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Foreword

The animal digital X-ray radiography system is a professional diagnostic system for veterinary x-ray use. The products and manufacturers are described as follows.

Product name:	Animal Digital X-ray Radiography System
Model:	RV-32A/RV-32B
Classification by type of protection against electric shock:	Class I equipment that is powered by an external power supply
Classification by degree of protection against electric shock:	Part of Type B applications
Classification by degree of protection against incoming liquids:	Unprotected equipment of category IPX0
By mode of operation:	Continuous operation with intermittent loading
Production licence number:	No.20060026
Company name:	Dawei Veterinary Medical (Jiangsu) Co.,Ltd.
Address:	28 Jinqiao road, Economic Development Zone Xuzhou, Jiangsu, CHINA.
Production address:	28 Jinqiao road, Economic Development Zone Xuzhou, Jiangsu, CHINA.
Tel:	+86-516-82388909
Fax:	+86-516-87893639
After Sales Contact:	+86-516-82358866/82388899
Postcode:	221004
Website:	www.dwvet.com
Note:	This device is a veterinary diagnostic product and is not intended for human diagnostic use.

The date of preparation of this user manual is 20th July,2021.

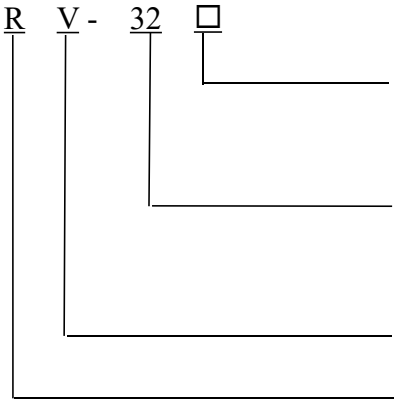
The animal digital X-ray radiography system is developed and manufactured by Dawei Veterinary Medical (Jiangsu) Co.,Ltd. To obtain more information please contact the company.

Chapter 1 Overview

1.1 Principle of operation

The animal digital X-ray radiography system(hereinafter referred to as "Animal DR") is designed to generate X-rays by applying a high voltage from a high voltage generator to both poles of the X-ray tube assembly, causing the electrons on the cathode filament (tungsten filament) of the X-ray source assembly to move at high speed in the vacuum tube and impact the high density anode target. In clinical use of X-ray photography, the X-ray generating device emits X-rays to penetrate animal bones, muscles and other tissues of different densities, and the X-rays containing image information through the animal tissues are converted into visible images of animal tissues of different densities by the image receiving device (flat panel detector), which are then sent to a computer for image processing, and finally medical institutions can make clinical diagnosis based on the images.

1.2 Description of the product models and classification



Represents product configuration codes, A/B for different configurations respectively

Represents maximum output power of the product high voltage generator

Representing the company's veterinary products

Representing the company in radiological products

1.3 Composition of the product structure

1.3.1 The composition of the product and the specification of each component are shown in the table below

Name		Model	Specifications	Main functions	RV-32A	RV-32B
X-ray Generators	High- voltage Generators	DTXR-32C	Output Power : 32kW Input Voltage : 220VAC±10% 50/60Hz Tube Voltage Range : 40kV~150kV Tube Current Range : 10mA~400mA	The main function is to provide high voltage to the tube for the production of X-rays	√	√
	X-ray Tube Assembly	LQ16-XD51-20	X-ray Tube Voltage Range : 40kV-125kV Nominal Focal Spot Value : 1.0mm(Small Focus) 2.0mm(Large Focus) Nominal Anode Input Power : 20kW(Small Focus) 40kW(Large Focus) Anode Heat Content : 140KHu	X-ray generators	√	—
	X-ray Tube Assembly	E7239X	X-ray Tube Voltage Range : 40kV-125kV Nominal Focal Spot Value : 1.0mm(Small Focus) 2.0mm(Large Focus) Maximum X-ray Tube Current : 340mA(Small Focus) 570mA(Large Focus) Anode Heat Content : 140KHu	X-ray generators	—	√
	Bea Limiting Device	104i	Light Field Indicator : LED 5W Control Mode : Manual control Rectangular X-ray Field Selection : 45cm*45cm Maximum Radiation Leakage : <1mGy/h	Used to control the X-ray field of exposure	√	√
X-Ray Imaging Unit	Flat Panel Detector	DR1717	Detector Technology : Amorphous silicon Scintillator : CsI Number of Pixels : 3072*3072 Pixel Pitch : 139um Active Area : 43cm*43cm(17*17 in) Image Acquisition Time : 1s	The core part of image acquisition	√	√
	Image Processing	DRVET	—	Equipped with image processing software,	√	√

	Systems			which is the main control part of the system		
	Workstation Host	-	Minimum performance requirements： CPU：3.7GHz RAM：4G Hard Disk： 500G		User Self-assignment	User Self-assignment
	Displays	-	Minimum performance requirements： Screen range：19inches Type: Browse, LCD, B&W Resolution：1280(H)×1024(V) Maximum brightness: not less than 300cd/m2		User Self-assignment	User Self-assignment
	Touchable displays	TD156D	Screen size: 15.6 inches Display ratio: 16:9 Screen type: Capacitive touch	Easy pre-bed observation of images by physicians	—	√
Ancillary Equipment	Photographic beds	-	Load-bearing uniform load: ≤100kg Height of bed from floor: 800mm Longitudinal floating range of bed level: 100mm±10mm Horizontal lateral floating range of bed surface: 320mm±10mm Bed size: 1400mm x 720mm	For carrying animals	√	√
	Tube Column	-	Column height: 1946mm SID: 1000mm, tolerance ±50mm	One end is fixed to the base and the other end is fitted with an X-ray tube and bea limiting device	√	√

Remark: Monitors and workstation hosts with CCC certificate or compliance information Safety standards, replacement of the same type meeting minimum performance requirements, no need to disclose model and manufacturer.

1.3.2 Product view

RV-32A Exterior view **RV-32B Exterior view**

Figure 1-1 Product appearance diagram

1.4 Product characteristics

The animal DR is a digital product developed, designed and produced by our company. The main advantages are rapid diagnosis, the image can be displayed within a few seconds after exposure; small dose of irradiation to the animal under examination, also greatly reduces the harm of X-ray to medical workers; has a high dynamic range and contrast range, the image level is richer; high accuracy, animal DR adopts digital technology, its dynamic range is wide, with a wide exposure tolerance, can improve the accuracy of the shooting, can make repeated irradiation It has powerful post-processing functions, such as window width and position adjustment, magnification, and distance, area, angle and density measurement, which provide technical support for detailed observation of lesions in image diagnosis, before and after comparison, etc. It can also carry out information management, data storage and transmission; it reduces the use of X-ray film and development (fixation) solution in medical institutions, saving the cost of using X-ray machines in hospitals and Reduces environmental pollution.

1.5 Scope of application

For medical institutions (animals) to obtain X-ray images by x-ray of animals for medical imaging diagnosis.

1.6 Product performance

● 1.6.1 Working conditions

1.6.1.1 Environmental conditions

The operating conditions of the DR system should meet：

a）Ambient temperature：10°C~40°C

b）Relative humidity：30%~75%

c）Atmospheric pressure：700 hPa ~1060hPa。

1.6.1.2 Power conditions

The power conditions of the DR system should meet：

a) Power supply voltage: single-phase 220V, fluctuations in network voltage should not exceed ±10% of the nominal value.

b) Power supply frequency: 50Hz±1Hz.

c) Power supply internal resistance: ≤ 0.17Ω

d) Power supply capacity: ≥80kVA.

● 1.6.2 Electric power

1.6.2.1 Maximum output electric power

Maximum output electrical power: 32kW (80kV, 400mA).

1.6.2.2 Nominal electrical power

Nominal electrical power: 32kW (80kV, 400mA, 0.1s).

● 1.6.3 Loading factors and control

1.6.3.1 X-ray tube voltage

a) The adjustment range of the X-ray tube voltage is 40kV to 125kV, adjustable in steps of 1kV.

b) The deviation of the X-ray tube voltage value shall be no greater than ±10%.

1.6.3.2 X-ray tube current

(a) The adjustment range of the X-ray tube current is 10mA to 400mA, adjustable in steps, with the steps selected in the R'10 number system.

(b) the deviation of the X-ray tube current value should not be greater than ± 20%.

1.6.3.3 Loading time

(a) The adjustment range of the loading time is 1 ms to 6300 ms, adjustable in steps, with the steps selected in the R'10 number system.

b) The deviation of the loading time value shall be ≤ ± (5% + 0.2ms).

1.6.3.4 Current time product

(a) The adjustment range of the current time product is 0.1mA-s to 150mA-s, adjustable in steps, the steps being selected in the R'10 number system.

(b) The deviation of the current time product value shall be ≤ ± (5% + 0.2mA-s).

1.6.3.5 Overload protection

The DR system shall have anti-overload measures to ensure that the loading factors are not selected to exceed the rated capacity of the X-ray tube, and that the maximum combination of loading factors shall be in accordance with Figure 1-2 and Figure 1-3.

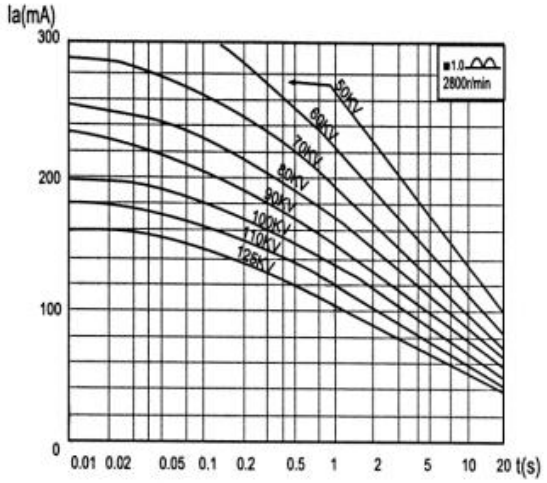


Figure 1-2 X-ray tube small focus load characteristic curve

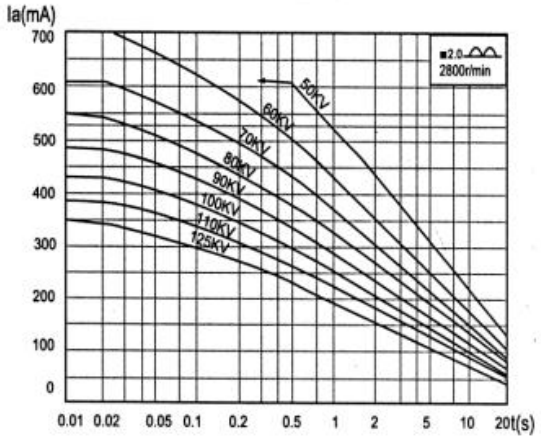


Figure 1-3 X-ray tube large focus load characteristic curve

1.6.3.6 Correspondence between X-ray field and image receiving surface

The equipment shall be measured in all normal modes of use, respectively, at the SID of 1000 mm for clinical use as specified in the accompanying documentation, and the measurements shall conform to the following requirements.

a) When the image receiving plane is perpendicular to the reference axis, the sum of the deviations between each side of the X-ray field and each corresponding side of the image receiving plane along each of the two principal axes of the image receiving plane shall not exceed 3% of the distance from the indicated focal point to the image receiver.

(b) The sum of the deviations between the two axes shall not exceed 4% of the distance from the indicated focal point to the image receiver.

● 1.6.4 Imaging performance

1.6.4.1 Spatial resolution

The spatial resolution of the image shall be not less than 3.7 lP/mm in the case of aluminium (>99.5% purity) attenuated bulk mode with a thickness of 25 mm.

1.6.4.2 Low contrast resolution

The low contrast resolution in the nominal incident field mode shall be not greater than 2.3%.

1.6.4.3 Dynamic range

The number of discernible dynamic steps in the nominal field of view mode is not less than 16.

1.6.4.4 Image uniformity

The ratio of the standard deviation of the grey value R to the mean grey value Vm at sampling points with a loading factor of 70 kV, 2.5 mA-s and an SID of 1000 mm is not greater than 2.5% .Formula（1）:

$$\frac{R}{V_m} \times 100\% \leq 2.5\% \quad \text{……（1）}$$

In it： R=Standard deviation of greyscale values;

V_m=Mean value of grayscale values.

1.6.4.5 Effective imaging area

The effective imaging area is 43cm x 43cm and the actual effective field size is not less than 95% of the nominal value.

1.6.4.6 Remnants

At a loading factor of 70 kV, 2.5 mA-s and an SID of 1000 mm no visible residual images exist.

1.6.4.7 Artefacts

No visible artefacts affecting the clinical diagnosis were present at a loading factor of 70 kV, 2.5 mA-s and a SID of 1000 mm.

1.6.4.8 Detector calibration and stability test

a) The DR system has the capability to support the user in routine detector calibration.

b) The user should calibrate the detector every six months or when exposure conditions have changed significantly.

1.6.4.9 Quantum detection efficiency

The value of the quantum detection efficiency of the detector used shall be given in the random file for the specified standard radiation mass, exposure dose and different spatial frequencies (e.g. 0.5 lp/mm, 1.0 lp/mm, 1.5 lp/mm, 2.0 lp/mm, 2.5 lp/mm, 3.0 lp/mm, 3.5 lp/mm).

● 1.6.5 Mechanical device performance

1.6.5.1 Mechanical range of motion

1) Mechanical range of motion of the camera bed

a) Dimensions (length x width): 1400mm x 720mm (±10mm).

b) Bed longitudinal movement stroke: not less than 100mm.

c) Bed transverse travel: not less than 320mm.

2) Attenuation equivalent

The bed surface attenuation equivalent ≤ 0.5mmAl.

1.6.5.2 Braking force

The linear motion part of the mechanical device should have a braking device, and its braking force should be not less than 100N.

1.6.5.3 Starting force

The starting force shall be not more than 50 N.

1.6.5.4 Load-bearing

The support device shall be able to work normally after bearing a mass of 100kg.

1.6.5.5 Noise

The noise generated during operation under no load (non-load bearing condition) is not greater than 70dB (A) (excluding non-continuous and non-periodic noise within 3s).

1.6.5.6 High voltage inverter frequency

High voltage inverter frequency: ≥ 25kHz.

● 1.6.6 Networks and Software

1.6.6.1 Network communication

Conforms to DICOM 3.0 standard.

1.6.6.2 Information management

a) Examination registration management: registration of patient information, which is stored in the database and associated with the images examined by the patient.

b) Film examination: according to the registered examination site, film examination is performed, and the body position can be added or deleted at any time, and the film dose can be adjusted.

c) Diagnostic aids: DR images are enhanced, providing a range of diagnostic aids such as map adjustment, cropping and labelling.

d) Case management: patient cases and examination images are stored in a database and can be viewed at any time.

e) System interfacing: Adopting the standard DICOM 3.0 communication protocol, it can easily access hospital HIS, RIS, PACS and other systems, and connect to DICOM film printers.

f) Film printing: supports local printing and DICOM network printing.

g) Diagnostic reports: Reports can be set up according to the needs of the hospital or department, and the report layout can be edited.

1.6.6.3 Imaging time

The imaging time is no more than 3s.

1.6.6.4 Preview time

The preview time is not greater than 2s.

● 1.6.7 High voltage cable plugs, sockets

Conform to the requirements of GB/T 10151-2008 regarding type and basic dimensions, marking and connection.

● 1.6.8 Appearance

a) The DR system is neat and beautiful in appearance, with a flat and smooth surface and uniform colour, without defects such as bruises and cracks.

b) Clear text and markings.

c) The main plating parts conform to the requirements of YY 0076-1992 for the appearance of class 2.

d) The main painted parts conform to: smooth surface and even colour; no exposed bottom, blistering, flaking, cracking, whitening or hanging.

● 1.6.9 Environmental test

Comply with the requirements of YY/T 0291-2016.

● **1.6.10 Safety**

Comply with the requirements of GB 9706.1-2007, GB 9706.3-2000, GB 9706.11-1997, GB 9706.12-1997, GB 9706.14-1997, GB 9706.15-2008 and YY 0505-2012.

1.7 Operating procedures

There are certain operating procedures that we should follow when using the Animal DR, especially the sequence of power on and off. Please read this section and the following chapters carefully before using the Animal DR officially. Figure 1-4 shows the operation flow of the Animal DR system, if you have any questions please contact us.

Figure 1-4 Animal DR system operation flow chart

1.8 Important symbols

	Disconnection (mains supply)		Attention! Check the random file	Note	Note
	Connected (mains)		Type B application section	Dangers	Dangers
	Grounding (earth)		Focus position	Warning	Warning
	Hot and humid weather		Ionising radiation		Operating manuals
	Hazardous voltage		Small Focus		No touching
	Protective earthing		Big focus		Anode sockets for high voltage cables
	Moving up		Fragile, so be careful		Cathode sockets for high voltage cables
	Avoid sunlight		No stacking of yards		Avoid rain
	Temperature limits for storage and transport		No Tumbling		

Chapter 2 Safety

2.1 Safety Symbol Descriptions

The following safety precautions are used to highlight certain safety instructions：

DANGER

DANGER: "DANGER" is used to identify a situation or operation where a specific hazard is known to exist and where ignoring this instruction could result in serious injury or death or significant property damage.

WARNING

WARNING: "WARNING" is used to identify a situation or operation where a specific hazard is known to exist and where ignoring this instruction could result in serious injury or property damage.

Caution

Caution: "Caution" is used to identify situations or operations that may be potentially hazardous and, if ignored, may result in minor personal injury or property damage.

NOTE

NOTE: "NOTE" is used to instruct the user on installation, operation, and maintenance information that is not hazardous, but is important for proper operation.

2.2 Caution

- This instrument should be sold and installed by professional sales personnel.
- This instrument should be operated by or under the direction of a qualified operator.
- Before operating the instrument, ensure that you have read and accurately understood all the contents in this manual, including product overview, safety, hardware installation and calibration, workstation software installation, workstation operation procedures, turning on the system, turning off the system, routine maintenance, troubleshooting and troubleshooting.
- Pay special attention to the contents of the manual that are marked with "Danger", "Warning", "Caution", and "Tips".
- Before use, please fill out the Product Warranty Card completely, accurately record important information such as the user's name, contact person, contact phone number, equipment number, and date of purchase, tear off the first copy and return it to our company, and keep the second copy of the Product Warranty Card together with the Product Certificate of Conformity, etc.
- When the Product Manual is not used frequently, please keep it with you for future reference.

2.3 Declaration

The manufacturer is considered responsible for the safety, reliability and performance of the instrument only in the following cases, i.e.

- Assembly operations, expansion, readjustment, improvement and repair are carried out by personnel approved by the manufacturer.
- The electrical equipment in question complies with national standards.
- The instrument is used in accordance with the operating instructions.

WARNING

■ Failure to achieve a satisfactory maintenance program for each hospital or institution responsible for using this instrument may result in abnormal instrument failure and may endanger personal health.

2.4 Radiological Protection

The instructions in this document should be read and understood before starting to operate the equipment. We are willing to provide assistance and cooperation in putting this system into operation.

This equipment incorporates a high-intensity protection device to resist X-ray radiation beyond the useful beam. However, this equipment does not replace the basic requirement for protection against radiation - that is, the high degree of care that each user must take to prevent a situation in which he or she or another person is exposed to radiation through the negligence, error or ignorance of a particular person.

Every person associated with the operation of x-ray equipment must take sufficient steps to ensure protection from injury. All persons authorized to use the equipment must be aware of the dangers of exposure to X-rays in order to prevent any injury or damage resulting from such exposure. We strongly recommend that users use protective materials and equipment to prevent any damage and destruction due to X-ray radiation.

2.5 Precautions

● 2.5.1 General safety

- Always pay attention to the patient and do not allow the patient to act alone.

- In case of an emergency, remove the patient quickly.
- Keep the equipment clean. Remove liquids from the body to prevent damage to health and affect internal parts. Clean the equipment with warm soapy water or neutral disinfectant.
- Familiarize yourself with the hardware functions so that you can detect serious problems. If the machine is damaged or malfunctioning, do not use it and wait for qualified personnel to fix the problem.
- Do not call any software on the computer that is not part of the system; the computer must not be connected to the Internet, otherwise there is a risk of virus infection causing the system to crash.
- The equipment should be properly grounded when installed.
- This equipment does not allow electrical access that is not from this equipment, otherwise there is a risk of electrical safety.
- When this equipment is used, there may be electromagnetic interference between it and other devices. To avoid this phenomenon, it is recommended that other equipment using the same external power source as this equipment can be properly grounded by this device.

Caution Do not call any software on your computer that is not part of this system, and do not connect to the Internet, as this may cause the computer to be paralyzed.

● 2.5.2 Electrical Safety

- Avoid contact with any electrical conductor, otherwise there is a risk of electric shock.
- To ensure safe and reliable equipment performance, prepare the site according to the requirements in this manual. If you have any questions about the requirements, please contact us.
- Only personnel who are familiar with the proper operating procedures and can use the tools properly should be permitted to install, commission, repair or alter the equipment.
- This product must be properly grounded when installed and used, otherwise there may be a risk of electric shock.

Caution Avoid contact with any electrical conductor, otherwise there is a risk of electric shock.

● 2.5.3 Radiation Safety

- During each X-ray exposure, medical personnel should stand behind the lead screen or lead glass barrier, and other unrelated personnel should stay away from the lead room.
- Use the dose index provided by the radiologist or diagnostician. Use the dose value that produces the best diagnostic result and uses the least amount of X-ray exposure.

▶ Provide the necessary protection for the patient's unrelated parts and pay attention to the protection of caregivers.

▶ Do not calibrate the detector or heat the bulb while the patient or operator is in the lead room.

▶ Close the doors and windows before the official exposure and make sure that all necessary protection is in place.

• 2.5.4 Adjustment requirements

▶ If interference is found to be generated by this equipment (determined by switching the switch status of the equipment), the user (or qualified service personnel) should resolve the problem using one or more of the following methods.

- ■ Reorienting the affected equipment or repositioning the affected equipment.
- ■ Increase the separation distance between this equipment and the affected equipment.
- ■ Use a different power source than the affected equipment to power this equipment.

▶ For more advice, consult your sales or service representative.

▶ To reduce the possibility of interference, use only the connection cables recommended by us. Do not make any changes to this equipment that are not authorized by us.

▶ Do not use equipment used to transmit RF signals (cell phones, transmitters, or wireless control products) in the vicinity of this equipment. This may cause the performance to exceed the published specifications.

Caution

Do not use equipment used to transmit RF signals in the vicinity of this device, as this may cause the device to malfunction or even produce unintended results。

Caution

This device generates, uses and radiates radio frequency energy. This equipment may interfere with other medical or non-medical equipment equipment and wireless communications

• 2.5.5 Disposal of waste

The outer packaging of this product and the waste generated during use, such as dust-free cloths, empty bottles after using high pressure silicone grease, etc., should be disposed of in accordance with the regulations of the local environmental protection department.

• 2.5.6 Citation of safety standards

International Safety Standards	
IEC 60601-1-2012	Medical electrical equipment-Part 1： General requirements for basic safety and essential performance
IEC 60601-2-7-1998	Medical electrical equipment-Part 2-7:Particular requirements for the safety of high-voltage generators of diagnostic X-ray generators of diagnostic X-ray generators
IEC 601-2-28-1993	Medical electrical equipment; part 2: particular requirements for the safety of X-ray source assemblies and X-ray tube assemblies for medical diagnosis
IEC 601-1-3-1994	Medical electrical equipment - Part 1: General requirements for safety - 3. Collateral standard: General requirements for radiation protection in diagnostic X-ray equipment
IEC 601-2-32-1994	Medical electrical equipment Part 2: Particular requirements for the safety of associated equipment of X-ray equipment
IEC 60601-1-1-2000	Medical electrical equipment - Part 1-1: General requirements for safety; Collateral standard: Safety requirements for medical electrical systems

Chapter 3 Hardware Installation and Calibration

3.1 Main system components

● 3.1.1 RV-32A

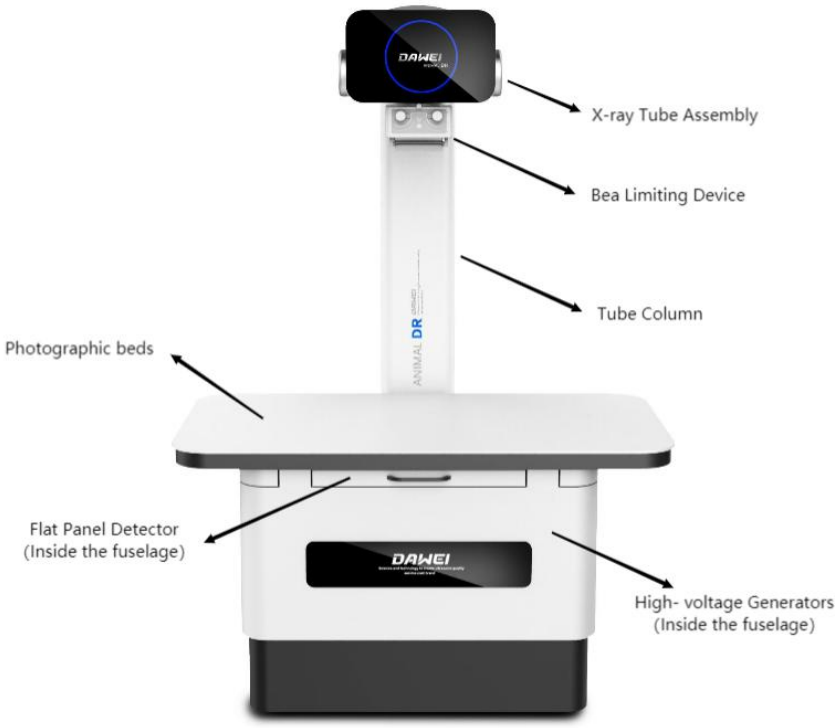


Figure 3-1 RV-32A system assembly diagram

● 3.1.2 RV-32B

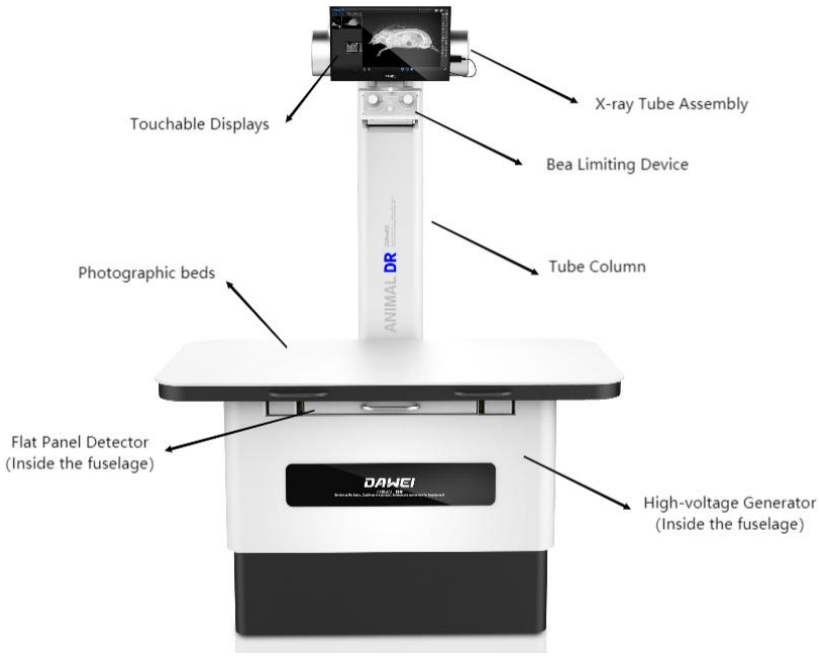


Figure 3-2 RV-32B system assembly diagram

As shown in Figures 3-1 and 3-2, the RV-32A is mainly composed of the frame part (photographic beds, tube column), high-voltage generato, X-ray tube assembly, bea limiting device, and flat panel detector; the RV-32B is mainly composed of the frame part (photographic beds, tube column), high-voltage generato, X-ray tube assembly, bea limiting device, flat panel detector, and touchable display. Foot switch, control box,workstation host (user self-assignment) and displays (user self-assignment) and more.

3.2 Storage and transportation environmental requirements

Ambient temperature: -20℃~ +55℃.

Relative humidity: 10% ~ 95%, non-condensing.

Atmospheric pressure: 500 hPa ~ 1060hPa.

3.3 Instrument installation

● 3.3.1 Rack installation

Stand the column on the base plate of the column, and use the screws to lock the column to the base plate, then connect the reinforcement plate to the rack position and fix the lock.

● 3.3.2 Installation of high voltage generator

The installation of the high-frequency high voltage generator is described in the DTXR-32C/50C GENERATOR OF MEDICAL DIAGNOSTIC RADIOGRAPHY SYSTEM Operator Manual.

● 3.3.3 X-ray tube assembly installation

First, take off the upper part of the tube clamp from the bracket and put the tube on it, then put the removed tube clamp on it, and then fix it with screws, as shown in Figure 3-3.

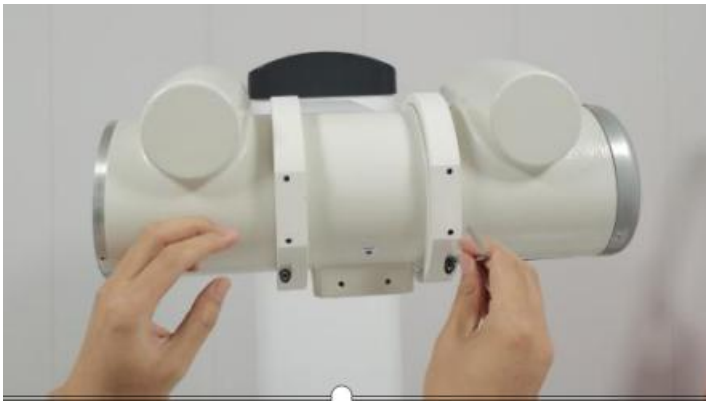


Figure 3-3 X-ray tube assembly installation diagram

● 3.3.4 Bea limiting device installation

Connect the bea limiting device to the X-ray tube assembly window, as shown in Figure

3-4.

Figure 3-4 Bea limiting device installation diagram

● 3.3.5 Metal housing of X-ray tube head（RV-32A）or Touchable display（RV-32B）Installation

Place the metal housing of X-ray tube head on the rack, keep both sides horizontal without tilting. As in Figure 3-5.

Install the touchable display to the bracket and assemble the bracket on the rack, fix and lock it, then connect the power cable, video signal cable, and data cable respectively, as shown in Figure 3-6.

Figure 3-5 Diagram of Metal housing of X-ray tube head installation diagram

Figure 3-6 Touchable display installation diagram

● 3.3.6 Installation of flat panel detector

As shown in Figure 3-7, install the flat panel detector, fix and secure the flat panel detector, then plug the flat panel detector cable into the power cord and network cable separately.

Figure 3-7 Flat panel detector installation diagram

● 3.3.7 The whole machine assembly

Connect the foot witch power cable and exposure cable to the corresponding interface behind the bed tightly, and place the foot witch at an adapted position after completion. After connecting the line, then connect the network cable and signal cable through the lead room to the computer.

Attention

When install each component, all screws must be tightened, otherwise there is a risk of falling.

3.4 Image processing system installation

Place the image processing system on a workstation outside the radiology room and connect each cable to image processing system.

If the image processing system needs to be connected to RIS, PACS, laser printer, etc., use a standard network cable with appropriate length to connect the network interface of the acquisition workstation and the network interface of other devices.

3.5 Animal DR system commissioning

The system has been adjusted to the best state of each parameter before leaving the factory, but due to changes in the working environment of the flat detector, the instrument

needs to do the necessary calibration of the flat detector after the installation is completed.

3.6 Calibration

The purpose of the calibration process is to overcome the anode effect, to compensate for defective pixels, and to correct the pixel gain of the detector and X-ray tube.

Calibration of the equipment is required when the following conditions occur:

When a detector is first installed or replaced.

When the X-ray tube is first installed or replaced.

When the beam limiter is first installed or replaced

When other image quality conditions occur, such as artifacts.

● 3.6.1 X-Ray tube calibration

3.6.1.1 Power up the high voltage generator and turn it on.

a） Close the main gate of high-voltage power supply.

b） Start "RemedyServiceTool.exe".

3.6.1.2 Login as an engineer

a） Click "File"->"Login", and a window will pop up asking you to answer the login password, as in Figure 3-8 and Figure 3-9.

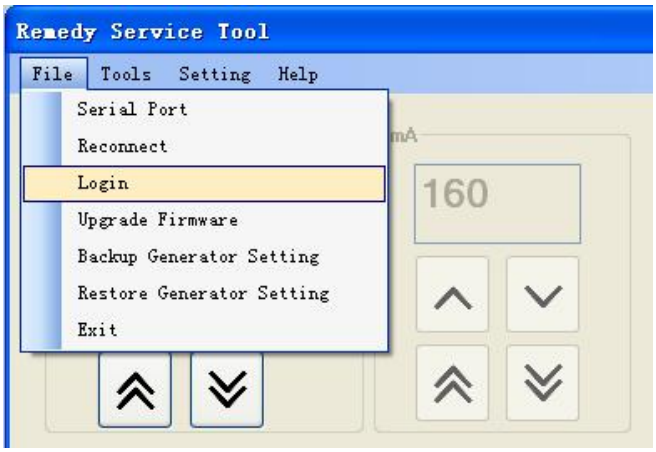


Figure 3-8

Figure 3-9

b） Fill in "remedy2014" and click "OK".

3.6.1.3 Select Tube Model

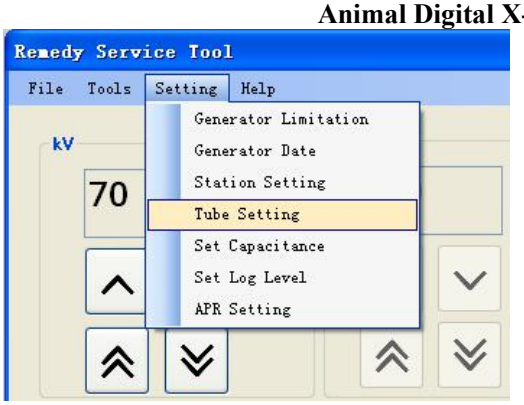


Figure 3-9

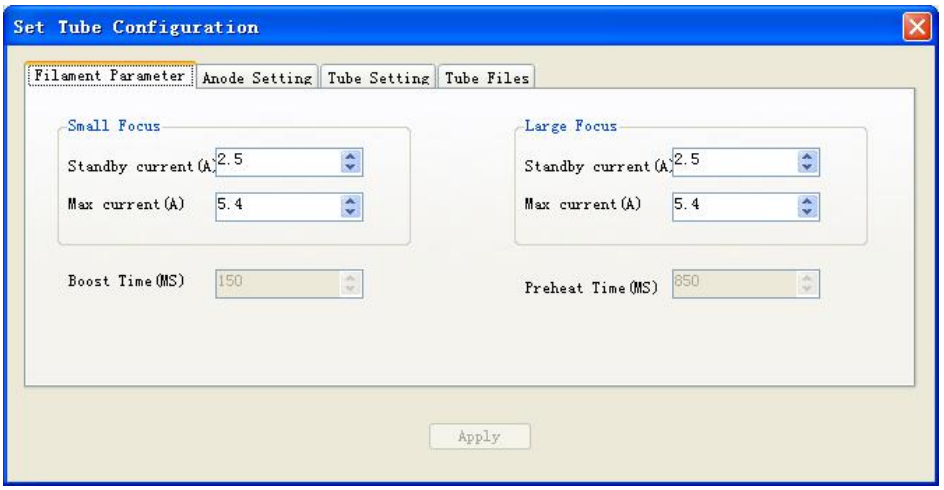


Figure 3-10

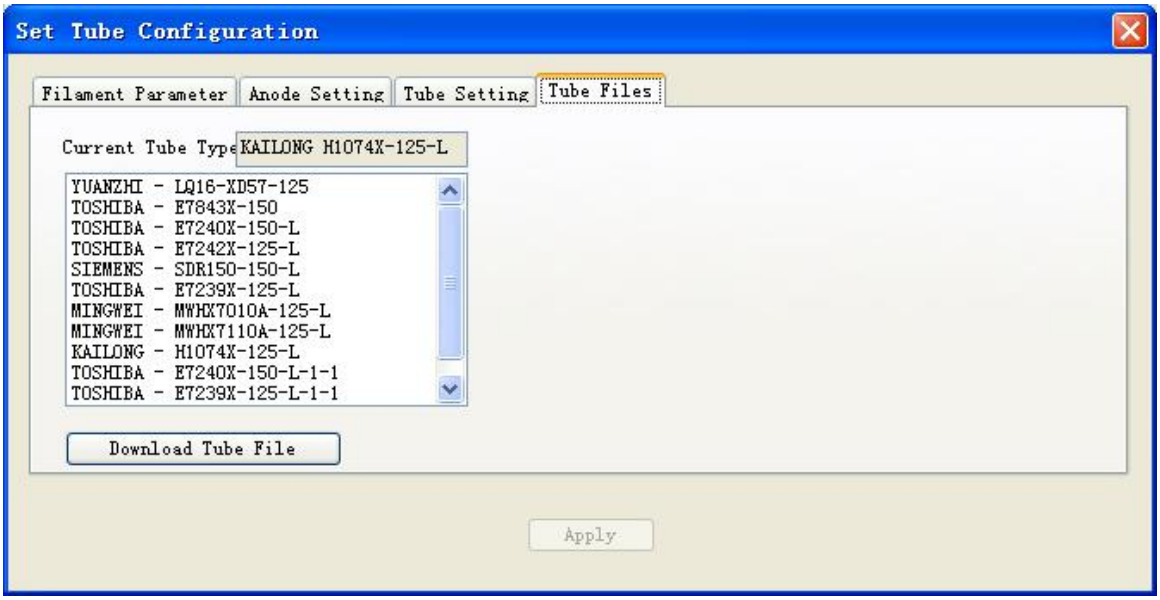


Figure 3-11

Follow Figure 3-9, Figure 3-10 and Figure 3-11 to select the tube type, then click "Download Tube File", if there is no error, a success window will pop up, as in Figure 3-12.

Figure 3-12

Click "OK" to close the window for setting the tube.

3.6.1.4 Filament Calibration

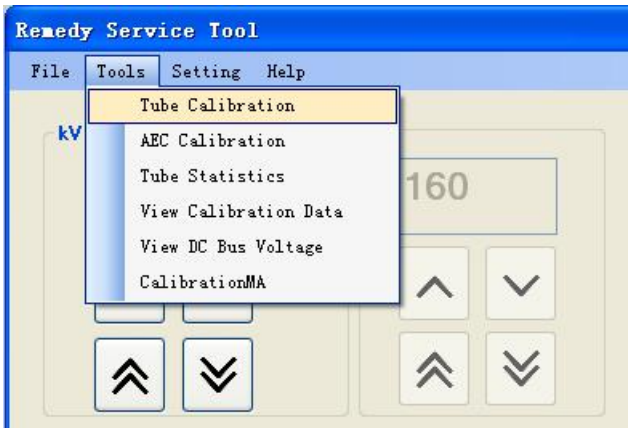


Figure 3-13

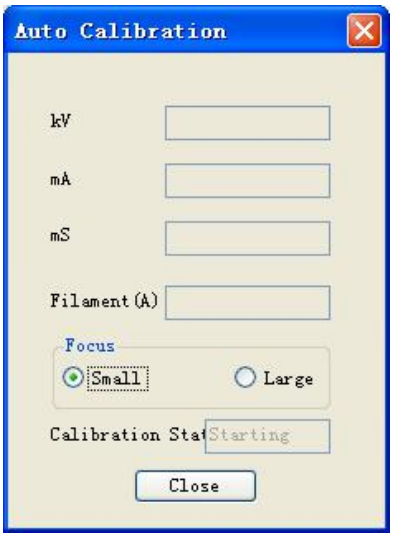
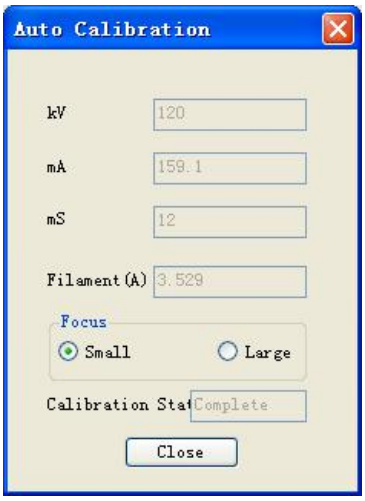


Figure 3-14

a）Small Focus Filament Calibration

■ Select "Small" under "Focus", as in Figure 3-13 and Figure 3-14.

■ Press the exposure handbrake to the end and do not let go, the calibration exposure begins, as shown in Figure 3-15. The calibration process ends in approximately 4 minutes.



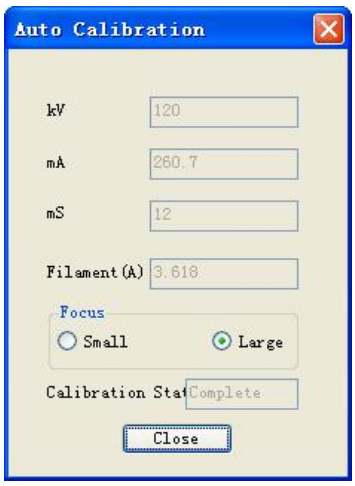


Figure 3-15

Figure 3-16

At this point, the calibration of the small focus filament of the bulb is complete.

b） Large Focus Filament Calibration

■ Select "Large" under "Focus".

■ Press the exposure handbrake to the end, do not let go, calibration of the exposure begins, as shown in Figure 3-16. calibration process in about 4 minutes

At this point, the calibration of the large focus filament of the bulb is complete.

● 3.6.2 Flat Panel Detector Calibration

Open the testUI, make sure don't put any object on top of the flat panel before doing the template, make sure the flat panel type is correct,1717 panel type is 4343A,as shown in Figure 3-17, make sure the “Pre-processing” and “Post-processing” status is “Raw” (if not, please change it to “Raw”) .

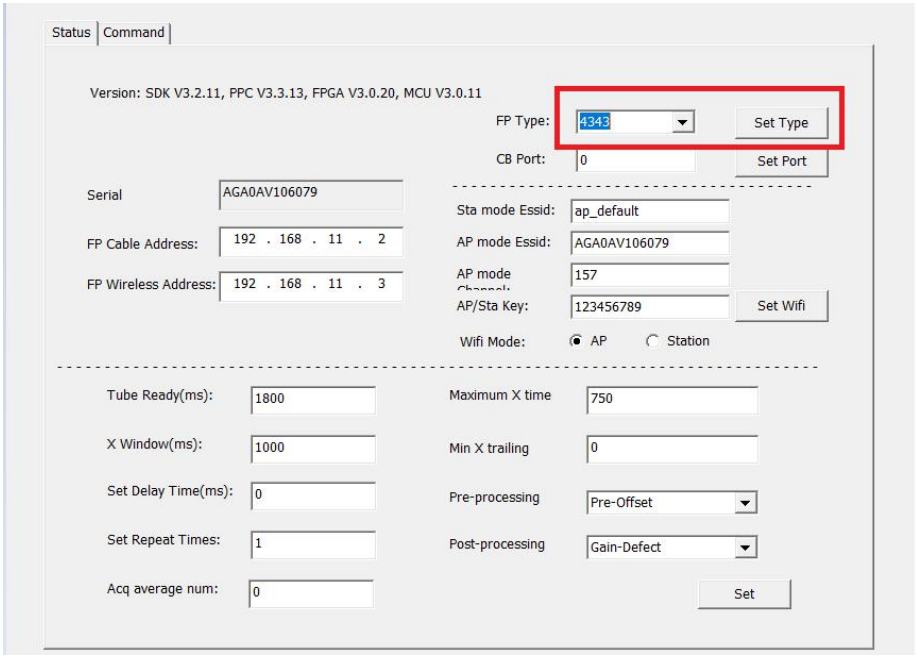


Figure 3-17

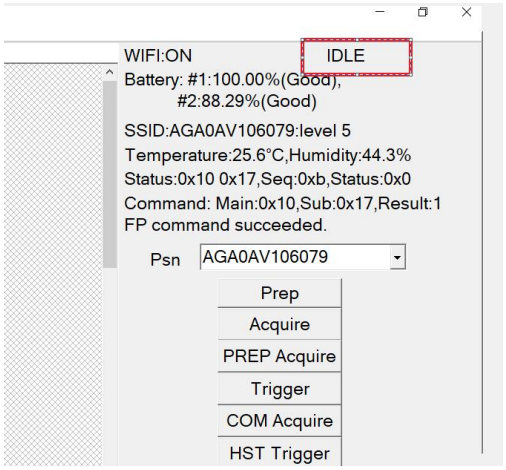


Figure 3-18

Figure 3-19

a）Exposure as the template

As shown in Figure 3-18, after the successful connection to the flat panel, click open, the status at upper right corner is IDEL. (If is not IDLE please click stop to let the status change to IDLE)

Click AED Trigger on the right interface, wait for the status at upper right corner to AED2, distance 1.0 m, 70KV, 3.6MAS (dose varies with the actual situation and change, to ensure uniform exposure grayscale value can be achieved) exposure.

As shown in Figure 3-19, after the image comes out, confirm the value is between 30000-40000 at lower left corner. If the value is not enough, please increase or reduce the dose, and then exposure, until the value is between 30000-40000 .

After confirming that the Value is between 30000-40000, do not move the dose, click STOP, and the status in the upper right corner changes from AED2 to IDEL mode.

b）Click the Template button in the upper left corner of the interface, and select the AED Quick Generate button, as shown in Figure 3-20.

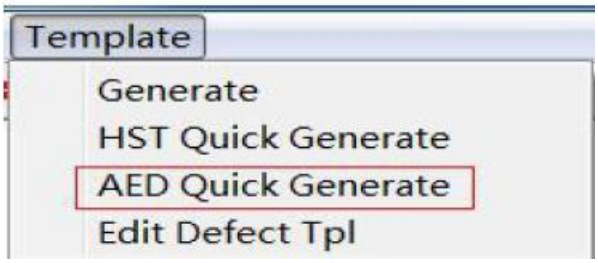


Figure 3-20

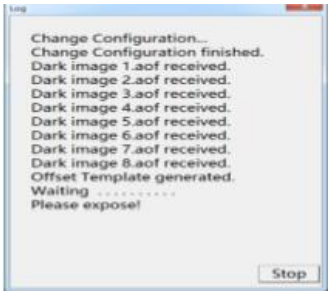


Figure 3-21

c）A pop up template generation dialog. It takes about 10 minutes, as shown in Figure 3-21.

d）When the interface shows Please expose, you need to manually expose to get the bright field map, please expose until all the bright field map is completely taken (a total of 8

times to expose, take 8 pictures) Finally the interface shows Finished, and exit the message indication, that means generation of the template is complete, as shown in Figure 3-22.

Figure 3-22

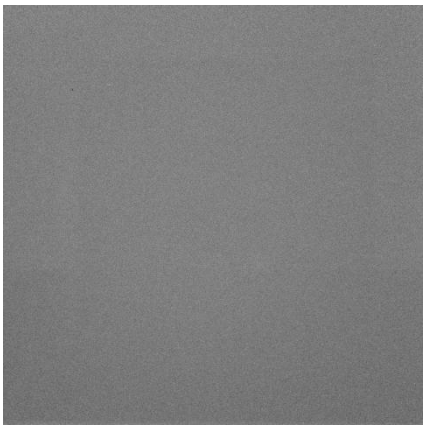


Figure 3-23

e）The calibrated image is shown in Figure 3-23.

3.7 Optic system adjustment

● 3.7.1 Purpose

During the initial installation, it is possible that the view of the X-ray and the view of the beam limiter do not overlap. In this case, it is possible that the X-ray and the detector center cannot be calibrated to be perpendicular, resulting in uneven brightness between the left and right images or a skewed image. Therefore, it is necessary to adjust the position of the components during installation to ensure that the view of X-rays and the of view of the beam limiter are overlapped , and that the X-rays and the detector center are perpendicular.

● 3.7.2 Adjustable parts for optical alignment

a） Bea limiting device adjustment

The bea limiting device adjustment is to coincide the X-ray radiation field with the bea limiting device radiation field.The adjustment part is shown in Figure 3-24,with a switch lock,which can be adjusted to the right side to rotate the bea limiting device and then released to achieve the above purpose.

Figure 3-24 Position adjustment diagram of bea limiting device

b）Adjustment of the vertical orientation of the focus and flat panel detector

The adjustment of this position is used to adjust the horizontal line of the bea limiting device's light view to coincide with the vertical line of the flat panel detector, the adjustment position is shown in Figure 3-25, loosen the two hexagonal screws and rotate the X-ray tube assembly, so as to adjust the focal point in line with the vertical direction of the flat panel detector.

Figure 3-25 Position adjustment diagram of the X-ray tube assembly focal point and the flat panel detector's vertical direction

Chapter 4 Workstation Software Installation

4.1 Installation Environment

	Minimum Configuration	Recommended configuration
Processor	I3 2.4G	I5 3.0G or above
Memory	2G	More than or equal to 8G
Hardware	500G	More than or equal to 1T
Network card	1000M Independent Network Card	1000M Independent Network Card
Operating System	Windows 7	Windows 10

4.2 Installation Steps

■ Obtain the software installation package and double-click to install it;

■ Select the installation language;

■ Following the indication to install dot Net Framework 4.6 and vc_2015, skip if already installed;

■ Select the installation path, generate a desktop shortcut, confirm and then start the installation and display the installation progress;

■ Confirm completion;

Chapter 5 Workstation operation process

5.1 Introduction to software use

● 5.1.1 Configuration software

■Configure current detector type	Automatic identification without configuration.
■Configure detector working mode	'HST' is a synchronous mode which required a hand switch and a control box. 'AED'is automatic detection mode, exposure without control box. 'TEST' is a DEMO mode, acquire image without X-ray.Please refer to detector user manual for specific steps of HST mode and AED mode.
■Configure generator type	Open the configuration tool 'Config Tool', 'HVGType' in the system directory can be configured with exposure mode. Default element is 'TEST', the generator doesn't integrate with PZDR software if you don't change it.
■Other Configurations	Refer to 5.2.6 if you would like to configure other information such as hospital name \ generator type \ DICOM node \ DICOM printer, etc. Run software after you finishing configurations above. The default username is 'Admin', and password is '1'.

● 5.1.2 Registration

■Register a patient's information and add body part items to create a study, enter acquiring interface after clicking 'check'.

■Register a patient's information and add body part items to create a study, click 'register' to save it in local worklist. Users could start examination later after batch registration.

■Emergency button simplifies register steps, users start an examination without filling many boxes, all information of a study requires to fill are providing by default.

■It is easily to switch to different interfaces such as acquisition \ worklist \database \ transmission queue, etc. you could check detector state, hard drive space and current users well.

● 5.1.3 Registered Inspection

■'Registered Inspection' interface is actually a local worklist. PZDRVET is not only able to get patient's registered studies from RIS in hospital, but also let user register studies on local workstation.

■On this interface it is abled to filter studies according to 'start time' and 'end time' by user pointing, and only display studies in this time interval as user's.

■Select a study to start this examination.

■Select registered studies that you don't need and delete.

● 5.1.4 Queue

■Displays the current state of all checks being sent by DR To pacs.

■Displays all incoming checks on the workList。

● 5.1.5 Completed Inspection

■'Completed Inspection' interface is a local studies database, you can review \delete \ send \ print and modify studies here.

■On this interface it is abled to filter studies according to 'start time' and 'end time' by user pointing, and only display studies in this time interval as user's will.

■Click 'Modify' button, Select one to check for modification information.

■Click 'review' button, Select a completed study to review this examination.

■Select a completed study or multiple completed studies then click 'delete'button to remove batch deletion on local database.

■Select a completed study or multiple completed studies then click 'Send' button to finish batch sending, later soon these studies will display in sending queue and complete tasks one by one.

■Select a completed study or multiple completed studies then click 'Print' button jump to print interface, click 'ok' to printing after images layout.

■'Report' button, Select a check to enter the report editing screen.

■'DVD Burn' button, Burns the selected check to a DVD.

■'View' button, View the image after the check is completed.

■'Export' button, Export inspection.

● 5.1.6 Exposure Interface

Exposure interface is a transitional interface, you could add and delete body part items and modify condition on virtual console. If you would like to do image processing and a series tools, please jump to acquisition interface.

a） You could add and delete body part items after starting an examination on exposure interface.

b) Different body part and different view requires different condition, there are some parameters of dose by default for each view. Virtual console will give you a reference condition after you selecting size \ view \ position 'table' or 'stand', you can also modify dose such increase and decrease by symbol '+'&'-' if you don't satisfy with reference condition, save the new dose after modification.

c）You can modify condition efficient by clicking different size. e.g, click size 'large' you

will get a bigger dose in a quick way rather than click ‘increase’ button ‘+’.

d）There are detector state, generator state and other devices state displaying on exposure interface. Doctors are supposed to follow the devices state indicator to expose..

● 5.1.7 Acquisition Interface

User can do image processing and use a series tools on acquisition interface.

a) The detector will send image to PZDR software after exposure, then image display on exposure interface after image-processing automatically.

b) There are a series tools on acquisition interface such as WWWL adjustment \ move \ zoom in and zoom out \ flip \ invert \ rotate \ brightness and contrast adjustment \ ROI \ mark \ text \ clip, etc.

c) Click ‘save’ after completing examination, image will be saved, and generate a bitmap what is corresponding to this image.

● 5.1.8 Viewing and enhance

a）There are a series tools on acquisition interface such as WWWL adjustment \ move \ zoom in and zoom out \ flip \ invert \ rotate \ brightness and contrast adjustment \ ROI \ mark \ text \ clip, etc.

b) When reprocessing, the parameters can be freely adjusted.

● 5.1.9 Print Layout

User can easily layout films on this interface.

a） Set films size you usually use in configuration file, images will be imported to film area automatically.

b） There are a series tools for image editing such as WWWL adjustment \ move \ zoom in and zoom out \ flip \ invert \ rotate \ brightness and contrast adjustment \ ROI, etc.

c） Print task will be sending to printer after you click ‘print’ button, the printer could be DICOM printer and paper printer.

● 5.1.10 Diagnostic Report

a）The doctor gives the description and diagnosis of the disease according to the image，The description and diagnosis in the system can assist doctors to complete the diagnosis， for reference only.

b ） Reports are generated after the diagnosis is completed. Besides description and diagnosis, images can be added to the report. The doctor previews the report and then prints it.

5.2 Software Function Description

● 5.2.1 Login Interface

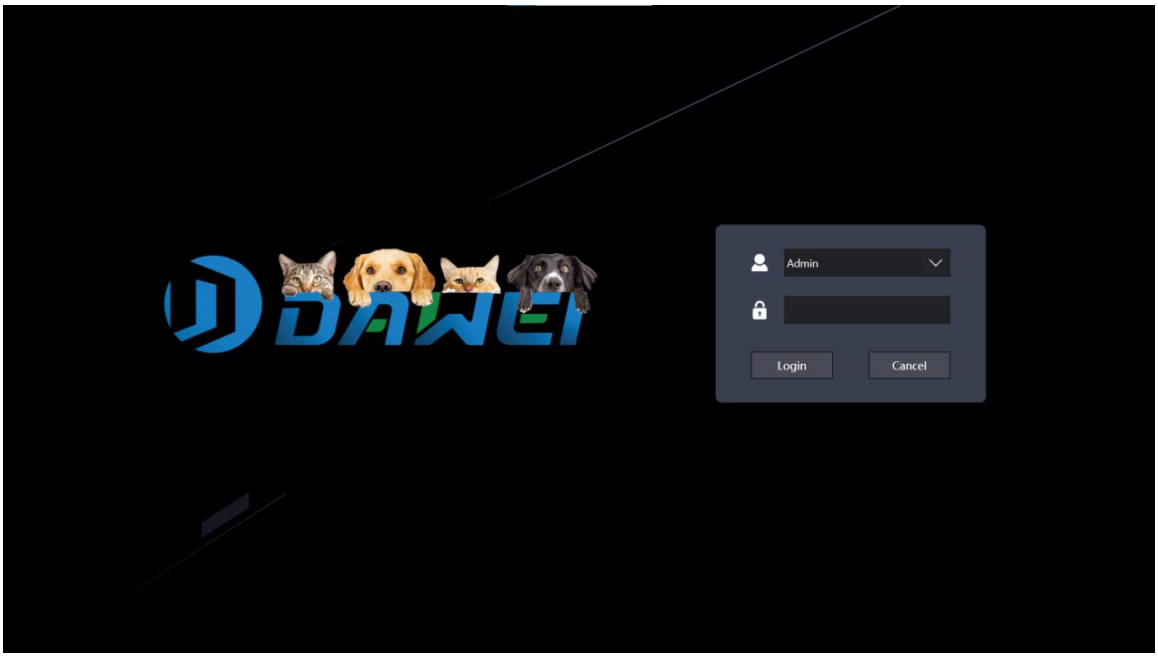
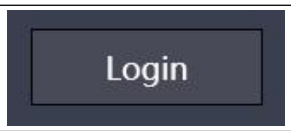
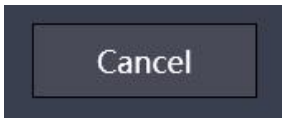


Figure 5-1 Login Interface

The default user name is ‘Admin’, and password is ‘1’.

Users are allowed to be modified\added\deleted in database.

Button	Function Introduction
	Login to system
	Cancel login

● 5.2.2 Initialization interface

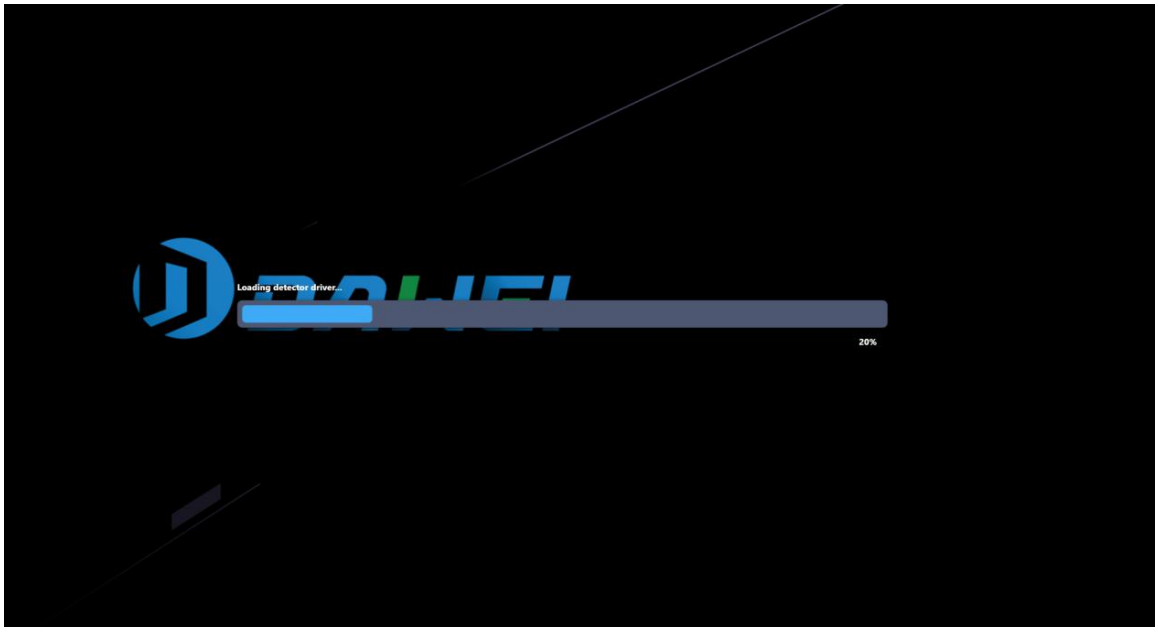


Figure 5-1 Initialize interface

There is something system needs to do before entering Register interface, which is including initialization detector, detector state checking, detector serial number checking, database initialization, generator initialization and then importing all information to display on interface. After initialization completed you will login to system successful. The progress bar shows every steps of system initialization.

● 5.2.3 The Register Interface

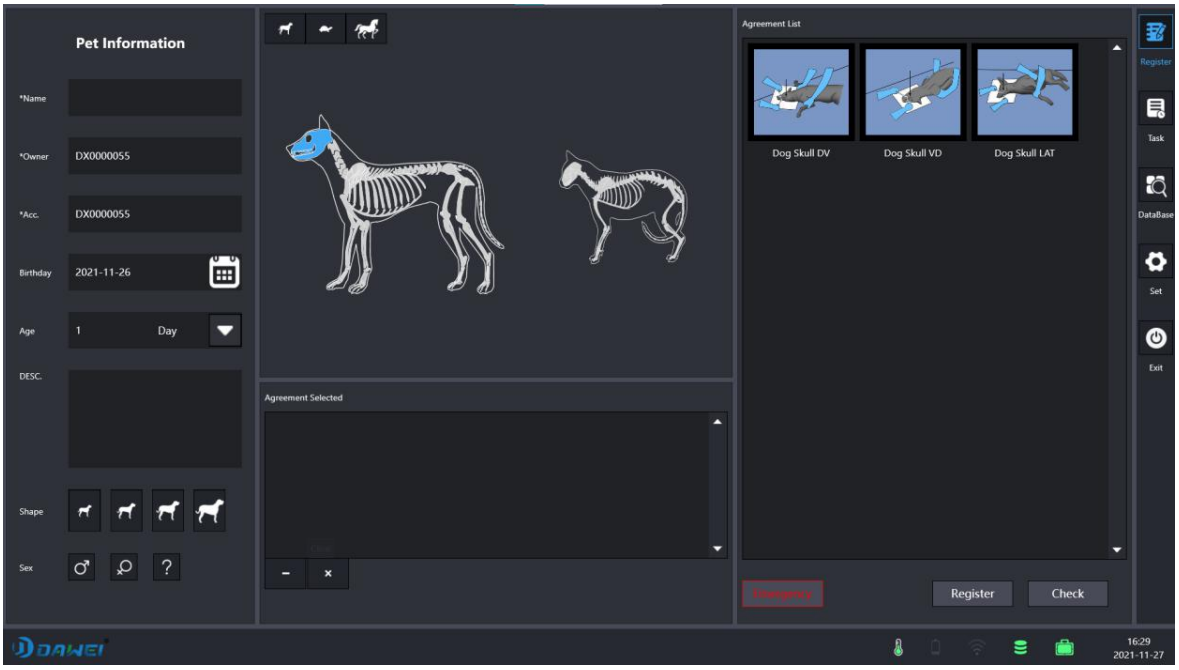
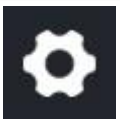


Figure 5-3 Register Interface

There are five symbols on the left corresponding to these buttons, register \ Task \DataBase \ Set\Exit.

Buttons	Function introduction
	Click it to enter the registration interface and fill patient information.
	It is actually a local worklist, both study from RIS and registered study on local workstation will exist here.
	It is actually a local database, Click to enter completed list to review studies.
	Enter the configuration interface, Password is as same as the login password.
	Exit the software.

There are software logo, current user name, current time, battery indicator, signal indicator, detector state, hard drive space and exit symbols on the top bar.

Icons	Introduction
	Software Version. Click this symbol to check current software version
	Battery Indicator. Check battery state here if the current detector is a wireless one.
	Signal state. Check the intensity variation of the signal from 0-4.
	Detector state. Click to check the current detector serial number and temperature.
	Hard drive remaining capacity. Check hard drive space remaining.
	Click it and pop-up Detector temperature.

User have to fill some boxes such as patient's name and gender, patient's ID and access number, patient's birthday and age, description, size to create a study.

The patient's name, patient's ID and access number are necessary information.

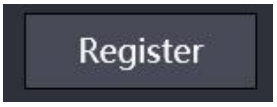
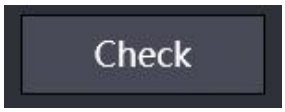
After filling the necessary information, user could add body part items to expose.

The unwanted body part items could be deleted or clear.

Button	Function
	Delete Button. Click it to delete body part item one by one.
	Clear Button. Click it to clear all body part items.

User can start an examination in a quick way on emergency interface, just need to select body part items without filling patient's information which will be generated by default.

Click 'register' button after adding body part items to create a study on register list (local worklist), or click 'check' to start an examination.

Button	Function Introduction
	Emergency Button. Start an examination in a quick way without filling patient's information.
	Register Button. Click it to create a study on register list (local worklist).
	Check Button. Click it to start an examination.

● 5.2.4 Task List

a）Task List

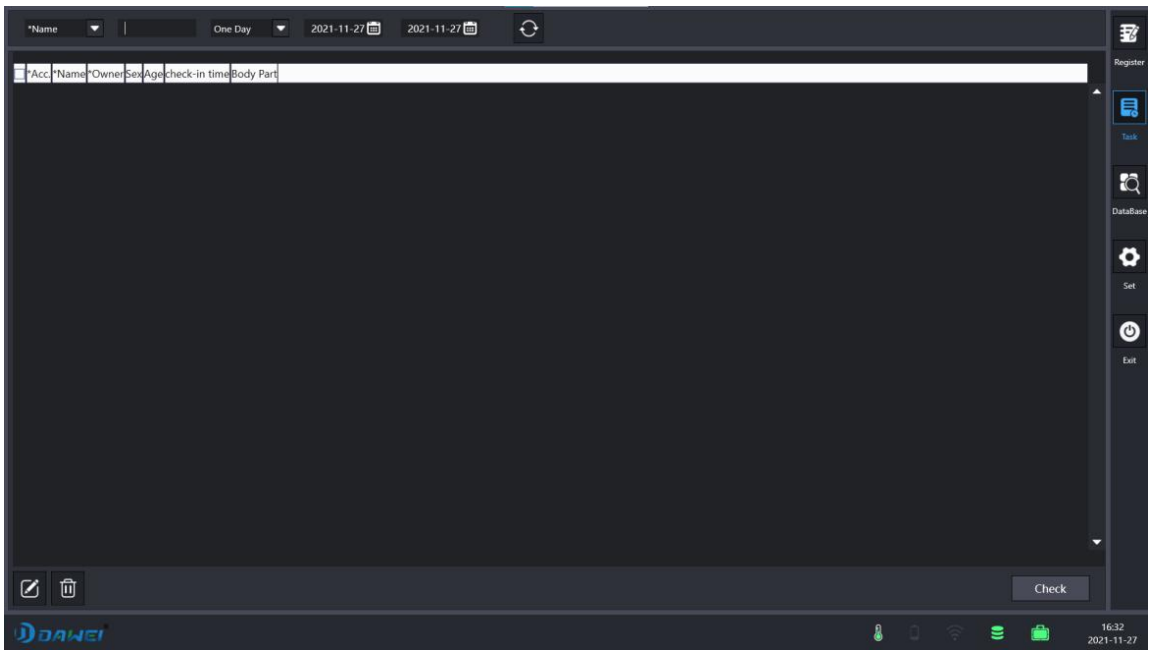


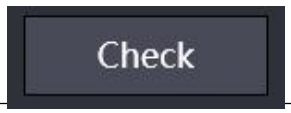
Figure 5-4 Task list

Both registered studies and studies from RIS will be saved in registered list (local worklist). On this interface it is abled to filter studies according to ‘start time’ and ‘end time’ by user pointing, and only display studies in this time interval as user’s will.

Click delete button to remove unwanted studies.

Button	Function Introduction
	Refresh Button. Fresh all checks that meet the criteria.
	Delete Button. Click it to delete selected studies.
	Modify patient information.

Jump to exposure interface if you would like to start an examination.

Button	Function Introduction
	Check Button. Select a study and click it to jump to exposure interface.

● 5.2.5 Database

a）Database

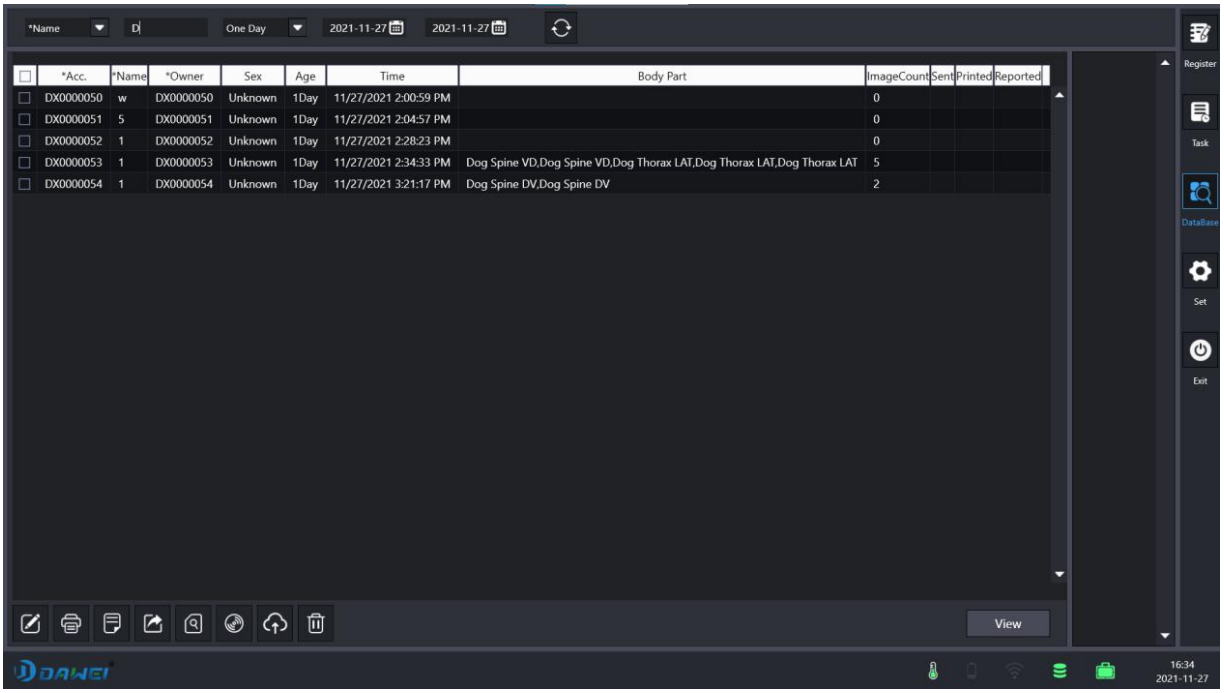


Figure 5-5 Database

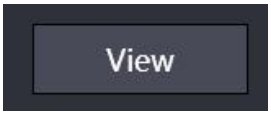
‘DataBase’ interface is a local studies database, you can review \ delete \ send \print

\report\export\ view\burn and modify studies here.

On this interface it is abled to filter studies according to ‘start time’ and ‘end time’ by user pointing, and only display studies in this time interval as user’s will.

Button	Function
	The modify button. Click to enter the modify information interface.
	Archive Button. Click it to send all studies to PACS or other nodes. Check task transmission state in the sending queue.
	Print Button. Click ‘print’ button and jump to print interface.
	Report Button. Click ‘Report’ button and jump to Report interface.
	Delete Button.
	Review Button. Click ’Review’ button and jump Exposure Interface.
	‘DVD Burn’ Button. Burn the check to the CD/DVD disk.
	‘Export’ Button. Export check.

Review completed studies.

Button	Function
	View Button. Click it to enter local database and review completed studies

b）Modify Information

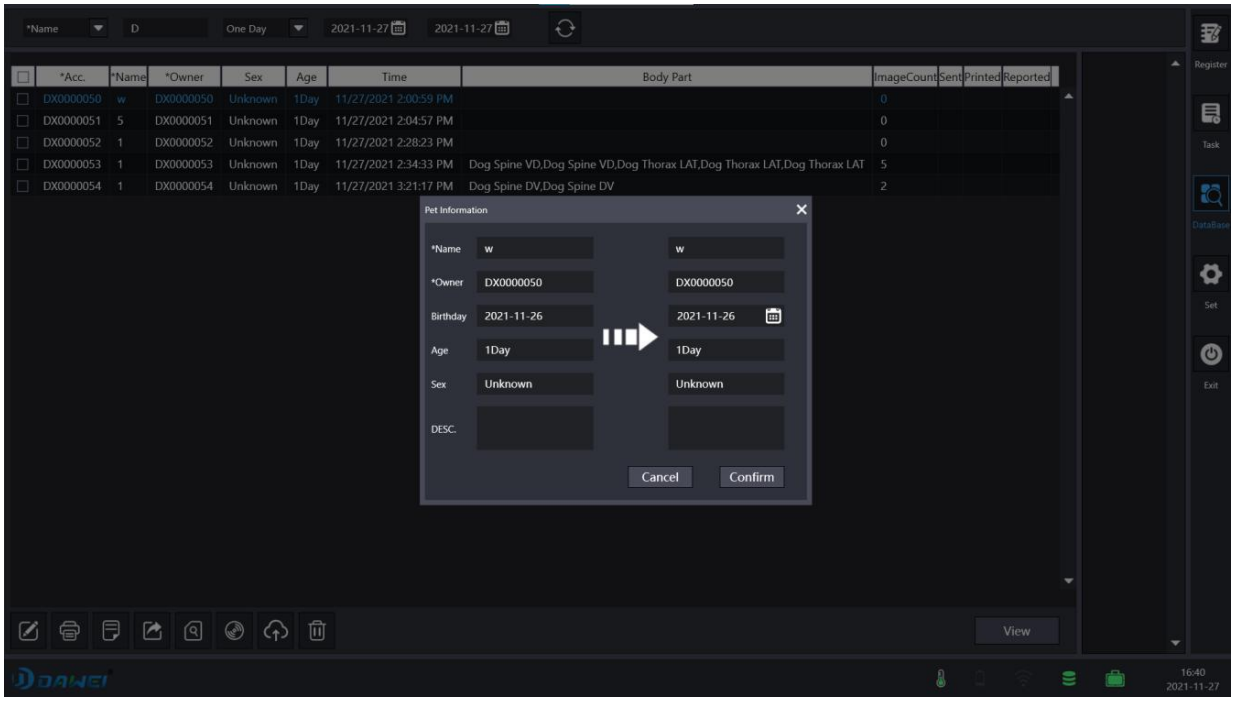
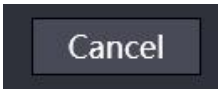


Figure 5-6 Modify Information

This interface is used to modify the pet name, owner, birthday, and age. The left side is the content before modification, the right side is the modified content. There are 2 buttons refer to return and save modification, respectively.

Button	Function
	Cancel Button , cancel the changes
	Confirm button, save the changes

c）DVD Burn

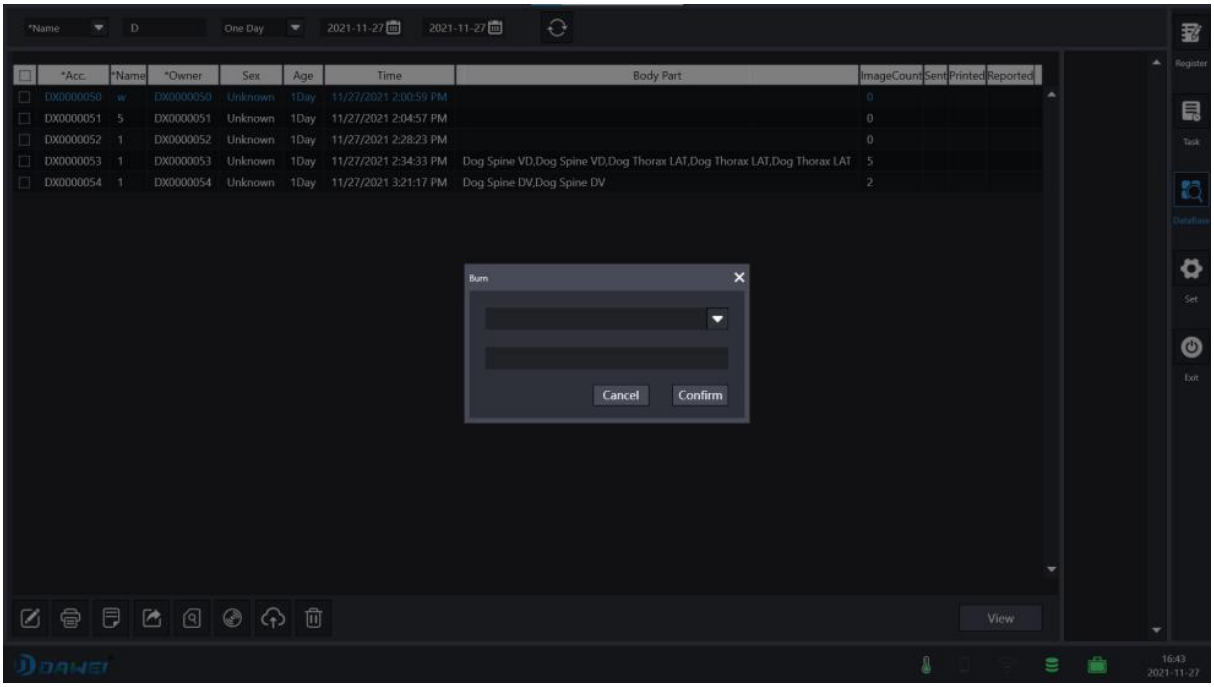


Figure 5-7 DVD Burn

There are 2 status, burning status / finished.

Button	Function
Cancel	Return Button , cancel the burn
Confirm	Save button, begin to burn

d）Export

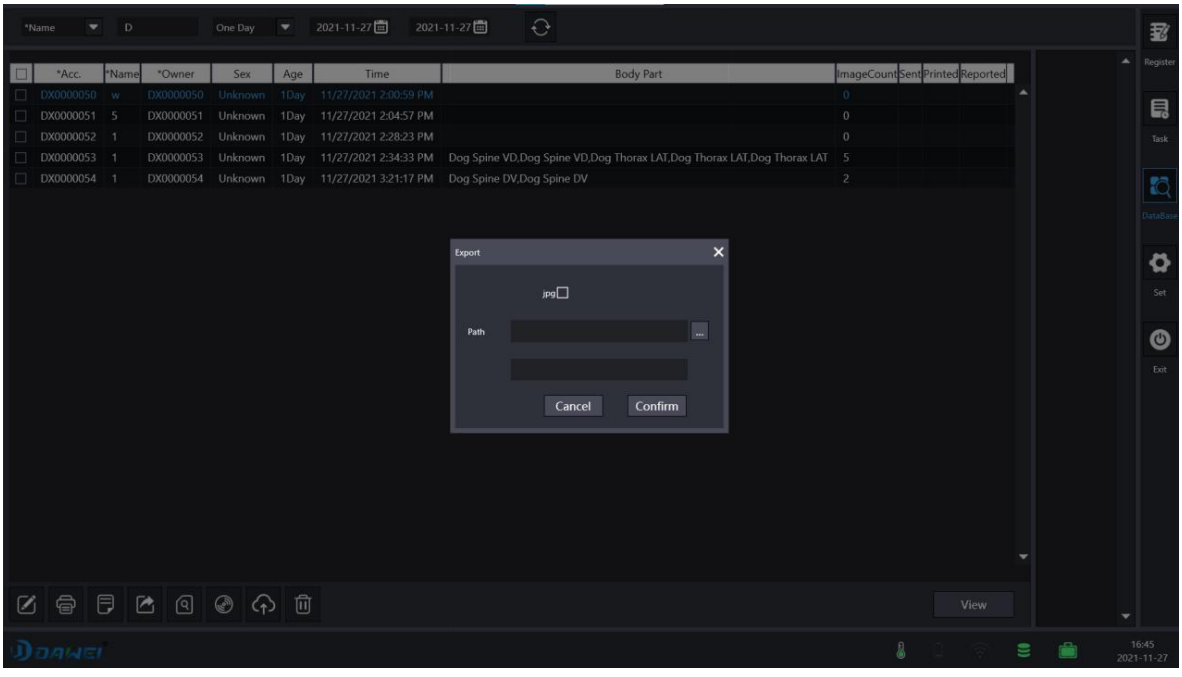


Figure 5-8 Export

Click button export, the status bar below shows the current export items

Button	Function
...	The export path
Cancel	Cancel burn
Confirm	Begin to burn

e）Send Queue

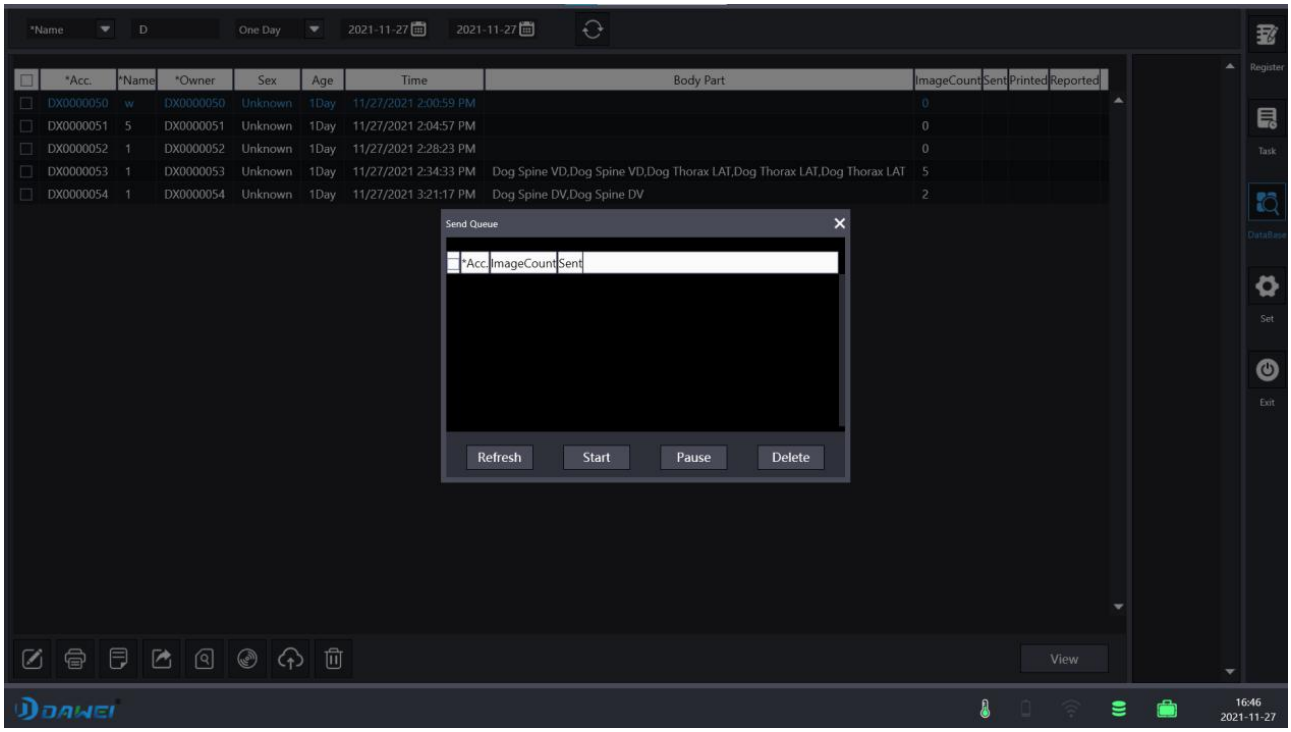


Figure 5-9 Pacs queue

Send studies to PACS.

Button	Function
Refresh	Refresh queue
Start	Start to send
Pause	Pause
Delete	Delete queue

● 5.2.6 Setup Tools

a）Click the Setting button, enter the password (the same as the software password) in the password dialog box that pops up. As shown below ：

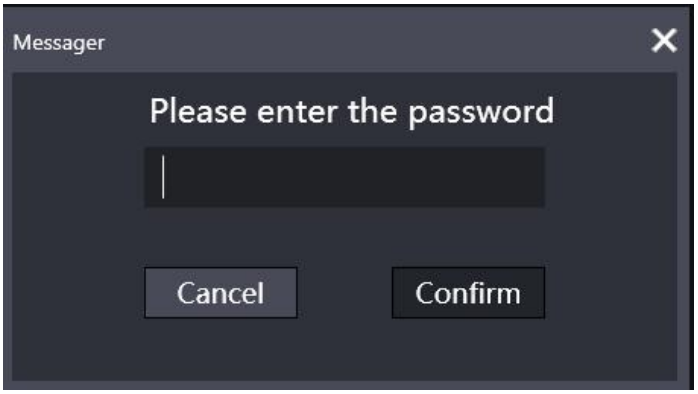


Figure 5-10

b）Configuration interface

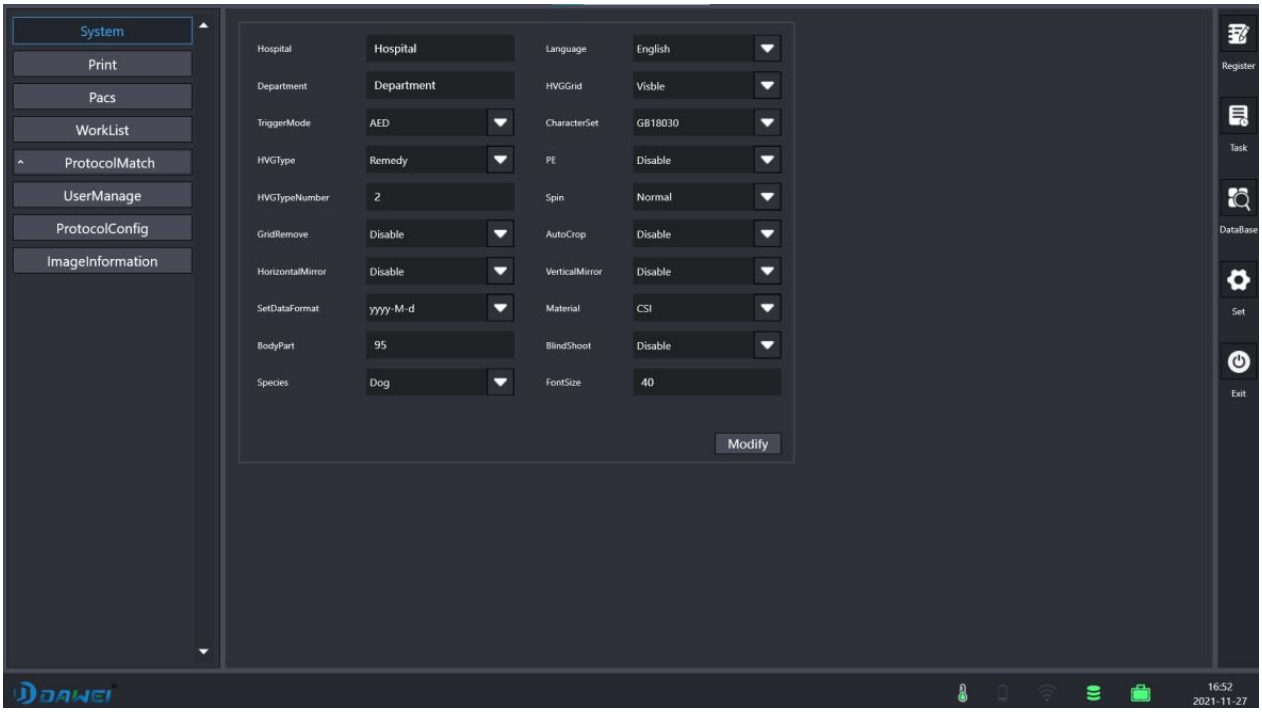


Figure 5-11 System configuration interface

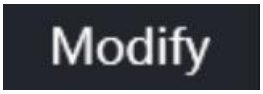
■ The hospital name: fill the name of current hospital.

■ The department name: fill the name of current department.

■ The working mode of detector: There are 3 working modes for detector, HST \ AED \ TEST.

The HST mode need to be synchronization, it is usually used with control box (option CB01 \ CB02);

The AED mode is an automatic mode, it make detector detects x-ray automatically.

	The TEST mode is a DEMO mode, user could acquire image without X-ray.
■ The generator configuration:	a ‘TEST’ for default.
■ PE：	Enable & Disable.
■ The generator port:	The actual port shall prevail.
■ GridRemove:	Enable & Disable.
■ Language:	Chinese, English, Deutsch, Russian: Chinese simplified, Chinese traditional characters, English, German, Russian, Italian, Romanian
■ CharacterSet:	character encoding
■ Spin:	Angle rotate
■ Autocrop：	Enable & Disable
■ HorizontalMirror:	Horizontal flip
■ VerticalMirror:	Vertical flip
■ Material:	GoS or CsI
■ Blindshoot：	Enable & Disable
■ Fontsize：	The font size of the tag: L.R. Manual tag
■ DataFormat:	Modify DateFormat
■ HVGGrid:	Display/hide high voltage panel
■ Species:	Select the software to display the default species
■ BodyPart：	Emergency default position
■ Graphics Card：	Enable & Disable
	Click Modify and restart the software to apply configuration

b）Print configuration

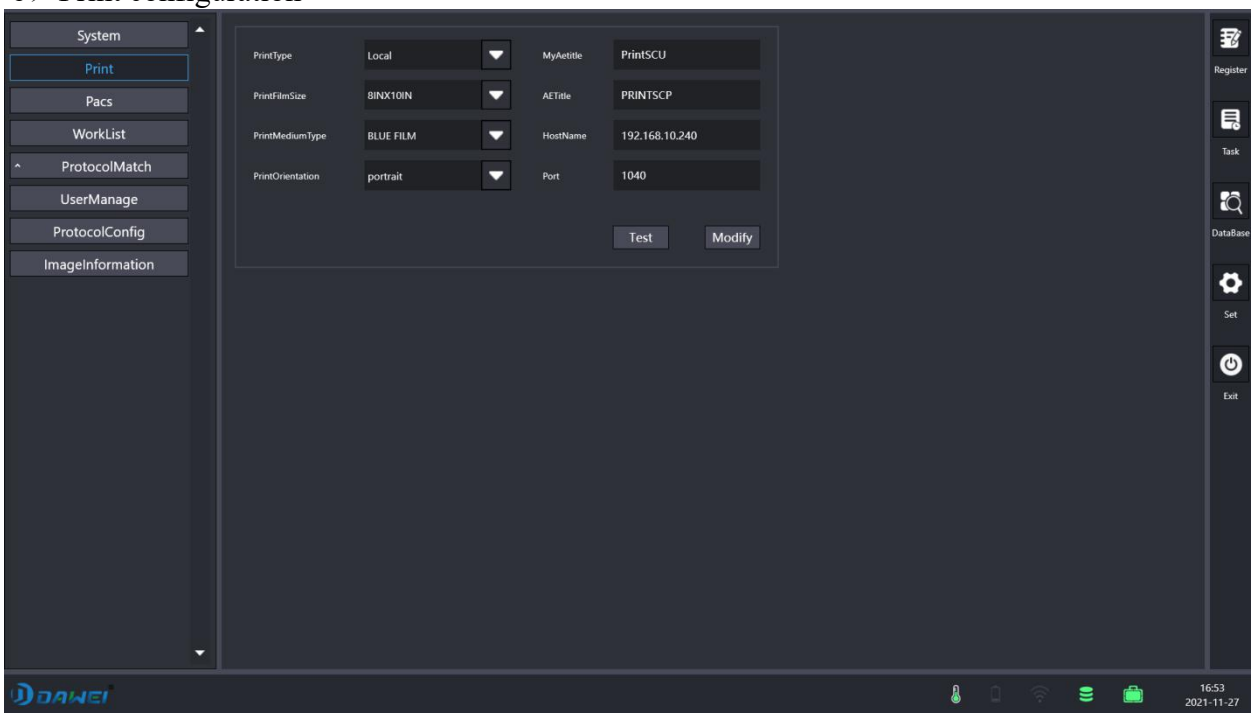


Figure 5-12 Print configuration interface

■ The printer configuration: there are two options which are DICOM and local.
Option ‘DICOM’ means user chooses a standard DICOM printer, option ‘local’ means paper printer.

■ AETitle: Printer AETitle

■ MyAETitle: Local program AETitle

■ Port: Printer Port

■ PrintFilmSize: Film size

■ PrintMediumType: BLUE FILM,CLEAR FILM

PrintOrientation: Portrait, Landscape

HostName: Printer IP

Test — Click Test to check wether the configuration was set successful

Modify — Click Modify and restart the software to apply the configuration

c）Pacs

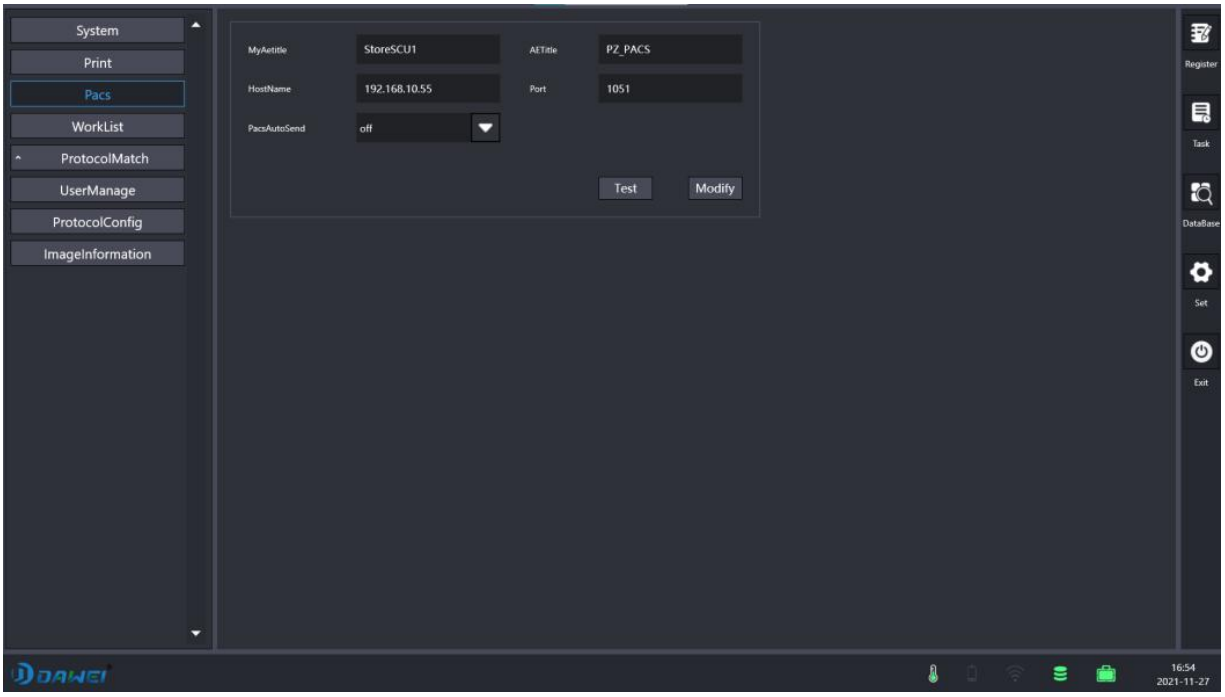


Figure 5-13 Pacs

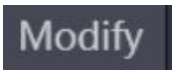
■ AETitle: PACS AETitle, Consistent with PACS in hospital.

■ HostName: PACS IP, Consistent with PACS in hospital.

■ Port: PACS IP, Consistent with PACS in hospital.

■ The configuration of sending to PACS automatically: There are two options, ON and OFF.

Click Test to check that the configuration was successful



Click Modify and restart the software for the configuration to take effect

D）WorkList

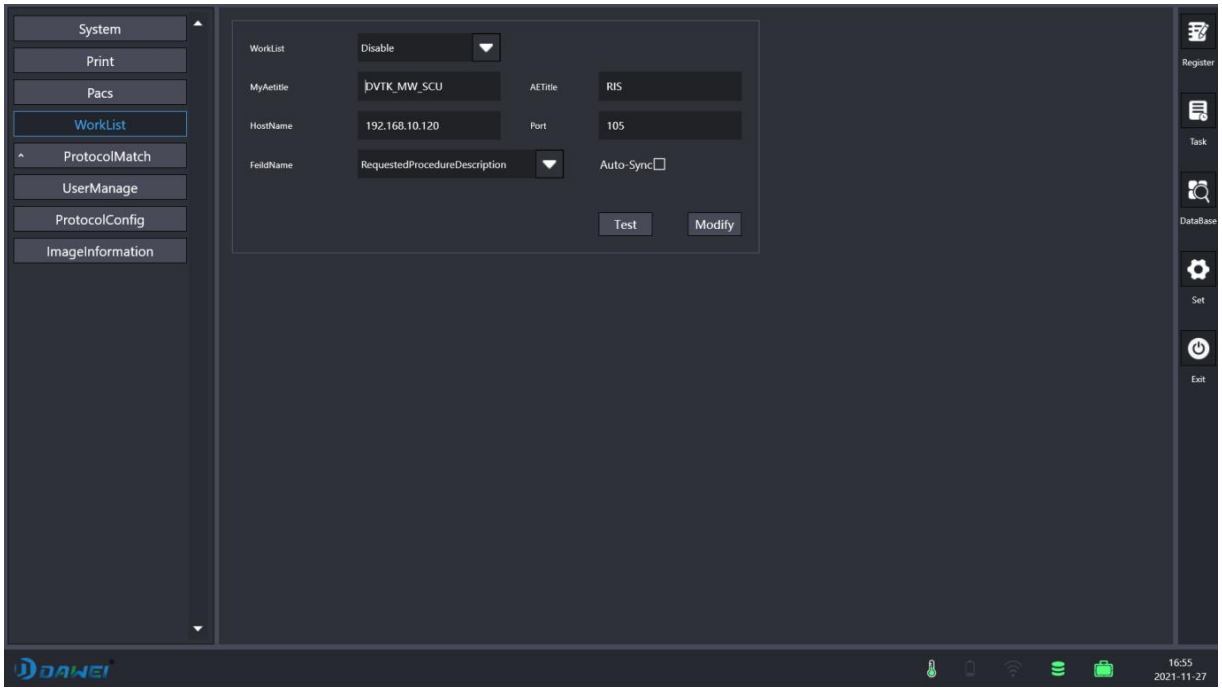


Figure 5-14 WorkList

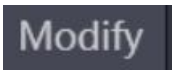
■ AETitle: WorkList AETile, Consistent with WorkList in hospital.

■ HostName: WorkList IP, Consistent with WorkList in hospital.

■ Port: WorkList Port, Consistent with WorkList in hospital.

■ Auto-Sync: If selected, it will refresh the Worklist server automatically. If it is not selected, it will not refresh worklist.

Click Test to check wether the configuration was set successful



Click Modify and restart the software to apply the configuration

e）ProtocolMatch

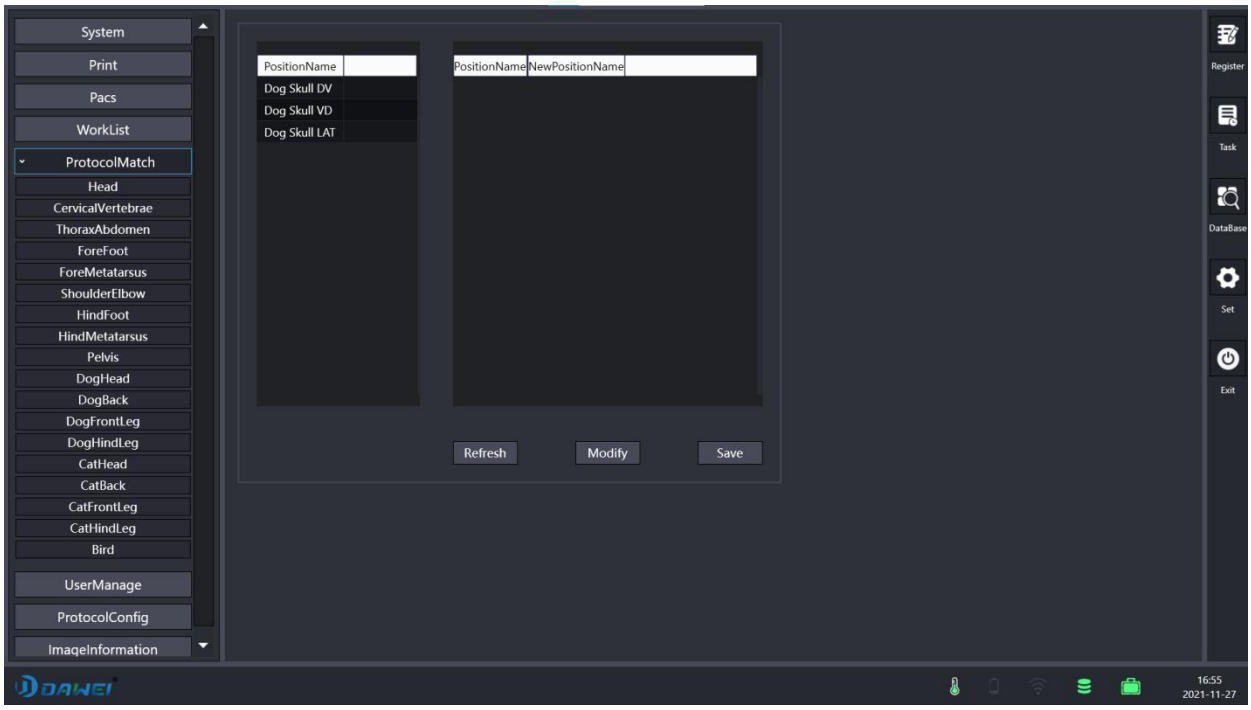


Figure 5-15 Protocol Match

Select local protocol and item from worklist to match the protocol.

f）User Manage

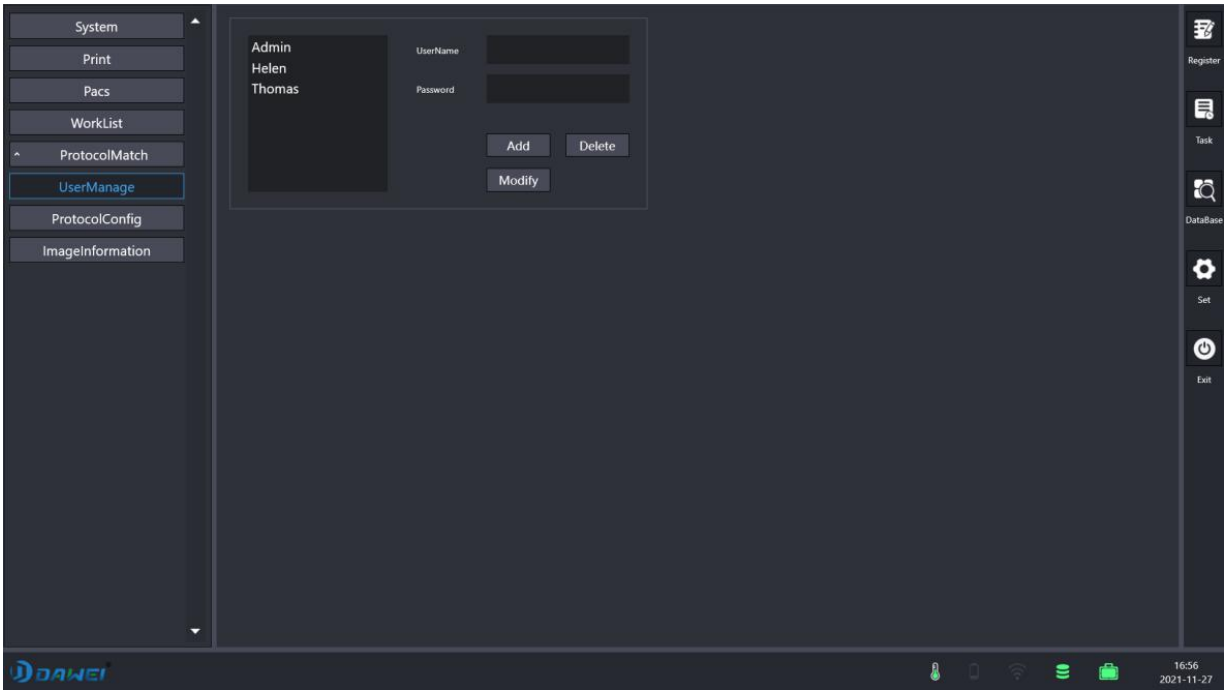


Figure 5-16 User Manage

Add / modify /delete user name and password.

g）ProtocolConfig

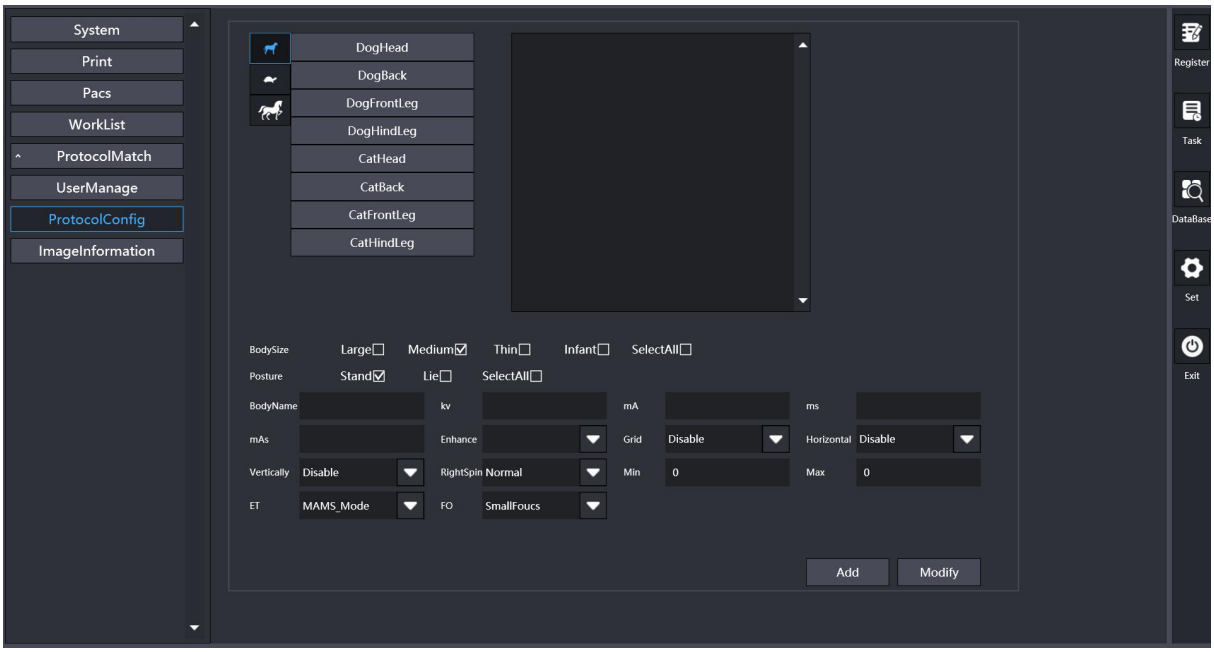


Figure 5-17 ProtocolConfig

■ Animal icon: Click the corresponding animal icon button to select the position of the new animal

■ Body type: Single or all body types

■ Position: Standing/Table

■ Protocol: Add a new protocol

Dose: kV \ mA \ mS \ mAs Fill the corresponding value to modify

Enhancements: Select image post-processing files

Grid: Enable / Disable grid suspending

Horizontal flip: Enable / Disable flip

Vertical flip: Enable / Disable flip

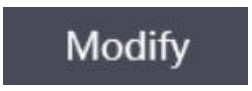
Rotation: Rotate panel from 90\180\270 degree

Min\Max: Set minimum and maximum values

ET: Switch mAs, mA\mS mode

FO: Large focus / small focus

Click it to add a new position and more details



Click Modify and restart the software

h）ImageInformation

Image information refers to 4 corners on an exposed image. It is able to add or remove by this interface.

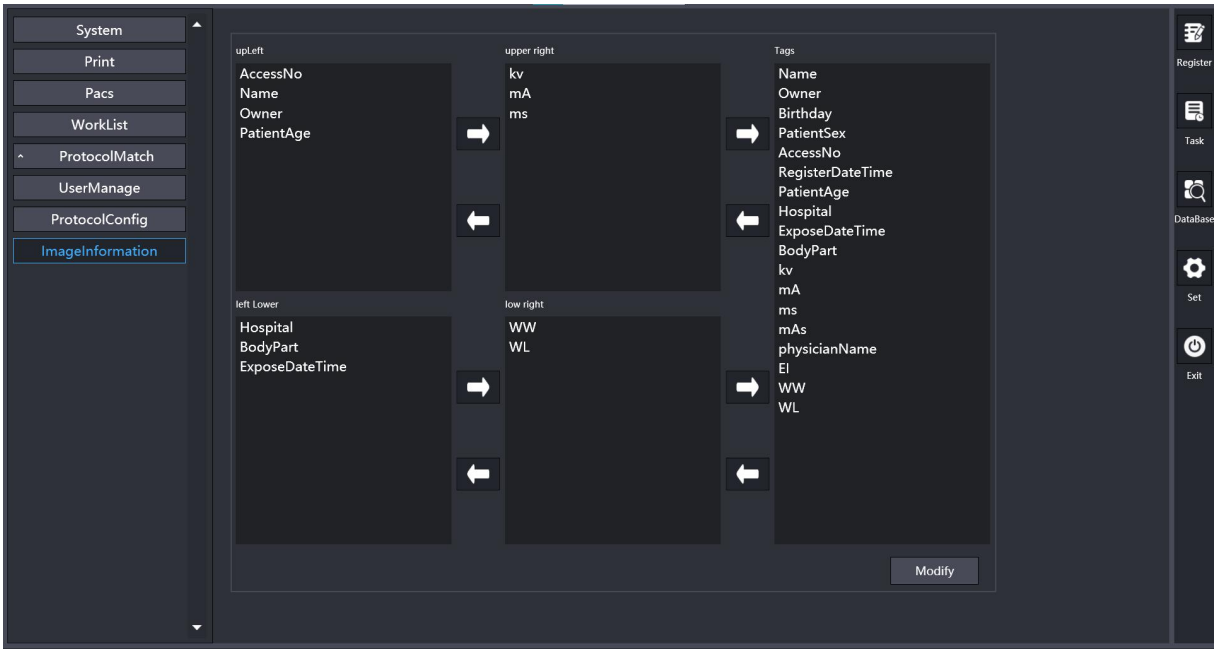


Figure 5-18　ImageInformation

● 5.2.7 Exposure Interface

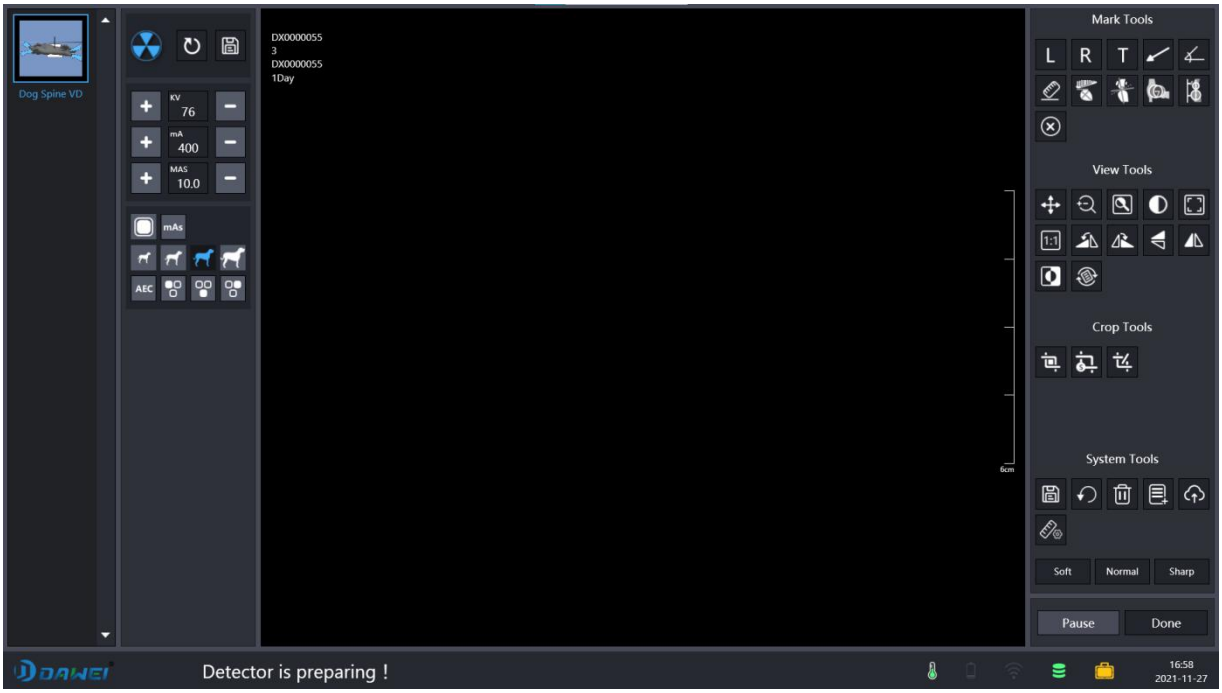


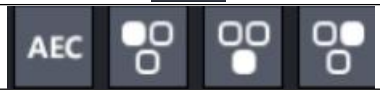
Figure 5-19 Exposure Interface

There are exposure indicator and detector state.

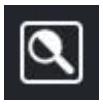
Icon	Function
	Generator does not connect successful
	Available to expose
	Ready
	In this state, release handswitch
	Detector Disconnect
	Detector preparing
	Detector IDLE
	Connected with detector and ready to expose

Different patient require different condition.

User could modify condition by switching right buttons in a quick way on the right middle square box, such as body size \ table position and standing position, and user can increase dose and decrease dose by clicking corresponding buttons as well.

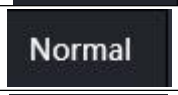
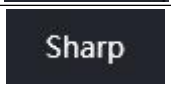
Button	Function
	Adjust the KV value Adjust the MA value Adjust the mAs value
	baby
	Small size
	Normal size
	Large size
	AEC sensors
	mAs mode, click to switch mA/mS mode
	mA/mS status
	Large focus, click to switch to small focus mode
	Small Focus
	Default the dose
	Save modified dose
	Test mode

There are many tools on right square box on acquisition interface.

Button	Introduction
	Move Click this icon then move cursor to image area, click and drag image to move it to anywhere as users will.
	Scale Click this icon then move cursor to image area. click left button and drag mouse to move it up and down, moving up cursor to make image zoom in, moving down cursor to make image zoom out.
	Window level and window width. Click this icon then move cursor to image area. click left button and drag mouse to move it up \ down \ left \right, moving mouse up to decrease window level, moving mouse down to increase window level, moving mouse left to decrease window width and moving mouse right to increase window width.
	ROI User could use this button to do WWWL adjustment in a quick way. Click this icon then move cursor to image area, click left button and drag mouse to draw a rectangular area, the entire WWWL of image will be calculated automatically based on this selected area after releasing left button.
	Adaptable button. Click this button then current image will zoom in \ out automatically to fill all image area window.
	Flip horizontal. Click the Button to flip the image horizontally.
	Flip vertical. Click the Button to flip image vertically
	Right Rotation. Click this button and rotate image 90 degrees to right.
	Left Rotation. Click this button and rotate image 90 degrees to left.
	Real size. Click this button to display image in an actual size.
	Inverse Inverse the image

	Mark left. Click this button to put a label 'L' on the left of current image, and you could click on it and drag it to move anywhere as you will.
	Mark right. Click this button to put a label 'R' on the right of current image, and you could click on it and drag it to move anywhere as you will
	Annotation Text. Click it to input annotation on a box.
	Arrows. Mark arrows on the image.
	Measuring distance. Set 2 points to measure an distance.
	Measuring Angle. Label an Angle. Set 3 points to measure an angle.
	HIP 1. Mark 3 points around the right socket to create a circle; 2. Mark 3 points around the right femur to create a circle; 3. Mark 3 points around the left joint to create a circle; 4. Mark 3 points around the left femur to create a circle; 5. L: left hip-joint deviation distance, Di: left hip jointdistraction index, R: right hip joint deviation distance, DI: right hip joint distraction index
	VHS(Vertebral Heart Scale) 1. Mark the length of the 5 vertebrae (starting from the fourth thoracic spine) with two points; 2. Mark the max length of the heart with two points; 3. Mark the min length of the heart with two points; 4. L: heart max length, S: heart min length, AVG: average vertebral length, VHS: Vertebral Heart Scale
	TPLO 1. Mark two points along the tibial plateau; 2. Mark two points along the fibula axis; 3. Mark 2 points, one is the center of tibia circle and the other one is the radius of the tibia;

	TTA 1. Mark an ankle of the femur with 3 points; 2. Mark the other ankle of the femur with 3 points; 3. Mark 3 points along the tibia; 4. Mark the most protruding position of the knee with a point; 5. Mark the most protruding position on the outside of the tibia with a point; 6. The distance between the most protruding point and the line on the outside of tibia
	Cancel arrows\segment, Label Clear labels, line segments, arrows, and angles, if these haven't already been written to the image.
	Save arrows\segment Writes the tag, line segment, image, and Angle to the image
	Clipping button. Click it on left button, a rectangular area appears, you could move and scale this rectangular box as you need, the box covers the area to be cropped.
	Clipping save. Save the cropped area and fill the entire image-box automatically.
	Undo clipping. Cancel all clipping operation, make image back to last step - none clipping.
	Reset Click this button back to image original state.
	Free rotation Free angle rotate
	Add protocol
	Delete protocol
	Send single image
	Correct length Mark two points and enter the correct distance

	Modify the exposure parameters
	Reprocess the image
	Smooth image style
	Normally image style
	High contrast and more sharp image style

There are two buttons on the bottom right. The left button is for exiting exposure interface and save current images you have already acquired, jumping to register interface. This unfinished study will be appeared in registered list (worklist) again, User could continue to expose if pitch on this study and click “Check” Button ,you can enter to exposure interface again.

The right button is for saving all information about this study to database and exiting exposure interface to register interface. Current study will be regard as a completed study and won’t appear in registered list (worklist) again.

Button	Function
	Pause Stop exposure temporary and exit exposure interface to registered interface.
	Save saving all information about of this study to database and exiting exposure interface to register interface

● 5.2.8 Review Interface

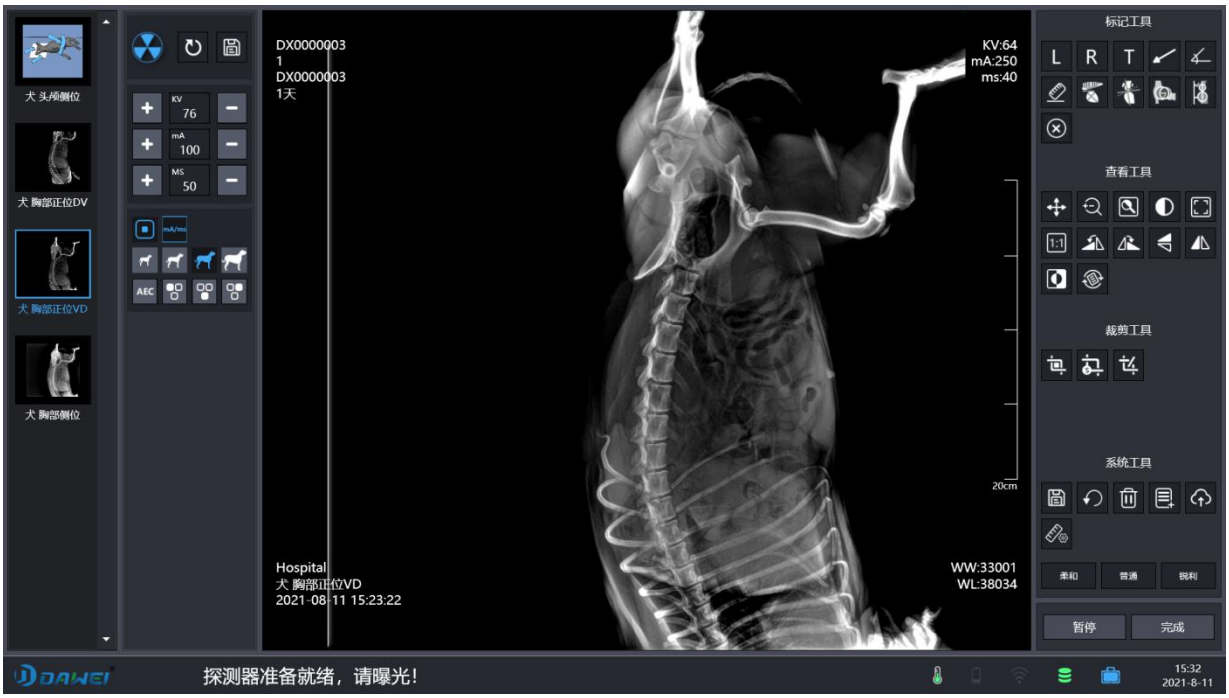
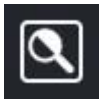


Figure 5-20 Review Interface

There are various tools on review interface.

Button	Introduction
	Move Click this icon then move cursor to image area, click and drag image to move it to anywhere as users will.
	Scale Click this icon then move cursor to image area. click left button and drag mouse to move it up and down, moving up cursor to make image zoom in, moving down cursor to make image zoom out.
	Window level and window width. Click this icon then move cursor to image area. click left button and drag mouse to move it up \ down \ left \right, moving mouse up to decrease window level, moving mouse down to increase window level, moving mouse left to decrease window width and moving mouse right to increase window width
	ROI User could use this button to do WWWL adjustment in a quick way. Click this icon then move cursor to image area, click left button and drag mouse to draw a rectangular area, the entire WWWL of image will be calculated automatically based on this selected area after releasing left button.

	Adaptable button. Click this button then current image will zoom in \ out automatically to fill all image area window.
	Flip horizontal. Click the Button to flip the image horizontally.
	Flip vertical. Click the Button to flip image vertically
	Right Rotation. Click this button and rotate image 90 degrees to right.
	Left Rotation. Click this button and rotate image 90 degrees to left.
	Real size. Click this button to display image in an actual size.
	Inverse Inverse the image
	Mark left. Click this button to put a label ‘L’ on the left of current image, and you could click on it and drag it to move anywhere as you will.
	Mark right. Click this button to put a label ‘R’ on the right of current image, and you could click on it and drag it to move anywhere as you will.
	Annotation Text. Click it to input annotation on a box
	Arrows Mark arrows in the image.Three sliders can drag a line segment.
	Measuring distance Measuring distance. Three sliders can drag a line segment.
	Measuring Angle Label an Angle.Three sliders can drag a line segment.

	HIP 1. Mark 3 points around the right socket to create a circle; 2. Mark 3 points around the right femur to create a circle; 3. Mark 3 points around the left joint to create a circle; 4. Mark 3 points around the left femur to create a circle; 5. L: left hip-joint deviation distance, Di: left hip jointdistraction index, R: right hip joint deviation distance, DI: right hip joint distraction index
	VHS(Vertebral Heart Scale) 1. Mark the length of the 5 vertebrae (starting from the fourth thoracic spine) with two points; 2. Mark the max length of the heart with two points; 3. Mark the min length of the heart with two points; 4. L: heart max length, S: heart min length, AVG: average vertebral length,
	TPLO 1. Mark two points along the tibial plateau; 2. Mark two points along the fibula axis; 3. Mark 2 points, one is the center of tibia circle and the other one is the radius of the tibia;
	TTA 1. Mark an ankle of the femur with 3 points; 2. Mark the other ankle of the femur with 3 points; 3. Mark 3 points along the tibia; 4. Mark the most protruding position of the knee with a point; 5. Mark the most protruding position on the outside of the tibia with a point; 6. The distance between the most protruding point and the line on the outside of tibia
	Cancel arrows\segment, Label Clear labels, line segments, arrows, and angles, if these haven't already been written to the image.
	Save arrows\segment Writes the tag, line segment, image, and Angle to the image
	Reset Click this button back to image original state.
	Copy Copy the image to the paste board

	Paste Copy the information in the paste board to the current check
	Retreatment Click to reprocess the image
	Send single image
	Export the selected image to the specified location
	Choose one or two of them and compare them
	Delete protocol

Button	Function
	Cancel Exit review interface and return to database.
	Save Exit review interface and return to database.

● 5.2.9 The interface for comparison

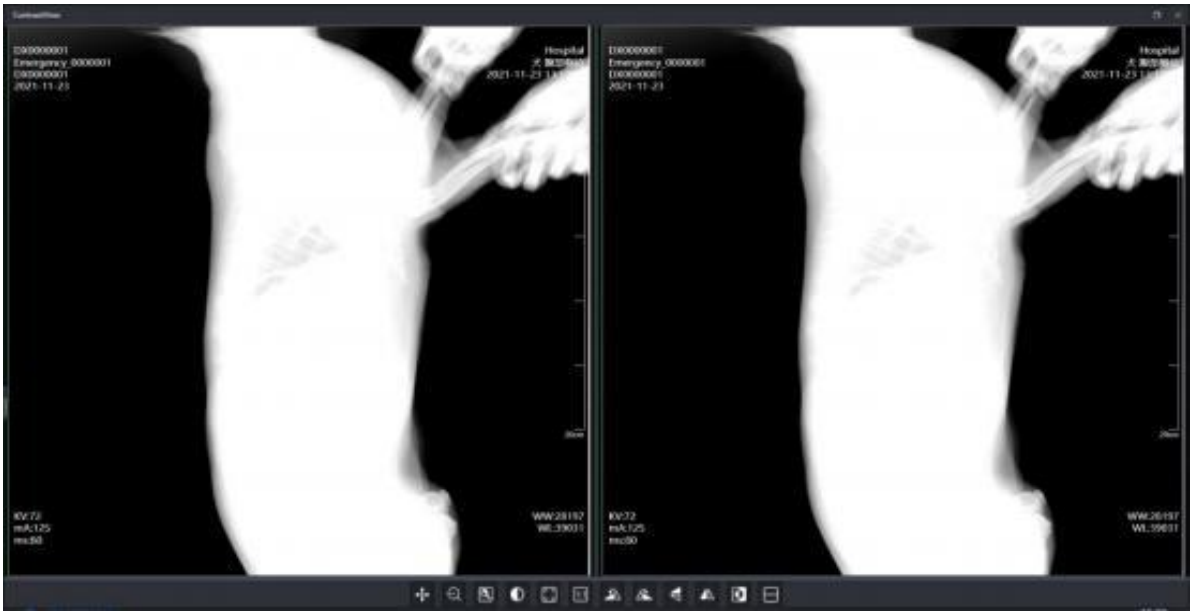
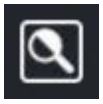
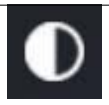
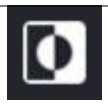


Figure 5-21 Print List Interface

	Move Click this icon then move cursor to image area, click and drag image to move it to anywhere as users will.
	Scale Click this icon then move cursor to image area. click left button and drag mouse to move it up and down, moving up cursor to make image zoom in, moving down cursor to make image zoom out.
	ROI User could use this button to do WWWL adjustment in a quick way. Click this icon then move cursor to image area, click left button and drag mouse to draw a rectangular area, the entire WWWL of image will be calculated automatically based on this selected area after releasing left button.
	Window level and window width. Click this icon then move cursor to image area. click left button and drag mouse to move it up \ down \ left \ right, moving mouse up to decrease window level, moving mouse down to increase window level, moving mouse left to decrease window width and moving mouse right to increase window width

	Adaptable button. Click this button then current image will zoom in \ out automatically to fill all image area window.
	Real size. Click this button to display image in an actual size.
	Left Rotation. Click this button and rotate image 90 degrees to left.
	Right Rotation. Click this button and rotate image 90 degrees to right.
	Flip vertical. Click the Button to flip image vertically.
	Flip horizontal. Click the Button to flip the image horizontally.
	Inverse Inverse the image
	Two layouts
	Two layouts

● 5.2.10 Print the List

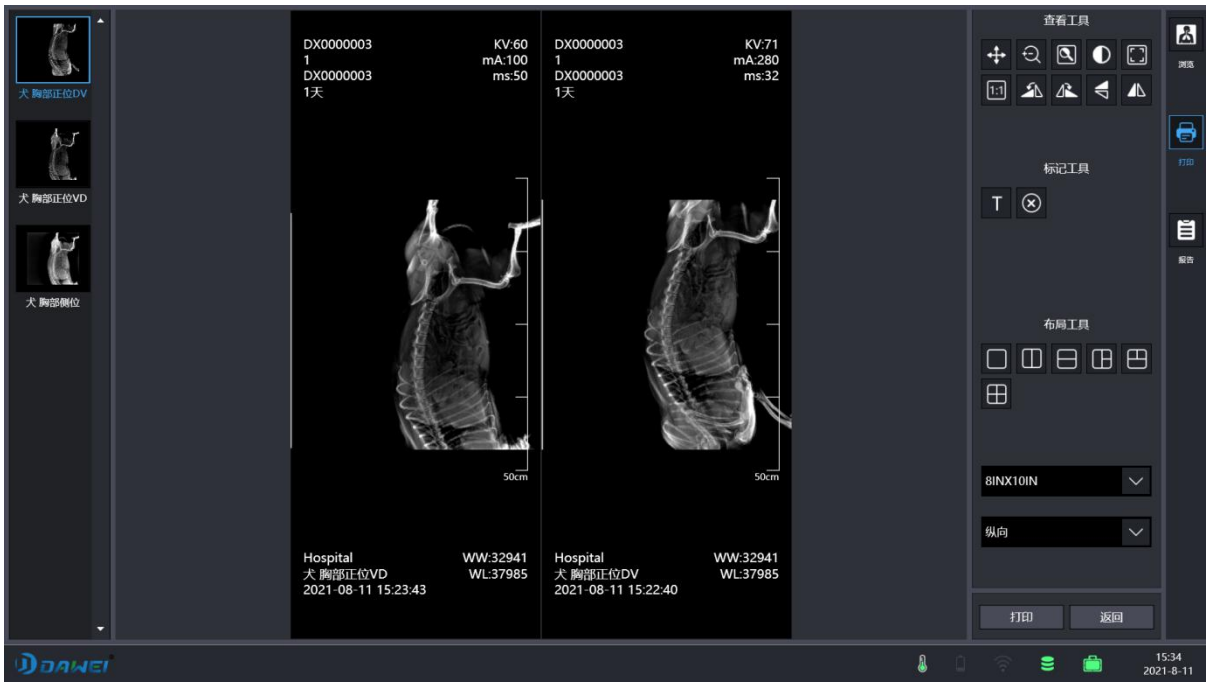
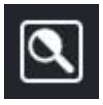


Figure 5-22 Print the List

There are various tools on review interface.

Icon	Introduction
	Move Click this icon then move cursor to image area, click and drag image to move it to anywhere as users will.
	Scale Click this icon then move cursor to image area. click left button and drag mouse to move it up and down, moving up cursor to make image zoom in, moving down cursor to make image zoom out.
	Window level and window width. Click this icon then move cursor to image area. click left button and drag mouse to move it up \ down \ left \ right,moving mouse up to decrease window level, moving mouse down to increase window level, moving mouse left to decrease window width and moving mouse right to increase window width.
	ROI User could use this button to do WWWL adjustment in a quick way. Click this icon then move cursor to image area, click left button and drag mouse to draw a rectangular area, the entire WWWL of image will be calculated automatically based on this selected area after releasing left button.

	Adaptable Click this button then current image will zoom in \ out automatically to fill all image area window.
	Flip horizontal. Click the Button to flip the image horizontally.
	Flip vertical. Click the Button to flip image vertically.
	Right Rotation. Click this button and rotate image 90 degrees to right.
	Left Rotation. Click this button and rotate image 90 degrees to left.
	Actual size. Click this button to display image in an actual size.
	Annotation Text. Click it to input annotation on a box
	Delete selecting the mark on the image, click to delete it

Layout tool, place multiple images on a single sheet of film.Drag the rules:Left-click to select the bitmap, release, Right-click and drag.

Icon	Function
	A single layout
	Two layouts
	Two layouts
	Layout of three pictures

	Layout of three pictures
	Layout of four pictures

Film Size Selection and Printing Direction Tools:

	Click the drop-down box to select print film size
	Click the drop-down box to choose the direction of printing

There are two buttons at right bottom.

Icon	Introduction
	Print, click to print film
	Return, click to return to the database list

● 5.2.11 Report

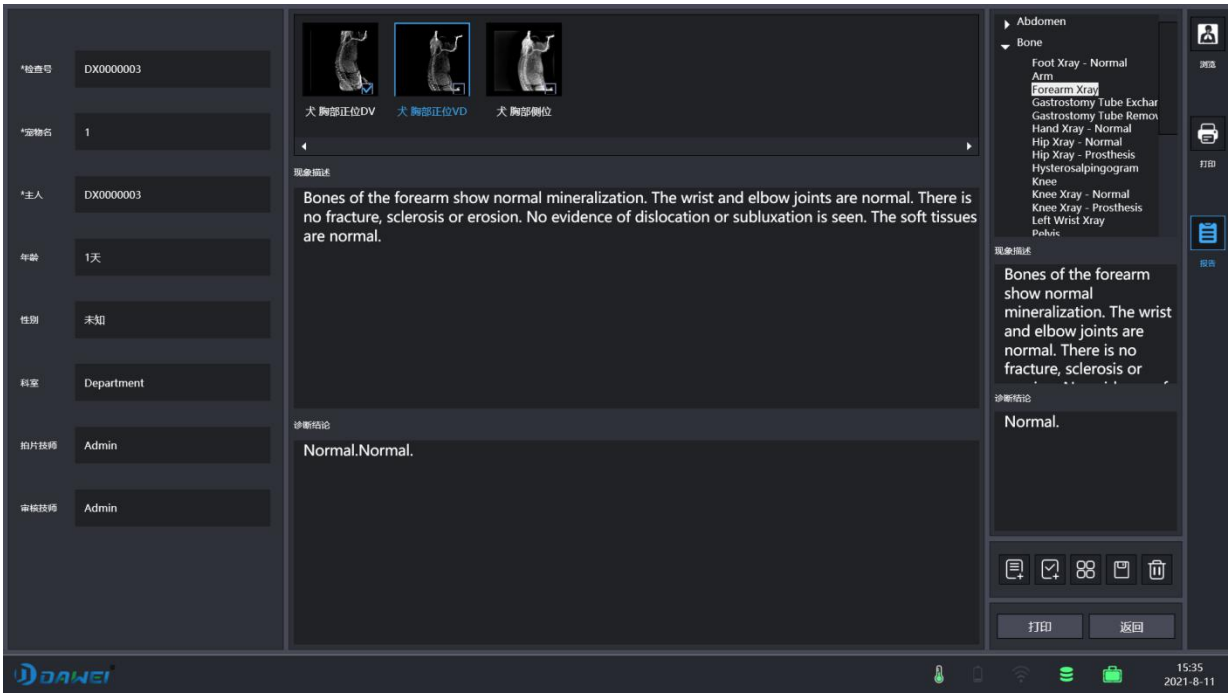


Figure 5-23 Report

Add description and diagnosis with image and save as a study:

Icon	Introduction
	Add a description
	Add the diagnosis
	Add description and diagnosis
	Save all changes to the database
	Clear description and diagnosis
	Print Click it to print film.
	Return Click it and return to database

● 5.2.12 Processing

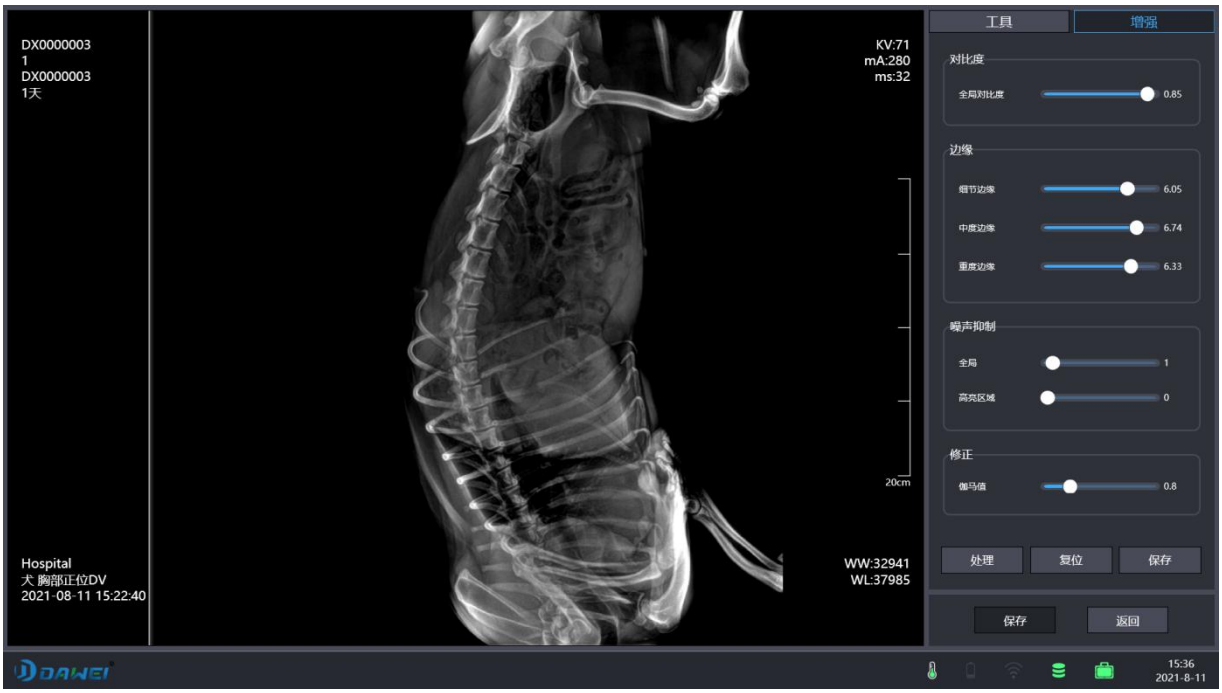


Figure 5-24 Processing

All the tools are as the same as the acquisition interface. The image enhancement parameters are including Global Contrast / Thin Edge / Medium Edge/ Thick Edge / Global Noise / Bright Area Noise / Gamma Correction.

There are buttons on review interface.

Icon	Introduction
	Save the processing effect and back to the previous screen
	Process the image according to the panel parameters
	Cancel all processions
	Save the processing effect and back to the previous screen
	Return without doing anything

5.3 System Maintenance

- When operating the system, pay special attention not to suddenly cut off the power.
- No random deletion of system files.
- Not allowed to delete desktop shortcuts at will.
- The console computer should be protected against computer viruses and should not use USB sticks, floppy disks or CD-ROMs that are not related to the computer.
- Without the permission of the system administrator, the system shall not be arbitrarily restored.

Chapter 6 Opening System

6.1 Precautions before Opening System

The startup of the system includes powering on the high-voltage generator, powering on the flat panel detector, powering on the photographic bed, and powering on the image processing system. When only the image processing system is opened, only case management and image retrieval, image processing, CD burning, image transmission, etc. can be completed.

Pay attention to the following matters before starting up：

- Check that the voltage is stable before starting up. If the voltage fluctuates by more than ±10%, do not switch on the machine to prevent damage to the equipment.
- Turn on external devices such as monitors, recorders, printers, etc. before starting the image processing system, and then turn on the main unit if the external devices are not abnormal.
- Do not disconnect power during software startup as this will result in software corruption
  or hardware destruction.
- It is strictly forbidden to operate other parts of the system while the image processing system is switched on.
- Animals should not be allowed in the filming room before the system is in operation to avoid danger.
- The system requires the detector to be powered on before starting the software, otherwise the software may start abnormally, or may crash.

6.2 Boot Sequence

- Power on the photographic bed.
- Power on flat panel detector.
- Turn on the X-ray high voltage generator and wait for the generator to complete the self-test and enter the working state.
- Turn on external devices such as computer, printer, recorder, monitor, etc. in turn, and if the image processing system is connected to servers such as PACS, WorkList, etc., ensure that these servers are in working order.

6.3 Turn-on the high-voltage generator

When the power is turned on, the generator console will emit a soft "click" sound, and the generator will complete the self-check after the sound stops, then the generator will enter

the working state.

Warning

Please do not touch the generator with your hands as there is a risk of electric shock!

6.4 Turn-on the Image Processing System

Please turn on the computer first, double click on the image processing program on the desktop, wait for the host to self-test and start the software.

Hint

1. Turn on the power of the flat panel detector before starting the software, otherwise the image processing system may not work properly or crash.
2. If the image processing system is connected to external devices such as film printer, recorder, or other servers such as PACS, WorkList, etc., please ensure that these devices or servers are properly connected to the image processing system.

Chapter 7 Shutdown System

7.1 Shutdown Sequence

a）Exit the software image processing system;

b）Turn off external devices such as computers, printers, recorders, etc.;

c）Disconnect flat panel detector power;

d）Disconnect high voltage generator;

e）Disconnect the photographic bed.

7.2 Exit the Image Processing System

Click the "Exit" button on the main interface of the software to exit the system. Please turn off the monitor after the host computer shuts down.

7.3 Disconnect Flat Panel Detector Power

Disconnect flat panel detector power.

7.4 Disconnect High Voltage Generator

Please switch off the workstation system first and then the power switch.

7.5 Disconnect photographic bed

Disconnect photographic bed.

Warning

Please do not touch the generator for at least 5 minutes, otherwise there is a danger of electric shock!

As when the power of the high-voltage generator is turned off, some electric energy will remain in the high-voltage generator itself.

Chapter 8 Daily Maintenance

8.1 Mechanical System Maintenance

- **8.1.1** Check the firmness of the fixing screws of the system in three-month intervals to ensure safe movement of the frame.
- **8.1.2** Four-way floating guide with a three-month period to reduce friction.

8.2 Electrical System Maintenance

- **8.2.1** Make sure the power supply voltage is within the allowable operating range of the system before switching on each time.
- **8.2.2** Follow the instructions for switching on and off and daily operation, do not attempt any operation during switching on and off, cutting off the power directly may cause damage to the system software.
- **8.2.3** Semi-annual inspection of the cable's path through the pipe jacket and holes to prevent rat chewing and soaking water.

8.3 Image System Maintenance

- **8.3.1** Image data should be backed up in time to avoid system damage caused by accidental failures and data loss.
- **8.3.2** Inspect the optical center in one-year intervals.
- **8.3.3** Calibrate the detector in six-month intervals.
- **8.3.4** Replace the tube, repair the high voltage generator, or calibrate the tube if an error in exposure dose is detected.

8.4 Cleaning & Disinfection

- **8.4.1** Clean the dust of the console, high voltage generator control panel and display housing if necessary. Do not use organic solvents or corrosive cleaning fluids for cleaning.

  Ensure that the system is powered off when cleaning and prevent water or cleaning fluids from entering the system, otherwise the system may be damaged.
- **8.4.2** Clean the high voltage silicone grease from the high voltage cable head with gauze and replace the high voltage grease in six-month intervals.
- **8.4.3** The surface of the diagnostic bed should be wiped with alcohol frequently or covered with a disposable film to keep the surface clean and disinfected.

8.5 Environmental Protection Instructions

- **8.5.1** Other items used with the equipment, such as barium sulphate and various catheters, should be disposed of in accordance with their respective disposal methods after use.
- **8.5.2** Parts removed from the device due to maintenance, replacement, etc., must not be discarded at will, and must be handled with the help of maintenance engineers.

Chapter 9 Fault Diagnose and Process

This chapter provides a description of the faults that can occur.

9.1 Main Power Failure

After pressing the start button under normal power supply in the machine room, the start button indicator is not bright and the machine cannot be turned on, indicating that the main circuit fuse is burned out. Please replace the main circuit fuse.

If the generator cannot be turned on normally when the main power supply has electricity, please check whether the emergency stop switch of the console is in the pressed state, and it can operate normally when it is placed in the released state.

Releasing method: rotate gently according to the direction of rotation marked on the top of the emergency stop switch, and the emergency stop switch will automatically bounce when it is rotated through a certain angle.

9.2 Bea Limiting Device Bulb Failure

The cabinet is powered up normally and also the hand control box functions normally. When the bea limiting device light button is pressed or the bea limiting device motion button is pressed, the bea limiting device bulb does not light up normally and after checking the bea limiting device connections are normal, it can be determined that the internal bea limiting device bulb is damaged.

Open the bea limiting device cover to reveal the fixed position of the bulb, loosen the fastening screws on the bulb foot and replace the bulb with a new one.

Hint

Please do not change the position of the bulb fixing device when replacing the bulb. After replacing the bulb, power up the system and check that the optical centre is the same as the ray centre. If it is not, change the depth of insertion of the bulb foot and test again until the conditions are met.