Certifications: CE
ISO 9001:2015
EN ISO 13485:2016

USER MANUAL
MDX – 100DX



Leading Through Innovation

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The manual should only be used with the supplied version of the software and hardware. Any other uses result in loss or damage to the operating system or to the machine itself.

PRODUCT APPROVALS

- **Atomic Energy Regulatory Board (AERB) for Radiation safety standards.**
- **Bureau of Indian Standards (BIS) for Mechanical & Electrical safety standards.**

OUR CERTIFICATIONS

- **AN ISO 9001-2015 CERTIFIED COMPANY**

1. INTRDUCTION

1.1 SCOPE

MDX-100 DX is a medium powered X-Ray unit. It provides ease of operation with simple controls. In all procedures, a proper sequence of operation is required. The user will become familiar with these controls by studying this User Manual. It is recommended to study this user manual before operating the equipment and operating directions be followed carefully.

This equipment is to be used only by Radiologist, Radiology Technician or Doctor. Its unauthorized use can cause injury or damage.

This equipment is Type Approved for Electrical, Mechanical safety from Bureau of Indian Standards & Radiation Safety Standards from the Atomic Energy Regulatory Board (AERB), Govt. of India, thus making it entirely safe from the Radiation Hazards.

1.2 INTENDED USE

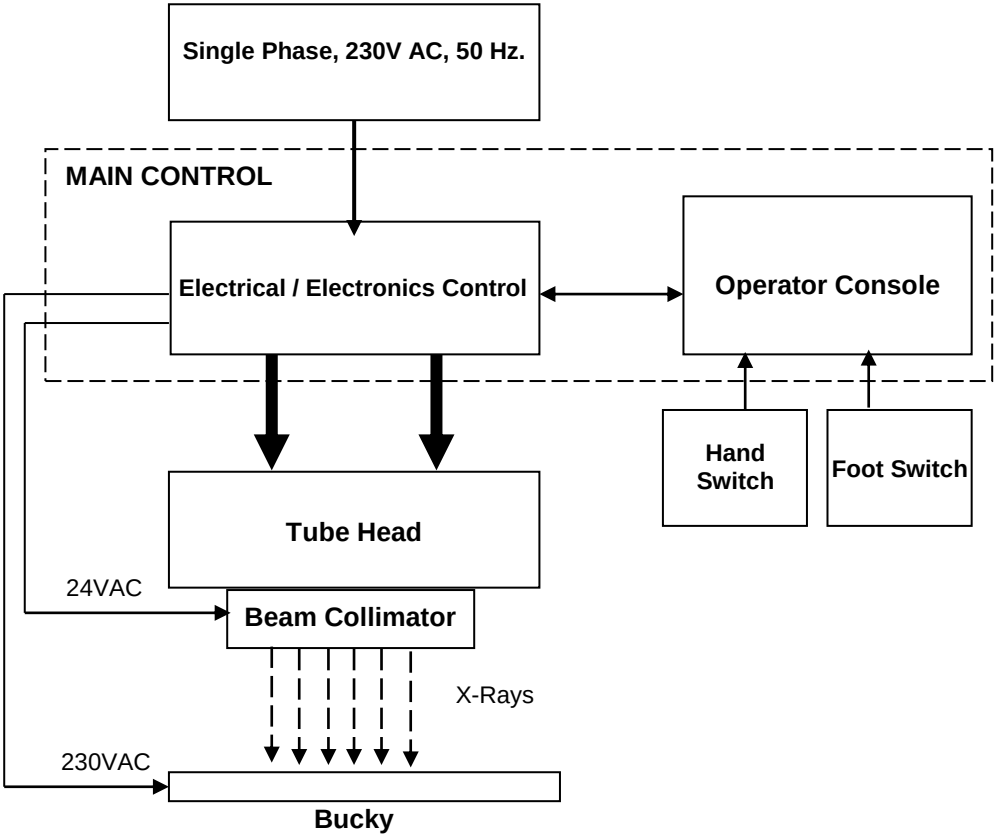
MDX – 100 DX machine has two modes of operation i.e. Fluoroscopy and Radiography. It is also featured with APR (Anatomical Programming) in which the parameters as per the patient sizes are pre selected.

This equipment fulfills the requirements of radiologists & physicians, Surgeons & technologists with quality X- Rays.

A variety of tube stands & tables can be choosed depending upon the customer requirements. These machines are best suited for chest, extremities, skull, abdomen and pelvic for all routine & special radiographic & fluoroscopic examines.

MDX – 100 DX with floor to ceiling stand and floatex table makes an ideal combination for all possible radiographic applications offering ease of patient positioning specially in trauma cases.

1.3 BLOCK DIAGRAM

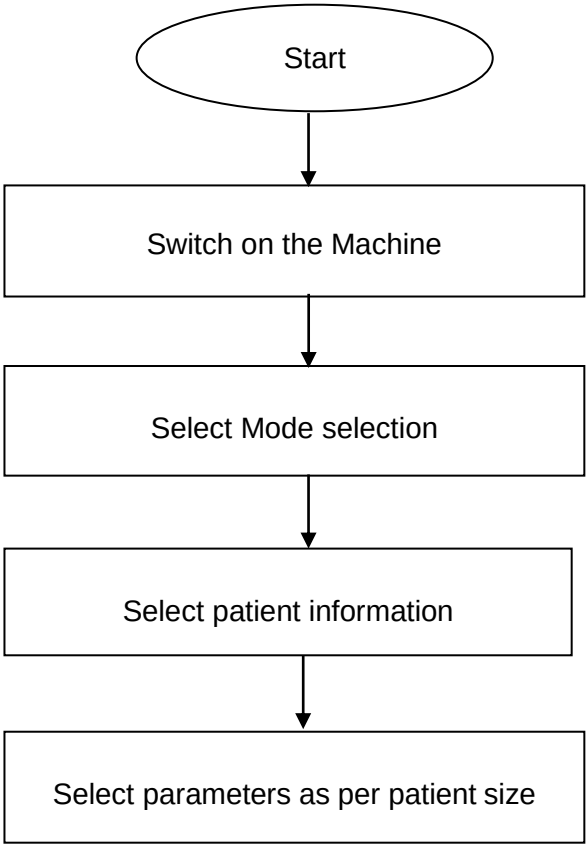


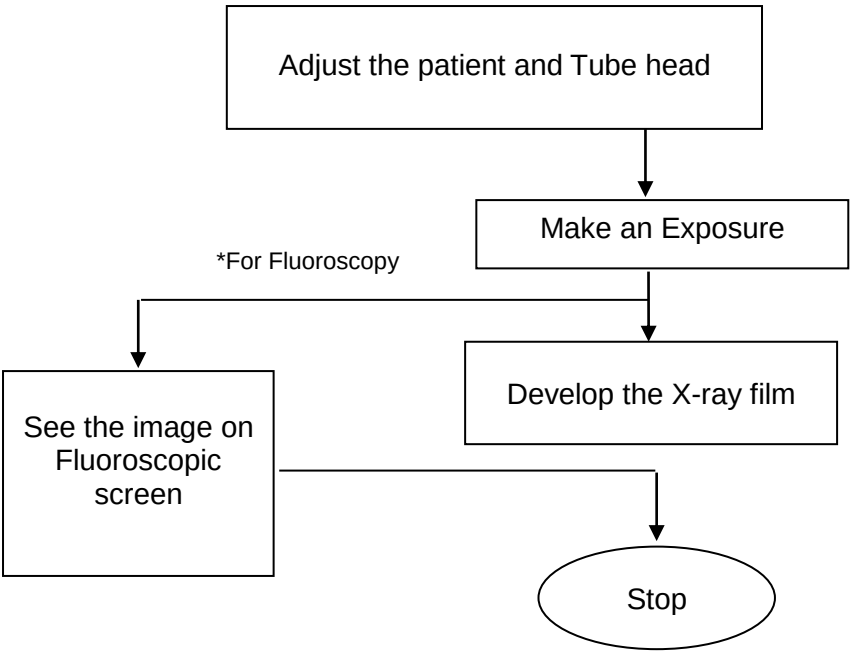
- **BRIEF DESCRIPTION OF OPERATION**

On giving 230V AC to the equipment and pressing **ON** switch,energizes the equipment. The operator has to select the parameters as per the patient size.

In Radiography, when **Ready** switch is pressed either from operator console or from hand switch, boosts up the filament supply and then on pressing the **Exposure** switch the system exposes and X-rays are generated.

In case of Fluoroscopy, on pressing either **Exposure** switch on operator console or **Foot switch**, the system exposes and X- rays are generated.





*FLUROSCOPY (OPTIONAL)

2. OPERATIONS & CONTROLS

2.1 DESCRIPTION OF CONTROL

- **PANEL DESCRIPTION**

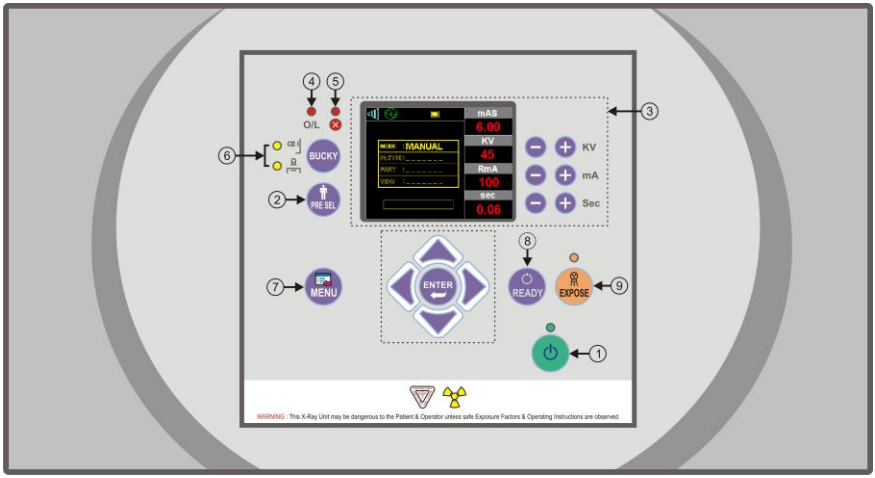


Figure 2.1: Keypad of MDX-100 DX

1. ON SWITCH/ OFF SWITCH



On pressing this switch, the equipment energizes and the voltmeter above the panel shows the line voltage.

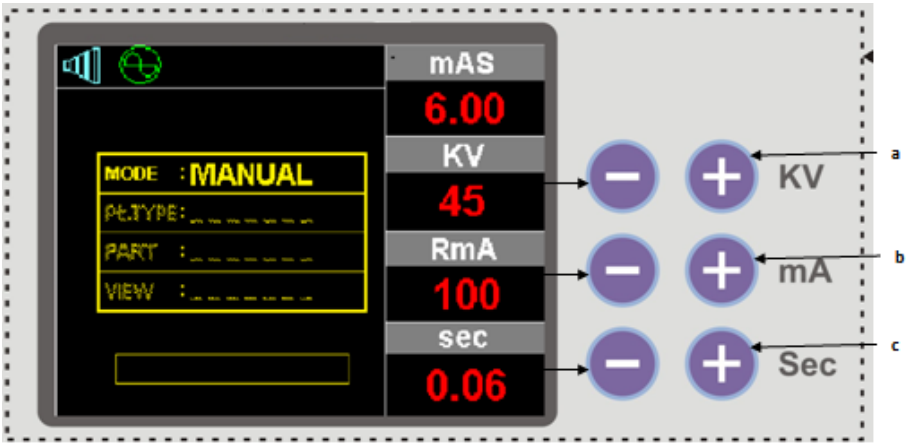
On pressing this switch, the equipment get de-energizes and the LED above switch starts glowing.

2. PRE SEL



This switch is used Feed the most frequent parameter used by the radiographer, PRE SEL parameter can be modified or changed at any time. By pressing this key directly the radiographer can directly access the desired parameter.

3. TFT DISPLAY WITH SELECTION KEYS



a) KV Up / Down keys

These keys are used to increase or decrease the KV as per patient sican be increased or decreased in the step of 2KV.

b) mA Up / Down keys

These keys are used to increase or decrease the mA. For radiography mA steps are 25, 50, and 100.

c) Time selection key

These keys are used to increase or decrease the exposure time as per the dose required to be given to the patient.

4. OVERLOAD INDICATOR



This indicator starts glowing when the operator selects the parameters which are above the maximum limits of the Tube rating chart.

NOTE: When the Overload indicator glows, the exposure can not be made.

5. ERROR INDICATOR 

This indicator starts blinking when one of the following errors occurs in the machine:

a. **Filament Fault** occurs when the filament supply to the tube gets open.

b. **Kv Control Fault** occurs when the proper Kv from the variac is not set as compare to the displayed Kv.

c. **High / Low input voltage Fault** occurs when the voltage is either lower than 190V AC or more than 250V AC.

NOTE:

i) The fault conditions are also displayed on the TFT except Kv control fault .The exposure will not take place only when the filament fault is there.

6. BUCKY SELECTION SWITCH 

The switch is used for selecting either table bucky or vertical bucky. On pressing the switch the **HORIZONTAL** bucky is selected and  LED starts glowing

Again on pressing the **bucky switch** the vertical bucky get energized 

and LED starts glowing again on pressing the switch, the bucky selection is de- energized. **NOTE:** The bucky function will be operative only with the machines where table is used.

7. MENU KEY 

When **Menu** key is pressed it shows the user two options either to select manual or to select APR mode as shown in Figure 2.6.

8. READY INDICATOR / READY SWITCH 

When the Ready switch is pressed then the above said indicator starts glowing.
When Ready switch is pressed it boost X-ray tube filament voltage from standby to operating value determined by the settings made.

9. EXPOSURE INDICATOR/ EXPOSURE SWITCH



After pressing the **Ready** switch if **Exposure** switch is pressed then this indicator starts glowing.

When the **Exposure** switch is pressed after pressing the **Ready** switch the X-rays are generated. After completion of exposure the operator hears the beep sound.

If it is released before the selected time the exposure automatically terminates and the operator does not heard any beep sound.

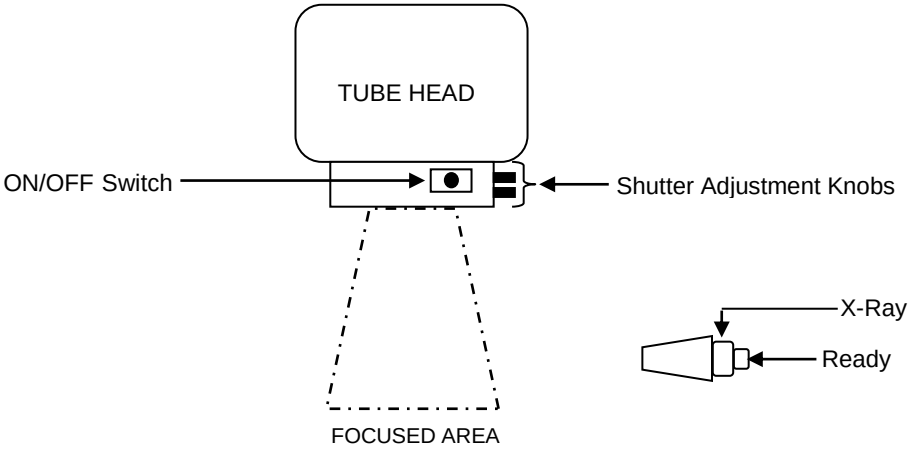
- **LBD**

LBD is mounted on the Tube Head having the bulb and lead shutters. Lead shutters are used for the collimation of the X-ray beam so that the X-ray Beam cannot be scattered and does not cause any harm to the operator.

The operator has to focus the light beam of the LBD on the area to be exposed and when the X-ray switch is pressed the X-Ray beam falls exactly at the same area where the light beam is adjusted. It is equipped with:

➢ **ON/OFF SWITCH**

This is a toggle switch. When this switch is pressed towards ON side, LBD bulb gets on. When switch is pressed towards OFF side when bulb is glowing, bulb turns off.



- **HAND SWITCH (MOUNTED ON CONTROL PANEL)**

  This is two position switch. When switch is pressed in first step, Ready function is activated and when this switch is pressed further, X-Ray function is activated.

2.2 DESCRIPTION OF OPERATION

- Switch on the **MAINS**.
- Press the **ON** switch to switch ON the unit. The unit will warm-up and the figure 2.2 appears on the TFT screen. The interval may be used for preparing the patient and for adjusting the tube positioning etc.

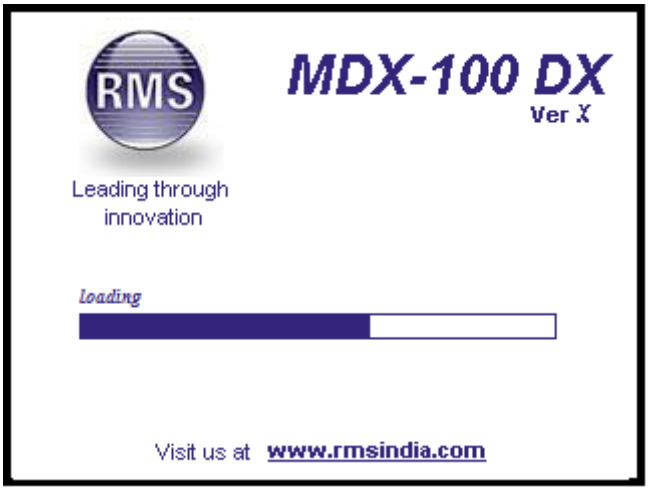


Figure 2.2: Booting screen

Note: Ver. X is firmware version.

- After the processing of the booting screen is over a window appears which displays the settings of the last exposure performed.

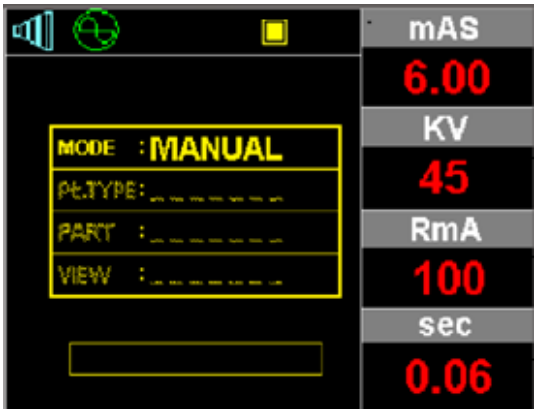


Figure 2.3: Final screen

- If the user wants to perform the test when screen 2.3 appears then he can directly press the **Ready** button here. Pressing the **Ready** button displays the following screen.

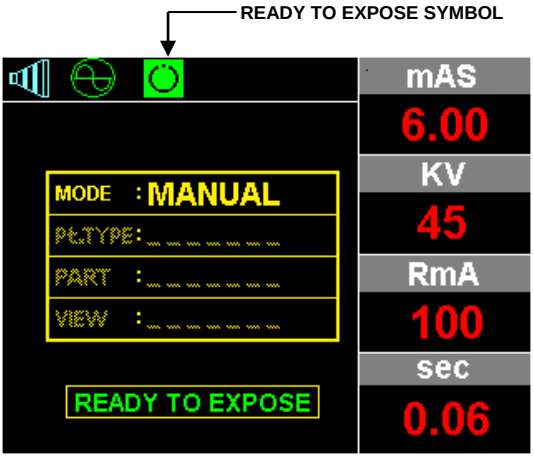


Figure 2.4: Ready to Expose window

- When this screen appears press simultaneously the **Expose** button, another screen (Figure 2.5) appears on the TFT.

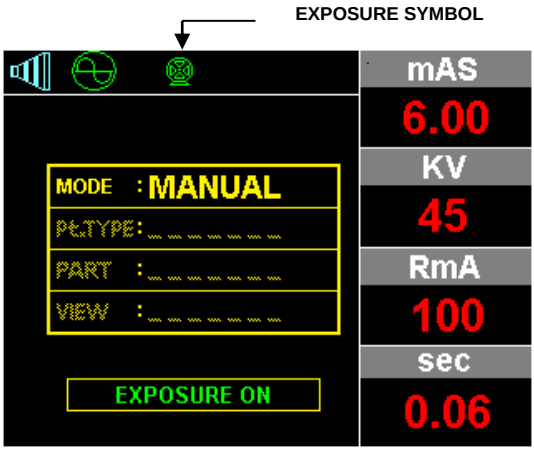


Figure 2.5: Exposure window

- If the user does not want to start the test from the last exposure set values, he / she can either change the values for that mode or can enter into the menu by pressing the **Menu key** as described below:

1. When the **Menu** key is pressed the following window appears:

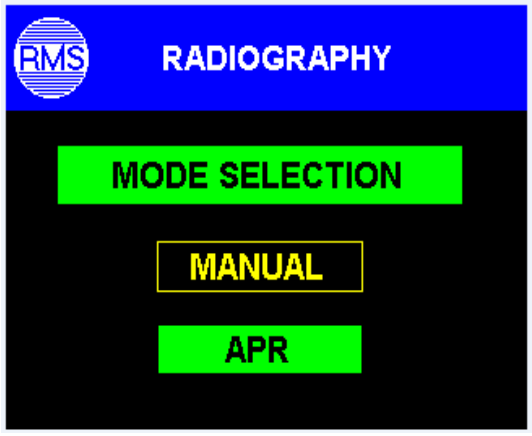


Figure 2.6: Mode selection window

2. Select the APR (Anatomical Programming Radiography) mode and press **Enter**.

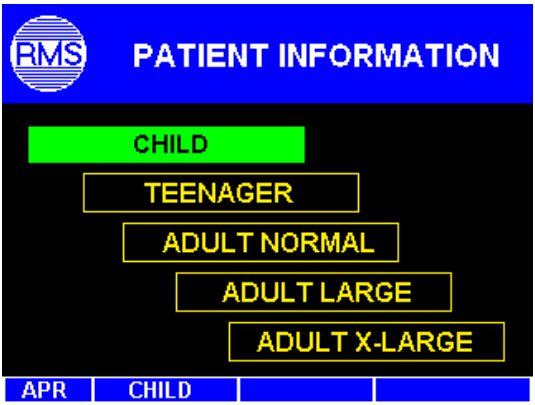


Figure 2.7: Patient Information screen

3. Select the patient type from the options given in the screen (Figure 2.7). The mode selected in the previous screen and the patient selected here is displayed at the bottom of the screen in separate cells. After selecting the patient again press **Enter**.

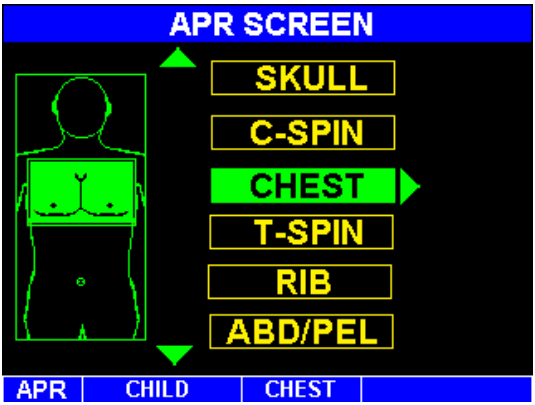


Figure 2.8: APR settings window (CHEST)

Select the body part of the patient whose X-Ray is to be performed. Use the arrow keys for selection. When a particular body part is selected then its corresponding views are displayed in the column next to it. Use the left & right arrow keys for the selection of diff. views required & this way you can also select the screen speed used. Finally press the enter key. The body part & the view selected also get displayed at the bottom of the screen. (Figure 2.11).

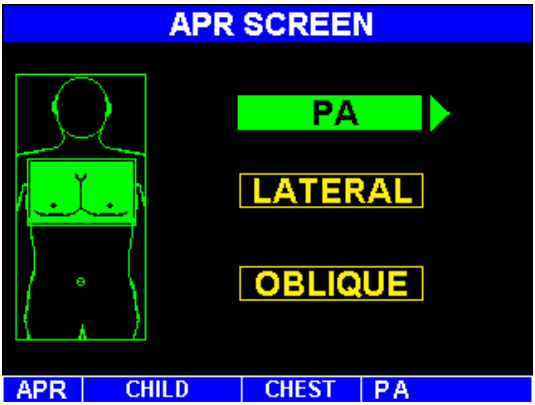


Figure 2.9: APR settings window (PA)

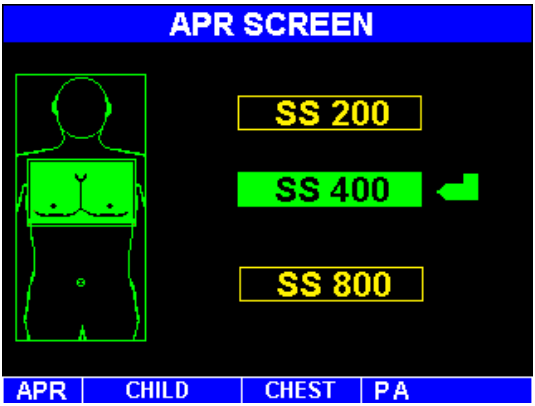


Figure 2.10: APR settings window (SS 400)

The values of KV, mA and time appear and their corresponding mAS is also displayed in the screen. The values can be altered as per the desire by using the corresponding selection keys for changing the values of KV, mA and sec.

The mAS can directly be altered by increasing or decreasing the density bar.

Note: The Radiographic parameters displayed are as per intensifying screen speed selection.

1. To make the exposure, first press the **READY** switch (Screen 2.11) and then after a brief delay (1 sec) press the **EXPOSURE** switch (Screen 2.12). Do not release both the switches until exposure is terminated by timer or the “Exposure ON” is displayed on the graphical TFT or the beep sound is terminated.

Note: When Ready and Exposure switch is pressed corresponding LEDs of Ready and Exposure also glows.

2. Switch OFF the unit by pressing the **OFF** switch. This step should be taken on termination of the exposure, unless another exposure is to be made on the next patient.

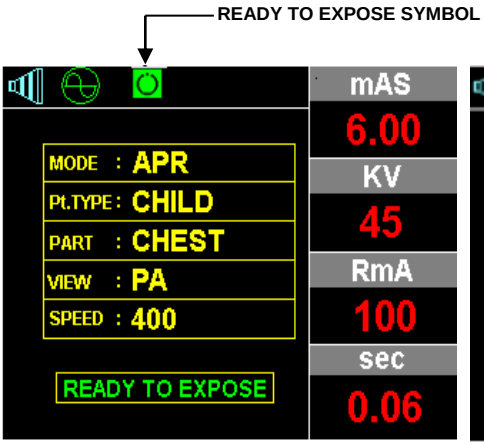


Figure 2.11: Ready to Expose window

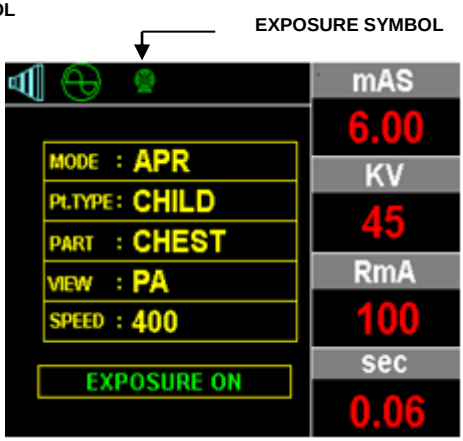


Figure 2.12: Exposure window

3. If instead of APR mode the user wants to perform the radiography in Manual mode, then after Pressing Menu Key in figure 2.6 select **Manual** mode in screen 2.7, the following screen appears.

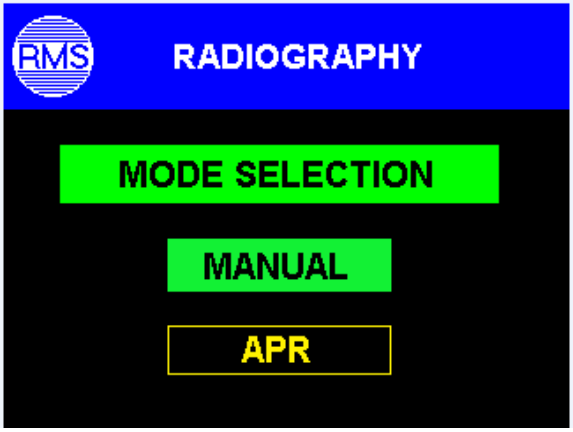


Figure 2.13: Mode selection window

4. After selecting the Manual mode click **Enter**. The next screen appears (Figure 2.14).

5. Set the values of KV, mA and sec as per the patient size by using the corresponding selector switch.

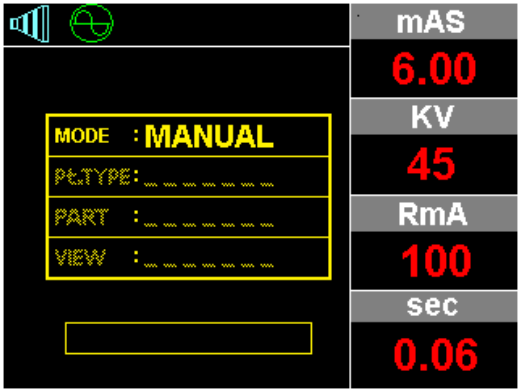


Figure 2.14: Value setting window

6. After selecting all the parameters press **Ready** and **Exposure** switches, the screen will display the similar options as shown earlier in the APR mode. Also the beep sound will be heard after the exposure.

2.3 ERRORS ON THE SCREEN

The screen shows the indication for the various errors.

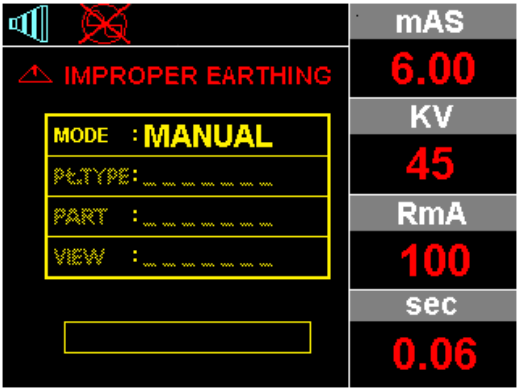


Figure 2.15: Error screen

Problem	Cause
LIMIT ENDS ! The operator attempts to select values which are beyond the maximum permissible limit of the unit (either KVP, mA or time).	The operator has to select the values which are in the limits of the unit.
⚠ IMPROPER EARTHING The error occurs when the proper earthing is not provided to the machine.	User has to check the earthing of the room where the machine is placed.
 This error occurs when the input voltage is either greater than 250V AC or less than 190V AC.	The operator has to either increase or decrease the input voltage. **The exposure can be made under this condition since the machine has inbuilt automatic voltage stabilizer.**

3. RADIOGRAPHIC PARAMETERS

3. 1 RADIOGRAPHIC PARAMETERS

With the radiographic factors given in the table, radiographs are taken and films developed with conventional standard processing procedures. KVP values given in the chart are minimum & maximum values for different anatomical parts.

With the experience gathered, the finally selected mAs (mA x sec.) are entered in the columns provided in chart and are reliably used for producing consistent & satisfactory radiographs.

3.2 RADIOGRAPHIC CHART

Note:

1. The Radiographic parameters displayed are as per intensifying screen of 200 speed
2. For RARE EARTH SPEED CLASS – 4-SCREEN, decrease mAs by 40%.
3. Distance means distance from Tube's Focal Spot to Film (FFD-Film Focus Distance).
4. The factors suggested above are applicable for people with average built.
5. Average Persons: Adjustments must be made as per physique of the patient.
6. Suggested exposure factor will be changed according to the speed of intensifying screens used. If screens speed is more than 250, such as KR-4 (Speed 400) than decrease the above mAs by 40 % but KVP will be same in both cases.

The above Radiographic Technic Chart is only for customer's guidance. There may be slight variations in the factors to produce better results. This is because of certain variables like operator's skills, power line conditions, types of screens used and patient's physique.

RADIOGRAPHIC CHART

S No.	PART	VIEW	mA	TIME (Sec.)	MAs	KVP	DIST. (Cms.)	GRID 6:1, 60 LINES/INCH	USER SELECTED mAs
1	CHEST	PA	100	0.04-0.30	4-30	40-70	150	No	
2	CHEST	LAT	100	0.06-0.30	3-30	55-75	150	No	
3	CERVICAL SPINE	AP	50	0.06-0.30	3-25	40-62	90	YES	
4	CERVICAL SPINE	LAT	50	0.08-0.50	10-25	45-60	90	YES	
5	SHOULDER	AP	25	0.48-0.96	12-24	44-56	90	YES	
6	ABDOMEN/ KUB BLADDER/IVP	AP	25-50	0.24-5.00	12-125	50-90	90	Yes	
7	SKULL/PNS	AP	50	0.36-1.10	18-55	55-75	90	Yes	
8	SKULL	LAT	50	0.30-1	25-50	50-72	90	Yes	
9	LUMBER VERTEBRA	AP	50	0.30-2.40	12-120	50-85	90	Yes	
10	LUMBER VERTEBRA	LAT	50	0.36-6.00	18-150	55-90	90	Yes	
11	WRIST	AP/LAT	25	0.20-0.24	5-6	40-50	90	No	
12	ELBOW	AP/LAT	25	0.26-0.40	6.50-10	42-50	90	No	
13	FINGER	AP/LAT	25	0.20-0.24	5-6	38-45	90	No	
14	ANKLE	AP/LAT	25	0.30-0.36	6-9	42-56	90	No	
15	KNEE	AP/LAT	25	0.30-0.40	8-10	42-52	90	No	

Position of patient:-

ERECT - Standing or sitting up.

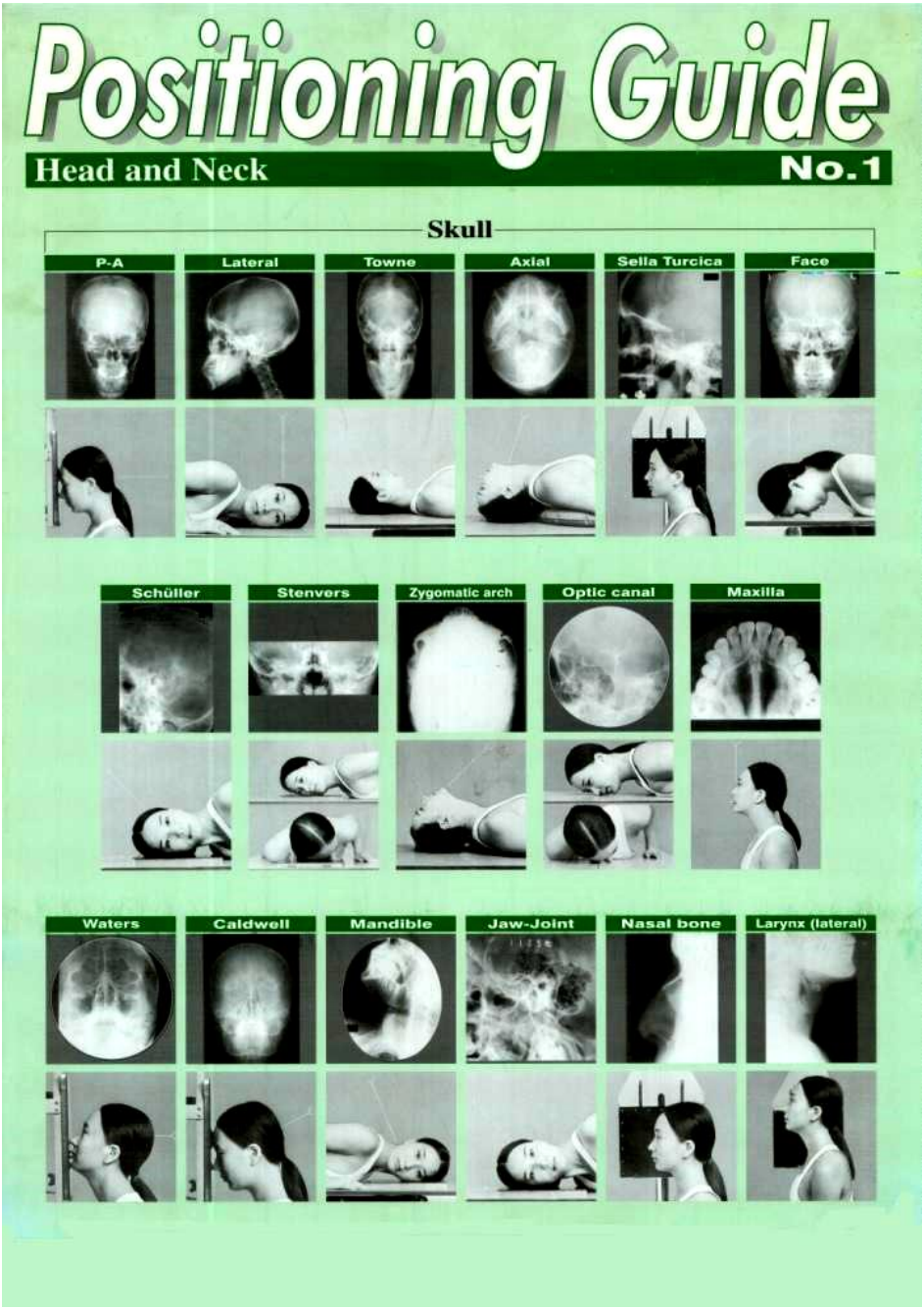
SUPINE - Lying on the back.

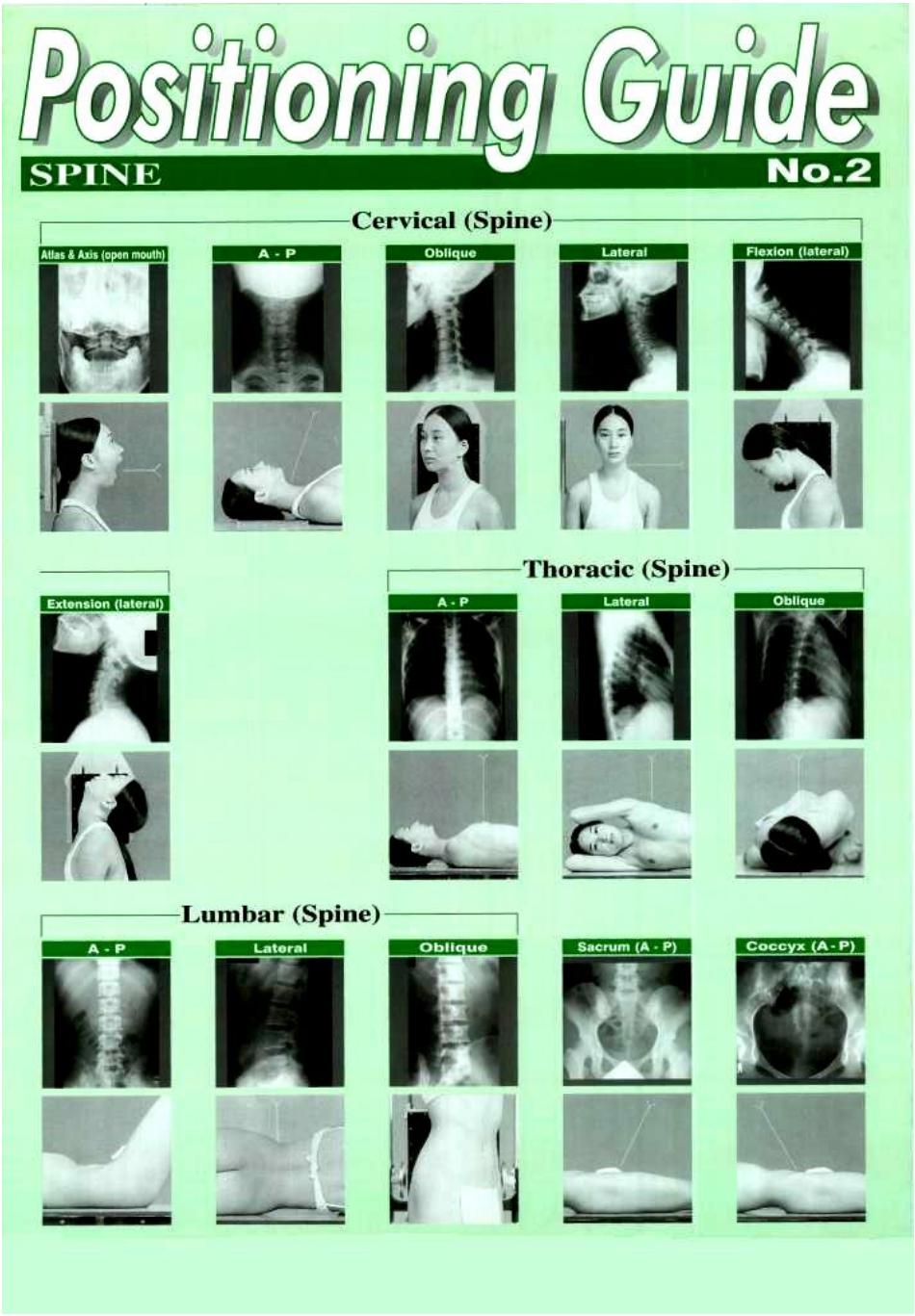
PRONE - Lying on the stomach.

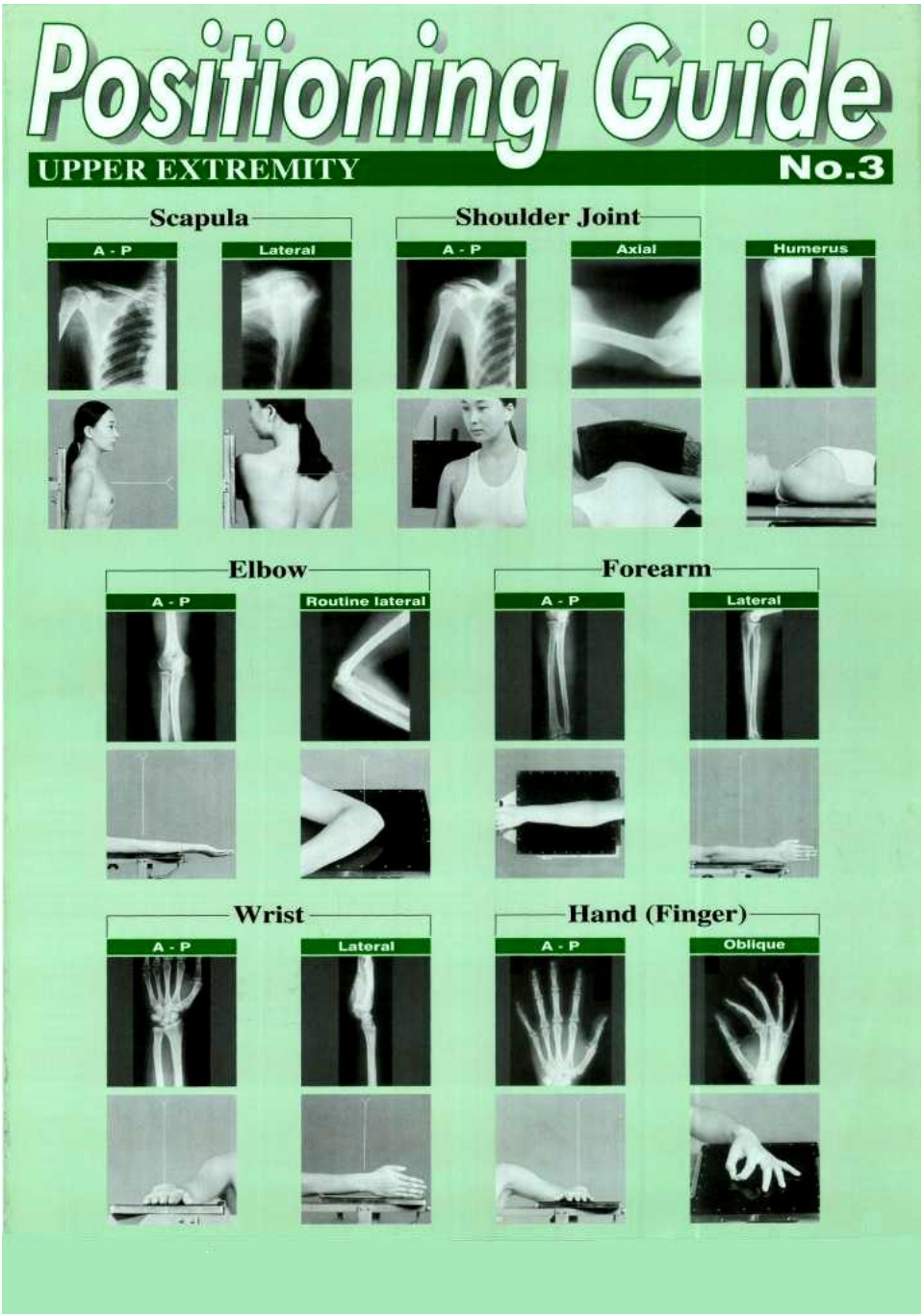
OBLIQUE - Turned a little, usually at a given angle.

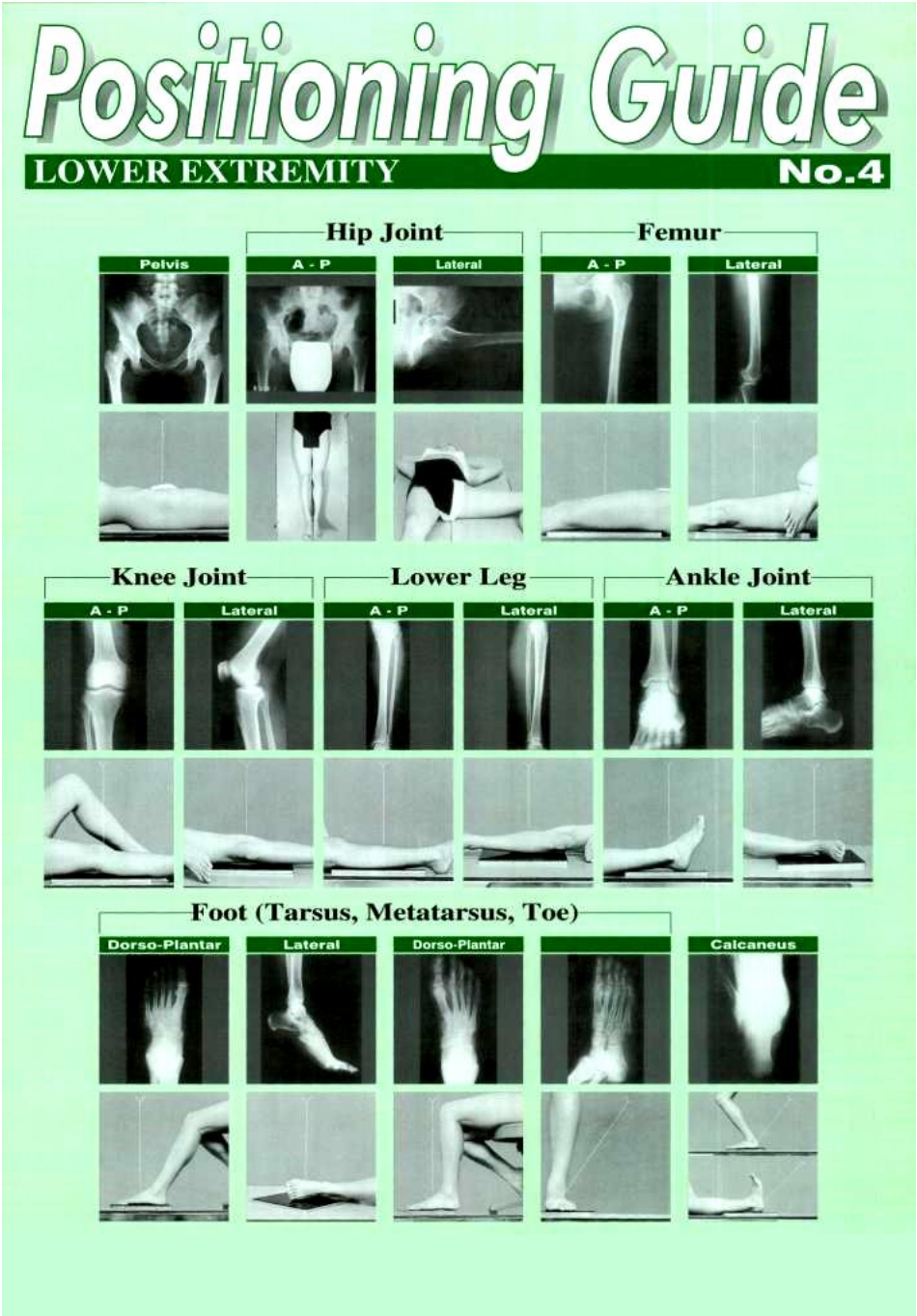
LATERIAL - Standing or sitting or lying with one side class to the cassette or cassette holder.

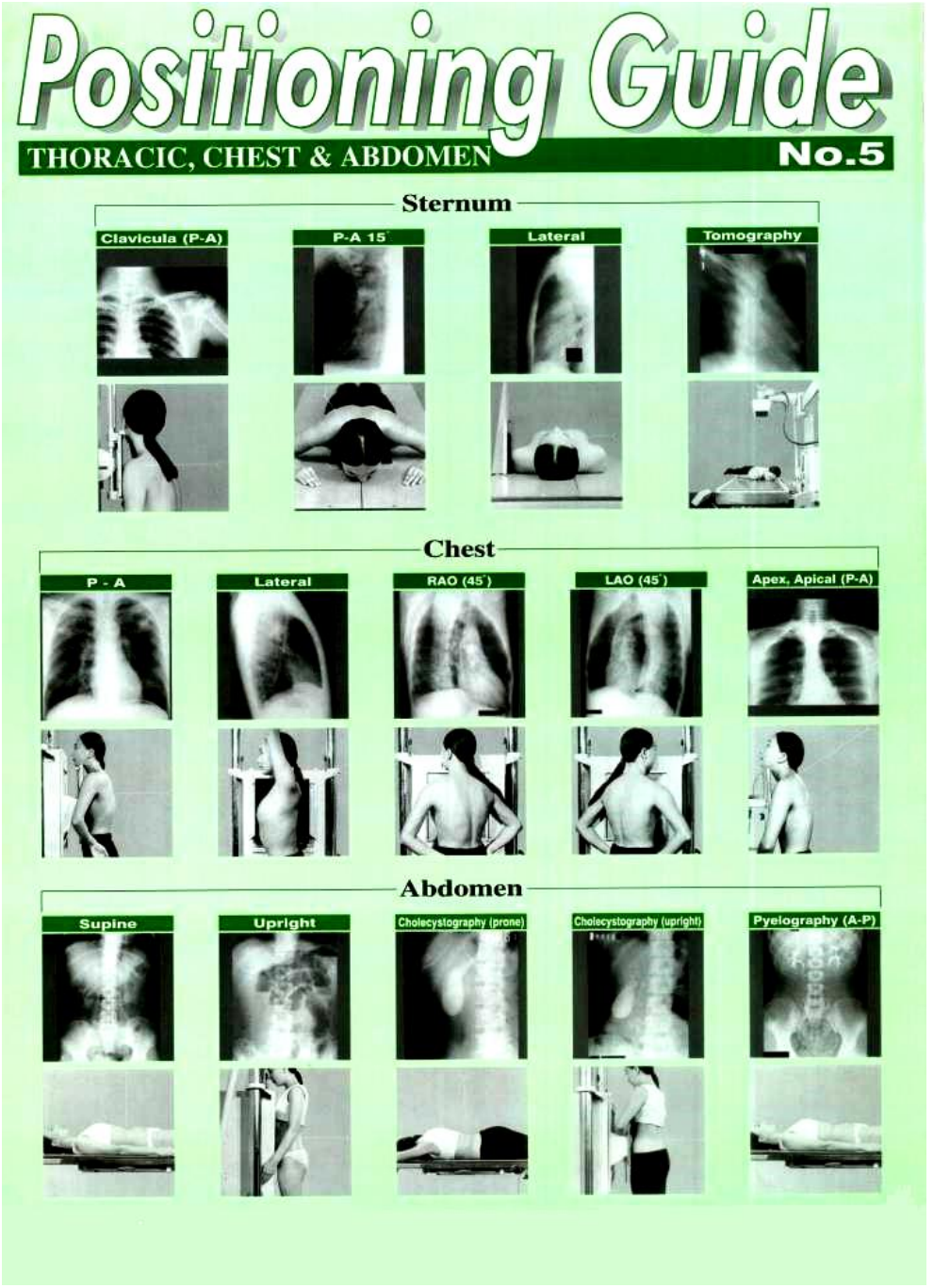
POSITIONING GUIDE




Positioning Guide
SPINE
No.2
Cervical (Spine)
Atlas & Axis (open mouth)
A - P
Oblique
Lateral
Flexion (lateral)
Extension (lateral)
Thoracic (Spine)
A - P
Lateral
Oblique
Lumbar (Spine)
A - P
Lateral
Oblique
Sacrum (A - P)
Coccyx (A - P)


Positioning Guide
UPPER EXTREMITY
No.3
Scapula
A - P
Lateral
Shoulder Joint
A - P
Axial
Humerus
Elbow
A - P
Routine lateral
Forearm
A - P
Lateral
Wrist
A - P
Lateral
Hand (Finger)
A - P
Oblique


Positioning Guide
LOWER EXTREMITY
No.4
Hip Joint
Femur
Pelvis
A - P
Lateral
A - P
Lateral
Knee Joint
Lower Leg
Ankle Joint
A - P
Lateral
A - P
Lateral
A - P
Lateral
Foot (Tarsus, Metatarsus, Toe)
Dorso-Plantar
Lateral
Dorso-Plantar
Calcaneus


Positioning Guide
THORACIC, CHEST & ABDOMEN
No.5
Sternum
Clavicula (P-A)
P-A 15°
Lateral
Tomography
Chest
P - A
Lateral
RAO (45°)
LAO (45°)
Apex, Apical (P-A)
Abdomen
Supine
Upright
Cholecystography (prone)
Cholecystography (upright)
Pyelography (A-P)

4. ROOM LAYOUT

4.1 ROOM LAYOUT FOR AN X-RAY INSTALLATION

Room for diagnostic X-Ray unit and related equipment shall be located as far away as feasible from areas of high occupancy and general traffic, such as maternity and pediatric wards and other departments of the hospital that are not directly related to the radiation and its use.

In case the installation is located in the residential complex, it shall be ensured that the wall(s) of the X-Ray room on which the primary beam falls is not less than 35 cm thick brick or the equivalent walls of the X-Ray room on which the scattered X-Ray falls is not less than 23 cm thick brick or equivalent, there is shielding of 1.7mm of lead in front of doors and windows of the X-ray room to protect the adjacent areas.

- **LAY OUT**

The lay out of the room in the X-Ray installation shall be such that the number of doors for the entry to the X-Ray room shall be kept to the minimum. The unit shall be so located that it shall not be possible to direct the primary X-Ray beam towards the dark room, door, windows, and control panel or area of high occupancy.

- **ROOM SIZE**

The room housing for an X-ray unit shall not be less than 18 sq. mtr. for general purpose radiography and conventional; fluoroscopic equipment.

- **SHIELDING**

Appropriate structural shielding shall be provided for walls, doors, ceiling and floor of the room housing of the X-Ray unit so that doses received by workers and the members of public are kept to the minimum and shall not exceed the respective annual effective doses as prescribed by the AERB. Appropriate shielding shall also be provided for the dark room to ensure that the stored X-ray films are not exposed.

- **OPENINGS AND VENTILATION**

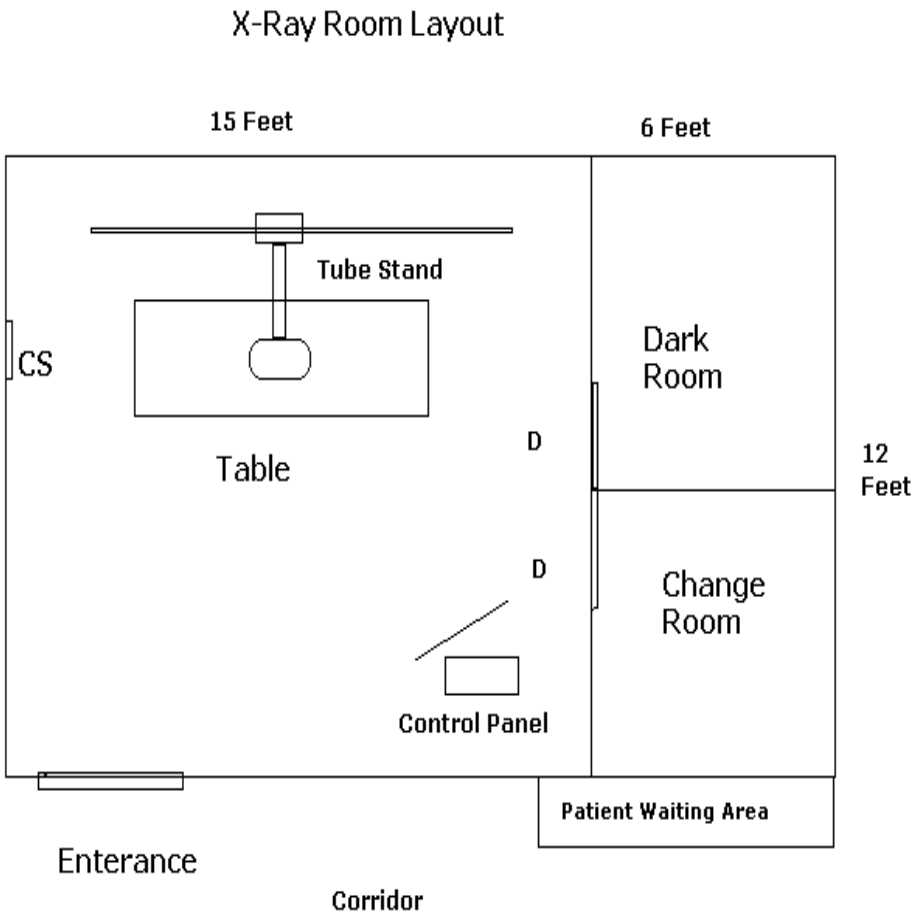
Unshielded openings in the X-Ray room for ventilation or natural light shall be located above a height of 2m from the finished floor level outside the x-ray room.

For the X-Ray equipment operating at 125kVp or above, the control panel shall be installed in the separate room adjoining the Main X-Ray room and for the fluoroscopic equipment the adequate darkness shall be achieved when required in the room.

- **WAITING AREAS**

  Patient waiting areas shall be provided outside the X-Ray room.

4.2 SUGGESTED X-RAY ROOM LAYOUT



4.3 RADIATION PROTECTION ACCESSORIES

It is advisable to all personnel handling X-Ray machines to use following radiation protection accessories:

i. Lead Goggles
ii. Protective Barriers
iii. Lead Apron
iv. Lead Gloves
v. Thyroid Shield
vi. Gonad Shie

4.4 SUGGESTED DARK ROOM LAYOUT

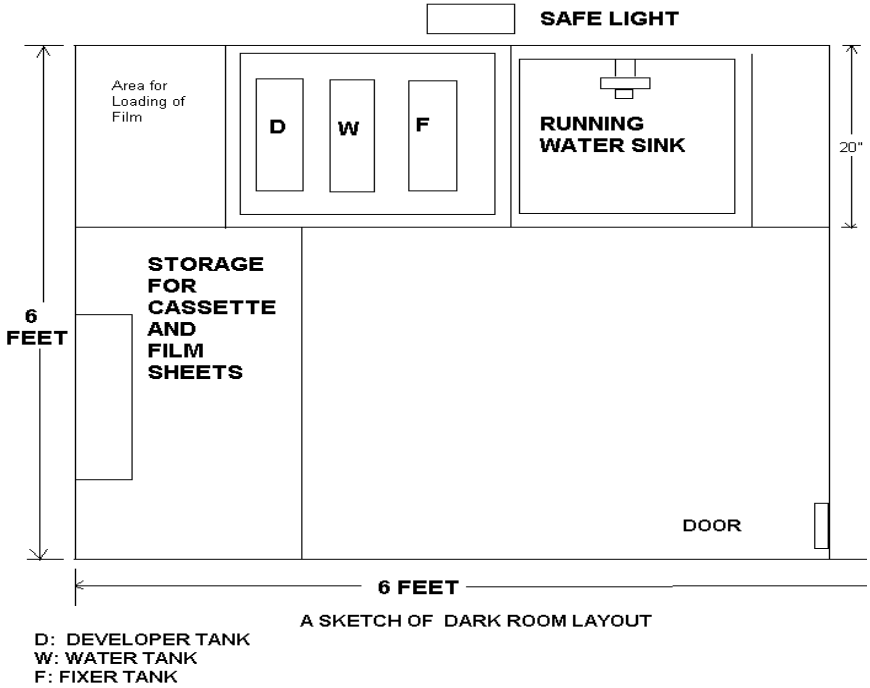


Figure 4.2 Dark Room Layout

4.5 DARK ROOM ACCESSORIES

Film processing takes place in the darkroom. There should not be any light inside the Darkroom except a safelight. A safe light is a low wattage (15 watt) Red bulb at a height of one meter from the developer tank. The Darkroom should be adjoining the X-ray room.
The Darkroom should preferably be of size 6'X6' with only one door for entry & exit.

- **ACCESSORIES OF DARKROOM**

1. Tank for Developer (SS)
2. Water Tank (SS)
3. Fixer Tank (SS)
4. Chemicals viz. Developer & Fixer.
5. Cassettes of Different sizes fitted with Intensifying Screens.
6. Hangers for drying films
7. Safe Light.
8. Films of Different Sizes.
9. Lead Markers 0-9 & L/R

There should be a provision of continuous water supply in the Darkroom. An exhaust fan should also be there.

5. DARK ROOM PROCEDURE

5.1 DARK ROOM PROCEDURE

To obtain the best results from the X-Ray Machine, following should be observed in Dark Room: -

1. Dark Room should be totally dark and no light should enter in the room.

2. Loading and unloading of films in the cassette should be done only in Dark Room under standard safe light.

3. A qualified and trained Radiographer should only be allowed to operate the X-Ray Equipment.

4. Films should be stored in Dry and Dark place.

5. The Intensifying screens should be handled with care and touching the screens with fingers should be avoided.

6. The Developer and the Fixer solutions should always be covered and preferably new solutions to be prepared after every 30-40 days or after 250 films whichever is earlier.

7. The Temperature of Developer and Fixer to be maintained between 25 to 30 Degrees.

8. Solutions should be stirred with wooden stick each time films are dipped. Separate wooden sticks, each for developer and fixer should be used.

5.2 X-RAY FILM PROCESSING

1. Open the exposed cassette in the Dark Room.

2. Take out the exposed film and fix it in the hanger of suitable size.

3. Dip the film in the Developer. After about 15 seconds take out the film from the Developer to visually observe the Developing status. Dip it again and take out to monitor the development as frequently as possible.

4. Take out the film from the Developer tank after it is fully developed.

5. Dip the film in water to rinse all traces of developer on the film.

6. After proper rinsing, dip the film in the fixer. Let it be dipped in fixer for 5 Minutes.

7. Dip the film in running water to rinse and remove all the fixer from the film.

8. Dry film either in open place or in film drier.

6. INSPECTING THE SYSTEM

6.1 INSPECTING THE SYSTEM

- **DAILY CHECKLIST**

√ After each use, remove the power cord from Power outlet and cover the machine properly.

√ Clean the Tube Head and external surface of the unit by dry cloth.

- **WEEKLY CHECKLIST**

√ Check system power cord for any cracks or damages.

√ Check all connectors outside the machine for their firmness.

√ Clean the Foot Switch with a Soft Dry Cloth.

- **MONTHLY CHECKLIST**

√ Visually inspect the unit every month for any physical damage to different parts.

√ Check that panel covers are properly tight with screws from all sides.

√ Check the electrical and power cables for any crack, cuts etc.

√ Check the equipment for any loose connection or loose hardware.

√ Check the Tube Head for any leakage.

√ Check for any abnormal noise or sparking in the machine.

√ Check conditions of Dark Room Chemicals (Chemicals must be replaced every month).

Note:

1. *Regular maintenance of system is necessary for safe and trouble free use. Periodic maintenance helps in reducing equipment downtime, service cost and operational hazards.*
2. *Contact the local service representative for spares or preventive maintenance inspections. It is recommended that preventive maintenance be performed every three months.*

6.2 GENERAL MAINTENANCE

- Since only trained & qualified personnel should be permitted access to the internal portion of the X-ray unit, it is recommended that service and maintenance be performed by our local Service Engineers.
- User should confine only to preserve the external appearance of the unit by cleaning the unit with dry cloth. It is recommended to take suitable precautions against accumulation of dust etc. on the control panel, tube head and fluoroscopy etc. Dust covers may be used.
- RMS maintains a nationwide network of Service Centers through which the assistance of skilled service personnel may be obtained. You are requested to contact any of the centres near you for all your service related problems. Contact details along with Telephone Numbers of our Service Centers are mentioned in this manual.
- Following the installation, occasional readjustments of tube current will be required because of changes in electron emission of the filament of X-Ray tubes brought out by evaporation of Tungsten.
- When mA values differ by more than 10% from the selected values, the tube current must be readjusted. This should be done by qualified Service Engineer specially trained in servicing the equipment.



Caution:

1. *The users are requested not to open the machine & access inside the control panels, Tube Head and other devices, as it may be dangerous and risky for them.*
2. *The servicing of X-Ray equipment should be entrusted to only RMS authorized Service Personnel. Company is not responsible for Guarantee Claims if the service to this equipment is provided by unauthorized service personnel.*

7. HEAD OFFICE ADDRESS

7.1 HEAD OFFICE ADDRESS

Recorders & Medicare Systems (P) Ltd.
Plot No. 11, HSIIDC IT Park, Sector-22, Panchkula-134114, Haryana, India
Ph.: +91-172 2564196, 2565196
Unit II: Plot No. 9, Industrial Area, Phase 1, Panchkula-134113, India
RMS Toll Free No.: 1800-1200-767
Website: www.rmsindia.com, E-mail: helpdesk@rmsindia.com

7.2 CUSTOMER CARE (X-RAY DIVISION)

Mr. Amandeep Singh : 09216001898

Email : helpdesk@rmsindia.com

A. APPENDIX

A.1 DEVICE SYMBOLS

Symbol	Description
	Protective Earth
	Type B Applied part
	Dangerous Voltage
	Off
	On
	Attention
	Alternating Current
	Foot Switch
	Hand Switch
	Radiation Material

A.2 TECHNICAL SPECIFICATIONS

MDX-100 DX	100mA -100KVP, Full Wave Rectified X-Ray Generator with Stationary Anode X-Ray Tube.
Rating	8 KW
KVP Range	36 to 100KVP in Steps of 2 KVP/ Step.
mA OUTPUT	
Radiography	25mA, 50mA &100mA for the range of 36 – 100kVp.
Fluoroscopy (OPTIONAL)	0.1mA – 3mA, in the steps of 0.1mA for the range of 36 – 100kVp.
CONTROL FEATURES	
Timer	Software based Timer with range from 0.02 to 8 sec in 31 steps.
Control	Attractive and Ergonomic designed control design with: • Graphical Colored TFT display. • Voltmeter indicating line voltage. • In built Automatic voltage compensator, coarse & fine. • Booster X-mer is provided for stabilization of filament Voltage. • Soft touch panel switches for selection of various parameters. • Also having APR mode with 121 programs and density control system.
FUSES	
F1 – Line	25 Amps.
F2 – Bucky Supply	4 Amps.
F3 – LBD Supply	4 Amps.
MCB	16 Amps.
POWER SUPPLY REQUIREMENTS	
Input Voltage	Single phase 230V AC $\pm$ 10 %
Input Frequency	50/60 Hz
Power Requirements	10KVA
Line Resistance	0.4 Ohms (*To be ensured by local electrical authority*)
SAFETY FEATURES	
Overload Protection	• **Overload** X-ray indicator • **Error indicator** which gives indication of following errors: ➢ Earth ➢ Communication • Also the fuses are provided for the protection of various circuits.

TUBE HEAD	
Tube Head	• Self contained tube head equipped with: ➢ X-Ray Tube ➢ Compact heavy duty full wave rectifiers ➢ H.V. Transformers This is immersed in oil which is hermetically sealed. • Tube head can be tilted 360° with full flexibility for use in operation theatres and in ward for bedside radiography
X-Ray Tube	• Stationary anode X-ray tube • Focal spot size : 2.8mm^2
STANDS AND TABLES	
Stand & Tables	Different Tube Stands / *Tables are available and the user can select most appropriate stand / table as per his/her requirement. **STANDS:** (i) MCB-Counter Balanced Mobile (ii) FS-Floor to Ceiling / ceiling free (iii) FSF-Floor to Ceiling with Fluoroscopy **TABLES:** (i) HRT - Horizontal Bucky Table. (ii) MPT-5 Position, Hand Tilt Manual Table (iii) HFT-Horizontal table with Floating Table Top
ENVIRONMENTAL CONDITIONS	
Storage Conditions	Temperature : 0 to 40° C Humidity : Maximum 90% at 30° C
Operating Conditions	Temperature : 10° to 40° C Humidity :Up to 80%

⚠ ***Warning:*** *It is strongly recommended that independent earthing (at zero potential) is available in the power socket in the Room where the machine is to be installed. Proper earthing not only enhances the performance & reliability of the equipment but increases safety for the operating staff as well.*

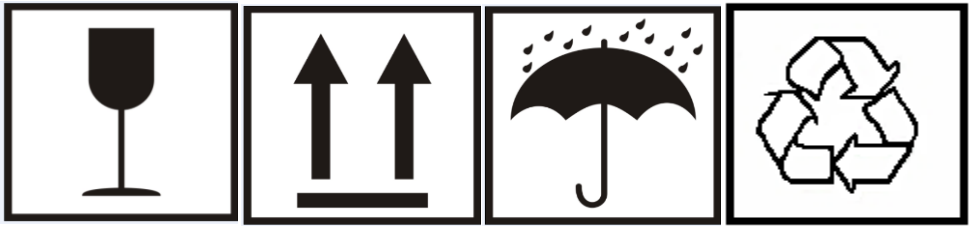
A3. HARDWARE & ACCESSORIES

Accessories	Quantity
Touchup Paint	01
User Manual	01
Fuse – 25A	01
Fuse – 4A	02

- **STICKERS ON PACKING**



Handle with Care



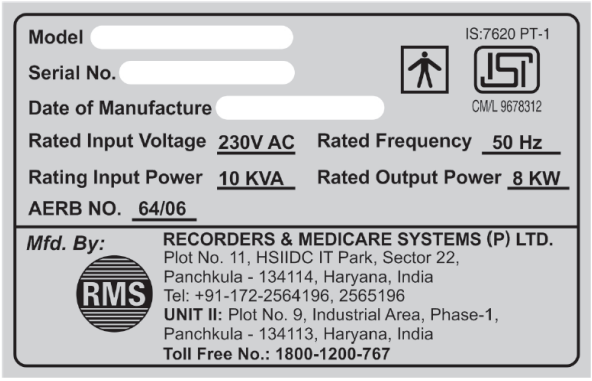
Fragile

Move and store packaging this end up

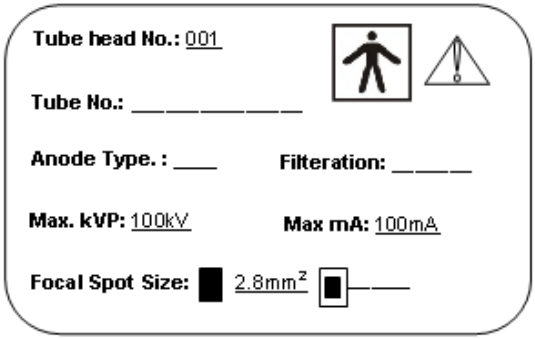
Keep Dry

Recycle the Packaging materials after use

- **SERIAL NUMBER STICKER (FOR MACHINE)**



- **SERIAL NUMBER STICKER (FOR TUBE HEAD)**



A.4. ABBREVIATIONS

Abbreviations	Meaning
AERB	Atomic Energy Regulatory Board
BIS	Bureau of Indian Standards
RSO	Radiological Safety Officer
TLD	Thermoluminuos Dosimeter
A.C.	Alternating Current
APR	Anatomical Programming
KVP	Kilovolt Peak
mA	Milliamperes (Tube current)
TFT	Thin Film Transistor Display
MCB	Miniature Circuit Breaker
LBD	Light Beam Diaphragm
Hz	Hertz
H.V.	High Voltage
mAS	Milli-ampere-seconds
RmA	Radiographic milli-ampere
FmA	Fluoro milli-ampere
SS	Stainless Steel
AP	Anterior –Posterior (front to back)
PA	Posterior –Anterior (back to front)

WARRANTY CARD

Recorders & Medicare Systems (P) Ltd.

Plot No. 11, HSIIDC IT Park, Sector-22, Panchkula-134114, Haryana, India
Ph.: +91-172 2564196, 2565196
Unit II: Plot No. 9, Industrial Area, Phase-1, Panchkula-134113, Haryana, India
RMS Toll Free No.: 1800-1200-767
Website: www.rmsindia.com, E-mail: helpdesk@rmsindia.com

Customer : _____

: _____

Equipment Description : _____

Model : _____

Serial No. of Unit : _____

Date of Installation : _____ Date of Warranty Expiry : _____

Recorders & Medicare Systems Pvt. Ltd. makes the following Warranty with respect to _____& accessories, which bear the RMS Mark.

The equipment supplied is warranted against defective workmanship & material for a period of 12 months from the date of Sale. Equipment & parts proving defective within the warranty period shall be replaced or repaired free of material & labour cost.

This warranty shall not extend to glassware items & parts, which are subject to normal wear & tear. The warranty also does not cover breakages of any item due to misuse.

All Vacumatic items (X-Ray Tubes & Image Intensifying Tubes) are subject to pro-rata warranty and these items going defective during the warranty period shall be replaced as per following replacements policy. (This is in line with warranty being extended to us by suppliers of these parts)

a) Price of the X-Ray Tube or I.I. Tube = Rs. X
b) Un-expired portion of the warranty = Y Months
c) Pro-Rata Credit to be allowed to customer = XxY/12
d) Replacement cost to be borne by customer = a)-c) =Rs._____

The warranty is valid only in case the equipment is operated as per Operating Instructions & Normal Input Voltage. Warranty doesn't cover defects out of misuse of equipment.

For **Recorders & Medicare Systems (P) Ltd.**

(AUTHORIZED SIGNATORY)

Name: _____ Date_____

Employee Code: _____

(One Copy is to be retained by customer & one copy to be send to CS (HO)

Terms and Conditions

1) The warranty is valid only in case the equipment is operated as per instructions given in the User Manual and normal Power Line Voltage & Frequency.
2) RMS shall not be obliged to furnish warranty service in case of:
   - Where the machine has been installed, serviced, repaired, opened or tampered by any unauthorized person.
   - Damage caused by the use of Non- RMS supplies, Parts, Consumables & accessories.
   - Damage resulting from modification and integration with other products.
   - Damage due to electric power fluctuations.
   - Damage caused by mice, lizards, rodents, cockroaches etc.
   - Any defect, failure or damage caused by improper use, operation by un-qualified Technicians, inadequate maintenance and care.
3) The warranty is limited to repair/replacement of material parts and does not cover consumables like paste, jelly and electrodes etc which are consumed during normal operation of machine.
4) This warranty shall not extend to glassware items & parts which are subject to normal wear & tear.
5) The warranty also does not cover breakages of any item due to misuse.
6) Parts repaired or replaced under the warranty are warranted for the remaining period of original warranty period only.
7) This warranty will apply to the original purchaser only.
8) This warranty will be the sole and only remedy, either express or implied, for RMSPL products.
9) Customers can avail services under Annual Maintenance Contract after the warranty period.
10) All vacuumatic items, in case of X-Ray machines & C-Arms (X-ray Tubes & Image Intensifying Tubes) are subject to pro-rata warranty and these items going defective during the warranty period shall be replaced as per following replacement policy. (This is in line with the warranty being extended to us by suppliers of these items)
    a) Price of the X-Ray Tube or I.I. Tube = Rs. **X**
    b) Un-expired portion of the warranty = Y Months
    c) Pro-Rata Credit to be allowed to Customer = XxY/12
    d) Replacement cost to be borne by Customer = a)-c) = Rs. _____
11) This warranty shall be subject to following limitations & exclusions:-
    a) Damage, defects and or malfunctions resulting from Dust, interference of foreign objects, natural disaster, Lightning, fire, water and or liquid substances, exposure to sunlight, improper ventilation, drop from height, inoperative/leaking batteries, civil unrest or accidents.
    b) Software Media which does not conform to the specifications referred to in the operating instructions.
    c) Loss of any Data or memory and or setting during operation and or in the course of any repair/service.
    d) Units on which the Serial No. has been defaced modified or removed.
    e) If the product is used in Industrial or Rental purposes.
12) This Warranty shall be applicable in Republic of India only.
13) The warranty is subject to the jurisdiction of Panchkula courts.

WARRANTY CARD

Recorders & Medicare Systems (P) Ltd.

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RMS Toll Free No.: 1800-1200-767
Website: www.rmsindia.com, E-mail: helpdesk@rmsindia.com

Customer : _____

: _____

Equipment Description : _____

Model : _____

Serial No. of Unit : _____

Date of Installation : _____ Date of Warranty Expiry : _____

Recorders & Medicare Systems Pvt. Ltd. makes the following Warranty with respect to _____& accessories, which bear the RMS Mark.

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a) Price of the X-Ray Tube or I.I. Tube = Rs. X
b) Un-expired portion of the warranty = Y Months
c) Pro-Rata Credit to be allowed to customer = XxY/12
d) Replacement cost to be borne by customer = a)-c) =Rs._____

The warranty is valid only in case the equipment is operated as per Operating Instructions & Normal Input Voltage. Warranty doesn't cover defects out of misuse of equipment.

For **Recorders & Medicare Systems (P) Ltd.**

(AUTHORIZED SIGNATORY)

Name: _____ Date_____

Employee Code: _____

(One Copy is to be retained by customer & one copy to be send to CS (HO)

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1) The warranty is valid only in case the equipment is operated as per instructions given in the User Manual and normal Power Line Voltage & Frequency.
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   - Where the machine has been installed, serviced, repaired, opened or tampered by any unauthorized person.
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   - Damage resulting from modification and integration with other products.
   - Damage due to electric power fluctuations.
   - Damage caused by mice, lizards, rodents, cockroaches etc.
   - Any defect, failure or damage caused by improper use, operation by un-qualified Technicians, inadequate maintenance and care.
3) The warranty is limited to repair/replacement of material parts and does not cover consumables like paste, jelly and electrodes etc which are consumed during normal operation of machine.
4) This warranty shall not extend to glassware items & parts which are subject to normal wear & tear.
5) The warranty also does not cover breakages of any item due to misuse.
6) Parts repaired or replaced under the warranty are warranted for the remaining period of original warranty period only.
7) This warranty will apply to the original purchaser only.
8) This warranty will be the sole and only remedy, either express or implied, for RMSPL products.
9) Customers can avail services under Annual Maintenance Contract after the warranty period.
10) All vacuumatic items, in case of X-Ray machines & C-Arms (X-ray Tubes & Image Intensifying Tubes) are subject to pro-rata warranty and these items going defective during the warranty period shall be replaced as per following replacement policy. (This is in line with the warranty being extended to us by suppliers of these items)
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    d) Replacement cost to be borne by Customer = a)-c) = Rs. _____
11) This warranty shall be subject to following limitations & exclusions:-
    a) Damage, defects and or malfunctions resulting from Dust, interference of foreign objects, natural disaster, Lightning, fire, water and or liquid substances, exposure to sunlight, improper ventilation, drop from height, inoperative/leaking batteries, civil unrest or accidents.
    b) Software Media which does not conform to the specifications referred to in the operating instructions.
    c) Loss of any Data or memory and or setting during operation and or in the course of any repair/service.
    d) Units on which the Serial No. has been defaced modified or removed.
    e) If the product is used in Industrial or Rental purposes.
12) This Warranty shall be applicable in Republic of India only.
13) The warranty is subject to the jurisdiction of Panchkula courts.



ATTENTION

RMS makes no warranty of any kind, expressed or implied, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. RMS assumes no responsibility for errors that may appear in this document. RMS makes no commitment to update or to keep current the information contained in this document.

CUSTOMER RESPONSIBILITY

This product and its components & accessories will perform reliably only when operated and maintained in accordance with the instructions contained in this manual, accompanying labels, and/or leaflets. A defective product should not be used. Parts which may be broken or missing or are plainly worn out, distorted or damaged should be immediately replaced with genuine replacement parts manufactured by or made available by RMS or from sources recommended by RMS. The responsibility of RMS for a malfunctioning product is limited by the warranty set forth in this manual. Should repair or replacement of this product become necessary after the warranty period, the customer should seek advice from RMS prior to such repairs or replacement. If this product needs repair, it should not be used until all repairs have been carried out and the unit is functioning properly and is ready for its intended use. The owner of this product bears sole responsibility for any malfunction resulting from improper use or maintenance, or repair by any unauthorized person or agency , as well as for any malfunction caused by parts which are damaged or modified by anyone other than RMS.



WARNING, CAUTION & NOTE SYMBOLS

Please read and follow all WARNINGS, CAUTIONS and NOTES provided in this manual. To avoid the possibility of injury, damage to the product or loss of data, observe these safety precautions while operating the system.



WARNINGS

This machine uses a USB cord for power. Inspect the USB Cable often for fraying or other damage. Do not operate the machine with a damaged power cord or plug. Improper grounding is a safety hazard.

Note: Informs the reader about the relevant facts and conditions: draws the attention to important information; however this does not necessarily cause damage to people or to the equipment.

Caution: Warns of conditions and situations which, if not taken care of or avoided, could cause damage to the equipment.

Warning: Warns of conditions and situations which, if not taken care of or avoided, could cause damage to the patient or the operator.



WARNINGS

- This device has not been designed to be used in environments where vapors, anesthetic mixes flammable with air, or oxygen and nitrous oxide can be detected.
- Avoid pouring water, even accidentally, or other liquids into the device, as this could cause short-circuits.
- Before cleaning the device, please disconnect it from the Power Supply.
- Wherever necessary, use the Radiation Protection accessories, such as the lead vinyl aprons, to protect the patient & operator from radiation exposure.
- While performing the radiography, no one, apart from the operator and the patient, must remain in the room.
- Though this unit has been designed with a quite acceptable protection level from electromagnetic interference, it is advisable to install it at a certain distance from electrical energy transformation rooms, from static continuity units, from portable receiving transmitting units for amateurial use and for cellular use. Cellular phones are only admitted at a distance of more than 1, 5 m from any component of the device. Other medical instruments and devices that must be used in the same installation area of the unit must comply with the Electromagnetic Compatibility rules in force. Non-complying instruments, of which the poor immunity from electromagnetic fields is well known, must be installed at least 3 m away from the equipment and supplied by a different electrical line.

- The equipment must be off while using devices such as electrical scalpels or similar instruments. The equipment automatically performs some self-test functions and therefore is able to detect some anomalous conditions. However, whenever there are doubts on the performance of the equipment (e.g. images too bright, too dark or with artifacts), the activity must be suspended and an RMS qualified and authorized engineer must be contacted.

- During the use of the equipment, the operator must comply with the local work safety regulation, in particular with the ones referring to the use of x-ray equipments.

- When the unit is to be used after being “OFF” for overnight or four hours or more, it is recommended that control be turned “ON” routinely for five minutes before exposure is made. This will provide consistency of radiographic results and ensure proper warm up of tube filament.

- Since X-RAYS are harmful, keep the maximum safe distance from the primary beam.

ENVIRONMENTAL RISKS AND DISPLACEMENT

The equipment contains in some of its parts, materials that at the end of the unit’s life, must be recycled at an approved location. Particularly the device contains the following materials and/or components:

- **Central unit and control console:** iron, copper, aluminum, no biodegradable plastic material, glass-resin for printed circuit boards (PCB).

- **Tube head Assembly**: Tube head assembly of this x-ray equipment contains High voltage transformer, X-ray tube and oil filled alongside, printed circuit board (PCB) and lead used for controlling stray radiations.

NOTE:

RMS is not responsible for the disposal of the device performed by the user and for the costs related to this intervention.

It is assumed by the manufacturer and distributors of this equipment that all persons responsible for the operation of this equipment are aware of danger and excessive exposure to X-radiation and this equipment is sold with the understanding that RMS, their agents and representatives have no responsibility for injury or damage which may result from exposure to X-radiations.

RECOMMENDATIONS TO REDUCE RADIATION EXPOSURE

The main objective of radiation protection procedures in an X-Ray diagnostic installation is to limit the radiation exposure arising from the use of the diagnostic equipment as low as possible so that the radiation doses received by the radiological personnel and general public never exceeds the maximum permissible dose limits recommended by ICRP (International Commission on Radiation Protection).

- The radiation exposure to the patient should be the minimum exposure required to produce images of good diagnostic quality. Use radiation with care, caution and at a rate which is **ALARA** - 'As Low as Reasonably Achievable'.
- The speed of the film, or screen and film combinations should be of fastest speed consistent with the diagnostic objective of the radiographic examination.
- During the radiographic examination, X-ray field should be collimated to dimensions not greater than the X-ray film dimensions.
- When a patient or film must be provided with auxiliary support during radiation exposure:

  a) Mechanical holding devices shall be used when the technique permits.

  b) Individuals may be permitted to hold the patient when absolutely necessary and no individual shall be used routinely for this purpose to the exclusion of others who might share the task.

  c) If a human holder is required, the holder shall be positioned such that no part of body shall be struck by primary X-ray beam unless protected by at least 0.5 mm lead equivalent and shall be protected from direct scatter radiation by protective lead apron of not less then 0.25 mm lead equivalent.

- Gonadal shielding of not less then 0.25 mm lead equivalent shall be used for patients who have not passed their reproductive age during radiographic procedures in which gonads are under primary beam, except, in cases where shielding would interfere with diagnostic procedures.
- Doors of an X-ray room should be closed before making exposures.
- The X-ray beam should not be directed towards doors or windows of the room, or towards control panel or darkroom walls unless no other geometry is possible.
- No patient should wait or change in X-ray room while another patient is being radio graphed.

- Except for patients who cannot be moved out of the room, only the staff and necessary personnel required for medical procedure shall be inside the room during radiographic exposure. Other then patient being examined:

  a) All individuals shall be positioned such that no part of body is struck by useful beam unless protected by not less then 0.5 mm lead equivalent.

  b) The staff or ancillary persons shall be protected from direct scatter radiations by protective aprons or full body protective barriers of not less then 0.25 mm lead equivalent. The aprons shall be wrapped around if an X-Ray exposure to the back is possible.

  c) Patients who cannot be moved out from the room shall be protected from direct scatter radiation by protective barriers not less then 0.25 mm lead equivalent or shall be positioned in such a way that nearest portion of the body is at least 2 meters away from both the tube head and nearest edge of image receptor.

- Obey radiation protection rules pertinent to time, distance and shielding.
- Prefer low exposure settings to high.
- Use collimator to set minimal useful field size; keep image intensifier in close proximity to the patient.

PERSONAL REQUIREMENTS AND RESPONSIBILITIES

SAFETY PERSONNEL:

Every X-Ray department shall have Radiological safety officer (RSO). The RSO may either be the employer or consultant or the full time employee to whom the employer shall delegate the responsibility of ensuring compliance with appropriate radiation safety requirements applicable to X-Ray installation.

RADIOLOGIST:

All the X-Ray units or even the single unit shall have the services of the qualified radiologists. All the radiologists or the persons working in the X-ray field area must have the TLD (Thermoluminuos Dosimeter) badges. These badges are issued by AERB itself on filling up of the application form.

DOSE LIMITS:

- The cumulative effective dose over a block of five years shall not exceed 100mSv.
- The effective dose in any calendar year during a five-year block shall not exceed 30mSv.
- The equivalent dose in any calendar year to the lens of the eye shall not exceed 150mSv.
- The equivalent dose in any calendar year to the skin, the hands and feet shall not exceed 500mSv.
- In case of a woman operator / user of reproductive age, once pregnancy has been established, the concepts shall be protected by applying a supplementary equivalent dose limit to the surface of the woman's abdomen (lower trunk) of 2mSv for the remainder of the pregnancy. Internal exposures shall be controlled by limiting intakes of radio nuclides to about 1/20 of ALI. The employment shall be of such type that it does not carry a probability of high accidental doses and intakes.

HEALTH EFFECTS OF IONIZING RADIATION

Radiation energy absorbed in living tissues initiates physical and chemical reactions, resulting in biological changes. Some diagnostic x-ray equipment, particularly fluoroscopic equipment when obsolete or improperly operated, is capable of delivering doses that may be high enough to produce cellular reactions seen as acute tissue damage.

Even a small dose may increase the risk of cancer, and small absorbed doses in the gonads may induce mutations or chromosomal changes potentially capable of inducing hereditary disorders in the offspring.

FIRST AID IN CASE OF ELECTRICAL SHOCK

- Switch off the power supply. If it is not possible, protect yourself with dry insulating material and pull the victim clear off the conductor. Do not touch the victim with your bare hands until he/she is clear off the conductor.
- Place the victim in supine position.
- Keep the air passage clear by turning the head to one side, opening the patient's mouth and cleaning of water, saline, muscus or blood, a lot of which might have accumulated in the back of the throat.
- If the jaw is rigid, try to force the mouth open by putting pressure on the gum behind the last molar tooth of the lower jaw. When the upper air passage is cleared tilt the head backward and force the jaw forward from the angles of the jaw in front of the ears. This would prevent mechanical obstructions to the upper air passages.
- Hold the chin up and forward with one hand and pinch the nostril of the victim with other
- Take a very deep breath and apply your mouth to the victim and blow into his mouth until the chest of the victim moves up indicating filling up of the lungs (Never allow the chin to sag).
- When the chest moves up, withdraw your mouth and allow the chest to sink back.
- Repeat this process every three to four seconds until the victim begins to breathe again or until he/she is taken over by medical attendant. This method can be continued in an ambulance during transit of the patient from the site of accident to the nearest medical centre.

Note:

1. *Have someone else sent for a doctor.*
2. *Keep patient warm and loosen his/her clothing.*
3. *Do not give liquids until the patient is conscious.*



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