70mA Mobile Medical X-Ray Unit

The User's Manual

Read the users manual carefully prior to using this product

Notes:

- **Please read this user manual carefully before operating the machine to promise the maximum efficiency of the machine and assure safety of machine and operator.**
- **The manufacturer provides limited warranty for the safety, the reliability and the function of this machine under the following condition:**
  1. installation, testing, operating and maintaining are performed by licensed professional personnel;
  2. The power supply, the electricity facilities and the environment with which this machine use is match relevant directives
  3. The users are presumed to operate the machine under the manual's instruction.
- **The manufacturer provides one year product warranty except the following circumstance:**
  1. damage caused by inappropriate impact during the process of installation and usage;
  2. operating the product regardless of the users manual instruction;
  3. dismantling, replacing hardware, modifying this machine without the authorization of the manufacturing business;
  4. replacing spare parts which are not designated by the manufacturer
  5. malfunction caused by the environment that is not in line with the users manual provision(power supply, use environment, etc)

In this test:

【Caution】: means that possible unsafe condition of injury if don't evade

【Notice】: means that some key points to prevent possible system failure & photograph failure

This equipment is designed for medical diagnosis. Please use it for medical purpose on

Thanks for using our product. Our company provides technique consultation, after-sales service and maintenance for you with all sincerity.

Content

I. Summary

70mA mobile medical x-ray unit is designed for inconveniently-moved patients to take x-ray photography in the emergency room, wards, operating rooms, etc.

X-ray machine can be moved near to sickbed, operating table, stretcher, etc. The photograph diagnosis can also be taken at home or the outdoors. It is an ideal diagnostic equipment for both medical staff and Heavy jing patients.

X-ray machine is equipped with full-wave rectification combined type tube assembly. High-pressure silicon full-wave rectification technology is adopted in the tube assembly to improve x-ray tube's efficiency, also with function of temperature overload protection. There are 3 factors capacity interlock control system: kilovoltage (kV), milliampere (mA) and time(s). Controlled silicon zero passage circuit is adopted for high-voltage primary output, with overloading indicator, loading prepare indicator & the protection circuit of excessive voltage & insufficient voltage, thus the tube assembly won't be damaged by mis-operation. Cable manual switch exposure or wireless remote control emitter exposure can be chosed according to requirements. There is acousto-optic indicator when radiant exposure which provide convenience for patients & medical personnel. Panel of this machine:

Power voltage V and tube current mA are displayed in pointer type, kilovoltage (kV) and time (s) are selected by settled grades.

The tube assembly on the cantilever of x-ray machine can be moved up and down and can be fixed at any position. It can also be settled dexterously at required angle and height to facilitate the photograph. If the whole x-ray machine need to be moved，please put the cantilever to the lowest position and lock it, so that the machine can be moved safely and conveniently.

This machine is equipped with the dynamoelectric beam limiting device with controlled radiation field position and setting amplitude of the various X-ray film. The dynamoelectric cluster limiter will send out a beam of visual light while operating to aim the nidus and the scale of the visual light overlaps the scale of X ray exposing. This function makes it convenient that medical personnel position the nidus & the x ray exposed area.

Weight of the whole machine is 97 kg. When be moved, the outside measurement is 125cm×71cm×128cm (length×width×height). It can be used to move in the ward and between beds conveniently.

The maximum output of x-ray machine is 70kV 70mA 1.0s or 90kV 30mA 5.0s; input power with single phase AV 180V～250V； maximum power consumption of 5.5kW（instantaneous）； maximum photograph width（when focus-skin distance is 1m）to 40cm×40cm.

II. Main Technical Data

1. X-ray tube

1.1 model:XD3－3.5/100

1.2 material:tungsten

1.3 reference axis of target angle and focus: target angle and focus to anode head face 95±1.75mm

1.4 angle of target surface to regulated reference axis:19°

1.5 nominal value of reference axis:2.6

1.6 inherent filtration: 0.8mmAl

1.7 nominal voltage: 100kV

1.8 heater supply: AC 6～8V　Current 4.5A　Frequency 50Hz

2. Tube assembly

2.1 full-wave rectification, oil cooling, combined & occluded

2.2 nominal electric power : 90kV 30mA 5.0s；70kV 70mA 1.0s

2.3 measurement size: 370mm×300mm×250mm

2.4 weight: 27kg

2.5 loading factor value of leakage radiation: 90kV 50mA 0.2s ＜0.02mGy/h

2.6 tube assembly belongs to I class B type, non-watertight equipment

2.7 inner surface temperature should not exceed 55℃

2.8 filtration: 2.8mmAl

2.9 power supply of high voltage:　AV 116V～214V

2.10 heater supply: AC voltage＜220V

3. Electric beam limiting device

3.1 Power supply: AC 24V　Capacity: 110W

3.2 light source of indicating light field: AC 24V Power 100W, tungsten halogen lamp

3.3 light field illumination intensity:＞100lx when tube assembly focus to image is 100cm

3.4 width of light field:

a) when distance from x-ray tube focus to image receipt face (SID)is 65cm， max light field /axis field≤35cm×35cm

b) when distance from x-ray tube focus to image receipt face (SID)is 100cm， min light field /axis

field≤5cm×5cm

3.5 filtration: 0.5mmAl

3.6 weight: 2.2kg

4．Condition of the power supply

4.1 Single-phase three-wire alternating current voltage: 180V-250V frequency: 50Hz power supply resistance ≤0.8Ω capacity: 5.5kW instantaneous electric current: 24A (Max)

If not in this range, please select another AC voltage regulator with capacity more than 5kW.

4.2 Single phrase three-core three-core no less than 250V/16A; earth lead in the socket should be good and reliable；qualified breaker should be placed in the front of the socket.

4.3 To promise the machine can work normally, this machine power is not possible with other large capacity electric equipment share a power supply socket.

5. Operating condition of X-ray machine

5.1 ambient temperature:＋10℃ ～＋40℃；

5.2 relative humidity：30％～75％

5.3 atmospheric pressure:700hpa～1060hpa；

5.4. power supply：single phrase AC, voltage:220V±22V；Frequency:50Hz±1Hz；
Power：＞5.5kVA；Current：＞24A (instantaneous)

6. X-ray machine

6.1 Input power: 5.5kVA

6.2 Selection of timing range:0.063s～5.0s 20 digital type (execute R′10 value of GB9706.3 affix BB）

6.3 maximum rated capacity (see diagram 1)

s / kV / mA	～1.0	～4.0	～5.0
30	90	90	90
50	90	80	/
70	70	/	/

6.4 Specification of fuse plug:6G or 6C 125V/250V φ6×32mm

6.5 Top position from focus to ground (window down): 172cm
lowest position from focus to ground (window down): 50cm

6.6 Height of safety self-lock device when x-ray machine moves up and down(from focus to ground，window down): I grade 155cm；II grade 117cm；III grade 74cm

6.7 Width of tube assembly rotate around the axis of cantilever＞90°；
width of tube assembly rotate forth around the axis of supporting stand：＞90°

6.8 Mode of operation：interval loading, continuous operation

6.9 Exposure distance of remote control switch： 6m

6.10 Size of the whole machine（length ×width ×height）1510mm×710mm×1920mm

6.11 Weight of the whole machine: 97kg

6.12 Required pulling force to move the whole machine: ≤250N

6.13 Drain current, earth resistance, dielectric strength：qualified with requirements of GB9706.1、GB9706.11

III. Main Parts and Functions

1. Main parts（see Figure 1）

（1） tube assembly——to radiate & output x-ray

（2） ruler of focus distance：to measure distance from focus to film cassette

（3）electric beam limiting device：to adjust and limit the x-ray axis field

（4）cantilever：to hang and fix the tube assembly

（5）stand column: main strutting piece of x-ray machine

（6）stander：movable x-ray machine housing base

（7）foot rest lever：jam on the foot rest lever，the front small wheel will turn up and can raise above obstacles lower than 5cm

（8） brake pedal：to lock or relax the base frame of x-ray machine

（9） documents bucket：store x-ray films or documents

（10）controller：circuit control system of x-ray machine

（11） handspike：to move the x-ray machine by push or pull

（12） brake wrench of tube assembly rotation：to lock or relax the tube assembly

（13） remote control switch：wireless remote control switch for x-ray radiation output

（14） manual switch：wired manual switch for x-ray radiation output

2. Control panel （see Figure 2a）

(1) voltage meter：indicate x-ray machine’s working voltage after power turn-on（V）

(2) loading prepare indicator light：the green light——x-ray machine is in working condition of interval loading preparation

(3) output indicate light：the yellow light——indicate that the x-ray machine is radiating

(4) mA selection button：set required current（mA）grade when x-ray machine radiate

(5) alarm lamp：the red light——excess voltage or under voltage/exceed max rated capacity； indicate temperature control overload, disconnect

(6) power light：the green light——indicate the power turned-on

(7) maximum rated capacity：the max range of x-ray radation output

(8) ammeter：indicate the current value when x-ray machine radiate

(9)kV selection button：set required high-voltage （kV）grades when x-ray machine radiate

(10) turn-off button：to disconnect the x-ray machine and the power

(11)turn on button：control the connection of x-ray machine and power supply

(12)photography time display window——indicate photography time 0.063s～5.0S

(13)s increase button：setting time（s）needed for x-ray radiation

(14)s decrease button：setting time（s）needed for x-ray radiation

(15) voltage selection button: to adjust the working voltage

3. Socket connector（see Figure 3）

（1） power supply socket for electric beam limiting device：power output AC24V for electric beam limiting device by controller

（2）power supply socket for tube assembly：power output for tube assembly through controller

（3） fuse protector：controller powder fuse protector, 6C or 6G 250V φ6×32mm

（4） input power line：power supply for x-ray machine provided by user

（5） manual switch socket：wired control switch for x-ray radiation output

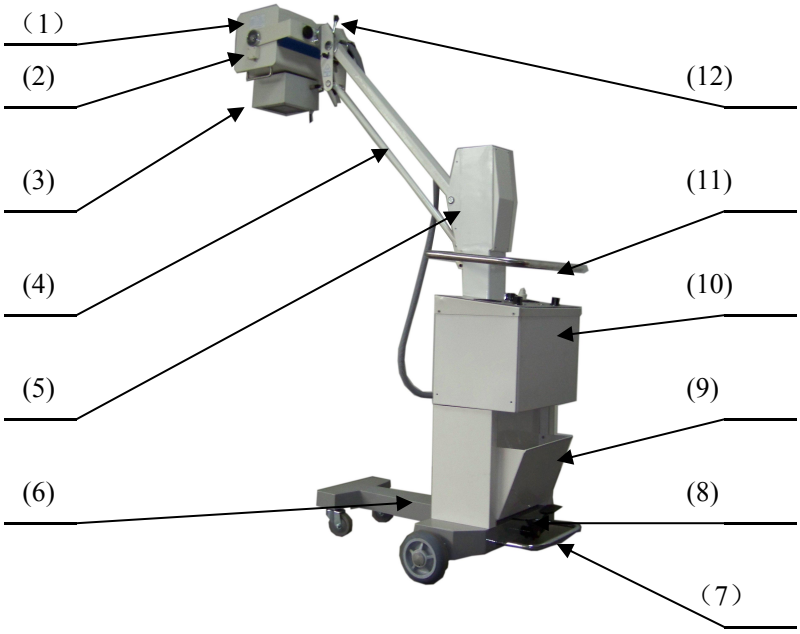


Figure 1

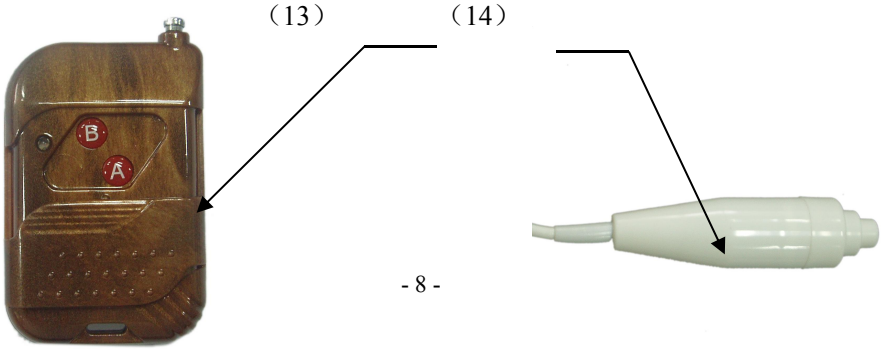


Figure 1（continue）

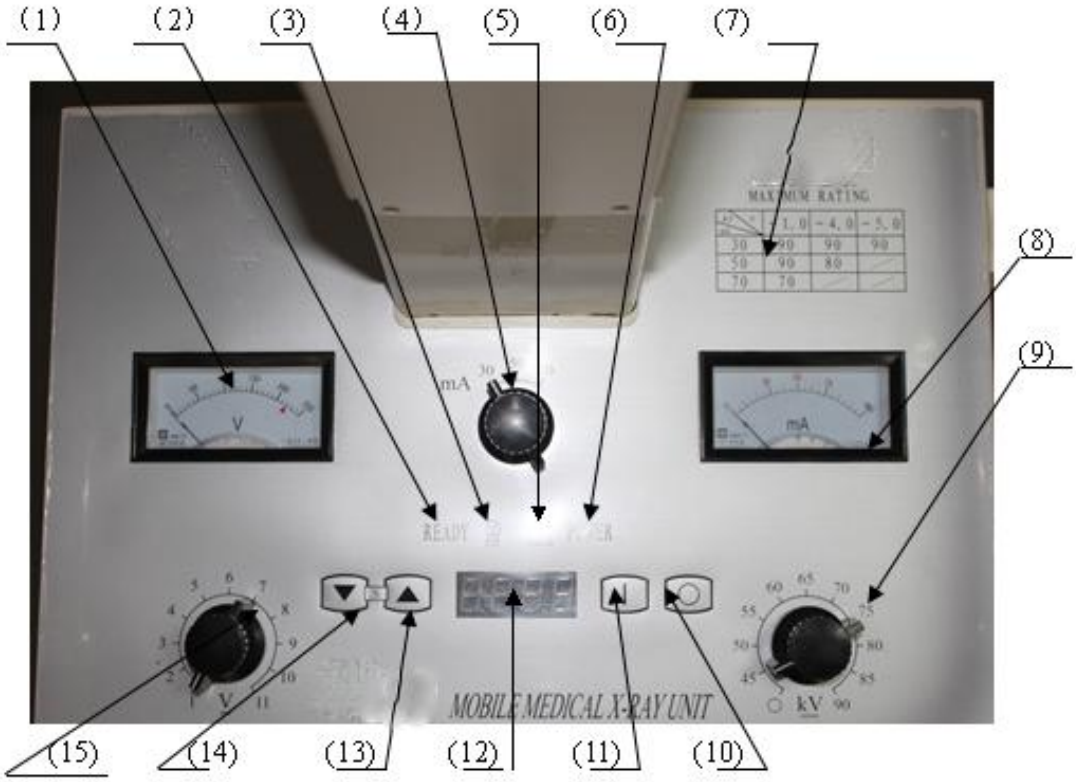


Figure 2a

Figure 3

4. Explanation of the symbols

 —— x-ray machine product type: I B

 ——— physiological effect: belongs to radiologicalapparatus

 ——— safety earthing

 ——— x-ray photograph control

 ——— transverse width of light field/ radiation field of beam limiting

 ——— longitudinal width of light field/ field of beam limiting

 ——— beam limiting light field source

 ——— power on

 ——— power off

 ———note！refer to the file

IV. Installation

1. Power supply

1.1 Single-phase three-wire alternating current voltage: 180V-250V frequency: 50Hz power supply resistance ≤0.8Ω capacity: 5.5kVA instantaneous electric current: 24A (Max)

If not in this range, please select another AC voltage regulator with capacity more than 5kVA.

1.2 Single phrase three-core three-core no less than 250V/16A; earth lead in the socket should be good and reliable；qualified breaker should be placed in the front of the socket.

1.3 To promise the machine can work normally, this machine power is not possible with other large capacity electric equipment share a power supply socket.

[Caution]: the 3-plug outlets must be connected to ground goodly to promise the safety of the medical staffs and patients.

2. Unpacking check

Open the packed wooden box, take out 《the users manual 》 from the documents bucket, according to the enclosed packing list in the 《the users manual 》, check the machine components & the accessories . Wipe and clean the antirust oil and the dust.

[Caution]: Do not dismantle the spacing pull strips at first, in order to prevent the cantilever rebounds, resulting in personnel's injury and machine damage.（see Figure 5）

3. Assembling and installation

3.1 take out of the x-ray machine frame, tube assembly, beam limiting device, etc from the wooden case
3.2 remove the wrapping paper and other protective equipment and clean x-ray machine oil, dust, etc.
3.3 insert the tube assembly（window down,nameplate face to cantilever）sleeve into the hole of cantilever, and tighten the two locking bolts。（see Figure 6）
3.4 ensure that tube assembly fixed with the cantilever safely, then remove the spacing trip that connect the cantilever and the baseframe（see Figure 5）
3.5 loose the locking screw of the beam limiting device, with the fixed screw sleeve on tube assembly window, tighten the locking screw（see Figure 7）
3.6 prepare seven core cable, manual switch line, power line

【Notice 】 before X-ray tube head is set up on the cantilever, the spacing pull strips are strictly prohibited to tore down(see figure 5), in order to prevent the rebound injury and machine damage.

Spacing lashing strip

Figure 5

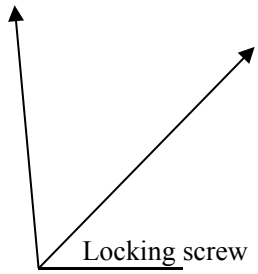


Figure 6

Figure 7

V. Testing, Adjustment & Training

Controller and tube assembly are two main electrical components of the machine. Whether they work properly decide the machine's electrical performance and quality. Although strict debugging and testing before leave factory, in consideration of user area's power supply, installation quality and transit may be influenced by the vibration effect, be sure to test, adjust, train the machine according to requirements and steps in the operational manual by recognized professionals before use the machine, to ensure the correct and safe operation of x-ray machine. Please take reference to x-ray machine electrical schematic diagram.

1. Adjustment with zero load

1.1 Connect the manual switch line, beam limiter power line, seven core cable in the controller, tighten the plug bolt. Note: short-circuit the ⑥ and ⑦ jacks of seven core cable plug by wire(attachment).
1.2 Insert the power line plug into the user's power socket.
1.3 Connect a 300V AC voltage meter in ① and ③ jacks of seven core cable plug.(see figure 8）

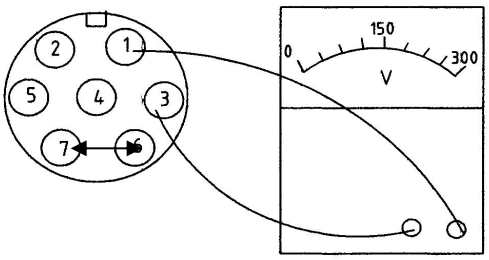


Figure 8

1.4 Press power（ ┃），the power supply switch on, power indicator（the green）light，load prepare indicator (the green) not light , there should be voltage indication of the voltage meter when machine preheat. Intermittent "beep" sounds and the alarm indicator（the red）lights.
1.5 Regulate power supply selection button（V），make the pointer of voltage/kV meter on controller point to 215V～220V."Beep" sound inside the controller will terminate automatically after maintenance of about 10～20s，（red）lamp is extinguished. This indicates that the selection of power supply voltage

can meet x-ray machine work requirements and exposure & photography can be taken. **When "beep" sound is not terminated, it proves improper selection of power voltage and the machine is in automatic protection condition, then can't control exposure photography.** （ take reference to prevention of under-voltage and over-voltage exposure protection circuit description.

1.6 Turn "mA" option knob to"30","50","70" mA respectively, ①、③ lead on-line electric voltmeter displays about 220V. When regulating power supply one interval leftwards or rightwards, ①、③lead on-line electric voltmeter index number should be change.

1.7 Remove electric voltmeter from socket ①、③ of 7 core cable plug to socket ①、② (High voltage transformer)

1.8 Regulate "kV" knob to "80 kV"; turn time（s）selection button，select 2.0s.

1.9 Regulate "mA"button to（30）、（50）mA, load prepare indicator(the green) lights, press manual switch, load prepare indicator(the green) extinguish, output indicator(the yellow) lights with continuous "beep" sounds. There should be indication voltmeter connected with ①、② and the value should confirm to Diagram 1. "Beep" sound stops, release the manual switch,output indicator (the yellow) extinguish and the circuits enter into interval loading break timing.

1.10 Regulate "mA"button to 70mA,kV to 60Kv,time to 1.0s。

1.11 Select 70mA, press s decrease button and select time to 1.0S and exposure by manual switch. There should be indication voltmeter connected with ①、② and the value should confirm to Diagram 2.

Diagram 2

V / mA / kV	30	50	70
80	190	194	/
60	146	150	205

1.12 X-ray machine is equipped with remote control photography device, remote control emitter exposure photography distance is about 6m. Press the button of remote control emitter, x-ray exposure photography can be taken（it can replace manual control exposure）

Note 1: This machine is set with 20 gears for s, 0.063～5.0s. Press once to display a value, increasing the keys from 0.063 ~ 5.0s, reducing the key function is the opposite.

Note 2: When take above test for photography, yellow lamp on the panel will light. After photography,the yellow lamp extinguishes, and circuit enter into interval loading break timin g for 30 seconds. After 30 seconds, the loading prepare lamp(the green) lights and photography into next round of operation.

Note 3：Selcet kV switch to "0"or "00", press the manual switch, three is no output for both manual switch and remote control switch.

【Warning】Once press the manual switch or remote control emitter button, press any other buttons or keys is forbidden in the middle-way.

2. Mis-operation experiment

2.1 X-ray machine designs three parameters of interlocking device（kV）、（mA）、（s）and mis-operation

warning. If select exceed maximum rated capacity, the red warning lamp will light and green loading lamp extinguish, manual switch and remote control switch will be locked automatically and exposure photography can't be took. More than max rated capacity can be chose purposely when testing, observe whether the red warning lamp lights. When press manual switch and remote control switch, there should be no sound of the relay closing in the controller & the yellow output lamp on the panel should not light.

2.2 X-ray machine is designed with tube assembly temperature control protection circuit. In normal working condition, if external shell of tube assembly more than 55°, temperature control circuit will lock the manual control switch and remote control switch automatically, x-ray exposure photography can't be took. Cable can be took away from the tube assembly purposely when testing, then alarm indicator (the red) lamp on controller lights, ready for loading (the green) extinguishes, the output indicator (the yellow) should be not bright when press the manual switch and the remote control switch.

3. About the protection circuit avoiding excessive voltage exposing and insufficient voltage exposing

To prevent over-voltage exposure(kV value too high)and under-voltage exposure（kV deficiency），X-ray machine is designed with protection circuit and power sully detection circuit. When supply voltage is less than 190V or more than 235V, the controller will emit "beep" alarm sound and x-ray exposure photography will be cut off automatically. Then neither manual switch nor remote control switch can make x-ray exposure photography.

When test, may regulate voltage selection button purposely,make the voltage value exceeds 190V ~ 230V rang, then you can hear intermittent "beep" sound and photography can be took. Exposure and photography can only be took when regulate the voltage button to be 215～225V range and beep sound terminate automatically after 10～20s.

The power supply voltage range is 180V~250V. X-ray machine can't work normally beyond of this range, requiring another stabilized voltage supply of AC250V and capacity no less than 5kVA to achieve required voltage range and make the machine work properly. Therefore the voltage protection device can prevent too high and kV insufficient exposure photography caused by machine's own factors(such as voltage selection error, indicating value error), can also prevent affection to x-ray machine when user power supply suddenly have larger fluctuations, such as high power electric device that in the same power supply with x-ay machine suddenly turn on or turn off.

When x-ray machine use high kV value of 70mA or 50mA, if power supply can't input more than 24A current into x-ray machine in short time and voltage of power supply decrease greater than 20V, when exposure instantly or after exposure finished, may cause x-ray machine sampling and detection of voltage once more. Then protection circuit may also work, which is normal phenomenon Once this happened, it indicates that user's power is too small or power line from power supply to x-ray machine is too long, the source resistance is too large(more than 0.8Ω), which caused x-ray machine can't use its maximum output power. If you need to use, can choose small mA value （ 30mA ） and longer time exposure photography conditions to achieve the technician anticipatory kV value and mAs value.

4. Training of the machine

【Caution】There is x-ray radiation output during following process of x-ray machine training and adjustment. Please close the window of beam limiting device and make proper body protection. Pregnant woman and those who can be pregnant can't attend the training & adjustment, can't use x-ray machine.

4.1 After finishing the zero load test and normal, training need to be taken for new x-ray machine and re-use x-ray machine after long time more than 3 months).

4.2 cut off the powder, turn off all the switches or turn to the min position,dismantle the voltage meter and short circuit wire that connected with tube assembly cable,insert the plug into their holes within the x-ray tube assembly and tighten the plug socket bolts.

4.3 the machine powered on, regulate the voltage knob to the voltmeter indication between 215V～,select 45kV, 0.5s.

4.4 select 30mA, preheat more than 3 minutes,load prepare indicator (the green)lights on， take exposure photography by manual switch, the controller issues "beep" sound when normal working, the output indicator(the yellow) on the control panel light on.

4.5 After finishing the exposure photography, regulate kV knob to 50kV, with interval time3minutes, the loading prepare indicator (the green) light on, take exposure photography by manual switch.

4.6 Increase kV value step by step, with interval more than 3 minutes, take manual switch exposure photography, until increase kV to 90kV。

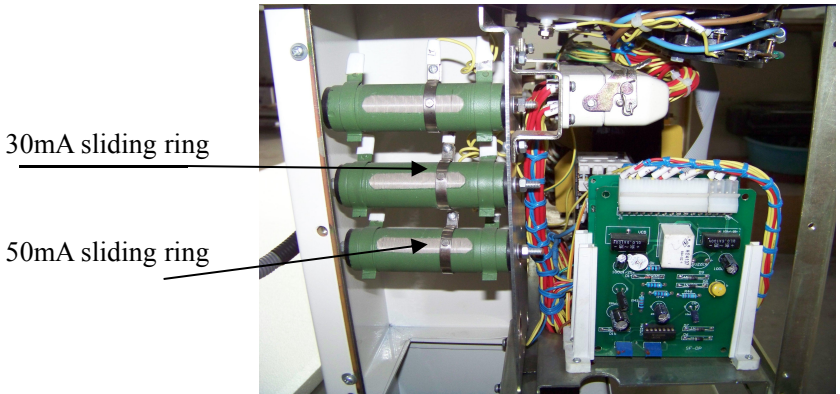
4.7 When select less than 70kV, interval exposure can be taken twice at each grade, when select more than 70kV, exposure can be taken once at each grade to train the x-ray tube.

【Caution】According to x-ray tube's characteristics, there must be certain interval time between exposure and next exposure. Although the circuit has set up interval loading time of rest, to prevent x-ray tube and tube assembly overheating, recommended intervals of time are as follows: exposure time＜1 second, interval time＞3 minutes; exposure time＞1 second, interval time＞5 minutes.

4.8 select 30mA、50mA、70mA respectively, select 1.0s、 "65"kV, exposure one time or two time, observe mA indicated value.

4.9 when indicated value of 30mA、50mA、70mA is insufficient or too big（15％）please adjust sliding ring on the variable resistance in the controller (see Figure 14)

4.10 Several remote control exposure can be taken in the training process to check the remote control device's performance. X-ray machine after training normally can be for photography use.



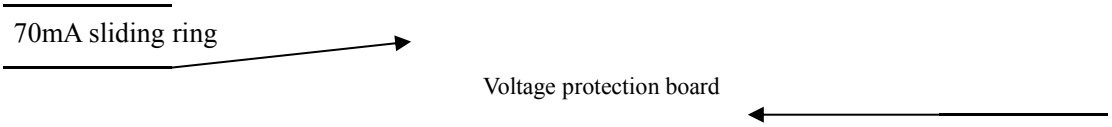


Figure 14

5. About the remotely controlled exposing and manually controlled exposing

5.1 Check and confirm that the battery in the remote control emitter has been connected well.

5.2 Before take the photograph, preset all the exposure photograph conditions on the controller（Power supply V, kV, mA, s, beam limiting device light field, focus-film distance, size of stamp of x-ray film, focus position of patient, etc.

5.3 To reduce suffer from x-ray stray radiation, medical and technical staff of operation should hand hold the manual switch, at the distance of more than 2m from the tube assembly, press the button on the manual switch; or

5.4 hand hold the manual switch, at the distance of 2-6 m from the tube assembly, press the buttons on the remote control transmitter, which can perform exposure radiography.

5.5 When the x-ray machine in the lead room and the operator is outside the lead room, may not exposure by remote control operation. After some time use, the control distance of the controller will be reduces, which is normal phenomenon, should be promptly replace the battery in the controller by same type and same specification battery, so as to ensure the reliability of the operation of remote control transmitter.

5.6 Once press the button on the manual switch or on the remote control emitter, do not shake or loose, to avoid mis-operation or insufficient exposure time caused and affect the photography quality.

【Caution】Once press the button on the manual switch or on the remote control emitter, do not shake or loose, should let the controller control exposure time automatically and loose hold till the output indicator extinguishes and beep sound finishes to avoid insufficient exposure photography. To take the photography safely, reliably and accurately, when take photography to critically ill patients, wireless remote control transmitter operation is not recommended.

VI. Operation of the Machine

1. Electric appliance parts

1.1 Firstly, check and make sure all knobs and keys on the control panel of X-ray instrument are closed or in minimum position.

1.2 Insert the plug into user's sockets and powder on.

1.3 Press down button （ | ） of power supply, power supply indicator (green) light on and loading prepare indicator (green) not light , machine start to preheat and timing ,voltage volt meter should indicate, intermittent sound “BUZZ” comes from the controller, ready indicator (green) is out, alarming indicator light (red) is ON

1.4 Turn voltage selecting knob of power supply (V), make pointer of the voltmeter point to c215～220V. Sound of BUZZ will stop automatically 10～20 seconds later, the alarming indicator (red) is OFF and the loading prepare indicator (green) is ON, select a mA gear, preheat tube assembly for moren than 3 minutes.

1.5 According to conditions of the photographed position, put proper size X-ray film in place, preset kV, mA, s, focus-film distance. Then according to the selected width of x-ray film, select horizontal and longitudinal dimension of light field on the beam limiter, adjust and fix the angel of light field and control scope of radiation field.

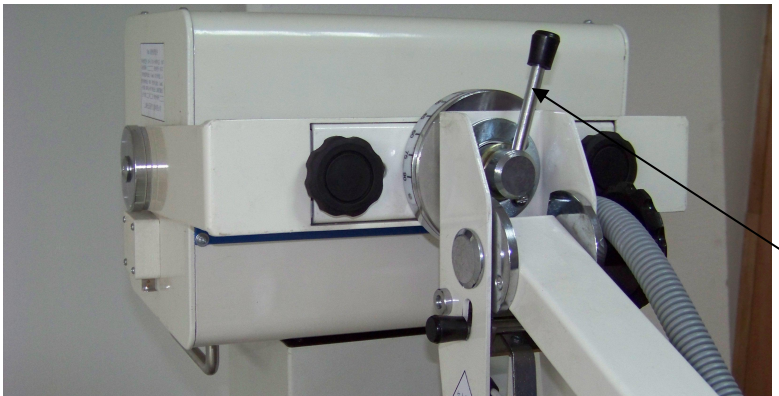
1.6 Press down button of manual switch or remote controller, X-ray instrument starts to carry out the photography, meanwhile, sound of BUZZ comes from the controller and output indicator light (yellow) is ON. The mA meter on the controller displays current value when photographing.

1.7 After finish photography, turn off all the knobs and keys on the control panel or turn to the min position.

2. Mechanical part

2.1 As required, X-ray Tube Assembly can be rotated around axis of cantilever from the left and right side or rotated around axis of holder of X-ray Tube Assembly outwardly. Angle of rotation should be above 90°. After locating, lock X-ray Tube Assembly with specific rotation braking spanner.

2.2 Three safe position locking grades are set in vertical travel from upper limit, locking can be released by pressing down Position Handle. When X-ray Tube Assembly is locked while moving downward, X-ray Tube Assembly and cantilever must be lifted lightly when press down Position Handle for unlocking. After unlocked, let go of the Position Handle and move X-ray Tube Assembly to required position. If X-ray Tube Assembly and cantilever move upward, such function is disabled, do not need to unlock.（please refer to Figure 1）



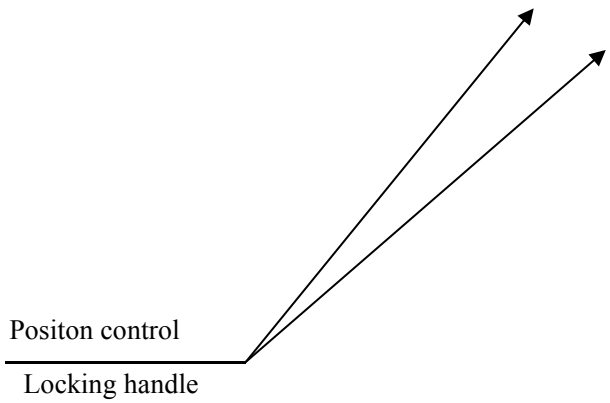


Figure 14

2.3 If encounter obstacles like threshold while moving, hold on hand pushrod meanwhile step on foot brake pedal so that two small front wheels are tilted, move forward and lift rear wheels to stride over obstacle.

2.4 As required, X-ray instrument can be fixed by pedal brake.

3. Electric beam limiting device（see Figure 4）

3.1 Auto-reset switch in left side is used for controlling the transversal size of light field.

3.2 Auto-reset switch in right side is used for controlling the longitudinal size of light field. 3.3 The electric beam limiting device will send out visible light field by pressing down light source button each time. It will go out automatically after last for 8-12s.

3.4 When X-ray instrument is made, visual light field of beam limiter has been adjusted to overlap with X-ray radiation field.

3.5 When photographing, just align center of "┼" line in light field of beam limiter to center of lesion of patient, regulate angle of beam limiter, fasten locking screw of beam limiter to fix it. Then select proper width of light field by pressing down left and right auto-resetting switch.

（Recommendation: light field edge than cassette large 1.5 cm）

3.6 Limit rod of focal spot and skin is used for limiting distance between tube focus and skin of patient. Please do not pull it or use it for moving and positioning of x-ray tube.

3.7 The minimum distance from focus of x ray tube to skin of patient is 20cm.

3.8 Rotate angle of x-ray tube assembly and electric beam limiter (please refer to Appendix6

【Note】Before photography , the instrument must be selected reasonable gear and preheated for 2~3 minutes after normally electrified so to ensure the accuracy of mA, improve clarity of image and protect x-ray tube.

VII. Quality Analysis of Photography

1. Instance for operation steps of photography（Normotopia part of Lumbar for medium figure's patient）（just for reference）

1.1 Move the X-ray instrument to sick bed, align the window of electric beam limiter with the Normotopia part of Lumbar in the same vertical line; align window in beam limiter of X-ray Tube to rectified position of vertebra in same vertical line.

1.2 Insert the power cord of x-ray instrument into the power socket of user, switch on the power.

1.3 Press down ON（┃）of power supply, power indicator (green) in the controller is ON, ,. Ready light (green) is out, machine starts to preheat and timing, voltmeter should indicate.

1.4 intermittent sound “BUZZ” comes from the controller, alarming indicator(red) is ON .

1.5 Turn the voltage selecting knob of power supply (V) and make the pointer of Voltmeter in the controller point to 215～220V. Sound “ BUZZ” stop automatically after 10~20s, alarming indicator (red) is out and loading prepare Light (green) is ON.

1.6 select50mA, leave the tube assembly preheated for more than 3 minutes.

1.7 Turn KV knob to 80KV.

1.8 Turn time selection knob(S) to 1.6s.

1.9 In darkroom, put a piece of x-ray film into a film cassette【10"×12"（254 ㎝×305 ㎝）x-ray film is suitable for Normotopia part of Lumbar】

1.10 Set the distance between focus x-ray tube assembly and film cassette is 100cm

1.11 Press down switch on button of light field in beam limiter, turn and adjust angle of beam limiter, make center “┼” of light filed align with the center of normotopia part of lumbar. Adjust radiation width of light field by using left and right auto-resetting switch in beam limiter and coincide it with film cassette then locked

1.12 Pull the manual switch (or the remote control switch) to 2m away from the machine,press and hold the button on the manual switch (or the remote control switch), output indicator(the yellow) is ON, don’t release the button until “beep”sound in the controller finished. Photography ends.

1.13 Turn off all the knobs and keys on the controller panel or make them at min position.

1.14 Press turn off key“**O**”，move the cable and coin the cable on the frame

1.15 Take out film cassette from lumbar of patient and process the film in darkroom.

2. Factors that affecting quality of photography

2.1 Whether the power supply meets using requirements of instrument, instant power voltage drop of exposure shouldn’t be greater than 20V, for example.

2.2 Selecting value of KV and .mA•s for photography part

2.3 Distance between tube focus and image receiving surface of nidus position(SID)；

2.4 Quality and photosensitive speed of x ray film.

2.5 Speed of intensifying screen inside the film cassette

2.6 Quality and speed of develop and fix solution.

Key factors to get a piece of film in good definition and layering image: first, using conditions must comply with the using requirements of instrument. Second, the operators must have skilled

radiography skills and application ability to set photography conditions according to actual situations while photographing. Especially, when power supply of user can't reach using requirement of instrument, for instance, power supply drop is greater than 20V while using mA value of 50mA or 700mA, at this moment, operators can use 30mA to increase photography exposure time so to sure the needed mAs value of photography and to reduce the demand for power capacity of users.

The table of photography conditions offered in the User Manual is acquired while user's power supply comply with using requirements of instrument, develop and fix solution in normal condition and by using ordinary intensifying screen. The table is just for reference, operators should select correct photography conditions according to actual situations while photographing.

3. Photography conditions reference table（see appendix 1）

Ⅷ. Adjustment of the Machine

1. Debugging and adjustment

Note: 1 All of the following operations require accredited professionals to operate or likely to cause damage to the machine.

Note: 2 All of the following operations are under electrified condition and controller circuit expose outside.

1.1 Adjustment of mA value

When photography, if reader of certain mA grade of ammeter is too low or large（＞15％）, corresponding variable resistor inside controller can be adjusted.Operation as follows:Dismantle right door of controller, turn screw of sliding ring in regulated variable resistor & move to regulate position of sliding ring so that mA value of the grade can be changed.mA value increased while move towards the right,mA value decreased while move towards the left.Then tighten screw of sliding ring&close front door.

1.2 Adjustment of voltage protection board

Owing to various reasons, when machine starts, the Buzzer keep on ringing when the voltage is 220V and alarming light (red) is ON, instrument can't work normally after using for a period. Regulating the variable resistor on the voltage protection board inside controller, regulation method as below: dismantle rightside door of controller, then a green color board comes into view. Two blue flat potentiometers on bottom left of the board, code number of Rheostat: R44、 R43（please refer to illustrations 1、2 of circuit board). R43 potentiometer is used for limiting voltage of high position (high position means buzzer keep ringing when voltage over 225V), R44 potentiometer is used for limiting voltage of low position (low position means buzzer keep ringing when voltage over 200V). Specific steps: 1. Unscrew the cable plug of x-ray tube assembly before adjustment, shorting connect plug ⑥ and hole ⑦ by a shorted wire 2. Adjust the voltmeter, let the pointer aim at▲ 3.Adjust the potentiometer from low position (R44) and remember the adjusted places, rotate right one circle first then to see whether the buzzer is still ring after

20s. If it still rings, rotate right one circle again.After rotating right for 3 circles,if the buzzer no sound, it is ok; if buzzer keeps ringing, you must rotate back 3 circles, return it to the originally place. 4. Adjust R43, same to step 3 but rotate left. Please contact our company if problem still exists after above adjustment.

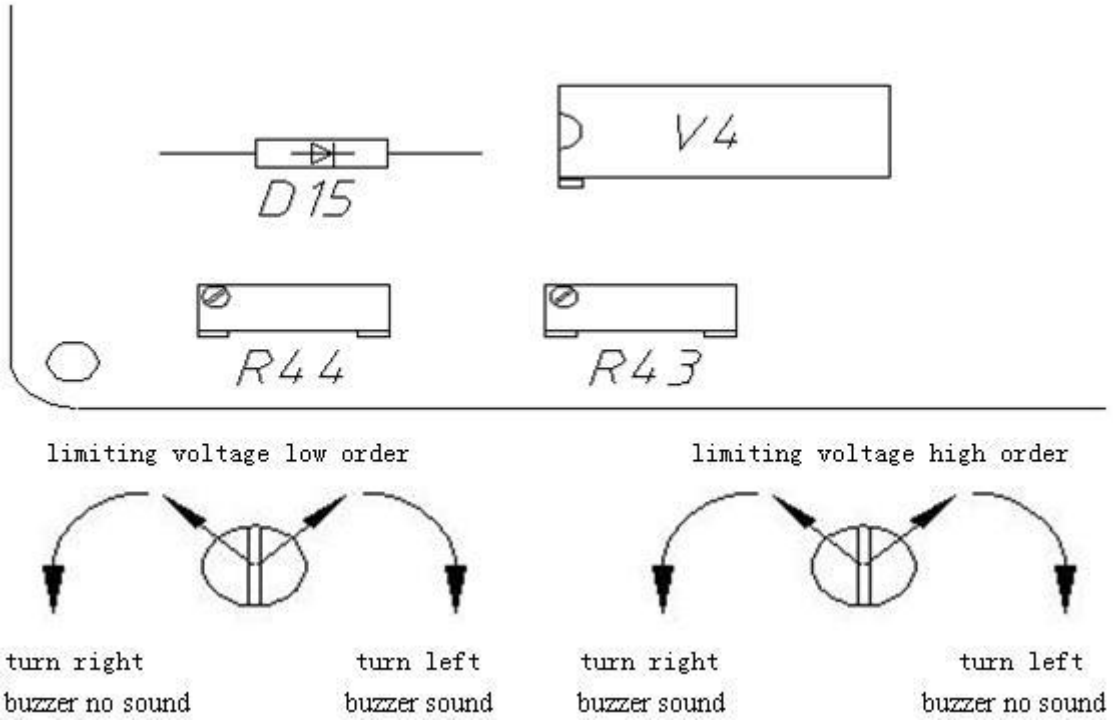


Illustration of circuit board

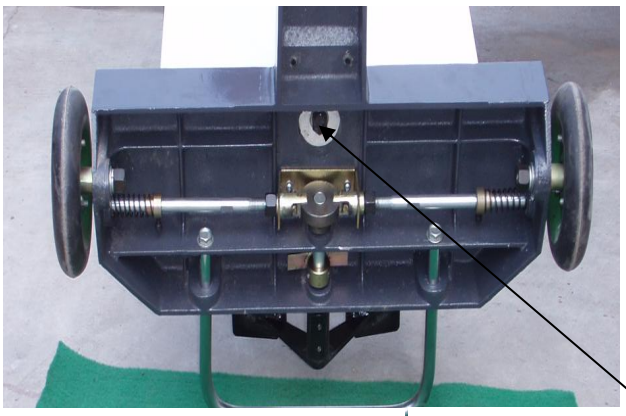
Warning:

1. After calibration, turn off the machine, dismantle the guide wire connected on the test meter and test point of socket, the original short wires wtill connected to the outlet 3-4 holes.(Note: This short wires must contact reliable, otherwise easily cause damage of the tube assembly)

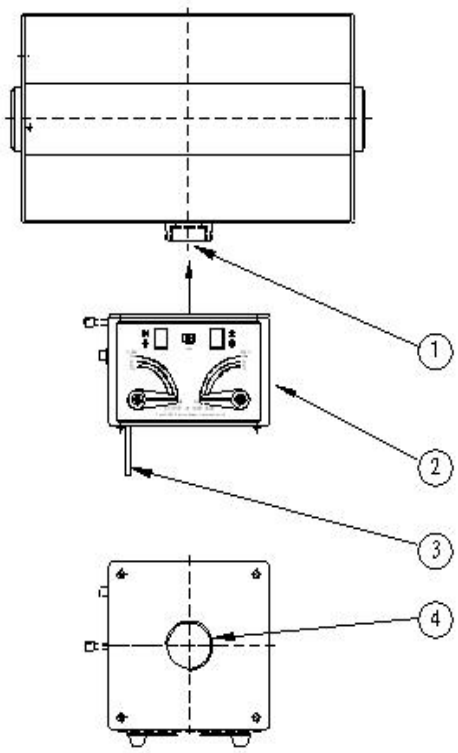
2. All cables should be restored to their original, then turn on the machine and do the normal program operation.

2. Balance adjustment of cantilever of x-ray tube assembly

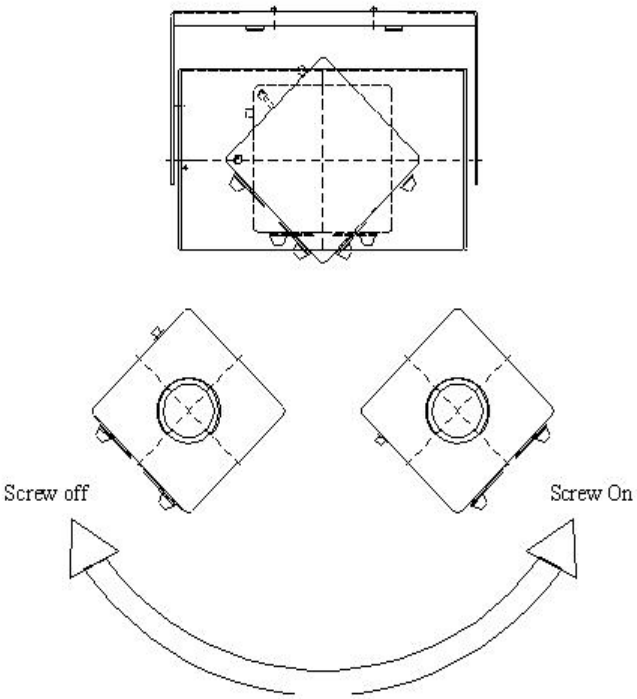
Spring is used for balancing the x-ray tube assembly. Spring suffers max force when x-ray tube assembly is in lowest position, it's easy for the machine to be fatigue. Therefore, when do not use the machine, please let the x-ray tube assembly stay in highest position thus can reduce force of spring and make sure the stability of balance so to extend the lifetime of instrument. If sinking phenomenon occurs, tilt x-ray instrument backwardly and adjust M12 screw in bottom of pillar, rotate 2~3 circles clockwise with a socket wrench. (Please refer to figure 23)



Schematic Diagram 1



Schematic Diagram 2



IX. Attentions and Maintenance

1. Attentions

X-ray instrument is a kind of rather precise equipment for medical diagnosis. Therefore, operator should not only be familiar with performance, structure and operation method of X-ray instrument, but also execute daily maintenance and care for full use of X-ray instrument, longer useable life and safety of equipment and life. Following items should be noticed:

1.1 X-ray instrument should be placed in dry and tidy environment with good ventilation, flat floor, avoid high temperature, humidity, vibration and excessive exposure of the sun, etc.

X-ray instrument is common medical electrical apparatus, no-liquid immersed inside the machine.

1.2 In operation, always pay attention to condition of power supply. If abnormal phenomena such as abrupt fluctuation occur, please stop using immediately.

1.3 Using switches, knobs in controller carefully. Don't operate them with excessive force in case of dislocation and damage and leading to bad condition of contact.

1.4 Do not pull the **Focus-skin Distance Limit Rod** on the collimator or use it to move and lock the x-ray tube assembly.

1.5 When moving the instrument or rotating the x-ray tube assembly, handle with close care, avoid collision. The shape dimension of this instrument, please refer to Appendix 4.

1.6 After using or do not use for a long period, keep the x-ray tube assembly at the highest position to avoid the balance spring in stress state so as to extend life of the spring.

1.7 When photography in large capacity continuously, the instrument must be used properly according to the allowable heat capacity and interval time. Liner surface temperature of x-ray tube assembly should not exceed 55℃.

1.8 Before photography, please take proper measurement to protect against stray radiation of X-ray Protective garment and cap should be worn in exposure photography. Please operate X-ray instrument with manual switch or remote switch more than 2m distance away from X-ray instrument and control output of X-ray photography.

1.9 When photography, patient should be protected properly. And keep unrelated people away from the instrument in case of unnecessary radiation and stray radiation to unrelated persons especially children and pregnant woman.

1.10 When taking photography for patients, please select big focus-skin distance as much as possible if medical diagnosis won't be affected and clear photography image can be acquired, so to make sure patients absorb the lowest and reasonable dosage of x-ray.

1.11 Please wipe away dust in surface of instrument regularly. Check and make sure all fasteners lock tightly, cantilever and x-ray tube assembly not sinking, tube assembly and cantilever connect firmly in case of occurrence of accidents.

1.12 Once cantilever or tube assembly are out of control and sinking, users must contact with distributors or supplier for repairing.

1.13 In warranty period, in no case should the user dismantle the instrument or replace parts or repair it without approval of the company. Such practice may probably aggravate failure of X-ray instrument and invalidity of warranty and thus lead to loss.

1.14 When obsolete this instrument or some parts of it, some parts may cause dangerous. Please pay special attention to it.

a) Inside the tube assembly, there are insulating dielectric and lead protection components. When obsoleted, must comply with current standards and regulations.

b) Inside the electric beam limiter, there is a lead plate which used for covering x-ray when limiter not use. When obsoleted, must comply with current standards and regulations.

c) Inside the electrolytic capacitor, there is insulating dielectric. When obsoleted, must comply with current standards and regulations.

Notice：All parts that need to be obsoleted and dealt must be comply with the local law at that time.

1.15 Around the equipment, there should not have electromagnetic interference so as not to interfere with it, and affect normal use.

2. Maintenance

2.1 If failure occurs in X-ray instrument, before you connect with distributor for repairing, please check the instrument carefully and get knowledge of failure and phenomena of X-ray instrument, then connect and negotiate with distributor or servicing section of the company.

2.2 If abnormal phenomena occur with the instrument while using, please stop to check immediately in case of its working with failure and thus aggravate scope of failure and lead to greater loss.

2.3 X-ray instrument should be operated and checked by well-trained qualified professionals. In order to prevent accidents, it should not be checked and repaired while power supply is ON.

2.4 If fuse is broken due to accidental failure, just replace it with tool. If it is broken continuously, the instrument should be stopped for checking.

Fuse specification: 6G or 6C 125V /250V φ6×32mm glass tube core or ceramic tube core

2.5 Always check connection part of cantilever and X-ray tube assembly, ensure them safely and firmly connected.

2.6 Please refer to Chapter 11 for Common failure, Cause and Troubleshooting.

2.7 Daily checking for x-ray instrument are as following:

2.7.1 Once a day

a）Checking signals of circuit, display and operation of LED；

b）Checking opertion of fixed braking or positioning；

c）Checking the intactness of warning signs and dangerous labels.

2.7.2 Once a week

a) Checking to see if any oil leakage occurs in the x-ray tube assembly；

b) While the instrument is sending out x-ray, check and see if any abnormal noise occurs inside x-ray tube assembly.

2.7.3 Once every half month

a) Checking working conditions of the whole grounding circuit；

b) Checking value of power supply voltage；

c) Checking sustained voltage value that generated inside the system；

d) Checking the stability and comprehensive state of the circuit board；

e) Check to see if centers of tube assembly and beam limiter coincided.

Notice: The checking of once a week and once every half month should be done by professionals.

2.8 Cleaning and disinfection: do not use alcohol, corrosive, cleanser or solvent that contains high abrasives to clean equipment's surface. It must abide by related disinfection and protection methods when doing the disinfection in case of causing accidents.

Notice:Following preventive measures need to be done while cleaning and disinfecting for instrument:

a) Switch off the instrument and pull the power cord.

b) No-liquid immersed inside the machine in case of short-circuit or corrosion of electronic components and electromechanical parts.

Ⅹ. Principle and Main Components of X-ray Machine

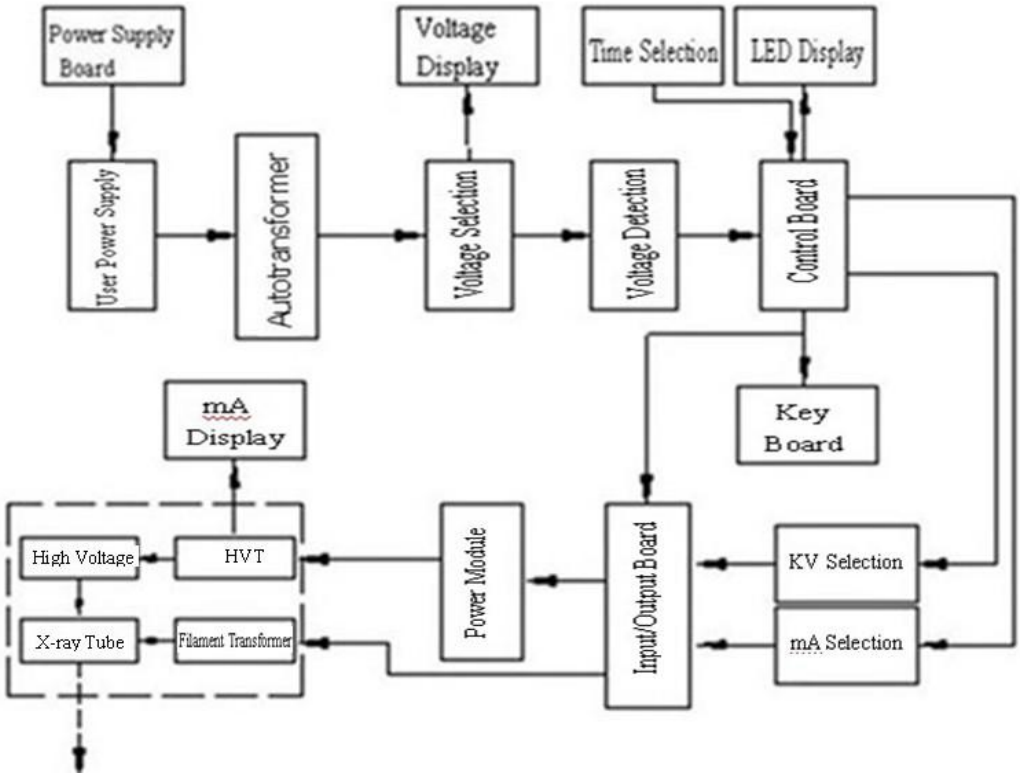
1. Block Diagram of X-ray Machine（Please refer to block diagram）

2. Electrical Schematic Diagram of X-ray Machine（Please refer to electrical schematic diagram）

3. Main Electrical Components of X-ray Machine（Please refer to list of main electrical components）

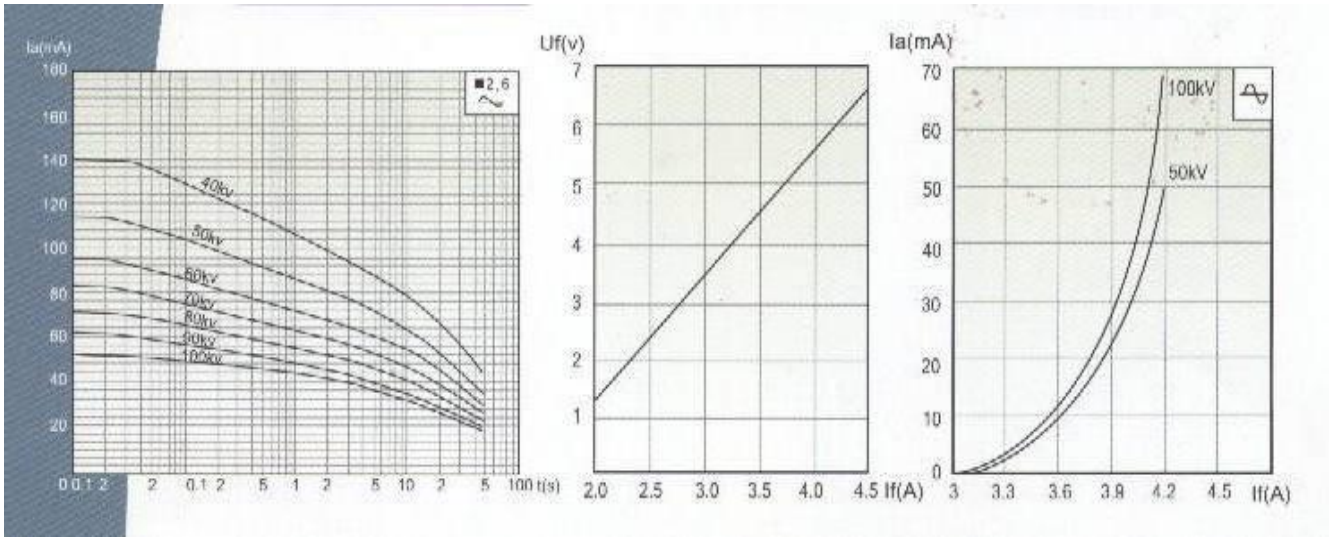
4. Characteristics of X-ray Tube（Please refer to characteristic curve of X-ray tube）

Block Diagram of X-ray instrument



XD3-3.5/100 Characteristics of X-ray Tube

Load Features Curve　　Filament Features Curve　　Filament Emission Features Curve



XI. Common Failure, Causes and Troubleshooting

Failure Phenomena	Causes	Elimination Method
When switch on the power, green indicator doesn't light, no indication of display screen	Poor contact of user's power supply; Poor contact of power cord of the controller	Check users' power supply, socket; Insert the power cord into users' power socket correctly.
Red alarm lamp lights	1. Choose a wrong data 2. Temperature control overload of the x-ray tube assembly, line fall off	1) Setting according to 《Max. Rating Capacity Table》, choose voltage in right range; 2) Check shell temperature of x-ray tube assembly, tighten the plug of cable.
No indication of mA while photography	Poor contact between controller and connecting line of x-ray tube assembly	Insert the connecting line of x-ray tube assembly correctly and tighten it.
Difficult to push the whole machine	Wheel on pedestal is blocked	Lift brake pedal of wheel and loosen
Fuse of the instrument is broken while exposure	X-ray tube assembly broke down	1. Ask qualified department for overhaul 2. Send it back to the company for overhaul.
Sinking of x-ray tube assembly while positioning	Deviation of spring	Please refer to Technical Specification User Manual 8.2 (please refer to figure 11)
X-ray tube assembly can't be lifted while moving it to lowest position	Being locked of x-ray tube assembly	Move the locking handle downwardly while lifting the x-ray tube assembly slightly to any position.(please refer to figure 11)
Serious misalignment between light field of beam limiter and radiation field of x-ray	Deviation of reflector inside the beam limiter	Please refer to User Manual **8.3.1** (please refer to figure 4)
Connection between beam limiter and x-ray tube assembly loose or can't be rotated	Locking handle of beam limiter is too loose or too tight	Tighten the locking screw while beam limiter need to be fixed; Tighten the locking screw while beam limiter need to be rotated
light source of beam limiter does not shine	Damage to Tungsten Halogen Lamp of beam limiter	Please refer to User Manual **8.3.3** (please refer to figure 4)
Yellow lamp on manual switch lights while photography, no indication of mA meter	Take down aluminum filtration piece on the window of x-ray tube assembly, push or choose a "photography mA selection" button, bubble on the window of	1. Ask qualified department for overhaul 2. Send it back to the company for overhaul.

	x-ray tube doesn't light, measure and find voltage between 7-core socket pin 1 and pin 3 is about 200V	
Yellow lamp on manual switch lights while photography, there is indication on mA meter but no image.	Take down aluminum filtration piece on the window of x-ray tube assembly, push or choose a "photography mA selection" button, can observe focus of x-ray tube shift.	1. Ask qualified department for overhaul 2. Send it back to the company for overhaul.

Ⅻ. Environment Condition for Transportation and Storage

1. Transportation

1.1 Transportation of X-ray instrument

When the instrument is inside the package or X-ray Tube Assembly in low limit and locked, the whole instrument can be transported in flat road as long as it is fixed reliably.

1.2 Transportation of X-ray Tube Assembly

Anode terminal (the part with socket) of x-ray tube assembly should be put downwardly and covered with plastic bag, then put it into hard corrugated carton or wood box, covered with 2cm thick of foam plastic. After packed well, the instrument can be transported in flat road as long as it is fixed reliably.

2. Storage

2.1 Storage of x-ray instrument

If external package is not damaged, X-ray instrument can be kept in following environment for 3 months：

a) Ambient temperature：－40℃～70℃

b) Relative humidity：≤80％

c) Atmospheric pressure：500hPa～1060hPa

d) In room with good ventilation and no erosive gas

2.2 Storage of X-ray Tube Assembly

Under same packing as 12.1.2, X-ray Tube Assembly can be kept in following environment for 3 months：

a) Ambient temperature：－40℃～70℃

b) Relative humidity：≤80％

c) Atmospheric pressure：500hPa～1060hPa

d) In room with good ventilation and no erosive gas

XIII. Special Instructions of X-ray Machine

After reading and getting knowledge of Technical Specifications User Manual of the instrument, he should operate it correctly according to illustrations, symbols and regulations in Technical Specifications. Besides maintenance and care of the instrument, user must grasp following specific requirements, performance and technical parameters：

1．General Requirements：Please refer to illustrations, symbols in Technical Specifications User Manual and Instrument.

2．Filtration of X-ray Tube Assembly：2mmAl filter is fixed in window of X-ray Tube Assembly of the instrument, user cannot dismantle it or demolish it at will in normal use.（Please refer to II 2.8 in Technical Specifications User Manual for filtrations of X-ray tube Assembly）

3. **Filtration of X-ray Source Assembly：**Beam limiter of the instrument has additional effect of filtration. When instrument is used, X-ray Tube Assembly should be loaded with beam limiter, total filtration of X-ray Source Assembly is 3.3mmAl.（Please refer to II 3.5 in Technical Specifications User Manual for filtration of beam limiter）.

4. Indication of Filter：Window of X-ray Tube Assembly is equipped with fixed aluminum plate with sign of 2.8mmAl on it.

5. Method for Limiting Beam of X-ray Instrument：Beam limiter is used to limit X-ray beam of the instrument.（For performance and usage of beam limiter, please refer to II 3, III 4, VI 3 in Technical Specifications User Manual）

6. Nameplate Recognition on this instrument: Please refer to Appendix 1

7．Requirements to User Manual： Performance and usage are introduced in detail in this Technical Specification User Manual. (Please refer to II 3, III 4, VI 3)

8. The Accuracy of Marks and Actual Indications：The difference between distance on beam limiter (SID) and size of light field and size of image should be less than the distance 1.8% from image to focus of x-ray tube

9. Position of Reference Axis：Cross line like "＋" is marked in beam limiter, center of projection line of "＋" is the position of reference axis. For related reference axis of x-ray tube, please refer to Appendix 2.

10. **Distance between focus of x-ray tube assembly and image receiving surface：**The max. distance between focus of x-ray tube assembly and image receiving surface is 100cm, the min. distance is 20cm.

11. Corresponding relation between x-ray field and image receiving surface：The projection of light field of beam limiter always coincide with the image receiving surface.

12. Reference Loading Conditions: 90kV 1.5mA.

13. Explanation to Documents that along with the machine： Please refer to IX .1 in Technical Specification User Manual.

14. Requirements：Please refer to Technical Specification User Manual IX .2

15. Protection that rely on Distance：The line length of manual switch is 2.5m, it can help to protect

operator from x ray radiation effectively. (Please refer to IX 1.8 in Technical Specification User Manual.

16. **Control of Radiation Protection Area：** The control of radiation protection area is done by the length of manual switch line. Operators must control the x-ray output at 2m away from the instrument. (Please refer to IX 1.8 in Technical Specification User Manual.)

17. Prescribed Effective Occupying Area：

Effective occupying area for controlling output of X-ray is outside of a round region centered on X-ray Tube Assembly with a diameter of 2m. Please refer to Appendix 3.

18. **Handle and Controller：** Manual switch or remote control switch can be used for controlling the x-ray output, operators should take photography at 2m away from the instrument. X-ray photography switch on/off button on the panel can only be used when repair the machine.

19. Tolerance between focus and reference axis is ±2.

20. Schematic diagram of QG70Z I tube assembly wiring： please refer to Appendix 5.

XIV. Packing List

X-ray instrument is packed in a big wood box. Parts are listed as following:

1. Cantilever, Pillar, Controller, Pedestal Assembly 1 piece
   Document box on the controller has following accessories:
   1.1 Manual switch and connecting wire 1 piece
   1.2 X-ray tube assembly, electric beam limiter /controller connecting cable 1 piece
   1.3 Accessories bag 1 piece
   Contains of bag: fuse 2 pieces
   Filter piece 1 piece
   Sliding Ring of Rheostat 2 pieces
   Shorted Wire 1 piece
2. X-ray tube assembly 1 piece
3. Electric beam limiter 1 piece
4. Documents along with the machine:
   4.1 User Manual 1 piece
   4.2 Qualification Certificate of Production 1 piece
   4.3 User Guarantee Card and Receipt 1 piece

Appendix 1 Reference table for photography conditions

Part	kVp	mA	s	Beam Filter	Distance (cm)
Chest (sitting)	70	70	0.16～0.20	/	180
Chest (sleeping)	70	70	0.12～0.16	/	100
Chest (children)	60	50	0.1	/	100
Head Front	90	50	1.0	+	100
Head Side	50	50	1.0	+	100
Shoulder Joint	60	50	0.2	/	100
Elbow Joint	55	50	0.16	/	100
Wrist	55	50	0.12	/	100

Metacarpus	50	30	0.12	/	100
Finger Phalange	45	30	0.12	/	100
Hipbone Joint	65	70	0.24～0.30	/	100
Knee Joint	55	50	0.16～0.20	/	100
Hough	50	50	0.16	/	70
Foot Front	50	50	0.12	/	100
Toe	45	30	0.12	/	100
Intraoperative Cholangiography	70	70	1.0	+	100
Intraoperative Neck-vertebra Anchoring	70	70	0.12～0.16	/	75～100
Paranasal Sinus(Water's)	90	50	1.0	+	70
Lumbra Front	80	50	1.6	+	100
Lumbar Side	90	30	4.0	+	100
Abdomen Front	80	40	1.5	+	800
Pelvis Front	80	40	2.0	+	1000
hip joint Front	80	40	1.5	+	800

Explanation: 1. Above reference table is under using ordinary slow speed intensifying screen.

2. “+” must be use fixed beam filter

Appendix 6a Main Components List

Serial No.	Code	Name	Specification	Qty	Remark
1	SSR	Solid state relay	SGDH6004 ZD3 60A-440V/AC	1	with radiator
2	SB1	Light touch button (boot)	B3F	1	
3	SB2	Light touch button (power off)	B3F	1	
4	SA1	Power Selection Switch	KZS-11W2D	1	
5	SA2	KV Selection Switch	KZS-11W2D	1	
6	SA8	Light Touch Button Time Selection Button [＋]	B3F	1	
7	SA9	Light Touch Button Time Selection Button [－]	B3F	1	
8	SA3	mA Selection Button	KZS-11W3D	1	
9	SA5	Manual Switch	LS-01（single file）	1	

10	YF	Remote Control Transmitter	JZ-2A	1	
11	YJ	Remoter Control Receiver	JZ-2A	1	
12	R1-R3	Variable Resistance	RX20T-50W-390Ω	3	
13	KM	Power Contactor	CJX2 0910 AC220V	1	
14	FU1，FU2	Fuse Holder	BLX-31	2	
15		Fuse Core	6C or 6G 250V Φ6×32	2	
16		Power Cord	Single-phase 3-core 250V 16A	1	
17	VC7	Silicon Stack	2CL-125KV/0．5A	4	
18	X	X-ray tube	XD3-3.5/100	1	
19	mA	DC Ammeter	69C17-A DC 0～100mA	1	
20	V	AC Voltmeter	69L17-AC 0～250V	1	
21	VC2	Bridge Type Ballast	QL 100V 1A	1	
22	B1	Autotransformer		1	Made by ourselves
23	B2	High-voltage Transformer		1	Made by ourselves
24	B3	Filament Transformer		1	Made by ourselves
25	SA10.SA11	Self-reset button(light field)	R62KKBTOB [black]	2	Beam Limiter
26	XK1～XK4	Micro switch	KW4-3Z-3	4	Beam Limiter
27	SA12	Button Switch	AA12-222[G]	1	Beam Limiter
28	K11	Relay	HG4123-012-2C	1	Beam Limiter
29	C10	Capacitance	CD11-220 uF/50V	1	Beam Limiter
30	C11	Capacitance	CBB22-0.1uf/63V	1	Beam Limiter
31	C9	Capacitance	CD11-100uf/50V	1	Beam Limiter
32	R50	Resistance	RJ- 1W 75KΩ	1	Beam Limiter
33	R51	Resistance	RJ-1/4W 22KΩ	1	Beam Limiter
34	R52	Resistance	RJ-1/4W 75KΩ	1	Beam Limiter
35	R53	Resistance	RJ-1/4W 100Ω	1	Beam Limiter
36	R54,R55	Resistance	RX21-4 200Ω	2	Beam Limiter
37	BG4	Voltage Regulator Block	7812	1	Beam Limiter

38	BG5	Manifold Block	NE555	1	Beam Limiter
39	D23,D24	Diode	IN4001	2	Beam Limiter
40	HL11	Light Source of Beam Limiter	AC24V 100W bromine tungsten lamp	1	Beam Limiter
41	VC6	Bridge Type Ballast	QL25B 50V 0.5A	1	Beam Limiter
42	M1,M2	micro motor	DL-40ZYC DC24V	2	Beam Limiter
43	V4	Manifold Block	LM324	1	Voltage Protection Board
44	V5	triode	3DK4B (blue)	1	Voltage Protection Board
45	HA1	Buzzer(Photography output)	YMD 12095 (FT10Ⅰ)	1	Voltage Protection Board
46	HA2	Buzzer(Voltage Protection)	YMD 12095 ((FT10Ⅱ)	1	Voltage Protection Board
47	D6～D9	Diode	IN4001	4	Voltage Protection Board
48	D14、D15	voltage stabilizing diode	2CW64 (18V～24V)	2	Voltage Protection Board
49	VC4、VC5	Bridge Type Ballast	QL25B- 50V /0.5A	2	Voltage Protection Board
50	C6	Capacitance	CD11－220μF/50V	1	Voltage Protection Board
51	C4、C9、	Capacitance	CD11－100μF/25V	2	Voltage Protection Board
52	C5	Capacitance	CD11－4.7μF/50V	1	Voltage Protection Board
53	C7	Capacitance	CD11－220μF/25V	1	Voltage Protection Board
54	C8	Capacitance	CD11－10μF/25V	1	Voltage Protection Board
55	K1	Relay	HG4137/024-2Z-1	1	Voltage Protection Board
56	R43,R44	Relay	3296-10KΩ	2	Voltage Protection Board
57	R40,R42	Resistance	RJ 1/2W 1KΩ	2	Voltage Protection Board
58	R46	Resistance	RJ 1/2W 3KΩ	1	Voltage Protection Board
59	R41，R45	Resistance	RJ 1/2W 10KΩ	2	Voltage Protection Board
60	C1,C4,C5,C7,C8 C9,C10,C11,C15 C16,C17,C18,C19	Capacitance	104	13	Control Panel
61	C2,C3,C6	electrolytic capacitor	1000Uf/25V	3	Control Panel

62	C12	electrolytic capacitor	10uF/16V	1	Control Panel
63	C13,C14	Capacitance	20pF	2	Control Panel
64	D1,D2,D3,D4,D7	Diode	1N4007	5	Control Panel
65	LS2	Buzzer	Buzzer	1	Control Panel
66	PR1	RN	4.7K	1	Control Panel
67	Q1,Q2,Q3,Q4,Q5,Q6,Q7	NPN Triode	8085	7	Control Panel
68	R1,R2,R3,R4,R28	Resistance	330Ω	5	Control Panel
69	R5,R6,R7,R20 R21,R22,R26,R30	Resistance	1K	4	Control Panel
70	R8,R13,R29,R31	Resistance	4.7K	4	Control Panel
71	R9,R10,R11,R12,R16 R17,R18,R19,R25	Resistance	10K	5	Control Panel
72	R14,R15	Resistance	2K	2	Control Panel
73	R23,R24,R27	Resistance	100Ω	3	Control Panel
74	U1,U3	Manifold Block	74LS14	2	Control Panel
75	U2	Manifold Block	W77E58	1	Control Panel
76	VR1	voltage stabilizer	7812	1	Control Panel
77	VR2	voltage stabilizer	7805	1	Control Panel
78	Y1	crystal oscillator	12M	1	Control Panel
79	DS1	4 digits digital tube	4*LEDNUM	1	Display Board
80	D_OUT	Flat light-emitting tube	LED FLAT（yellow）	1	Display Board
81	D_PWR,D_RDY	Flat light-emitting tube	LED FLAT（green）	2	Display Board
82	D_WARN	Flat light-emitting tube	LED FLAT（red）	1	Display Board
83	R1	Resistance	330Ω	1	Display Board
84	K0	Relay	HG4130 012-Z1C	1	

※ ：**1. Numerical random of components**

2. Battery Specification of Remoter Control Transmitter23A/12V

Appendix 1 Recognition nameplate of the Machine

1. Equipment nameplate which paste on the front housing of controller

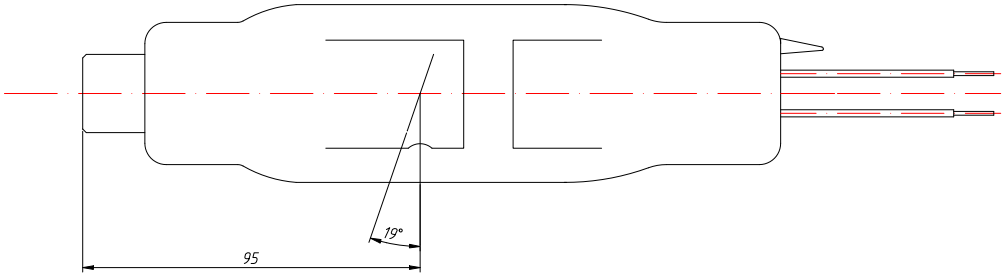
Mobile Medical X-ray Machine

Power: Single phase AC 220V Frequency: 50Hz

Internal resistance of power source: <0.8Ω Rated capacity: 5.5kVA

Rated output: 90kVp 70mA 1.0s; 90kV 30mA 5.0s

2. X-



X-ray Tube Serial No.:[ ] Nominal Value of Focus: 2.6

X ray Tube Inherent Filtration: 0.8mmAl

Manufacturer of X-ray Tube: Shanghai Nine Medical Instrument Factory

Nominal Voltage : 90kV Tube Assembly Filtration: 2.8mmAl

Enforce Criterion: GB9706.11-1997 Tube Assembly Model: QG70Z I

Manufacture Date: [ ] Serial No.: [ ]

3. Controller nameplate which paste on the front housing of controller

70 Type II Controller

Controller Serial No.: [ ]

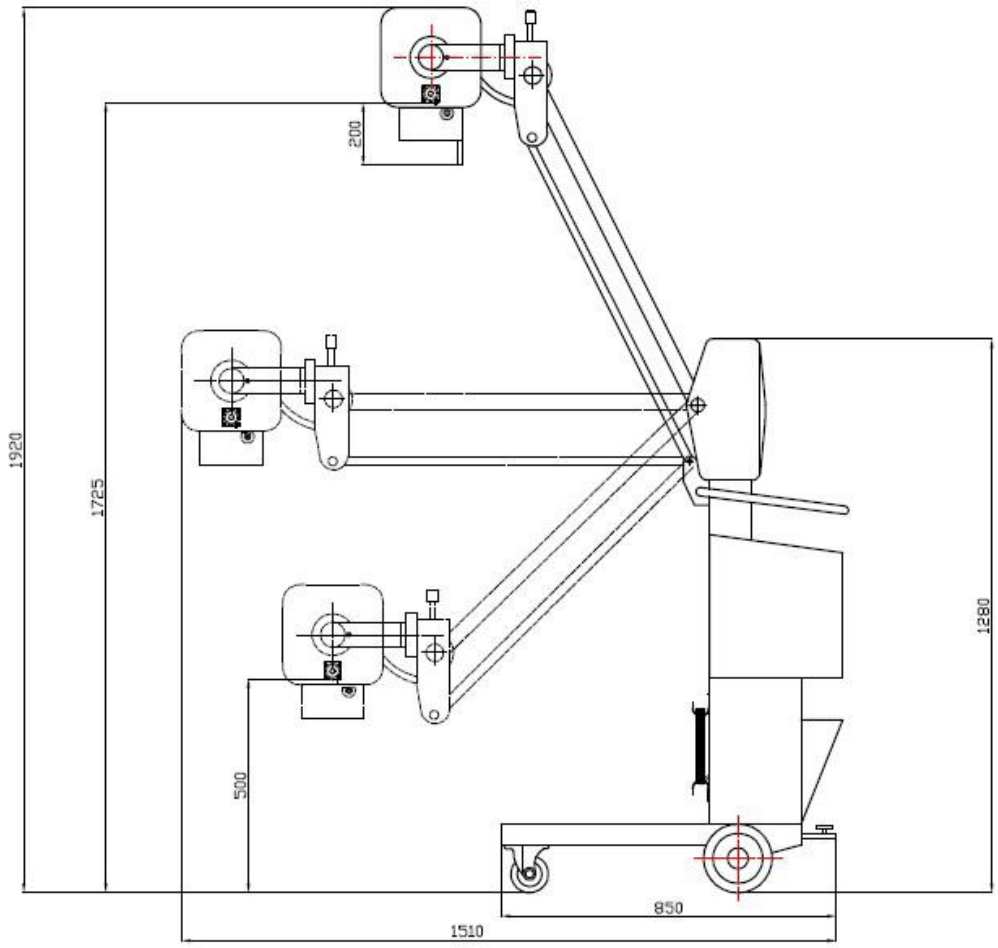
4. Nameplate which paste on the base of mobile frame

70 Type Mobile Rack

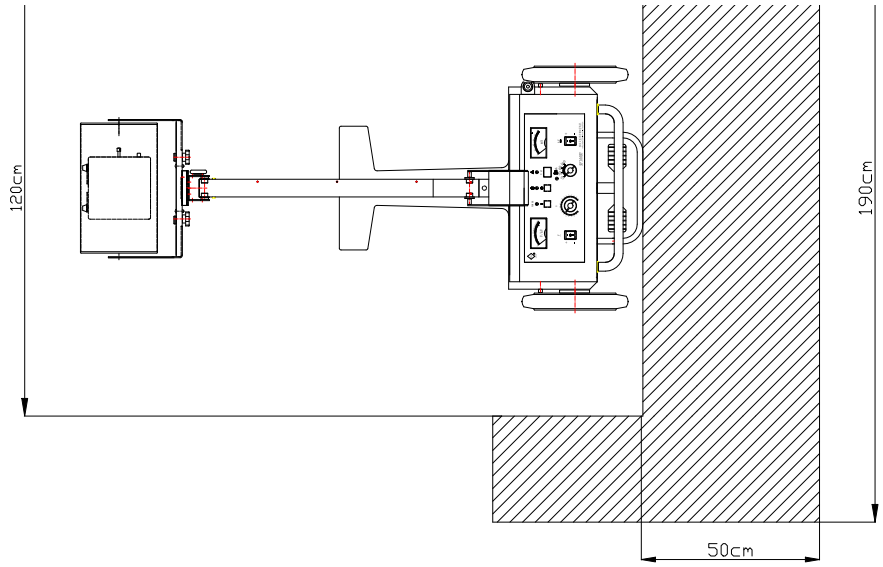
Rack Serial No.: [ ]

Appendix2 Fiducial axis of x-ray tube XD3-3.5/100 fiducial axis of x-ray tube

Ap



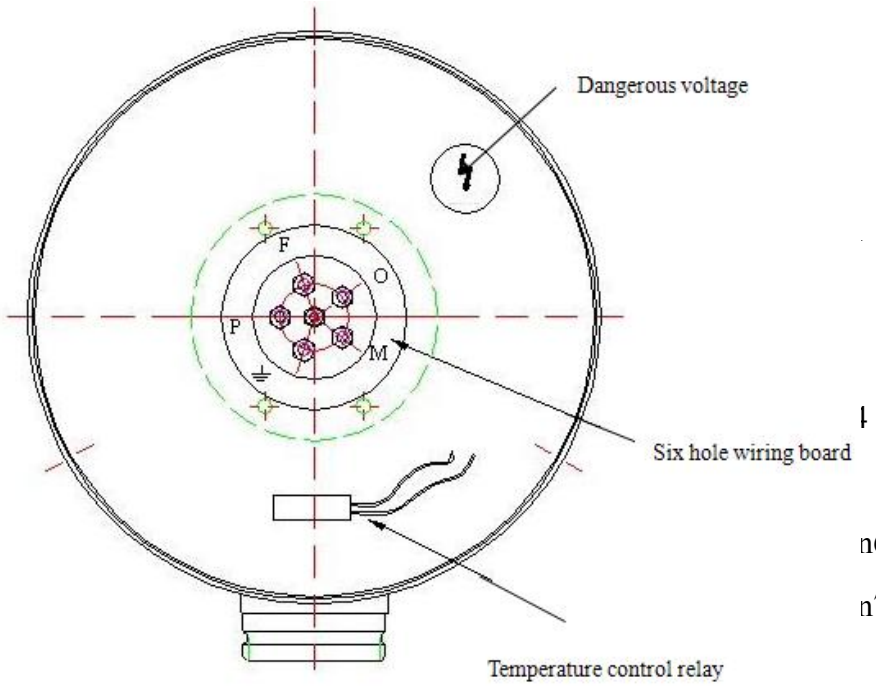
A



Appendix 5 QG70Z Ⅰ Schematic diagram of tube assembly wiring

Schematic dia

Wiring directi



A

A n6

A n7

Appendix 6 Rotation angle of x-ray tube assembly and beam limiter

①、②———angle direction marks