

X-ray R/F System

SONIALVISION G4

Instruction Manual

Read the manual thoroughly before you use the product.
Keep this manual for future reference.

About the Symbols Appearing in this Instruction Manual

Throughout the text in this manual, warnings and other information essential when using this unit, such as cautionary or prohibited items, appear classified as per the following:

Mark	Description
 DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in serious injury or death.
 WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in serious injury or possibly death.
 CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor to moderate injury or equipment damage.
 NOTE	Emphasizes additional information that is provided to ensure the proper use of this product.
 Instructions	Indicates an action that must be performed.
 Prohibitions	Indicates an action that must not be performed.
 Hint	Indicates information provided to improve product performance.
 Reference	Indicates the location of related reference information.

Revision History

Revision	Date	Changes
First edition	Feb. 2013	First edition released
A	May 2013	Description on RSM-DXA, Fluoroscopy Roadmapping, and Program Sequence added
B	Aug. 2013	Applications, Diagnostic Table Operational Mode, and Labels changed
C	Nov. 2013	Description on SLOT radiography added / Compliant with standard
D	Feb. 2014	Description on Tomography and Tomosynthesis, some specifications, and some error messages added Some part in Label, Image List screen, Measures for Power Outrages, and Error code changed
E	-	-
F	Mar. 2014	Compliant with standard
G	Dec. 2014	Some part in Radiography parameter and Inspection Data Measurement Procedure changed. Some description on Standard Air Kerma deleted.
H	Apr. 2015	Description on UPS in Consumable Parts List changed. Add some SLOT radiography functions, Iteration Reconstruction option, and RDSR. Add and revise Error message.
J	May 2015	Delete "Not Sold in The US" from Tomosynthesis-related description. Change section title of 1.9. Add NOTE in section 4. Update some screen shots.
K	-	-
L	Feb. 2016	Add a note on the touch panel operation and the urological radiography. Add the X-ray diagnostic table lock operation and moving speed operation, the radiography program edit, and a power outage measure. Add and revise Error message. Correct a note for displayed dose.
M	Apr. 2016	Add the auto warm-up and an error message. Change the system menu.

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Introduction

Thank you for purchasing the X-ray R/F System SONIALVISION G4 (hereafter referred to as "equipment").

This instruction manual contains information for ensuring proper use of the equipment. Read this manual thoroughly before using the equipment and operate the equipment in accordance with the instructions in this manual.

If the precautions in this manual are disregarded, there is risk of damage to equipment or injury to operators and patients. However, it is not possible to foresee all risks and provide precautions for each of them. Therefore, when using the equipment in ways not described in this manual or when questions about the manual description arises, please contact the place of purchase or a sales representative listed at the end of this manual.

This manual should be kept available for future reference. If the user or usage location changes, ensure that this instruction manual is always kept together with the equipment.

Periodically check to be sure that the instruction manual and the warning labels are not missing or damaged. If they are, contact your Shimadzu service representative for replacement.

Original version is approved in English.

Notice

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Operating Precautions

Operating Precautions for Safety in the Use of Electric Medical Equipment

1. Only an experienced technician should operate the equipment.
2. When installing the equipment, pay attention to the following items:
 - (1) Do NOT install it near water faucet or similar equipment.
 - (2) Install it away from potential sources of problems such as abnormal pressure, temperature or humidity, drafts, direct sunlight, dust, or locations where the air has a high concentration of salt or sulfur.
 - (3) Avoid tilting, vibration and any impact during transportation and operation of the equipment.
 - (4) Keep the equipment away from the areas where chemicals or gases are stored.
 - (5) Use only the correct electrical power source with matching frequency, voltage and current (or wattage).
 - (6) Check the condition of the battery power source (power and polarity) before operating the equipment.
 - (7) Correctly ground the equipment.
3. Before operating the equipment, pay attention to the following items:
 - (1) Check the conditions of switch contacts, polarity, dial settings, and meters, and make sure the equipment performs correctly.
 - (2) Confirm that the ground is connected correctly.
 - (3) Check the whole wiring is connected correctly and completely.
 - (4) Pay attention when using more than one unit at a time, because it may lead to an incorrect diagnosis and cause danger.
 - (5) Check the condition of the external electric circuit that will be directly connected to a patient.
 - (6) Check the condition of the battery power source.

4. While operating the equipment, pay attention to the following items:
 - (1) Do NOT over-exceed time or the amount of equipment use needed for diagnosis or therapy.
 - (2) Observe the equipment and patient continuously for early detection of problems.
 - (3) When a problem is detected with the equipment, take proper action to stop the equipment without harming the patient.
 - (4) Do NOT let the patient touch the equipment unless necessary.
5. After operating the equipment, pay attention to the following items:
 - (1) Return the operation buttons and the dial to their original states before use in the prescribed order. Then, turn off the main power.
 - (2) Do NOT pull the power cable forcibly from the outlet.
 - (3) When storing the equipment, pay attention to the following factors:
 - (i) Keep the equipment away from the water.
 - (ii) Store it away from potential causes of problems such as abnormal pressure, temperature or humidity, drafts, direct sunlight, dust, or locations where the air has a high concentration of salt or sulfur.
 - (iii) Avoid tilting, vibration and any impact when storing.
 - (iv) Store the equipment away from areas where chemicals and gases are stored.
 - (4) Clean all attachments, cables and contacts, and store them in one place.
 - (5) Keep the equipment clean to avoid problems during the next use.
6. If the equipment is found to be out of order, do NOT try to repair it. Immediately contact Shimadzu service representative for repair.
7. Do NOT modify any part of the equipment.
8. Preventive maintenance
 - (1) The equipment and its parts should be periodically checked.
 - (2) If the equipment has not been in operation for an extended period of time, test it prior to actual operation to make sure it works correctly and safely.
9. Correctly operate the equipment according to the instruction manual.

Precautions for Use

When using this equipment, please observe the following precautions for safety of the operator and patient:

 WARNING	
 Instructions	The responsibility for management of use and maintenance of medical equipment lies with the user. This equipment is restricted to use by, or under supervision of, a diagnostic radiology technician or a person with a certificate indicating equal proficiency. Repair and inspection of the inside of the equipment is dangerous. Be sure to contact your Shimadzu service representative for repair and inspection.
 Prohibitions	Never modify the equipment. In general, modifications are strictly prohibited by the Regulatory requirements of the law of the country where the device is installed. Please contact your Shimadzu service representative if it is necessary to modify the equipment.
 Instructions	Perform periodic inspection. Preventive maintenance is required to maintain long-term safety and performance of the equipment. The " 6 Maintenance " chapter in this manual gives detailed descriptions of daily and periodic maintenance and inspection that a user should perform. As for the maintenance and inspection that only specially trained experts can perform, utilize the maintenance agreement program offered by Shimadzu.
 Instructions	Repair and maintenance of the inside of the equipment can only be performed by engineers assigned by Shimadzu. Maintenance must be assigned to specially trained experts. Contact your Shimadzu service representative for repair and maintenance.
 Instructions	In order to ensure safety when using the system, read the instruction manual provided with each system component for details on usage and relevant precautions.



CAUTION



Instructions

If the operator has no experience in operating the equipment, be sure that he or she receives instruction on how to operate it from Shimadzu service personnel or someone who has adequate experience in using the equipment.

In order to operate the equipment safely, an explanation of the operation needs to be given. When installing the equipment, Shimadzu service personnel explain the operating procedure using this instruction manual. Follow their directions and operate the equipment correctly.

 **Reference** ["1.8 Operator Profile" P.1-16](#)



Instructions

Secure the means for the operator and the patient to communicate with each other.

If equipment usage is deemed to put the patient at risk due to his or her condition, refrain from conducting the study or treatment.

Be Sure to Read the Following to Prevent Explosion, Electric Shock, or Injury



DANGER



Prohibitions

Do NOT use any potentially flammable or explosive gas, such as disinfectant sprays, near the equipment.

Use of such gas may cause an explosion.



WARNING



Instructions

Check the condition of the patient before conducting a study.

If equipment usage is deemed to put the patient at risk due to the his or her condition, refrain from conducting the study or treatment.



Prohibitions

Do NOT use the equipment at places where the liquid may enter. Do NOT spill liquids onto the surface or the inside of the equipment.

Otherwise, electric shock may occur.

In case of liquid spillage to the equipment, immediately turn off the power, and contact your Shimadzu service representative.

 WARNING	
 Instructions	If an abnormality occurs during operation, or if an unusual odor or smoke is emitted during operation, stop using the equipment immediately and contact your Shimadzu service representative. Continued use may damage the equipment and cause injury.
 Prohibitions	Do NOT open the covers of the equipment. Otherwise, electric shock may result. When opening the covers for maintenance, contact your Shimadzu service representative.
 Prohibitions	Do NOT use in a location where metal fragments may enter the equipment. This may result in electric shock.
 Instructions	Always be very careful when moving the table top to avoid contact with the patient or operator and to ensure that the patient or operator does not become caught between the equipment and any neighboring devices. Otherwise, it may cause injury.
 Instructions	Patients who have difficulty with physical activity must be escorted by a caregiver.



If the following happens, turn the power off and then restart the equipment.

- The X-ray diagnostic table does not function properly but an error message is not displayed, even after operating the table.
- X-rays are not irradiated but an error message is not displayed, even after performing fluoroscopy or radiography operations.
- The digital radiography unit and touch panel cannot be operated or do not respond even if operated.



The values displayed on this equipment may include a margin of error as stipulated in the applicable standards.

 **Reference** ["7.2.3 International Standards" P.7-12](#)

Cautions on Environmental Conditions


WARNING



Do NOT use the equipment in an oxygen-rich environment.

Using the equipment in an oxygen-rich environment may cause fire, which may lead to fatal or serious injuries to the patient or damage to the equipment.



Do NOT connect the equipment other than the designated equipment to the system.


CAUTION



Be sure to use the equipment under the following environmental conditions:

The installation of a dedicated air-conditioner is recommended if the building air-conditioner cannot maintain the necessary environmental conditions 24 hours a day.

- Examination room

Atmosphere:	No explosive gas, highly concentrated oxygen, nor corrosive gas in the atmosphere
Temperature:	10 to 30 °C
Relative humidity:	15 to 75 % (no condensation)
Atmospheric pressure:	800 to 1060 hPa
- Operation room

Atmosphere:	No explosive gas, highly concentrated oxygen, nor corrosive gas in the atmosphere
Temperature:	10 to 30 °C
Relative humidity:	20 to 70 % (no condensation)
Atmospheric pressure:	800 to 1060 hPa
Environment luminosity:	150 to 500 lx
Ambient noise level:	70 dB max.

There must be no sudden changes in temperature or humidity. This could cause condensation, which may lead to equipment malfunction.

 **Reference** ["1.5 Environmental Conditions" P.1-8](#)



Ground the equipment using ground wires.

Be sure to carry out grounding according to the installation manual to reduce the danger of electric shock.

CAUTION	
 Instructions	Before using the equipment, ensure correct operations of switches and meters as well as proper connections of high-voltage cables, cords, and ground wires.
 Prohibitions	Do NOT disconnect cords, cables and other connections, unless it is required.
 Instructions	Contact your Shimadzu service representative for installation and relocation of the equipment.

Cautions on Radiography

WARNING	
 Instructions	Restrict all persons other than the patient from accessing the equipment in accordance with local regulations. To avoid unnecessary exposure, acceptable distances (maximum access values) to the equipment by any person other than the patient are defined for each region.
 Instructions	The equipment must only be operated by qualified personnel, such as radiology technicians or those with equivalent qualifications.
 Prohibitions	No person but the patient is allowed to stay in the examination room during X-ray irradiation. If the equipment is not used correctly, the operator, the patient, and other persons may receive a greater dose of radiation than necessary. If for some reason another person has to be in the examination room, that person must take adequate measures to protect themselves against radiation (protective apron, screen, etc.). During X-ray irradiation, the alarm sounds, and  lights up and is displayed on the acquisition monitor.
 Instructions	Perform X-ray irradiation carefully and according to the doctor's directions when using the equipment with expectant mothers, women who suspect they are pregnant, lactating women, or children. Particular ways of using the equipment may increase the scatter dose absorbed into the patient, which may cause a radiation hazard.

 WARNING	
 Instructions	During X-ray irradiation, ensure that the X-rays irradiate the necessary region only. To avoid unnecessary exposure, narrow down the collimator and take protection measures, such as wearing a protective apron.
 Prohibitions	Do NOT place unnecessary objects in the area of X-ray exposure. Doing so might subject the patient to unnecessary exposure.

 CAUTION	
 Instructions	Be sure to warm-up the equipment (running-in operation of the X-ray tube unit) before taking an X-ray radiograph.  Reference "4.6 X-ray Tube Warm-up" P.4-36
 Instructions	Perform the warm-up if an arc occurs. Suddenly using the X-ray tube unit near the nominal X-ray tube voltage (above 100 kV) after using the unit at a relatively low tube voltage (80 kV max.) for a prolonged period may result in arc. This arc occurs due to loss of the warm-up effect at high tube voltage after the X-ray tube unit is used at a relatively low tube voltage for a prolonged period.  Reference "4.6 X-ray Tube Warm-up" P.4-36
 Prohibitions	Do NOT perform unnecessary preparation for radiography. If radiography has not been performed for long with  (Ready for radiography) lit on the console, wire disconnection or withstand voltage failure may occur due to the evaporation of the X-ray tube filament.
 Instructions	In order to minimize the radiation dose on the patient, make the distance between the focus and the patient's body surface as long as possible (Minimum 45 cm). The shorter the distance becomes, the greater the amount of scatter dose absorbed into the patient, which may cause a radiation hazard.
 Instructions	Pay extra attention when irradiating X-rays for a long time or repeatedly. It may cause a radiation hazard.
 Instructions	Hold down the exposure start switch or hand switch until the exposure is complete. If the switch is released partway through, X-ray irradiation is aborted at that point and an appropriate radiograph may not be taken.

System Operation



WARNING

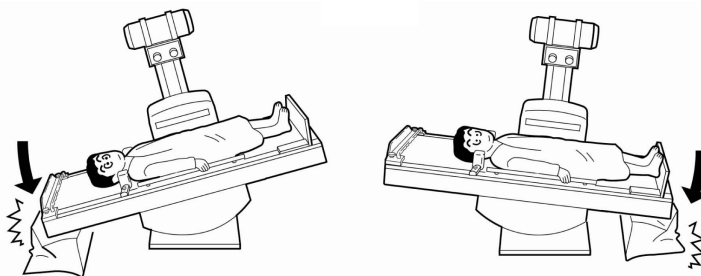


Prohibitions

Do NOT place anything in the operating range of the X-ray diagnostic table.

Do NOT place desks, chairs, stretchers or footswitches within the operating range of the X-ray diagnostic table.

The X-ray diagnostic table may collide with other equipment, causing damage or accidents.



 **Reference** "Operating Range" P.1-9



Instructions

Ensure that no one is under the X-ray diagnostic table.

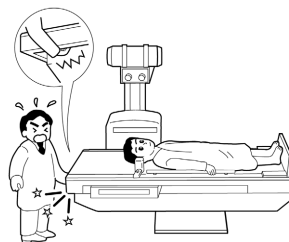
The person may become caught under the table and injured.



Prohibitions

Do NOT put your hand or fingers between the tabletop and the main frame when moving the tabletop.

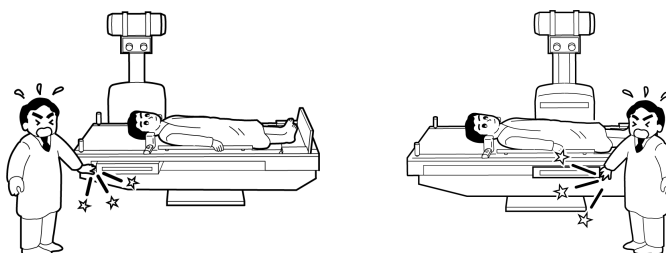
Otherwise your hand could get caught and injured.



Prohibitions

Do NOT put your hand between the tabletop and the main frame when moving the imaging unit.

Otherwise your hand could get caught and injured.

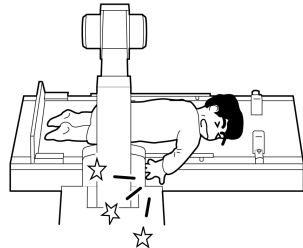


! WARNING

!
Instructions

Ensure that the patient does not put his or her hand between the tabletop and the imaging unit when moving the imaging unit.

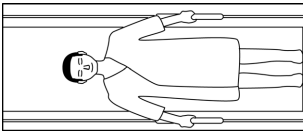
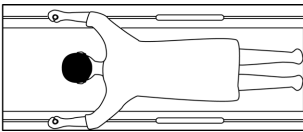
Otherwise his or her hand could get caught and injured.



!
Instructions

Instruct the patient to hold the hand grips when he or she is placed on the tabletop.

Instruct the patient to hold the hand grips firmly. Insufficient holding could cause the patient to fall off the tabletop and be injured.

!
Instructions

Ensure the safety of the patient when using squeeze compression.

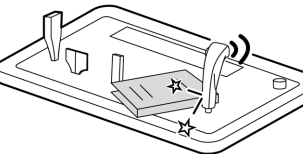
Squeeze compression could fracture the patient's ribs if not performed correctly. After squeeze compression, press the  (squeeze compression) button to turn it off. If the imaging unit or tabletop is moved while the compression cone is operating, the compression cone may collide with the shoulder rests or foot rest and could be damaged.



! CAUTION

!
Instructions

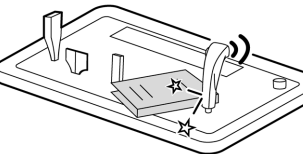
Before using the equipment, check the settings on the control device and ensure that the exposure conditions for fluoroscopy or radiography is correctly set.



⊘
Prohibitions

Do NOT place anything on the console.

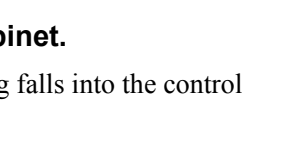
The equipment may unintentionally be activated if anything hits the operation lever.



⊘
Prohibitions

Do NOT place anything on the control cabinet.

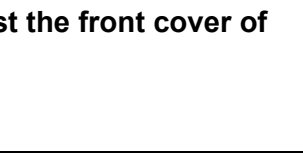
The internal equipment may be damaged if anything falls into the control cabinet ventilation opening.



⊘
Prohibitions

Do NOT allow a stretcher to collide against the front cover of the X-ray diagnostic table.

Doing so may damage the front cover.

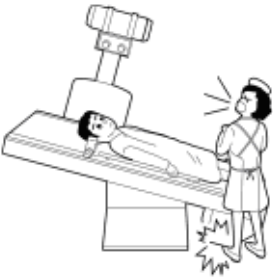


CAUTION	
 Instructions	After using the equipment, open the circuit breaker to which the power cord of the high-voltage generator is connected to ensure safety.
 Instructions	It is recommended to keep backup X-ray equipment in case the equipment fails to operate due to a fault.

Cautions on the LCD Monitor

CAUTION	
 Prohibitions	Do NOT leave rubber or vinyl products in contact with the LCD monitor for long periods. This could cause decomposition, or peeling of the coating.
 Prohibitions	Do NOT scratch or hit the LCD monitor surface with a hard material, such as a ballpoint pen. Otherwise, the LCD monitor surface may be damaged.
 Prohibitions	Do NOT push hard on the LCD monitor surface. It may cause an uneven image, leading to the monitor's failure.

Accessories and Options

WARNING		
 Prohibitions	Do NOT place the footswitch under the X-ray diagnostic table. The operator's foot may get caught under the X-ray diagnostic table and injured.	
 Prohibitions	Do NOT place anything on the footswitch. Pay extra attention not to step on the footswitch accidentally. Unintended X-rays may be radiated.	



WARNING

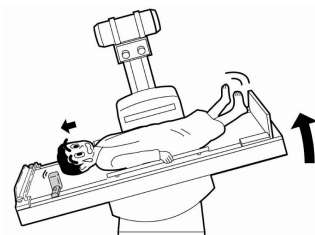


Instructions

Completely fasten shoulder rests, hand grips and foot rest to the tabletop.

Otherwise the patient may fall off and be injured.

The accessories may also become detached from the tabletop, fall and injure the patient or damage the equipment. Particularly when tilting the tabletop downward by 20° or more, confirm the patient's safety and proceed carefully.

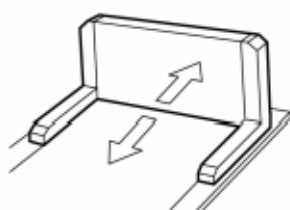


Instructions

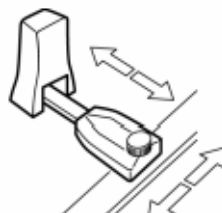
When starting the examination, attach accessories like the foot rest, shoulder rests and hand grips according to the patient's body and body position.

After attaching accessories or relocating them, apply force to them in both directions to ensure that they are secured to the equipment firmly.

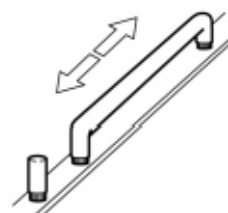
Should these accessories become loose during operation, the patient may fall off the tabletop and be injured.



Attaching the foot rest



Attaching a shoulder rest



Attaching a hand grip



Prohibitions

Do NOT support the patient's body weight only with the shoulder rests, hand grips or upper hand grip.

Tilting the tabletop could cause the patient to fall off the tabletop and be injured.



Instructions

Completely fasten the compression band to the tabletop.

If not fastened firmly, the compression band may come off or the lever may fall over, which could cause injury.



Instructions

Gradually tighten the compression band while checking the patient's condition.

Rapid tightening could cause bone fractures.



WARNING



Prohibitions

Do NOT support the patient's body weight only with the compression band.

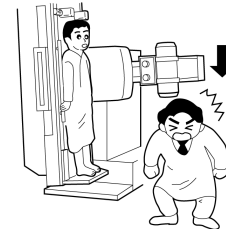
Tilting the tabletop could cause the patient to fall off the tabletop and be injured.



Instructions

Be careful of the motion of the X-ray diagnostic table while operating the local console.

When moving or tilting the imaging unit in the vertical position, the X-ray tube unit may hit and injure the operator's head.



CAUTION



Prohibitions

Do NOT use the local console or monitor cart on a floor that is tilted more than 5°.

This could cause the local console or monitor cart to fall over.



Prohibitions

Do NOT move the local console or monitor cart while their casters are locked.

This could cause the local console or monitor cart to fall over.



Instructions

Move the local console or monitor cart by holding the handle, being careful about bumps and cables on the floor.

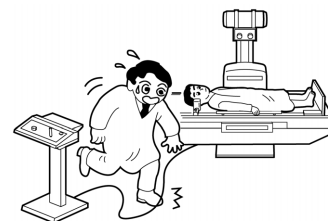
This could cause the local console or monitor cart to fall over.



Instructions

Watch out for the cable of the local console or monitor cart.

If you catch the cable with your foot the local console or monitor cart could fall over.



Prohibitions

Do NOT subject the grid to any force from above while it is pulled out.

Doing so could damage it.



CAUTION



Instructions

To mount or remove the X-ray grid, move the tabletop all the way back and lift the hand guard.

If you do it without moving the tabletop all the way back, you may get your fingers caught between the tabletop and the grid.

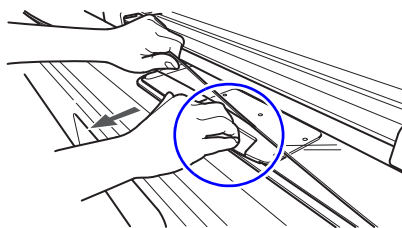
If you do it without lifting the hand guard, your fingers may be injured by the hand guard.



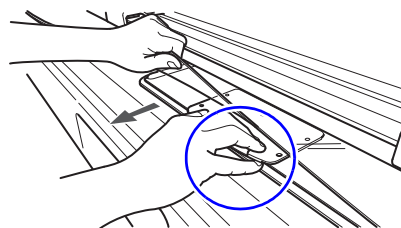
Instructions

When holding the grid handle, take care not to allow your fingers to protrude from the grid.

Your fingers might get nipped between the unit and the grid.



How to hold the handle –
Good example



How to hold the handle –
Bad example



Instructions

Make sure not to allow anyone to control the unit while you are mounting or demounting the X-ray grid.

If someone moves the tabletop, you may get the finger caught between the tabletop and the grid.



Instructions

When not connecting the rotary foot rest and the X-ray diagnostic table with a curl cord, be sure to attach the dust cap to the connection parts.

The equipment may be damaged if foreign matter enters it.

Digital Radiography Unit



WARNING



Prohibitions

Do NOT install any other software on the computer.

The system may not run due to changes to the operating system or conflicting drivers. The warranty will be invalidated if any other software is installed.



CAUTION



Instructions

Observe the following precautions:

- Do NOT attempt to alter any system software.
Doing so could disrupt the functioning of the system and result in loss of images.
- Do NOT attempt to alter any system hardware components.
Doing so could disrupt the functioning of the system and result in loss of images. Use of any hardware components not provided by Shimadzu is strictly prohibited. This includes peripherals (mouse, keyboard, monitor, etc.).
- Pay careful attention to other high frequency-generating equipment in the room. The PC cabinet should be as far as possible from any such device to prevent noise from affecting the image video signal.
- Do NOT disconnect the cables connected to this system.
Otherwise the image may not be displayed, the data may be damaged and the system may fail to start up.
- A system hardware failure may delete images archived in the hard disk.
Shimadzu is not responsible for the images in this case.
- Do NOT move any system component.
If necessary, move it carefully to avoid damage.
- Do NOT connect the system to the Internet.
Shimadzu accepts no responsibility for infection by computer viruses entering the system via an Internet connection and for leaks of hospital, patient and other information.
Also, do NOT connect the system to a network on another PC that can be connected to the Internet.
- Do NOT apply any shocks to the system components.
- Do NOT place anything which may generate magnetic fields near the system components.
- Do NOT alter the system settings. Do NOT install any software to the system other than that provided by Shimadzu for this system.
Otherwise, the system may fail to start up.

Measurement Accuracy

 WARNING	
 Prohibitions	Do NOT attempt to use the measurement function for purposes other than references for evaluation because precise image measurement is not possible.

Cautions on Data Loss

 CAUTION	
 Instructions	Either archive (backup) important images or raw data in an external file system such as optical disks, or print it on film. If for some reason individual data is lost or corrupted, Shimadzu may adjust the system to prevent a reoccurrence of data loss; however, Shimadzu does not guarantee that the lost data can be restored. Remember that the data stored on the system disk may be lost or corrupted at any time. Data loss may occur due to a decrease in performance of components (age deterioration) as well as a fault or malfunction of the equipment. Create a hard copy of the image data on film without delay or save it on external media (CD-R or DVD-R) recommended by Shimadzu for safekeeping the important image data. Note that, however, the data recorded on external media may also be lost, and check the recorded data at regular intervals. CD-R/DVD-R Use the following CD-R or DVD-R disks recommended by Shimadzu for writing or reading of data. If any other disk is used, proper operation is not guaranteed. Recommended CD-R disks: Disks, CD-R P/N: 562-27681-10 (10 per set) Recommended DVD-R disks: Disks, DVD-R P/N: 562-27680-10 (10 per set)

Cautions on Network Connections



CAUTION



Instructions

Shimadzu accepts no responsibility for any of the following items due to infection by malware (i.e. malicious software, including computer viruses and worms, which cause damage to the infected computer):

- Loss, alteration, and leakage of data, including images, recorded on this equipment
- Accidents due to the malfunction of this equipment
- Infection of other equipment via this equipment and any damages incurred due to the infection
- Other issues including all events caused by malware infection



Instructions

When using the networks described below, the customer must implement security measures to prevent infection by malware (i.e. malicious software, including computer viruses and worms, which causes damage to the infected computer).

- Networks that lack security management
- Networks that may be subject to malware intrusion
- Networks that are connected to or have the ability to connect to the following devices
 - Devices that lack security management by the customer
 - Devices that can be used by persons unauthorized by the customer
 - Wireless communication devices

Examples of security management are as follows ;

- NOT connecting to networks that lack security management
- NOT connecting to the internet
- Checking whether media (external storage media such as FDs, CDs and DVDs) are infected with malware before use.
- Avoiding actions that may result in malware infection
- NOT connecting to the network of another PC connectable to the internet.

Any viral infection or leakage of hospital information or patient information via internet connections is not covered under warranty.



CAUTION



Instructions

It is strongly recommended that the user identify, analyze, evaluate, and control unacceptable risks resulting from a network connection.

A connection of the equipment to a network might cause unacceptable risks that were not specified in advance for patients, operators or third parties.

Also, changing the network connection will invite new risks, which will also require additional analysis.

Changing the network connection includes the following:

- Changing the network configuration
- Adding on equipment to the network
- Removing equipment from the network
- Updating equipment connected to the network
- Upgrading equipment connected to the network

Cautions on Cleaning and Disinfection



WARNING



Instructions

Be sure to turn the equipment power OFF before cleaning and disinfecting the equipment.

Otherwise, a malfunction may occur in the equipment, or the equipment may operate in an unintended way.

Also, thoroughly ventilate the room before turning ON the power after disinfection work is complete.



CAUTION



Instructions

Be sure to clean and disinfect the equipment.

Cleaning and disinfection is very important to ensure that the equipment can be used hygienically and safely. Strictly follow the methods prescribed.



Prohibitions

Do NOT directly apply or spray rubbing alcohol or water onto the equipment.

Wipe the surface of the equipment with a cloth soaked with rubbing alcohol. If rubbing alcohol gets inside the equipment, it can cause failure or accidents.

 CAUTION	
 Prohibitions	Do NOT use an organic solvent. Organic solvents may change the surface color. If an organic solvent adheres to the surface, wipe it off immediately.
 Prohibitions	Do NOT use the following disinfectants: If any of the following disinfectants are applied, the equipment performance and safety cannot be guaranteed. • Chlorine-based disinfectants • Disinfectants that corrode metals, plastics, rubber, or paint • Disinfectants unsuitable for metals, plastics, rubber, or paint • Spray-gas type disinfectants • Volatile disinfectants • Disinfectants that may enter the equipment
 Instructions	Use disinfectants at a minimum. Repeated disinfection over a long time may lead to discoloring and cracking on the equipment surface, and deterioration of rubber and plastic. If any abnormality is found on the equipment after disinfection, stop using the equipment immediately. Contact your Shimadzu service representative for repair.
 Prohibitions	Do NOT grease tabletop rails. Be sure to wipe the tabletop rails with a soft dry cloth. Any oil or grease may cause the accessories on the tabletop to slip off.

Cautions on Emergency Stop

 CAUTION	
 Instructions	Press the STOP button to stop the equipment immediately in times of urgency. Press the STOP button (red button) to stop the X-ray diagnostic table. The STOP button is provided on the front control panel of the X-ray diagnostic table and the console.  Reference "5.1 Emergency Stop" P.5-2

Cautions Relating to Cellular Telephones

 WARNING	
 Prohibitions	Do NOT bring any cellular telephones or related devices into the examination room with their power ON. Such devices can exceed the EMC standard limitations, and under some conditions this can impair the proper functioning of the equipment. In the worst case, this can cause serious injuries or clinical errors.

Cautions on Electromagnetic Compatibility (EMC)

 WARNING	
 Instructions	This equipment needs special precautions regarding EMC. Install and use the equipment according to the EMC information provided in this instruction manual.  Reference "7.1 Environmental Conditions of EMC (Electromagnetic Compatibility)" P.7-2
 Instructions	Make sure that electromagnetic compatibility is obtained. All peripheral devices must satisfy EMC standards regarding emission of electromagnetic energy and susceptibility to electromagnetic environment. Devices that do not satisfy these standards may disturb the correct functioning of the equipment. In the worst case, this can cause serious injuries or clinical errors.  Reference "7.1 Environmental Conditions of EMC (Electromagnetic Compatibility)" P.7-2
 Prohibitions	Do NOT use this equipment adjacent to, or stacked with, other equipment. If adjacent or stacked use is necessary, check to be sure that this equipment works properly in the environment.  Reference "7.1 Environmental Conditions of EMC (Electromagnetic Compatibility)" P.7-2

Cautions When Irradiating Consecutive Pulse-shaped X-ray Fluxes



WARNING



Instructions

Observe the following precautions when irradiating consecutive pulse X-rays:

- Conducting studies involving irradiating consecutive pulse X-rays onto the region where an implantable pacemaker or defibrillator is implanted may cause these devices to malfunction.
- Refer to the "Important General Cautions," "Interactions," or other relevant sections in the accompanying documentation of the implantable pacemaker or defibrillator and take the prescribed measures before irradiating the implanted region of these devices with consecutive pulse X-rays.

Fluoroscopy or radiography performed by irradiating consecutive pulse X-rays (such as serial radiography with a few second intervals, pulsed fluoroscopy, digital angiography, DSA, or cineradiography) can adversely affect the CMOS circuit in implantable pacemakers and defibrillators. Such affects may cause oversensing in these devices that can temporarily inhibit pacing pulse output and result in an inappropriate heart rate.

Pediatric Imaging

General

X-ray diagnosis is convenient and useful to visualize inside of human body, however the use of X-ray has potential risk. This section describes pediatric imaging consistent with ALARA¹ principles to minimize the radiation dose.

Exposure to ionizing radiation is of particular concern in pediatric patients for three reasons:²

- 1) younger patients are more radiosensitive than adults (i.e., the cancer risk per unit dose of ionizing radiation is higher for younger patients);
- 2) younger patients have a longer expected lifetime for the effects of radiation exposure to manifest as cancer; and
- 3) use of equipment and exposure settings designed for adult use can result in excessive radiation exposure for the smaller patient.

Besides this section, the some websites provide additional information for pediatric imaging.

American College of Radiology: <http://www.acr.org>

Image Gently: <http://www.imagegently.org>

US Food and Drug Administration, FDA: <http://www.fda.gov>

1 ALARA: As Low As Reasonably Achievable

2 FDA DRAFT GUIDANCE, Pediatric Information for X-ray Imaging Device Premarket Notifications, May 10, 2012

Suggestions for Pediatric Imaging

This section describes some suggestions for reducing dose of pediatric imaging.

They are:

- minimizing unnecessary dose;
- adjusting parameters and
- monitoring dose indications.

Minimizing unnecessary dose

To minimize unnecessary dose, adjust the collimator to cover just region concerned and the region concerned to be center of the image. Before exposure, use proper protective means in accordance with predefined guidelines, ex. protective clothes, when applicable, and check the parameters or the selection of proper preset which influence the radiation dose, based on ALARA principles.

■ Adjusting parameters

Select a preset based on patient size or region concerned. That is a start point for adjusting parameters like kVp and MAS. Some of the systems equip detachable grid to reduce dose. Consultation with professionals to adjust proper parameters based on ALARA principles is strongly recommended.

■ Monitoring dose indications

It is important to measure and quantify radiation dose for each patient. Some of the X-ray Diagnostic Imaging Systems equip the means to display estimates of entrance dose (dose-area product for general radiographic system or air kerma for interventional or non-interventional fluoroscopic system). Some also have means to store radiation dose information in the DICOM header of each image or means to generate separate radiation dose information besides clinical images. It is suggested to utilize those capabilities to monitor radiation dose, and consequently to minimize radiation dose to the patient.

Warranty

The system is warranted to be free from defects in material and workmanship for one year from the date of delivery. If found to be defective, the system must be offered to Shimadzu for inspection and examination. Upon examination, Shimadzu, at its sole option, will repair or replace at no charge, the system or any part found to be defective. Components which wear are not warranted.

This warranty extends to original purchaser or the lessee of the new system only.

If the system is to be resold or delivered to a third party, such third party must be provided with a copy of this manual, the installation manual and the technical manual supplied with the system.

This warranty does not apply to the following:

1. Failure or damage due to any installation, relocation, or service not provided by your SHIMADZU service representative or a SHIMADZU designated contractor.
2. Failure or damage caused by the product of other companies (except those purchased from SHIMADZU).
3. Failure or damage due to repairs using non-SHIMADZU certified service parts.
4. Failure or damage due to non-compliance with the notices and procedures set forth in this manual.
5. Failure or damage due to any operating environment deviating from the requirements set forth in this manual.
6. Failure or damage due to natural disasters such as power surge, rain, fire, earthquake, flood, and thunder.

Service after the expiration of the warranty is available at a reasonable cost and should be performed by your Shimadzu service representative.

IN NO EVENT SHALL SHIMADZU AND ITS AFFILIATED ENTITIES BE LIABLE TO ANY PERSON OR ENTITY FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES (INCLUDING, WITHOUT LIMITATION, ANY DAMAGES RESULTING FROM LOSS OF USE, BUSINESS INTERRUPTION, LOSS OF PROFITS, LOSS OF SAVINGS, THE COST OF PROCUREMENT OR SUBSTITUTED GOODS, SERVICES OR TECHNOLOGIES OR FOR ANY MATTER ARISING OUT OF OR IN CONNECTION WITH THE USE OR INABILITY TO USE THE SYSTEM.

In some jurisdictions, some of the foregoing warranty disclaimers or damage limitations may not apply.

Shimadzu will be indemnified for any claims, liability, or damage arising out of the misuse or non-compliance with this manual by the purchaser or lessee of the system.

Software License Agreement



1. Definition of licensed software

The licensed software ("software") refers to all computer programs used by the product, in addition to all related documentation.

2. Ownership of license

The software used in this product is copyrighted by Shimadzu Corporation ("Shimadzu") who possesses all rights, including sublicenses for those rights (for copyrights, etc.) held by third parties.

The equipment with the installed software is sold on the basis of Shimadzu licensing the software ownership to the customer.

Accordingly, when the customer uses the software, the customer must observe the items outlined below:

- (1) The customer shall only use the software for use with a single equipment.
- (2) The intellectual property rights for the software are not transferred to the customer.
- (3) The customer, or any third party, is prohibited from performing any of the following actions:
 - Duplicating the software.
 - Changing the software, in whole or part.
 - Transferring, loaning, or sublicensing the software.
 - Transferring the software outside Japan without prior permission of the Japanese or U.S. government.

Software Version

The information in this Instruction Manual is based on the following software version.

Version: Ver.01

Service Life

The equipment lifetime is 10 years (based on Shimadzu's criteria) assuming the specified maintenance checks are performed.

Disposal Precautions

 CAUTION	
 Instructions	When disposing of the equipment, contact your Shimadzu service representative. An improper disposal of this equipment may pollute the environment by substances contained in parts.

Action for Environment (WEEE)

To all users of Shimadzu equipment in the European Union:

Equipment marked with this symbol indicates that it was sold on or after 13th August 2005, which means it should not be disposed of with general household waste. Note that our equipment is for industrial/professional use only.



WEEE Mark

Contact your Shimadzu service representative when the equipment has reached the end of its life. They will advise you regarding the equipment take-back.

With your co-operation we are aiming to reduce contamination from waste electronic and electrical equipment and preserve natural resource through re-use and recycling. Do not hesitate to ask your Shimadzu service representative, if you require further information.

Inspect the safety labels periodically (once a year).

If any label is peeled or unreadable by stain or scratch, replace it with a new one.

For new labels, contact your Shimadzu service representative.



Related Instruction Manuals

Component	Document Name	Document No.
Digital radiography unit	Digital Radiography System DR-300 Instruction Manual (Image Acquisition)	M517-E210
	Digital Radiography System DR-300 Instruction Manual (Post Processing)	M517-E211
X-ray tube unit	0.7/1.2JG326D-265 Instruction Manual	M535-E324
	0.4/0.7JG326D-265 Instruction Manual (Not sold in the US)	M535-E329
	0.6/1.2P324DK-125 Instruction Manual	M535-E277
Collimator	COLLIMATOR TYPE R-300 OPERATION MANUAL	M526-E024
Ceiling tube support	CEILING TUBE SUPPORT CH-200/CHU-200 OPERATION MANUAL	M514-E070
General radiography console	SONIALVISION G4 Additional Console Option Instruction Manual	M501-E102

Guide to Abbreviations

EMC	: Electro Magnetic Compatibility
FPD	: Flat Panel Detector
AEC	: Automatic Exposure Control
HU	: Heat Unit
IBS	: Image Brightness Stabilizer
kV	: kilovolt
LED	: Light Emitting Diode
mA	: milliamper
mAs	: milliamper second
min	: minute
ms (msec)	: millisecond
sec	: second
RIS	: Radiology Information System
CR	: Computed Radiography
SID	: Source Image Distance
DSA	: Digital Subtraction Angiography
DR	: Digital Radiography
SDA	: Subdivisional Acquisition
ERCP	: Endoscopic Retrograde Cholangio-Pancreatography

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Chapter *1*

Overview

This chapter describes the applications and features of SONIALVISION G4.

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1.1 Applications

SONIALVISION G4 is a multi-purpose X-ray R/F system that can meet a wide range of requirements for individual clinics.

The main applications are as follows:

- Fluoroscopy diagnosis
- Gastrointestinal series
- Angiography
- General radiography

Do NOT use this system in imaging studies intended for cerebrovascular and cardiovascular applications.

1.2 Features

- A large-field 17-inch FPD and digital image processing enable you to acquire high quality diagnostic images.
- The equipment employs a high-frequency inverter system with maximum frequency of 50 kHz for high-voltage generation and ensures high efficiency by low-ripple output.
- The X-ray diagnostic table holds a wide examination area and allows radiography from head to foot without the need to move the patient.
- The tabletop can be raised or lowered in the height range from 47 cm to 110 cm to help the patient get on or off and allow the operator to take an unforced pose according to required examinations.
- The operator can assist the patient while operating the X-ray diagnostic table on its front control panel.
- The control panel is equipped with a 10.4-inch LCD touch panel, where the operator can view the patient information or change the fluoroscopy or radiography condition. The screen layout or display options can be switched as appropriate according to the purpose of examination. Customizable hard switches help you access to the frequently used functions with a single touch of a button.
- Low-dose exposure and high image quality are achieved at the same time by incorporating automatic selection of BH-filter (X-ray filter), wave-tail cut-off mechanism for pulsed fluoroscopy, detachable anti-scatter grid, virtual collimation, and single-mask collimator (option).
- A series of radiography conditions for examination can be registered in a program to repeat the same series of radiography.
- Image data can be stored for a prolonged period by saving it on DVD-R or CD-R disks in DICOM format.
- The equipment supports DICOM3.0 and allows smooth connection to a hospital network. DICOM Print, Media Storage, DICOM Storage, MWM/MPPS (option) and RDSR (option) are also supported.

1.3 Principle

1

This equipment detects the X-rays, which are radiated from the X-ray tube unit and passed through the patient's body, using a flat-panel detector (FPD), converts them into digital image data, and takes it into the image processing unit. The image processing unit displays digitally processed images on the monitor, records the images, and transfers them to network.

It is also possible to perform general radiography in combination with the second tube (option) and cassettes.

1.4 Configuration

1.4.1 Standard Components

SONIALVISION G4 comprises the following parts.

Unit	Name	Component
X-ray diagnostic table	Remote controlled X-ray diagnostic table ZS-200	X-ray diagnostic table body ^{*1} Control cabinet (for X-ray diagnostic table) Remote control panel Anti-scatter grid ^{*1} Tabletop mat ^{*1, *2} Foot rest ^{*1, *2} , Hand grips ^{*1, *2} , Upper hand grip ^{*1, *2} , Shoulder rests ^{*1, *2}
Digital radiography unit	Digital Radiography System DR-300	Control cabinet (for digital radiography unit) Operation cabinet FPD ^{*1, *3} Acquisition monitor, Reference monitor Touch panel ^{*1, *4} Keyboard, Mouse
High-voltage generator	Diagnostic X-ray High-Voltage Generator D150BC-40S (D150VC-40S<Not sold in the US>)	Control cabinet (for high-voltage generator) Hand switch Phototimer receiver ^{*1, *3}
X-ray tube unit	Medical X-Ray Tube Unit 0.7/1.2JG326D-265 (0.4/0.7JG326D-265< Not sold in the US>)	X-ray tube ^{*1, *3}
Collimator	Collimator R-300	Collimator ^{*1, *3}

*1: Equipment suitable for use in patient environment

*2: The patient's body comes into contact with these parts (applied parts).

*3: Incorporated in the X-ray diagnostic table

*4: Incorporated in the remote control panel

1.4.2 Optional Components

1

Name	Description
Remote control desk	Desk incorporating a remote control panel and an operation cabinet for digital radiography unit.
Remote control panel box	Required when a remote control panel is placed on a desktop.
Remote control panel cart	Cart for mounting a remote control panel.
Remote control panel installation kit	Required when the remote control panel is installed in a desk other than the remote control desk.
Local console ^{*1}	Local console for operations in the examination room.
Local console with touch panel ^{*1}	Local console for operations in the examination room, which is equipped with the same touch panel as the remote control panel.
Monitor cart ^{*1}	Cart that holds the monitor inside the examination room.
Monitor cart with control panel ^{*1}	Cart that holds the monitor inside the examination room, which is equipped with a proximity control panel.
Acquisition monitor for the examination room ^{*1}	Acquisition monitor to use inside the examination room.
Reference monitor for the examination room ^{*1}	Reference monitor to use inside the examination room.
Microphone ^{*1} and speaker for intercom	For communications between the examination room and control room.
Upper GI examination unit ^{*1, *2}	Compression unit and barium cup holder used for upper GI examinations.
Compression band ^{*1, *2}	Used to hold the patient when observing while compressing the region of interest.
Leg support ^{*1, *2}	Used for urological examination in a horizontal position.
Endoscope support ^{*1}	Used to secure the endoscope fiber.
Drain bag ^{*1, *2}	Plastic disposal bag for urological examination.
Elbow support ^{*1}	Used to hold the operator's elbow for urological examination.
Voiding Cystographic Chair ^{*1, *2}	Used for urological examination in a sitting position.
Rotary foot rest ^{*1, *2}	Foot rest used to turn the standing patient on his or her body axis.
Foot rest for myelography ^{*1, *2}	Used for myelography examination.
Foot switch for examination room ^{*1}	Foot switch used for fluoroscopy or radiography at a remote place from the control console in the examination room.
Foot controller ^{*1}	Foot controller used to operate the X-ray diagnostic table in the examination room.
Withstand load 500 lb option	Withstand load increased from standard 450 lb (204 kg) to 500 lb (227 kg).
Hand grip (D) ^{*1, *2}	Large-sized hand grip.
Hand grip Bar (E) ^{*1, *2}	Used to support a patient in the lateral position in the SLOT radiography.

Name	Description
Fixing Belt ^{*1, *2}	Used to support a patient in the vertical position in the SLOT radiography.
Exclusive Footrest ^{*1, *2}	Used for the SLOT radiography in the vertical position. It is attached to the footrest.
Drip hanger ^{*1}	Drip hanger to fit on the tabletop of the X-ray diagnostic table.
Auxiliary tabletop ^{*1, *2}	Used to extend the X-ray diagnostic table by 600 mm.
Auto transformer ZAT-1	Built in the control cabinet (for X-ray diagnostic table) if the power voltage for high-voltage generator and X-ray diagnostic table is other than 200 V.
DSA radiography option	Optional software for DSA radiography.
RSM-DSA radiography option	Optional software for RSM-DSA radiography.
SLOT radiography option	Optional software for SLOT radiography.
Tomosynthesis option	Optional software to acquire Tomosynthesis images.
DICOM Storage option	Optional software that transfers radiographic images to a server.
DICOM MWM option	Optional software that acquires study information from the server.
DICOM MPPS option	Optional software that transfers the study status and records to a server.
DICOM RDSR option	Optional software that transfers the radiation dose information in the report format to a server.
Barcode reader	Used to input patient information from a barcode.
UPS	Allows the digital radiography unit to be safely shut down when a power failure occurs during the equipment operation.
High-voltage generator control panel GSC-2002L	Console used exclusively for displaying and altering X-ray conditions.
Auto transformer XAT-2H	Built in the control cabinet (for high-voltage generator) if the power voltage for high-voltage generator and X-ray diagnostic table is 200, 220 or 240 V.
Exposure reduction option ^{*1}	Includes a C-leaf collimator and independent mask collimation to reduce X-ray exposure.
Line marker ^{*1}	Used to check the center of the irradiation field in the longitudinal direction.
Area dosimeter adapter ^{*1} (For VACUTEC)	Adapter for fitting an area dosimeter manufactured by VACUTEC to the collimator.
Lateral cassette holder ^{*1, *2}	Used to hold a cassette for lateral radiography on the X-ray diagnostic table.

*1: Equipment suitable for use in patient environment

*2: The patient's body comes into contact with these parts (applied parts).

		WARNING
	Do NOT connect equipment other than the designated equipment to the system.	
	Prohibitions	

1.5 Environmental Conditions

To obtain proper performance, be sure to use the equipment under the specified environmental conditions.

1.5.1 Operation Environment

The installation of a dedicated air-conditioner is recommended if the building air-conditioner cannot maintain the necessary environmental conditions 24 hours a day.

■ Examination Room

Item	Condition
Atmosphere	No explosive or corrosive gases
Ambient temperature	10 to 30 °C
Relative humidity	15 to 75 % (No condensation)
Atmospheric pressure	800 to 1060 hPa

■ Operation Room

Item	Condition
Atmosphere	No explosive or corrosive gases
Ambient temperature	10 to 30 °C
Relative humidity	20 to 70 % (No condensation) * It is recommended to use a dehumidifier for humidity control.
Atmospheric pressure	800 to 1060 hPa
Environmental illuminance	150 to 500 lx
Ambient noise level	70 dB max.


WARNING



Prohibitions

Do NOT use the equipment in an oxygen-rich environment.

Using the equipment in an oxygen-rich environment may cause fire, which may lead to fatal or serious injuries to the patient or damage to the equipment.


CAUTION

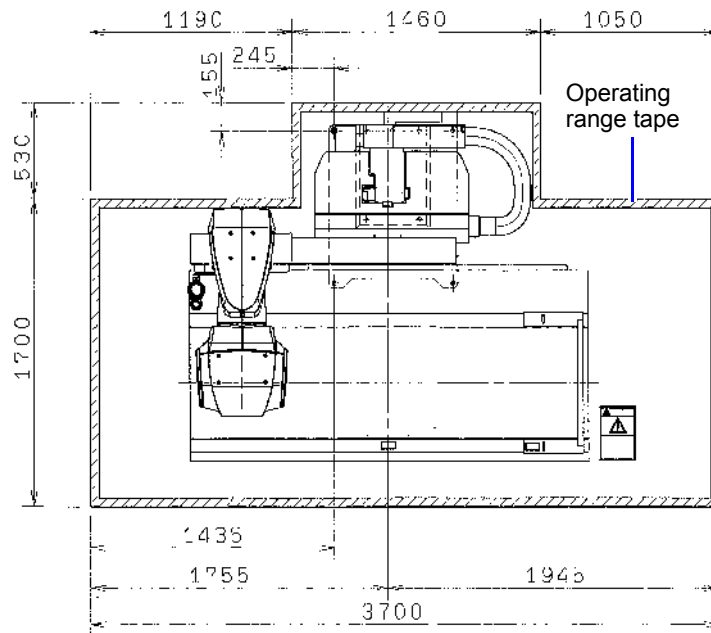


Prohibitions

Even under the prescribed conditions, do NOT change the temperature or humidity rapidly.

Condensation may occur and cause failure. Also, rust or corrosion may occur inside the equipment.

Operating Range



1.5.2 Transportation and Storage Environment

Item	Condition
Ambient temperature	-10 to 60 °C
Relative humidity	10 to 95 % (No condensation)
Atmospheric pressure	700 to 1060 hPa


CAUTION



Instructions

Condensation inside the equipment may cause rust formation or corrosion.

Under low ambient temperature, freezing could occur and damage the internal circuit.

Exercise care when storing the equipment in a place with sharp changes in temperature and humidity, such as a warehouse.

1.5.3 Amount of Heat Generation

	Component	Power ON	Power OFF
Examination room	X-ray diagnostic table body Control cabinets Local console with monitors	Approx. 2700 kcal/h	Approx. 640 kcal/h
Operation room	Remote control desk	Approx. 160 kcal/h	Approx. 30 kcal/h

- The amount of heat generation for "Power OFF" is generated by the continuous power supply unit.
- The heat from a person in each room is not included.

1.5.4 Power Supply

DANGER

Instructions

Be sure to use the power supply specified in the instruction manual.

Using a power supply other than the one specified may cause equipment malfunction or serious accidents such as fire, smoke emission, or explosions.

■ Power Supply 1 (for Digital Radiography Unit)

- Nominal voltage: 200/220/230/240 VAC, single phase
- Frequency: 50/60 Hz
- Allowable voltage range (at no load): Nominal voltage $\pm 10\%$
- Electric capacity: 7.0 kVA
- Grounding resistance: 100 Ω max.

■ Power Supply 2 (for High-Voltage Generator, X-ray Diagnostic Table)

- Nominal voltage: 200/220/240/380/400/415/440/480 VAC, 3-phase
- Frequency: 50/60 Hz
- Allowable voltage range (at no load): Nominal voltage $\pm 10\%$

Electric capacity and recommended transformer capacity:

Item	Capacity
Electric capacity	133 kVA
Recommended transformer capacity	75 kVA

Auto transformers to be combined:

Voltage	Auto Transformer
200 V	XAT-2H
220/240 V	XAT-2H, ZAT-1
380/400/415/440/480 V	ZAT-1

Power supply impedance:

Voltage	Power Supply Impedance
200/220/240 V	0.054 Ω max.
380 V	0.10 Ω max.
400 V	0.11 Ω max.
415 V	0.12 Ω max.
440 V	0.13 Ω max.
480 V	0.16 Ω max.

Nominal cross-sectional area of incoming line:

Transformer capacity: 75 kVA, conduit wiring

Voltage	Incoming Line Length (Single)									
	Up to 10 m	Up to 20 m	Up to 30 m	Up to 40 m	Up to 50 m	Up to 60 m	Up to 70 m	Up to 80 m	Up to 90 m	Up to 100 m
200 V	14	22	38	38	60	60	60	100	100	100
415 V	5.5	8	14	22	22	22	38	38	38	38

(Units: mm²)**Safety devices**

Voltage	Type	Fuse or Breaker Rated Current
200 V line	Breaker	100 A
	Knife switch and fuse	
400 V line	Breaker	75 A



When installing an earth leakage breaker with any power voltage, be sure to use an inverter-type earth leakage breaker to prevent malfunctions in the high-frequency circuits.

Grounding conditions

Voltage	Grounding Resistance
200 V line	100 Ω max.
400 V line	10 Ω max.



WARNING



Instructions

Be sure to connect the equipment only to a (commercial) power outlet with a ground terminal.

If the outlet does not have a ground terminal, electric shock may occur.



NOTE

Open the wiring circuit breaker or knife switch of the switchboard that the equipment is connected to before removing the equipment from the power supply.

1.6 Classification of Equipment

This equipment is classified as follows, based on safety standards for electrical medical equipment.

■ Protection Method Against Electric Shock

Class I equipment

■ Classification of Applied Parts

Equipment including Type B Applied Parts

■ Operation Mode

Continuous operation

■ Degree of Protection Against Liquid Ingress

- Ordinary equipment
- Foot switch: IPX1
Foot controller: IPX4
Otherwise: Regular

*: The IPX Waterproof Specification, specified by the International Electrotechnical Commission, indicates waterproof/drip-proof performance on instruments and equipment.

■ Use in an Oxygen-Rich Environment

 WARNING	
 Prohibitions	Do NOT use the equipment in an oxygen-rich environment. Using the equipment in an oxygen-rich environment may cause fire, which may lead to fatal or serious injuries to the patient or damage to the equipment.

■ Use in Flammable Atmosphere

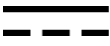
 DANGER	
 Prohibitions	Do NOT use the equipment or system in the presence of flammable anesthetic gas. Doing so may cause an explosion.

■ Classification of Installation Type

Permanent installation type equipment

1.7 Symbols

The symbols used on the equipment are shown below:

Symbol	Location	Meaning
	On name plate	Alternating current
	On name plate	Direct current
	Inside the equipment, where protective earth conductor in power cord is connected	Protective earth ground
	On applied parts	Safety classification: Type B
	Remote console	Power ON (partial circuit ON)
	Remote console	Power OFF (partial circuit OFF)
	On name plate	Refer to instruction manual
	On warning and caution labels	Observe described items, or refer to instruction manual.
	On name plate	Refer to instruction manual
	On name plate	Serial number
	On name plate	Year and month of manufacture
	On name plate	Manufacturer

Symbol	Location	Meaning
	Base of X-ray diagnostic table	Refer to instruction manual
	Collimator	Danger of X-ray irradiation

1.8 Operator Profile

Item	Details
Age	Age that person can obtain the license of Radiological Technologist or a license equal to it.
Sex	No limitation
Nationality	No limitation
Education	Radiological Technologist or person who has a license equal to it. The capacity to read and understand the instruction manual.
Knowledge	Radiological Technologist or person who has a license equal to it.
Language	Can read and understand English.
Experience	Necessary. Every operator needs to take training for operating the equipment before using the equipment.
Permissible impairments	Corrected eyesight is over 0.7 using the decimal system (70%). Impaired by 40% resulting in 60% of normal hearing at 500 Hz to 2 kHz.

1.9 Indications for Use [For United States and Canada]

- The equipment is intended to be used for the fluoroscopy/radiography diagnosis in hospital.
- The equipment must only be operated by qualified personnel, such as radiography technicians or those with equivalent qualifications.
- The equipment is used for total patient population.
- The equipment is NOT intended to be used for Mammography screening.
- The equipment is NOT intended to be used for interventional procedure.
- The equipment is used for radiographic, fluoroscopic, angiographic and pediatric examinations.
- Stored images in the equipment can be used for re-monitoring, image processing, storing to optical media (CD/DVD), and sending to DICOM server.
- The Tomosynthesis option for the SONIALVISION G4 is intended to generate tomographic images of human anatomy including chest or extremities. Tomosynthesis technique is used to produce a specific cross-sectional plane of the body by reconstruction of tomographic acquisition. The device is not intended for mammographic applications.

 WARNING	
	United States Federal Law restricts this device to sale by or on the order of a physician.
Instructions	

Chapter 2

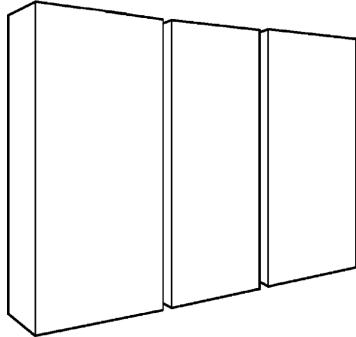
Configuration

This chapter outlines the configuration of this system.

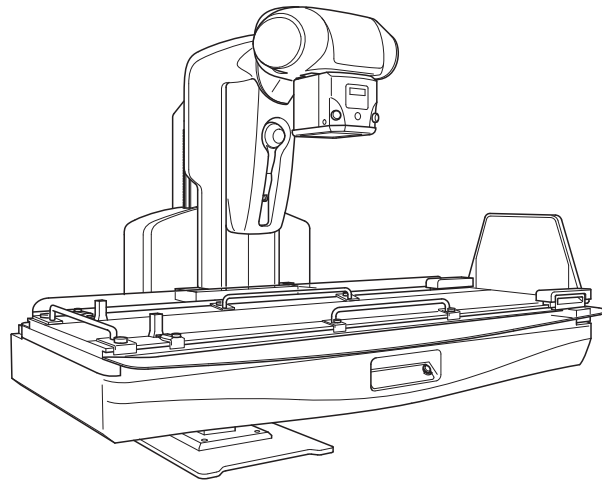
■ Contents

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2.4	Local Console and Monitor Cart (Optional).....	2-19
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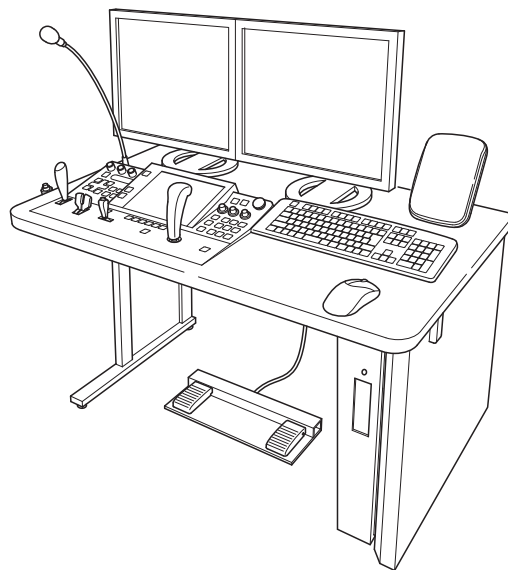
2.1 Configuration



Control cabinet



X-ray diagnostic table

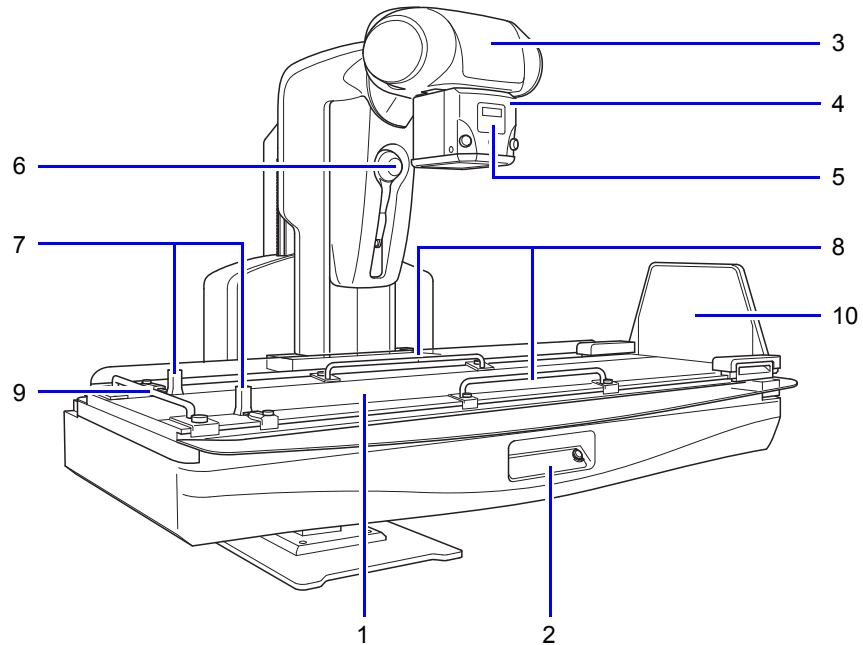


Remote control desk

2.2 X-ray Diagnostic Table

2.2.1 X-ray Diagnostic Table

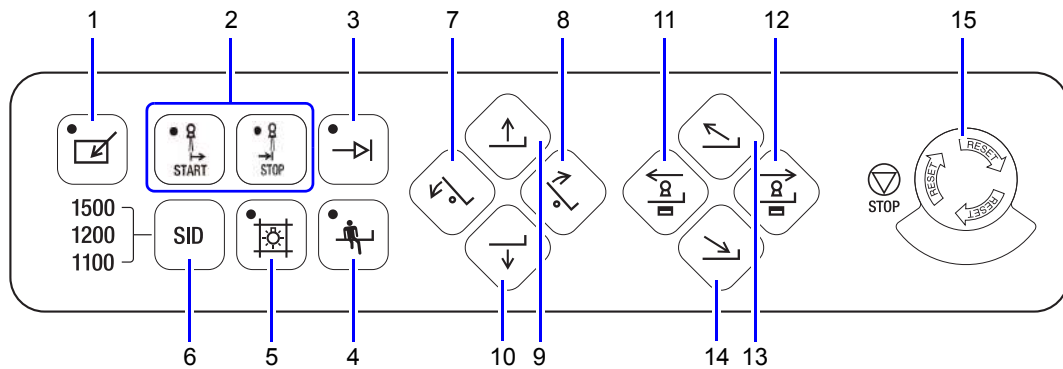
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No.	Name	Function
1	Tabletop ^{*1}	The patient lies on this.
2	X-ray diagnostic table front control panel	This panel mainly controls the X-ray diagnostic table.  Reference P.2-4
3	X-ray tube unit	This radiates X-rays.
4	Collimator	This controls the area of X-ray exposure to the irradiation field required for fluoroscopy or radiography.
5	Collimator control panel	This panel mainly controls the collimator.  Reference P.2-5
6	Compression unit ^{*1}	This is used when compression is utilized on the patient.  Reference P.4-63
7	Shoulder rests ^{*1}	These are used to support the patient's body when the tabletop is tilted.
8	Hand grips ^{*1}	
9	Upper hand grips ^{*1}	
10	Foot rest ^{*1}	

^{*2}: The patient's body comes into contact with these parts (applied parts).

2.2.2 X-ray Diagnostic Table Front Control Panel



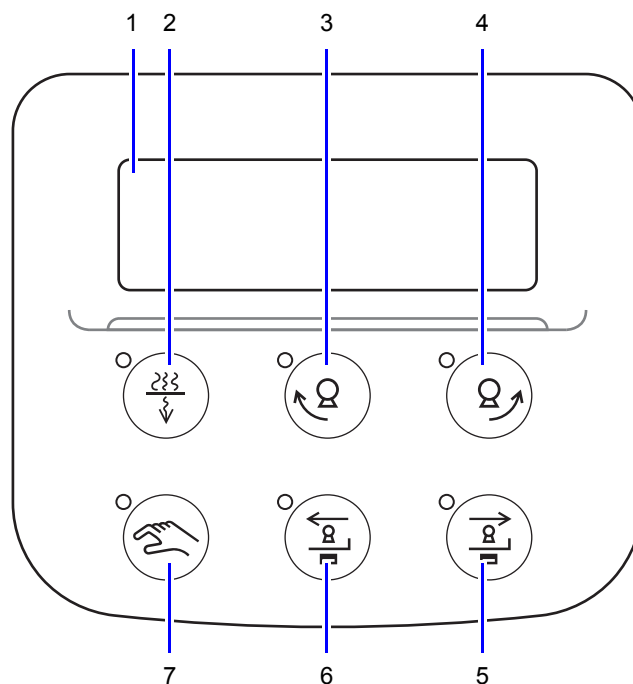
No.	Form	Name	Function
1		Operational button	When this button is lit, the X-ray diagnostic table can be operated via the front control panel. Reference P.4-47
2		Start point button (optional)	Sets the start and stop points in the SLOT radiography (Option). Reference P.4-153
		Stop point button (optional)	
3		Set button *1	Used with the position memory function. Reference P.4-59 Moves the X-ray tube and FPD to the radiography start point in the SLOT radiography (option). Reference P.4-153
4		Tabletop return button	The tabletop returns to the horizontal position and to the height set when it was installed. Reference P.4-59
5		Collimator lamp button	The collimator irradiation field lamp comes on for 30 seconds. If you press this button while the irradiation field lamp is on, the lamp will be turned off. Reference P.4-71
6		SID switchover button	Sets the distance of the FPD input surface from the focal spot of the X-ray tube unit. Reference P.4-58
7		Reverse tilt button *1	The tabletop tilts in the opposite direction. Reference P.4-48
8		Tilt button *1	The tabletop tilts in a vertical direction. Reference P.4-48
9		Raise tabletop button *1	Raises the tabletop. Reference P.4-53
10		Lower tabletop button *1	Lowers the tabletop. Reference P.4-53

No.	Form	Name	Function
11		Imaging unit shift button (towards the head) *1	The imaging unit moves towards where the patient's head is. Reference P.4-57
12		Imaging unit shift button (towards the feet) *1	The imaging unit moves towards where the patient's feet are. Reference P.4-57
13		Tabletop left shift button *1	The tabletop moves towards the patient's left. Reference P.4-51
14		Tabletop right shift button *1	The tabletop moves towards the patient's right. Reference P.4-51
15		Emergency stop button	Brings the movement of the tabletop to an emergency stop. Reference P.5-2

*1: Only moves while the button is being pressed.

2.2.3 Collimator Control Panel

Control Panel



No.	Form	Name	Function
1		Display	Displays data about the irradiation field, SID, etc. The backlight comes on when the X-ray tube unit is selected. It goes out when the No.2 tube unit is selected. Reference P.2-6
2		Filter switchover button	Changes the BH filter. Reference P.4-102

2 Configuration

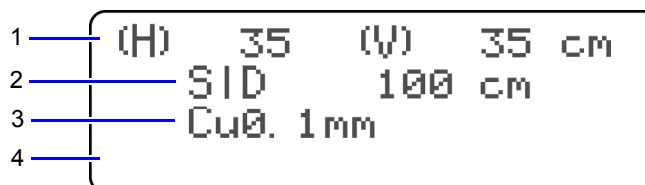
No.	Form	Name	Function
3		X-ray tube unit rotation button	Rotates the X-ray tube unit in the direction of the arrow when the tabletop is in the vertical position.  Reference P.4-196
4			
5		Imaging unit shift button (towards the feet)	The imaging unit moves towards where the patient's feet are.  Reference P.4-196
6		Imaging unit shift button (towards the head)	The imaging unit moves towards where the patient's head is.  Reference P.4-196
7		Manual operation button	The irradiation field can be set while the LED is lit by using the collimator open/close knobs. Press the button to light the LED if  (customizable button) is assigned on the console when using the DR technique.  Reference P.4-70



Hint The function on the C-leaf collimator (optional) or the Independent mask collimator (optional) can be allocated to some buttons on the control panel.

Contact your Shimadzu service representative if you wish to change the layout of the control panel buttons.

Display

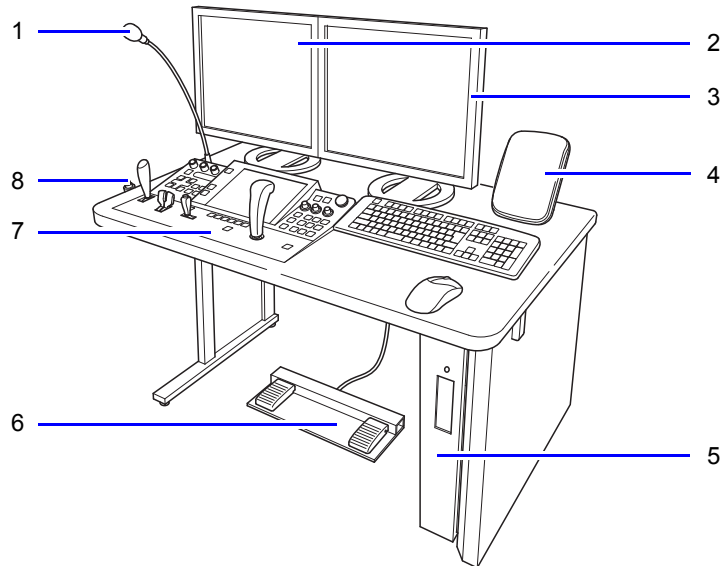


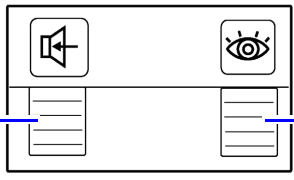
No.	Name	Function
1	Irradiation field	Displays the irradiation field (in cm/inch).
2	SID	Displays the SID value (in cm/inch). Is not displayed while the DR technique is selected.
3	Filter type	Displays the filter type that has been selected.
4	Message	Displays error messages and other operational messages.

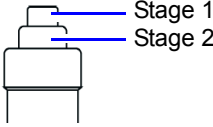
2.3 Remote Control Desk and Remote Console

2.3.1 Remote Control Desk

2

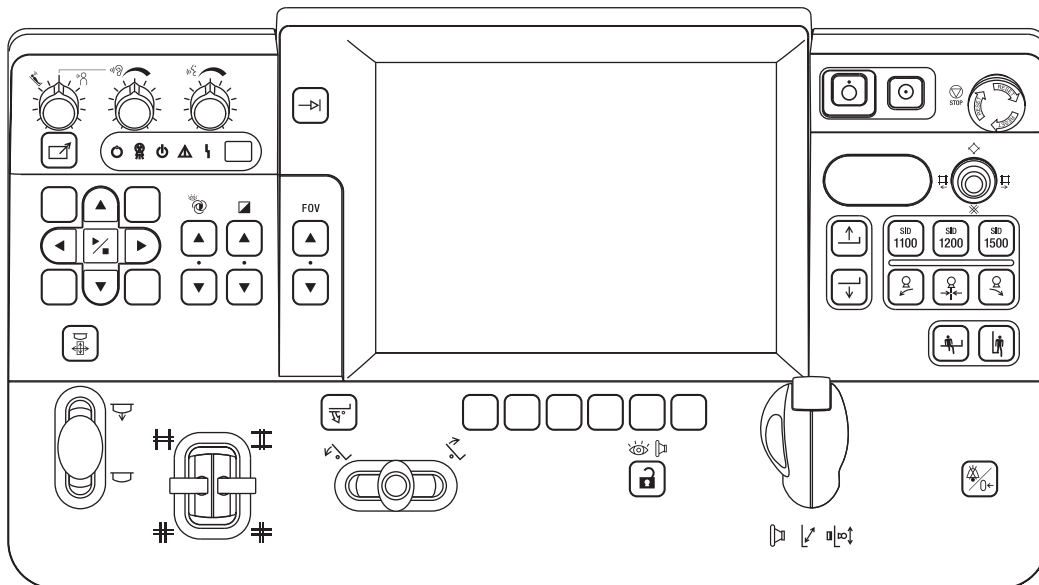


No.	Name	Function
1	Microphone	Your voice is heard from the speaker in the examination room when the intercom foot switch is being pressed down.
2	Acquisition monitor	Images being acquired are displayed in real time.
3	Reference monitor	Displays images whose acquisition is complete and examination control data.
4	Speaker	Transmits sound from the examination room.
5	Operation cabinet	This is the control cabinet of the digital radiography unit.
6	Foot switch	The microphone is enabled when the intercom foot switch (left) is pressed down. Fluoroscopy is performed when the fluoroscopy foot switch (right) is pressed down while the remote console's  button is lit up. 
7	Remote console	This is a console to operate the equipment from outside the examination room.  Reference P.2-8

No.	Name	Function
8	Hand switch	This is a two-stage switch for X-ray radiography. When  on the remote console is lit and this switch is pushed down to the first level, the equipment is in a state of readiness for radiography. When this switch is pushed down to the second level, radiography is performed. 

2.3.2 Remote Console

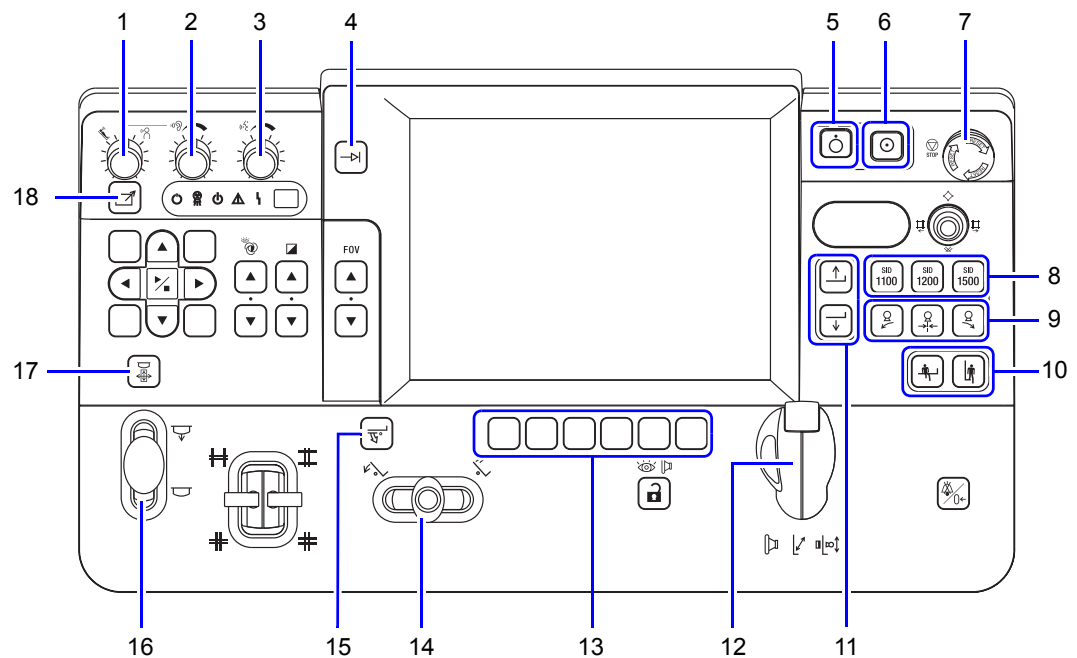
This is a console to operate the equipment from outside the examination room.



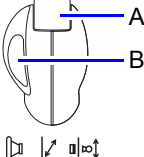
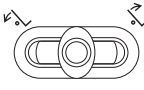
Some of the buttons and levers on the console are connected with the movement of the X-ray diagnostic table and some are connected with X-ray irradiation. They are explained according to function.

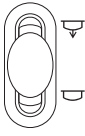
 **Reference** ["Controls that Operate the X-ray Diagnostic Table" P.2-9](#)
["Controls Related to Fluoroscopy and Radiography" P.2-12](#)

Controls that Operate the X-ray Diagnostic Table



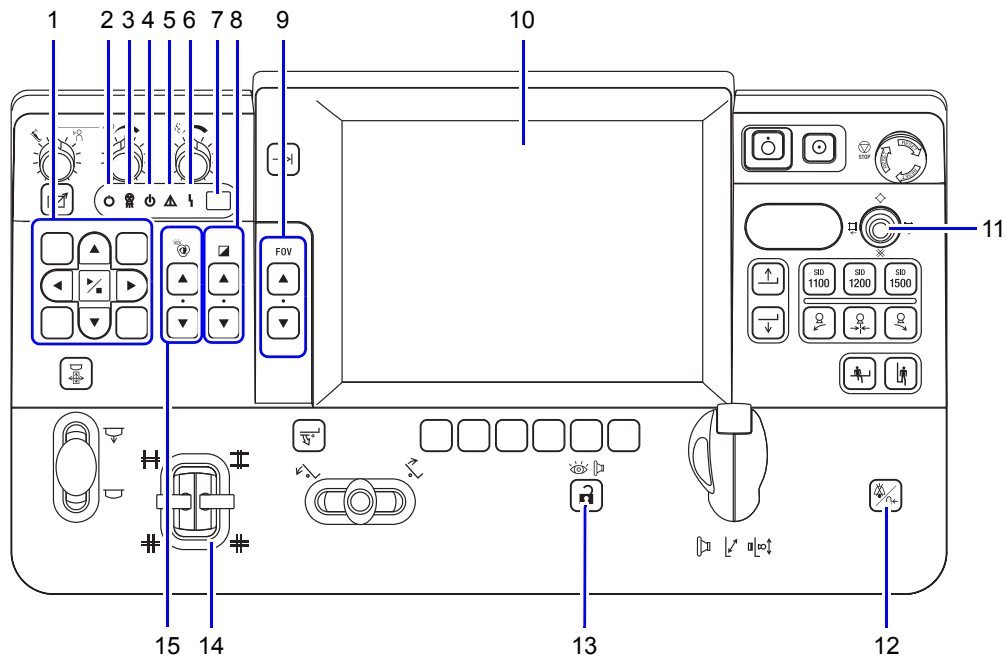
No.	Form	Name	Function
1		Balance adjustment dial	Adjusts the mixing balance between the microphone installed in the tabletop and the auxiliary microphone. Mixing is increased for the tabletop microphone when the dial is turned towards , and increased for the auxiliary microphone when the dial is turned towards . Reference P.4-73
2		Control room speaker volume adjustment dial	Adjusts the volume of the control room speaker. Turning it to the right increases the volume, and turning it to the left lowers the volume. Reference P.4-73
3		Examination room speaker volume adjustment dial	Adjusts the volume of the examination room speaker. Turning it to the right increases the volume, and turning it to the left lowers the volume. Reference P.4-73
4		Set button *1	Used with the position memory function. Reference P.4-59 Moves the X-ray tube and FPD to the radiography start point in the SLOT radiography (option). Reference P.4-153
5		Power OFF button	Turns the system's power off. Reference P.4-34
6		Power ON button	Turns the system's power on. Reference P.4-34
7		Emergency stop button	Brings the movement of the X-ray diagnostic table to an emergency stop. Reference P.5-2

No.	Form	Name	Function
8	  	SID switchover buttons	Sets the distance of the FPD input surface from the focal spot of the X-ray tube unit.  Reference P.4-58
9	  	Oblique projection buttons* ¹	Controls the oblique projection angle of the X-ray tube unit.  slants the X-ray tube unit towards the patient's head and  slants it towards the feet.  returns the X-ray tube unit back to the center from the slanted position.  Reference P.4-58
10	 	Tabletop return buttons* ¹	Returns the tabletop slant and height to the set position.  returns the tabletop to the horizontal position and to the height set when it was installed.  moves the tabletop to the vertical position.  Reference P.4-59
11	 	Raise tabletop button* ¹ Lower tabletop button* ¹	 raises the tabletop and  lowers it.  Reference P.4-53
12		Tabletop and imaging unit control lever* ¹	When tilted to the left or right, the tabletop moves to the left or right. When tilted up or down, the imaging unit moves up or down. A: Radiography button B: Button to change the speed of the tabletop's movement to the left or right  Reference P.4-51 , P.4-57
13		Customizable buttons	You can assign frequently used functions to these buttons.  Reference P.2-25
14		Tabletop tilting lever* ¹	Tilts the tabletop. It is operated while holding down the button on the top of the lever. When it is moved to the right, the tabletop is tilted in a vertical direction. It is tilted in the opposite direction when the lever is moved to the left.  Reference P.4-48
15		Tabletop reverse tilt check button	Press when reversing the tilt of the tabletop. When the button is pressed and lit up, the tilt can be reversed using the tabletop tilting lever.  Reference P.4-49

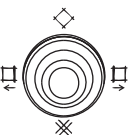
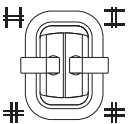
No.	Form	Name	Function
16		Compression unit control lever *1	Controls the compression unit. Push forward to apply compression on the patient. Pull towards you to return the compression unit to its original position.  Reference P.4-63
17		Squeeze compression button	Use this when applying "squeeze compression".  Reference P.4-64
18		Operational button	When this button is lit up, the X-ray diagnostic table and X-ray exposure can be controlled by the remote console.  Reference P.4-47

*1: Only moves while the button is being pressed or the lever is being operated.

Controls Related to Fluoroscopy and Radiography



No.	Form	Name	Function
1		Image control buttons	These are used when looking at the taken images on the acquisition monitor. Their operations vary according to the image display style (display of one frame or display of multiple frames). When one frame is displayed: displays the previous image and displays the next image. displays the previous frame and displays the next frame. starts or stops video playback. When multiple frames are displayed: selects the upper frame and selects the lower frame. selects the left-hand frame and selects the right-hand frame. displays the selected frames one at a time. Refer to "M517-E210 Digital Radiography System DR-300 Instruction Manual (Image Acquisition)" for details. The surrounding four buttons () are customizable buttons. You can assign frequently used functions to these buttons. Reference P.2-25
2		Ready for radiography display	The green light comes on when the preparations for radiography are complete.

No.	Form	Name	Function
3		X-ray irradiating display	The yellow light comes on during X-ray irradiation.
4		System standby status display	The green light comes on when X-rays can be radiated. The light goes off when X-rays cannot be radiated, for example due to a failure.
5		Caution display	The red light comes on when the interlock is on for the X-ray diagnostic table movement or X-ray irradiation.
6		Failure display	The red light comes on when the system's protective circuit is in operation, or when an error has occurred in the system's functions.
7		Caution/failure code display	Displays the caution/failure code when the caution or failure display is lit up.  Reference P.5-13
8		Density buttons	These adjust the density during AEC radiography in 11 stages, from -5 to 5.  increases density and  reduces density.  Reference P.4-94
9		Magnification size switchover buttons	Changes the FPD magnification size through 5 levels.  increases the magnification and  decreases it.  Reference P.4-67
10		Touch panel	Sets the fluoroscopy and radiography conditions. Operated by touching the screen display.  Reference P.2-14
11		Collimator open/close switch	Controls the collimator irradiation field. Controls the C-leaf collimator (optional) and independent mask collimator (optional).  Reference P.4-69
12		Fluoroscopy timer button	Turns off the fluoroscopy timer alarm, and restarts the timer count from 0.  Reference P.4-83
13		X-ray irradiation clearance button	Lights up when pressed, signalling that X-ray irradiation is permitted.
14		Collimator open/close lever	Controls the collimator irradiation field. Controls the collimator in a horizontal/vertical direction.  Reference P.4-68
15		Fluoroscopy density buttons	Adjust the brightness of the fluoroscopy images during IBS fluoroscopy.  brightens the image and  darkens it.  Reference P.4-81

Touch Panel

Operated by touching the screen display.

**CAUTION**

**Do not press hard on the touch panel or place objects upon it.**
Doing so can cause a malfunction.

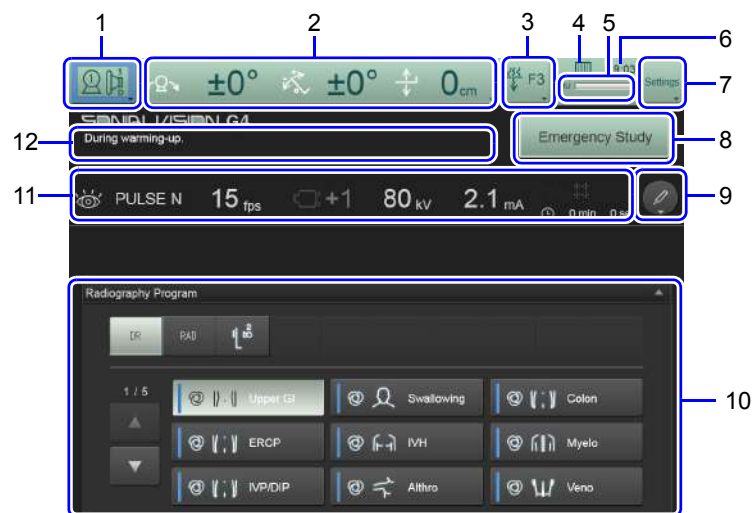
Prohibitions

**CAUTION**

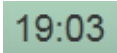
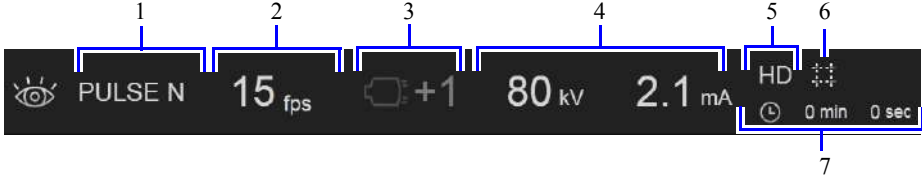
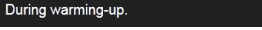
**Do not press 2 or more points on the touch panel at the same time.**
Doing so can cause unexpected operation.

Prohibitions

Display when no examination is being performed (DR technique)



No.	Item	Function
1		The current technique is displayed. Press the button to change the technique.
2	1 2 3  Displays the current position information of the X-ray diagnostic table. 1 Oblique projection angle 2 Tilt angle 3 Tabletop height When the screen is pressed, X-ray diagnostic table related functions can be used.	

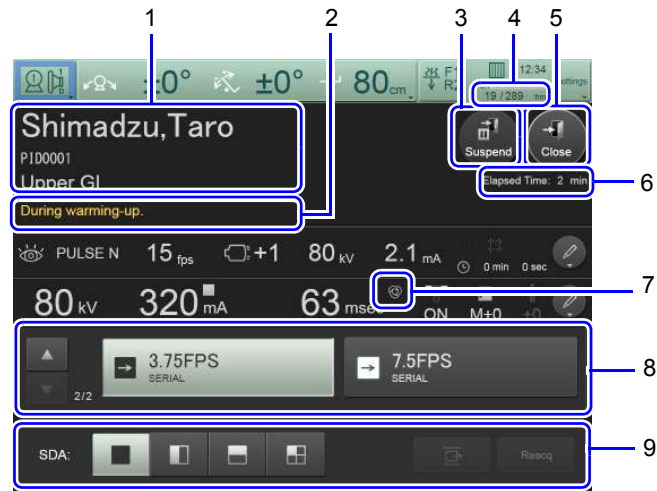
No.	Item	Function
3		Displays the current information of the BH filter. - F: For fluoroscopy - R: For radiography Press this button to browse detailed information about the filter or change the filter.
4		Displays the current information of the grid.
5		Displays the current information of the heat unit.
6		Displays the current time.
7		Press this button to open the settings menu. The settings menu is for selecting the touch panel display mode and the control method for the radiography X-ray conditions and for resetting the fluoroscopy timer/fluoroscopy cumulative time.  Reference P.2-18
8		Starts an emergency study.
9	 Fluoroscopy detailed configuration button	Press this button to set/browse detailed fluoroscopy-related information.
10	 Radiography program display button	Toggles display/hide of the radiography program list.
11	Fluoroscopy information display  The current fluoroscopy conditions and fluoroscopy-related information is displayed. 1 Displays the current fluoroscopy mode. 2 Displays the fluoroscopy pulse rate. 3 Displays IBS ON/OFF and IBS density. 4 Displays the fluoroscopy tube voltage and fluoroscopy tube current. 5 Is lit up while HD fluoroscopy is selected. 6 Is lit up when virtual collimation is on. 7 Displays the fluoroscopy cumulative time.	
12	 Message display	Displays system messages, such as the current system status.

Display when no examination is being performed (other than DR technique)



No.	Item	Function
1		Displays the dose area product value after radiography.
2	 Radiography detailed configuration button	Press this button to set/browse detailed radiography-related information.
3	Radiography information display The current radiography conditions and radiography-related information is displayed. 1 Radiography tube voltage 2 Radiography tube current or radiography current time product 3 Radiography focus 4 Radiography time 5 AEC ON/OFF and photo pickup field 6 Density of AEC and film sensitivity 7 Body thickness correction	

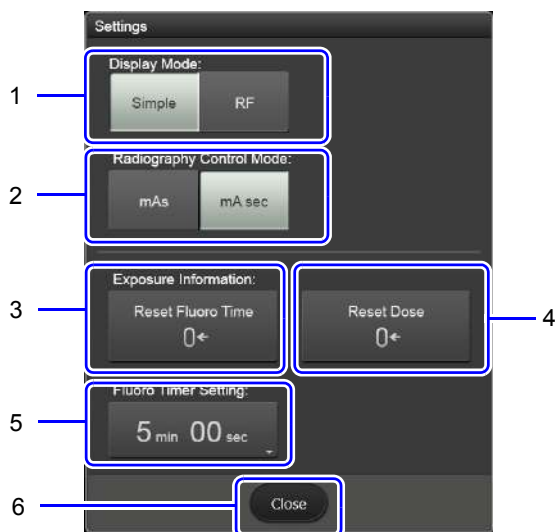
Display during an examination

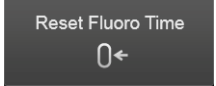
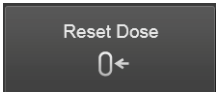
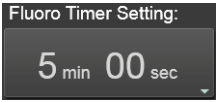
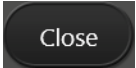


No.	Item	Function
1	Examination information display	Displays the patient's name, ID and procedure.
2	Message display	Displays system messages, such as the current system status.
3	Examination suspend button	Suspends the examination.
4		When serial radiography is selected, the number of shots that can be taken under the current X-ray conditions is displayed as the denominator and the number of shots taken is displayed as the numerator.
5	Examination end button	Ends the examination.
6		The time elapsed since the start of the examination is displayed.
7		This is displayed when memory shot is selected.
8	Protocol display section	The current radiographic protocol is displayed. Press any button to change the radiographic protocol.
9	Subdivisional acquisition information display section	The current subdivisional acquisition settings are displayed. Press any button, for example, to change the subdivisional acquisition settings or retry radiography.

Settings menu

The settings menu is displayed when the [Settings] button is pressed. In the settings menu, the touch panel display mode and the control method for the radiography X-ray conditions can be selected, and the fluoroscopy timer/fluoroscopy cumulative time can be reset.



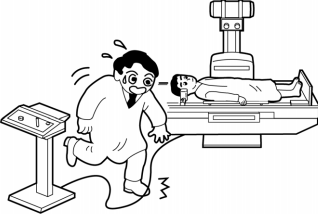
No.	Item	Function
1		Changes the display mode of the touch panel.
2		Selects the control method for the radiography X-ray conditions.
3		Resets the fluoroscopy cumulative time.
4		Resets the cumulative dose information.
5		Sets the fluoroscopy timer.
6		Closes the settings menu.

2.4 Local Console and Monitor Cart (Optional)

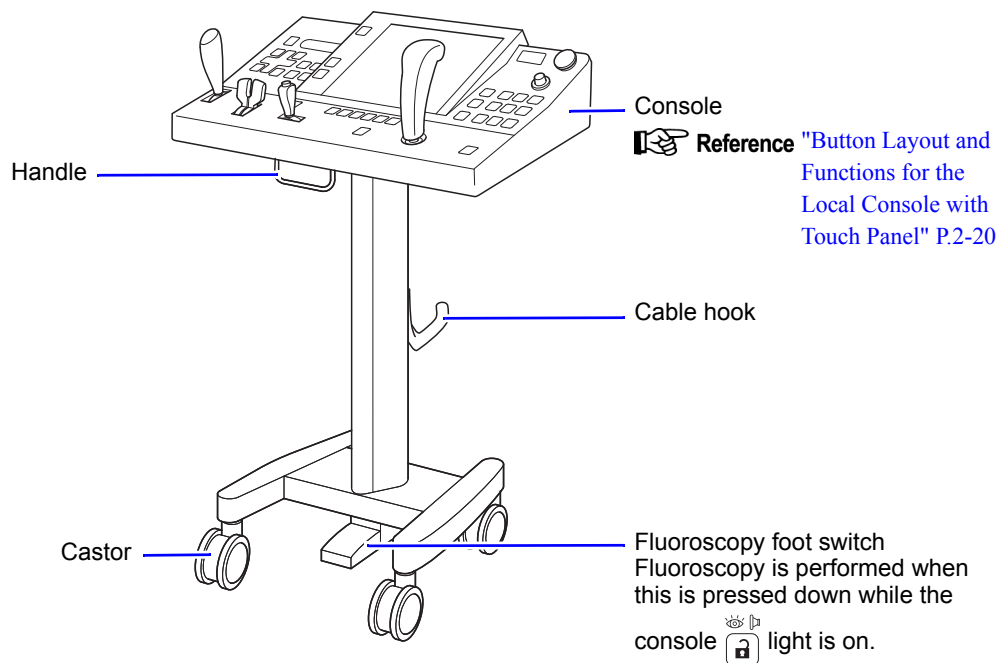
2.4.1 Local Console with Touch Panel

This console comes with a cart so that it can be operated inside the examination room.

2

CAUTION	
 Prohibitions	Do NOT use the local console or monitor cart on a floor that is tilted more than 5°. This could cause the local console or monitor cart to fall over.
 Prohibitions	Do NOT move the local console or monitor cart while their casters are locked. This could cause the local console or monitor cart to fall over.
 Instructions	Move the local console or monitor cart by holding the handle, being careful about bumps and cables on the floor. This could cause the local console or monitor cart to fall over. 
 Instructions	Watch out for the cable of the local console or monitor cart. If you catch the cable with your foot the local console or monitor cart could fall over. 

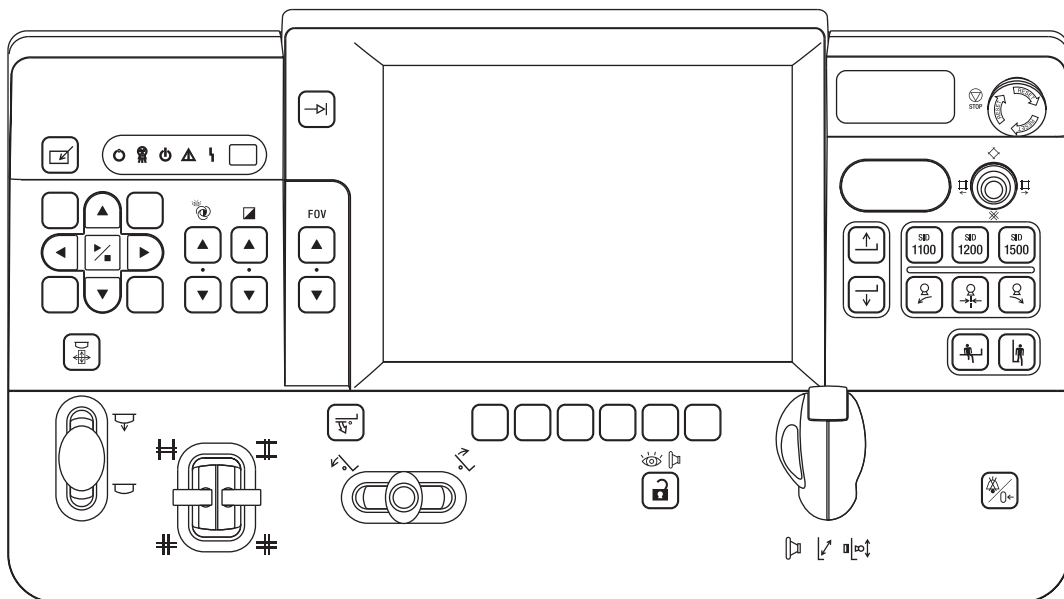
Overall View



Button Layout and Functions for the Local Console with Touch Panel

The touch panel and button operations are the same as those of the remote console, however the local console does not have the following dials and buttons.

- Balance adjustment dial
- Control room/examination room speaker volume adjustment dial
- Power ON button/Power OFF button



2.4.2 Local Console

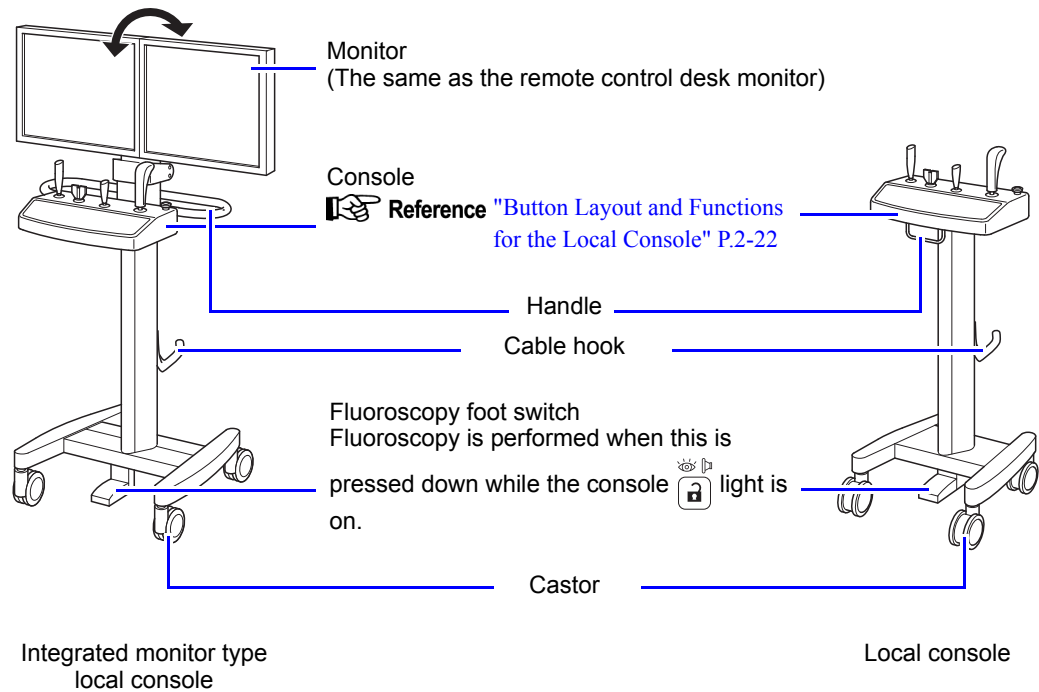
This console comes with a cart so that it can be operated inside the examination room. It is not fitted with a touch panel.

The local console comes in the following types:

- With an integrated monitor for use in the examination room
- Separate from the monitor cart



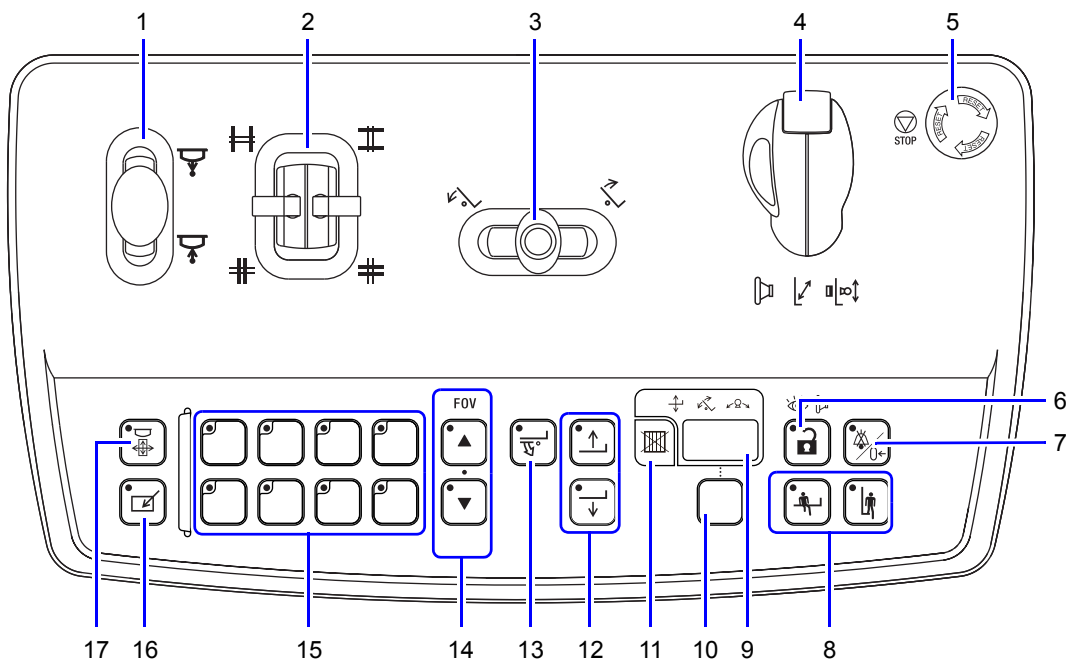
Reference "In Combination with the Monitor Cart" P.2-24



The monitor angle can be raised and lowered. When changing the angle, hold the center of the two monitors and tilt them backwards or forwards.

■ Button Layout and Functions for the Local Console

The button operations are the same as on the remote console, with the exception of some buttons which have been omitted.



No.	Form	Name	Function
1		Compression unit control lever *1	Controls the compression unit. Push forward to apply compression on the patient. Pull towards you to return the compression unit to its original position. Reference P.4-63
2		Collimator open/close lever	Controls the collimator irradiation field. Controls the collimator in a horizontal/vertical direction. Reference P.4-68
3		Tabletop tilting lever *1	Tilts the tabletop. It is operated while holding down the button on the top of the lever. When it is moved to the right, the tabletop is tilted in a vertical direction. It is tilted in the opposite direction when the lever is moved to the left. Reference P.4-48
4		Tabletop and imaging unit control lever *1	When tilted to the left or right, the tabletop moves to the left or right. When tilted up or down, the imaging unit moves up or down. A: Radiography button B: Button to change the speed of the tabletop's movement to the left or right Reference P.4-51, P.4-57
5		Emergency stop button	Brings the X-ray diagnostic table to an emergency stop. Reference P.5-2

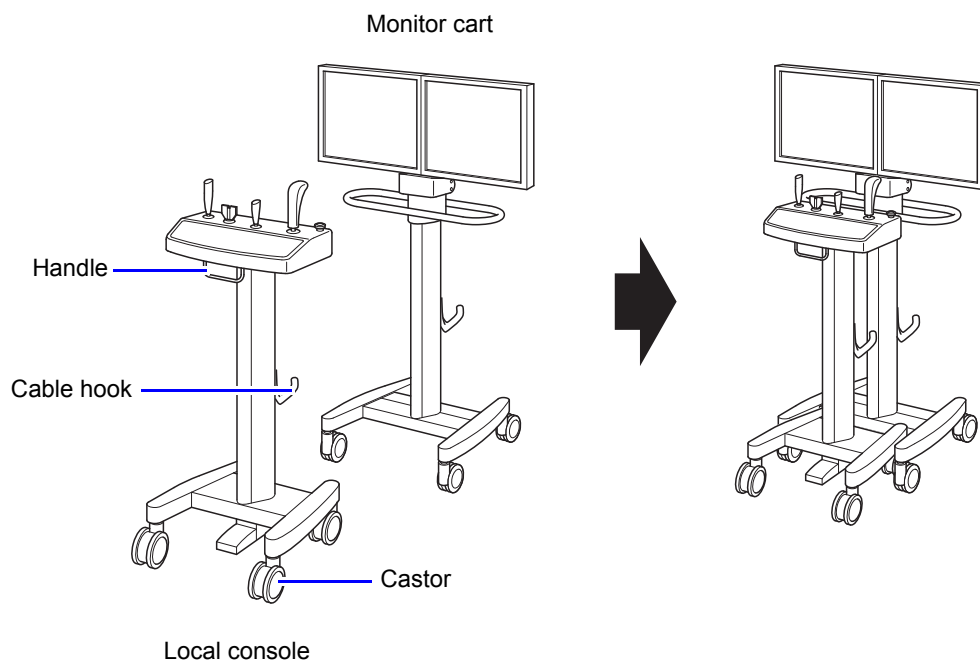
No.	Form	Name	Function
6		X-ray irradiation clearance button	Lights up when pressed, signalling that X-ray irradiation is permitted.
7		Fluoroscopy timer button	Turns off the fluoroscopy timer alarm, and restarts the timer count from 0.  Reference P.4-83
8		Tabletop return buttons*1	Returns the tabletop slant and height to the set position.  returns the tabletop to the horizontal position and to the height set when it was installed.  moves the tabletop to the vertical position.  Reference P.4-59
9		Display	Displays the tabletop height ( above lights up), the angle at which the tabletop is tilted ( lights up) and the angle at which the X-ray tube unit is tilted ( lights up). The caution/failure code is displayed when a caution or failure occurs.
10		Display switchover button	Changes the display on the screen.
11		Grid display lamp	Lights up when the anti-scatter grid has been removed.  Reference P.4-32
12		Raise tabletop button*1 Lower tabletop button*1	 raises the tabletop and  lowers it.  Reference P.4-53
13		Tabletop reverse tilt check button	Press when reversing the tilt of the tabletop. When the button is pressed and lit up, the tilt can be reversed using the tabletop tilting lever.  Reference P.4-49
14		Magnification size switchover buttons	Changes the FPD magnification size through 5 levels.  increases the magnification and  decreases it.  Reference P.4-67
15		Customizable buttons	You can assign frequently used functions to these buttons.  Reference P.2-25
16		Operational button	When this button is lit up, the X-ray diagnostic table and X-ray irradiation can be controlled by the local console.  Reference P.4-47
17		Squeeze compression button	Use this when applying "squeeze compression".  Reference P.4-64

*1: Only moves while the button is being pressed or the lever is being operated.

In Combination with the Monitor Cart

The local console can be combined with the monitor cart. This can be done to save space.

When combining the two, slide the local console's feet between the monitor cart's feet (they cannot be fixed together). Hang the local console cable on the cable hook so that it does not get trodden on, and run it over the top of the base.



The local console and the monitor cart cannot be fixed together. Please move them separately.

2.5 Functions that Can Be Assigned to Customizable Buttons

The functions listed below can be assigned to the customizable buttons as necessary.
Contact your Shimadzu service representative if you wish to do so.

2

Form	Name	Function
	Store fluoroscopy button	Stores images acquired during fluoroscopy to the system's image database.
	Fluoroscopy road map button (optional)	Performs image subtraction so that the position of blood vessels and catheters can be clearly displayed during fluoroscopy.
	Multi-display switchover button	Displays all the images acquired during the examination on the acquisition monitor as a multi-display.
	Virtual collimation button	The irradiation field can be adjusted on fluoroscopy L.I.H. images.
	Image V-reverse button	Fluoroscopy/radiography images are displayed vertically reversed.
	Image H-reverse button	Fluoroscopy/radiography images are displayed horizontally reversed.
	Full screen mode button	Full screen mode or Subdivisional Acquisition (SDA) can be selected.
	Horizontal 2 division (1×2) button	
	Vertical 2 division (2×1) button	
	4 division (2×2) button	
	Subdivision switchover button	Press this button to switch between full screen mode and subdivisional acquisition (SDA).
	Subdivisional re-acquisition button	Re-acquires images in spot subdivisional acquisition.
	Sweep button	When this is pressed after one or more frames have been exposed in SDA, a composite image is created from the images that have been taken so far.
	Tabletop height reset mode button	Resets the tabletop to the registered height after the tabletop is returned to the horizontal level from the vertical or Trendelenburg position.

2 Configuration

Form	Name	Function
	Oblique projection head side button	Slants the X-ray tube to the head side.
	Oblique projection center button	Returns the X-ray tube to the center from the oblique projection position.
	Oblique projection foot side button	Slants the X-ray tube to the foot side.
	SID selection button *1	Selects SID.
	Set button	Moves the X-ray diagnostic table to the position pre-registered by the position memory function.  Reference P.4-59 Moves the X-ray tube and FPD to the radiography start point in the SLOT radiography (option).  Reference P.4-153
	Rotate foot rest clockwise button (optional)	Rotates the foot rest in the specified direction.
	Rotate foot rest anticlockwise button (optional)	
	Collimator lamp button	Lights up and turns the collimator lamp off.
	Collimator relative-movement mode button	This button is used for digital radiography. Adjust the irradiation field using the collimator open/close lever on a non-operational console or the collimator open/close knobs on the collimator.
	Protocol up/down button *1	Selects the protocol.
	Magnification size selection button *1	Selects the magnification size.
	AEC button	Turns AEC on and off.
	Radiography density up/down button *1, *2	Switches the density of AEC radiography.
	Radiography density selection button *1	Switches the density of AEC radiography.
	Fluoroscopy density up/down button *1, *2	Switches the density of IBS fluoroscopy.

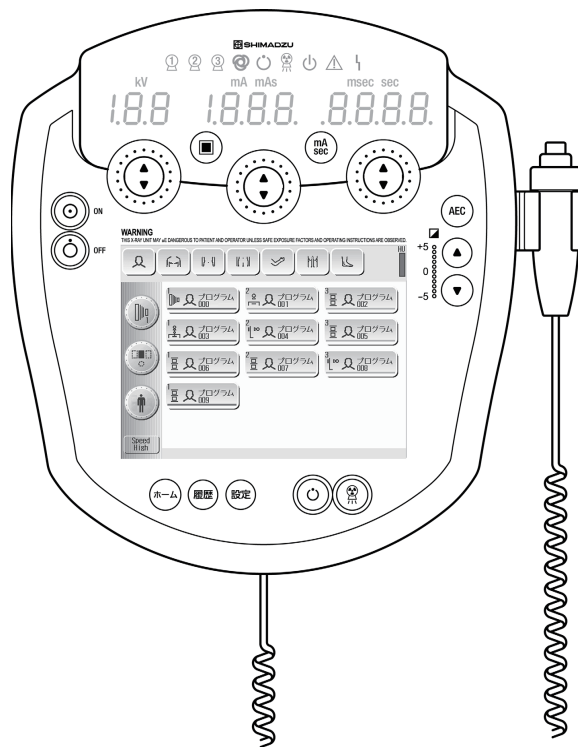
Form	Name	Function
	Fluoroscopy density selection button *1	Switches the density of IBS fluoroscopy.
	IBS button	Turns IBS on and off.
	Fluoroscopy pulse rate selection button *1	Switches the fluoroscopy pulse rate.
	Fluoroscopy pulse rate up/down button *1	Switches the fluoroscopy pulse rate.
	HD fluoroscopy button	Turns HD fluoroscopy on and off.
	Start point button (optional)	Registers the start point in the SLOT radiography (option).
	Stop point button (optional)	Registers the stop point in the SLOT radiography (option).

*1: Multiple buttons such as SID 1100, 1200 and 1500 are provided.

*2: These buttons can only be assigned to the local console (optional).

2.6 General Radiography Console GSC-2002L (Optional)

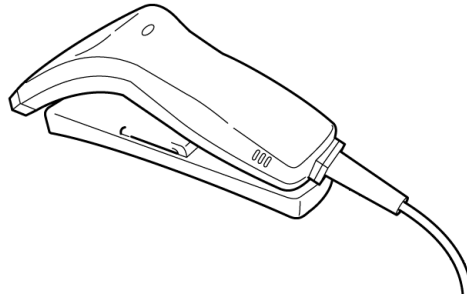
The GSC-2002L general radiography console is an optional console which makes it easy to set radiography X-ray conditions. Please refer to ["How to Use the GSC-2002L \(Optional\) General Radiography Console" P.4-100](#) for further details.



2.7 Barcode Reader (Optional)

Patient information can be recorded using the barcode reader. Please refer to the "M517-E210 Digital Radiography System DR-300 Instruction Manual (Image Acquisition)" for further details.

2



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Chapter 3

Examination Guide

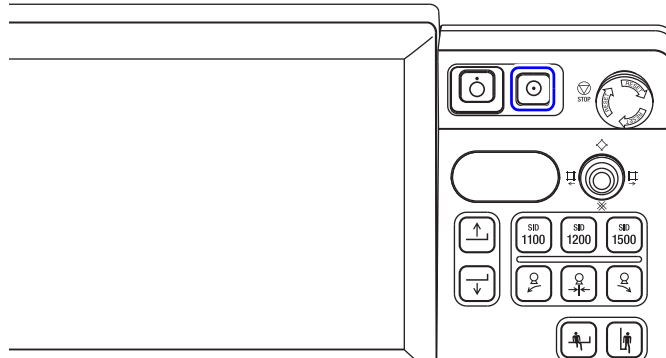
This chapter explains the basic procedures to carry out examinations using this system.

■ Contents

3.1	Examinations Using the X-ray Diagnostic Table's X-ray Tube Unit and Built-in FPD	3-2
3.2	Examinations Using the X-ray Diagnostic Table's X-ray Tube Unit and an External Receiver	3-10
3.3	Examinations Using the No.2 Tube Unit and an External Receiver.....	3-15

3.1 Examinations Using the X-ray Diagnostic Table's X-ray Tube Unit and Built-in FPD

- 1 Check that  on the remote console is lit up.
If it is not lit up, switch on the high voltage generator power switch (breaker).
- 2 Press  on the remote console.
The whole system will start up.



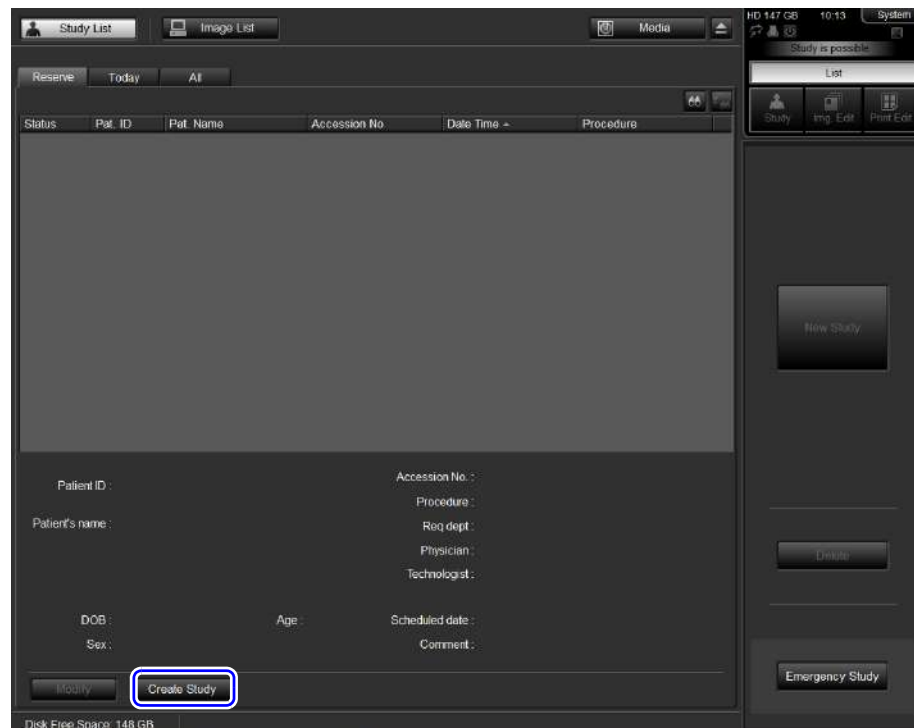
The control cabinet power comes on.

Startup is complete when the "Study List" screen is displayed on the reference monitor (the right-hand monitor).

- 3 Register the patient information.
There are various methods of registering patient information. This section explains the manual input method, and the automatic input method used in the case of an emergency.

Manual input

- 1 Click "Create Study" on the "Study List" screen.



3.1 Examinations Using the X-ray Diagnostic Table's X-ray Tube Unit and Built-in FPD

2 Enter the patient information required for examination.

The following items are required.

- "Patient ID"
- "Patient's name"

The procedure can also be selected if necessary.

The screenshot shows the 'Create new study' dialog box. The 'Patient ID' field contains 'PID0001' and the 'Patient's name' field contains 'Taro Shimadzu'. Both fields are highlighted with blue boxes and have arrows pointing to them with the text 'Must be entered.'. The 'DOB' field is '1950 / 02 / 19', 'Age' is '62 Y', and 'Sex' is 'M'. The 'Accession No.' field contains '1'. The 'Procedure' field is set to '<No Select>' and is highlighted with a blue box, with an arrow pointing to it and the text 'Select if necessary.'. Below these are fields for 'Req. dept.', 'Physician', and 'Technologist', all currently empty. There is a 'Comment' field and a 'Scheduled date' field. At the bottom are 'Start study', 'OK', and 'Cancel' buttons.

3

3 Click on "Start study".

The patient information is registered and the examination begins.

This screenshot shows the same 'Create new study' dialog box as the previous one, but with the 'Start study' button highlighted by a blue box. The data entered in the previous step is still visible: Patient ID 'PID0001', Patient's name 'Taro Shimadzu', DOB '1950 / 02 / 19', Age '62 Y', Sex 'M', Accession No. '1', and Procedure '<No Select>'. The 'Start study' button is at the bottom left, next to 'OK' and 'Cancel' buttons.



The starter is checked automatically if a study is started without performing fluoroscopy or radiography after starting the system. The X-ray tube makes an operating noise. This is not an abnormality.



Hint



flashes on the console when selecting a procedure for which position memory is set.



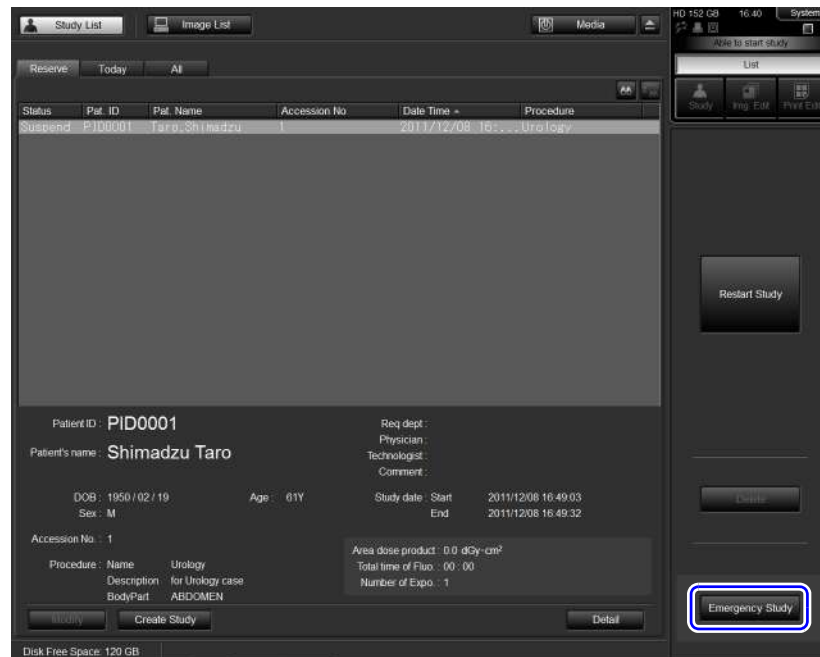
Reference "I-Tilt Mode" P.4-55
"Operation in Urology Mode" P.4-61

Automatic input in the case of an emergency

In an emergency it is possible to skip entering the patient information so that the examination can be started quickly.

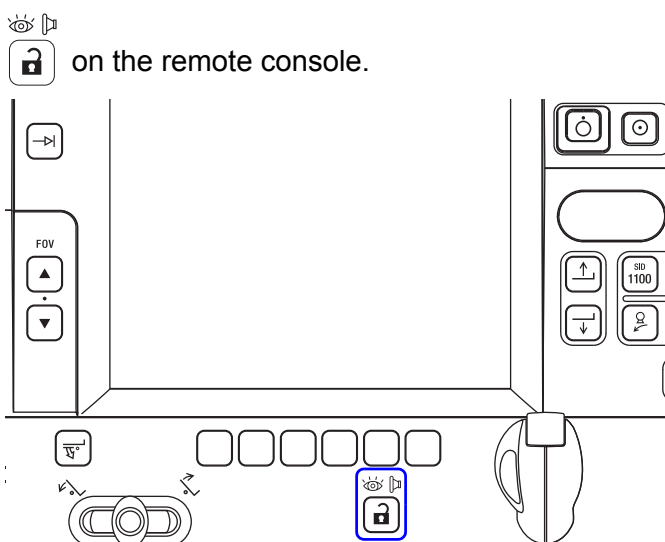
1 Click "Emergency Study" on the "Study List" screen.

Emergency patient information is automatically entered based on the date and time, and the examination starts immediately.



- Please replace the emergency patient information with the correct information after the examination has been completed.
Refer to "M517-E210 Digital Radiography System DR-300 Instruction Manual (Image Acquisition)" for details.
- Other ways to input patient information are to click "MWM" and acquire the patient information from an external server, or to use a barcode reader.
Refer to "M517-E210 Digital Radiography System DR-300 Instruction Manual (Image Acquisition)" for details.

4 Press   on the remote console.

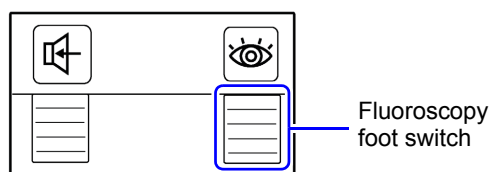


The button lights up, signalling that X-ray irradiation is permitted.



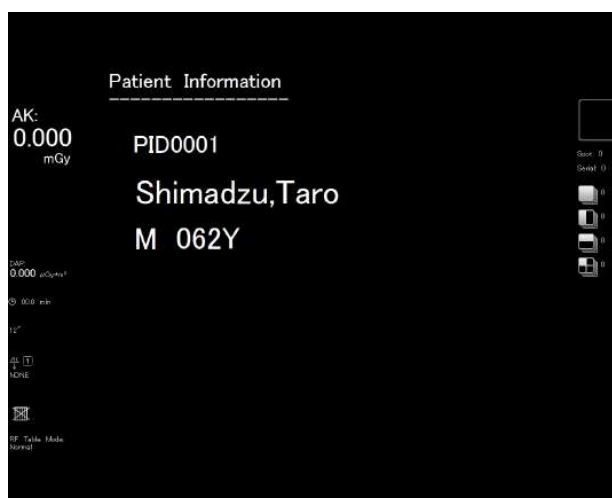
Always turn off  when you move away from the equipment so that X-rays cannot be radiated.

- Press down the remote console desk's fluoroscopy foot switch () and perform fluoroscopy.

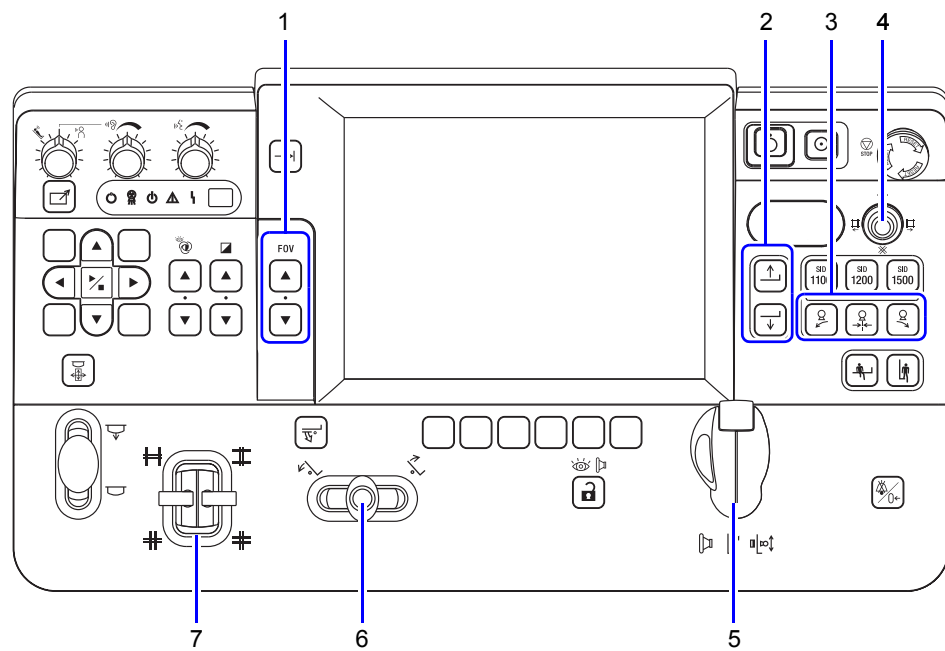


 on the remote console lights up.

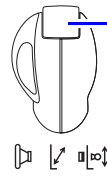
- Adjust the X-ray irradiation range while observing the fluoroscopy image on the acquisition monitor (the left-hand monitor).



The X-ray irradiation range is mainly adjusted by the following buttons and levers.



No.	Function	Operation
1	Change FPD magnification size	Changes the FPD magnification size through 5 levels. ▲ increases the magnification and ▼ decreases it.
2	Tabletop vertical movement*1	↑ raises the tabletop and ↓ lowers it. Enabled when the tabletop is in a horizontal position.
3	X-ray tube unit oblique projection*1	slants the X-ray tube unit towards the patient's head and slants it towards the feet. returns the X-ray tube unit back to the center from the slanted position.
4	Exposure field adjustment (C-leaf collimator/independent mask collimator)	C-leaf collimator (optional): When this is tilted forward the C-leaf exposure field becomes smaller. When it is tilted back the C-leaf exposure field becomes bigger. The collimator opens to its widest aperture when the switch is pressed. Independent mask collimator (optional): When this is tilted to the right, the exposure field on the patient's left-hand side is blocked. When it is tilted to the left, the exposure field on the patient's right-hand side is blocked. The collimator opens to its widest aperture when the switch is pressed.

No.	Function	Operation
5	Move tabletop left/right ^{*1} / Move imaging unit up/down ^{*1} / Radiography	Move tabletop left/right: When the lever is tilted to the right, the tabletop moves towards the patient's left. When the lever is tilted to the left, the tabletop moves towards the patient's right. Move imaging unit up/down: When the lever is tilted forward, the imaging unit moves towards the patient's feet. When the lever is tilted backward, the imaging unit moves towards the patient's head. Radiography: When the button on the top of the lever is pressed radiography is performed. 
6	Tabletop tilt ^{*1}	It is operated while holding down the button on the top of the lever. When it is moved to the right, the tabletop is tilted in a vertical direction. It is tilted in the opposite direction when the lever is moved to the left.
7	Exposure field adjustment (adjusting the field vertically/horizontally)	Adjusting the field vertically (up/down on the monitor): When the right-hand lever is raised, the size of the exposure field is increased in the vertical direction. When the lever is lowered, the field is reduced in size. Adjusting the field horizontally (left/right on the monitor): When the left-hand lever is raised, the size of the exposure field is increased in the horizontal direction. When the lever is lowered, the field is reduced in size.

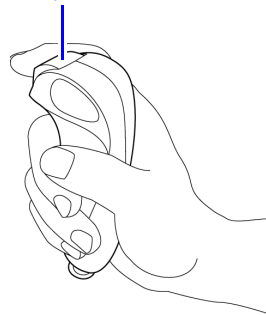
*1: Only moves while the button is being pressed or the lever is being operated.

7 Modify the X-ray conditions as necessary.

 **Reference** "4.11 Setting X-ray Conditions for Fluoroscopy and Radiography" P.4-76

8 Press the radiography button.

Radiography button



on the remote console comes on during the radiation of X-rays.

The image that has been taken is displayed on the monitor.



Keep the button pressed down until the radiography is finished. If you let go of the button during radiography, images will not be taken properly.

Use the touch panel if you want to set Subdivisional Acquisition (SDA).



Full screen mode
Horizontal 2 division (1x2)
Vertical 2 division (2x1)
4 division (2x2)

9 Repeat fluoroscopy and radiography as necessary.

10 Press  on the touch panel when all the radiography is finished.



This completes the examination.

Turn the power off

Follow the procedures below to turn the system off.



CAUTION



Instructions

Do not turn the power off when the digital radiography unit is transferring image data to storage media (CD-R, DVD etc.)

Doing so can damage the image data.

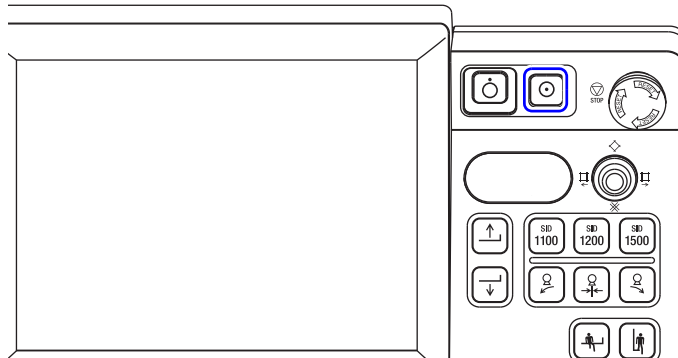
3

- 1 Click on [System] in the top right corner of the reference monitor screen.
The system menu is displayed.
- 2 Click on [Shutdown].
- 3 Select [Shutdown] and click on [OK].
The digital radiography unit's power is turned off.
- 4 Press  on the remote console.
The power of the high voltage generator and X-ray diagnostic table is turned off.
- 5 After the power has been turned off, wait for at least 20 seconds before switching off the high voltage generator power switch (breaker).
Do not switch off the power switch of the digital radiography unit or the breaker at the bottom left of the front of the control cabinet except in an emergency.

3.2 Examinations Using the X-ray Diagnostic Table's X-ray Tube Unit and an External Receiver

When using an external receiver (IP cassette, portable FPD, etc.), please complete all the preparations for the external receiver before the radiography.

- 1 Check that  on the remote console is lit up.
If it is not lit up, switch on the high voltage generator power switch (breaker).
- 2 Press  on the remote console.
The whole system will start up.



The control cabinet power comes on.

Startup is complete when the "Study List" screen is displayed on the reference monitor (the right-hand monitor).

- 3 Select the preset X-ray conditions.
 - 1 Select the tab.



3.2 Examinations Using the X-ray Diagnostic Table's X-ray Tube Unit and an External Receiver

2 Select the radiography program.

To display a radiography program that is not being shown, press  or .

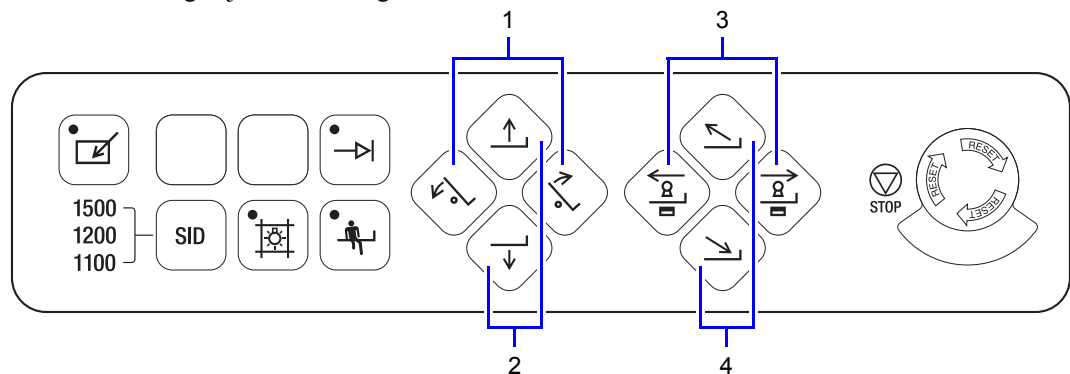


Modify the X-ray conditions as necessary.

 **Reference** "4.11 Setting X-ray Conditions for Fluoroscopy and Radiography" P.4-76

4 Adjust the X-ray exposure range using the light from the irradiation field lamp as a guide.

The main buttons on the X-ray diagnostic table front control panel that are used for making adjustments are given below.



No.	Function	Operation
1	Tabletop tilt ^{*1}	 tilts the tabletop backwards and  tilts it forwards.
2	Tabletop vertical movement ^{*1}	 raises the tabletop and  lowers it.
3	Move imaging unit up/down ^{*1}	 moves the imaging unit towards the patient's head and  moves it towards the feet.
4	Move tabletop left/right ^{*1}	 moves the tabletop towards the patient's left and  moves it towards the patient's right.

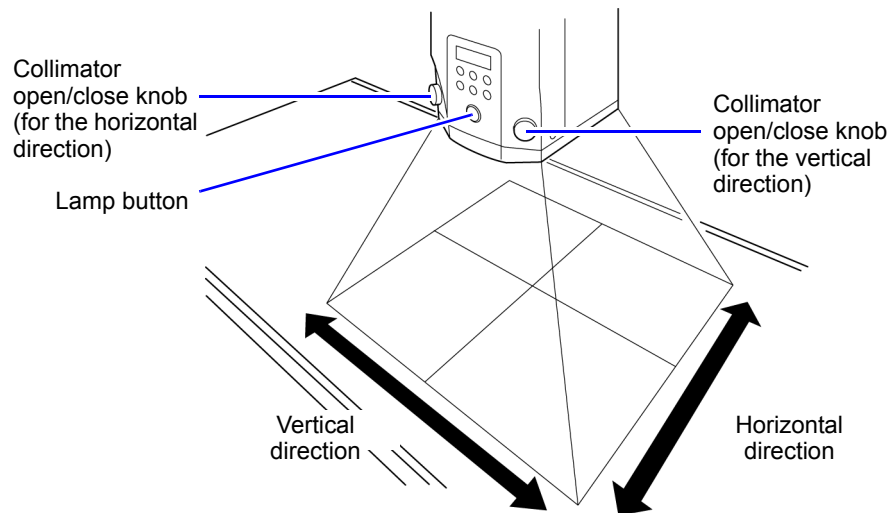
^{*1}: Only moves while the button is being pressed.

 **Hint** It is possible to move the tabletop to the vertical position and perform radiography on a patient who is on a stretcher.

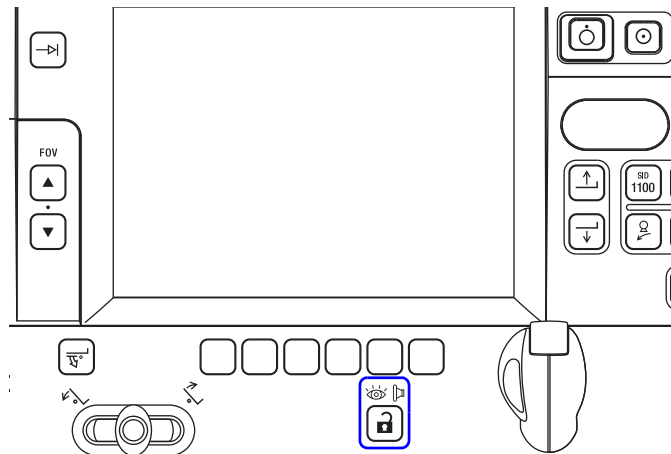
 **Reference** "4.14.1 Radiography with X-ray Tube Rotation" P.4-195

The vertical and horizontal field is adjusted with the collimator open/close knobs on the collimator.

When the lamp button is pressed, the irradiation field lamp and line marker (optional) light up for approximately 30 seconds.



5 Press  on the remote console.



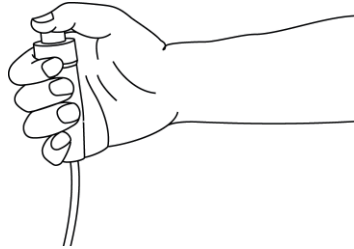
The button lights up, signaling that X-ray irradiation is permitted.



NOTE Always turn off  when you move away from the equipment so that X-rays cannot be irradiated.

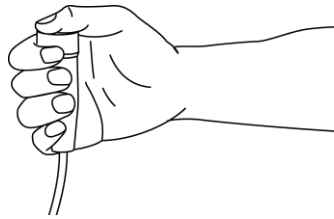
6 Perform radiography by using the hand switch.

1 Press the hand switch down to the first level.



 on the remote console lights up when the preparations for radiography are complete.

2 Press the hand switch down to the second level.



 on the remote console comes on during the radiation of X-rays.



- Keep holding down the hand switch to the first and second levels until the radiography is complete. If you let go during radiography, you will not get the images you want.
- The dose area product of the radiography is displayed on the touch panel after radiography.
- Doses from radiography performed using the external receiver are not added to the cumulative air kerma and cumulative dose area product displayed on the acquisition monitor.

7 Repeat radiography as necessary.

Turn the power off

Follow the procedures below to turn the system off.

 CAUTION	
 Instructions	Do not turn the power off when the digital radiography unit is transferring image data to storage media (CD-R, DVD etc.) Doing so can damage the image data.

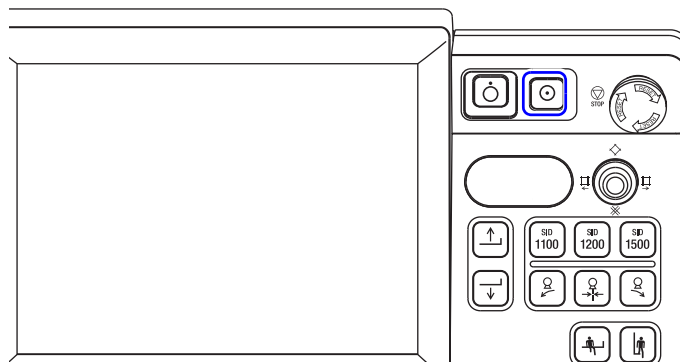
- 1 Click on [System] in the top right corner of the reference monitor screen.
The system menu is displayed.
- 2 Click on [Shutdown].
- 3 Select [Shutdown] and click on [OK].
The digital radiography unit's power is turned off.
- 4 Press  on the remote console.
The power of the high voltage generator and X-ray diagnostic table is turned off.
- 5 After the power has been turned off, wait for at least 20 seconds before switching off the high voltage generator power switch (breaker).
Do not switch off the power switch of the digital radiography unit or the breaker at the front of the control cabinet except in an emergency.

3.3 Examinations Using the No.2 Tube Unit and an External Receiver

The No.2 tube unit is the X-ray tube unit in the ceiling CH-200 X-ray tube support.

When using an external receiver (IP cassette, portable FPD, etc.), please complete all the preparations for the external receiver before the radiography.

- 1 Check that  on the remote console is lit up.
If it is not lit up, switch on the high voltage generator power switch (breaker).
- 2 Press  on the remote console.
The whole system will start up.



The control cabinet power comes on.

Startup is complete when the "Study List" screen is displayed on the reference monitor (the right-hand monitor).

- 3 Select the preset X-ray conditions.
 - 1 Select the tab.



2 Select the radiography program.

To display a radiography program that is not being shown, press  or .

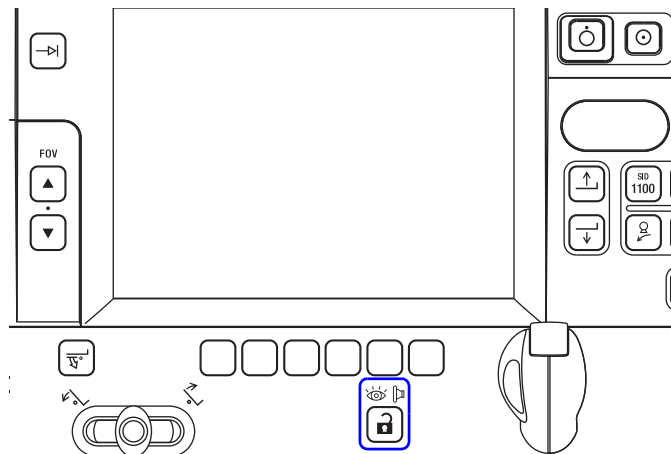


Modify the X-ray conditions as necessary.

 **Reference** "4.11 Setting X-ray Conditions for Fluoroscopy and Radiography" P.4-76

4 Operate the X-ray tube support and adjust the X-ray exposure range. Refer to "M514-E070 CEILING TUBE SUPPORT CH-200/CHU-200 OPERATION MANUAL" for details about the operation of the X-ray tube support.

5 Press on the remote console.



The button lights up, signaling that X-ray irradiation is permitted.

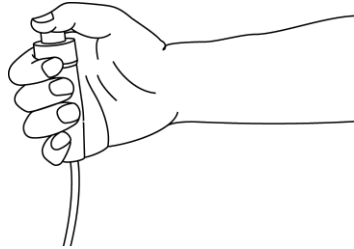


NOTE

Always turn off  when you move away from the equipment so that X-rays cannot be irradiated.

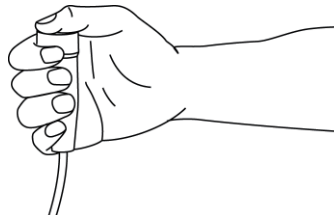
6 Perform radiography by using the hand switch.

1 Press the hand switch down to the first level.



on the remote console lights up when the preparations for radiography are complete.

2 Press the hand switch down to the second level.



on the remote console comes on during the radiation of X-rays.



- Keep holding down the hand switch to the first and second levels until the radiography is complete. If you let go during radiography, you will not get the images you want.
- The dose area product of the radiography is displayed on the touch panel and GSC-2002L general radiography console (optional) only when combining the No.2 X-ray tube unit (CH-200), R-300 collimator and GSC-2002L general radiography console (optional).
Dose area product is not displayed when using any other combination, so a separate area dosimeter needs to be prepared in order to meet the IEC 60601-2-54:2009 standard.
- Doses from radiography performed using the external receiver are not added to the cumulative air kerma and cumulative dose area product displayed on the acquisition monitor.

7 Repeat radiography as necessary.

Turn the power off

Follow the procedures below to turn the system off.

 CAUTION	
 Instructions	Do not turn the power off when the digital radiography unit is transferring image data to storage media (CD-R, DVD etc.) Doing so can damage the image data.

- 1 Click on [System] in the top right corner of the reference monitor screen.
The system menu is displayed.
- 2 Click on [Shutdown].
- 3 Select [Shutdown] and click on [OK].
The digital radiography unit's power is turned off.
- 4 Press  on the remote console.
The power of the high voltage generator and X-ray diagnostic table is turned off.
- 5 After the power has been turned off, wait for at least 20 seconds before switching off the high voltage generator power switch (breaker).
Do not switch off the power switch of the digital radiography unit or the breaker at the front of the control cabinet except in an emergency.

Chapter 4

Operation of Each Part of the System

This chapter describes the operation of each part of this system.

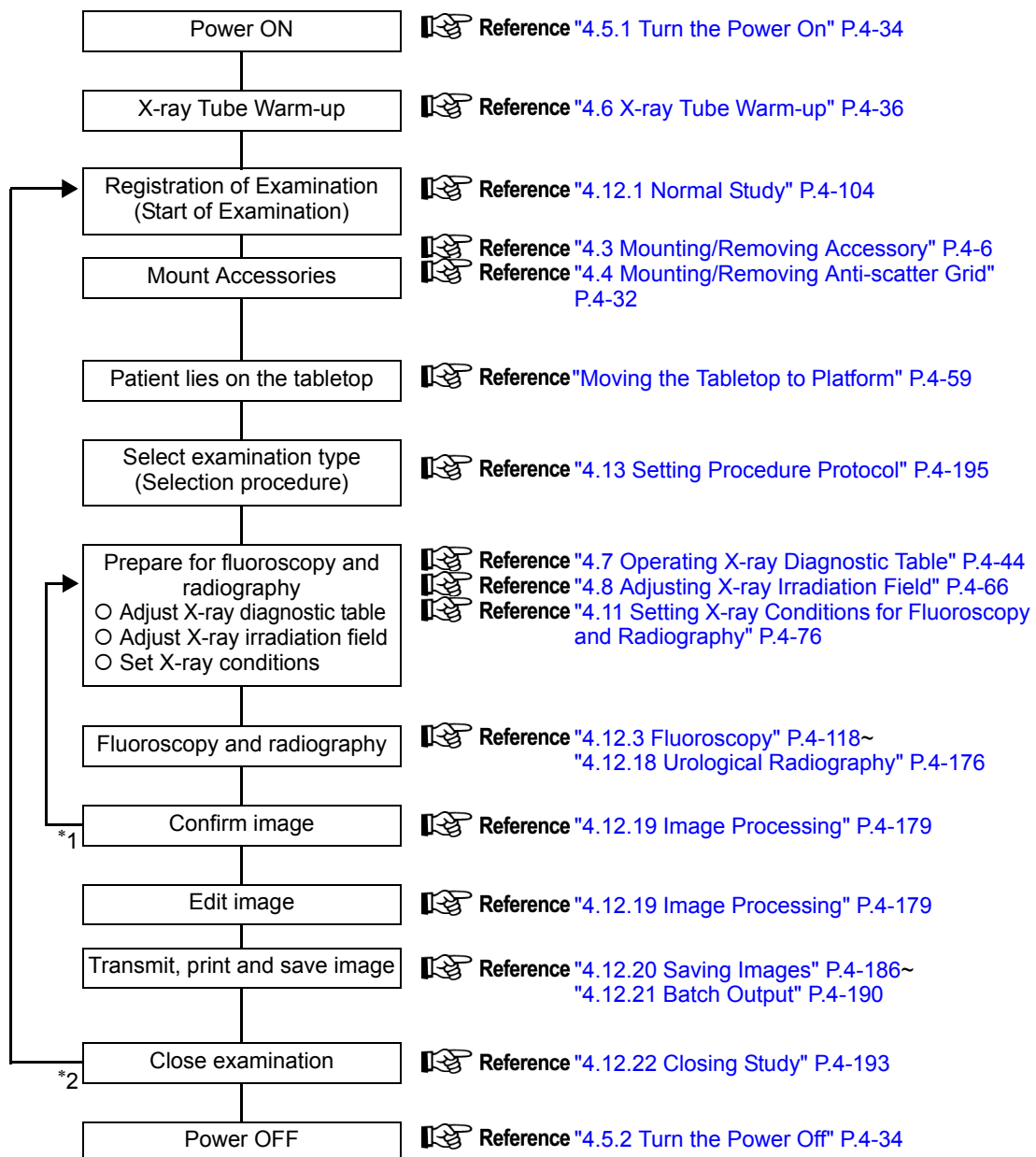
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4.1 Operation Flow

4.1.1 Operation During Examination

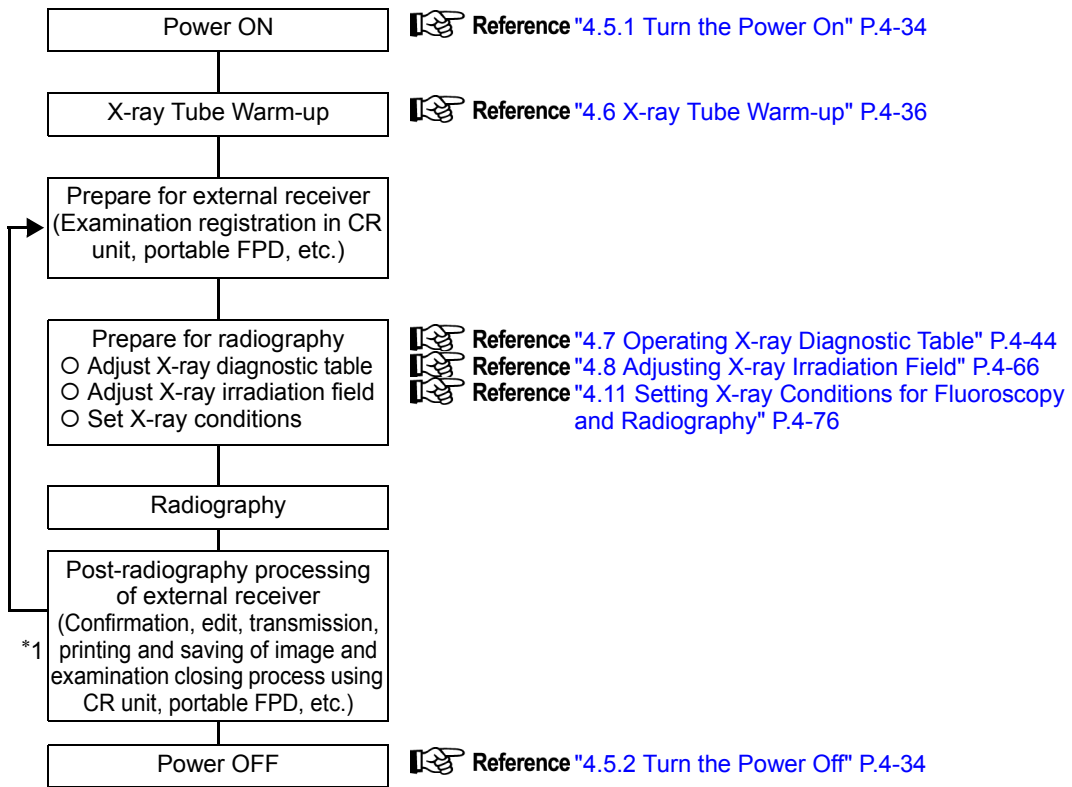
Examinations Using the X-ray Diagnostic Table's X-ray Tube Unit and Built-in FPD



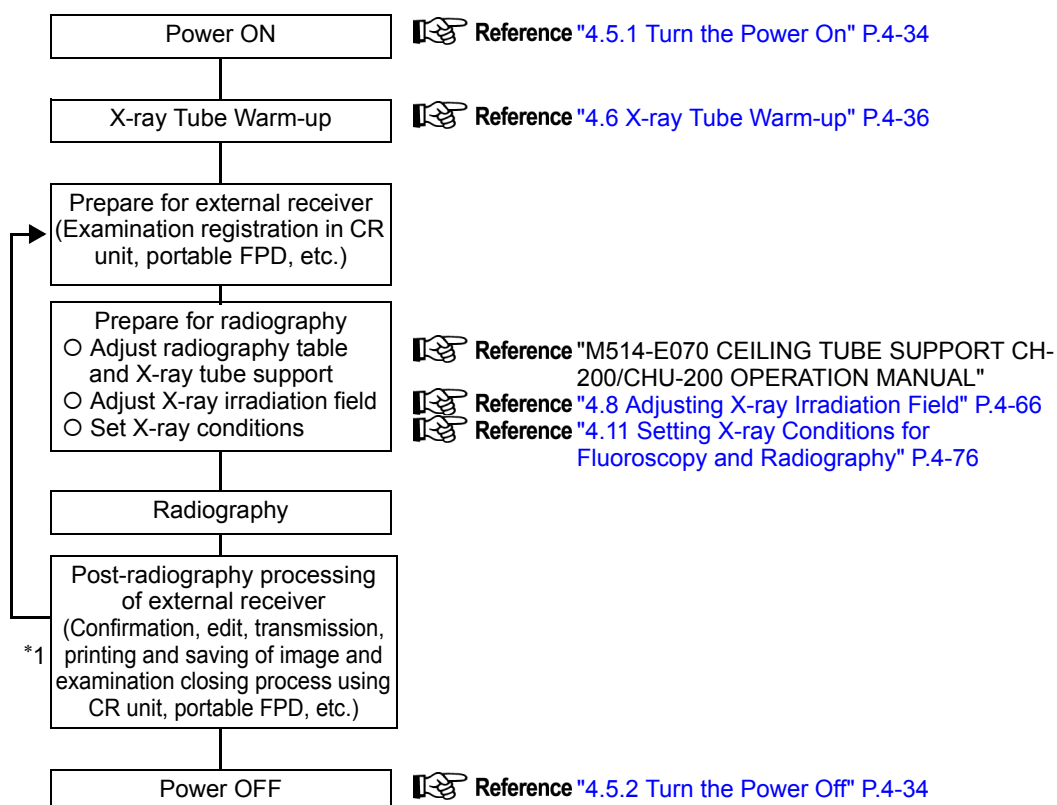
*1: Go back to "Preparing for fluoroscopy and radiography" to continue fluoroscopy and radiography.

*2: Go back to "Registration of Examination (Start of Examination)" to deal with another patient.

Examinations Using the X-ray Diagnostic Table's X-ray Tube Unit and an External Receiver



■ Examinations Using the No.2 Tube Unit and an External Receiver



*1: Go back to "Preparing for external receiver" to continue radiography.

4.1.2 Operation Outside of Examination

■ Registering/Editing presets

See ["4.13 Setting Procedure Protocol" P.4-195](#).

4.2 Maintenance Before Operation

 CAUTION	
	Make sure everything is in safe condition in the examination room before turning on power.
Instructions	Note that turning on the remote console also turns on the power of the X-ray diagnostic table, etc. Make sure no one is present or no obstacle is left within the machine's working range.

4

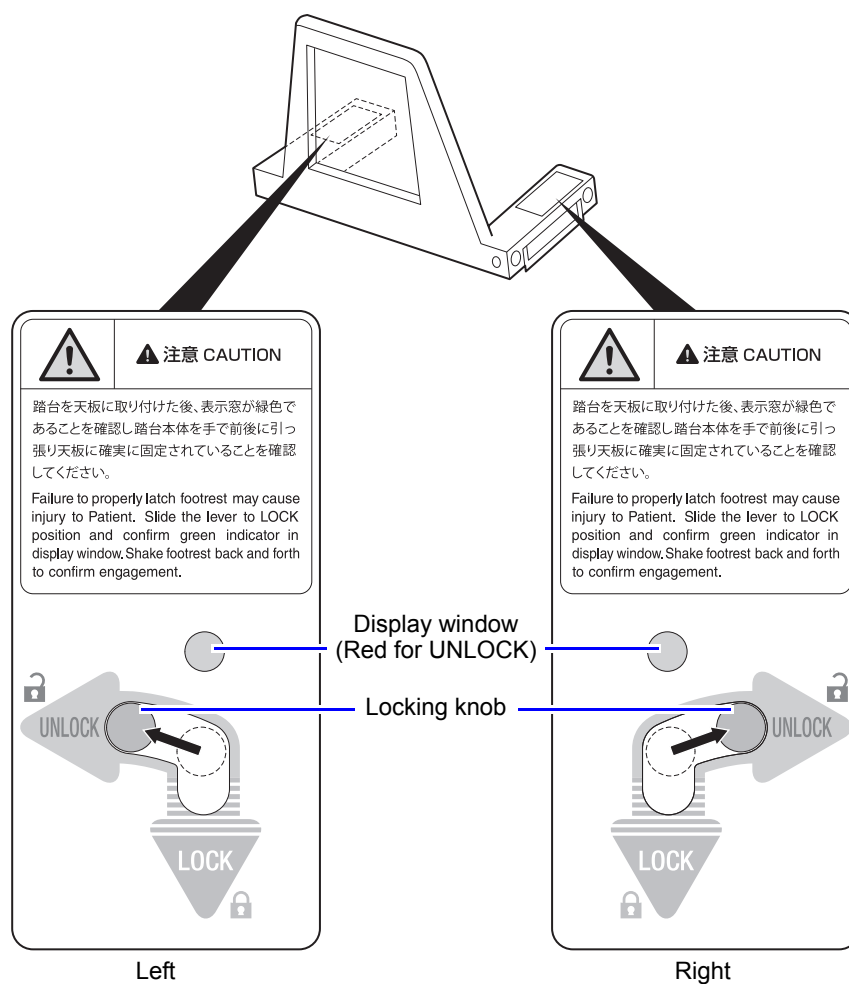
For information about starting inspection, see ["Daily Maintenance" P.6-2](#).

4.3 Mounting/Removing Accessory

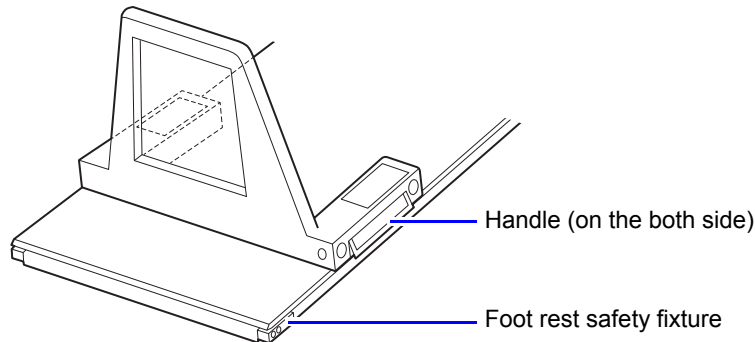
4.3.1 Mounting/Removing Foot Rest

■ Mounting

- 1 Slide the right and left locking knobs to "UNLOCK".



- 2 With the locking knobs on "UNLOCK", open the right and left handles, and put the foot rest on the tabletop.
Place the open handles onto the either ends of the tabletop.

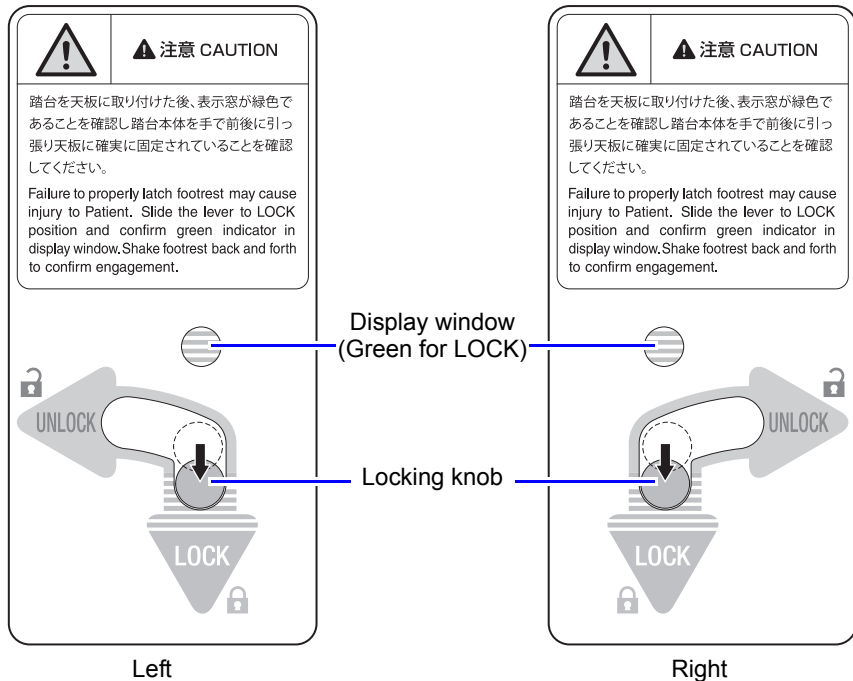


- 3 Release the handles and slide the foot rest longitudinally until it catches the tabletop.

The tabletop has a hole to catch the pin of the foot rest. Put the pin into the hole where the position is suitable for the examination. Once the pin is caught in the hole, the locking knob returns to the center position.

When you want to adjust the position, move the knob to "UNLOCK" and move the foot rest holding the handles.

- 4 When the position is determined, slide the right and left locking knobs to the direction of "LOCK".



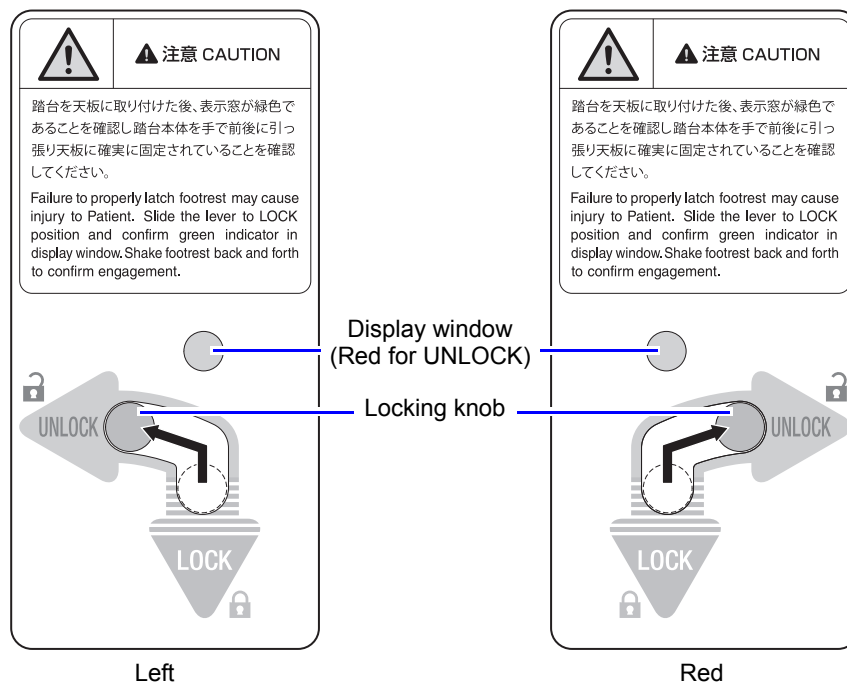
The handles are locked and the foot rest gets secured to the tabletop.

Confirm green indicators in the display windows.

CAUTION	
	Make sure the foot rest is firmly secured after you have installed or moved it.
Instructions	Ensure that the foot rest is secured by moving it back and forth. The unsecured foot rest may come off from the tabletop, causing injury to a patient.
	Do not remove the foot rest safety fixtures from the tabletop.
Prohibitions	The foot rest may fall from the tabletop and the patient may be injured.

■ Removing

- 1 Slide the right and left locking knobs to "UNLOCK" and hold the right and left handles.

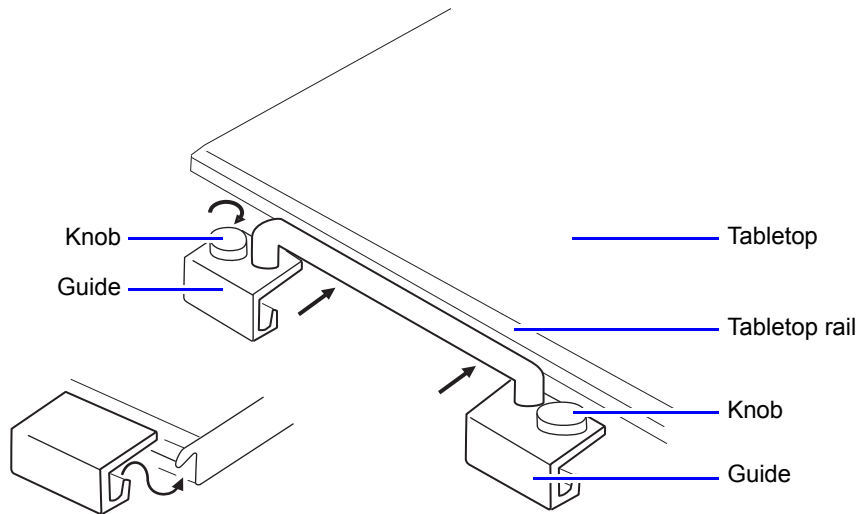


The handle locks are released. The display window turns red.

- 2 Hold the both handles and remove the foot rest from the tabletop.

4.3.2 Mounting Hand Grips

- 1 Set the guide of hand grip to the tabletop.



- 2 Move the hand grips to a position where a patient can easily hold it.
The hand grip should be placed where the arm or elbow of a patient does not stick out of the tabletop.
- 3 Rotate the knob clockwise to secure firmly.
The hand grips are secured.

**WARNING**

**Make sure the hand grips are firmly secured after you have installed or moved their position.**

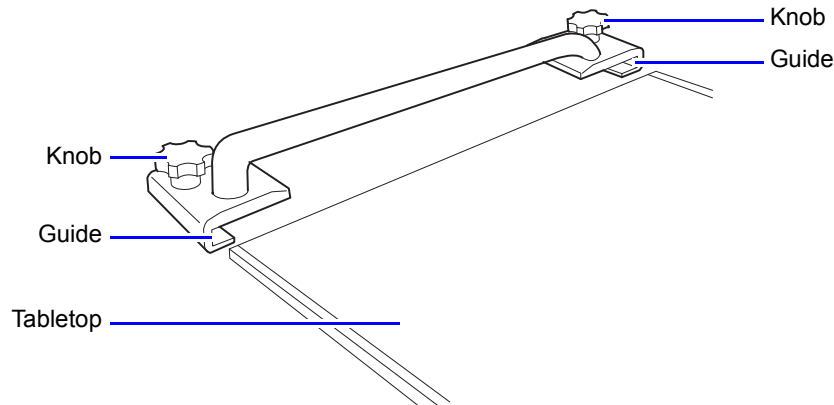
Instructions The unsecured hand grips may come off, causing a patient to fall from the tabletop and get injured.

**Take care of a patient so that he/she may not sustain the body weight only by holding the hand grips.**

Instructions Otherwise the patient may fall from the tabletop when you tilt it.

4.3.3 Mounting Upper Hand Grip

- 1 Set the guide of the upper hand grip to the tabletop.



- 2 Move the upper hand grip to a position where a patient can easily hold it.
The hand grip should be placed where the arm or elbow of a patient does not stick out of the tabletop.
- 3 Rotate the knob clockwise to secure firmly.
The upper hand grip is secured.



WARNING



Instructions

Make sure the upper hand grip is firmly secured after you have installed or moved its position.

The unsecured upper hand grip may come off, causing a patient to fall from the tabletop and get injured.



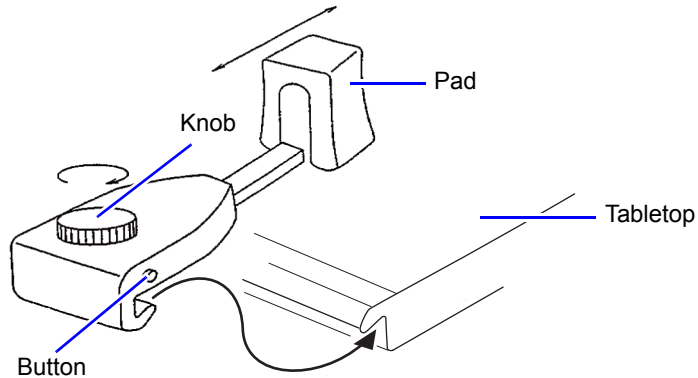
Instructions

Take care of a patient so that he/she may not sustain the body weight only by holding the upper hand grip.

Otherwise the patient may fall from the tabletop when you tilt it.

4.3.4 Mounting Shoulder Rests

- 1 Set a shoulder rest to the tabletop.



- 2 Adjust the position of shoulder rests to the height of a patient.
- 3 Rotate the knob clockwise to secure firmly.
The shoulder rests are secured.
- 4 Press the button and adjust the pad position.
- 5 Release the button.
The pad is secured.



WARNING

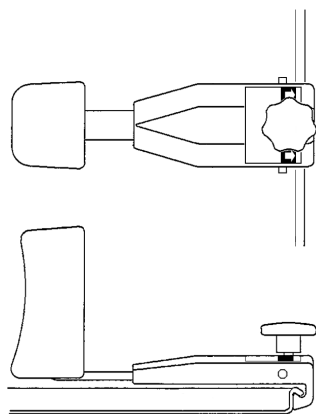


Instructions

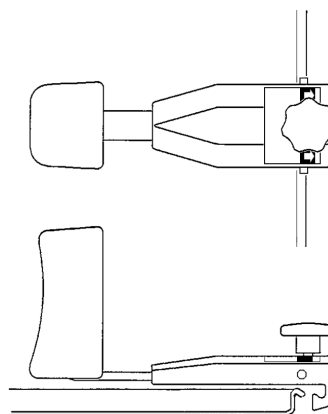
After you have adjusted the shoulder rest position to the body size of a patient, make sure to secure firmly the shoulder rests so that they support the patient's shoulders.

Referring to the illustration below, insert the pad fully and secure it when the line of shoulder rest label has come to the end of tabletop rail when viewed from above.

The unsecured shoulder rests may come off or slip off, causing a patient to fall from the tabletop and get injured.



OK



NG



Instructions

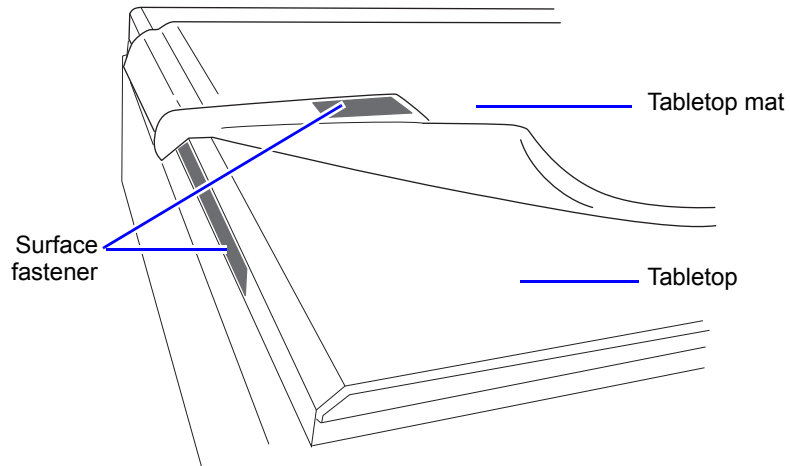
Take care of a patient so that he/she may not sustain the body weight only by means of the shoulder rests.

Otherwise the patient may fall from the tabletop when you tilt it.

4.3.5 Mounting Tabletop Mat

■ Mounting

- 1 Set a tabletop mat on the tabletop.
Set it so that the side without cushion faces a patient's feet.
- 2 Secure it with surface fasteners.
Attach to secure the surface fastener of the tabletop mat onto the surface fastener located on the longitudinal side of the tabletop.



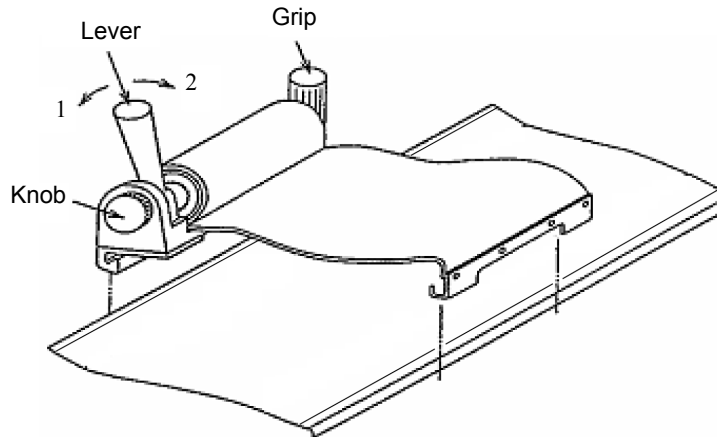
■ Removing

- 1 Peel off the surface fastener to remove the tabletop mat.

4.3.6 Mounting Compression Band (Optional)

■ Mounting

- 1 Mount the compression band to the tabletop.
- 2 Rotate the grip clockwise to secure firmly.
The compression band is secured.



- 3 Push the lever in the direction of 1.
- 4 Pull out the compression band.
- 5 Cover the part of a patient to be fixed with the compression band.
- 6 Hook the end fixture to the opposite side of the tabletop.
- 7 Rotate the knob so that the compression band tightens temporarily.
- 8 Push the lever in the direction of 2 several times to tighten the compression band.
The lever has a ratchet mechanism.
- 9 Fasten the knob tightly.



WARNING



Instructions

Tighten the compression band gradually while monitoring the patient.

Abrupt tightening may break a patient's bone.



Instructions

Secure the compression band firmly to the tabletop.

The unsecured compression band may come off or let the lever fall, causing injury.

To Loosen

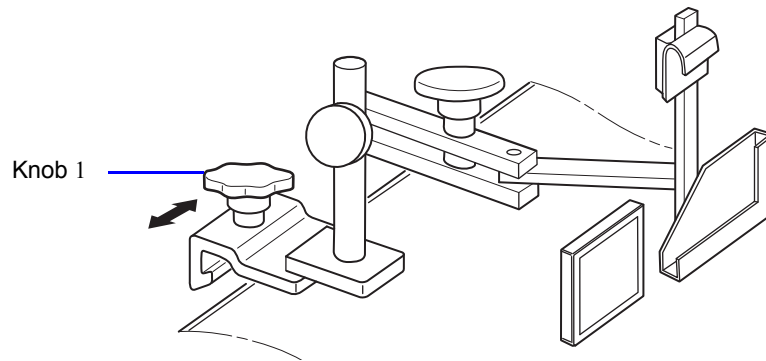
- 1 After use, push the lever in the direction of 1 to loosen the compression band.

4.3.7 Mounting Lateral Cassette Holder (Optional)

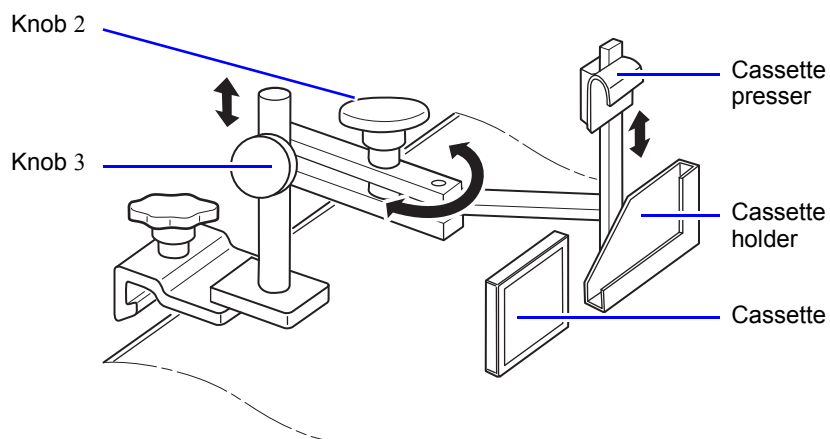
The lateral cassette holder is a device to hold the cassette in order to carry out lateral radiography combined with the ceiling X-ray tube support.

Mounting

- 1 Mount the lateral cassette holder onto the tabletop.
- 2 Slide on the tabletop to determine the position.
- 3 Rotate the knob 1 clockwise to secure firmly.
The lateral cassette holder is secured.

**Setting Cassette**

- 1 Loosen knobs 2 and 3.
Now you can adjust the cassette holder.



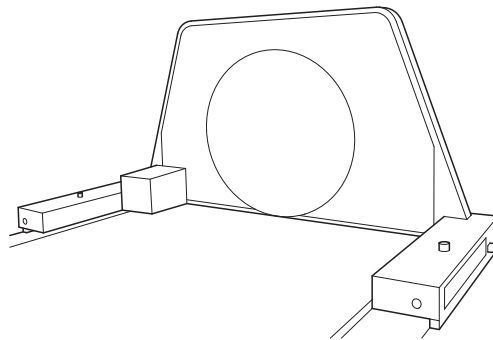
- 2 Adjust the cassette holder position.
- 3 Keep pressing the rear lever of the cassette presser and raise the cassette presser.

- 4 Set the cassette in the cassette holder.
- 5 Lower the cassette presser and secure the cassette.
Push the cassette onto the right end of the cassette holder and secure it with the cassette presser.



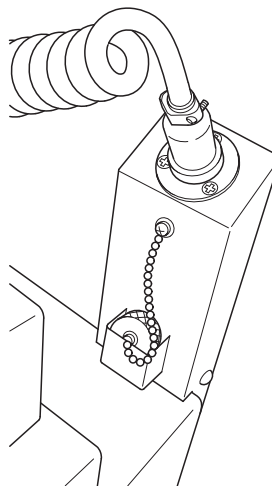
For adjusting the radiography position and setting the irradiation field, operate manually.

4.3.8 Mounting Rotary Foot Rest (Optional)



■ Mounting

- 1 Mount it using the same procedures as for the conventional foot rest.
 **Reference** ["Mounting" P.4-6](#)
- 2 Remove the dust cap and mount the curl cord.



See ["4.7.8 Operating Rotary Foot Rest \(Optional\)" P.4-65](#) to operate the rotary foot rest.



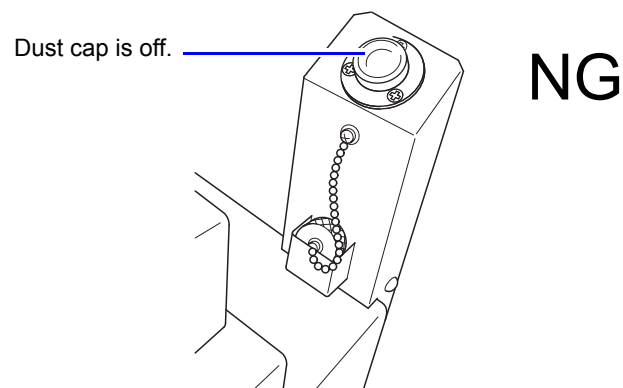
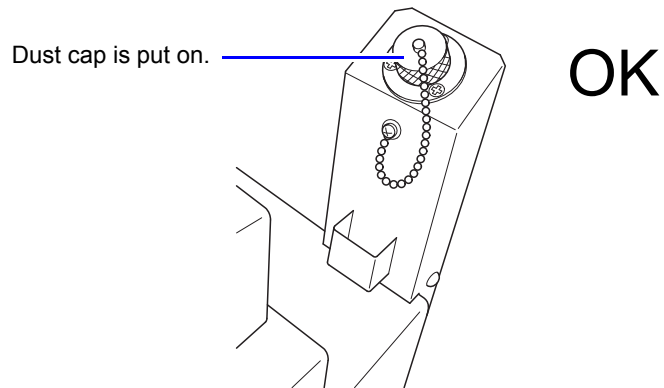
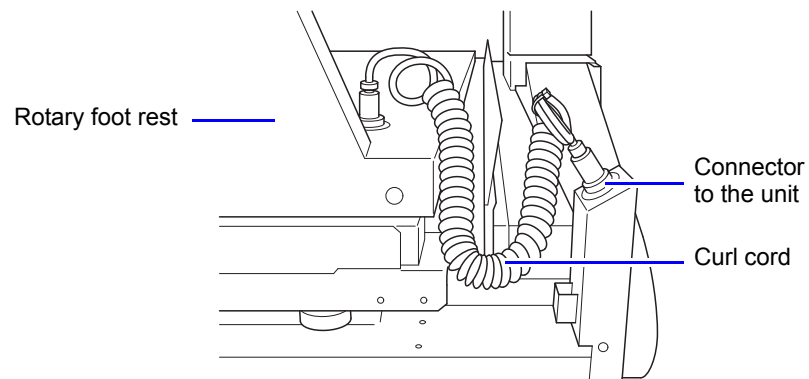
CAUTION



Instructions

If you do not connect the rotary foot rest to the X-ray diagnostic table using the curl cord, make sure to put the dust cap on.

The equipment may be damaged if foreign matter enters it.



4

Removing

- 1 Remove the curl cord and mount the dust cap.
- 2 Demount it using the same procedures as for the conventional foot rest.

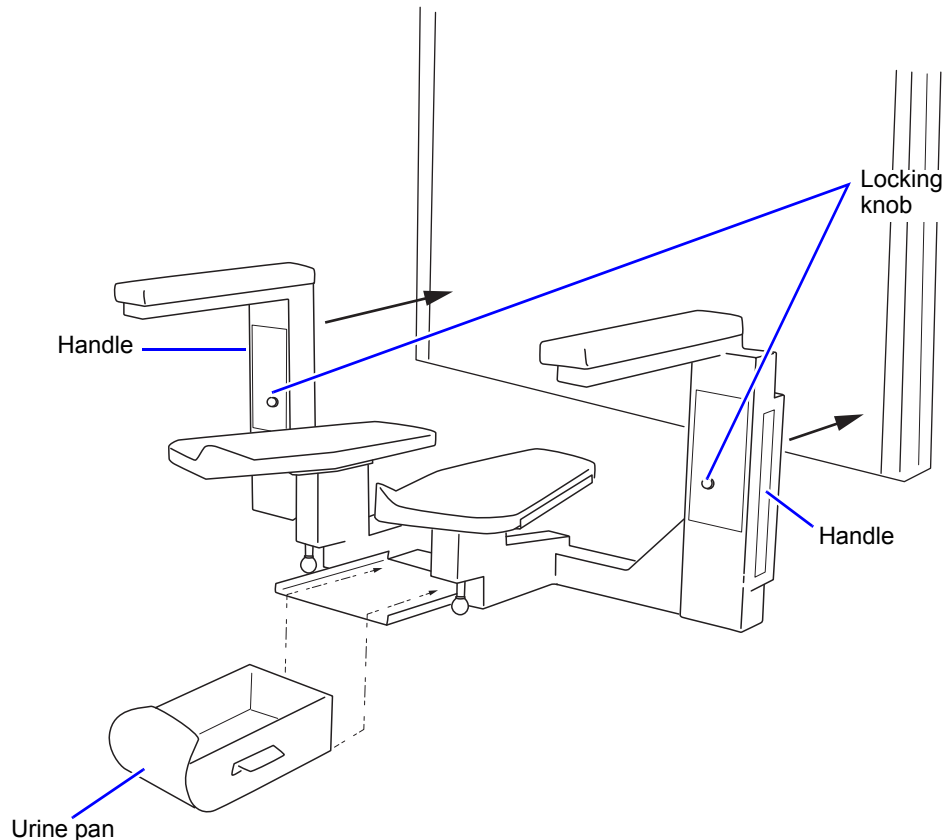


Reference "Removing" P.4-8

4.3.9 Mounting Voiding Cystographic Chair (Optional)

■ Mounting

- 1 Slide the right and left locking knobs to "UNLOCK".
- 2 With the locking knobs on "UNLOCK", open the right and left handles and put the chair on the tabletop.
Place the open handles onto the either ends of the tabletop.
- 3 Release the handles and slide the platform longitudinally until it catches the tabletop.
The tabletop has a hole to catch the pin of the chair. Put the pin into the hole where the position is suitable for the examination. Once the pin is caught in the hole, the locking knob returns to the center position.
When you want to adjust the position, move the knob to "UNLOCK" and move the chair holding the handles.
- 4 When the position is determined, slide the right and left locking knobs to "LOCK".
The handles are closed and the chair gets secured to the tabletop.
- 5 Insert the urine pan from the front side.



**WARNING**

Instructions

Make sure the chair is firmly secured after you have installed or moved it.

Ensure that the chair is secured by moving it back and forth. The unsecured chair may come off from the tabletop, causing injury to a patient.

**NOTE**

Use a suitable platform, as necessary, so that a patient get on and off the voiding cystographic chair easily.

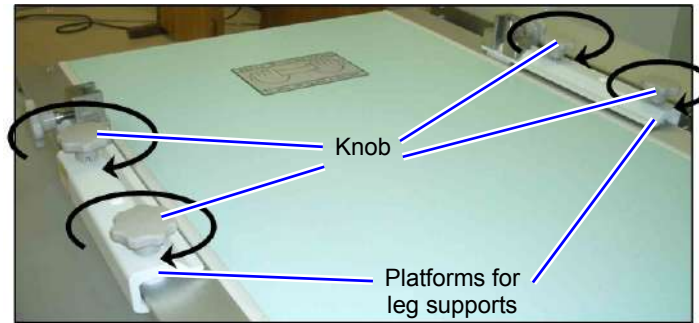
■ Removing

- 1** Slide the right and left locking knobs to "UNLOCK" and hold the right and left handles.
The handle locks are released.
- 2** Hold the both handles and remove the chair from the tabletop.

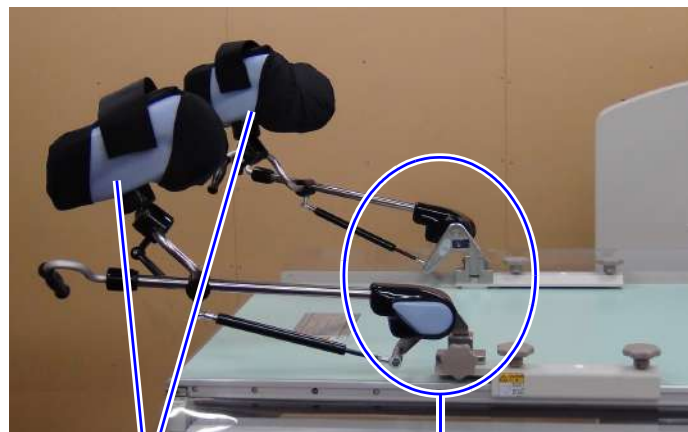
4

4.3.10 Mounting Leg Supports (Optional)

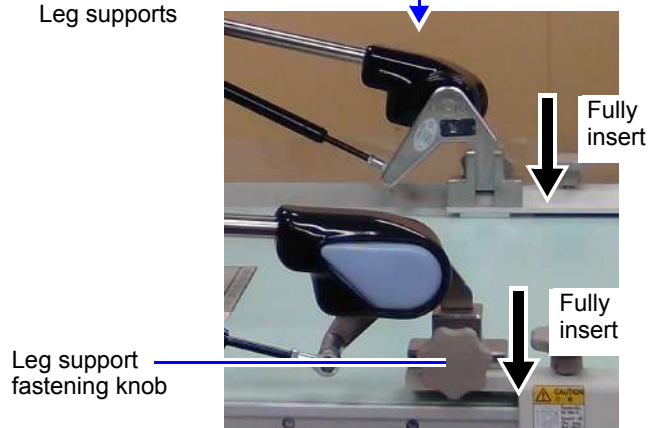
- 1 Mount the platforms to the tabletop.
Mount the platform to the position where it can be firmly secured.
- 2 Rotate the four knobs on the platforms clockwise to secure firmly.
The platform is secured to the tabletop.



- 3 Read the warning label on the platform and insert the leg supports fully into the platform.



Leg supports

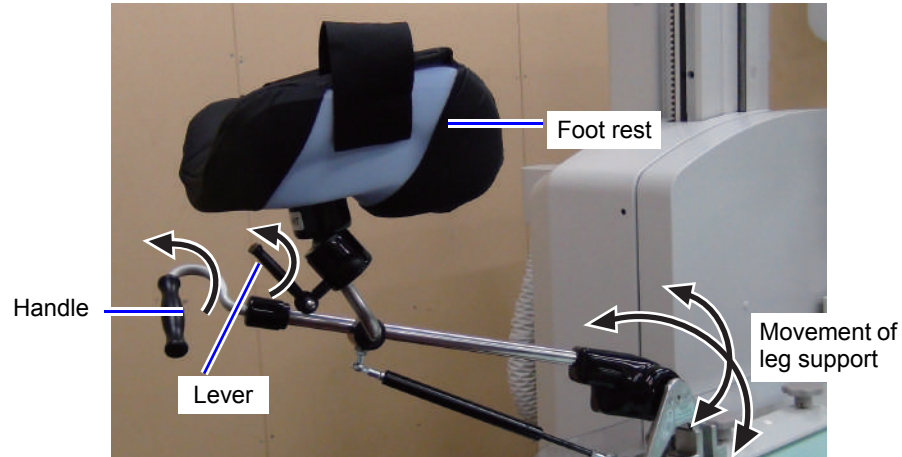


- 4 Tightly fasten the leg support fastening knob on the platform by turning it clockwise.
The leg supports are secured to the platform.

The leg supports can be moved with the handle and lever. Adjust the position of foot rest to the body size of a patient.

- 1 Adjust the position of the leg support while holding the handle in the outward position.

Releasing the handle secures the leg support in the selected position.



- 2 Turn the lever to the left to loosen the foot rest, and adjust the position. The foot rest can be moved vertically and horizontally.
- 3 Turn the lever to the right to secure the foot rest.

4

!
WARNING

!

After you have adjusted the platform or leg supports to the body size of a patient, make sure to secure it firmly.

Instructions Make sure that they are firmly secured to the tabletop by pulling them. The unsecured platform or leg support may come off from the tabletop, causing injury to a patient.

It may also cause damage.

!

Make sure that the leg supports are far enough from the floor or ceiling when tilting the tabletop after mounting.

Instructions Otherwise, the leg supports may collide with the floor or ceiling and get damaged.

!

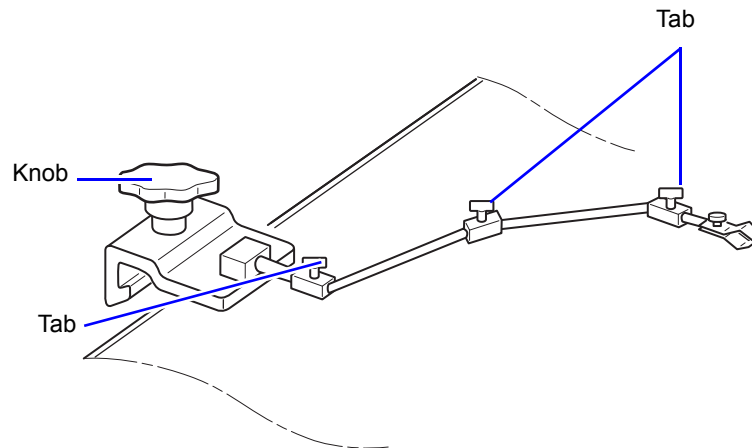
Take care when operating the imaging unit when the leg support is mounted, as the leg support is close to the column of the X-ray diagnostic table.

Instructions The leg support may touch the column of the X-ray diagnostic table, which may injure the patient or damage the unit.

4.3.11 Mounting Endoscope Support (Optional)

The endoscope support is a multi-joint supporting tool for the endoscope fiber during an examination.

- 1 Mount the endoscope support to the tabletop.
- 2 Rotate the knob clockwise to secure firmly.



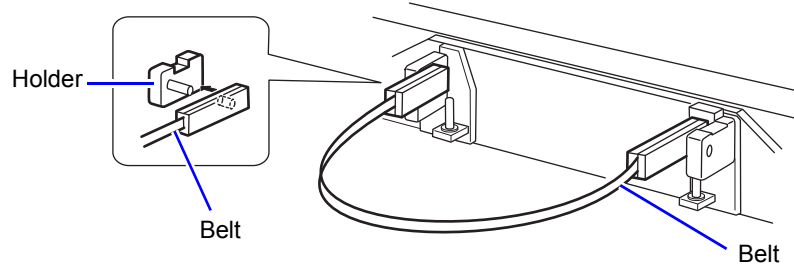
The endoscope support is secured.

- 3 Rotate the tab on the joint and secure each joint in an appropriate position.

4.3.12 Mounting Drain Bag (Optional)

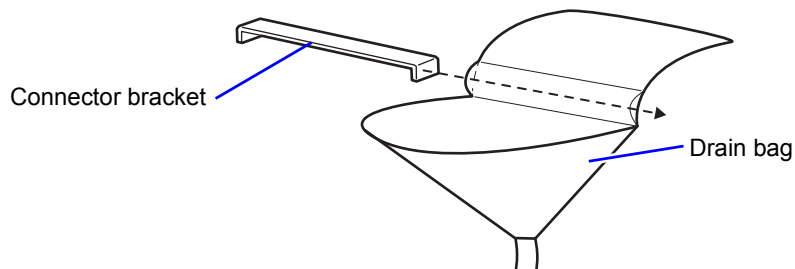
The drain bag is a plastic container to collect bodily waste such as urine during the examination of urethral tube or others in a horizontal position. Ten sets of the urine drain bag are provided with the product.

- 1 Mount the belt to the holder.

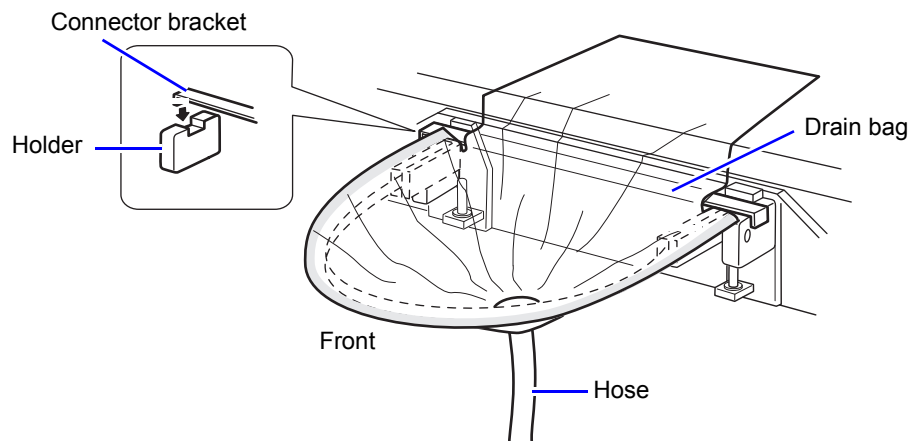


 **Hint** There is a long belt and a short one. Select as necessary.

- 2 Pass the connector bracket through the tube in the rear of drain bag.



- 3 After placing the drain bag on the belt, secure the connector bracket in the holder.





CAUTION



Instructions

Make sure that the drain bag is far enough from the floor or ceiling when tilting the tabletop after mounting.

Otherwise, the drain bag may collide with the floor or ceiling and get damaged.



Hint

Provide the following number to order additional drain bags:

- Drain bag (1EA): 571-90634

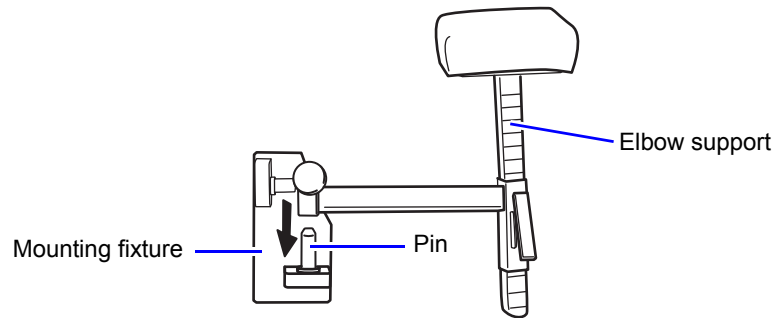
4.3.13 Mounting Elbow Support (Optional)

The elbow support steadies the operator's elbow when performing a urological examination. It is used in combination with the drain bag.

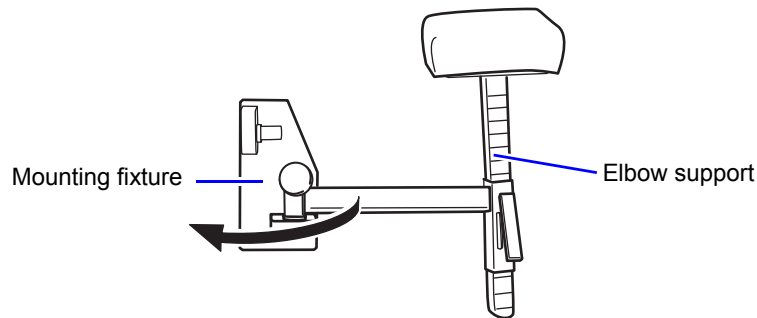


Mount the elbow support before mounting the drain bag.

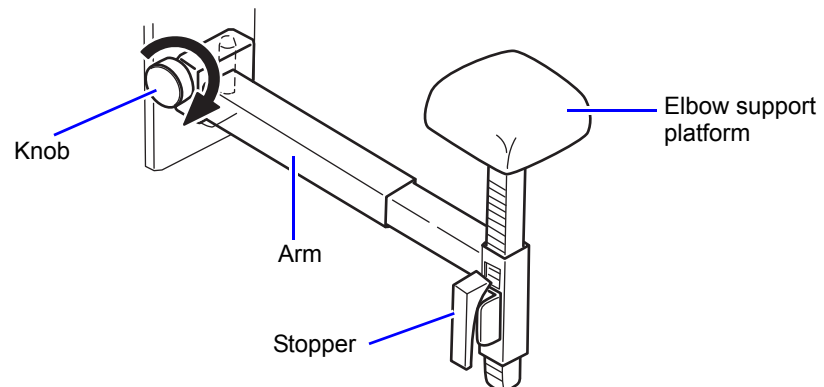
- 1 Insert the elbow support into the mounting fixture pin as shown below.



- 2 Rotate the elbow support 90° forward.



- 3 Secure by fastening the knob tightly clockwise.



- 4 Adjust the length of the arm.

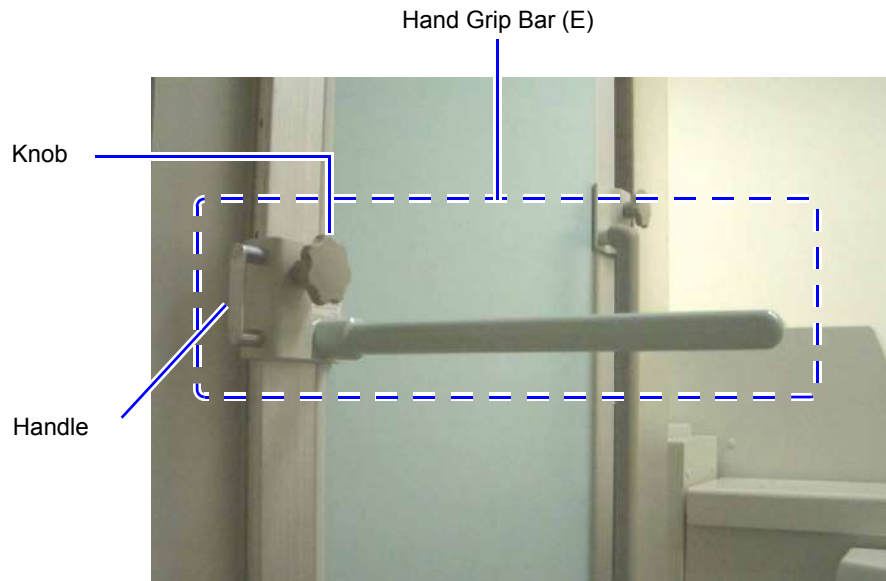
- 5** Adjust the height of the elbow support platform.
- To raise the elbow support platform, lift it up and release at the desired height.
- To lower the elbow support platform, press the stopper and lower the elbow support platform down.

 CAUTION	
 Instructions	Make sure that the elbow support is far enough from the floor or ceiling when tilting the tabletop after mounting. Otherwise, the elbow support may collide with the floor or ceiling and get damaged.
 Instructions	Completely fasten the stopper after adjusting the height of the elbow support platform. Otherwise, the elbow support platform may fall lower, causing injury.
 Prohibitions	Do not place excessive weight on the elbow support platform. Excessive weight may damage the elbow support, causing injury. The elbow support platform is designed to steady the operator's elbow.

4.3.14 Hand Grip Bar (E)

This is a supportive device to keep the position of an upper body to take an X-ray image of a backbone of a patient by gripping it in the vertical position.

- 1 Lose the knob of the hand grip bar (E), and attach it to the front side rail of the table top.
- 2 Fix the hand grip bar (E) on the rail certainly with fastening knob as the diagram below indicates.



Fasten the knob with holding handle.



WARNING



Fix the hand grip bar (E) on the rail of the tabletop certainly.

If it is dropped, the patient may be injured.

Instructions



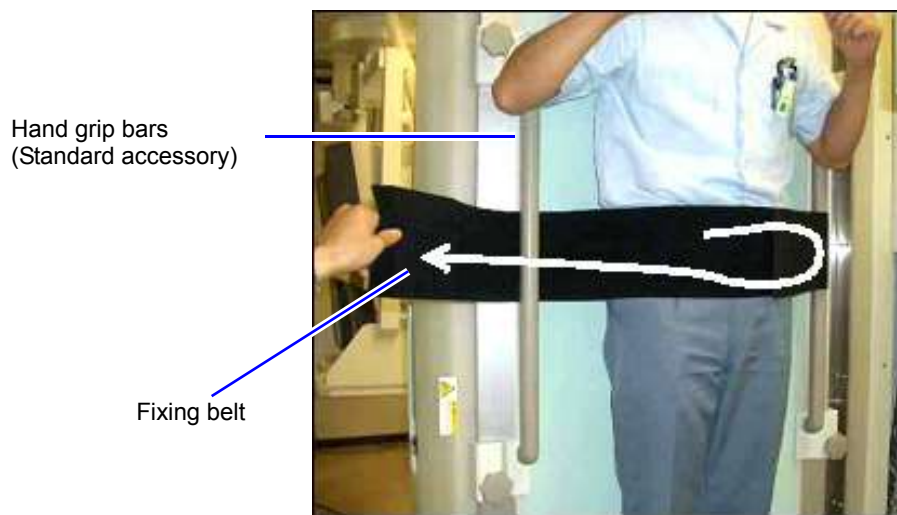
NOTE

Hand grip bar (E) is attached only front side of the table top. It is not attached to far side of the table.

4.3.15 Fixing Belt

This is a supportive device to support a position of a patient in the vertical position. It is attached to two hand grip bars (standard accessory).

- 1 Attach the hand grip bar (standard accessory) to rails of the tabletop.
- 2 Decide the usage position by moving along the rails, and fix the hand grip bars on the rails by fastening the knob.
- 3 Attach the one end of the fixing belt to the hand grip bar at far side of the tabletop, and attach another end of it at front side of the tabletop to hold the patient.



**WARNING**

**Mind behavior of a patient not to fall down or be exposed to risk for him.**

Instructions The fixing belt is a supportive device to support a patient in the vertical position. It is not a supportive device that prevents a patient from falling down from diagnostic table perfectly. Mind their behavior carefully.

**Look the fixing belt without a snag stitch before use it**

Instructions If it is unfasten, patient may fall down from the diagnostic table and be injured.

**After the fixing belt is through two hand grip bars, fasten it with hook and loop fastener certainly.**

Instructions If it is unfasten, patient may fall down from the diagnostic table and be injured. Fasten its ends with hook and loop fastener certainly.

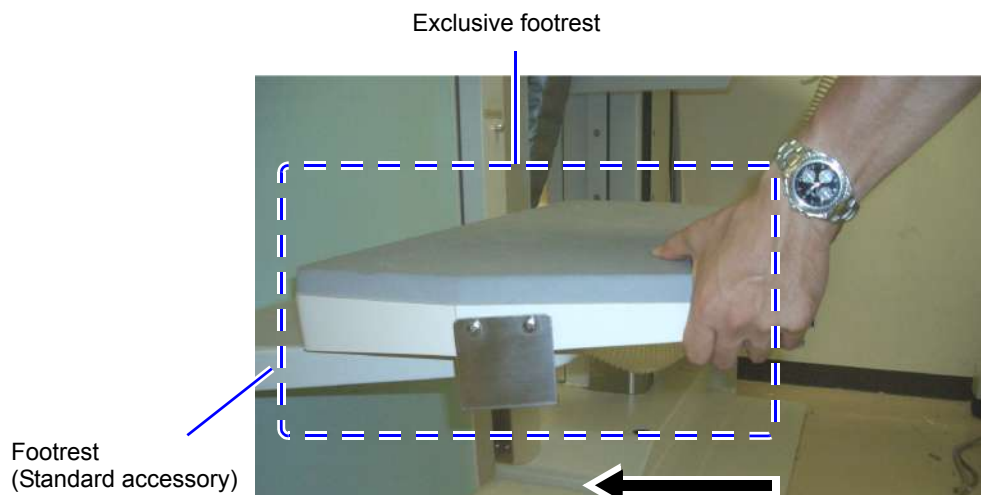
**Fix the hand grip bars on the rails of the tabletop certainly.**

Instructions If it fall down, patient may be injured.

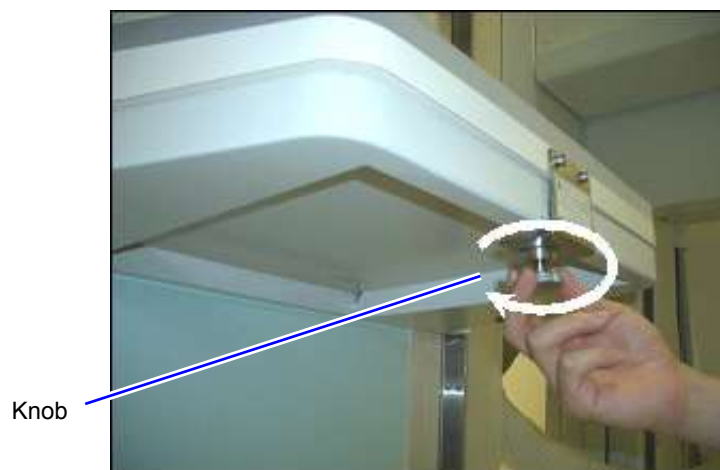
4.3.16 Exclusive Footrest

This is a supportive device to take an X-ray image of a lower leg of a patient in the vertical position. It is attached to the footrest (standard accessory).

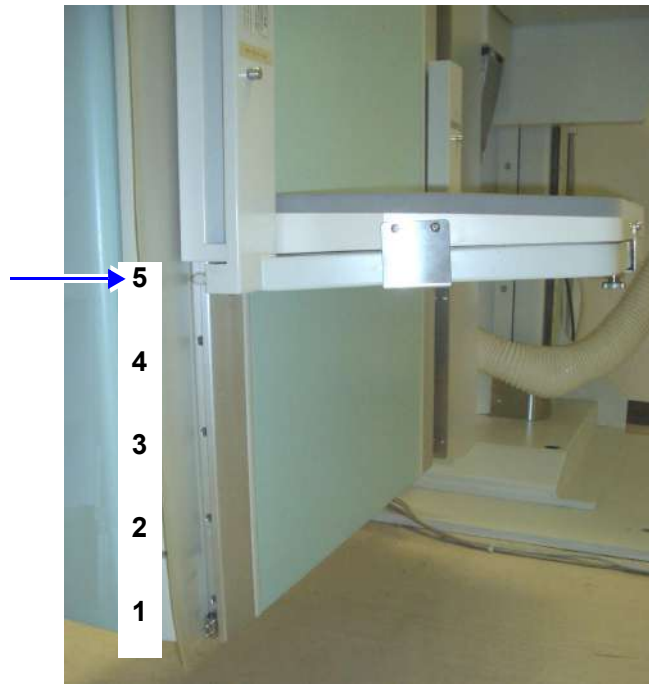
- 1 Attach the footrest (standard accessory) to the table top.
- 2 Attach the exclusive footrest to the attached footrest.



- 3 Fix the exclusive footrest on the footrest certainly to fasten the knob of the exclusive footrest.



- 4 Move the footrest along the rails of the tabletop until the fifth hole from foot side end of the table top.



4



WARNING



Instructions

Make sure the foot rest is firmly secured after you have installed or moved it.

Ensure that the foot rest is secured by moving it back and forth. The unsecured foot rest may come off from the tabletop, causing injury to a patient.



Instructions

Fix the exclusive footrest on the footrest certainly.

If it fall down, patient may be injured.



Instructions

Use by a combination of the exclusive footrest and the fixing belt.

It is at risk for a fall of a patient from the footrest. When the exclusive footrest is used, the fixing belt is used at same time



Instructions

The exclusive footrest is used only taking X-ray images of a lower foot.

It is at risk for a fall of a patient from the footrest in the vertical position, because result in a higher rate of wobbling forward for using the footrest.



NOTE

Be careful about the use and keeping, because the contact surface of this exclusive footrest tends to scar easily.

4.4 Mounting/Removing Anti-scatter Grid

Using the anti-scatter grid improves image quality by reducing the impact of scattered X-ray. However, the X-ray grid should be removed when the exposure level must be reduced to perform radiography for pregnant women or infants.


CAUTION



Instructions

To mount or remove the X-ray grid, move the tabletop all the way back and lift the hand guard.

If you do it without moving the tabletop all the way back, you may get your fingers caught between the tabletop and the grid.

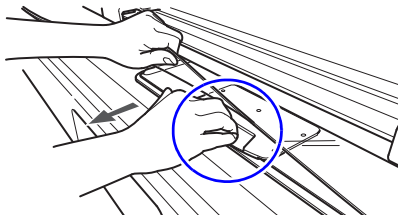
If you do it without lifting the hand guard, your fingers may be injured by the hand guard.



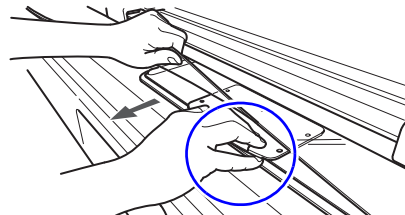
Instructions

When holding the grid handle, take care not to allow your fingers to protrude from the grid.

Your fingers might get nipped between the unit and the grid.



How to hold the handle –
Good example



How to hold the handle –
Bad example



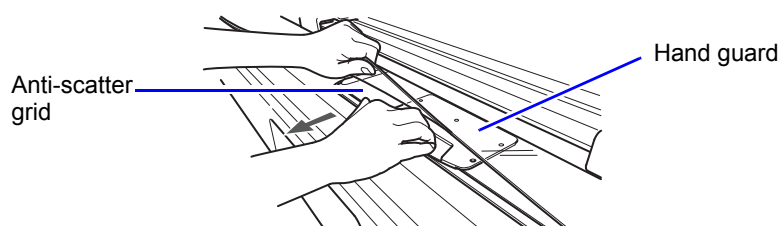
Instructions

Make sure not to allow anyone to control the unit while you are mounting or demounting the X-ray grid.

If someone moves the tabletop, you may get the finger caught between the tabletop and the grid.

■ Removing X-ray Grid

- 1 Move the tabletop all the way back.
 Reference ["Moving Tabletop Laterally" P.4-51](#)
- 2 Lift the hand guard and hold the handle to draw the X-ray grid.
 When holding the grid handle, take care not to allow your fingers to protrude from the grid.

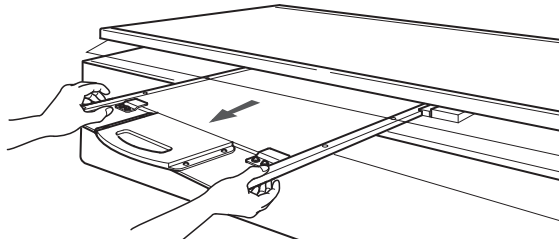


4-32

SONIALVISION G4 INSTRUCTION MANUAL

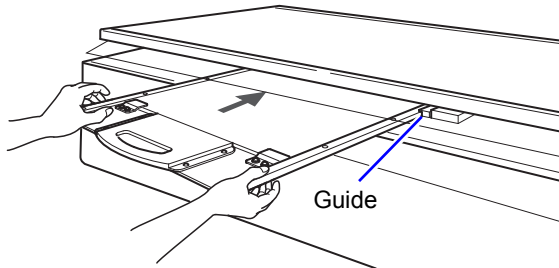
M517-E209

- 3 Hold the X-ray grid with both hands and remove it.

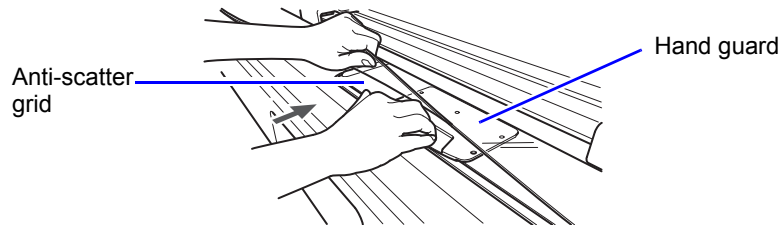


Mounting X-ray Grid

- 1 Move the tabletop all the way back.
 **Reference** "Moving Tabletop Laterally" P.4-51
- 2 Lift the hand guard and insert the X-ray grid all the way in.
 Check that the X-ray grid is not turned upside down and insert it along the guide.



- 3 Insert the X-ray grid all the way in.



NOTE

Insert the X-ray grid all the way in. The imaging unit cannot be moved or obliquely projected and the tabletop cannot be moved vertically or tilted if the grid is not inserted all the way in.

The state of the anti-scatter grid is displayed on the touch panel, the acquisition monitor and the local console (optional). The state indication is as follows:

Touch panel/ Acquisition monitor	Local console (optional)	State
	 Unlit	Installed
	 Blinking	Not inserted all the way in
	 Lit	Uninstalled

The type of the anti-scatter grid is displayed on the acquisition monitor.

Please refer to the "M517-E210 Digital Radiography System DR-300 Instruction Manual (Image Acquisition)" for further details.

4.5 Turning the Power ON/OFF

This section describes how to turn on/off power.

4.5.1 Turn the Power On



- Wait at least 10 seconds after power was turned off, before you turn the power on again or disengage the emergency stop button. Otherwise the unit may not operate normally.
- Wait at least 10 seconds after power was turned off and on again or the emergency stop button disengaged, before you perform any operation. Otherwise the unit may not operate normally.

- 1 Switch on the X-ray high voltage generator power switch (breaker).
- 2 Press  on the remote console.
The whole system will start up.

4.5.2 Turn the Power Off



CAUTION



Instructions

Do not turn the power off when the digital radiography unit is transferring image data to storage media (CD-R, DVD etc.).

Doing so can damage the image data.

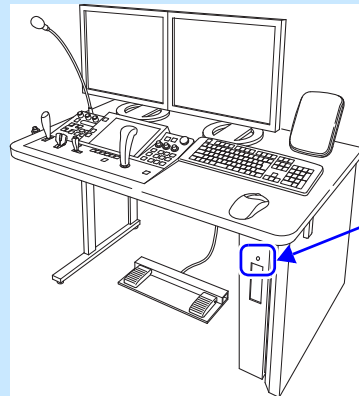
- 1 Exit the digital radiography unit.
 - 1 Click on [System] in the top right corner of the reference monitor screen.
The system menu is displayed.
 - 2 Click on [Shutdown].
 - 3 Select [Shutdown] and click on [OK].
The digital radiography unit's power is turned off.
- 2 Press  on the remote console.
The power of the high voltage generator and X-ray diagnostic table is turned off.

- 3** After the power has been turned off, wait for at least 20 seconds before switching off the X-ray high voltage generator power switch (breaker). Do not switch off the power switch of the digital radiography unit or the breaker at the front of the control cabinet except in an emergency.

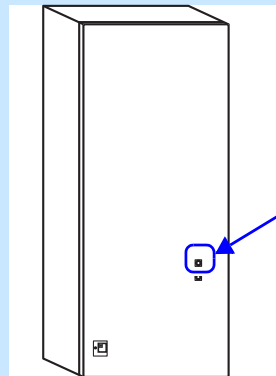
**NOTE**

Follow the procedures below to turn the system off if this cannot be done by following the above procedures.

1. If the power button at the front of the digital radiography unit's control cabinet is lit in yellow, press and hold for about 5 seconds until the light goes out.



2. If the power button at the top center of the digital radiography unit's control cabinet is lit in yellow, press and hold for about 5 seconds until the light goes out.



Wait around 1 minute before pressing  on the remote console to start the system again.

4.6 X-ray Tube Warm-up

Perform warm-up of the X-ray tube unit daily before use. Warm-up is effective not only to prevent arcing, but to verify that no problem exists in the high voltage generator and the X-ray tube unit.

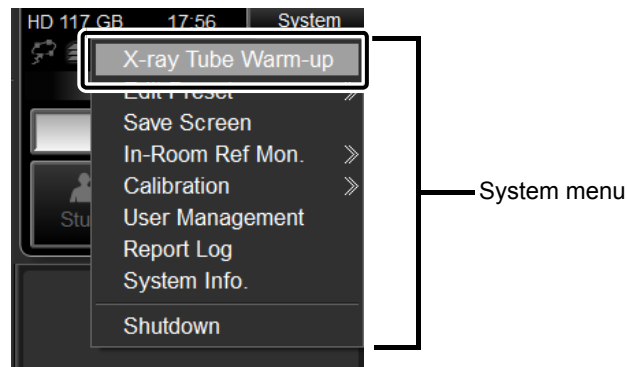
There are two types of warm-up procedure: auto procedure and manual procedure.

If you find out any abnormal condition during warm-up, turn off the unit and the breaker on the switch board as well, and contact Shimadzu service representative.

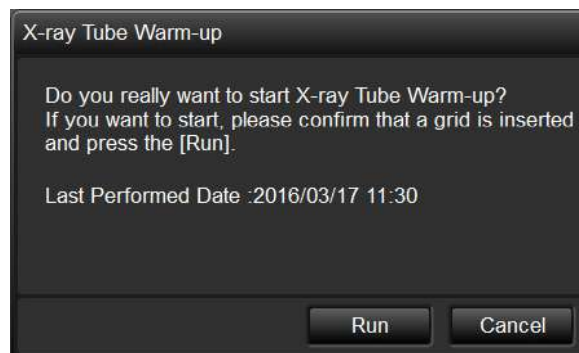
4.6.1 Auto Warm-up

The auto warm-up procedure is shown below:

- 1 Click [System] - [X-ray Tube Warm-up] on the system menu.



The [X-ray Tube Warm-up] window appears.

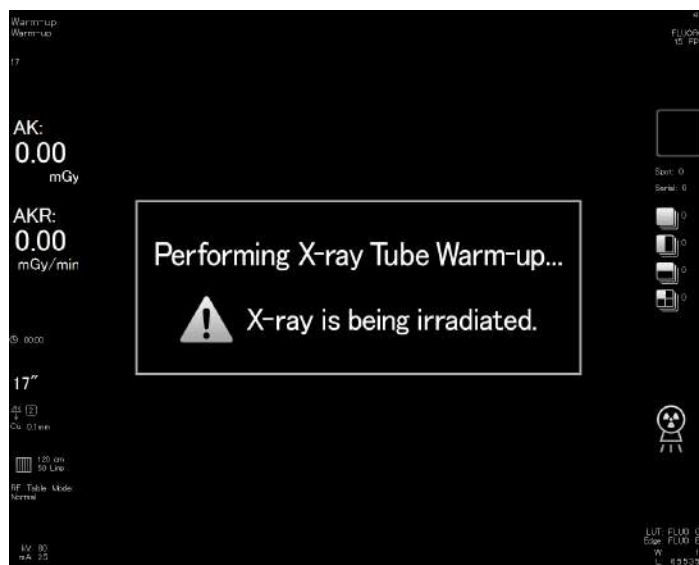


The grid must be inserted to execute the X-ray tube warm-up.

- 2 Check the gird is inserted and click [Run] to start the X-ray tube warm-up. The X-ray tube warm-up is started. The [Status] window appears on the reference monitor, indicating the progressing status and remaining time of the warm-up.



The windows below appear on the acquisition monitor, indicating the warm-up is being performed.



Acquisition Monitor

On the touch panel, the  /  (Arrow) button next to the protocol is only available during the warm-up.

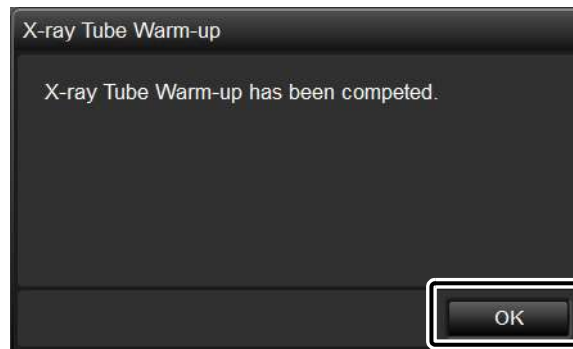


Touch Panel

Click [Cancel] to cancel the X-ray tube warm-up. The [Image List] window returns.

4 Operation of Each Part of the System

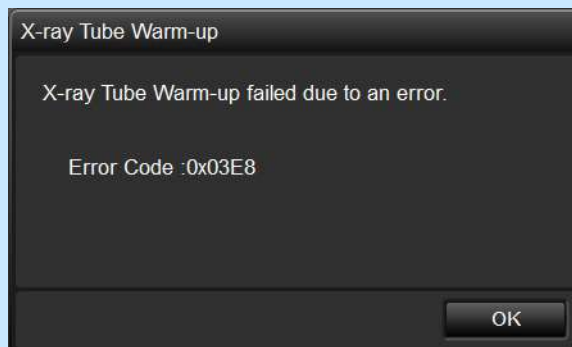
The warm-up takes from a few minutes to ten minutes according to the status of options. When the warm-up is completed, the window below appears.



- 3 Click [OK] to exit the warm-up.
- 4 When a radiography tube voltage higher than that used in the auto warm-up or the second X-ray tube is used, perform the manual warm-up.

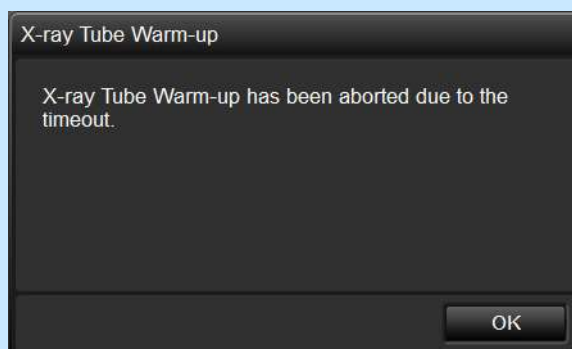
**NOTE**

The window below appears when the error occurs during the X-ray tube warm-up. Check the error code displayed and cope with the error. Please refer to the "M517-E210 Digital Radiography System DR-300 Instruction Manual (Image Acquisition)" for error details.



Then, perform the X-ray tube warm-up from the beginning again.

The window below appears when the timeout occurs due to communication error between units during the X-ray tube warm-up.



Restart the system and retry the X-ray tube warm-up. When the timeout occurs after the system restart, contact a Shimadzu service representative.

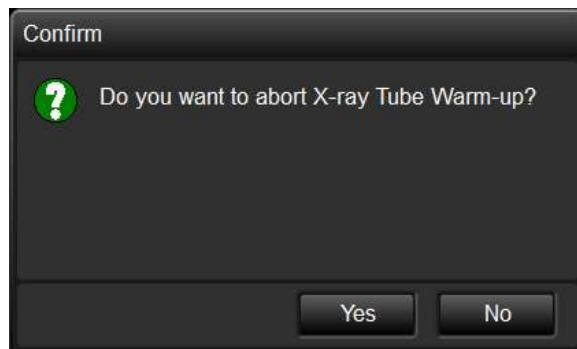
4.6.2 Canceling Auto Warm-up

Cancel the auto warm-up as follows:

- 1 Click [Cancel] on the [Status] window that appears during the X-ray tube warm-up.

 **Reference** ["4.6.1 Auto Warm-up" P.4-36](#)

The windows below appears.

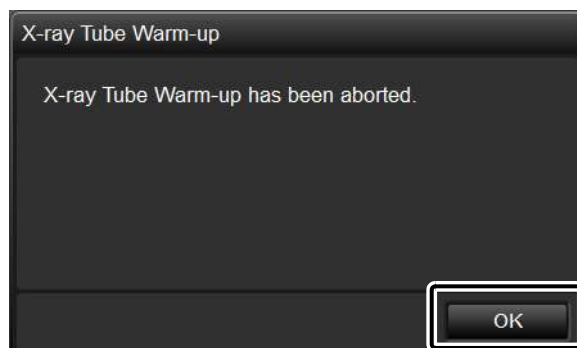


- 2 Click [Yes] or [NO].

Click [Yes] to stop for the X-ray tube warm-up.

Click [No] to proceed the X-ray tube warm-up.

When the X-ray tube warm-up is canceled, the window below appears.



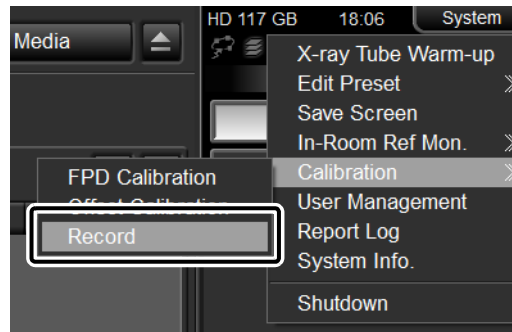
- 3 Click [OK].

Perform necessary operation and then perform the X-ray tube warm-up from the beginning again.

4.6.3 History of Auto Warm-up

The history of the auto warm-up can be checked.

- 1 Click [System] - [Calibration] - [Record].



- 2 The [Record of calibration] window appears.
The date and result of warm-up is displayed.



Check the history and click [Close] to close the window.

4.6.4 Manual Warm-up

The manual warm-up procedure is shown below:

- 1** Close the X-ray irradiation field completely.
Lower the collimator open/close lever (right and left).
 **Reference** ["4.8.2 Adjusting Irradiation Field with Remote Console" P.4-68](#)
- 2** Set the fluoroscopy tube voltage manually to 50 kV.
 **Reference** ["Setting Fluoroscopy Tube Voltage Manually" P.4-82](#)
- 3** While performing fluoroscopy, increment the tube voltage in 10 kV/min and keep it for 5 minutes at a maximum kV for fluoroscopy.
 **Reference** ["4.12.3 Fluoroscopy" P.4-118](#)
- 4** Select the general radiography technique.
 **Reference** ["4.10 Selecting Technique and X-ray Tube" P.4-75](#)
- 5** Select large focus.
 **Reference** ["Setting Focus" P.4-88](#)
- 6** In order to perform radiography, follow the steps below to set the subsequent conditions with about 1 minute interval between steps.
 **Reference** ["Setting kV and mA or mAs and sec" P.4-90](#)



Hint The procedure of "Warm-up" has been set for X-ray condition in Steps 2 to 6 above.

- 1** Perform one radiography with the settings of 80 kV for radiography tube voltage, maximum available tube current mA, and 0.1 sec for radiography time.
- 2** Perform one radiography with the settings of 90 kV for radiography tube voltage, maximum available tube current mA, and 0.1 sec for radiography time.
- 3** Perform one radiography with the settings of 100 kV for radiography tube voltage, maximum available tube current mA, and 0.1 sec for radiography time.
- 4** Perform one radiography with the settings of 110 kV for radiography tube voltage, maximum available tube current mA, and 0.1 sec for radiography time.
- 5** Perform one radiography with the settings of 120 kV for radiography tube voltage, approximately half of maximum available tube current mA, and 0.1 sec for radiography time.

7 In order to perform high-voltage radiography (130 kV and higher), follow the steps below to set the subsequent conditions up to a maximal tube voltage used.

- 1** Perform one radiography with the settings of 130 kV for radiography tube voltage, maximum available tube current mA, and 0.1 sec for radiography time.
- 2** Perform one radiography with the settings of 140 kV for radiography tube voltage, maximum available tube current mA, and 0.1 sec for radiography time.
- 3** Perform one radiography with the settings of 145 kV for radiography tube voltage, maximum available tube current mA, and 0.1 sec for radiography time.
- 4** Perform one radiography with the settings of 150 kV for radiography tube voltage, approximately half of maximum available tube current mA, and 0.1 sec for radiography time.

**NOTE**

- If an error occurs during warm-up, leave a 1 minute interval and lower the tube voltage by 30 kV, and then retry radiography.
- For a multi-focus X-ray tube unit, verify that you can perform radiography with focus switched.

8 Perform warm-up for each X-ray tube unit.

4.7 Operating X-ray Diagnostic Table

4.7.1 Safety Sensors

This unit has a safety sensor to ensure safety for both patients and operators. The column and the tabletop halts when one of these sensors is activated.



If the column and tabletop stop, remove the object that caused the sensor to operate. Before resuming operation, release your hand from the lever or button, and check if everything is safe around the X-ray diagnostic table.

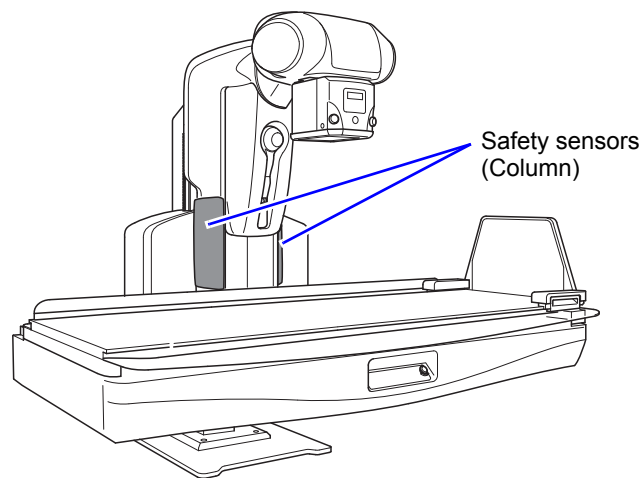
The safety sensors work in any of the following conditions:

■ When the Safety Sensor (Column) Has Touched a Person or an Object

Safety sensors are located on both sides of the column. If you attempt to move the imaging unit in the direction of the obstacle, the column stops moving and the error message C1-25 or C1-26 is displayed on the console.

 **Reference** ["Messages Relating to the X-ray Diagnostic Table and Collimator" P.5-14](#)

Move the imaging unit to the opposite side and remove the obstacle. This gets the operation restarted.

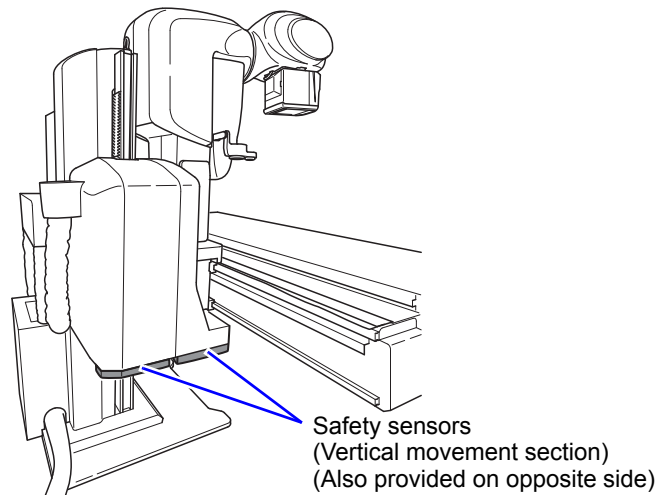


■ When the Safety Sensor (Vertical Movement Section) Has Touched a Person or an Object

Sensors are located on the bottom of both sides of the vertical movement section. While lowering the tabletop, the tabletop stops and the error message C1-29 is displayed on the console when the sensor has touched an object.

 **Reference** ["Messages Relating to the X-ray Diagnostic Table and Collimator" P.5-14](#)

Raise the tabletop and remove the obstacle. This gets the operation restarted.

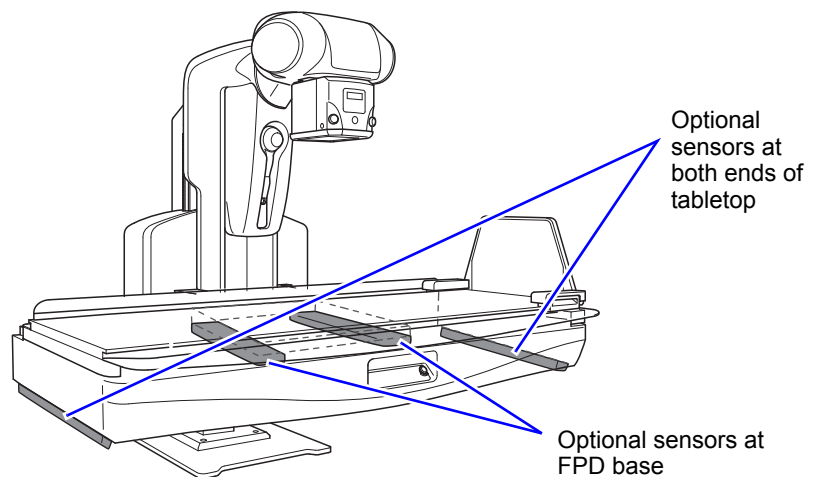


4

4.7.2 Optional sensors

These sensors prevent objects from getting caught when lowering or tilting the tabletop.

Optional sensors can be mounted at both ends (two locations) of the tabletop and base (two locations) of the FPD.



While lowering or tilting the tabletop, tabletop operation stops and the error message C1-27 or C1-28 is displayed on the console when the optional sensor touches an object.

 **Reference** ["Messages Relating to the X-ray Diagnostic Table and Collimator" P.5-14](#)

Normal operation is restored when the obstacle is removed.

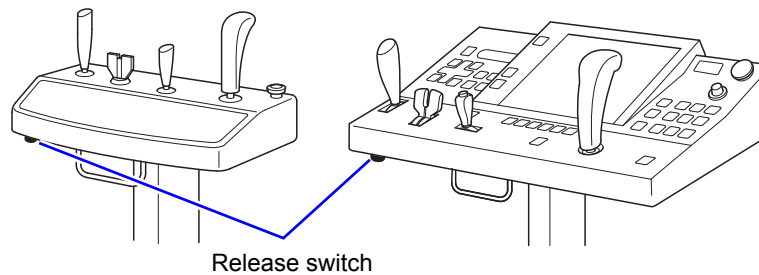


NOTE

When tabletop operation is stopped, remove the object(s) that the sensor reacted to. Before resuming operation, release your hand from the lever or button, and check if everything is safe around the X-ray diagnostic table.

If the obstacle(s) cannot be removed, move the tabletop with the release switch on the base of the local console held down and then remove the obstacle(s).

A warning alarm will sound while the release switch is being pressed.



NOTE

The optional sensors do not react while the release switch is pressed in. Do not move the tabletop in the direction where the sensor is reacting against the obstacle(s).

4.7.3 Operational Button

The front control panel on the X-ray diagnostic table, the remote console, and the local console with/without an optional touch panel have a button with  or  mark (operational button).

The buttons listed below for controlling the X-ray diagnostic table and X-ray irradiation are enabled only when the operational button on the console is lit.

X-ray diagnostic table front control panel  Reference P.2-4	Set button, SID switchover button, tabletop return button, raise tabletop button, lower tabletop button, reverse tilt button, tilt button, imaging unit shift button (towards the head), imaging unit shift button (towards the feet), tabletop left shift button, tabletop right shift button
Remote console  Reference P.2-8	Set button, SID switchover button, oblique projection button, tabletop return button, tabletop vertical movement buttons, tabletop and imaging unit control lever, tabletop tilting lever, tabletop reverse tilt check button, compression unit control lever, squeeze compression button, X-ray irradiation clearance button
Others	Fluoroscopy foot switch, hand switch

Other buttons and touch panels are enabled even when the operational button is unlit.

The operational buttons on the X-ray diagnostic table front control panel automatically go off 60 seconds after the front control panel was operated.



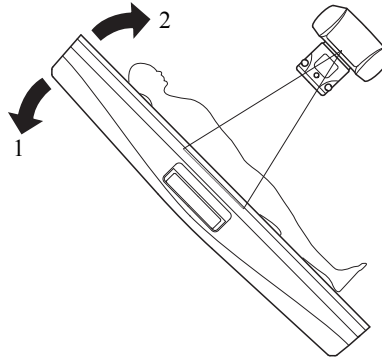
- If there are optional consoles, switch between operational consoles by pressing  or  on the console.
The remote console is always operational if there are no optional consoles.
- The operational button on the console is not unlit even if the operational button on the front control panel is lit.
- The foot switch for the examination room (optional) can be operated at all times, regardless of the status of the operational button.

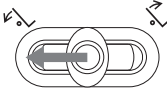
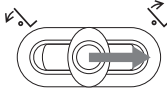
4.7.4 Operating Tabletop

Tilting Tabletop

To change tilting

The tabletop inclination can be adjusted by tilting it.



To operate	Tilt in the direction of 1	Tilt in the direction of 2
Remote console	Holding down the button on the top of the lever, shift the tabletop tilting lever to the left. 	Holding down the button on the top of the lever, shift the tabletop tilting lever to the right. 
X-ray diagnostic table front control panel	Press  .	Press  .

- The tabletop moves only while the button is being pressed or the lever is being operated.
- When the lever is moved in the direction of 1, the tabletop automatically stops at horizontal level.
- The tilt angle is displayed on the touch panel. The operation range falls within -90° to 90° .

 **WARNING**



Make sure that there is NO ONE UNDER the X-ray diagnostic table while it is being tilted.

Instructions Failure to comply may result in a person becoming trapped and injured.

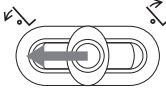


Do NOT place the foot switch (optional) under the X-ray diagnostic table.

Instructions Failure to comply may result in the operator's foot becoming trapped, causing injury.

Tilting from the horizontal position to the Trendelenburg position

The tabletop can be tilted so that the head position of a patient lowers below the horizontal level (Trendelenburg position).

To operate	Tilting to the Trendelenburg position
Remote console	Press  to light it up at a horizontal level and then shift the tabletop tilting lever to the left. 
X-ray diagnostic table front control panel	Press  .

- The tabletop moves only while the button is being pressed or the lever is being operated.
- To raise the tabletop, shift the lever to the right or press . It does not stop automatically at horizontal level.



WARNING



Check that a patient's body is firmly supported by means of hand grips and shoulder rests, when tilting the tabletop to the Trendelenburg position.

Unsafe support may result in the patient falling from the tabletop, causing injury.

Instructions

 **Hint** When  is lit, pressing  turns it unlit and the tabletop will not be tilted in the direction towards the Trendelenburg position. To tilt the tabletop in the direction towards the Trendelenburg position again, press  once again.

To pause tilting

The equipment can be configured so that tilting pauses automatically at a preset tilting angle (pausing angle). Contact your Shimadzu service representative if you wish to configure so.

If a pausing angle is set, tilting stops automatically when the preset tilting angle is reached. To tilt further in the same direction, operate as shown below.

To operate	Regular tilting	Tilting more in the Trendelenburg position
Remote console	Move the tabletop tilting lever to the center and shift it to the left or right.	 blinks when the preset tilting angle is reached. Press  to light it up and shift the tabletop tilting lever to the left or right.
X-ray diagnostic table front control panel	Release  or  once and press it once again.	Release  or  once and press it once again.



Hint The tabletop will not pause at the pausing angle or the horizontal position, if the tabletop tilting lever is shifted while  is pressed on the remote console.



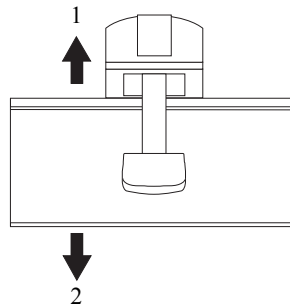
- The tabletop cannot be tilted either when the X-ray tube unit is rotating. Reset the rotation angle of the X-ray tube unit to 0°.
- The imaging unit may be pulled back down due to the ceiling height of the examination room or the SID.



Hint The safety-stop angle can be adjusted between -5° and -45°. The factory-preset angle is -30°. Contact your Shimadzu service representative if you wish to change it.

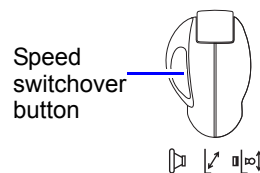
Moving Tabletop Laterally

You can move the tabletop laterally.



To operate	To move left (in the direction of 1)	To move right (in the direction of 2)
Remote console	Shift the tabletop and imaging unit control lever to the right. 	Shift the tabletop and imaging unit control lever to the left. 
X-ray diagnostic table front control panel	Press  .	Press  .

- The tabletop moves only while the button is being pressed or the lever is being operated.
- You can change the tabletop moving speed to 5.0 cm/sec by shifting the lever while holding down the speed switchover button. The normal speed is set at 2.5 cm/sec.



Hint

- The tabletop lateral speed can be adjusted between 1.0 cm/sec and 5.0 cm/sec. Contact your Shimadzu service representative if you wish to change it.
- The direction of movement of the imaging unit and tabletop is linked to the movement on the monitor. The settings can be changed to fix the direction of movement. Contact your Shimadzu service representative to change this setting.

Lock Operation

The lateral movement of the tabletop can be locked with the touch panel. The lock function disables the right-and-left shift of the tabletop and imaging unit control lever to prevent unexpected move.

- 1 Press the position information area of the X-ray diagnostic table on the touch panel.



The [R/F Table Setting] screen is displayed.

- 2 Press [Lock].



- 3 When the setup is finished, press [OK].

The [R/F Table Setting] screen closes.

The lateral movement of the tabletop is locked until a study starts or ends. When a user tries to move the tabletop laterally, the message appears. Press [Lock] again to release it.



- The moving speed in the lateral direction cannot be changed in the lock state.
- Turning off the power releases the lock.

Moving Tabletop Vertically

The tabletop can be moved vertically when it is in a horizontal position.

To operate	Move up	Move down
Remote console	Press 	Press 
X-ray diagnostic table front control panel	Press 	Press 

- Moves only while the button is being pressed.
- The height of the tabletop is displayed on the touch panel. The operation range falls within 47 cm to 110 cm.
- Between 47 cm and 57 cm above the floor, the tabletop moves in the following manner:
 - While lowering, it stops at a height of 57 cm above the floor. If you command again to lower, it starts lowering slowly with alarm.
 - The imaging unit moves slowly.
 - The safety sensor (vertical movement section) functions.



CAUTION



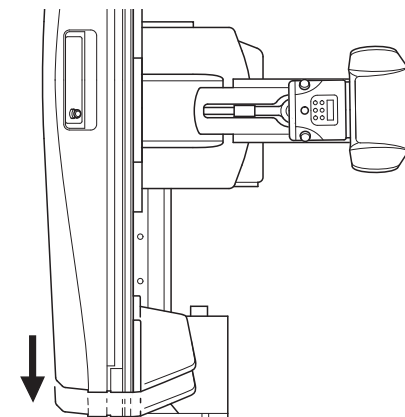
Prohibitions

Do not place your foot or an object under the X-ray diagnostic table while it is lowering.

Failure to comply may result in your foot becoming trapped, causing injury.

■ Raising/Lowering the Tabletop in Vertical Position

The tabletop can be lowered further when it is in the vertical or Trendelenburg position. Lowering the tabletop makes it easier for the patient to get on or off the foot rest.



To operate	Move up	Move down
X-ray diagnostic table front control panel	Press  .	Press  .

- Tabletop moves within the tilt angle 80° to 90° or -80° to -90° range.
- Moves only while the button is being pressed.
- Moves at low speed while the alarm is sounding.
- If tilting is performed when the tabletop is lowered in the vertical position, the tabletop automatically returns to the original height before tilting.

	CAUTION
 Prohibitions	When the tabletop is lowered, the gap between the system and the floor becomes extremely narrow. When lowering the tabletop, do so with the utmost care. Also, do not place your foot or an object under the X-ray diagnostic table while it is being lowered. Failure to comply may result in your foot becoming trapped, causing injury.

I-Tilt Mode

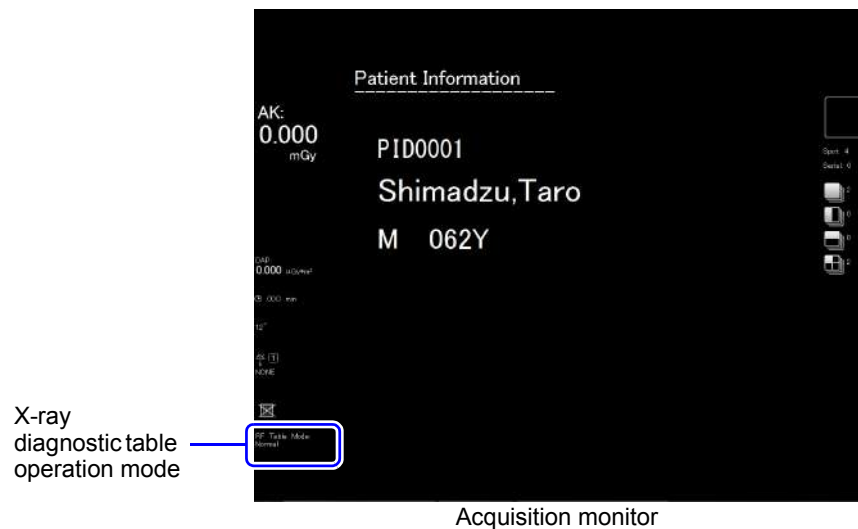
In I-Tilt mode, the tabletop can be tilted between set angles without raising the tabletop. Stopping the tabletop from rising lessens the change in the position of the patient's body.

1 Start a study.

Refer to the "M517-E210 DR-300 Instruction Manual (Image Acquisition)" for details on setting modes.

 flashes on the console if position memory is registered.

Press  to move the imaging unit to the registered position. When it reaches that position,  is lit and the operation mode automatically changes to [I-Tilt].



- This can be used when the tilt angle is horizontal, the SID is 1100 or 1200 and the oblique projection angle is within $\pm 30^\circ$.
- Tilting starts from the height of the tabletop at the start of operation.
- Select the normal mode to return to the normal tilt operation.



Operation is restricted to the following range in I-Tilt mode.

- SID: 1100 or 1200
- Tilt angle: -30° to 30°
- Tilt speed: Max. $3^\circ/\text{sec}$

■ Tabletop Height Reset Mode

When  (customizable button) is assigned on the console, the tabletop can be automatically reset to the tilt start height after the tabletop is returned to the horizontal level from the vertical or Trendelenburg position.

- 1 Turn  on.
- 2 Operate the ,  or tabletop tilt lever to tilt the tabletop.
The tabletop height is registered.
- 3 Operate the ,  or tabletop tilt lever to return the tabletop to the horizontal level.
Continue operating the buttons or lever even after the tabletop has reached the horizontal level.
The tabletop is returned to the registered height.

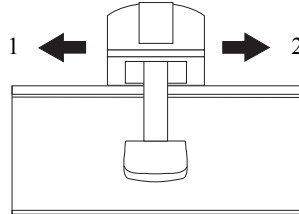


To return to the regular tilt operation, press  to cancel the tabletop height reset mode.

4.7.5 Operation of Imaging Unit

Moving Imaging Unit Vertically

You can move the imaging unit vertically.



To operate	To move towards the head (in the direction of 1)	To move towards the feet (in the direction of 2)
Remote console	Pull the tabletop and imaging unit control lever. 	Push the tabletop and imaging unit control lever.
X-ray diagnostic table front control panel	Press	Press
Collimator control panel	Press	Press

- The tabletop moves only while the button is being pressed or the lever is being operated.
- Using the front control panel on the X-ray diagnostic table or collimator control panel moves the imaging unit slower than when it is controlled by the remote console.

CAUTION

Prohibitions

Do not place your hand under the tabletop when moving the imaging unit.

Failure to comply may result in your hand becoming trapped, causing injury.

Hint The direction of movement of the imaging unit and tabletop is linked to the movement on the monitor. The settings can be changed to fix the direction of movement. Contact your Shimadzu service representative to change this setting.

Inclining X-ray Tube Unit (Oblique Projection)

The X-ray tube unit can be inclined vertically.

To operate	Incline toward head	Incline toward feet	Reset vertically
Remote console	Press 	Press 	Press and hold 

- Moves only while the button is being pressed.
- The oblique projection angle is displayed on the touch panel. The operation range falls within -40° to 40° .



Operation range may be restricted by the ceiling height of the examination room or the SID.

Changing SID

In this unit, the distance between "X-ray tube focus" and "FPD input surface" is called "Focus to FPD input surface distance" and represented with SID.

You can select an SID from 3 values: 110 cm, 120 cm, and 150 cm.

To operate	110 cm	120 cm	150 cm
Remote console	Press 	Press 	Press 
X-ray diagnostic table front control panel	Press  (switches over each time it is pressed).		



- SID cannot be changed when the X-ray tube is obliquely projected.
- It may not be possible to change the SID due to the ceiling height of the examination room or the tilt angle.

4.7.6 Interlocking Between Tabletop and Imaging Unit

Moving the Tabletop to Platform

The tabletop can be moved to the horizontal or vertical platform position to help a patient to get on and off easily. You can move it to horizontal or vertical position using the remote console, and to horizontal position using the front control panel on the X-ray diagnostic table.

To operate	Move to horizontal platform position*1	Move to vertical position
Remote console	Press 	Press 
X-ray diagnostic table front control panel	Press 	—

*1: When moved to a horizontal position, the tabletop comes to the originally set height.

Moves only while the button is being pressed.



Hint The position of the imaging unit, height of the tabletop and SID when in the horizontal position, and position of the imaging unit when in the vertical position can be changed. Contact your Shimadzu service representative if you wish to do so.

Operations Using the Position Memory Function

When the position memory function is used, the X-ray diagnostic table can be moved to the pre-registered position.



NOTE The following position information can be registered: tabletop height, tilt angle, SID, imaging unit position, and oblique projection angle of X-ray tube. The position information of left and right movement of the tabletop cannot be registered.

Refer to the "M517-E210 DR-300 Instruction Manual (Image Acquisition)" for details on registering position memory.

- 1 Select the procedure for which position memory is set.

 on the console flashes.

- 2 Press and hold .

The X-ray diagnostic table automatically starts moving and when it reaches the registered position  goes out.



- Hint**
- If you move your hand away from  before the table reaches the registered position, the X-ray diagnostic table stops moving. Movement is resumed by pressing  again.
 - When the X-ray diagnostic table is operated manually while  is flashing, the position memory function is canceled, and  goes out.

■ Setting Moving Speed

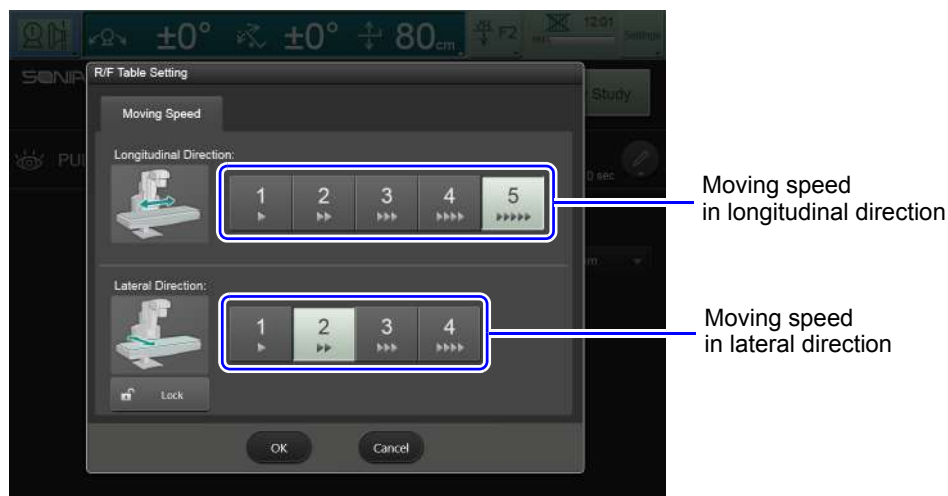
The moving speed can be changed in the longitudinal and lateral directions.

- 1 Press the position information area of the X-ray diagnostic table on the touch panel.



The [R/F Table Setting] screen is displayed.

- 2 Select the each moving speed.
"1" is the lowest moving speed. Increasing the number increases the speed.



- The moving speed cannot be changed while the X-ray diagnostic table is in operation.
- The moving speed returns to the initial value when the power is turned off.

Hint Contact a Shimadzu service representative if you wish to change the initial moving speed.

- 3 When the setup is finished, press [OK].
The [R/F Table Setting] screen closes.

Operation in Urology Mode

In urology mode, you can rotate the X-ray tube unit slightly, adjust the irradiation field according to the head end of the selected field size, and tilt the tabletop without changing the height of the imaging unit.

This mode is particularly useful when performing urological examinations at the end of the tabletop.

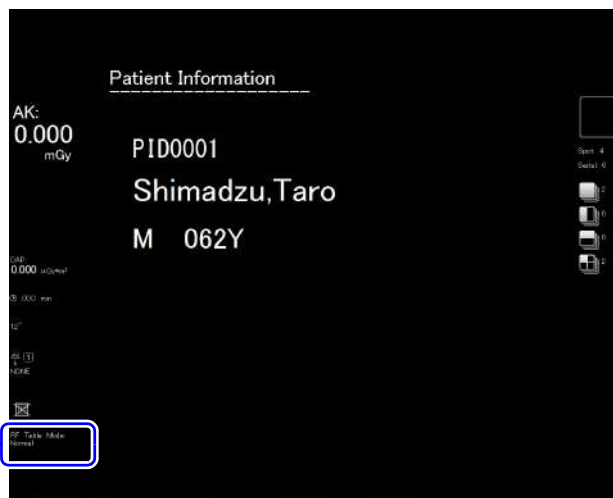
1 Start a study.

Refer to ["4.12.18 Urological Radiography" P.4-176](#) for details on setting modes.

 flashes on the console if position memory is registered.

Press  to move the imaging unit to the registered position. When it reaches that position,  is lit and the operation mode automatically changes to [Urology].

X-ray
diagnostic table
operation mode



Acquisition monitor

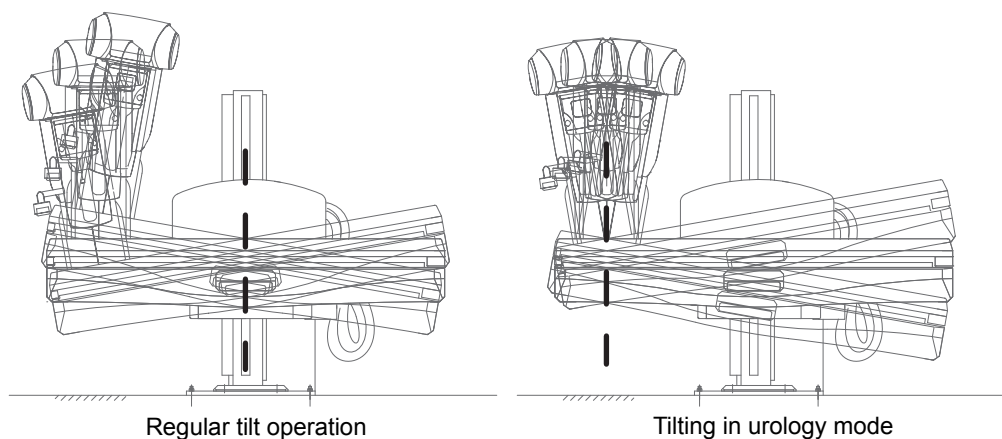
2 Operate the or or tabletop tilt lever to tilt the tabletop.

The tabletop is tilted with the height at the position registered in step 1 maintained.

 **Hint** The height of the tabletop is maintained if it is moved vertically while in the horizontal position.



Reference ["Moving Tabletop Vertically" P.4-53](#)



Regular tilt operation

Tilting in urology mode

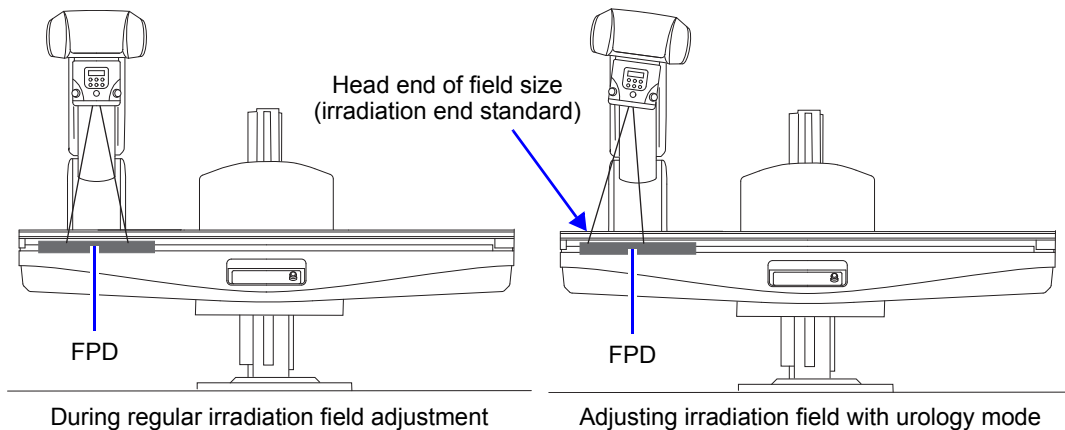


Operation is restricted to the following range.

- Tilt angle: Max. 10° vertically
- Movement range of imaging unit: head side to center
- SID: 110 cm or 120 cm

3 Adjust the X-ray irradiation field using the collimator open/close knob on the collimator or the collimator open/close lever on the console.

The X-ray tube rotates and the irradiation field is adjusted according to the head end of the selected field size.



- As the head end of the selected field size is the irradiation end standard, decreasing the field size moves the irradiation end standard inward.

- The X-ray may not be radiated in the center photo pickup field of the phototimer () when in urology mode, stopping the AEC from operating normally. Select the upper center photo pickup field () instead.

The photo pickup field automatically changes to the upper center photo pickup field () if the center photo pickup field () is selected when Urology Mode is started.

- Irradiation opens and closes horizontally in the same way as normal.
- Select the normal mode to return to normal operation.

4.7.7 Operating Compression Unit

Compression can be controlled by using any of the following methods:

- Normal compression with compression unit
- Squeeze compression, which is performed while moving the tabletop and imaging unit, with the compression unit secured

The tip of the compression unit can be replaced. Replace it to fit the patient's body thickness.

Compression

Lower the compression unit to apply compression to a patient.

If you control the tabletop or imaging unit while compression is being applied, the compression unit automatically retracts to ensure safety. Make sure that  is off before applying compression.

WARNING

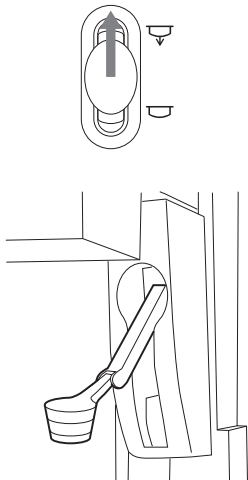
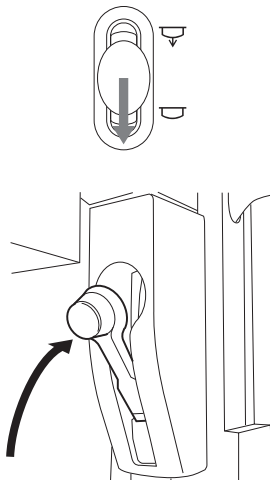


Make sure that  is off when you apply normal compression.

Instructions

While  is lit up, the compression unit does not retract when you control the tabletop or imaging unit while compressing, which may cause injury to a patient such as bone fracture.

Use the remote console to control the compression unit.

Lower compression unit	Reset to original position
Push the compression unit control lever. 	Pull the compression unit control lever. 

Squeeze Compression

Squeeze compression is a compression method to lower and secure the compression unit and move the tabletop and imaging unit.

 WARNING	
	To apply squeeze compression, control carefully while monitoring a patient.
Instructions	Careless control may cause injury to a patient, such as bone fracture, because the compression unit is secured.

- 1 Press .

When the button lights up, the unit is ready to provide squeeze compression.

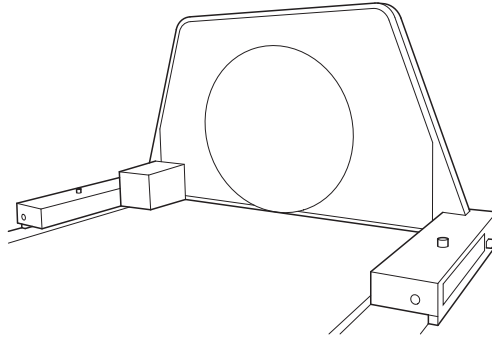
- 2 While pushing the compression unit control lever, move the tabletop and imaging unit.

The compression unit does not retract when you move the tabletop and imaging unit while pushing the compression unit lever. Pay close attention to a patient when you control the tabletop and imaging unit to apply compression.

The compression unit retracts with 0.5 seconds delay when you move the tabletop and imaging unit without pushing the compression unit lever. The tabletop and imaging unit move at a slowest speed regardless of the lever position.

4.7.8 Operating Rotary Foot Rest (Optional)

The rotary foot rest is used to rotate a patient during an examination at vertical position.



Use the remote console to control the rotary foot rest.

4

Rotate clockwise	Rotate counterclockwise
Press  	Press  



NOTE

The compression unit retracts automatically to the original position while the rotary foot rest is being controlled. You cannot control to apply compression.

4.8 Adjusting X-ray Irradiation Field

By adjusting X-ray irradiation field, you can obtain more diagnostically capable fluoroscopic or radiographic images while reducing a patient's exposure level.

The method for adjusting X-ray irradiation field differs depending on the technique.

DR Technique

- Change the field size of the FPD.
 **Reference** ["4.8.1 Changing FPD Magnification Size" P.4-67](#)
- Use the remote console to control the collimator and adjust the X-ray irradiation field.
 **Reference** ["4.8.2 Adjusting Irradiation Field with Remote Console" P.4-68](#)
- Adjust the irradiation field using a non-operational console or the collimator open/close knobs on the collimator.
 **Reference** ["4.8.3 Adjusting the Irradiation Field in the Collimator Relative-Movement Mode" P.4-70](#)



- During DR technique, this unit automatically adjusts the X-ray irradiation field according to the magnification size; however, it is recommended to perform fine adjustment, such as manual adjustment, for the irradiation field to reduce the exposure level for a patient.
- In consideration of patients' radiation exposure, the irradiation field of the collimator is adjusted upon installation so that it is no wider than the FPD field size. This means that a small portion of the collimator leaf may be included in the image depending on the tilt angle of the X-ray diagnostic table or the oblique projection angle of the X-ray tube unit.

Other Techniques

- Use the collimator open/close knob on the collimator and adjust the X-ray irradiation field.
 **Reference** ["4.8.4 Adjusting Irradiation Field with Collimator Open/Close Knob" P.4-71](#)

4.8.1 Changing FPD Magnification Size

FPD magnification size can be changed while DR technique is selected. The size can be selected from 5 options.

To operate	Enlarge Magnification Size	Reduce Magnification Size
Remote console	Press 	Press 

Available magnification sizes are provided below.

Larger/Smaller Field	Indication		Magnification Size	
			inch	cm
Larger  Smaller	17"	43 cm	17×17	43×43
	15"	38 cm	15×15	38×38
	12"	30 cm	12×12	30×30
	9"	23 cm	9×9	23×23
	6"	15 cm	6×6	15×15

The magnification size that has been set is displayed on the acquisition monitor.



Hint

- The unit can be either inch or cm.
Contact your Shimadzu service representative if you wish to change it.
- Changes made to the magnification size are effective for SID 1100 to 1500.



NOTE

- Pulsed fluoroscopy at a pulse rate of 30 fps cannot be selected for magnification sizes of 15" and 17".
- If the magnification size is changed while pulsed fluoroscopy at a pulse rate of 30 fps is selected, the pulse rate will automatically be changed to 15 fps. Even if the magnification size setting is then made smaller, it will not automatically return to 30 fps.
If the pulse rate must be returned to 30 fps, change the pulse rate setting manually.



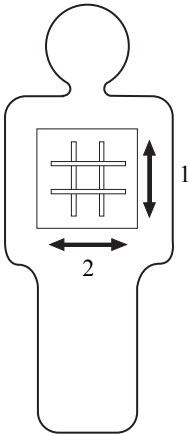
Reference "4.11.1.3 Selecting Pulse Rate" P.4-79

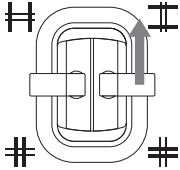
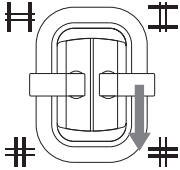
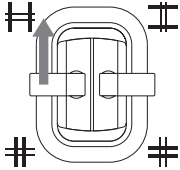
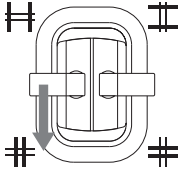
4.8.2 Adjusting Irradiation Field with Remote Console

■ Adjusting Field Horizontally/Vertically

Use the collimator open/close lever on the remote console to adjust the irradiation field. You can adjust the vertical and horizontal aperture separately.

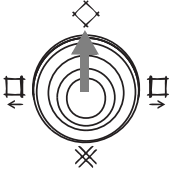
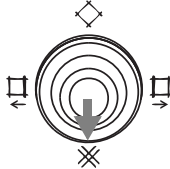
The size set for the magnification size is the maximum size for the X-ray irradiation field.



Enlarge Irradiation Field	Reduce Irradiation Field
Raise the collimator open/close lever (right).  The vertical collimator (1) opens widely.	Lower the collimator open/close lever (right).  The vertical collimator (1) closes.
Raise the collimator open/close lever (left).  The horizontal collimator (2) opens widely.	Lower the collimator open/close lever (left).  The horizontal collimator (2) closes.

C-leaf Collimator (Optional)

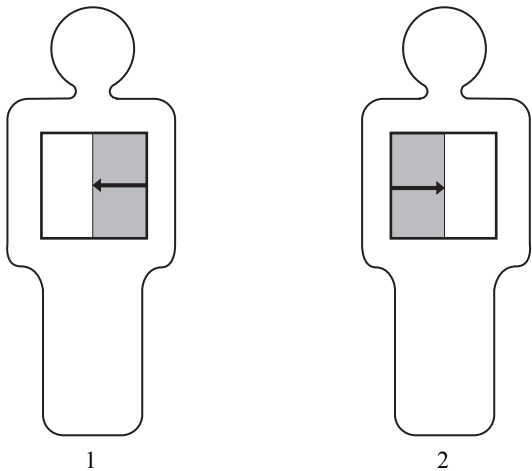
Use the collimator open/close switch on the remote console to adjust the irradiation field.

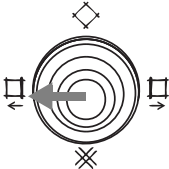
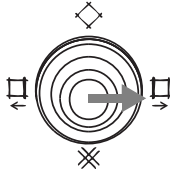
Enlarge Irradiation Field	Reduce Irradiation Field
Tilt backward the collimator open/close switch.  Pushing the collimator open/close switch opens the aperture to the full. It opens up to circumscribed octagon to FPD.	Tilt forward the collimator open/close switch. 

4

Independent Mask Collimator (Optional)

You can use the collimator open/close switch on the remote console to block only a side of horizontal irradiation field, regardless of the horizontal aperture status. It can limit the exposure to the region of interest, especially when performing radiography for an arm or leg.



Enlarge right blocking area (1)	Enlarge left blocking area (2)
Tilt leftward the collimator open/close switch.  Pushing the collimator open/close switch opens the aperture to the full. Tilting it rightward reduces the blocking area.	Tilt rightward the collimator open/close switch.  Pushing the collimator open/close switch opens the aperture to the full. Tilting it leftward reduces the blocking area.



The blocking area is up to the center. You cannot use the both blocking plates at the same time.

4.8.3 Adjusting the Irradiation Field in the Collimator Relative-Movement Mode

Irradiation fields can be operated from non-operational consoles and the irradiation field can be adjusted using the lighting field of the collimator when using the DR technique.

This can be used when  (customizable button) is assigned on the console.

For details on operational buttons, see ["4.7.3 Operational Button" P.4-47](#).

■ Adjusting the Irradiation Field from a Non-operational Console

- 1 Press  on the non-operational console.

 lights up.

- 2 Use the collimator open/close lever to adjust the irradiation field.
If the lever is at the end, move it back to the center position before making fine adjustments.

The irradiation field may not fully open or close in collimator relative-movement mode, even if the collimator open/close lever on the console is moved all the way to the end.

■ Adjusting the Irradiation Field Using the Lighting Field of the Collimator

- 1 Press  on the collimator.

 and  are lit.

- 2 Adjust the irradiation field using the collimator open/close knob on the collimator.

The irradiation field may not fully open or close in collimator relative-movement mode, even if the collimator open/close lever on the console is moved all the way to the end.

 **Hint** The collimator open/close lever on the console can also be used to finely adjust the irradiation field.

■ Turning Off Collimator Relative-Movement Mode

- 1 Press .

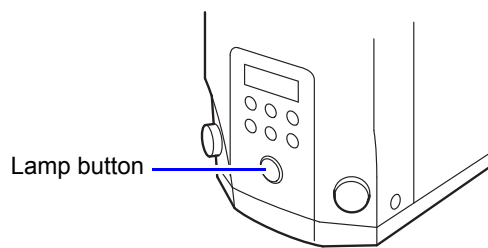
Adjust the irradiation field using the collimator open/close lever on consoles with operational irradiation.

- When operational control has moved to the console without , the collimator relative-movement mode is automatically canceled.
- Collimator relative-movement mode is also turned off automatically when the field size is changed or a study is completed.

4.8.4 Adjusting Irradiation Field with Collimator Open/Close Knob

You can adjust the irradiation field using the open/close knob on the collimator.

- 1 Press the lamp button.

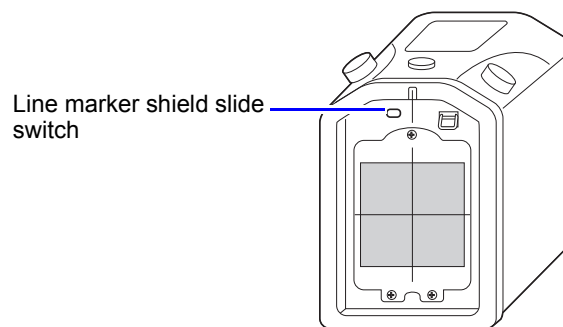


The collimator irradiation field lamp comes on.

The irradiation field lamp also comes on the  on the X-ray diagnostic table's front control panel.

The optional line marker is equipped, it also lights up.

When a line marker is required, operate the line marker shield slide switch on the base of the collimator to open the shutter.



WARNING



Prohibitions

Do not look full at the line marker.

Doing so may cause eyesight damage or blindness.



CAUTION



Instructions

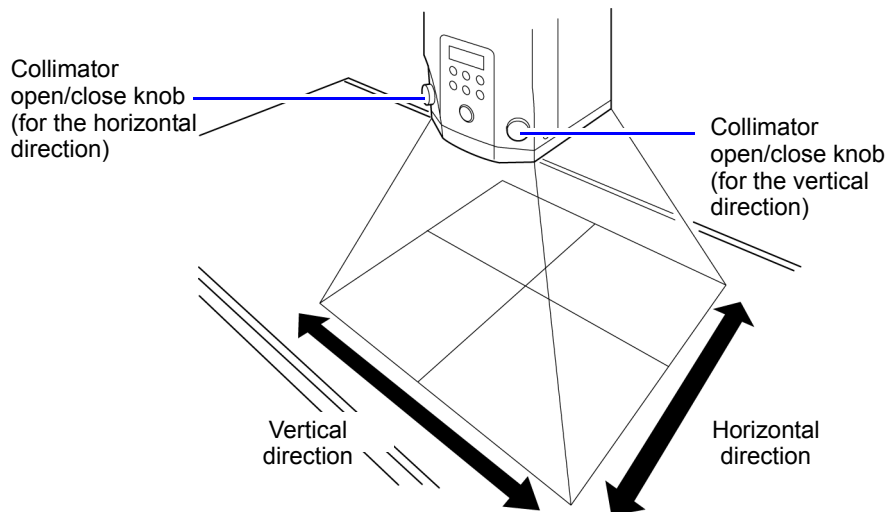
Only operate the line marker shield slide switch on the base of the collimator and open the shutter when the line marker is required.



Instructions

Continuous illumination of the irradiation field lamp causes the lamp cover to get hot on the back of the collimator. Touching the hot lamp cover may cause burns.

2 Adjust the irradiation field using the collimator open/close knob.



The irradiation field lamp does not illuminate when [Lamp-ON time limited] is indicated on the display panel. Illuminate the irradiation field lamp after the message goes off.

4.8.5 Virtual Collimation

After performing fluoroscopy, you can adjust the irradiation field on an image of the last image hold.

It can reduce dose, because fluoroscopy is not required during collimator adjustment.

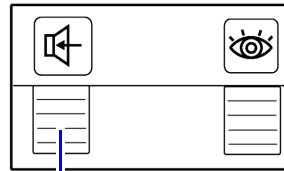


- L.I.H. needs to be turned on.
 **Reference** "4.12.4 Fluoroscopy L.I.H. (Last Image Hold) Function" P.4-120
- Irradiation from the C-leaf collimator (optional) is not displayed in virtual collimation.
- Virtual collimation cannot be used if the oblique projection angle exceeds $\pm 30^\circ$.

4.9 Operating Intercom

■ Outputting Sound

Step on the intercom foot switch to output the sound from the remote console microphone using the examination room speaker. Sound is output only while the switch is stepped on.



Intercom foot switch

Sound from the tabletop microphone and auxiliary microphone is always output from the control room speaker.

■ Adjusting Sound Volume

The sound volume output from the speaker can be adjusted with the dial on the remote console.

Controlling Mixing Balance	
Rotate the balance adjustment dial.  Adjusts the mixing balance between the microphone installed in the tabletop and the auxiliary microphone. Mixing is increased for the tabletop microphone when the dial is turned towards , and increased for the auxiliary microphone when the dial is turned towards .	
Adjusts the volume for the control room speaker	Adjusts the volume for the examination room speaker
Rotate the volume adjustment dial for the control room speaker.  Turning it to the right increases the volume, and turning it to the left lowers the volume.	Rotate the volume adjustment dial for the examination room speaker.  Turning it to the right increases the volume, and turning it to the left lowers the volume.



CAUTION



Prohibitions

Do not set the volume too loud.

An excessive current may cause damage to the speaker. Use the speaker with moderate volume.



- Setting volume too loud may cause sound distortion. Set the volume lower or place a microphone a bit afar.
- An auxiliary microphone collects sound caused by a nearby operator. It does not collect sound near the X-ray diagnostic table.
To collect sound near the X-ray diagnostic table, use the microphone for the tabletop.

4.10 Selecting Technique and X-ray Tube

Technique can be selected from the touch panel. The X-ray tube is automatically input when a technique has been selected.

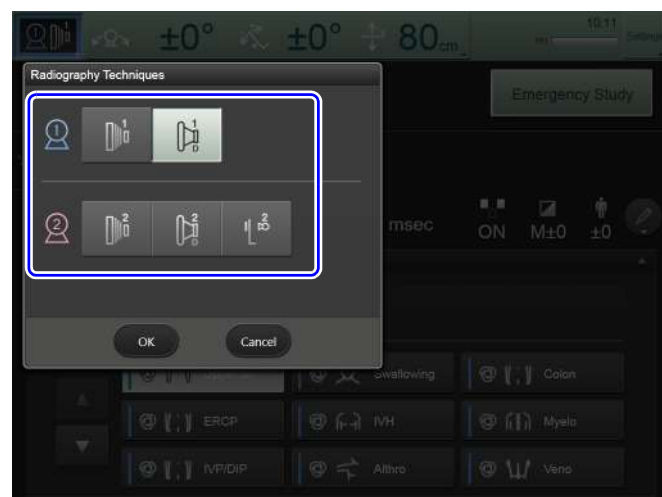
- 1 Press  on the touch panel.



The [Radiography Techniques] screen is displayed.

- 2 Select the technique.

The upper column displays the techniques of the No.1 tube unit and the lower column displays the techniques of the No.2 tube unit.



- 3 Press [OK] when the settings are completed.

The [Radiography Techniques] screen closes.

The selected X-ray tube unit and technique are displayed by .

4.11 Setting X-ray Conditions for Fluoroscopy and Radiography

4.11.1 Setting Conditions for Fluoroscopy

The conditions for fluoroscopy is displayed on the touch panel.

4.11.1.1 Selecting Fluoroscopy Mode

This unit allows multiple fluoroscopy modes to be registered during installation and adjustment. Multiple fluoroscopy modes are useful in the following cases:

- To change the correlation between fluoroscopy tube voltage and current for use in abdominal or orthopedic examinations.
- To reduce irradiation dose as practically low as possible for infant patients.

A fluoroscopy mode has four settings below.

- Fluoroscopy tube current that interlocks with fluoroscopy tube voltage
- Upper limit for fluoroscopy tube voltage
- Selecting Pulsed Fluoroscopy/Continuous Fluoroscopy
- Limitation of maximum rate for pulsed fluoroscopy

1 Press the upper  icon on the touch panel.



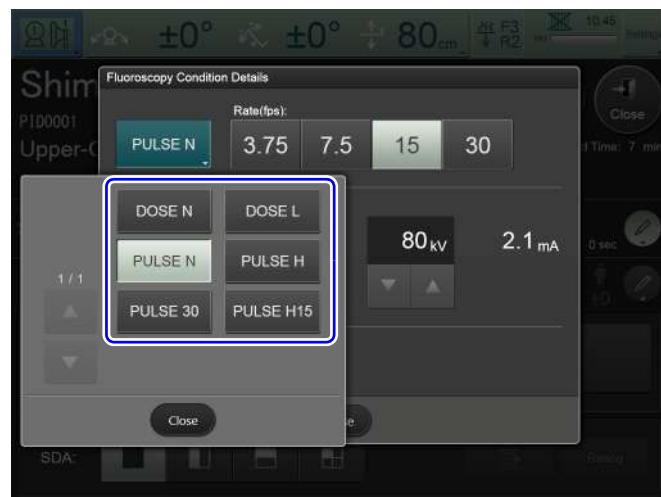
The [Fluoroscopy Condition Details] screen is displayed.

- 2 Press **PULSE N**.



4

- 3 Select the fluoroscopy mode you want to configure.
When 9 or more fluoroscopy modes are available, you can switch display using  or .



- 4 Press [Close] when the settings are completed.
The [Fluoroscopy Condition Details] screen closes.

4.11.1.2 HD Fluoroscopy

With HD fluoroscopy, the visibility of minute stents, guide wires, etc. is improved since fluoroscopy is performed at the same resolution as radiography.

- 1 Set the magnification size to 6".
 **Reference** "4.8.1 Changing FPD Magnification Size" P.4-67
- 2 Press the upper  icon on the touch panel.



The [Fluoroscopy Condition Details] screen is displayed.

- 3 Press [HD].



The mode is automatically set.

- 4 Press [Close] when the settings are completed.
The [Fluoroscopy Condition Details] screen closes.



- HD fluoroscopy can be selected only for a magnification size of 6".
- While HD fluoroscopy is selected, the magnification size cannot be changed. To change the magnification size, press [HD] to turn HD fluoroscopy off.

4.11.1.3 Selecting Pulse Rate

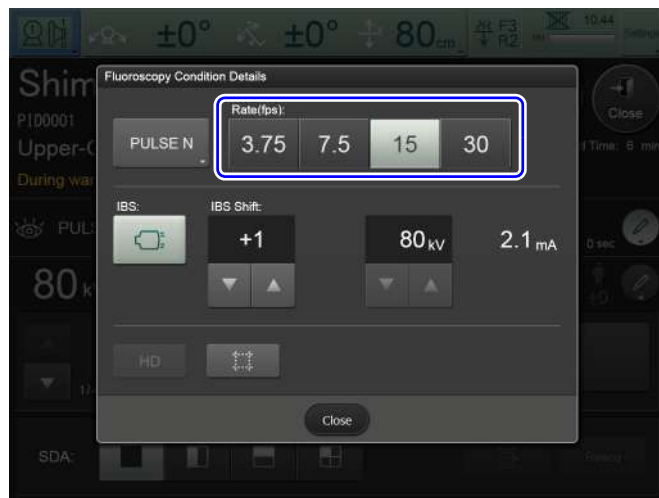
You can change pulse rate when pulsed fluoroscopy mode is selected.

- 1 Press the upper  icon on the touch panel.



The [Fluoroscopy Condition Details] screen is displayed.

- 2 Select the pulse rate you want to configure.



- 3 Press [Close] when the settings are completed.

The [Fluoroscopy Condition Details] screen closes.

 **Hint** Fluoroscopy tube current during pulsed fluoroscopy operation is indicated as an average value per second. The value varies depending on pulse rates as shown below.

- 30 fps: 2.4 mA
- 15 fps: 1.2 mA
- 7.5 fps: 0.6 mA
- 3.75 fps: 0.3 mA

The above listed mA are examples. You can specify it during installation. Contact your Shimadzu service representative if you wish to change it.



- Pulsed fluoroscopy at a pulse rate of 30 fps cannot be selected for magnification sizes of 15" and 17".
- If the magnification size is changed while pulsed fluoroscopy at a pulse rate of 30 fps is selected, the pulse rate will automatically be changed to 15 fps. Even if the magnification size setting is then made smaller, it will not automatically return to 30 fps.
If the pulse rate must be returned to 30 fps, change the pulse rate setting manually.

Reference "4.11.1.3 Selecting Pulse Rate" P.4-79

4.11.1.4 Switching of Automatic / Manual Setting of Fluoroscopy Tube Voltage

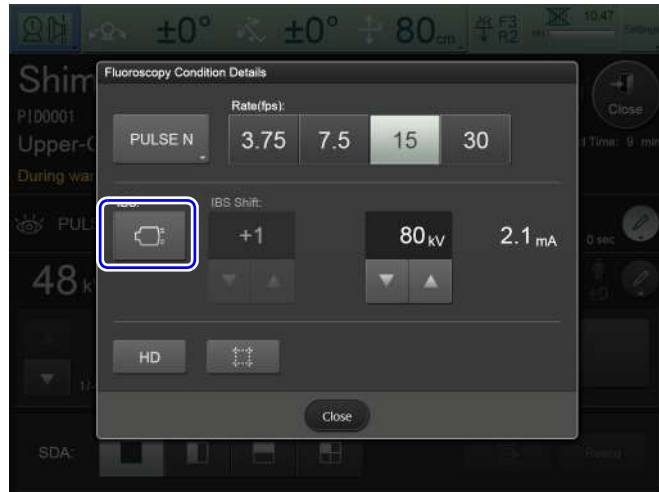
■ Setting Fluoroscopy Tube Voltage Automatically

- 1 Press the upper icon on the touch panel.



The [Fluoroscopy Condition Details] screen is displayed.

- 2 Press to turn on IBS.



4

Fluoroscopy tube voltage falls within a range of 50 to 120 kV.

When IBS has been already turned on, fluoroscopy tube voltage is automatically set during fluoroscopy operation.

- 3 Press ▼ or ▲ to control brightness, as necessary.



-  Hint •  or  on the remote console can be also used to control brightness.
- Brightness has 5 options from -2 to +2. The dimmest is -2 and the brightest is +2.

- 4 Press [Close] when the settings are completed.
The [Fluoroscopy Condition Details] screen closes.

■ Setting Fluoroscopy Tube Voltage Manually

- 1 Press the upper  icon on the touch panel.



The [Fluoroscopy Condition Details] screen is displayed.

- 2 Press  or  to adjust fluoroscopy tube voltage.

When  is lit, press it to turn off IBS.



Fluoroscopy tube voltage falls within a range of 50 to 120 kV.

Fluoroscopy tube current is automatically adjusted in connection with fluoroscopy tube voltage.

- 3 Press [Close] when the settings are completed.
The [Fluoroscopy Condition Details] screen closes.



In general, it is recommended to perform fluoroscopy at IBS ON (e.g. setting Fluoroscopy Tube Voltage automatically).

However, there are some cases that appropriate brightness is not obtained. In these cases, select IBS OFF and adjust the brightness with setting Fluoroscopy Tube Voltage manually. The followings are, but not limited to, the examples that manual setting is recommended.

- When direct radiation enters, such as Fluoroscopy of Hand.
- When tissue of region of interest is thicker than the surrounding tissue, such as vertebral body.
- When region of interest is out of the center of the Field of View, such as Fluoroscopy of Upper arm, Hip, Femur, Both knee joint.
- When collimator is not fully opened or is manually collimated to minimize radiation field.

4

4.11.1.5 Setting Fluoroscopy Timer

A warning alarm will sound after fluoroscopy has been performed for a given period of time. The time to start alarming can be adjusted between 5 minutes to 0 seconds (default setting is 4 min 30 sec).

- 1 Press [Settings] on the touch panel.



The settings menu screen is displayed.

- 2 Press [Fluoro Timer Setting].



- 3 Press  or  to set the timer.



4



Select from among 5 min, 4 min 30 sec, 4 min, 3 min 30 sec, 3 min, 2 min 30 sec, 2 min, 1 min 30 sec, 1 min, 30 sec, and 0 sec.

If you select 0 sec, alarm sounds all the time while fluoroscopy is in progress.

- 4 Press [OK] when the settings are completed.
An alarm is set to sound after the specified time has elapsed.
- 5 Press [Close].
The settings menu screen closes.

4.11.1.6 Resetting Fluoroscopy Timer

After fluoroscopy started, an alarm sounds and  blinks on the remote console, when a given time has elapsed. Follow the procedures below to reset the alarm sound and the blink of button.

- 1 Press  on the remote console.

This resets the alarm sound and the blink of button, causing the fluoroscopy timer count to restart from zero.

The integrated time of fluoroscopy is not reset by resetting the timer.

4.11.1.7 Resetting the Fluoroscopy Cumulative Time

- 1 Press [Settings] on the touch panel.



The settings menu screen is displayed.

- 2 Press [Reset Fluoro Time].



The fluoroscopy cumulative time is reset.

- 3 Press [Close].

The settings menu screen closes.

 **Hint** The fluoroscopy cumulative time can also be reset by holding down  on the remote console.

4.11.2 Selecting the Radiography Program

The radiography program is automatically selected when a protocol has been set.

Follow the procedures below to change the radiography program.

- 1 Press the lower  icon on the touch panel.



The radiography program is displayed.

- 2 Select the radiography program.

To display a radiography program that is not shown, press  or .



- 3 When the setup is finished, the screen returns to the initial screen.

4.11.3 Setting Radiography Parameter

You can use the touch panel on the remote console to configure various parameters for radiography.

■ Setting Focus

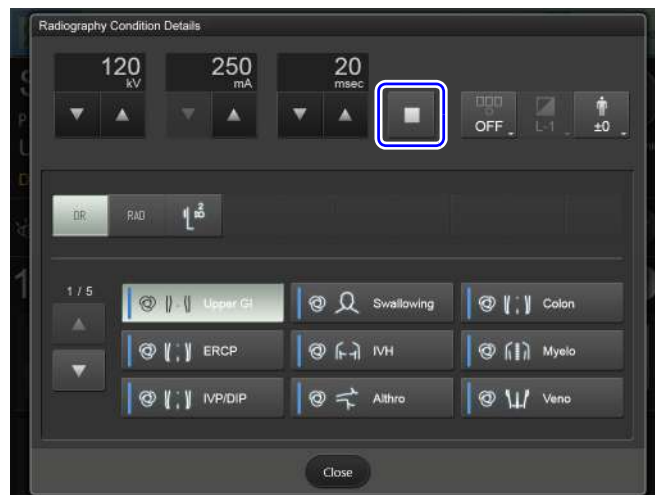
The focus of the X-ray tube can be set at either large or small.

- 1 Press the lower  icon on the touch panel.



The [Radiography Condition Details] screen is displayed.

- 2 Press .
The focus shifts between large and small each time the button is pressed. When the focus is set to small, the display will be .



- 3 Press [Close] when the settings are completed.
The [Radiography Condition Details] screen closes.

Switching the Radiography Setting Method (mAs/mA sec)

There are two radiography setting methods as indicated below. Either of them is registered in the X-ray conditions preset for radiography.

- mAs method
kV and mAs are set. Within the rated range for the X-ray tube, a maximum tube current and the shortest radiography time period are calculated based on the mAs value.
The radiography time can be corrected manually. Once the radiography time has been corrected, mA is also corrected automatically according to the mAs value that is set.
- mA sec method
kV, mA and sec are set.

Radiography setting method can be switched by following the steps below.

- 1 Press [Settings] on the touch panel.



The settings menu screen is displayed.

- 2 Press [mAs] or [mA sec] to switch the method.



- 3 Press [Close].
The settings menu screen closes.

■ Setting kV and mA or mAs and sec

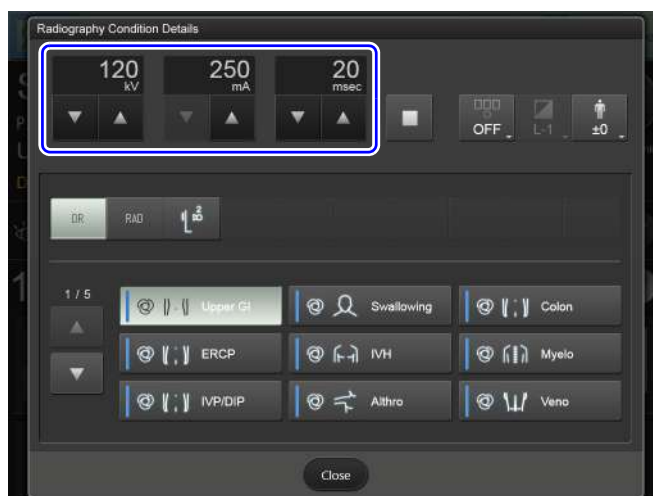
You can specify values for kV (radiography tube voltage), mA (radiography tube current) or mAs (radiography tube current time product), and sec (radiography time).

- 1 Press the lower  icon on the touch panel.



The [Radiography Condition Details] screen is displayed.

- 2 Use  or  under each item to specify a value.





There are radiography time limits in DR radiography.
The radiography time limits are as follows.

Radiography mode	Radiography resolution	Acquisition rate	Maximum radiography time
SPOT, HC-SPOT	Original (1×1 binning)	–	200 ms
	Normal (2×2 binning)	–	200 ms
L-SPOT	Original (1×1 binning)	–	800 ms
SERIAL, HC-SERIAL	Original (1×1 binning)	3, 1, 0.5 fps	200 ms
	Normal (2×2 binning)	6, 3, 2, 1, 0.5 fps	125 ms
	Normal (HS) (2×2 binning)	15, 7.5 fps	16 ms
DSA, HC-DSA, (Optional)	Normal (2×2 binning)	6, 3, 2, 1, 0.5 fps	125 ms
	Normal (HS) (2×2 binning)	7.5 fps	16 ms
RSM-DSA, HC-RSM- DSA (Optional)	Normal (2×2 binning)	6, 3, 2, 1, 0.5 fps	125 ms

An error message (C5-22) appears if a radiography time exceeding these restrictions is set.

Reference "Messages Relating to High-Voltage Generator" P.5-24

- Press [Close] when the settings are completed.
The [Radiography Condition Details] screen closes.

■ Setting AEC Radiography

You can configure the items for AEC (automatic exposure control) radiography.

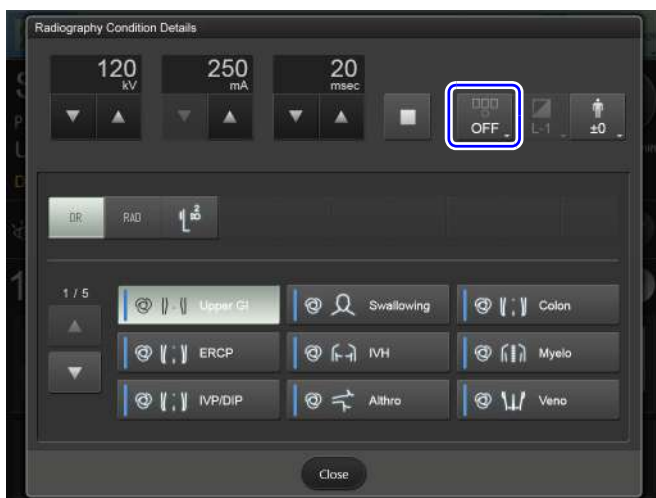
Turning AEC ON/OFF and Setting Photo Pickup Field

- 1 Press the lower  icon on the touch panel.

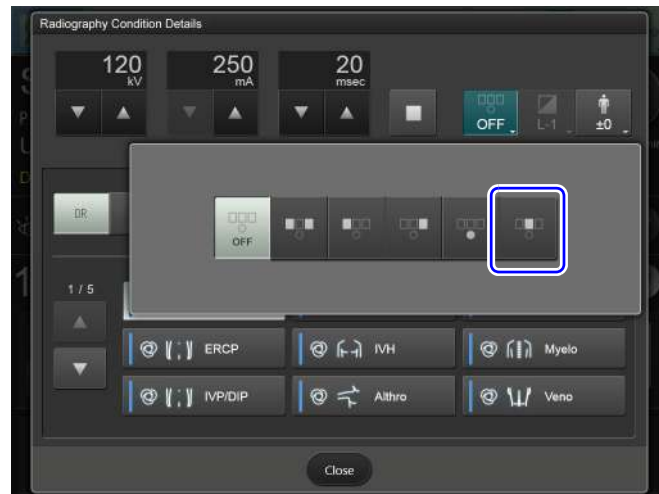


The [Radiography Condition Details] screen is displayed.

- 2 Press .



- 3 Select the photo pickup field you want to configure.



- 4 Press [Close] when the settings are completed.
The [Radiography Condition Details] screen closes.



NOTE

Select the center photo pickup field of the phototimer () if the magnification size is 12" or less. X-ray may not be radiated in the upper photo pickup fields (, ,), stopping the AEC from operating normally. However, select the upper center photo pickup field () when selecting urology mode.



Reference "Operation in Urology Mode" P.4-61

■ Setting Speed and Density

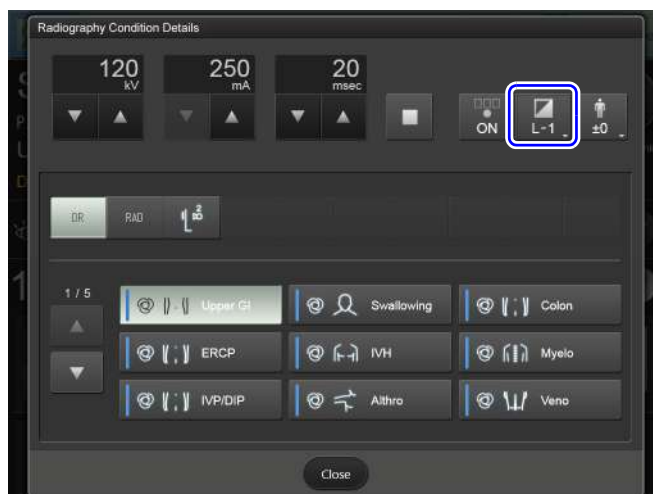
You can configure the speed (film speed) and the density (film density) for AEC radiography.

- 1 Press the lower  icon on the touch panel.



The [Radiography Condition Details] screen is displayed.

- 2 Press .



3 Press **Speed M**.



4 Select the speed you want to configure.
The film speed increases (radiography time decreases) in order of L, M, H.



5 Select the density you want to configure.

You can set a value within a range of -5 to +5.

Film density increases 15% in increment of +1 and decreases 15% in decrement of -1.



 Hint  or  on the remote console can be also used for adjustment.

6 Press [Close] when the settings are completed.

The [Radiography Condition Details] screen closes.

Setting the Body Thickness Correction Parameters

Radiography parameters can be corrected to suit the patient's body thickness.

- 1 Press the lower  icon on the touch panel.



The [Radiography Condition Details] screen is displayed.

- 2 Press .



4 Operation of Each Part of the System

- 3 Press  or  to set the body thickness.

Refer to "M517-E210 Digital Radiography System DR-300 Instruction Manual (Image Acquisition)" for details.



- 4 Press [Close] when the settings are completed.
The [Radiography Condition Details] screen closes.

Memory Shot Radiography

With memory shot radiography, radiography parameters are set automatically from fluoroscopy parameters. When memory shot is set, the  mark is displayed on the touch panel.



- 1 Select the protocol to which memory shot radiography is registered.

 **Reference** ["4.12.1 Normal Study" P.4-104](#), ["4.12.7 SPOT Radiography" P.4-125](#)

- 2 Perform fluoroscopy with IBS on.

The radiography parameters are set automatically.



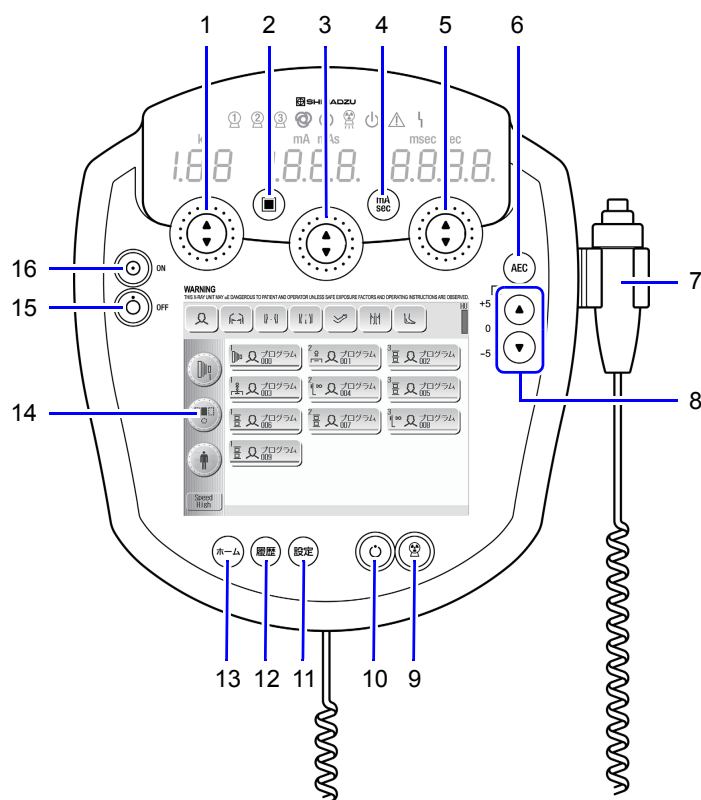
NOTE

- By performing fluoroscopy with IBS on, the appropriate radiography parameters are set.
 **Reference** ["Setting Fluoroscopy Tube Voltage Automatically" P.4-80](#)
- When memory shot is set, the following radiography parameters cannot be changed:
 - Focus
 - Control method (mA sec/mAs)
 - kV, mA/mAs, sec
 - Body thickness correction

How to Use the GSC-2002L (Optional) General Radiography Console

An optional GSC-2002L facilitates the configuration of radiography parameters.

Only basic operation is provided in this section. For further detail, refer to the "M501-E102 SONIALVISION G4 Additional Console Option Instruction Manual".



No.	Name	Function
1	kV shuttle and kV button	Sets radiography tube voltage. Turning the shuttle to the right increases the value, and turning it to the left lowers the value. Pressing ▲ increases the value, and pressing ▼ lowers the value.
2	Focus switchover button	Switches the X-ray tube focus. The focus shifts between large and small each time the button is pressed. When the light is turned on, the small focus is selected.
3	mA/mAs shuttle and mA/mAs button	Sets radiography tube current or radiography current time product. Turning the shuttle to the right increases the value, and turning it to the left lowers the value. Pressing ▲ increases the value, and pressing ▼ lowers the value.
4	mA/mAs switchover button	Switches the setting method for radiography parameters. The method switches between mA sec and mAs each time the button is pressed. When the light is turned on, the mA sec method is selected.
5	sec shuttle and sec button	Sets radiography time period. Turning the shuttle to the right increases the value, and turning it to the left lowers the value. Pressing ▲ increases the value, and pressing ▼ lowers the value.

4.11 Setting X-ray Conditions for Fluoroscopy and Radiography

No.	Name	Function
6	AEC button	Switches to enable or disable AEC. AEC switches between being enabled and disabled each time the button is pressed. When the light is turned on, AEC is enabled.
7	Hand switch	This is a two-stage switch for X-ray radiography.
8	Density buttons	Sets density for AEC radiography. You can set a value within a range of +5 (densest) to -5 (thinnest). Pressing  increases the density, and pressing  decreases the density.
9	X-ray radiography button	Performs X-ray radiography.
10	Preparatory for radiography button	Prepares for X-ray radiography.
11	Configuration button	Displays the configuration screen on the touch panel. You can register radiography programs or perform other settings.
12	History button	Displays the history of radiography on the touch panel.
13	Home button	Displays the home screen on the touch panel.
14	Touch panel	Displays the configuration screen or the radiography history.
15	Power OFF button	Turns the system's power off.
16	Power ON button	Turns the system's power on.

4.11.4 BH Filter

Switching BH filter (Beam Hardening filter) controls the quality of individual X-rays for fluoroscopy and radiography.

Fluoroscopy filter cannot be changed manually, because it is automatically set according to fluoroscopy modes.

Radiography filters are registered in the preset of X-ray conditions for radiography and can be changed manually even after the preset is loaded.

Filter Type

No.	Material/display	Application
1	Cu 0 mm	General radiography
2	Cu 0.1 mm	Angiography, SLOT radiography, Tomography, etc.
3	Cu 0.2 mm	Not Used
4	Cu 0.3 mm	Pediatric study, Tomosynthesis (Low dose).

Manually Switching Radiography Filter (Touch Panel)

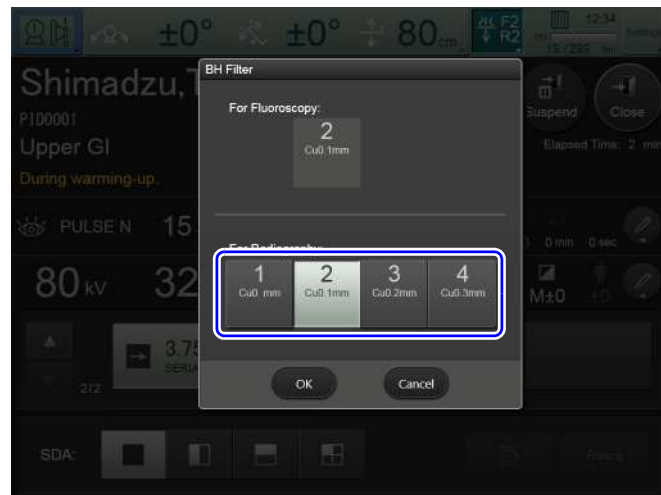
Use the touch panel to switch it.

- 1 Press  on the touch panel.



The [BH Filter] screen is displayed.

- 2 Select the filter you want to configure.



- 3 Press [OK] when the settings are completed.
The [BH Filter] screen closes.

Manually Switching Radiography Filter (Collimator)

- 1 Press  on the collimator control panel.

It switches from "Cu 0 mm" to "Cu 0.1 mm", "Cu 0.2 mm", "Cu 0.3 mm" and back to "Cu 0 mm" each time the button is pressed.



Fluoroscopy filters cannot be changed manually.

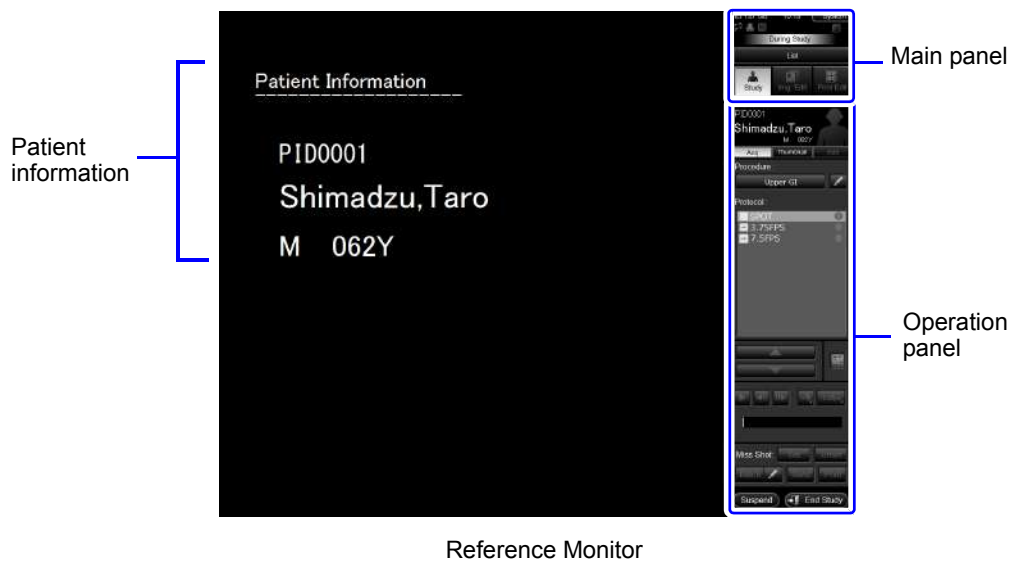
4.12 Fluoroscopy and Radiography Using FPD in X-ray Diagnostic Table

The X-ray diagnostic table is equipped with the FPD that can digitize the radiography image, which will be subjected to real-time image processing and display. Various applications, such as SPOT radiography, SERIAL radiography, DSA are available on the system.

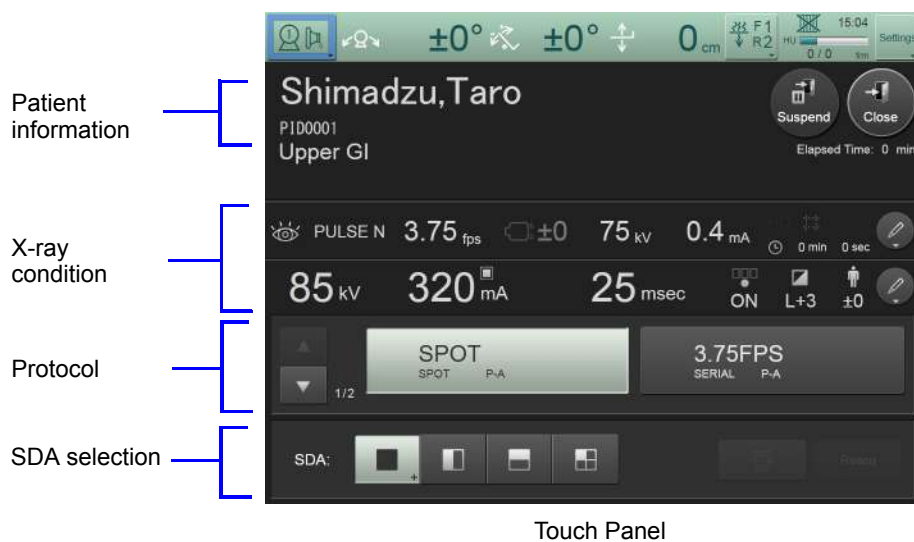
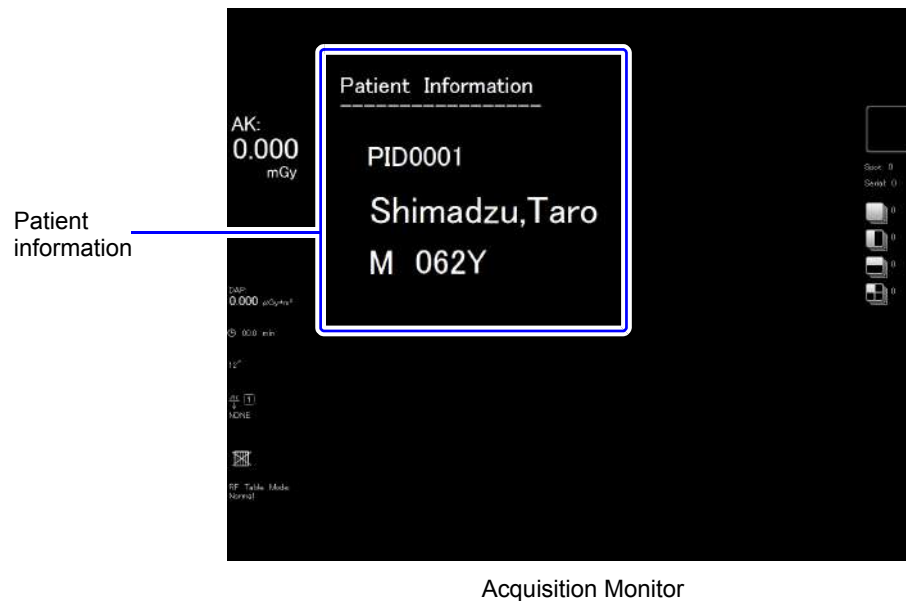
4.12.1 Normal Study

- 1 Start a study by either one of the following methods:
 - select the study reserved or registered in MWM and click [New Study].
 - Create a new study and click [Start study].

The window switches to the [Study] window, and the patient information appears on the reference and acquisition monitors. The information is also displayed on the touch panel.

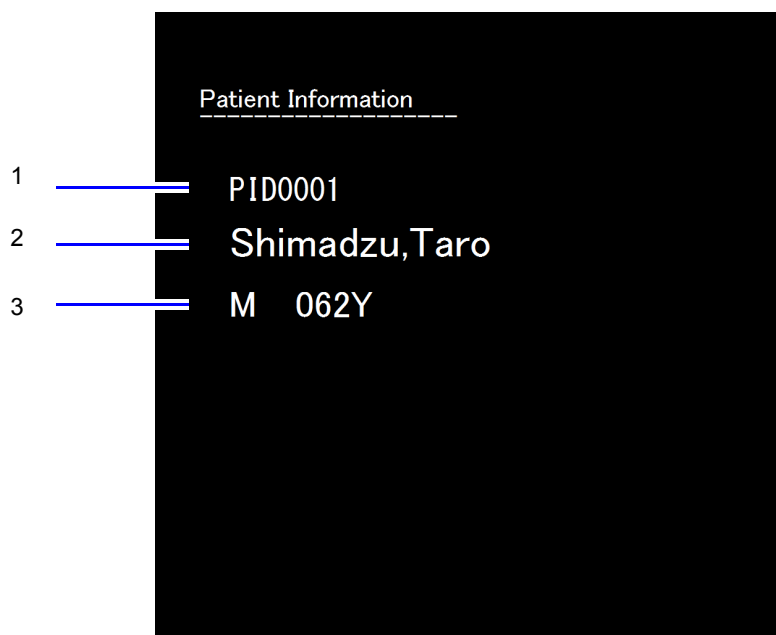


Reference Monitor



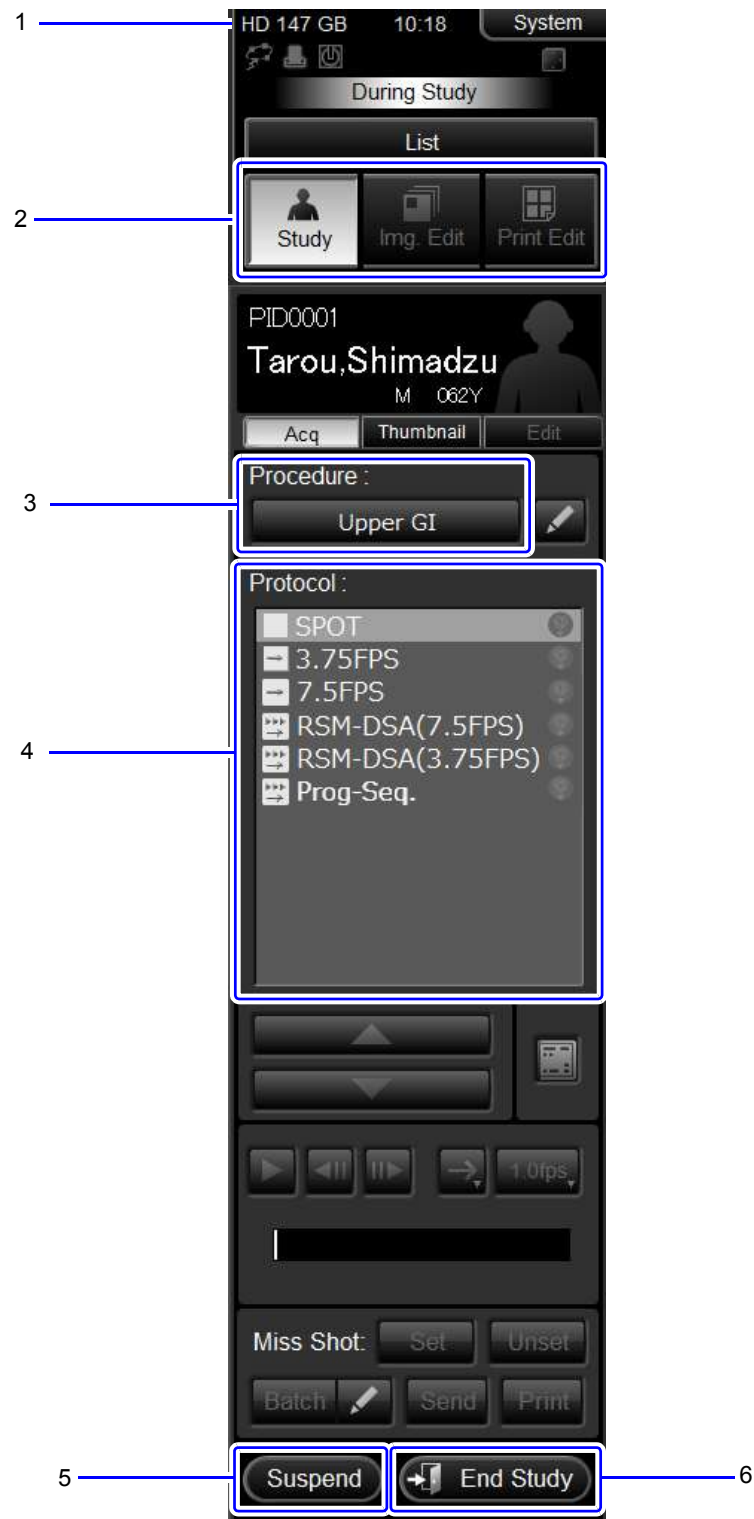
Make sure that the patient information on the reference and acquisition monitors and the touch panel matches that of the patient to be examined.

■ Information Display (Before Study)

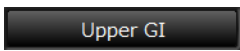
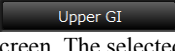
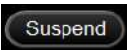


Reference and Acquisition Monitors

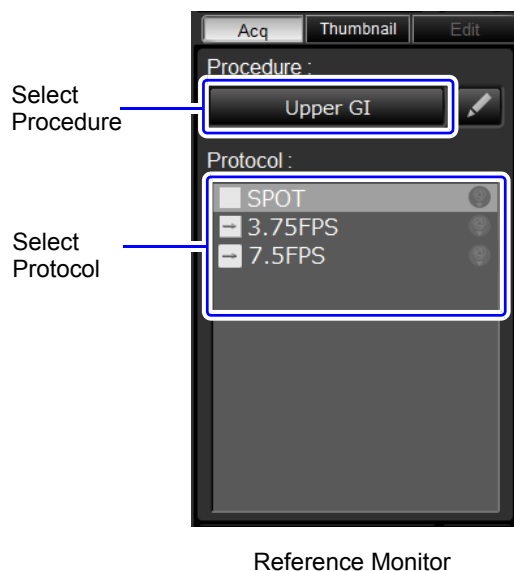
No.	Item	Function
1	Patient ID	The patient ID is displayed.
2	Patient name	The patient's name is displayed.
3	Sex/Age	The patient's sex and age are displayed. M: Male, F: Female, O: Other

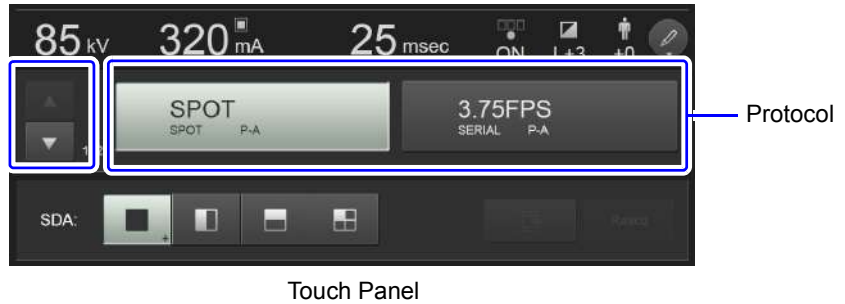
Main Panel/Operation Panel

4

No.	Item	Function
1		Disk Free Space Displays free space on the hard disk.
2	  	[Study] Switches to the [Study] window. [Img. Edit] Switches to the [Image Edit] window. [Print Edit] Switches to the [Print Edit] window.
3		Procedure Selection/Display Area Select and display the procedure. Press  and select a procedure from the displayed screen. The selected procedure is displayed on the button.
4	Protocol Display Area	[Protocol] Displays protocols registered in a procedure. The protocol selected here or via the touch panel is highlighted.
5		[Suspend] Suspends the study and switches to the [Study List] window.
6		[End Study] Closes the study and switches to the [Study List] window.

- 2 Select the desired procedure (study type) and protocol (acquisition condition) on the operation panel on the reference monitor.
The protocol can be selected on the touch panel.





Touch Panel

When the selected procedure has more than two of protocols, click the / to show hidden protocols.

For details of procedures and protocols, refer to "M517-E091 DR-300 Instruction Manual (Image Acquisition)".

- 3 Hold down the radiography button of the control lever on the remote console until you hear the short, high-pitched sound.

The irradiation starts. The appears on the acquisition monitor. Then the image acquired appears in the image display area on the reference and acquisition monitors.

The acquired image is normally saved to the hard disk of the equipment. is displayed at the bottom right of the acquisition monitor if the image is saved.

Acquisition Monitor

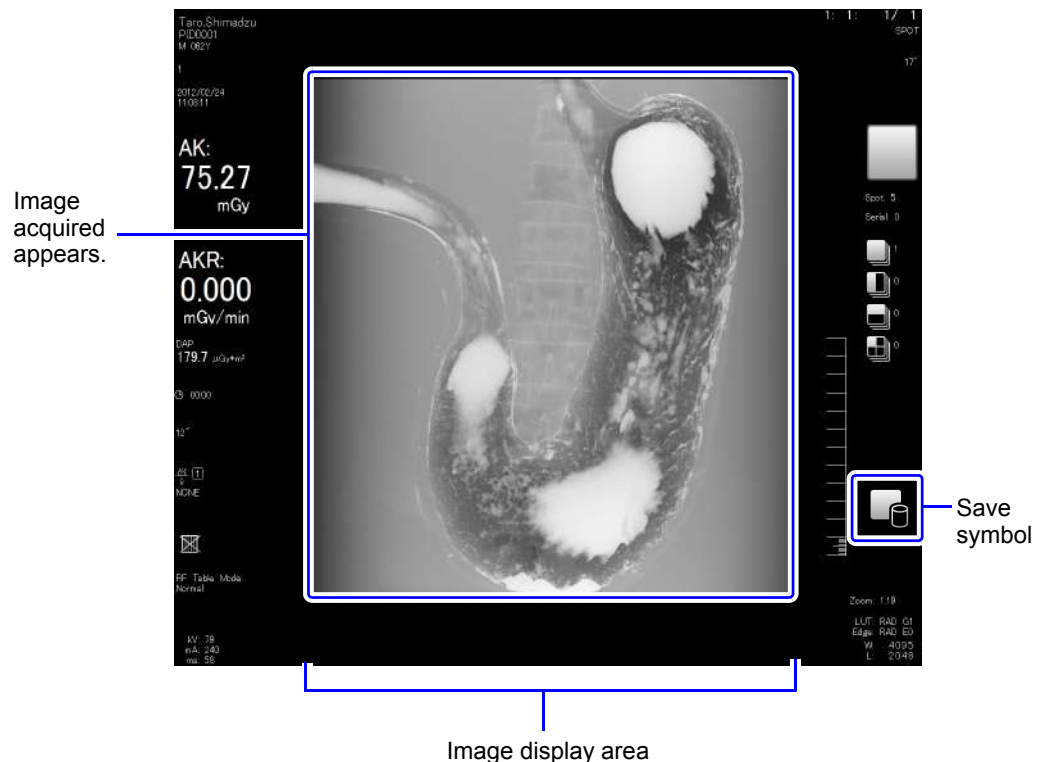
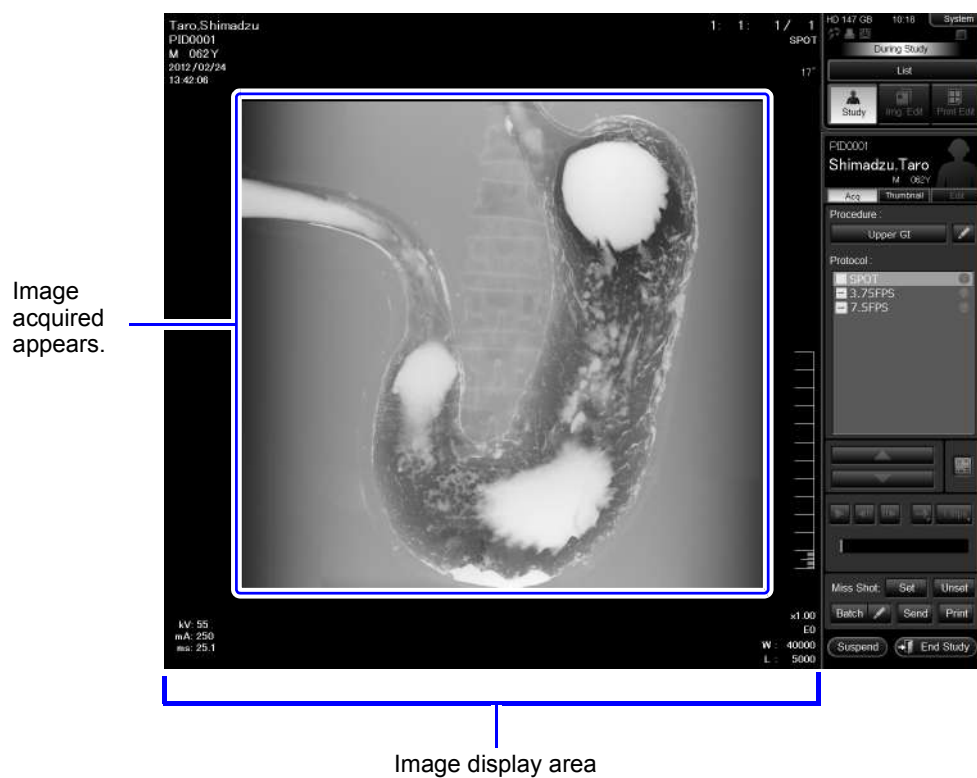


Image acquired appears.

Image display area

4 Operation of Each Part of the System

Reference Monitor



Information Display (During Study)

- Acquisition monitor



No.	Item	Description
1	Patient name	The patient's name is displayed.
2	ID	The patient's ID is displayed.
3	Sex/Age	The patient's sex and age are displayed. M: Male; F: Female; O: Other.
4	Accession Number	The accession number is displayed.
5	Acquisition date Acquisition time	The acquisition date is displayed in the "year/month/day" format. The acquisition time is displayed in the "hour:minute:second" format.
6	Cumulative Reference Air Kerma	The cumulated reference air kerma* ¹ within the current study is displayed.
7	Reference Air Kerma Rate	The reference air kerma rate* ¹ is displayed, which is displayed only during fluoroscopy, SERIAL or DSA radiography.
8	DAP	The total dose area product within the current study is displayed. This is not displayed during fluoroscopy or radiography.
9	Total Fluoroscopy Time	The total fluoroscopy time is displayed within the current study.
10	FPD magnification size	Current FPD magnification size is displayed.
11	Beam Hardening filter state	The number in the square indicate the number of the filter current inserted. The material information of the filter is displayed under the filter number.
12	Antiscatter Grid State	The icon indicates the current grid state (Inserted, half-inserted, removal). When the grid is inserted, the convergence distance and flux density of the grid are displayed beside the icon.

4 Operation of Each Part of the System

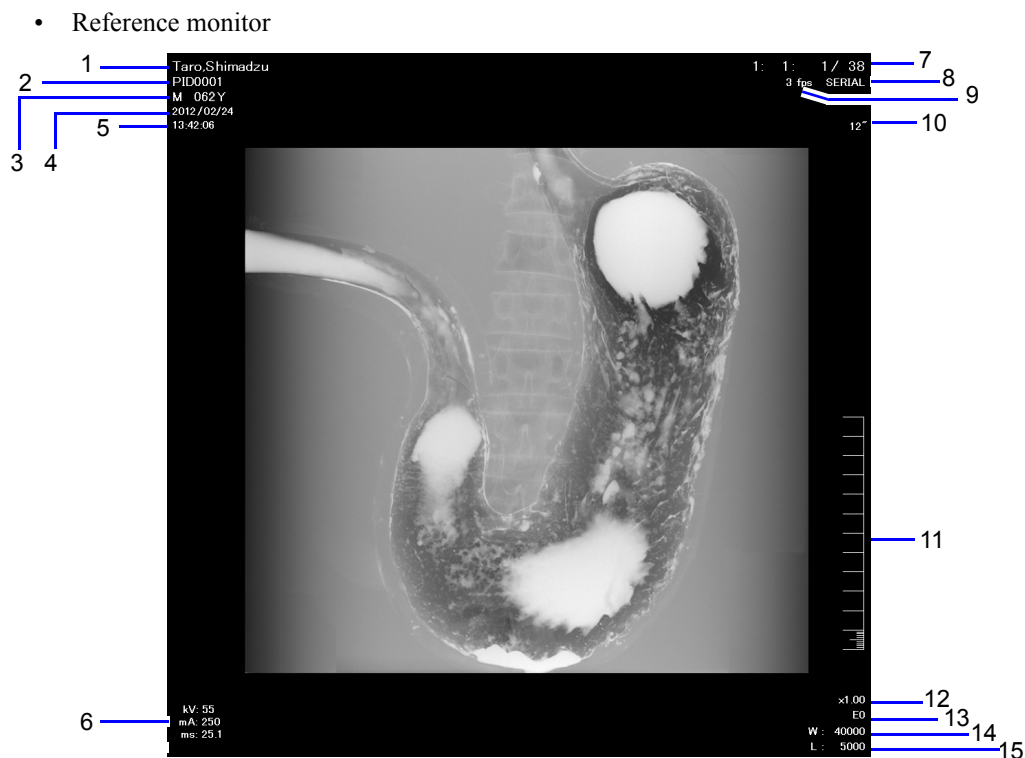
No.	Item	Description
13	Diagnostic Table Operational Mode	The operational mode of the diagnostic table is displayed. Normal: Normal operation mode I-Tilt: I-Tilt operation mode Urology: Urology operation mode
14	X-ray condition	The X-ray conditions below are displayed. kV: Tube voltage at the irradiation mA: Tube current at the irradiation ms: Irradiation duration in millisecond units
15	Frame number and total number of frames	The numbers related to the displayed image are displayed as shown below: Series number: Image number: Frame number/Total number of frames Ex. 1: 2: 1/1
16	Radiography mode	The radiography mode [e.g., SPOT, SERIAL, DSA (option), RSM-DSA (option)] is displayed.
17	FPD magnification size	The FPD magnification size at the irradiation is displayed. FPD magnification size: 17, 15, 12, 9, or 6 inch
18	Multi-division mode display	The selected SDA mode is displayed.  Full  Horizontal 2 divisions  Vertical 2 divisions  4 divisions
19		[Spot]: The number of times of spot radiography is displayed. [Serial]: The number of times of serial radiography and DSA radiography is displayed.
20		The number of the acquired full and SDA images is displayed.
21	Scale	The scale size is displayed for the subject 10 cm above the Table. The large scale unit is 1 cm.
22	Zoom	The enlargement factor is displayed.
23	Gamma	The gamma is displayed.
24	Edge	The edge level is displayed.
25	Window width (W)	The window width value is displayed.
26	Window level (L)	The window level value is displayed.

*1: The Reference Air Kerma (rate) is the Air Kerma (rate) at the height of 30 cm above the diagnostic table.

**NOTE**

- Doses from radiography performed using the external receiver are not added to the cumulative air kerma and cumulative dose area product.
- Suddenly changing the irradiation field during fluoroscopy or SERIAL radiography can cause large fluctuations to occur temporarily in the displayed standard air kerma rate.

4 Operation of Each Part of the System



No.	Item	Description
1	Patient name	The patient's name is displayed.
2	ID	The patient ID is displayed.
3	Sex/Age	The patient's sex and age are displayed. M: Male; F: Female; O: Other.
4	Acquisition date	The acquisition date is displayed in the "year/month/day" format.
5	Acquisition time	The acquisition time is displayed in the "hour:minute:second" format.
6	X-ray condition	The X-ray conditions below are displayed. kV: Tube voltage at the irradiation mA: Tube current at the irradiation ms: Irradiation duration in millisecond units
7	Image number	The numbers related to the displayed image are displayed as shown below: Series number: Image number: Frame number/Total number of frames Ex. 1: 2: 1/1
8	Radiography mode	The radiography mode [e.g., SPOT, SERIAL, DSA (option), RSM-DSA (option)] is displayed.
9	Frame Rate	The acquisition rate is displayed when the multi frame image is displayed.
10	FPD magnification size	The FPD magnification size at the irradiation is displayed. FPD magnification size: 17, 15, 12, 9, or 6 inch
11	Scale	The scale is displayed for the subject 10 cm above the table. The larger scale unit is 1 cm.
12	Enlargement factor (xN)	The enlargement factor (N) is displayed.

4.12 Fluoroscopy and Radiography Using FPD in X-ray Diagnostic Table

No.	Item	Description
13	Edge level	The edge level is displayed.
14	Window width (W)	The window width value is displayed.
15	Window level (L)	The window level value is displayed.

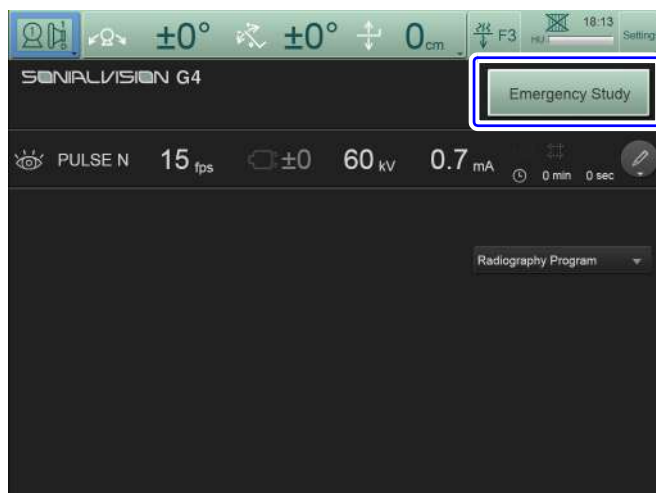


Items not registered at the time of irradiation are not displayed.

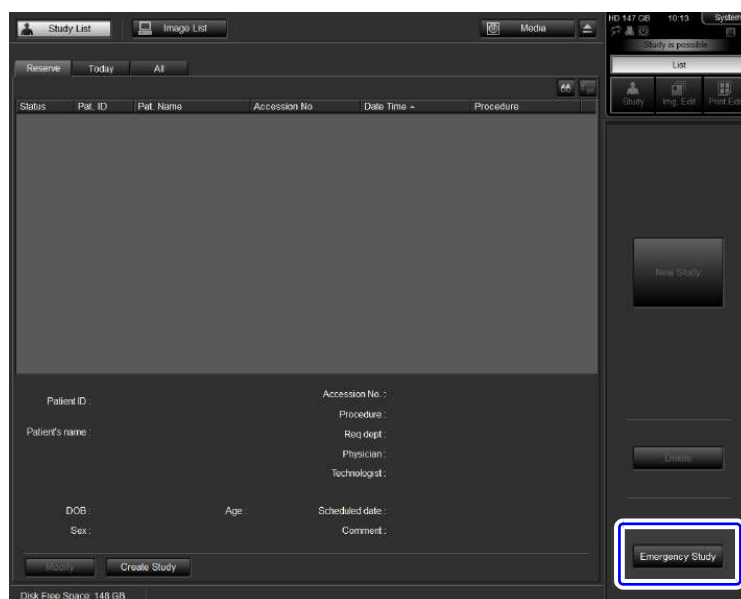
4.12.2 Emergency Study

At emergency studies for emergency patients, the required information can be set automatically for starting an study.

- 1 Press [Emergency Study] on the touch panel, or click [Emergency Study] on the operation panel on the reference monitor.



Touch Panel



Reference Monitor

The window switches to the [Study] window.

- During an emergency study, the patient's ID and name are automatically generated as follows:

Item	Function
Patient Last name	The patient last name is generated using the year/month/date at emergency study start. LN+ year/month/date Example) September 3, 2012, Patient Last Name will be LN20120903.
Patient First name	The patient first name is generated using the hour/minute/second at emergency study start. FN+hour/minute/second Example) September 3, 2012, Patient Last Name will be FN141530.
Patient ID	The patient ID is generated using the year/month/date-hour/minute/second at emergency study start. Example) 14:15:30 on September 3, 2012, Patient ID will be EPID20120903-141530.



Reference

The tentative data must be corrected after the study.



Hint

- The procedure for the emergency study is set in the service settings.
- In the case of the emergency study, only items that require entry are displayed.
- The patient information of images acquired in the emergency study can be changed later by updating the patient information in the [Image List] window.



NOTE

When [Emergency Study] is clicked during entry or display of the patient information, the information is discarded. Then emergency study begins with the patient's ID and name automatically generated.

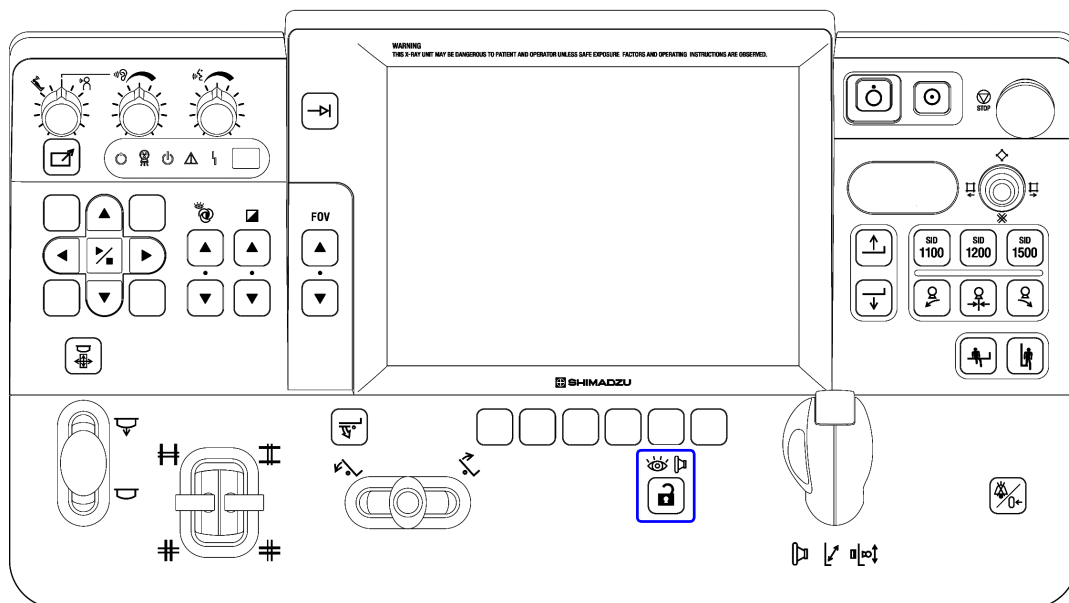
4.12.3 Fluoroscopy

Before image acquisition, perform fluoroscopy to check the state and position inside the subject. The fluoroscopy condition is set by the procedure selection. The settings in the [Fluoroscopy] tab in the [Edit Procedure] window are reflected.



Turn  to ON.

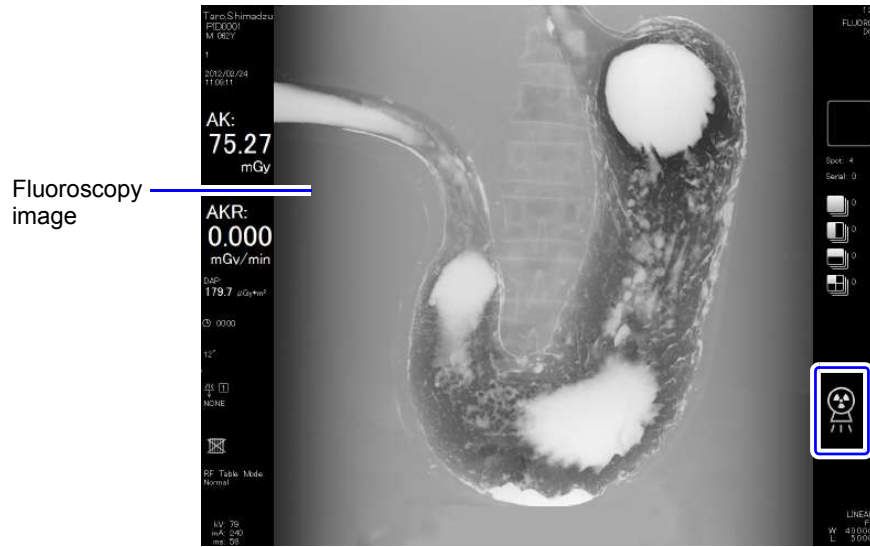
- 1 Make sure that  on the remote console is lit.



2 Step on the fluoroscopy foot switch.

The fluoroscopy image and  appear on the acquisition monitor.

Determine the position by using the control lever on the remote console (when required).



Acquisition Monitor

To end fluoroscopy, release your foot from the fluoroscopy foot switch.

The  disappears from the acquisition monitor.



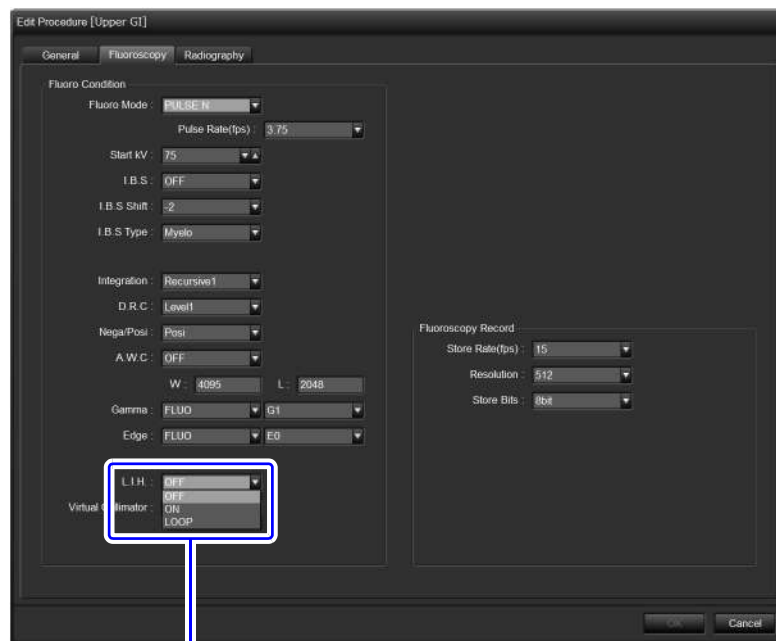
When L.I.H. (Last Image Hold) is set to OFF, the Image display area turns completely black on the acquisition monitor when fluoroscopy ends.



Reference ["4.12.4 Fluoroscopy L.I.H. \(Last Image Hold\) Function" P.4-120](#)

4.12.4 Fluoroscopy L.I.H. (Last Image Hold) Function

The L.I.H. function remains the fluoroscopy image on the acquisition monitor after releasing the fluoroscopy foot switch, and is set in the [Fluoroscopy] tab in the [Edit Procedure] window.



L.I.H. setting

The L.I.H. has three options below.

Option	Function
OFF	The image display area turns completely black on the acquisition monitor after releasing the fluoroscopy foot switch.
ON	The fluoroscopy image acquired last appears on the acquisition monitor after releasing the fluoroscopy foot switch.
LOOP	The fluoroscopy images acquired during fluoroscopy is replayed on the acquisition monitor after releasing the fluoroscopy foot switch.

4.12.5 Fluoroscopy Store

The fluoroscopy store function can selectively store fluoroscopy images to the system's image database. Images can be stored during or after fluoroscopy.

■ Store Image During Fluoroscopy

- 1 Step on the fluoroscopy foot switch to start fluoroscopy.
The fluoroscopy image and  appear on the acquisition monitor.
- 2 Press  (Customizable button) on the remote console.
Image storing starts from the point shortly before pressing the button.

 **Hint** The starting point of image storing is set in the service settings.

- 3 Stop image storing by either one of the following methods:
 - Press  (Customizable button) again.
 - Release the fluoroscopy foot switch.

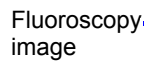
 **Hint** If you do not take the step 3 and keep pressing the fluoroscopy foot switch, the image storing will be automatically ended when a number of fluoroscopy images stored reaches to 1,000 images.

■ Store Image After Fluoroscopy

The image to be stored depends on the L.I.H. setting; ON or LOOP. When the setting is OFF, no image is stored.

 **Reference** ["4.12.4 Fluoroscopy L.I.H. \(Last Image Hold\) Function" P.4-120](#)

- 1 Step on the fluoroscopy foot switch to start fluoroscopy.
The fluoroscopy image and  appear on the acquisition monitor.
- 2 Release the fluoroscopy foot switch after fluoroscopy images desired are acquired.
The fluoroscopy image acquired last appears on the acquisition monitor.
- 3 Press  (Customizable button) on the remote console.
When the L.I.H. has been set to "ON", the last fluoroscopy image is stored.
When the L.I.H. has been set to "LOOP", fluoroscopy images acquired during fluoroscopy are stored.



- L.I.H. symbol

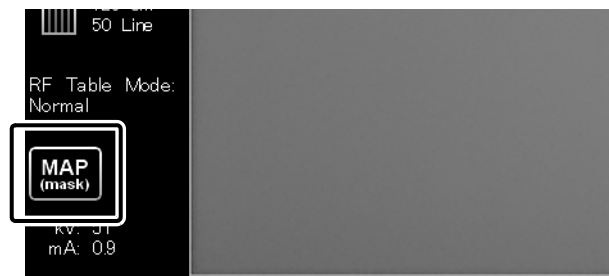
4.12.6 Fluoroscopy Roadmapping (Optional)

Fluoroscopy Roadmapping is a function to help positioning a catheter by superimposing blood-vessel and fluoroscopy images. Contrast agent is used to create the mask image which is subtracted from the fluoroscopy image. This function is useful to position the catheter in a complicated blood-vessel route during study.

The settings in the [Fluoroscopy] tab in the [Edit Procedure] window are reflected.

■ Procedures for Fluoroscopy Roadmapping Function

- 1 Press **MAP** (Customizable button) on the remote console.
- 2 Step on the fluoroscopy foot switch.
After a several seconds, the countdown for mask image acquisition will start.
- 3 Inject a dye into the patient's vein.
The mask image is acquired. **MAP (mask)** appears at the lower left corner of the acquisition monitor, which indicates the mask image is being acquired.

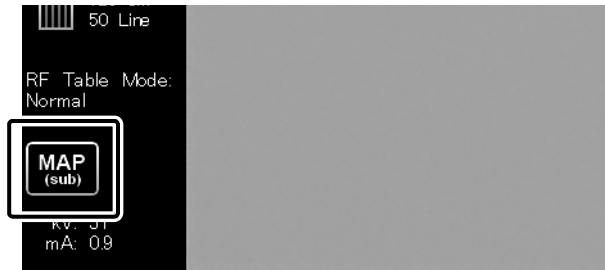


Lower left corner of the acquisition monitor

- 4 Release the fluoroscopy foot switch.
The mask image is created according to the settings in the [Fluoroscopy] tab in the [Edit Procedure] window.

- 5 Do not inject a dye into the patient's vein and step on the fluoroscopy foot switch.

The mask image is subtracted from the fluoro image and the subtraction image is displayed in real time.  appears at the lower left corner of the acquisition monitor, which indicates subtraction images are being acquired.



Lower left corner of the window

- 6 Release the fluoroscopy foot switch.
- 7 Repeat step 5 to 6, if necessary.
- 8 Press  (Customizable button) again.
Roadmapping will be terminated



- Roadmapping will be also terminated using one of the operations below:
 - Switch the procedure or protocol
 - Hold down the hand switch
 - After the mask image acquisition, switch the fluoroscopy mode.
- During fluoroscopy roadmapping, the FOV size cannot be changed.
- The functions of L.I.H., LOOP, and Fluoroscopy Store are not applied to the fluoroscopy images acquired until the mask image is generated.

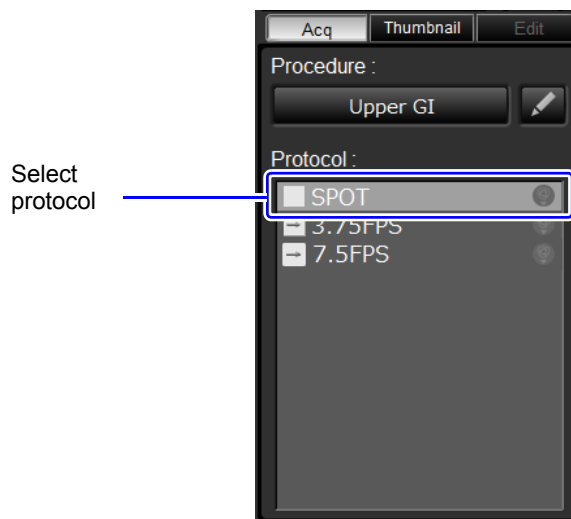
4.12.7 SPOT Radiography

The SPOT radiography is the single-frame image acquisition with one X-rays emission. Select the protocol used for image acquisition in advance. Various setting regarding radiography is set up by selecting the protocol. The settings on the [Radiography] tab in the [Edit Procedure] window are used.

- 1 Select the desired protocol on the touch panel or on the operation panel.



Touch Panel



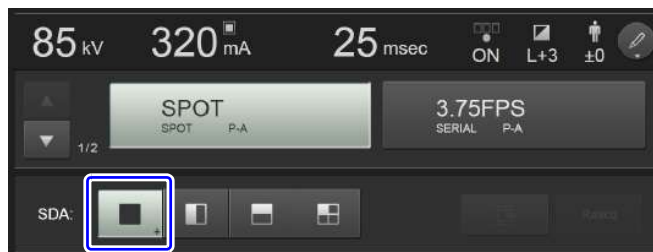
Operation Panel on Reference Monitor

4 Operation of Each Part of the System

- 2 Click  in the SDA mode on the touch panel.

You will hear a short, high-pitched sound and the mode selected will be highlighted on the touch panel.

 **Hint** You do not need to switch to  if it is already set as the default mode.



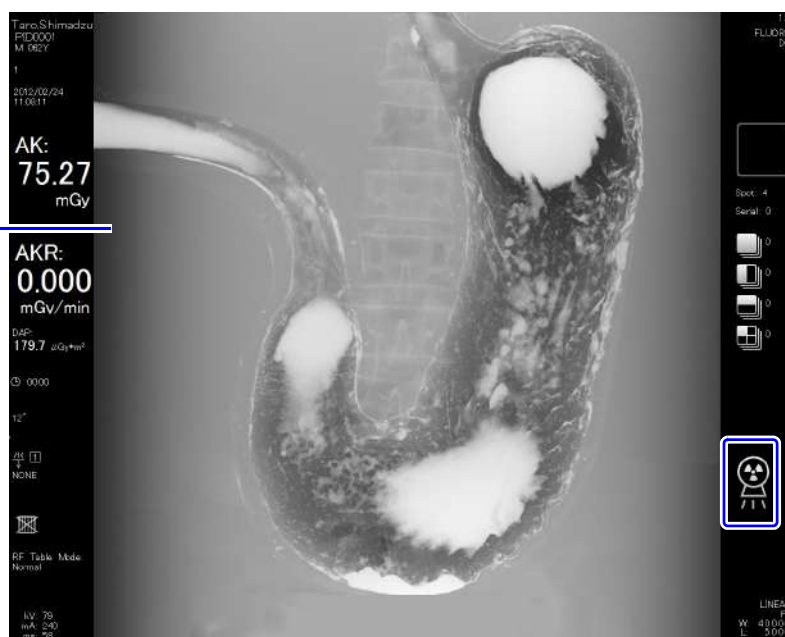
Touch Panel

- 3 Step on the fluoroscopy foot switch.

The fluoroscopy image and  appear on the acquisition monitor.

Determine the position by using the control lever on the remote console (when required).

Fluoroscopy
image



Acquisition Monitor

- 4** Hold down the radiography button of the control lever on the remote console until you hear the short, high-pitched sound.

The irradiation starts and the  appears on the acquisition monitor. Then the image acquired appears on the acquisition and reference monitors.



Hint

The image is applied and post-processing is automatically started when any of the following operations is performed after the image is acquired.

- When you have switched to another image
- When you have performed the next image acquisition
- When you have stored an image for printing
- When you have switched the SDA mode

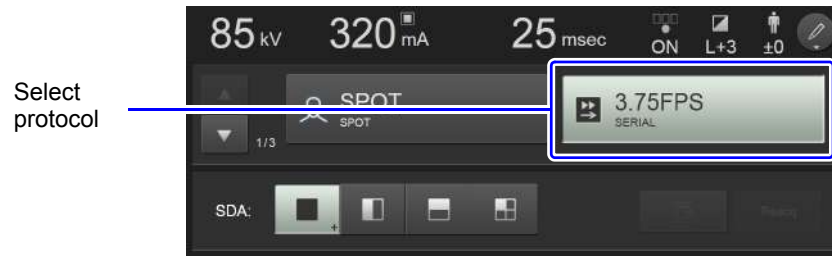
4.12.8 SERIAL Radiography

The SERIAL radiography is multiple-frame image acquisition with intermittently emitted X-rays. Select the protocol used for image acquisition in advance. Various setting regarding radiography is set up by selecting the protocol. The settings on the [Radiography] tab in the [Edit Procedure] window are used.

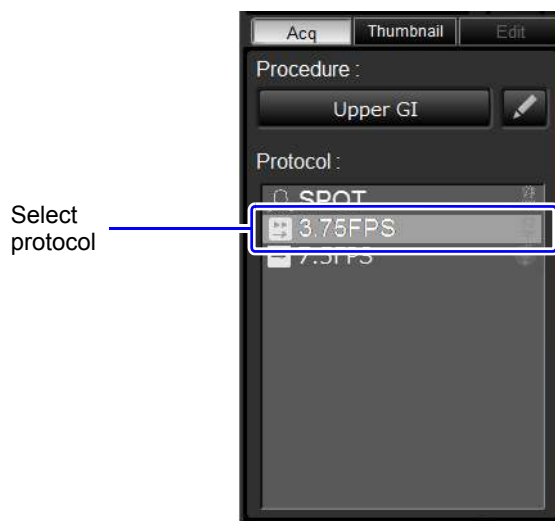


- When the [Auto Print] check box is selected of [Post process] in the procedure preset edit, all frames are stored for printing.
- X-ray emission is stopped and image acquisition ends when the radiography button is released midway during irradiation or when the preset number of frames are completed to be acquired.
- appears on the acquisition monitor according to the frame rate below:
 - 2 fps or more: is kept displayed from acquisition start to end.
 - 1 fps or less: appears on actual X-ray emission.This display method is common among all acquisition modes.

- 1 Select the desired protocol on the touch panel or on the operation panel.



Touch Panel



Operation Panel on Reference Monitor

- 2 Click  in the SDA mode on the touch panel.
You will hear a short, high-pitched sound and the mode selected will be highlighted on the touch panel.

 **Hint** You do not need to switch to  if it is already set as the default mode.



Touch Panel

4 Operation of Each Part of the System

3 Step on the fluoroscopy foot switch.

The fluoroscopy image and  appear on the acquisition monitor.

Determine the position by using the control lever on the remote console (when required).



- 4** Hold down the radiography button of the control lever on the remote console until you hear the short, high-pitched sound and keep pressing it until the preset number of frames are acquired.

The irradiation starts and the  appears on the acquisition monitor. The frames are continuously acquired and displayed on the acquisition and reference monitors.

Then irradiation automatically stops when the preset number of frames are acquired.



Hint

The image is applied and post-processing is automatically started when any of the following operations is performed after the image is acquired.

- When you have switched to another image
- When you have performed the next image acquisition
- When you have stored an image for printing
- When you have switched the SDA mode

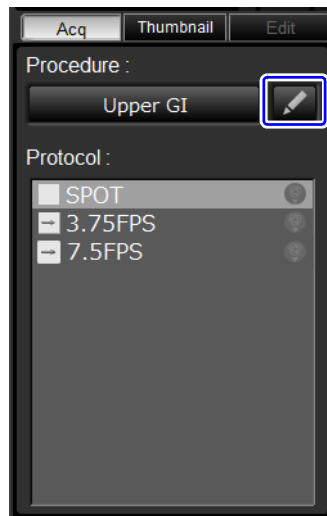
4.12.9 Program Sequence

The program sequence is the image acquisition with varying preset acquisition rates. The rate is set in each phase from 1 to 5 in the [Radiography] tab in the [Edit Procedure] window.



The program sequence is available only with [Normal] of [Resolution].

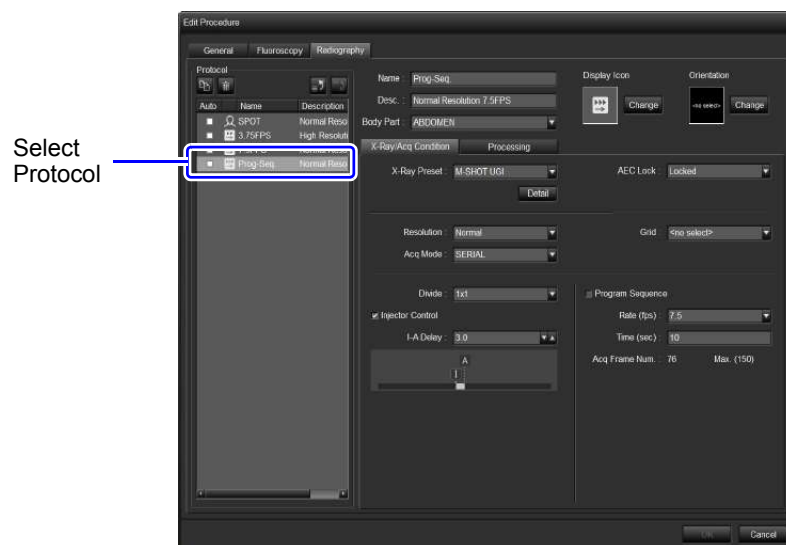
- 1 Click [Edit] on the operation panel on the reference monitor.



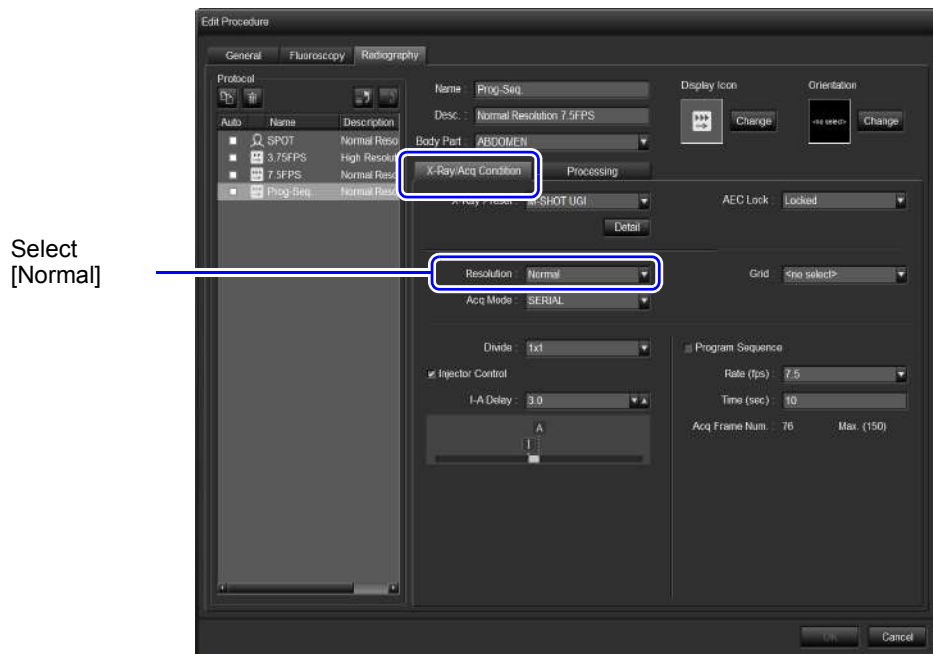
Operation Panel on Reference Monitor

The [Radiography] tab in the [Edit Procedure] window appears.

- 2 Select the protocol in which the program sequence will be set.
The current settings for the protocol selected appears.

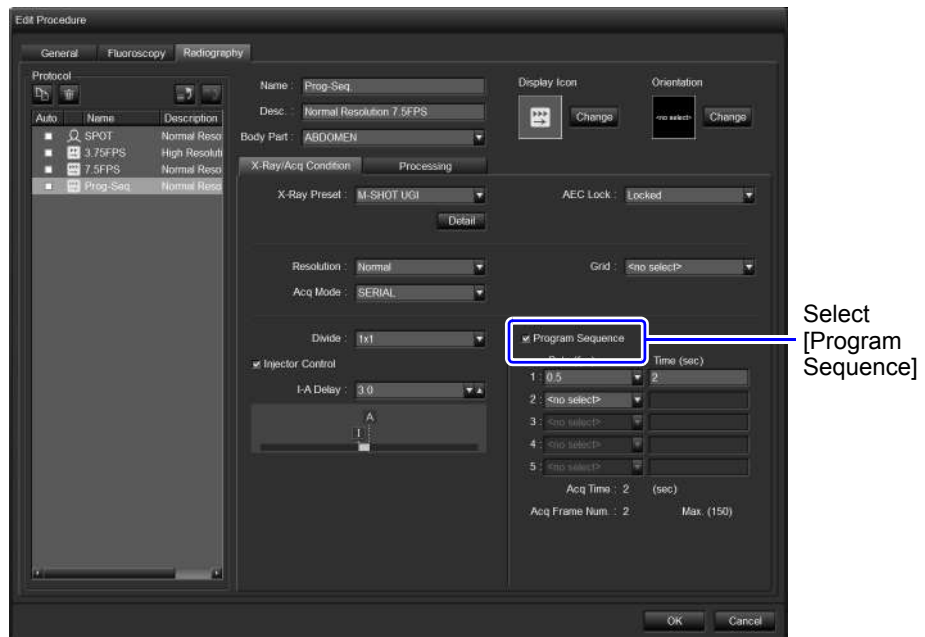


- Click [X-ray/Acq Condition] tab. Select [Normal] for [Resolution].



4

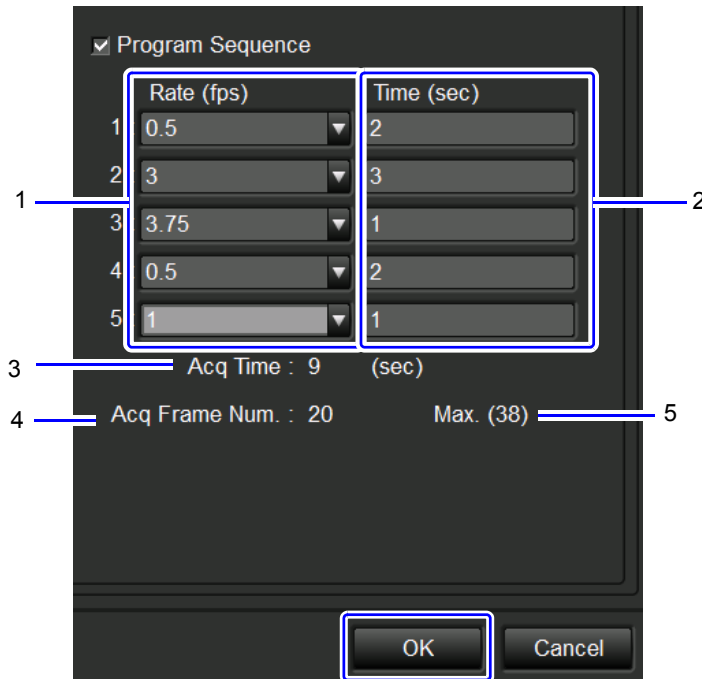
- Select the [Program Sequence] checkbox.



The [Program Sequence] setting is available.

5 Set the acquisition rate (fps=frame/second) from the list and input the time (second) for each phase.

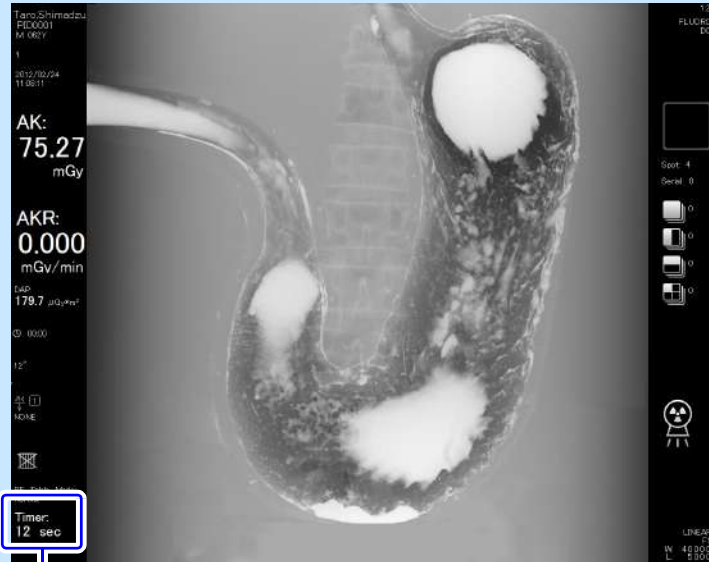
The program sequence has 5 phases at maximum. As setting each phase, the total frames and total time are real-time calculated and displayed..



NO.	Item	Function
1	Rate (fps)	Selects an acquisition rate (fps=frame/second) from the list.
2	Time (sec)	Inputs acquisition time (second).
3	Acq Time (sec)	Displays the total time of current setting.
4	Acq Frame Num.	Displays the total number of frames of current setting.
5	Max. (xx)	Displays the maximum total number of frames.



- X-ray is not radiated in phases set as paused. The set pause time is counted down by a timer displayed at the bottom left of the acquisition monitor. X-ray is radiated according to the next phase setting after the set time has elapsed.



Timer

6

Click [OK] or [Cancel].

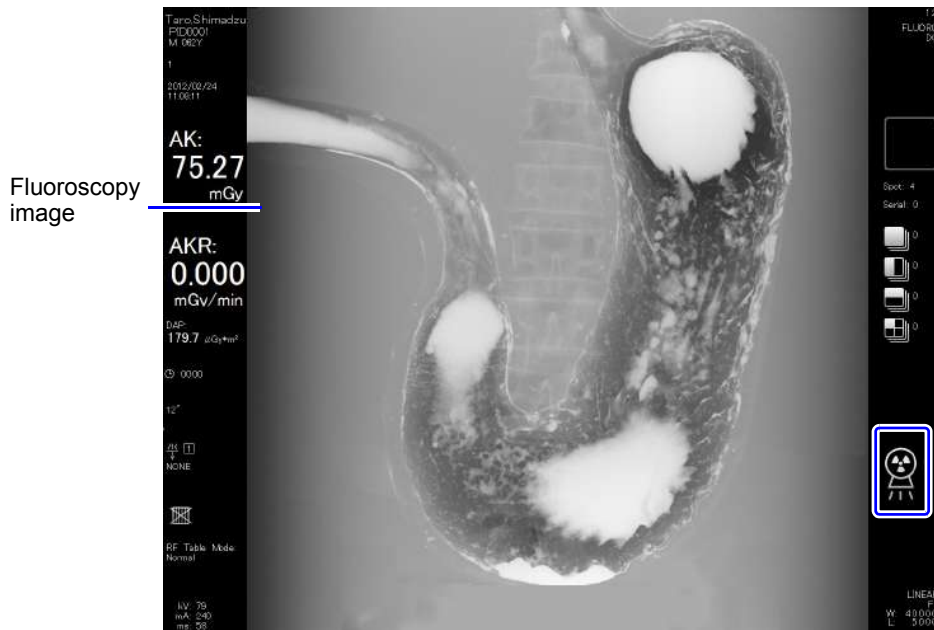
Click [OK] to enable the set conditions and return to the [Study] screen. The protocol with which a program sequence has been set is selected on the touch panel or the reference monitor control panel.

Click [Cancel] to cancel the set conditions and return to the [Study] screen.

7 Step on the fluoroscopy foot switch.

The fluoroscopy image and  appear on the acquisition monitor.

Determine the position by using the control lever on the remote console (when required).



Acquisition Monitor

8 Hold down the radiography button of the control lever on the remote console until the program sequence is ended.

The irradiation starts and the  appears on the acquisition monitor.

The image is acquired in order of the phase, with varying the acquisition rate.

The time will be count down at the lower left of the window in the phase set as "Pause".

Then irradiation automatically stops when the preset number of frames are acquired.

4.12.10 Subdivisional Acquisition (SDA)



Hint

The image is applied and post-processing is automatically started when any of the following operations is performed after the image is acquired.

- When you have switched to another image
- When you have performed the next image acquisition
- When you have stored an image for printing
- When you have switched the SDA mode

The subdivisional acquisition (SDA) acquires preset number of frames and combined them into the single image. The SDA has two types: SPOT SDA and SERIAL SDA.

Select the protocol used for image acquisition in advance. Various setting regarding radiography is set up by selecting the protocol. The settings on the [Radiography] tab in the [Edit Procedure] window are used.

4



Hint

In the SDA, the preset number of frames (original images), and the combined image obtained by combining these frames are saved.



NOTE

- In the SDA, the X-ray emission range is limited to an area of 1/2 or 1/4 of the full screen mode even if the collimator is fully opened. Therefore, the outer periphery of the irradiated area of the image displayed during fluoroscopy or radiography is masked.
- When the [Auto Print] check box is selected of [Post process] in the procedure preset edit, all frames are stored for printing.
- The SDA mode buttons are invalid during SDA.
- When acquired frames are combined, the display parameters of each frame are reflected in the combined image. The display parameters for the combined image are: edge type "Std", edge level "0", gamma type "Std", gamma level "1", window width "65536", and window level "32767".

SPOT SDA

The preset number of frames are acquired individually, and combined into the single image.

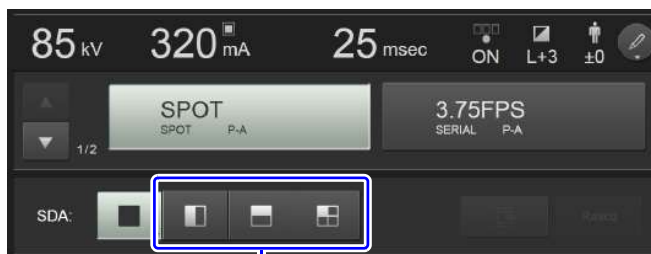


NOTE

In spot SDA, SDA automatically finishes and automatic post-processing is started after a set number of sectional frames have been taken.

This can also be set so that radiography continues after the set number of sectional frames have been taken or SDA finishes when a set number of frames have been taken after continuing. Contact a Shimadzu service representative if you wish to do so.

- 1 Select the desired protocol on the touch panel or on the operation panel.
- 2 Press the desired SDA mode button on the touch panel.
You will hear a short, high-pitched sound and the button will be highlighted.



Press the desired SDA mode button.

SDA Mode	Function
	Switches to the horizontal 2 division mode.
	Switches to the vertical 2 division mode.
	Switches to the 4 division mode.

The acquisition-status display shows the SDA mode selected on the acquisition monitor.
(example: 4 division mode)

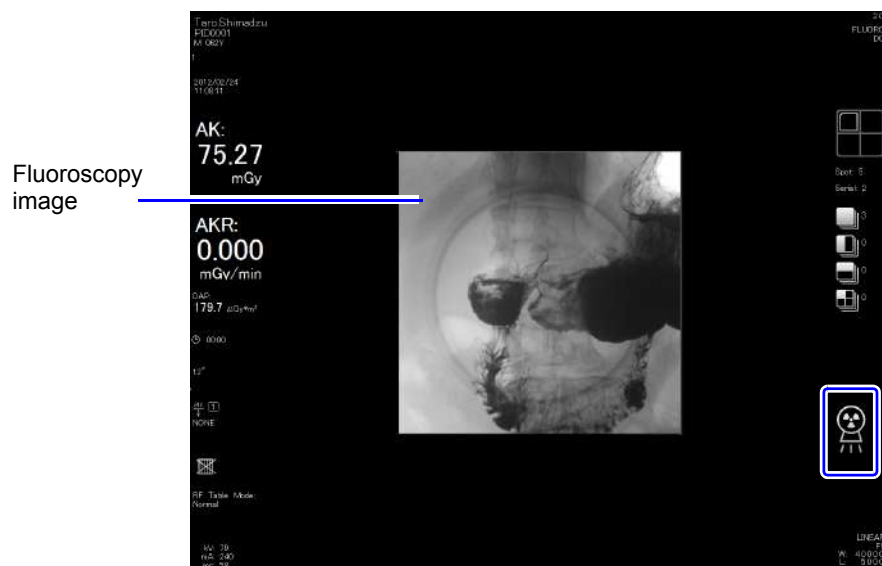


Acquisition Monitor

3 Step on the fluoroscopy foot switch.

The fluoroscopy image and  appear on the acquisition monitor.

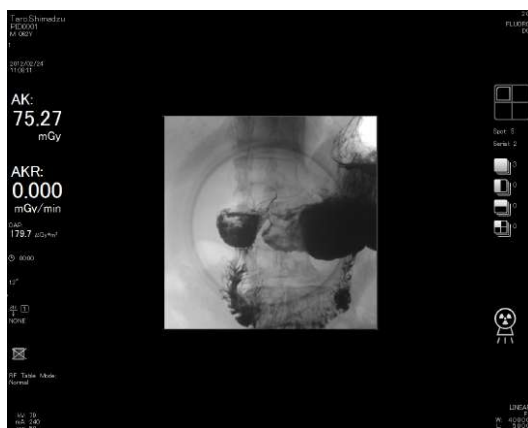
Determine the position by using the control lever on the remote console (when required).



Acquisition Monitor

- 4 Hold down the radiography button of the control lever on the remote console until you hear the short, high-pitched sound.

The irradiation starts and the  appears on the acquisition monitor. Then the frame acquired appears in the frame size of the selected SDA mode on the acquisition monitor and is allocated in the format of the selected SDA mode on the reference monitor.



Acquisition Monitor



Reference Monitor



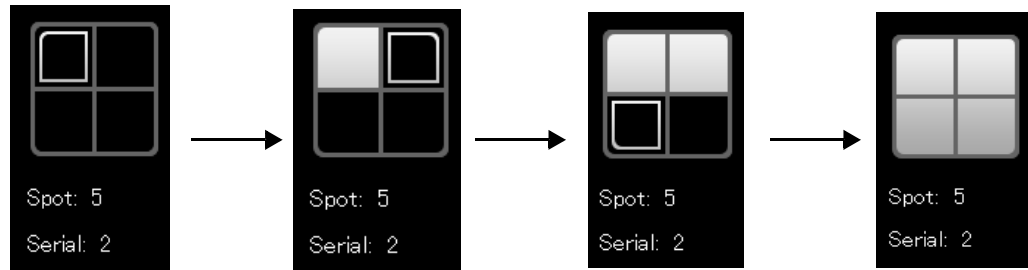
- The density of each acquired frame can be adjusted using the reference monitor.
- After the first frame has been taken, the following operations cannot be performed until all frames have been taken.
 - Changing field size
 - Vertical or horizontal reversal

- 5 Repeat step 3 and 4 until all the frames in the selected SDA mode are acquired.

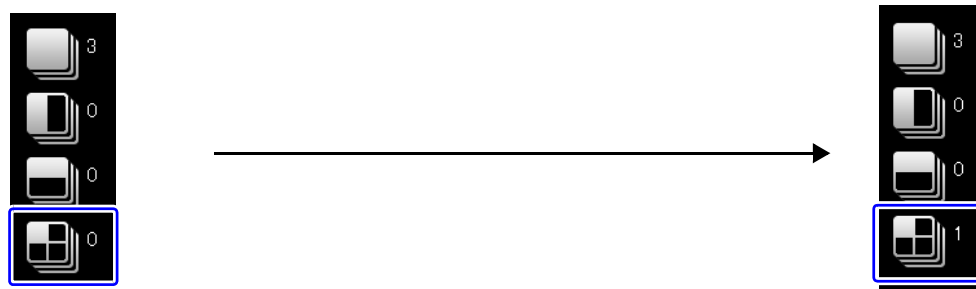
The acquisition-status display shows the current status as follows:

(Example: 4 division mode)

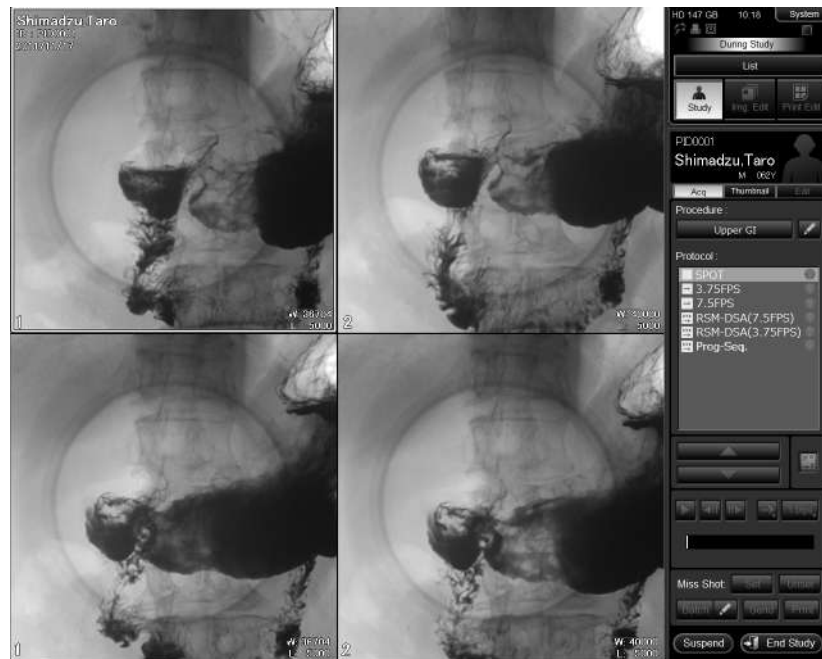
The frame format of the selected SDA mode will be filled as the frame is acquired.



When all frames are acquired, the image counter for the selected SDA mode increases by one.



When all frames are acquired, the frames are automatically combined and displayed on the reference monitor.



 **Hint** The [Reacq] button on the touch panel is enabled during frame acquisition. To acquire the frame again, press [Reacq].



- Only the previously acquired frame can be acquired again using the [Reacq] button. The [Reacq] is not available for frames taken up till then.
 **Reference** ["4.12.11 Re-acquisition" P.4-146](#)
- It is not possible to switch to serial SDA after taking one frame by spot SDA. (For example, it is not possible to take two quadrisectional frames by spot SDA and then take the remaining two frames by serial SDA.)



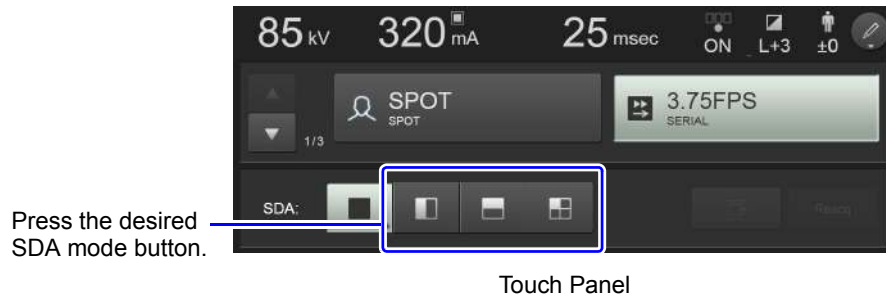
Hint

- The image is applied and post-processing is automatically started when any of the following operations is performed after the image is acquired.
 - When you have switched to another image
 - When you have performed the next image acquisition
 - When you have stored an image for printing
 - When you have switched the SDA mode
- To end the current SDA before acquiring all frames, perform the sweep operation.
 **Reference** ["4.12.12 Sweep" P.4-146](#)

SERIAL SDA

The X-rays are emitted intermittently in a single irradiation to obtain the preset number of frames, which are then combined to form a single image.

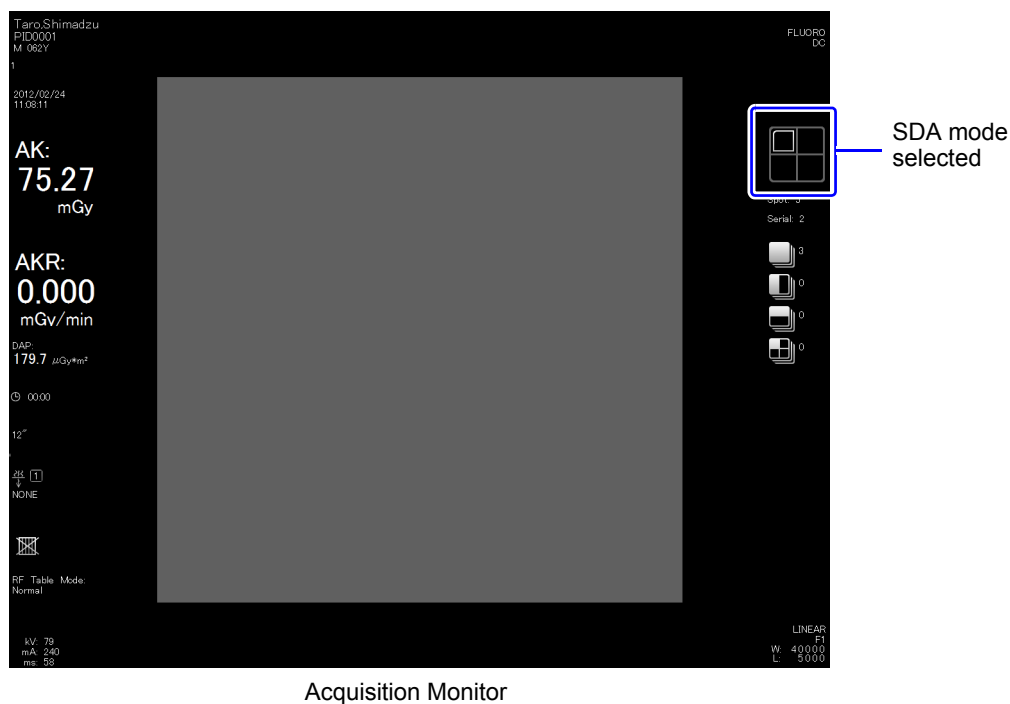
- 1 Select the desired protocol on the touch panel or on the operation panel.
- 2 Press the desired SDA mode button on the touch panel.
You will hear a short, high-pitched sound and the button will be highlighted.



SDA Mode	Function
	Switches to the horizontal 2 division mode.
	Switches to the vertical 2 division mode.
	Switches to the 4 division mode.

4 Operation of Each Part of the System

The acquisition-status display shows the SDA mode selected on the acquisition monitor.
(example: 4 division mode)



3 Step on the fluoroscopy foot switch.

The fluoroscopy image and  appear on the acquisition monitor.

Determine the position by using the control lever on the remote console (when required).



- 4** Hold down the radiography button of the control lever on the remote console until you hear the short, high-pitched sound and keep pressing it until the all frames of the SDA mode are acquired.

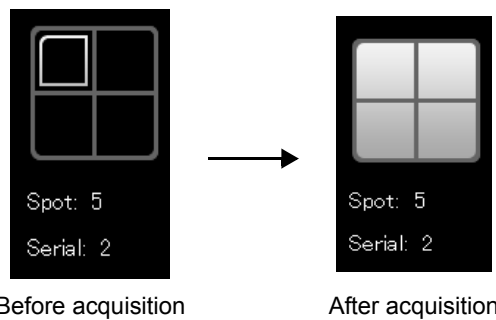
The irradiation starts and the  appears on the acquisition monitor.

The frames continuously are acquired. (In the case of the 4 division mode, 4 images are acquired continuously and displayed on the acquisition and reference monitors.)

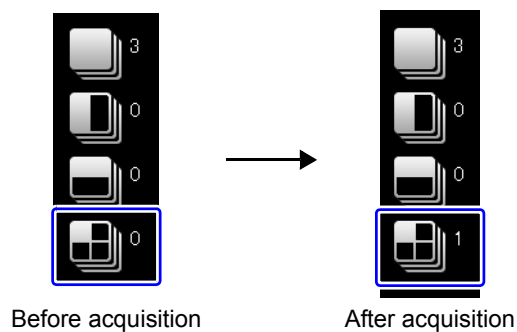
The acquisition-status display shows the current status as follows:

(Example: 4 division mode)

When all frames are acquired, the frame format of the selected SDA mode will be filled.



When all frames are acquired, the image counter for the selected SDA mode increases by one.



Then irradiation automatically stops when all frames are acquired and these frames are automatically combined into the single image.

 **Hint** The images are confirmed and automatic processing starts when radiography is complete.



- The mode cannot be switched to the SERIAL SDA after one or more frames have been acquired. (For example, 2 frames are acquired in SPOT SDA of 4 division mode, and remaining 2 frames cannot be acquired in the SERIAL SDA.)
- The re-acquisition function is disabled in the SERIAL SDA.
- When the radiography button is released midway during irradiation, the number of frames taken so far are saved as a file.

4.12.11 Re-acquisition

An image can be acquired again during or after the SPOT SDA.

- 1 Hold down the radiography button of the control lever on the remote console to acquire an image.

The [Reacq] button is enabled on the touch panel.



- 2 Press [Reacq] on the touch panel.
The image disappears from the reference and acquisition monitors. An image can be acquired.
- 3 Hold down the radiography button to acquire an image.

 **Hint** The [Reacq] function is not available when any of the following operations is performed after the SPOT SDA:

- When you have closed the current study
- When you have switch the procedure
- When you have acquire an image with another protocol
- When you have edit a procedure temporarily

4.12.12 Sweep

Press  of the touch panel to end the SPOT SDA before all the frames acquisition are completed. The composite image is created using the acquired images.

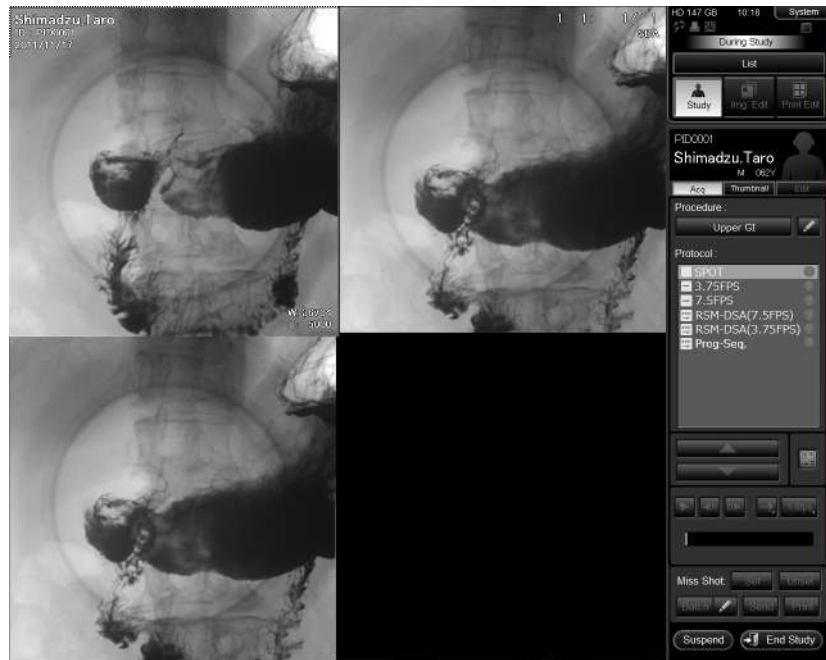
- 1 Start the SPOT SDA and acquire the image.

 is enabled on the touch panel.

 ["SPOT SDA" P.4-138](#)

- 2 Click  on the touch panel after acquiring the desired image.

- 3 The composite image is created using the acquired images and appears on the reference monitor.



4

-  **Hint** The image is applied and post-processing is automatically started when any of the following operations is performed after the image is acquired.
- When you have switched to another image
 - When you have performed the next image acquisition
 - When you have stored an image for printing
 - When you have switched the SDA mode

4.12.13 DSA (Optional)

In DSA, X-rays are emitted intermittently to obtain a mask image at first, and then live images continuously. The mask image is subtracted from the live images to create a subtraction image.

Select the protocol used for image acquisition in advance. Various setting regarding radiography is set up by selecting the protocol. The settings on the [Radiography] tab in the [Edit Procedure] window are used.

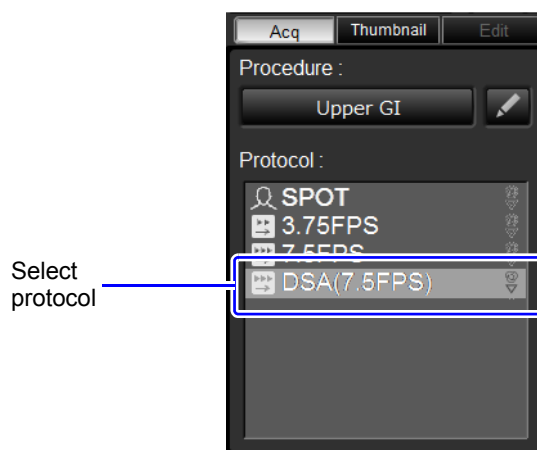


- When the [Auto Print] check box is selected of [Post process] in the procedure preset edit, all frames exclusive of mask images are stored for printing.
- Any SDA modes cannot be selected in the DSA.
The SDA mode is automatically switched to the full screen mode.
- X-ray emission is stopped and image acquisition ends when the radiography button is released midway during irradiation or when the preset number of frames are completed to be acquired.

- 1 Select the desired protocol on the touch panel or on the operation panel on the reference monitor.



Touch Panel

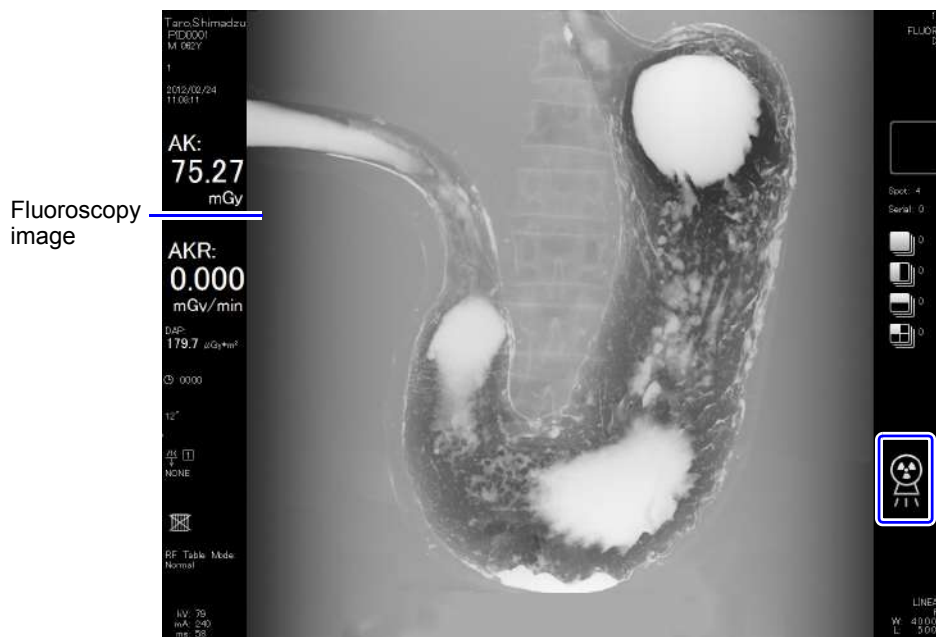


Operation panel on the Reference monitor

2 Step on the fluoroscopy foot switch.

The fluoroscopy image and  appear on the acquisition monitor.

Determine the position by using the control lever on the remote console (when required).



Acquisition Monitor

3 Prepare the injector.

4 Hold down the radiography button of the control lever on the remote console until you hear the short, high-pitched sound and keep pressing the switch until the preset number of frames are acquired.

The irradiation starts and the  appears on the acquisition monitor.

5 is displayed at the bottom of the acquisition monitor when acquisition of live images starts according to the injector setting of the procedure setting. Inject the contrast medium into the patient.

The subtraction image, in which the mask image is subtracted from live images, appears on the acquisition and reference monitors.

After the irradiation of the preset number of frames is completed, image acquisition ends automatically.



Hint The image is applied and post-processing is automatically started when any of the following operations is performed after the image is acquired.

- When you have switched to another image
- When you have performed the next image acquisition
- When you have stored an image for printing
- When you have switched the SDA mode

4.12.14RSM-DSA (Optional)

The RSM-DSA is the procedure to acquire the vessels image by subtracting the mask, which is generated from the image itself, from the image with contrast medium (the Live).

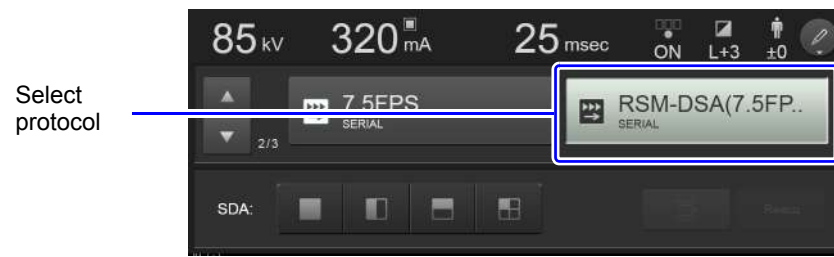
Through the digital processing, the blurred image is generated from the Live image to be used as the mask. Then this mask image is subtracted from the Live image. By repeating this procedure at every one frame acquisition, the subtraction image is generated and displayed.

Select the protocol used for image acquisition in advance. Various setting regarding radiography is set up by selecting the protocol. The settings on the [Radiography] tab in the [Edit Procedure] window are used.

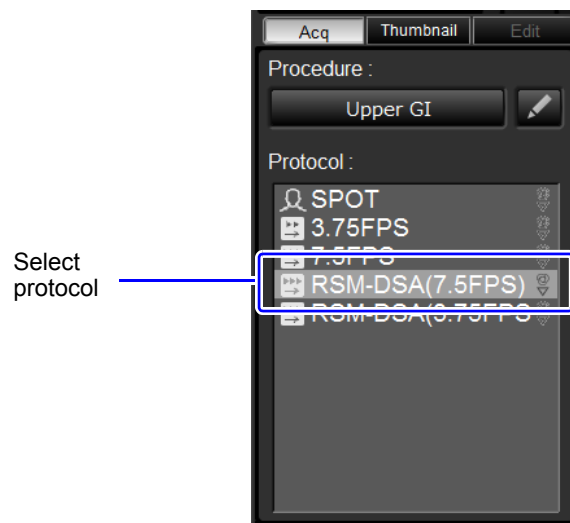


- All frames except mask images are registered for printing when [Print] is selected in [Post-processing] in procedure and preset editing.
- SDA mode cannot be selected for RSM-DSA radiography. It automatically switches to full-screen mode.
- X-ray irradiation stops and acquisition is completed when the radiography button is released during radiography, or when acquisition of a preset number of images is completed.

- 1 Select the desired protocol on the touch panel or on the operation panel.



Touch Panel

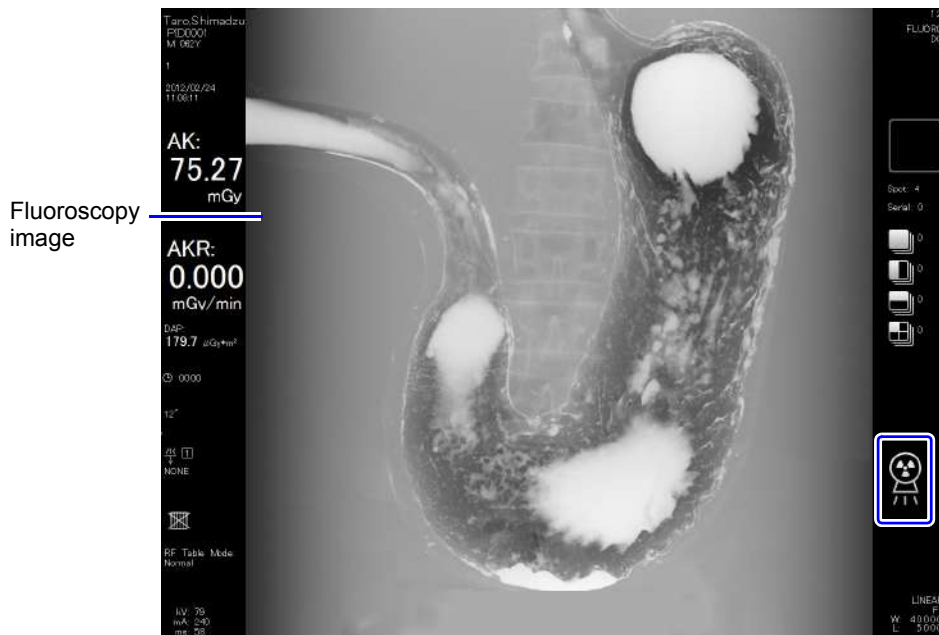


Operation Panel on Reference Monitor

2 Step on the fluoroscopy foot switch.

The fluoroscopy image and  appear on the acquisition monitor.

Determine the position by using the control lever on the remote console (when required).



Acquisition Monitor

3 Prepare the injector.

4 Hold down the radiography button of the control lever on the remote console until you hear the short, high-pitched sound and keep pressing the switch until the preset number of frames are acquired.

The irradiation starts and the  appears on the acquisition monitor.

5 is displayed at the bottom of the acquisition monitor when acquisition of live images starts according to the injector setting of the procedure setting. Inject the contrast medium into the patient.

The subtraction image will be displayed on the acquisition and reference monitors.

When the set time in procedure has passed, RSM-DSA will stop.

 **Hint** The image is applied and post-processing is automatically started when any of the following operations is performed after the image is acquired.

- When you have switched to another image
- When you have performed the next image acquisition
- When you have stored an image for printing
- When you have switched the SDA mode

4.12.15 SLOT Radiography (Optional)

The SLOT radiography is an option for creating a long image. The X-ray tube and FPD are moved simultaneously in parallel along the body axis to acquire images. These images are then connected to create a long image. Acquired images and the long image can be observed, subjected to the image processing, and printed.

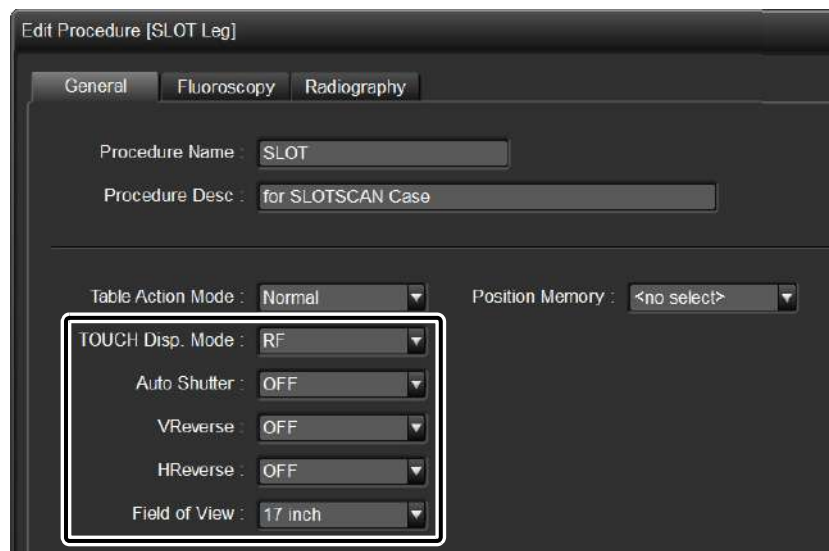


- Only the long image is registered for printing when [Print] is selected in [Post-processing] in procedure and preset editing.
- X-ray irradiation stops and acquisition is completed when the radiography button is released during radiography, or when acquisition of a preset number of images is completed.

4

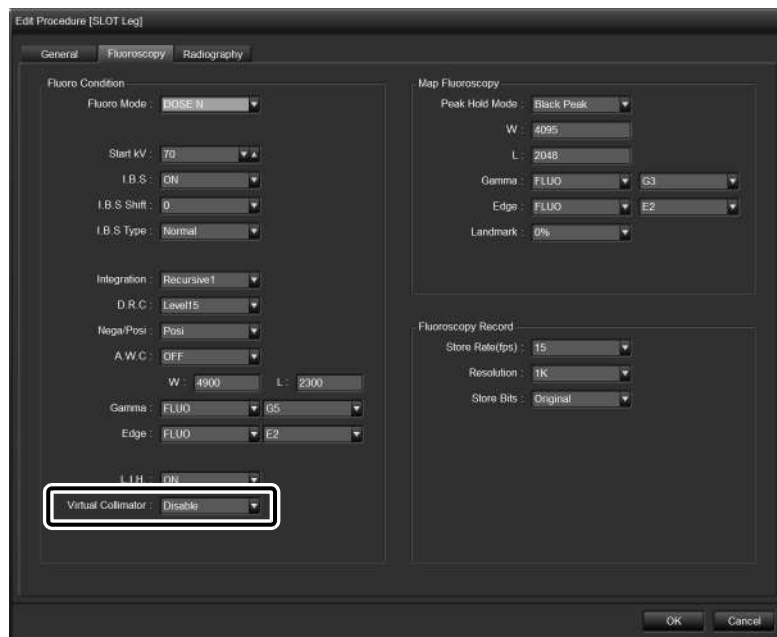
1 Open the [General] Tab of [Edit Procedure] window and set up items below:

- Select [RF] for [TOUCH Disp. Mode] since the buttons on the RF mode of the touch panel is used to register the radiography start and stop points.
- Set [Auto Shutter] to [OFF].
- Set an image display method by using [V Reverse] or [H Reverse] in the [General] tab or  and  (Customizable button) on the remote console such that the head side is displayed on the upper side of the monitor.
- Select 9 inch or larger for [Field of View].



[General] Tab of [Edit Procedure] window

- 2 Set [Virtual Collimator] to [Disable] on the [Fluoroscopy] Tab of [Edit Procedure] window.

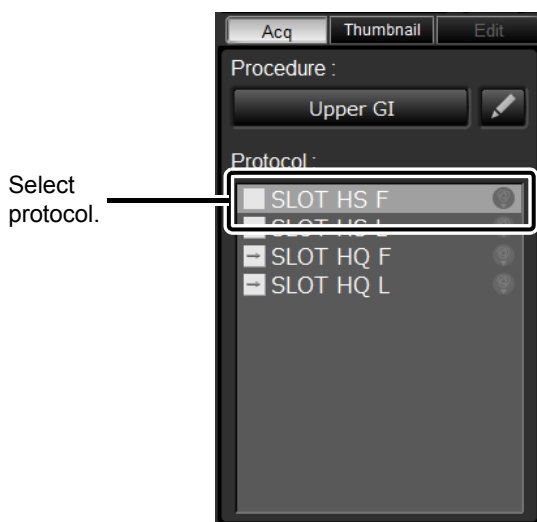


[Fluoroscopy] Tab of [Edit Procedure] window

- 3 Select the desired protocol for the SLOT radiography on the touch panel or on the operation panel on the reference monitor.



Touch panel (RF mode)



Operation panel on the reference monitor



- Switching a protocol sets the X-ray condition for the SLOT radiography.
- Turn the AEC OFF for the SLOT radiography. When turning it ON, an image cannot be acquired with an appropriate dose.
- Adjust the X-ray condition according to a patient size.

- 4 Set the SID to 1200.

- 5 In case of the vertical position, secure a patient with the attached belt.

**CAUTION**

**Keep eye on a patient during SLOT radiography.**

The attached belt is to support a position of a patient. Keep eye on a patient during radiography

Instructions

- 6 The message [Register First Point] is displayed on the acquisition monitor and touch panel. Move the X-ray tube and FPD to the first point with the Tabletop and imaging unit control lever on the remote console. Then press



to register the first point.



is lit up.

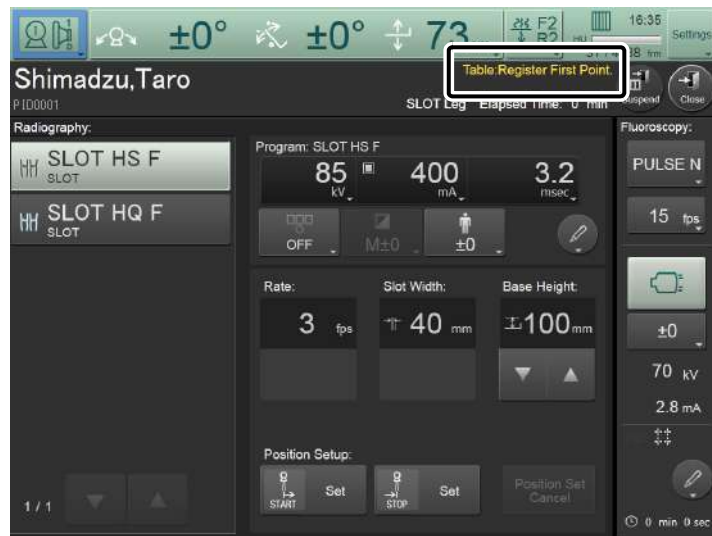


Hint

- The first point can be registered by pressing  on the X-ray diagnostic table.
- The first point can be canceled by pressing  on the touch panel.



Acquisition Monitor



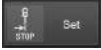
Touch panel (RF mode)

 **Hint** The position can be adjusted during fluoroscopy.



NOTE

- Turn OFF IBS and set the X-ray condition manually during fluoroscopy.

- 7 The message [Register Second Point] is displayed on the acquisition monitor and touch panel. Set the X-ray irradiation clearance button to ON, move the X-ray tube and FPD to the second point with the Tabletop and imaging unit control lever on the remote console. Then press  to register the second point.  is lit up.



Hint

- The second point can be registered by pressing  on the X-ray diagnostic table.
- The second point can be canceled by pressing  on the touch panel.



Acquisition Monitor



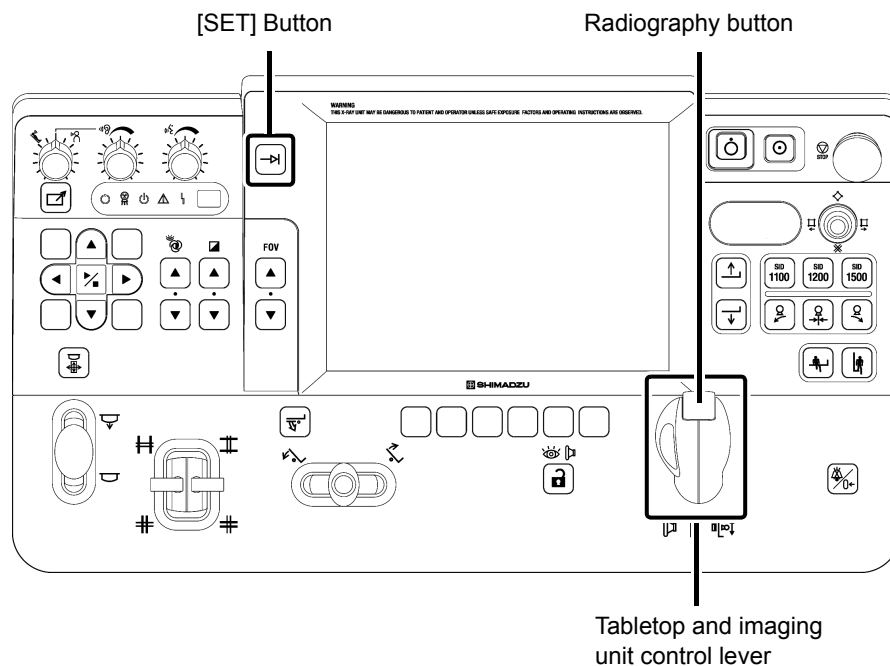
Touch panel (RF mode)



NOTE

- The first point can be registered by pressing . The X-ray tube and FPD will move from the second point toward the first point.
- Do not set up the first and the second points in the both-ends area in the movable range of the X-ray tube and FPD. Radiography cannot be performed in 7 cm from the both end of the movable range.
- The registration of first or second point is canceled in the following cases. Start over the registration.
 - Change a procedure or edit it temporarily.
 - Switch the protocol to that other than SLOT.
 - Press  and  (Customizable button) on the remote console.

- 8 When two points setup is completed, the  blinks on the remote console, and the message "Hold down [SET] button." is displayed on the acquisition monitor and touch panel. Hold down .



- 9 The message [Ready for exposure.] is displayed on the acquisition monitor and touch panel. Check this message, and then release .

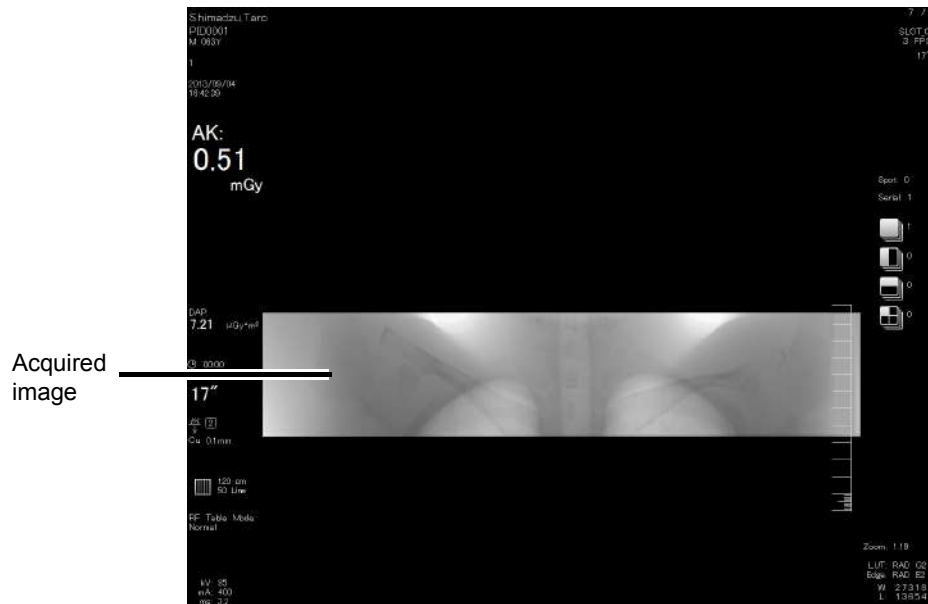
-  **Hint**
- After the first and second points have been registered, they can be reset until pressing .
 - Even after the exposure has been prepared, pressing  cancels registered points. Although the canceled points are stored, you can register new points.



NOTE When the message, [Ready for exposure] is displayed, the exposure can be started. The vibration of the X-ray tube may be seen due to the moving to the start point. Start a radiography after the vibration of the X-ray tube stops.

- 10 Hold down the radiography button of the control lever on the remote console until you hear the short, high-pitched sound as many times as the specified number of exposure.

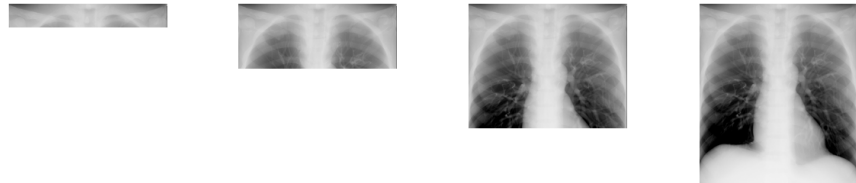
The acquisition starts and the  appears on the acquisition monitor.



Acquisition Monitor

 **Hint** When the protocol with the Real-time Stitching function ON is selected, during the SLOT radiography, a simple long image is gradually created on the acquisition monitor in real time. The acquired part will be added one after another until image acquisition ends.

SLOT radiography starts.



Refer to "M517-E210 Digital Radiography System DR-300 Instruction Manual (Image Acquisition)" for setup of the function.

4 Operation of Each Part of the System

A radiography will finish when the X-ray tube and FPD reaches the second point. Then the long image is created and displayed on the reference monitor.



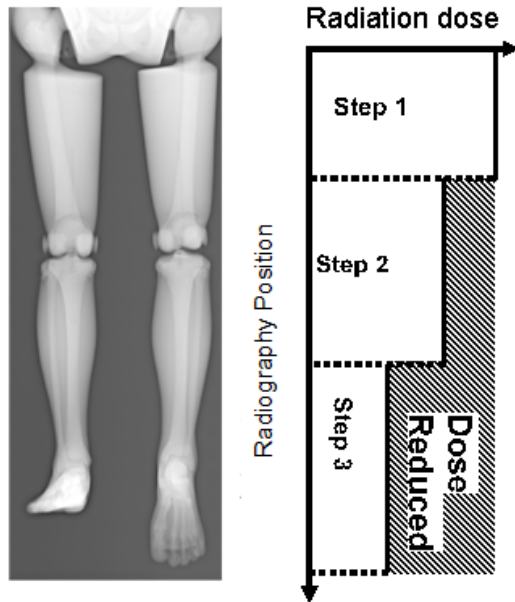
X-ray emission is stopped and image acquisition ends when the radiography button is released midway during irradiation.



Hint To continue the SLOT radiography, perform the procedure from the step 7.

Variable Dose SLOT Radiography

The Variable Dose SLOT radiography function provides the dose-reduced SLOT radiography. The X-ray condition changes according to an object's thickness to reduce the total amount of dose in one SLOT radiography.



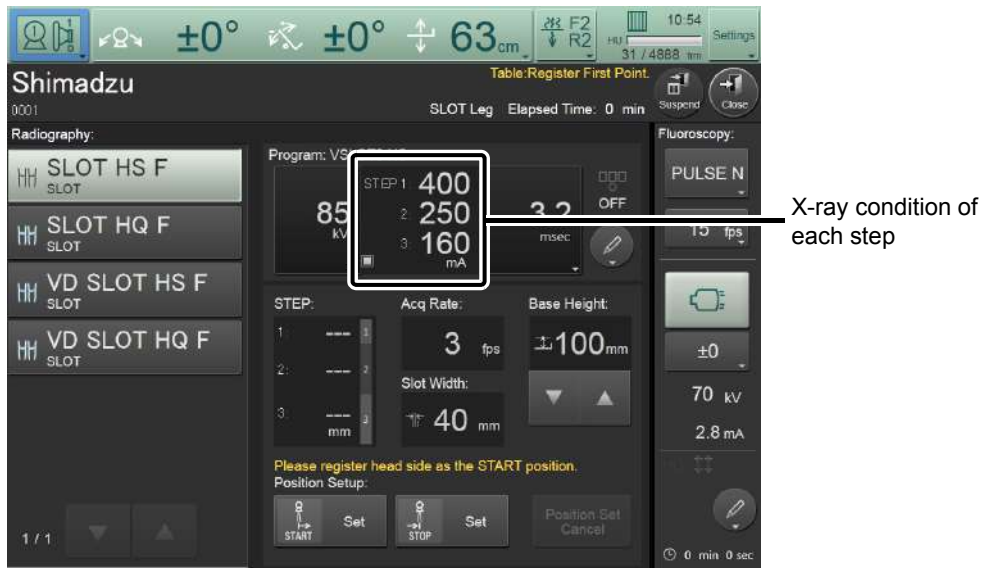
NOTE

- The Variable Dose SLOT radiography is only for the lower limb. Do not apply it to other body parts.
- The scan direction in the Variable Dose SLOT radiography is "Head to Foot" only.
- A thin band may appear in a Variable Dose SLOT radiography image on the boundary of X-ray condition. When a band is highly visible, use the normal SLOT radiography.
- With the Variable Dose SLOT radiography, the following radiography parameters cannot be changed:
 - Focus
 - Control method (mAs/mA sec)
 - mA
 - AEC

4 Operation of Each Part of the System

- 1 Select a desired protocol for the Variable Dose SLOT radiography on the touch panel or on the operation panel on the reference monitor.
The touch panel shows the value (mA) of each step of X-ray conditions.

 **Hint** The Variable Dose SLOT function is turned ON/OFF on the radiography tab of the Procedure Preset Edit window. Refer to "M517-E210 Digital Radiography System DR-300 Instruction Manual (Image Acquisition)" for details.

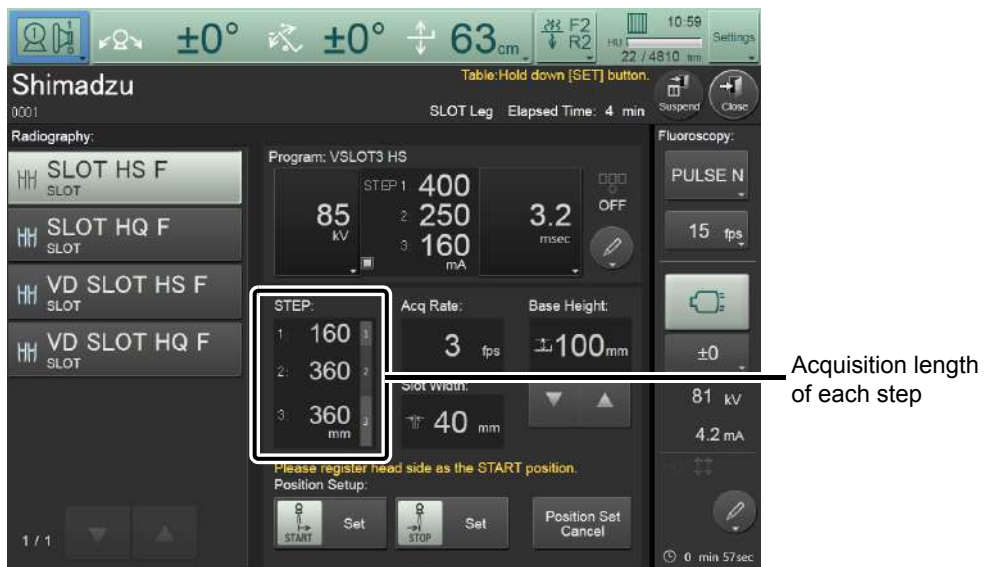


Touch panel (RF mode)

The subsequent step is the same as in the normal SLOT radiography.

 **Reference** "4.12.15 SLOT Radiography (Optional)" P.4-153

 **Hint** When the position setup is completed, the touch panel shows the acquisition length of each step.



Touch panel when the position setup is completed

4.12.16 Tomography and Tomosynthesis (Optional)

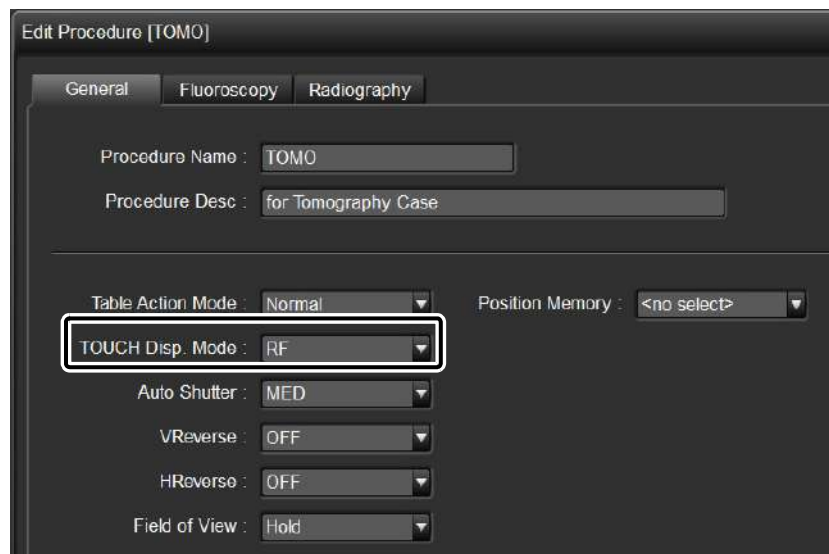
Tomography is for creating longitudinal sectional images of the body. Image data is acquired in single scan during in which the X-ray tube travels through an arc.

Tomography has two types: Tomography (TOMO) allows you to reconstruct an image of one specific section and Tomosynthesis (TOMOS, Optional) allows creation of images of any section by reconstruction processing.

■ Procedure Setting

Open the [General] Tab of [Edit Procedure] window and set up item below:

- Select [RF] for [TOUCH Disp. Mode] since the Tomography uses the [Height] and Tomosynthesis uses the [Height], [Range], and [Pitch] on the RF mode.



[General] Tab of [Edit Procedure] window

Tomography (TOMO)

Tomography (TOMO) allows you to acquire an image of one specific section.

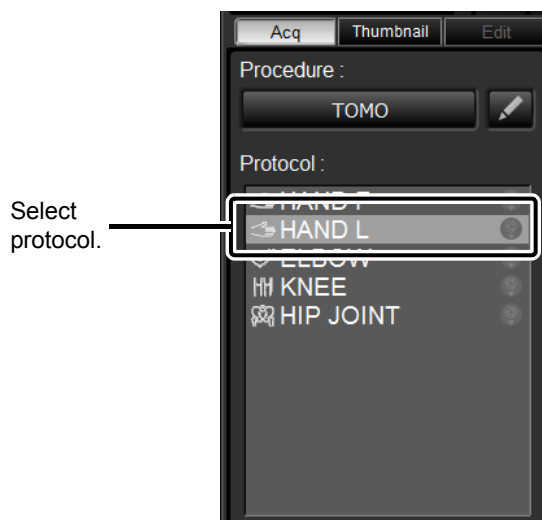


- All frames will be sent or registered for printing when the [Auto Send] or [Auto Print] check box is selected of [Post process] in the procedure and preset editing.

- 1 Select the desired protocol for the tomography on the touch panel or on the operation panel on the reference monitor



Touch panel (RF mode)



Operation panel on the reference monitor



Switching a protocol sets the X-ray condition for the tomography.

- 2 Set the SID to 1100.

- 3 The menu for tomography appears on the touch panel. Edit each item as appropriate.



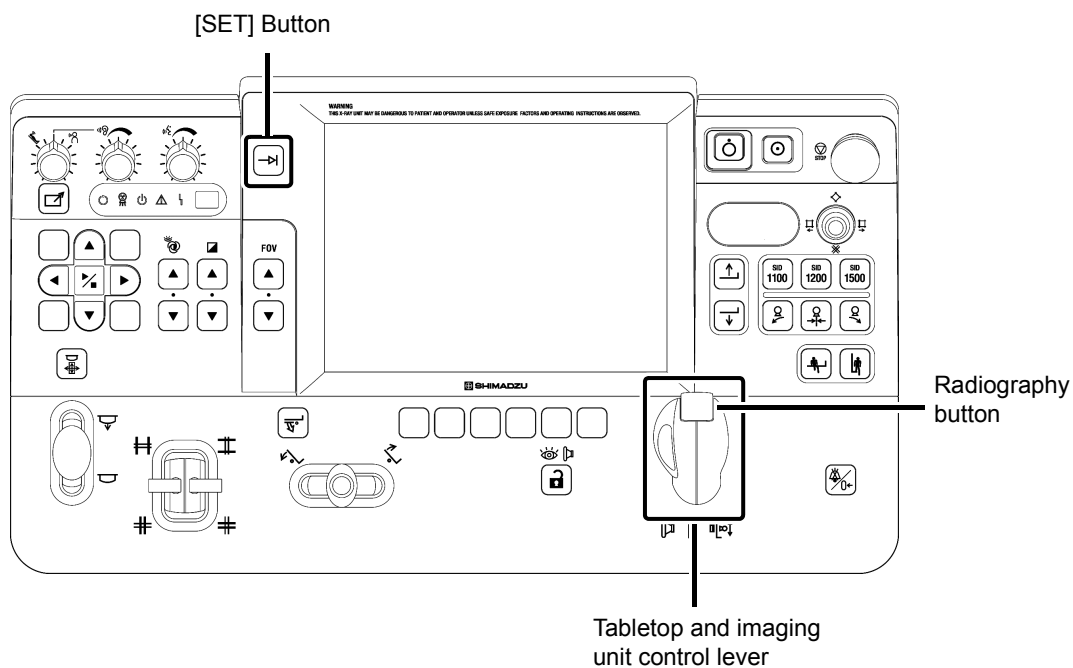
Touch panel (RF mode)

- 4 Step on the fluoroscopy foot switch.
The fluoroscopy image and  appear on the acquisition monitor.
Determine the position by using the control lever on the remote console (when required).



Note the excessively narrow collimator in the vertical direction. Data in the vertical direction may be lost even though they are visible in a field of view with the X-ray tube of 0 degree.

- 5 The  blinks, and the message "Hold down [SET] button." is displayed on the acquisition monitor and touch panel. Hold down . The X-ray tube and FPD move to the tomography starting point.



- 6 The message [Ready for exposure.] is displayed on the acquisition monitor and touch panel. Check this message, and then release .

- 7 Hold down the radiography button of the control lever on the remote console until you hear the short, high-pitched sound as many times as the specified number of exposure.

The acquisition starts and the  appears on the acquisition monitor.



Acquisition monitor

After the radiography is ended, release the radiography button. The tomography image at the specified height appears on the acquisition monitor and then appears on the reference monitor.



NOTE

X-ray emission is stopped and image acquisition ends when the radiography button is released midway during irradiation.

■ Tomosynthesis (TOMOS)(Optional)

Tomosynthesis (TOMOS) allows you to create images of any section by reconstruction processing.

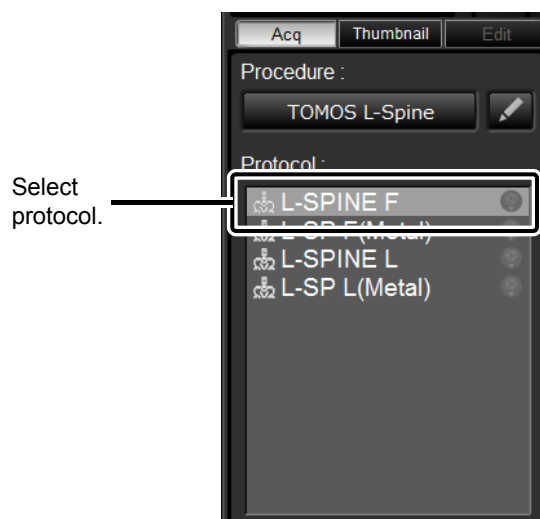


Only TOMOS reconstructed image will be sent or registered for printing when the [Auto Send] or [Auto Print] check box is selected of [Post process] in the procedure and preset editing.

- 1 Select the desired protocol for the Tomosynthesis on the touch panel or on the operation panel on the reference monitor.



Touch panel (RF mode)



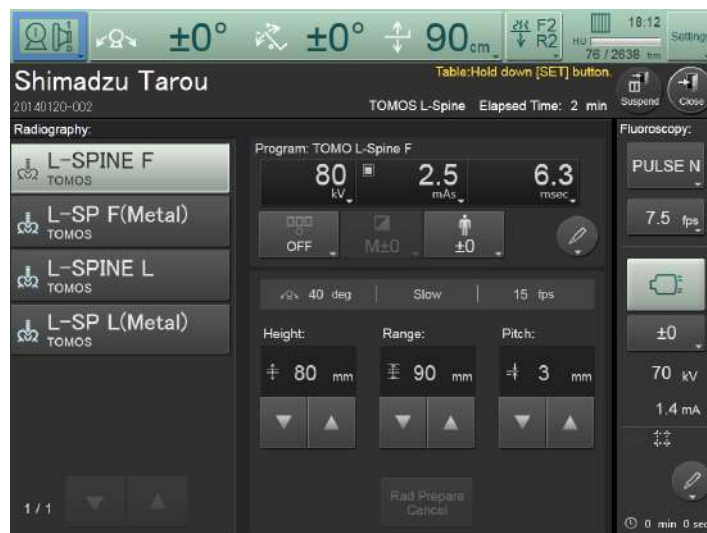
Operation panel on the reference monitor



- Switching a protocol sets the X-ray condition for the Tomosynthesis.
- When the "Resolution" of a protocol is set as "Original (High definition TOMOS mode)", the FOV size of 6 inches is only available.
- A protocol for low dose provides tomosynthesis with lower radiation dose than that of normal one.
- Do not select "Original (High definition TOMOS mode)" for "Resolution" of TOMOS procedure setting.

- 2 Set the SID to 1100.
- 3 The menu for Tomosynthesis appears on the touch panel. Edit each item as appropriate.

4



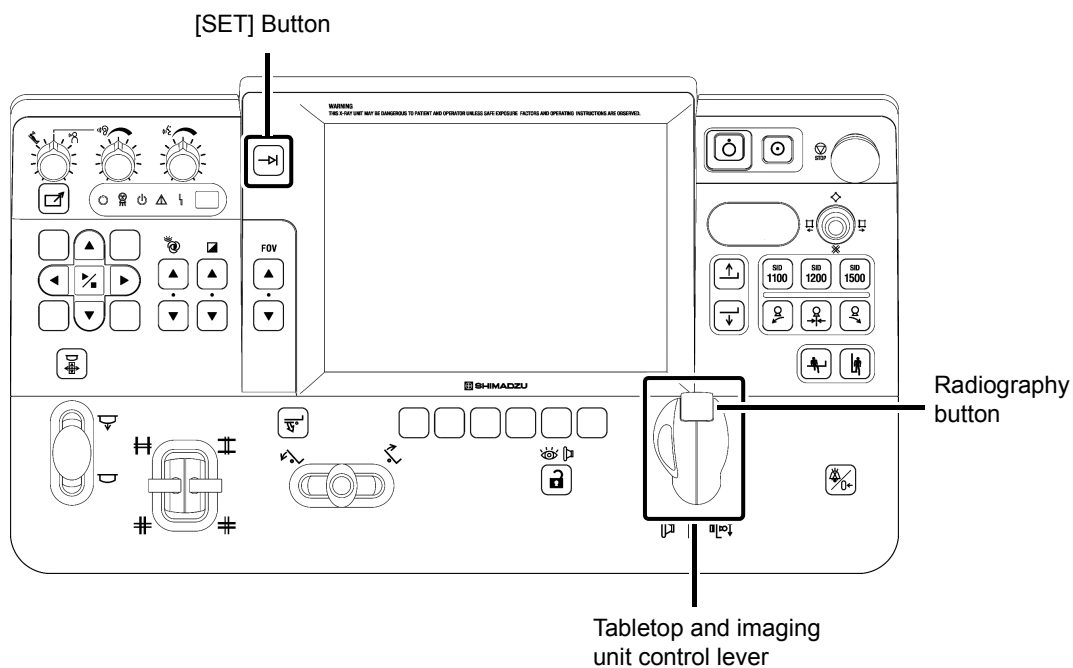
Touch panel (RF mode)

- 4 Step on the fluoroscopy foot switch.
The fluoroscopy image and appear on the acquisition monitor.
Determine the position by using the control lever on the remote console (when required)



Note the excessively narrow collimator in the vertical direction. Data in the vertical direction may be lost even though they are visible in a field of view with the X-ray tube of 0 degree.

- 5 The  blinks, and the message "Hold down [SET] button." is displayed on the acquisition monitor and touch panel. Hold down . The X-ray tube and FPD move to the Tomosynthesis starting point.



- 6 The message [Ready for exposure.] is displayed on the acquisition monitor and touch panel. Check this message, and then release .

- 7 Hold down the radiography button of the control lever on the remote console until you hear the short, high-pitched sound as many times as the specified number of exposure.

The acquisition starts and the  appears on the acquisition monitor.

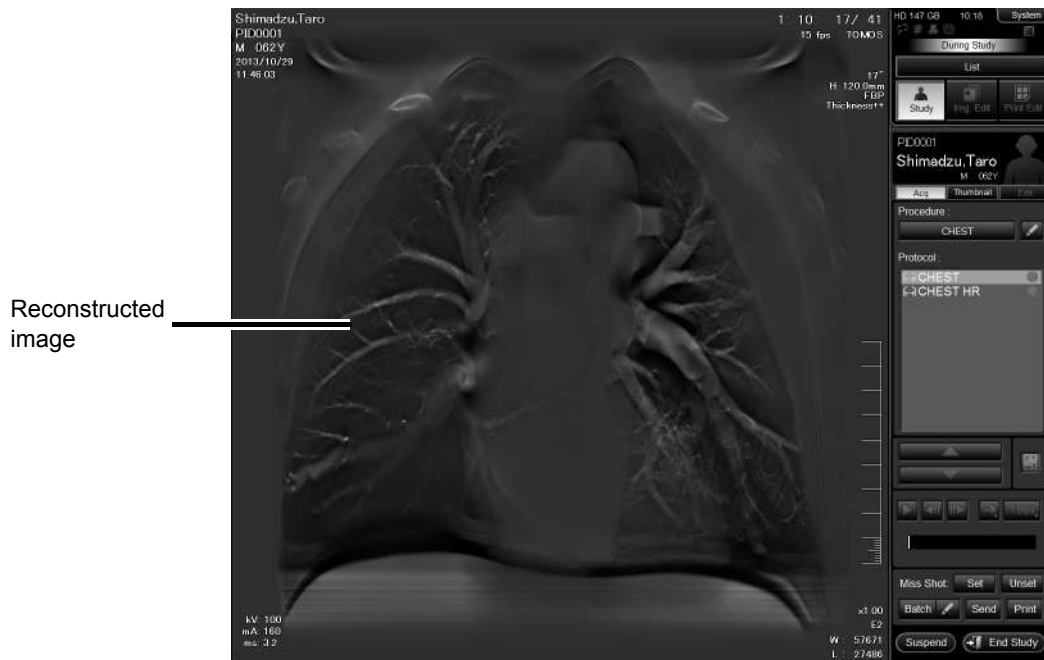


Acquisition monitor

After the radiography is ended, release the radiography button.
The acquired image appears on the acquisition monitor.

4 Operation of Each Part of the System

When the "Auto Reconst." is ON in the procedure preset edit, the reconstructed image then appears on the reference monitor.

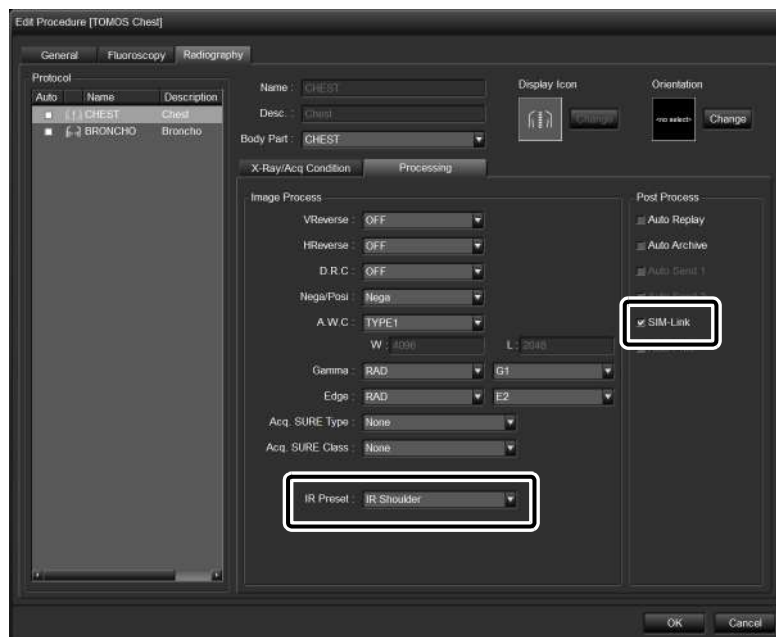


X-ray emission is stopped and image acquisition ends when the radiography button is released midway during irradiation. The correct Tomosynthesis image cannot be reconstructed if the number of images acquired is less than the half of the specified number of image.

4.12.17 Iteration Reconstruction (Optional)

The Iteration reconstruction is an option mode to create a TOMOS reconstruction image in the iteration method. A TOMOS image is sent to Side Station i3 (option) and reconstructed automatically using the iteration method in the Side Station i3.

- 1 Open the [Radiography] Tab of [Edit Procedure] window and set up items below:
 - Set a desired mode for [IR Preset].
 - Select the checkbox of [SIM-Link] in [Post Process].



[Radiography] Tab of [Edit Procedure] window



When a TOMOS protocol of low dose is selected, or when the "Resolution" of a protocol is set as "Original (High definition TOMOS mode)", do not enable the IR Preset.



Hint Refer to "M517-E210 Digital Radiography System DR-300 Instruction Manual (Image Acquisition)" for [Radiography] tab.

2

Perform Tomosynthesis radiography.

The subsequent step is the same as in the normal Tomosynthesis radiography.

Reference ["4.12.16 Tomography and Tomosynthesis \(Optional\)" P.4-165](#)

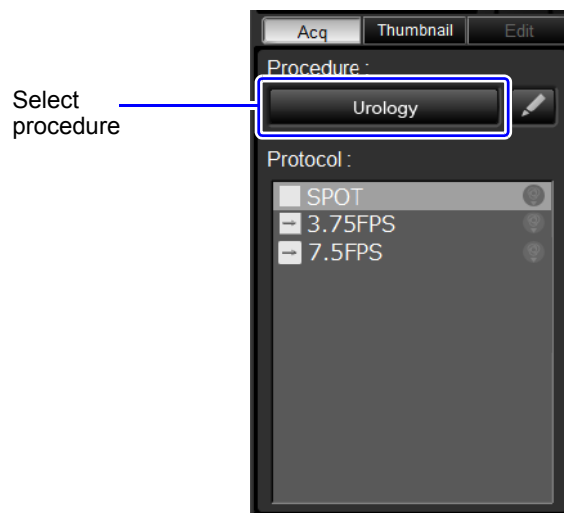
After radiography, the images are automatically sent to the Side Station i3 and reconstructed automatically using the iteration method. Refer to "M517-E283 Side Station i3 Instruction Manual" for details.

4.12.18 Urological Radiography



- Turn OFF IBS and set the X-ray condition manually during fluoroscopy.
- Pressing the "Image V-Reverse" or "Image H-reverse" button on the remote console will cancel the position registration. Start over the registration.

- 1 Select [Urology] for [Table Action Mode] in [General] tab in the [Edit Procedure] window.
Refer to "M517-E210 Digital Radiography System DR-300 Instruction Manual (Image Acquisition)" for details on procedures.
- 2 Select the procedure for the Urology.



Operation Panel on Reference Monitor

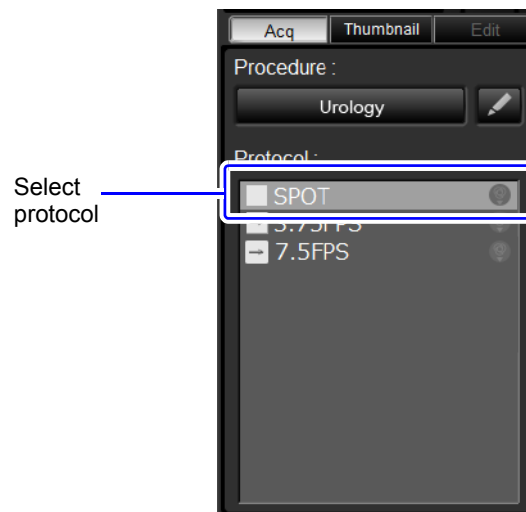


The procedure name displayed on the operation panel depends on the configuration of the procedure preset. Select a procedure with the "Urology" of the Table Action Mode.

- 3 Select the desired protocol on the touch panel or on the operation panel.



Touch Panel

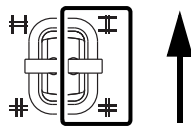


Operation Panel on Reference Monitor

4

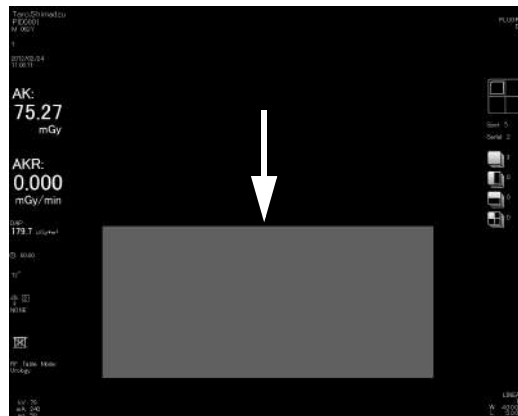
- 4** Step on the fluoroscopy foot switch to determine the irradiation position. The fluoroscopy image and  appear on the acquisition monitor.
- Determine the irradiation position by using the control lever on the remote console. Determine the irradiation area by using the right collimator lever on the remote console. When you push the right collimator lever to backward, the upper end of the irradiation area on the acquisition monitor will go up, and when you pull the lever toward you, the end will go down.

Push the right collimator lever to backward



Upper end of the irradiation area will go up.

Pull the lever toward you



Upper end of the irradiation area will go down.

Acquisition Monitor

- 5** Hold down the radiography button of the control lever on the remote console until you hear the short, high-pitched sound. The irradiation starts and the  appears on the acquisition monitor. Then the image acquired appears on the acquisition and reference monitors.



Hint The image is applied and post-processing is automatically started when any of the following operations is performed after the image is acquired.

- When you have switched to another image
- When you have performed the next image acquisition
- When you have stored an image for printing
- When you have switched the SDA mode

4.12.19 Image Processing

The images obtained can be enlarged, reduced, moved, or subjected to processes such as intensity adjustment. These image processing are performed in the [Image Edit] window on the reference monitor.

- 1 Click [Image List] to display the [Image List] window on the reference monitor.

Executed studies are displayed in the window.



Reference Monitor

2 Select the desired file and click [Open] on the operation panel.

The background color of the selected study is changed.

The selected thumbnail image is surrounded by the selection border.

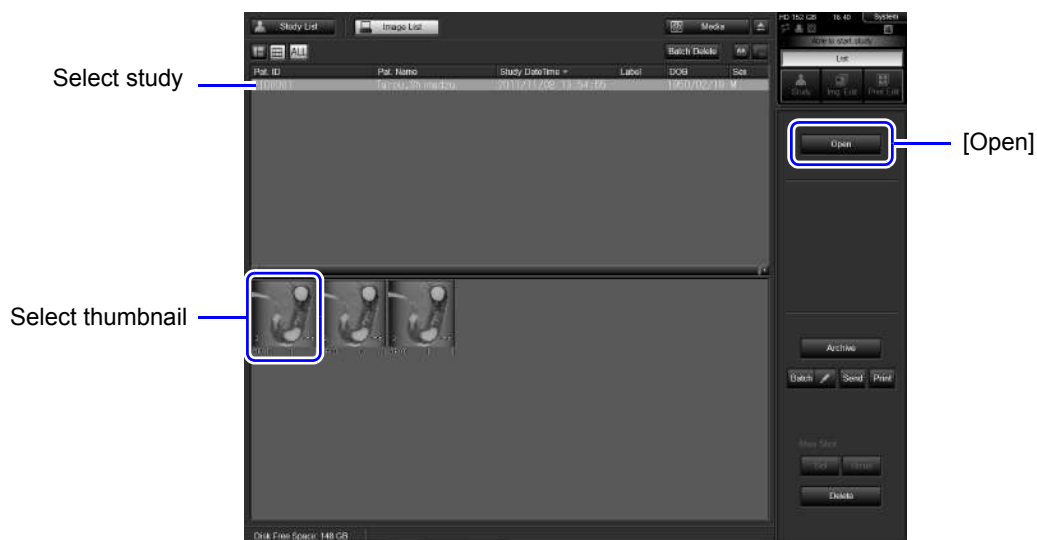
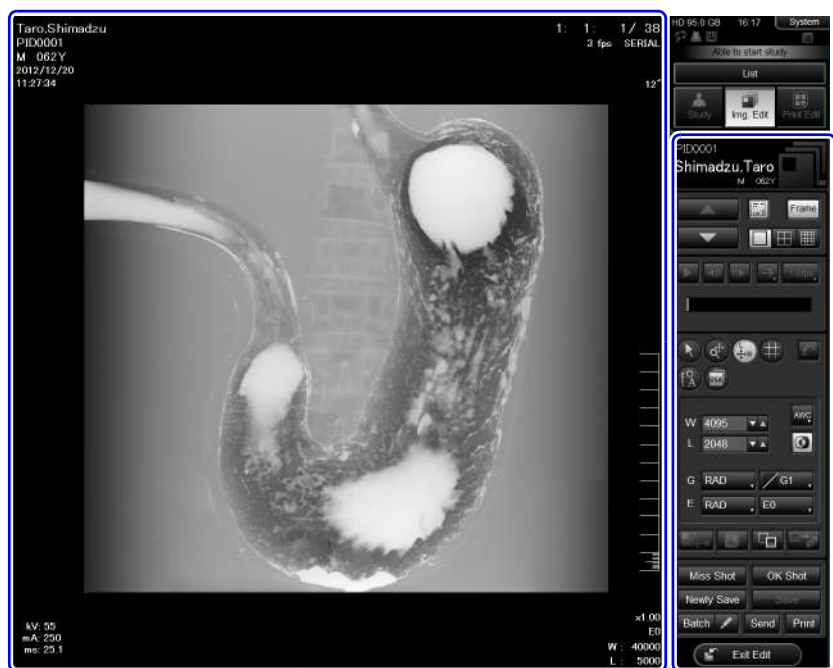


Image List window

The [Image List] window switches to the [Image Edit] window.

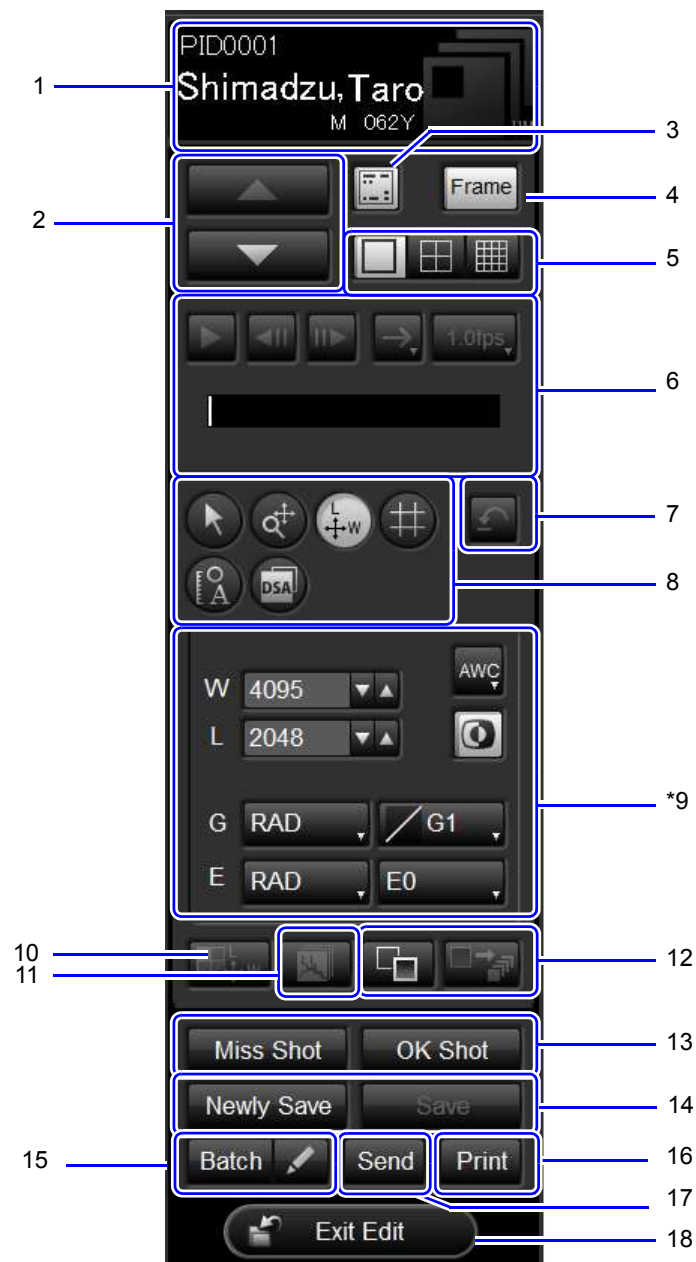
The image corresponding to the selection appears in the image display area and the image edit operation panel appears.



 **Hint** The [Image Edit] window can also be opened by double-clicking the study or image.

■ Operation Panel of Image Edit Window

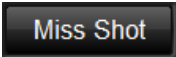
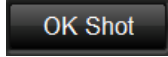
The image can be processed by clicking the corresponding buttons the operation panel.



* indicates that the display varies with the selected button.

4 Operation of Each Part of the System

No.	Item	Function
1	Patient information display section	Displays the patient information for the displayed image.
2		Switch page buttons If the selected study contains multiple images, these buttons are used to switch to the previous/next image.
3		Display Image Information button Specifies whether or not to display the image information over the displayed image.
4		Switch Display Mode button Switches the display mode between the all frame display and the representative frame display.
5		Select Display Format button Switches the image display format (number of subdivisions).
6		Image Sequence buttons Plays sequences of multi-frame images.
7		Undo button Cancels previous operations and returns to the state that was saved.
8	     	Select Image button Selects an image. Enlarge/Reduce/Move button Enlarges, reduces, or moves an image. Adjust Intensity button Adjusts the image intensity. Shutter button Adjusts an image display area. Annotation button Inserts footnotes, arrows, lines and other annotations anywhere in an image. DSA button Performs DSA post-processing.
* 9	Process menu display section	The display changes in accordance with selection of the button in "8" row above, enabling the process or operation allocated to it.
10		Edit Divided Image button Changes the intensity of each frame of a combined image when a combined image is displayed. When a SERIAL image is displayed, this button creates a new combined image.
11		Peak Hold button Creates one image showing a flow of the contrast medium from the DSA image.

No.	Item	Function
12		Copy Processing Information button Copies the processing information of the selected image.
		Paste Processing Information button Pastes the copied processing information to the selected image.
13		[Miss Shot] Registers an image acquired as a miss shot.
		[OK Shot] Cancels the miss shot.
14		[Newly Save] Saves a frame registered in a file as a new image file.
		[Save] Saves the results of image processing.
15		[Batch] Sends or registers images to a preset destination.
		Batch Output Setting button Sets a image sending or printing destination.
16		[Print] Registers images to a print destination different from that set up in the Batch output settings.
17		[Send] Sends images to a destination different from that set up in the Batch output settings.
18		[Exit Edit] Closes the [Image Edit] window.

3 Select the image to be processed with .

- 4 Select the desired button among the Image processing buttons and apply desired processing to the image selected.

The process menu display section shows the processing menu or buttons specific to the button selected.

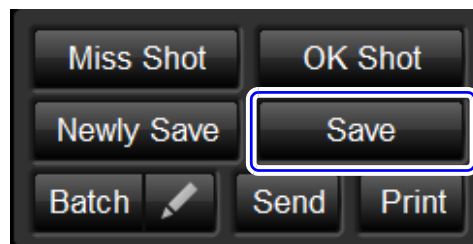
Refer to "M517-E211 Digital Radiography System DR-300 Instruction Manual (Post Processing)" for details on procedures.



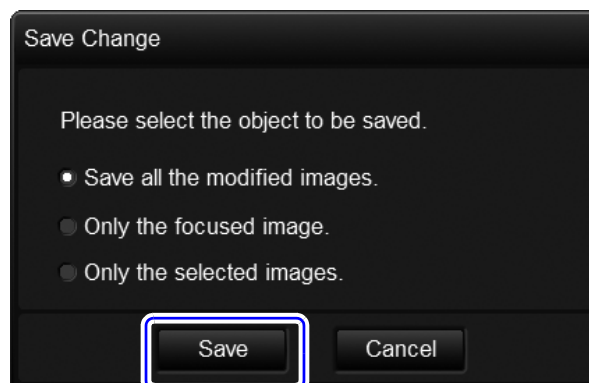
The processed image appears on the reference monitor.

 **Hint** If you cancel the image processing, click [Undo]. The image processing applied are cancelled to restore previously saved state.

- 5 Save the results of image processing. Select the image to be saved and click [Save] on the operation panel.



The [Save Change] window appears.



No.	Item	Function
1	Save all the modified image.	All changed files are saved.
2	Only the focused image.	The single image selected with the focus border is saved.
3	Only the selected image.	The images selected with the selection border is saved.

- 6 Select the desired option and click [Save].
The image is saved.
- 7 Exit the image processing. Click [Exit Edit] on the operation panel.



The [Image Edit] window closes and the [Image List] window returns.

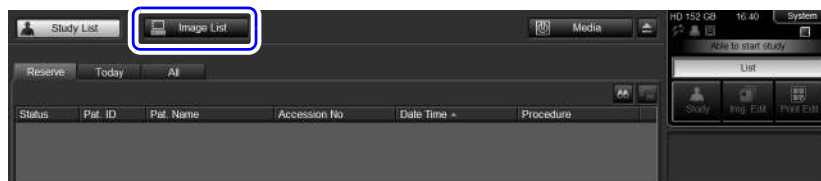
4.12.20 Saving Images

Images acquired and processed can be saved in the CD-R or DVD-R. The image storing are performed in the [Image List] window on the reference monitor.

■ Image Registration

- 1 Click [Image List] to display the [Image List] window on the reference monitor.

Executed studies are displayed in the window.



Reference Monitor

- 2 Select the desired file and click [Archive] on the operation panel.
The background color of the selected study is changed.
The selected thumbnail image is surrounded by the selection border.

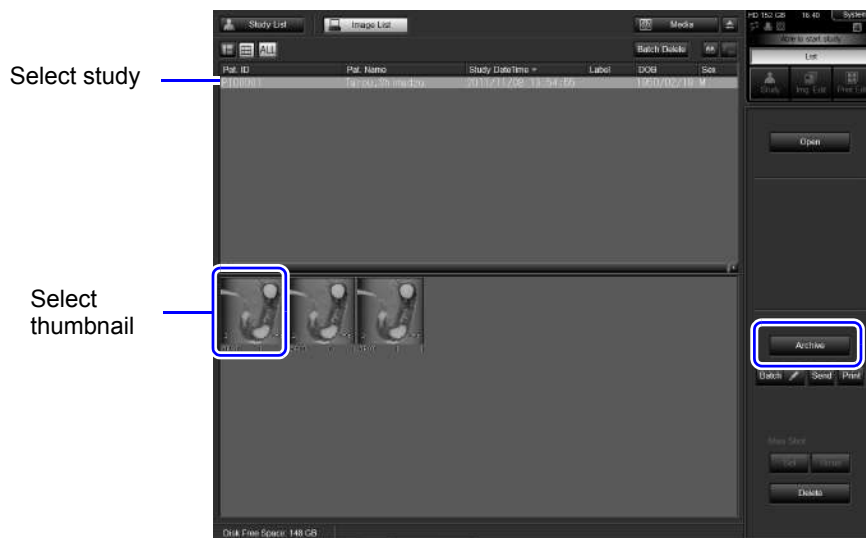
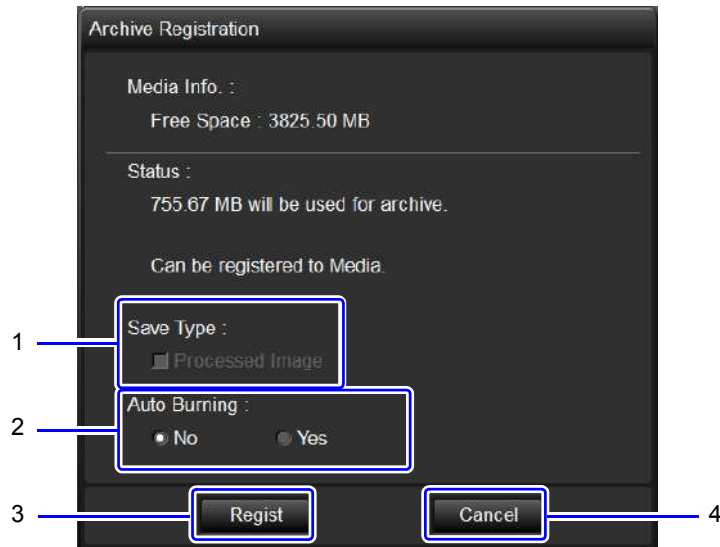


Image List window

3 The [Archive Registration] window appears.



No.	Item	Function
1	Save Type : ☐ Processed Image	[Save Type] Selects the [Processed Image] checkbox to register processed images to a storage medium. The processed image is archived with the image display tool. Clears the [Processed Image] checkbox to register images without processing to a storage medium.
2	Auto Burning : ☒ No ☐ Yes	[Auto Burning] Selects [No] not to write images to a storage medium at clicking [Regist]. Select [Yes] to write images to a storage medium at clicking [Regist].
3	Regist	[Regist] Registers images for archiving.
4	Cancel	[Cancel] Aborts the image registering process.

4 Click [Regist].
As background processing, the images are registered in order.
Click [Cancel] to cancel the registration.

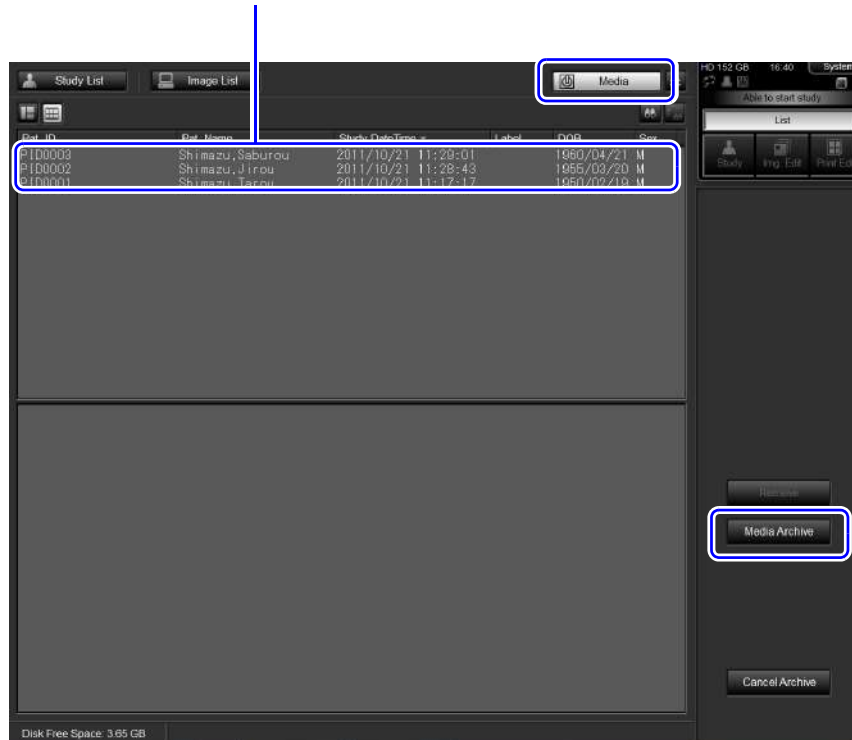
■ Writing Images to Storage Media

At the point when the registration of images to be saved is completed, the images still have not been written to the storage medium. To write the images, follow the procedure below.

1 Click [Media].

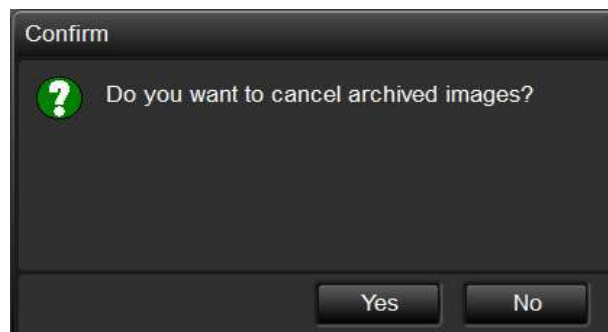
The [Media] is inverted and a list of the study in the storage medium and the study registered is displayed.

List of study in storage medium and registered



Hint

- To add the study registration, click [Image List]. The [Image List] window appears. Repeat the study registration step.
- To cancel the registration, click [Cancel Archive] on the operation panel. The [Confirm] window appears. Click [Yes] to cancel the registration. The [Image List] window appears.



- 2 Click [Media Archive] on the operation panel.
The media archive confirmation window appears.



- 3 Click either [Yes] or [No].
If you click [Yes], writing is executed. The display switches from the [Media] window to the [Image List] window.
Writing is registered as background processing and requires a few minutes to several tens of minutes.
When writing is completed, the storage medium is automatically ejected. If you click [No], writing is aborted, and the confirmation window closes.

4.12.21 Batch Output

Images acquired and processed can be sent or printed with the Batch output. The Batch output is performed in the [Image Edit] window on the reference monitor.

- 1 Click [Image List] to display the [Image List] window on the reference monitor.

Executed studies are displayed in the window.



Reference Monitor

- 2 Click  on the operation panel.

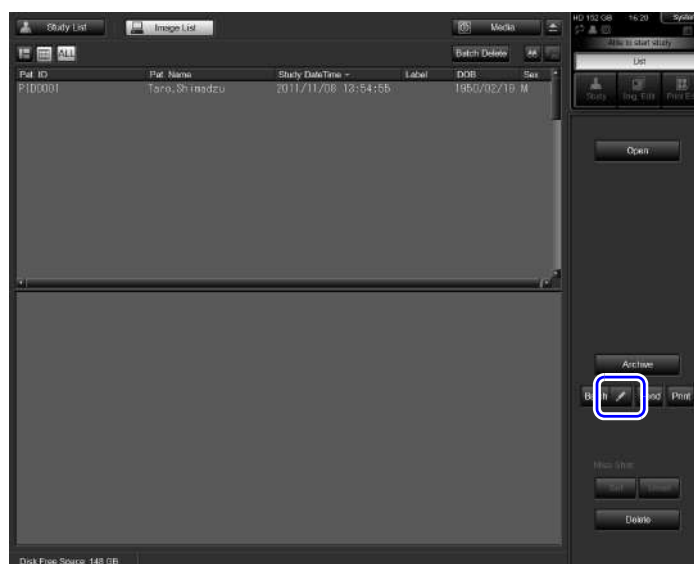


Image List window

The [Batch Output Setting] window appears.

For image send, select the [Send] checkbox and select the desired destination checkbox.

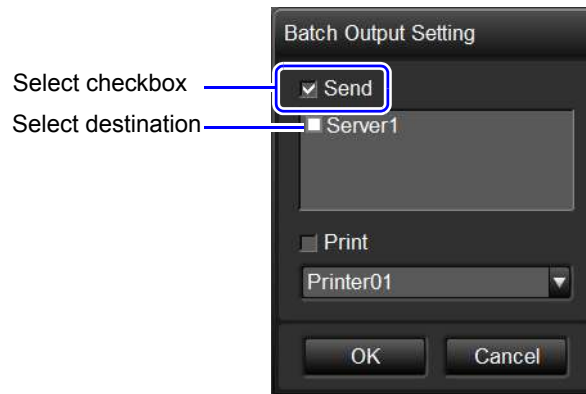


Image Send

For image printing, select the [Print] checkbox and the desired printer form the list.

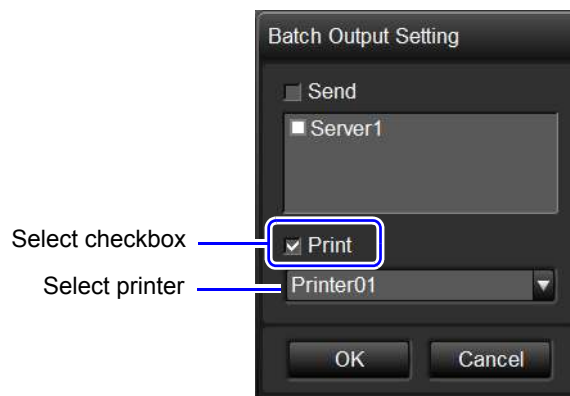


Image Print

3 Click [OK].

- 4 Select the study or image to be output and click [Batch] on the operation panel.

The background color of the selected study is changed.

The selected thumbnail image is surrounded by the selection border.

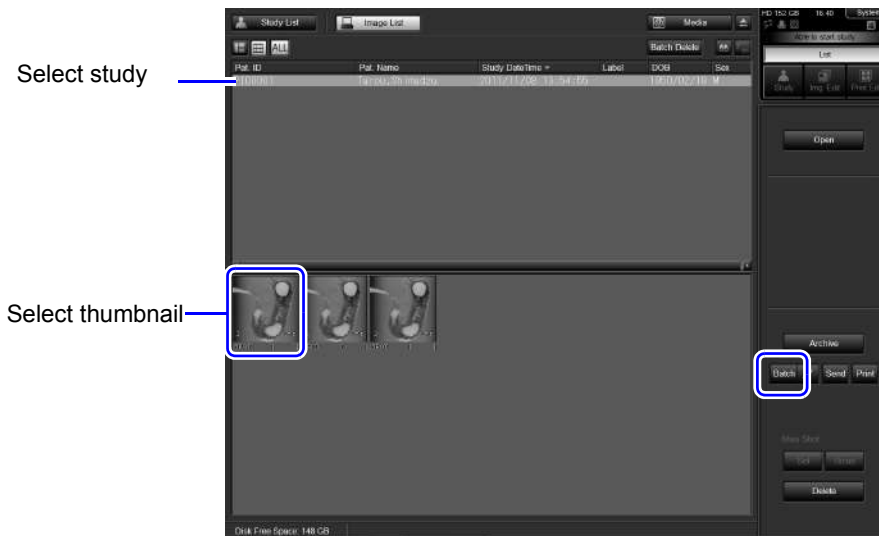
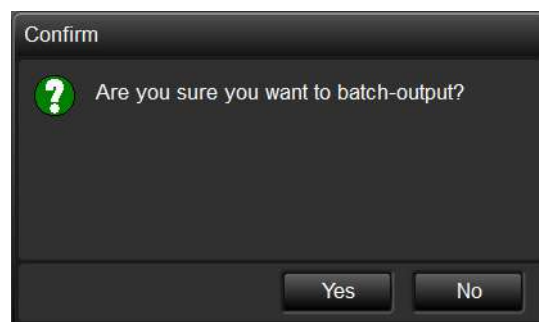


Image List window

- 5 The [Confirm] window appears. Click [Yes] to start the output.



The files are registered for background processing and then will be output in order.

To abort the operation, click [No].



Hint When you send or register images to a destination different from that set up in [Batch Output Setting], use **Send** **Print** on the operation panel. Refer to "M517-E211 Digital Radiography System DR-300 Instruction Manual (Post Processing)" for details.

4.12.22 Closing Study

The active study is closed by the study exit or suspend. After closing the study, the [Image List] returns on the reference monitor.

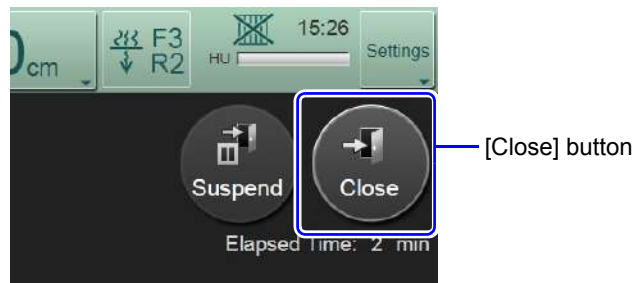


NOTE When the [Auto Archive], [Auto Send], or [Auto Print] check box is selected of [Post process] in the procedure preset edit, these processing will apply the image when the study ends. In this case, it may take several seconds, or several minutes when there are many images, for the study to end.

Closing Study

1 Close the active study. Follow either step below.

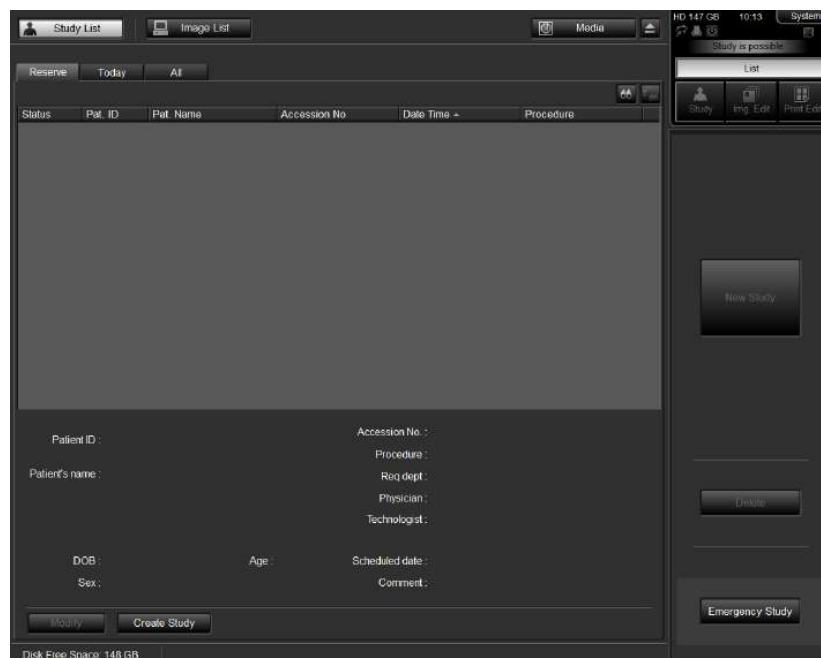
- Touch panel
Press [Close] at the upper right corner on the touch panel.



- Reference monitor
Click [End Study] at the bottom on the operation panel.



The study is closed and the [Study List] window appears on the reference monitor.



■ Suspending Study

The suspend button is available after a study is started.

1 Suspend the active study. Follow either step below.

- Touch panel
Press [Suspend] at the upper right corner on the touch panel.

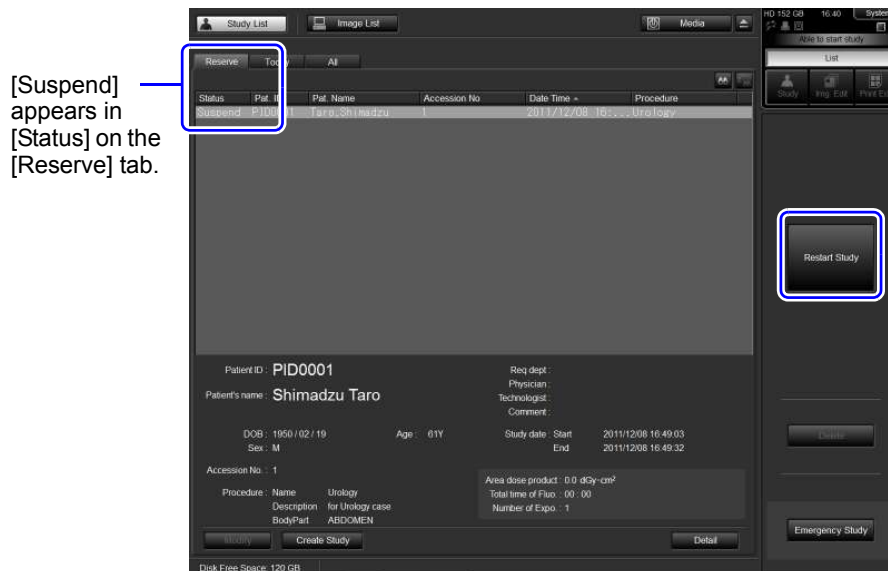


- Reference monitor
Click [Suspend] at the bottom on the operation panel.



The study is suspended and the [Study List] window appears on the reference monitor.

The [Status] in [Reserve] tab shows [Suspend] for the suspended study. To restart the suspended study, click it and [Restart Study]. The study can be restarted.



4.13 Setting Procedure Protocol

The conditions for fluoroscopy/radiography can be registered and edited as presets for procedures (examination type) and protocols (radiography parameter).

Refer to "M517-E210 Digital Radiography System DR-300 Instruction Manual (Image Acquisition)" for details.

Edit the factory-set procedures and protocols as necessary.

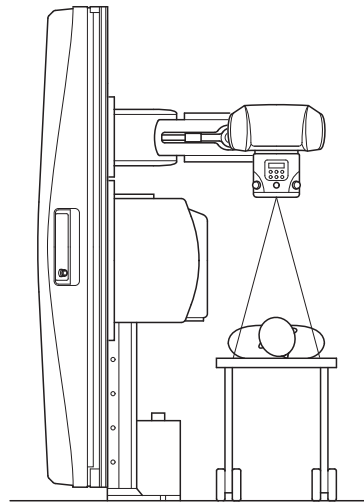
4.14 Examination and Radiography with External Receiver

4

4.14.1 Radiography with X-ray Tube Rotation

Directing the rotated X-ray tube downward on the vertically positioned X-ray diagnostic table is referred to as "X-ray tube rotation".

By directing the X-ray tube downward, you can perform radiography keeping a patient on the stretcher.

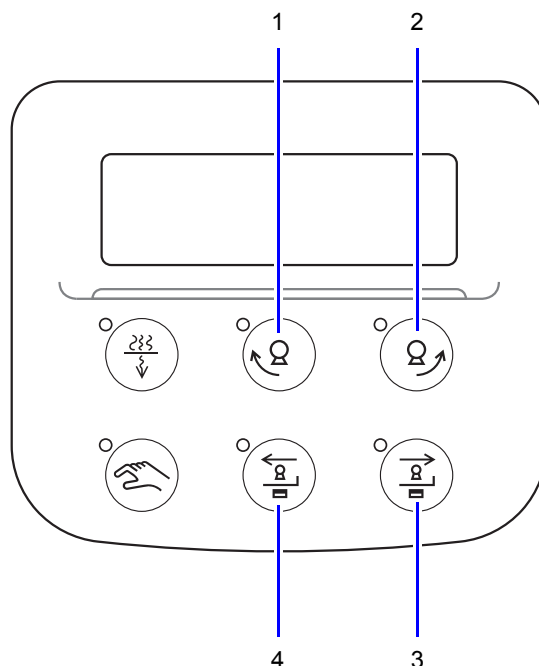


NOTE

- When you use the X-ray tube rotation, place the X-ray diagnostic table vertically (80° or more).
- The tabletop cannot be tilted while the X-ray tube is rotating.

How to Rotate the X-ray Tube

Use the collimator control panel.



No.	Name	Function
1	X-ray tube unit rotation button	Rotates the X-ray tube unit in the direction of the arrow when the tabletop is in the vertical position.
2		
3	Imaging unit shift button (towards the feet)	The imaging unit moves towards where the patient's feet are. The moving speed is fixed at 7.5 cm/sec (half the maximum speed).
4	Imaging unit shift button (towards the head)	The imaging unit moves towards where the patient's head is. The moving speed is fixed at 7.5 cm/sec (half the maximum speed).

- The rotation angle is automatically adjusted according to the tilt angle. Pressing  when the tabletop tilt angle is at 85° makes the X-ray tube rotate 85° to face the floor.
- Pressing  or  while the X-ray tube is rotating stops the rotation.

 **Hint** You can change the configuration so that  and  may operate only while being pressed. Contact your Shimadzu service representative if you wish to do so.

X-ray Tube Rotation Radiography

Follow the procedures below to perform radiography using the X-ray tube rotation.

- 1 Select the radiography program.
 **Reference** "4.11.3 Setting Radiography Parameter" P.4-88
- 2 Tilt the tabletop to place it vertically (80° or more).
 **Reference** "Tilting Tabletop" P.4-48
- 3 Press  to turn the X-ray tube to face the floor.
- 4 Press  or  to adjust radiography position.
- 5 Use the collimator open/close knob on the collimator to adjust the irradiation field.
 **Reference** "4.8.4 Adjusting Irradiation Field with Collimator Open/Close Knob" P.4-71
- 6 Modify the radiography parameters as necessary.
- 7 Perform the radiography by using the hand switch.



NOTE

To return the tabletop horizontally, press  to return the X-ray tube at 0°, and then tilt it.

4.14.2 Radiography Using No.2 Tube Unit (CH-200)

The CH-200 is a ceiling X-ray tube support.

See "3.3 Examinations Using the No.2 Tube Unit and an External Receiver" P.3-15 for the operational flow using CH-200.

Refer to the "M514-E070 CEILING TUBE SUPPORT CH-200/CHU-200 OPERATION MANUAL" for further details.

4.15 Editing Radiography Program

The radiography program in the protocol can be edited. Detailed control of the radiography condition provides the more appropriate image acquisition, and improves the operability.

4.15.1 Outline

The radiography program edit provide a new creation, overwriting, rename, display edit, move, and delete of the program through the touch panel.

 **Hint** The DR techniques cannot be selected outside of the examination. Start a study to edit the radiography program of DR technique.

How to Edit

- 1 Press the lower  icon on the touch panel.



The radiography program is displayed.

- 2 Select the desired radiography program.

To display a radiography program that is not shown, press  or .

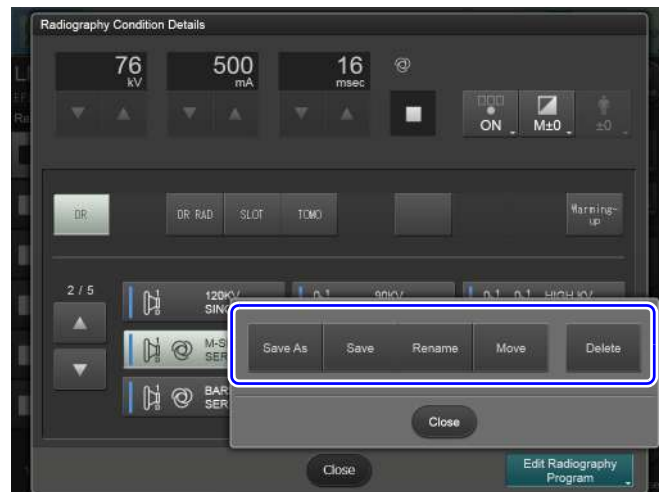


- 3 Press [Edit Radiography Program].



The buttons for radiography program edit appear.

- 4 Press the desired button.



4.15.2 Save As

Create a new radiography program based on a existing one with current radiography conditions.

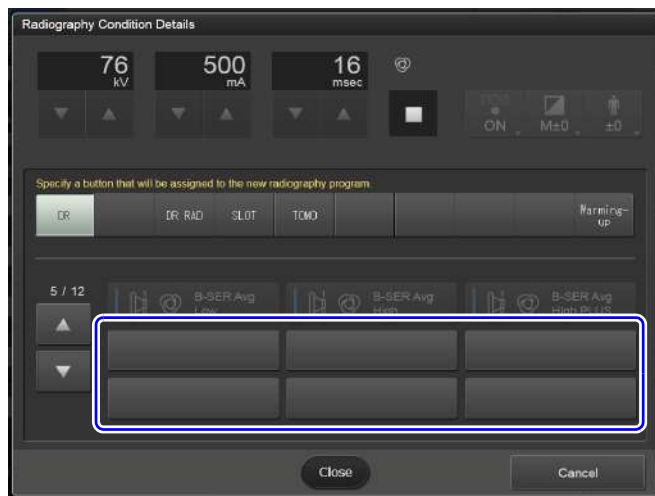
- 1 Select the radiography program to be used as a base and set up the radiography conditions.

 **Reference** ["4.11.3 Setting Radiography Parameter" P.4-88](#)

- 2 Press [Save As].



- 3 Select an empty button for a new radiography program.
A button that has been assigned to an existing program cannot be selected.

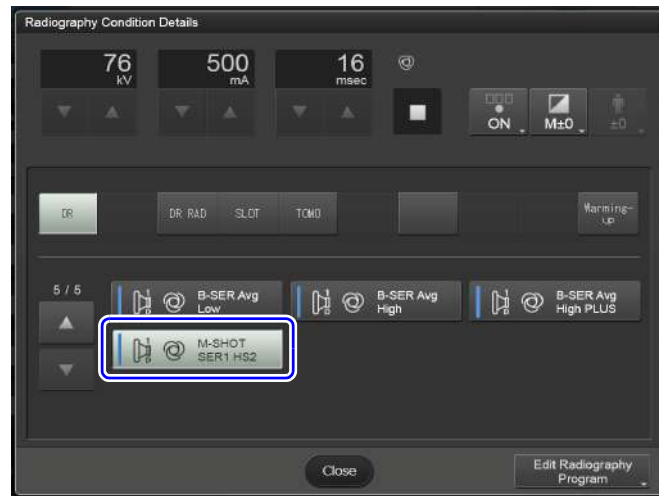


- 4 The [Save As New Radiography Program] dialog box appears.
Select a display icon and input a name for the new radiography program if needed.

 **Reference** ["4.15.4 Rename" P.4-204](#)



- 5 Click [OK] to save the settings.
The [Save As New Radiography Program] dialog box closes. The new radiography program appears on the selected button.



4.15.3 Save

The radiography condition of the selected radiography program is overwritten with the current radiography condition.

- 1 Select the radiography program to be overwritten and set up the radiography conditions.

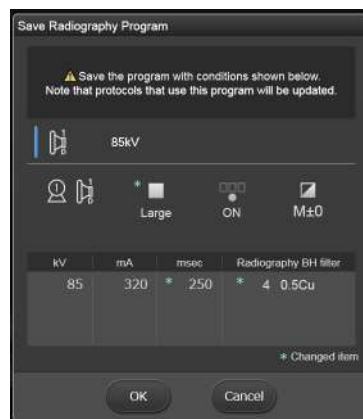
 **Reference** ["4.11.3 Setting Radiography Parameter" P.4-88](#)

- 2 Press [Save].



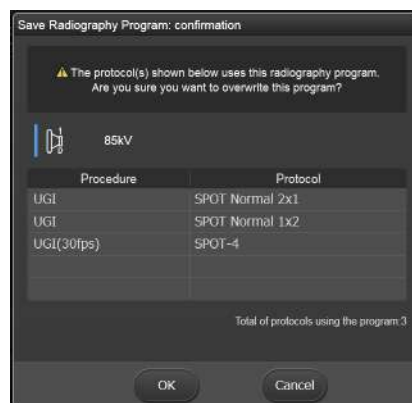
The [Save Radiography Program] dialog box appears to show the current radiography conditions.

- 3 Check the conditions and click [OK] to overwrite the program with them.



 **Hint** For the memory shot radiography, the radiography condition is displayed as "Auto".

The search is started for procedure presets that use the radiography program to be overwritten. The search result is displayed.

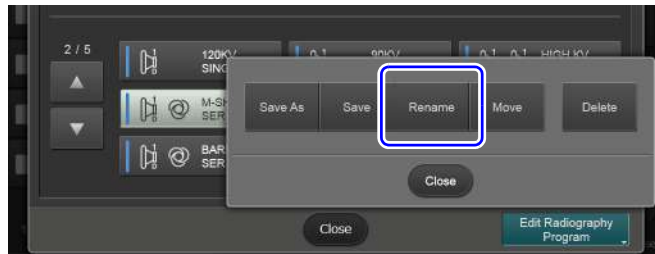


- 4 Click [OK] to overwrite the procedure of the search result.
The [Save Radiography Program] dialog box closes and the overwriting starts.
Click [Cancel] to stop the overwriting.

4.15.4 Rename

Change the display icon and name of the selected radiography program.

- 1 Select the radiography program to change its name and icon.
- 2 Press [Rename].



The [Change Name of Radiography Program] dialog box appears.

- 3 Select items to be changed.



- Click the display icon to show the icon list. Select an icon for the program.



 **Hint** When you select [Technique], the technique icon that has been set in the radiography program will be used.

- Click the name area to show the input field. Input a new name for the program using the keyboard of the Reference PC and click [OK].



NOTE While the mouse cursor is on the reference monitor, the field does not accept any input from the keyboard. Move the cursor onto the acquisition monitor for input.

4



Hint The name for radiography program is up to 40 characters long. The long name will be shortened on the display button.

4

Click [OK] to save the settings.
The [Change Name of Radiography Program] dialog box closes. The renamed radiography program appears.

4.15.5 MOVE

Change the display position of the selected radiography program.

- 1 Select the radiography program to change its display position.
- 2 Click [Move].



- 3 Select the new button for the program selected.
When you selected an empty button, the radiography program is moved on it.
When you selected a button that has been assigned to an existing program, they are switched.



4.15.6 Delete

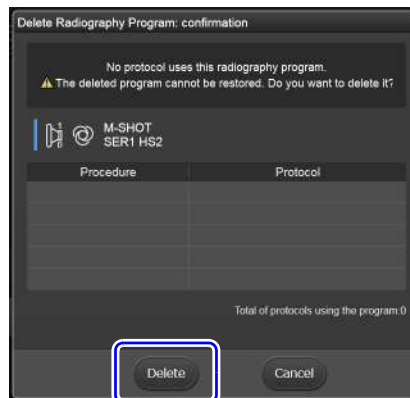
Delete a selected radiography program.

- 1 Select the radiography program to be deleted.
- 2 Click [Delete].

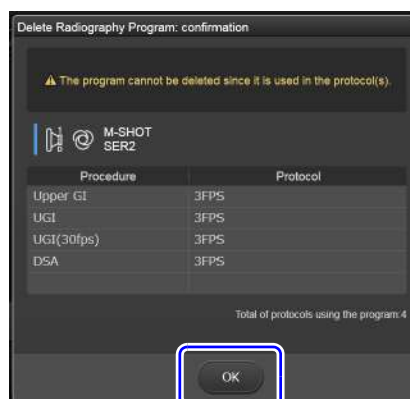


The search is started for procedure presets that use the radiography program to be deleted. The search result is displayed.

- When there is no procedure using the radiography program, you can delete the program. Click [Delete] to delete it.



- When there is a procedure using the radiography program, you cannot delete the program. Click [OK] to close [Delete Radiography Program: confirmation] dialog box.



When you want to delete the program, delete the radiography protocol using it from the procedure displayed on the dialog box, and try to delete the program. Please refer to "M517-E210 (DR-300 Instruction Manual [Image Acquisition])" on how to edit the procedure.

4.16 Maintenance After Operation

For information about maintenance after operation, see "[Daily Maintenance](#)" P.6-2.

Chapter 5

Troubleshooting

This chapter describes the operation regarding emergency stop, power outage and error message.

■ Contents

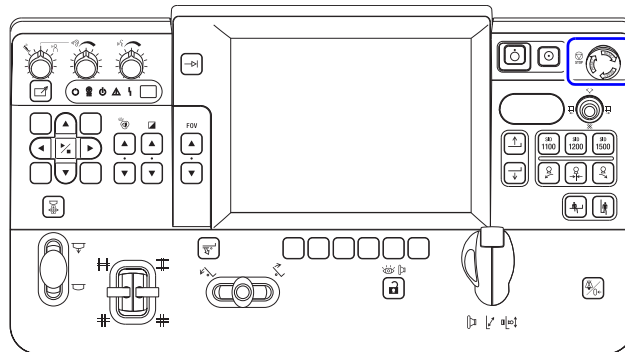
5.1	Emergency Stop	5-2
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5.1 Emergency Stop

5.1.1 Emergency Stop/Recovering from Emergency Stop

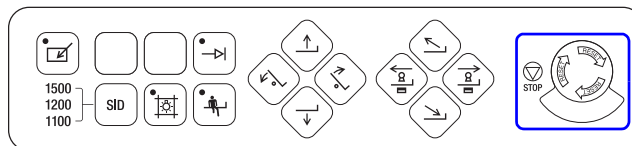
Press the emergency stop button to immediately stop the X-ray diagnostic table from operating.

Emergency stop buttons are located on the remote console, the local console with touch panel, and the front control panels of the X-ray diagnostic table.



Remote console

(For the local console with touch panel, the emergency stop button is located at the same position.)



X-ray diagnostic table front control panel

Emergency Stop

1 Press  .

It brings the movement of the X-ray diagnostic table to an emergency stop. The button remains depressed.

■ Recovering from Emergency Stop

- 1 Rotate the pressed   clockwise.

The button will be released and the X-ray diagnostic table restarts.



NOTE

- When recovering from emergency stop, pay close attention to the system for any abnormal operations. If you find any abnormality, press the emergency stop button, and then contact your Shimadzu service representative.
- Once you stopped the system by pressing the emergency stop button, wait 10 seconds or more before you release the button to recover the system. Moreover, wait 10 seconds or more before you perform any operation after the system has been recovered.
- You can perform fluoroscopy/radiography even while the system is under emergency stop condition.

5.2 Measures for Power Outages

5.2.1 If a Power Outage Occurs

X-ray Diagnostic Table

The X-ray diagnostic table safely stops operating if a power outage occurs during use.

The compression unit can also be retracted manually.

If the X-ray diagnostic table stops while the tabletop is in the Trendelenburg position, ensure that multiple helpers support the patient get off the table.

Digital Radiography Unit

If a power outage occurs during use

If a power outage occurs while using the unit, this may cause loss of images being acquired or abnormalities in unit operations, fluoroscopy images or radiography images after recovery of power.

If a power outage occurs, take the power outage measures when the outage occurs and perform the recovery operations when the power resumes. Operations differ depending on whether there is an UPS (optional).

With UPS (optional)

1 Shut down the digital radiography unit.

The UPS maintains the power supply of the digital radiography unit's computer for a fixed period of time if a power outage occurs while using the unit. The digital radiography unit can be safely shut down automatically during this time.

 **Reference** ["5.2.2 Power Outage Measures \(with Optional UPS\)" P.5-5](#)

2 Perform recovery operations after recovery of power.

 **Reference** ["5.2.3 Recovery Operations After Power Outage \(with Optional UPS\)" P.5-6](#)

Without UPS (optional)

1 Take power outage measures.

The power of the unit turns off immediately if a power outage occurs while using the unit.

 **Reference** ["5.2.4 Power Outage Measures \(Without Optional UPS\)" P.5-8](#)

2 Perform recovery operations after recovery of power.

 **Reference** ["5.2.5 Recovery Operations After Power Outage \(Without Optional UPS\)" P.5-8](#)



If an examination was in progress at the time of the power outage, this becomes "abnormal" and cannot be resumed after recovery of power.

Refer to the "M517-E210 Digital Radiography System DR-300 Instruction Manual" for further details.

If a power outage occurs while the unit is powered off

Abnormalities in unit operations, fluoroscopy images or radiography images may occur after recovery of power even if the unit was powered off when the power outage occurred. Follow the procedures in ["5.2.9 If the Acquisition Screen is Abnormal After Recovery of Power" P.5-12](#) to perform recovery operations if image abnormalities occur after starting the unit.

**NOTE**

If a power outage at your facility is predicted, perform the procedures in ["5.2.6 Preparing for a Planned Power Outage" P.5-9](#) before the power outage. Follow the procedures in ["5.2.7 Recovery After a Planned Power Outage" P.5-10](#) to perform recovery operations after the planned power outage.

5.2.2 Power Outage Measures (with Optional UPS)

If a power outage occurs while using the unit, the power of the acquisition monitor and reference monitor is turned off but the power of the digital radiography unit's computer is maintained for a fixed period of time by the UPS. The digital radiography unit can be safely shut down automatically during this time.

Power outage measures differ depending on the length of the power outage.

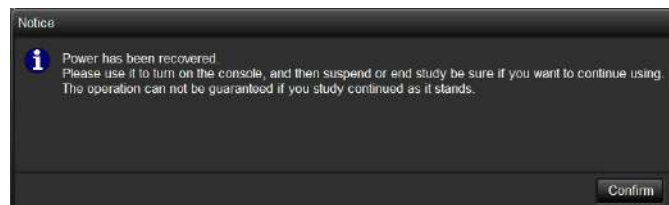
5**If the Power Is Recovered Within 3 Minutes After the Power Outage Occurred**

The power of the monitors turns on again. The message [Power failure] flashes on the reference monitor and the power is turned off automatically within 3 minutes. Therefore, no other measures need to be taken.

**NOTE**

Even if "Detector: Control Unit Malfunction." is displayed on the acquisition monitor, no measures need to be taken.

When the dialog box shown below appears on the power recovery, you can continue using the system after closing the study.

**If the power outage lasts longer than 3 minutes**

No measures need to be taken if the power outage lasts longer than 3 minutes, as the unit power is turned off automatically. The power of the monitors remains off after recovery of power.

5.2.3 Recovery Operations After Power Outage (with Optional UPS)

1 Turn the power on.

 **Reference** ["4.5.1 Turn the Power On" P.4-34](#)

The whole system starts and the message [Able to start study] is displayed after around 15 minutes.

**NOTE**

- Wait at least 3 minutes after turning the power off during the power outage before turning the power back on.
The unit will not start normally if the power is turned back on less than 3 minutes after turning it off.
- Follow the procedures in ["5.2.8 If the Unit Does Not Start After Recovery of Power" P.5-11](#) if the system screen is not displayed on the reference monitor or acquisition monitor after turning the power on.

2 Start an examination and perform fluoroscopy and radiography.

Check that the image is normal.

**NOTE**

Perform recovery operations again if the image is abnormal.

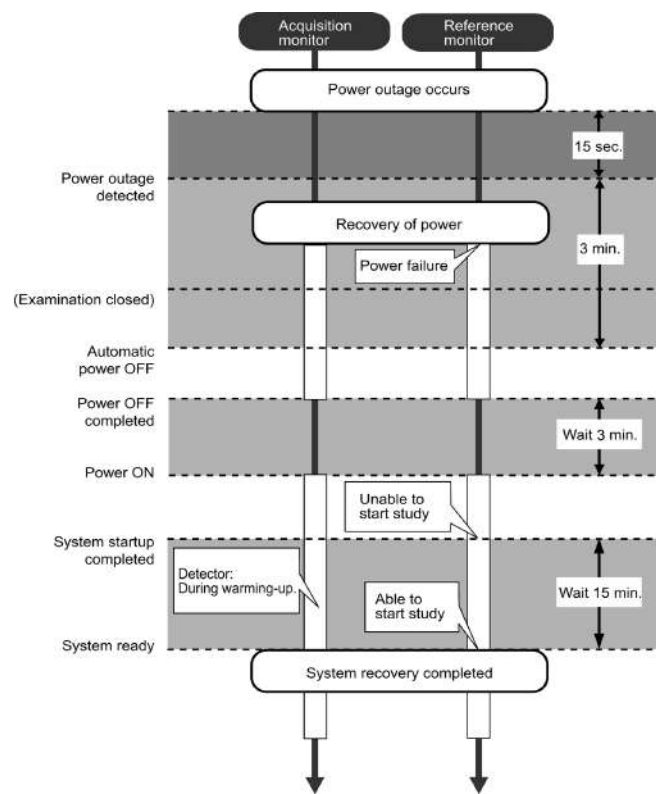
 **Reference** ["5.2.9 If the Acquisition Screen is Abnormal After Recovery of Power" P.5-12](#)

**NOTE**

The UPS might not work correctly if a power outage occurs again in short interval after recovery of power.

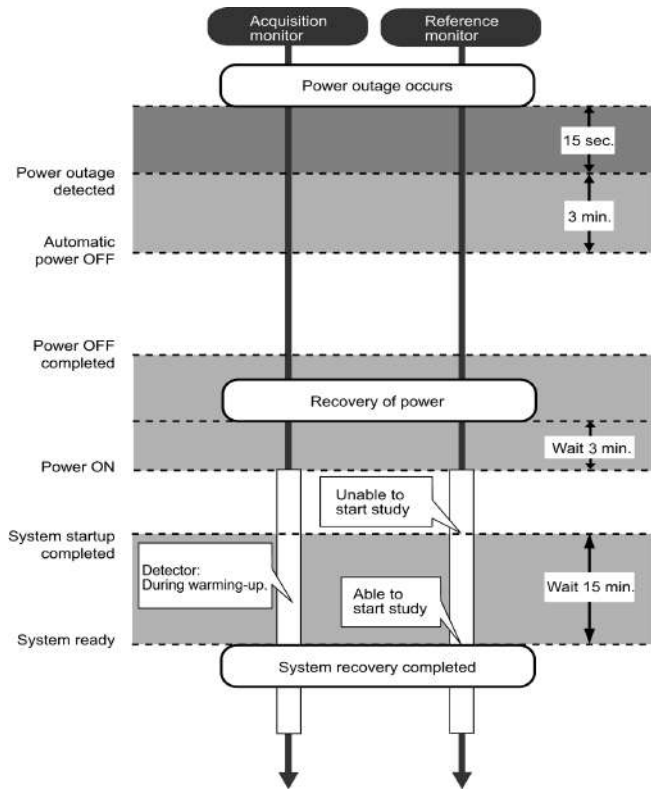
Messages displayed on the acquisition monitor and reference monitor before the unit is ready are as shown in the flow diagrams below.

If the power is recovered within 3 minutes after the power outage occurred



5

If the power outage lasts longer than 3 minutes



5.2.4 Power Outage Measures (Without Optional UPS)

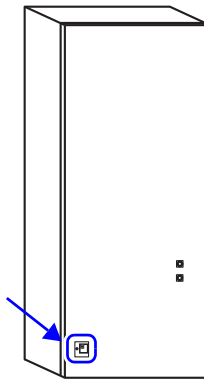
The power of the whole system turns off immediately if a power outage occurs while using the unit. Wait until power is recovered.

5.2.5 Recovery Operations After Power Outage (Without Optional UPS)

Follow the procedures below to recover the system after recovery of power.

- 1 Turn off the breaker at the bottom left of the front of the digital radiography unit's control cabinet.

The green light beside the breaker goes out.



- 2 Wait around 10 seconds and turn the breaker on again.

The green light beside the breaker is lit.

- 3 Wait around 2 minutes and turn the power on.

 **Reference** ["4.5.1 Turn the Power On" P.4-34](#)

The whole system starts and the message [Able to start study] is displayed after around 15 minutes.



NOTE

Follow the procedures in ["5.2.8 If the Unit Does Not Start After Recovery of Power" P.5-11](#) if the system screen is not displayed on the reference monitor or acquisition monitor after turning the power on.

- 4 Start an examination and perform fluoroscopy and radiography.

Check that the image is normal.

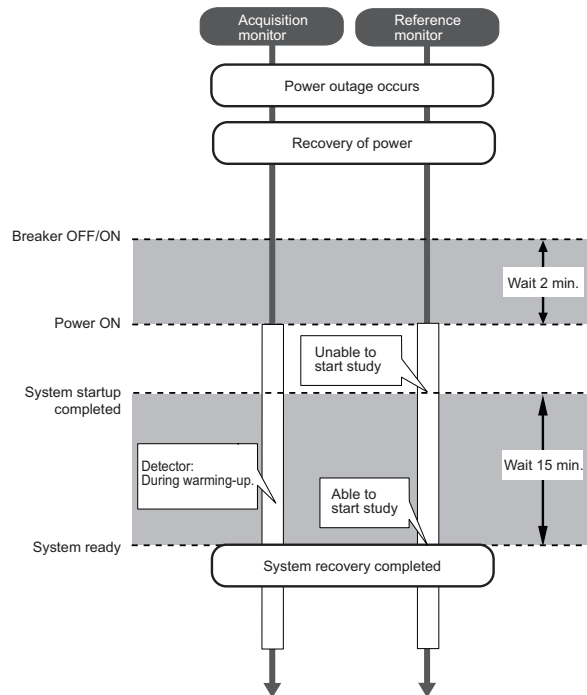


NOTE

Perform recovery operations again if the image is abnormal.

 **Reference** ["5.2.9 If the Acquisition Screen is Abnormal After Recovery of Power" P.5-12](#)

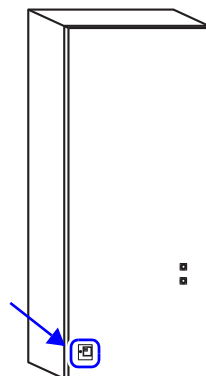
Messages displayed on the acquisition monitor and reference monitor before the unit is ready are as shown in the flow diagrams below.



5.2.6 Preparing for a Planned Power Outage

If a power outage at your facility is predicted, perform the following procedures before the power outage.

- 1 Turn the power off.
 **Reference** "4.5.2 Turn the Power Off" P.4-34
- 2 Turn off the breaker at the bottom left of the front of the digital radiography unit's control cabinet.
 The green light beside the breaker goes out.

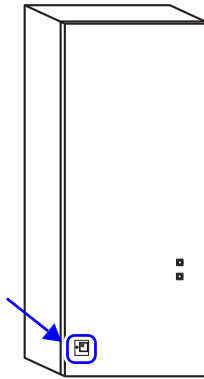


5.2.7 Recovery After a Planned Power Outage

Follow the procedures below to recover the system after recovery of power.

- 1 Turn on the breaker at the bottom left of the front of the digital radiography unit's control cabinet.

The green light beside the breaker is lit.



- 2 Wait around 2 minutes and turn the power on.

 **Reference** "4.5.1 Turn the Power On" P.4-34

The whole system starts and the message [Able to start study] is displayed after around 15 minutes.



Follow the procedures in "5.2.8 If the Unit Does Not Start After Recovery of Power" P.5-11 if the system screen is not displayed on the reference monitor or acquisition monitor after turning the power on.

- 3 Start an examination and perform fluoroscopy and radiography.

Check that the image is normal.



Perform recovery operations again if the image is abnormal.

 **Reference** "5.2.9 If the Acquisition Screen is Abnormal After Recovery of Power" P.5-12

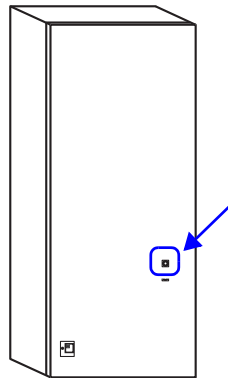
5.2.8 If the Unit Does Not Start After Recovery of Power

Perform the following actions if the system screen is not displayed on the reference monitor or acquisition monitor after turning the power on.

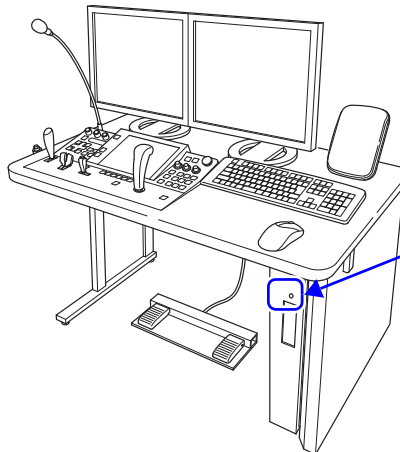


Contact a Shimadzu service representative if the unit does not start normally after performing the following actions.

- 1 Press the power button at the top center of the digital radiography unit's control cabinet if the button is unlit.
The computer in the cabinet starts and the button is lit in yellow. This does not need to be done if it is already lit.



- 2 Press the power button on the front of the digital radiography unit's operation cabinet if the button is unlit.
The computer in the cabinet starts and the button is lit in yellow. This does not need to be done if it is already lit.



- 3 Turn the power off when the system screen is displayed on the acquisition monitor and reference monitor.
 **Reference** ["4.5.2 Turn the Power Off" P.4-34](#)
- 4 Turn the power on.
 **Reference** ["4.5.1 Turn the Power On" P.4-34](#)

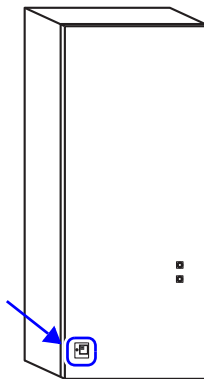
5.2.9 If the Acquisition Screen is Abnormal After Recovery of Power

If fluoroscopy or radiography images are abnormal after recovery of power, turn the power off and perform recovery operations again.



Contact a Shimadzu service representative if normal fluoroscopy and radiography cannot be done after performing the following actions.

- 1 Turn the power off.
 **Reference** ["4.5.2 Turn the Power Off" P.4-34](#)
- 2 Turn off the breaker at the bottom left of the front of the digital radiography unit's control cabinet.
The green light beside the breaker goes out.



- 3 Wait around 10 seconds and turn the breaker on again.
- 4 Wait around 2 minutes and turn the power on.
 **Reference** ["4.5.1 Turn the Power On" P.4-34](#)
The whole system starts and the message [Able to start study] is displayed after around 15 minutes.



Follow the procedures in ["5.2.8 If the Unit Does Not Start After Recovery of Power" P.5-11](#) if the system screen is not displayed on the reference monitor or acquisition monitor after turning the power on.

- 5 Start an examination and perform fluoroscopy and radiography.
Check that the image is normal.

5.3 Error Message

A message is displayed when an error has occurred in the system or certain operation is required. Take appropriate measures following the information given in this section.



NOTE

When the displayed message is not described in this chapter or the same error message persists even after appropriate measures have been taken, contact a Shimadzu service representative.

5.3.1 Message Displayed on Remote Console

Messages relating to the X-ray diagnostic table, collimator, FPD, and high-voltage generator are displayed on the remote console.

Caution and failure codes such as "Cx-xx" and "Ex-xx" are displayed on the caution/failure code display area, and the caution indication icon or failure indication icon flashes. Messages are displayed on the touch panel.

When a message is displayed on the touch panel, press either the [OK] or [RESET] key on the screen, and perform the corresponding measures for the error message.



NOTE

When a message with the [OK] or [RESET] key is displayed on the touch panel during X-ray exposure, the exposure is stopped. Press either the [OK] or [RESET] key on the screen and retry exposure operation to restart exposure.

■ Messages Relating to the X-ray Diagnostic Table and Collimator

Error Code	Message	Meaning	Measures
E1-01	Table:Stop button is pressed. Wait for a while.	Stop button is pressed.	Wait a while.
E1-02	Table:Stop button is pressed. Reset system.	Stop button is pressed.	Release the stop button.
E1-03	Table:Alert for AC servo (Tube). Reset system.	Alert for AC servo (Tube).	Turn the stop button or the system power off then back on again. If this does not solve the problem, contact your Shimadzu service representative.
E1-04	Table:Alert for AC servo (Image). Reset system.	Alert for AC servo (Image).	
E1-05	Table:Alert for AC servo (Rot). Reset system.	Alert for AC servo (Rot).	
E1-06	Table:Position detection error (tilting). Reset system.	Tilting position is not changing correctly.	
E1-07	Table:Position detection error (up/down). Reset system.	Tabletop up/down position is not changing correctly.	
E1-08	Table:Position detection error (SID). Reset system.	SID position is not changing correctly.	Contact your Shimadzu service representative.
E1-09	Table:Check power and reactivate system.	Check power and reactivate system.	
E1-10	Table:No position registration. Perform calibration.	No position registration.	
E1-11	Table:No calibration for control panels. Perform calibration.	No calibration for control panels.	Do not touch the remote console. If this does not solve the problem, contact your Shimadzu service representative.
E1-12	Table:Button on remote console is pressed.	Button on remote console is pressed.	
E1-13	Table:Button on local console is pressed.	Button on local console is pressed.	Do not touch the local console. If this does not solve the problem, contact your Shimadzu service representative.
E1-14	Table:Button on front control panel is pressed.	Button on front control panel is pressed.	Do not touch the X-ray diagnostic table front control panel. If this does not solve the problem, contact your Shimadzu service representative.

Error Code	Message	Meaning	Measures
E1-15	Table:Position detection error (tilting). Operation suspended.	Position detection error (tilting).	Turn the stop button or the system power off then back on again. If this does not solve the problem, contact your Shimadzu service representative.
E1-16	Table:Position detection error (up/down). Operation suspended.	Position detection error (up/down).	
E1-17	Table:Position detection error (SID). Operation suspended.	Position detection error (SID).	
E1-18	Table:Position detection error (Tube H/F). Operation suspended.	Tube H/F position is not changing correctly.	
E1-19	Table:Position detection error (Image. H/F). Operation suspended.	Imaging unit H/F position is not changing correctly.	
E1-20	Table:Position detection error (Tube Rot). Operation suspended.	Tube rotation position is not changing correctly.	Do not touch the collimator control panel. If this does not solve the problem, contact your Shimadzu service representative.
E1-21	Table:Button on collimator control panel is pressed.	Button on collimator control panel is pressed.	
E1-22	Table:Stop Button Error.	Stop button circuit error.	Turn the stop button or the system power off then back on again. If this does not solve the problem, contact your Shimadzu service representative.
E1-23	Table:It's time to inspect table up/down rack. Please call Service.	It's time to inspect table up/down rack.	Contact your Shimadzu service representative.
E1-24	Table:Collimator Error (H-Leaf).	The collimator (H-Leaf) is not working properly.	Turn the stop button or the system power off then back on again. If this does not solve the problem, contact your Shimadzu service representative.
E1-25	Table:Collimator Error (V-Leaf).	The collimator (V-Leaf) is not working properly.	
E1-26	Table:Collimator Error (BH-Filter).	The collimator (X-ray filter) is not working properly.	
E1-27	Table:Collimator Error (C-Leaf).	The collimator (C-Leaf) is not working properly.	
E1-28	Table:Collimator Error (EXT-Shutter).	The collimator (Independent mask) is not working properly.	

Error Code	Message	Meaning	Measures
E1-29	Table:Sensor Error (H-Leaf).	An error was detected at the position sensor of the collimator (H-Leaf).	Turn the stop button or the system power off then back on again. If this does not solve the problem, contact your Shimadzu service representative.
E1-30	Table:Sensor Error (V-Leaf).	An error was detected at the position sensor of the collimator (V-Leaf).	
E1-31	Table:Sensor Error (BH-Filter).	An error was detected at the position sensor of the collimator (X-ray filter).	
E1-32	Table:Sensor Error (C-Leaf).	An error was detected at the position sensor of the collimator (C-Leaf).	
E1-33	Table:Sensor Error (EXT-Shutter).	An error was detected at the position sensor of the collimator (Independent mask).	
E1-34	Table:Collimator Communication Error.	Collimator communication error.	
E1-35	Table:Inverter Thermal Error. (up/down)	Inverter thermal error (up/down).	
E1-36	Table:Inverter Thermal Error. (tilting)	Inverter thermal error (tilting).	
E1-37	Table:Inverter Alert of damping resistance. (up/down)	Inverter alert of damping resistance (up/down).	
E1-38	Table:Inverter Alert of abnormality. (up/down)	Inverter alert of abnormality (up/down).	
E1-39	Table:Inverter Alert of overload. (up/down)	Inverter alert of overload (up/down).	
E1-40	Table:Inverter Alert of damping resistance. (tilting)	Inverter alert of damping resistance (tilting).	
E1-41	Table:Inverter Alert of abnormality. (tilting)	Inverter alert of abnormality (tilting).	
E1-42	Table:Inverter Alert of overload. (tilting)	Inverter alert of overload (tilting).	
E1-43	Table:DC Motor Alert. (Table right/left)	DC motor alert (Table right/left).	
E1-44	Table:AC servo Communication Error (Tube).	AC servo communication error (Tube).	
E1-45	Table:AC servo Communication Error (Image).	AC servo communication error (Image).	

Error Code	Message	Meaning	Measures
E1-46	Table:AC servo Communication Error (Rot).	AC servo communication error (Rot).	Turn the stop button or the system power off then back on again. If this does not solve the problem, contact your Shimadzu service representative.
E1-47	Table:AC servo Lost Origin Error (Tube).	AC servo lost origin error (Tube).	
E1-48	Table:AC servo Lost Origin Error (Image).	AC servo lost origin error (Image).	
E1-49	Table:AC servo Lost Origin Error (Rot).	AC servo lost origin error (Rot).	
E1-50	Table:Communication fault was detected. Redo the procedure selection.	Communication fault was detected.	Redo the procedure selection.
E1-51	Table:Connection fault was detected. (remote console)	Connection with the remote console cannot be established.	Turn the stop button or the system power off then back on again. If this does not solve the problem, contact your Shimadzu service representative.
E1-52	Table:Connection fault was detected. (local console)	Connection with the local console cannot be established.	
E1-53	Table:Connection fault was detected. (front control panel)	Connection with the front control panel cannot be established.	
E1-54	Table:Connection fault was detected. (diagnostic table)	Connection with the diagnostic table cannot be established.	
C1-01	Table:Interlock is being released.	The interlock was released by the release switch.	Operate with care.
C1-02	Table:Oblique projection is invalid.	During SID operation, oblique projection is not possible.	Retry the operation after SID operation has stopped.
C1-03	Table:Cannot Tilt. Set SID at 1200 or less.	Tilt operation is possible only when SID is 1200 mm or less.	Set SID to 1200 mm or less.
C1-04	Table:Cannot operate. Set the X-ray tube angle to 0 degree.	Tilt operation is not possible with the X-ray tube in a rotation state.	Set the rotation angle of the X-ray tube to 0°.
C1-05	Table:No SID change during oblique projection.	In an oblique projection state, SID operation is not possible.	Set the rotation angle of the X-ray tube to 0°.
C1-06	Table:Vertical position only: X-ray tube rotation	When the X-ray diagnostic table is not in a vertical position, X-ray tube rotation operation is not possible.	Set the tabletop tilt angle to 80° or more.

Error Code	Message	Meaning	Measures
C1-07	Table:Cannot operate imaging unit. Safety sensor is responding.	Operation of the imaging unit is not possible since the safety sensor is activated.	Check to see if anything is touching the safety sensor.
C1-08	Table:No compression during oblique projection/ X-ray tube rotation.	Compression operation is not possible in an oblique projection state or with the X-ray tube in a rotation state.	Set the rotation angle of the X-ray tube to 0°.
C1-09	Table:Cannot operate at SID above 1200. Set SID at 1100.	At SID1200 mm or more, operation is not possible.	Set SID to 1100 mm.
C1-10	Table:Cannot change SID.	At this position, SID cannot be operated.	Check to see if there is sufficient space for SID to operate.
C1-11	Table:Set X-ray tube angle within 30 degree.	In the I-Tilt mode, tilt is not possible at this oblique projection angle.	Set the oblique projection angle to within 30°.
C1-12	Table:Selection is invalid. Return angle to center with → ←.	The position of the imaging unit is incorrect.	Return it to the center with  .
C1-13	Table:Set the tabletop Horizontal.	The tabletop is not horizontal.	Set the tabletop to a horizontal state.
C1-14	Table:Set the table height below 85 cm.	At this position, SID cannot be operated.	Set the tabletop height to 85 cm or less.
C1-15	Table:Return angle to center with → ←.	At this position, oblique projection operation is not possible.	Return it to the center with  .
C1-16	Table:Set the table height below 100 cm.	At this position, SID cannot be operated.	Set the tabletop height to 100 cm or less.
C1-17	Table:Cannot operate. Set the X-ray tube angle to 0 degree.	SID cannot be operated with the X-ray tube in a rotation state.	Set the rotation angle of the X-ray tube to 0°.
C1-18	Table:Cancel I-Tilt mode.	In the I-Tilt mode, operation is not possible.	Cancel the I-Tilt mode.
C1-19	Table:Selection is invalid. Set Collimator switch to AUTO.	Cannot be selected since the collimator mode is not AUTO.	Set the collimator mode button to AUTO.
C1-20	Table:Cannot operate table down. Detection of sensor (Table bottom).	Vertical operation of the tabletop is not possible since the safety sensor on the rear of the tabletop is activated.	Check to see if anything is touching the safety sensor.
C1-21	Table:No response from DR.	There is no response from the digital radiography unit.	Wait a while.

Error Code	Message	Meaning	Measures
C1-22	Table:Tilting is limited. Cancel I-Tilt mode.	This is the tilt limit angle.	To tilt further, cancel the I-Tilt mode.
C1-23	Table:Cannot operate during this mode.	Operation is not possible in the current mode.	Check the current mode.
C1-24	Table:Set the X-ray tube angle to 0 degree.	Cannot select since the rotation angle of the X-ray tube is not 0°.	Set the rotation angle of the X-ray tube to 0°.
C1-25	Table:Cannot operate imaging unit. Detection of sensor (Head side).	Operation of the imaging unit is not possible since the safety sensor on the imaging unit (head side) is activated.	Move the imaging unit towards the feet.
C1-26	Table:Cannot operate imaging unit. Detection of sensor (Foot side).	Operation of the imaging unit is not possible since the safety sensor on the imaging unit (foot side) is activated.	Move the imaging unit towards the head.
C1-27	Table:Cannot operate tilt and down. Detection of sensor (FPD).	Tilt or tabletop lower operation is not possible since the safety sensor on the image reception unit (lower side) is activated.	Check the safety sensor on the image reception unit (lower side).
C1-28	Table:Cannot operate tilt and down. Detection of sensor (Tilting).	Tilt or tabletop lower operation is not possible since the safety sensor on the main frame (lower side) is activated.	Check the safety sensor on the main frame (lower side).
C1-29	Table:Cannot operate tilt and down. Detection of sensor (Table bottom).	Tilt or tabletop lower operation is not possible since the safety sensor on the tabletop rear (lower side) is activated.	Check the safety sensor on the tabletop rear (lower side).
C1-30	Table:Cannot operate imaging unit. Check grid.	Operation of the imaging unit is not possible since the grid is not at the correct position.	Check that the grid is completely inserted or removed.
C1-31	Table:Return to normal position. Press [SET] to begin operation.	The position of the X-ray diagnostic table is incorrect.	Press the Set button to return the X-ray diagnostic table to the correct position.
C1-32	Table:Cannot register the position while moving.	Cannot be registered since the X-ray diagnostic table is in operation.	Retry registration after operation has stopped.

Error Code	Message	Meaning	Measures
C1-33	Table:Cannot register position.	Registration is not possible in the current status, for example, the stop button was pressed or the system is in another operation mode.	Check the state of the X-ray diagnostic table.
C1-34	Table:Cannot operate Position Memory.	Position memory cannot be executed since the X-ray diagnostic table is in operation or in another operation mode, or the stop button been pressed.	Check the state of the X-ray diagnostic table.
C1-35	Table:Invalid position !	The registered information is incorrect.	Retry registration.
C1-36	Table:Detection of end limit sensor. (Image H/F)	Detection of end limit sensor (Image H/F).	Contact your Shimadzu service representative.
C1-37	Table:Detection of end limit sensor. (Tube H/F)	Detection of end limit sensor (Tube H/F).	
C1-38	Table:Detection of end limit sensor. (up/down)	Detection of end limit sensor (up/down).	
C1-39	Table:Detection of end limit sensor. (tilting)	Detection of end limit sensor (tilting).	
C1-40	Table:Detection of end limit sensor. (SID)	Detection of end limit sensor (SID).	
C1-41	Table:Cannot select during other mode execution.	Another mode is running.	Check to see that the other mode is canceled.
C1-42	Table:Invalid operation ! Return angle to center with → <←.	Rotation operation of the X-ray tube is not possible during oblique projection.	Set the rotation angle of the X-ray tube to 0°.
C1-43	Table:Invalid operation ! Set SID at 1200 or less.	With SID1500, operation is not possible.	Set SID to 1200 mm or less.
C1-44	Table:Release Radiography button to select.	The radiography button is pressed.	Release the radiography button, and select again.
C1-45	Table:Release Foot switch to select.	The foot switch was pressed.	Release the foot switch, and select again.
C1-46	Table:Insufficient Stroke. Move imaging unit toward head.	Insufficient stroke for head side at this position.	Move the imaging unit towards head.
C1-47	Table:Insufficient Stroke. Move imaging unit toward foot.	Insufficient stroke for foot side at this position.	Move the imaging unit towards feet.
C1-48	Table:Cannot select SID1500.	SID1500 cannot be selected in the current setting.	The function is restricted. Contact your Shimadzu service representative.

Error Code	Message	Meaning	Measures
C1-49	Table:SID1500 is disable at vertical position.	SID1500 is disabled at vertical position in the current setting.	The function is restricted. Contact your Shimadzu service representative.
C1-50	Table:SID1500 is disable at Trendelenburg position.	SID1500 is disabled at Trendelenburg position in the current setting.	The function is restricted. Contact your Shimadzu service representative.
C1-51	Table:Collimator is Initializing. Wait for a while.	Collimator is initializing.	Wait for a while.
C1-52	Table:Max. tilting angle is limited.	Cannot move the tabletop to the vertical position because the tilting angle is limited.	The function is restricted. Contact your Shimadzu service representative.
C1-53	Table:Make the FOV size small.	Cannot operate because the C-Leaf aperture is limited.	Select smaller FOV.
C1-54	Table:Set the table height below 95 cm.	With this position, operation is not possible.	Set the table height below 95 cm.
C1-55	Table:Positions are too close to register.	This positions is too close to the registered position.	Leave more space between registered positions and register it again.
C1-56	Table:Reconfigure the exposure point.	Radiography operation cannot be allowed at this point.	The X-ray tube and FPD cannot reach this point. Register it again.
C1-57	Table:Retract the compression cone.	The compression cone is not retracted.	Retract the compression cone.
C1-58	Table:Illegal detection of end limit sensor.(Table right/left)	Two end limit sensors (Table right/left) are detected simultaneously.	Contact your Shimadzu service representative.
C1-59	Table:Insufficient Stroke. Move imaging unit.	The stroke for the imaging unit is insufficient at this position.	Move the imaging unit.
C1-60	Table:Cannot operate.	The operation is not allowed.	Do not operate it in this state.
C1-61	Table:Cannot change SID. Move imaging unit.	SID cannot be operated at this position.	Move the imaging unit to the position to allow SID operation.
C1-62	Table:Set SID at 1500.	The operation is allowed only SID 1500.	Set SID to 1500 mm.
C1-63	Table:Operation is invalid, while the imaging unit is moving.	Cannot operate because the imaging unit is moving.	Operate after the imaging unit stop.
C1-64	Table:Cannot start calibration while moving.	Cannot start calibration because the imaging unit is moving.	Start calibration after the imaging unit stop.

Error Code	Message	Meaning	Measures
C1-65	Table:Cannot operate. Movement area is limited.	Movement area is limited so the table cannot move beyond it.	Do not move the table to this direction.
C1-66	Table:Set the table height above 65cm.	With this height, operation is not possible.	Set the table height above 65 cm.
C1-67	Table:Set the table height below 110cm.	With this height, operation is not possible.	Set the table height below 110 cm.
C1-68	Table:Register at head side.	This position cannot be registered. Register a position much closer to head side.	Check the scan direction and register the position again.
C1-69	Table:Register at foot side.	This position cannot be registered. Register a position much closer to foot side.	Check the scan direction and register the position again.
C1-70	Table:Operation is locked. (Table right/left) Cancel the lock.	The table movement in right and left directions is locked.	Release the lock.
C1-71	Table:Close the study before select it.	Cannot select it during the study.	Select it after closing the study.
C1-72	Table:Set to regular position by -> <-.	The imaging unit position is not correct.	Set the tabel to the regular position by -> <-.

Messages Relating to FPD

Error code	Message	Meaning	Measures
E3-01	Detector: Not connected.	A connection cannot be established with the FPD.	Restart the system. If the message persists, contact your Shimadzu service representative.
E3-02	Detector: Abnormal Temperature. Power will turn off.	A temperature abnormality on the FPD was detected. Turn the detector off.	Perform the power outage recovery procedure. If the message persists, contact your Shimadzu service representative.
E3-03	Detector: Control Unit Malfunction. Restart the system.	An abnormality on the FPD was detected.	Perform the power outage recovery procedure. If the message persists, contact your Shimadzu service representative.
E3-04	Detector: Acquisition invalid.	An abnormality on the unit was detected. Acquisition operation is not possible in this state.	Change the procedure and retry acquisition. If the message persists, contact your Shimadzu service representative.
C3-01	Detector: Abnormal Temperature.	A temperature abnormality on the FPD was detected. If the temperature continues to rise beyond this point, the FPD will be turned off automatically. Calibration cannot be executed.	Check to see if the temperature in the examination room is within the ambient operating conditions, and restart the system.
C3-02	Detector: During warming-up.	The FPD is warming up and the images may not have been acquired in an optimum condition. Calibration cannot be executed.	Wait for warm-up to complete and the message to disappear.

■ Messages Relating to High-Voltage Generator

Error code	Message	Meaning	Measures
E5-01	Generator: Power Down	Abnormal control circuit power supply voltage	Contact your Shimadzu service representative.
E5-02	Generator: Line Voltage Over	Abnormal power supply voltage	
E5-03	Generator: Fluo Over Current	The tube current for DC fluoroscopy exceeds approximately 9 mA.	If the message persists, contact your Shimadzu service representative.
E5-04	Generator: Radio Over Current	The radiography tube current exceeded the set value of +200 mA.	
E5-05	Generator: Measured kV+ Over	The measured tube voltage exceeded the allowable range.	
E5-06	Generator: Measured kV- Over		
E5-07	Generator: Measured kV Over		
E5-09	Generator: I.F. Over	Abnormal filament heater current	
E5-10	Generator: Charge Voltage Error	Abnormal charging voltage of primary smoothing capacitor	Contact your Shimadzu service representative.
E5-11	Generator: H.V.T. Not Connected	Abnormal connection to high-voltage transformer	
E5-12	Generator: Starter Error	Abnormal starter	If the message persists, contact your Shimadzu service representative.
E5-17	Generator: G.C. Error	Abnormal grid control unit	Contact your Shimadzu service representative.
E5-18	Generator: Inverter unit Thermal Over	Abnormal inverter temperature	If the message persists, contact your Shimadzu service representative.
E5-19	Generator: kV adjustment board Error	Abnormal control board	Contact your Shimadzu service representative.
E5-20	Generator: Arcing Trouble	Repeated arcing occurred.	If the message persists, contact your Shimadzu service representative.
E5-22	Generator: Measured kV Under	The measured tube voltage exceeded the allowable range.	
E5-23	Generator: Filament Not Ready	Abnormal filament heater current	
E5-24	Generator: Board Status Error	Abnormal control board	Contact your Shimadzu service representative.

Error code	Message	Meaning	Measures
E5-25	Generator: Measured kV Over (Unbalance)	The measured tube voltage exceeded the allowable range.	If the message persists, contact your Shimadzu service representative.
E5-37	Generator: Tube 1 Oil Flow Error	Abnormal oil cooler in X-ray tube unit	Contact your Shimadzu service representative.
E5-38	Generator: System Communication Defect	Abnormal system communication. Radiography is not possible. Fluoroscopy is possible continuously for up to 30 seconds.	Restart the system. If the message persists, contact your Shimadzu service representative.
E5-39	Generator: Dosimeter Communication Error	Abnormal communication with area dosimeter. The display dose value might not be accurate.	
E5-49	Generator: Door / Interlock	The examination room door is open. Fluoroscopy and radiography are not possible.	Close the door.
C5-01	Generator: HU Over Predicted	The value was predicted to go out of range if the heat units increase from the current heat unit value according to the set radiography parameters. Radiography is not possible.	Change the radiography parameters or suspend operation until the heat unit value decreases.
C5-02	Generator: HU Full Stored	The heat units reached the allowable limit. Radiography is not possible.	Suspend fluoroscopy and radiography until the heat unit value decreases.
C5-03	Generator: HU Warning	The heat units exceeded 80 % of the allowable limit.	Pay attention to the heat units.
C5-07	Generator: Battery Warning	The data recording battery in the control board must be replaced soon.	Contact your Shimadzu service representative.
C5-08	Generator: Battery Empty	The data recording battery in the control board is empty.	
C5-12	Generator: mAs too small	The mAs value is smaller than 0.5 mAs, or the specified tube current is below the minimum value in the mAs setting method.	Change the set value.

Error code	Message	Meaning	Measures
C5-14	Generator: Emission Over	Emission characteristics are out of range.	Increase the radiography tube voltage or lower the radiography tube current.
C5-15	Generator: Generator Load Over	Equipment ratings are exceeded.	Lower the radiography parameters.
C5-16	Generator: Tube Load Over	X-ray tube unit ratings are exceeded.	
C5-17	Generator: Tube Load Over	X-ray tube unit ratings are exceeded.	
C5-18	Generator: mAs too small	The mAs value is smaller than 0.5 mAs, or the specified tube current is below the minimum value in the mAs setting method.	Change the radiography parameters.
C5-20	Generator: Tube Load Over	X-ray tube unit ratings are exceeded.	Lower the radiography parameters.
C5-21	Generator: Tube Load Over	X-ray tube unit ratings are exceeded.	
C5-22	Generator: mAs/Time Over	The radiography time exceeded 10 seconds due to too large an mAs value, or the radiography time exceeded the allowable range.	Change the radiography parameters.
C5-40	Generator: Thermal Over	The X-ray tube unit temperature exceeded the allowable range.	Wait for the heat unit value to decrease. If this problem is not solved after waiting five minutes, turn the system off and contact a Shimadzu service representative.
C5-41	Generator: Door / Interlock	The examination room door is open. Fluoroscopy and radiography are not possible.	Close the door.
C5-45	Generator: X-ray switch Error	The radiography start button or the hand switch was pressed when the power was turned on.	Restart the system. If the message persists, contact your Shimadzu service representative.
C5-46	Generator: Foot switch Error	The foot switch was pressed when the power was turned on.	
C5-47	Generator: Starter is not working	The starter does not work.	Contact your Shimadzu service representative.

Error code	Message	Meaning	Measures
C5-55	Generator: AEC Over	AEC failed and AEC backup functioned during AEC radiography.	Set a longer radiography time and retry.
C5-56	Generator: Press Exposure release button	Fluoroscopy and radiography are not possible since the X-ray irradiation clearance button is not lit up.	Press the X-ray irradiation clearance button to light it up.
C5-57	Generator: Communication Error	Radiography parameters that cannot be set for the equipment were received from the external equipment.	Change the settings for the external equipment and retry receiving.
C5-59	Generator: Tube 2 Filter Error	Abnormal filter on No.2 tube unit (optional). If diagnosis by the obtained image is not obstructed, the filter can continue to be used. However, avoid prolonged use.	Contact your Shimadzu service representative.
C5-76	Generator: Invalid radiography condition	The radiography program or exposure area of the variable SLOT radiography is invalid. Radiography is impossible.	Select appropriate radiography program and exposure area.

Message	Meaning
[Generator Info] Photo pickup field is changed.	The photo pickup field of the photo timer was changed since it was outside the X-ray exposure range.

5.3.2 Messages Displayed on the Reference Monitor

Messages relating to the digital radiography unit are displayed on the reference monitor.

Please refer to the "M517-E210 Digital Radiography System DR-300 Instruction Manual (Image Acquisition)" for details on messages.

Chapter 6

Maintenance

This chapter describes daily and periodic inspection items for SONIALVISION G4.

■ Contents

6.1	Maintenance	6-2
6.2	Consumable Parts List.....	6-35

6.1 Maintenance

Maintaining the effectiveness and safety of the increasingly sophisticated medical equipment that has appeared in recent years is an extremely important part of providing superior medical care. Correct maintenance is absolutely essential to maintain the performance and safety of medical equipment, and also the periodical inspection should be performed by service personnel who is specially trained by Shimadzu Service Organization. Shimadzu and its world-wide service network employ many expert service representatives with extensive experience and knowledge related to medical equipment.

This equipment is shipped in optimum condition after clearing thorough quality management and inspections. To maintain this optimum condition, maintenance must be carried out regularly.

Maintenance of this equipment is classified as follows.

Maintenance Item		Performer	Maintenance Cycle
Daily maintenance	Start-up maintenance	Operator or supervisor	Daily (before operation)
	Post-operation maintenance	Operator or supervisor	Daily (after operation)
FPD calibration		Operator or supervisor	Every three months
Inspection of lighting field dimensions		Operator or supervisor	At appropriate time
Checking warning/caution labels		Operator or supervisor	Every one year
Cleaning and disinfection		Operator or supervisor	At appropriate time
Periodic inspection		Shimadzu service representative	Every six months

Please refer to the "M517-E210 Digital Radiography System DR-300 Instruction Manual (Image Acquisition)" for details on FPD calibration.

6.1.1 Daily Maintenance

Daily maintenance involves start-up and post-operation maintenance. Carry out daily maintenance to ensure a longer service life of the equipment.

Perform inspection according to the procedures shown in ["8.6 Checklist for Start-Up Maintenance" P.8-13](#) and ["8.7 Checklist for Post-Operation Maintenance" P.8-16](#) in ["8 Appendix"](#).

Make sure that all inspections and measures have been successfully finished before starting to use the system again.



Hint Keep the checklist for a set period of time for future reference.



CAUTION



Instructions

If any abnormality is found during the maintenance check, stop using the equipment and contact your Shimadzu service representative.

When a user performs the maintenance check for himself or herself, please keep in mind his or her own safety.

Shimadzu shall not be liable for any damage resulting from the checks other than those by Shimadzu or Shimadzu representative.

■ Inspecting Lighting Field Dimensions

- 1 Set to SID1100.
- 2 Set the X-ray irradiation field of the collimator to fully open.
- 3 Light up the lighting field lamp of the collimator and measure the length of each side on the tabletop.

Make sure that the measured values are within the ranges in the table below at each magnification.

FOV	Length of side
17"	38 to 40 cm
15"	34 to 36 cm
12"	25.5 to 27.5 cm
9"	20 to 22 cm
6"	13 to 15 cm

6

■ Inspection for Warning and Caution Labels

Periodically (once a year) inspect the labels attached on the equipment.

If any label is peeled or unreadable by stain or scratch, contact your Shimadzu service representative for replacement of a new one.

 **Reference** ["Warning and Caution Labels" P.xxviii](#)

6.1.2 Cautions on Cleaning and Disinfection



WARNING



Instructions

Be sure to turn the equipment power OFF before cleaning and disinfecting the equipment.

Otherwise, a malfunction may occur in the equipment, or the equipment may operate in an unintended way.

Also, thoroughly ventilate the room before turning ON the power after disinfection work is complete.



CAUTION



Instructions

Be sure to clean and disinfect the equipment.

Cleaning and disinfection is very important to ensure that the equipment can be used hygienically and safely. Strictly follow the methods prescribed.



Prohibitions

Do NOT directly apply or spray rubbing alcohol or water onto the equipment.

Wipe the surface of the equipment with a cloth soaked with rubbing alcohol. If rubbing alcohol gets inside the equipment, it can cause failure or accidents.



Prohibitions

Do NOT use an organic solvent.

Organic solvents may change the surface color. If an organic solvent adheres to the surface, wipe it off immediately.



Prohibitions

Do NOT use the following disinfectants:

If any of the following disinfectants are applied, the equipment performance and safety cannot be guaranteed.

- Chlorine-based disinfectants
- Disinfectants that corrode metals, plastics, rubber, or paint
- Disinfectants unsuitable for metals, plastics, rubber, or paint
- Spray-gas type disinfectants
- Volatile disinfectants
- Disinfectants that may enter the equipment



Instructions

Use disinfectants at a minimum.

Repeated disinfection over a long time may lead to discoloring and cracking on the equipment surface, and deterioration of rubber and plastic. If any abnormality is found on the equipment after disinfection, stop using the equipment immediately. Contact your Shimadzu service representative for repair.

**CAUTION**

Prohibitions

Do NOT grease tabletop rails.

Be sure to wipe the tabletop rails with a soft dry cloth. Any oil or grease may cause the accessories on the tabletop to slip off.

1 Ensure that the power to the equipment is off.

 **Reference** "4.5.2 Turn the Power Off" P.4-34

2 Clean and disinfect the equipment as below.

Location	Procedure
X-ray diagnostic table and accessories (except the tabletop rails)	Soak a cloth in a diluted neutral detergent, squeeze it well, and wipe them clean. Wipe them with another dry cloth. Alternatively use a cloth moistened with rubbing alcohol squeezed lightly to wipe them.
X-ray diagnostic table (tabletop rails)	Wipe it with a soft dry cloth.
Control console (except the touch panel)	Soak a cloth in a diluted neutral detergent, squeeze it well, and wipe them clean. Wipe it with another dry cloth. Alternatively use a cloth moistened with rubbing alcohol squeezed lightly to wipe it.
Control console (Touch panel)	Lightly wipe it with a soft dry cloth. If it is dirty, use a cleaner for monitors.
Keyboard	Use an air duster with long nozzle, and remove dust and dirt from the spaces between the keys. When using a vacuum cleaner, be careful not to detach the keytop by suction.
Monitor	Lightly wipe the screen with a soft dry cloth. If it is dirty, use a cleaner for monitors. Remove dust from the vent with a vacuum cleaner.
Monitor cart	Soak a cloth in a diluted neutral detergent, squeeze it well, and wipe them clean. Wipe it with another dry cloth. Alternatively use a cloth moistened with rubbing alcohol squeezed lightly to wipe it.
Control cabinet	Soak a cloth in a diluted neutral detergent, squeeze it well, and wipe them clean. Wipe it with another dry cloth. Alternatively use a cloth moistened with rubbing alcohol squeezed lightly to wipe it. Remove dust from the vent with a vacuum cleaner.
Operation cabinet	Lightly wipe it with a soft dry cloth. Remove dust from the vent with a vacuum cleaner.

3 After cleaning, check the following points before turning on the power to the equipment again.

- No water or disinfectant remains on the equipment.
- The tools used for cleaning and disinfectant are put away.

6.1.3 Periodic Inspection

Even without any problem in daily inspection, the following items should be inspected periodically.

		WARNING
	Be sure to perform periodic inspection (every 6 months).	
	Failure to do this may cause serious accidents or significantly shorten the lifetime of the equipment.	
Instructions		

Periodic inspections mainly check the equipment performance and the internal mechanisms. The inspections require good knowledge of the internal mechanisms and can also be dangerous. Contact your Shimadzu service representative to request a periodic inspection. It is recommended to conduct periodic inspections every 6 months. A fee is charged for periodic inspections after expiry of the warranty periods.

The maintenance work involves dangerous tasks. Be sure to request your Shimadzu service representative to perform the periodic inspection.

Outline of periodical inspection is shown as below tables. Shimadzu service representative executes the inspection in accordance with the following documents. Details of each check point procedure are covered by these documents.

- M506-E361: SONIALVISION G4 Installation Manual
- M517-E648: SONIALVISION G4 Image Quality Adjustment Manual
- M517-E708: SONIALVISION G4 Standard Maintenance Procedures

■ Periodic inspection procedure (Standard Maintenance procedures)

1.Cautions Regarding Maintenance

Maintenance is performed to ensure the instrument can be operated safely and reliably and to maintain performance at optimal levels. Maintenance procedures include cleaning, checks, adjustments, and modifications, as well as the replacement of degraded electronic parts and worn mechanical parts.

Maintenance for this instrument also includes procedures that would be dangerous if attempted by a customer. It is thus strongly recommended that you entrust maintenance work to a Shimadzu service center.

2.Inspection Content, Inspection Methods, Inspection Items, and Inspection Timing

For more information on what is included in inspections, the methods used, what to inspect, and when to inspect items, refer to the attached Maintenance Procedures.

3.List of Replacement and Consumable Parts, Replacement Timing, and Replacement Methods

Over time, the degradation of parts, and loss of accuracy due to wear will gradually reduce instrument performance in comparison to initial levels, leading to image quality issues and reducing the instrument operating ratio. Accordingly, to maintain instrument performance at original levels, it is necessary to periodically replace parts that have a limited service life.

Please have regular replacement parts and consumable parts replaced by a Shimadzu service center at the same time as maintenance work. Replacement procedures can be dangerous and should not be attempted by the customer.

4.Maintenance Related Inquiries

For questions regarding maintenance, please contact our business office or your nearest Shimadzu service center.

- SONIALVISION G4 Maintenance Procedures

These procedures apply to maintenance work on SONIALVISION G4 (DR-300/FPD/ZS-200/D150BC-40S). Refer to the attached Inspection Data Measurement Procedures and Image Quality Inspection Data Table when filling in the Inspection Data Form in the Inspection Results Report. The documents below should be filled in the periodic inspection.

- Maintenance Report
- System Component List
- Inspection Results Report
- Inspection Data Form
- Performance Check Sheet

The inspection timing stated in these Maintenance Procedures is based on two periodic inspections per year.

Check the items below before starting the inspections.

1. Check Items

- 1 Check the previous inspection data.
Inform the customer of the items planned for inspection this time and obtain the customer's approval. List the replacement parts.
- 2 Check the failure log.
Check the failure log and the results of instrument operation since the previous inspection.
- 3 Power related environment
 - a. Power supply equipment Differences from the power supply facilities at the time of installation
 - b. Power supply voltage Check the instrument operating voltage range: rated supply voltage $\pm 10\%$
- 4 Exterior and interior appearance
 - a. Exterior Deformation, scratches, nameplates
Check for abnormalities.
 - b. Interior Contamination, dust, mould
Check for abnormalities.
- 5 Operating environment
 - a. Instrument leveling Effects on instrument
Check for abnormalities.
 - b. Floor and instrument fastening Vibration and unstable operation
Check for abnormalities.

- c. Checking for interfering objects Check for safety in the range of machine movement.
(before and after inspection)
Check indicated range of machine movement.
 - d. Corrosion Operating environment OK/NG?
Check air-conditioning operation, including exhaust and dehumidification.
- 6 Operational tests
 - a.Pre-inspection operational test Check the operation status before the inspection. Conduct failure correction before conducting the inspection.
 - b.Post-inspection operational test Check the operation status after the inspection. Attach all covers and conduct the full range of operational tests.

3. Inspection Procedures (1/4)

Inspection Item	Inspection Details	Measurement Method and Inspection Method	Inspection Timing		Replace	Safety	Remarks
			1	2			
1. Checking installation environment							
(1) X-ray exposure indicator	Check that the exposure indicator is properly lit.	Visually check for abnormalities.	*	*		@	If defective, report to the facility manager.
(2) Temperature and humidity	Measure the temperature and humidity. (For the permitted ranges, refer to the specifications for the instrument.)	Temperature/humidity meter	*	*			If defective, report to the facility manager.
(3) Power supply voltage	Measure the supply voltage for each instrument (100 V single-phase).	Digital multimeter	*	*			
(4) Grounding	Check the grounding.	Check for changes at the facility. Visually check for looseness or corrosion of the earth cable.	*	*			
2. Checking instrument conditions							
(1) External appearance	Check that there is no significant contamination or damage on each unit.	Visually check for abnormalities.	*	*			
(2) Nameplates	Check that no nameplate is lost, contaminated, or damaged.		*	*			
(3) Instrument cleaning	Clean all units with a cleaner.		*	*			
(4) Cable connections	Check the connection of the cable terminals and connectors on each unit.		*	*			
(5) Cable conditions	Check the cables between the units for rubbing, twisting, and pulling.		*	*			
(6) Instrument fixing	Check the instrument mounting on the floor. Ensure all nuts and bolts are tight.		*	*			
(7) Environment around the instrument	Check that there are no obstacles around the instrument.		*	*			
3. X-ray tube unit							
(1) X-ray tube unit condition and installation	Check the appearance and installation of the X-ray tube housing.	Aurally check for abnormalities.	*	*			
(2) Noise from anode rotation	Check for noises caused by anode rotation.		*	*			
(3) Heat exchanger	Check the appearance of the heat exchanger and hoses, and check for abnormal noises.		*	*			

Inspection Procedures (2/4)

Inspection Item	Inspection Details	Measurement Method and Inspection Method	Inspection Timing		Replace	Safety	Remarks
			1	2			
4. X-ray controller							
(1) Fluoroscopy operation	Check that operation is normal.		*	*			
(2) Starter operation	Check that operation is normal.	Operation check for abnormalities.	*	*			
(3) General radiography operation	Check that operation is normal.		*	*			
(4) Fluoroscopy tube voltage precision and reproducibility	Measure the tube voltage.	Measure with an oscilloscope. (See section 3.2.1.)		*			
(5) Fluoroscopy tube current precision and reproducibility	Measure the tube current.	Measure with an oscilloscope. (See section 3.2.2.)		*			
(6) Radiography tube voltage precision and reproducibility	Measure the tube voltage.	Measure with an oscilloscope. (See section 3.3.1.)		*			
(7) Radiography tube current precision and reproducibility	Measure the tube current.	Measure with an oscilloscope. (See section 3.3.2.)		*			
(8) Radiography time precision and reproducibility	Measure the radiography time.	Measure with an oscilloscope. (See section 3.3.3.)		*			
(9) Radiography tube current-time product precision and reproducibility	Measure the radiography tube current time product.	Measure with an oscilloscope. (See section 3.3.4.)		*			
(10) High-voltage cable and bushing	Remove the bushings. Check for discharge marks and damage to the packing. Wipe off old grease. Replace or re-grease the packing.	Visually check for abnormalities.		*	○		
(11) Insulating oil	Check the degree of deterioration.			*			
(12) Max. fluoroscopy dose	Measure the maximum skin dose during fluoroscopy to ensure it does not exceed 50 mGy/min (5.75 R/min, for standard setting) or 87mGy/min (9.5R/min, for bariatric setting).	Measure with a dosimeter. (See section 3.4.)	*	*		@	
(13) Automatic control	(1) Fluoroscopy IBS balance conditions (2) Memory Shot radiography conditions (3) Phototimer radiography conditions	Refer to the Image Quality Adjustment Manual and 3.7 Procedures for Creating Image Quality Inspection Data.		*			
5. FPD-related parts							
(1) FPD	(1) Uneven brightness, scratches, dirty spots (2) Check the missing pixels and size of pixel clusters. (3) Check the FPD temperature.	Visually check for abnormalities. Check for increased missing pixels at the PCU. Check the FPD temperature at the PCU.	*	*			

Inspection Procedures (3/4)

Inspection Item	Inspection Details	Measurement Method and Inspection Method	Inspection Timing		Replace	Safety	Remarks
			1	2			
6. Digital image processing unit							
(1) Filter		Visually check for abnormalities.	*	*			
(2) Fan	Check that the fan is rotating.	Visually and aurally check for abnormalities.	*	*			
(3) Image capture operation	(1) SPOT	Visually confirm operation and check for image abnormalities.	*	*			
	(2) SER radiography ^{*1)} (7.5 fps)		*	*			
	(3) DSA radiography ^{*1)} (7.5 fps)		*	*			
	(4) Digital multi-frame imaging (4 frames)		*	*			
	(5) Digital tomography ^{*1)} (30°, fast)	Visually confirm operation and check for image abnormalities.	*	*			
	(6) Tomosynthesis ^{*1)} (60 kV, 1.25 mAs)		*	*			
	(7) RSM-DSA ^{*1)} (7.5 fps)		*	*			
	(8) SLOT ^{*2)}		*	*			
(4) Image reading	Shuttle operation, IVR master operation, etc.	Operation check for abnormalities.	*	*			
(5) File operations	Image display, copy, print, delete, etc.		*	*			
(6) Fluoroscopy image processing	Invert, loop, fluoroscopy recording, etc.		*	*			
(7) DVD reading and writing	Writing to DVD and reading from DVD		*	*			

*1) Option, *2) Option

Inspection Procedures (4/4)

Inspection Item	Inspection Details	Measurement Method and Inspection Method	Inspection Timing		Replace	Safety	Remarks
			1	2			
(9) Printing and density	(1) Auto print, manual print	Operation check for abnormalities.	*	*			
	(2) Check the density with a SMPTE test pattern.	Check with a densitometer	*	*			
(10) DICOM transmission ^{*1)}	Check DICOM transmission.	Operation check for abnormalities.	*	*			
(11) DICOM MWM/MPPS information transmission ^{*1)}	Check DICOM MWM/MPPS information transmission.		*	*			
7. Image quality							
(1) Fluoroscopy image quality	Check overall image quality of the FPD-DR system (spatial resolution, contrast).	See 3.3 Procedures for Creating Image Quality Inspection Data, 3.3.1 Fluoroscopy Image Evaluation.		*			
(2) Radiography image quality	Check overall image quality of the FPD-DR system (spatial resolution, contrast)	See 3.3 Procedures for Creating Image Quality Inspection Data, 3.3.2 Radiography Image Evaluation.		*			
(3) Fluoroscopy S/N ratio	Vq (FPD)			*			
8. Accessories							
(1) Monitor	(1) Check brightness and contrast with an SMPTE test pattern.	Visually check the density distribution.	*	*			
	(2) Pixel losses	Visually check for abnormalities.	*	*			
(2) Intercom	Check the volume and sound quality.	Aurally check for abnormalities.	*	*			
(3) VTR ^{*1)}	Check operation and recorded images.	Operation check for abnormalities.	*	*			
(4) Monitor cart (support) ^{*1)}	Check caster operation and the cable condition.	Visually confirm operation and check for abnormalities.	*	*			
(5) Laser imager ^{*1)}	Check the printing operation. ^{*1)}	Operation check for abnormalities.	*	*			
*1) Option							

List of Measuring Conditions and Equipment Used

Control Number _____

Hospital Name _____

SID cm			
Phantom Water cm		Acrylic cm	
Comments			
Type	Manufacturer	Model	Manufacturer's Serial Number
Tester			
Mega ohmmeter			
Leakage Current Tester			
KV meter			
mA meter			
mAs Meter			
Oscilloscope			
Densitometer			
Dosimeter			
Other			

Reason for Changing Instrument (Date):		
Comments		
Date of Entry	Inspected by:	Supervisor:
— —	Inspected by:	Supervisor:

- SONIALVISION G4 Digital Radiography System Inspection Data Measurement Procedures

1. Introduction

This data is used for the maintenance and management of the delivered instrument. It can be used to confirm changes over time and changes in characteristics from the preventative maintenance viewpoint and to conduct instrument inspections to ensure safe operation. Follow the procedure below to enter the measured values.

2. Precautions

- 1 Use the same measuring instrument and measuring conditions for each inspection. Conduct the measurements at least three times and take the average value.
- 2 If the measured data values fluctuate, record the average value as the measured value.
- 3 Any values requiring adjustment should be adjusted according to the appropriate IEC standards (IEC60601-1 etc.). However, if measurements were conducted according to another standard, record the name of this standard.
- 4 If the values set in the Inspection Data Form change due to a change in the instrument specifications, enter the changed value in the form.

3. Inspection Data Measurement Procedures

3.1 Supply Voltage

Measurement points	Measure the voltage at the following two points. Power input points on the high-voltage unit (200 V or 400 V, 3-phase) Across L0–L100 on the terminal block on the TERMINAL-2002 board (100 V, single-phase) Power input points on the DR-300 transformer (200 V, single-phase)
Measurement method	Measure with a voltmeter (RMS). If the value fluctuates over time, enter the amplitude of fluctuation.
Permitted values	Within the permitted value range in the instrument specifications (+10 %, -10 % max.). (Refer to the installation manual.)
Comment	The RMS value indicates the amount of heat consumed in a certain resistance when a sinusoidal voltage is measured. It is the equivalent DC voltage giving the same heat consumption. (RMS = root mean square)

3.2 Measuring Fluoroscopy-Related Data

1 Fluoroscopy Tube Voltage

Measurement points	Using DC fluoroscopy/manual, measure the tube voltage at two points: 75 kV and 115 kV.
Measurement method	Measure with an oscilloscope at CP32 TKV (1 V/20 kV) on the UD CONT2002 board.
Permitted values	Within the range prescribed in IEC (± 10 % max.). Re-adjust if the value is out-of-range.

2 Fluoroscopy Tube Current

Measurement points	Using DC fluoroscopy/manual, set to 0.8 mA (near 56 kV).
Measurement method	Measure with an oscilloscope TMA on the UD CONT2002 board.
Permitted values	Within the range prescribed in IEC (± 20 % max.). Re-adjust if the value is out-of-range. (Refer to the D150BC-40S/VC-40S installation manual)

3.3 Measuring Radiography-Related Data

1 Radiography Tube Voltage

Measurement points	Measure the radiography tube voltage at the following two points for a general radiography procedure. i) 60 kV 0.1 s 80 % of the maximum selectable tube current (1 step down from the maximum) ii) 100 kV 0.1 s 80 % of the maximum selectable tube current (1 step down from the maximum)
Measurement method	Measure with an oscilloscope the TKV on the UD CONT2002 board. (Refer to the D150BC-40S/VC-40S installation manual)
Permitted values	Within the range prescribed in IEC (± 10 % max.). Re-adjust if the value is out-of-range.

2 Radiography Tube Current

Measurement points	Measure the radiography tube current at the following two points for a general radiography procedure. i) 100 kV 0.1 s Minimum selectable tube current ii) 80 kV 0.1 s 80 % of the maximum selectable tube current (1 step down from the maximum)
Measurement method	Measure with an oscilloscope the TMA on the UD CONT2002 board. (Refer to the D150BC-40S/VC-40S installation manual)
Permitted values	Within the range prescribed in IEC (± 20 % max.). Re-adjust if the value is out-of-range.

3 Radiography Time

Measurement points	Measure the radiography time at the following two points for a general radiography procedure. i) 100 kV 3.2 ms Arbitrary tube current ii) 100 kV 0.1 s 80 % of the maximum selectable tube current (1 step down from the maximum)
Measurement method	Observe the radiography tube voltage waveform on an oscilloscope at the TKV on the UD CONT2002 board and measure the radiography time. (Refer to the D150BC-40S/VC-40S installation manual)
Permitted values	Within the range prescribed in IEC ($\pm 10\%$ + 1 ms)

4 Radiography Tube Current Time Product

Measurement points	Measure the radiography tube current time product at the following two points for a general radiography procedure. i) 100 kV 0.5 mAs ii) 60 kV 100 mAs
Measurement method	Observe the radiography tube current waveform on an oscilloscope at the TMA on the UD CONT2002 board. Calculate mA $\times$ s (seconds). (Refer to the D150BC-40S/VC-40S installation manual)
Permitted values	Within the range prescribed in IEC ($\pm 10\%$ + 0.2 mAs)

3.4 Maximum Fluoroscopy Dose

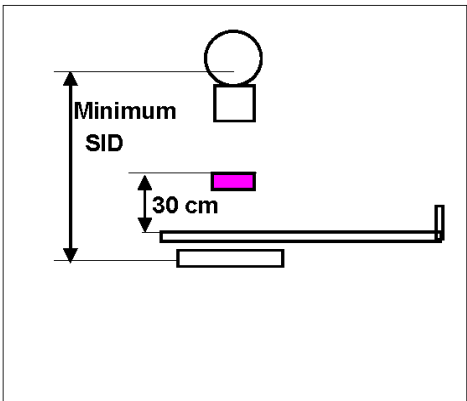
1 Measuring the maximum fluoroscopy dose

Confirm the serial fluoroscopy and low-dose pulsed fluoroscopy maximum dose for each mode, referring to the Image Quality Adjustment Data Measurement Procedures and DR-300 Image Quality Adjustment Manual (M517-E648). If the dose exceeds the regulation values in the Japanese Medical Care Act, re-adjust the instrument to conform to the Medical Care Act. The diagram below shows the measurement point for each fluoroscopy system configuration. In each case, measurement is prescribed at the dimension where the maximum dose occurs at the object.

Fluoroscopy mode	DC fluoroscopy, Pulse fluoroscopy	
Fluoroscopy conditions	Manual fluoroscopy	120 kV
	IBS fluoroscopy	120 kV (FPD max. irradiation field shielded with lead)
SID	ZS-200	110 cm

If the measured dose exceeds the stipulated value (50 mGy/min (5.75 R/min) for standard setting, 87mGy/min (10R/min) for bariatric setting), reduce the fluoroscopy tube current at the maximum fluoroscopy tube voltage (120 kV) or at the voltage exceeded point.

1) Dosimeter position for ZS–200



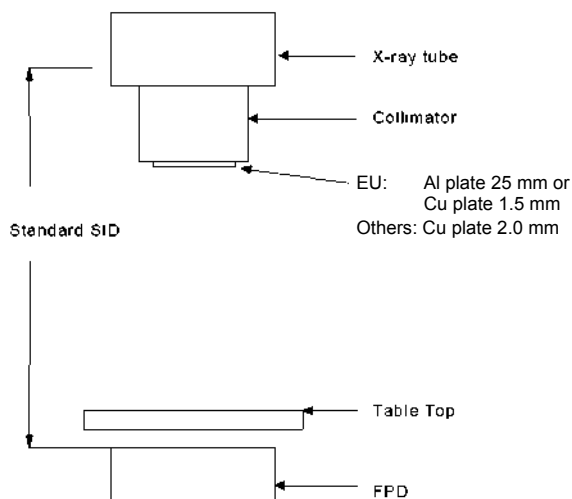
SID (FFD): 1100 mm (minimum)
Dosimeter position: 30 cm above the tabletop

	FKV			
	90 kV	100 kV	120 Manual	120 Auto
Measured Dose				

3.5 Automatic Exposure

Record the balanced kV, mA point in the IBS automatic fluoroscopy and mAs point for automatic radiography modes.

Measuring geometry is as below.



Standard SID is 1100mm.

For IBS inspection, reference values are shown as below tables for each setting. The acceptance range is ± 2 kV of reference values.

(a) Standard

Fluoroscopy Mode	DRC Level	Grid	BH Filter	FOV	kV	mA
PULSE N	Level 1	120cm, 50Line	2 (Cu0.1mm)	17	74	3.3
				15	74	3.3
				12	77	3.6
				9	79	3.9
				6	81	4.2
PULSE L	Level 6	120cm, 50Line	2 (Cu0.1mm)	17	74	1.4
				15	74	1.4
				12	75	1.5
				9	76	1.6
				6	79	1.8
PULSE 30	Level 9	120cm, 50Line	2 (Cu0.1mm)	17		
				15		
				12	76	4.8
				9	77	4.9
				6	79	5.3
PULSE HD	Level 1	120cm, 50Line	2 (Cu0.1mm)	17		
				15		
				12		
				9		
				6	79	6.9
PULSE LL	Level 5	Not Used	4 (Cu0.3mm)	17	79	1.8
				15	79	1.8
				12	82	1.9
				9	85	2.0
				6	87	2.2

(b) Bariatric

Fluoroscopy Mode	DRC Level	Grid	BH Filter	FOV	kV	mA
PULSE N	Level 1	120 cm, 50Line	2 (Cu0.1mm)	17	73	2.7
				15	73	2.7
				12	75	2.9
				9	76	3
				6	79	3.3
PULSE L	Level 6	120 cm, 50Line	2 (Cu0.1mm)	17	71	1.3
				15	72	1.4
				12	75	1.6
				9	76	1.7
				6	79	1.9
PULSE L75	Level 9	120 cm, 50Line	2 (Cu0.1mm)	17	71	1.3
				15	73	1.5
				12	75	1.6
				9	76	1.7
				6	80	2
PULSE HD	Level 1	120 cm, 50Line	2 (Cu0.1mm)	17		
				15		
				12		
				9		
				6	77	4.7
PULSE LL	Level 5	Not Used	4 (Cu0.3mm)	17	79	1.8
				15	79	1.8
				12	82	1.9
				9	85	2.0
				6	87	2.2
PULSE 30	Level 1	120 cm, 50Line	2 (Cu0.1mm)	17		
				15		
				12	75	5.8
				9	76	6.0
				6	78	6.5

PULSE UN	Level 14	120cm, 50Line	1 (Cu0mm)	17	66	3.5
				15	66	3.5
				12	68	3.7
				9	68	3.7
				6	70	3.9
PULSE UL	Level 17	120cm, 50Line	1 (Cu0mm)	17	66	2.4
				15	66	2.4
				12	68	2.6
				9	68	2.6
				6	70	2.7
PULSE UN75	Level 14	120cm, 50Line	1 (Cu0mm)	17	63	3.2
				15	63	3.2
				12	65	3.4
				9	65	3.4
				6	67	3.6
PULSE UL75	Level 17	120cm, 50Line	1 (Cu0mm)	17	63	2.2
				15	63	2.2
				12	65	2.3
				9	65	2.3
				6	67	2.5
PULSE UHD	Level 14	120cm, 50Line	1 (Cu0mm)	17		
				15		
				12		
				9		
				6	71	4
PULSE ULL	Level 20	Not Used	2 (Cu0.1mm)	17	75	2.9
				15	75	2.9
				12	78	3.2
				9	78	3.2
				6	81	3.5
PULSE U30	Level 14	120cm, 50Line	1 (Cu0mm)	17		
				15		
				12	68	7.4
				9	68	7.4
				6	70	7.9

(c) EU

Fluoroscopy Mode	DRC Level	Grid	BH Filter	FOV	kV	mA
PULSE N	Level 1	120cm, 50Line	2 (Cu0.1mm)	17	77	3.2
				15	78	3.3
				12	80	3.5
				9	81	3.8
				6	81	3.8
PULSE L	Level 6	120cm, 50Line	2 (Cu0.1mm)	17	76	1.7
				15	78	1.8
				12	80	2
				9	81	2.6
				6	82	2.9
PULSE L75	Level 9	120cm, 50Line	2 (Cu0.1mm)	17	77	1.8
				15	77	1.8
				12	80	2.3
				9	81	2.4
				6	83	3.3
PULSE HD	Level 1	120cm, 50Line	2 (Cu0.1mm)	17		
				15		
				12		
				9		
				6	77	6.5
PULSE LL	Level 5	Not Used	4 (Cu0.3mm)	17	74	1.49
				15	75	1.55
				12	78	1.72
				9	80	1.84
				6	81	1.89
PULSE 30	Level 11	120cm, 50Line	2 (Cu0.1mm)	17		
				15		
				12	75	5.7
				9	76	6
				6	77	6.2

For automatic radiography inspection, adjustment conditions are as below.

Adjustment Conditions

SID	Phantom	Grid	BH Filter
1100 mm	Cu plate 2 mm	120 cm, 50Line	2 (Cu0.1mm)

Acceptance values are as below tables for system with/without area dosimeter.

Adjustment Basis in Each Radiography Mode (without Area Dosimeter)

Acquisition mode	Radiography conditions	17"	15"	12"	9"	6"
SPOT	85 kV 320 mA	13 ms (4.2 mAs)	14 ms (4.5 mAs)	15 ms (4.8 mAs)	18 ms (5.8 mAs)	22 ms (7.0 mAs)
HC-SPOT (For low dose)		2.7 ms (0.9 mAs)	3.4 ms (1.1 mAs)	6.8 ms (2.2 mAs)	7.9 ms (2.5 mAs)	10 ms (3.2 mAs)
L-SPOT		40 ms (13 mAs)	43 ms (14 mAs)	45 ms (14 mAs)	47 ms (15 mAs)	52 ms (17 mAs)

Adjustment Basis in Each Radiography Mode (with Area Dosimeter)

Acquisition mode	Radiography conditions	17"	15"	12"	9"	6"
SPOT	85 kV 320 mA	16 ms (5.1 mAs)	17 ms (5.4 mAs)	18 ms (5.8 mAs)	22 ms (7.0 mAs)	26 ms (8.3 mAs)
HC-SPOT (For low dose)		3.6 ms (1.2 mAs)	4.3 ms (1.4 mAs)	8.7 ms (2.8 mAs)	10 ms (3.2 mAs)	12 ms (3.8 mAs)
L-SPOT		45 ms (14 mAs)	48 ms (15 mAs)	52 ms (16 mAs)	54 ms (17 mAs)	59 ms (19 mAs)

3.6 Checking DR System Operation

- 1 Check the fan operation (rear of the cabinet).
 - 2 Check the image capture operation.
 - 1) SPOT
 - 2) SER radiography (15 fps, 3 s)
 - 3) DSA radiography (15 fps, 3 s)(with options)
 - 4) Multi-frame imaging (4 frames)
 - 5) Digital tomography (30°, Fast)(with options)
 - 6) Tomosynthesis (60 kV, 1.25 mAs)(with options)
 - 7) RSM-DSA (15 fps)(with options)
 - 8) SLOT(with options)
 - 3 Image reading
 - 4 Display operations (multi, zoom, cropping, etc.)
 - 5 File operations (image display, copy, print, delete, etc.)
 - 6 Fluoroscopy image operations (invert, loop, fluoroscopy recording, etc.)
 - 7 CD-R, DVD reading and writing
 - 8 Printing (auto print, manual print, etc.)
 - 9 DICOM transmission *1)
 - 10 DICOM MWM/MPPS information transmission
- *1) Option

3.7 Procedures for Creating Performance Check Sheet (SONIALVISION G4)

This form (Performance Check Sheet) describes the methods for collecting and recording the inspection data. This data shall be stored by the inspector and the customer.

For DR system maintenance, also record the data in the Digital Radiography System Inspection Data Forms (DR system) that is appended to the Maintenance Report, and submit this to the customer.

Refer to the DR-300 Image Quality Adjustment Manual (M517-E648) for information on the data collection methods and procedures.

1 Image Quality Adjustment Data Sheet

Create the Performance Check Sheet as described in the DR-300 Image Quality Adjustment Manual (M517-E648).

2 Evaluating Fluoroscopy Image Levels

Record the balance kV, mA, confirmed during fluoroscopy IBS adjustment.

Refer to "3.5 Automatic Exposure". Refer to the item of "9. Image Quality Evaluation" in DR-300 Image Quality Adjustment Manual (M517-E648).

3 Evaluating of Vq analysis

Using the VQ method with the following conditions, acquire a 9BCu phantom image in the fluoroscopy store and the SPOT radiography. Measure the pixel value of each block acquired by the VQ method. Record kV and mA of the IBS balance point and kV, mA, msec of the radiography condition.

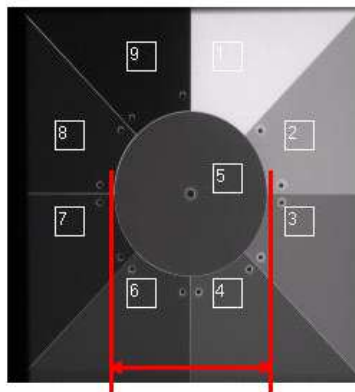
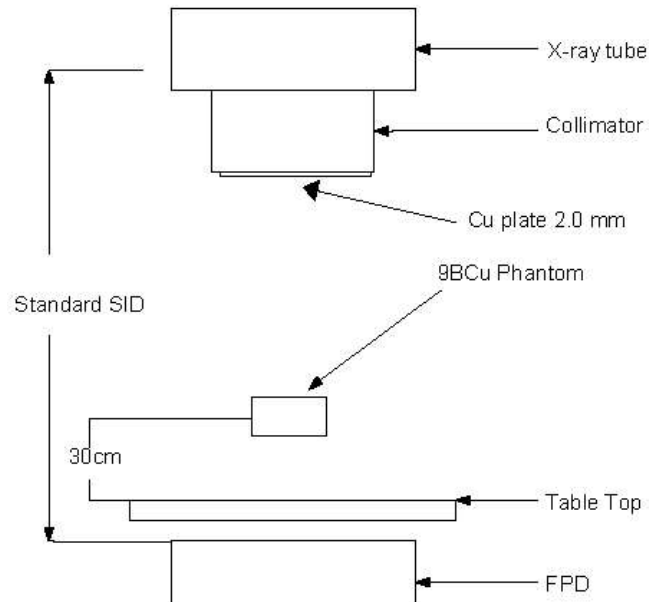
FOV size	9"
Collimator	Full open
SID	1100 mm
Position	30 cm over the tabletop (Refer to [Arrangement for the measurement].)
IBS	ON
AEC	ON
Filter	Cu plate 2mm (placed under the collimator.)
Recording method	Fluoroscopy: Fluoroscopy store of DR Radiography: SPOT radiography of DR
Number of record frames	Fluoroscopy: 30 or more frames* Radiography: 1 frame
Procedure	QC1
Remarks	Start acquisition after IBS is stabilized

*Set about 40 frames as maximum. If the number of frames increases, the analysis will take a long time.

[Arrangement for the measurement]

SID: 1100mm (shortest)

FOV size: 9", Collimator: Full open



The 9BCu phantom is placed about 30cm over a tabletop so that the diameter of central black will be occupy more than 30% of the screen.

How to Correct Images

- 1 Start a study with the DR300 application. Select the procedure "QC1."
- 2 Set the "Auto Send 1" to "Uncompressed" on the General tab of the "Edit Procedure" window. Select "Auto Send 1" checkbox in the "Post Process" on the Radiography tab of the "Edit Procedure" window.
- 3 Store the fluoroscopy image of 9BCu. Press the Store fluoroscopy button on the Remote console after the IBS is stabilized. After 30 or more frames are stored, press the Store fluoroscopy button again. (When this button is not available, store the fluoroscopy image by referring "2. How to Store Fluoroscopy image" of Appendix A in DR-300 Image Quality Adjustment Manual (M517-E648)."
- 4 Check whether 1 to 30 frames have constant brightness. When the brightness varies, return to step (3).
- 5 Acquire the radiography image of 9BCu.
- 6 Double-click the shortcut icon "Vq" on the desktop of remote maintenance PC, and start the Vq software.
- 7 Click the "File Open" button and open the collected images. The collected images are saved in "C:\Image\Uncompressed." (When the image has not been saved, transfer them from the Reference PC through the Batch Output.)
- 8 Click the "Edit" button and set the starting point as "1" and set the end point as "30" for the region.
- 9 Click the [1] button in [EditDialog] window and then click the [OK] button.
- 10 Set the region of each block as shown in the previous page.
- 11 Click the "Analyze" button and record the value of "Average" and "SNR" of each block, and Vq (Normalize).

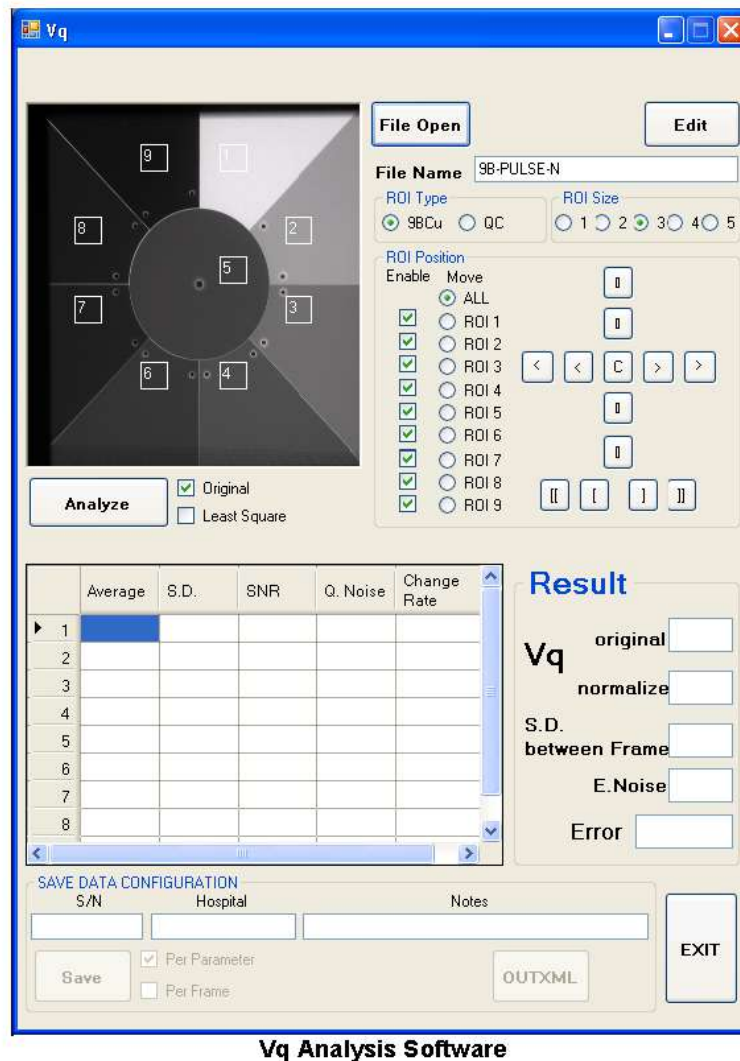
Fluoroscopy Reference Value

	Block								
	1	2	3	4	5	6	7	8	9
Average	1025	675	465	325	280	235	150	135	110
SNR	35	29	24	21	19	17	13	12	10
VQ (Normalize)	0.75								

Tolerance range of fluoro VQ (Normalize): 10 or less.

Radiography Reference Value

	Block								
	1	2	3	4	5	6	7	8	9
Average	8000	4900	3150	2050	1700	1400	800	700	550
SNR	160	125	102	82	78	70	45	44	16



4 Creating the Adjustment Data

Create the adjustment data used to determine the system installation or operating status. Enter all the required adjustment data in the Data Sheets. Create the following data:

- 1) Adjustment data (Performance Check Sheet)
- 2) Image files (CD-R)

No. _____

Maintenance Report	
Name of Institution	Date (M/D/Y): _____
Approved by _____	
Address	Telephone Number
Name of Room	Maintenance Supervisor

I hereby report that the following maintenance work has been completed.

Name of System	System Component System Component List
Management Registration No.	Installation Date _____ (M/D/Y)
Inspection Date _____ (M/D/Y)	Planned Next Inspection _____ (M/Y)
Inspection Details Described in the attached Inspection Results Report.	
Comments on Inspection	
Maintenance Engineer	
Signature	☐ MRC— ☐
Maintenance Company	Telephone Number

No. _____

Name of Institution: _____ Control No.: _____

System Component List (1/)

	Unit Name	Model Name	Serial No.	Remarks
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

System Record

Inspection Results Report

[DR System]

Name of Institution: _____

Control No.: _____

Inspected by: _____

Engineer: _____

No.	Inspection Item	Result						No.	Inspection Item	Result					
		A	B	C	D	E	/			A	B	C	D	E	/
1.	Checking installation environment							(2)	Water cooling unit						
(1)	X-ray exposure indicator							(1)	Change the antifreeze liquid.						
(2)	Temperature and humidity							(2)	Replace the fan, filter, and pump.						
(3)	Power supply voltage							(3)	Air cooling unit						
(4)	Grounding							(1)	Temperature controller function						
								(2)	Clean the air filter.						
								(3)	Replace the water supply sponge and filter.						
								(4)	Replace the main cooling unit.						
2.	Checking instrument conditions							6.	Digital image processing unit						
(1)	External appearance							(1)	Filter						
(2)	Nameplates							(2)	Fan						
(3)	Instrument cleaning							(3)	Image capture and display						
(4)	Cable connections							(1)	SPOT						
(5)	Cable conditions							(2)	SER radiography						
(6)	Instrument fixing							(3)	DSA radiography ^{*1)}						
(7)	Environment around the instrument							(4)	Digital multi-frame imaging						
								(5)	Digital tomography ^{*2)}						
3.	X-ray tube unit							(6)	Tomosynthesis						
(1)	X-ray tube unit condition and installation							(7)	RSM-DSA ^{*1)}						
(2)	Noise from anode rotation							(8)	SLOT ^{*2)}						
(3)	Heat exchanger							(9)	D.E. ^{*1)}						
								(4)	Image reading						
4.	X-ray controller							(5)	Image processing functions						
(1)	Fluoroscopy operation							(6)	File operations						
(2)	Starter operation							(7)	Fluoroscopy image processing						
(3)	General radiography operation							(8)	DVD reading and writing						
(4)	Fluoroscopy tube voltage precision and reproducibility							(9)	Printing						
(5)	Radiography tube current precision and reproducibility							(10)	DICOM transmission ^{*1)}						
(6)	Tube voltage precision and reproducibility							(11)	DICOM MWM/MPPS transmission ^{*1)}						
(7)	Tube current precision and reproducibility														
(8)	Radiography time precision and reproducibility							7.	Image quality						
(9)	Radiography tube current-time product precision and reproducibility							(1)	Fluoroscopy image quality						
(10)	High-voltage cable and bushing							(2)	Radiography image quality						
(11)	Insulating oil							(3)	IOC (FPD)						
(12)	Max. fluoroscopy dose							(4)	Vq (FPD)						
(13)	Automatic control														
	(1) Fluoroscopy IBS balance conditions							8.	Accessories						
	(2) Memory Shot radiography conditions							(1)	Monitor						
	(3) Phototimer radiography conditions							(2)	Intercom						
5.	FPD-related parts							(3)	VTR						
(1)	FPD							(4)	Monitor cart (support)						
	(1) Uneven brightness, scratches, dirty spots							(5)	Laser imager						
	(2) Missing pixels							(6)	Injector						
	(3) Temperature														

Result codes: A: normal; B: adjusted; C: fine-tuned; D: replaced; E: cleaned; /: N/A

*1) Option, *2) Option (however, standard on systems with air-cooled FPDs and later systems)

Digital Radiography System Inspection Data Form

[DR System]

Name of Room: _____

Model Name: _____

Control No.: _____

Measurement Date, Created By, and Measured Values (M/D/Y)										
Measurement Date										
Created by										
Measured Item/Details		On Installation	Before Adjustment	After Adjustment	Before Adjustment	After Adjustment	Before Adjustment	After Adjustment	Before Adjustment	After Adjustment
Power Supply Voltage	Single-Phase									
Max. Fluoroscopy Dose [Detailed Inspection Data] (See attached material.)										
Automatic Exposure [Detailed Inspection Data] (See attached material.)										
Imager [Detailed Inspection Data] (See attached material.)										
Air Conditioning Temperature (Examination Room) Humidity										
Air Conditioning Temperature (Control Room) Humidity										
Remarks										

Create the detailed data related to image quality in each fluoroscopy and radiography mode as described in the attached material.

Appendix Data Sheet

SONIALVISION G4 Data Sheet 1/3

SONIALVISION G4 series Performance Check Sheet (1/3) ☐ Installation ☐ Relocation ☐ Maintenance (☐ 11th month ☐ Other)										Reporting Department _____ Report Date ____ / ____ / ____	
Destination Facility and Room Name						System Name					
						System No.					
Image Quality Confirmation (Common data sheet) (refer to M517-E648 SONIALVISION G4 Image Quality Adjustment Manual)											
Max Skin dose	Fluoroscopy mode	Fluo.kV	Fluo.mA	X-ray Dose	Fluoroscopy mode	Fluo.kV	Fluo.mA	X-ray Dose			
	Pulse N (15fps)	120 kV	mA	R/min mGy/min	DOSE N (DC)	120 kV	mA	R/min mGy/min			
	Pulse L (15fps)	120 kV	mA	R/min mGy/min	Pulse LL (15fps)	120 kV	mA	R/min mGy/min			
	Pulse HD (15fps)	120 kV	mA	R/min mGy/min							
	Pulse 30 (30fps)	120 kV	mA	R/min mGy/min							
	Pulse L75 *1 (7.5fps)	120 kV	mA	R/min mGy/min							
IBS Fluo. Balanced Condition	Field of View	Cu 2mm	PULSE N (15 fps) DRC Level 1		PULSE L (15 fps) DRC Level 6		PULSE HD (15 fps) DRC Level 1				
		17"						-	-	-	
		15"						-	-	-	
		12"						-	-	-	
		9"						-	-	-	
		6"									
			PULSE LL (15 fps) DRC Level 5		PULSE 30 (30 fps) DRC Level 8/1 *1		PULSE L75 (7.5 fps) *2 DRC Level 9				
		17"				-	-	-			
		15"				-	-	-			
		12"									
		9"									
		6"									
		17"									
		15"									
		12"									
		9"									
		6"									
		Note *1: Use Level 9 for Standard setting. Use Level 1 for Bariatric setting. *2: Bariatric setting only.									
		Remarks									

SONIALVISION G4 Data Sheet 2/3

SONIALVISION G4 series												
Performance Check Sheet (2/3)												
☐ Installation ☐ Relocation ☐ Maintenance (☐ 11th month ☐ Other)						Reporting Department _____ Report Date ____/____/____						
Destination Facility and Room Name						System Name			Destination Facility and Room Name			
						System No.						
Image Quality Confirmation (Common data sheet for Fixed pulse-width and Variable pulse-width fluoroscopy) (refer to M517- E648 SONIALVISION G4 Image Quality Adjustment Manual)												
Photo timer Adjustment	Cu 2 mm DRC=OFF	FOV	Photo. Gain PH/DR	Radio. kV	Radio. mA	Exposure time mSec	Digital Value (DR-300)					
	SPOT (Original)	17"		85	320							
		15"		85	320							
		12"		85	320							
		9"		85	320							
		6"		85	320							
	L-SPOT (Original)	17"		85	320							
		15"		85	320							
		12"		85	320							
		9"		85	320							
		6"		85	320							
	HC-SPOT (Original)	17"		85	320							
		15"		85	320							
		12"		85	320							
		9"		85	320							
		6"		85	320							
Phototimer Correction	SPOT DRC = OFF	FOV	Cu	Radio. kV	Radio. mA	Exposure time mSec	Digital Value (DR-300)					
	Short time comp.	12"	1 mm	85	160							
		12"	2 mm	85	320							
	kV comp.	12"	1 mm	60	320							
		12"	2 mm	85	320							
Flash Check	Rad. Condition			Focus	Radio. kV	Radio. mA	mSec	Actual mA				
	Exp. SW	Ready - X-ray		LARGE	85	0.7/1.2JG: 630 0.4/0.7JG: 320	50					
	Hand SW	Ready > (2 sec) > X-ray										
	Exp. SW	Ready - X-ray		SMALL	85	0.7/1.2JG: 400 0.4/0.7JG: 160	50					
	Hand SW	Ready > (2 sec) > X-ray										
Laser Imager Density	SMPTE	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%	0%
	Density											
Note *2 : The X-ray tube current differs according to the tube model.												
Remarks												

SONIALVISION G4 series Performance Check Sheet (3/3) ☐ Installation ☐ Relocation ☐ Maintenance (☐ 11th month ☐ Other)						Reporting Department _____ Report Date / /			
Destination Facility and Room Name				System Name					
				System No.					
Image Quality Confirmation (M517- E648 SONIALVISION G4 Image Quality Adjustment Manual)									
Contrast	Pixel value measurement t 9BCu phantom (w/ Cu 2mm)	Study name		☐ QC1 ☐ ()		☐ QC1 ☐ ()		☐ ☐ ()	
		Fluoroscopy mode		Pulse N					
		kV / mA		kV	mA		kV	mA	
				Measurement result		Measurement result			
		(1) 0.5t							
		(2) 1.0t							
		(3) 1.5t							
		(4) 2.0t							
		(5) 2.3t							
		(6) 2.5t							
		(7) 3.5t							
		(8) 3.6t							
		(9) 4.0t							
		Graininess	S/N measurement 9BCu phantom (w/ Cu 2mm)			Measurement result		Measurement result	
(1) 0.5t									
(2) 1.0t									
(3) 1.5t									
(4) 2.0t									
(5) 2.3t									
(6) 2.5t									
(7) 3.5t									
(8) 3.6t									
(9) 4.0t									
VQ measurement 9BCu phantom (w/ Cu 2mm)			Measurement result						
	VQ value								
Notes									
Remarks									

6.2 Consumable Parts List

To maintain system performance, some parts must be replaced periodically. These consumable parts are replaced by a Shimadzu service representative.

When replacing parts, use only the following regular parts.

Location	Part Name	Replacement Cycle
X-ray diagnostic table body	V-belt	3 years
	Micro switch	3 years
	Photo sensor	3 years
	Chain (for tilting)	7 years
	Chain joint link (for tilting)	7 years
	Chain (for raising/lowering the tabletop)	7 years
	Chain joint link (for raising/lowering the tabletop)	7 years
	Position detection unit	5 years
Control cabinet (for X-ray diagnostic table)	Battery (for AC servo encoder)	1 years
	Battery (for control PCB)	2 years
	Fuse	2 years
	Contactors	2 years
Digital radiography unit	Fan	2 years
	Fuse	2 years
	Battery	3 years
	Hard disk drive	4 years
	Uninterruptible Power Supply (UPS)	5 years
High-voltage generator	Fuse	2 years
	Battery	2 years
	Hand switch	2 years
Collimator	Lamp	1 year

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Chapter 7

Specifications

This chapter describes the specifications of SONIALVISION G4.

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7.1 Environmental Conditions of EMC (Electromagnetic Compatibility)

The equipment satisfies the EMC (Electromagnetic Compatibility) standard below:

IEC 60601-1-2:2007

 CAUTION	
	Pay attention to the electromagnetic circumstances at the installation site.
Instructions	The equipment may be affected by the electromagnetic environment at the installation site. Also, the installation of the equipment may affect other existing equipment.

■ Classification of EMI in Accordance with EN/IEC 60601-1-2:2007

Group 1, Class A

The system uses radio-frequency energy only for its internal function and is not intended to deliver energy to the patient. However, even a small amount of radio frequency energy leakage does harm to high sensitive equipment.

The system main power line in the clinical site should be connected to the domestic power sources which are separated from the public main network.

 CAUTION	
	For replacement parts of internal components, make sure to apply the cables supplied by Shimadzu.
Instructions	The use of non-cable devices, accessories, or cables other than those sold by Shimadzu as replacement parts for the internal components may result in increased emissions or decreased immunity of the equipment.

■ Performance to Be EMC Immunity Tested (Essential Performance)

Essential performances of this equipment are as followings:

- Securing the patient
- Positioning of X-ray irradiation field
- Settings of X-ray conditions
- X-ray exposure
- Patient information registration
- Image acquisition
- Image display

List of Cables

S: Shielded
U: Unshielded

No.	Cable Name	Cable Length (m)	Shield	Manufacturer
1	Power Cable 3 Phase	16	S	Shimadzu
2	Earth Cable	16	U	Shimadzu
3	ZS POWER CABLE	20	S	Shimadzu
4	Cable, UD-ZS	20	S	Shimadzu
5	Cable, HV	30	S	Shimadzu
6	Cable, HV 04-TYPE	30	S	Shimadzu
7	Cable, SPTX4	35	S	Shimadzu
8	ZS SERVO LV CABLE	20	S	Shimadzu
9	ZS SIGNAL CABLE	20	S	Shimadzu
10	ZS POW INV CABLE	20	S	Shimadzu
11	Earth Cable	40	U	Shimadzu
12	Cable, ZS-Remote	30	S	Shimadzu
13	Cable, ZS-Mini Local	20	S	Shimadzu
14	Earth Cable	32	U	Shimadzu
15	Power Cable	30	S	Shimadzu
16	Earth Cable	30	U	Shimadzu
17	Cable, UD-DR	20	S	Shimadzu
18	Cable, CAT6A SFTP	30	S	Shimadzu
19	Cable, DR-Remote	30	S	Shimadzu
20	Cable, CAT6A SFTP	30	S	Shimadzu
21	Cable, CAT6A SFTP	30	S	Shimadzu
22	Cable, CAT6A SFTP	30	S	Shimadzu
23	DVI PS Cable	30	S	Shimadzu
24	Cable, CAT6A	30	U	Shimadzu
25	Cable, CAT6A	30	U	Shimadzu
26	Power Cable	20	U	Shimadzu
27	Power Cable	30	U	Shimadzu
28	FAN Cable	40	S	Shimadzu
29	Power Cable	40	S	Shimadzu
30	Optical Cable	40	U	Shimadzu

7 Specifications

No.	Cable Name	Cable Length (m)	Shield	Manufacturer
31	Logger Cable	16	U	Shimadzu
32	Cable, CAT6A SFTP	30	S	Shimadzu
33	Cable, CAT6A SFTP	30	S	Shimadzu
34	Rolling Step Cable	20	S	Shimadzu
35	Speaker Cable	20	U	Shimadzu
36	Speaker Cable	20	U	Shimadzu
37	Microphone Cable	30	S	Shimadzu
38	Microphone Cable	30	S	Shimadzu
39	Earth Cable	30	U	Shimadzu
40	DVI Cable	2	S	Shimadzu
41	Cable, IBS	20	S	Shimadzu
42	Power Cable	2.5	U	Shimadzu
43	DVI Cable	2.5	S	Shimadzu
44	Power Cable	2.5	U	Shimadzu
45	DVI Cable	2.5	S	Shimadzu
46	Keyboard Cable	2	S	Shimadzu
47	Mouse Cable	2	S	Shimadzu
48	Card Reader Cable	1	S	Shimadzu
49	Barcode Reader Cable	2	S	Shimadzu
50	Keyboard Cable	2	S	Shimadzu
51	Mouse Cable	2	S	Shimadzu
52	Hand Switch Cable	4.5	U	Shimadzu
53	Foot Switch Cable	2	S	Shimadzu
54	Earth Cable	8	U	Shimadzu
55	ZS Foot Switch Cable	10	U	Shimadzu
56	ZS Foot Controller Cable	5	S	Shimadzu
57	Power Cable	20	U	Shimadzu
58	Earth Cable	20	U	Shimadzu
59	Power Cable	2.5	U	Shimadzu
60	Power Cable	2.5	U	Shimadzu
61	DVI Cable	5	S	Shimadzu
62	Power Cable	5	U	Shimadzu
63	DVI Cable	5	S	Shimadzu

7.1 Environmental Conditions of EMC (Electromagnetic Compatibility)

No.	Cable Name	Cable Length (m)	Shield	Manufacturer
64	Power Cable	5	U	Shimadzu
65	Cable,CAT6A	20	U	Shimadzu
66	Cable,CAT6A	20	U	Shimadzu
67	Power Cable	16	S	Shimadzu
68	Earth Cable	16	U	Shimadzu
69	Signal Cable	20	S	Shimadzu
70	Power Cable	10	S	Shimadzu
71	Arcnet Cable	10	S	Shimadzu
72	Signal Cable	32	S	Shimadzu
73	Earth Cable	32	U	Shimadzu
74	Signal Cable	20	S	Shimadzu
75	Power Cable	20	S	Shimadzu
76	Earth Cable	20	U	Shimadzu
77	LV Cable	32	S	Shimadzu
78	Cable, HV	32	S	Shimadzu
79	Cable, HV	32	S	Shimadzu
80	Signal Cable	20	S	Shimadzu
81	Earth Cable	20	U	Shimadzu
82	Cable, SPTX4	35	S	Shimadzu
83	Power Cable	10	S	Shimadzu
84	Hand Switch Cable	4.5	U	Shimadzu
85	Com Cable	20	S	Shimadzu



NOTE

The cables listed above are the parts specified to be compliant with the standards. These parts are not attached to the equipment.

List of Accessories

No.	Accessory Name	Manufacturer
1	Mini Local Console	Shimadzu
2	Large Local Console	Shimadzu
3	Remote Console Box	Shimadzu
4	ZS Foot Switch	Shimadzu
5	ZS Foot Controller	Shimadzu
6	Rolling Step	Shimadzu
7	Mat Sensor A	Shimadzu
8	Mat Sensor B	Shimadzu
9	Auto Transformer ZAT-1	Shimadzu
10	Monitor Cart	Shimadzu
11	In Room Monitor	Shimadzu
12	Barcode Reader	Shimadzu
13	Card Reader	Shimadzu
14	Side Station	Shimadzu
15	Side Station Monitor	Shimadzu
16	Uninterruptible Power Supply	Shimadzu
17	Uninterruptible Power Supply for Side Station	Shimadzu
18	GSC-2002L	Shimadzu
19	Auto Transformer XAT-2H	Shimadzu
20	Area Dosimeter (VACUDAP)	Shimadzu
21	Collimator C-leaf	Shimadzu
22	Collimator Single-mask	Shimadzu
23	Collimator Auto-filter	Shimadzu
24	Line Marker	Shimadzu
25	Microphone (Remote)	Shimadzu
26	Microphone (Patient)	Shimadzu
27	Microphone (Aux)	Shimadzu
28	Speaker (Remote)	Shimadzu
29	Speaker (Exam. Room)	Shimadzu
30	CH-200	Shimadzu
31	BK-120M	Shimadzu
32	Phototimer	Shimadzu



The accessories listed above are the parts specified to be compliant with the standards. These parts are not attached to the equipment.

Guidance and Manufacturer's Declaration - Electromagnetic Emissions

Guidance and manufacturer's declaration - electromagnetic emissions		
The SONIALVISION G4 is intended for use in the electromagnetic environment specified below. The customer or the user of the SONIALVISION G4 should assure that it is used in such an environment.		
Emissions test	Compliance	Electromagnetic environment - guidance
RF emissions EN 55011/ CISPR 11	Group 1	The SONIALVISION G4 uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions EN 55011/ CISPR 11	Class A	The SONIALVISION G4 is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions EN 61000-3-2/ IEC 61000-3-2	Not applicable	
Voltage fluctuations/ flicker emissions EN 61000-3-3/ IEC 61000-3-3	Not applicable	

Guidance and Manufacturer's Declaration - Electromagnetic Immunity

Guidance and manufacturer's declaration - electromagnetic immunity			
The SONIALVISION G4 is intended for use in the electromagnetic environment specified below. The customer or the user of the SONIALVISION G4 should assure that it is used in such an environment.			
Immunity test	EN/IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
Electrostatic discharge (ESD) EN 61000-4-2/ IEC 61000-4-2	± 6 kV contact ± 8 kV air	± 6 kV contact ± 8 kV air	Floors should be wood, concrete or ceramic tile. If the floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient / burst EN 61000-4-4/ IEC 61000-4-4	± 2 kV for power supply lines ± 1 kV for input/output lines	± 2 kV for power supply lines ± 1 kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge EN 61000-4-5/ IEC 61000-4-5	± 1 kV line(s) to line(s) ± 2 kV line(s) to earth	± 1 kV line(s) to line(s) ± 2 kV line(s) to earth	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines EN 61000-4-11/ IEC 61000-4-11	$<5\%U_T$ ($>95\%$ dip in U_T) for 0.5 cycle $40\%U_T$ (60% dip in U_T) for 5 cycles $70\%U_T$ (30% dip in U_T) for 25 cycles $<5\%U_T$ ($>95\%$ dip in U_T) for 5 sec	Not applicable $<5\%U_T$ ($>95\%$ dip in U_T) for 5 sec	Mains power quality should be that of a typical commercial or hospital environment. If the user of the SONIALVISION G4 requires continued operation during power mains interruptions, it is recommended that the SONIALVISION G4 be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field EN 61000-4-8/ IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE U_T is the a.c. mains voltage prior to application of the test level.			

Guidance and Manufacturer's Declaration - Electromagnetic Immunity

Guidance and manufacturer's declaration - electromagnetic immunity			
The SONIALVISION G4 is intended for use in the electromagnetic environment specified below. The customer or the user of the SONIALVISION G4 should assure that it is used in such an environment.			
Immunity test	EN/IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
Conducted RF EN 61000-4-6/ IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	3 Vrms 150 kHz to 1000 MHz	Portable and mobile RF communications equipment should be used no closer to any part of the SONIALVISION G4, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance $d = 1.2 \sqrt{P}$ Radiated RF EN 61000-4-3/ IEC 61000-4-3 $d = 1.2 \sqrt{P} \quad 80 \text{ MHz to } 800 \text{ MHz}$ $d = 2.3 \sqrt{P} \quad 800 \text{ MHz to } 2.5 \text{ GHz}$ where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey^{*1}, should be less than the compliance level in each frequency range^{*2}. Interference may occur in the vicinity of equipment marked with the following symbol: 
NOTE - At 80 MHz and 800 MHz, the higher frequency range applies. - These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people. *1: Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the SONIALVISION G4 is used exceeds the applicable RF compliance level above, the SONIALVISION G4 should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the SONIALVISION G4. *2: Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.			

List of the transmitters or equipment used as RF test sources and the frequency and modulation characteristics of each source

kind of equipment	type	manufacturer	Spot check frequencies	Modulation
Digital Transceiver	IC-DPR5	ICOM	351.2 MHz	FSK (frequency shift keying)
Cellular Telephone	812SH	Sharp	1980 MHz	PM (Phase modulation)
Wireless LAN Station	WHR-HP-G	BUFFALO	2412 MHz	OFDM (Orthogonal Frequency-Division Multiplexing)

 **WARNING**



When using the devices at frequencies other than the tested frequencies, be sure to check the electromagnetic influence.

Instructions

The equipment is tested for radiated RF immunity only at particular frequencies. Note that the test is not necessarily performed over the entire frequency range from 80 MHz to 2.5 GHz.

Recommended Separation Distances Between Portable and Mobile RF Communications Equipment and SONIALVISION G4

Recommended separation distances between portable and mobile RF communications equipment and the SONIALVISION G4			
The SONIALVISION G4 is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the SONIALVISION G4 can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the SONIALVISION G4 as recommended below, according to the maximum output power of the communications equipment.			
Rated maximum output power of transmitter (W)	Separation distance according to frequency of transmitter (m)		
	150 kHz to 80 MHz $d = 1.2\sqrt{P}$	80 MHz to 800 MHz $d = 1.2\sqrt{P}$	800 MHz to 2.5 GHz $d = 2.3\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23
NOTE For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer. - At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies. - These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			

7.2 Statement of Compliance [For Europe]

7.2.1 Regulatory Information

For Europe (with CE-MDD mark only)

The product complies with the requirements of the Medical Device Directive 93/42/EEC and RoHS Directive 2011/65/EU.

Product Name:	X-RAY TELEVISION SYSTEM
Model Name:	SONIALVISION G4
Parts Number:	503-78000 (MDD not RoHS) / 566-10000 (MDD and RoHS)
Manufacturer:	SHIMADZU CORPORATION Medical Systems Division
Address:	1, NISHINOKYO-KUWABARACHO, NAKAGYO-KU, KYOTO, 604-8511, JAPAN
Authorized Representative in EU:	SHIMADZU EUROPA GmbH
Address:	Albert-Hahn-Strasse 6-10, 47269 Duisburg, F.R. Germany

7.2.2 Company's Quality System

The company's Quality System is satisfied with Annex II, Article 3 for 93/42/EEC as amended by 2007/47/EC, which is certified by TUV Rheinland LGA Products GmbH; Tillystrasse 2, D-90431 Nurnberg, Germany (Notified under No. 0197) as Registration No.: HD 60029841 0001

7.2.3 International Standards

SONIALVISION G4 conforms to the following international standards.

- IEC 60601-1:2005 / EN 60601-1:2006
- IEC 60601-1-2:2007 / EN 60601-1-2:2007
- IEC 60601-1-3:2008 / EN 60601-1-3:2008
- IEC 60601-1-6:2010 / EN 60601-1-6:2010
- IEC 60601-2-54:2009 / EN 60601-2-54:2009

- ANSI /AAMI ES 60601-1:2005
- CAN / CSA-C22.2 No.60601-1:08
- CAN / CSA-C22.2 No.60601-1-3:09
- CAN / CSA-C22.2 No.60601-2-54:11

- IEC 62304:2006 / EN 62304:2006
- IEC 62366:2007 / EN 62366:2008
- ISO 10993-1:2009 / EN ISO 10993-1:2009
- ISO 14971:2007, Corrected version / EN ISO 14971:2012
- EN 980:2008
- EN 1041:2008

(For 566-10000 (RoHS) system only)

- EN 50581:2012

7.3 Statement of Compliance with Standards

X-RAY EQUIPMENT for RADIOGRAPHY and/or RADIOSCOPY SONIALVISION G4
IEC 60601-2-54:2009

7.4 Manufacturer Information

Manufacturer: SHIMADZU CORPORATION
Medical Systems Division

Address: 1, NISHINOKYO-KUWABARACHO,
NAKAGYO-KU, KYOTO, 604-8511, JAPAN

7.5 Specifications

The specifications of SONIALVISION G4 are given below.



The specification may be subject to change without notice responding to technological advances.

The given values are standard values. Actual values may vary.

7.5.1 X-Ray Diagnostic Table

Item			Description
Configuration of X-ray diagnostic table			Over table/tube system island type
Tabletop section	Tabletop		76.5×235 cm, flat
	Attenuation equivalent		0.8 mm Al eq.
	Allowable load weight		All motions: 204 kg (450 lb) * ¹
	Lateral	Range	25 cm
		Speed	Max. 5.0 cm/sec
	Tilting	Range	Trendelenburg position 90° to vertical position 90°
		Speed	Max. 6°/sec (continuously variable)* ² Soft start/soft stop
	Vertical	Range	Height with the tabletop in the horizontal position 47 to 110 cm
		Speed	Max. 3.6 cm/sec
Imaging unit	Longitudinal	Range	160.5 cm
		Speed	Max. 15 cm/sec Soft start/soft stop
	Distance from X-ray focus to FPD surface (SID)		110, 120, 150 cm
	Distance between irradiation field center and floor		Vertical: 59.5 to 220 cm Trendelenburg: 46.5 to 207 cm
	Angle	Range	Patient head side 40° to patient foot side 40°
		Speed	3°/sec
	X-ray tube rotation angle		Vertical: Counter-clockwise 90° Trendelenburg: Clockwise 90°
	Irradiation field adjusting means		Collimator
	Anti-scatter grid		Detachable

Item		Description	
Tomography / Tomosynthesis (optional)	Movement	Liner	
	Exposure range	FFD:110 cm Possible at any tilting angle +90° to -90°	
	Exposure angle	8°, 20°, 30°, 40°	
	Speed	Max. 2.5 sec./40°	
	Layer Height	0 mm to 250 mm on the tabletop	
Component	Tabletop mat	Attenuation equivalent	0.3 mm Al eq. ^{*3}
	Foot rest	Allowable load weight	227 kg
	Shoulder rests		227 kg
	Rotary foot rest (option)		227 kg
	Auxiliary tabletop (option)		30 kg
Compression unit	Compression force	Max. 80 N (approx. 8 kgf)	
	Compression cone shape	Either flat or extruded	
	Distance between compression cone head and tabletop surface	10 to 45 cm	
Installation	Space needed for installation	Recommended: W370×D350 cm or larger (Minimum: W350×D350 cm or larger)	
	Ceiling height for installation	Recommended: 290 cm or larger (Minimum: 260 cm or larger)	
	Control cabinet dimensions	W70×H190×D50 cm	
	Control cabinet mass	Approx. 230 kg	
	X-ray diagnostic table dimensions	See "8.5 Dimensions" P.8-12	
	X-ray diagnostic table operation/maintenance mass	Approx. 1560 kg	

*1: When the withstand load 500 lb option is combined: 227 kg (500 lb) for all motions; 318 kg (700 lb) in the tabletop horizontal / stop position

*2: When the withstand load 500 lb option is combined: Max. 5.3° /sec

*3: If a tabletop mat other than the SHIMADZU certified parts is used, the attenuation equivalent may be affected.

7.5.2 High-Voltage Generator

■ D150BC-40S Specifications

Item			Description
Radiography technique			General radiography, Bucky radiography, Auto-changer radiography, Diagnostic fluoroscopy, Digital radiography
Number of connectable X-ray tubes			2 tubes
Setting range *1 *2 *3 *4 *5	Radiography	Tube voltage	40 to 150 kV
		Tube current	10 to 1000 mA
			Any 12 of the following positions permitted by the X-ray tube can be used for each focus. 1000, 900, 800, 710, 630, 560, 500, 450, 400, 360, 320, 280, 250, 220, 200, 180, 160, 140, 125, 110, 100, 90, 80, 71, 63, 56, 50, 45, 40, 36, 32, 28, 25, 22, 20, 18, 16, 14, 12, 11, 10 mA
		mAs	0.5 to 800 mAs
			Set from the following 65 positions. 500 mAs is the upper limit for AEC radiography. 0.50, 0.56, 0.63, 0.71, 0.80, 0.90, 1.0, 1.1, 1.25, 1.4, 1.6, 1.8, 2.0, 2.2, 2.5, 2.8, 3.2, 3.6, 4.0, 4.5, 5.0, 5.6, 6.3, 7.1, 8.0, 9.0, 10, 11, 12.5, 14, 16, 18, 20, 22, 25, 28, 32, 36, 40, 45, 50, 56, 63, 71, 80, 90, 100, 110, 125, 140, 160, 180, 200, 220, 250, 280, 320, 360, 400, 450, 500, 560, 630, 710, 800 mAs
		Time	0.001 to 10 sec
	Set from the following 81 positions. A value below 0.5 or above 800 mAs cannot be set. 500 mAs is the upper limit for AEC radiography. 1.0, 1.1, 1.2, 1.4, 1.6, 1.8, 2.0, 2.2, 2.5, 2.8, 3.2, 3.6, 4.0, 4.5, 5.0, 5.6, 6.3, 7.1, 8.0, 9.0, 10, 11, 12, 14, 16, 18, 20, 22, 25, 28, 32, 36, 40, 45, 50, 56, 63, 71, 80, 90, 100, 110, 125, 140, 160, 180, 200, 220, 250, 280, 320, 360, 400, 450, 500, 560, 630, 710, 800, 900 ms, 1.0, 1.1, 1.2, 1.4, 1.6, 1.8, 2.0, 2.2, 2.5, 2.8, 3.2, 3.6, 4.0, 4.5, 5.0, 5.6, 6.3, 7.1, 8.0, 9.0, 10 sec		
	Fluoroscopy	Tube voltage	50 to 125 kV
		Tube current	0.3 to 20 mA
		Time	Total time display: 99 min 59 sec., continuous fluoroscopy time: 10 min
Nominal supply voltage (50/60 Hz)		400 V line	3-phase AC: 380/400/415/440/480 V
		200 V line	3-phase AC: 200/220/240 V
Recommended switchboard transformer capacity			75 kVA

Item		Description
Nominal Electric Power		80 kW (100 kV, 800 mA, 0.1 sec)
Short-time rating*2		150 kV 500 mA, 125 kV 630 mA, 100 kV 800 mA, 80 kV 1000 mA
Nominal X-ray tube voltage and max. tube current that can flow at nominal X-ray tube voltage*2		Short-time rating: 150 kV 500 mA Long-time rating: 125 kV 12 mA
Max. tube current and max. tube voltage to achieve max. tube current*2		Short-time rating: 80 kV 1000 mA Long-time rating: 75 kV 20 mA
Tube voltage and tube current combination for max. electrical output*2		Short-time rating: 80 kV 1000 mA, 100 kV 800 mA Long-time rating: 75 kV 20 mA, 125 kV 12 mA
Min. tube current time product		0.5 mAs
Long-time rating*2		75 kV 20 mA, 125 kV 12 mA
Nominal min. exposure time (AEC radiography)		3 ms
Dimensions	Control cabinet	W700×H1900×D500 mm
	Control panel (option)	W308×H345×D82 mm
Mass	Control cabinet	Approx. 300 kg
	Control panel (option)	2.5 kg

*1: The setting range differs according to the type of X-ray tube unit.

*2: Restrictions apply depending on the type of X-ray tube unit.

*3: Accuracy of each condition is given below (confirm to IEC standards).

Tube voltage (within ±10 %), tube current (within ±20 %)
mAs: within ±(10 %+0.2 mAs), time: within ±(10 %+1 ms)

*4: X-ray output stability is given below.

Variation coefficient: 0.005 or less

*5: The X-ray output stability with neighboring setting values satisfies the following formula.

$$\left| \frac{\bar{K}_1}{I_1 t_1} - \frac{\bar{K}_2}{I_2 t_2} \right| \leq 0.2 \frac{\frac{\bar{K}_1}{I_1 t_1} + \frac{\bar{K}_2}{I_2 t_2}}{2}$$

Where

$\bar{K}_1, \bar{K}_2$: Mean value of measured X-ray output values obtained using neighboring setting values

I_1, I_2 : Neighboring tube current setting values

t_1, t_2 : Neighboring radiography time setting values

Load condition when combined with the X-ray tube unit

Item	X-ray Tube Unit		
	0.7/1.2JG326D -265	0.4/0.7JG326D -265	0.6/1.2P324DK -125
Nominal X-ray tube voltage and max. tube current that can flow at nominal X-ray tube voltage	125 kV, 7.6 mA	125 kV, 7.6 mA	125 kV, 2.4 mA
	150 kV, 500 mA	150 kV, 360 mA	150 kV, 500 mA
Max. tube current and max. tube voltage to achieve max. tube current	80 kV, 11.8 mA	80 kV, 11.8 mA	125 kV, 2.4 mA
	100 kV, 800 mA	112 kV, 500 mA	100 kV, 800 mA
Tube voltage and tube current combination for max. electrical output	125 kV, 7.6 mA	125 kV, 7.6 mA	125 kV, 2.4 mA
	100 kV, 800 mA	112 kV, 500 mA 140 kV, 400 mA	100 kV, 800 mA
Nominal electric power	80 kW (100 kV, 800 mA, 0.1 sec)	50 kW (100 kV, 500 mA, 0.1 sec)	80 kW (100 kV, 800 mA, 0.1 sec)

Upper: Long-time rating

Lower: Short-time rating

D150VC-40S Specifications (Not Sold in the US)

Item			Description
Radiography technique			General radiography, Bucky radiography, Auto-changer radiography, Diagnostic fluoroscopy, Digital radiography
Number of connectable X-ray tubes			2 tubes
Setting range *1 *2 *3 *4 *5	Radiography	Tube voltage	40 to 150 kV
		Tube current	10 to 800 mA
			Any 12 of the following positions permitted by the X-ray tube can be used for each focus: 800,710,630, 560, 500, 450, 400, 360, 320, 280, 250, 220, 200, 180, 160, 140, 125, 110, 100, 90, 80, 71, 63, 56, 50, 45, 40, 36, 32, 28, 25, 22, 20, 18, 16, 14, 12, 11, 10 mA
		mAs	0.5 to 800 mAs
			Set from the following 65 positions. (500 mAs upper limit for AEC radiography.) 0.50, 0.56, 0.63, 0.71, 0.80, 0.90, 1.0, 1.1, 1.25, 1.4, 1.6, 1.8, 2.0, 2.2, 2.5, 2.8, 3.2, 3.6, 4.0, 4.5, 5.0, 5.6, 6.3, 7.1, 8.0, 9.0, 10, 11, 12.5, 14, 16, 18, 20, 22, 25, 28, 32, 36, 40, 45, 50, 56, 63, 71, 80, 90, 100, 110, 125, 140, 160, 180, 200, 220, 250, 280, 320, 360, 400, 450, 500, 560, 630, 710, 800 mAs
		Time	0.001 to 10 sec
	Set from the following 81 positions. (Cannot be set with an mAs value below 0.5 or above 800 mAs. 500 mAs upper limit for AEC radiography.) 1.0, 1.1, 1.2, 1.4, 1.6, 1.8, 2.0, 2.2, 2.5, 2.8, 3.2, 3.6, 4.0, 4.5, 5.0, 5.6, 6.3, 7.1, 8.0, 9.0, 10, 11, 12, 14, 16, 18, 20, 22, 25, 28, 32, 36, 40, 45, 50, 56, 63, 71, 80, 90, 100, 110, 120, 140, 160, 180, 200, 220, 250, 280, 320, 360, 400, 450, 500, 560, 630, 710, 800, 900 ms, 1.0, 1.1, 1.2, 1.4, 1.6, 1.8, 2.0, 2.2, 2.5, 2.8, 3.2, 3.6, 4.0, 4.5, 5.0, 5.6, 6.3, 7.1, 8.0, 9.0, 10 sec		
	Fluoroscopy	Tube voltage	50 to 125 kV
		Tube current	0.3 to 20 mA
		Time	Total Time Display 99 min 59 sec, continuous fluoroscopy time 10 min.
Nominal supply voltage (50/60 Hz)			200/220/240/380/400/415/440/480 VAC, 3-phase
			200/220/240 VAC, single-phase
Recommended switchboard transformer capacity			75 kVA
Nominal Electric Power			65 kW (103 kV, 630 mA, 0.1 sec)
Short-time rating*2			150 kV 400 mA, 125 kV 500 mA, 100 kV 630 mA, 80 kV 800 mA

7 Specifications

Item		Description
Nominal max. tube voltage and max. tube current that can flow at nominal max. tube voltage*2		Short-time rating: 150 kV 400 mA Long-time rating: 125 kV 12 mA
Max. tube current and max. tube voltage to achieve max. tube current*2		Short-time rating: 81 kV 800 mA Long-time rating: 75 kV 20 mA
Tube voltage and tube current combination for max. electrical output*2		Short-time rating: 130 kV 500 mA Long-time rating: 75 kV 20 mA, 125 kV 12 mA
Min. tube current time product		0.5 mAs
Nominal min. exposure time (AEC radiography)		3 ms
Long-time rating*2		75 kV 20 mA, 125 kV 12 mA
Dimensions	Control cabinet	W700×H1805×D400 mm
	Control panel (option)	W308×H345×D82 mm
Mass	Control cabinet	Approx. 300 kg
	Control panel (option)	2.5 kg

*1: The setting range differs according to the type of X-ray tube unit.

*2: Restrictions apply depending on the type of X-ray tube unit.

*3: Accuracy of each condition is given below (confirm to IEC standards).

Tube voltage (within ±10 %), tube current (within ±20 %)
mAs: within ±(10 %+0.2 mAs), time: within ±(10 %+1 ms)

*4: X-ray output stability is given below.

Variation coefficient: 0.005 or less

*5: The X-ray output stability with neighboring setting values satisfies the following formula.

$$\left| \frac{\bar{K}_1}{I_1 t_1} - \frac{\bar{K}_2}{I_2 t_2} \right| \leq 0.2 \frac{\frac{\bar{K}_1}{I_1 t_1} + \frac{\bar{K}_2}{I_2 t_2}}{2}$$

Where

$\bar{K}_1, \bar{K}_2$: Mean value of measured X-ray output values obtained using neighboring setting values

I_1, I_2 : Neighboring tube current setting values

t_1, t_2 : Neighboring radiography time setting values

Load condition when combined with the X-ray tube unit

Item	X-ray Tube Unit		
	0.7/1.2JG326D -265	0.4/0.7JG326D -265	0.6/1.2P324DK -125
Nominal X-ray tube voltage and max. tube current that can flow at nominal X-ray tube voltage	125 kV, 7.6 mA	125 kV, 7.6 mA	125 kV, 2.4 mA
	150 kV, 400 mA	150 kV, 360 mA	150 kV, 400 mA
Max. tube current and max. tube voltage to achieve max. tube current	80 kV, 11.8 mA	80 kV, 11.8 mA	125 kV, 2.4 mA
	81 kV, 800 mA	112 kV, 500 mA	81 kV, 800 mA
Tube voltage and tube current combination for max. electrical output	125 kV, 7.6 mA	125 kV, 7.6 mA	125 kV, 2.4 mA
	130 kV, 500 mA	112 kV, 500 mA 140 kV, 400 mA	130 kV, 500 mA
Nominal electric power	65 kW (103 kV, 630 mA, 0.1 sec)	45 kW (100 kV, 450 mA, 0.1 sec)	65 kW (103 kV, 630 mA, 0.1 sec)

Upper: Long-time rating

Lower: Short-time rating

7.5.3 Collimator

Item			Description
Max. voltage used for applicable X-ray tube			150 kV
Irradiation field (SID 110 cm)	Without C-leaves and independent H mask (option)		Max. rectangular irradiation field: 523×523 mm Min. rectangular irradiation field: 0×0 mm
	With C-leaves and independent H mask (option)		Max. rectangular irradiation field: 495×495 mm Min. rectangular irradiation field: 0×0 mm (Independent H mask can block a half of irradiation field, either on the right or on the left of the horizontal center of X-ray irradiation.) Min. polygonal irradiation field: φ118 mm (Diameter of circle inscribed in C-leaves)
Lighting field	Average illumination		160 lx or more (when SID is 100 cm)
	Illumination duration		Continuously for 30 seconds (automatically turns off)
	Lamp model		JM 12V 106W 5H
	Adjustment mechanism		Provided
	Discrepancy between lighting field and actual irradiation field		Within 2 % of the SID (adjusted on shipment from the factory)
Filtration	Inherent filtration		1.1 mm Al (70 kV HVL 2.5 mm Al). ^{*1}
	Rotary type BH filter	Filter #1	-
		Filter #2	Cu 0.1 mm
		Filter #3	Cu 0.2 mm
		Filter #4	Cu 0.3 mm
Pb equivalency of shielding leaves	H-leaves and V-leaves		3 mm Pb (middle leaf: 2 mm Pb)
	Independent H mask (option)		3 mm Pb
	C-leaves (option)		2 mm Pb
Leaf driving method			Stepping motor drive
Distance between the focus and fitting face			60 mm
External dimensions			W231×H259×D317 mm
Mass			Approx. 10 kg
Power supply (supplied from high-voltage generator)			24 VDC, 240 VA

*1: Total filtration when combined with the X-ray tube unit is 2.6 mm Al eq.

7.5.4 Digital Radiography (DR) Unit

Item		Description
Hardware	CPU	Operating frequency of 3.0 GHz or more (or equivalent)
	Memory	2 GB or more
	OS	Microsoft Windows 7 or later
	Operation	Mouse and keyboard
	Hard disk drive capacity	500 GB or more
	Number of storable images	10000 (at 1024×1024)
Image input	Flat panel sensor	17×17 inch
	Matrix	Up to 3032×3032 pixel
	Pixel size	139 μm
	Density resolution	16 bits/65536 graduation
Image output	Display monitor	LCD monitor
	Display matrix	1024×1024 (image area)
	Display graduation	256
External output	Video output	NTSC/PAL
Fluoroscopy	Pulsed fluoroscopy	Rate: 30/15/7.5/3.75 fps
	Map Fluoroscopy (with DSA radiography option)	Superimposes fluoroscopy images on a blood-vessel image acquired in previous fluoroscopy.
	Store fluoroscopy	Direct record: Records an image being provided through current fluoroscopy directly on hard disk drive. L.I.H. record: records one frame of the last fluoroscopic image-hold images. Loop record: Records in memory the last 1000 fluoroscopic frame images (also storable in hard disk drive).
	Virtual collimation	Enables to configure irradiation field by displaying the collimator position onto fluoroscopic L.I.H. image.

Item		Description
Radiography	SPOT radiography	Single shot (Original/Normal mode) 17" field : 3032×3032 / 1512×1512 15" field : 2700×2700 / 1350×1350 12" field : 2052×2052 / 1026×1026 9" field : 1620×1620 / 810×810 6" field : 1080×1080 / 540×540
	Subdivisional Acquisition (SDA)	2 × 1/1 × 2/2 × 2 By-block radiography (serial shots possible)
	SERIAL radiography	Up to 15 frames/sec SERIAL radiography (Original/Normal/Normal (HS) mode) 17" field : 3032×3032 / 1512×1512 / 1512×1512 15" field : 2700×2700 / 1350×1350 / 1350×1350 12" field : 2052×2052 / 1026×1026 / 1026×1026 9" field : 1620×1620 / 810×810 / 810×810 6" field : 1080×1080 / 540×540 / 540×540 Injector control available
	DSA radiography (optional)	Up to 7.5 frames/sec SERIAL radiography and real-time subtraction processing Injector control available
	RSM-DSA radiography (with DSA radiography option)	Performs subtraction processing in the frequency domain of the image. Injector control available
	SLOT radiography (optional)	Connect sequential images acquired along body axis to create a long image.
	Tomography	Digital Tomography by working with X-ray diagnostic table
	Tomosynthesis (option)	Digital Tomosynthesis by working with X-ray diagnostic table and the image reconstruction at the arbitrary layer height.
	Program Sequence	5 phases maximum and pause phase available

Item		Description
Image processing	SUREngine-Advance	Contrast and graininess are improved with a special image processing engine.
	Graduation processing	Density/contrast adjustment, black/white reversal, auto optimization processing (AWC)
	Gamma processing	Selection from up to 10 types of graduation conversion curve
	Reversal processing	Horizontal or Vertical reversal
	Noise filter processing	Recursive processing
	Edge processing	Template filter processing
	Magnification processing	Fourfold magnification
	Multi-display	2×2 or 4×4 multi-display
	Annotation	Overlays text and pointer on images.
	Re-masking processing (with DSA radiography option)	Performs subtraction processing for specified mask image.
	Re-registration processing (with DSA radiography option)	Performs subtraction processing for mask image with overlay position shifted.
	Digital-RSM processing (with DSA radiography option)	Performs subtraction processing in the frequency domain
	Stacking processing (with DSA radiography option)	Holds the display of the peak pixel value of multiple frames.
	Landmarking processing (with DSA radiography option)	Displays a live image where a weighted mask image is added to a subtracted image.
	SLOT reconstruction image (with SLOT radiography option)	Create a long image by combining images acquired in the SLOT acquisition.
	Tomosynthesis reconstruction image (with Tomosynthesis option)	Create a Tomosynthesis reconstruction image using images acquired in the Tomosynthesis acquisition.
	Iteration Reconstruction (with Tomosynthesis option)	Create a Tomosynthesis reconstruction image in the iteration method using images acquired in the Tomosynthesis acquisition.
Measurement processing	Distant measurement	Measures distance on image.
	Angle measurement	Measures angle on image.

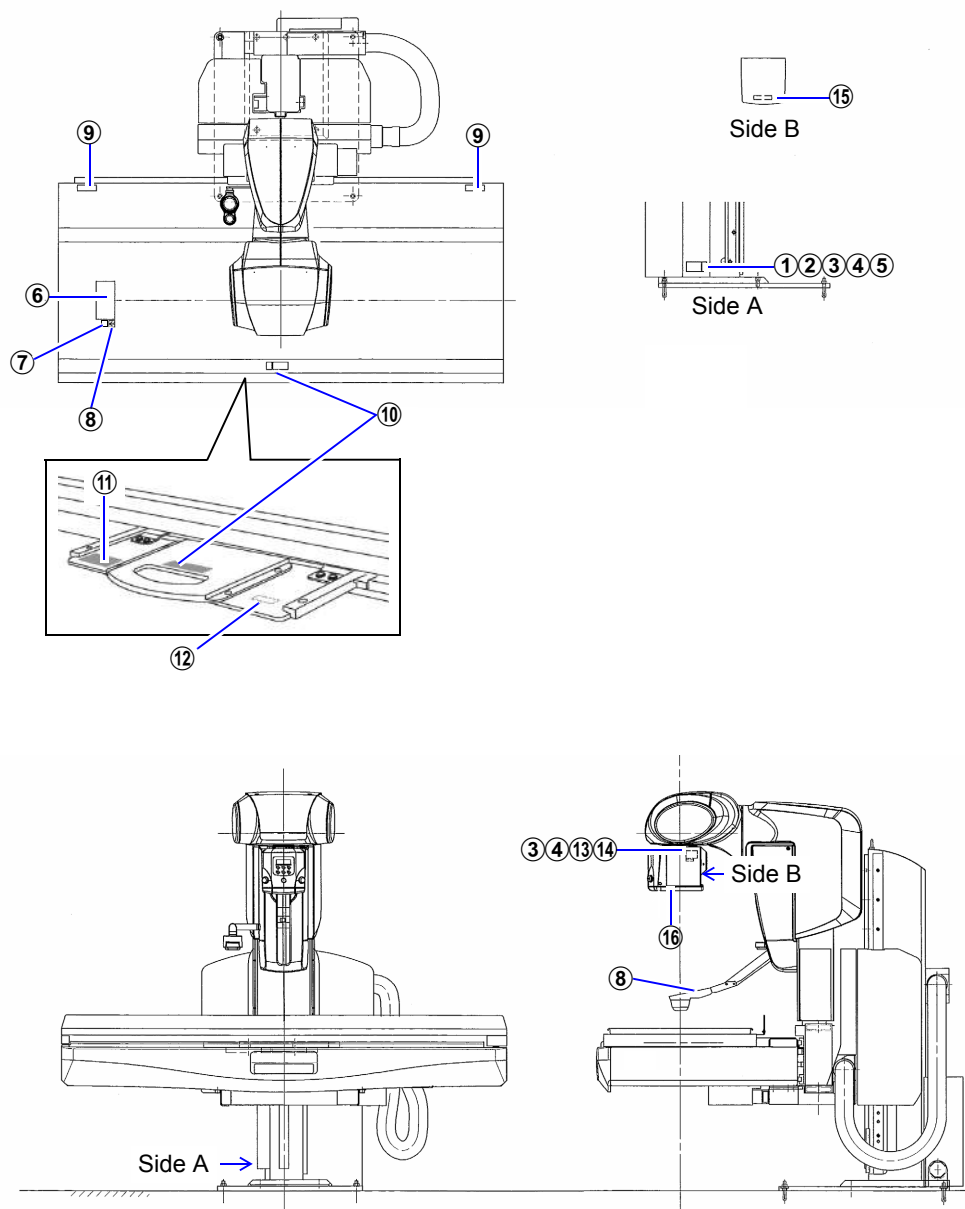
7 Specifications

Item		Description
DICOM communication	LI output	DICOM Print support
	Network transmission (optional)	DICOM Storage support Modality: RF/XA/CR/DX
	Media output	CD-R, DVD-R (DICOM format)
	MWM (optional)	Receives examination information from server.
	MPPS (optional)	Transmits examination information to server.
	RDSR (option)	Transmits radiation dose information in the report format to server.
	Bar code reader (optional)	Inputs patient information from bar code reader and performs search with MWM (option).
Maintenance	Remote maintenance	Provides remote system maintenance work (communication link equipment is required separately).
Dimension	Control cabinet	W700×H1900×D500 mm
	Operation cabinet	W160×H575×D470 mm
Mass	Control cabinet	320 kg
	Operation cabinet	35 kg
Rated power supply voltage		Single phase 200/220/230/240 V, 50/60 Hz, 7.0 kVA

7.6 Labels

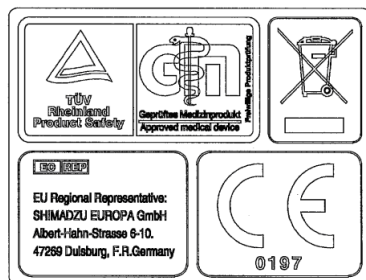
The labels used with SONIALVISION G4 are shown below.

7.6.1 X-ray Diagnostic Table

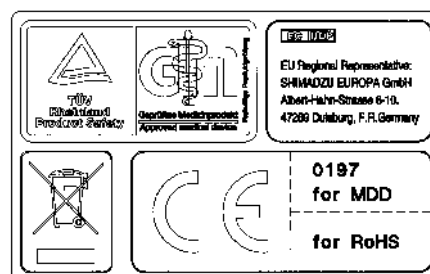




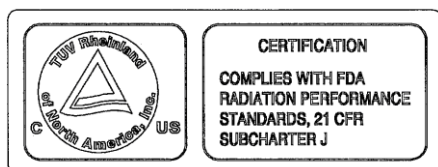
③ (for EU only) (alternative)
(Not RoHS)



(RoHS)



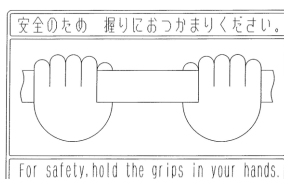
④ (for USA only)



⑤



⑥



⑦



⑧



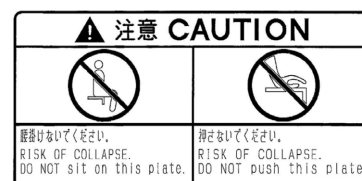
⑨



⑩



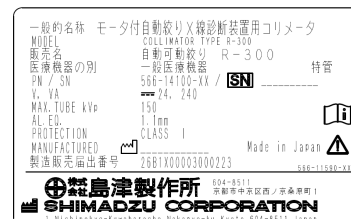
⑪



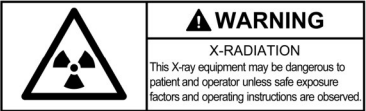
⑫



⑬



⑭

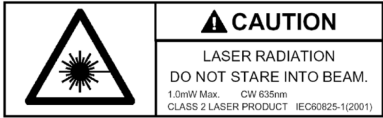


⑮



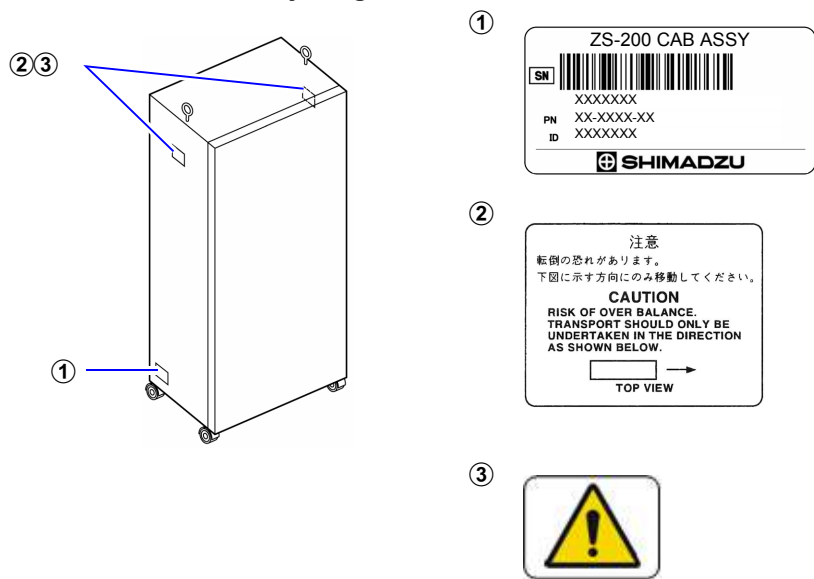
⑯

(Option)

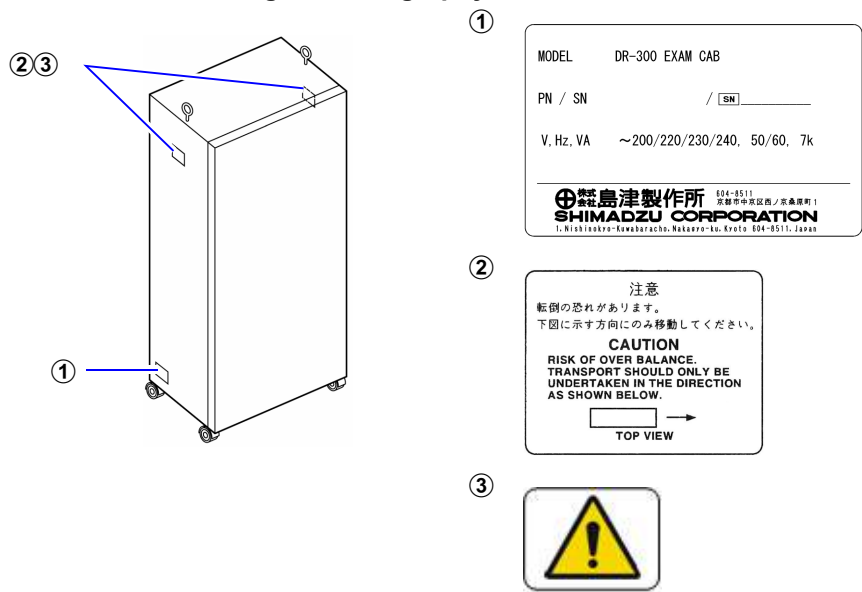


7.6.2 Control Cabinet

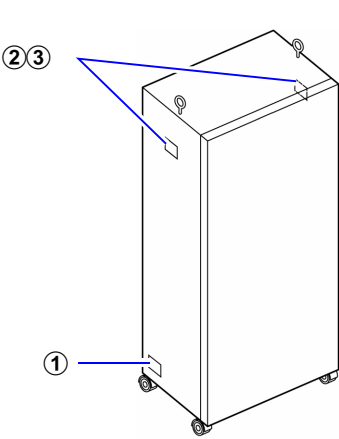
Control Cabinet for X-ray Diagnostic Table



Control Cabinet for Digital Radiography Unit



Control Cabinet for High-Voltage Generator



① (D150BC-40S)

MODEL	D150BC-40S	
PN / SN	/ SN	
V. HZ. VA	3 ~ 200/220/240/380/400/415/440/480, 50/60, 133k	
RATED	125kV, 12mA CONTINUOUS	
	75kV, 20mA	
	150kV, 500mA INSTANT	
	80kV, 1000mA	
SHIMADZU CORPORATION 604-8511 1, Nishinokyo-Ku, Kyoto 604-8511, JAPAN		

(D150VC-40S)

MODEL	D150VC-40S	
PN / SN	/ SN	
V. HZ. VA	3 ~ 200/220/240/380/400/415/440/480, 50/60, 133k	
RATED	125kV, 12mA CONTINUOUS	
	75kV, 20mA	
	150kV, 400mA INSTANT	
	80kV, 800mA	
SHIMADZU CORPORATION 604-8511 1, Nishinokyo-Ku, Kyoto 604-8511, JAPAN		

②

注意
転倒の恐れがあります。
下図に示す方向にのみ移動してください。

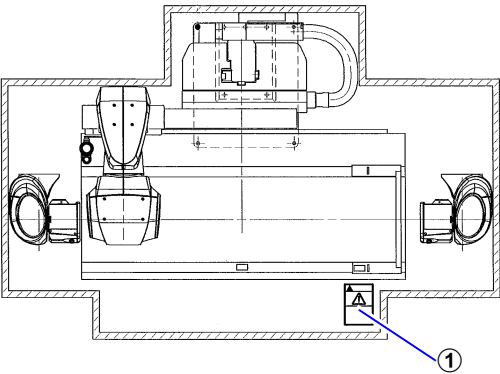
CAUTION
RISK OF OVER BALANCE.
TRANSPORT SHOULD ONLY BE
UNDERTAKEN IN THE DIRECTION
AS SHOWN BELOW.

TOP VIEW

③



7.6.3 Operating Range



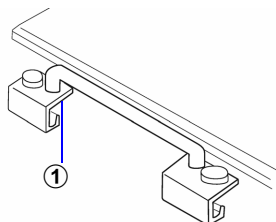
①

注意
CAUTION

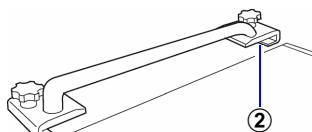
テープで仕切られた装置動作範囲に、
ものなどを置かないで下さい。
また、装置動作範囲に立入る場合は装置の
動きに十分注意をして下さい。
Don't put anything within the
operating range, which is marked
by tape. If you get into the
operating range by necessity pay
rigid attention to the motion
of the table.

7.6.4 X-ray Diagnostic Table Accessories

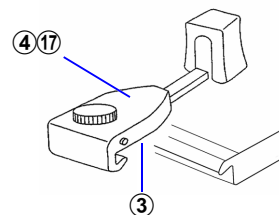
Grip bar



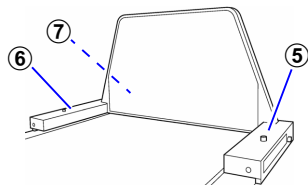
Upper grip bar



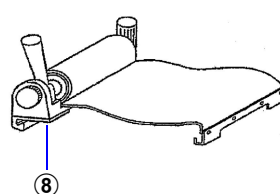
Shoulder rests



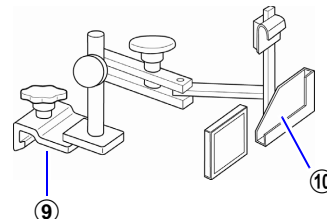
Foot rest



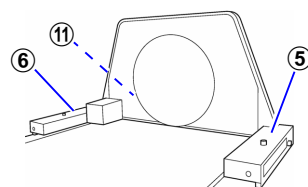
Compression band*¹



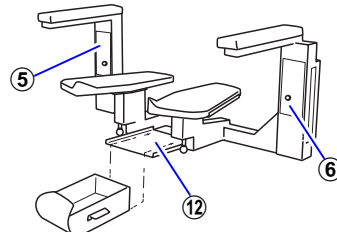
Lateral cassette holder*¹



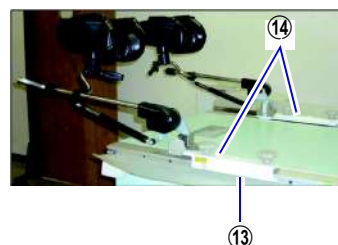
Rotary step*¹



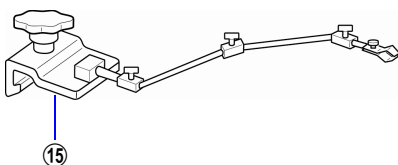
Voiding cystographic chair*¹



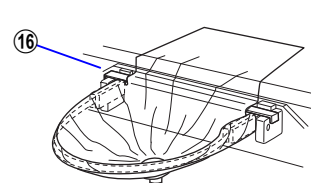
Leg support*¹



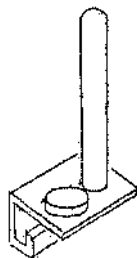
Endoscope support*¹



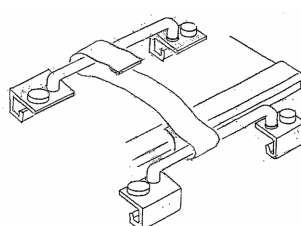
Drain bag*¹



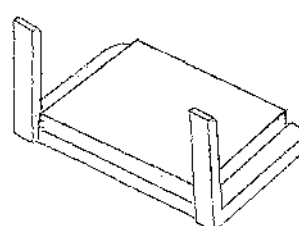
Hand Grip Bar (E)*¹



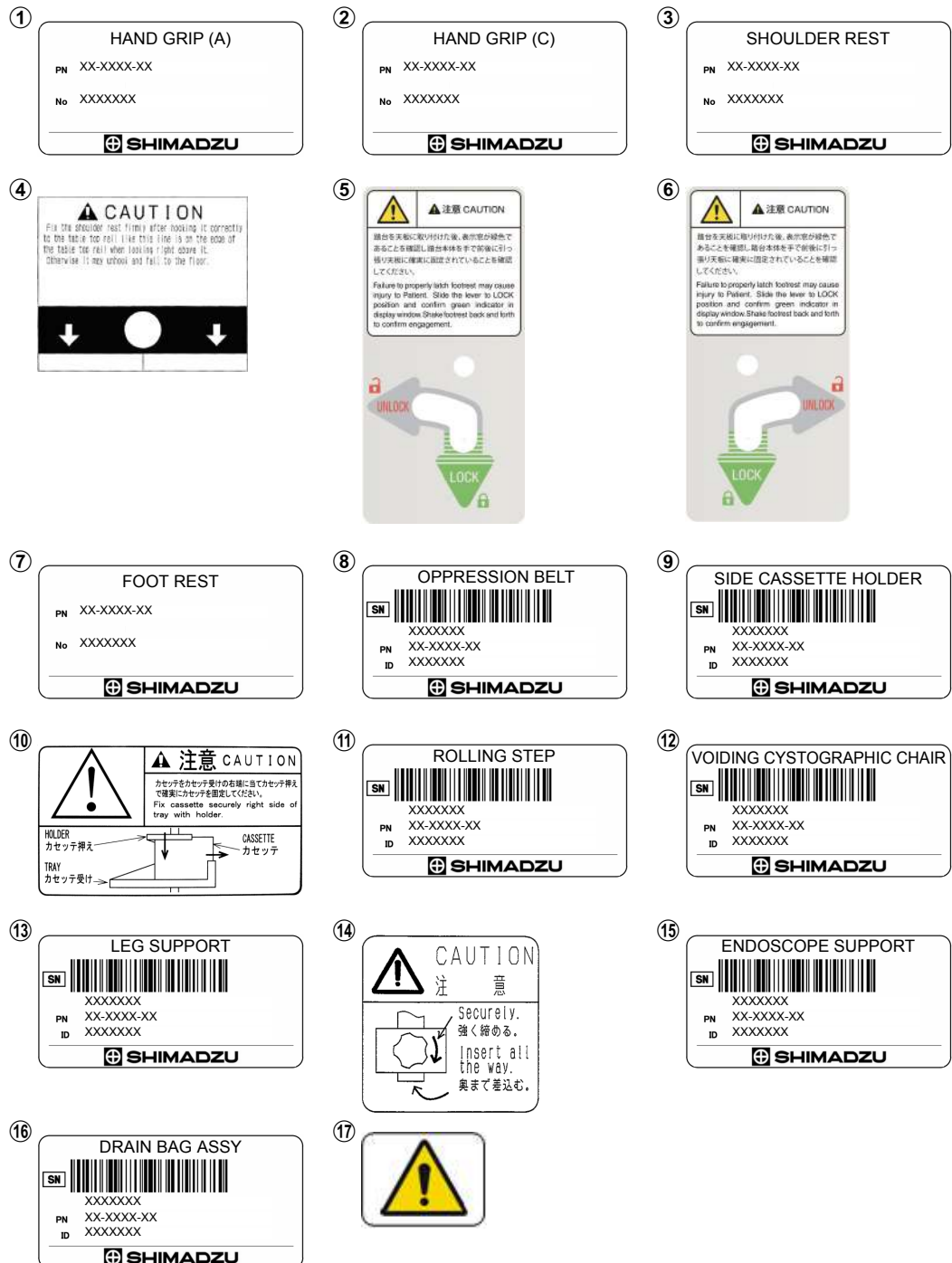
Fixing Belt*¹



Exclusive Footrest*¹

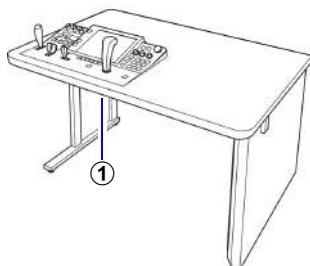


*1: Optional

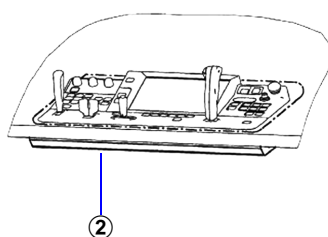


7.6.5 Accessories

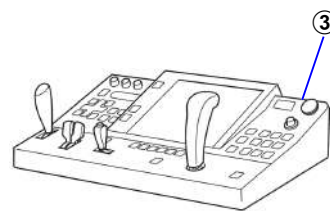
Remote console (Type A)*¹



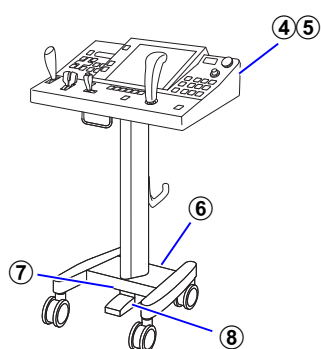
Remote console (Type B)*¹



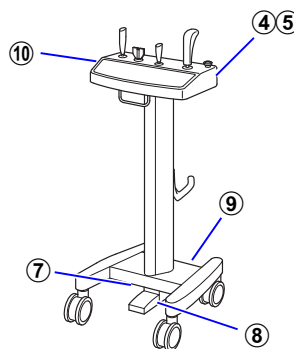
Remote console (Type C)*¹



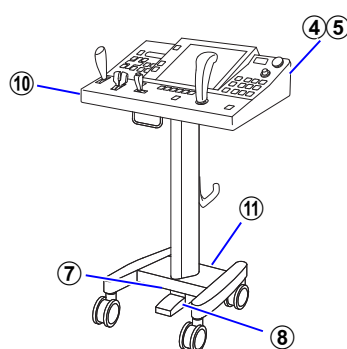
Remote console (Type D)*¹



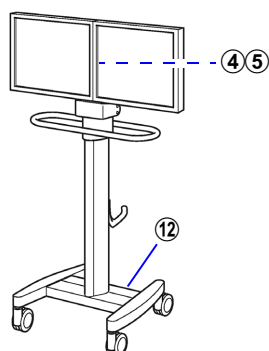
Local console (Type A)*²



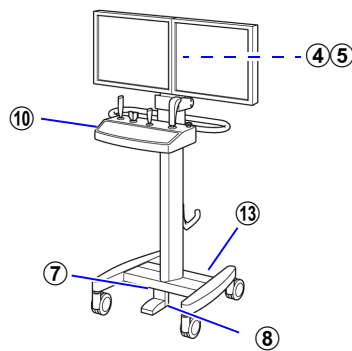
Local console (Type B)*²



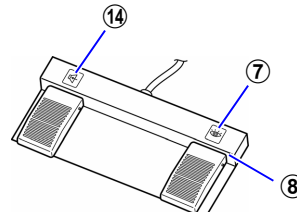
Monitor cart (Type A)*²



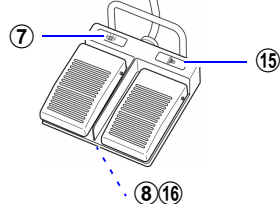
Monitor cart (Type B)*²



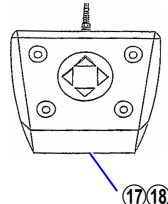
Foot switch (Remote console)*²



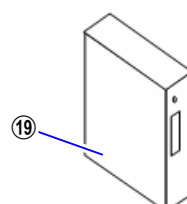
Foot switch (Examination room)*²



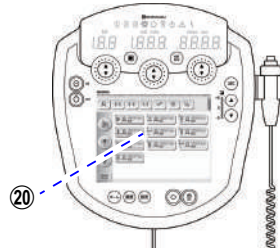
Foot controller*²



Operation cabinet

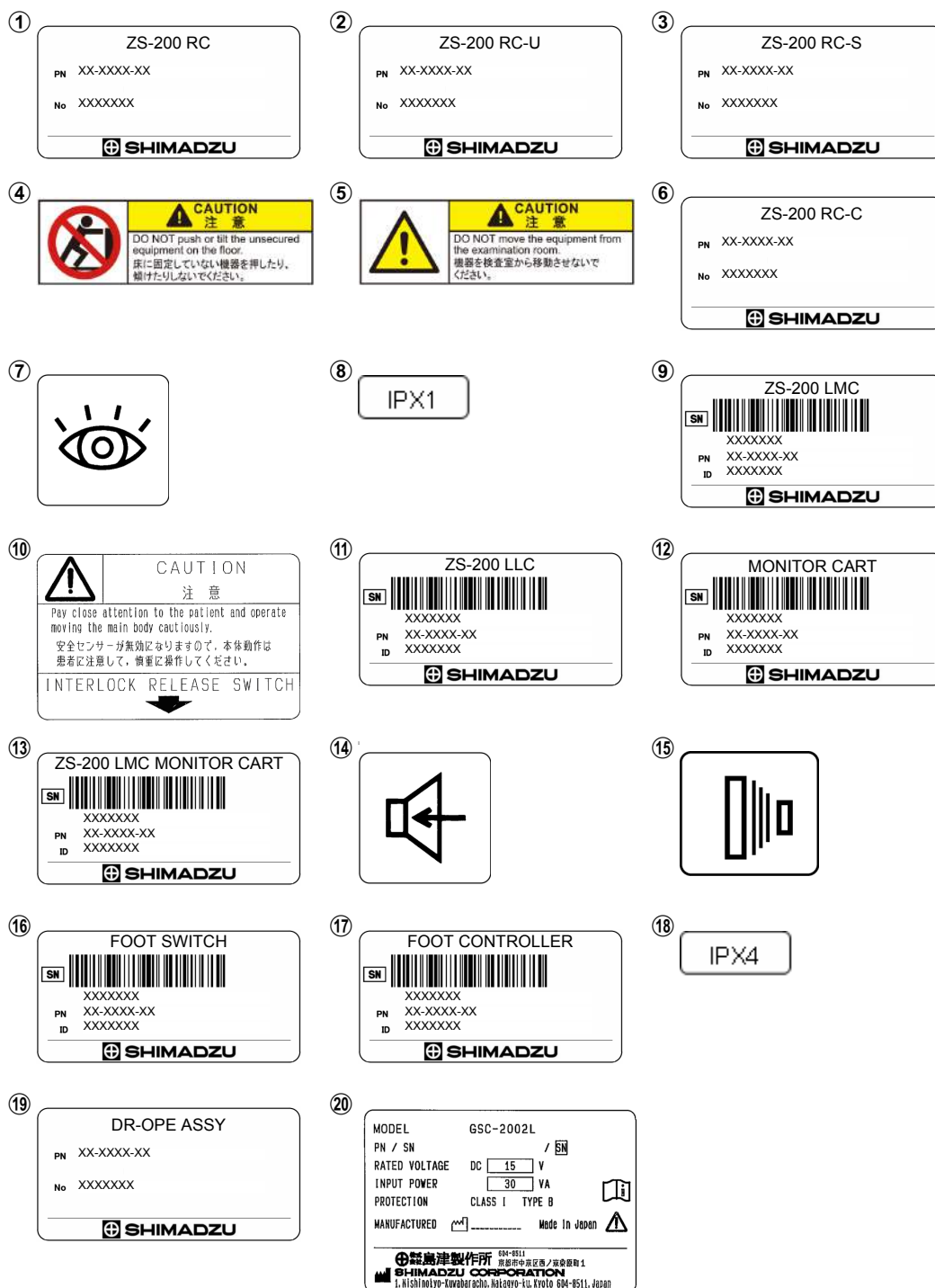


General console*²



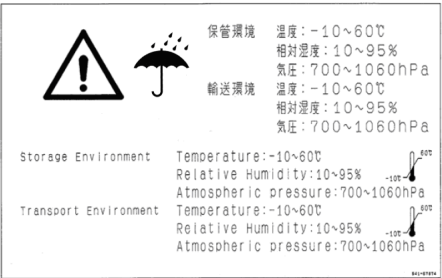
*1: One of types A to D can be selected.

*2: Optional



■ Package for transport

The following shows the label on the package for transportation, describing about storage environment and transport environment.



Symbol	Location	Meaning
	Package	Keep away from rain in during transport.

Chapter 8

Appendix

■ Contents

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8.1 Information on Radiation

8.1.1 Radiation Protection

To minimize X-ray exposure on patients and medical staff, the operator must observe the local laws and regulations specified in each region, as well as the following precautions. It is also highly recommended to study and know about the recommendations of the International Commission on Radiological Protection (ICRP).

■ Principle

- Limit X-ray irradiation to the minimum.
- Keep the fluoroscopy duration to the minimum and utilize the L.I.H. feature and the virtual collimator.
- Use the fluoroscopy mode with low radiation dose.
- To avoid unintended X-ray irradiation, turn OFF the X-ray irradiation clearance button when unnecessary.

■ For Radiation Protection of Patients

- If there is any possibility that the regions easily affected by radiation (eye balls, gonad, etc.) are irradiated by X-ray, be sure to protect those regions.
- Adjust X-ray irradiation field appropriately to avoid X-ray irradiation to the area other than the region of interest.
- Keep the focus-skin distance as long as possible.
- Always check the cumulative dose area product and the cumulative reference Air Kerma displayed in the acquisition monitor.

**NOTE**

The uncertainty of the displayed dose value is 35 %.

Periodical calibration is required for the dose area product meter chamber and the dose calculating function.

■ For Radiation Protection of Medical Staff

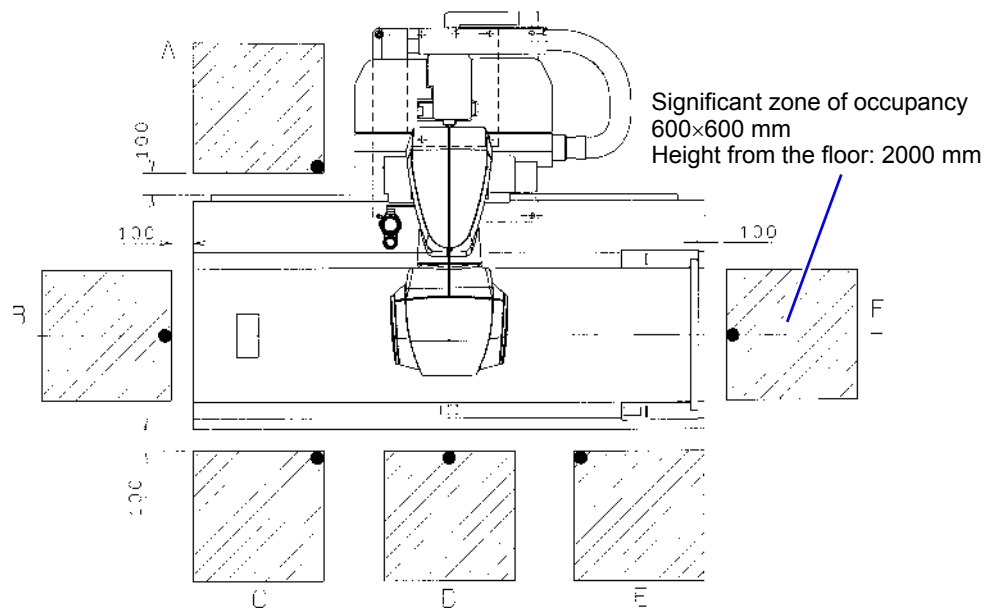
- Be sure to execute X-ray irradiation operation at the remote operation desk located outside of the controlled area, as much as possible.
- Limit the time of staying in the controlled area as short as possible. While in the area, be sure to wear the radiation protective gear, such as protective apron, gloves, glasses, etc.
- Keep the distance as far as possible from the X-ray source. The radiation dose is inversely proportional to the square of the distance from the radiation source.
- Be sure to use a badge or pocket dosimeter to check your personal exposure dose.

8.1.2 Stray Radiation in the Significant Zone of Occupancy

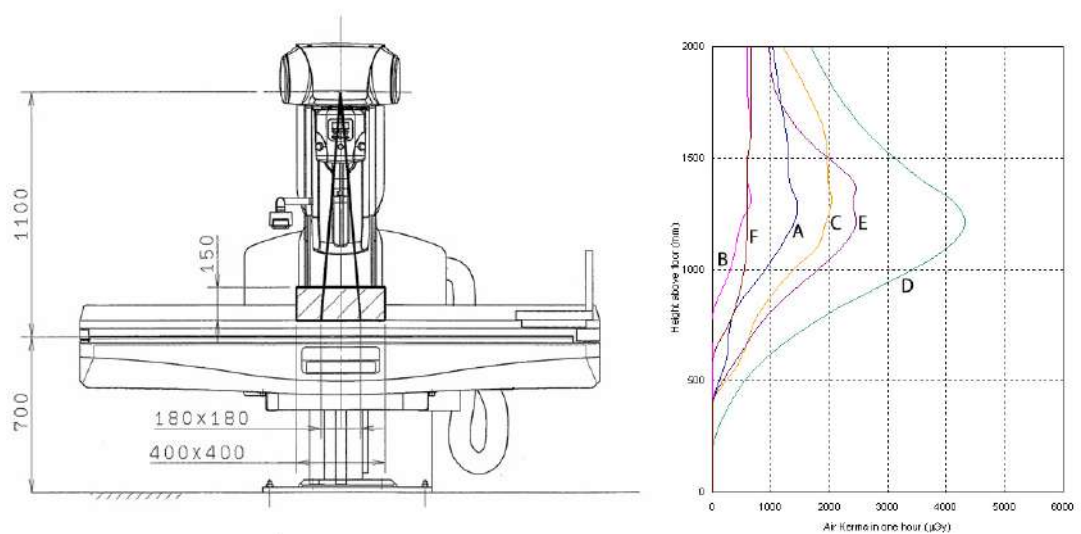
The significant zone of occupancy to be used by the operator and medical staff for examination/medical treatment shall be defined as follows: The examinations requiring a work in the significant zone of occupancy are myelography, ERCP, urography, videofluorography, etc.

Horizontal Position

The significant zones of occupancy are as follows:

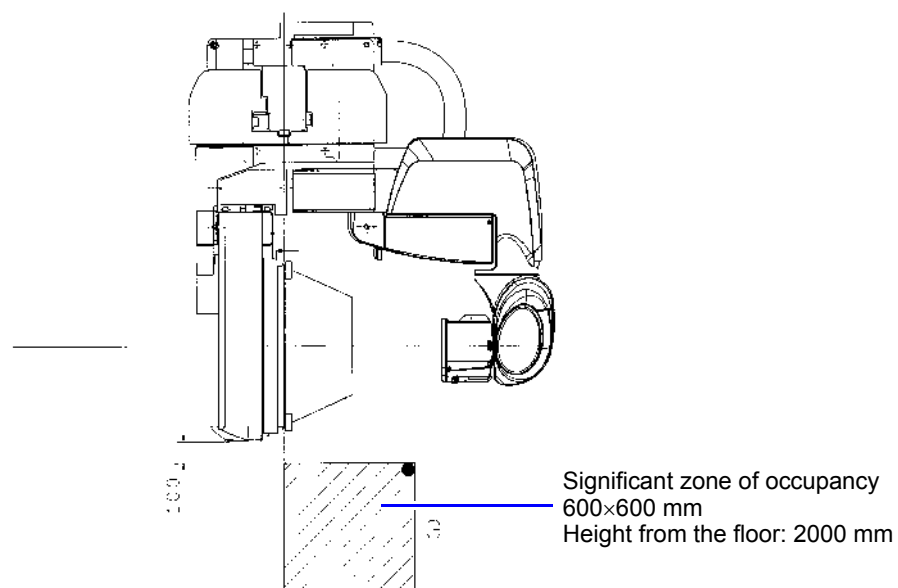


The following graph shows the stray radiation doses measured at the points marked with (●) in the figure above.

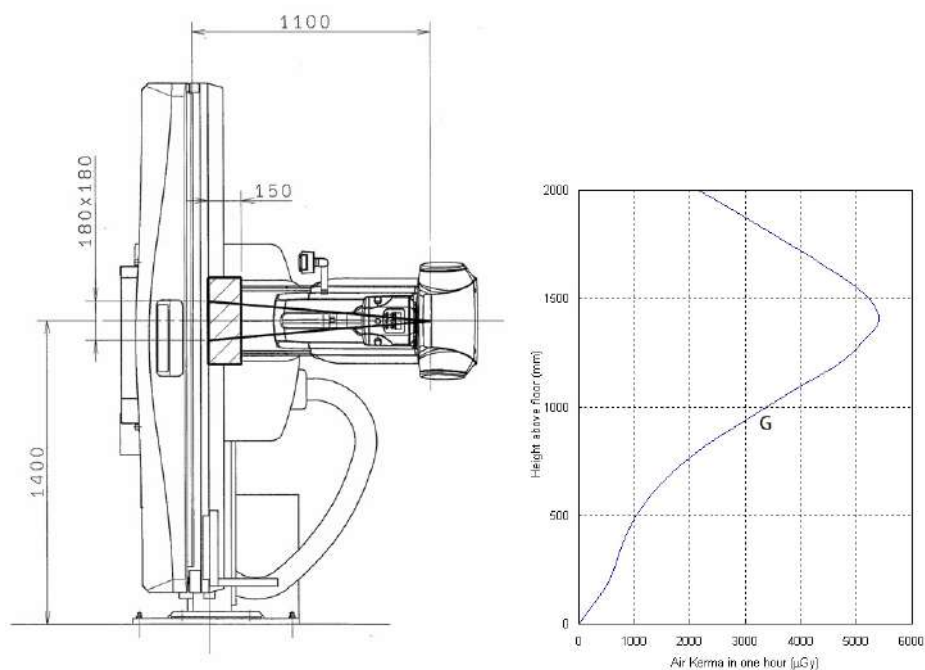


Vertical Position

The significant zone of occupancy is as follows:



The following graph shows the stray radiation dose measured at the point marked with (●) in the figure above.



Measurement Conditions

- Measurement method: Conforming to IEC 60601-2-54: 2009 clause 203.13.6
- X-ray conditions: 125 kV, 3 mA, not using BH filter
- Phantom: PMMA 400×400×150 mm

8.1.3 Deterministic Effect

In the examination using this equipment, there is a possibility that the cumulative skin dose during the examination may reach the level that could bring a deterministic effect on the patient. According to the ICRP60, the threshold at which a deterministic effect appears on skin or crystalline lens is 1 to 3 Gy. The following shows an example of X-ray conditions which could bring skin dose of 1 Gy during the examination using this equipment.

Example: Performing 15 min of fluoroscopy under the parameters of SID1100, Fluoroscopy mode Pulse N, 120 kV, and 7.5 mA

8.1.4 Standard Air Kerma (Rate)

For the standard air kerma during fluoroscopy and radiography, refer to the either document below according to the setting:

Standard and Bariatric: M517-E260 (SONIALVISION G4 Procedure Preset List)

EU: M517-E279 (SONIALVISION G4 Procedure Preset List for EU)

8.2 Useful Features for Pediatric Imaging

There are several useful features for Pediatric Imaging on SONIALVISION G4. It is suggested to utilize those features when pediatric examination is performed.

1) Removable Anti-scatter Grid

The X-ray grid of the SONIALVISION G4 is removable. Removing the x-ray grid often contributes to reduce radiation dose especially for infant patient. The way to mount or remove the X-ray grid is explained in the following page.

 **Reference** ["4.4 Mounting/Removing Anti-scatter Grid" P.4-32](#)

2) Irradiation Field Adjustment from Remote Console

Appropriate irradiation field adjustment directly contributes to minimize unnecessary radiation dose.

The SONIALVISION G4 has multiple ways to adjust irradiation field. Especially, C-leaf Collimator (optional) and Independent Mask Collimator (optional) effectively help to cut unnecessary radiation. For more details, please refer to the following page.

 **Reference** ["4.8.2 Adjusting Irradiation Field with Remote Console" P.4-68](#)

3) Virtual Collimation (optional)

Reduction of total fluoroscopy time is considerably significant to reduce radiation dose. This Virtual Collimation (available as option) functions to adjust the irradiation field by using the last image hold of previous fluoroscopy. For more details, please refer to the following page.

 **Reference** ["4.8.5 Virtual Collimation" P.4-72](#)

4) Selection of Proper Fluoroscopy mode for Pediatric Imaging

A Pediatric Fluoroscopy Program is prepared at factory default setting. When pediatric examination is performed, it may be considered as a first choice. Please select appropriate program before you make radiation. The following section explains how to select or change fluoroscopy program. In general, this pediatric program is recommended to be used for child up to 12 years old with typically 10cm body thickness.

 **Reference** ["4.11.1.1 Selecting Fluoroscopy Mode" P.4-76](#)

 **Reference** M517-E260 SONIALVISION G4 Procedure Preset List

5) Selection of Pulse Rate

It is also possible to reduce radiation dose by changing the pulse rate. In general, lower pulse rate results lower radiation. The following section explains how to change the pulse rate when pulsed fluoroscopy mode is selected.

 **Reference** ["4.11.1.3 Selecting Pulse Rate" P.4-79](#)

6) Dose Information Display

Several kinds of Dose Information, like Cumulative Reference Air Kerma, Reference Air Kerma Rate or DAP, can be seen on the display during or after fluoroscopy or radiography. It is also important to keep monitoring total fluoroscopy time as well. The location of display and contents are seen in the following page

 **Reference** ["4.12 Fluoroscopy and Radiography Using FPD in X-ray Diagnostic Table" P.4-104](#)

 **Reference** ["Information Display \(During Study\)" P.4-111](#)

8.3 Imaging and dosimetry performance specifications

IMAGER OVERVIEW

Figure 1 shows the imager configuration of the system. X-rays are absorbed by the Receptor and converted to raw digital data. The raw data is normalized for offset and gain variations pixel-by-pixel in the Command Processor. The Command Processor also interpolates the value of any pixels identified as defective. These corrections are accomplished in “real-time” and there is no frame delay in the data stream from the Receptor through the Command Processor.

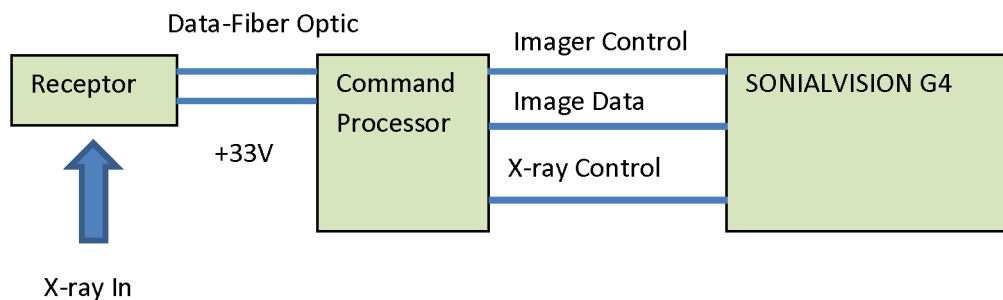


Figure 1. Imager Configuration as part of the overall imaging system

PIXEL FEATURES AND SENSOR ARCHITECTURE

The core of the detector is an array of amorphous silicon pin photo-diodes and thin film transistors (TFTs). On top of the amorphous silicon (a-Si) array is an x-ray scintillator, which converts the x-ray photons to visible radiation. This scintillator is a thallium-doped CsI, which is directly deposited on the a-Si array. This x-ray conversion screen emits near 550 nm, which corresponds to the peak quantum efficiency of the photo-diodes. The a-Si devices are fabricated on a glass substrate in the same manner as the TFTs in active-matrix flat panel displays.

The glass substrate is mounted in a base plate, which also holds the readout chips and drives electronics for the panel. These are custom chips design specifically to meet the low noise/ high speed requirements of fluoroscopy, and at the same time the dynamic range requirements necessary to achieving radiography. To summarize the signal conversion chain:

- X-rays are converted to visible photons by the scintillator
- The visible photons are absorbed by the pin photodiodes and converted to electron-hole pairs, which collect on the capacitance of the photodiodes
- The pin photodiodes are discharged when the pixel's TFT is turned ON. The charge is collected by an integrating amplifier and converted to a voltage.
- The signal voltage has a programmable gain applied, dependent upon operating conditions.
- The output voltage is converted to digital data by an analog-to-digital converter (ADC).

SIGNAL CONVERSION CHAIN

The signal conversion chain is shown in Figure 2. At each step in the process the factors affecting the efficiency of the energy conversion is shown just above. To begin with, x-rays are absorbed by the CsI. The number of x-ray photons absorbed depends on the input flux and the energy of the photons. The light output of the CsI is also a function of the energy of the x-ray photons. Higher energy photons produce more light. Roughly, the CsI converts each 18eV of absorbed x-ray energy into a visible photon. The produced visible photons are emitted in all directions, but are reflected through the columnar grain structure toward the photodiode just below the xray absorption. In addition, a reflector is mounted or deposited on top of the CsI to reflect any light going away from the a-Si array back toward the photodiode. As a result, nearly all the generated light is incident on the photodiode array. An absorptive backing may also be used to favor resolution over light output. However, the collection efficiency is limited by the fill factor of the pixel (the amount of active area) and the quantum efficiency of the photodiode. For this detector, the fill factor is about 60% and the quantum efficiency at 550nm is about 80%.

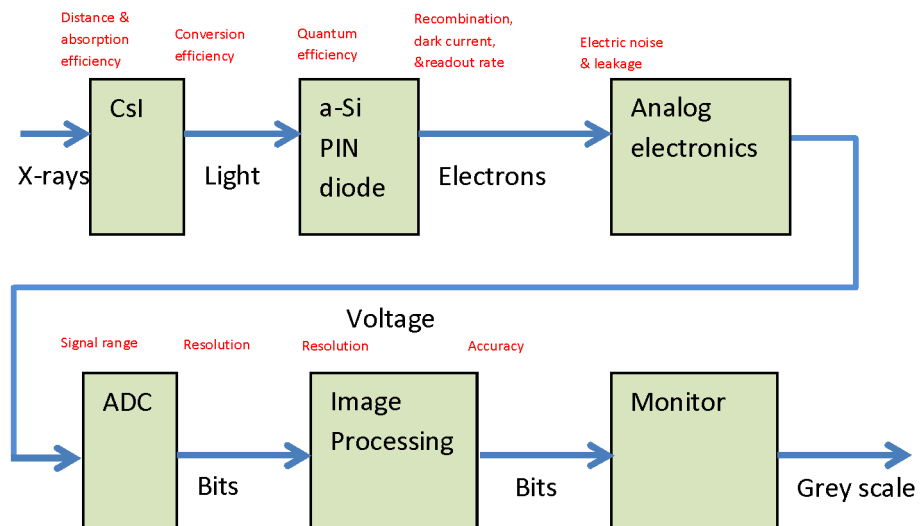


Figure 2. Signal conversion chain in the detector.

The visible photons collected by the photodiode are converted to electron/hole pairs, which are separated by the internal electric field of the diode and then stored on the diodes capacitance.

On the other hand, there is a possibility that the data of imaging is degraded by the specifications of the monitor. The data described herein was determined using a monitor mounted on the system.

Sensitometric response characteristics

Sensitometric response means the relationship between the output signal values with respect to the input X-ray dose. This system is in a linear relationship to output signal values and input dose. Typically 1700 *ADU (Analog Digital Unit) at 2uGy was taken with a 72kVp energy, at 1x1 mode, adjusted for an HVL of 7.1mm Al, with added filtration 21 mm Al (RQA5)

*ADU: Value of how much analog value is converted into 1 digital value.

■ Spatial resolution properties

Spatial resolution is an index which shows whether a how far fine thing can be recognized.

Typically 2.8 lp/mm or more was taken with a 60kVp,80mA, 7.1msec, SID 1200mm, FOV 12 inch.

■ DQE

DQE is a measure for evaluation of transfer characterization by comparing the signal-to-noise ratios of the input and output to quantify the amount of change. Typically 65 or more was taken with outline of the IEC 62220-1-3 standard.

■ Dynamic range

Dynamic range is that the ratio of the maximum value and the minimum value of the identifiable signal, and one of the analog indicators of the amount of information signal.

Dynamic range ability is 16bit for this system.

■ SNR

SNR stands for signal-noise-ratio, which is expressed of ratio of noise to the signal.

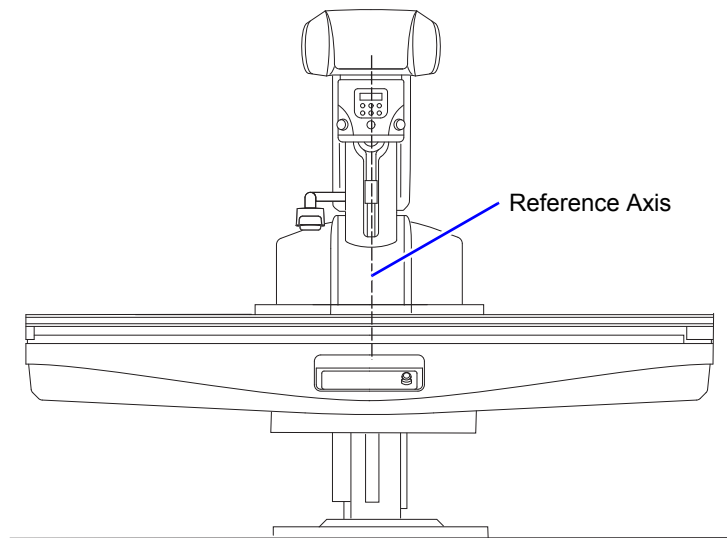
One of the methods to improve the SNR is to increase radiation dose. However, it is always trade-off. It should be well considered based on ALARA principle and it may be selected only when required.

■ Radiation Dose

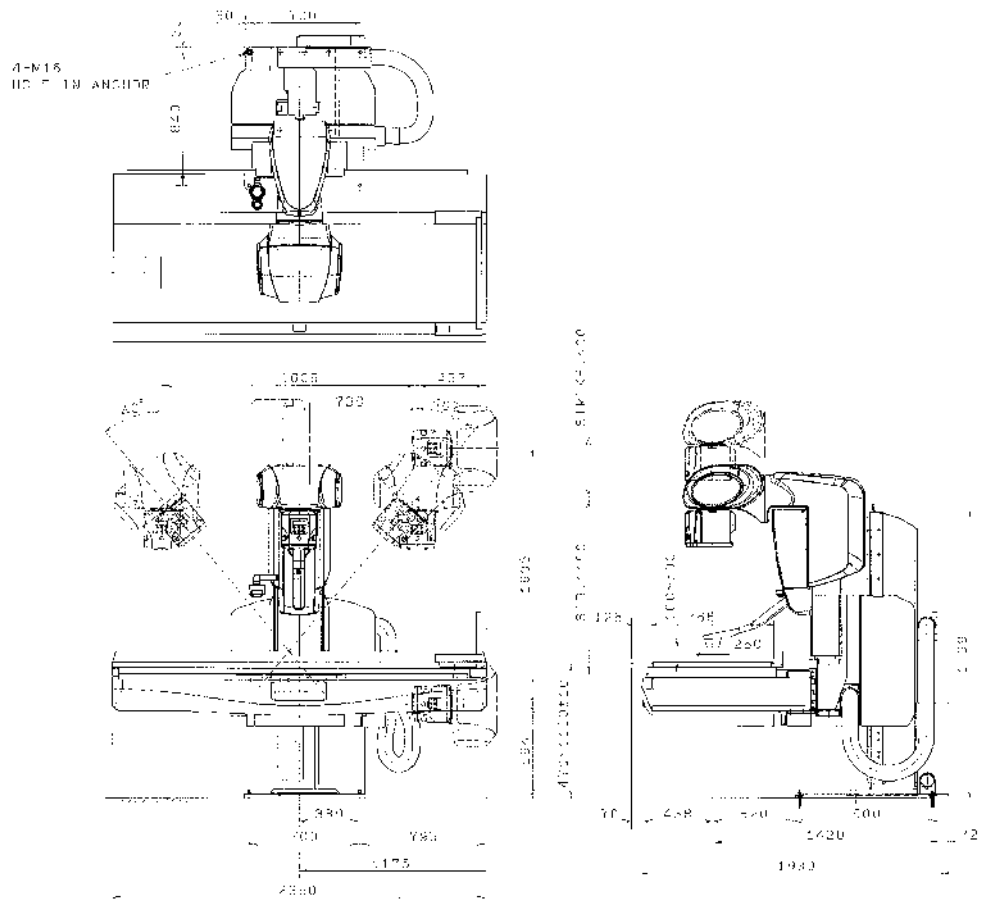
The digital imaging technology gives us an opportunity to reduce radiation dose comparing to old analog system. Operator may be able to achieve the same image quality at a lower dose comparing to old analog technology, or better image quality at the same dose vice versa. The trade-off between image quality and radiation dose is essential in X-ray diagnostic imaging. In this circumstance, appropriate parameter setting or proper selection of anatomical program is important to optimize the image quality at lowest possible dose.

8.4 Reference Axis of Equipment

The reference axis which employed in normal operation of equipment means the incident X-ray axis from X-ray tube unit to FPD vertically as shown below.



8.5 Dimensions



8.6 Checklist for Start-Up Maintenance

Date: _____

Name: _____

- 1 Turn ON the power to the equipment and ensure that it starts up correctly. Take the recommended corrective action if you find any abnormalities.

Item	Check
☐ No unnecessary items around the instrument and on the X-ray diagnostic table	Remove unnecessary items.
☐ No contrast medium or chemicals adhering to the instrument	Clean up.  Reference P.6-4
☐ No rust or metal chips on the floor or on the movable part of the instrument	Remove any rust and/or metal chips.
☐ No cable jamming or twisting	Untangle cables.
☐ No cable disconnection	Connect cables.
☐ No cable stripping	Contact your Shimadzu Service Representative.
☐ No dents, cracks, or dew condensation on the exterior of the instrument	

- 2 Touch the collimators and accessories ON the X-ray diagnostic table with your hand to ensure that they are secure. Take the recommended corrective action if you find any abnormalities.

Item	Check
☐ Foot rest is locked in place.	Lock completely in place.
☐ Shoulder rests are locked in place.	
☐ Hand grips are locked in place.	
☐ Collimator is locked in place.	

- 3 Turn ON the power to the equipment and ensure that it starts up correctly. Take the recommended corrective action if you find any abnormalities.

Item	Check
☐ No abnormal noise or smell	Contact your Shimadzu Service Representative.
☐ No abnormal heating of the instrument	
☐ Normal temperature and humidity in the examination room and control room	Make an adjustment.  Reference P.1-8
☐ No error messages	Take the corrective action.  Reference P.5-13
☐ Normal indication on the monitors	Contact your Shimadzu Service Representative.

- 4 Operate the control panel to ensure that each component moves correctly. Take the recommended corrective action if you find any abnormalities.

Item	Check
☐ Normal operation noise during tilting	Contact your Shimadzu Service Representative.
☐ Tilting stop at $\pm 90^\circ$	
☐ Normal operation noise while the tabletop is moving right and left	
☐ Normal operation noise while the imaging unit is moving	
☐ Normal operation noise while the X-ray tube is inclining	
☐ Normal operation noise while the compression unit is operating	
☐ Normal operation noise while the collimator shutter is being opened or closed	
☐ Collimator lamp providing sufficient brightness	
☐ Normal rotation of the X-ray tube anode 1 Select a general radiography technique for the No.1 tube unit. 2 Press the hand switch down to the first level. 3 Check to see if sound of the anode rotation can be heard from the No.1 tube unit or there is no abnormal sound. 4 Perform the same check on the No.2 tube unit if mounted.	Make an adjustment.  Reference P.4-73
☐ Appropriate volume level of the intercom	

When an error message is displayed, refer to "[5.3 Error Message](#)" [P.5-13](#).

- 5 Perform fluoroscopy while checking that the digital radiography unit and the high-voltage generator operate properly. Take the recommended corrective action if you find any abnormalities.

Item	Check
☐ A fluoroscopic image appears on the acquisition monitor. 1 Turn IBS off. 2 Set the fluoroscopy mode to [PULSE N], 15 fps, and 50 kV. 3 Make sure that no absorber is placed on the tabletop. 4 Perform fluoroscopy with the X-ray irradiation field of the collimator set to fully open, and check to see if the fluoroscopic image is displayed on the acquisition monitor.	Turn the system off then back on, and perform the check again. If this does not remedy the problem, contact your Shimadzu service representative.
☐ The magnification size is selected correctly during fluoroscopy.	Contact your Shimadzu Service Representative.
☐ Turn on the IBS function and open or close the collimator shutter while checking that the fluoroscopy tube voltage automatically changes.	
☐ The AKR value displayed on the acquisition monitor is appropriate when an area dosimeter is connected. 1 Turn IBS off. 2 Set the fluoroscopy mode to [PULSE N], 15 fps, and 70 kV. 3 Perform fluoroscopy with the X-ray irradiation field of the collimator set to fully open. 4 Observe the AKR value displayed on the acquisition monitor. Check that the difference between this and the AKR value recorded in the "AKR value record field" below is within $\pm 30\%$. 5 Return IBS to its regular operating setting. "AKR value record field" After installation adjustments, perform fluoroscopy by the above procedure at as early a stage as possible, and note down the AKR value displayed on the acquisition monitor in the field below. mGy/min	

This completes the start-up maintenance.

8.7 Checklist for Post-Operation Maintenance

Date: _____

Name: _____

- 1 Check the following points before turning OFF the power to the equipment. Take the recommended corrective action if you find any abnormalities.

Item	Check
☐ No error messages	Take the corrective action.  Reference P.5-13
☐ No abnormal noise or smell	Contact your Shimadzu Service Representative.
☐ X-ray diagnostic table in the vertical position ($\pm 90^\circ$) or horizontal position (0°)	Return to its proper position.
☐ X-ray tube in the 0° position	

- 2 Check the following points after turning off the power to the equipment. Take the recommended corrective action if you find any abnormalities.

Item	Check
☐ No dents, cracks, or condensation on the exterior of the instrument	Contact your Shimadzu Service Representative.
☐ No cable jamming or twisting	Untangle cables.
☐ No cable disconnection	Connect cables.
☐ No cable stripping	Contact your Shimadzu Service Representative.

- 3 Clean the equipment as necessary and check the following points. Take the recommended corrective action if you find any abnormalities.

Item	Check
☐ No contrast medium or chemicals adhering to the instrument	Clean up.
☐ Clean and sanitary inside the room	 Reference P.6-4

This completes the post-operation maintenance.

8.8 Checklist for Troubleshooting

Fill in the following details and contact your Shimadzu service representative.

Hospital :

Phone :

FAX :

Serial Number:

Date of Installation:

Item	Check
☐ Was someone injured?	
☐ When did the trouble occur?	
☐ Were there previous indications that a problem may have occurred?	
☐ Was there a power failure or electrical storm when the trouble occurred?	
☐ Has water been applied to the equipment?	
☐ Has the equipment been given an impact upon?	
☐ How many patients are inspected with the equipment per day?	
☐ When was the last periodic inspection?	

8.9 Safety Instruction Registry

Hospital	☐ Name	
	☐ Phone	
	☐ Extension number	
	☐ FAX	
	☐ Address	
	☐ Room number	
Device	☐ Name	
	☐ Serial number	
	☐ Date of installation	
Instructor	☐ Affiliation	
	☐ Phone	
	☐ FAX	

Date	Description	Maintenance and Operating Staff	Instructor
		Signature	Signature

- At the time of installation or when changing the designated operator, your Shimadzu service representative will explain this manual's safety description of this device's maintenance to operation staff and record the new information.
- This manual is important. We request all maintenance personnel to keep it in a safe place close to the equipment.

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