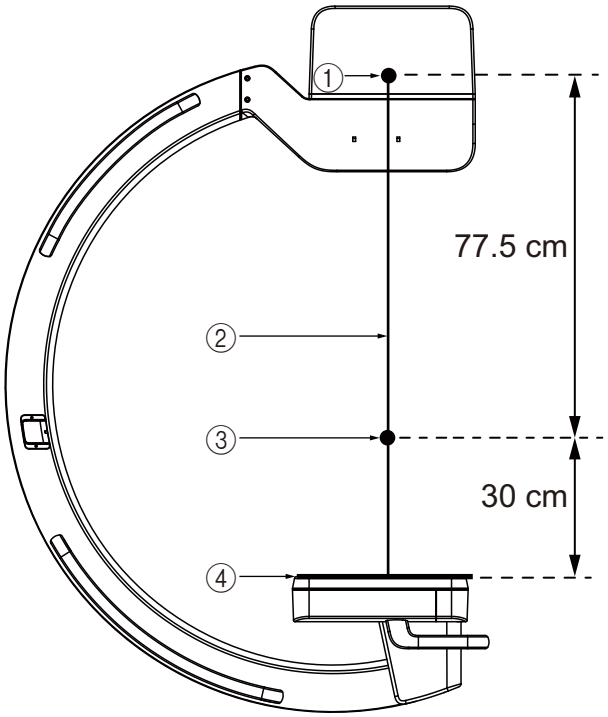
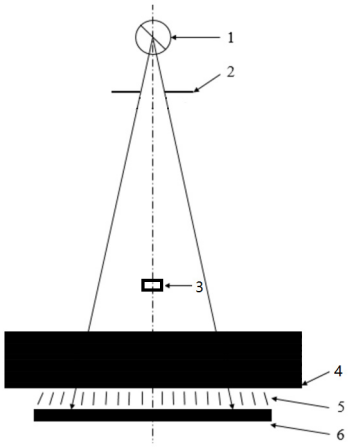


Figure 15-1 Reference axis

1. Focal spot
2. Reference axis
3. Patient entrance reference point
4. FPD

15.4.2 Patient entrance reference does test geometry



1. X-ray tube
2. Collimator
3. Dosimeter
4. 20 cm PMMA
5. Grid
6. FPD

15.4.3 Patient entrance reference dose

The following table provides the reference air kerma under different configurations such as the imaging mode, loading factors and the Mag level.

- Test condition: the dosimeter is located 30 cm above the FPD, place a 20 cm PMMA between the dosimeter and the FPD.
- Regarding the reference axis, see"Patient entrance reference point" on page 15-6.
- Deviation: Accoring to IEC 60601-2-43.203.5.2.4.5.101 c), the measured values shall not deviate from stated values by more than 50%.

Table 15-2 Patient entrance reference dose with grid

Imaging mode			**with Grid**			
			Auto mode (20 cm PMMA)			**Max**
Mag			**Level 0**	**Level 1**	**Level 2**	
PULSE (0.5 f/s)	Low dose	kV/mA	83/3.7	84/3.8	85/3.8	110/10.7
		AKR (mGy/min)	0.11	0.12	0.12	0.59
	Normal dose	kV/mA	81/7.8	81/8	82/8.2	110/10.7
		AKR (mGy/min)	0.21	0.22	0.23	0.59
	High quality	kV/mA	75/15	75/15	76/15	110/10.7
		AKR (mGy/min)	0.32	0.33	0.34	0.59

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Imaging mode			with Grid			
			Auto mode (20 cm PMMA)			Max
Mag			Level 0	Level 1	Level 2	
PULSE (1 f/s)	Low dose	kV/mA	83/3.7	84/3.8	85/3.8	110/10.7
		AKR (mGy/min)	0.22	0.24	0.24	1.17
	Normal dose	kV/mA	81/7.8	81/8	82/8.2	110/10.7
		AKR (mGy/min)	0.42	0.44	0.46	1.17
	High quality	kV/mA	75/15	75/15	76/15	110/10.7
		AKR (mGy/min)	0.64	0.66	0.68	1.17
PULSE (2 f/s)	Low dose	kV/mA	83/3.7	84/3.8	85/3.8	110/10.7
		AKR (mGy/min)	0.44	0.48	0.48	2.33
	Normal dose	kV/mA	81/7.8	81/8	82/8.2	110/10.7
		AKR (mGy/min)	0.84	0.88	0.92	2.33
	High quality	kV/mA	75/15	75/15	76/15	110/10.7
		AKR (mGy/min)	1.28	1.32	1.36	2.33
PULSE (3 f/s)	Low dose	kV/mA	83/3.7	84/3.8	85/3.8	110/10.7
		AKR (mGy/min)	0.66	0.72	0.72	3.50
	Normal dose	kV/mA	81/7.8	81/8	82/8.2	110/10.7
		AKR (mGy/min)	1.26	1.32	1.38	3.50
	High quality	kV/mA	75/15	75/15	76/15	110/10.7
		AKR (mGy/min)	1.92	1.98	2.04	3.50
PULSE (6 f/s)	Low dose	kV/mA	83/3.7	84/3.8	85/3.8	110/10.7
		AKR (mGy/min)	1.32	1.44	1.44	6.99
	Normal dose	kV/mA	81/7.8	81/8	82/8.2	110/10.7
		AKR (mGy/min)	2.52	2.64	2.76	6.99
	High quality	kV/mA	75/15	75/15	76/15	110/10.7
		AKR (mGy/min)	3.84	3.96	4.08	6.99
PULSE (12.5 f/s)	Low dose	kV/mA	83/3.7	84/3.8	85/3.8	110/10.7
		AKR (mGy/min)	2.70	2.81	2.95	15.30
	Normal dose	kV/mA	81/7.8	81/8	82/8.2	110/10.7
		AKR (mGy/min)	5.09	5.34	5.63	15.30
	High quality	kV/mA	75/15	75/15	76/15	110/10.7
		AKR (mGy/min)	7.86	8.16	8.40	15.30

Imaging mode			with Grid			
			Auto mode (20 cm PMMA)			Max
Mag			Level 0	Level 1	Level 2	
PULSE (25 f/s)	Low dose	kV/mA	83/3.7	84/3.8	85/3.8	110/10.7
		AKR (mGy/min)	5.37	5.58	5.91	29.10
	Normal dose	kV/mA	81/7.8	81/8	82/8.2	110/10.7
		AKR (mGy/min)	10.14	10.56	11.28	29.10
	High quality	kV/mA	75/15	75/15	76/15	110/10.7
		AKR (mGy/min)	15.78	16.14	16.80	29.10
SPOT	Low dose	kV/mA	83/3.7	84/3.8	85/3.8	110/10.7
		AKR (mGy)	5.37	5.58	5.91	29.10
	Normal dose	kV/mA	81/7.8	81/8	82/8.2	110/10.7
		AKR (mGy)	10.14	10.56	11.28	29.10
	High quality	kV/mA	75/15	75/15	76/15	110/10.7
		AKR (mGy)	15.78	16.14	16.80	29.10
DR	kV/mAs		70/22	70/21.92	70/21.62	110/14.5
	AKR (mGy)		0.79	0.76	0.78	1.39

Table 15-3 Patient reference dose without grid

Imaging mode			without Grid			
			Auto mode (20 cm PMMA)			Max
Mag			Level 0	Level 1	Level 2	
PULSE (0.5 f/s)	Low dose	kV/mA	66/3.1	68/3.2	70/3.2	110/10.7
		AKR (mGy/min)	0.05	0.06	0.06	0.59
	Normal dose	kV/mA	68/4.6	70/4.8	71/5.2	110/10.7
		AKR (mGy/min)	0.08	0.09	0.10	0.59
	High quality	kV/mA	63/9.3	63/10.6	64/12.4	110/10.7
		AKR (mGy/min)	0.13	0.15	0.17	0.59
PULSE (1 f/s)	Low dose	kV/mA	66/3.1	68/3.2	70/3.2	110/10.7
		AKR (mGy/min)	0.10	0.11	0.13	1.17
	Normal dose	kV/mA	68/4.6	70/4.8	71/5.2	110/10.7
		AKR (mGy/min)	0.16	0.18	0.20	1.17
	High quality	kV/mA	63/9.3	63/10.6	64/12.4	110/10.7
		AKR (mGy/min)	0.26	0.30	0.35	1.17

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Imaging mode			without Grid			
			Auto mode (20 cm PMMA)			Max
Mag			Level 0	Level 1	Level 2	
PULSE (2 f/s)	Low dose	kV/mA	66/3.1	68/3.2	70/3.2	110/10.7
		AKR (mGy/min)	0.20	0.22	0.26	2.33
	Normal dose	kV/mA	68/4.6	70/4.8	71/5.2	110/10.7
		AKR (mGy/min)	0.32	0.36	0.40	2.33
	High quality	kV/mA	63/9.3	63/10.6	64/12.4	110/10.7
		AKR (mGy/min)	0.52	0.60	0.70	2.33
PULSE (3 f/s)	Low dose	kV/mA	66/3.1	68/3.2	70/3.2	110/10.7
		AKR (mGy/min)	0.30	0.33	0.39	3.50
	Normal dose	kV/mA	68/4.6	70/4.8	71/5.2	110/10.7
		AKR (mGy/min)	0.48	0.54	0.60	3.50
	High quality	kV/mA	63/9.3	63/10.6	64/12.4	110/10.7
		AKR (mGy/min)	0.78	0.90	1.05	3.50
PULSE (6 f/s)	Low dose	kV/mA	66/3.1	68/3.2	70/3.2	110/10.7
		AKR (mGy/min)	0.60	0.66	0.78	6.99
	Normal dose	kV/mA	68/4.6	70/4.8	71/5.2	110/10.7
		AKR (mGy/min)	1.44	1.62	1.80	6.99
	High quality	kV/mA	63/9.3	63/10.6	64/12.4	110/10.7
		AKR (mGy/min)	2.34	2.70	3.15	6.99
PULSE (12.5 f/s)	Low dose	kV/mA	66/3.1	68/3.2	70/3.2	110/10.7
		AKR (mGy/min)	1.27	1.41	1.55	15.30
	Normal dose	kV/mA	68/4.6	70/4.8	71/5.2	110/10.7
		AKR (mGy/min)	2.00	2.23	2.56	15.30
	High quality	kV/mA	63/9.3	63/10.6	64/12.4	110/10.7
		AKR (mGy/min)	3.13	3.65	4.35	15.30
PULSE (25 f/s)	Low dose	kV/mA	66/3.1	68/3.2	70/3.2	110/10.7
		AKR (mGy/min)	2.53	2.72	3.08	29.10
	Normal dose	kV/mA	68/4.6	70/4.8	71/5.2	110/10.7
		AKR (mGy/min)	4.01	4.40	5.10	29.10
	High quality	kV/mA	63/9.3	63/10.6	64/12.4	110/10.7
		AKR (mGy/min)	6.30	7.26	8.70	29.10

Imaging mode			without Grid			
			Auto mode (20 cm PMMA)			Max
Mag			Level 0	Level 1	Level 2	
SPOT	Low dose	kV/mA	66/3.1	68/3.2	70/3.2	110/10.7
		AKR (mGy)	2.53	2.72	3.08	29.10
	Normal dose	kV/mA	68/4.6	70/4.8	71/5.2	110/10.7
		AKR (mGy)	4.01	4.40	5.10	29.10
	High quality	kV/mA	63/9.3	63/10.6	64/12.4	110/10.7
		AKR (mGy)	6.30	7.26	8.70	29.10
DR	kV/mAs		53/3.2	53/3.3	54/3.3	110/14.5
	AKR (mGy)		0.037	0.038	0.040	1.39

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15.5 Component specifications

15.5.1 High voltage generator

Parameter	Description
Tube voltage range	40 kV to 110 kV
Tube current range	◆ Digital radiography mode: 1 mA to 35 mA ◆ Spot fluoroscopy mode: 0.1 mA to 30 mA ◆ Pulsed fluoroscopy mode: 0.1 mA to 30 mA
Pulse frame frequency	0.5 f/s, 1 f/s, 2 f/s, 3 f/s, 6 f/s, 12.5 f/s, 25 f/s
Range of the current-time product in single-frame radiography mode	0.01 mAs to 30 mAs
Input power voltage	Single-phase AC, 230 V AC±10%, 110 V AC±10%
Input power frequency	50 Hz/60 Hz ± 1 Hz
Inverse frequency	40 kHz to 100 kHz
Single-frame radiography time	4 ms to 10s
Pulsed fluoroscopy time	20 min @ 600 W

15.5.2 Monoblock

Parameter	Description
Model	Model of the X-ray tube assembly: ORX-2.0 MG (U-A/T) Model of the X-ray tube: D-068SBR
Tube Type	Stationary Anode
Anode heat capacity	81 kHU
Maximum anode heat dissipation	48.7 kHU/min
Tube housing heat capacity	1081 kHU
Tube housing heat dissipation	8.1 kHU/min
Nominal tube voltage	110 kV
Nominal power	2.1 kW
Tube Focus	0.6 mm
Target angle	9°
Target material	Tungsten
Inherent filtration	2.7 mmAl @ 75 kV/8 mA
Maximum fluoroscopy duration	20 min @ 600 W
Test conditions for radiation leakage	110 kV/5 mA
Fuel tank heat capacity	≥ 800 kJ

Parameter	Description
Maximum continuous heat dissipation of the fuel tank	≥ 100 W
Single load rating	2100 W
Multiple load rating	600 W
Reference axis	From the focus center to the center of the image receiving surface
Loading factor value relevant to radiation leakage	Not greater than 600 W
Category	I

15.5.2.1 X-ray tube

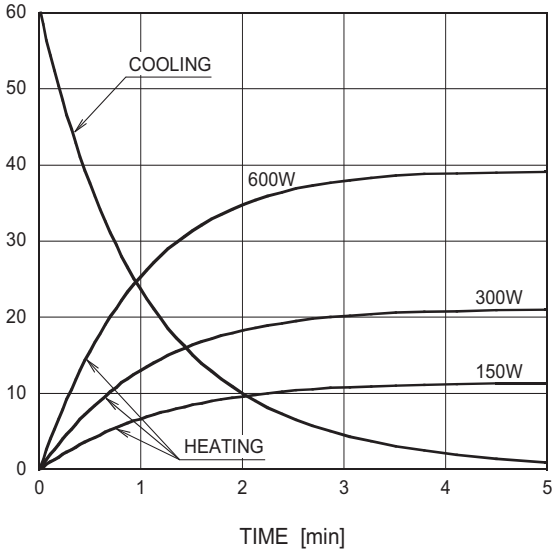


Figure 15-2 Anode heating/cooling curves of the X-ray tube

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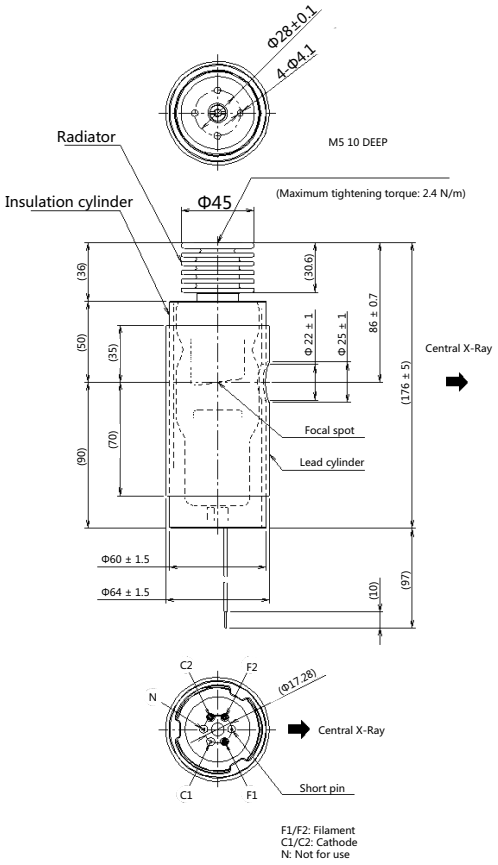


Figure 15-3 Dimensions of the X-ray tube assembly (unit: mm)

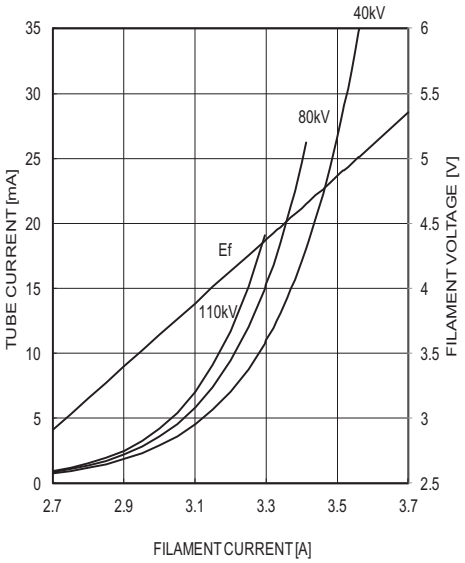
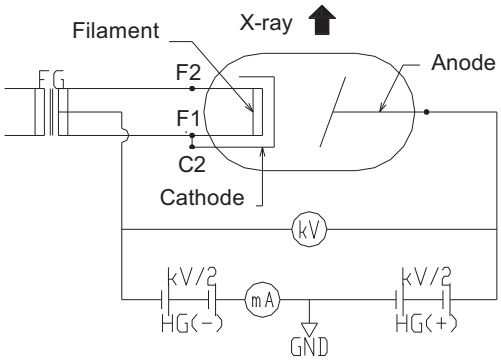


Figure 15-4 Cathode emission feature of the X-ray tube

Circuit



HG: High voltage source (DC)

FG: Filament source

kV: Measurement part of tube voltage

mA: Measurement part of tube current

Figure 15-5 Connection of the high voltage generator

15.5.2.2 Focus features

- SID = 1075 mm
- Maximum symmetrical radiation field: 264 mm × 264 mm

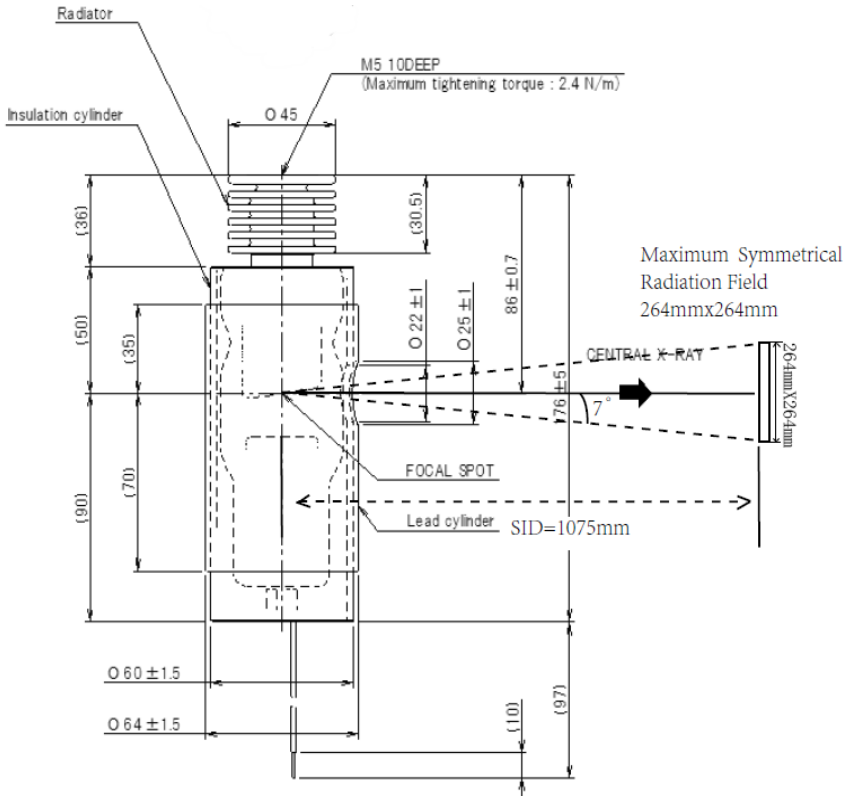


Figure 15-6 Schematic diagram of focus features

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15.5.3 Collimator

Parameter	Description
Control mode	Electrically powered
Rectangular lead shutter motion	Synchronous zoom
Bar lead shutter motion	Separate translation, synchronous rotation, 360° unlimited rotation
SID	1075 mm/42.3 in
Maximum X-ray radiation field (rectangular collimator)	230 mm × 230 mm
Maximum X-ray radiation field (bar collimator)	230 mm



Complies with FDA performance standards for laser products except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007

Figure 15-7 Laser label

15.5.4 Grid

Parameter	Description
Type	Focused Type
Focal length	110 cm
Grid density	70 L/cm
Grid ratio	10:1
Dimension	352.5 mm × 282.5 mm
Removable Grid	Yes

15.5.5 FPD

Parameter			Xineos-2222HS		
		Unit	Min.	Typical	Max.
Technology					
	Scintillator		\	CsI	\
	Pixel materials		\	monocrystal silicon	\
	Detector Size		\	Mag0: 215 mm × 215 mm Mag1: 160 mm × 160 mm Mag2: 107 mm × 107 mm	\
Image format					
	Spatial Resolution	lp/mm	\	3.3 lp/mm	\
	Pixel width × height	µm	\	151.8 µm × 151.8 µm	\
	Fill factor		\	83%	\
	Total number of pixels	pixel (H × V)	\	1416 × 1420	\
	Pixel array area	mm (H × V)	\	215 × 216	\
	X-ray imaging resolution[1)]	pixel (H × V)	\	1416 × 1396	\
	X-ray imaging area[1)]	mm (H × V)	\	215 × 212	\
	Used binning		\	1 × 1	\
	1). Typical area is defined as area with 80% to 100% of nominal X-ray sensitivity.				

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Parameter			Xineos-2222HS		
Dose characteristics					
	Voltage range	keV	40	\	125
	Saturation Dose (Low Full Well Mode)	µGy	1.6	2.2	2.6
	Dynamic Range (Low Full Well Mode)	dB	69	70	\
Image quality performance					
	Random Noise (in dark) (Low Full Well Mode)	LSB	\	20	24
	DQE @ 0lp/mm	%	64	75	\
	DQE @ 1.0lp/mm	%	46	57	\
	DQE @ 2.0lp/mm	%	30	41	\
	MTF @ 1.0lp/mm	%	50	60	\
	MTF @ 2.0lp/mm	%	20	27	\
Functionality					
	Maximum data output value		\	65535 (16 bits)	\
	Max frame rate for full field of view	fps/binning/x-ray window	\	27/1 × 1/16 ms	\

15.5.6 PDU

Parameter	Description
Input voltage	Single-phase AC, 230 V AC ± 10%, 110 V AC ± 10%
Frequency requirements	50 Hz/60 Hz ± 1 Hz
Maximum output power	3 kW

15.5.7 Monitor

Table 15-4 Monitor specifications

Parameter	Value
size	34 inches
Pixel matrix	3440 × 1440
Max.brightness	550 cd/m²
Calibration luminance	400 cd/m²
Contrast Ratio	700:1
H/V Viewing Angle	178°/178°

15.5.8 Control panel

Table 15-5 Control panel specification

Parameter	Description
Size	12 inches
Touch Type	Resistance screen
Pixel matrix	1280 × 800
Luminance	250 cd/m²
Contrast	800:1
Field of view	170°/170°

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15.5.9 Optional devices

15.5.9.1 DAP meter technical properties

Item	Value
Reproducibility (At constant air pressure and humidity)	< 1%
Radiation quality	40 kVp - 150 kVp
Energy dependence (40 – 150 kV)	± 8%
Quality equivalent filtration	< 0.3 mm Al
Beam hardening	< 0.15 mm Al
Air Kerma rate range (at the position of the Chamber)	12 µGy/s -2 Gy/s
DAP measurement range	0.1 μGym^2 – 99999999.99 μGym^2
DAP resolution	0.01 μGym^2
DAP linearity	< 10 μGym^2 5%; ≥ 10 μGym^2 2%
DAP rate measurement range	0.1 $\mu Gym^2/s$ – 2500 $\mu Gym^2/s$
DAP rate resolution	0.01 $\mu Gym^2/s$
DAP rate linearity	< 1 $\mu Gym^2/s$ 5%; ≥ 1 $\mu Gym^2/s$ 2%
Power supply	+ 15 – + 24 VDC ± 10%, < 100 mA
Power consumption	< 3 W
Start-up time	10 sec
Chamber voltage	410 V ± 5%
Active area	90 mm × 90 mm
Field size	35 mm^2 – 8000 mm^2
Electrode spacing	7 mm
Communication interface	CANopen, 500 kBit/s, Node ID: 59h

15.5.9.2 Wireless foot switch

Table 15-6 Wireless specifications

Item	Value
Distance	10 m -30 m (with internal antenna, depends on spatial conditions and the surrounding)
Output rating	3 dBm (max. 7 dBm optional)
Input sensitivity	-93 dBm
Antenna	Internal antenna with U.FL-plug

Item	Value
Frequency range	2402 to 2480 MHz
Chanel spacing	2 MHz
Modulation	GFSK, adaptive frequency hopping of 40 channels

15.5.9.3 Printer

Table 15-7 Large printer performance parameters

Item	Value
Thermal Print	Sony UP-971AD
Resolution	325 dpi
Gray scale	8 bits
Image resolution	7680 × 2560
Imaging area	600 mm × 200 mm (max)
Paper size	210 mm (width)

Table 15-8 Small printer performance parameters

Item	Value
Thermal Print	Sony UP-D898MD
Resolution	325 dpi
Gray scale	8 bits
Image resolution	4096 × 1280
Imaging area	320 mm × 100 mm (max)
Paper size	110 mm (width)

15.5.9.4 Removable optical drive

Table 15-9 Specification of removable optical drive

Item	Description
Interface	USB 2.0
Reading speed	DVD ± R / DVD ± RW / DVD-ROM / DVD ± R(DL) / DVD-ROM(DL): 8 X
Burning speed	DVD ± R / DVD + RW: 8 X DVD - RW / DVD ± R(DL): 6 X

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15.6 Configuration performance

15.6.1 Host

Table 15-10Host

Parameter	Description
Memory	16 GB
Hard disk Capacity	◆ SSD 240 GB ◆ SSD 960 GB
Image Storage Capacity	960 GB
Operating system	Windows embedded standard 10 (WES 10)

15.6.2 Network conditions

Table 15-11Network conditions

Parameter	Description
Network	Local area network (LAN) connected in a wired manner
Interface	Ethernet
Bandwidth	20 ± 5 frames/s

15.6.3 Data interface

Table 15-12Data interfaces

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

15.6.4 Image acquisition

Table 15-13Image Acquisition

Parameter	Description
Anatomical Programs	Head / Extremities / Thorax / Lumber / Pelvis / Ankle
Metal Correction	Distinguish metal implants and optimize exposure parameters to reduce radiation dose
Motion Detection	Detect moving parts and adjust the pulse frequency to suppress motion artifacts

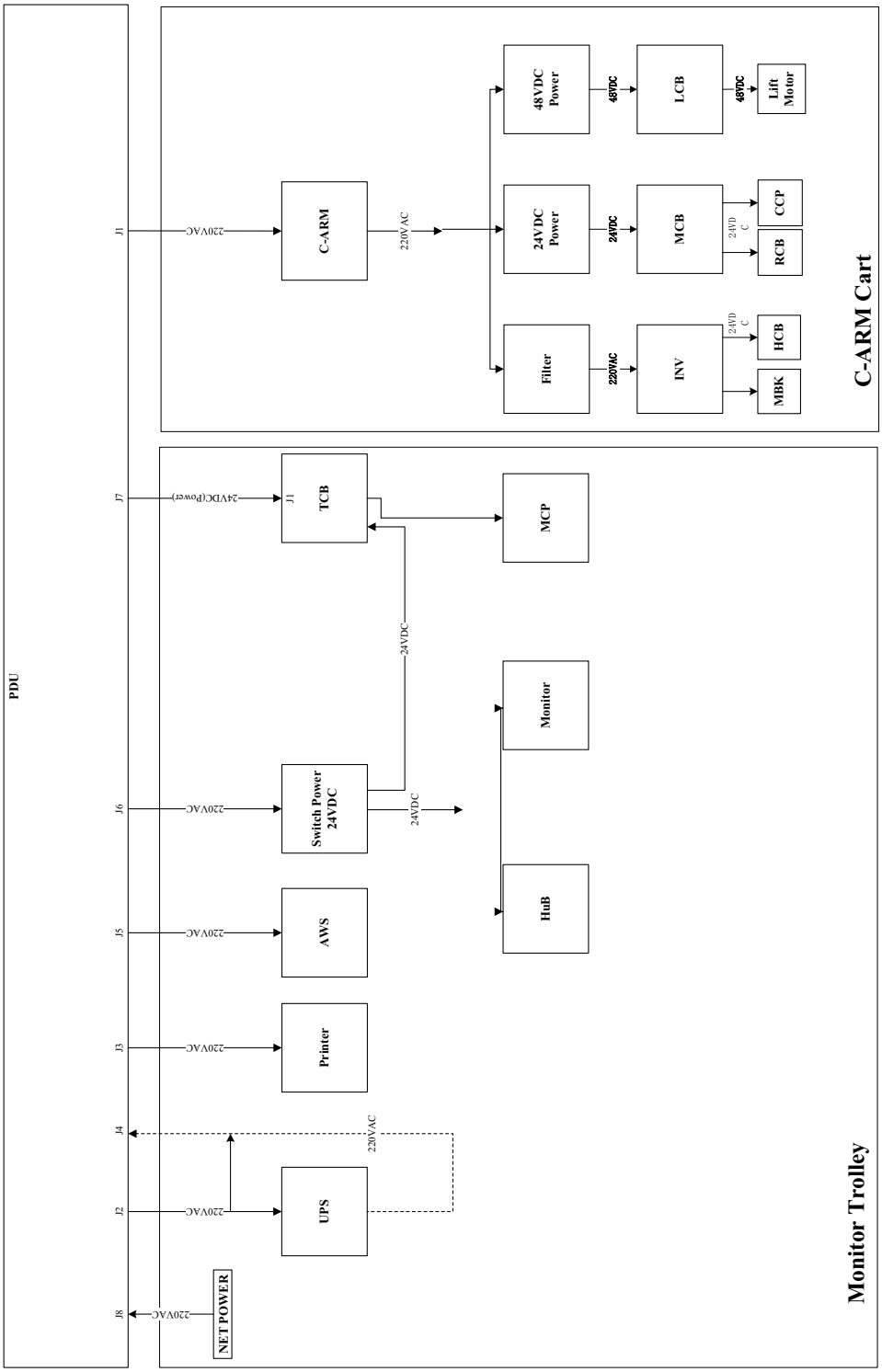
Parameter	Description
Object Detection	Identify shooting locations and optimize exposure parameters to reduce invalid shots
Noise Reduction	3 levels
Cine Loop	Up to 25 pps
Image Save	Manually or automatically image save

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15.7 Mechanical performance

Mechanical movement	Parameter
Orbital motion of C-arm	140°(-50°~+90°)
Angulation of C-arm	- 225° to + 225°
Movement of C-arm	Vertical movement range: not smaller than420 mm / 16.5 in. Horizontal movement range: not smaller than 200 mm / 7.9 in.
Swivel motion of C-arm	± 10°
Distance from the focus of C-arm to the image receptor	1075 mm / 42.3 in
Arc depth of C-arm	The maximum vertical depth from the center of the X-ray beam to the arc wall of C-arm is 690 mm / 27.2 in.
Opening distance of C-arm	The minimum distance from the cover of the X-ray source assembly to the image receptor is 850 mm / 33.6 in.
C-arm trolley dimension	Length: 1870 mm / 73.6 in Width: 748 mm / 29.5 in Height: 1633 mm / 64.3 in
Monitor cart dimension	Length: 840 mm / 33.0 in Width: 905 mm / 35.6 in Height: 1745 mm / 68.7 in
Color-coded Break	Yes

15.8 Electrical schematic



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A Appendix

A.1 Statement A-2
A.2 Clinical positioning for adult A-3
A.3 Clinical position for pediatrics (only available for U.S.A) A-6

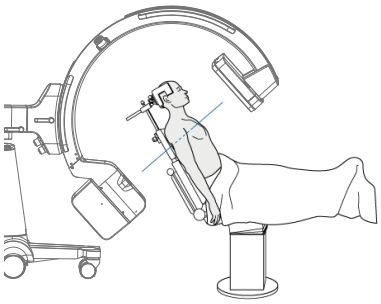
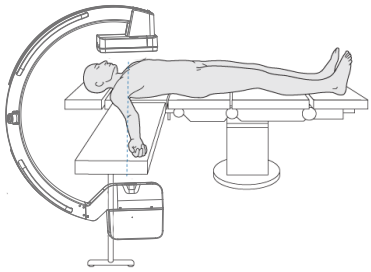
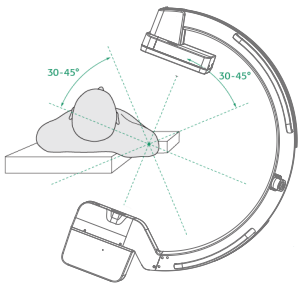
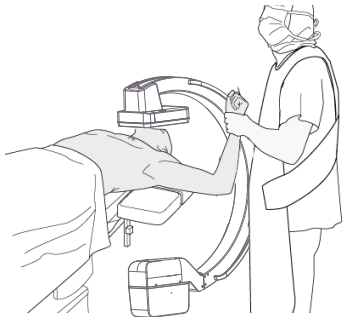
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A.1 Statement

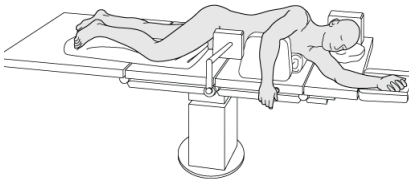
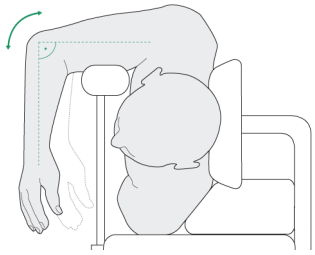
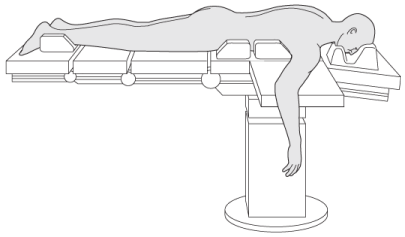
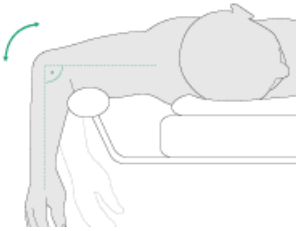
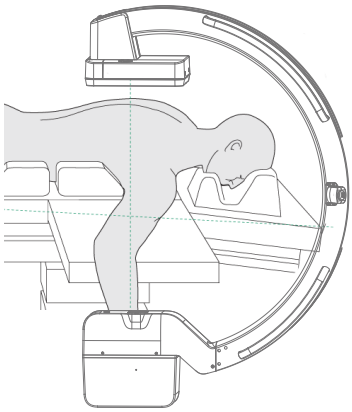
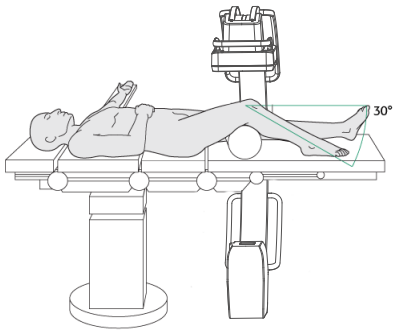
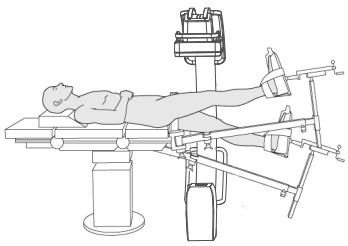
This manual contains only some typical anatomical parts for adults. The positioning information shown are for reference only and are not used for decisive guidance. The sketch maps do not show the only or necessarily the best positions. The specific placements need to be determined and operated by certified and trained medical professionals. More anatomical clinical positioning need to be determined by certified and trained medical professionals according to the actual situation of patients.

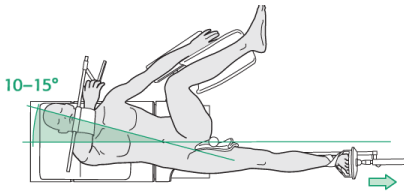
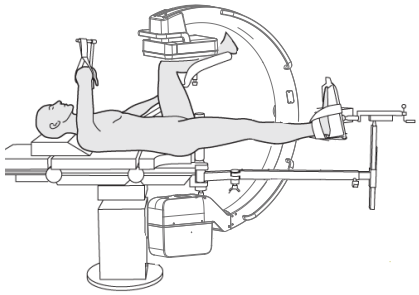
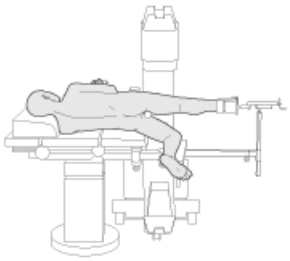
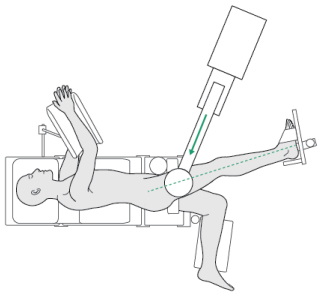
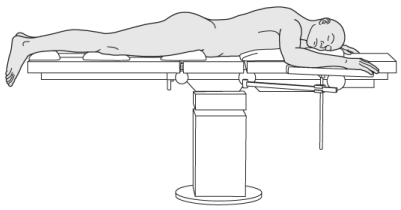
A.2 Clinical positioning for adult

Table A-1 The clinical positioning for adult

Clinical feature	Position	Examples	
Humerus fracture	Beach chair position		
	Supine position		
			

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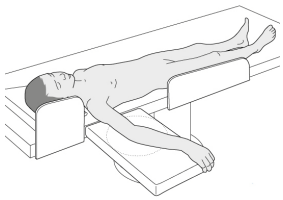
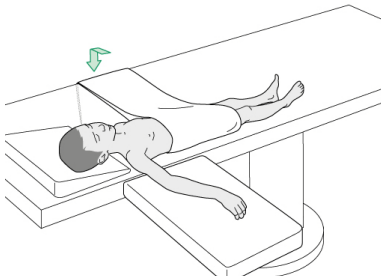
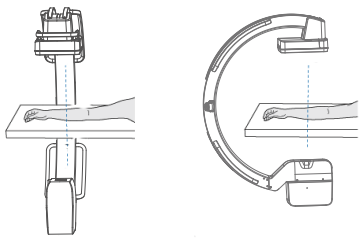
Clinical feature	Position	Examples	
Humerus fracture	Lateral position		
	Prone position		
			
Femur fracture	Supine position		

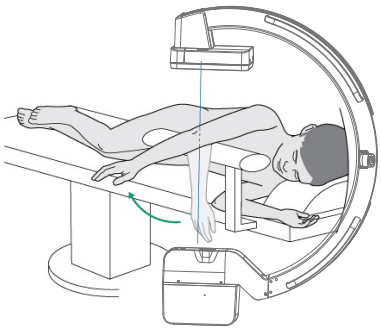
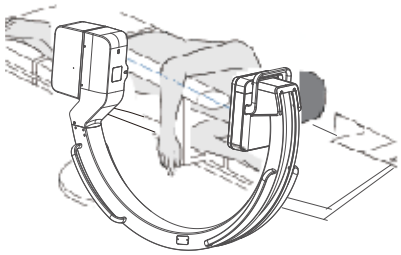
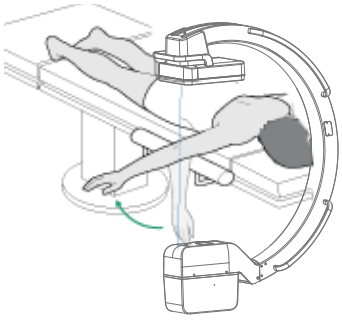
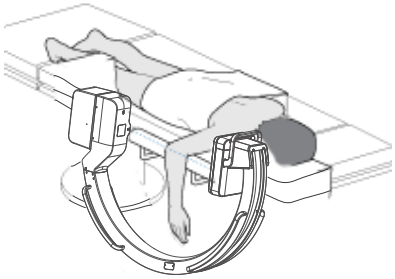
Clinical feature	Position	Examples	
Femur fracture	Supine position		
	Lateral position		
	Prone position		

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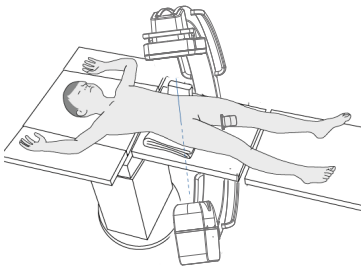
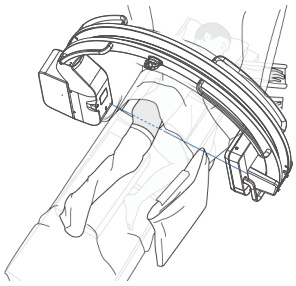
A.3 Clinical position for pediatrics (only available for U.S.A)

For neonate and infant, special care is required, the clinical staff shall assist with proper positioning. Pay more attention to keep the neonate and infant warm during surgery. The position shall not affect the breathing. circulation, or pressure on peripheral nerves to facilitate anesthesia.

<table>
<tr><th>Clinical feature</th><th>Position</th><th colspan="2">Examples</th></tr>
<tr><td rowspan="3">Humerus fracture</td><td rowspan="3">Supine position</td><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td colspan="2">Note:
■ The fractured extremity is positioned as close as possible to the edge of the table. Side support is recommended to prevent the pediatric from falling down from the operating table.
■ Care should be taken that the upper body is not supported by the arm table especially in small pediatric with a short arm. Great care must be taken to avoid extremes of neck positioning.
■ Very small pediatric (up to 5 years - 6 years) can additionally be fixed using a towel around the thorax that is attached to the contralateral side of the table.</td></tr>
</table>

<table>
<tr><th>Clinical feature</th><th>Position</th><th colspan="2">Examples</th></tr>
<tr><td rowspan="4">Humerus fracture</td><td rowspan="2">Lateral position</td><td></td><td></td></tr>
<tr><td colspan="2">Note:
■ This position is unsuitable for closed management of supracondylar fractures, as it is difficult to manipulate the fracture with the patient in a lateral decubitus position.
■ This position is less suitable for children below 6 years - 8 years due to short upper arm.</td></tr>
<tr><td rowspan="2">Prone position</td><td></td><td></td></tr>
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■ This position is unsuitable for closed management of supracondylar fractures, as it is difficult to manipulate the fracture with the patient in a lateral decubitus position.
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<tr><td rowspan="4">Istrics</td><td rowspan="2">Supine position</td><td></td><td></td></tr>
<tr><td colspan="2">Note:
■ This position brings more difficulty for use of the C-arm.
■ This position requires more demanding for anesthetist.</td></tr>
<tr><td rowspan="2">Lateral position</td><td></td><td></td></tr>
<tr><td colspan="2">Note:
■ For small pediatric, it may be necessary to rest the shoulder on the arm table to allow unimpeded imaging. This may require gentle lateral flexion of the neck and trunk with appropriate padding and attention to pressure areas.</td></tr>
</table>

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Shanghai United Imaging Healthcare Co., Ltd.
www.united-imaging.com

Address: No. 2258 Chengbei Road, Jiading District, Shanghai, 201807, P.R. China
TEL: +86(21)-67076888
FAX: +86(21)-67076889

EC REP Shanghai International Holding Corp. GmbH (Europe)
Address: Eiffestrasse 80, 20537 Hamburg, Germany
TEL: +49-40-2513175
FAX: +49-40-255726