REX-***R(F)

Owner's Manual

Rev. 3 , 2007.

THIS PRODUCT IS FOR MEDICAL INSTRUMENT

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Revision History

Revision	Date	Contents
0	April 24, 2003	First release
1	December 29, 2003	Second release
2	April 1, 2004	Third release
3	July 10, 2007	Fourth release

SAFETY

General safety information

Advisory symbols

The following advisory symbols will be used throughout this manual.
The definition and application are described below.

Mark	Meaning
DANGER	DANGERS ADVISE OF CONDITIONS OR SITUATIONS THAT IF NOT HEEDED OR AVOIDED WILL CAUSE SERIOUS PERSONAL INJURY OR DEATH.
WARNING	ADVISE OF CONDITIONS OR SITUATIONS THAT IF NOT HEEDED OR AVOIDED COULD CAUSE SERIOUS PERSONAL INJURY, OR CATASTROPHIC DAMAGE OF EQUIPMENT OR DATA.
	ADVISE OF CONDITIONS OR SITUATIONS THAT IF NOT HEEDED OR AVOIDED COULD CAUSE PERSONAL INJURY OR DAMAGE TO EQUIPMENT OR FIRE. ⚠ CAUTION
	Advise information how to use machine properly.

Please read owner's manual carefully. It provides instructions on safety, warnings, cautions, and how to prolong the life of the product.

1. INTRODUCTION

Dear User.
We welcome you as a user of the REX-***R(F) system manufactured by LISTEM Corporation.
This manual will guide you to safe and easy Operations for the equipment.

For safe and proper operations of this equipment, carefully read the instructions in this manual before operations. Also keep it at hand for quick reference.

Please make sure to acknowledge and understand attachment document, warnings, and cautions in this manual before installing this equipment.

Warning

The specifications of this equipment are subject to change without notice for safety and improvement in accordance with relevant regulations.

Warnings for operating the equipment

In order to maintain this equipment in good condition for long time, please make sure to operate as following [Important matters in using medical electronic equipment (safety and risk prevention)].

Medical electronic equipment (Safety and protection) Check list

1. It is important that everyone working with X-radiation be properly trained and take adequate steps to insure protection against injury
2. When you install the machine, be cautious in following situation:
   ⑴ Install the equipment in a dry area.
   ⑵ Install the equipment where it will not be exposed to atmospheric pressure, temperatures, humidity, ventilation, sunlight, dust, salt content, sulfur.
   ⑶ Be cautious to keep the equipment steady and level. Avoid slopes, earthquakes and shocks (during movement)
   ⑷ Do not install the equipment around chemical, drug or gas storage .
   ⑸ Be careful about electric frequency, voltage or numerical value.
   ⑹ Ground the wire properly.

3. Before using the equipment:
   ⑴ Make sure the connection of buttons and check polarity to check proper and accurate operation of the equipment.
   ⑵ Make sure the ground wire is fully connected.
   ⑶ Make sure that all the wires are properly and completely connected.
   ⑷ You may make a wrong diagnosis or cause injury if equipment is operated simultaneously.
   ⑸ Double check the exterior circuit which touches the patient directly.

4. When using the equipment:
   ⑴ Don't over use the equipment during diagnose, treatment.
   ⑵ Check the patient and machine all the time. Use proper protective equipment for safe to a patient and an operator.
   ⑶ If you find error on with the equipment or indisposition of patient, stop the machine under safe condition.
   ⑷ You must be careful to protect the patient from injury by operating equipment.

5. After using the equipment, be careful with following.

⑴ Turn off the machine after all the buttons and shuttles are placed in original position.

⑵ Do not force to unplug power cord.

⑶ Be cautious with storage on following.

(ⅰ) Do not store in wet place.

(ⅱ)Avoid Installation of the equipment where exposed to atmospheric pressure, temperatures, humidity, ventilation, direct sunlight, dust, salt content, sulfur.

(ⅲ) Be cautious to keep the equipment steady and level. Avoid slopes, earthquakes and shocks (during movement)

(ⅳ) Do not install the equipment around chemical, drug or gas storage .

⑷ Keep and arrange the parts, and cords etc clean and neat.

⑸ Always keep the equipment clean.

6. Always mark “out of order” if the equipment is not working properly.
   And contact service center.
7. Do not make alteration or conversion on the product.
8. Repair & Inspection
   ⑴ Must have periodical inspection on the equipment and parts.
   ⑵ If the equipment is not operated for long time, make sure it operates properly before use.
9. Operate properly according to user manual.

IMPORTANT! X-ray Protection!

X-RAY EQUIPMENT IS DANGEROUS TO BOTH PATIENT AND OPERATOR UNLESS MEASURES OF PROTECTION ARE STRICTLY OBSERVED.

X-ray equipment if not properly used may cause injury. Accordingly, an operator shall thoroughly read and understand the instructions before attempting to operate this equipment.

Although this equipment is built to the highest safety standards, it is not 100% protected and may be exposed to X-radiation for those operators who do not follow proper safety regulation or make false operation.

Appropriate trainings are required to persons who handle X-radiation and proper protections are required to avoid injury. It is also imperative that these persons are fully acquainted with the recommendations of the International Commission on Radiation Protection (ICRP) report 26, recommendations of National Council on Radiation Protection and Measurements announced in NCRP report and the other applicable standards.

All persons using X-ray equipment must be aware of the danger of excessive exposure to X-ray.

Various protective materials and devices are available. It is strongly recommended that such materials and devices to be used.

Maximum Permissible Dose (MPD)

Many kinds of researches on effects or influences about X-radiation provide basics about maximum permissible dose. These research results were used for ICRP to recommend Maximum Permissible Dose but it is hard to define exactly and it is updated from time to time with new research result. For occupational exposures, the ICRP 60 recommends that the MPD accumulated shall not exceed the following limits:

- ▷ Annual effective dose 50 mSv
- ▷ Annual dose for the lens of the eye 150 mSv
- ▷ Annual dose for all other parts of body 500 mSv

User radioactivity dose measurement

It is valuable information to measure individual radioactivity exposure dose of equipment operators to determine appropriateness of current radioactivity protective method. In other words, it shows inconsistence or potential future danger of current radioactivity protective methods.
The most effective way to determine appropriateness of existing protective method is using exposure dose measuring device. The measurement participants must be able to attach these measuring devices anywhere on the body that is exposed to radioactivity. Radioactivity exposure can never exceeed maximum permissible dose.
Operators are recommended the use of personal radiation dosimeters to determine whether personnel have been exposed to excessive radiation. This is using very sensitive films or fluorescent material in folder. This method can only measure the exposure of attached parts of the body but it is a very rational way to measure radioactivity exposure.

A. Radiation protection

Because exposure to X-ray radiation may damage health, use great care to provide protection against exposure to the primary beam. Some of the effects of X-ray radiation are cumulative and may be extended over a period of months or years.
The beat safety regulation for X-ray operator is "Avoid exposure to the primary beam at all times". The secondary radiation may occur when there is an object on the route of primary beam.
Intensity of secondary radiation is in accordance with energy and intensity of primary beam, or atomic number of object on the route. Secondary radiation may be of greater intensity than that of the radiation reaching the film. Take protective measures to safeguard against it. One of the effective protective measurements is shielding with lead. In order to minimize radiation exposure, lead screen, lead impregnated gloves, aprons, thyroid collars, etc must be used. The lead screen shall contain a minimum of 2.0 mm of lead or equivalent and personal protective devices (aprons, gloves, etc) must contain a minimum of 0.25mm of lead or equivalent. For confirmation of the local requirements at your site, please refer to your local radiation protection rules.

WARNING

The equipment is dangerous to both patient and operator unless it is properly used. Only paitent should stay X-ray lab. If other persons inevitably have to stay in the lab during X-Ray operation, proper protective measurement should be used.

WARNING

Be careful not to exposure x-lay to unnecessary area. To minimize exposure, use such items as lead screens, lead impregnated gloves, aprons, thyroid collars, etc.

Protection against electric shock hazard

This high frequency X-ray system has been classified as type-B equipment in accordance with IEC-601.1 and IEC-601.2.7 Standards. This classification has been established according to the degree and quality of protection against electric shocks, which is described in terms of the maximum allowable leakage Current.
Type-B equipment is suitable for applications involving external or internal contact with the patient, including the heart.

WARNING

Power off the equipment except X-Ray exposure

Make sure to power off the equipment during cleaning, sanitizing, and sterilizing to avoid electrical shock and a leakage of electricity.

WARNING

Do not use this equipment where it might infiltrate by liquid!
This product is not protective for liquid. Do to not operate this equipment where it might infiltrate by liquid to avoid electrical shock. Don't spill liquid to the surface of equipment. Stop the operation if you spill liquid to machine, and call the service center immediately.

WARNING

Do not use the equipment where metallic materials can be adulterated to prevent property damage, electric shock, and injury.

WARNING

Do not disassemble the machine. It could causes electric shock or problems.

WARNING

Users have responsibility for equipment repair and maintenance.

Only qualified technician or competent person can operate the equipment. It is dangerous to repair or to inspect inside of the equipment. Please contact an authorized Service Center.

WARNING

It is dangerous to modify or converse the specifications of this equipment. In accordance with [Important matters in using medical electronic equipment (safety and risk prevention)] by the president of pharmacy welfare Consumption, modificatons of the equipment by users are prohibited. According to medical equipment regulation, modification of equipment by manufacturer requires approval.

WARNING

Must conduct periodical inspection.

In order to extend and maintain safety and performance, maintenance and inspection are required.

Required occasional or periodic maintenances that have to be performed by users are described in the main section in detail.

Use headquarters' [Maintenece and Inspection System] for required specific maintenece and inspection by trained professionals.

WARNING

Do not use the equipment in the place where combustible gas / explosive gas can be generated.
This is not explosion proof equipment. Therefore do not use the equipment in the place where combustible gas / explosive gas may be generated.

WARNING

Don't spray disinfectant directly to the equipment. Also take extra cautions when using disinfectant spray.
If disinfectant is applied inside the equipment, it may cause electric shock or electric leakage. To perform cleaning of the equipment, clean the equipment surface with disinfectant clothes.
Do not use disinfectiant sprey that is explosive. The vapors of disinfectiant sprey may ignite or explode.

WARNING

After cleaning, ventilate the air of the lab for considerable amount of time. If explosive gas remains in the lab, there is risk of fire, smoke, explosion or electric shock.

WARNING

Do not bring cellular phone or similar devices in the lab.
Do not bring portable equipments (i.e cellular phone) that cause radio wave regardless of power ON or OFF. Some of the devices exceed EMC radio wave standard that may interupt regular operation of the equipment. In some cases, serious injury or medical treatment accident may occur.

Attention! While Operating!

(1) It is important that everyone working with X-radiation shall be properly trained (A doctor or a radiotherapist) and takes adequate steps to insure protection against injury.

(2) Please contact authorized service center for installation or relocation of the equipment.

(3) Please be cautious on following items before using the equipment.

① Check switch, meter operation, high volatage cable, cord, ground wire connection.

② Check controller setup for appropriate setting.

(4) Please be cautious on following items during equipment operation.

① Do not operate more than necessary diagnosis time or exposure dose.

② Check the patient and equipment all the time include display circuit of the equipment.

③ If you find any errors on the equipment or indisposition on patient, you must stop the operation and conduct appropriate actions under safety condition.

④ Patient should not be allowed to touch the equipment.

(5) Please be cautious on following items after equipment operation

① For the safty, turn off the power switch that power cord of the equipment is connected.

② Keep the equipment clean for future use.

(6) In case of malfunction do not attempt to operate. It is important that anyone repair with X-radiation shall be properly trained (A doctor or a radiotherapist) and takes adequate steps to insure protection against injury. Call distributor or service center for repair.

(7) Do not modify the product.

(8) If it is not necessary, do not unplug cords, cables or other connectors.

(9) Periodical inspections are required for the equipment and parts. If the equipment is not operated for long time, make sure it operates properly and safely before use.

※ About warranty

This equipment is warranted for a 12 month after purchase.

Listem has no responsibility in breakdown or damage on following reason.

1. Breakdown or damage caused by installation, relocation or repair by person that is not trained by Listem, Inc.
2. Breakdown or damage that is caused by product not manufactured by Listem, Inc.
3. Breakdown or damage by using other company parts or using inappropriate part to service or repair.
4. A consequence from not following regulations or operation processes in the owner's manual.
5. Breakdown or damage by other surrounding conditions that are not described as operation conditions in this manual including power, installation environment etc.
6. Break down or damage because of natural disaster such as fire, earthquake, flood damage etc.

After one-year warranty period, appropriate service charges wil be applied for all the services. Call nearest service center for service request.

※About equipment or parts disposal

Before disposing the equipment or parts, please contact our service center. There are risks of environment contaminations if disposed inappropriately.

The life cycle of this product is 8 years. (All the maintenance and inspection procedures have to be carefully performed)-Maximum life cycle.

Abbreviation

AEC	: Automatic Exposure Control
APR	: Anatomical Program
HU	: Heat Unit
kV	: kilovolt Unit of voltage
LED	: Light Emitting Diode
mA	: milli-ampere Unit of tube power
mAs	: milli ampere second
ms(msec)	: millisecond: exposure time (minutes)
sec	: second: exposure time (second)
RIS	: Radiology Information System
HIS	: Hospital Information System
PACS	: Picture Archiving Communication System
HSR	: High Speed Rotor

Table of contents

1. INTRODUCTION

Welcome you as a user of the REX-***R(F) system manufactured by LISTEM Corporation.

Dear customer
Welcome you as a user of the REX-R/F system manufactured by LISTEM Corporation. This manual will guide you safe and easy use of this equipment.

For safe and correct use of this equipment read carefully the instructions in this manual before using the equipment. And keep it at hand for quick reference.

High frequency x-ray system has high quality image by outstanding reproducibility and linearity of x-ray output.

A compact, lightweight generator built with advanced digital circuit comes with the advanced features such as digital console, anatomical programming, self-diagonostic funtions and power strorage unit.

The specifications of This equipment are subject to change for safety and improvement in accordance with relevant regulations without notice.

1.1 Purpose of use

This medical equipment is designed to diagnose human body by providing fluoroscopic or radiographic x-ray image with anatomical structure.

1.2 General features

The main features of this equipment are :

1) High frequency inverter type generator.
2) Optimal exposure factors selection as anatomically programmed radiography.
3) Multiple microprocessor control-high reproducibility and linearity.
4) Self-disagonostic circuitry with error code reporting (Filament error, Rotor error, overload etc.)
5) Digital console with anatomical programmed radiography(APR).
6) Wide range of configuration available in all power rating allows selections of most economical system.
7) Reliable x-ray image quality by Automatic Exposure Control.(AEC)
8) Automatic Brightness Control (ABC)

1.3 Product identification

The major components (the generator, tube stand, x-ray tube, etc,) have some identification labels
attached to them which provide the following manufacturer and product information.

- Voltages, Line Phases, Frequency(Hz) , and Power (kVA)
- Date of manufacture
- System serial number
- Manufacturer
- Address of manufacturer

The model name is shown in the upper coner of conslole.
System serial number is shown on the label “SYSTEM”(refer to 7.Label in this manual)

1.4 Certifications

The fluoroscopic/radiographic x-ray system covered by this operation Manual is authorized to be marked with certificate below granted by the Notified Body DNV_{0434}.

It means that manufacturer / product is certified against :

- KS-EN-ISO 9001.
- ISO 13485.

2. OPERATING METHOD

This chapter is explains on steps and method of operating method.

2. OPERATING METHOD

2.1 System configurations

2.1.1 REX-***R(F)

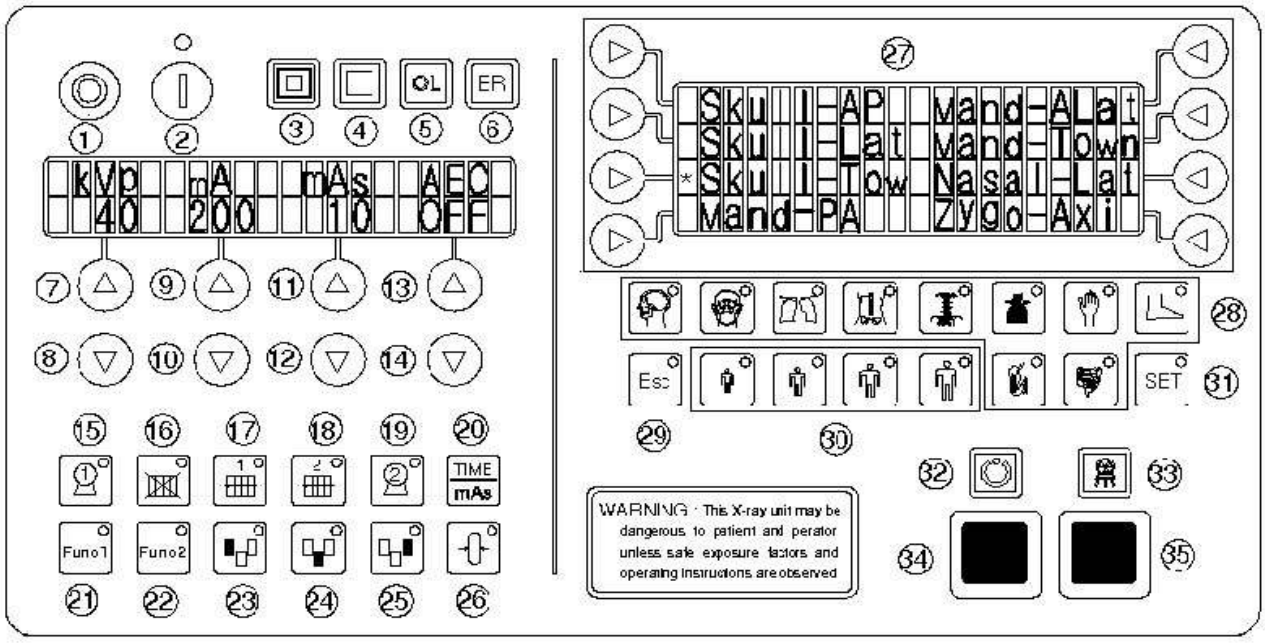
REX-R(F) System covers following model and can be configured following components.

MODEL		**REX-850RF**	**REX-650RF**	**REX-550RF**	**REX-525RF**	**REX-1050R**	**REX-650R**	**REX-550R**	**REX-525R**	**REX-325R**	**REX-125R**
APPROVED CE		**N/A**	**O**	**O**	**O**	**N/A**	**O**	**O**	**O**	**O**	**O**
CONSOLE		REXC-850	REXC-650	REXC-550	REXC-525	REXC-1050R	REXC-650R	REXC-550R	REXC-525R	REXC-325R	REXC-125R
High Voltage Transformer		REXH-850	REXH-650	REXH-550	REXH-525	REXH-1050R	REXH-650R	REXH-550R	REXH-525R	REXH-325R	REXH-125R
TUBE	E7239X(LTN-25)	N/A	N/A	N/A	O	N/A	N/A	N/A	O	O	O
	E7252X(LNT-50)	O	O	O	◎	O	O	O	◎	N/A	N/A
Beam Limiting Device	BLD-150RK	O	O	O	O	O	O	O	O	O	O
	BLD-150FK	O	O	O	O	O	N/A	N/A	N/A	N/A	N/A
TABLE	DMT-80	O	O	O	O	O	N/A	N/A	N/A	N/A	N/A
	KOB-60	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎
	KOB-I	◎	◎	◎	◎	◎	O	O	O	O	O
	KOB-III	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎
STAND	CSTS-28	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎
	SFC-31(R)	O	O	O	O	O	O	O	O	O	O
	SFM-31	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎
	BS-20	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎
I.I	LIF-06	◎	◎	◎	◎	◎	N/A	N/A	N/A	N/A	N/A
	LIF-09	O	O	O	O	O	N/A	N/A	N/A	N/A	N/A
MONITOR	PM-K12	◎	◎	◎	◎	◎	N/A	N/A	N/A	N/A	N/A
	PM-K17	O	O	O	O	O	N/A	N/A	N/A	N/A	N/A

○ :Standard, ◎ : Optional

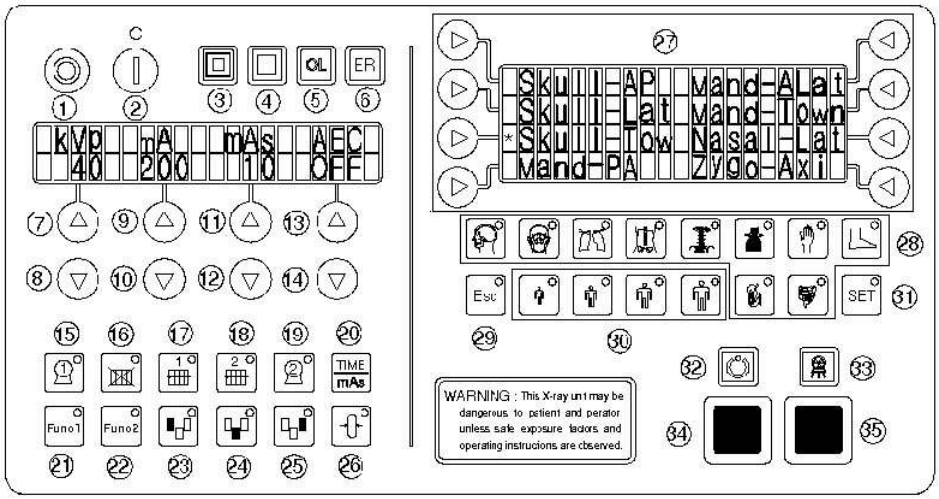
2.2 Operating controls

2.2.1 REX-***R

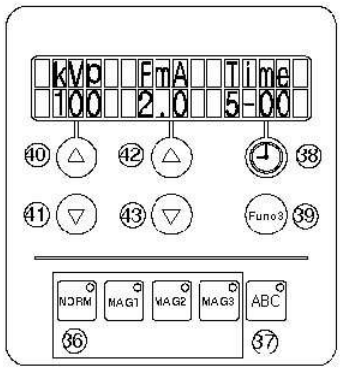


1. Power Off Button
2. Power On Button
3. Small Focal Spot Indicator
4. Large Focal Spot Indicaton
5. Over Load Indicator
6. Error Indicator
7. KV Increase Button
8. KV Decrease Button
9. mA Increase Button
10. mA Decrease Button
11. Sec/mAs Increase Button
12. Sec/mAs Decrease Button
13. AEC On / Density Increase Button
14. AEC Off / Density Decrease Button
15. Tube1 Select Button
16. No Bucky Select Button
17. Bucky1 Select Button
18. Bucky2 Select Button
19. Tube1 Select Button
20. Time/mAs Select Button
21. Function1 Button(Spare1 Button)
22. Function2 Button(Spare2 Button)
23. AEC Left Field Select Button
24. AEC Center Field Select Button
25. AEC Right Field Select Button
26. Reset Button
27. Anatomical View Select Button
28. Body Region Select Button
29. Escape Select Button
30. Body Size Select Button
31. Data/Anatomical Condition Save Button
32. Ready Finish Indicator
33. X-ray Indicator
34. Preparation Button
35. Exposure Button

2.2.2 REX-***RF



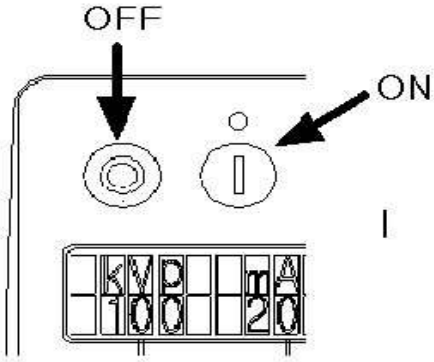
Radiographic console



Fluoroscopic console

1. Power Off Button
2. Power On Button
3. Small Focal Spot Indicator
4. Large Focal Spot Indicaton
5. Over Load Indicator
6. Error Indicator
7. KV Increase Button
8. KV Decrease Button
9. mA Increase Button
10. mA Decrease Button
11. Sec/mAs Increase Button
12. Sec/mAs Decrease Button
13. AEC On / Density Increase Button
14. AEC Off / Density Decrease Button
15. Tube1 Select Button
16. No Bucky Select Button
17. Bucky1 Select Button
18. Bucky2 Select Button
19. Tube1 Select Button
20. Time/mAs Select Button
21. Function1 Button(Spare1 Button)
22. Function2 Button(Spare2 Button)
23. AEC Left Field Select Button
24. AEC Center Field Select Button
25. AEC Right Field Select Button
26. Reset Button
27. Anatomical View Select Button
28. Body Region Select Button
29. Escape Select Button
30. Body Size Select Button
31. Data/Anatomical Condition Save Button
32. Ready Finish Indicator
33. X-ray Indicator
34. Preparation Button
35. Exposure Button
36. Magnification Select Button
37. ABC Select Button
38. Flulotime Reset Button
39. Function3 Button(Spare1 Button)
40. Flulo KV Increase Button
41. Flulo KV Decrease Button
42. Flulo mA Increase Button
43. Flulo mA Decrease Button

2.2.3 System power ON/OFF

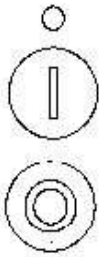


1) Power ON
Turn ON the generator by pressing this button.
The green lamp will come on and the screen shown on the left will appear displayed "Initializing..."

2) Power OFF
Turn OFF the Generator by pressing this button.

2.3 Console operating function and exposure parameter

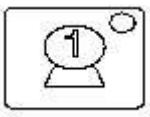
2.3.1 Power ON/OFF



ON : Turning on the power by pressing the button and starting the generator. The power for the x-ray sysytem will come on standby.

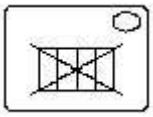
OFF : Turning off the power of generator by pressing the button. The power for the x-ray sysytem will come off.

2.3.2 Workstation selection

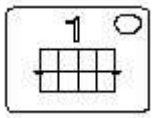


TUBE-1
Selecting tube1 by pressing this button when you wish general radiography.

TUBE-2
Selecting tube2 by pressing this button when you wish fluoroscopy and spot radiography during fluoroscopic.

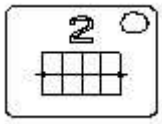


No BUCKY
Selecting No Bucky by pressing this button when you don't wish to use
the grid.
Selecting radiography on the top of patient table.



BUCKY 1

- Selecting Bucky 1 by pressing this button.
- If the thickness of a subject become thick, it causes loss of the image due to the effect of the scattering line from the subject. Therefore, when you take X-ray, you should select BUCKY 1 to prevent image quality from contrast loss by scattering line.
- You should use this button when you take X-ray a subject on the table and should take X-ray after inserting a cassette into the cassette tray. This goes out of sight the grid line which makes the observance of a region difficult by the grid moving when you take X-ray. Also this enhances the contrast of a image quality by limiting scattering line effectively.

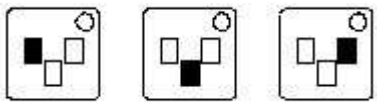


BUCKY 2

- Selecting Bucky 2 by pressing this button.
- When you take a X-ray standing, you should use this with using Wall Bucky.
- This is used for mainly hest photographing, abdomen photographing, PNS photographing, etc., and enhances the contrast of image quality by limiting effectively the scattering line from a subject.

Time/mAs select button

- You can indicate the time or the amount of tube current by pressing this button.
- If you press this button at first, you can get the irradiation time, and press it one more time you can get the amount of tube current.
- You can check the irradiated amount of tube current and the time.

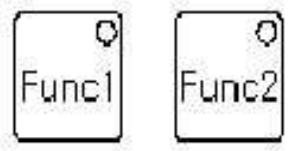


AEC(Auto Exposure Control) ; optional

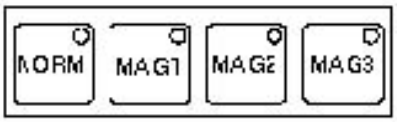
- You can make a regular film strength under any condition by using AEC and this consists of three partitions(left, central, right).
- You can select the each partition separately and can collate with the partitions in any way.
- You can take a photograph the part where you want to observe in detail, after selecting the part.

Spare button

You can set up the other function additionally.
Please contact the factory if you need to use this function.



Magnification select button

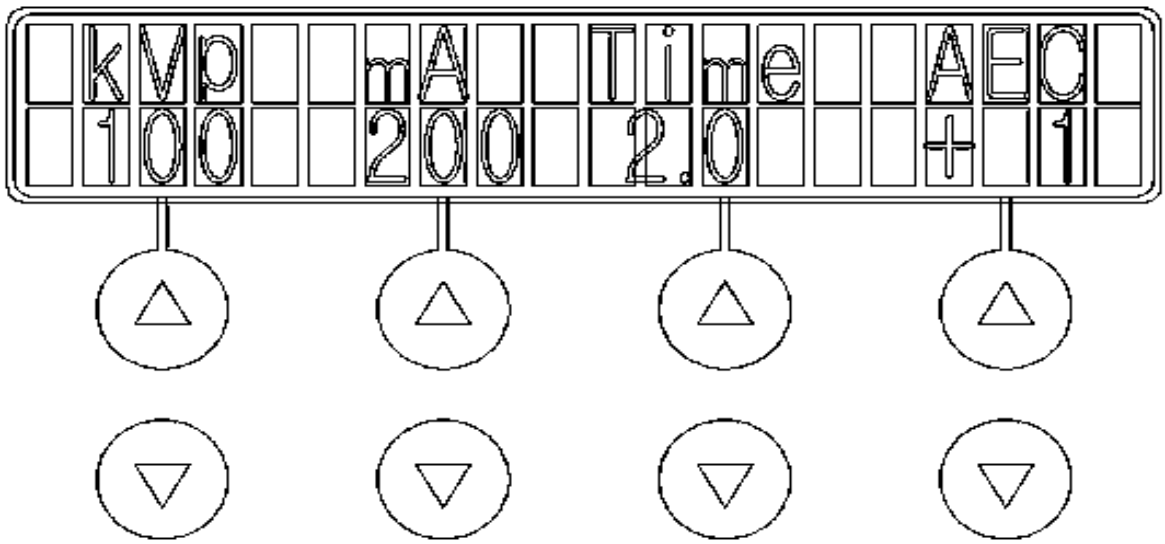


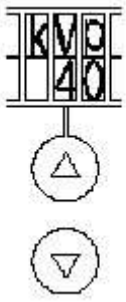
6″	NORM	It makes life-size image.
	MAG1	N/A
	MAG2	N/A
	MAG3	N/A
9″	NORM	It makes life-size image.
	MAG1	It enlarges the input-side by 6".
	MAG2	It enlarges the input-side by 9".
	MAG3	N/A
12″	NORM	It makes life-size image.
	MAG1	It enlarges the input-side by 9".
	MAG2	It enlarges the input-side by 6".
	MAG3	It enlarges the input-side by 4.5".

ABC(Auto Brightness Control)

In the process of the fluoroscopy, you can carry out the ABC by pressing this button.
There is the merit that reaction speed is very fast due to the change of KV and mA complexly at the same time.
It forms the collation from 40KV, 0.4mA to 120KV, 4mA.
(Higher mA – Option)

2.3.3 Radiographic Parameters



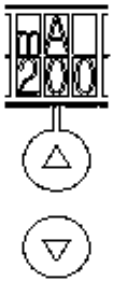


kVp DISPLAY :

Shows the radiographic kVp value selected for the general.

The error messages during the system fault, preceded by the letter “E”.

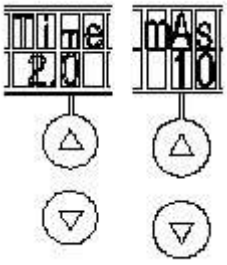
kV: Increase or decrease by 1kV step through 40kV to150kV(or 125kV).



mA DISPLAY :

Shows the radiographic mA value selected for the general.

mA : Increase or decrease ranging from 10mA to 500mA



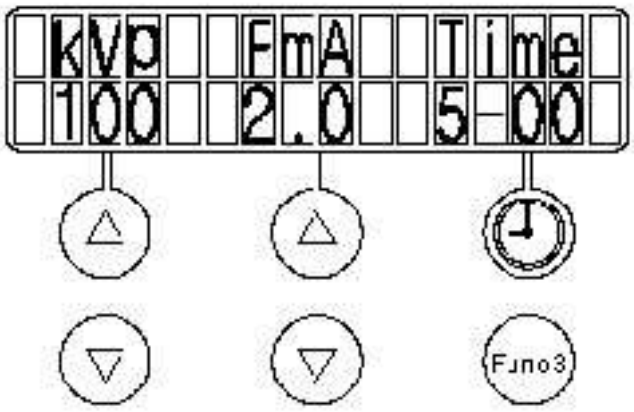
Time / mAs DISPLAY

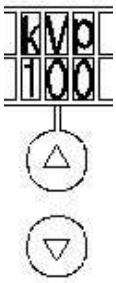
Shows the mAs or time value selected for the general.

Sec : Increase or decrease ranging from 1ms to 10s.

mAs : Increase or decrease ranging from 0.02 to 600mAs.

2.3.4 Fluoroscopic Parameters

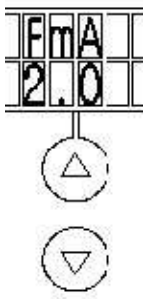




Fluoro kVp DISPLAY

Shows kVp value selected for the fluoroscopy.

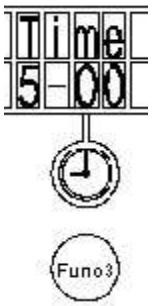
kV range : 40kV to 120kV. (Option : 125kV) – **Adjustable at SFD.**



Fluoro mA DISPLAY

Shows fluoroscopic mA value selected for fluoroscopy.

mA range : 0.2mA to 4.0mA. (Option : 6mA) – **Adjustable at SFD**



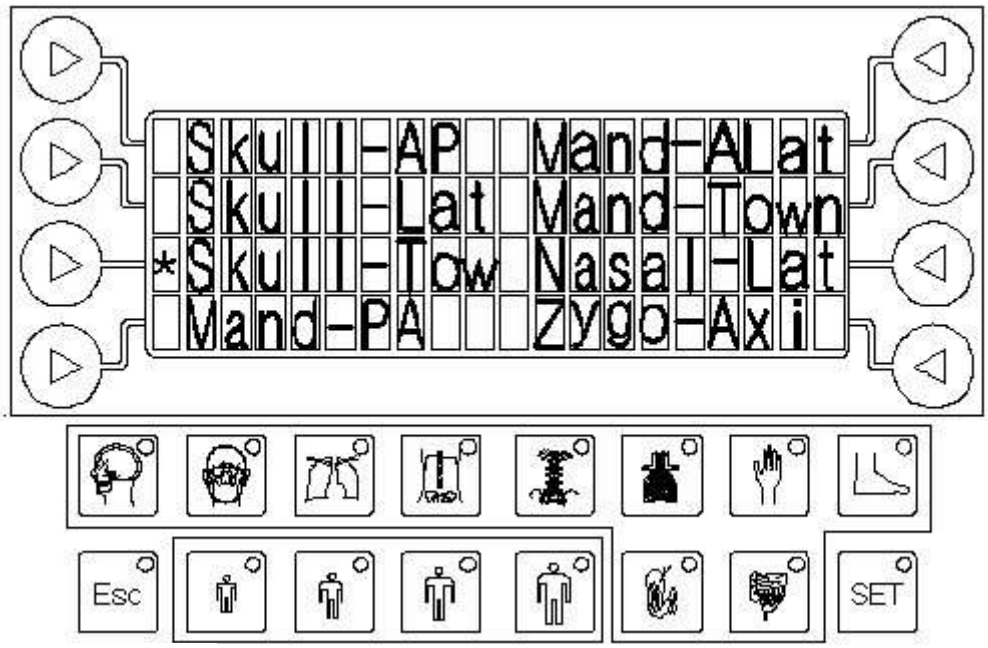
Fluoro Time DISPLAY

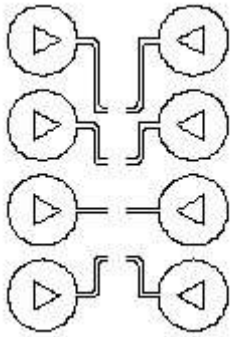
Shows fluoroscopic accumulated exposure time to protect exessive exposure during exposure.

Accumulated exposure time can be adjusted for 10 minutes, audio alart will sound after set period.

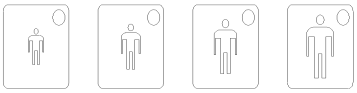
NOTE : **Operator to be adjusted Fluoro kV and mA at Spot film device.**

2.3.5 Anatomical Programmer (APR)

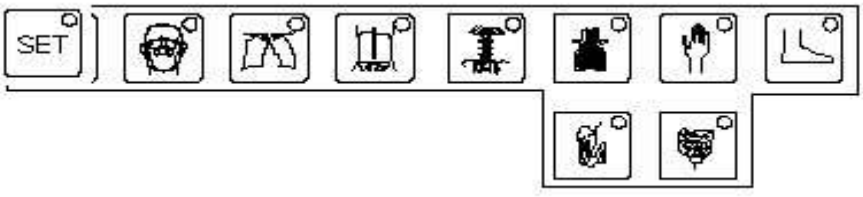




Anatomical View selection switch :
Select the exposure position by pressing this button and indicator lamp selected status will be illuminated.



Patient size selection switch : These are four positions according to the size of patient. (pediatric, small, standard and large)

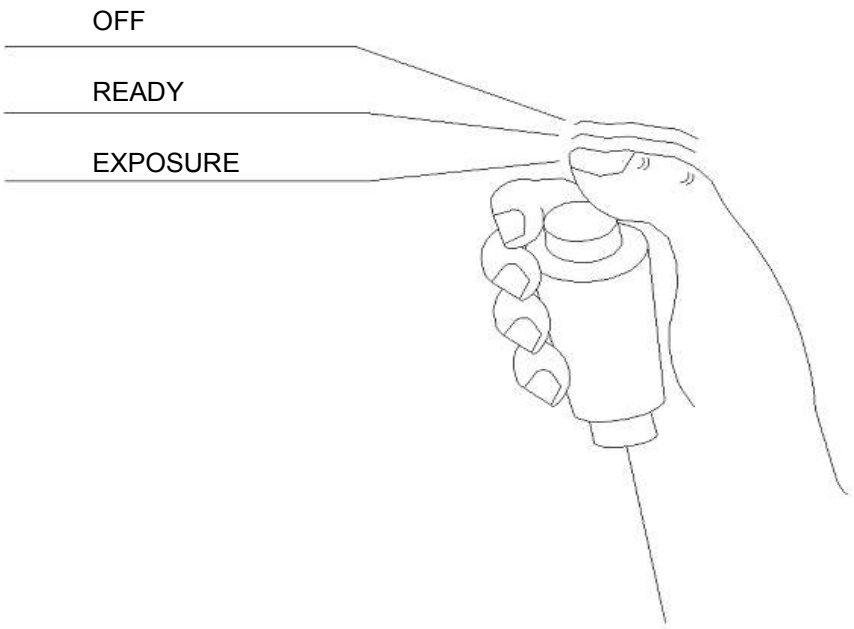


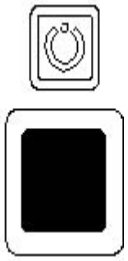
Body region selection button : When a Body Region is selected the APR display shows all its respective Anatomical Views. (HEAD, FACIAL, CHEST, ABDOMEN,UPPER TRUNK, LOWER TRUNK, UPPER EXTREMITY, LOWER EXTREMITY, UPPER GI, COLON STUDY)

SET switch
Press the push-buttons to store the new technique.

2.4 Exposure controls and indicators

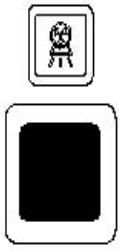
The X-ray handswitch is a three-positions, “OFF”, “Ready” and “X-ray exposure”, according to the pushing steps in its early status.





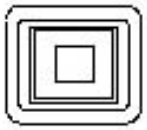
Ready

Press this push-button to prepare the selected X-ray tube for an exposure. The “Ready” indicator on the console will light when the x-ray tube is prepared, and there are no interlock failure or system faults.
Anode rotation.
Filament current switches from stand-by to the selected mA.
High voltage is applied to generator inverter.

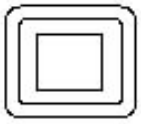


Exposure

After the “Ready” indicator is illuminated, press this push-button to start an x-ray exposure. The “X-ray On” indicator remains illuminated and an audible signal sounds during the length of exposure.



Small focal spot
Indicates that the X-ray tube is in small focal spot.(10,~100mA)



Large focal spot
Indicates that the X-ray tube is in large focal spot (150~800mA)

NOTE ☞

The sign of a focal spot is changed automatically according to the selection of a tube current.
The collation of the tube current and Small/Large focal spot can be changed by the capacity of the collated tube, and this process is carried out in the factory.
If you want to change the collation of the Small/Large focal spot by selecting the tube current, you can set repeatedly as you want value within the capacity of the tube.

2.5 Self-diagonosis indicators

Indicates that a technique has been selected beyond the X-ray tube ratings

Indicates that the error of circuit connection or it has not been selected exposure parameter. In this case an error code will be displayed on the console.

2.6 Error codes

Code	Description
E00	IPM Fault
E01	Filament preheating low error
E02	Filament after ready low error
E03	Filament preheating high error
E04	Filament after ready high error
E05	Rotor error
E06	Change error
E07	Tube overheat error
E08	Console and HT control board communication error
E09	Less measured kV value than setting value by –20%
E10	More measured kV value than setting value by +20%
E12	Door open error
E13	Ready finish overtime error
E14	Exposure not end error
E16	Checksum error
E17	Generator communication error
E18	SFD communication error
E19	Not center error(Ortopedia type)
E20	SFD error

3. OPERATIONS

This chapter is explains on steps and method of operations.

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3. Fluorscopy & Radiography operations

3.1 Start-up

System power is applied by pressing the power "On" button on the Control Console. The generator will go through a start-up routine conducting an automatic self-test that will show on the RAD kVP Display information usable only to service personnel.

After the power-up has been completed the console shall display normal radiographic factors. If there is a malfunction, error messages will be displayed on the RAD kVp Display specifying the fault.

NOTE ☞ Some indicators on the Console are used to provide service information during the start-up process. These indicators shall be ignored by the operator until the unit has completed its power-up sequence.

3.2 Warm-up of x-ray tube

⚠ CAUTION Before effecting X-ray exposures ensure that the tube is properly warmed-up. Make sure that no persons will be inadvertently exposed to unnecessary X-rays during this procedure.

Routine exposures shall not be effected unless the tube is previously warmed-up, this prolongs X-ray tube life.

It is recommended that the following procedure will be performed for X-ray tube warm-up, at the start of each day and when the tube selected has not been in use for approximately one hour.

Excessive filament evaporation shortens X-ray tube life.
Minimize evaporation by keeping Exposure "Preparation" time to an absolute minimum.

▣ Refer to the manual by TOSHIBA
(Attached the tube manual)

3.3 Radiography and fluoroscopy

3.3.1 Radiographic operation

A typical RAD examination sequence is as indicated below.

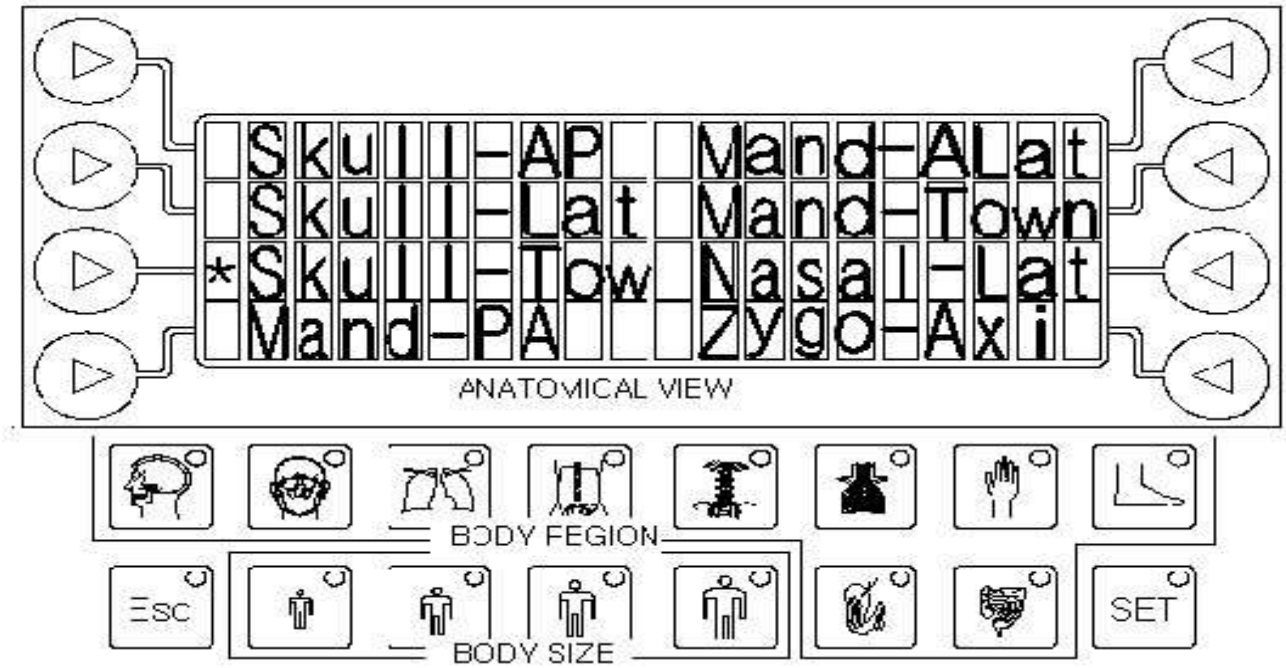
1. Make sure that the X-ray tube to be used is properly warmed-up.
2. Position the patient for the examination.
3. Select the "workstation" and technique parameters using the RAD controls on the console.
4. Instruct patient to maintain the required position. Prepare the X-ray tube by pressing the handswitch button to the "Prep position and maintain it until the "Ready" indicator is illuminated.
5. Instruct patient to remain still and to hold his breath as required, then make the x-ray exposure by pressing the handswitch push-button fully to the "Exp" position and maintain it throughout the exposure. The "X-ray On" indicator will light and an audible signal will sound during the exposure.
6. When the exposure is finished, release the handswitch button.
7. Repeat the procedure if additional exposures are desired.

3.3.2. Fluoroscopic operation

1. Make sure that the X-ray tube to be used is properly warmed-up.
2. Position the patient for the examination.
3. Select the "workstation" and technique parameters using the Flu controls on the console.
4. Explain the inspection process to a patient, and insert the dye needed to inspection.
5. Order the needed rolling to a patient, and begin to scan to find the region by pressing the button of the fluoroscopy.
6. Begin to spot radiography for the suspect part about a region, after finishing the fluoroscopy.

3.4 APR operation

An examination using an APR technique could consist of the following:



1. Make sure that the X- ray tube to be used is properly warmed-up.
2. Position the patient for the examination
3. Select the "Patient Size" corresponding to the patients anatomy. This operation starts the APR mode. Select the "Pediatric" button if the patient is not an adult.
4. Select a general "Body Region" and an "Anatomical View" of the indicated on the APR Display.
5. Technique parameters, Workstation information, Focal Spot, etc.. corresponding to the APR selection are displayed and indicated on the control console. If needed, the parameters and selections can be directly modified by the operator.
6. Continue with the normal procedure for a typical RAD examination.

3.5 AEC operation

3.5.1 Introduction

AEC makes regular strength of the film by controlling the exposed time.
It uses the Ionchamber as the sensor to measure the amount of X-ray. And if the amount of incident X-ray come to the set radiation amount, the exposure is stopped.

3.5.2 Minimum response time & maximum exposure time

MRT is the minimum time to operate the system and MET is long exposure time as possible to finish a irradiation.
Even though you set the exposure time very shortly, the AEC function of the REX-RF Series doesn't make the excessive strength pictures regardless of MRT. And you can protect a patient from the excessive exposure, even though there is any problem in AEC equipment, as the MET is designed not to excess 600mAs per irradiation.

3.5.3 Intensifying screen & Film selection

It is necessary to control AEC system according to the collation of Film/Screen.
REX-RF Series is controlled on the strength with the standard of the rare earth type intensifying screen/ortho type, and it should be set the strength compensation value of AEC differently according to the intensifying screen and used film. This process should be carried out in the factory, and it can be controlled suitably by the customer's ask.

3.5.4 Suggestions for using AEC

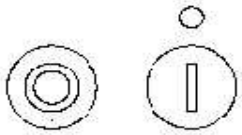
- Adjust perfectly pose of a patient to central beam.
- Use the AEC only when you use the grid.
- It is basic to select the suitable sensor in taking a X-ray with AEC.
- Adjust the terminal of strength control to “0” for the normal patients, and control the terminal only for the extremely different figures or pathological situation.
- Therefore, don't often control the terminal of strength control.
- Select the central sensor for taking all of the skulls.

NOTE ☞ You may get a faint or dark picture when you use AEC, as follows;

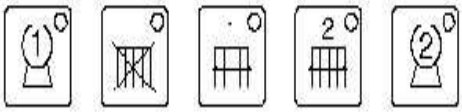
- When you take a lumbar you may get such picture, if the inner gas covers the part of the field selection accidentally.
- If the part which has abnormality in the absorption by region covers the position of the sensor, you may get such picture.
- If the dye covers the position of the sensor, you may get such picture.

To adjust the proper strength by using AEC, you should adequately select the Positioning and Field Selection

3.5.5 Operating Sequences



1. Turning on the power by pressing the button for the X-ray sysytem.

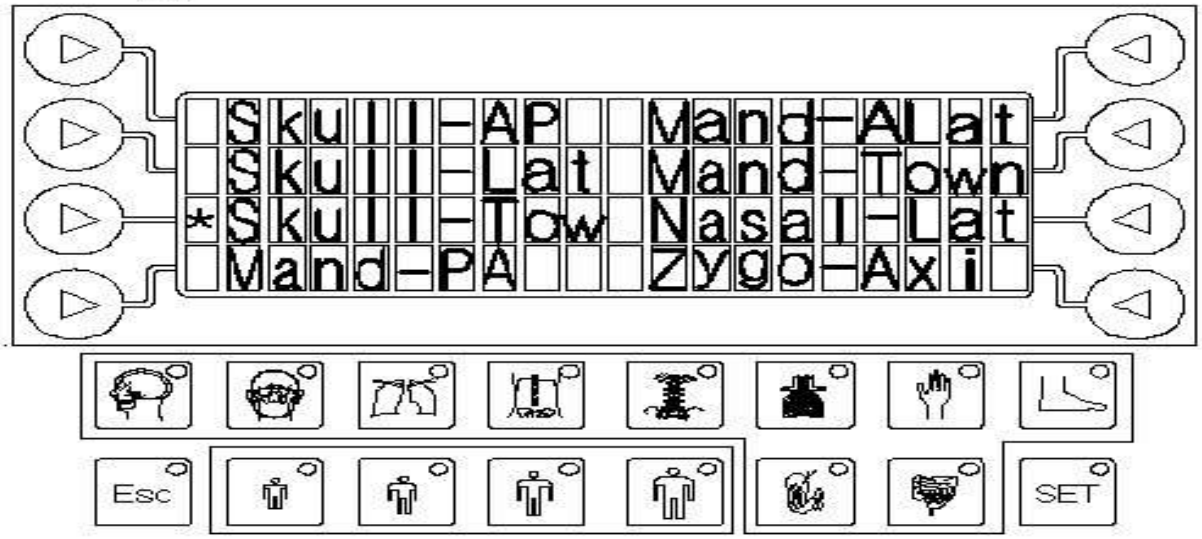


2.Selecting tube1 or tube 2 by pressing the button you want use.

3.Selecting BUCKY1 or BUCKY 2 by pressing the button you want radiography.

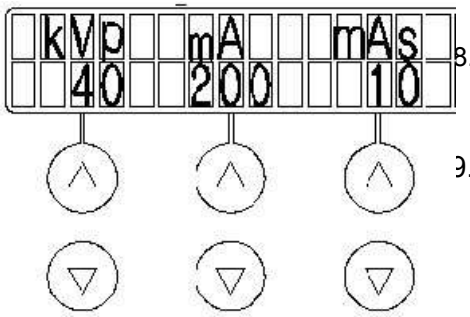
4.Selecting the interesting region you want radiography.

5.Selecting one among "-2, -1, 0, +1, +2" by pressing AEC Density UP/DOWN Button. (Secting nsity 0 generally)



6. After selecting the proper size of a patient according to the patient size, select the Anatomic Body Region as you want to take a X-ray.

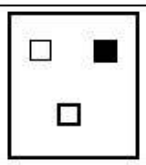
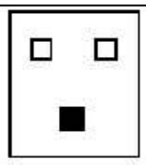
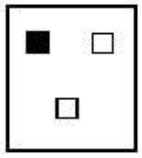
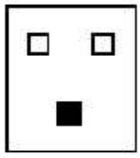
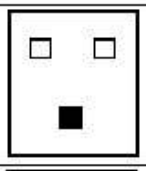
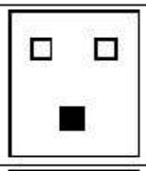
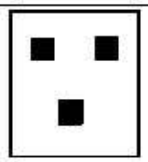
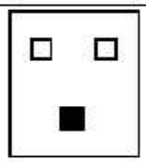
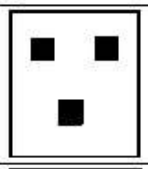
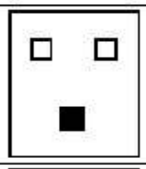
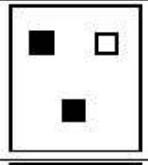
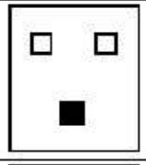
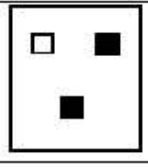
7. Select the body region on the Anatomical View LCD Screen.

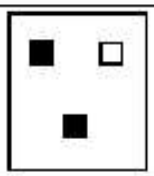
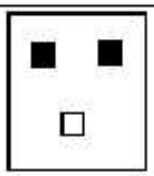
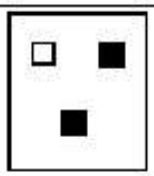
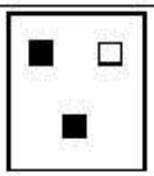
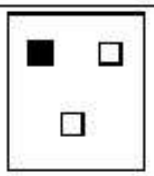
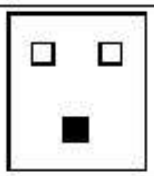
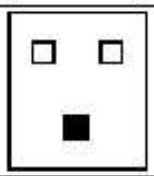
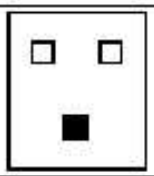
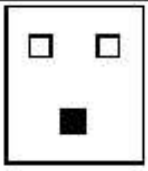
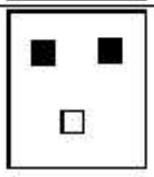
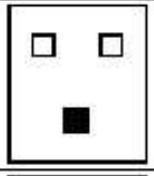
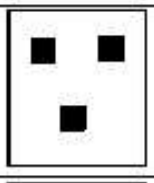
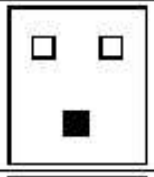
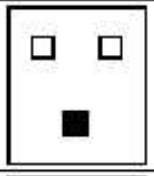
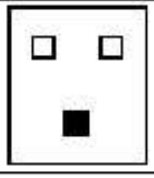
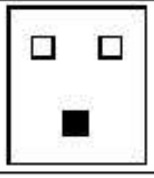


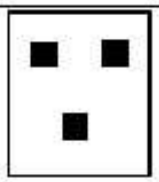
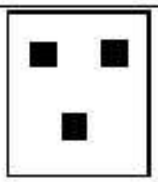
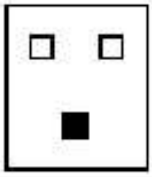
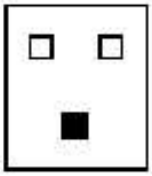
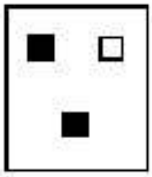
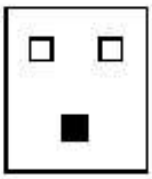
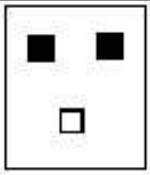
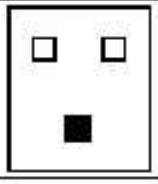
8. Precisely set the KV, mA, and sec/mAs by controling EXPOSURE PARAMETER.

9. After operating Ready, finish the taking X-ray by operating Exposure.

3.5.6 Selection of AEC field

Position	AEC Field	Position	AEC Field
Chest PA		Shoulder	
Chest AP		Humerus(AP&LAT)	
Chest LAT		Clavicle	
Rib upper AP		Femur(AP&LAT)	
Rib lower AP		Knee (AP,OBL&LAT)	
LPO/RAO		TIB/FIB (AP&LAT)	
RPO/LAO		Pelvis AP	

Position	AEC Field	Position	AEC Field
Sternum RAO		Abdomen for I V P	
Sternum LAO		Abdomen Left LAT	
Sternum Lt.LAT		LS Spine (LPO/RPO)	
Shoulder AP		LS Spine LAT	
T-Spine LAT		Abdomen Supine AP	
LS Spine AP		Abdomen Stand AP,LAT,DECUB	
Hip (AP&Frog Leg)		C-Spine AP&LAT	
SI joint OBL		T-Spine AP	

▣ AEC Field at spot radiography during fluoroscopy			
Stomach AP/PA		Small Bowel	
RAO/LPO		Esophagus AP or RAO	
Right LAT		Esophagus LAT	
Colon AP/PA		Rectum LAT	
LPO,RAO,RPO,LAO,LAT DECUB			

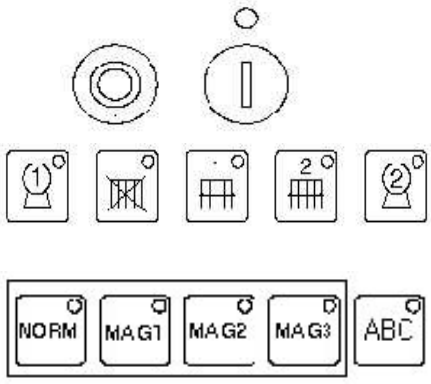
3.6 ABC operation

3.6.1 Introduction

Automatic Brightness Control(ABC) always makes a regular image on the monitor by controling the fluoroscopic tube-voltage or fluoroscopic tube-current according to the X-ray absorption of a subject.

REX-R/F quickly copes with reaction speed of the monitor brightness according to the change of a subject by controling simultaneously the fluoroscopic tube-voltage and fluoroscopic tube-current.

3.6.2 Operating Sequences

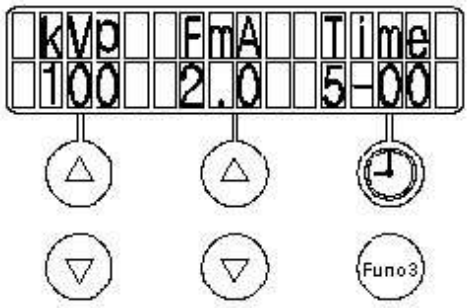


1. Turning on the power by pressing the button for the x-ray sysytem.

2. Slecting tube 2(fluoroscpic mode).

3. Don't select the BUCKY because it is fixed to the Tower part.

4. Slecting ABC at workstation.



5. Start fluoroscopy by pressing the FLU button at tower part.

6. Fluoroscopic tube-voltage and fluoroscopic tube-current irradiated to a patient during the fluoroscopy are displayed on the LCD screen to make controller know it.

7. ABC is geared with the range of 40～120KV for fluoroscopic tube-voltage and of 0.4～4mA(Higher mA : Option) for fluoroscopic tube-current according to the X-ray absorption of a subject during the fluoroscopy.

8. To prevent the radiation from exposing excessively, the time for fluoroscopy isn't over 5 minutes and you can hear the warning signal when the set period passes.

3.7 Beam limiting device operation

1) Locate the position which is wanted to expose to.
2) Settle the SID with the side measuring tape 4.
3) Light on the collimator lamp switch 3) and establish the X-ray exposure range.
4) Adjust the X-ray field to suit the exposure region with the variable switch 1) of collimator.
The distance is divided into 100cm, 150cm and 200cm according to the exposure purpose.
When the X-ray field is adjusted to the scale on the collimator window, the X-ray field values are shown on the table top according to the distance.
5) To restrain the radiation dose for chest at the minimum, obtain the real size image and prevent the image from blurring, lengthen the distance between the focus and the exposure region
6) Perform the exposure and develop the films.

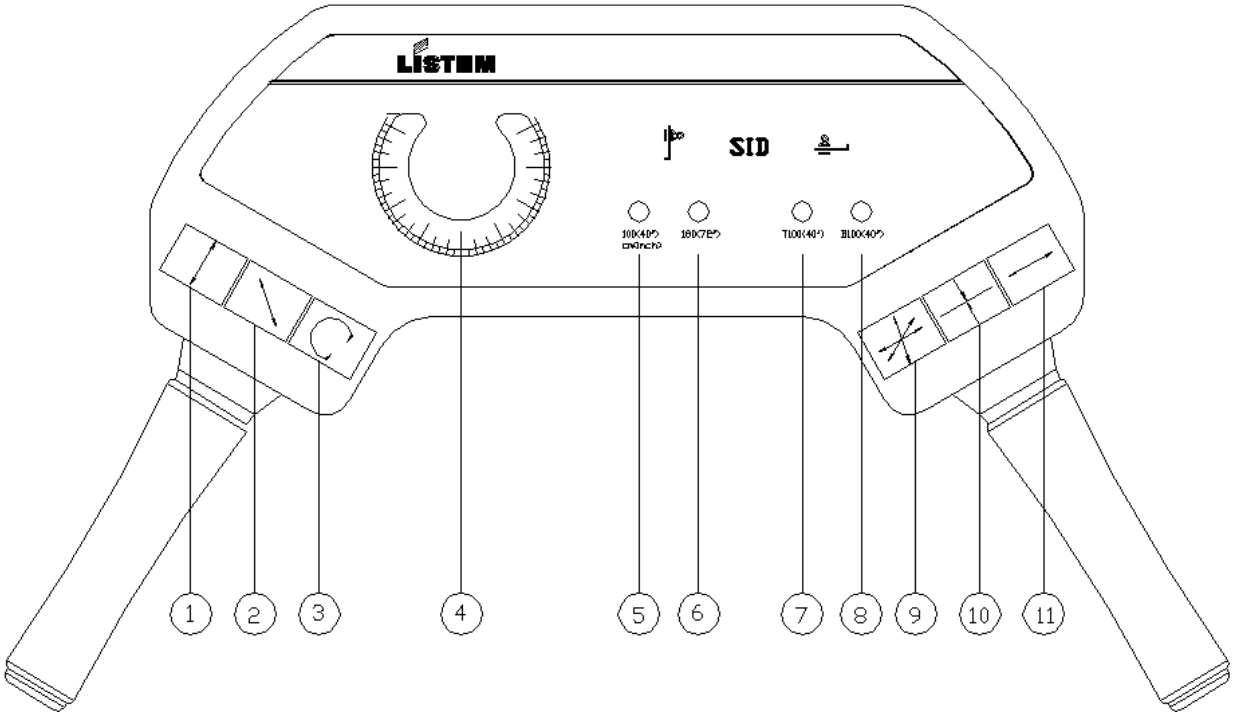
▣ Positioning between the standard axis and the image reception area

When the scale of handle bar's protractor indicates 0°, the X-ray projects vertically on the image reception area.

3.8 Tube stand operation

3.8.1 Floor to ceiling mounted stand; SFC-31(R)

(1) Handle bar Operating



① Lock On/Off Switch for right-and-left movement of Tube
② Lock On/Off Switch for back-and-forth movement of Tube
③ Lock On/Off Switch for Tube rotation
④ Tube Protractor
⑤ LED to mark that the interval is 100cm between the Tube Center and Table Board
⑥ LED to mark that the interval is 180cm between the Tube Center and Chest Holder
⑦ LED to mark that the interval is 100cm between the Tube Center and Table BUCKY
⑧ LED to mark that the interval is 180cm between the Tube Center and BUCKY Stand
⑨ Lock On/Off Switch for simultaneous movement; up-and-down, back-and-forth, right-and-left.
⑩ Switch for Positioning of Table Center
⑪ Lock On/Off Switch for up-and-down movement of Tube

1) Right-and-Left Movement
After pressing the button ①, move the Handle from side to side.
2) Back-and-Forth Movement
After pressing the button ②, move the Handle from back to forth.
3) Tube Rotation
After pressing the button ③, rotate the Handle.
When you use this function, you can find the exact angle of Tube from the Protractor.

4) Up-and-Down Movement
After pressing button ⑪, move the Handle from upward to downward.
5) Positioning of Table Center
After pressing button ⑩, move the Tube back-and-forth, then it will be fixed to the same position of X-ray Center and Table Center. And then press the button ②, it can move again.

(2) Appearance Structure and Title

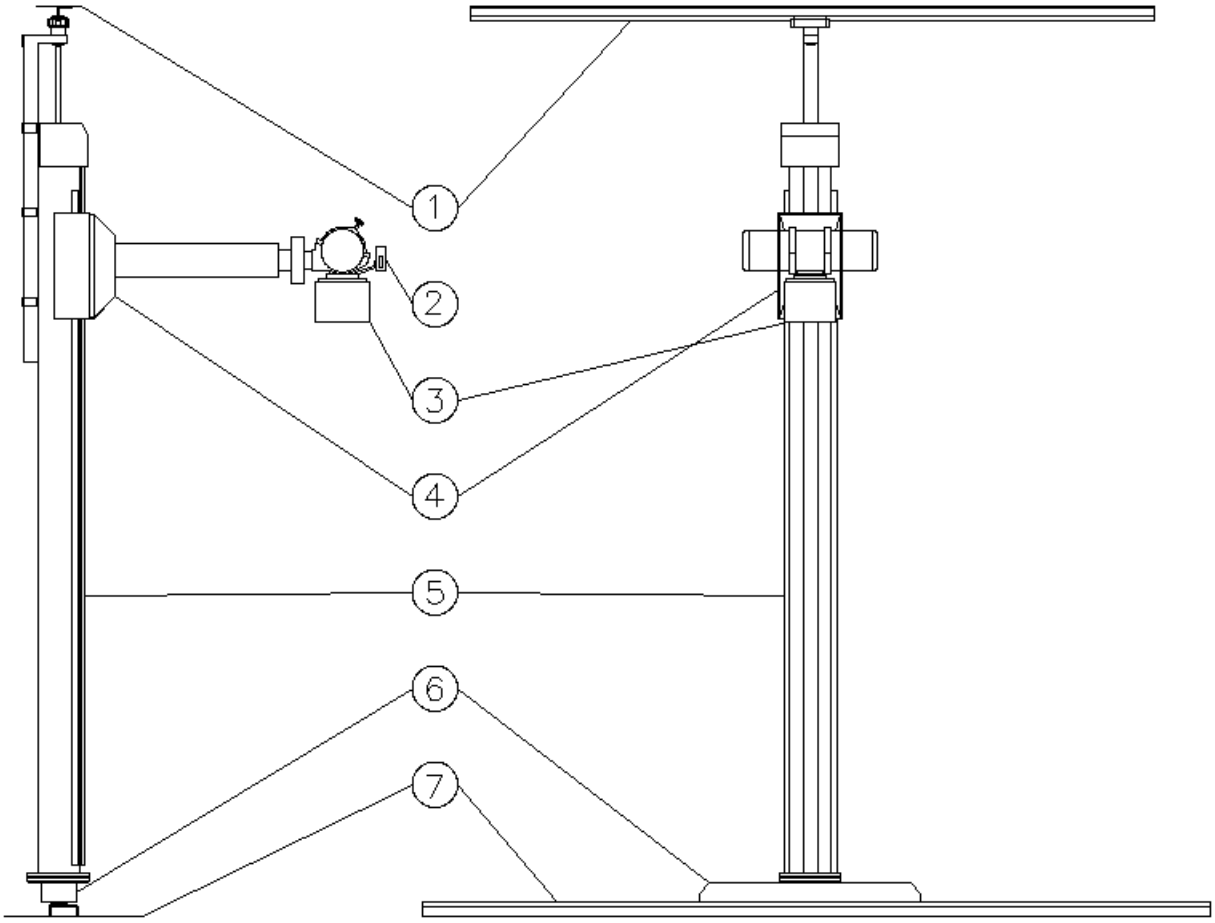
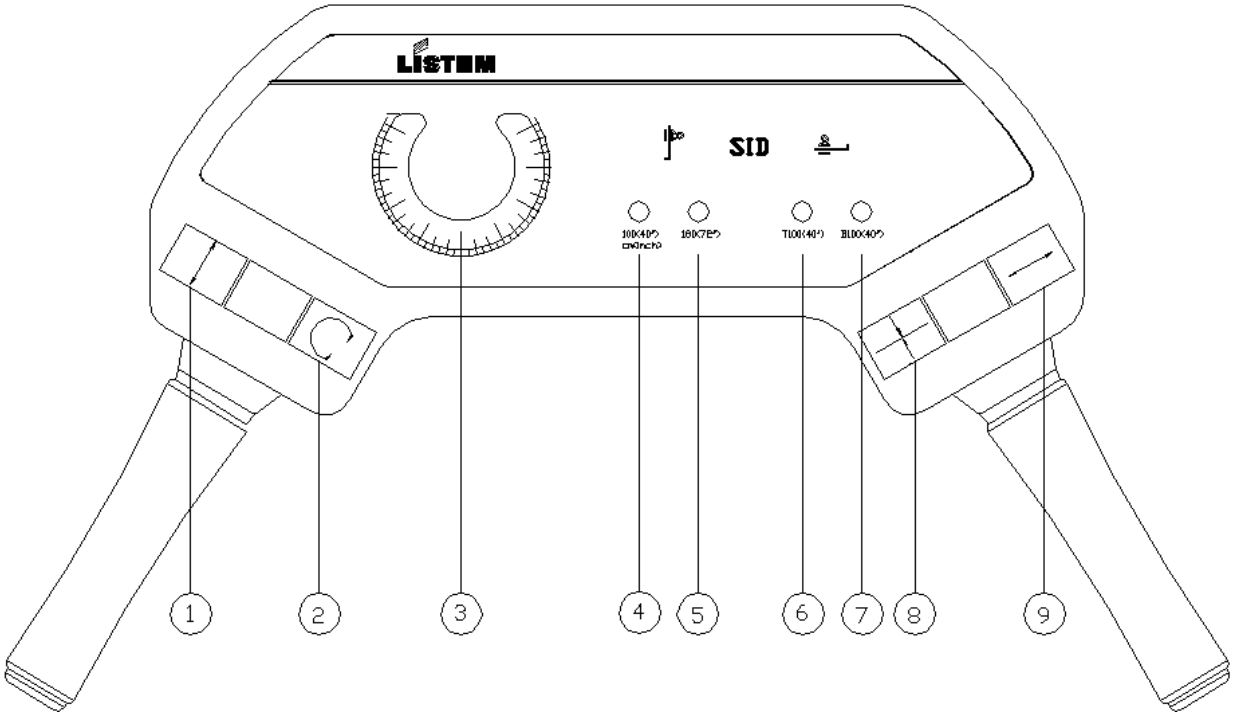


Fig. 1 SFC-31(R)

① Ceiling Rail
② Handle Bar Assembly
③ X-ray Tube & Beam Limiting Device (Optional)
④ Vertical Carriage Assembly
⑤ Vertical Column Assembly
⑥ Base Assembly
⑦ Floor Rail

3.8.2 Floor mounted stand ; SFM-31

(1) Handle bar Operating



① Lock On/Off Switch for right-and-left movement of Tube
② Lock On/Off Switch for Tube rotation
③ Tube Protractor
④ LED to mark that the interval is 100cm between the Tube Center and Table Board
⑤ LED to mark that the interval is 180cm between the Tube Center and Chest Holder
⑥ LED to mark that the interval is 100cm between the Tube Center and Table BUCKY
⑦ LED to mark that the interval is 180cm between the Tube Center and BUCKY Stand
⑧ Switch for Positioning of Table Center
⑨ Lock On/Off Switch for up-and-down movement of Tube

1) Right-and-Left Movement
After pressing the button ①, move the Handle from side to side.
2) Back-and-Forth Movement
After pressing the button ②, move the Handle from back to forth.
3) Tube Rotation
After pressing the button ③, rotate the Handle.
When you use this function, you can find the exact angle of Tube from the Protractor.

4) Up-and-Down Movement
After pressing button ⑪, move the Handle from upward to downward.

5) Positioning of Table Center
After pressing the button ⑧, move the Tube back-and-forth, then the LAMP is turned on when the X-ray Center is placed on the same position with Table Center.

(2) Appearance Structure and Title

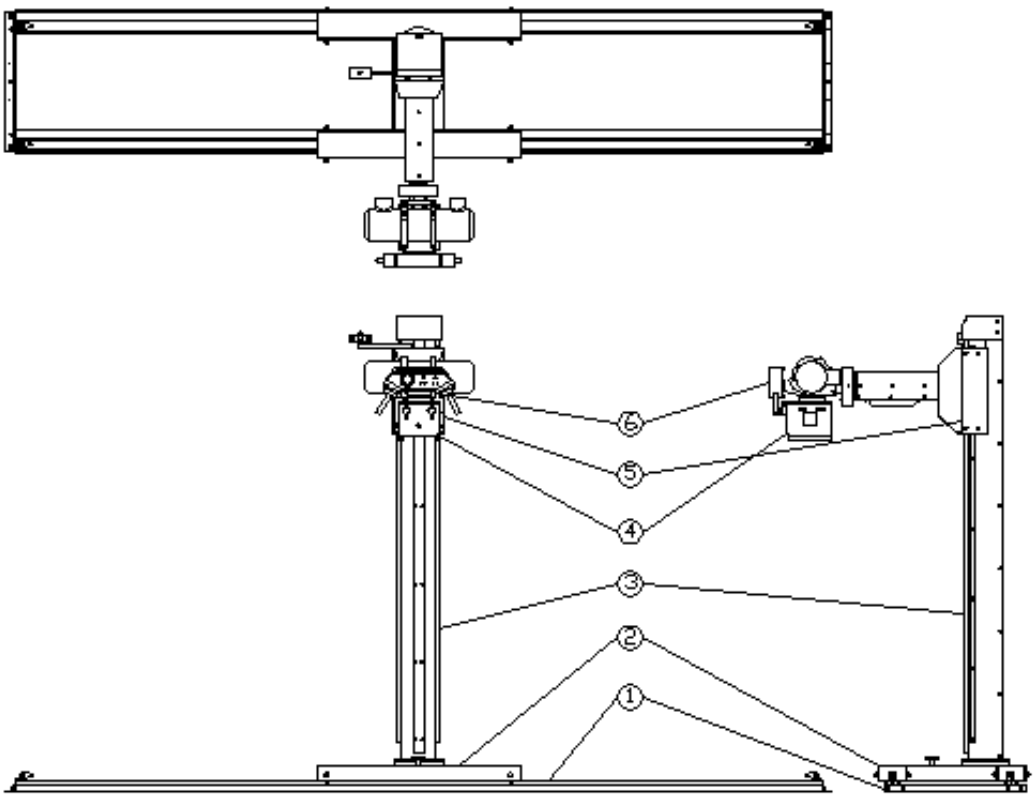
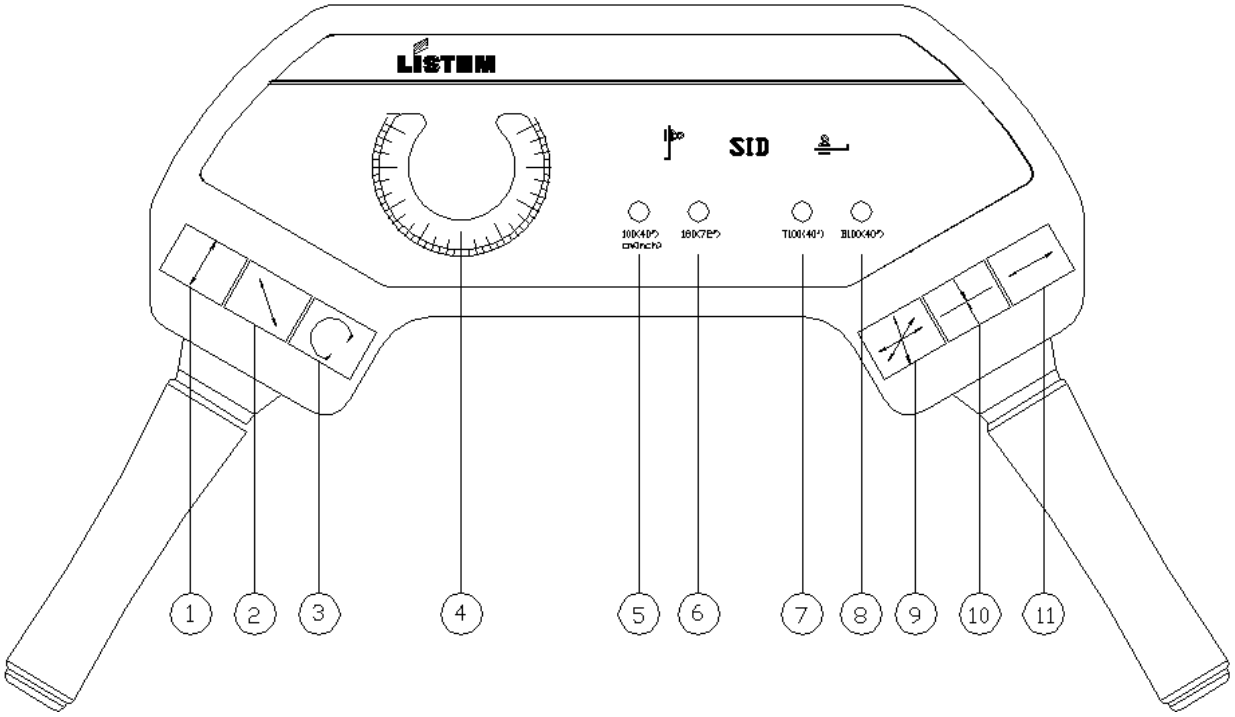


Fig. 2 SFM-31

① Floor rail
② Base assembly
③ Vertical column assembly
④ X-ray Tube & Beam limiting device
⑤ Vertical carriage assembly
⑥ Handle bar assembly

3.8.3 Ceiling mounted stand ; CSTS-28

(1) Handle bar Operating



① Lock On/Off Switch for right-and-left movement of Tube
② Lock On/Off Switch for back-and-forth movement of Tube
③ Lock On/Off Switch for Tube rotation
④ Tube Protractor
⑤ LED to mark that the interval is 100cm between the Tube Center and Table Board
⑥ LED to mark that the interval is 180cm between the Tube Center and Chest Holder
⑦ LED to mark that the interval is 100cm between the Tube Center and Table BUCKY
⑧ LED to mark that the interval is 180cm between the Tube Center and BUCKY Stand
⑨ Lock On/Off Switch for simultaneous movement; up-and-down, back-and-forth, right-and-left.
⑩ Switch for Positioning of Table Center
⑪ Lock On/Off Switch for up-and-down movement of Tube

1) Right-and-Left Movement
After pressing the button ①, move the Handle from side to side.
2) Back-and-Forth Movement
After pressing the button ②, move the Handle from back to forth.
3) Tube Rotation
After pressing the button ③, rotate the Handle.
When you use this function, you can find the exact angle of Tube from the Protractor.

4) Up-and-Down Movement

After pressing button ⑪, move the Handle from upward to downward.

5) Positioning of Table Center

After pressing button ⑩, move the Tube back-and-forth, then it will be fixed to the same position of X-ray Center and Table Center. And then press the button ②, it can move again.

(2) Appearance Structure and Title

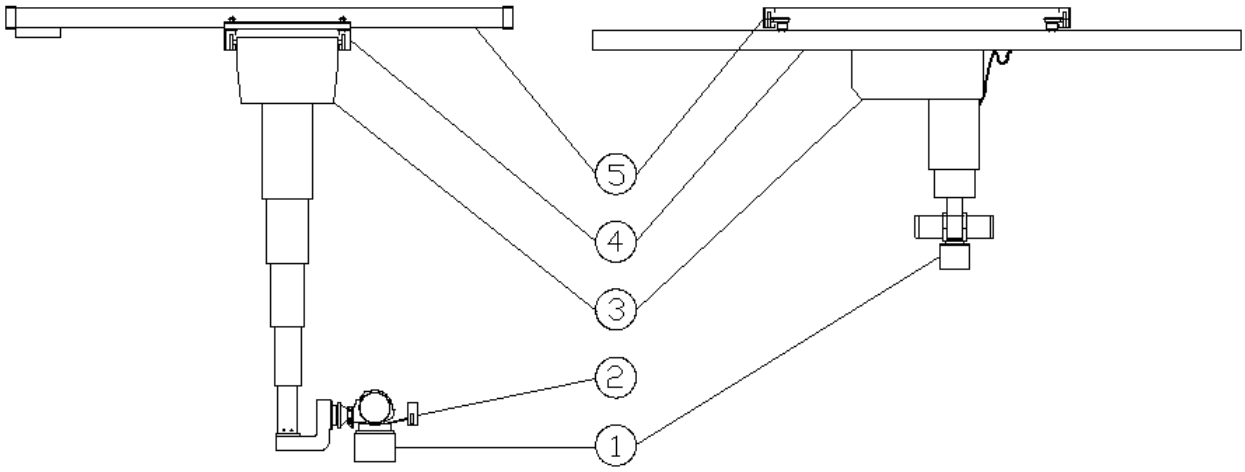
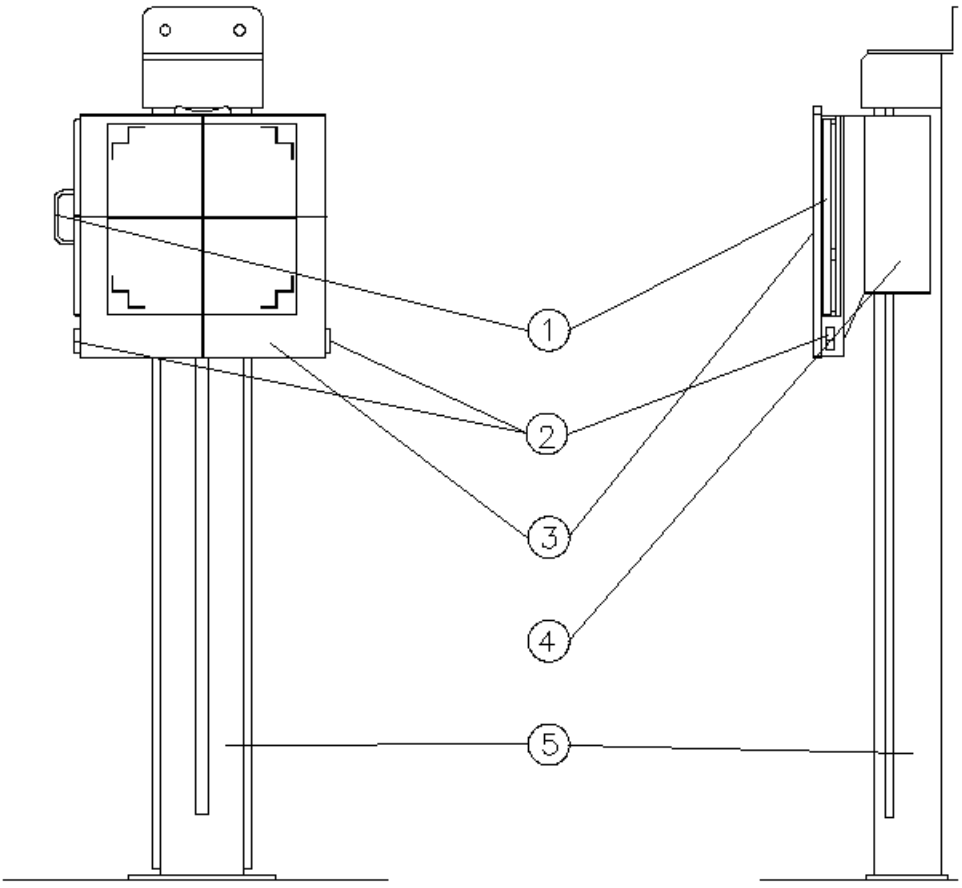


Fig. 3 CSTS-28

① X-ray Tube & Beam Limiting Device (Optional)
② Control handle bar assembly)
③ Telescopic column assembly
④ Transverse carriage assembly (Lateral rails) with terminal panel box.
⑤ Ceiling Rails (Longitudinal Travel)

3.8.4 Bucky stand(BS-20) operating

① Pull the Cassette Tray.
② Considering the Cassette Tray size, install the grip of it in the groove which centered on it in a line, if you need.
③ Put the X-ray film cassette into the Cassette Tray.
④ Push into the Cassette Tray.
⑤ Pressing the switch under the Bucky Device, move the Bucky Device up-and-down then adjust the proper height according to a patient or fluoroscopy.
⑥ Take a X-ray.



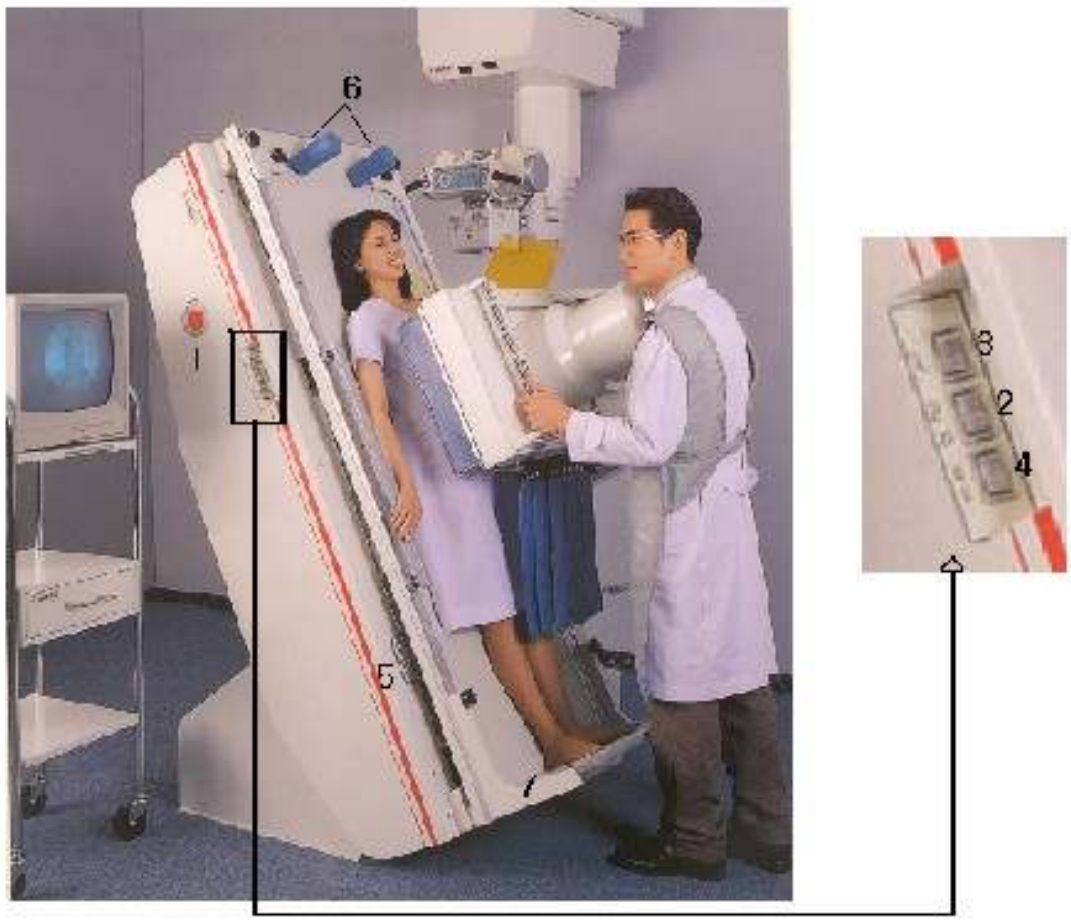
Picture 4 BS-20

① Cassette tray
② Bucky up/down button
③ Bucky Device Assembly
④ Vertical Carriage Assembly
⑤ Vertical Column Assembly

3.9. Table operation

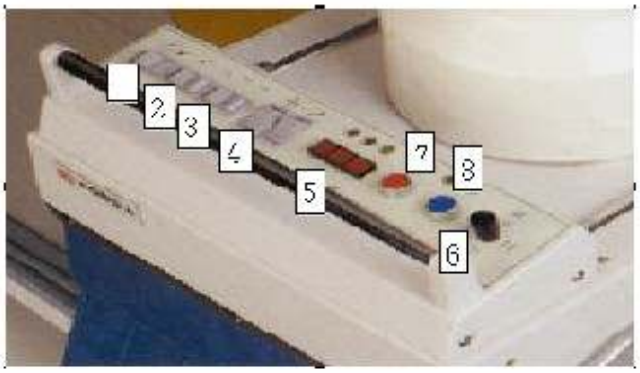
3.9.1 Fluoroscopic/radiographic Patient Table; DMT-80

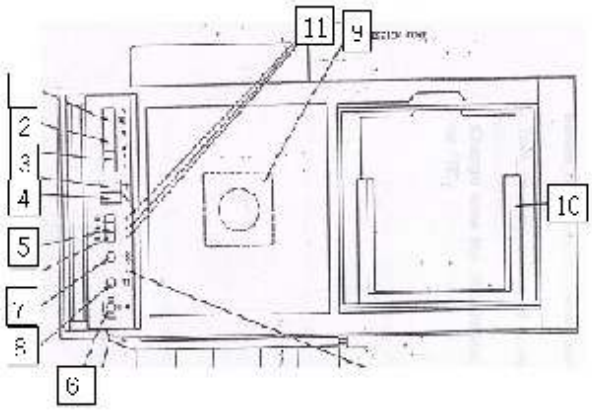
1) Appearance Structure and Title



1. Protractor : Mark for an angle of inclination, when it is supported.
2. Keeping Horizon Button: For keeping the Table in horizontal state to prevent it from inclining inversely
3. Button for Inclination and Inverse Inclination: For inclining the Table.
4. Sliding Button: For moving the Table Board.
5. Cassette Tray: For putting a Cassette
6. Shoulder Support: For preventing a patient from sliding, when the Table is stands inversely.
7. Foot Support: For supporting a patient's foot, when the Table stands vertically.

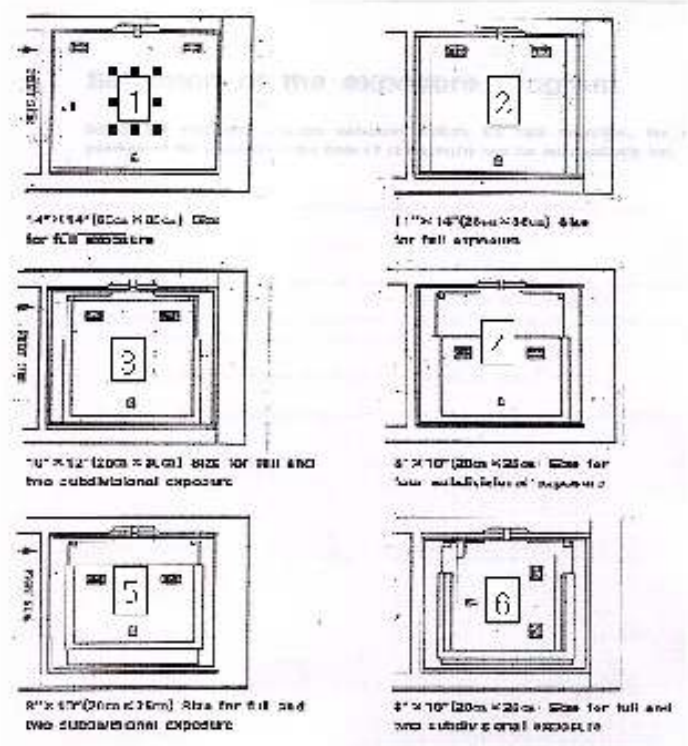
▣ Tower part





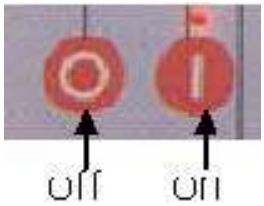
① Keeping Horizon Button : For fixing to 0。 to prevent the Table from inclining inversely
② Button for Inclination and Inverse Inclination : For inclining the Table.
③ Sliding Button : For moving the Board toward head and leg
④ Lock Device of Tower Part : For locking all directions or partially locking only back-and-forth
⑤ Mark for Division Picture-Taking : For taking X-ray, with dividing into 1, 2, and 4.
⑥ Control Screw of Collimator Iris : For controling right-and-left, back-and-forth direction
⑦ Fluoro Button
⑧ Exposure Button
⑨ Pressure Corn(?)
⑩ Cassette Tray
⑪ Led for Division Mark

▣ FILM LOADING



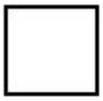
① 14'*14'(35cm*35cm)size for full exposure
(It is possible to insert this, after removing the spot film device.)
② 11'*14'(28cm*35cm)size for full exposure
(It is possible to insert this, after removing the spot film device.)
③ 10'*12'(25cm*30cm)size
for full and two subdivisional exposure
④ 8'*10'(20cm*25cm)size for four exposure
⑤ 8'*10'(20cm*25cm)size
for full and two subdivisional exposure
(cassette transvers insert)
⑥ 8'*10'(20cm*25cm)size
for full and two subdivisional exposure
(cassette longitudial insert)

2) System power ON

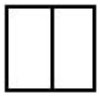


Press the Console Power Switch "on" of the REX-RF System

3) Tower part operating



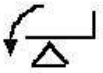
Choose for 1 spot radiography



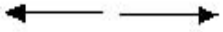
Choose for 2 spot radiography

Choose for 4 spot radiography

Choose for the Table inclination(90。) and for the inverse inclination(-15。)



Choose for keeping the Table in horizontal state(0。), not to be inversely

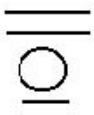


Choose for sliding Movement

Choose for keeping all directions of Tower Parts to be under lock
(up/down, right/left, back/forth)

for keeping the up/down movement of Tower Part under lock

Open and close the up/down Iris with Collimator Lever.

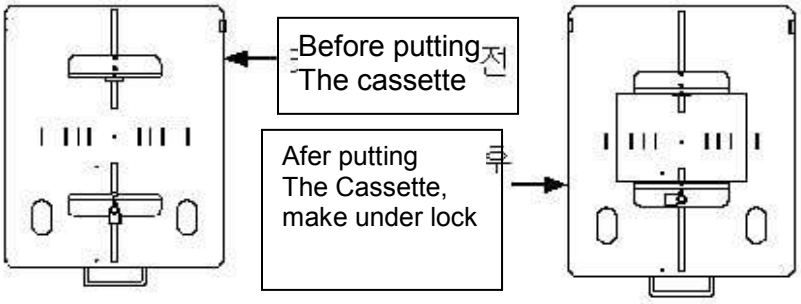


Open and close the right/left Iris with Collimator Lever

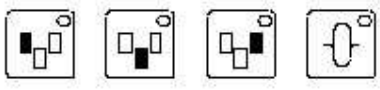
3.9.2 Radiographic operating

1) General radiography method

1. Fit the wide X-ray Field into the Table Center
2. Move a patient to the Table.]
3. Insert the Cassette into the part that you will take X-ray
   (When you take X-ray directly on the affected part...)
4. If you take X-ray with using Bucky, insert the Cassette after pulling the Cassette Tray out.



5. After putting the Cassette, fix it with lock device, not to make movement.
   (Push the Cassette Tray into the Table inside, then it is fixed by the lock device.)
6. Move directly toward the part which you want to take X-ray, using Table Sliding Button or tube.
7. Check the position and check again the Cassette position.
   (When you need to adjust again, repeat above 5.)
8. Explain the suggestions about breathing and movement to a patient.
9. X-ray exposure control
   ① For the Hand-operated Mode
   Collate the tube voltage, tube current and time for taking X-ray
   ② For the AEC Mode



1) Select the position for the Field Selection
2) You can select the singular or plural position for the Field Selection.

In the AEC Mode, if the X-ray quantity is accumulated adequately, time is controled automatically to generate the regular picture strength regardless of the subject's thickness.

After turning off the LED by pressing the READY button, finish taking X-ray by pressing the Exposure button.
Check the follow point, when you finish READY.
Check whether Table Bucky operates well or not, when you select BUCKY 1(Check the sound)

10. Finish Taking X-ray
    - After taking X-ray, relocate the Table position originally.

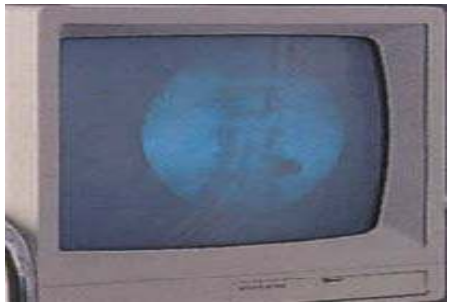
2) Fluoroscopy operating

1. Move a patient to the Table.
2. Explain the inspection process to the patient before taking X-ray, and check it slowly.
3. Move the Tower Part forward and then prepare for fluoroscopy by coming it down.
4. Insert the Cassette. (Select 1,2,4SPOT for division, when you insert Cassette)
   (When you take X-ray separately with using SPOT, insert the pressure corn into the part which need to pressure, and it should be separated manually.)

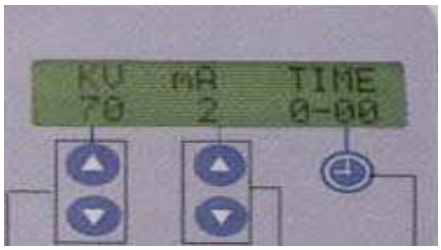
5. Select SOPT(1spot, 2spot, 4spot) for taking X-ray separately.
   (When you select the SPOT, the LED is turned on.)

6. Begin to fluoroscopy, using the fluoroscopy button. When you press the button, the LED is turned on, "inspecting".

7. Through the monitor, look at the part which you want to take X-ray.



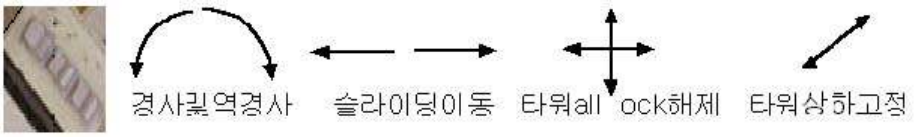
8. Control the fluoroscopic tube voltage and tube current.
   ① In the manual mode
   According to the patient's physical condition, control the fluoroscopic tube voltage and tube current through the monitor.



REX-RF fluoroscopy console

   ② In the ABC mode
   Set the ABC mode by pressing the ABC function key at the console.
   In the ABC mode, fluoroscopic tube voltage and tube current are changed adequately according to the X-ray absorption of a subject, and they control the monitor brightness regularly.

9. Begin to scan for catching the adequate part which you'll take X-ray, moving the Table and Tower part.

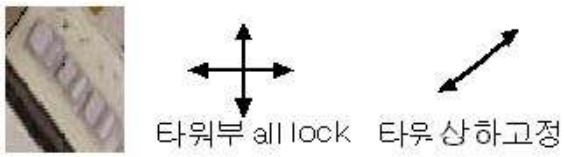


Inclination & Inverse Inclination	Sliding Movement	Release all lock of Tower	Fixation for up/down movement of Tower

10. If the scan image is catched adequately, you can control the fluoroscopic iris to describe the detail region and clearer anatomical image. Control the range of the X-ray Field, then you can get clearer image due to the reduction of scattering line.

If you move the iris screw to left, it becomes narrower with right/left same width.
If you move the iris screw to right, it becomes wider with right/left same width.
If you move the iris screw to up, it becomes wider with up/down same width.
If you move the iris screw to down, it becomes narrower with up/down same width.

11. If you complete the preparation for taking X-ray with SPOT, lock the Tower to prevent it from moving.



All lock the Tower	Fixation for up/down movement of Tower

12. Explain the suggestions about the breathing or movement to a patient, before taking X-ray.

13. Set the Exposure Factors(fluoroscopic tube voltage, fluoroscopic tube current, time) in advance for taking X-ray with SPOT according to position.

14. After selecting the part which you want to take X-ray, press EXPOSURE S/W.
    Taking X-ray is completed after 3 seconds, if you press the EXPOSURE switch.
    
    (The LED on the button is turned off by irradiation completion while you operate the EXPOSURE.)

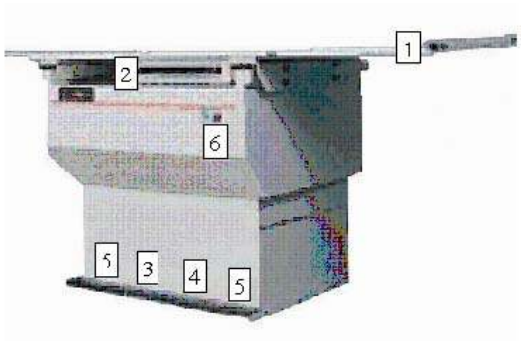
You can hear the audible sounds which indicate "irradiating" during taking X-ray, and the sounds stop when the irradiation is completed. The part which is taken X-ray is displayed on the monitor and it is disappeared when the irradiation is completed.

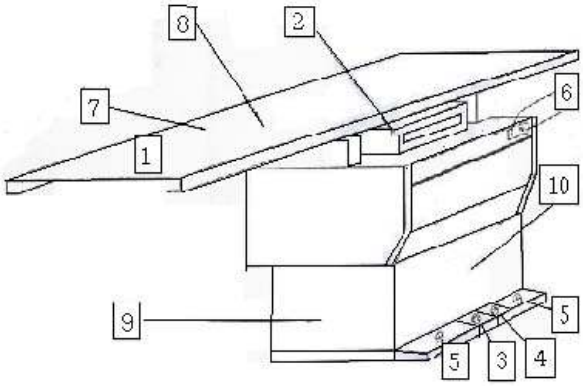
15. If you need to take X-ray additionally, repeat the process from 4 to 14 after inserting a film.

16. Completion to take X-ray
    — After taking X-ray, relocate the Table originally.
    — Expl`ain the details for following treatment to the patient.

3.9.3 6-Way Table : KOB-60

(1) Appearance Structure and Title





① Table Board : It is possible to move in 6-way.(back/forth, right/left)
② Cassette Tray : After moving toward the part which you'll take X-ray, insert this.
③ Foothold Switch for Table UP: If you press the UP Foothold Switch, it moves upward.
④ Foothold Switch for Table DOWN : If you press the DOWN Foothold Switch, it moves downward.
⑤ Foothold Switch for Table 4-Way : If you press the Foothold Switch in both ends, the board moves.
⑥ Power Switch : To power for the Table.
⑦ Control Sensor for Back/Forth Way : When the Table moves in Back/Forth Way, this controls the both ends to be same width.
⑧ Control Sensor for Maximum Height : This controls the Table not to go up more maximum height.
⑨ Control Device for Oil Pressure : This controls the pressure of the Table by Oil.
⑩ Device for Power Supply : This supplies Power for the Table itself.

(2) Table Power ON

1) Operate the GENERATOR by powering for the system.
2) Prepare for Table operation by pressing its own Power Switch on the right-centered of the Table.

(3) Normal Taking X-ray

1) Fit the wide X-ray Field into the Table Center.
2) Adjust the Table Center, pressing the Foothold Switch.

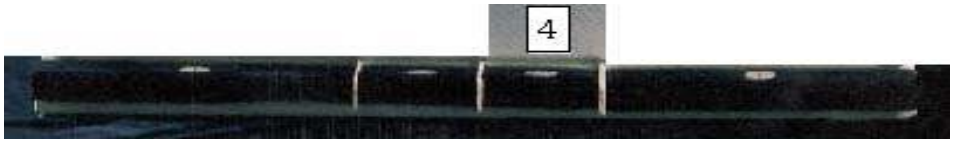
(Press the Table 4-Way Foothold Switch No. 5 in the both ends.)

3) Lower the Table height to the lowest location.

(Press the Table DOWN Foothold Switch No. 3 in the center.)

4) Move the patient to the Table.

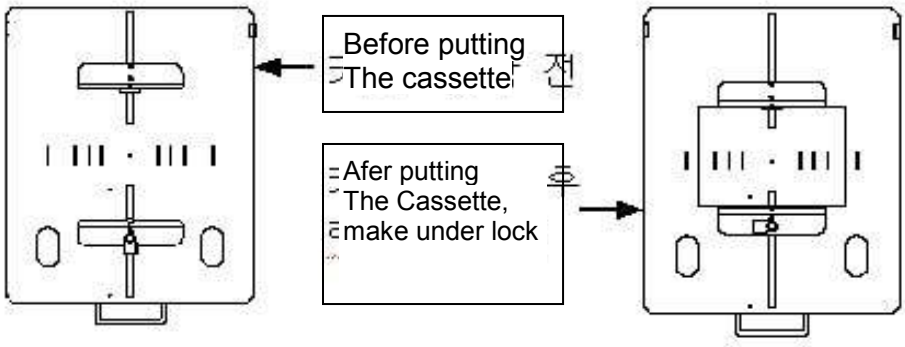
5) Move the Table upward to the distant for taking X-ray, using the Foothold Switch.



(Press the Table UP Foothold Switch No. 4 in the center.)

6) Insert the Cassette into the part which you'll take X-ray.
(when you take X-ray directly on the affected part)

7) If you take X-ray with using BUCKY, insert the Cassette, after drawing the Cassette Tray out.



8). After putting the Cassette, fix it with lock device, not to make movement.
(Push the Cassette Tray into the Table inside, then it is fixed by the lock device.)

9) Move the Table Board to the part which you want to take X-ray.

(Press the Table 4-Way Foothold Switch, No5.)

10) Check the position and check again the Cassette position.
(When you need to adjust again, repeat above 5)

11) Explain the suggestions about breathing and movement to a patient.

12) X-ray Irradiation Control

① For the Hand-operated Mode
Collate adequately the tube voltage, tube current and time for taking X-ray

② For the AEC Mode(Only for the REX-R)

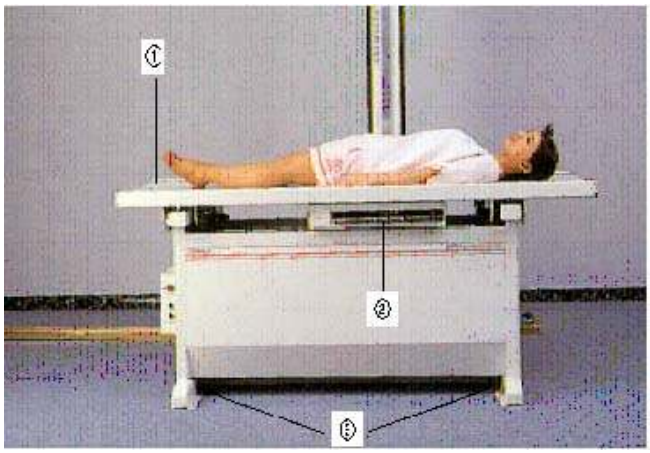
1) Select the position for the Field Selection
2) You can select the singular or plural position for the Field Selection.
In the AEC Mode, if the X-ray quantity is accumulated adequately, time is controled automaticall
to generate the regular picture strength regardless of the subject's thickness.

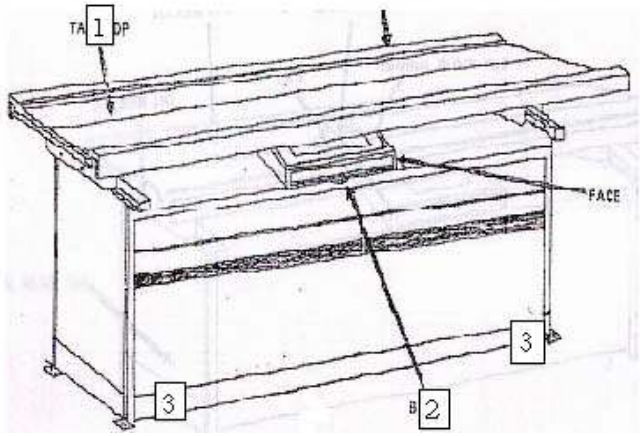
After turning off the LED by pressing the READY button, finish taking X-ray by pressing the EXPOSURE button. When you complete READY, check whether the ion chamber and the Table BUCKY operate or not.

13) Finish Taking X-ray

3.9.4. 4-way Table; KOB-1(sensor type)

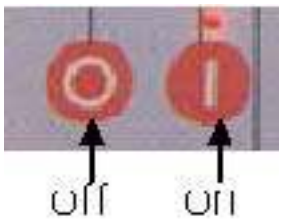
1) Appearance Structure and Title





① Table Board : It is possible to move in 4-way.(back/forth, right/left)
② Cassette Tray : After moving toward the part which you'll take X-ray, insert this.
③ Electronic Lock Device : This senses through the sensor in the both ends. If you insert your foot, the Table moves.

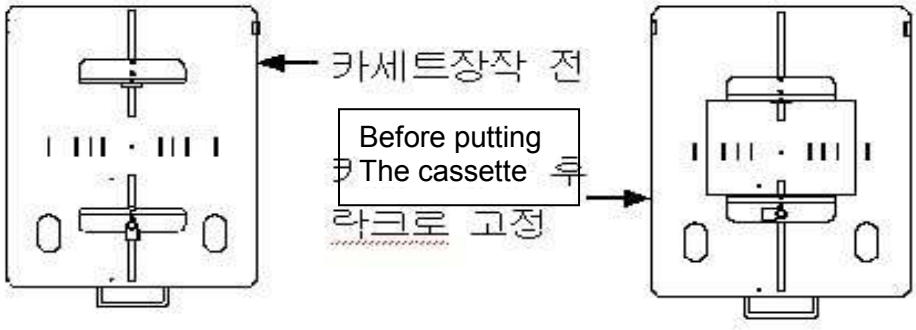
2) System power ON



Press the Console Power Switch ON of the REX-325R System.

3) General radiograhpy

1. Fit the wide X-ray Field into the Table Center.
2. Move a patient to the Table.
3. Insert the Cassette into the part which you'll take X-ray (when you take X-ray directly on the affected part).
4. If you take X-ray with using BUCKY, insert the Cassette, after drawing the Cassette Tray out.



Afer putting The Cassette, make under lock

5. After putting the Cassette, fix it with lock device, not to make movement.
(Push the Cassette Tray into the Table inside, then it is fixed by the lock device.)

6. Move the Table Board to the part which you want to take X-ray, using Table Sensor.

7. Check the position and check again the Cassette position.
(When you need to adjust again, repeat above 5.)

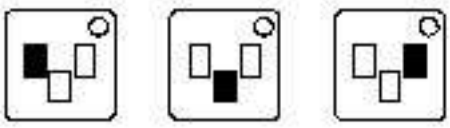
8. Explain the suggestions about breathing and movement to a patient.

9. X-ray Irradiation Control

① For the Hand-operated Mode

Collate adequately the tube voltage, tube current and time for taking X-ray

② For the AEC Mode



1) Select the position for the Field Selection

2) You can select the singular or plural position for the Field Selection.
In the AEC Mode, if the X-ray quantity is accumulated adequately, time is controled automatically to generate the regular picture strength regardless of the subject's thickness.

After turning off the LED by pressing the READY button, finish taking X-ray by pressing the EXPOSURE button. Check the follow point, when you finish READY.

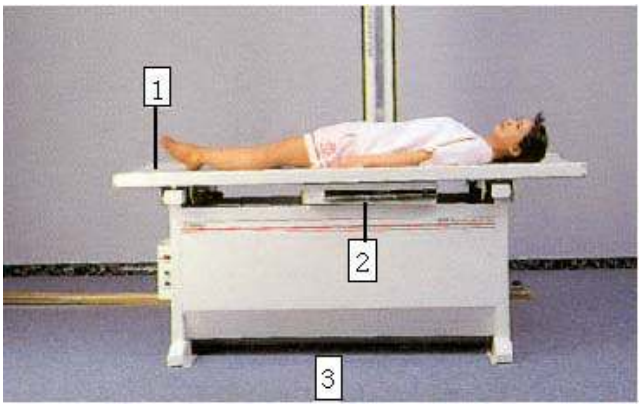
Check whether Table Bucky operates well or not, when you select BUCKY 1 (Check the sound)

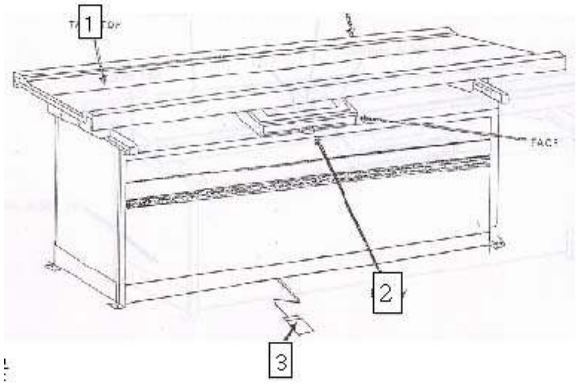
10. Finish Taking X-ray

- After taking X-ray, relocate the Table position originally.

3.9.5. 4-way Table ; KOB-Ⅲ(foot switch type)

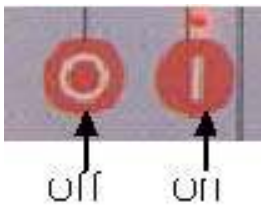
(1)Appearance Structure and Title





① Table Board : It is possible to move in 4-way.(back/forth, right/left)
② Cassette Tray : After moving toward the part which you'll take X-ray, insert this.
③ Foot Switch Lock Device : If you press the Foot Switch it is under lock, and if you take off your foot the lock is released.

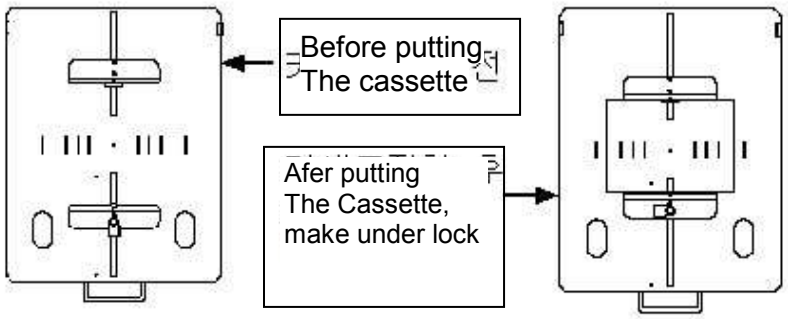
(2) System power ON



Press the Console Power Switch ON of the REX-325R system.

(3) Radiograhpy method

1. Fit the wide X-ray Field into the Table Center.
2. Move a patient to the Table.
3. Insert the Cassette into the part which you'll take X-ray (when you take X-ray directly on the affected part).
4. If you take X-ray with using BUCKY, insert the Cassette, after drawing the Cassette Tray out.



5. After putting the Cassette, fix it with lock device, not to make movement.
   (Push the Cassette Tray into the Table inside, then it is fixed by the lock device.)

6. Move the Table Board to the part which you want to take X-ray, using Foot Switch Sensor.

7. Check the position and check again the Cassette position.
   (When you need to adjust again, repeat above 5.)

8. Explain the suggestions about breathing and movement to a patient.

9. X-ray Irradiation Control
   ① For the Hand-operated Mode
      Collate adequately the tube voltage, tube current and time for taking X-ray
   ② For the AEC Mode(Only for the REX-R)

1) Select the position for the Field Selection
2) You can select the singular or plural position for the Field Selection.
   In the AEC Mode, if the X-ray quantity is accumulated adequately, time is controled automatically to generate the regular picture strength regardless of the subject's thickness.

After turning off the LED by pressing the READY button, finish taking X-ray by pressing the EXPOSURE button. Check the follow point, when you finish READY.

Check whether Table Bucky operates well or not, when you select BUCKY 1 (Check the sound)

10. Finish Taking X-ray
    - After taking X-ray, relocate the Table position originally.

4. MAINTENANCE & REPAIR

This chapter explains about REX-***R(F) system maintenance and repair.

4.1 Summary

Objective of periodical maintenance is to maintain safety of patients and operators, improve service capacity and reduce maintenance costs while using the system.

Following maintenance and inspection steps are recommendation of LISTEM Corporation for the most efficient usage of the system. But specially trained X-Ray system technicians must conduct following service procedures.
The first periodic inspection service must be conducted 6 months after installation. Yearly periodic inspections are recommended thereafter.

① The system and the parts need periodic inspections.
② When the system is not used for long time, check complete normal operation before reusing.

The system is delivered in optimal condition after thorough quality control and inspection. In order to maintain the best condition, maintenances and inspections need to be perfromed periodically. The maintenance and inspection schedule are as following.

Repair check list		Inspector	Inspection date
Daily inspection	Starting inspection	Operator or equipment manager	Everyday before starting
	Finishing inspection	Operator or equipment manager	Everyday after finishing
Clean and sterilization		Operator or equipment manager	Proper time
Periodical inspection		Service Branch	Every 6 month

4.1.1 Daily inspection

Daily inspection is composed of starting inspection and finishing inspection. Daily inspection is necessary in order extend lifetime of the system. Please use the system after all the inspection is completed.

[Appendix 2.] has pre-operation inspection list and [Appendix 3.] has post operation inspection list. Please make copies and utilize them. We recommend keeping recorded check list for considerable amount of time.

Please perform following inspection before operating the system. When there is recognizable problem, please contact service center.

◦Check control panel for any abnormal indication.

◦Check for abnormal odor or sound when power is supplied or during recharge.

◦Check for abnormal sound or vibration on X-Ray tube device.

◦When control cabinet cover or other external parts are not clean please use household neutral detergent and carefully clean them.

4.1.2 Cleaning and sterilization

Turn off power before cleaning or sterilization.
It may cause electric shock or short circuit.

Do not spray water to the system.
The system is not protected against fluid. For cleaning the system please use cloths wetted with sterilization fluid and clean the surface.
Spraying water may cause electric shock or short circuit.

WARNING

Do not directly spray sterilization fluid to the system. Please be always cautious in using spray. For cleaning the system please use cloths wetted with sterilization fluid and clean the surface.
Do not use flammable sprays. It may cause fire or damages to the system.

WARNING

After sterilization and before supplying power, take enough time for ventilation of the room. Flammable gas may cause explosion, fire or electric shock.

Do not use following sterilization fluid

Performance and safety is not guanteed when following fluid is used.

◦ Chlorinetype sterilization fliud

◦ Sterilization fliud that erode metal, plastic, rubber or coating.
◦ Sterilization fliud that is not appropriate for metal, plastic, rubber or coating.
◦ Spray type gas sterilization fluid.
◦ Inflammable sterilization fluid.
◦ sterilization fluid that may be applied to internal system.

Please minimize use of sterilization fluid.

Long exposure to sterilization fluid may cause deformation, discoloration or damage rubbers or plastics. When system is deformed due to sterilization fluid, stop operating the system and contact service center.

1. Check for disconnection of power supply.

Please, refer to[3.3 power off] more detail.

2. Perform cleaning and sterilization fluid.
3. After completion, please check followings before supplying power.
◦Dry water or sterilization fluid completely.
◦Arrange tools that are used for cleaning and sterilization.

4.1.3 Periodical Inspection

In order to maintain the system in best condition, it is important to have periodic maintenance and inspection schedule before damages or errors.
Below maintenance schedule shows the minimum frequency. This is the minimum schedule that has to be performed and if necessary, additional maintenances have to be performed.

WARNING

Record all performed maintenance services and changed data on Data Book.

Check cables

Check for correct connections and proper strappings for all the wires. Wires cannot be exposed from connectors and check for proper and complete cable covers.

WARNING

In case of errors or damages on the system check for basic problems including power supply or fuse problems. Service technician from the manufacturer must perform other services or repairs.

1) Connection ground cable

The centeral standard grounding connection of the system is located in Power Cabinet. Check minimum resistance range of ground lead wires with multi-meter.

WARNING

In case of errors or damages on the system check for basic problems including power supply or fuse problems. Service technician from the manufacturer must perform other services or repairs.

2) AC power supply for exposure room

Check AC power supply value between the phase, neutral, and grounding wires. These values must be within tolerance level of initial installation.

WARNING

In case of errors or damages on the system check for basic problems including power supply or fuse problems. Service technician from the manufacturer must perform other services or repairs.

daily	- Operational condition of detector power device - Operational condition of detector - Operational condition or errors on system computer - Cleanness of detector device - Examine test - Drive test andexamine focused test
weekly	- Tightening condition of high voltage terminal - Wiring condition. - Screws tightening condition - Cleanness of Generator - Check surface conditions of detector, grid and ion chamber
monthly	- Generator oiling condition. - Image Resolution Test. - Safety stopper fixation condition. - Gap adjustment and operating conditions of Locks - Check wire rope
quarter	- X –Ray examination condition - Deformation status of installed parts - Difference between collimation and actual X-Ray collimator - Wiring condition

list	Check list
X-Ray exposure	Check tube voltage, tube currency and exposure time
AEC	Using human body and equivalence of pentum, check AEC operation and film density.

4.2 Equipment Lifecycle

The lifecycle of the equipment is 8 years when all the required maintenances and inspections are performed (Internal test result). It may vary according to operation environments.

WARNING

End-Users have responsibility for operation, repair and management of the system. Do not operate the equipment without qualified personnel or under the supervision of qualified personnel. Internal repair and inspection may be dangerous. Please contact customer service center for assistance.

WARNING

It is dangerous to modify or converse the specifications of this equipment. In accordance with [Important matters in using medical electronic equipment (safety and risk prevention)] by the president of pharmacy welfare Consumption, modificatons of the equipment by users are prohibited. According to medical equipment regulation, modification of equipment by manufacturer requires approval.

WARNING

Must conduct periodical inspection.
In order to extend and maintain safety and performance, maintenance and inspection are required.
Required occasional or periodic maintenances that have to be performed by users are described in the main section in detail.
Use headquarters' [Maintenece and Inspection System] for required specific maintenece and inspection by trained professionals.

4.3 Periodic Part Replacement

	Major consumables and periodic part replacement parts	Replacement cycle
1	X-ray tube Equipment	30,000 times check
2	Stand chain	About 4 years
3	Hand switch	10,000 times or 3 years
4	Light lamp	About 1 years
5	Stand wire	About 4 years
6	Motor	About 4 years
7	High electric pressure origination On/Off switch	About 3 years
8	membrane	About 2 years
9	Driving part belt	About 2 years

Periodic part replacement estimation is minimum standard requirement to maintain the performance of the equipment. It is not guarantee of the part.

WARNING

Unexpected error or problem may occur when the parts are not replaced as recommended. The users have responsibility for these matters.

WARNING

- End-Users have responsibility of operation, repair and maintenance of medical equipments.
- Do not operate the equipment without qualified personnel or under the supervision of qualified personnel
- Internal repair and inspection may be dangerous. Please contact customer service center for assistance

In order to maintain the best condition and prevent serious damages we recommend preventive maintenance contract. Please contact us for detail.

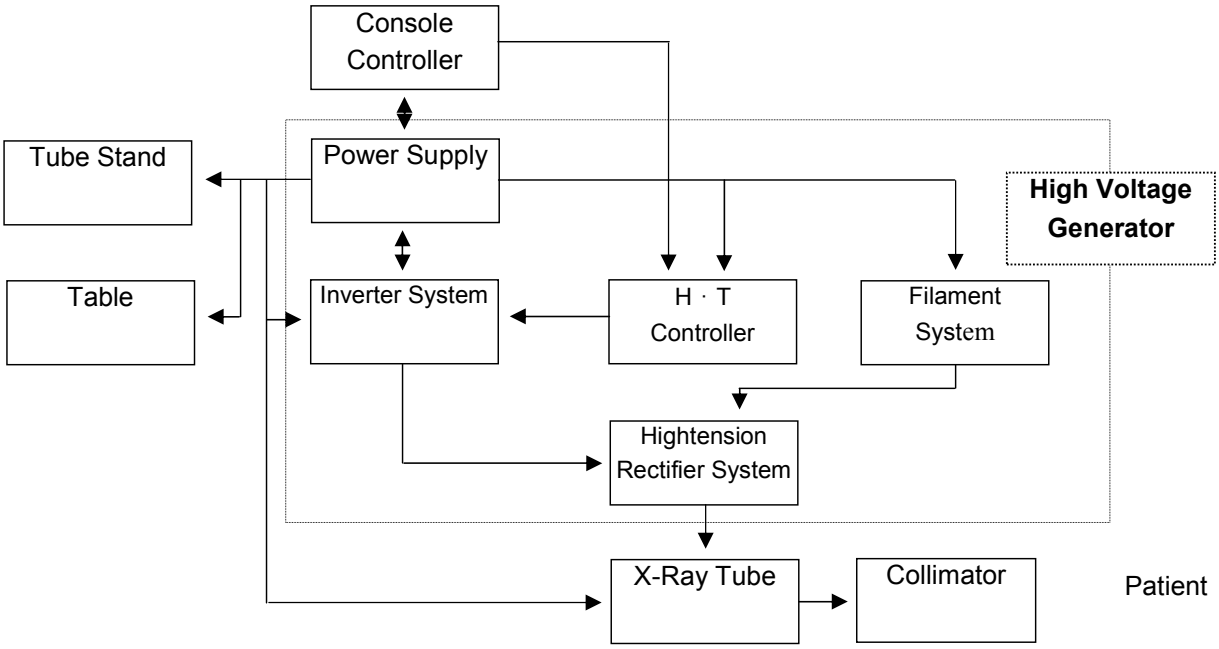
5. Technical Data

This chapter is explains on steps and method of technical data.

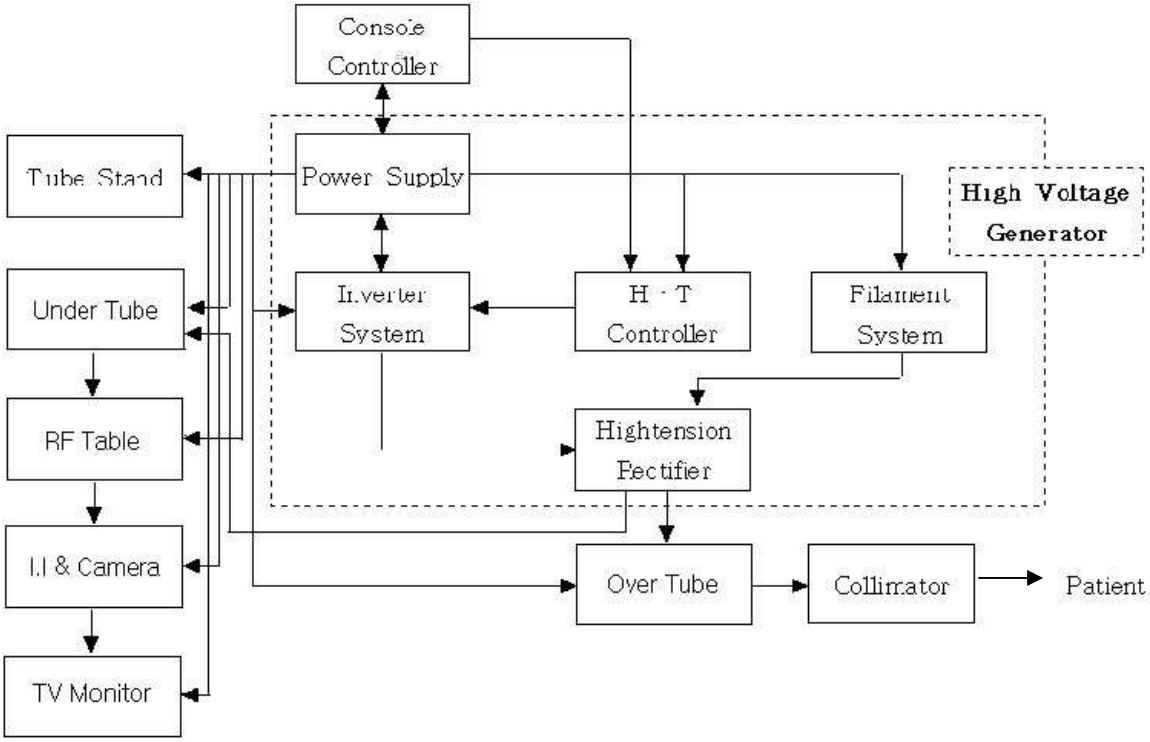
5. TECHNICAL SPECIFICATIONS

5.1 System block diagram

5.1.1 Model group : REX-***R



5.1. 2 REX-***RF



5.2 Highvoltage generator

1) REX-RF

MODEL			REX-850RF	REX-650RF	REX-550RF	REX-525RF
System Power Line Requirement		Phase	3Ø	3Ø	3Ø	3Ø
		Voltage (±10%)	400VAC	400VAC	400VAC	400VAC
		Frequency	50/60Hz	50/60Hz	50/60Hz	50/60Hz
		Power Input KVA	100KVA	80KVA	62.5KVA	50KVA
System	Power capacity		80KW	64kW	50kW	40kW
	Rating (Rad)	Maximum mA at Maximum KVP	800/100	400/150	320/150	320/125
		Maximum KVP at Maximum mA	500/150	100/640	100/500	80/500
	Rating (Fluor)	Maximum mA at Maximum KVP	4mA/120kVp	4mA/120kVp	4mA/120kVp	4mA/120kVp
Maximum mA			800	640	500	500
Fluoro Maximum mA			4mA (Higher mA-upto 6mA- : Option)			
Maximum KVP			150	150	150	125
Fluoro Maximum KVP			120kVp			
mA Range (±20% precision)			10~800, (20steps)	10~600, (19Steps)	10~500, (18Steps)	
Fluoro mA Range (±20% precision)			0.4~4mA (19Steps) (Higher mA – upto 6mA : Optional)			
mAs Range			0.01~600			
KVP Range (±10% precision)			40~150kVP, (1KVp Step)			40~125kVp, (1KVP Step)
Fluoro KVP Range (±10% precision)			40~120kVp, (1kVp Step)			
Time Range (±10% +1ms precision)			1ms~10sec (38 Steps)			
Fluoro Time Range			0~10Minutes (available by user's selection)			
Exposure Indication			Audible and Visible			
mA, kVp selector			Push Button			
Self Diagnostic System			Yes			
Anode Current MAX.			100mA Small	100mA Small	100mA Small	100mA Small
			800mA Large	640mA Large	500mA Large	500mA Large

2) REX-***R

GENERATOR MODEL			REX-1050 R	REX-650 R	REX-550 R	REX-525 R	REX-325 R	REX-125 R
System Power Line Requirement		Phase	3Ø	3Ø	3Ø	1 Ø /3Ø	1 Ø /3Ø	1Ø
		Voltage (±10%)	400VAC	400VAC	400VAC	220V/ 400VAC	220/ 400VAC	220/ 400VAC
		Frequency	50/60Hz	50/60Hz	50/60Hz	50/60Hz	50/60Hz	50/60Hz
		Power Input KVA	90KVA	80KVA	62.5KVA	50KVA	40KVA	12.5KVA
System	Power capacity		72kW	64kW	50kW	40kW	32Kw	10kW
	Rating	Maximum mA at Maximum KVP	400/150	400/150	320/150	320/125	250/125	100/125
		Maximum KVP at Maximum mA	70/900	100/640	100/500	80/500	100/320	100/100
Maximum mA			900	640	500	500	320	100
Maximum KVP			150	150	150	125	125	125
mA Range (±20% precision)			10~900, (21Steps)	10~640, (19Steps)	10~500, (18Steps)	10~500, (18Steps)	10~320, (16Steps	10~100, (11Steps
mAS Range			0.025~600					
KVP Range (±10% precision)			40~150KVP, (1KVP Step)			40~125KVP, (1KVP Step)		
Time Range (±10% +1ms precision)			1ms~10sec (38 Steps)					
Exposure Indication			Audible and Visible					
mA, kVp selector			Push Button					
Self Diagnostic System			Yes					
Inverter Frequency			30khz					
Anode Current MAX.			100mA Small	100mA Small	100mA Small	100mA Small	100mA Small	100mA Small
			900mA, Large	640mA Large	500mA, Large	500mA, Large	320mA, Large	100mA Small

5.3 X-ray tube

Tube Model	**LTN-50(E7252X)**		**LTN-25(E7239X)**	
Inherent filtration	0.9mm Al eq.		0.9`mm Al eq.	
Fixed added filtration	Intermittent	Continuous	Intermittent	Continuous
	1.0mm Al eq.	2.0mm Al eq.	1.0mm Al eq.	2.0mm Al eq.
Operating Tube voltage	40 to 150 kV Max.		40 to 125 kV Max.	
Focal spot	0.6 / 1.2 mm		1.0 / 2.0 mm	
Target angle	12°		16°	
Construction	Rhenium-Tungsten-Faced Molybdeum		Rhenium-Tungsten-Faced Molybdeum	
Anode Heat Storage Capacity	300 kHU		140 kHU	
Maximum Anode Dissipation Rate	475W(667HU/s)		475W(667HU/s)	
Housing Heat Storage Capacity	900KJ(1250KHU)		900KJ(1250kHU)	
Cooling Method	Natural or Forced air		Natural or Forced air	
Maximum Filament Current	Large Focus : 5.5A Small Focus :5.2A		Large Focus : 5.2A Small Focus :5.2A	
Filament voltage	Large Focus : 12.7~17.1V Small Focus : 7.0~9.4V		Large Focus : 7.8~10.6V Small Focus : 5.9~8.1V	
Average Input Power	142W(200HU/s)		142W(200HU/s)	

5.4 Beam limiting device

Model	**BLD-150RK**	**BLD-150FK**
Power Supply	24VAC, 6.25A	12VDC, 0.42A
Power Capacity	150VA	5VA
Maximum KVP	150kvp	150kvp
Inherant Filtration	1.5mmAl eq.	0.1mmAl eq.
Max.Field Size	35×35cm at SID 65cm	35×35cm at SID 65cm
Min.Field Size	5×5cm at SID 100cm	5×5cm at SID 100cm
Halogen Lamp	24VAC,150W	N/A
Light Intensity	>160LUX	N/A

5.5 Patient table

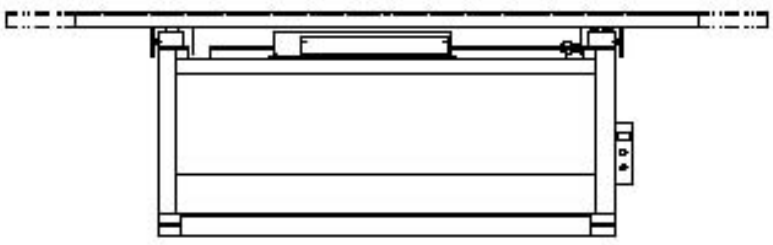
▣ Model Group

KOB-1	KOB-3	KOB-60	DMT-80

1) KOB-1, KOB-3, KOB-60

Item	Specification		
	KOB-1	**KOB-3**	**KOB-60**
DESCRIPTION	4-way Floating Top Bucky Table	4-way Floating Top Bucky Table	6-way Floating Top Bucky Table
LOCK Operating System	Operated by Sensor	Operated by Foot Switch	Operated by Foot Switch
Table base	1260mm×500mm	1260mm×500mm	1108mm×859mm
Table Top	2100mm×735mm	2100mm×735mm	2130mm×685mm
Table Top Height	737mm	737mm	min.560mm~max.820mm
Table Top Longitudinal Travel	910mm	910mm	900mm
Table Top Cross Travel	320mm	320mm	300mm
Table top-to-Film Distance	70mm	70mm	88mm
Table Top Inherent filtration	1.0mm Al eq.	1.0mmAl.eq	1.0mmAl eq
Bucky Travel	420mm	420mm	280mm
Power Supply	110VAC, 110VA, 50/60HZ	110VAC, 110VA 50/60HZ	220VAC, 220VA, 50/60HZ

KOB-SERIES



2) DMT-80

Item	Specification
	DMT-80
Film Format& Exposure program	8*10″(20㎝×25㎝), 10*12″(25㎝×30㎝), 11*14″(28㎝×35㎝), 14*14″(35㎝×35㎝)
Spot Film device	Traditional spot film device
Grid	Ratio 8:1, Density 40lines/cm (Option -10:1 / 47lines/cm)
Travel range of spot film device	Longitudinal Travel : Approx. 55cm
	Lateral travel : Approx. ±12
Cassette shifting	Automatic operation with automatic sequence advance by motor drive
Locking of spot film device movement	Electromagnetic lock system
Table tilting	Type : motor driven
	Range : Approx. +90~-15
	Speed : Approx. 90 /24sec
Table sliding	Type : motor driven
	Range : Approx. 50cm over the head end and 50cm over the footend
	Speed : Approx. 4cm/24sec
Table top height in the horizontal position	Approx. 85cm from floor
Total weight	Approx.. 650kg (without I.I system)
Power requirements	AC220V,0.75KW (Supplied from X-ray control)

5.6 Tube stand

▣ Model Group

SFC-31R	SFC-31	SFM-31	CSTS-28	BS-20

1) SFC-31(R) Dimension-approx.

Item		Specification	
		SFC-31R	SFC-31
Counter Balance System		Weight Balance	Weight Balance
Minimum/Maximum ceiling height		2300mm/2790mm *[90.5"/109.8"]*	2500mm/2990mm *[98.4"/117.7"]*
Rails			
Floor Rail		3500(3000*)mm *[137.8(118.1*)"]*	3500(3000*)mm *[137.8(118.1*)"]*
ceiling Rail		*3000mm[118.1"]*	*3000mm[118.1"]*
Longitudinal Travel		2500mm	2500mm
Vertical Travel		1500mm	1505mm
Transverse Travel		240mm	400mm
Automatic Position Selection		Ivory	Ivory
Transverse		±90°	±90°
Color		±180°	±180°
Column rotation		55Kg*[121.3lbs]*	55kg*[121.3lbs]]*
Tube Rotation		24VDC, 24VA	24VDC, 24VA
Vertical Carriage maximum Load		W3500(3000*)×H2300 *[W137.8(118.1*)"×H90.5"]*	W3500(3000*)×H2500 *[W137.8(118.1*)"×H98.4"]*
Power Supply		W3500(3000*)×H2790 *[W137.8(118.1*)"×H109.8"]*	W3500(3000*)×H2990 *[W137.8(118.1*)"×H117.7"]*
*Dimension(mm)	160*[360]* (Exception of Rai)	165*[375]* (Exception of Rai)	W3500(3000*)×H2500 *[W137.8(118.1*)"×H98.4"]*
	Maximum	W3500(3000*)×H2790 *[W137.8(118.1*)"×H109.8"]*	W3500(3000*)×H2990 *[W137.8(118.1*)"×H117.7"]*
Weight(kg)		160*[360]* (Exception of Rai)	165*[375]* (Exception of Rai)

2) SFM-31

Item	Specification
Counter Balance System	Weight Balance
Minimum ceiling height	2250mm*[88.6"]*
Rails	
Floor Rail	Approx. 3050mm
Longitudinal Travel	Approx. 2500mm
Vertical Travel	Approx. 1500mm
Transverse Travel	Approx. 240mm (Option : 400mm)
Column rotation	±180°
Automatic Position Selection	
Longitudinal	SID 1000mm & 1800mm*[40"×72"]* for wall Bucky or Chest Holder
Transverse	Table & Bucky mid-line center
Vertical	Table bucky & Table top
Color	Ivory
Tube Rotation	±180°
Vertical Carriage maximum Load	Approx. 45Kg*[99.5lbs]*
Power Supply	24VDC, 24VA
Weight(kg)	Approx. 160*[352.7kg]*
Lock type	Electromagnetic Lock

3) X-ray tube stand(CSTS-28)

Item	Specification
Counter Balance System	Spring Balance
Minimum ceiling height	2500mm*1*[98.4"*1*]
Rails	
Transverse Rail(Standard)	2400mm*2*[94.5"*2*]
Longitudinal Rail(Standard)	3000mm*2*[118.1"*2*]
Longitudinal Travel(Standard)	Approx. 2420mm5.0"*2*]
Vertical Travel	Approx. 1450mm[57.1"]
Transverse Travel(Standard)	Approx. 3430mm6.1"*3*]
Column rotation	±90°
Automatic Position Selection	
Longitudinal	SID 1000mm & 1800mm[40"×72"] for wall Bucky or Chest Holder
Transverse	Table & Bucky mid-line center
Vertical	Table bucky & Table top
Color	Ivory
Tube Rotation	±180°
Vertical Carriage maximum Load	Approx. 32Kg[70.5lbs]
Power Supply	110VAC, 1.3A, 60(50)Hz
Weight(kg)	Approx.130[286.6lbs] (Exception of Transverse & longitudinal Rail weight)

*1: KOB-1,3 *2: optional

5.7 Bucky stand

1) BS-20

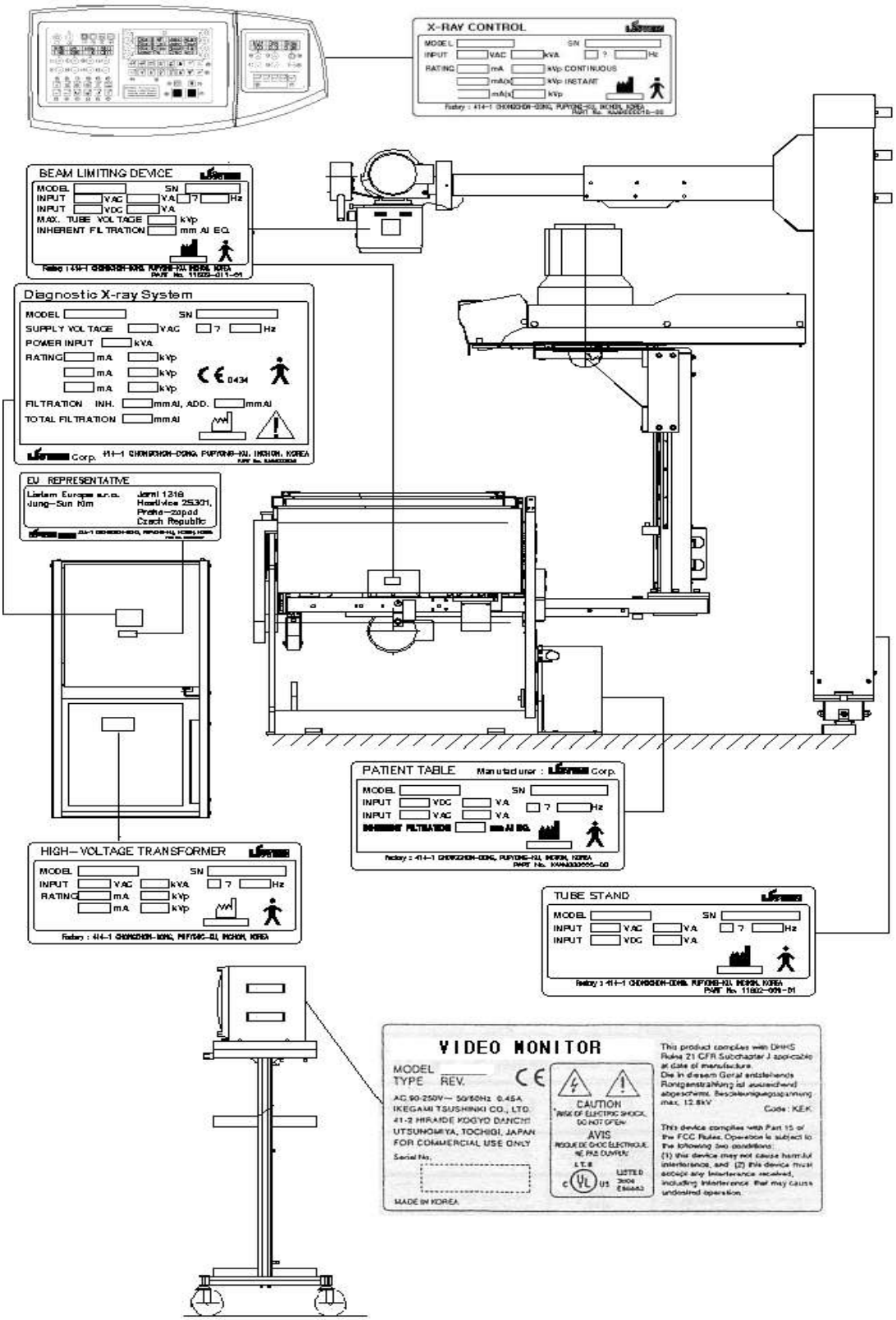
Item	Specification
Counter Balance System	Weight Balance
Minimum ceiling height	2050mm*[80.7“]*
Vertical Travel	Approx. 1105mm*[43.5“]*
Front plate to film distance	Approx. 30mm
Film formats	From 127mm×177.8mm to 355.6mm×431.8mm *[5"×7" to 14"×17"]* Cassette
Cassette Insertion	Can be loaded from both sides
Vertical Carriage maximum load	Approx. 15kg*[33.1lbs]*
Transverse Travel(Standard)	Reciprocating motion
Grid ratio	8:1 (Option - 10:1)
Grid density	40lines/cm
Focusing Distance	1000mm to 1800mm*[40" to 72"]*
Grid Dimensions	440mmW × 480mmD*[17-1/4"W × 18-7/8"D]*
Interspacer	Aluminum
Color	Ivory
Bucky stand mounting	Bolted to floor and wall mounted
Power Supply	110VAC, 1.3A, 60(50)Hz
Weight(kg)	120Kg

5.8 Physical characteristics

Item		**Dimension(mm)** approxi.	**Weight(kg)** Approxi.
High voltage generator		W500×D500×H933	138
Controller		W356×D262×H60	1.8
X-ray Tube		Ø140×W479	16
Collimator		W182×D197×H186	6
Tube Stand	CSTS-28	W3500×H2790	160
	SFC-31	W3500×H2790	160
	SFC-31R	W3500×H2790	165
	SFM-31	W3050×H2250	160
Bucky	BS-20	W400×H1990	120
Table	DMT-80	L2155×W1150×H840	650
	KOB-1	L2100×W735×H750	100
	KOB-3	L2100×W735×H750	100
	KOB-60	L2130×W985×H(570~800)	270
	TS-10	L1800×W615×H610	68
	TS-10B	L2000×W675×H610	68

5.9 Classification of MDD 93/42/EEC : Class Ⅱb

▣ LABEL



▣ Appendix 1 : Exposure factor

촬영명 \ 구분			pediatric				small				medium				large			
			kVp	mA	mAs	grid	kVp	mA	mAs	grid	kVp	mA	mAs	grid	kVp	mA	mAs	grid
HEAD	SKULL	AP	72	200	6.4	1	70	320	10	1	72	320	16	1	75	320	21	1
		Lateral	70	200	6.4	1	70	320	10	1	70	320	16	1	75	320	16	1
		town's	70	200	10	1	73	320	16	1	77	320	16	1	80	320	21	1
	Mandible	PA	50	200	6.4	non	70	200	10	1	70	200	16	1	70	200	20	1
		Axial Latera	50	200	5	non	70	200	10	1	72	200	13	1	74	200	16	1
		town's	68	200	10	1	71	200	16	1	76	200	16	1	78	200	20	1
	Nasal Bone	Lateral	43	100	2	non	43	100	3.2	non	45	100	3.2	non	45	100	5	non
	Zygomatic arch	axial	43	100	3.2	non	43	100	5	non	45	100	5	non	45	100	6.4	non
FACIAL	PNS	Waters	70	200	8	1	73	320	21	1	80	320	21	1	88	320	21	1
		Caldwell	70	200	5	1	70	320	16	1	70	320	21	1	77	320	21	1
		Lateral	70	200	5	1	70	320	10	1	70	320	16	1	77	320	16	1
	Mastoid	Law	70	100	3.2	1	75	200	16	1	78	200	20	1	85	200	20	1
		Stenvers	65	100	3.2	1	70	200	13	1	70	200	16	1	73	200	20	1
		Townes	70	100	5	1	71	200	16	1	73	200	20	1	78	200	20	1
	T-M joint	Lateral	72	100	3.2	1	78	200	16	1	80	200	20	1	82	200	25	1
		town's	71	100	5	1	72	200	16	1	74	200	20	1	75	200	20	1
CHEST	Chest	AP	45	200	2.5	non	50	100	2	non	55	100	2.5	non	58	100	3.2	non
		PA	65	200	1.6	non	120	320	1.9	2	120	320	2.6	2	120	320	3.2	2
		Lateral	65	200	2.5	non	120	320	5.1	2	120	320	6.4	2	120	320	8	2
		APICO	65	200	1.6	non	120	320	1.9	2	120	320	2.6	2	120	320	3.2	2
	Rib(upper)	AP	55	100	3.2	non	70	320	16	2	75	320	16	2	75	320	21	2
		Both obliqu	60	100	3.2	non	70	320	21	2	75	320	21	2	80	320	21	2
	Rib(lower)	AP	55	100	5	non	70	320	16	2	70	320	16	2	73	320	21	2
		Both obliqu	60	100	5	non	70	320	21	2	75	320	21	2	80	320	21	2
ABDOMEN	Supine		55	200	5	non	70	320	16	1	75	320	16	1	78	320	21	1
	Erect		55	200	5	non	72	320	16	1	77	320	16	2	80	320	21	2
	KUB		55	200	5	non	72	320	16	1	72	320	21	1	77	320	21	1
	Pelvis	AP	55	200	5	non	70	320	16	1	70	320	21	1	75	320	21	1
		Lateral	60	200	8	non	85	320	21	1	92	320	21	1	95	320	32	1
	Hip	AP	53	100	3.2	non	70	320	16	1	75	320	16	1	75	320	21	1
		Lateral	55	100	3.2	non	72	320	16	1	77	320	16	1	80	320	21	1
	decubitus		55	100	3.2	non	72	320	16	1	77	320	16	1	80	320	21	1
UPPER TRUNK	C-spine	AP	50	100	2.5	non	70	320	10	2	70	320	16	2	75	320	16	2
		Lateral	50	100	3.2	non	85	320	10	2	90	320	13	2	95	320	16	2
		oblique	50	100	2.5	non	76	320	10	2	77	320	13	2	78	320	16	2
		open mouth	50	100	2.5	non	72	320	10	2	75	320	13	2	75	320	16	2
	T-spine	AP	55	100	3.2	non	70	200	16	1	70	200	16	1	75	200	20	1
		Lateral	60	200	8	non	80	200	20	1	85	200	20	1	90	200	20	1
		oblique	55	200	5	non	76	200	16	1	78	200	20	1	80	200	25	1
		swimmer	60	200	8	non	80	200	16	1	85	200	16	1	90	200	16	1
LOWER TRUNK	L-spine	AP	55	200	5	non	75	320	16	1	80	320	16	1	85	320	16	1
		Lateral	60	200	8	non	85	320	21	1	90	320	21	1	95	320	32	1
		oblique	58	200	5	non	80	320	21	1	86	320	21	1	95	320	21	1
		cone down	58	200	5	non	80	320	16	1	90	320	16	1	95	320	21	1
	sacrum	AP	56	100	5	non	76	320	16	1	85	320	16	1	86	320	21	1
		lateral	61	100	8	non	86	320	21	1	91	320	21	1	92	320	26	1
	coccyx	AP	57	100	5	non	78	320	16	1	86	320	16	1	87	320	21	1
		Lateral	62	100	8	non	88	320	21	1	92	320	21	1	93	320	26	1
UPPER EXTRIMITYY	Hand	AP	43	100	1.6	non	45	100	2.5	non	47	100	3.2	non	50	100	3.2	non
	Wrist	AP	45	100	1.6	non	50	100	2.5	non	50	100	3.2	non	50	100	5	non
	Foream	AP	45	100	2.5	non	50	100	3.2	non	50	100	5	non	50	100	8	non
	Elbow	AP	45	100	2.5	non	50	100	3.2	non	50	100	5	non	50	100	8	non
	Humerus	AP	45	100	2.5	non	55	100	5	non	56	100	6.4	non	56	100	8	non
	shouder	AP	46	100	2.5	non	55	100	5	non	56	100	6.4	non	56	100	8	non
	clavicle	AP	46	100	2.5	non	55	100	5	non	56	100	6.4	non	56	100	8	non
	scapula	AP	47	100	2.5	non	56	100	5	non	56	100	6.4	non	56	100	8	non
LOWER EXTRIMITY	Toe	AP	43	100	1.6	non	50	100	1.6	non	50	100	2	non	50	100	2.5	non
	Foot	AP	43	100	2	non	50	100	1.6	non	50	100	2	non	50	100	3.2	non
	Ankle	AP	45	100	2.5	non	53	100	2.5	non	53	100	3.2	non	55	100	4	non
	Tibia	AP	45	100	2.5	non	55	100	2.5	non	55	100	3.2	non	55	100	5	non
	Knee	AP	45	100	3.2	non	55	100	3.2	non	55	100	4	non	55	100	5	non
	Merchant		45	100	3.2	non	55	100	3.2	non	55	100	4	non	55	100	5	non
	Femur	AP	50	100	3.2	non	60	100	5	non	60	100	6.4	non	60	100	8	non
	calcanus	axal.	46	100	2.5	non	54	100	2.5	non	54	100	3.2	non	56	100	4	non

Part number	Trade name	Type/Model	Ratings
Primary fuse (Power module F1,F2,F3)	AMP-TRAP	AJT50	50A,600V
Accessible fuse Main power board F1,F7	WEBER	6×32mm	250V, 6.3A(F1) 250V,10A(F7)
Accessible fuse Main power board F2	WEBER	6.3×32T	250V, 6.3A
Accessible fuse Main power board F3	WEBER	6.3×32T	250V, 4A
Accessible fuse Main power board F4,F5,F6	WEBER	6×32mm T	250V, 2.5A(F4.5) 250V,6.3A(F6)
Accessible fuse Power board F1,F2	WEBER	5×20mm	250V, 3.15A
Accessible fuse Filament drive board F1	WEBER	5×20mm	250V,5A
Accessible fuse Main power board F8,F9,F10	WEBER	6×32mm	250V, 10A
Capacitor Power module C6,C7,C8,C9	KENDEIL	K01400472	400V, 4700μF
Capacitor Power board C1,C11	Sam young	Eletrolytic capacitor	80WV,3300μF
Capacitor Filament drive boardC14	Sam young	Eletrolytic capacitor	100WV,2200μF
Capacitor Filament drive board C7,C8	Sam young	Eletrolytic capacitor	200WV, 470μF
Capacitor Power board C2,C10	Sam young	Eletrolytic capacitor	50V,407μF
Capacitor Power board C6,C8	Sam young	Eletrolytic capacitor	50V, 10 μF (C6) 80wv,2200 μF(C8)
Capacitor Power board C4, C12	Sam young	Eletrolytic capacitor	35V, 220μF
Capacitor Main Power board C1, C2	Sam young	Eletrolytic capacitor	100V,2200μF
Capacitor HT control board C3,C44~C49	Sam young	Eletrolytic capacitor	35V, 100μF(C3) 35VDC, 22 μF (C44~49)

▣ Appendix 2; Electrical component parts list

Part number	Trade name	Type/Model	Ratings
Capacitor Power Module	SAM WHA	QMS-100H00100A	1000VDC, 10 μF
Capacitor Power Module	Digital Tech	DMB-4EJ04E	450V, 4.5 μF
Filament drive board C2,C3	Sam young	Eletrolytic capacitor	35V, 100μF
Capacitor HT control board C55,C74,C75	Sam young	Eletrolytic capacitor	35V, 47μF
Capacitor Power board C7	Sam young	Eletrolytic capacitor	25V, 100μF
EMI filter	OCKY	FT3PS-4050	3φ,450V,50A 50/60HZ
Relay Main Power Board K4	KOINO	KH-102-3C	24V DC
Relay Relay2 board K1~K5, K7,K8 Relay1 board K1,K2,K3 Main power board K1,K2	KOINO	KH-103-2C	24V DC
Relay Main power board K3,K6	LG	RY24W-K	24VDC
Relay Relay2 board K9,K10	KOINO	KH-103-2C	12V AC
Relay AEC Board K5~K12	LG	RY24W-K	24VDC
Magnet Contactor MG1,MG2	LG	GMD-65	440V, 48A
Bridge Diode Filament drive board D1 Main Power board D1,D2	DC	KBPC2506	600V, 25A
Dual diode power module D2,D3	I.O.R	IRKD91/16A	100A,1600V
Transformer T1	AEESCO	REX-AUTO.	In put :380VAC Out put: 12,20,24,50,110,220VAC
Transformer T2	S.J	S.J transfomer	Input 220V Out put 20.20.0.15VAC
INVERTER	YOU SUNG ENGEENERING	RM-070S	220V,3.0KVA

Part number	Trade name	Type/Model	Ratings
FAN	BI-SONIC Technology	9P-230HS	230VAC,50/60HZ 16/14W
SMPS(ps1)	Fine suntronics	VSF30-BDW	Input : 85~264VAC,0.7A Out put : CH1 5VDC,0.3~3.0A CH2 12VDC, 1.2A
Noise Filter	OKY	BT2AB-2010	250V,10A,50/60Hz
IPM	MITSUBISHI	PM300DSA120	1200V,300A
X-ray Tube Housing	TOSHIBA	E7239X	50~125KV, 47KW
3 Phase Tilting Motor	SI DAE ELECTRONICS	SDT-0084	220/380V, 0.75KW 4P(1710RPM,60HZ)
Table transformer T1	S.J	S.J transfomer	input : 110 or 220VAC output : 0,6,12,24VAC
Bucky transformer T2	S.J	S.J transfomer	input : 110VAC output:0,11,13,14.5,16.5, 18,24VAC

PC = Power cord (set) OI = Opto isolator TB = Terminal block J = Feed through FL = RFI filter PF = Primary fuse SF = Secondary fuse XF = Fuse-holder	C = RFI capacitor L = RFI choke R = Resistor MS = Mains switch S = Interlock SI = Safety interlock CB = Circuit breaker VS = Voltage selector F = Fan	T = Transformer TP = Thermal protector SSR = Solid state relay PS = Power supply M = Motor MC = Motor capacitor R = Relay

After Service :

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