



The best value option

# The best value option

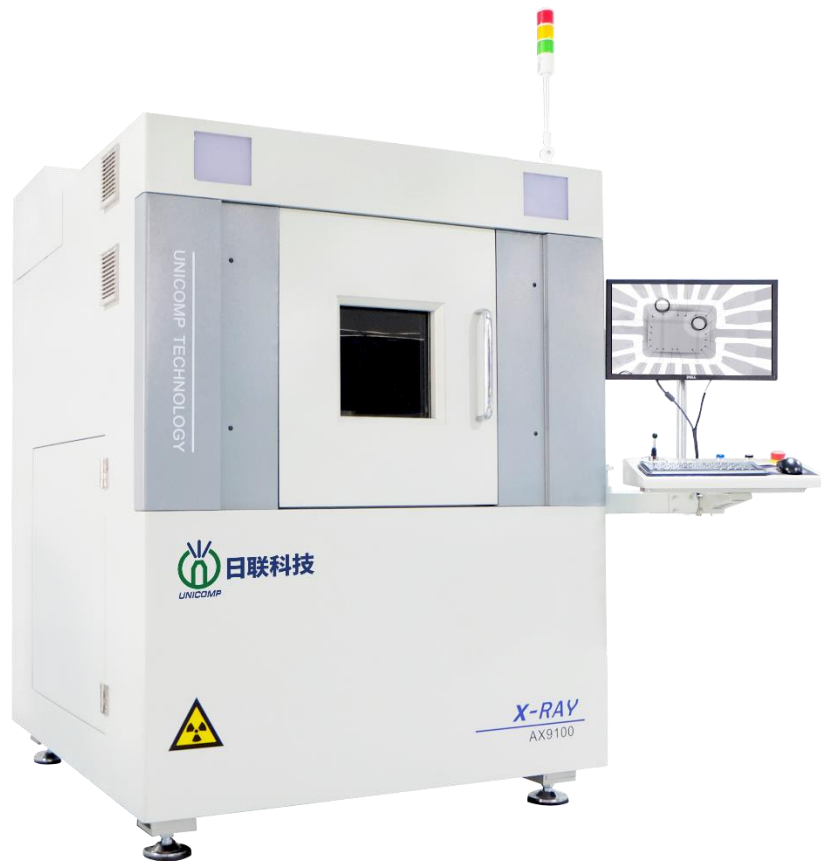
Thank you for choosing us as a partner, Unicom will wholeheartedly provide you with the best quality service

# X-RAY



## AX9100

## User manual



Copyright © Unicom Technology Co., Ltd.

No. 11, Lijiang Road, Wangzhuang Street, New District, Wuxi, Jiangsu Province

Before using this product, please read the manual carefully and keep it properly.



## The best value option

### Remarks

The information related to this version may be changed and upgraded in the future. During this period, Unicom does not undertake the obligation to communicate the changes and upgrade information to each user. The change and upgrade information will be compiled into the new version directly or in the form of auxiliary documents.

Please fill in the equipment model, factory number, purchase date and location in the blank space below. The equipment label will also have information such as the equipment number and model.

**Without the permission of Unicom, you are not allowed to copy, extract or reprint any information in this version at will.**

AX series X-Ray inspection equipment

Model: \_\_\_\_\_

Numbering: \_\_\_\_\_

Purchase date: \_\_\_\_\_

**The name and label of Unicom has been registered by Unicom. Any company or individual is not allowed to copy or use it at will, otherwise Unicom will pursue its legal responsibility.**



**Preface**

**Thanks for using Unicomp products, and I would like to express my sincere thanks to you.**

Unicomp has long been committed to the research and development and production of the X field, and provides customers with high-quality, economical and applicable X-Ray machines. I hope this product can solve difficult problems for your company.

**The equipment uses a closed X-Ray tube and is equipped with a million-level high-resolution FPD. The system magnification is 1600X, the maximum tilt inspection angle of the detector is 60°, and a 8x high-definition real-time imaging axis linkage system. It is widely used in the following projects:**

Semiconductor, SMT, DIP, electronic component inspection

IC, BGA, CSP, flip chip and other package types inspection

Car parts, aluminum die casting mold inspection

New energy testing for LED, battery, photovoltaic industry, etc.

Special industry testing such as molded plastic and ceramic products.

**The equipment adopts the most advanced modular control system, which is centrally controlled and managed by a computer through software, which is very conducive to repair and maintenance. The high-resolution flat-panel detector is used to generate faster and clearer images, which is convenient for employees to operate.**



**Safety instructions**

**Before using the AX series X-Ray machine.....**

In order to ensure a more effective test result and user experience, please read the safety instructions carefully before using the X-Ray machine.

**Please take care to avoid shock or vibration to the equipment.**

This equipment is a precision machine, so be careful when using it, and don't subject the machine to shock or vibration. Including the use process, the transportation process and the installation process; if the impact or excessive vibration such as falling, collision, etc. during the process, the machine will malfunction and malfunction.

**Please avoid using or storing this equipment in the following places.**

Vibrating place

Places with corrosive and flammable dangerous gases

Places with high humidity and dust

Places exposed to direct sunlight, heating appliances, etc., which tend to get hot

Extremely cold place

Where there is oily smoke and steam

Places with large changes in temperature and humidity

Near objects that generate strong magnetism and radio waves

Places exposed to liquids or potential risks

Other places that cause damage or potential risks to the equipment

**Please do not use this equipment in an environment where chlorine gas is generated.**

Chlorine gas can corrode the beryllium of the X-Ray irradiation window and damage the vacuum tube.



## Safety instructions

Please do not use it in an environment where chlorine gas is generated. Please pay attention to the operation, when using vinyl chloride and other samples that may generate chlorine.

### **Please do not use power sources other than those specified**

If you use a power source other than the specified one, it may cause electric shock and fire.

### **Please do not use cables other than those specified**

If cables other than those specified are used, electric shock and fire may result.

### **Be sure to ground**

To prevent electric shock accidents, be sure to ground the GND terminal of the host and the cable.

### **If there is any abnormality, please stop using**

If there is smoke, peculiar smell or abnormal sound, it will be very dangerous to continue using the equipment. Please stop using it immediately, turn off the power switch, and unplug the power plug. For countermeasures related to abnormal handling, please talk to our company or sales agents.



# Contents

Contents.....	VI
<b>Chapter 1 Introduction to AX9100 Equipment.....</b>	<b>1</b>
1.1 AX9100 Overview.....	1
1.2 AX9100 Equipment configuration and parameters.....	1
1.2.1 Equipment Configuration.....	1
1.2.2 Equipment parameters.....	1
1.3 X-Ray Imaging principle.....	3
1.4 The relationship between focal spot size and imaging blur.....	3
<b>Chapter 2 Preparations and Installation Instructions Before Installation.....</b>	<b>4</b>
2.1 Power supply system.....	4
2.2 Grounding requirements.....	4
2.3 Equipment installation.....	5
2.3.1 Lighthouse.....	5
2.3.2 X-Ray tube installation.....	6
2.3.3 Flat panel detector installation.....	10
2.3.4 Uninterrupted power supply.....	12
2.3.5 Display.....	12
2.3.6 Grounding facility.....	13
<b>Chapter 3 Basic Operation.....</b>	<b>14</b>
3.1. AC power.....	14
3.2. PC power.....	15
3.3. Joystick.....	16
<b>Chapter 4 Security.....</b>	<b>17</b>
4.1. X-Ray safety protection.....	17
4.2. X-Ray machine housing.....	17



## Contents

4.3. Security door sensor .....	18
4.4. Electromagnetic lock .....	18
4.5. Emergency stop button .....	19
4.6. X-Ray automatic shutdown function .....	19
4.7. Safety sign .....	19
<b>Chapter 5 Maintenance and common problem solving .....</b>	<b>21</b>
5.1. Maintenance .....	21
5.1.1 Daily inspection items .....	21
5.1.2 Monthly inspection items .....	21
5.1.3 Semi-annual inspection items .....	21
5.1.4 Yearly maintenance items .....	22
5.2. Common problems and solutions .....	22
<b>Chapter 6 Contact information .....</b>	<b>24</b>



# Chapter 1 Introduction to AX9100 Equipment

## 1.1 AX9100 Overview

AX9100 is a synchronous, high-magnification new X-Ray inspection system independently developed and produced by Unicom to meet the needs of our customers. It is suitable for BGA, CSP, flip chip inspection, semiconductors, and packaged components above large circuit boards. , Electronic connector module inspection, ceramic products, aviation components, photovoltaics, batteries and other special industries inspection.

## 1.2 AX9100 Equipment configuration and parameters

### 1.2.1 Equipment Configuration

Item	Quantity	Remarks
X-Ray tube	1	Installed on the equipment
FP Detector	1	Installed on the equipment
Image signal cable	1	Installed on the equipment
X-Ray tube Power cable	1	Installed on the equipment
X-Ray tube Control Cable	1	Installed on the equipment
Stage	1	Installed on the equipment
PC(Includes power cable)	1	Installed on the equipment
Mouse	1	Installed on the equipment
Keyboard	1	Installed on the equipment
Image processing software	1	Installed on the equipment
User's Guide	1	Random delivery
22 Inch display	1	Installed on the equipment
AC 220V Dedicated power cable	1	Random delivery
Power Supply	1	Random delivery

### 1.2.2 Equipment parameters

Classification	Component	Item	Parameters and Functions
Hardware Configuration	X-Ray tube	Type	Closed
		Voltage	130kV
		Maximum output power	40W
	Imaging unit	Type	Flat Panel Detector
		System magnification	1600x
	Computer	Host	Industrial PC





## Chapter 1 Introduction to AX9100 Equipment

		Display	22 inch
		Operation system	Windows 10 64-bit
	Stage	Maximum object size	φ570mm
		Maximum inspection area	450*450[mm]
		Maximum sample weight	5kg
	Operation	Joystick & Mouse & Keyboard	
Navigation System	Configuration	HD camera	
Software system	Software Description	Software	Unicomp independently develops multifunctional image processing software
		Interface language	English
	Software function	Image automatic setting	Record location coordinates and parameter information of feature points
		Auto navigation function	Convenient and fast move to the inspection point
		Calculation function	Possibility to measure the bubbles of electronic/semiconductor
		Position editing function	Can easily realize multi-point running inspection
Axis Control	8 Axis		
Machine parameters	Power supply	220V 50Hz	
	Typical Power Consumption	3.0kW	
	Dimension	1420(W)*1580(D)*2000(H) mm	
	Weight	1500kg	
	Safety	<1μSv/h	
	Warranty	One year warranty for the whole machine	
X-Ray Security	1.Safety standard: radiation leakage dose<1μSv/h.		
	2.The protective equipment of the shell material adopts a steel-lead-steel structure, and the front door window adopts lead-containing glass to protect against rays.		
	3.Safety interlock function The opening position of the door is equipped with a limit switch, when the door is opened, the X-Ray tube is automatically powered off.		
	4.The automatic protection function of the X-Ray tube is not operated, and the X-Ray tube is automatically powered off after 5 minutes and enters the protection state.		
	5.The status indicator is used to indicate the working status of the X-Ray tube.		

### 1.3 X-Ray Imaging principle

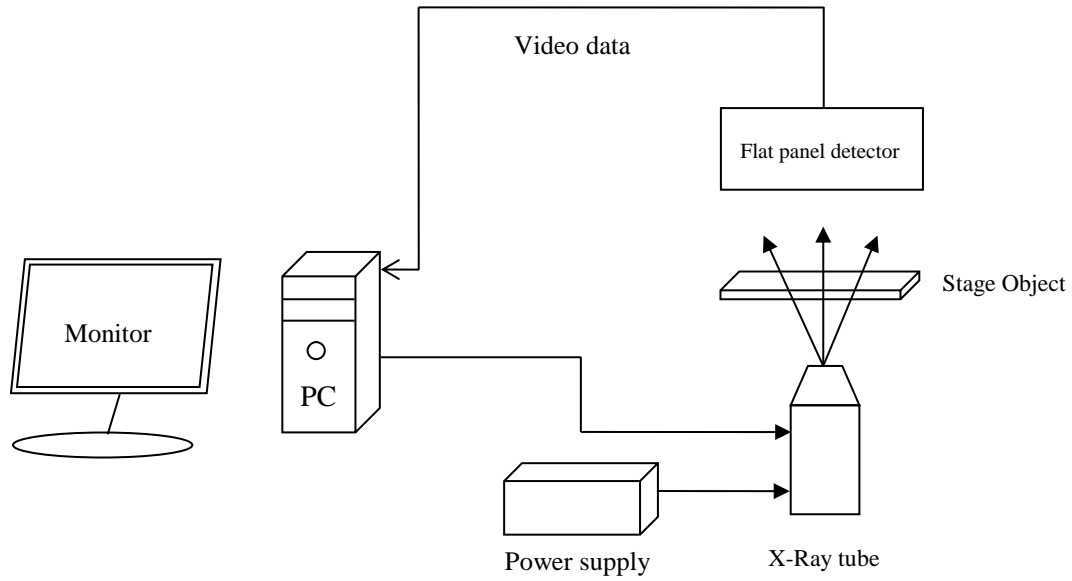


Figure 1.3-1 X-ray imaging principle

### 1.4 The relationship between focal spot size and imaging blur



Figure 1.4-1 The relationship between focal spot size and imaging blur

<p>With a small focal spot X-Ray tube, there is a large part of the phantom in the obtained image, which makes the sharpness of the image fail to meet the inspection requirements.</p>	<p>Using a micro-focus spot X-Ray tube, the resulting image has very little phantom, more vivid contrast, and high image clarity.</p>
-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------

## Chapter 2 Preparations and Installation Instructions Before Installation

Before the equipment is installed, the installation department should carefully read the instruction manual; understand the weight, volume, working environment and grounding requirements of the equipment; prepare a forklift (2.5 tons and above) for transporting the equipment for easy handling. If the equipment needs to be moved upstairs, A freight elevator with a load of at least 2.5 tons is also required.

### 2.1 Power supply system

AX9100 requires single-phase communication 220V, power is at least guaranteed 2KVA external power supply. The power socket uses the Chinese standard 3C power socket, and the copper wire is  $\geq 4\text{mm}^2$ .

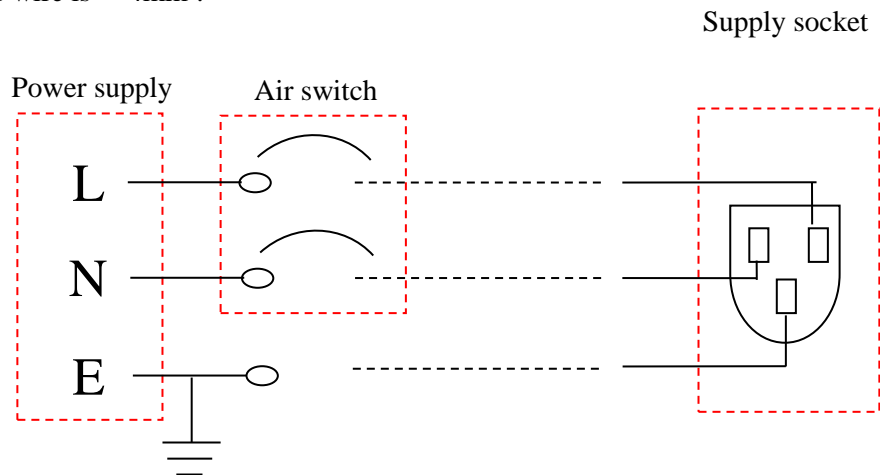


Figure 2.1-1 Schematic diagram of power supply system

### 2.2 Grounding requirements

The equipment should be installed with good grounding measures and ensure that the main electrical components of the equipment are connected to the main grounding wire. According to the GB50150-2006 Ministry of Construction's announcement requirements on the national standard "Electrical Installation Engineering-Electrical Equipment Handover Test Standard", the effective grounding system is:  $Z \leq 2000/I$  or  $Z \leq 0.5 \Omega$  (when  $I > 4000\text{A}$ ) where :

I— The short-circuit current flowing into the ground through the grounding equipment, A

Z—The maximum ground impedance considering seasonal changes,  $\Omega$

Note: When the ground impedance does not meet the above requirements, the ground impedance can be increased through technical and economic comparison, but it should not be



greater than  $4\Omega$ . At the same time, a comprehensive analysis of the grounding equipment should be combined with the ground potential measurement. In order to prevent the harm caused by the transfer potential, isolation measures should be taken.

### 2.3 Equipment installation

#### Precautions before installation:

1. The factory should pre-divide the work area, prepare the power supply in accordance with the requirements of chapter 2.1, and prepare the ground wire in chapter 2.2;
2. Remove the packaging materials of the equipment, check the equipment according to the packing list, and install it after checking that it is correct;

#### 2.3.1 Lighthouse

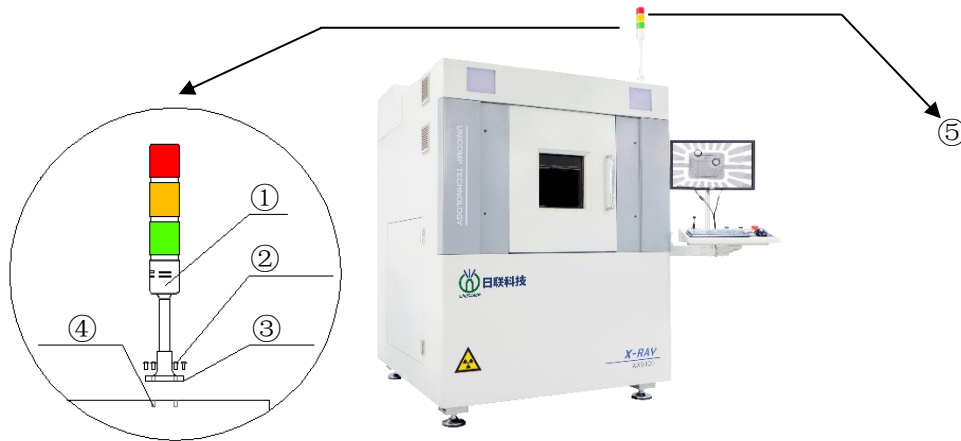


Figure 2.3.1-1 Lighthouse

Lighthouse: The lighthouse is located on the upper left side of the machine and is used to indicate the operating status of the equipment.

As shown, use 3 Screw connection, Fix the base of the lighthouse.

- ① lighthouse
- ② Screw (3 pcs)
- ③ Lighthouse base
- ④ Screw connection hole

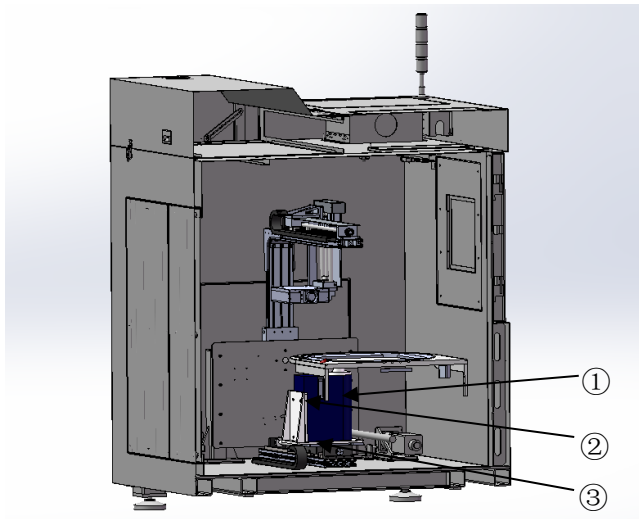
⑤ X-Ray ON Indicator light: tower light Red light, Instructions X Light work.



Figure 2.3.1-2 Schematic diagram of lighthouse fixed details

The lighthouse and lighthouse signal lines will be removed when leaving the factory to prevent the lighthouse from breaking due to rubbing during transportation. After the transportation arrives at the customer site, fix it with 3 hexagon socket screws and plug in the connecting wire.

### 2.3.2 X-Ray tube installation



The X-Ray tube is located at the bottom of the equipment casing. As shown in the figure, the X-Ray tube connecting frame and the X-Ray tube bracket are locked with 4 screws.

- ① X-Ray tube
- ② Screws (4 at the back)
- ③ X-Ray tube bracket, the corresponding bracket is randomly installed at the factory

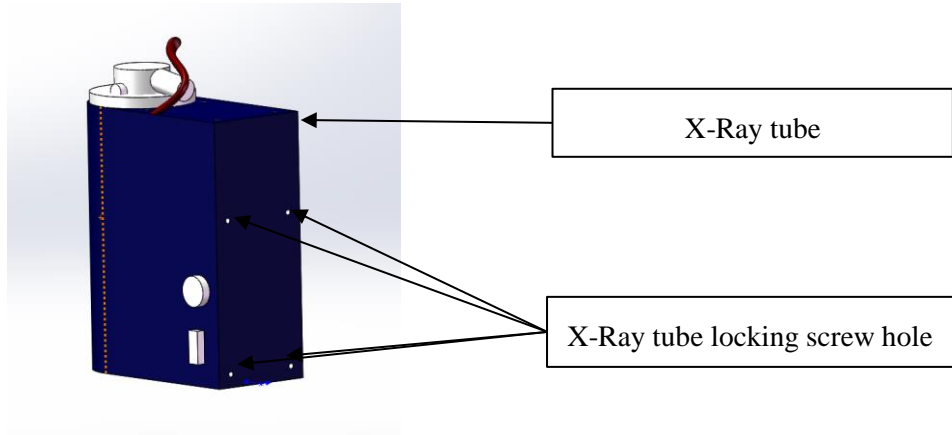


Figure 2.3.2-1 X-Ray tube installation details



Figure 2.3.2-2 Connecting the ground wire



## Chapter 2 Preparations and Installation Instructions Before Installation

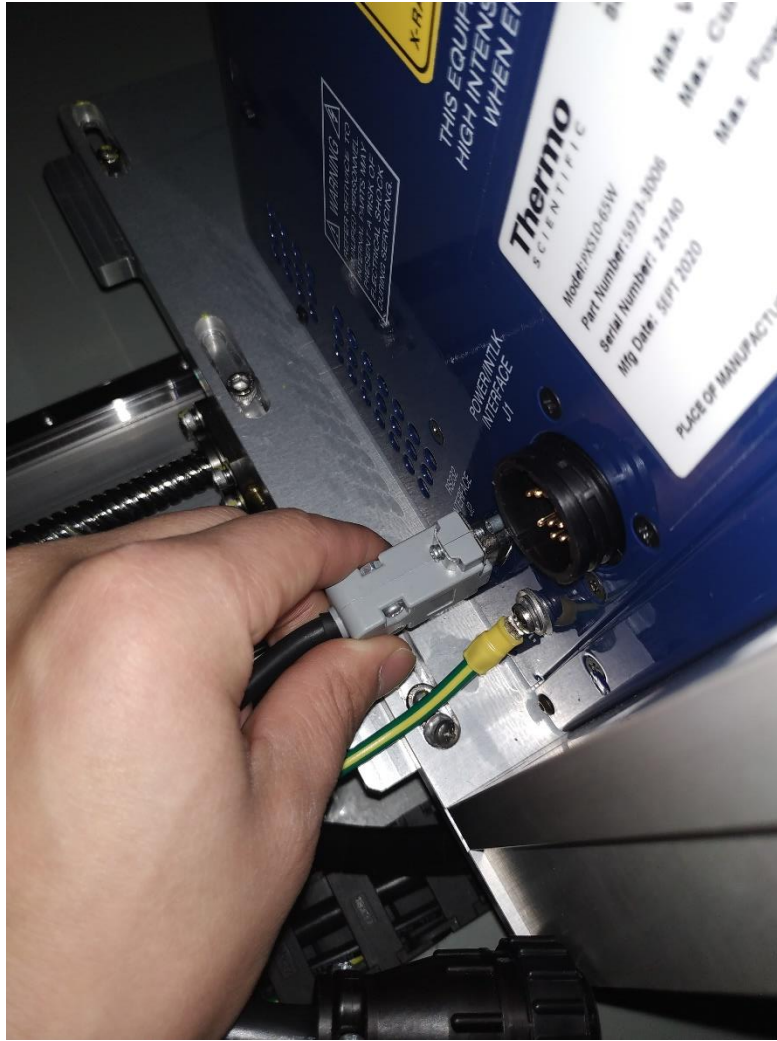


Figure 2.3.2-3 Connect 232 communication line



## Chapter 2 Preparations and Installation Instructions Before Installation

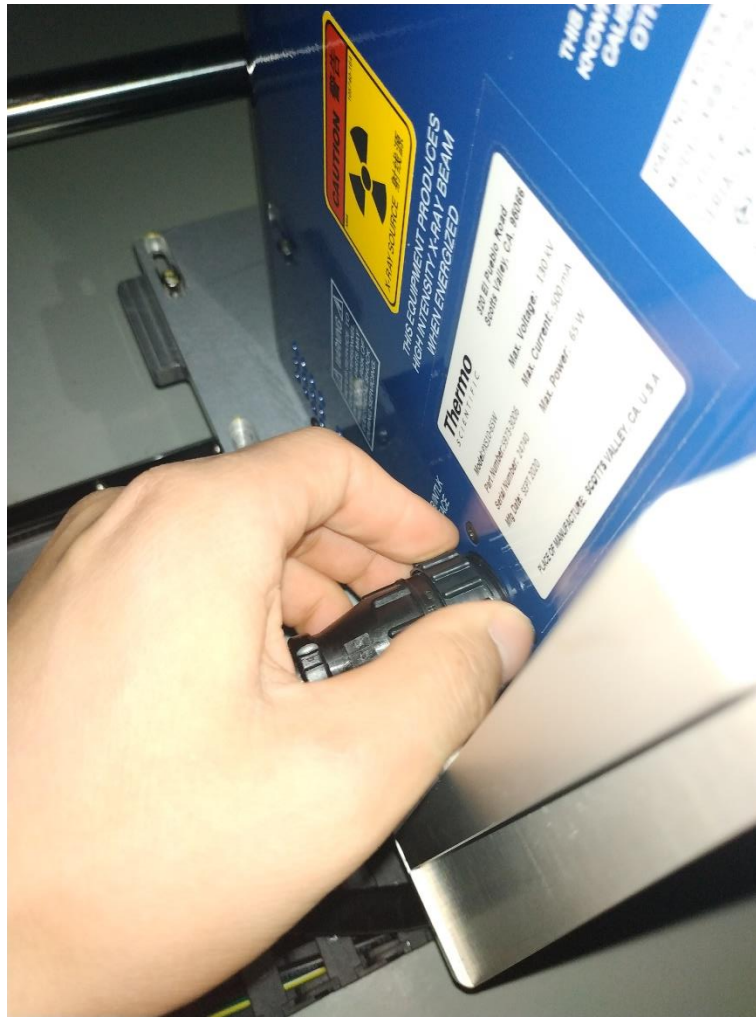


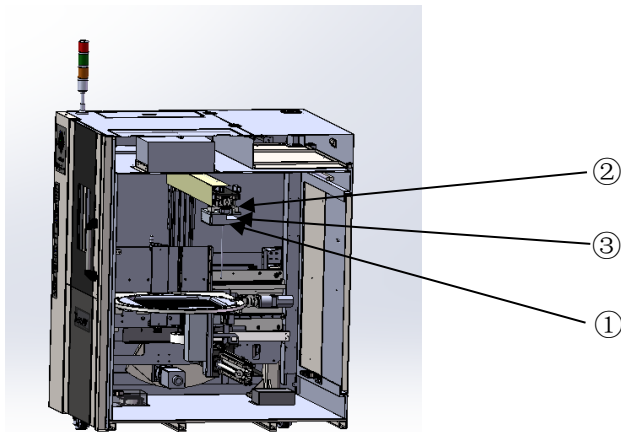
Figure 2.3.2-4 Connect 24V power cord & INTERLOCK





图 2.3.2-5 All cables of the X-Ray tube are connected

### 2.3.3 Flat panel detector installation



The flat panel detector is located in the upper part of the equipment housing, as shown in the left picture, the detector and the connecting plate are locked with 4 screws.

- ① Flat Panel Detector
- ② Connecting plate for Flat Panel Detector
- ③ Screw (4 Pieces)

Figure 2.3.3-1 Schematic diagram of detector installation

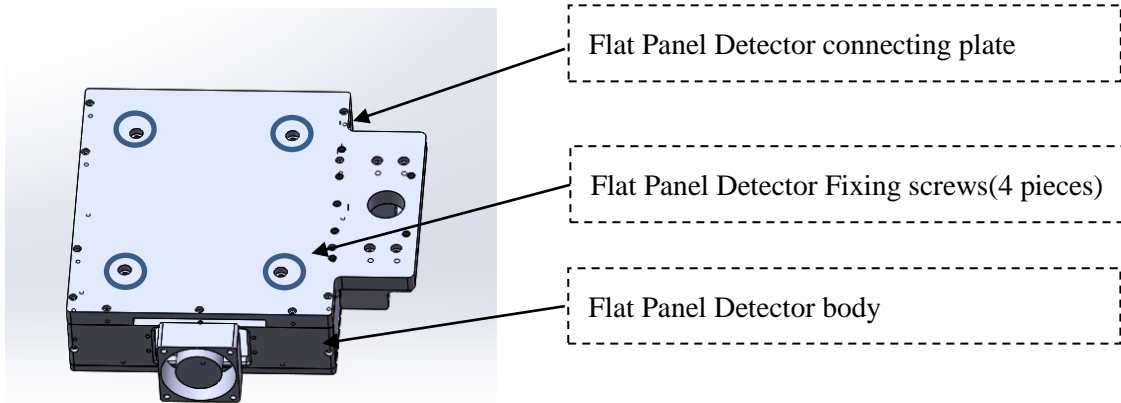


Figure 2.3.3-2 Schematic diagram of detector connection board

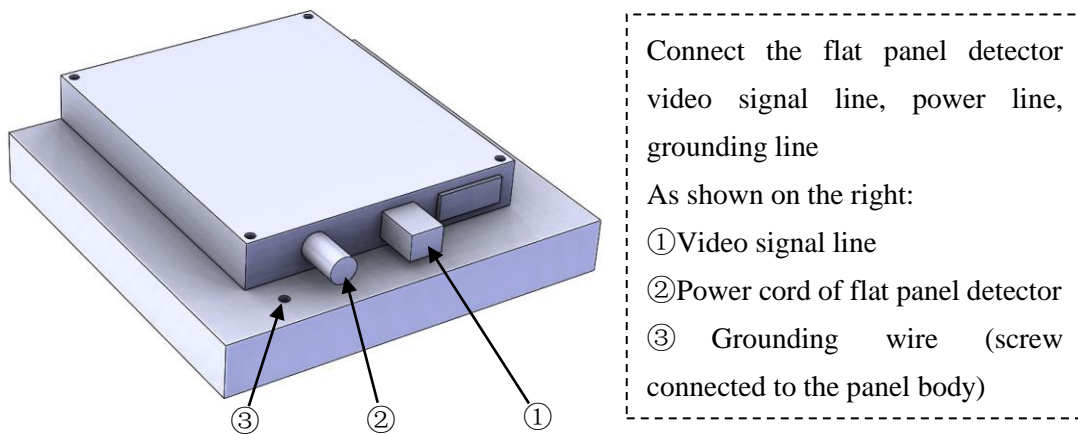


Figure 2.3.3-3 Detector installation details

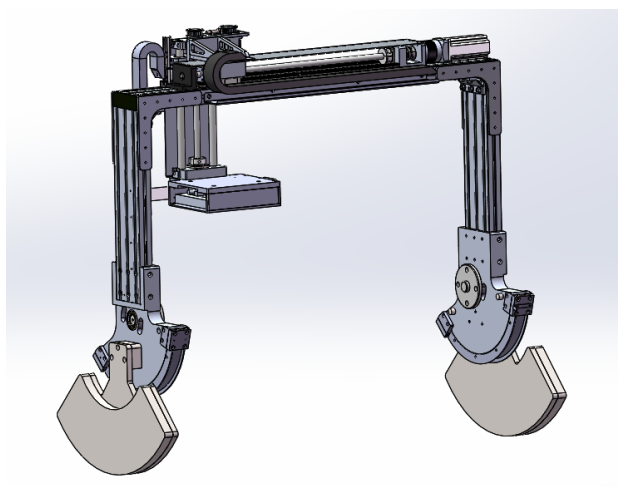


Figure 2.3.3-4 Schematic diagram of the detector after installation



2.3.4 Uninterrupted power supply

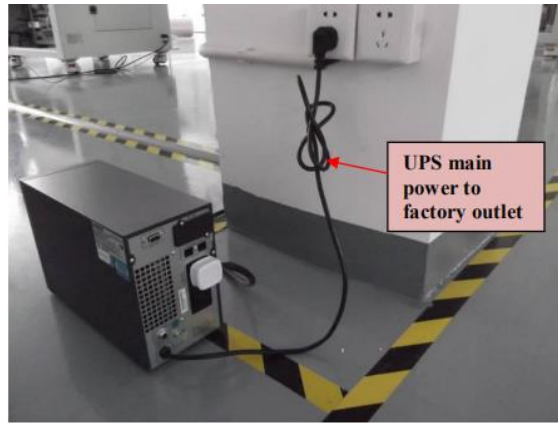
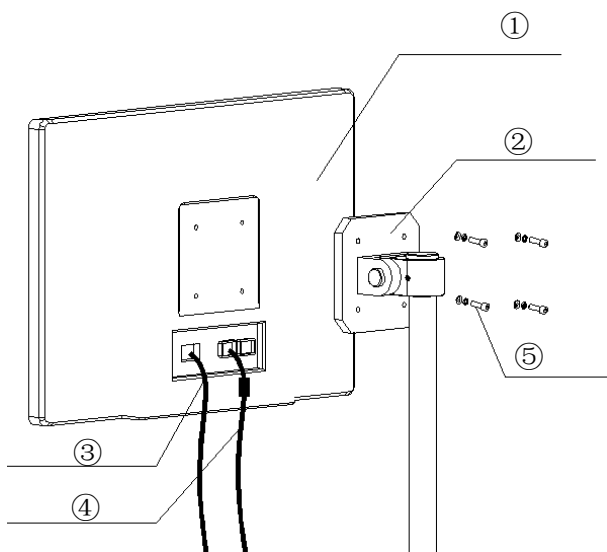


Figure 2.3.4-1 Schematic diagram of external uninterrupted power supply



Figure 2.3.4-2 Uninterruptible power supply logo diagram

2.3.5 Display



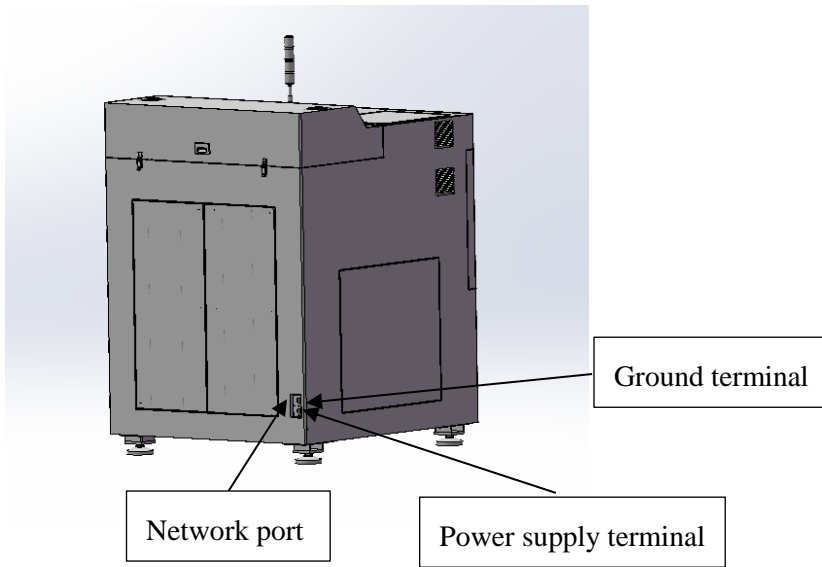
Align the fixing bracket on the back of the display with the base bracket on the machine and lock it Screw, Fix the display, connect to the power supply and VGA Line, as shown on the left:  
①Display  
②Display connection board  
③Power cord  
④VGA line  
⑤ Hexagon socket screws4Pieces

Figure 2.3.5-1 Diagram of display installation

This document is a confidential company document and cannot be circulated without permission.



2.3.6 Grounding facility



Whether the grounding facilities are perfect has a great influence on the life of the X-Ray tube, power supply and various circuit components. If the machine is not well grounded, it will directly damage the X-Ray tube, power supply or other components.

Figure 2.3.6-1 Grounding diagram

## Chapter 3 Basic Operation

### 3.1. AC power

The power of AX9100 is turned on from the key switch on the right side of the front of the machine, and the power can be turned on or off by turning the key switch.



Figure 3.1-1 Schematic diagram of equipment power on/off



### 3.2. PC power

Press the first blue illuminated button on the right to turn on the computer.

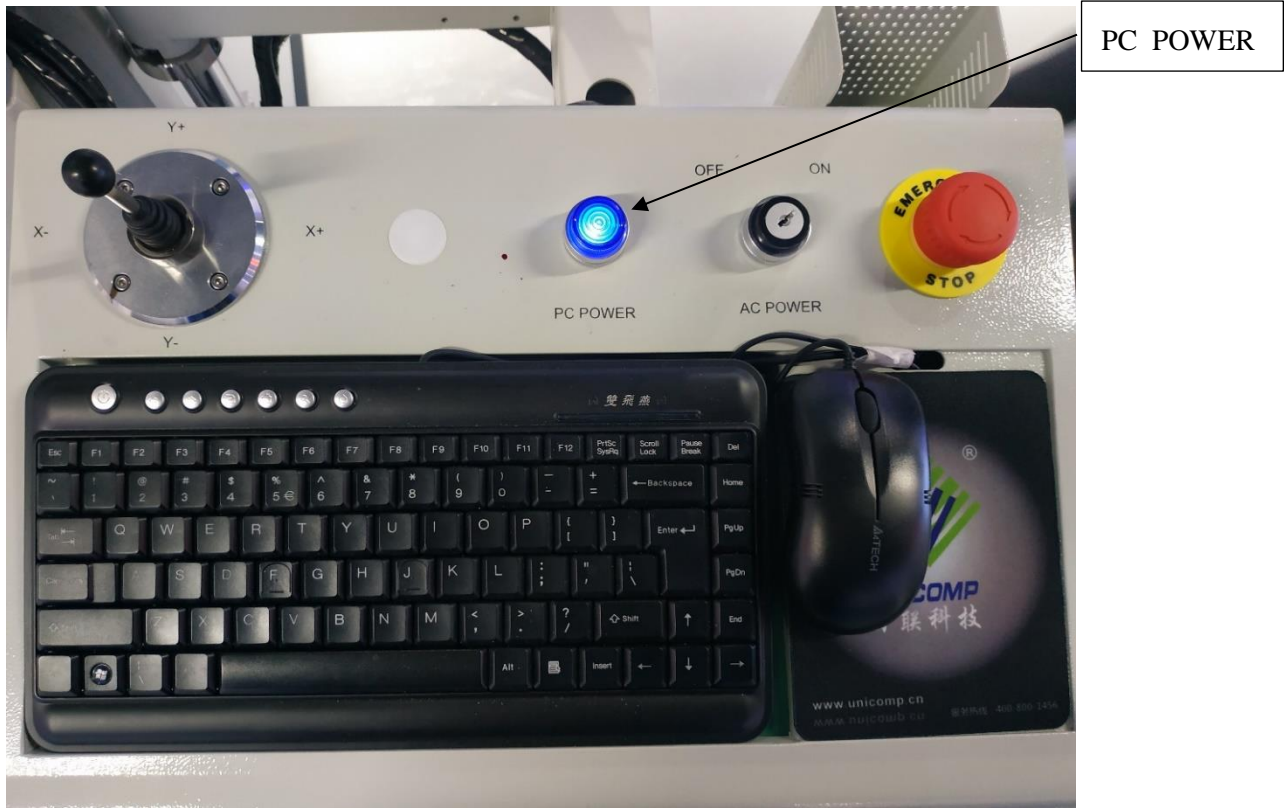


Figure 3.2-1 Schematic diagram of computer startup

### 3.3. Joystick

You can use the joystick to move the inspection position.

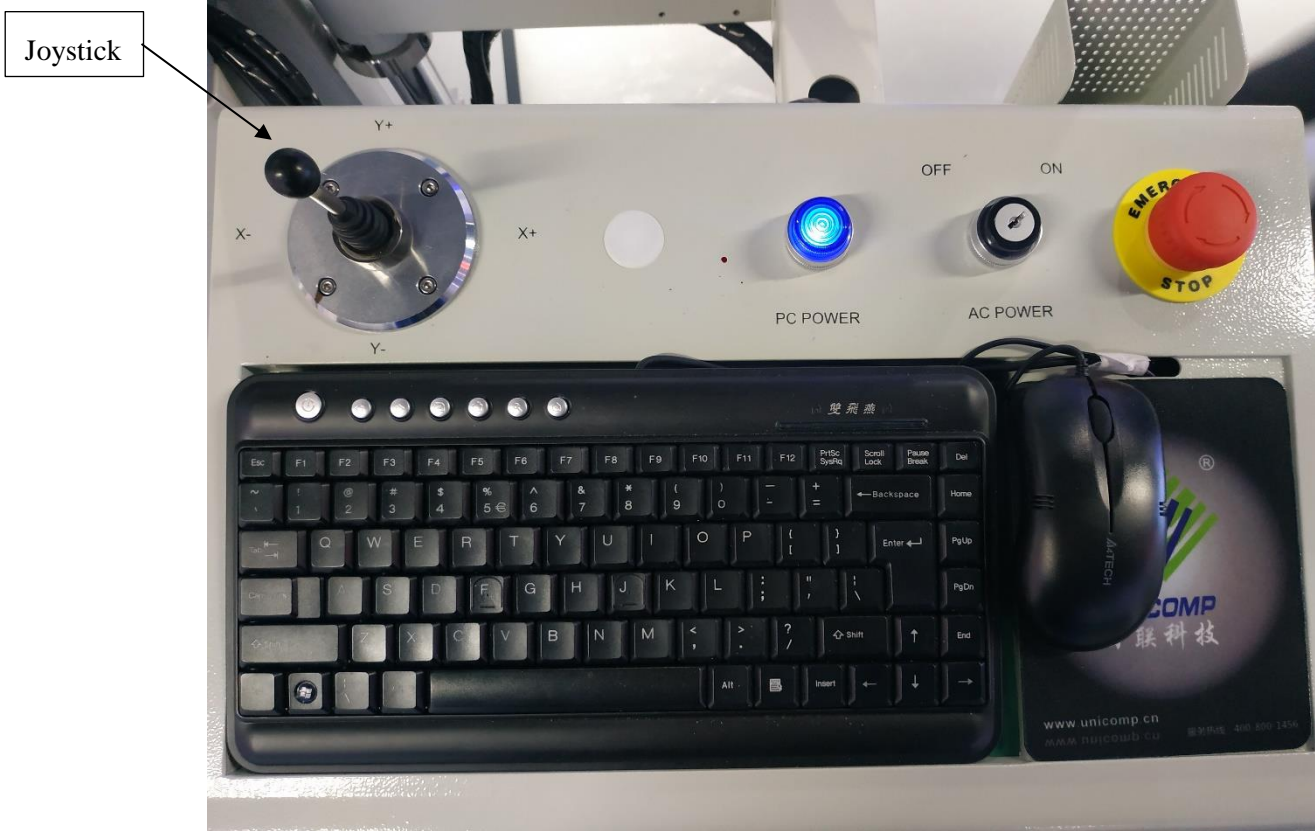


Figure 3.3-1 Schematic diagram of joystick

## Chapter 4 Security

### 4.1. X-Ray safety protection

X-Ray safety is the most concerned issue in X-Ray application technology. The AX series of X-Ray equipment independently developed by Unicom takes into account the safety of X-Rays. Many safety protection settings have been added during the design of the equipment. At present, the equipment has passed the European Union CE safety certification and the US FDA safety certification.

### 4.2. X-Ray machine housing

The entire machine shell is made of materials that prevent X-Ray leakage to ensure safety in compliance with national and international safety standards.

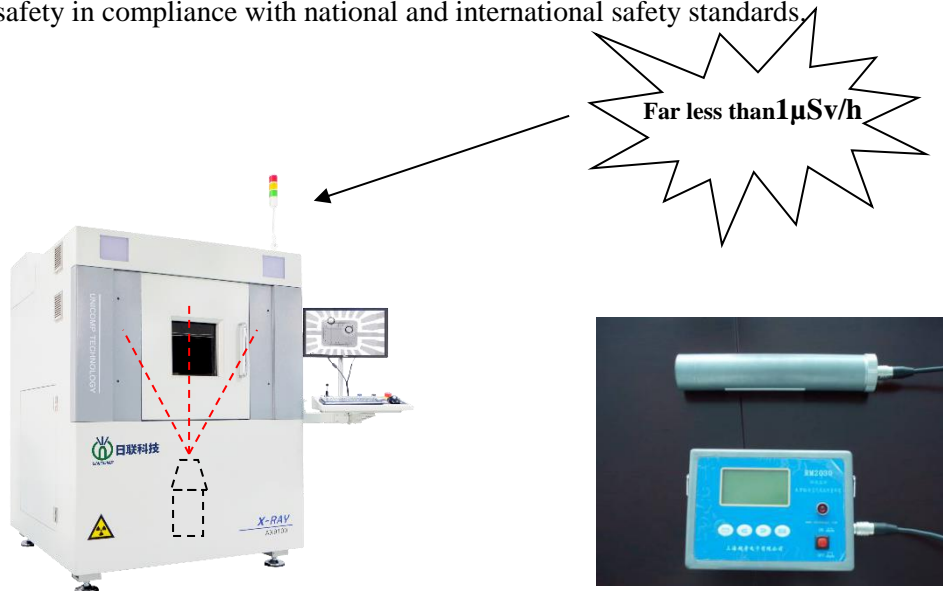


Figure 4.2-1 Schematic diagram of equipment radiation and radiation detector

Before all the equipment leaves the factory, the tester has used the radiation detector shown in the figure on the right (annual inspection) to strictly inspect the equipment shell, confirming that the X-Rays have been completely isolated from the outside by the equipment shell and can be detected by the X-Ray detector. The leakage metering equivalent rate of radiation is far less than  $1\mu\text{Sv/h}$ ; its radiation equivalent is smaller than sunlight and will not cause any harm to the operator.



### 4.3. Security door sensor

The AX series inspection machine is equipped with a safety sensor design on the back door or the side door. During X-Ray work, if the door is not closed or opened at will, the sensor can sense immediately, and the X-ray will not work or stop immediately.

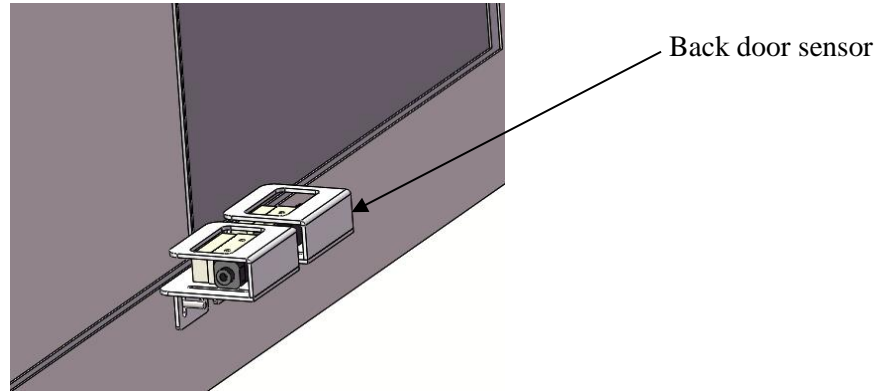


Figure 4.3-1 Schematic diagram of back door sensor

### 4.4. Electromagnetic lock

When the X-Ray is on, The front door will be locked by an electromagnetic lock and cannot be opened. The front door can only be opened after the X-Ray is turned off.

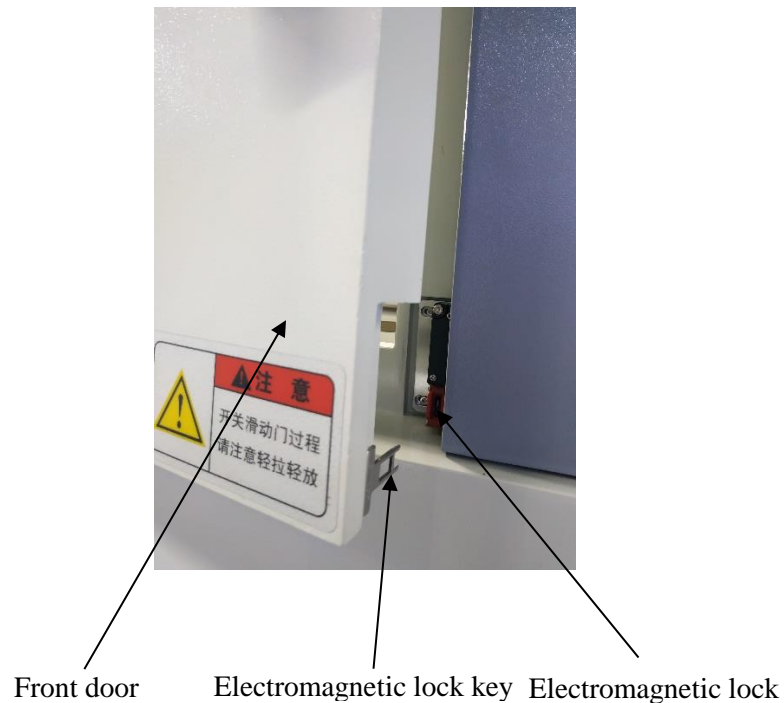


Figure 4.4-1 Schematic diagram of electromagnetic lock

### 4.5. Emergency stop button

During the operation of the equipment, if an abnormal state occurs, the user must immediately press the emergency stop button. When the emergency stop button is pressed, most of the total control on the equipment will be stopped, including X-ray operation and electromechanical control. For safety reasons, if the emergency stop button is not restored, the equipment will not operate normally.



Figure 4.5-1 Schematic diagram of emergency stop button

### 4.6. X-Ray automatic shutdown function

When the X-Ray is activated, the equipment will automatically turn off the X-Ray if the equipment is not operated within 5 minutes (that is, the time is set for 5 minutes). If users need to continue using, please restart X-Ray.

### 4.7. Safety sign



Figure 4.7-1 Safety signs Figure 4.7-2 Radiation danger mark



Figure 4.7-3 Radiation hazard warning decal

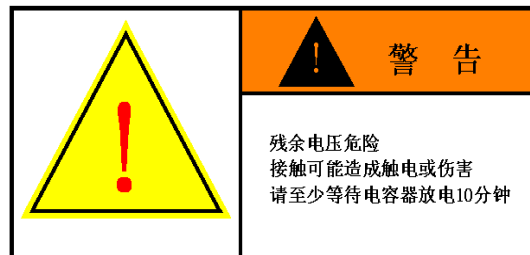


Figure 4.7-4 Residual voltage warning decal

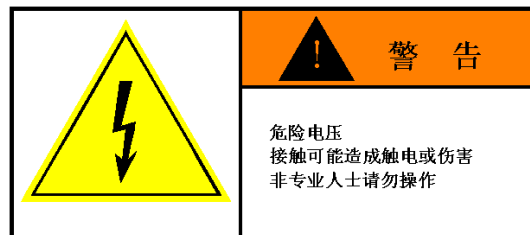


Figure 4.7-5 Dangerous voltage warning decal



## Chapter 5 Maintenance and common problem solving

### 5.1. Maintenance

#### 5.1.1 Daily inspection items

1. Check before Whether the back door safety sensor switch is valid.

Method: Close before Back door Check whether the indicator lights of the "Front Safety Door" and "Rear Safety Door" in the operating software interface are green. If the display is green, the safety sensor switch is valid. If it is red, the safety sensor switch is invalid.

2. Check whether the four-axis movement and the rotation axis are working properly.

Method: After turning on the main power supply, Open the software, and then shake the joystick on the console to view X axis YIs the axis movement normal? Click on the software interface Tube And the up and down buttons of the flat panel detector to check whether the two axes are moving normally.

3. Check whether the sensors of each motion axis are working properly.

Method: Control each axis to move to the corresponding sensor position, when the sensor indicator light is on, whether the movement stops.

Check whether the computer starts normally.

**Note: If any of the above items are NG, please contact X-Ray engineers as soon as possible.**

#### 5.1.2 Monthly inspection items

1. Movement mechanism inspection:

Check whether the movement of each axis is normal, see the daily inspection items for specific methods.

Check whether the movement of each movement axis is smooth.

Check whether the screws and nuts of the moving parts and the screws on the work platform are loose.

Check whether the screw of each moving shaft is smooth. If there is rust, grease each screw and move it repeatedly to lubricate it.

2. Check whether the STOP switch is effective.

Method: Manually press STOP to see if the machine stops running.

#### 5.1.3 Semi-annual inspection items

1. Power inspection:

Method: Open Electric control cabinet Door, check All DC Whether the power supply is normal.



## Chapter 5 Maintenance and common problem solving

2. The lubricating oil on the equipment guide rail and the appearance of the equipment are clean:

Method: Turn off the equipment, Turn off the power.

Open the back door, apply lubricating oil on each screw, and move it repeatedly to lubricate it, and at the same time clean the inner wall.

Open the side door and clean it with a dust-free cloth.

Fan filter cleaning

### 5.1.4 Yearly maintenance items

1. Check whether there are signs of damage on the outside and inside of the machine.

2. Check the glass for scratches.

3. Check the operation of each moving shaft, lubricate guide rods and bearings.

4. Check all fans and clean the filter cotton.

5. Re-do high-pressure maintenance and the warm-up process needs to be completed within 10 minutes.

6. In Rays Perform X-Ray leak inspection under full source voltage and provide radiation test report to customers, And keep vice this.

7. Check the X-Ray image quality.

## 5.2. Common problems and solutions

Problem Description	problem analysis	Solution
The computer does not start up normally	A The computer power connector is loose; B The virus causes the system to be paralyzed;	A Reinsert the computer power plug B Reinstall the system
Automatically restart after boot	Computer virus	Restore the system
The image processing software cannot be started	The software's system files are missing	Reinstall image processing software
After the software is started, the image acquisition button does not work	A Camera initialization is unsuccessful; B Camera driver is lost;	A View the error information in the software information interface, and check according to the error information; B Check the camera indicator, if it only lights up red, the camera is not initialized C Update camera driver
The motor does not run	A There is a problem with the drive power supply; B The connector is loose; C Drive is abnormal;	A Replace the power supply; B Fasten the connector; C Replace the drive;



## Chapter 5 Maintenance and common problem solving

The track jam occurs during the movement	A The coupling is loose; B The roller screw and linear guide have not been lubricated for a long time, caused by dryness	A Check the coupling and tighten it; B Lubricate the roller screw and linear guide
Equipment cannot start	Check if the UPS power supply has power	Give ups Regulated power supply
Software drawing is not clear or there are seams	A The FPD temperature changes too much B The FPD has not been used for a long time	Recalibrate the FPD



## Chapter 6 Contact information

**If users have any questions during the installation, commissioning, operation, and subsequent maintenance and repair of the machine, please call Unicom's consultation telephone 400-880-1456. We will provide you with the most sincere service!**

### **Wuxi Unicom Technology Co., Ltd.**

11 Li jiang Road, Xin wu District, Wuxi City, Jiangsu Province

Tel: +86 510 6850 668

Website: <http://www.unicomp.cn>

### **Shenzhen Unicom Technology Co., Ltd.**

Building A, Bangkai Technology Industrial Park, No. 9 Bangkai Road, High-tech Industrial Park, Guangming New District, Shenzhen

Tel: +86 755 2732 5815

### **Chongqing Unicom Technology Co., Ltd.**

Yingang Industrial Park, No. 71, Tongxing South Road, Beibei District, Chongqing

Tel: +86 023 6322 6131