



Veterinary Color Doppler Ultrasound System

User Manual

Statement

Thank you for selecting Veterinary Color Doppler Ultrasound System.

Prior to use the system, please read this user manual carefully.

In addition, keep this user manual so that you may read it at anytime when necessary.

Product Information

Product Name: Veterinary Color Doppler Ultrasound System

Product Model: VU2

The system consists of the console (including display and control panel), software package (software name: Color Doppler Ultrasound System Software, release version: V1), probes and power adapter.

Optional accessories: lithium battery, printer, and foot switch.

Optional ultrasound probes: 3C5PD, 6I6PD, 7L4PD, 3P2PA

Optional needle-guided brackets: ZNG-07, ZNG-08, ZNG-09.

Application range: The system is intended for veterinary use in clinical ultrasound examination and diagnosis.

Register / manufacturer: Wuhan Zoncare Bio-medical Electronics Co., Ltd.

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Address of manufacturing: #380, High-tech 2nd road, Eastlake high-tech district, Wuhan, Hubei, P. R. China

Production date: see tag

Service life: 10 years

Intellectual Property Statement

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Responsibility of the manufacturer

Zoncare is responsible for the effects on safety, reliability, and performance of the product, only if:

- All installation operations, expansions, adjustments, upgrades and repairs of this product are conducted by Zoncare authorized personnel;
- All components for replacement, accessories and consumables are original of Zoncare or approved by Zoncare;
- Electrical installation complies with the applicable national standards and the requirements of this user manual;
- Use this product only in accordance with this user’s manual.

About This Manual

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This manual details all information necessary for safe operation of the system. The applications, functions, operations and maintenance of the product are described with the most comprehensive configuration in this manual. If there is any discrepancy between the description in the manual and the physical one, please prevail in kind. If you have questions, please contact us.

Zoncare is committed to continuously improve product performance and reliability. Contents of this manual are subject to change without prior notice. Figures shown in this manual may be different from physical one, please prevail in kind.

This manual is intended for users familiar with the basic principles and techniques of ultrasound. It does not involve ultrasound training or medical procedures.

Conventions used in this manual

Before using the system, read carefully and be sure to completely understand these conventions in this manual.

Symbols and conventions	Description
 Danger	DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.
 Warning	WARNING indicates a potentially hazardous situation, which, if not avoided, may result in physical injury or death.
 Caution	CAUTION Indicates a potentially hazardous situation, which, if not avoided, could result in minor or moderate injury or equipment damage.
	Patient /user infection due to contaminated equipment.
NOTE	Provide additional Information
Click	Press the [Set] button
Double-click	Press the [Set] button twice in quick succession
Select	Highlight a menu item with the trackball
[Bold]	Physical buttons or knobs on the device, prompts or menu items on the screen
<Keyboard>	Keyboard keys

Warranty

The warranty period is subject to the sale contract.

Consumables refer to disposable consumables that need to be replaced after each use or vulnerable materials that need to be replaced regularly. Consumables are not covered by warranty.

The warranty period starts from the “installation date” filled in the “Product Warranty Card” that accompanies the product. The “Product Warranty Card” is the only voucher for calculating the warranty period and enjoying the warranty service.

To protect your rights and interests, please fill in the warranty card after the system is installed, and give it to the installer or mail it to the Customer Service Department of Zoncare Company.

During the warranty period, Zoncare will provide you with free warranty service; beyond the warranty period, Zoncare will provide maintenance service for products under the condition of reasonable labor fee, spare parts fee and transportation fee.

But please note that even during the warranty period, the following condition is not covered by the free warranty. Zoncare will charge for repair and accessories:

- Artificial damage;
- Improper use;
- The voltage of the power grid is beyond the scope specified by the product;

- Irresistible natural disasters;
- Replace or use of parts, accessories, and consumables not approved by Zoncare or maintain the system by unauthorized personnel;
- Failures not arise from the product itself;
- Failure to follow any operation instruction of the user manual.

Disclaimer

Zoncare does not assume any responsibility for unintended use, mis-operation by unqualified medical personnel or failure to follow operation instruction of the user manual.

Zoncare does not assume any responsibility for any medical disputes arising from the rental of equipment to third parties or other institutions.

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Chapter 1 Safety

1.1 Safety Information

Read, understand and strictly follow the instructions before using the system to ensure the safety of animal and operator.

This system should be used by a professional clinician or under the guidance of a professional clinician. Unauthorized person or untrained person shall not perform any operation.

Manufacturer is responsible for the effects on safety, reliability, and performance of the product, only if following precautions are strictly followed.

1.1.1 Precautions

1.1.1.1 System safety



- **DO NOT operate the system in the presence of flammable gases or anesthetics or ethyl alcohol. Explosion may result.**
 - If flammable substances are detected, **DO NOT** plug the power cord or power on the system.
 - If flammable substances are detected after the system is powered on, **DO NOT** attempt to shut down the system or unplug the power cord.
 - If flammable substances are detected, exhaust the air in the area and make well ventilation before shutting down the system.
- **Never operate the system in thunderstorm weather.**



- **DO NOT connect the grounding wire to any gas pipeline or water pipe. Otherwise it may lead to poor grounding or explosion risk.**
- **Connect the grounding wire correctly before powering on the system. Make sure the system grounding is always well-connected to the earth when operating the system.**
- **Ensure that a standard three-pronged grounding plug is used. Push the power plug securely to the hospital grade grounding outlet of appropriate power rating.**
- **DO NOT place liquids on or above the console. Spilled liquid may contact live parts and increase the risk of electric shock. If liquid is accidentally into the system, stop using the system immediately and shut down the system, contact Zoncare Customer Service Department or sales representative.**
- **Never allow the animal to contact the live part of the system or other device, e.g. Signal I/O ports. Electric shock may result.**
- **DO NOT use the system with high-frequency surgical equipment, high frequency electrotome, or defibrillator.**

- Unauthorized personnel are NOT allowed to remove protective covers. Short-circuit or electric shock may result. Refer servicing to authorized service personnel only.
- Before cleaning procedure, shut down the system and unplug the power cord. Electric shock may result.
- Keep the system dry all the time; avoid fast moving the system from a cold place to a warm place. Otherwise, condensation or water droplets may occur, which may lead to short circuit or shock hazard.
- When the non-medical electrical equipment in the system is powered by a removable, multiperture socket with an isolating transformer, the plug must be full-plugged into a standard socket (hospital grade). Professional installer is responsible to comply with the safety requirements.
- All devices (analog and digital) connected to this system must comply with specified IEC standards (e.g. IEC 60950 information technology equipment safety standard and EN 60601-1 medical equipment standard). All configurations must in accordance with relevant requirements of IEC standards. When using additional peripheral equipment that is to be interconnected by functional connection, the combination is considered to be a medical electrical system. It is your responsibility to comply with EN 60601-1-1 and test the system to those requirements. If you have questions, contact your sales representative.
- Sterilization of the machine and accessories is not recommended unless required in the instructions of the accessories.
- The manufacturer shall be notified when the system is scrapped.
- If any part of the system is known or suspected to be defective or incorrectly adjusted, DO NOT use the system until it is repaired.
- Use the system in proper environment, DO NOT use the system in the cases of direct sunlight, heat source, high humidity, drastic temperature change, dusty and vibration-easily situation.
- DO NOT use the system in the vicinity of strong electric field, magnetic field or mobile radio frequency communication equipment, such as mobile phones, radio transceivers, mobile radio transmitters, etc. Otherwise, poor performance or even malfunction may result.
- When using movable multiperture socket, qualified, safe products with grounding protection should be selected, and the maximum allowable load should not exceed the maximum power of the system.
- DO NOT connect non-system components of electrical equipment to movable multiperture sockets; otherwise it may cause interference, overload and other risks.
- DO NOT place movable multiperture sockets on the ground.
- When there is a large temperature difference in the operating environment of the system, the system should be vacant for 4



hours before the first power-on to keep the temperature and humidity reach a balance within the system.

- The system must be installed and set up by the manufacturer's authorized or trained personnel. Unauthorized personnel may not disassemble, install or misuse the system by themselves.
- Shut down the system and unplug the power cord before moving the system.
- Check the casters for obvious damage or malfunction before moving the system.
- Avoid large vibration during transportation. Mechanical parts damage may result.
- DO NOT lean or sit on the control panel. Function button damage may result.
- DO NOT place any object on the control panel to prevent them from falling and causing damage.
- DO NOT block the air filter or the air outlet. Otherwise, the internal temperature of the system may rise, causing fire, personal injury and other potential hazard.
- If the system triggers the shutoff protection, which, indicating the malfunction of the system or peripheral equipment. Contact manufacturer's Customer Service Department or sales representative.
- Maintenance shall be taken regularly to ensure the performance of the system, and ensure that the system is well grounded and meets the safety requirements.

1.1.1.2 Accessories Safety



- Use only approved accessories. E.g. probes, peripheral equipment or cables.
- The ultrasound probes apply for use by qualified specialist staff only. Physicians who use this system for biopsy must undergo professional ultrasound guidance training and strictly observe the operation requirements of biopsy in order to avoid unnecessary harm to animals.
- DO NOT immerse any probes beyond the specified cleaning or disinfection level shown in "13.1.4 Probe Disinfection".
- Never make conducting solution contacts with probes.
- Printer can be used in an animal environment.
- For the safe use and maintenance of the printer, please refer to the printer manual.
- Thermal printer shall be only powered by external power source.
- Be sure the probe and cable are in normal before and after performing an ultrasound exam. Use the probe with care. Stop use immediately if the probe appears to be malfunctioning.
- Pay attention to careful use of cable, check the cable before and after use. If there is any damage, stop using the system immediately.
- Never attempt to strike or damage the surface of transducer. Otherwise, electric shock may result when using.

- Probe sheath is required when performing intra-cavitary ultrasound exam. **DO NOT** activate intra-cavitary probe in vitro.
- Components connected to the system shall meet the safety requirements in this manual.



- The system and accessories are not disinfected when delivering. Before use probe and biopsy bracket, disinfection is required according to the method provided in their instructions.
- Always inspect whether the edge of the probe is too sharp or the surface is too rough before using the probe. If so, replace the probe to avoid damaging sensitive tissue.
- Use the probe with care, and place the probe properly in the probe holder after use. When out of service for a long time, the probe should be protected by a silicone probe cap.
- **DO NOT** disconnect probe when scanning. Otherwise, system damage may result.
- Normally, there is no risk of burnt when using this system; however, if the probe is placed in the same part of the animal's body for a long time, burnt may result. Under the condition of obtaining effective images, shorten the inspection time as possible.
- Shut down the system before plugging or unplugging the system or other peripheral equipment (such as printers). Otherwise system damage may result.
- Always use approved, coupling gel. Read the instructions of the coupling gel carefully before use
- Remove the coupling gel from the probe thoroughly after each use. Otherwise, moisture in the coupling gel may affect the safety and performance of the probe.
- Always use legally marketed probe sheaths for infection control in intra-cavitary and biopsy procedure. Before using latex probe sheaths, check the packaging and determine the composition of the latex probe sheaths. Studies have shown that natural rubber latex may cause allergic reactions in latex sensitive individuals. **DO NOT** use and change the brand of latex probe sheaths if allergic reaction occurs.
- After cleaning or disinfecting accessories, the chemical reagents or odors must be completely removed.
- Never use foot switch in operating room.

1.1.1.3 Software Safety



- To ensure the security of data, users must backup to external storage media when recording important data (such as hospitals, animal data, etc.), for the data stored in the system may be lost due to abnormal operation or failure.
- **DO NOT** shut down the system when print, save and load data, or data will be lost.
- Improper power failure may result in damage to the drive or system.
- Attempt to power the system on again at least 5 minute later after each shutting down. System malfunction may result.
- **DO NOT** run non-system software on your system computer.

- Before using the USB flash disk, please format the USB flash disk to prevent computer viruses from intruding the system.

1.1.1.4 Biological Hazard



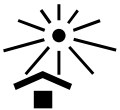
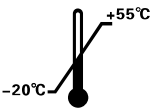
- To ensure the safety of animals and inspectors, it is forbidden to directly touch samples, mixtures and waste liquids. Please use protective materials (gloves, probe sheath, etc.) during operation, and perform disinfection steps as needed.
- If the sample contacts with skin inadvertently, you must immediately stop operating and notify your physician.
- Some disinfectants have strong acidity or alkalinity. Please use them carefully to prevent direct contact with hands and clothes. If hands or clothes are inadvertently exposed to disinfectants, wash them with soap and flowing water immediately; if disinfectants enter eyes inadvertently, wash them with plenty of clean water immediately and consult an ophthalmologist.
- Disinfectants, intensive cleaning agent and waste liquids must be disposed as bio-hazardous material in accordance with local standards. Consult the relevant disinfectant manufacturer or distributor for details.
- Probes used on animals with transmissible spongiform encephalopathy (TSE), such as mad cow disease, must be disposed of. Otherwise, it may infect the animals and operators. Currently, there is no method to clean or disinfect the probes used by TSE-affected animals.
-
- Follow all internal infection control procedures applicable to personnel and systems.
- Disposable biopsy bracket must be disposed of as infectious waste.
- Disinfect the reusable biopsy bracket before store it.

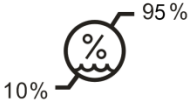
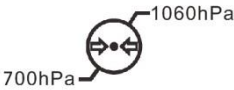
1.1.2 Labels and Symbols

The following table describes the important information of labels and symbols used on the equipment.

Table 1 Labels and symbols

Labels/symbols	Description
Tag	Tag includes the following information: ● The name and address of the manufacturer ● Date of manufacture ● Model and Serial Number ● Electrical rating (voltage, frequency)
	Type BF applied part
	Important information concerning the safe operation

Labels/symbols	Description
	Dangerous voltages
	Equipotentiality
	Alternating current
	Power on/ off switch.
	USB port
	Ethernet connection
	Manufacturer
	Date of manufacture
	Serial number
	Refer to user manual/booklet
	Fragile, handle with care
	Keep dry
	Away from sunlight
	Keep facing up
	Temperature range (transport and storage)
	Stacking load limitation

Labels/symbols	Description
	Indoor use only
	Waste electrical and electronic equipment
	Relative humidity range (transport and storage)
	Atmospheric pressure range (transport and storage)
	Nonionizing electromagnetic radiation
	Chinese Environmentally Friendly Use Period symbol

1.2 Application of Acoustic Power

Although it is generally believed that diagnostic ultrasound is safe, there are still studies confirming that there is a risk of damage when high-intensity ultrasound passes through human tissues. Therefore, the operator must follow the ALARA principle when using the ultrasonic diagnostic equipment and use the ultrasound with care.

1.2.1 ALARA

The guiding principle for the use of diagnostic ultrasound is defined by “ALARA principle” (As Low As Reasonably Achievable). That is, by keeping ultrasound intensity as low as possible while obtaining diagnostic images.

The ultrasound intensity depends on the intensity and exposure time of irradiation.

The ultrasound intensity required differs among application modes and animals.

Less ultrasonic power can only obtain low-quality images, which affects the reliability of the diagnosis; while using overdose ultrasonic power increases the risk of bioeffects.

Therefore, it is operator’s responsibility to reconcile ultrasonic power with diagnostic image quality. That is, to obtain qualified images while minimizing the ultrasonic bioeffects.



Warning

Special attention should be paid to the ALARA principle in obstetric exam, as any potential bioeffect can have a significant impact on the embryo or fetus.



Caution

- **Operators should always follow the ALARA principle to ensure the image quality and keep the referencing index and exposure time at lowest level.**
- **It is important for operators to master the function of the system and observe the acoustic output referencing index reading all the time.**

1.2.2 Bioeffect

Ultrasound produces two types of bioeffects, thermal and mechanical.

1.2.2.1 Temperature Index (TI)

The TI informs the operator about the potential for temperature rise in body tissue. It is an estimate of temperature rise in body tissue with specific properties. And temperature rise is influenced by factors such as tissue type, vascularity, operation mode, and others.

There are three types of TI. The system only displays one index at a time. The operator should choose the appropriate index to display according to the actual application location:

- The soft tissue thermal index (TIS) is suitable for abdominal and cardiac application. It indicates the potential for temperature rise in homogeneous tissue.
- The bone thermal index (TIB) is suitable for obstetric (mid-late pregnancy) or pediatric (newborn head) applications. It indicates the potential for temperature rise of bones or at near soft tissue.
- The cranial thermal index (TIC) indicates the potential for temperature rise of bones or at near soft tissue.

1.2.2.2 Mechanical Index (MI)

The MI informs the operator about the possibility for mechanical bioeffect occurrence. It is an estimate of damage in body tissue due to cavitation.

The higher the MI value the greater the possibility of mechanical bioeffect result.

NOTE : When gas and soft tissue exist at the same time, special attention should be paid to setting the MI value to a lower level.

1.2.3 Output Display

The system displays two basic index of Acoustic Output.

TI includes TIS, TIB and TIC. Each probe has a set of appropriate default options.

A TIS, TIB or TIC is displayed by probe and application mode chosen and the increment is 0.1 on the system.

The MI ranged from 0~1.9, the increment is 0.1.

A lower TI/MI index signifies a lower bioeffect. Operators should take TI and MI values as

a reference when applying the ALARA principle.

1.2.4 Probe Surface Temperature

The surface temperature of the transducer should not exceed 43°C to ensure the safety of animals.

1.2.5 Acoustic Power Control

The acoustic power can be controlled through three ways:

1.2.5.1 Direct Control

The direct control is to adjust the acoustic power by rotating the knob under **[A. Power]**.

1.2.5.2 Indirect Control

Indirect control is mainly performed by adjusting image parameters to control the acoustic power. Parameters that affect acoustic power include: imaging mode, probe and its frequency, position and number of focus, image depth, and PRF.

1.2.5.3 Receiver Control

The receiver control only affects the receiving mode of the ultrasonic wave, and does not affect the acoustic output while improving the image quality. The operator can optimize the image quality by adjusting the gain, TGC, and dynamic range to obtain effective diagnostic image with the minimum acoustic output.

Receiver control is recommended before direct control and indirect control.

Chapter 2 System Overview

2.1 Application Range

The device is suitable for clinical ultrasound examination for dogs, cats, equine, bovine and ovine.

2.2 Contraindications

None.

2.3 Packing List

Check the contents of the packing list before installing the system to ensure that the accessories are complete.

If you have any question, please contact manufacturer or sales representatives.

The following table shows the standard packing list. The contents of the packing list should be based on the actual purchased model.

Table 2 Standard Packing List

No.	Description
1	Console * 1
2	Power Cord * 1
3	User manual*1
4	Warranty Card
5	Accessory package * 1

2.4 System Configuration

2.4.1 Optional Probes

Table 3 Optional Probes

No.	Probe Model	Nominal/ Testing Frequency (MHz)	Probe Type	Region Applied	Intended Use
1	3C2PD	3.5/Gen	Convex Array probe	Surface	Abdomen, cardiology, reproduction, and small parts
2	6C1PD	6.5/Gen			
3	3C5PB	3.5/Gen	Convex Array probe	Surface	Reproduction and abdomen
4	3C5PD	3.5/Gen			
5	6I6PD	6.5/Gen	Intracavitary probe	Transrectal	Abdomen and small parts
6	7L4PD	7.5/Gen	Linear Array probe	Surface	
7	3P2PA	3.0/Gen	Phased Array probe	Surface	Cardiology

2.4.2 Optional Module

Table 4 Optional Module

3D mode	4D mode
CW mode	DICOM Service
Elastography	Panoramic Imaging

2.4.3 Optional Accessories

Table 5 Optional Accessories

Printer	Reusable Needle-guided Bracket
Foot Switch	Battery

2.5 System Components

2.5.1 Console

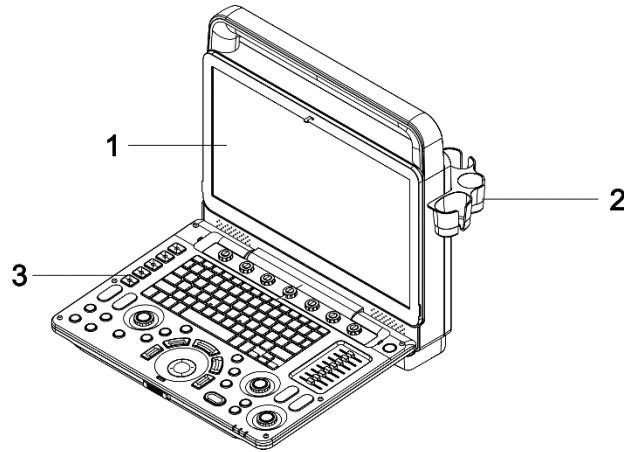


Figure 1 Front View

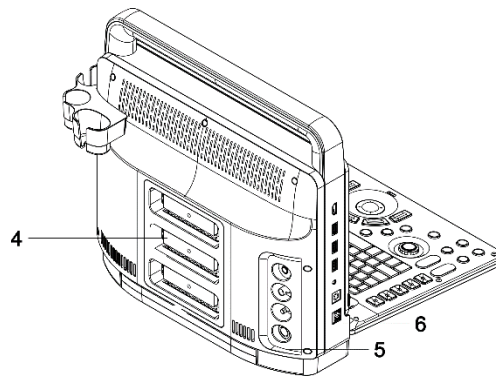


Figure 2 Back View
Table 6 Console

No.	Item	Function
1	Monitor	Display all user interfaces.
2	Probe Holder	Used for fixing al probe.
3	Control Panel	Provide system human-machine interface to facilitate the operation and control.
4	Probe Receptacles	Used for connecting ultrasonic probe. PORT 3 is optional.
5	Back Panel	Refer to “2.5.5 Back Panel” for details.
6	Side Panel	Refer to “2.5.6 Side Panel” for details.

2.5.2 Control Panel

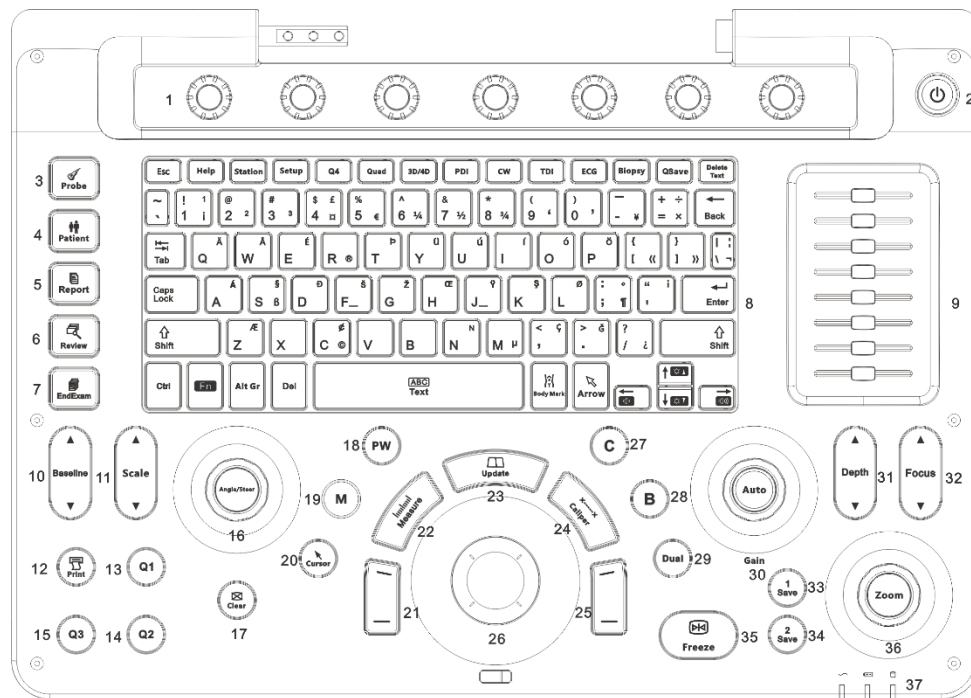
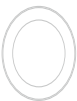


Figure 3 Control Panel
Table 7 Control Panel

No.	Icon	Description	Function
1	/	knob	Adjust the parameters corresponding to the screen. Center knob is the navigation knob.
2		Power switch	Power on/ off the system.
3	Probe	Probe/Exam switch button	Toggle probe and exam mode.
4	Patient	Animal information button	Enter / exit the Animal Information screen.
5	Report	Report button	Enter / exit the Report screen.
6	Review	Review button	Enter / exit the Review screen.
7	EndExam	EndExam button	End the current exam.
8	/	Keyboard	Refer to “2.5.3 Keyboard” for details.
9	TGC	TGC slider	Move left and right to adjust depth gain.
10	Baseline	Baseline button	Press ▲ / ▼ on the button to adjust the baseline position.
11	Scale	Scale button	Press ▲ / ▼ on the button to adjust the scale.
12	Print	Print button	Press to print.

No.	Icon	Description	Function
13	Q1	Customized Button	Customized Button.
14	Q2	Customized Button	Customized Button.
15	Q3	Customized Button	Customized Button.
16	Angle/Steer	Angle/Steer button	Press to switch between angle adjustment and steer adjustment. Rotate to adjust the angle or steer.
17	Clear	Clean button	Clear the measurement, comments and body mark in the screen.
18	PW	PW mode button	Press to pre-activate PW mode; double-press to enter PW mode.
19	M	M mode button	Press to pre-activate M mode; double-press to enter M mode.
20	Cursor	Cursor button	Display or hide a cursor.
21		Left set button	Press to confirm the operation.
22	Measure	Measure button	Activate / exit application measurement and calculation functions.
23	Update	Update button	In M/PW/CW pre-activation mode, press this button to enter M/PW/CW mode. In B+PW or B+CW mode, press this button to switch between the PW/CW image and the B mode image. In 3D/4D mode, press this button to acquire 3D/4D images.
24	Caliper	Caliper button	Activate / exit general measurement function.
25		Right set button	Press to confirm the operation.
26		Trackball	Refer to "2.5.4 Trackball" for details.
27	C	Color mode button	Press to enter Color mode.
28	B	B mode button	Press to enter Color mode.
29	Dual	Dual display	Press to enter B mode.
30	Auto/Gain	Auto/Gain knob	Press this knob to activate the auto optimization function. Rotate this knob to adjust the image gain.

No.	Icon	Description	Function
31	Depth	Depth slider	Move up and down to adjust the imaging depth.
32	Focus	Focus slider	Move up and down to adjust the focus position.
33	Save1	Image save button	Press this button to save the current frame image by default. You can customize its function depending on your needs. Refer to “4.2.5 Customize” for details.
34	Save2	Cine save button	Press this button to save the set cine by default. You can customize its function depending on your needs. Refer to “4.2.5 Customize” for details.
35	Freeze	Freeze button	Press this button to freeze the current image and press again to resume real-time status.
36	Zoom	Zoom knob	Rotate the knob to enter global zoom mode. Press the knob to enter local zoom mode.
37	/	Indicator light	 External power indicator.
			 Battery status indicator.
			 Hard disk status indicator.

2.5.3 Keyboard

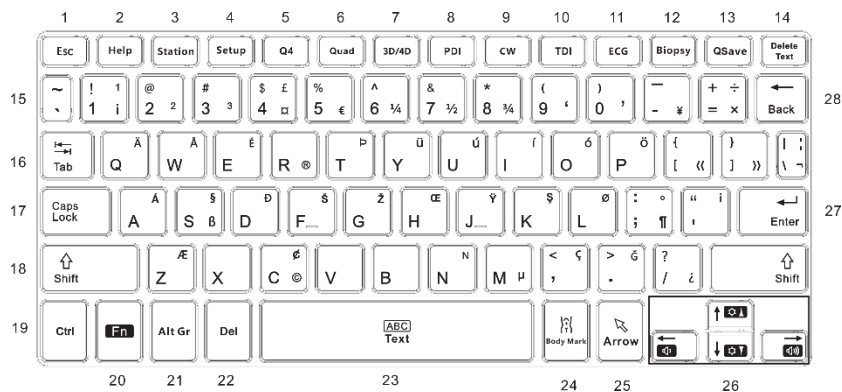


Figure 4 Keyboard
Table 8 Keyboard Description

No.	Key	Function
1	Esc	Back to Home screen.
2	Help	Open / close accompanying help documents.(Reserved function)
3	Station	Enter / exit Work Station screen.
4	Setup	Enter / exit System Setup screen.
5	Q4	User-defined keys.

No.	Key	Function
6	Quad	Enter Quad-Split display.
7	3D/4D	Press to enter 3D pre-activate mode; press again to enter 4D pre-activate mode.
8	PDI	Enter PDI mode.
9	CW	Press to pre-activate CW mode; double-press to enter CW mode.
10	TDI	Enter TDI mode.
11	ECG	Activate / exit ECG function.(Reserved function)
12	Biopsy	Activate / exit biopsy function.
13	QSave	Save the current image parameters as a preset for the next exam.
14	Delete Text	Delete all text annotation on the screen.
15	Symbolic key	Enter symbolic characters in the input box.
16	Tab	Jumps to next menu item.
17	Caps Lock	Toggle between the upper / lower case.
18	Shift	Key combination. Used together with other keys.
19	Ctrl	Key combination. Used together with other keys.
20	Fn	Key combination. Used together with other keys.
21	Alt Gr	Key combination. Used together with other keys.
22	Del	Delete the character after the cursor.
23	Space/Text	Insert a space/ comment.
24	Body Mark	Activate / exit body mark function.
25	Arrow	Activate / exit arrow annotation function.
26	↑←↓→	Move the cursor position by character.
27	Enter	Move the cursor to the next line of text or the input box.
28	Back	Delete the character before the cursor.

2.5.4 Trackball

Use the trackball and **[Set]** button to control the screen directly and easily.

Function	Description
Move	Roll the trackball to move the cursor.

Function	Description
Click / Select	Use the trackball to move the cursor over the select item, image, or annotation you want to select and press the [Set] button.
Drag	1) Click the image, or annotation you want to move and press the [Set] button 2) Roll the trackball to move the image or annotation to the desired location. 3) Press the [Set] button again.
Adjust ROI	1) Roll the trackball to adjust the size of ROI frame. 2) Press the [Set] button.

2.5.5 Back Panel

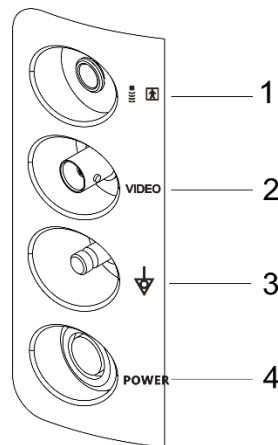


Figure 5 Front Panel

Table 9 Front Panel Description

No.	Name	Description
1		Type BF applied part.(Reserved function)
2	VIDEO	Video output.
3		Equipotential.
4	POWER	AC power input.

2.5.6 Side Panel

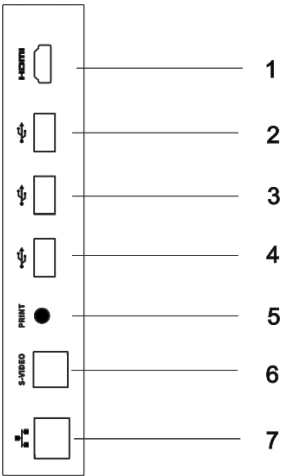


Figure 6 Side Panel
Table 10 Side Panel Description

No.	Icon	Description
1	HDMI	HDMI port.
2~4		USB port.
5	PRINT	Printer remote control.
6	S-VIDEO	S-video output.
7		Network port.

Chapter 3 Preparing the System

3.1 Moving the System

Care must be taken when moving the system and the specifications of this section must be strictly followed.

1. Shut down the system and disconnect the power cord and peripheral equipment cables.
2. Disconnect all cables, probes and accessories and move the system separately.
3. Pack the system correctly. It is recommended to pack the system in the original packaging at the factory.
4. Do not invert the system during transportation.

3.2 Positioning the System

To position the system, perform the following steps:

1. Position the system on a level, anti-slip surface. Leave at least 25 cm of space on the back and left and right sides of the system.
2. Properly place all power cords and cables to prevent tripping hazard.
3. Make sure that the environment is well ventilated.



Warning

DO NOT place the system on a slope or a slippery surface to prevent a tipping hazard which causes possible animal or operator injury and damage to the system.

3.3 Connecting the System

The system supports external power supply and battery power supply.

3.3.1 External Power Supply

The system power must be supplied from a properly rated outlet as required.

To connect external power supply, connect the power port of the Back Panel and a hospital grade grounded power outlet with the power cord.

3.3.2 Battery Power Supply



Warning

- **Battery can only be disassembled or installed by professionals. Disassembly and assembly by user will void the warranty. If the battery fails or needs to be replaced, please contact the manufacturer or your sale-representative.**
- **If you do not use the system for a long time on battery power, please shut down the system. Frequent charging and discharging**

will impact the service life of batteries.

3.3.2.1 Battery Charging and Use

The battery is a rechargeable lithiumion battery.

When an external power source is connected, the battery will be charged automatically when the battery power is not full.

The system switches to battery power supply automatically when external power source is removed. Fully charged battery will give about 2 hours of use.

3.3.2.2 Battery Status

Battery status is indicated by icons on the status bar.

Table 11 Battery Status Icons

Icon	Description
	Battery level 80%~100%
	Battery level 60%~80%
	Battery level 40%~60%
	Battery level 20%~40%
	Battery level 10%~20%
	Battery level below 10%
	Charging

3.3.2.3 Battery Maintenance

It is recommended to perform a complete discharge/charge cycle when the battery is used for the first time or not used for more than 3 months.

To perform a complete discharge/charge cycle:

1. Allow the battery to discharge completely until the system turns off.
2. Full charges the battery.
3. Repeat step 1~2 if necessary.

3.3.2.4 Battery Recycling

Replace and properly recycle the battery when it is obviously damaged or exhausted. Follow the corresponding regulations when disposing the used batteries.

3.4 Power On/ Off the System

3.4.1 Power on



Caution

- Do not power on the system without probe connected.
- If an abnormal power interruption occurs during the last system operation (such as a sudden interruption of AC power), you may have to wait longer 30~60s than usual to reboot the system.
- System can be rebooted 5 minute later of power off. Otherwise system failure may result.

NOTE : First power-on is recommended to be done by the authorized personnel. Make sure that the power cord is connected to the system and fully plugged into an appropriate grounded power rating outlet.

To power on the system, perform the following steps:

1. Press the power switch “” located on the upper right section of the control panel to startup the system and the power indicator lights up.
2. A boot screen appears, and the Home screen displays after startup.
3. After initialization has been completed, refer to the following items for startup check. If there is any abnormality, please contact your sales representative or the customer service department of the manufacturer.

Table 12 Checking List

No.	Item
1	Abnormal sound, smell, or overheating.
2	Error message.
3	Discontinuous display or abnormal dark area on the 2D image.
4	When the probe is connected to the system, monitor that the surface temperature of the probe all the time to avoid abnormal heat burn the animal.
5	The buttons and knobs of the control panel are fully functional.
6	The system time displays correctly.

3.4.2 Power off

To shut down the system, perform the following steps:

1. Press the power switch “” located on the upper right section of the control panel.
2. A confirmation prompt pops up, select **[Shutdown]** to power off the system.
3. When the power indicator lights out, the shutdown is completed.
4. Remove the plug from the wall outlet as needed.



Caution

- Never attempt to shut down the system while the system is in an upgrade or data transfer process.
- DO NOT remove U disk or cut down the power during upgrading.
- End the current exam before shutdown the system.
- DO NOT cut down the power before the shutdown procedure is completed. Files damaged and animal data lost may result.

NOTE :

- If the system fails to shutdown normally, unplug the power cord to force the system to shut down.
- It is not recommended to power off the circuit breaker or to remove the power plug directly for doing this may cause damage or loss of animal data.
- If the system is not used for a long time, disconnect the external power supply and turn off the circuit breaker, disconnect all peripheral equipment after shutdown the system.

3.4.3 Screensaver

Without any operation for a period of time, the system will enter the screen saver. You can customize screensaver settings, including the waiting time before entering the screen saver.

Setting path: **[Preset]** (press <Setup>) → **[System Preset]** → **[General]** → **[System Screensaver]**, refer to “4.2.2 General” for details.

3.5 Adjust the Monitor

Before starting the exam, you can adjust the monitor for better viewing.

- NOTE :
- Be careful to prevent crushing your hands when adjusting the monitor.
 - When transporting or moving the system, tilt the monitor to the vertical position and close the console to avoid damage to the screen.

Operation: Grab the top and bottom of the monitor with two hands and tilt the monitor up and down.

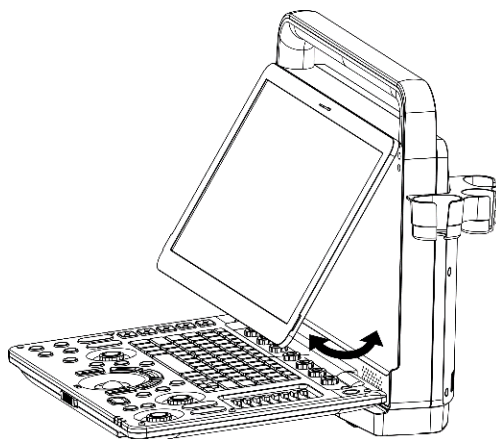


Figure 7 Adjust the Monitor

3.6 Connect / Remove the Probe



Warning

- Before connecting or removing the probe, freeze the image or shut down the system power, otherwise the system and probe damage may result.
- Use only probes provided by manufacturer. Using other probes may damage the system and probes and cause unpredictable accidents or malfunctions.
- Before connecting the probe, make sure that the surface, cable and socket of the probe are without cracks or any failure. Electrical shock may result if a defective probe has been used.
- Before connecting or removing the probe, place the probe in the probe holder and fix the probe cable to prevent the probe from accidentally falling.

NOTE:

- The third probe receptacle is optional and can only be connected if your system is configured for three receptacles. Verify your system's configuration before attempting to connect the third receptacle.

3.6.1 Connect the Probe

To connect a probe, perform the following steps:

1. Keep the probe cable to the left and carefully insert the probe connector into the probe receptacle completely.
2. Lock the probe.

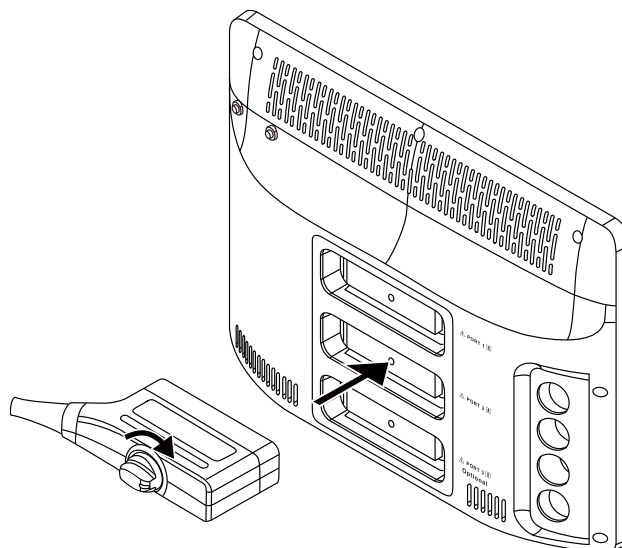


Figure 8 Connect the Probe

3.6.2 Remove the Probe

To remove the probe, perform the following steps:

1. Unlock the probe.

2. Pull the probe connector straight out of the probe receptacle.

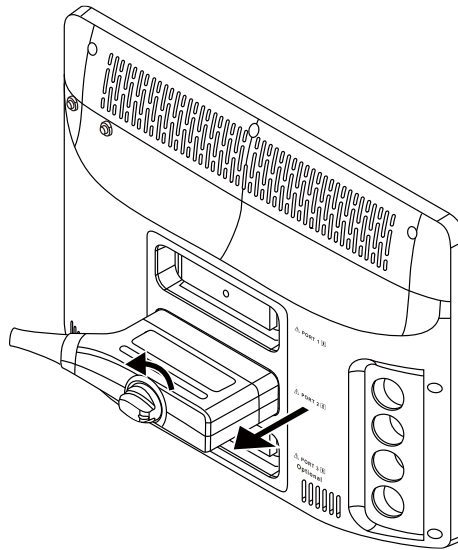


Figure 9 Remove the Probe

3.7 Foot Switch (Optional)

Foot switch is an optional accessory. Preset its function before using.

Setting path: **[Preset]** (press **<Setup>**) → **[System Preset]** → **[Customize]**, refer to “4.2.5 Customize” for details.

Operation: connect the foot switch to the system via USB port, and step on the foot switch to perform the corresponding operation.

3.8 Connect the Network

NOTE : To ensure the network security of the system, **DO NOT** connect any external network when using the system normally.

To connect the network, perform the following steps:

1. Connect the network port and the local LAN port with network cable.
2. Setup the local network.
 - Setting path: **[Preset]** (press **<Setup>**) → **[Network Preset]** → **[Local TCP/IP]**, refer to “4.5 Network Preset” for details.
3. Check the network connection status by the screen status bar.
 -  means successful network connection.
 -  means failed network connection, try to connect again.
 - Place the cursor on the network icon to automatically display the network information.

3.9 Connect Peripheral Device

3.9.1 Connect USB Device

➤ **To connect a USB device:**

1. Insert the USB device into the USB port.
2. After initialization, “” displays on the status bar.

➤ **To remove a USB device:**

1. Move the cursor over the “”, press the **[Set]** button.
2. Select the USB storage device to be removed in the pop-up dialog box and click **[OK]** to remove the USB device safely.
 - If the USB device is in the middle of a transfer, the system will prompt: “The USB device is in use, please wait until the task is complete to uninstall.”



Warning

Do not use USB storage device with unsafe data, otherwise system damage may result.

Remove the USB device safely. Direct removal may damage the USB device and the system.

3.9.2 Connect Printer

3.9.2.1 Connect Digital Printer

This section takes the HP OfficeJet Pro 8210 as an example. For the connection details for other models of printers, please refer to the printer manual.

To connect a digital printer, perform the following steps:

1. Connect the medical power supply and the printer with the power cable of the printer.
2. Connect the system to the printer using a USB cable or by joining the same network.
3. Add print service to the printer.
 - 1) Press **<Setup>** key to enter the Preset screen. Click **[Print Preset]** to enter print setting screen.
 - 2) Click **[Add Service]** to add print service to the printer.
 - 3) Enter the printer service name, select the printer service type, and click **[OK]**.
4. Install the printer driver.
 - 1) The set print service is displayed in the print service list; select the service by pressing **[Set]** button.
 - 2) Click **[Add Printer]** and a dialog box pops up.
 - 3) The printer driver path for the connected device will be displayed by URL.

Select the desired printer driver and then enter the printer name.

- 4) Click **[OK]** to install the driver.



Warning When using multiple peripherals that are not powered by the auxiliary output of the system, it must be ensured that the total leakage current of the peripherals and the system meets the medical equipment electrical safety standards in relevant areas.

3.9.2.2 Connect Thermal Printer

Please refer to the printer manual for installation details.

Once the printer is connected successfully, you can use it after relevant settings.

3.9.2.3 Connect DICOM Printer

Once the system is connected to the DICOM server and the DICOM print server has been set up, animal images and reports can be printed remotely. Refer to “12.2.2 DICOM Print” for details.

3.10 Screen

The system enters the Home screen by default after power on.

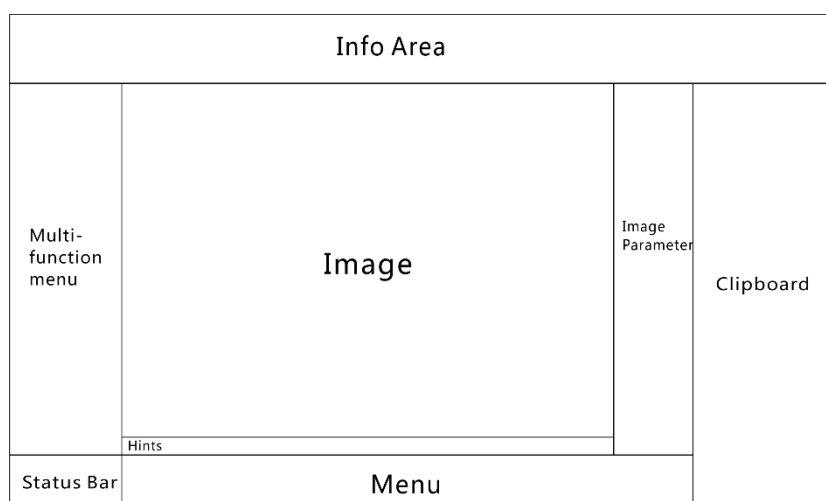


Figure 10 Home Screen

Table 13 Home Screen

Functional Area	Description
Information Area	The information area is located at the top of the Home screen. This area displays information such as LOGO, hospital name, physician, animal information, exam mode and date, probe parameter, TI & MI and battery information. You can set whether to display animal ID, name, gender, age, birthday, operator and hospital information as needed. Refer to “4.2.2 General” for details.
Multi-function Menu	The corresponding annotation information is displayed when the text

Functional Area	Description
	annotation / body mark annotation / arrow annotation / measuring functions are activated.
Image Area	The ultrasound image area is located in the center of the Home screen. This area displays real-time ultrasound images, probe marks, coordinate axes, focus positions, gray scale bars, and color bars of each exam mode. The cine replay progress bar is displayed under freeze state. The measuring scale and result window are displayed when the measure function is activated.
Hints	Display prompt information, help information, or progress status of the current screen.
Image Parameter	The image parameter area is located on the right side of the image area. This area displays the real-time parameters of current mode.
Clipboard	Display a thumbnail of the stored picture under the current exam. Users are able to perform paging up&down, sending or deleting.
Status bar	Display icons for current system status, including network connection status, input method, power status, storage status, USB and recycle bin, etc.
Menu	The menu is located on the right side of the Home screen. This area displays different menus for different screens, including but not limited to image menu, measurement menu, annotation menu and body mark menu.

Chapter 4 System Settings

4.1 Overview

This section details the access to configuration and service functions of the system. Customize your system to facilitate operation.

Item	Description
Enter the Preset screen	Press the <Setup> to enter the Preset screen.
Tab	Move the cursor over the tab and press the [Set] button to enter the corresponding setting screens.
Select an Item	Move the cursor over a setting item; press the [Set] button to select the item.
Text Box	Select the text box, enter text and numbers directly.
Drop-Down Box	Click the drop-down box to display all the sub-options under the current option.
Check box	Check the check box to activate corresponding option.
Save	Click to save current settings and return to the Home screen.
Cancel	Click to cancel all modifications and return to the Home screen.
Exit the Preset screen	In the Preset screen, press <Setup> again or click [Cancel] to cancel all modification and exit the Preset screen. In the Preset screen, click [Save] to save all modification and exit the Preset screen.

4.2 System Preset

4.2.1 Region

The Region tab is the default page of the Preset screen.

Open the Region tab via **[Preset]** (press **<Setup>**) → **[System Preset]** → **[Region]**. This tab is access to related information settings, such as hospital information, system language, and system time.

Figure 11 System Preset-Region

Table 14 System Preset-Region

Item		Description
Hospital Info	Name	Hospital Name.
	Address	Hospital Address.
	Telephone	Hospital telephone.
	Fax	Hospital Fax.
	Upload hospital logo	Click [Upload], a dialog box pops up. Select the picture you want to upload, and click [OK]. After the upload is completed, the logo is displayed in the Logo area. This logo will be displayed in the Report review screen.
Language & Time	Languages	Set the system language.
	Date & Time	Set the current date and time of the system. Enter the date in the date and time bar, or select the date through the calendar. Delete the original value, and enter the correct value.
	Date Format	Set the date format.
	Time zone	Set the time zone of the system.
	Current Time	Set the current time of the system. Delete the original value, and enter the new value.
	Time Format	Set the time format of the system.
	Sync	Synchronize system time to the system hardware time.

4.2.2 General

Open the General tab via [**Preset**] (press <Setup>) → [**System Preset**] → [**General**].

This tab is access to animal information display settings of the Home screen, setup of height and weight unit, status after exam the exam and standby mode, etc.

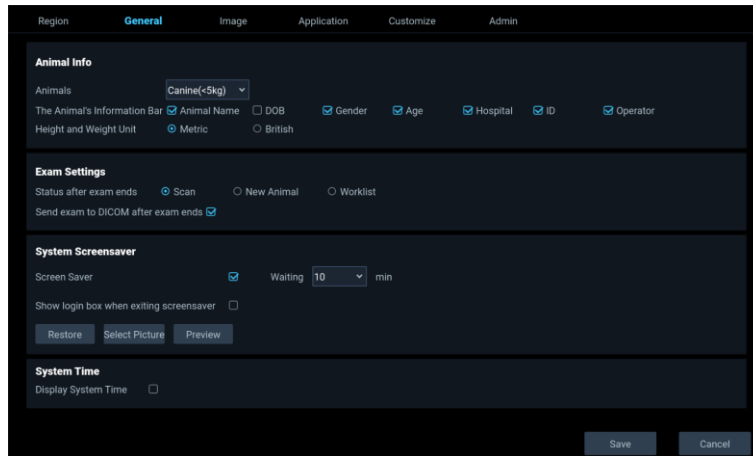


Figure 12 System Preset-General

Table 15 System Preset-General

Item		Description
Animal Info	Display Item	Set whether to display animal name, DOB, gender, age, hospital, animal ID and operator information in the Home screen.
	Height and Weight Units	Set the Height and Weight units of animal.
	Body Surface Area Formula (BSA)	Set BSA formula.
Exam Settings	Status after exam ends	Set the status after exam ends.
	Send exam to DICOM after exam ends	Set whether to send the animal data automatically to the DICOM server for storage or printing after exam ends.
System Screensaver	Screen Saver	Enable/disable the screen saver and set the waiting time before entering the screen saver state.
	Display login interface when exiting screensaver	Set whether to display login interface when exiting screensaver
	Restore	Restore the screensaver picture to the default.
	Select Picture	Select pictures for screensaver.
	Preview	Preview the screen saver picture.
System Time	Display System Time	Set whether to display system time in the lower-right corner of the screen.

4.2.3 Image

Open the Image tab via **[Preset]** (press **<Setup>**) → **[System Preset]** → **[Image]**. This

tab is access to related settings on save, output, display, and freeze for images and cines.

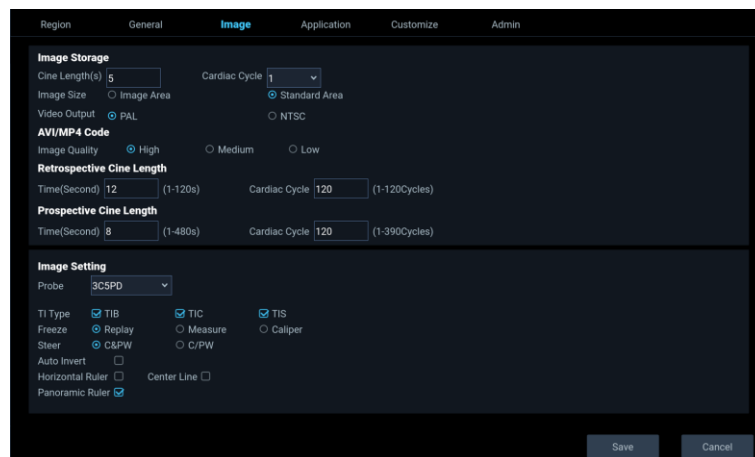


Figure 13 System Preset-Image

Table 16 System Preset-Image

Item		Description
Image Storage	Cine Length	Set the cine length.
	Cardiac Cycle	Set the cardiac cycle.
	Image Size	Set the save area of the image. Image Area: image and image parameters Standard Area: image, image parameters, and information at the top of the Home screen
	Video Output	Set the format of video output / S-video output.
AVI/MP4 Code	Image Quality	Set the quality of images to be sent as AVI/MP4. Higher quality means clearer images, but it takes longer to save and uses more storage space.
Retrospective Cine Length		Set the cine length for retrospective live capture and cardiac cycle.
Prospective Cine Length		Set the cine length for prospective live capture and cardiac cycle.
Default	Probe	Select default probe.
Image Settings	TI Type	Set whether to display the bone thermal index of bone (TIB) and the thermal index of cranial (TIC) or thermal index of soft tissue (TIS) in the image area.
	Freeze	Set status after freeze.
	Zoom Type	Set the magnification type.
	Steer	Set whether to steer the sampling frame of the Color mode and the sampling line of the PW mode together under B + Color + PW mode.
	Auto Invert	Set whether the spectrum automatically inverts accordingly when the sampling line and the sampling frame are steered.

Item		Description
	Horizontal Ruler	Set whether to display horizontal imaging ruler.
	Center Line	Set whether to display center line.
	Panoramic Ruler	Set whether to display Panoramic imaging ruler.

4.2.4 Application

Open the application tab via **[Preset]** (press **<Setup>**) → **[System Preset]** → **[Application]**. This tab is access to related setting of measurement and annotation.

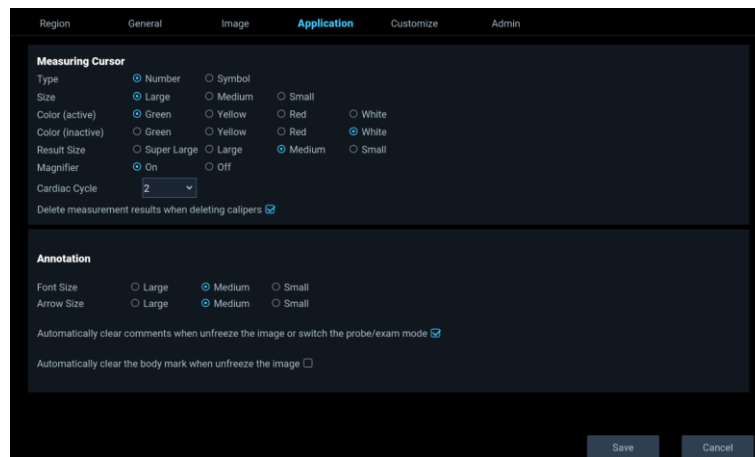


Figure 14 System Preset-Application
Table 17 System Preset-Application

Item		Description
Measuring Cursor	Type	Set the cursor type.
	Size	Set the cursor size.
	Color (active)	Set the color of cursor and measurement results of activated state.
	Color (Inactive)	Set the color of cursor and measurement results of not-activated state.
	Result Size	Set the font size for measuring result.
	Magnifier	Set whether to enable the magnifier function when entering the measurement mode.
	Cardiac Cycle	Set the number of cardiac cycles when taking heart rate measurement.
	Delete measurement results when deleting calipers	Set whether to clear the measurement results in the result window when deleting the calipers.
Annotation	Font Size	Set the font size for text annotation or comments.
	Arrow Size	Set the arrow size for arrow annotation.

Item		Description
	Automatically clear comments when unfreeze the image or switch the probe or exam mode.	Set whether to clear all comments or annotations on the image automatically when unfreeze the image, or switch the probe, or switch the exam mode.
	Automatically clear the body mark when unfreeze the image	Set whether to clear the body mark automatically when unfreeze the image.

4.2.5 Customize

Open the Customize tab via **[Preset]** (press **<Setup>**) → **[System Preset]** → **[Customize]**. This tab is access to function definition for user-defined buttons and foot switch.

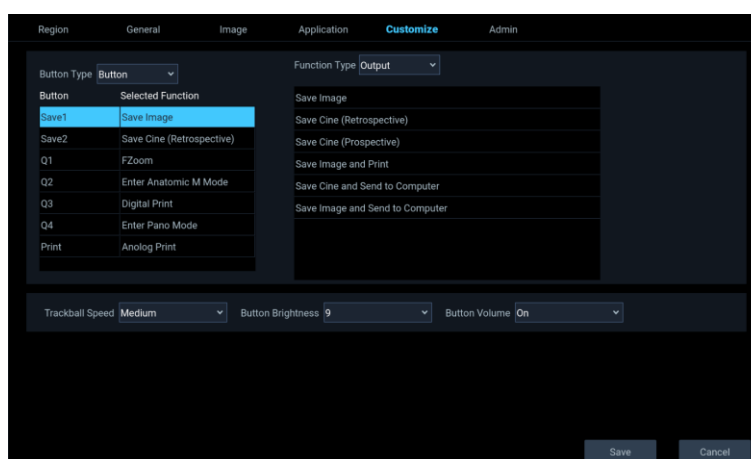


Figure 15 System Preset-Customize
Table 18 System Preset-Customize

Item	Description
Button Type	Select the button type you want to set.
Function Type	Select the function assigned by the button and the function list displays below.
Trackball Speed	Set the speed of trackball.
Button Brightness	Set the button brightness level.
Button Volume	Turn on/off the button volume function.

To customize user-defined button/foot switch, perform the following steps:

1. Click **[Button Type]** drop-down box and select button type.
2. Select a button you want to customize by pressing the **[Set]** button.
3. Click the **[Function type]** drop-down box to display all definable functions.
4. Double click a definable function to assign the function to the desired button.
5. Click the **[Save]** to save modifications and return to the Home screen.

4.2.6 Admin

The system supports three types of users: the administrator, operator and emergency user.

Icon	User	Permission
	Administrator	Access to all animal data in the system and be able to add users, delete users, import data, export data, delete data, edit data, store data, upgrade software / firmware, etc.
	Operator	Access to all animal data in the system and be able to import data, export data, delete data, edit data, and store data.
	Emergency user	Access to view and store animal data only. Data exporting, deleting and edition are not allowed.

4.2.6.1 Access Setting

Open the Permission tab via **[Preset]** (press **<Setup>**) → **[System Preset]** → **[Admin]**.

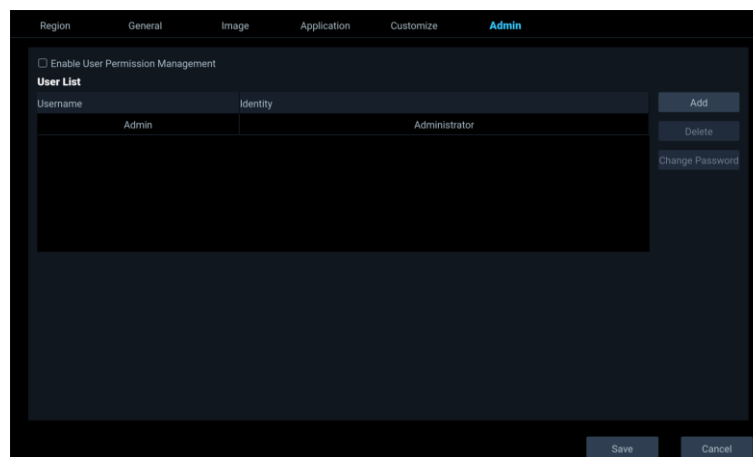


Figure 16 System Preset-Admin
Table 19 System Preset-Admin

Item	Description
Enable User Permission Management	After enabling user permission management, login is required when exporting data, backing up data, deleting data, etc. User permission management is not enabled by default.
Add	To add a new user: 1) Click [Add] to pop up the Add New User dialog box. 2) Enter a new user name, enter password, confirm the password, select a new user type, and click [OK] to complete adding a new user.
Delete	To delete an existed user: ● Select the target user in the user list and click [Delete].
Change Password	To modify the password of current user: 1) Select the target user in the user list and click [Change Password], a dialog box pops up. 2) Enter the new password, confirm the new password and click [OK] to complete the password modification.

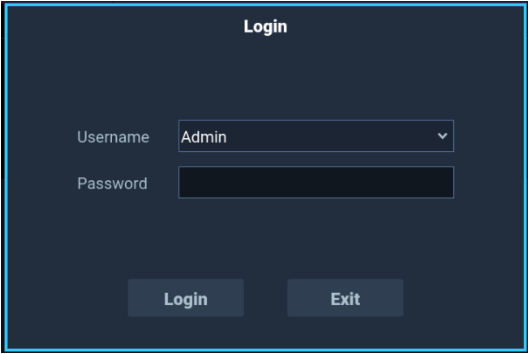
Item	Description
------	-------------

NOTE: Only administrators can add or delete users.

4.2.6.2 System Login

When admin is enabled, you can access the data in the system only after login.

To log on the system:

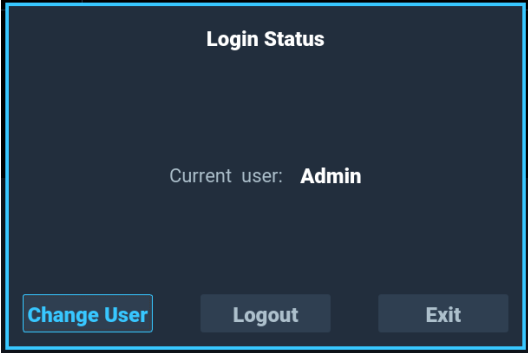
1. Click the user icon “


The image shows a dark-themed dialog box titled "Login". It contains two input fields: "Username" with a dropdown menu showing "Admin" and a small downward arrow, and "Password" with a text input field. At the bottom, there are two buttons: "Login" and "Exit".

2. Click **[Username]** drop-down box to select the user name.
3. Enter correct password and click **[Login]**.

4.2.6.3 Change User

To change user:

1. Click the user icon “


The image shows a dark-themed dialog box titled "Login Status". It displays "Current user: Admin". At the bottom, there are three buttons: "Change User" (highlighted with a blue border), "Logout", and "Exit".

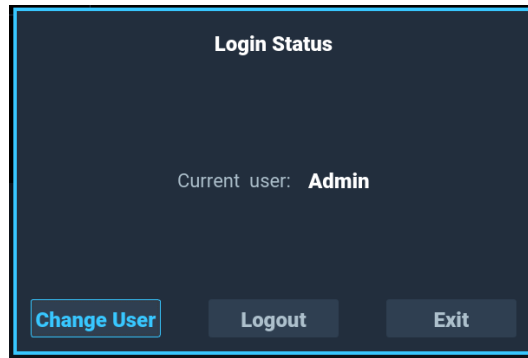
2. Click **[Change User]**, the login dialog box pops up.
3. Select desired user name and enter the password and then click **[Login]**.

4.2.6.4 System Logout

To log out the system:

1. Click the user icon “

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2. Click **[Logout]**.

4.3 Exam Preset

Enter the Exam Preset screen by clicking **[Exam Preset]** in Setup screen.

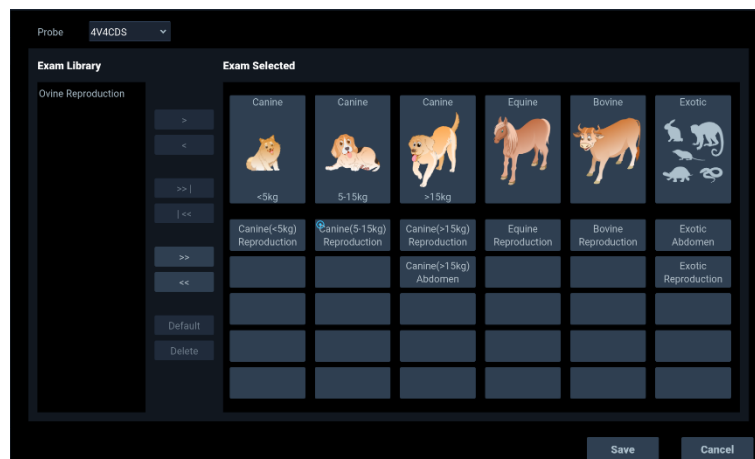


Figure 17 Exam Preset
Table 20 Exam Preset

Item	Description
Probe	Select a probe.
Exam Library	Display all available exam modes for current probe.
Exam Selected	Display all selected exam modes for current probe.
[<] / [>]	Add / Remove selected exam modes of current probe.
[<<] / [>>]	Add / Remove all exam modes of current probe.
Default	Set the selected exam mode as default to the current probe. Default exam mode is marked with a “  ”.
Delete	Delete User-defined exam mode.

4.3.1 Add Exam Mode

To add an exam mode, perform the following steps:

1. Click the **[Probe]** drop-down box to select the probe type.
2. Select the desired exam mode list from the Exam Library.
3. Click the blank box of the Exam Selected area to determine the location to add exam mode.

If you do not assign a location, the system defaults to add an exam mode to the blank box in the order of top-down, left-to-right.

4. Click the **[>]** to add selected exam mode to the Exam Selected area.
Or click the **[>>]** to add all exam mode from the Exam Library to the Exam Selected area.
5. Click **[Save]** to complete setting.

4.3.2 Remove Exam Mode

To remove exam mode:

1. Click the **[Probe]** drop-down box to select the probe type.
2. Select an exam mode you want to remove from the Exam Selected area.
3. Click **[<]** to remove the selected exam mode.
Or click **[<<]** to remove all exam mode listed in the Exam Selected area.
4. Click **[Save]** to complete setting.

4.3.3 Create/Delete User-defined Exam Mode

To create a user-defined exam mode:

1. Press the **<QSave>** on the keyboard to open the QSave dialogue box.
2. Rename and select data source and then click **[Create]** to create a user-defined exam mode.

To delete a user-defined exam mode:

1. Select the user-defined exam mode you want to delete in the Exam Preset screen.
2. Remove the desired exam mode to the Exam library and click **[Delete]** to delete a user-defined exam mode.

4.3.4 Adjust Exam Mode Display Position

You can adjust the display position of the exam mode to facilitate operation by following methods:

➤ Method 1

Select an exam mode to move and click on a blank box.
The selected exam mode will be moved to the blank box position.

➤ Method 2

Click two exam modes to exchange the positions of these two exam modes.

4.4 Measure Preset

Enter the Measure Preset screen by clicking **[Measurement Preset]** in the Preset Screen. The Measure Preset is access to related settings for general measure items, application measure items and report templates.

4.4.1 General Measurement Preset

To preset the general measurement:

1. Click **[Caliper]** tab to enter the general measurement preset page. The left column lists available measurement items while the right column lists selected measurement items.
2. Click **[2D]**, **[M]**, or **[Doppler]** tab to set measurement items under corresponding imaging mode.
3. Set measurement item.

Operation	Description
Add Measurement Item	1) Select the item(s) you want to add from the left column. 1) Click [>] to add the selected items of the left column to the right column. Or Click [>>] to add all the selected items of the left column to the right column.
Remove measurement Items	1) Select the item(s) you want to add from the left column. 2) Click [<] to remove the selected items from the right column to the left column. Or Click [<<] to remove all the selected items from the right column to the left column.
Adjust measurement item position	Select a selected measurement item and click [Up] / [Down] to adjust the position of the measurement items.
Set default measurement item	Select a selected measurement item and click [Default] to set the measurement item as default. Default measurement item is marked with a “√”.
Set Measurement Item Property	Select a selected measurement item, click [Property] to open the properties dialog box. Check the items to display in the result window or set the measurement item properties.
Status after completing current measurement.	Click on the [Measurement Sequence] drop-down box to set the status after completing current measurement. ● None: No measurement item is activated after completing the current measurement. ● Repeat: Activate the current measurement item again after completing the current measurement. ● Next: Activate the next current measurement item after completing the current measurement.

4. Click **[Save]** to save current settings and return to the Home screen.

4.4.2 Application Measurement Preset

To preset application measurement item:

1. Click **[Measure]** tab to enter the application measurement preset page.
The left column lists available measurement items while the right column lists selected measurement items.
2. Click **[2D]**, **[M]**, or **[Doppler]** tab to set measurement items under corresponding imaging mode.
3. Click **[Measurement Package]** drop-down box to select an exam mode.
4. Set measurement item.

Operation	Description
Add Measurement Item	1) Select the item(s) you want to add from the left column. 2) Click [>] to add the selected item of the left column to the right column. Or click [>>] to add all the selected items of the left column to the right column.
Remove Measurement Item	1) Select the item(s) you want to remove from the right column. 2) Click [<] to remove the selected item from the right column to the left column. Or click [<<] to remove all the selected items from the right column to the left column.
New	Open the Customize Wizard dialog box.
Delete	Remove a customize measurement item.
Advanced	Open the Advanced Setting dialog box.
Adjust Measurement Item Position	Select a selected measurement item and click [Move Up] / [Move Down] to adjust the position of the measurement items.
Set Default Measurement Item	Select a selected measurement item and click [Default] to set the measurement item as default. Default measurement item is marked with a “√”.
Set Measurement Item Property	Select a selected measurement item, click [Property] to open the properties dialog box. Check the items to display in the result window or set the measurement item properties.
Status after completing current measurement.	Click [Measurement Sequence] drop-down box to set the status after completing current measurement. ● None: No measurement item is activated after completing the current measurement. ● Repeat: Activate the current measurement item again after completing the current measurement. ● Next: Activate the next current measurement item after completing the current measurement.

5. Click **[Save]** to save current settings and return to the Home screen.

4.4.2.1 Customize Application Measurement / Calculation Item

To customize application measurement / calculation item:

1. Click **[New]** to open the Customize Wizard dialog box.
2. Enter an item name, select item type, and click on **[Next]**.
3. Set measurement item properties.
4. Click **[Complete]** to save the customize measurement/calculation item settings and close the Customize Wizard dialog box. The customize measurement / calculations items are displayed at the bottom of the list of available measurement items on the left.

4.4.2.2 New Study

1. Click **[New Study]** to open new study dialog box.
2. Enter the name of the new study and click **[OK]**. The new study is displayed at the bottom of the list on the right.

4.4.2.3 Edit Measurement Package

To edit measurement package:

1. Click **[2D]**, **[M]** or **[Doppler]** tab to set the imaging mode of the measurement package.
2. Click **[Advanced]** to enter the New Measurement Package screen. Available packages are listed in the left column while the selected packages are listed in the right column.
3. Edit Measurement package. You can add, remove, adjust the measurement package order, and set the default measurement package.

Operation	Description
Add Measurement Package	1) Select the package(s) you want to add from the left column. 2) Click [>] to add the selected package from the left column to the right column. Or click [>>] to add all the selected packages from the left column to the right column. 3) The measurement package can be activated by rotating the knob under [Exam].
Remove Measurement Package	1) Select the package(s) you want to remove from the right column. 2) Click [<] to remove the selected package from the right column to the left column. Or click [<<] to remove all the selected packages from the right column to the left column.
New	Open the Customize Wizard dialog box.
Delete	Remove a customize measurement item.
Adjust Measurement Package Position	Select a selected measurement package and click [Move Up] / [Move Down] to adjust the measurement package position.

Set Default Measurement Package	Select a selected measurement package and click [Default] to set the measurement package as default. Default measurement package is marked with a “√”.
--	--

- Click **[OK]** to exit the New Measurement Package screen and the current measurement package will be replaced by the new default measurement package.

4.4.3 Report Template

Click **[Report]** tab to enter the Report Preset screen. This tab is access to relevant settings of report template.

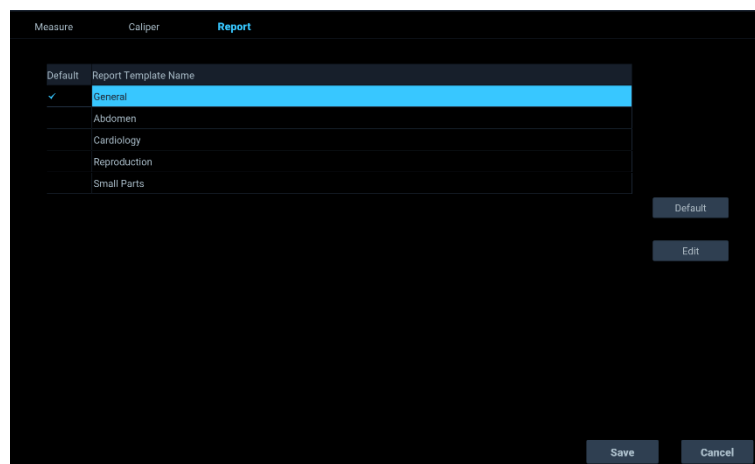


Figure 18 Measure Preset- Report

4.4.3.1 Default Report Template

Select a report template in the report template list and click **[Default]** to set the template as default.

Default report template is marked with a “√”.

4.4.3.2 Edit Report Template

- Select a report template in the report template list.
- Click **[Edit]** to enter the report template edit screen.
- Complete relevant settings as needed.
- Click **[OK]** to save modifications and exit the report template edit screen.

4.5 Network Preset

Network preset includes local and DICOM service-related network settings, as well as transfer assistant settings.

This section only introduces local network settings and transfer assistant settings. For details about the DICOM service-related network settings, refer to “Chapter 12 DICOM”.

4.5.1 Local Network

In the Preset screen, select **[Network Preset]** → **[Local TCP/IP]** to enter the local network setting screen. This screen is access to local network and LAN settings.

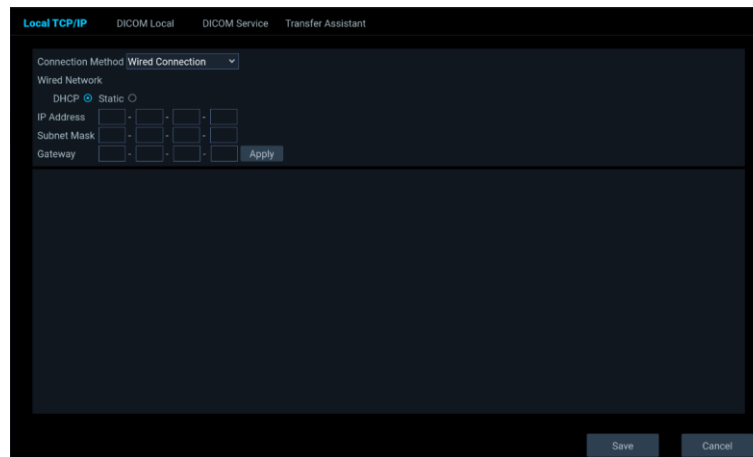


Figure 19 Network Preset- local TCP/ IP

Table 21 Network Preset- local TCP/ IP

Item	Description	
Wired Network	Network Acquiring	Select network acquiring method.
	IP Address	The IP address of system should be in the same network segment as the IP address of the server.
	Subnet Mask	Enter the subnet mask address of the system to set different network segments.
	Gateway	Enter the gateway address of the system.
	Apply	Click to make the modifications in this network property effective.
Wireless Network (Reserved function)	ON /OFF	Turn on / off the WIFI function.
	Auto Connection	Turn on /off the Auto connection function.

NOTE : IP address should not be occupied by other device in the LAN. Malfunction of DICOM will result.

4.5.2 Transfer Assistant

In the Preset screen, select **[Network Preset]** → **[Transfer Assistant]** to enter the transfer assistant setting screen. The transfer assistant is used to configure settings for transfer animal data directly to the computer via local area network (LAN).

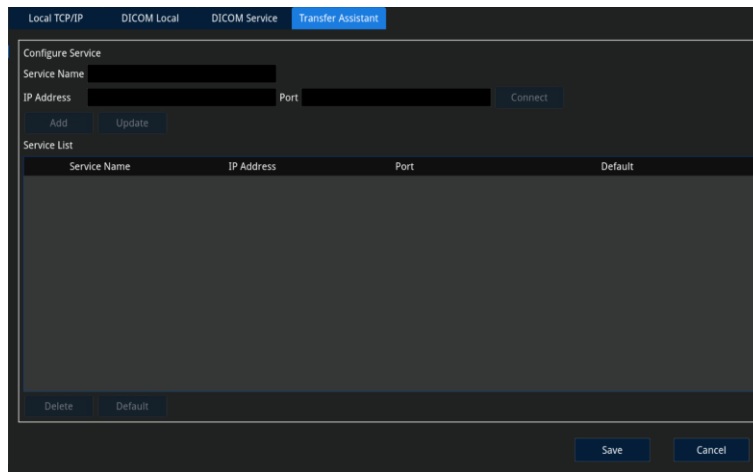


Figure 20 Network Preset - Transfer Assistant

Table 22 Network Preset - Transfer Assistant

Item		Description
Configure Service	Service Name	Enter a service name (do not use a duplicate service name).
	IP Address	Enter the IP address of your computer.
	Port	Enter the port of the computer client.
	Connect	Verify whether the computer client is successfully connected to the ultrasound device.
	Add	Add the configured service to the service list.
	Update	Update the IP address and port information of the selected service.
Service List		Displays a list of services that have been added.
Delete		Deletes the selected service in the service list.
Default		Set the selected service in the service list as the default service.

Note: Before configuring the transfer assistant, please install or update the corresponding version of the software package on your computer and configure the service.

4.5.2.1 Configure the Transfer Assistant Service

To configure the Transfer Assistant service, perform the following steps:

1. Enter the service name, the IP address and port corresponding to the computer client under Configure Service on the transfer assistant setting screen, and click **[Connect]**.

- The computer and ultrasound device must be on the same local area network to

establish a connection.

2. Click **[Add]** to add the configured service to the service list, and the first service added will be the default service.

- **Update service:** Select the desired service from the list, the service name, IP address, and port will be automatically filled in to the corresponding location. Modify the information, and click **[Update]** to update the IP address and port information of the selected service.
- **Delete service:** Select the desired service in the service list and click **[Delete]** to delete it.
- **Default service:** Select the desired service in the service list, and click **[Default]** to set it as the default service.

3. Click **[Save]** to save the settings and exit.

4.6 Print Preset

In the Preset screen, select **[Print Preset]** to enter the print preset screen. This screen is access to printing settings.

To add a printer, refer to “3.9.2 Connect Printer” for details.

The screenshot shows a software interface for managing print services and settings. It is divided into three main sections: 'Print Service', 'Printer Property', and 'Printing Parameter'. The 'Print Service' section at the top contains a table with columns for Service Name, Service Type, Printer, Default, and Status. It lists one service: 'Analog Image Print' with service type 'Analog Image Print', printer 'Video Graphic Printer', default '1', and status 'Unknown'. To the right of this table are five buttons: 'Add', 'Delete Service', 'Rename', 'Add Printer', and 'Default'. The 'Printer Property' section in the middle has fields for 'Service Type', 'Service Name', 'Printer' (a dropdown), 'Paper Orientation' (a dropdown), and 'Paper Size'. The 'Printing Parameter' section at the bottom has fields for 'Brightness', 'Contrast', 'Saturation', 'Rows' (a dropdown), and 'Columns', along with a 'Restore' button. At the very bottom right are 'Save' and 'Cancel' buttons.

Figure 21 **Print Preset**
Table 23 **Print Preset**

Item		Description
Print Service	Add Service	Click to open the add service dialog box.
	Delete	Click to remove the selected service.
	Rename	Click to rename the selected service.
	Add Printer	Select printer driver and performs related settings.

Item		Description
	Default	Click to set the selected service as default.
Printer Property	Service Type	Display service type of the printer.
	Service Name	Display service name of the printer
	Printer	Set the printer type.
	Paper Orientation	Set the paper orientation for printing.
	Paper Size	Set the paper size for printing.
Printing Parameter	Brightness	Set the brightness for printing.
	Contrast	Set the contrast for printing.
	Saturation	Set the saturation for printing.
	Rows	Set the number of rows for printing.
	Columns	Set the number of columns for printing.
	Restore	Restore default parameter setting for printing.

4.7 Maintenance Preset

In the Preset screen, select **[About & Maintenance]** to enter the Maintenance Preset screen.

This screen is access to system information, detailed information, option and other. You can view important information regarding the system information, submenus for option and other settings.

4.7.1 System Information

Select **[About & Maintenance]** → **[System Info]** to enter the System Information screen, where you can view the release version information of the system.

4.7.2 Detailed Information

Select **[About & Maintenance]** → **[Detailed Info]** to enter the Detailed Information screen, where you can view the detailed information of the system.

The displayed information varies depending on the configuration and version of the system.

4.7.3 Option

Select **[About & Maintenance]** → **[Option]** to enter the Option screen. This screen lists all the available options and their installation status. You can also view the machine code

in this screen and contact the dealer to complete the whole machine authorization.

4.7.4 Other

Select **[About & Maintenance]** → **[Other]** to enter the Other screen.

This screen is access to import / export for preset data and exam mode, restore factory defaults and upgrade.

Table 24 About & Maintenance- Other

Item		Description
Preset Management	All Preset	Select management preset data to all preset.
	Image Preset	Select management preset data to image preset.
	Customize	Select all management preset data to customize measurement preset.
	Export	Export selected preset data.
	Import	Import preset data to the system.
Exam Mode	Export	Export selected exam mode.
	Import	Import exam mode to the system.
Restore factory defaults		Return all settings to factory defaults.
Upgrade		Upgrade software versions
Enter Background		Enter engineering mode. Only available to authorized personnel.
Export Log		Export the log. Only available to authorized personnel.

Chapter 5 Preparing an Exam

5.1 Animal Information

Although the system supports exam without entering animal information, to avoid data chaos, it is recommended to enter animal information before performing an exam for better animal data management.

For archived animals, you can obtain animal information via the local and DICOM servers.

5.1.1 New Animal

Enter the animal information prior to the exam for the first time.

To start a new animal, perform the following steps:

1. Press **[Patient]** button on the control panel to enter the Animal Information screen.

Figure 22 Animal Information Screen

Table 25 Animal Information Screen

Item	Description
Worklist	Click to enter the Worklist screen.
New Animal	Click to erase all animal data and create a new animal record by entering new animal information.
New Exam	Click to end current exam and create a new exam for current animal.
Pause Exam /Resume Exam	Click to pause the current exam. Click again to resume the paused exam.
Cancel Exam	Click to cancel the current exam. Canceled exam cannot be restored.
Save	Click to save animal information and back to the home screen.
Cancel	Click to cancel animal information input and back to the home screen.

2. Move the cursor to the desired text box and enter the animal basic information.

Exam Information	Description
Animal Name	Enter animal name.
Animal ID	The system generates the animal ID automatically. To enter the animal ID manually, please delete the default animal ID first and then enter the new ID.
Animal No.	The system auto-synchronizes the serial number of the same animal in the worklist.
Gender	Click drop-down box to select animal gender.
Age	Enter the date of birth; the system will automatically calculate the animal's age. Otherwise, manual input is required.
DOB (Date of Birth)	Enter directly in the text box, or click the drop-down box to select the animal's date of birth in the calendar.
Host	Enter host name.
Animal Type	Select animal type.
Sterilization	Select sterilization status.

NOTE : Use keyboard for information entry. Press <Ctrl> + <Space> to switch input method between Chinese and English.

- Click the corresponding tab to select the appropriate exam type, and enter the animal's exam information.

Exam Type	Exam Information	Description
Abdomen	Height	/
	Weight	/
	BSA (Body Surface Area)	After entering the height and weight, the system calculates the BSA according to the formula selected by the user. To set the BSA formula, refer to "4.2.2 General" for details.
Reproduction	Calculation Index	LMP: enter the last menstrual period.
	Gestations	Select fetus number. The system supports up to 15 fetus measurements.
	Gravida	Times of pregnancy.
	Para	Times of delivery.
	Ectopic	Times of abnormal pregnancy. (E.g. Ectopic pregnancy)
	Abortion	Times of abortion.
Cardiology	Height	/
	Weight	/
	BSA (Body Surface Area)	After entering the height and weight, the system calculates the

Exam Type	Exam Information	Description
	surface area)	BSA according to the formula selected by the user.
	HR	Heart rate of the animal.
	RA Press	Right atrium pressure of the animal.
	BP	Blood pressure of the animal.
Small Parts	/	/

4. Enter operation information.

Operation Information	Description
Exam Description	Briefly describe the exam.
Charge Code	Enter the charge code.
Charge Description	Briefly describe the charge information.
Clinician	Enter the name of the clinician.
Diagnostician	Enter the name of the diagnostician who is responsible for the exam.
Operator	Enter the name of the operator.
Comment	Enter exam information.

5. Click **[Save]** to save the animal information and return to the Home screen.

- NOTE:**
- In case of emergency, you can perform an exam directly without animal information entry.
 - When an image or cine is frozen, the system automatically generates a animal ID.

5.1.2 Retrieve Animal Information (Station)

For animal information stored in the local hard disk, you can obtain animal information through the Station screen.

To retrieve animal information, perform the following steps:

1. Press **<Station>** key to enter the Station screen.

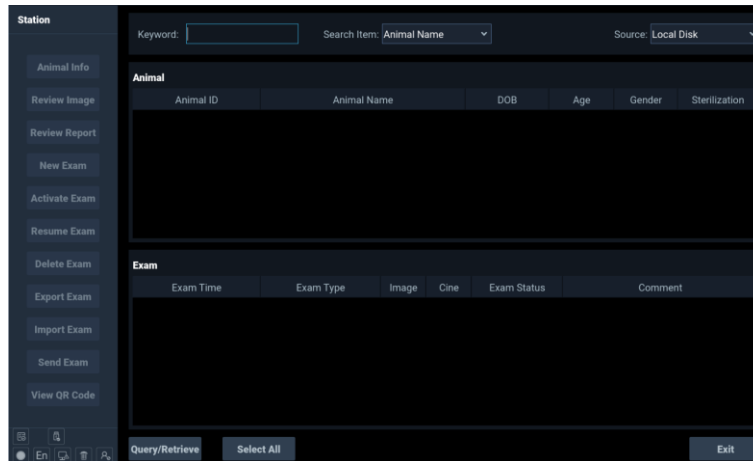


Figure 23 Station Screen

2. Click **[Source]** drop-down box to select the storage location of the desired animal information.
3. Search the desired animal.

Item	Description
Keyword	Enter the keyword for the research item. The animal list shows the animals who meet the requirements, the exam list shows all the exams under the selected animals, and the system defaults to select the first animal in the animal list.
Search Item	Click [Search Item] drop-down box to select a search item.

4. Select the desired animal and press the **[Set]** button to open the operation menu.

Item	Description
Animal Info	Click to enter the animal information screen, and view the selected animal information.
Review Image	Click to enter the review screen, and review the images of the selected exam.
Review Report	Click to enter the report screen and review the selected report.
New Exam	Click to create a new exam for the selected animal.
Activate Exam	Click to continue an exam that ends within 24 hours.
Resume Exam	Click to continue an exam that was interrupted within 24 hours.
Delete Exam	Click to delete the selected exam.
Export Exam	Click to export the selected exam to the storage media supported by the system.
Import Exam	Click to import animal information from other media to the system.
Send Exam	Click to send the selected exam to the external storage media, DICOM server or printer.

Item	Description
View QR Code	Click to view the QR code and link for animal data that has been sent to zStorage. Refer to “11.5.2.2 Transfer Animal Data to Electronic Device via Wi-Fi” for details.
Query / Retrieve	Click to view animal information stored on the DICOM server.
Select All Exams	Click to select all animals and exams for batch operations.
Exit	Click to exit Station screen and back to the home screen.

5.1.3 Retrieve Animal Information (DICOM)

After the system is connected to the DICOM server and the worklist server is set up (refer to “12.1.2.3 Worklist” for more information). You can remotely query or import animal information via the worklist server. Refer to “12.2.3 DICOM Worklist” for details.

5.2 Select Probe and Exam Mode

- NOTE :**
- If the exam mode is switched during the measurement, all general measurement data will be cleared while the application measurement data will be saved in the report.
 - Freeze the image or shutdown the system power before connect or remove the probe. Otherwise, system and probe damage may result.
 - After replacing the probe, please switch the probe from the Probe / Exam mode screen.

To select probe / exam mode, perform the following steps:

1. Connect the probes to the probe receptacle. (Refer to “3.6 Connect / Remove the Probe” for details).
2. Press **[Probe]** button on the control panel to enter the Probe / Exam mode screen. Connected probe and exam mode are displayed.

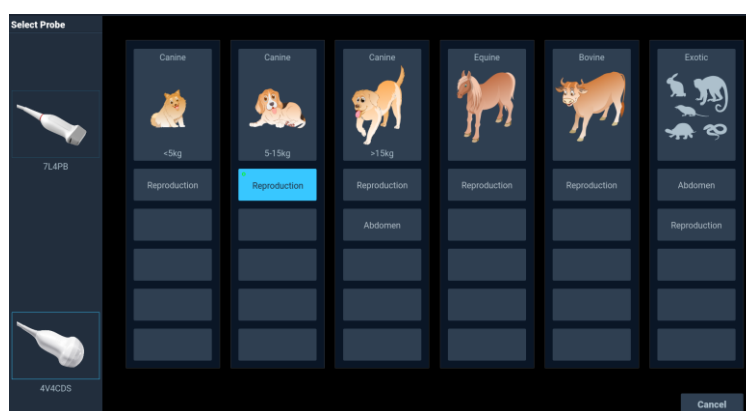


Figure 24 Probe/Exam Mode Screen

3. Click the probe icon to select an appropriate probe.
4. Select exam mode under the probe icon and the system enters the

corresponding exam mode.

- Double-clicking a probe icon selects the probe and enters its default exam mode automatically.

5.3 Select Imaging Mode

Select an appropriate imaging mode. Refer to “Chapter 6 Optimizing the Image” for more information of each imaging mode.

5.4 Resume/Activate Exam

5.4.1 Resume Exam

To resume an interrupted exam, perform the following steps:

1. Press **<Station>** key to enter the Station screen.
2. Select the desired animal and exam.
3. Click **[Resume Exam]** to load the animal basic information and measurement data to resume the previously interrupted exam.

NOTE : Only exams interrupted within 24 hours can be resumed.

5.4.2 Activate Exam

For animals that have completed the exam but need to be re-examined, perform the following steps:

1. Press **<Station>** key to enter the Station screen.
2. Select the desired animal and exam.
3. Click **[Activate Exam]** to load the animal basic information and measurement data to resume the previously completed exam.

NOTE : Only exams completed within 24 hours can be reactivated.

5.5 Cancel / End Exam

5.5.1 Cancel Exam

To cancel an exam, perform the following steps:

1. Press the **[Patient]** button on the control panel to enter the animal information screen.
2. Click **[Cancel Exam]** to pop up the Cancel exam dialog box.
3. Click **[OK]** to cancel the exam or **[Cancel]** to resume the current exam.

5.5.2 End Exam

To avoid data chaos between different animals and measurement items, end the current exam before proceeding to the next exam.

1. To end the current exam:
 - Press the **[EndExam]** button on the control panel.
 - Press the **[Patient]** button on the control panel to enter the animal information screen.
Click **[New Animal]** or **[New Exam]**.
2. The end exam dialog box pops up. Click **[OK]** to save the current animal data and exit the current exam.

Chapter 6 Optimizing the Image

6.1 Imaging Mode

The system offers a set of imaging modes to accommodate a variety of imaging applications.

The system supports following imaging modes:

Imaging Type	Imaging Mode
B	B-mode, 2B mode, 4B mode
M	M-mode, Anatomic M mode, Color CM mode
Color	Color mode, PDI mode, DPDI mode, Color+B mode, PDI+B mode
Doppler	CW mode, PW mode
Special	Panoramic imaging, Elastography, TDI imaging
3D	3D mode, 4D mode

6.2 B-mode

The B-mode imaging uses a multi-beam scanning method to form each scanning line into a 2D grayscale image, and displays the strength of the tissue echo signal by the intensity of the brightness.

B-mode imaging is the most basic imaging mode by displaying the anatomical structure of tissues and organs in real time.

B-mode can also be used together with other modes.

6.2.1 Basic Procedure of B-mode

To perform B-mode imaging, perform the following steps:

1. Start a new exam.
2. Select appropriate probe and exam mode, the system enters B-mode by default or press the **[B]** knob on the control panel to enter B-mode.
3. Optimize the image.(Refer to “6.2.2 Image Optimization (B)” for details)
The parameter area provides real-time parameter information of the B mode. The meanings of each parameter are as follows:

Parameter	B (2D) Mode
F	Working Frequency (MHz)
D	Depth

Parameter	B (2D) Mode
G	Gain (dB)
FR	Frame Frequency
DR	Dynamic Range
ZClear	Image Enhancement

4. Perform measurement and calculation as needed.

6.2.2 Image Optimization (B)

6.2.2.1 Gain

The gain is used to adjust the brightness of the B image. You can brighten the image and observe more echo signals by increasing the gain. However, with increased gain, more noise has been introduced.

Operation:

Rotate the **[Auto/Gain]** knob on the control panel to adjust the gain value.

6.2.2.2 TGC

The TGC controls compensation for signal attenuation as depth increases by varying the gain of the received signals at a specific depth.

Operation:

Move the TGC slider on the control panel to adjust the brightness of the segmented image of the corresponding depth.

6.2.2.3 Depth

Depth controls the field of view. Increase the depth to look at a deeper or larger tissue structure, decrease the depth to look at tissue structures near the skin line. Increase the depth tends to decrease the frame rate.

Operation:

Press the **[▲/▼]** of **[Depth]** on the control panel to adjust the image depth.

NOTE : Adjustable range depends on the current probe. The actual depth is shown in mm in the image parameter area.

6.2.2.4 Steer

Steer control is used to deflect the direction of beam without moving the probe.

Operation:

Rotate the **[Angle/Steer]** knob on the control panel to adjust the direction of the ultrasonic beam.

NOTE : Applicable to linear probe only.

6.2.2.5 Acoustic Power

Adjust the acoustic power of current selected probe in B-mode.

Operation:

Rotate the navigation knob to display **[A.Power]**, and then rotate the knob under **[A.Power]** to adjust the acoustic power.

6.2.2.6 Auto-optimization

The system automatically optimizes image parameters based on the tissue characteristics of the current scan area.

When auto-optimization function is enabled, an “Auto” mark is displayed in the image parameter area.

Operation:

Press the **[Auto/Gain]** knob on the control panel to enable/disable auto optimization.

6.2.2.7 Focus Position/Number

Adjust the focus of the ultrasonic beam to increase the resolution of the particular area and focus the optimized image.

The focus symbol “” is displayed on the image depth scale.

➤ **Adjust the focus number**

Rotate the navigation knob to display **[Focus number]**, and then rotate the knob under **[Focus number]** to adjust the number of focus.

➤ **Adjust the focus position**

Press the **[▲/▼]** of **[Focus]** on the control panel to adjust the focus position.

- NOTE:**
- Disable the SCI function before adjusting the focus number.
 - The phased array probe does not support adjusting the focus number.

6.2.2.8 Image Quality

Adjust image quality by controlling the frequency. User selects the appropriate frequency type and frequency value based on the depth of scanning and tissue characteristics to achieve optimal imaging results.

The fundamental wave is marked with an “F” while the harmonic wave is marked with an “F H”.

Operation:

1. Press the knob under **[Image Quality]** to switch between **[Fundamental Frequency]** and **[Harmonic Frequency]**.
2. Rotate the knob under **[Image Quality]** to select the frequency.

- Fundamental frequency options: Pen (Penetration priority), Gen (General imaging), Res (Resolution priority)
- Harmonic frequency options: HPen (Penetration priority), HGen (General imaging), HRes (Resolution priority), HPen-Gen (between Penetration and General)

NOTE : Adjustable range depends on the current probe.

6.2.2.9 Dynamic Range

Change the display range of the grayscale to adjust the contrast of the image.

Operation:

Rotate the knob under **[Dyn Ra.]** to adjust the dynamic range.

6.2.2.10 ZClear

Used to enhance image contrast, smooth images and reduce noise.

Operation:

Rotate the knob under **[ZClear]** to adjust the image enhancement.

6.2.2.11 Persistence

Superimpose and average the images of adjacent frames to remove the noise and enhance the details.

Operation:

Rotate the knob under **[Persistence]** to adjust the persistence value.

6.2.2.12 Gray Map

Optimize the images by adjusting the black-white contrast of the image.

Operation:

Rotate the knob under **[Gray Map]** to adjust the grayscale map.

6.2.2.13 TSI

Select the acoustic velocity according to the scanning site to highlight the tissue texture.

Operation:

Rotate the navigation knob to display **[TSI]**, and then rotate the knob under **[TSI]** to select the tissue texture.

6.2.2.14 Chroma

Replace grayscale distinction with color distinction to intuitively show grayscale level of the images.

Operation:

Rotate the knob under **[Chroma]** change the color.

6.2.2.15 Field of View

Change the scan range without moving the probe or ROI box.

You can get a wider FOV (field of view) by a larger scan range. A larger FOV trends to decrease the frame rate.

Operation:

Rotate the navigation knob to display **[Field of View]**, and then rotate the knob under **[Field of View]** to adjust the scan range.

6.2.2.16 Compound Imaging

Compound imaging is the process of merging frames of different steering angles into a single frame. This function is used to improve the spatial resolution and signal-to-noise ratio of the image, making the image subtle and clean.

There are two types of compound imaging: SCI (Spatial Compound Imaging) and FCI (Frequency Compound Imaging)

SCI and FCI cannot be used simultaneously. When one of the compounds imaging type is activated, the other type will automatically turn off.

➤ **SCI (Spatial Compound Imaging)**

Operation:

Rotate the navigation knob to display **[SCI]**, and then rotate the knob under **[SCI]** to adjust SCI levels.

➤ **FCI (Frequency Compound Imaging)**

FCI is only available for the fundamental frequency.

Operation:

Rotate the navigation knob to display **[FCI]**, and then rotate the knob under **[FCI]** to adjust FCI level.

6.2.2.17 Line Density

Line density determines the number of the ultrasonic scanning lines of a certain width or angle.

Operation:

Rotate the navigation knob to display **[Line Density]**, and then rotate the knob under **[Line Density]** to adjust line density level.

6.2.2.18 Image Rotation

Change the orientation of the image display.

Operation:

- Rotate the navigation knob to display **[Rotation]**, and then rotate the knob under **[Rotation]** to change the image display.
- Rotation Options: 0°, 90°, 180°, and 270°.

NOTE : “●” of the image is consistence with the orientation mark of the probe.

6.2.2.19 Image Reverse

Reverse the image orientation horizontally or vertically for better observation.

Operation:

Rotate the navigation knob to display **[UD Reverse]** or **[LR Reverse]**, and then rotate the knob under **[UD Reverse]** or **[LR Reverse]** to turn on/off the image reverse function.

6.2.2.20 EFOV (Extended filed-of-view)

When the extended imaging function is enabled, trapezoidal imaging (for linear array probes) or extended scanning angle (for convex array and phased array probes) will be displayed.

Operation:

Rotate the navigation knob to display **[EFOV]**, and then rotate the knob under **[EFOV]** to adjust the EFOV level.

6.2.2.21 Dual Live

Display two B images of one probe at the same time.

Operation:

Rotate the navigation knob to display **[Dual Live]**, and then press the knob under **[Dual Live]** to enable / disable the function of displaying two B images at the same time.

6.2.2.22 Center Line

Display or hide a centerline which is used for needle guidance.

Operation:

[System Preset] → [Image] → [Image Setting] → [Center Line] to display or hide the centerline.

6.2.2.23 Horizontal Scale

Display or hide the horizontal scale.

Operation:

[System Preset] → [Image] → [Image Setting] → [H scale] turn on / off the function.

6.3 M-mode

M-Mode is used to determine patterns of motion for objects along the M-line. The most common use is for viewing motion patterns of the heart.

6.3.1 Basic Procedure of M-mode

In M-mode, the M-line can only be set within 90 degrees of sector angle, so it is more suitable for organs with regular shape and normal position.

To perform an M-mode imaging:

1. Optimize the B-mode image to make the image sharper.
2. Press the **[M]** button on the control panel to enter the pre-active M-mode, and M-line is displayed on the B-mode image.
3. Roll the trackball to adjust the position of the M-line.
4. Press the **[M]** button or the **[Update]** button on the control panel to enter the M-mode. The image is divided into two parts: B-mode image at the top and M-mode image at the bottom.
 - X axis: displays time
 - Y axis: displays the tissue position or depth
5. Move the M-line on B-mode image with the trackball; you can learn the movement of the anatomy along the M-line in the M-mode image.
6. Optimize the M-mode image. Refer to “6.3.2 Image Optimization (M)” for details. The parameter area on the right side of the screen provides real-time parameter information of the M-mode. The meanings of each parameter are as follows:

Parameter	M-mode
F	Working Frequency (MHz)
D	Depth
G	Gain (dB)
V	Velocity
DR	Dynamic Range

7. Perform measurement and calculation items as needed.

6.3.2 Image Optimization (M)

6.3.2.1 Gain

The gain is used to adjust the brightness of the M-mode image. You can brighten the image and observe more echo signals by increasing the gain. However, with increased gain, more noise has been introduced.

Operation:

In M-mode, rotate the **[Auto/Gain]** knob on the control panel to adjust the gain value.

6.3.2.2 Dynamic Range

Change the display range of the grayscale to adjust the contrast of the image.

Operation:

Rotate the knob under **[Dyn Ra.]** to adjust the dynamic range.

6.3.2.3 Gray Map

Optimize the images by adjusting the black-white contrast of the image.

Operation:

Rotate the knob under **[Gray Map]** to adjust the gray map.

6.3.2.4 Speed

Control the scanning speed of M mode imaging.

Operation:

Rotate the knob under **[Speed]** to adjust the M speed.

6.3.2.5 Chroma

Replace grayscale distinction with color distinction to intuitively show grayscale level of the images.

Operation:

Rotate the knob under **[Chroma]** to change the selection color.

6.3.2.6 Display Format

Change the display format of B image and M image for easy comparison of images.

Operation:

Rotate the knob under **[Display Format]** to select the appropriate display format.

6.4 Color Mode

Color mode is also a Doppler mode to provide blood flow information in colors. Color mode includes basic color mode and PDI mode.

NOTE : Acoustic power in Color mode is synchronous with that of B-mode.

6.4.1 Basic Procedure of Color Mode

Typically, the color above the color bar baseline indicates the flow towards the probe; while color below the color bar baseline indicates the flow away from the probe.

The brighter the color, the faster the blood flows; the darker the color, the slower the blood flows.

To perform a color mode imaging:

1. Observe the anatomical structure, adjust the B-mode image and probe to make the target area at the center of the B-mode image.
2. Press the **[C]** button on the control panel to enter Color-mode.
3. Adjust the position and size of the ROI box.
 - When the ROI box displayed a solid line frame, roll the trackball to adjust the position of the ROI box, press the **[Set]** button to confirm.
 - When the ROI box displayed a dotted line frame, roll the trackball to adjust the size of the ROI box, press the **[Set]** button to confirm.
 - Press the **[Set]** button to toggle between position and size adjustment.
4. Optimize the image.(refer to “6.4.3 Image Optimization (Color/PDI)” for details)
The parameter area on the right side of the screen provides real-time parameter information of the Color mode. The meanings of each parameter are as follows:

Parameter	Color-mode
F	Working Frequency (MHz)
G	Gain (dB)
WF	Wall Filter
PRF	Pulse Repetition Frequency

5. Perform measurement and calculation items as needed.

6.4.2 Basic Procedure of PDI mode

Power Doppler Imaging (PDI) is used to show the presence or absence of blood flow and to reflect the density of red blood cells.

NOTE : PDI mode only provides perfusion information of blood flow, but cannot indicate the direction and speed of blood flow.

To perform a PDI mode imaging:

1. Observe the anatomical structure, adjust the B-mode image and probe to make the target area at the center of the B-mode image.
2. Press **<PDI>** key to enter PDI mode.
3. Adjust the position and size of the ROI box.
 - When the ROI box displayed a solid line frame, roll the trackball to adjust the position of the ROI box, press the **[Set]** button to confirm.
 - When the ROI box displayed a dotted line frame, roll the trackball to adjust the size of the ROI box, press the **[Set]** button to confirm.
 - Press the **[Set]** button to toggle between position and size adjustment.

4. Optimize the image. (Refer to “6.4.3 Image Optimization (Color/PDI)”) The parameter area on the right side of the screen provides real-time parameter information of the PDI mode. The meanings of each parameter are as follows:

Parameter	PDI-mode
F	Working Frequency (MHz)
G	Gain (dB)
WF	Wall Filter
PRF	Pulse Repetition Frequency

5. Perform measurement and calculation items as needed.

6.4.3 Image Optimization (Color/PDI)

6.4.3.1 Gain

Adjust the overall sensitivity of flow signals.

Operation:

Rotate the **[Auto/Gain]** knob on the control panel to adjust the Color/PDI gain value.

6.4.3.2 Baseline

Calibrate the 0 position of the scale for the best blood flow speed display.

Operation:

Press the **[▲/▼]** of **[Baseline]** on the control panel to adjust the baseline.

NOTE : Baseline function is unavailable for PDI mode.

6.4.3.3 Image Quality

Adjust the frequency of current selected probe in Doppler mode.

Operation:

- Rotate the knob under **[Image Quality]** to select the frequency.
- Fundamental frequency options: Pen (Penetration priority), Gen (General imaging), Res (Resolution priority).

6.4.3.4 Scale

Adjust the speed range of color flow by changing the scale.

Operation:

Press the **[▲/▼]** of **[Scale]** to adjust the scale value.

NOTE : Select appropriate PRF to match the flow velocity. Aliasing may resulted if low PRF is used for high flow velocity or small signal lost may resulted if high PRF is used for low flow velocity.

6.4.3.5 Wall Filter

Filter low frequency noise to reduce the impacts of breathing and other activities.

Operation:

Rotate the knob under **[Wall Filter]** to adjust the filtering value.

6.4.3.6 Smooth

Suppress noise and smooth the image.

Operation:

Rotate the knob under **[Smooth]** to adjust the smooth level.

6.4.3.7 Persistence

Superimpose and average the images of adjacent frames to remove the noise and enhance the details.

Operation:

Rotate the knob under **[Persistence]** to adjust the persistence level.

6.4.3.8 Priority

Set the priority to displays blood flow information by color signals or gray signals.

The larger the value, color signals are prior to display; while the smaller the value, gray signals are prior to display.

Operation:

Rotate the navigation knob to display **[Priority]**, and then rotate the knob under **[Priority]** to adjust the color priority value.

6.4.3.9 Color Map

➤ **Color**

Multiple sets of color maps are provided to optimize color flow display. This system provides multiple different maps for users to choose. The ordinary map is marked with “V” while 2D map is marked with “VV”. The chosen spectrum color map is displayed on the color bar on the right side of the screen.

Operation:

Rotate the navigation knob to display **[Color Map]**, and then rotate the knob under **[Color Map]** to choose the color map.

➤ **PDI**

Provide color image display effect parameters, including energy spectrum and directional energy spectrum. This system provides different effect maps for users to choose. The energy maps are P0-3 while the direction energy maps are dP0-3. Directional energy spectrum also shows the direction information of blood flow.

Operation:

Rotate the navigation knob to display **[Color Map]**, and then rotate the knob under **[Color Map]** to choose the color map.

6.4.3.10 Color Hide

Only black-and-white images are displayed when the color hiding function is on. Both color and black-and-white images are displayed when the function is off.

Operation:

Rotate the navigation knob to display **[Color Hide]**, and then press the knob under **[Color Hide]** to enable / disable the color hide function.

6.4.3.11 Sensitivity

Reflect the ability to reflect minimal detectable blood flow which is used to adjust the accuracy of color flow display. The higher the sensitivity, the more sensitive the response to low-speed blood flow and small blood vessel signals, and the better the image quality.

Operation:

Rotate the knob under **[Sensitivity]** to adjust the sensitivity.

6.4.3.12 Flow State

Optimize images of different blood flow states.

Operation:

Rotate the navigation knob to display **[Flow State]**, and then rotate the **[Flow State]** to adjust the flow state.

6.4.3.13 Dynamic Range (PDI)

Quickly optimize and adjust the images of different blood flow states.

Operation:

Rotate the navigation knob to display **[Dyn Ra.]**, and then rotate the knob under **[Dyn Ra.]** to adjust the dynamic range.

6.4.3.14 Line Density

Line density determines the number of the ultrasonic scanning lines of a certain width or angle.

Operation:

Rotate the navigation knob to display **[Line Density]**, and then rotate the knob under **[Line Density]** to adjust line density level.

6.4.3.15 Invert

Invert the color scale for blood flow direction.

By default, red color indicates the blood flow towards the probe; while blue color indicates

the blood flow away from the probe. When the invert function is enabled, blue color indicates the blood flow towards the probe; while red color indicates the blood flow away from the probe.

The color flow image and the color bars on the right side of the image will change accordingly.

Operation:

- Rotate the navigation knob to display **[Invert]**, and then press the knob under **[Invert]** to turn on / off the invert function.
- Rotate the navigation knob to display **[Auto-Invert]**, and then press the knob under **[Auto-Invert]** to turn on / off the auto-invert function. (Only applicable for linear probe)

6.4.3.16 Dual Live

Display B and C images of one probe at the same time.

Operation:

Rotate the navigation knob to display **[Dual Live]**, and then press the knob under **[Dual Live]** to enable / disable the function of displaying B and C live images at the same time.

6.4.3.17 B/C Align

Set the maximum width of the B images the same width as the ROI box.

Operation:

Rotate the navigation knob to display **[B/C Align]**, and then press the knob under **[B/C Align]** to turn on / off the function.

6.4.3.18 High Resolution Flow

Enhance the resolution of flow Image.

Operation:

Rotate the navigation knob to display **[HR Flow]**, and then press the knob under **[HR Flow]** to turn on / off the function.

6.4.3.19 Velocity Tag

Mark the flow at a specified velocity range for regional blood flow velocity observation.

Operation:

1. Rotate the navigation knob to display **[Velocity Tag]**, and then press the knob under **[Velocity Tag]** to turn on / off the function.
2. An indicator displays in the Color Bar, roll the trackball to target position and the velocity of the indicator shows in the image parameter area.

NOTE : Only applicable for Color mode.

6.5 Doppler Imaging Mode

Doppler imaging is primarily used to provide blood flow velocity information and to indicate blood flow direction, type (e.g, arterial blood flow, venous blood flow) and properties.

Doppler imaging includes PW (Pulsed Wave Doppler) mode and CW (Continuous Wave Doppler) mode. PW mode displays regional blood flow velocity, direction and properties at a certain depth; CW mode is often used to display high-speed blood flow frequency. The combination of the two modes improves the accuracy of the diagnosis.

6.5.1 Basic Procedure of PW-mode

PW (Pulsed Wave Doppler) mode is used to learn the movement information of blood flow along a scanning line in a certain area. PW mode includes common pulse mode and high pulse repetition frequency (HPRF) mode.

To perform a PW-mode imaging:

1. Observe the anatomical structure, adjust the B-mode image and probe to make the target area at the center of the B-mode image.
2. Press the **[PW]** button on the control panel to enter the pre-activated PW mode.

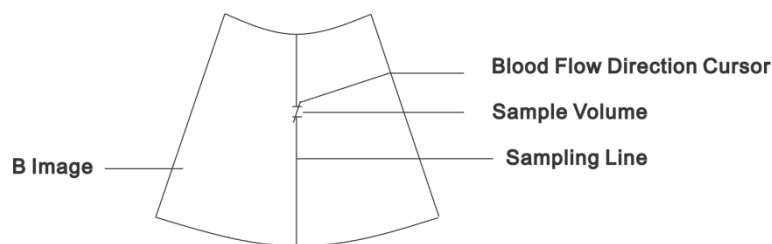


Figure 25 Pre-activated PW-mode

3. Adjust the sampling line and sampling depth to determine the sample volume in the target area.
 - Roll the trackball left and right to adjust the position of the sampling line.
 - Roll the trackball up and down to adjust the sample volume.
4. Adjust the sample volume and the cursor angle of blood flow direction.
 - Rotate the knob under **[SV]** to adjust the sample volume.
 - Rotate the **[Angle/Steer]** knob on the control panel to adjust the blood flow direction cursor angle so as to parallel to the blood flow direction.
5. Press the **[PW]** button or the **[Update]** button on the control panel to enter the PW-mode.

After entering PW-mode, the image area is divided into two parts: B-mode image at the top and PW-mode image at the bottom, as shown in the following figure.

- The X axis indicates time.

- The Y-axis indicates frequency change, and can also indicate the speed of forward or reverse direction after calibration.
 - Press the **[Update]** button on the control panel to toggle between B-mode and pre-activated PW-mode.
 - You can adjust the size and depth of sample volume and the cursor angle of the blood flow during exam.
 - Rotate the navigation knob to display **[Volume]**, and then rotate the knob under **[Volume]** to adjust the volume of the Doppler.
6. Optimize the image.(Refer to “6.5.3 Image Optimization (PW/CW)” for details)
The parameter area on the right side of the screen provides real-time parameter information of PW mode. The meanings of each parameter are as follows:

Parameter	PW-Mode
F	Working Frequency (MHz)
G	Gain (dB)
WF	Wall Filter
SVD	Sample Volume Depth
SV	Sample Volume
PRF	Pulse Repetition Frequency
Angle	Correction Angle

7. Perform measurement and calculation items as needed to obtain valid information.

6.5.2 Basic Procedure of CW mode

The CW (Continuous Wave Doppler) mode collects blood flow signals and data along the spectral sampling line and is used to detect high-speed blood flow.

NOTE : CW mode is only available for phased array probes.

To perform a CW mode imaging:

1. Observe the anatomical structure, adjust the B-mode image and probe to make the target area at the center of the B-mode image.
2. Press the **<CW>** key on the keyboard to enter the pre-activated CW-mode.

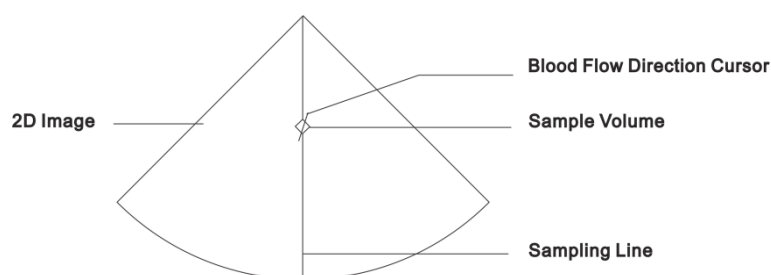


Figure 26 Pre-activated CW mode

3. Adjust the sampling line and sampling depth to determine the sample volume in the target area.
 - Roll the trackball left and right to adjust the position of the sampling line.
 - Roll the trackball up and down to adjust the sample volume.
4. Adjust the cursor angle of blood flow direction.
 - Rotate the **[Angle/Steer]** knob on the control panel to adjust the blood flow direction cursor angle so as to parallel to the blood flow direction;
5. Press the **[Update]** button on the control panel to enter the CW-mode.

After entering CW-mode, the image area is divided into two parts: B-mode image at the top and CW-mode image at the bottom, as shown in the following figure.

 - The X axis indicates time.
 - The Y-axis indicates frequency change, and can also indicate the speed of forward or reverse direction after calibration.
 - Press the **[Update]** button on the control panel to toggle between B-mode and CW-mode.
 - You can adjust the size and depth of sample volume and the cursor angle of the blood flow during exam.
 - Rotate the navigation knob to display **[Volume]**, and then rotate the knob under **[Volume]** to adjust the volume of the Doppler.
6. Optimize the image.(Refer to “6.5.3 Image Optimization (PW/CW)” for details)

The parameter area on the right side of the screen provides real-time parameter information of CW mode. The meanings of each parameter are as follows:

Parameter	CW Mode
F	Working Frequency (MHz)
G	Gain (dB)
WF	Wall Filter
SVD	Sample Volume Depth

Parameter	CW Mode
SV	Sample Volume
PRF	Pulse Repetition Frequency
Angle	Correction Angle

7. Perform measurement and calculation items as needed.

6.5.3 Image Optimization (PW/CW)

6.5.3.1 Gain

Increase or decrease the echo signal strength displayed in the image.

Operation:

Rotate the **[Auto/Gain]** knob on the control panel to adjust the PW/CW gain value.

6.5.3.2 Baseline

Calibrate the 0 position of the scale for the best blood flow speed display.

Operation:

Press the **[▲/▼]** of **[Baseline]** on the control panel to adjust the baseline.

6.5.3.3 Image Quality

Adjust the transmission frequency of the probe in Doppler mode. The higher the frequency, the higher the resolution and sensitivity, but the penetrating power is reduced. Select appropriate probe frequency based on the detection depth and tissue texture.

Operation:

- Rotate the knob under **[Image Quality]** to select the frequency.
- Options: Pen (Penetration priority), Gen (General imaging), Res (Resolution priority)

6.5.3.4 Scale

Adjust the speed range of color flow by changing the scale.

Operation:

Press the **[▲/▼]** of **[Scale]** to adjust the scale value.

NOTE : Select appropriate PRF to match the flow velocity. Aliasing may result if low PRF is used for high flow velocity or small signal lost may result if high PRF is used for low flow velocity.

6.5.3.5 SV (PW)

Adjust the width of sampling volume.

Operation:

Rotate the navigation knob to display **[SV]**, and then rotate the knob under **[SV]** to adjust the sample volume.

6.5.3.6 Dynamic Range

Change the display range of the grayscale to adjust the contrast of the image.

Operation:

Rotate the navigation knob to display **[Dyn Ra.]**, and then rotate the knob under **[Dyn Ra.]** to adjust the dynamic range.

6.5.3.7 Gray Map

Optimize the images by adjusting the black-white contrast of the image.

Operation:

Rotate the navigation knob to display **[Gray Map]**, and then rotate the knob under **[Gray Map]** to adjust the gray map.

6.5.3.8 Speed

Control the imaging speed. The smaller the value, the faster the speed is.

Operation:

Rotate the navigation knob to display **[Speed]**, and then rotate the knob under **[Speed]** to adjust the imaging speed.

6.5.3.9 Chroma

Replace grayscale distinction with color distinction to intuitively show grayscale level of the images.

Operation:

Rotate the navigation knob to display **[Chroma]**, and then rotate the knob under **[Chroma]** to change the color.

6.5.3.10 Angle

Change the direction of the cursor angle.

Operation:

Rotate the **[Angle/Steer]** knob on the control panel to adjust the correction angle.

6.5.3.11 Trace Area

Set the trace area of the Doppler wave in the spectrum map.

Operation:

Rotate the navigation knob to display **[Trace Area]**, and then rotate the knob under **[Trace Area]** to set the Doppler image tracing range.

6.5.3.12 Wall Filter

Filter low frequency noise to reduce the impacts of breathing and other activities.

Operation:

Rotate the navigation knob to display **[Wall Filter]**, and then rotate the knob under **[Wall Filter]** to quickly adjust the filtering value.

6.5.3.13 T/F Resolution

Obtain quality images by adjusting time resolution and spatial resolution.

Operation:

Rotate the navigation knob to display **[T/F Resolution]**, and then rotate the knob under **[T/F Resolution]** to quickly adjust the T/F resolution level.

6.5.3.14 Auto Calculation

Trace the spectral Doppler wave and perform parameter calculations. The results of the automatic calculation will be displayed in the measurement results window.

In the real-time state, the automatic spectrum results obtained from the latest or more cardiac cycles are always displayed; in the frozen and cine replay state, the corresponding measurement results of the traced area are displayed.

Operation:

1. Press the knob under **[Auto Calc]** to turn on the auto calculation function.
2. Rotate the knob under **[Auto Calc Cycle]** to select the cardiac cycles for calculation.
3. Rotate the navigation knob to display **[Auto Calc Para]**, and then press the knob under **[Auto Calc Para]** to select the parameter items.

6.5.3.15 Invert

Flip the directions of the spectrum display.

Operation:

- Press the knob under **[Invert]** to turn on / off the invert function.
- Rotate the navigation knob to display **[Auto-Invert]**, and then press the knob under **[Auto-Invert]** to turn on / off the auto-invert function. (Only applicable for linear probe)

6.5.3.16 Display Format

Change the display format of B image and PW/CW image to facilitate comparison of images.

Operation:

Rotate the navigation knob to display **[Display Format]**, and then rotate the knob under **[Display Format]** to select the appropriate display format.

6.5.3.17 Volume

Control and adjust the audio volume produced by the spectral Doppler which helps to determine the blood flow state and properties more effectively.

Operation:

Rotate the navigation knob to display **[Volume]**, and then rotate the knob under **[Volume]** to adjust the volume.

6.5.3.18 High Pulse Repetition Frequency (HPRF)

HPRF mode is used when detected velocities exceed the processing capabilities of the currently selected PW Doppler scale or when the selected anatomical site is too deep for the selective PW Doppler scale.

Operation:

Rotate the navigation knob to display **[HPRF]**, and then press the knob under **[HPRF]** to turn on/off HPRF function.

NOTE : Applicable to PW mode only.

6.5.3.19 Steer

Steer control is used to deflect the direction of beam without moving the probe.

Operation:

Rotate the **[Angle/Steer]** knob on the control panel to adjust the direction of the ultrasonic beam.

NOTE : Applicable to linear probe only.

6.5.3.20 Multi Sync

Display the PW image together with B image or with B+Color image at the same time.

Operation:

Rotate the navigation knob to display **[Multi Sync]**, and then press the knob under **[Multi Sync]** to turn on/off the function.

6.5.3.21 Auto-optimization

The system automatically optimizes image parameters based on the tissue characteristics of the current scan area.

Operation:

Press the **[Auto/Gain]** knob on the control panel to enable auto optimization.

6.6 Anatomical M-mode

Anatomical M-mode imaging can analyze any part and direction of the 2D image, so as to obtain the myocardial motion trajectory of the region of interest. Tissue information can be

evaluated more accurately and comprehensively by comparing multiple sampling lines and images at different times.

- NOTE:**
- **Anatomical M-mode is purchasable. Please confirm the function is purchased and installed before use.**
 - **Anatomical M-images are provided for reference only. When diagnosing, please combine other clinical data for comprehensive analysis.**

To perform an Anatomical M-mode imaging:

1. Before using anatomical M imaging, please set up user-defined button for anatomical M imaging. (Refer to “4.2.5 Customize”)
2. Observe the anatomical structure, adjust the image and probe to make the target area at the center of the B-mode image.
Or perform the anatomical M-imaging on the desired 2D cine file.
3. In B or M-mode, press user-defined “**Anatomical M**” button to enter Anatomical M-mode.
The A, B, and C sampling lines are displayed by default on the B mode image, and the M image shows the motion trajectories of the 3 sampling lines respectively.
4. Adjust sampling line. Green for activated while white for unactivated.
 - Position: roll the trackball to adjust the position of the sampling line.
 - Direction: rotate the **[Angle/Steer]** knob on the control panel to set the direction of the sampling line.
 - Display / Hide: press the knobs under **[Show A]**, **[Show B]** or **[Show C]** to display/hide the A, B, C sampling line. At least 1 sampling line shall be selected.
5. Optimize the image. (Refer to “6.3.2 Image Optimization (M)” for details)
6. Press the **[B]** button on the control panel to exit the Anatomical M mode and return to the B-mode.

6.7 Color M-mode

Color M-mode provides information of flow or tissue on the M-mode to indicate cardiac motion state.

For its sensitivities for motion signal changes, this mode provides more detailed diagnostic information.

To perform a Color M-mode imaging:

1. To enter Color M-mode:
 - **CFM (Color Flow M Mode)**
 - In B+M mode, press the **[C]** button on the control panel to enter the pre-activated Color mode and then press the **[M]** button on the control panel.

- In B+Color mode, B+Color+PW mode or B+Color+ CW mode, press the **[M]** button on the control panel twice.
2. Adjust the color ROI box size and position.
 - Move the trackball left and right to adjust the position of sampling line, the color ROI box moves together with the sampling line.
 - When the ROI box displayed a solid line frame, roll the trackball to adjust the position of the ROI box, press the **[Set]** button to confirm.
 - When the ROI box displayed a dotted line frame, roll the trackball to adjust the size of the ROI box, press the **[Set]** button to confirm.
 - Press the **[Set]** button to toggle between position and size adjustment.
 3. Optimize the Image. (For details, please refer to “6.3.2 Image Optimization (M)”)

6.8 Tissue Doppler Imaging (TDI)

TDI mode is used to detect low-speed, high-intensity tissue motion information, so as to analyze myocardial wall motion.

- NOTE :**
- **TDI function is purchasable. Please confirm the function is purchased and installed before use.**
 - **Applicable for phased array probes only.**

6.8.1 TDI-modes

The ultrasonic system provides 4 tissue Doppler imaging modes for observing different tissue motion characteristics.

- TVI: to color code the speed and direction of the ventricular wall motion for myocardial velocity analysis.
- TEI: to color code the energy of the ventricular wall motion to observe myocardial blood supply.
- TVD: to display tissue motion within the ROI box in the direction of the sampled beam in the form of spectrogram for quantitative analysis of tissue motion.
- TVM: to provide intuitive color maps of tissue cardiogram and velocity information of myocardial motion.

6.8.2 Basic Procedure of TDI mode

To perform a TDI-mode imaging:

1. Enter the TDI mode
In the real-time state of the following modes, press the **[Q2]** button on the control panel to enter the corresponding TDI mode:

- In B or Color mode, press the **<TDI>** key to enter the TVI mode.
 - In Power mode, press the **<TDI>** key to enter the TEI mode.
 - In PW mode, press the **<TDI>** key to enter the TVD mode.
 - In M mode, press the **<TDI>** key to enter the TVM mode.
2. Optimize the image.
 3. Select TDI mode.
 - Press **[C]**, **[PW]**, **<PDI>**, **[M]** to toggle between the TDI modes.
 4. Exit the TDI mode.

6.9 Panoramic Imaging

The panoramic imaging technology splices a series of real time 2D images into a continuous slice image, shows the whole picture of the anatomical region more intuitively and visually, and facilitates observation and measurement of the overall tissue texture. It is suitable for certain areas that require a larger field of view, such as the thyroid gland.

- NOTE :**
- **The Panoramic Imaging function is purchasable. Please confirm the function is purchased and installed before use.**
 - **Panoramic Images are provided for reference only. When diagnosing, please combine other clinical data for comprehensive analysis.**
 - **Panoramic imaging is an image splicing function. The quality of spliced images depends on the operator's technology to a certain extent. You may need to practice and master certain skills before you can get a satisfactory image. Therefore, there are certain risks in measurement.**
 - **The panoramic imaging is only available for convex and linear array probes.**

6.9.1 Basic Procedure of Panoramic Imaging

6.9.1.1 Precautions

- Make sure that the probe transducer and the scan path are evenly covered with enough coupling gel.
- Move the probe slowly and steadily.
- DO NOT shake, rotate or tilt the probe.
- DO NOT raise the probe or leave the skin surface, make sure that the probe is in vertical contact with the skin surface.
- DO NOT change the motion direction of the probe or move back and forth during scanning.
- Large scan depth usually requires a reduction in the probe moving speed.

6.9.1.2 Procedure

Perform the following steps:

1. Before using panoramic imaging, please set up user-defined button for panoramic imaging. (Refer to “4.2.5 Customize”)
2. In B or Color mode, press the user-defined “Pano” button to enter the pre-activated panoramic imaging move. The ROI box displays on the image.
3. Adjust the position and size of the ROI box.
 - When the ROI box displayed a solid line frame, roll the trackball to adjust the position of the ROI box.
 - When the ROI box displayed a dotted line frame, roll the trackball to adjust the size of the ROI box.
 - Press the **[Set]** button to toggle between position and size adjustment.
4. Press **[Update]** button on the control panel to activate the acquisition state.
 - The image area displays two images; the upper image shows the real-time 2D image while the lower image shows the real-time spliced image.
5. Slowly and smoothly move the probe along the scanning section to acquire image. When collecting images, please pay attention to the color of the ROI box and adjust the moving speed properly.
 - Green: appropriate speed.
 - Blue: too slow.
 - Red: too fast.
6. Press **[Freeze]** button to end the acquisition, and the spliced image displayed in the image area.
7. Optimize the image. (Refer to “6.9.2 Image Optimization (Pano)” for details)
8. View and manage images.
 - Zooming: Rotate the **[Zoom]** knob on the control panel to zoom in/out the image globally.
 - Rotation: Rotate the **[Angle/Steer]** knob on the control panel to rotate the panorama image.
 - Perform measuring or add body marks or annotations as desired.
9. Press the **[B]** button on the control panel to exit the panoramic imaging mode and return to B-mode.

6.9.2 Image Optimization (Pano)

6.9.2.1 Chroma

Replace grayscale distinction with color distinction to intuitively show grayscale level of the images.

Operation:

Rotate the knob under **[Chroma]** to change the color.

6.9.3 Image Quality

Panoramic images shall be combined with other clinical methods in diagnosis. Before using or measuring an image, make sure that the acquired image is clear and reliable.

Reacquire the image in the case of any one of the following situation happens:

- The image capture source is not a single plane.
- There is large black area in the image.
- Non continuous image.
- There are shadows in the image.
- Non continuous skin line.
- Unclear anatomical contour.

6.10 Elastography

Elastography indicates the elastic property distribution of the tissue by manual pressure or human breathing, and quantitatively displays the relative hardness of the tissue, thereby judging the hardness of the mass.

- NOTE :**
- **The Elastography function is purchasable. Please confirm the function is purchased and installed before use.**
 - **The Elastography is only available for linear array probes.**

6.10.1 Basic Procedure of Elastography

Perform the following steps:

1. Before using elastography imaging, please set up user-defined button for elastography imaging. (Refer to “4.2.5 Customize”)
2. In B-mode, press the user-defined “Elasto” button to enter the Elastography mode.
 - The image area displays two real-time images on the left and right; the left is elastography image with ROI box while the right is the real-time B image. The pressure curve is displayed in real time at the bottom of the screen.
 - X-axis indicates time and Y-axis indicates pressure level.
3. Adjust the position and size of the ROI box.
 - When the ROI box displayed a solid line frame, roll the trackball to adjust the position of the ROI box.
 - When the ROI box displayed a dotted line frame, roll the trackball to adjust the size of

the ROI box.

- Press the **[Set]** button to toggle between position and size adjustment.
4. Optimize the image.(Refer to “6.10.2 Image Optimization (Elastography)” for details)

The parameter area on the right side of the screen provides real-time parameter information of Elastography mode. The meanings of each parameter are as follows:

Parameter	Description
MAP	Map
OP	Opacity

5. View and manage images.
6. Press the **[B]** button on the control panel to exit the Elastography imaging mode and return to B mode.

6.10.2 Image Optimization (Elastography)

6.10.2.1 Persistence

Superimpose and average the images of adjacent frames to remove the noise and enhance the details.

Operation:

Rotate the knob under **[Persistence]** to adjust the persistence level.

6.10.2.2 Smooth

Suppress noise and smooth the image.

Operation:

Rotate the knob under **[Smooth]** to adjust the smooth level.

6.10.2.3 Opacity

Adjust the opacity of the image.

Operation:

Rotate the knob under **[Opacity]** to change the opacity of the image.

6.10.2.4 Map

Display different color maps and toggle the map between color and gray for better observation.

Operation:

Rotate the knob under **[Map]** to choose the map.

6.10.2.5 Invert

Flip the map.

Operation:

Press the knob under **[Invert]** to turn on / off the invert function.

6.10.2.6 Synchronization

Switch the display between dual image (B+Elasto) and B-mode image.

Operation:

Press the knob under **[Sync]** to switch the display between dual image (B+Elasto) and B-mode image.

Chapter 7 3D/4D

7.1 Overview

The 3D/4D function can display 2D and 3D images in multiple directions, which facilitates stereoscopic and intuitive observation of the human body's morphology structure to obtain more reference information.

3D/4D imaging has been widely applied in the exams of fetal, cardiac and vascular.

- NOTE:**
- The 3D/4D function is purchasable. Please confirm the function is purchased and installed before use.
 - The accuracy of 3D/4D imaging is largely environment-dependent, so the image obtained are provided for reference only. When diagnosing, please make a comprehensive analysis with other clinical data.
 - Applicable for volume probe only.

Table 26 Terms in 3D/4D Mode

Term	Description
VR (Volume Render) image	Refers to the 3D images
MPR(Multi Planer Render) image	Cross-section images divide by X, Y and Z axis, A, B, C represents sagittal, coronal and cross-sectional respectively.
View	The position for VR image observation.
ROI (Region of Interest)	Region of interest. ROI is used to determine the size and position of imaging area. The system only reconstructs 3D image of the ROI area.
VOI (Volume of Interest)	A collection of 3D Image data based on 2D image Sequence reconstruction.

7.2 Imaging Factors

- NOTE :**
- According to the ALARA principle, the scanning time of the fetus should be minimized on the premise of obtaining a valid 3D/4D image.
 - There are many factors affecting 3D imaging. More practice is needed to ensure the success of imaging.
 - Several attempts may be needed to obtain a satisfied image.

7.2.1 Imaging quality of B Image

The quality of 3D/4D imaging depends on high quality B images.

Therefore, in order to obtain a higher 3D/4D imaging quality, the quality of the B-type image should be optimized to meet the following requirements:

- Clear outline of the observation area.
- High contrast between the observation area and the surrounding amniotic fluid in the image.
- Low noise of the amniotic fluid area.

7.2.2 Operation

In the process of image acquisition, hold the probe perpendicularly to the scanning plane over the region of interest, the probe performs the scanning automatically.

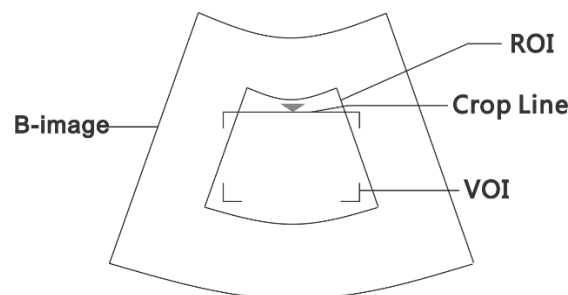
7.3 3D Mode

7.3.1 Static Image Acquisition Procedure

- NOTE :**
- The observation area should meet the conditions of high contrast with amniotic fluid, clear outline and low amniotic fluid noise.
 - Delete useless information when adjusting ROI to shorten process time and increase the frame rate.

Perform the following steps:

1. Press the **[Probe]** button on the control panel to enter the probe / exam mode screen and choose the appropriate probe and exam mode.
2. Apply sufficient contrast agent to the probe surface.
3. Enter B mode and optimize B image, scanning for the region of interest.
4. Press the **<3D/4D>** key on the keyboard to enter the pre-activated 3D mode. ROI and VOI display on the image.



5. Adjust the position and size of ROI as well as the position and direction of VOI.
 - Move the trackball to adjust the ROI position together with the VOI. When finished, press the **[Set]** button.
 - Move the trackball to adjust the ROI size together with the VOI. When finished, press the **[Set]** button.
 - Move the trackball to adjust the VOI crop line. When finished, press the **[Set]** button.
 - Move the trackball to adjust the direction of the VOI crop line and make the VOI direction

the view direction.

- The **[Set]** button can be used to switch between the four functions of adjusting the ROI position, adjusting the ROI size, adjusting the VOI position, and adjusting the VOI direction.

NOTE : Delete useless information when adjusting ROI to shorten process time and increase the frame rate.

6. Select rendering mode and set scanning quality and angle.

- To select a rendering mode: rotate the knob under **[Render Mode]**
- To set scanning quality: rotate the knob under **[Quality]**
- To set angle: rotate the knob under **[Angle]**
- Auto face: press the knob under **[Autoface]** to enable/disable the function
- Trim used: press the knob under **[Trim Used]** to enable/disable the function

7. Press the **[Update]** button on the control panel to acquire ROI image.

- A progress bar shows the loading progressing.
- After image acquisition, the system automatically enters the 3D review state. As shown in the figure below, one MPR images and one VR image (that is, 3D image, hereinafter referred to as VR image) display on the screen.
- Rotate the navigation knob to display **[RefSection]**, and then rotate the knob under **[RefSection]** to switch the desired MPR image. For the relationship between MPR image (A, B and C) and VR image, see "7.3.4.1 MPR and VR images" for details.

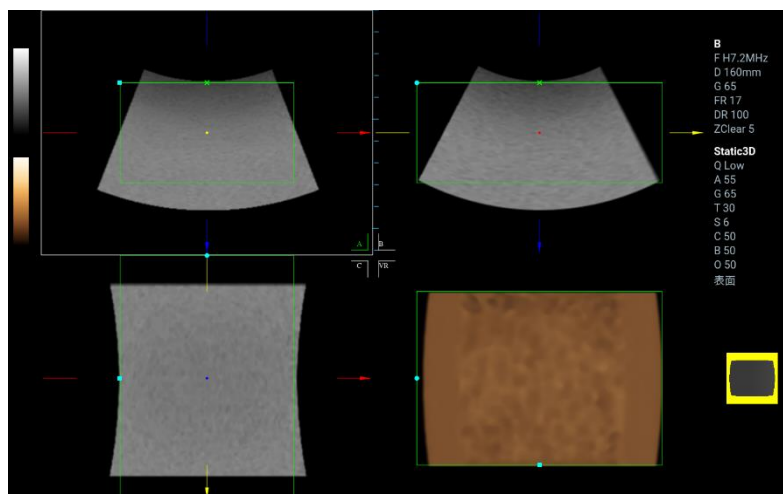


Figure 27 3D Mode Screen

8. Adjust the image and VOI as needed.

- Roll the trackball to move the image to ensure that the desired content is displayed in

the VOI box, and then press the **[Set]** button.

- Roll the trackball to adjust the size of VOI box, and then press the **[Set]** button.
 - Roll the trackball to adjust the crop line of VOI box, and then press the **[Set]** button.
 - The **[Set]** button can be used to switch between the image movement, the VOI size adjustment, and the VOI crop line adjustment.
 - To rotate, zoom, cutting or restore the image, see “7.3.4 Image Review” for details.
9. Optimize the Image parameters. (Refer to “7.3.3 Optimizing 3D Images” for details)

The parameter area on the right side of the screen provides real-time parameter information of the 3D mode. The meanings of each parameter are as follows:

Parameter	Meaning
Q	Scanning Quality
A	Angle
G	Gain
T	Threshold value
S	Smooth
C	Contrast
B	Brightness
O	Opacity
Z	Zoom

10. Annotate the image as needed. Refer to “7.3.5 Annotation” and “7.3.6 Measurement”.
11. Press the **[B]** knob on the control panel to exit the 3D mode and return to B mode.

7.3.2 Select Render Mode

Applicable render modes are very useful to help users to access the image information they need much easier.

The system provides several different render modes and applies the Surface mode by default.

You can select applicable render mode under the 3D pre-activated mode or 3D mode as needed.

7.3.2.1 Surface Render Mode

Clearly identify the VR image boundary structure, usually used to observe the fetal face and the surface of the hands and feet.

NOTE : Need to adjust the threshold value to remove noise and echoes.

Operation:

- The system applies the surface render mode by default.
- To select Surface Render Mode from other render modes, rotate the knob under **[Render Mode]** to **[Surface]**.

7.3.2.2 Depth Render Mode

Identify the VR image boundary structure, usually used to observe the fetal face and the surface of fetal hands and feet.

Operation:

Rotate the knob under **[Render Mode]** to **[Depth]**.

7.3.2.3 Max Render Mode

Display the maximum echo information in the viewing direction which is usually used to observe the bone structure.

Operation:

Rotate the knob under **[Render Mode]** to **[Max]**.

7.3.2.4 Min Render Mode

Display the minimum echo information in the viewing direction which is usually used to observe the blood vessels and hollow structures.

Operation:

Rotate the knob under **[Render Mode]** to **[Min]**.

7.3.2.5 X-ray Render mode

The imaging effect is similar to that of X-ray. It is usually used to observe tumor tissue or tissues with internal differences.

NOTE : Reduce the VOI depth as much as possible to increase the structural contrast within the VOI region.

Operation:

Rotate the knob under **[Render Mode]** to **[X-ray]**.

7.3.2.6 ZLive Render mode

Based on the surface mode, a virtual light source is placed around the image to enhance the authenticity and stereoscopic effect of the image. It is used to observe the surface of fetal face/hand or foot.

Operation:

- Rotate the knob under **[Render mode]** to **[ZLive]**.
- To adjust ZLive:
 - 1) Rotate the navigation knob to display **[Move Light]**, and then press the knob under **[Move Light]** activate light.
 - 2) The lighting effect applies on the VR images; adjust the light position by rolling the trackball as needed.

7.3.2.7 Silhouette Render Mode

Clearly display the organization outline and organization boundary structure, mainly used to observe the structural relationship between organizations.

NOTE : The Silhouette Render Mode function is purchasable. Please confirm the function is purchased and installed before use.

Operation:

- 3) Rotate the knob under **[Render mode]** to **[Silhouette]**.

7.3.3 Optimizing 3D Images

User can set imaging quality and imaging speed in 3D pre-activated status or optimize the MPR and VR images in 3D viewing status.

7.3.3.1 Image Quality

Adjust the image quality by changing the line density. Image quality can affect the 3D imaging speed. The higher the quality, the longer the imaging time takes.

Operation:

In 3D preparing status, rotate the knob under **[Quality]** to set image quality.

7.3.3.2 Angle

Set the imaging angle. The larger the angle, the wider field view of coronal section, as well as the longer imaging time and the lower frame rate.

Operation:

In 3D preparing status, rotate the knob under **[Angle]** to set the scanning angle.

7.3.3.3 Threshold

To make images subtler by setting the lower limit of the threshold of the VR image, so as to remove small noise and echoes.

Operation:

- Rotate the navigation knob to display **[MPR/VR]**, and then press the knob under **[MPR/VR]** to **[VR]** to activate VR image.
- Rotate the navigation knob to display **[Threshold]**, and then rotate the knob under

[Threshold] to set threshold.

Note: Threshold adjustment is only applicable for Surface, Depth, ZLive and Silhouette render mode.

7.3.3.4 Opacity

Adjust the opacity for VR rendering. Opacity indicates the transparency of image, and the larger the value, the denser and harder the surface appears.

Operation:

- Rotate the navigation knob to display **[MPR/VR]**, and then press the knob under **[MPR/VR]** to **[VR]** to activate VR image.
- Rotate the knob under **[Opacity]** to set opacity.

Note: Threshold adjustment is only applicable for Surface, Depth, ZLive and Silhouette render mode.

7.3.3.5 Smooth

Set the smoothness of the VR image.

Operation:

- Rotate the navigation knob to display **[MPR/VR]**, and then press the knob under **[MPR/VR]** to **[VR]** to activate VR image.
- Rotate the knob under **[Smooth]** to set the smoothness of the image.

7.3.3.6 Brightness

Set the brightness for MPR and VR images.

Operation:

- Rotate the navigation knob to display **[MPR/VR]**, and then press the knob under **[MPR/VR]** to **[VR]** or **[MPR]** to activate MPR/VR image.
- Rotate the knob under **[Brightness]** to set the brightness of the image.

7.3.3.7 Contrast

Set the contrast for MPR and VR images.

Operation:

- Rotate the navigation knob to display **[MPR/VR]**, and then press the knob under **[MPR/VR]** to **[VR]** or **[MPR]** to activate MPR/VR image.
- Rotate the knob under **[Contrast]** to set the contrast of the image.

7.3.3.8 Chroma

Apply color difference instead of gray difference to MPR and VR images.

Operation:

- Rotate the navigation knob to display **[MPR/VR]**, and then press the knob under **[MPR/VR]** to **[VR]** or **[MPR]** to activate MPR/VR image.
- Rotate the knob under **[Chroma]** to set the Chroma of the image.

7.3.3.9 Gray Map

Optimize image effect by changing the black-white contrast of the MPR image.

Operation:

- Rotate the navigation knob to display **[MPR/VR]**, and then press the knob under **[MPR/VR]** to **[MPR]** to activate MPR image.
- Rotate the navigation knob to display **[RefSection]**, and then rotate the knob under **[RefSection]** to activate A, B or C image as needed.
- Rotate the knob under **[Gray Map]** to set the gray map.

7.3.3.10 Image Enhance

Remove the noise and enhance the details.

Operation:

- Rotate the navigation knob to display **[MPR/VR]**, and then press the knob under **[MPR/VR]** to **[VR]** or **[MPR]** to activate MPR/VR image.
- Rotate the knob under **[Image Enh.]** to adjust the image enhancement.

7.3.3.11 Autoface

To automatically remove other tissues on the surface to identify the fetus's face.

Operation:

In 3D preparing status, press the knob under **[Autoface]** to enable/disable the function.

7.3.4 Image Review

7.3.4.1 MPR and VR images

The position where the fetal face is facing up and the probe convex bar is facing the head of the mother, the A, B, and C images respectively correspond to the three sections of the MPR image, and their relationship is as shown in the following figure.

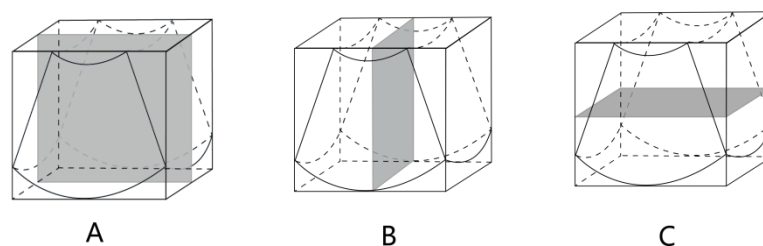


Figure 28 MPR and VR images

NOTE: When the fetal head is face down and the probe convex bar is facing the head of the mother, the fetal head is facing down in the 3D image.

7.3.4.2 Activate Image

Rotate the navigation knob to display **[RefSection]**, and then rotate the knob under **[RefSection]** to activate A, B, C or VR image as needed. When the image is activated, a

check box appears on the image.

7.3.4.3 Display Format

➤ Single Image

- Rotate the knob under **[Display Format]** to **[Single]**, a single VR image displayed by default.
- Rotate the navigation knob to display **[RefSection]**, and then rotate the knob under **[RefSection]** to activate A, B, C or VR image to display other single images.

➤ Dual Image

- Rotate the knob under **[Display Format]** to **[Dual]**, the A image displayed on the left side of the image area, and the VR image displayed on the right side.
- Rotate the navigation knob to display **[RefSection]**, and then rotate the knob under **[RefSection]** to switch the left image to other sections.

➤ Symmetric Quad Image

Rotate the knob under **[Display Format]** to **[Quad]** to display four symmetric images of A, B, C, and VR.

➤ Asymmetric Quad Image

Rotate the knob under **[Display Format]** to **[LeftQuad]** to display a larger VR image along with 3 small MPR images of A, B, C.

7.3.4.4 Move the Image

Roll the trackball to move the activated image. The other three images are moved along with the corresponding axes.

Press the **[Set]** button to toggle among moving the image, setting VOI size and VOI crop line.

7.3.4.5 Rotate the Image

➤ Axial Rotation

Axial rotation is used to rotate the currently activated image around the X, Y or Z axis.

Operation:

- To rotate along X-axis: rotate the knob under **[RotateX]**
- To rotate along Y-axis: rotate the knob under **[RotateY]**
- To rotate along Z-axis: rotate the knob under **[RotateZ]**

➤ Image Rotation

Rotate the VR image clockwise along the Z axis by 0°, 90°, 180°, and 270° only.

Operation:

Rotate the knob under **[Orientation]** to set the rotation angle of the VR image along the Z axis.

➤ Auto Rotation

Press the navigation knob, and then rotate the navigation knob to **[Auto Rotation]**.

1. Press the knob under **[Rotation Ori]** to enable auto rotation function.
2. Press the left **[Set]** button to set the starting position, roll the trackball to the desired ending position, and then press the right **[Set]** button to confirm the rotation range.
3. Press the knob under **[Start]** to perform auto rotation.
4. Press the knob under **[Rotation Mode]** to set rotation mode as needed.

7.3.4.6 View Direction

The system provides six view directions as well as reverse view and sync view, so as to view and compare side images in different directions easily.

Operation:

Rotate the navigation knob to display **[View Direction]**, and then rotate the knob under **[View Direction]** to change the view direction.

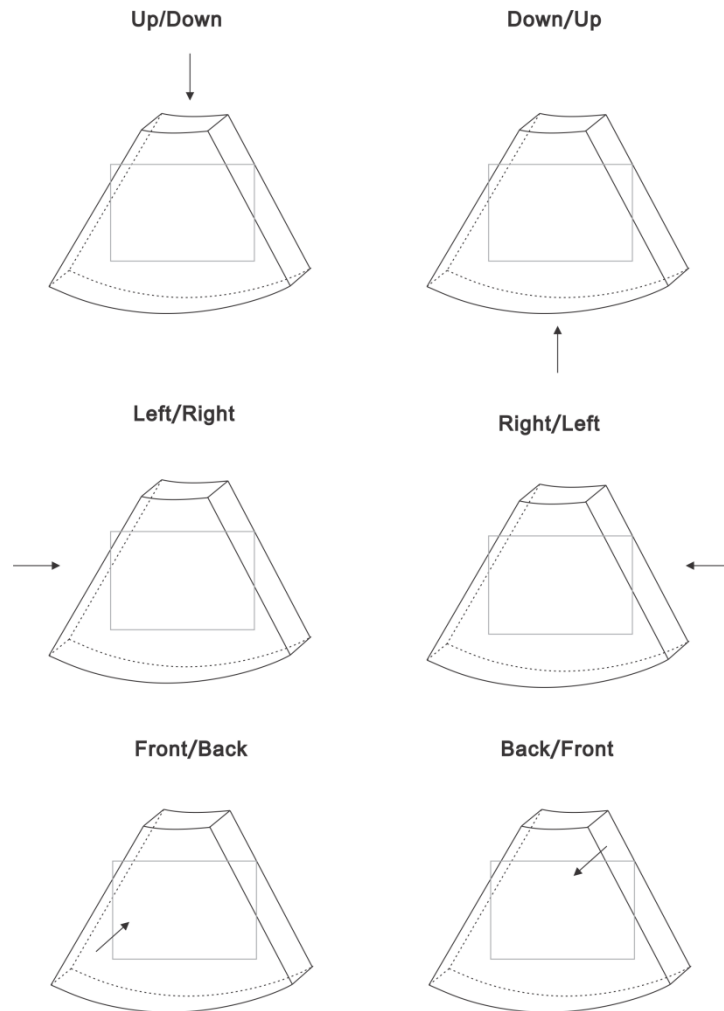


Figure 29 View Direction

7.3.4.7 Reverse View

Rotate the navigation knob to display **[Reverse View]**, and then rotate the knob under **[Reverse View]** switch the VR image direction opposite to the current view.

7.3.4.8 Sync View

Rotate the navigation knob to display **[Sync]**, and then press the knob under **[Sync]** to synchronize the VR image to the same view direction as the currently activated sectional image for better observation.

7.3.4.9 VOI adjustment

Adjust the VOI to acquire qualified VR image.

VOI is used to remove occlusion and non-interest areas. When rendering, the data outside the VOI frame will not be processed to optimize the VR image effect and speed up the rendering process.

When the VOI is turned off, the VR image shows all the information collected by the probe.

➤ Turn On/Turn Off VOI

In 3D preparing status, press the knob under **[Trim Used]** to turn on or turn off VOI adjustment.

➤ Adjust VOI

1. Select the appropriate orientation image by moving, rotating, or changing the view direction.
2. Select a desired MPR image by rotating the knob under **[RefSection]** to **[A]**, **[B]** or **[C]**.
3. Adjust the VOI box. The system automatically determines the rendering range based on the currently adjusted VOI.
 - Roll the trackball to move the image to ensure that the desired area is within the VOI box, and then press the **[Set]** button.
 - Roll the trackball to adjust the size of VOI box, and then press the **[Set]** button.
 - Roll the trackball to adjust the crop line of VOI box, and then press the **[Set]** button.
 - Press the **[Set]** button to toggle among moving the image, setting VOI size and VOI crop line.
4. To change MPR image, repeat step 2 and 3.

7.3.4.10 Reset VOI

Rotate the navigation knob to display **[ResetTrim]**, and then press the knob under **[ResetTrim]** to reset the VOI.

7.3.4.11 Image Zooming

Rotate the **[Zoom]** knob on the control panel to zoom in/out the VR image and sectional images synchronously.

NOTE: When the VOI is turned on, the zooming of VR image is limited by the VOI box. Image beyond the VOI box will be hidden.

7.3.4.12 Reset Orientation

Restore the MPR image, VR image and VOI to the initial status.

➤ **Reset Ori**

Rotate the navigation knob to display **[Reset Ori]**, and then press the knob under **[Reset Ori]** to restore the position and size of the images.

➤ **Reset All**

Rotate the navigation knob to display **[Reset All]**, and then press the knob under **[Reset All]** to reset image and VOI to original orientation and parameters.

7.3.4.13 Image Editing

To crop the occlusion on the ROI area for clearly VR image, perform the following steps:

1. Press the navigation knob, and then rotate the navigation knob to **[Image Edit]**, the crop cursor displays and the system enters the VR image editing status.
2. Adjust the VR image to a position for easy cropping.
3. Select an appropriate edit tool by rotating the knob under **[Edit Mode]** to select appropriate tool.

Edit tool	Description and operation
Rectangle	● Define the portion of the image you want to cut by a rectangular box. 1) Rotate the knob under [Edit Mode] to [Box In] (remove the portion in the rectangular box) or [Box Out] (remove the portion out of the rectangular box). 2) Roll the trackball to fix the start point, press the [Set] button. 3) Roll the trackball to fix the end point, press the [Set] button.
Contour	● Trace the portion of the image you want to cut. 1) Rotate the knob under [Edit Mode] to [Contour In] (remove the portion out of the region) or [Contour Out] (remove the portion within the region). 2) Roll the trackball to fix the start point, press the [Set] button. 3) Roll the trackball to trace the region you want to cut, press the [Set] button to end the tracing and cut the image.
Polygon	● Define the portion of the image you want to cut by a polygonal box. 1) Rotate the knob under [Edit Mode] to [Polygon In] (remove the portion out of the polygon) or [Polygon Out] (remove the portion within the polygon). 2) Roll the trackball to fix the start point, press the [Set] button. 3) Roll the trackball to define the polygon area you want to cut. Position the start position by pressing the [Set] button, roll the trackball and press the [Set] button to set the line segments in turn until the region you want to cut is traced. 4) When the start point and end point coincide. Press the [Set] button to end the tracing and cut the image.
Undo	● To undo the last cut. Press the knob under [Undo].

Edit tool	Description and operation
Undo All	To undo all cuts. Press the knob under [Undo All] .

4. Rotate the knob under the **[Trim Depth]** to set the cutting depth.
5. Repeat steps 3 ~4 as needed.

7.3.5 Annotation

To add comment, arrow and body mark on the MPR or VR images.

The operation is the same as adding comment and body mark on B image. See “8.5 Annotation” for details.

7.3.6 Measurement

Make measurement on the MPR image. The operation is the same as making measurement on B image. See “9.2 General Measurement” for details.

7.3.7 Image Storage

Press the **[Save1]** button on the control panel to store the current image data.

7.4 4D Mode

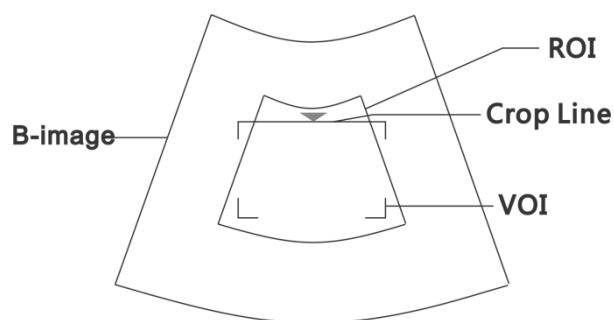
4D mode is a continuous volume acquisition process of 3D images.

During the scanning, the image has been reconstructed automatically.

- NOTE :**
- **The 4D imaging mode is purchasable. Please confirm the function is purchased and installed before use.**
 - **4D mode related operations are similar to 3D. See “7.3 3D Mode” for details.**

To perform a 4D imaging:

1. Press the **[Probe]** button on the control panel to enter the probe / exam mode screen and choose the applicable probe and exam mode.
2. Apply sufficient contrast agent to the probe surface.
3. Enter B mode and optimize B image, scanning for the region of interest.
4. Press the **<3D/4D>** key twice on the keyboard to enter the 4D imaging preparing status. A “4D” mark displayed in the image parameter area.
ROI and VOI box are displayed on the image, as shown in the following figure.



5. Adjust the position, size of the ROI and VOI by pressing **[Set]** button.
6. Select rendering mode, scanning quality and angle.
7. Press the **[Update]** button on the control panel to acquire ROI image.
8. Adjust the image and VOI as needed.
9. Optimize the Image parameters. (Refer to “7.3.3 Optimizing 3D Images” for details.)

The parameter area on the right side of the screen provides real-time parameter information of the 4D mode. The meanings of each parameter are as follows:

Parameter	Meaning
Q	Image Quality
A	Angle
G	Gain
T	Threshold
S	Smooth
C	Contrast
B	Brightness
O	Opacity
Z	zoom
VPS	Volume per second

10. Annotate and measure the image as needed. Refer to “7.3.5 Annotation” and “7.3.6 Measurement” for details.
11. Press the **[B]** button on the control panel to exit the 4D mode and return to B mode.

7.5 4D Mode and 3D Mode

In the 4D viewing status, press the **<3D/4D>** key on the keyboard to switch to the 3D viewing status. The image is consistent with the 4D acquisition status but higher quality.

7.6 Niche

The niche function combines the three vertical sections A, B, and C into a 3D section view, which provides a much clearer and specifically interior anatomical structure.

NOTE: The Niche function is purchasable. Please confirm the function is purchased and installed before use.

1. In 3D /4D mode, press the navigation knob, and then rotate the navigation knob to **[Layout]** to enable the Niche function.
2. Rotate the knob under **[RefSection]** to select the reference plane A, B, C or niche. The selected plane is highlighted with a green frame.
3. Rotate the knob under **[Niche Direction]** to select the view direction for niche display.

7.7 ZPage

The ZPage mode is based on 3D imaging and is used to display several parallel sectional images of the same VOI.

NOTE : The ZPage function is purchasable. Please confirm the function is purchased and installed before use.

7.7.1 Basic Procedure of ZPage

Perform the following steps:

1. In 3D /4D mode, press the navigation knob, and then rotate the navigation knob to **[ZPage]**.
 - The A/B/C sectional planes images are displayed on the left side of the image. Slice lines display on the A image by default, and the middle area displays the sectional view of the A image.
 - For planes and slice lines, refer to “7.7.2Slice and Slice Line” for details.

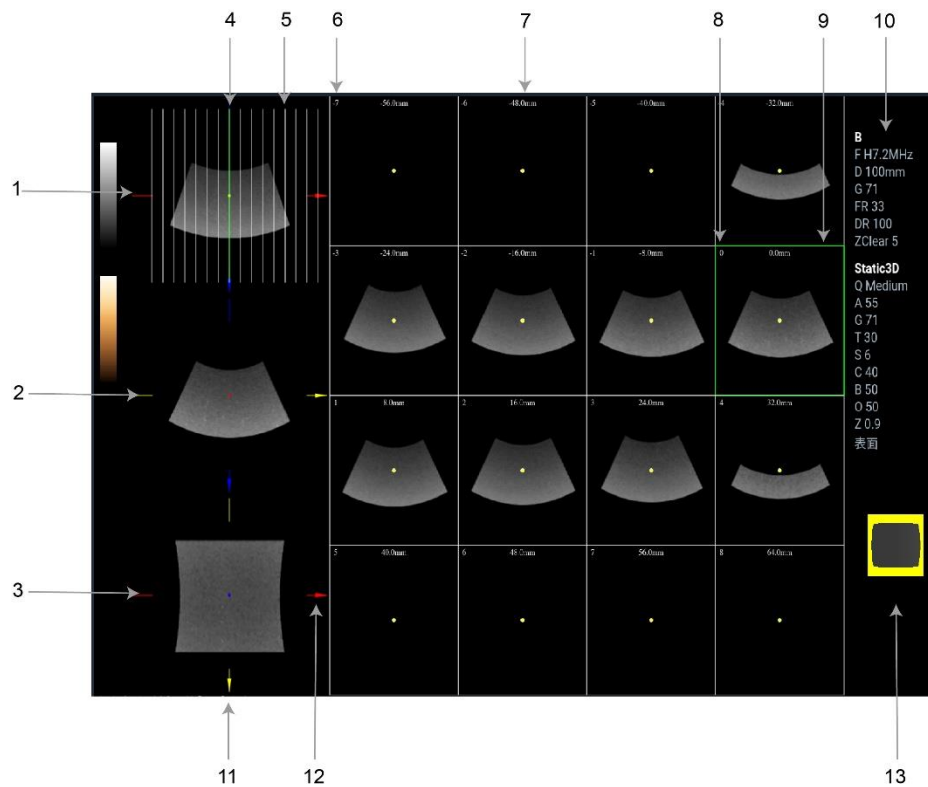


Figure 30 ZPage

NO.	Description	NO.	Description
1	A plane (the current reference image)	2	B plane
3	C plane	4	Current activated slice line (in green)
5	Slice line (in grey)	6	Slice order number
7	Slice position (to the central slice)	8	Central slice (marked as "0")
9	Activated slice (in green frame)	10	Image parameter area
11	Y-axis	12	X-axis
13	3D orientation reference		

2. Rotate the knob under **[RefSection]** to **[A]** / **[B]** or **[C]** to select reference image. Slice lines display on the reference image.
3. Rotate the knob under **[RotateX]** / **[RotateY]** or **[RotateZ]** to rotate the reference image for desired slice.
4. Set proper display layout, slice orientation, slice position and slice space.
 - Display layout: rotate the knob under **[Display Format]**.
 - Slice orientation: rotate the navigation knob to display **[Orientation]**, and then rotate the knob under **[Orientation]**.
 - Slice position: roll the trackball to adjust the slice line on the reference image.

- Slice space: rotate the knob under the **[Distance]**.
5. Observe interested slices.
- Slice activation: rotate the navigation knob to display **[Slice Pos]**, and then rotate the knob under the **[Slice Pos]** to select desired slice. Activated slice will be highlight in green.
 - Fullscreen: press the **[Set]** button on the control panel twice to fullscreen display the activated slice. Press the **[Set]** button again to return to original image.
 - Zooming: rotate the **[Zoom]** knob on the control panel to zoom out/in all slices.

7.7.2 Slice and Slice Line

7.7.2.1 Central Slice

The central slice line corresponds to the central slice, which is marked as “0”.

7.7.2.2 Slice Position

Define horizontal or vertical slice line on the reference image to display corresponding slice by rotating the knob under **[Orientation]** to **[Horizontal]** or **[Vertical]**.

7.7.2.3 Activate / Switch Slice

The currently activated slice line is highlighted in green; the corresponding slice is marked with a green frame. The default active slice is the central slice. Rotate the navigation knob to display **[Slice Pos]**, and then rotate the knob under **[Slice Pos]** to select the active slice line and slice.

7.7.2.4 Slice Order Number

Indicate the order of the slices. The central slice is marked with “0”; the slices before the central slice are marked with negative numbers while the slices after the central slice are marked with positive numbers.

7.7.2.5 Slice Distance

The slice position is displayed at the upper left corner of the image, indicating the spacing of each slice to the central slice. The slices before the central slice are marked with negative lengths while the slices after the central slice are marked with positive lengths.

Rotate the knob under the **[Distance]** to adjust the spacing between slices.

7.7.3 Slice Moving

Roll the trackball to move the crossing point of central axis, the slice will move accordingly with the crossing point.

7.7.4 Image Zooming

- In ZPage mode, rotate **[Zoom]** knob on the control panel to zoom in / out all slices.
- Select the desired slice, press the **[Set]** button to fullscreen display the slice, and rotate the **[Zoom]** knob on the control panel to zoom in /out the slice.

7.7.5 Image Layout

7.7.5.1 Adjust layout

Rotate the knob under **[Display Format]** to adjust the image display layout of the slices. The image size will change accordingly.

7.7.5.2 Slices Full

Rotate the navigation knob to display **[Slices Full]**, and then press the knob under **[Slices Full]** to turn on / off the fullscreen all slices function.

7.7.5.3 Single Slices Full

Select desired slice, press the **[Set]** button to fullscreen the slice.

7.7.6 Annotation

Add comments, arrows, and body marks to all slices.

The operation is the same as adding comment and body mark on B-image. See “8.5 Annotation” for details.

7.7.7 Measurement

Make measurement on the MPR image. The operation is the same as making measurement on B image. See “9.2 General Measurement” for details.

Chapter 8 Image Review and Management

After the image acquisition is complete, you can view and compare the image by splitting display, image zooming, cine replay, etc..., or you can perform other operations on the image, such as adding comments and body marks to the image.

8.1 Splitting Display

Dual-split display or Quad-split is used for ultrasound images comparison at different timing.

8.1.1.1 Dual-Split Display

1. In B-mode, press **[Dual]** button on the control panel to enter the dual-split mode. The image on the left displays the real-time B-image.
2. Press **[Dual]** button again, the image on the left will be frozen while the image on the right displays the real-time B image.

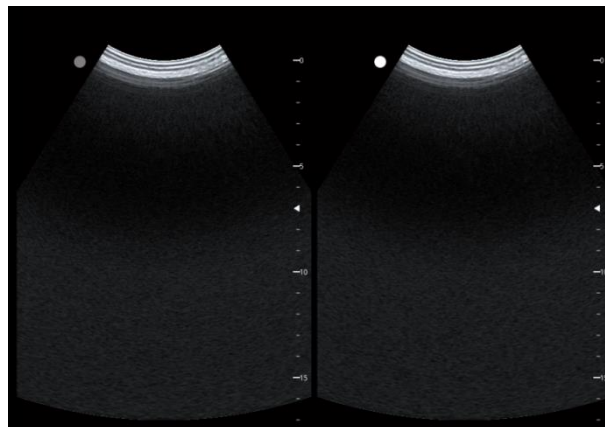


Figure 31 Dual-Split Display

3. Press the **[Dual]** button on the control panel to switch the real-time/frozen status of the left and right images.
4. Press the **[B]** knob on the control panel to exit dual-split display.

8.1.1.2 Quad-Split Display

1. Press **<Quad>** key on the keyboard to enter the Quad-Split display status which divides the image area into four equal areas.

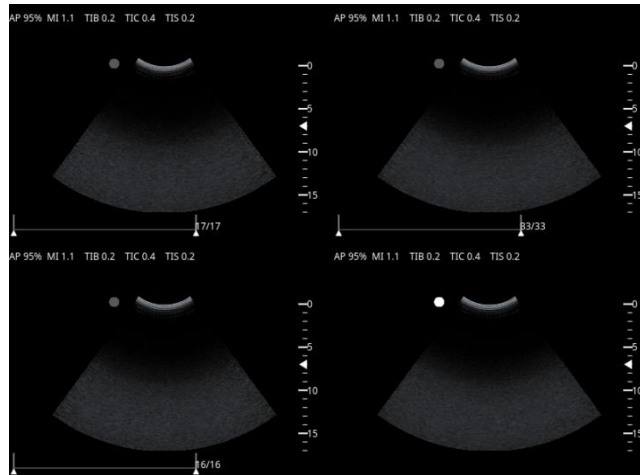


Figure 32 Quad-Split Display

2. Press **<Quad>** key again to freeze the current image and make the next image into real-time status.
3. Press the **[B]** knob on the control panel to exit Quad-Split display.

8.2 Image Magnification

Magnify the image to show more details.

- NOTE :**
- **Local zooming is only applicable to real-time images.**
 - **Image zooming changes the frame rate which tends to changes the thermal index and position of the focus area and possibly results in different positions of the peak intensity in the acoustic field. As a result, the MI may change.**
 - **Adjust the position of the scale or focus as needed.**

8.2.1 Global Zoom

Rotate the **[Zoom]** knob on the control panel to zoom the ultrasonic image.

8.2.2 Local Zoom

1. Press the **[Zoom]** knob on the control panel to activate local zoom function and display the ROI box.
2. Roll the trackball to adjust the position and size of ROI, press the **[Set]** button.
 - When the ROI box displayed a solid line frame, roll the trackball to adjust the position of the ROI box.
 - When the ROI box displayed a dotted line frame, roll the trackball to adjust the size of the ROI box.
 - Press the **[Set]** button to toggle between position and size adjustment.

3. Rotate the **[Zoom]** knob on the control panel to zoom the ROI image.
4. Press the **[Zoom]** knob again to exit local zoom function.

NOTE : Local zooming is only applicable to real-time images.

8.3 Freeze the Image

You can freeze the image for next operation during the scanning at anytime.

1. Press the **[Freeze]** on the control panel to freeze the image. Image zooming, measurement, annotation and optimization of some imaging parameters can be performed in the freeze status.
2. After freezing an image, the system may enter cine replay, caliper measurement or application measurement which depends on user's preset. For details, refer to "4.2.3 Image".
3. Press the **[Freeze]** again on the control panel to unfreeze the image.

NOTE : In Dual-Split display or Quad-Split display mode, only image of the currently activated window can be unfrozen, the other images remain frozen.

8.4 Cine Replay

In the real-time status, press the **[Freeze]** button on the control panel to freeze the current image and enter the cine replay by default, and the cine progress bar is displayed on the screen. You can review the cine repeatedly by automatic replay, or you can review the cine manually by rolling the trackball frame by frame.

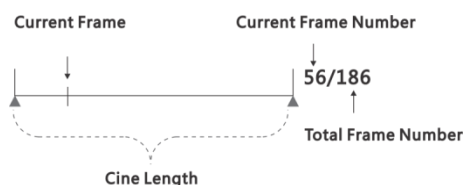


Figure 33 Cine Progress Bar (2D)



Figure 34 Cine Progress Bar (M/PW/CW/TVD)

Table 27 Cine Replay Operation

Item	Description
Save	Press the knob under [Save] to save cine region.
Reset	Press the knob under [Reset] to reset the first frame and last frame.

Item	Description
Jump to First	Jump to the first frame.
Jump to Last	Jump to the last frame.
Start Frame	Set the start frame.
End Frame	Set the end frame.
Start Time	Set the start time.
End Time	Set the end time.
Replay speed	Set the replay speed.

NOTE : System defaults to replay cine manually.

8.4.1 Cine Replay Region

To set the cine replay region, please perform the following steps:

➤ **2D Mode:**

1. Rotate the knob under the **[Start Frame]** or roll the trackball to desired frame and then press left set button to set the start point of the cine replay region.
2. Rotate the knob under the **[End Frame]** or roll the trackball to desired frame and then press right set button to set the end point of the cine replay region.

➤ **M/PW/CW/TVD Mode:**

1. Rotate the knob under the **[Start Time]** or roll the trackball to desired frame and then press left set button to set the start time of the cine replay region.
2. Rotate the knob under the **[End Time]** or roll the trackball to desired frame and then press right set button to set the end time of the cine replay region.

NOTE :

- The system plays the cine replay region automatically after replay region setting.
- Press the **[Save 2]** button on the control panel to save the cine replay region to the clipboard.

8.4.2 Manual Replay

After entering the cine replay, roll the trackball to replay the cine frame by frame. The progress bar shows the position of the current frame.

Manual replay can be performed in the replay region.

8.4.3 Auto Replay

➤ **Method 1**

- In the manual review status, rotate the knob under the **[Replay Speed]** to adjust the review speed to enable the auto replay.
- Rotate the knob under the **[Replay Speed]** to **[Off]** to disable the auto replay and

switch to the manual replay.

➤ **Method 2**

Roll the trackball quickly to activate the automatic replay function.

NOTE : The system plays the cine replay region automatically after replay region has been set.

8.5 Annotation

Annotation function provides comment, arrow and body mark functions to the image. Comment, arrow and body mark are available to the ultrasound images in freeze and real-time status.

NOTE : Users can preset annotation via [System Preset] → [Application]. Refer to “4.2.4 Application” for details.

8.5.1 Comment

Users can enter text content directly or add comment item to images.

8.5.1.1 Add Comment

To add a comment, please perform the following steps:

1. Press **<Text>** key on the keyboard in any modes to activate comment function.
2. Select comment language, comment library and comment size.
 - Rotate the knob under **[English]** to switch text language between Chinese and English.
 - Rotate the knob under **[Exam]** to preset comment item library.
 - Rotate the knob under **[Font Size]** to set text size.
3. Click comment item you want to add, roll the trackball to move the comment item to the desired position, press the **[Set]** button.
4. If there is no applicable comment item, roll the trackball to move the comment item to the desired position and enter the comment through keyboard, and press the **[Set]** button.
5. To add more comments, repeat Step 3 and 4.
6. Press **<Fn> + <Text>** key on the keyboard to exit comment function.

8.5.1.2 Edit Comment

1. Move the cursor over the comment item to activate the item. Activated comment item or text is highlight in green.
2. Move the cursor to the character to be modified by arrow keys of the keyboard.
3. Press the **<Back>** key on the keyboard to delete undesirable characters and enter new comments directly. After the modification, move the cursor away from the text comment to complete the modification.

8.5.1.3 Move Comment

1. Move the cursor to the text comment to be moved, press the **[Set]** button, the text comment is highlighted with green box.
2. Roll the trackball to move the text comment to the desire position, press the **[Set]** button.

8.5.1.4 Change Font Size

Rotate the knob under the **[Font Size]** to change the font size. Or you can change the font size through Preset screen (press<**Setup**>). Refer to “4.2.4 Application” for details.

8.5.1.5 Hide/Display Comment

Press the knob under **[Hide]** to hide or display comments.

8.5.1.6 Delete Comment

➤ Delete Selected Comment

1. In annotation screen, move the cursor over the comment to be deleted, press the **[Set]** button.
2. Press the **[Clear]** button on the control panel to delete the selected comment.

➤ Delete Recently-added Comment

In annotation screen, press the **[Clear]** button on the control panel to delete recently-added comment in reverse order.

➤ Delete All Comments

Long press the **[Clear]** button on the keyboard to delete all comments.

8.5.2 Arrow

8.5.2.1 Add Arrow

To add an arrow, please perform the following steps:

1. Press the **<Arrow>** key on the keyboard in any modes to activate arrow function.
2. Rotate the knob under **[Arrow Size]** to change the arrow size.
3. Rotate the **[Angle/Steer]** knob on the control panel to adjust the direction of the arrow.
4. Move the cursor to the desire position, press the **[Set]** button.
5. Press the **<Arrow>** key on the keyboard again to exit arrow function.

8.5.2.2 Hide/Display Arrow

Press the knob under **[Hide]** to hide or display arrows.

8.5.2.3 Delete Arrow

- In annotation screen, press the **[Clear]** button on the control panel to delete the recently-added arrow in reverse order.

- Long press the **[Clear]** button on the control panel to delete all arrow marks.

8.5.3 Body Mark

8.5.3.1 Add Body Mark

To add a body mark, please perform the following steps:

1. Press the **<Body Mark>** key on the keyboard in any modes to activate body mark function.
2. Rotate the knob under **[Exam]** to select body mark library.
3. Click the body mark you want to add.
4. Rotate the **[Angle/Steer]** knob on the control panel to adjust the direction of the body mark.
5. Press the **<Body mark>** on the keyboard again in any modes to exit body mark function.

NOTE : Click new body mark to replace current body mark.

8.5.3.2 Move Body Mark

1. Move the cursor over the body mark to be moved, press the **[Set]** button.
2. Move the trackball to the desire position and press the **[Set]** button to place the body mark.

8.5.3.3 Delete Body Mark

In annotation screen, press the **[Clear]** button on the control panel to delete the body mark.

Chapter 9 Image Measurement

Measurement includes general measurement and application measurement. The system supports measurement in real-time, freeze, Dual-Split display, Quad-Split display, zooming and cine replay status.



Warning

- Before making a measurement of the target area, make sure that the target area and image to be measured are correct and qualified to avoid misdiagnosis.
- Before performing Doppler color flow image measurement, do not let the probe emit direction perpendicular to the direction of blood flow, otherwise incorrect blood flow information may be displayed.

NOTE : During the measurement, if the system has been powered off or the [EndExam] button on the control panel has been pressed, all unsaved data will be lost.

9.1 Basic Operating Procedure

To perform a measurement, please perform the following steps:

1. In the real-time or frozen status, press the **[Caliper]** or **[Measure]** button on the control panel to activate the general / application measurement function.
2. Select measurement item.
 - Roll the trackball to select the measurement item and press the **[Set]** button.
3. Perform a measurement:
 - Move the cursor to the target area, press the **[Set]** button to activate measurement item. At the same time, the result window displays with measurement results and calculation data.
4. Adjust the position of result window (if needed).
 - After measurement, place the cursor on the title bar of the result window to change the cursor into a hand cursor. Press the **[Set]** button, and roll the trackball to move the result window.
5. After the measurement is completed, press the **[Caliper]** or **[Measure]** button on the control panel to exit the general / application measurement function.

9.2 General Measurement

9.2.1 2D General Measurement

9.2.1.1 Distance

Measure the distance between two points.

Perform the following steps:

1. Press the **[Caliper]** button on the control panel to start measurement.
2. Click **[Distance]** in the measurement menu, and the cursor appears.
3. Move the cursor to the start point and press the **[Set]** button.
4. Move the cursor to the end point and press the **[Set]** button.
5. Results are displayed in the result window.

9.2.1.2 Depth

Measure the distance from the center of sector to the cursor (for surface probe) or the distance from probe surface to the cursor in the direction of ultrasonic beam (for linear and convex array probe).

Perform the following steps:

1. Press the **[Caliper]** button on the control panel to start measurement.
2. Click **[Depth]** in the measurement menu, and the cursor appears.
3. Move the cursor to the desired position and press the **[Set]** button.
4. Results are displayed in the result window.

9.2.1.3 Curve Length

Measure the length of a curve. Available measurement method includes Trace and Spline.

➤ Trace Len

Perform the following steps:

1. Press the **[Caliper]** button on the control panel to start measurement.
2. Click **[Trace Len]** in the measurement menu, and the cursor appears.
3. Move the cursor to the start point of the trace line and press the **[Set]** button.
4. Roll the trackball to trace the outline of the target and press the **[Set]** button to fix the end point of the trace line.
5. Results are displayed in the result window.

➤ Trace Len (Spline)

Perform the following steps:

1. Press the **[Caliper]** button on the control panel to start measurement.
2. Click **[Trace Len (Spline)]** in the measurement menu, and the cursor appears.
3. Move the cursor to the start point of the target area and press the **[Set]** button.
4. Move the cursor along the target area to fix the second point and press the **[Set]** button.

5. Repeat step 4. A maximum of 12 points can be fixed.
6. Press the **[Set]** button twice to set the end point of the spline.
7. Results are displayed in the result window.

9.2.1.4 Angle

Measure the angle between two intersecting lines.

Perform the following steps:

1. Press the **[Caliper]** button on the control panel to start measurement.
2. Click **[Angle]** in the measurement menu, and the cursor appears.
3. Set two line segments as described in “9.2.1.1 Distance”.
4. The system automatically calculates the angle between the two line segments.
5. Results are displayed in the result window.

9.2.1.5 Area & Circumference

Measure the area and circumference of an enclosed area. Available measurement method includes Trace, Ellipse, Cross and Spline.

➤ Trace

Perform the following steps:

1. Press the **[Caliper]** button on the control panel to start measurement.
2. Click **[Trace]** in the measurement menu, and the cursor appears.
3. Move the cursor to the start point of the target area and press the **[Set]** button.
4. Roll the trackball to trace the outline of the target and press the **[Set]** button to fix the end point of the trace line.
5. Results are displayed in the result window.

➤ Ellipse

Perform the following steps:

1. Press the **[Caliper]** button on the control panel to start measurement.
2. Click **[Ellipse]** in the measurement menu, and the cursor appears.
3. Move the cursor to set the start point of the first axis of the ellipse and press the **[Set]** button.
4. Move the cursor to set the end point of the first axis of the ellipse and press the **[Set]** button.
5. Roll the trackball to size the measured axis as needed and press the **[Set]** button.
6. Results are displayed in the result window.

➤ Spline

Perform the following steps:

1. Press the **[Caliper]** button on the control panel to start measurement.
2. Click **[Spline]** in the measurement menu, and the cursor appears.
3. Move the cursor to the start point of the target area and press the **[Set]** button.
4. Move the cursor along the target area to fix the second point and press the **[Set]** button.

5. Repeat step 4. A maximum of 12 points can be fixed.
6. Press the **[Set]** button twice to complete the measurement.
7. Results are displayed in the result window.

➤ **Cross**

Perform the following steps:

1. Press the **[Caliper]** button on the control panel to start measurement.
2. Click **[Cross]** in the measurement menu, and the cursor appears.
3. Move the cursor to the start point of the target area and press the **[Set]** button.
4. Move the cursor to the end position of the fixed axis and press the **[Set]** button.
An irregular circle appears on the screen.
5. Roll the trackball to set the start point of the second axis of the circle and press the **[Set]** button.
6. Roll the trackball to set the end point of the second axis of the circle and press the **[Set]** button.
7. Results are displayed in the result window.

9.2.1.6 Volume

Measure the volume of the target object. Available measurement method includes 3 Dist, Ellipse and Ellipse Dist.

➤ **3 Dist**

To obtain the volume by measuring the vertical section area of the target object.

Perform the following steps:

1. Press the **[Caliper]** button on the control panel to start measurement.
2. Click **[Volume]** in the measurement menu, and the cursor appears.
3. Measures the length (D_1), width (D_2), and height (D_3) of the target object.
4. The system automatically calculates the volume. The length, width, height, and volume of the target object are displayed in the result window.
 - Formula: $\text{Volume (cm}^3\text{)} = \pi / 6 \times D_1 \text{ (cm)} \times D_2 \text{ (cm)} \times D_3 \text{ (cm)}$
 - D_1 , D_2 , and D_3 correspond to the length, width, and height of the target object.

➤ **Volume (Ellipse)**

Perform the following steps:

1. Press the **[Caliper]** button on the control panel to start measurement.
2. Click **[Volume (Ellipse)]** in the measurement menu, and the cursor appears.
3. Move the cursor to set the start point of the first axis of the ellipse and press the **[Set]** button.
4. Roll the trackball to set the end point of the first axis of the circle and press the **[Set]** button.
5. Move the cursor to adjust the second axis of the ellipse, and press the **[Set]** button to complete the volume ellipse measurement.
6. The system automatically calculates the volume. Results are displayed in the result window.

- Formula: Volume (cm³) = $\pi/6 \times a(\text{cm}) \times b^2(\text{cm})$
- Where, “a” corresponds to the first axis of the ellipse, and “b” corresponds to the second axis of the ellipse.

➤ **Volume (E+Dist)**

Perform the following steps:

1. Press the **[Caliper]** button on the control panel to start measurement.
2. Click **[Volume (E+Dist)]** in the measurement menu, and the cursor appears.
3. Measure the area of the vertical section as described in “9.2.1.5 Area & Circumference”.
4. Move the cursor to set the start point of the third axis and press the **[Set]** button.
5. Move the cursor to set the end point of the third axis and press the **[Set]** button.
6. The system automatically calculates the volume. The area, length, and volume of the target object are displayed in the result window.

- Formula: Volume (cm³) = $\pi/6 \times a(\text{cm}) \times b(\text{cm}) \times m(\text{cm})$
- Where, “a” corresponds to the long axis of the ellipse, and “b” corresponds to the short axis of the ellipse, “m” corresponds to the third axis of the ellipse.

9.2.1.7 Double Dist

Measure the distance between two mutually perpendicular lines.

Perform the following steps:

1. Press the **[Caliper]** button on the control panel to start measurement.
2. Click **[Double Dist]** in the measurement menu, and the cursor appears.
3. Move the cursor to set the start point of the first line segment and press the **[Set]** button.
4. Move the cursor to the end point of the line segment and press the **[Set]** button. A line perpendicular to the line segment is displayed on the screen.
5. Move the trackball to adjust the start point of the vertical line segment and press the **[Set]** button.
6. Move the trackball to adjust the end point of the vertical line segment and press the **[Set]** button.
7. Results are displayed in the result window.

9.2.1.8 Parallel

Measure the distance between five parallel lines on the ultrasound image.

Perform the following steps:

1. Press the **[Caliper]** button on the control panel to start measurement.
2. Click **[Parallel]** in the measurement menu, and the cursor and two lines perpendicular to each other appear.
3. Move the cursor to set the start point of the first parallel and press the **[Set]** button.
4. Move the cursor along the vertical line and press the **[Set]** button to set the

second parallel.

5. Repeat step 4 to set the third, fourth, fifth parallel as needed.
6. Results are displayed in the result window.

9.2.1.9 Ratio (D)

Measure the lengths of any two lines and calculates their ratio.

Perform the following steps:

1. Press the **[Caliper]** button on the control panel to start measurement.
2. Click **[Ratio (D)]** in the measurement menu, and the cursor appears.
3. Set two line segments as described in “9.2.1.1 Distance”.
4. The system automatically calculates the ratio, and the results are displayed in the result window.

9.2.1.10 Ratio (Area)

Measure the areas of any two enclosed areas and calculates their ratio.

Perform the following steps:

1. Press the **[Caliper]** button on the control panel to start measurement.
2. Click **[Ratio (Trace)]**, **[Ratio (Ellipse)]**, **[Ratio (Spline)]** or **[Ratio (Cross)]** in the measurement menu, and the cursor appears.
3. Use the area measurement method (choose one of trace, ellipse, spline, cross) to set two closed areas.
4. The system automatically calculates the ratio, and the results are displayed in the result window.

9.2.1.11 B Hist

Measures and calculates the gray scale distribution of the ultrasonic echo signals in an enclosed region.

Available measurement method includes B Hist (Trace), B Hist (Ellipse), B Hist (Spline) and B Hist (Rectangle).

Perform the following steps:

1. Press the **[Caliper]** button on the control panel to start measurement.
2. Click **[Hist (Trace)]**, **[Hist (Ellipse)]**, **[Hist (Spline)]** or **[Hist (Rectangle)]** in the measurement menu, and the cursor appears.
3. Set up an enclosed area with the area measurement method as described in “9.2.1.5 Area & Circumference”.
4. The system automatically calculates the gray distribution of the ultrasonic echo signal in this area and displays it at the top of the screen.

9.2.1.12 B Profile

Measure and calculates the gray distribution of the ultrasonic echo signals across a line.

Perform the following steps:

1. Press the **[Caliper]** button on the control panel to start measurement.
2. Click **[B Profile]** in the measurement menu, and the cursor appears.
3. Set a line with the distance measurement method as described in “9.2.1.1 Distance”.
4. The system automatically calculates the gray distribution of the ultrasonic echo signal on the line and displays it at the top of the screen.

9.2.1.13 Color Vel

Measure the color flow velocity in Color mode.

Perform the following steps:

1. Press the **[Caliper]** button on the control panel to start measurement.
2. Click **[Color Vel]** in the measurement menu, and the cursor appears.
3. Move the cursor to the desired point for blood flow velocity measurement and press the **[Set]** button.
4. Rotate the **[Angle/Steer]** knob to align the floating line to make it consistent with the direction of blood flow.
5. Results are displayed in the result window.

9.2.1.14 Volume Flow

Measure the blood flow through a blood cross section per unit time. Refer to “9.2.3.7 Vol Flow” for details.

9.2.1.15 IMT

Measure the intima-media thickness of the carotid artery. Refer to “9.3.5.3 Vascular Study and Calculation” for details.

9.2.1.16 Strain Ratio

Measure the strain ratio in the image.

NOTE : Only Elastography imaging supports this function.

Perform the following steps:

1. In the Elastography imaging mode, press the **[Caliper]** button on the control panel to start measurement.
2. Click **[Strain Ratio (Ellipse)]** in the measurement menu, and the cursor appears.
3. Perform the measurement as described in “9.2.1.10 Ratio (Area)”
4. After the measurement is complete, the measurement result will be displayed in the result window.

9.2.2 M General Measurement

9.2.2.1 Distance (M)

Measure the distance between two points on the sampling line at a certain time.

Perform the following steps:

1. In M-mode, press the **[Caliper]** button on the control panel to start measurement.
2. Click **[Distance (M)]** in the measurement menu, and the cursor appears.
3. Move the cursor to the start point and press the **[Set]** button.
4. Move the cursor to the end point and press the **[Set]** button.
5. Results are displayed in the result window.

9.2.2.2 Time (M)

Measure the time interval between two points.

Perform the following steps:

1. In M-mode, press the **[Caliper]** button on the control panel to start measurement.
2. Click **[Time (M)]** in the measurement menu, and the cursor appears.
3. Move the cursor to the start point and press the **[Set]** button.
4. Move the cursor to set the end point in horizontal direction and press the **[Set]** button.
5. Results are displayed in the result window.

9.2.2.3 Slope

Measures the depth and time between two points and calculates the slope.

Perform the following steps:

1. In M-mode, press the **[Caliper]** button on the control panel to start measurement.
2. Click **[Slope]** in the measurement menu, and the cursor appears.
3. Move the cursor to set the first point and press the **[Set]** button.
4. Move the cursor to set the second point and press the **[Set]** button.
5. Results are displayed in the result window.

9.2.2.4 HR (M)

Measures the time of N ($N \leq 8$) cardiac cycles and calculates the heart rate in M-mode image.

Perform the following steps:

1. Set the cardiac cycle.
 - Enter the Preset screen, select **[Preset]** → **[System Preset]** → **[Application]**
 - Select the number of cardiac cycles from the **[Cardiac Cycle]** drop-down list.

- Click **[Save]** to save current setting and return to the Home screen.
2. In M-mode, press the **[Caliper]** button on the control panel to start measurement.
 3. Click **[HR (M)]** in the measurement menu, and the cursor appears.
 4. Move the cursor to the start point and press the **[Set]** button.
 5. Move the cursor to set the end point in horizontal direction and press the **[Set]** button.
 6. Results are displayed in the result window.

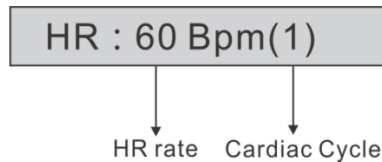


Figure 35 HR Result

NOTE : During the HR measurement, the number of cardiac cycles between the start and end points must be consistent with the preset. Otherwise, misdiagnosis may occur.

9.2.2.5 Velocity

Calculate the average velocity by measuring the distance and time between two points.

1. In M-mode, press the **[Caliper]** button on the control panel to start measurement.
2. Click **[Velocity]** in the measurement menu, and the cursor appears.
3. Move the cursor to the desired position and press the **[Set]** button.
4. Results are displayed in the result window.

9.2.3 Doppler General Measurement

9.2.3.1 Time (Doppler)

Measure the time interval between two points.

Perform the following steps:

1. In PW/CW mode, press the **[Caliper]** button on the control panel to start measurement.
2. Click **[Time (Doppler)]** in the measurement menu, and the cursor appears.
3. Move the cursor to the start point and press the **[Set]** button.
4. Move the cursor to set the end point in horizontal direction and press the **[Set]** button.
5. Results are displayed in the result window.

9.2.3.2 HR (Doppler)

Measures the time of N ($N \leq 8$) cardiac cycles and calculates the heart rate in Doppler mode image. The measurement procedure is the same as that of HR (M). Refer to “9.2.2.4 HR

(M)” for details.

9.2.3.3 Vel

Measure the velocity at a certain point on the Doppler image.

Perform the following steps:

1. In PW/CW mode, press the **[Caliper]** button on the control panel to start measurement.
2. Click **[Vel]** in the measurement menu, and the cursor appears.
3. Move the cursor, the real time velocity of the position is displayed in the result window. Move the cursor to the desired position and press the **[Set]** button.
4. Results are displayed in the result window.

9.2.3.4 Acceleration

Measure the velocity and time interval between two points on the Doppler image to calculate the acceleration, differential pressure, speed difference, and spectrum correction angle.

Perform the following steps:

1. In PW/CW mode, press the **[Caliper]** button on the control panel to start measurement.
2. Click **[Acceleration]** in the measurement menu, and the cursor appears.
3. Move the cursor to the first point and press the **[Set]** button.
4. Move the cursor to the second point and press the **[Set]** button.
5. The acceleration, differential pressure, speed difference, and spectrum correction angle between the two points are displayed in the result window.

9.2.3.5 D Trace

Trace one or several Doppler waveforms on the PW mode image to obtain speed and pressure gradient.

The Doppler spectrum diagram is shown below:

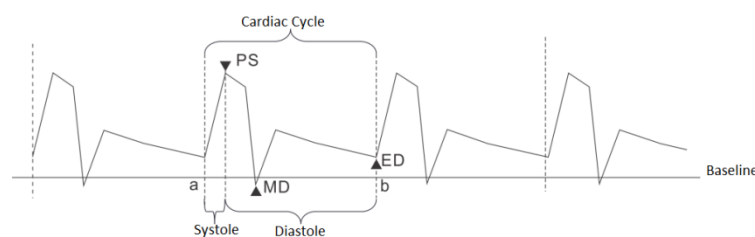


Figure 36 Doppler Spectrum

Perform the following steps:

1. In PW/CW mode, press the **[Caliper]** button on the control panel to start measurement.
2. Click **[D Trace]** in the measurement menu, and the cursor appears.
3. Move the cursor to the start point and press the **[Set]** button.

4. Roll the trackball to draw a trace line along the spectrum Doppler waveform to the end position, and press the **[Set]** button to complete the trace. The measurement result is displayed in the result window.

The parameters displayed in the result window are described as follows:

Parameter	Description	
PS	Peak Systolic Velocity	The maximum velocity of red blood cells passing through the sampling volume
ED	End-diastolic velocity	The blood flow velocity at the end of the cardiac cycle
MD	Min-diastolic velocity	The minimum velocity of the cardiac cycle
Vel	/	Blood flow velocity
Average velocity	/	$TAMAX \text{ (cm/s)} = \int_{T_a}^{T_b} V(t)dt / (T_b - T_a)$ Where V is the maximum velocity $TAMEAN \text{ (cm/s)} = \int_{T_a}^{T_b} V(t)dt / (T_b - T_a)$ Where V is the average velocity
PPG	Peak Pressure Gradient	$PPG(\text{mmHg}) = 4 \times PS(\text{m/s})^2$
Average Pressure Gradient	Average Pressure Gradient	$MPG \text{ (mmHg)} = \int_{T_a}^{T_b} 4(V(t))^2 dt / (T_b - T_a)$ Where V is the peak systolic velocity $MMPG \text{ (mmHg)} = \int_{T_a}^{T_b} 4(V(t))^2 dt / (T_b - T_a)$ Where V is the average systolic velocity
VTI	Velocity-Time Integral	$VTI(m) = \int_{T_a}^{T_b} V(t)dt$
AT	Acceleration Time	Acceleration time from end-diastolic velocity to peak systolic velocity
DT	Deceleration Time	Deceleration Time
HR	Heart rate	Beats per minute in a cardiac cycle
S/D	/	$S/D = PS(\text{m/s}) / ED(\text{m/s})$
D/S	/	$D/S = ED(\text{m/s}) / PS(\text{m/s})$
PI	Pulsatility Index	$PI = (PS(\text{m/s}) - ED(\text{m/s})) / TAMAX(\text{m/s}) $
RI	Resistive Index	$RI = (PS(\text{m/s}) - ED(\text{m/s})) / PS(\text{m/s}) $
θ	/	Correction Angle

Parameter	Description	
PV	Peak Velocity	The maximum velocity of red blood cells passing through the sampling volume and it also applicable to venous vessels

9.2.3.6 PS/ED

Measures the velocity of peak systolic point (PS) and end diastolic (ED) on the Doppler spectrum.

1. In PW/CW mode, press the **[Caliper]** button on the control panel to start measurement.
2. Click **[PS/ED]** in the measurement menu, and the cursor appears.
3. Move the cursor to the peak systolic velocity on the Doppler spectrum and press the **[Set]** button.
4. Move the cursor to the end diastolic velocity on the Doppler spectrum and press the **[Set]** button.
5. The RI, S/D and correction between the two points are displayed in the result window.

9.2.3.7 Vol Flow

Measure the blood flow through a blood cross section per unit time.

Perform the following steps:

1. In PW/CW mode, press the **[Caliper]** button on the control panel to start measurement.
2. Click **[Vol Flow]** in the measurement menu to display the sub-menu of volume flow.
3. Click **[Vas Area]** in the measurement menu, rotate the knob under **[Vas Area]** to select measuring method as needed and the cursor appears.
4. Move the cursor to the start point of the target area on B-image and press the **[Set]** button.
5. Move the cursor to the end point of the target area on B-image and press the **[Set]** button.
6. The flow area is displayed in the result window.

NOTE : Steps 4 to 5 can also be performed in B-mode.

7. Click **[TAMEAN]** or **[TAMAX]** in the measurement menu, and the cursor appears.
8. Move the cursor to the start point of the target area on Doppler Spectrum and press the **[Set]** button.
9. Move the cursor to the end point of the target area on Doppler Spectrum and press the **[Set]** button.
10. The system automatically generates trace lines. Results are displayed in the result window.

The parameters displayed in the result window are described as follows:

Parameter	Description	Formula
Vas Area	Dist	$\text{Vas Area} = \pi \times \text{Vas Diam (cm)}^2 / 4$
	Trace	See "9.2.1.5 Area & Circumference"
TAMEAN	Vol Flow(Area)-TAMEAN	$\text{Vol Flow(A) (ml/min)} = \text{Vas TAMEAN (cm/s)} \times \text{Vas Area (cm}^2) \times 60 \text{ (s)}$ Vas TAMEAN - Time Averaged Mean Velocity, obtained from Vas Trace measurement
TAMAX	Vol Flow(Area)-TAMAX	$\text{Vol Flow(A) (ml/min)} = \text{Vas TAMAX (cm/s)} \times \text{Vas Area (cm}^2) \times 60 \text{ (s)}$ Vas TAMAX - Time Averaged Maximum Velocity, obtained from Vas Trace measurement

9.2.3.8 Ratio (Vel)

Measures two D velocity and calculates their ratio for blood analysis.

Perform the following steps

1. In PW/CW mode, press the **[Caliper]** button on the control panel to start measurement.
2. Click **[Ratio (Vel)]** in the measurement menu, and the cursor appears.
3. Move the cursor to fix the two points for velocity measurement and press the **[Set]** button.
4. Move the cursor, the real time velocity of the position is displayed in the result window.
5. The velocity ratio of the two points is displayed in the result window.

- Formula: Vel Ratio (No unit) = $|\text{Vel 1 (cm/s)} / \text{Vel 2 (cm/s)}|$

9.2.3.9 Ratio (VTI)

Measure two VTI values and calculates their ratio.

Perform the following steps:

1. In PW/CW mode, press the **[Caliper]** button on the control panel to start measurement.
2. Click **[Ratio (VTI)]** in the measurement menu, and the cursor appears.
3. Move the cursor to the start point of VTI1 and press the **[Set]** button.
4. Move the cursor to the end point of VTI1 and press the **[Set]** button.
5. Repeat step 3~4 to fix the VTI2.
6. The VTI1, VTI2, and VTI ratio of the two points are displayed in the result window

- Formula: VTI Ratio (No unit) = $|\text{VTI 1 (cm)} / \text{VTI 2 (cm)}|$

9.3 Application Measurement

Application measurement package includes the following measurement item.

Table 28 Application Measurement Package

Application Measurement	Measurement Item
Abdomen	Applicable for measurements of animal abdominal organs (liver, spleen, gallbladder, pancreas and kidney) and abdominal large blood vessels.
Reproduction	Applicable for measurement of animal fetus development indicators, GA and EDD estimation.
Cardiology	Applicable for measurement of cardiac and other parameters of animal.
Small Parts	Applicable for measurement of small organs such as thyroid, isthmus, testis and mass.

9.3.1 Abdomen

9.3.1.1 2D Mode

The measurement items, calculation items and measurement method for 2D abdomen measurement are shown in the table below.

Table 29 2D Abdomen Measurement

Items	Subitems	Description	Methods or Formula
Liver	/	/	See "9.2.1.1 Distance"
GB	GB L	Gallbladder Length	See "9.2.1.1 Distance"
	GB H	Gallbladder Height	See "9.2.1.1 Distance"
	GB wall th	Gallbladder Wall Thickness	See "9.2.1.1 Distance"
Adrenal	Adrenal L	Adrenal Length	See "9.2.1.1 Distance"
	Adrenal H	Adrenal Height	See "9.2.1.1 Distance"
	Adrenal W	Adrenal Width	See "9.2.1.1 Distance"
CHD	/	Common hepatic duct	See "9.2.1.1 Distance"
CBD	/	Common Bile Duct	See "9.2.1.1 Distance"
Portal V Diam	/	Portal Vein Diameter	See "9.2.1.1 Distance"
Pancreas	Panc head	Pancreatic Head	See "9.2.1.1 Distance"
	Panc body	Pancreatic Body	See "9.2.1.1 Distance"
	Panc tail	Pancreatic Tail	See "9.2.1.1 Distance"

Items	Subitems	Description	Methods or Formula
	Panc duct	Pancreatic Duct	See "9.2.1.1 Distance"
	Pancreas	/	See "9.2.1.1 Distance"
Kidney	Renal L	Renal Length	See "9.2.1.1 Distance"
	Renal H	Renal Height	See "9.2.1.1 Distance"
	Renal W	Renal Width	See "9.2.1.1 Distance"
	Cortex	Renal Cortical Thickness	See "9.2.1.1 Distance"
	Renal Vol	Renal Volume	Measure Renal L, Renal H and Renal W, system then automatically calculates Renal Vol.
Spleen	/	/	See "9.2.1.1 Distance"
Aorta Diam	/	Aorta Diameter	See "9.2.1.1 Distance"
Iliac Diam	/	Iliac Diameter	See "9.2.1.1 Distance"
Prostate	Prostate L	Prostate Length	See "9.2.1.1 Distance"
	Prostate H	Prostate Height	See "9.2.1.1 Distance"
	Prostate W	Prostate Width	See "9.2.1.1 Distance"
Seminal Vesicle	Seminal L	Seminal Length	See "9.2.1.1 Distance"
	Seminal H	Seminal Height	See "9.2.1.1 Distance"
	Seminal W	Seminal Width	See "9.2.1.1 Distance"
Bladder	Pre-BL L	Pre-void Bladder Length	See "9.2.1.1 Distance"
	Pre-BL H	Pre-void Bladder Height	See "9.2.1.1 Distance"
	Pre-BL W	Pre-void Bladder Width	See "9.2.1.1 Distance"
	Pre-BL Vol	Pre-void Bladder Volume	Measure Pre-BL L, Pre-BL H and Pre-BL W, system then automatically calculates the Pre-BL Vol.
	Post-BL L	Post-void Bladder Length	See "9.2.1.1 Distance"
	Post-BL H	Post-void Bladder Height	See "9.2.1.1 Distance"
	Post-BL W	Post-void Bladder Width	See "9.2.1.1 Distance"
	Post-BL Vol	Post-void Bladder Volume	Measure Post-BL L, Post-BL H and Post-BL W, system then automatically calculates Post-BL Vol.

Items	Subitems	Description	Methods or Formula
	Mictur.Vol	Micturated Volume	Measure Pre-BL Vol and Post-BL Vol, system then automatically calculates Mictur.Vol.
Ureter	/	/	See "9.2.1.1 Distance"

9.3.1.2 Doppler Mode

Table 30 Doppler Abdomen Measurement

Items	Subitems	Description	Methods or Formula
Renal Arterial	Ren A Org	Renal Artery Origin	See "9.2.3.5 D Trace"
	Arcuate A	Arcuate Artery	See "9.2.3.5 D Trace"
	Segment A	Segmental Artery	See "9.2.3.5 D Trace"
	Interlobar A	Interlobar Artery	See "9.2.3.5 D Trace"
	Renal A	Renal Artery	See "9.2.3.5 D Trace"
	M Renal A	Main Renal Artery	See "9.2.3.5 D Trace"
	Renal V	Renal Vein	See "9.2.3.5 D Trace"
ABD Arterial	Aorta	/	See "9.2.3.5 D Trace"
	Celiac Axis	/	See "9.2.3.5 D Trace"
	SMA	Superior Mesenteric Artery	See "9.2.3.5 D Trace"
	C Hepatic A	Common Hepatic Artery	See "9.2.3.5 D Trace"
	Hepatic A	Hepatic Artery	See "9.2.3.5 D Trace"
	Splenic A	Splenic Artery	See "9.2.3.5 D Trace"
ABD Venous	CaVC	Caudal Vena Cava	See "9.2.3.5 D Trace"
	Portal V	Portal Vein	See "9.2.3.5 D Trace"
	M Portal V	Main Portal Vein	See "9.2.3.5 D Trace"
	Hepatic V	Hepatic Vein	See "9.2.3.5 D Trace"
	Lt Hepatic V	Left Hepatic Vein	See "9.2.3.5 D Trace"
	M Hepatic V	Middle Hepatic Vein	See "9.2.3.5 D Trace"
	Rt Hepatic V	Right Hepatic Vein	See "9.2.3.5 D Trace"
	Splenic V	Splenic Vein	See "9.2.3.5 D Trace"
	SMV	Superior Mesenteric Vein	See "9.2.3.5 D Trace"

Items	Subitems	Description	Methods or Formula
RAR	/	Ratio of Renal Artery PS the Abdominal Aorta PS	$RAR(\text{no unit}) = \frac{\text{Renal A PS (cm/s)}}{\text{Aorta PS (cm/s)}}$
SMA/Ao	/	Ratio of Superior Mesenteric Artery PS and Abdominal Aorta PS	$SMA/Ao (\text{no unit}) = \frac{\text{SMA PS (cm/s)}}{\text{Aorta PS (cm/s)}}$
CA/Ao	/	Ratio of Celiac Axis PS and Abdominal Aorta PS	$CA/Ao (\text{no unit}) = \frac{\text{Celiac Axis PS (cm/s)}}{\text{Aorta PS (cm/s)}}$

9.3.2 Reproduction

Note: Before performing reproduction measurements, please make sure that the system date is accurate, otherwise, the GA and EDD will be calculated incorrectly.

9.3.2.1 2D Mode

The measurement items, calculation items and measurement method for 2D obstetrics measurement are shown in the table below.

Animal	Item	Description	Methods or Formula
Dog	Dog CRL	Dog Crown Rump Length	See "9.2.1.1 Distance"
	Dog GS	Dog Gestational Sac Diameter	See "9.2.1.1 Distance"
	Dog HD	Dog Head Diameter	See "9.2.1.1 Distance"
	Dog BD	Dog Body Cavity Diameter	See "9.2.1.1 Distance"
Cat	Cat BD	Cat Body Cavity Diameter	See "9.2.1.1 Distance"
	Cat HD	Cat Head Diameter	See "9.2.1.1 Distance"
Equine	Equine GS-H	Equine Gestational Sac Diameter Horizontal	See "9.2.1.1 Distance"
	Equine GS-V	Equine Gestational Sac Diameter Vertical	See "9.2.1.1 Distance"
Bovine	Bovine CRL	Bovine Crown Rump Length	See "9.2.1.1 Distance"
	Bovine TD	Bovine Trunk Diameter	See "9.2.1.1 Distance"
	Bovine HD	Bovine Head Diameter	See "9.2.1.1 Distance"
Ovine	Ovine CRL	Ovine Crown Rump Length	See "9.2.1.1 Distance"
	Ovine BPD	Ovine Biparietal Diameter	See "9.2.1.1 Distance"
/	Body Lenth	/	See "9.2.1.1 Distance"

9.3.2.2 Doppler Mode

Items	Description	Methods or Formula
Umb A	Umbilical Artery	See "9.2.1.1 Distance"
MCA	Middle Cerebral Artery	See "9.2.1.1 Distance"
Fetal Ao	Fetal Aorta	See "9.2.1.1 Distance"
Desc Aorta	Descending Aorta	See "9.2.1.1 Distance"
Placenta A	Placental Artery	See "9.2.1.1 Distance"
Duct Venos	Ductus Venosus	See "9.2.1.1 Distance"

9.3.3 Cardiology

9.3.3.1 2D Mode

The measurement items, calculation items and measurement method for 2D cardiology measurement are shown in the table below.

Items	Description	Methods or Formula
LV Major	Left Ventricular major Diameter	See "9.2.1.1 Distance"
LV Minor	Left Ventricular minor Diameter	See "9.2.1.1 Distance"
LA Major	Left Atrium major Diameter	See "9.2.1.1 Distance"
LA Minor	Left Atrium minor Diameter	See "9.2.1.1 Distance"
LA Diam	Left Atrium Diameter	See "9.2.1.1 Distance"
RV Major	Right Ventricular major Diameter	See "9.2.1.1 Distance"
RV Minor	Right Ventricular minor Diameter	See "9.2.1.1 Distance"
RA Major	Right Atrium major Diameter	See "9.2.1.1 Distance"
RA Minor	Right Atrium minor Diameter	See "9.2.1.1 Distance"
RVDd(2D)	Right Ventricular Diameter at end-diastole	See "9.2.1.1 Distance"
RVAWd(2D)	Right Ventricular Anterior wall thickness at end-diastole	See "9.2.1.1 Distance"
Ao Diam (2D)	Aorta Diameter	See "9.2.1.1 Distance"
Ao Arch Diam(2D)	Aorta arch Diameter	See "9.2.1.1 Distance"

Items	Description	Methods or Formula
Ao Asc Diam (2D)	Ascending Aorta Diameter	See “9.2.1.1 Distance”
Ao Desc Diam (2D)	Descending Aorta Diameter	See “9.2.1.1 Distance”
LVOT Diam	Left Ventricular Outflow Tract Diameter	See “9.2.1.1 Distance”
MPA Diam	Main pulmonary Artery Diameter	See “9.2.1.1 Distance”
RVOT Diam	Right Ventricular Outflow Tract Diameter	See “9.2.1.1 Distance”
CaVC Diam (Expir)	Caudal vena cava expiration Diameter	See “9.2.1.1 Distance”
CaVC Diam (Insp)	Caudal vena cava inspiration Diameter	See “9.2.1.1 Distance”
Simp SP (A4C)	/	See “9.3.3.4 Cardiology Study and Calculation”
Simp SP (A2C)	/	See “9.3.3.4 Cardiology Study and Calculation”
Simpson BP	/	See “9.3.3.4 Cardiology Study and Calculation”
Teichholz (2D)	/	See “9.3.3.4 Cardiology Study and Calculation”
LV Mass (Cube 2D)	/	See “9.3.3.4 Cardiology Study and Calculation”
LV Mass (T-E)	/	See “9.3.3.4 Cardiology Study and Calculation”
LV Mass (A-L)	/	See “9.3.3.4 Cardiology Study and Calculation”
LV Vol (A-L)	/	See “9.3.3.4 Cardiology Study and Calculation”
LV Vol (Simp)	/	See “9.3.3.4 Cardiology Study and Calculation”
RA Vol (Simp)	/	See “9.3.3.4 Cardiology Study and Calculation”
AV Diam	Aorta Valve Diameter	See “9.2.1.1 Distance”
ACS (2D)	Aortic Valve Cusp Separation	See “9.2.1.1 Distance”
AVA	Aortic Valve Area	See “9.2.1.5 Area & Circumference”
AVA VTI	/	See “9.3.3.4 Cardiology Study and Calculation”
PISA AR	/	See “9.3.3.4 Cardiology Study and Calculation”

Items	Description	Methods or Formula
MV Diam	Mitral Valve diameter	See “9.2.1.1 Distance”
MVA	Mitral Valve area	See “9.2.1.5 Area & Circumference”
MCS (2D)	Mitral Valve Cusp Separation	See “9.2.1.1 Distance”
MV EPSS (2D)	Distance between point E and Interventricular Septum when mitral valve is fully open	See “9.2.1.1 Distance”
MVA (VTI)	/	See “9.3.3.4 Cardiology Study and Calculation”
PISA MR	/	See “9.3.3.4 Cardiology Study and Calculation”
PV Diam	Pulmonary valve Diameter	See “9.2.1.1 Distance”
PISA PR	/	See “9.3.3.4 Cardiology Study and Calculation”
TV Diam	Tricuspid valve Diameter	See “9.2.1.1 Distance”
TVA	Tricuspid Valve Area	See “9.2.1.5 Area & Circumference”
PISA TR	/	See “9.3.3.4 Cardiology Study and Calculation”
RVSP	/	See “9.3.3.4 Cardiology Study and Calculation”
PISA MR	/	See “9.3.3.4 Cardiology Study and Calculation”
PISA AR	/	See “9.3.3.4 Cardiology Study and Calculation”
PISA TR	/	See “9.3.3.4 Cardiology Study and Calculation”
PISA PR	/	See “9.3.3.4 Cardiology Study and Calculation”
VSD Diam	Ventricular Septal defect Diameter	See “9.2.1.1 Distance”
ASD Diam	Atrial Septal defect Diameter	See “9.2.1.1 Distance”
PDA Diam	Patent ductus Arteriosus Diameter	See “9.2.1.1 Distance”
PFO Diam	Patent Oval Foramen Diameter	See “9.2.1.1 Distance”

9.3.3.2 M Mode

The measurement items, calculation items and measurement method for M cardiology

measurement are shown in the table below.

Table 31 M Cardiology Measurement

Items	Description	Methods or Formula
LA/AO(M)	/	/
Diastole (Teich M)	End-diastolic Left Ventricular Measurement	See "9.3.3.4 Cardiology Study and Calculation"
Systole (Teich M)	End-systolic Left Ventricular Measurement	See "9.3.3.4 Cardiology Study and Calculation"
HR (Teich M)	Heart Rate	See "9.3.3.4 Cardiology Study and Calculation"
ACS(M)	Aortic valve Cusp Separation	See "9.2.2.1 Distance (M)"
RVOT Diam	Right Ventricular outflow tract Diameter	See "9.2.2.1 Distance (M)"
RVDd (M)	Right Ventricular Diameter at end- diastole	See "9.2.2.1 Distance (M)"
LVPEP (M)	Left Ventricular pre-ejection period	See "9.2.2.2 Time (M)"
LVET (M)	Left Ventricular ejectiontime	See "9.2.2.2 Time (M)"
RVPEP (M)	Right Ventricular pre-ejection period	See "9.2.2.2 Time (M)"
RVET (M)	Right Ventricular ejectiontime	See "9.2.2.2 Time (M)"
Teichholz (M)	/	See "9.3.3.4 Cardiology Study and Calculation"
Cube (M)	/	See "9.3.3.4 Cardiology Study and Calculation"
Gibson (M)	/	See "9.3.3.4 Cardiology Study and Calculation"
LV Mass (cube-M)	/	See "9.3.3.4 Cardiology Study and Calculation"
ACS (M)	Aortic valve Cusp Separation	See "9.2.2.1 Distance (M)"
LVPEP (M)	Left Ventricular pre-ejection period	See "9.2.2.2 Time (M)"
LVET (M)	Left Ventricular ejectiontime	See "9.2.2.2 Time (M)"
MV DE	Amplitude of the Mitral Valve DE wave	See "9.2.2.1 Distance (M)"
MV E-F Slope	Mitral Valve E-F slope	See "9.2.2.3 Slope"
MV EPSS (M)	Distance between point E and the interventricular septum	See "9.2.2.1 Distance (M)"
MV E Amp	Amplitude of the Mitral Valve E	See "9.2.2.1 Distance (M)"

Items	Description	Methods or Formula
	wave	
MV A Amp	Amplitude of the Mitral Valve A wave	See “9.2.2.1 Distance (M)”
MV C-O dur	/	See “9.2.2.2 Time (M)”
LV Tei Index (M)	/	See “9.3.3.4 Cardiology Study and Calculation”
RVPEP (M)	Right Ventricular pre-ejection period	See “9.2.2.2 Time (M)”
RVET (M)	Right Ventricular ejection time	See “9.2.2.2 Time (M)”
RVOT Diam	Right Ventricular outflow tract Diameter	See “9.2.2.1 Distance (M)”
MV ALL	/	See “9.3.3.4 Cardiology Study and Calculation”
CaVC Diam (Expir M)	Caudal vena cava expiration Diameter	See “9.2.2.1 Distance (M)”
CaVC Diam (Insp M)	Caudal vena cava inspiration Diameter	See “9.2.2.1 Distance (M)”
CrVC Diam (Expir M)	Cranial vena cava expiration Diameter	See “9.2.2.1 Distance (M)”
CrVC Diam (Insp M)	Cranial vena cava inspiration Diameter	See “9.2.2.1 Distance (M)”

9.3.3.3 Doppler Mode

The measurement items, calculation items and measurement method for Doppler cardiology measurement are shown in the table below.

Table 32 Doppler Cardiology Measurement

Items	Description	Methods or Formula
AV Vmax	Aorta Valve Maximum Velocity	See “9.2.3.3 Vel”
AV VTI	Aorta Valve Velocity-Time Integral	See “9.2.3.5 D Trace”
AVA (VTI)	/	See “9.3.3.4 Cardiology Study and Calculation”
AV AccT	Aorta Valve Acceleration Time	See “9.2.3.1 Time (Doppler)”
LVOT Vmax	Left Ventricular Outflow Tract Velocity	See “9.2.3.3 Vel”
LVOT VTI	Left Ventricular Outflow Tract Velocity-Time Integral	See “9.2.3.5 D Trace”
LVET (Doppler)	Left Ventricular Ejection Time	See “9.2.3.1 Time (Doppler)”

Items	Description	Methods or Formula
LVPEP (Doppler)	Left Ventricular Pre-ejection Period	See “9.2.3.1 Time (Doppler)”
AR Vmax	Aorta Valve Maximum Velocity	See “9.2.3.3 Vel”
AR VTI	Aortic Valve Regurgitation Velocity-Time Integral	See “9.2.3.5 D Trace”
AR DecT	Aortic Valve Regurgitation Deceleration Time	See “9.2.3.4 Acceleration”
AR PHT	Aortic Valve Regurgitation Pressure Half Time	See “9.2.3 Doppler General Measurement”
PISA AR	/	See “9.3.3.4 Cardiology Study and Calculation”
MV E Vel	Mitral Valve E-Vel	See “9.2.3.5 D Trace”
MV A Vel	Mitral Valve A-Vel	See “9.2.3.5 D Trace”
MV E Dur	Mitral Valve E-wave Duration	See “9.2.3.1 Time (Doppler)”
MV A Dur	Mitral Valve A-wave Duration	See “9.2.3.1 Time (Doppler)”
MVA (VTI)	/	See “9.3.3.4 Cardiology Study and Calculation”
MV (VTI)	Mitral Valve Velocity-Time Integral	See “9.2.3.5 D Trace”
MV AccT	Mitral Valve Acceleration Time	See “9.2.3.4 Acceleration”
MV DecT	Mitral Valve Deceleration Time	See “9.2.3.4 Acceleration”
IVRT	Isovelocity Relaxation Time	See “9.2.3.1 Time (Doppler)”
IVCT	Isovelocity Compression Time	See “9.2.3.1 Time (Doppler)”
LV Tei Index (Doppler)	/	See “9.3.3.4 Cardiology Study and Calculation”
MR Vmax	Mitral Valve Regurgitation Maximum Velocity	See “9.2.3.3 Vel”
MR VTI	Mitral Valve Regurgitation Velocity-Time Integral	See “9.2.3.5 D Trace”
dP/dt	/	/
PISA	/	See “9.3.3.4 Cardiology Study and Calculation”
RVOT Vmax	Right Ventricular Outflow Tract Maximum Velocity	See “9.2.3.3 Vel”
RVOT VTI	Right Ventricular Outflow Tract Velocity-Time Integral	See “9.2.3.5 D Trace”
PV Vmax	Pulmonary Valve Maximum	See “9.2.3.3 Vel”

Items	Description	Methods or Formula
	Velocity	
PV VTI	Pulmonary Valve Velocity- Time Integral	See “9.2.3.5 D Trace”
PV AccT	Pulmonary Valve Acceleration Time	See “9.2.3.4 Acceleration”
MPA Vmax	Main Pulmonary Artery Maximum Velocity	See “9.2.3.3 Vel”
LPA Vmax	Left Pulmonary Artery Maximum Velocity	See “9.2.3.3 Vel”
RPA Vmax	Right Pulmonary Artery Maximum Velocity	See “9.2.3.3 Vel”
RVET (Doppler)	Right Ventricular Ejection Time	See “9.2.3.1 Time (Doppler)”
RVPEP (Doppler)	Right Ventricular Pre-ejection Period	See “9.2.3.1 Time (Doppler)”
PAEDP	/	See “9.3.3.4 Cardiology Study and Calculation”
PISA PR	/	See “9.3.3.4 Cardiology Study and Calculation”
TV Vmax	Tricuspid Valve Maximum Velocity	See “9.2.3.3 Vel”
TV E Vel	Tricuspid Valve E-wave Flow Velocity	See “9.2.3.3 Vel”
TV A Vel	Tricuspid Valve A-wave Flow Velocity	See “9.2.3.3 Vel”
TV VTI	Tricuspid Valve Velocity-Time Integral	See “9.2.3.5 D Trace”
RVSP	/	See “9.3.3.4 Cardiology Study and Calculation”
RV Tei Index	/	See “9.3.3.4 Cardiology Study and Calculation”
PISA TR	/	See “9.3.3.4 Cardiology Study and Calculation”
PVein S Vel	Pulmonary Vein S-wave Flow Velocity	See “9.2.3.3 Vel”
PVein D Vel	Pulmonary Vein D-wave Flow Velocity	See “9.2.3.3 Vel”
PVein A Vel	Pulmonary Vein A-wave Flow Velocity	See “9.2.3.3 Vel”
PVein A Dur	Pulmonary Vein A-wave Duration	See “9.2.3.1 Time (Doppler)”
PVein DecT	Pulmonary Vein Deceleration	See “9.2.3.1 Time (Doppler)”

Items	Description	Methods or Formula
	Time	
PISA AR	/	See “9.3.3.4 Cardiology Study and Calculation”
PISA MR	/	See “9.3.3.4 Cardiology Study and Calculation”
PISA PR	/	See “9.3.3.4 Cardiology Study and Calculation”
PISA TR	/	See “9.3.3.4 Cardiology Study and Calculation”
ASD Vmax	Atrial Septal Defect Maximum Velocity	See “9.2.3.3 Vel”
VSD Vmax	Ventricular Septal Defect Maximum Velocity	See “9.2.3.3 Vel”
PDA Vel (d)	Patent Ductus Arteriosus Velocity at End-diastole	See “9.2.3.3 Vel”
PDA Vel (s)	Patent Ductus Arteriosus Velocity at End-systole	See “9.2.3.3 Vel”
MV Sa (lateral)	Mitral Valve lateral Systolic motion	See “9.2.3.3 Vel”
MV Sa (medial)	Mitral Valve medial Systolic motion	See “9.2.3.3 Vel”
MV Aa (lateral)	Mitral Valve lateral Late diastolic motion	See “9.2.3.3 Vel”
MV Aa (medial)	Mitral Valve medial Late diastolic motion	See “9.2.3.3 Vel”
MV ARa (lateral)	Mitral Valve lateral Acceleration Rate	See “9.2.3.3 Vel”
MV ARa (medial)	Mitral Valve medial Acceleration Rate	See “9.2.3.3 Vel”
MV DRa (lateral)	Mitral Valve lateral Deceleration Rate	See “9.2.3.3 Vel”
MV DRa (medial)	Mitral Valve medial Deceleration Rate	See “9.2.3.3 Vel”
MV Ea (lateral)	Mitral Valve lateral Early diastolic motion	See “9.2.3.3 Vel”
MV Ea (medial)	Mitral Valve medial Early diastolic motion	See “9.2.3.3 Vel”

9.3.3.4 Cardiology Study and Calculation

➤ Simpson SP

Measurement and study	Description	Method and Formula
EDV(Simp SP)	End-diastolic Left Ventricular Volume	$EDV(ml)$ $= \pi \times \frac{LVLd\ apical(cm)}{20} \times \sum_{i=1}^{20} r_i^2\ (cm)$ LVLd apical: left Ventricular Long-axis Length at End-diastole in apical view r_i: radius measured during diastole
ESV(Simp SP)	End-systolic Left Ventricular Volume	$ESV(ml)$ $= \pi \times \frac{LVLs\ apical(cm)}{20} \times \sum_{i=1}^{20} r_i^2\ (cm)$ LVLs apical: left Ventricular Long-axis Length at End-systole in apical view r_i: radius measured during systole
EDV Index (Simp SP)	/	EDV Index=EDV/BSA
ESV Index (Simp SP)	/	ESV Index=ESV/BSA
SV	Stroke Volume	SV(ml) = EDV(ml)-ESV(ml)
CO	Cardiac Output	CO(l/min) = SV(ml)×HR(bpm)/ 1000
EF	Ejection Fraction	EF(No unit) = SV(ml)/ EDV(ml)
SI	SV Index	SI(No unit) = SV(ml)/ Body Surface Area (m ²)
CI	CO Index	CI(No unit) = CO(l/min)/Body Surface Area (m ²)

➤ Simpson BP

Measurement and study	Description	Method and Formula
EDV(Simpson BP)	End-diastolic Left Ventricular	*1

Measurement and study	Description	Method and Formula
	Volume	
ESV(Simpson BP)	End-systolic Left Ventricular Volume	*2
EDV Index (Simpson BP)	/	EDV Index=EDV/BSA
ESV Index (Simpson BP)	/	ESV Index=ESV/BSA
SV(Simpson BP)	Stroke Volume	SV(ml) = EDV(ml)-ESV(ml)
CO(Simpson BP)	Cardiac Output	CO(l/min) = SV(ml)×HR(bpm)/ 1000
EF(Simpson BP)	Ejection Fraction	EF(No unit) = SV(ml)/ EDV(ml)
SI(Simpson BP)	SV Index	SI(No unit) = SV(ml)/ Body Surface Area (m ²)
CI(Simpson BP)	CO Index	CI(No unit) = CO(l/min)/Body Surface Area (m ²)

➤ ***1 Means:**

$$EDV(ml) = \pi \times \frac{MAX\{LVLD_{2i}(cm), LVLD_{4i}(cm)\}}{20} \times \sum_{i=1}^{20} (r_{2i}(cm) \times r_{4i}(cm))$$

➤ ***2 Means:**

$$ESV(ml) = \pi \times \frac{MAX\{LVLS_{2i}(cm), LVLS_{4i}(cm)\}}{20} \times \sum_{i=1}^{20} (r_{2i}(cm) \times r_{4i}(cm))$$

➤ **LV volume (A2C):**

$$EDV (2ml) = \pi \times \frac{LVLD_{2i}(cm)}{20} \times \sum_{i=1}^{20} r_{2i}^2 (cm)$$

$$ESV (2ml) = \pi \times \frac{LVLS_{2i}(cm)}{20} \times \sum_{i=1}^{20} r_{2i}^2 (cm)$$

➤ **LV volume (A4C):**

$$EDV (4ml) = \pi \times \frac{LVLD_{4i}(cm)}{20} \times \sum_{i=1}^{20} r_{4i}^2 (cm)$$

$$ESV (4ml) = \pi \times \frac{LVLS_{4i} (cm)}{20} \times \sum_{i=1}^{20} r_{4i}^2 (cm)$$

Note: When using Simpson BP to measure LV function, be sure to keep the apical four-chamber view and apical two-chamber view perpendicular. Otherwise the measure result will be incorrect.

➤ **Cube**

Measurement and study	Description	Method and Formula
Diastole	End-diastolic Left Ventricular Measurement	FoldLine in 2D mode or Parallel method in M mode
Systole	End-systolic Left Ventricular Measurement	FoldLine in 2D mode or Parallel method in M mode
LVIDd	Left Ventricular Internal Diameter at End-diastole	Distance in 2D/M General Measurements
LVIDs	Left Ventricular Internal Diameter at End-systole	Distance in 2D/M General Measurements
HR	Heart Rate	Obtained by ECG, input directly or measure manually
IVSd	Interventricular Septal Thickness at End-diastole	Distance in 2D/M General Measurements
LVPWd	Left Ventricular Posterior Wall Thickness at End-diastole	Distance in 2D/M General Measurements
EDV(Cube)	End-diastolic Left Ventricular Volume	$EDV(ml) = LVIDd(cm)^3$
ESV(Cube)	End-systolic Left Ventricular Volume	$ESV(ml) = LVIDs(cm)^3$
EDV Index (Cube)	/	$EDV \text{ Index} = EDV/BSA$
ESV Index (Cube)	/	$ESV \text{ Index} = ESV/BSA$
SV (Cube)	Stroke Volume	$SV(ml) = EDV(ml) - ESV(ml)$
CO (Cube)	Cardiac Output	$CO(l/min) = SV(ml) \times HR(bpm) / 1000$
EF (Cube)	Ejection Fraction	$EF(\text{No unit}) = SV(ml) / EDV(ml)$
SI (Cube)	SV Index	$SI(\text{No unit}) = SV(ml) / \text{Body Surface Area (m}^2\text{)}$
CI (Cube)	CO Index	$CI(\text{No unit}) = CO(l/min) / \text{Body Surface Area (m}^2\text{)}$

➤ **Teichholz**

Measurement and study	Description	Method and Formula
Diastole	End-diastolic Left Ventricular Measurement	FoldLine in 2D mode or Parallel method in M mode
Systole	End-systolic Left Ventricular Measurement	FoldLine in 2D mode or Parallel method in M mode
LVIDd	Left Ventricular Internal Diameter at End-diastole	Distance in 2D/M General Measurements
LVIDs	Left Ventricular Internal Diameter at End-systole	Distance in 2D/M General Measurements
HR	Heart Rate	Obtained by ECG, input directly or measure manually
IVSd	Interventricular Septal Thickness at End-diastole	Distance in 2D/M General Measurements
LVPWd	Left Ventricular Posterior Wall Thickness at End-diastole	Distance in 2D/M General Measurements
IVSs	Interventricular Septal Thickness at End-systole	Distance in 2D/M General Measurements
LVPWs	Left Ventricular Posterior Wall Thickness at End-systole	Distance in 2D/M General Measurements
EDV(Teichholz)	End-diastolic Left Ventricular Volume	$EDV(ml) = (7 \times (LVIDd(cm))^3) / (2.4 + LVIDd(cm))$
ESV(Teichholz)	End-systolic Left Ventricular Volume	$ESV(ml) = (7 \times (LVIDs(cm))^3) / (2.4 + LVIDs(cm))$
SV (Teichholz)	Stroke Volume	$SV(ml) = EDV(ml) - ESV(ml)$
CO (Teichholz)	Cardiac Output	$CO(l/min) = SV(ml) \times HR(bpm) / 1000$
EF (Teichholz)	Ejection Fraction	$EF(\text{No unit}) = SV(ml) / EDV(ml)$
FS (Teichholz)	Fractional Shortening	$FS(\text{No unit}) = (LVIDd(cm) - LVIDs[cm]) / LVIDd(cm)$
MVCF (Teichholz)	Mean Velocity of Circumferential Fiber Shortening	$MVCF = (LVIDd(cm) - LVIDs(cm)) / (LVIDd(cm) \times EF(s))$
SI (Teichholz)	SV Index	$SI(\text{No unit}) = SV(ml) / \text{Body Surface Area (m}^2\text{)}$
CI (Teichholz)	CO Index	$CI(\text{No unit}) = CO(l/min) / \text{Body Surface Area (m}^2\text{)}$

➤ **Gibson**

Measurement and study	Description	Method and Formula
Diastole	End-diastolic Left Ventricular Measurement	FoldLine in 2D mode or Parallel method in M mode
Systole	End-systolic Left Ventricular Measurement	FoldLine in 2D mode or Parallel method in M mode
LVIDd	Left Ventricular Internal Diameter at End-diastole	Distance in 2D/M General Measurements
LVIDs	Left Ventricular Internal Diameter at End-systole	Distance in 2D/M General Measurements
HR	Heart Rate	Obtained by ECG, input directly or measure manually
IVSd	Interventricular Septal Thickness at End-diastole	Distance in 2D/M General Measurements
LVPWd	Left Ventricular Posterior Wall Thickness at End-diastole	Distance in 2D/M General Measurements
IVSs	Interventricular Septal Thickness at End-systole	Distance in 2D/M General Measurements
LVPWs	Left Ventricular Posterior Wall Thickness at End-systole	Distance in 2D/M General Measurements
EDV(Gibson)	End-diastolic Left Ventricular Volume	$EDV(ml) = \pi/6(0.98 \times LVIDd(cm) + 5.90) \times LVIDd(cm)^2$
ESV(Gibson)	End-systolic Left Ventricular Volume	$ESV(ml) = \pi/6(1.14 \times LVIDs(cm) + 4.18) \times LVIDs(cm)^2$
EDV Index (Gibson)	/	$EDV\ Index = EDV/BSA$
ESV Index (Gibson)	/	$ESV\ Index = ESV/BSA$
SV (Gibson)	Stroke Volume	$SV(ml) = EDV(ml) - ESV(ml)$
CO (Gibson)	Cardiac Output	$CO(l/min) = SV(ml) \times HR(bpm) / 1000$
EF (Gibson)	Ejection Fraction	$EF(No\ unit) = SV(ml) / EDV(ml)$
FS (Gibson)	Fractional Shortening	$FS(No\ unit) = (LVIDd(cm) - LVIDs[cm]) / LVIDd(cm)$
MVCF (Gibson)	Mean Velocity of Circumferential Fiber Shortening	$MVCF = (LVIDd(cm) - LVIDs(cm)) / (LVIDd(cm) \times EF(s))$
SI (Gibson)	SV Index	$SI(No\ unit) = SV(ml) / Body\ Surface\ Area\ (m^2)$
CI (Gibson)	CO Index	$CI(No\ unit) = CO(l/min) / Body\ Surface\ Area\ (m^2)$

➤ LV Mass

Estimate the Index of Left Ventricular Mass (LV Mass-I) by calculating the LV Mass.

LV Mass (Cube)

Measurement and study	Description	Method and Formula
IVSd	Interventricular Septal Thickness at End-diastole	Distance in 2D/M General Measurements
LVIDd	Left Ventricular Internal Diameter at End-diastole	Distance in 2D/M General Measurements
LVPWd	Left Ventricular Posterior Wall Thickness at End-diastole	Distance in 2D/M General Measurements
LV Mass (Cube)	Left Ventricular Mass	*1
LV MASS-I (Cube)	Index of Left Ventricular Mass	*2

*1 Means:

$$LV\ Mass(g) = \left\{ 0.8 \times \left[1.04 \times \left((LVPWd(cm) + IVSd(cm) + LVIDd(cm))^3 - (LVIDd(cm))^3 \right) \right] \right\} + 0.6$$

*2 Means:

$$LV\ Mass-I\ (No\ unit) = LV\ Mass\ (g) / Body\ Surface\ Area\ (m^2)$$

LV Mass (A-L)

Measurement and study	Description	Method and Formula
LVAd sax Epi	Left Ventricular Epicardial Area at Papillary Muscle level at end-diastole in Short-axis view	Distance in 2D/M General Measurements
LVAd sax Endo	Left Ventricular Endocardial Area at Papillary Muscle level at end-diastole in Short-axis view	Distance in 2D/M General Measurements
LVLd apical	Left Ventricular Long-axis Length at End-diastole in apical view	Distance in 2D/M General Measurements
LV Mass (A-L)	Left Ventricular Mass	*1
LV MASS-I (A-L)	Index of Left Ventricular Mass	*2

*1 Means:

$$LV\ Mass(g) = 1.05 \times 5/6 \times (LVAd\ sax\ Epi(cm^2) \times (LVLd\ apical(cm) + t(cm)) - LVAd\ sax\ Endo(cm^2) \times LVL(cm));$$

$$t(cm) = \sqrt{\left(\frac{LVAdsaxEpi(cm^2)}{\pi}\right)} - \sqrt{\left(\frac{LVAdsaxEndo(cm^2)}{\pi}\right)}$$

*2 Means:

$$LV\ Mass-I\ (No\ unit) = LV\ Mass\ (g) / Body\ Surface\ Area\ (m^2)$$

LV Mass (T-E)

Measurement and study	Description	Method and Formula
LVAd sax Epi	Left Ventricular Epicardial Area atPapillary Muscle level at end-diastole in Short-axis view	Area in 2D General Measurements
LVAd sax Endo	Left Ventricular Endocardial Area atPapillary Muscle level at end-diastole in Short-axis view	Area in 2D General Measurements
a	Semi-major axis from widest minor axis radius to apex	Distance in 2D General Measurements
b	Truncated semi-major axis from widest minor axis radius to mitral annulus plane	Distance in 2D General Measurements
LV Mass (T-E)	Left Ventricular Mass	*1
LV MASS-I (T-E)	Index of Left Ventricular Mass	*2

*1 Means:

$$LV\ Mass(g) = 1.05\pi \times \left\{ (b+t)^2 \times \left[\frac{2(a+t)}{3} + d - \frac{d^3}{3(a+t)^2} \right] - b^2 \times \left(\frac{2a}{3} + d - \frac{d^3}{3a^2} \right) \right\}$$

$$t(cm) = \sqrt{\left(\frac{LVAdsaxEpi(cm^2)}{\pi}\right)} - \sqrt{\left(\frac{LVAdsaxEndo(cm^2)}{\pi}\right)}$$

$$b(cm) = \sqrt{\frac{LVAdsaxEndo(cm^2)}{\pi}}$$

*2 Means:

$$LV\ Mass-I\ (No\ unit) = LV\ Mass\ (g) / Body\ Surface\ Area\ (m^2)$$

➤ Mitral Valve Area (MVA)

Mitral Valve Area (MVA) can be calculated by two methods: pressure half time (PHT) or velocity- time integral (VTI).

MVA (VTI)

Measurement and study	Description	Method and Formula
LVOT Diam	Left Ventricular Outflow Tract Diameter	Distance in 2D General Measurements

Measurement and study	Description	Method and Formula
LVOT VTI	Left Ventricular Outflow Tract Velocity-Time Integral	D trace in Doppler General Measurement
MV VTI	Mitral Valve Velocity-Time Integral	D trace in Doppler General Measurement
MVA(VTI)	Mitral Valve Area	*1

*1 Means:

$$MVA(VTI)(cm^2) = \frac{\pi \times |LVOT VTI(cm)| \times LVOT Diam(cm)^2}{4 \times |MV VTI(cm)|}$$

➤ AVA (VTI)

Aortic Valve Area (AVA) can be calculated by velocity-time integral (VTI).

Measurement and study	Description	Method and Formula
LVOT Diam	Left Ventricular Outflow Tract Diameter	Distance in 2D General Measurements
LVOT VTI	Left Ventricular Outflow Tract Velocity-Time Integral	D trace in Doppler General measurements
AV VTI	Aortic Valve Velocity-Time Integral	D trace in Doppler General measurements
AVA(VTI)	Aortic Valve Area	*1

*1 Means:

$$AVA(VTI)(cm^2) = \frac{\pi \times |LVOT VTI(cm)| \times LVOT Diam(cm)^2}{4 \times |AV VTI(cm)|}$$

➤ LA Vol

LA Vol (A-L)

Measurement and study	Description	Method and Formula
LA Diam	Left Atrium Diameter	Distance in 2D General Measurements
LAA(A2C)	Left Atrium Area at apical 2-chamber view	Area in 2D General Measurements
LAA(A4C)	Left Atrium Area at apical 4-chamber view	Area in 2D General Measurements
LA Vol(A-L)	Left Atrium Area	*1

*1 Means:

$$LA Vol(A - L)(ml) = \frac{8\pi}{3} LAA(A4C)(cm^2) \times LAA(A2C)(cm^2) / LA Diam(cm)$$

LA Vol (Simp)

Measurement and study	Description	Method and Formula
LA Vol(A2C)	Left Atrium Volume at apical 2-chamber view	Same as Simpson SP measurement
LA Vol(A4C)	Left Atrium Volume at apical 4-chamber view	Same as Simpson SP measurement

➤ RA Vol (Simp)

Measurement and study	Description	Method and Formula
RA Vol(A4C)	Right Atrium Volume at apical 4-chamber view	Same as Simpson SP measurement

➤ LVIMP

Measurement and study	Description	Method and Formula
MV C-O dur	Mitral Valve close-open Duration	Time in M/Doppler General Measurements
LVET	Left Ventricular Ejection Time	Time in M/Doppler General Measurements
LVIMP	Left Ventricular Index of Myocardial Performance	*1

*1 Means:

$$LVIMP(no\ unit) = \frac{MV\ C-O\ dur(s) - LVET(s)}{LVET(s)}$$

➤ RVSP

Measurement and study	Description	Method and Formula
TR Vmax	Tricuspid Valve Regurgitation Maximum Velocity	D Vel in Doppler General Measurements
RAP	Right Atrium Pressure	Enter manually
TR PGmax	Tricuspid Valve Regurgitation Pressure Gradient	*1
RVSP	Right Ventricular Systolic Pressure	*2

*1 Means:

$$TR\ PGmax(mmHg) = 4 \times TR\ Vmax\ (m/s)^2$$

*2 Means:

$$RVSP(mmHg) = RAP(mmHg) + 4 \times (TR V \max(m/s))^2$$

➤ **PAEDP**

Measurement and study	Description	Method and Formula
PR Ved	Pulmonary Valve Regurgitation Velocity at end-Diastole	D Vel in Doppler General Measurements
RAP	Right Atrium Pressure	Enter manually
PR PGed	Pulmonary Valve Regurgitation Pressure Gradient at end-Diastole	/
PAEDP	Pulmonary Pressure at end-Diastole	*1

*1 Means:

$$PAEDP(mmHg) = RAP(mmHg) + 4 \times (PR.Ved (m/s))^2$$

➤ **RV Tei index(RVIMP)**

Measurement and study	Description	Method and Formula
TV C-O dur	Tricuspid Valve close-open Duration	Time in Doppler General Measurements
RVET	Right Ventricular Ejection Time	Time in Doppler General Measurements
RVIMP	Right Ventricular Index of Myocardial Performance	*1

*1 Means:

$$RVIMP(no \ unit) = \frac{TV \ C-O \ dur(s) - RVET(s)}{RVET(s)}$$

➤ **LV Tei index(LVIMP)**

Measurement and study	Description	Method and Formula
MV C-O dur	Mitral Valve close-open Duration	Time in Doppler General Measurements
LVET	Left Ventricular Ejection Time	Time in Doppler General Measurements
LVIMP	Left Ventricular Index of Myocardial Performance	*1

*1 Means:

$$LVIMP(no \ unit) = \frac{MV \ C-O \ dur(s) - LVET(s)}{LVET(s)}$$

➤ PISA

PISA (Proximal Isovelocity Surface Area) is used in quantitative analysis of the mitral valve regurgitation (PISA MR), aortic valve regurgitation (PISA AR), tricuspid valve regurgitation (PISA TR), and pulmonary valve regurgitation (PISA PR) in color mode.

PISA MR

NOTE : Only applicable for Color and Doppler modes.

Measurement and study	Description	Method and Formula
MR Rad	Mitral Valve Stenosis Radius	PISA measurement
MR VTI	Mitral Valve Regurgitation Velocity-Time Integral	D Trace in Doppler General Measurements
MR Als.Vel	Mitral Valve Regurgitation Aliasing Maximum Velocity	You can select to use top aliasing velocity or bottom aliasing velocity or input the value directly.
MR Vmax	Mitral Regurgitation Maximum Velocity	Obtained from MR VTI measurement
MR Flow	Mitral Regurgitation Flow	*1
MR Flow Rate	Mitral Regurgitation Flow Rate	*2
MR Fraction	Mitral Valve Regurgitation Fraction	*3
MR EROA	Mitral Valve Effective Regurgitant Orifice Area	*4

*1 Means:

$$MR\ Flow(ml) = \frac{2\pi MR\ Rad(cm)^2 \times MR\ Als.Vel(cm/s)}{|MRV\ max\ (cm/s)|} \times |MR\ VTI(cm)|$$

*2 Means:

$$MR\ Flow\ Rate(ml/s) = 2\pi\ MR\ Rad(cm)^2 \times MR\ Als.Vel(cm/s)$$

*3 Means:

$$MR\ Fraction\ (no\ unit) = \frac{MR\ Flow(ml)}{MV\ SV(ml)} \times 100\%$$

*4 Means:

$$MR\ EROA(cm)^2 = \frac{2\pi MR\ Rad(cm)^2 \times MR\ Als.Vel(cm/s)}{|MR\ Vmax(cm/s)|}$$

PISA AR

NOTE : Only applicable for Color and Doppler modes.

Measurement and study	Description	Method and Formula
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AR Rad	Aortic Valve Stenosis Radius	PISA measurement
AR VTI	Aortic Valve Regurgitation Velocity-Time Integral	D Trace in Doppler General Measurements
AR Als.Vel	Aortic Valve Regurgitation Aliasing Maximum Velocity	You can select to use top aliasing velocity or bottom aliasing velocity or input the value directly.
AR Vmax	Aortic Regurgitation Maximum Velocity	Obtained from AR VTI measurement
AR Flow	Aortic Regurgitation Flow	*1
AR Flow Rate	Aortic Regurgitation Flow Rate	*2
AR Fraction	Aortic Valve Regurgitation Fraction	*3
AR EROA	Aortic Valve Effective Regurgitant Orifice Area	*4

*1 Means:

$$AR\ Flow(ml) = \frac{2\pi AR\ Rad(cm)^2 \times AR\ Als.Vel(cm/s)}{|ARV\ max\ (cm/s)|} \times |AR\ VTI(cm)|$$

*2 Means:

$$AR\ Flow\ Rate(ml/s) = 2\pi\ AR\ Rad(cm)^2 \times AR\ Als.Vel(cm/s)$$

*3 Means:

$$AR\ Fraction\ (no\ unit) = \frac{AR\ Flow(ml)}{AV\ SV(ml)} \times 100\%$$

*4 Means:

$$AR\ EROA(cm)^2 = \frac{2\pi AR\ Rad(cm)^2 \times AR\ Als.Vel(cm/s)}{|AR\ Vmax(cm/s)|}$$

PISA TR

NOTE : Only applicable for Color and Doppler modes.

Measurement and study	Description	Method and Formula
TR Rad	Tricuspid Valve Stenosis Radius	PISA measurement
TR VTI	Tricuspid Valve Regurgitation Velocity-Time Integral	D Trace in Doppler General Measurements
TR Als.Vel	Tricuspid Valve Regurgitation Aliasing Maximum Velocity	You can select to use top aliasing velocity or bottom aliasing velocity or input the value directly.
TR Vmax	Tricuspid Regurgitation Maximum Velocity	Obtained from TR VTI measurement

TR Flow	Tricuspid Regurgitation Flow	*1
TR Flow Rate	Tricuspid Regurgitation Flow Rate	*2
TR Fraction	Tricuspid Valve Regurgitation Fraction	*3
TR EROA	Tricuspid Valve Effective Regurgitant Orifice Area	*4

*1 Means:

$$TR\ Flow(ml) = \frac{2\pi TR\ Rad(cm)^2 \times TR\ Als.Vel(cm/s)}{|TRV\ max\ (cm/s)|} \times |TR\ VTI(cm)|$$

*2 Means:

$$TR\ Flow\ Rate(ml/s) = 2\pi\ TR\ Rad(cm)^2 \times TR\ Als.Vel(cm/s)$$

*3 Means:

$$TR\ Fraction\ (no\ unit) = \frac{TR\ Flow(ml)}{TV\ SV(ml)} \times 100\%$$

*4 Means:

$$TR\ EROA(cm)^2 = \frac{2\pi TR\ Rad(cm)^2 \times TR\ Als.Vel(cm/s)}{|TR\ Vmax(cm/s)|}$$

PISA PR

NOTE : Only applicable for Color and Doppler modes.

Measurement and study	Description	Method and Formula
PR Rad	Pulmonary Valve Stenosis Radius	PISA measurement
PR VTI	Pulmonary Valve Regurgitation Velocity-Time Integral	D Trace in Doppler General Measurements
PR Als.Vel	Pulmonary Valve Regurgitation Aliasing Maximum Velocity	You can select to use top aliasing velocity or bottom aliasing velocity or input the value directly.
PR Vmax	Pulmonary Regurgitation Maximum Velocity	Obtained from PR VTI measurement
PR Flow	Pulmonary Regurgitation Flow	*1
PR Flow Rate	Pulmonary Regurgitation Flow Rate	*2
PR Fraction	Pulmonary Valve Regurgitation Fraction	*3
PR EROA	Pulmonary Valve Effective Regurgitant Orifice Area	*4

*1 Means:

$$PR\ Flow(ml) = \frac{2\pi PR\ Rad(cm)^2 \times PR\ Als.Vel(cm/s)}{|PRV\ max\ (cm/s)|} \times |PR\ VTI(cm)|$$

*2 Means:

$$PR\ Flow\ Rate(ml/s) = 2\pi\ PR\ Rad(cm)^2 \times PR\ Als.Vel(cm/s)$$

*3 Means:

$$PR\ Fraction\ (no\ unit) = \frac{PR\ Flow(ml)}{PV\ SV(ml)} \times 100\%$$

*4 Means:

$$PR\ EROA(cm)^2 = \frac{2\pi PR\ Rad(cm)^2 \times PR\ Als.Vel(cm/s)}{|PR\ Vmax(cm/s)|}$$

➤ TDI

Measurement and study	Description	Method and Formula
Ea/Aa(medial)	MV medial E-Vel/ A-Vel	$Ea / Aa(medial)(no\ unit) = \frac{Ea(medial)}{Aa(medial)}$
ATa(medial)	MV medial E-wave Acceleration Time	Obtained from ARa(medial) measurements
DTa(medial)	MV medial E-wave Deceleration Time	Obtained from DRa(medial) measurements
Ea/Aa(lateral)	MV lateral E-Vel/ A-Vel	$Ea / Aa(lateral)(no\ unit) = \frac{Ea(lateral)}{Aa(lateral)}$
ATa(lateral)	MV lateral E-wave Acceleration Time	Obtained from ARa(lateral) measurement
DTa(lateral)	MV lateral E-wave Deceleration Time	Obtained from DRa(lateral) measurement

➤ MV ALL

Measurement and study	Description	Method and Formula
MV E Amp	Amplitude of the Mitral Valve E-wave	See "9.2.2.1 Distance (M)"
MV D-E Amp	Amplitude of the Mitral Valve DE wave	See "9.2.2.1 Distance (M)"
MV D-E Slope	Mitral Valve D-E Slope	See "9.2.2.3 Slope"
MV E-F Slope	Mitral Valve E-F Slope	See "9.2.2.3 Slope"
MV A Amp	Amplitude of the Mitral Valve A-wave	See "9.2.2.1 Distance (M)"
MV A-C Interval	Mitral Valve A-C Interval	See "9.2.2.2 Time (M)"

9.3.4 Small Parts

9.3.4.1 2D Mode

The measurement items, calculation items and measurement method for 2D small parts measurement are shown in the table below.

Table 33 2D Small Parts Measurement

Items	Description	Methods or Formula
Thyroid L	Thyroid Length	See “9.2.1.1 Distance”
Thyroid H	Thyroid Height	See “9.2.1.1 Distance”
Thyroid W	Thyroid Width	See “9.2.1.1 Distance”
Isthmus H	Isthmus Height	See “9.2.1.1 Distance”
Testis L	Testicular Length	See “9.2.1.1 Distance”
Testis H	Testicular Height	See “9.2.1.1 Distance”
Testis W	Testicular Width	See “9.2.1.1 Distance”
Epididymis L	Epididymis Length	See “9.2.1.1 Distance”
Epididymis W	Epididymis Width	See “9.2.1.1 Distance”
Epididymis H	Epididymis Height	See “9.2.1.1 Distance”
Scrotal Wall Thickness	/	See “9.2.1.1 Distance”
Nip.-Mass 1~10 Dist.	Distance between nipple and mass	See “9.2.1.1 Distance”
Skin-Mass 1~10 Dist.	Distance between skin and mass	See “9.2.1.1 Distance”
Mass1~10 L	Mass Length	See “9.2.1.1 Distance”
Mass1~10 W	Mass Width	See “9.2.1.1 Distance”
Mass1~10 H	Mass Height	See “9.2.1.1 Distance”
Testis Mass1 d1-3	/	See “9.2.1.1 Distance”
Testis Mass2 d1-3	/	See “9.2.1.1 Distance”
Testis Mass3 d1-3	/	See “9.2.1.1 Distance”
Thyroid Mass 1~3 d1	/	See “9.2.1.1 Distance”
Thyroid Mass 1~3 d2	/	See “9.2.1.1 Distance”
Thyroid Mass 1~3 d3	/	See “9.2.1.1 Distance”
Thyroid Vol	Thyroid Volume	Measure Thyroid L, Thyroid W and

Items	Description	Methods or Formula
		Thyroid H, system calculates the Thyroid Vol automatically.

9.3.4.2 Doppler Mode

Items	Description	Methods or Formula
SAT	Superior Thyroid Artery	See “9.2.3.5D Trace”
ITA	Inferior Thyroid Artery	See “9.2.3.5D Trace”
Testis A	Testis Artery	See “9.2.3.5D Trace”
Testis V	Testis Vein	See “9.2.3.5D Trace”
Epididymis A	Epididymis Artery	See “9.2.3.5D Trace”
Epididymis V	Epididymis Vein	See “9.2.3.5D Trace”

9.3.5 Vascular

9.3.5.1 2D Vascular Measurement

Table 34 2D Vascular Measurement

Items	Description	Subitems	Methods or Formula
IMT	Intima-Media Thickness	CCA IMT	See “9.3.5.3 Vascular Study and Calculation”
		Bulb IMT	See “9.3.5.3 Vascular Study and Calculation”
		ICA IMT	See “9.3.5.3 Vascular Study and Calculation”
		ECA IMT	See “9.3.5.3 Vascular Study and Calculation”
CCA	Common Carotid Artery	Outer Diameter	See “9.2.1.1 Distance”
		Inner Diameter	See “9.2.1.1 Distance”
		Outer Area	See “9.2.1.5 Area & Circumference”
		Inner Area	See “9.2.1.5 Area & Circumference”
Bulb	Bulbillate	Outer Diameter	See “9.2.1.1 Distance”
		Inner Diameter	See “9.2.1.1 Distance”
		Outer Area	See “9.2.1.5 Area & Circumference”
		Inner Area	See “9.2.1.5 Area & Circumference”
Carotid Bifurcation	/	Outer Diameter	See “9.2.1.1 Distance”
		Inner Diameter	See “9.2.1.1 Distance”
		Outer Area	See “9.2.1.5 Area & Circumference”

Items	Description	Subitems	Methods or Formula
		Inner Area	See “9.2.1.5 Area & Circumference”
ICA	Internal Carotid Artery	Outer Diameter	See “9.2.1.1 Distance”
		Inner Diameter	See “9.2.1.1 Distance”
		Outer Area	See “9.2.1.5 Area & Circumference”
		Inner Area	See “9.2.1.5 Area & Circumference”
ECA	External Carotid Artery	Outer Diameter	See “9.2.1.1 Distance”
		Inner Diameter	See “9.2.1.1 Distance”
		Outer Area	See “9.2.1.5 Area & Circumference”
		Inner Area	See “9.2.1.5 Area & Circumference”
Carotid Stenosis 1-4	/	Outer Diameter	See “9.2.1.1 Distance”
		Inner Diameter	See “9.2.1.1 Distance”
		Outer Area	See “9.2.1.5 Area & Circumference”
		Inner Area	See “9.2.1.5 Area & Circumference”
C.Iliac A	Common Iliac Artery	Outer Diameter	See “9.2.1.1 Distance”
		Inner Diameter	See “9.2.1.1 Distance”
		Outer Area	See “9.2.1.5 Area & Circumference”
		Inner Area	See “9.2.1.5 Area & Circumference”
Ex. Iliac A	External Iliac Artery	Outer Diameter	See “9.2.1.1 Distance”
		Inner Diameter	See “9.2.1.1 Distance”
		Outer Area	See “9.2.1.5 Area & Circumference”
		Inner Area	See “9.2.1.5 Area & Circumference”
IIA	Internal Iliac Artery	Outer Diameter	See “9.2.1.1 Distance”
		Inner Diameter	See “9.2.1.1 Distance”
		Outer Area	See “9.2.1.5 Area & Circumference”
		Inner Area	See “9.2.1.5 Area & Circumference”
CFA	Common Femoral Artery	Outer Diameter	See “9.2.1.1 Distance”
		Inner Diameter	See “9.2.1.1 Distance”
		Outer Area	See “9.2.1.5 Area & Circumference”
		Inner Area	See “9.2.1.5 Area & Circumference”
DFA	Deep Femoral Artery	Outer Diameter	See “9.2.1.1 Distance”
		Inner Diameter	See “9.2.1.1 Distance”
		Outer Area	See “9.2.1.5 Area & Circumference”

Items	Description	Subitems	Methods or Formula
		Inner Area	See “9.2.1.5 Area & Circumference”
Int Jug V	Internal Jugular Vein	Anterior-Posterior	See “9.2.1.1 Distance”
		Transverse	See “9.2.1.1 Distance”
		Checklist	/
C.Iliac V	Common Iliac Vein	Anterior-Posterior	See “9.2.1.1 Distance”
		Transverse	See “9.2.1.1 Distance”
		Checklist	/
Ex. Iliac V	External Iliac Vein	Anterior-Posterior	See “9.2.1.1 Distance”
		Transverse	See “9.2.1.1 Distance”
		Checklist	/
IIV	Internal Iliac Vein	Anterior-Posterior	See “9.2.1.1 Distance”
		Transverse	See “9.2.1.1 Distance”
		Checklist	/
CFV	Common Femoral Vein	Anterior-Posterior	See “9.2.1.1 Distance”
		Transverse	See “9.2.1.1 Distance”
		Checklist	/
DFV	Deep Femoral Vein	Anterior-Posterior	See “9.2.1.1 Distance”
		Transverse	See “9.2.1.1 Distance”
		Checklist	/

9.3.5.2 Doppler Vascular Measurement

Table 35 Doppler Vascular Measurement

Items	Description	Subitems	Methods or Formula
Carotid	/	CCA	See 9.2.3.5 D Trace”
		ICA	See 9.2.3.5 D Trace”
		ECA	See 9.2.3.5 D Trace”
		Bulb	See 9.2.3.5 D Trace”
		Carotid Bifurcation	See 9.2.3.5 D Trace”
Lower Extremity Artery	/	C.Iliac A	See 9.2.3.5 D Trace”
		Ex.Iliac A	See 9.2.3.5 D Trace”

Items	Description	Subitems	Methods or Formula
		IIA	See 9.2.3.5 D Trace"
		CFA	See 9.2.3.5 D Trace"
		DFA	See 9.2.3.5 D Trace"
CCA (Sten)	Common Carotid Artery (Stenosis)	Pre Sten	See 9.2.3.5 D Trace"
		Sten	See 9.2.3.5 D Trace"
		Post Sten	See 9.2.3.5 D Trace"
ICA (Sten)	Internal Carotid Artery (Stenosis)	Pre Sten	See 9.2.3.5 D Trace"
		Sten	See 9.2.3.5 D Trace"
		Post Sten	See 9.2.3.5 D Trace"
ECA (Sten)	External Carotid Artery (Stenosis)	Pre Sten	See 9.2.3.5 D Trace"
		Sten	See 9.2.3.5 D Trace"
		Post Sten	See 9.2.3.5 D Trace"
Bulb (Sten)	Bulbilate (Stenosis)	Pre Sten	See 9.2.3.5 D Trace"
		Sten	See 9.2.3.5 D Trace"
		Post Sten	See 9.2.3.5 D Trace"
Carotid Bifurcation (Sten)	Carotid Bifurcation (Stenosis)	Pre Sten	See 9.2.3.5 D Trace"
		Sten	See 9.2.3.5 D Trace"
		Post Sten	See 9.2.3.5 D Trace"
Carotid Stenosis 1-4	/	Pre Sten	See 9.2.3.5 D Trace"
		Sten	See 9.2.3.5 D Trace"
		Post Sten	See 9.2.3.5 D Trace"
C.Iliac A (Sten)	Common Iliac Artery (Stenosis)	Pre Sten	See 9.2.3.5 D Trace"
		Sten	See 9.2.3.5 D Trace"
		Post Sten	See 9.2.3.5 D Trace"
Ex.Iliac A (Sten)	External Iliac Artery (Stenosis)	Pre Sten	See 9.2.3.5 D Trace"
		Sten	See 9.2.3.5 D Trace"
		Post Sten	See 9.2.3.5 D Trace"
IIA (Sten)	Internal Iliac Arter	Pre Sten	See 9.2.3.5 D Trace"

Items	Description	Subitems	Methods or Formula
	(Stenosis)	Sten	See 9.2.3.5 D Trace"
		Post Sten	See 9.2.3.5 D Trace"
CFA (Sten)	Common Femoral Artery (Stenosis)	Pre Sten	See 9.2.3.5 D Trace"
		Sten	See 9.2.3.5 D Trace"
		Post Sten	See 9.2.3.5 D Trace"
DFA (Sten)	Deep Femoral Artery (Stenosis)	Pre Sten	See 9.2.3.5 D Trace"
		Sten	See 9.2.3.5 D Trace"
		Post Sten	See 9.2.3.5 D Trace"
C.Iliac V	Common Iliac Vein	PV	See 9.2.3.5 D Trace"
		Reflux	See "9.2.3.1 Time (Doppler)"
		Checklist	/
Ex.Iliac V	External Iliac Vein	PV	See 9.2.3.5 D Trace"
		Reflux	See "9.2.3.1 Time (Doppler)"
		Checklist	/
IIV	Internal Iliac Vein	PV	See 9.2.3.5 D Trace"
		Reflux	See "9.2.3.1 Time (Doppler)"
		Checklist	/
CFV	Common Femoral Vein	PV	See 9.2.3.5 D Trace"
		Reflux	See "9.2.3.1 Time (Doppler)"
		Checklist	/
DFV	Deep Femoral Vein	PV	See 9.2.3.5 D Trace"
		Reflux	See "9.2.3.1 Time (Doppler)"
		Checklist	/

9.3.5.3 Vascular Study and Calculation

➤ IMT

IMT (Intima-Media Thickness) refers to the vertical dimension between LI (Lumen-Intima) and MA (Media-Adventitia).

Perform the following steps:

1. In 2D mode, press the **[Caliper]** button on the control panel to start measurement.

2. Click **[IMT(NEAR)]** or **[IMT(FAR)]** in the measurement menu and the ROI box appears.
3. Move the cursor to the start point of ROI and then press the **[Set]** button. Roll the trackball to adjust the ROI area and then press the **[Set]** button. Two auto trace lines appear in the ROI box. Results are displayed in the result window.

NOTE:

- Please freeze the image before starting IMT measurement.
- Make sure that you select the right vessel wall (Near/ Far) before IMT measurement; otherwise wrong calculation may result.

➤ **Stenosis D**

Measure Normal Diam and Resid Diam, calculates Stenosis D.

$$\text{Stenosis D} = (D_1 - D_2)/D_1 \times 100\%$$

Where D_1 is Normal Diam and D_2 is Resid Diam.

➤ **Stenosis A**

Measure Normal Area and Resid Area, calculates Stenosis A.

$$\text{Stenosis A} = (A_1 - A_2)/A_1 \times 100\%$$

Where A_1 is Normal Area and A_2 is Resid Area.

➤ **ICA/CCA(PS)**

Measure the flow velocity ratio between Internal Carotid Artery (ICA) and Common Carotid Artery (CCA) to calculate the stenosis.

Measure PS value of ICA and CCA distal by D trace method of Doppler general measurement, and the system automatically calculates the stenosis.

➤ **ABI**

Measure the Ankle Systolic Pressure (ASP) and Brachial Systolic Pressure (BSP) on Doppler image to calculate Ankle Brachial Index (ABI).

$$ABI = ASP/BSP$$

Chapter 10 Report

After the measurement is completed, the relevant measurement data will be displayed in the report.

10.1 View the Report

Press the **[Report]** on the control panel to enter the report screen of current animal.

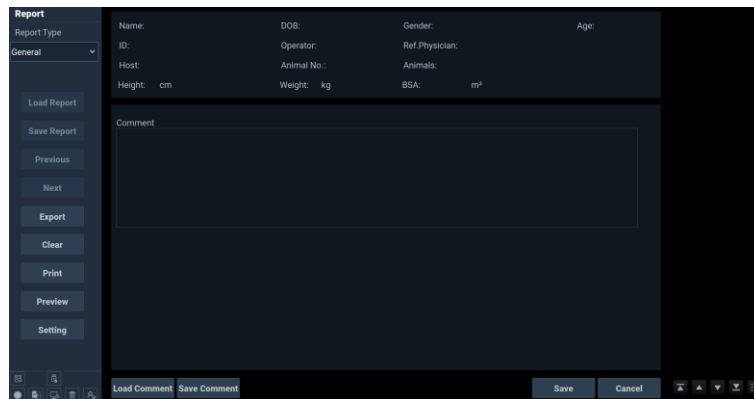


Figure 37 Report

- NOTE :**
- The report shows the three latest values and a final value for the measurement.
 - The report only displays the measurement data displayed by default for the corresponding template.
 - General report only displays the caliper measurement data.

Table 36 Button Functions

Item	Description
Load Report	Click to preview, export or print a saved report
Save Report	Click to save the current report in PDF
Previous/Next	Click [Previous] or [Next] to flip the pages if the report has more than one page
Export	Click to export report in PDF
Clear	Click to delete comments
Print	Click to print the current report
Preview	Click to preview the current report
Setting	Click to open the print Setting Dialog box
Load Comment	Click to load saved comment
Save	Click to save comment as template

Item	Description
Comment	
Add Image	Check the thumbnail in the Clipboard to add image
Save	Click to save current setting and return to the Home screen
Cancel	Click to cancel all modifications and return to the Home screen

10.2 Edit the Report

10.2.1 Edit the Measurement Data



Caution Incorrect data may cause misdiagnosis. Please modify the measurement data carefully.

- Note:**
- Only measurement results can be edited; calculation results cannot be edited.
 - Once the measurement result is modified, the average value and the corresponding calculated value will automatically update.

Perform the following steps:

1. After the measurement is completed, press **[Report]** on the control panel to enter the Report screen. The corresponding report of current exam displays.
2. To view other animal reports, click the **[Report Type]** drop-down box to select the corresponding report.
3. Click the **[Method]** drop-down box to set the method for calculating the final value. The value is updated and displayed according to the calculation formula selected.

Item	Description
Last	Display the latest value of the measurement
Avg	Display the average value of the measurement
Max	Display the maximum value of the measurement
Min	Display the minimum value of the measurement

Note: The calculation formula of GA and standard deviation should be preset for obstetric Report

4. Move the cursor to the value you want to edit and press the **[Set]** button.
5. Delete the value via <←> key on the keyboard and enter the new value.
6. After editing, click **[Save]** to save the modification and return to the Home screen.

10.2.2 Comment

10.2.2.1 Add Comment

Perform the following steps:

1. Move the cursor over the comment box and press the **[Set]** button.

Note: The comment box is at the bottom of the report page. For reports with more than one page, please click **[Next]** to view the comments.

2. Enter comments in the comment box.

10.2.2.2 Load Comment

Click **[Load Comment]** to load saved comment.

10.2.2.3 Save Comment

Click **[Save Comment]** to save current comment as template.

10.2.3 Add Image

Images saved in the current exam can be added to the report.

Perform the following steps:

1. The saved ultrasonic images displayed on the right column of the screen. Click the image you want to add, selected images marked with a “”.
2. Click “” icon at the bottom of the column to select or cancel all images .

10.3 Review the Report

Click **[Review Report]** to view the report.

Note: When reviewing, reports cannot be edited.

10.4 Print the Report

Click **[Print]** to print the report.

Note: Add the printer service prior to printing the report.

10.5 Backup the Report

Note: Save the report prior to loading or exporting the report.

10.5.1 Save

Click **[Save Report]** to save current report.

10.5.2 Load

Click **[Load Report]** to download existed report.

10.5.3 Export

Click **[Export]** to open the Export Wizard and set relevant parameters, click **[OK]** to export the current report.

Chapter 11 Animal Data Management

After the animal image is acquired and processed, you can store and review the animal image or export the animal data to a USB storage device or DICOM server for future viewing.

11.1 Storage

Image and cine are saved to the system by default. You can also choose to save the image and cine to a USB storage device.

11.1.1 Image Storage

In the freeze or real-time status, press the **[Save1]** button on the control panel, the system will automatically save the current image to the current animal database.

The system saves the standard area by default, and you can also set to save the image area. For details, refer to “4.2.3 Image”.

11.1.2 Cine Storage

In the freeze or real-time status, press the **[Save2]** button on the control panel, the system will automatically save the cine to the current animal database.

11.2 Image Viewing

Previous animal images/data can be viewed through the Station screen, and current animal images and data can also be viewed through other screens.

11.2.1 Current Animal

Image and cine of current animal can be viewed through the clipboard, review screen, and Station screen.

11.2.1.1 Through Clipboard

1. In the real-time or frozen status, press the **[Cursor]** button on the control panel to display cursor.
2. Roll the trackball, move the cursor to the desire thumbnail, double-click the **[Set]** button, and the screen displays the image in original size. To view cine, double-click the desire thumbnail to enter the cine replay status, the user can manually play the cine or play the cine automatically.

- While viewing the image, replay, zooming, measurements are also available.

- Press the **[Freeze]** button on the control panel to freeze the image and return to the home screen.

11.2.1.2 Through Review Screen

1. Press the **[Review]** button to enter the Review screen of current animal.

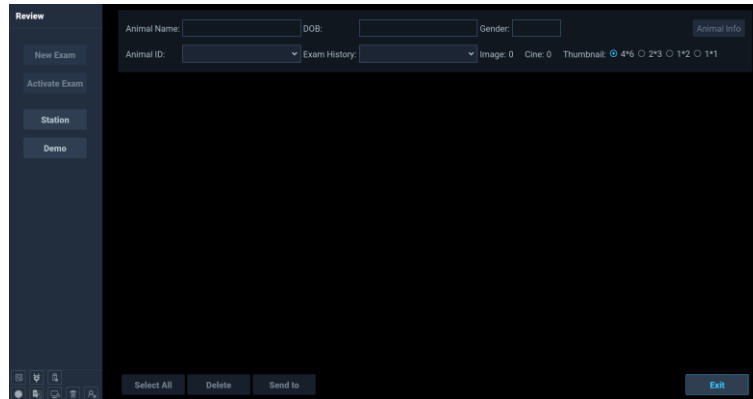


Figure 38 Review Screen

2. Roll the trackball, move the cursor to the desire thumbnail, double-click the **[Set]** button, and the screen displays the image in original size.

11.2.1.3 Though Station Screen

1. Press the **<Station>** key on the keyboard to enter the Station screen. The current animal is selected by default in the animal information list, and the clipboard displays the thumbnail image of the animal.

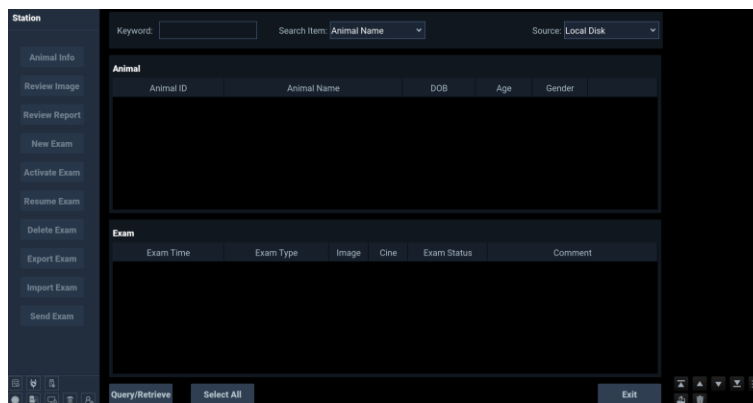


Figure 39 Station Screen

2. Move the cursor to the desire thumbnail image and double-click the **[Set]** button to enter the Home screen to view the image in original size.

11.2.2 Previous Animal

To view data of previous animal through Station screen:

1. Press the **<Station>** key on the keyboard to enter the Station screen.
2. Search the desired animal.

- Select the data source and search item, enter the keyword to search the desired animal.
 - Drop down the scroll bar on the right side of the animal information list to locate the desired animal.
3. Select the desired animal.

11.2.2.1 Animal Information

Click **[Animal Info]** to enter the Animal screen to check basic information and exam information of desired animal.

11.2.2.2 Image

- The clipboard displays the thumbnail image of the animal. Click ▲/▼/▲/▼ to scroll through the thumbnail images, move the cursor to the desired image, and double-click the **[Set]** button to view the image.
- Or click **[Review Image]** to enter the Review screen, move the cursor to the desired image, and double-click the **[Set]** button to view the image.

11.2.2.3 Report

Click **[Review Report]** to view the report.

11.3 Delete Image/Data

11.3.1 Current Animal

11.3.1.1 Delete image through Clipboard

1. Select image.
 - Click the ▲/▼/▲/▼ button to scroll up and down the thumbnail image.
2. Select thumbnail of the image you want to delete and the selected images are marked with a "●".
 - Click "☑" icon at the bottom of the clipboard to select or cancel all images .
3. Click "🗑" icon at the bottom of the clipboard to delete the image.

11.3.1.2 Delete image through Review screen

Perform the following steps:

1. Press the **[Review]** button on the control panel to enter the Review screen.
2. Select one or more thumbnail images, selected images are marked with a "●".
 - If you want to delete all images, click **[Select All]**
3. Click **[Delete]** to delete the selected image.

11.3.2 Previous Animals

Perform the following steps:

1. Press the **<Station>** key on the keyboard to enter the Station screen.
2. Search desired animal.
 - Select the data source and search item, enter the keyword to search the desired animal.
3. Select desired animal.
 - Roll the trackball over the desired animal, press the **[Set]** button.
4. Delete animal data.
 - Delete image: move the cursor to the image to be deleted, click the delete icon “” at the bottom of the clipboard to delete the image; or click **[Review Image]** to enter the animal screen and delete image.
 - Delete animal data: click **[Delete Exam]**, and then click **[OK]** in the pop-up dialog box to delete the animal data.
 - Delete all animal data: **[Select All]** to select all animals. Click **[Delete Exam]** and then click **[OK]** in the pop-up dialog box to delete all animal data.

11.4 Image/Data Recovery

Deleted animal data will be cached in the recycle bin.

Due to the space limitations of the hard disk, the recycle bin can only cache the most recently deleted animal data.

To recovery image/data, please perform the following steps:

1. Click “” icon in the status bar to enter the recycle bin screen.
2. Select desired animal image or data.
 - Click **[Restore]** to restore the selected image/data.
 - Click **[Restore All]** to restore all images and data.
 - Click **[Delete]** to delete the selected image/data.
 - Click **[Delete All]** to delete all images and data.

11.5 Exporting Image/Data

The system supports exporting animal information, image and report to a USB storage device or DICOM server.

- NOTE :**
- The data in this system is exported to USB storage devices in image format with different resolution, so the exported image is not the same as the image seen on the system display.
 - When connecting the external media, please check if the status bar displays the corresponding icon. If the icon is not displayed, re-connect the external media.
 - To ensure data security, please export important data regularly.

11.5.1 Exporting to USB Storage Device

11.5.1.1 Export Animal Data to USB Storage Device

Perform the following steps:

1. Connect the USB storage device to the system via the USB port and the status bar displays the  icon.
2. Press the **<Station>** key on the keyboard to enter the Station screen.
3. Select the animal information you want to export.
 - Select the desire animal: search the animal information via the search items in the animal list.
 - Select all animals: click **[Select All]**.
4. Click **[Export Exam]** to open the Export Exam dialog box.
5. Set the export parameter.
 - 1) Click **[Destination]** drop-down box to select export destination.
 - 2) Check **[Original Format]** or **[DICOM Format]** to select the export format.
 - 3) Select the cine zoom mode, cine compression mode, and cine compression ratio.
 - 4) Set whether to delete local animal exam information after export.
 - Select **[Delete after exporting]**, and then click **[Delete Exam]** to delete animal data.
 - Select **[Delete after exporting]**, and then click **[Delete Image]** to delete animal image.
6. Click **[Export]** to export exam.

11.5.1.2 Remove the USB Storage Device

Move the cursor over the  icon, press the **[Set]** button, select the USB storage device to be removed in the pop-up dialog box and click **[OK]** to remove the USB device safely.

11.5.2 Exporting to Electronic Device

11.5.2.1 Transfer Animal Data to Electronic Device via Bluetooth

- NOTE :**
- **Supported OS: Android and HarmonyOS (iOS not supported).**
 - **Only images and saved reports can be transferred; cines are transferred as thumbnails.**
 - **DO NOT use mass storage devices with Bluetooth.**
 - **DO NOT frequently plug and unplug the Bluetooth adapter.**

Perform the following steps:

1. Connect the USB Bluetooth adapter to the system via the USB port and the status bar displays the “” icon.
 - Recommended Bluetooth adapters: UGREEN CM109 (CPU: CSR8510, Bluetooth 4.0)
2. Send images/data to a Bluetooth device via the following screens:
 - Select the thumbnail you want to send in the clipboard. Selected images are marked with a “”, and then click “” icon.
 - Press **[Review]** button on the control panel to enter the Review screen. Move the cursor over the thumbnail you want to send. Selected images are marked with a “”, and then click **[Send to]** to send the selected images.
 - Press the **<Station>** key on the keyboard to enter the Station screen. Select desire animal and click **[Send Exam]**.
3. A sending dialog box pops up. Select the destination to send image/data.
 - Select **[Bluetooth]** in the destination list on the left side of the sending screen.
 - Ensure that the Bluetooth function of your electronic device is turned on. Select the desired device's Bluetooth name from the list on the right side of the screen.
4. Set the export parameters.
 - **[Export Image]**: Check the box to send animal images, then select the image type: JPG, BMP, PNG
 - **[Export Report]**: Check the box to send animal reports, then select the report type from the drop-down list.
 - **[Hide Animal Info]**: Set whether to hide animal information. If selected, the system hides all animal information by default; you can click **[Name]** to hide only the name.
5. Click **[OK]** and the image/data will be sent to the electronic device.

6. Confirm and view images or reports sent by the system on the electronic device.

11.5.2.2 Transfer Animal Data to Electronic Device via Wi-Fi

Perform the following steps:

1. Connect the USB Wi-Fi adapter to the system via the USB port and the status bar displays the “” icon.
 - Recommended Wi-Fi adapters: UGREEN CM492, TP-LINK TL-WDN5200H AC650
2. Connect the ultrasound device to the wireless network.
 - 1) Click the “” icon to enter the Wi-Fi interface.
 - 2) Double-click the wireless network to be connected, or select it and click **[Connect]**.
 - If the wireless network is encrypted, enter the password in the pop-up password input box and click **[OK]**.
 - To connect to a hidden network, click **[Other network]** and add network in the pop-up window.
 - If the desired network name is in the Wi-Fi list, click **[Refresh]** to retry.
 - The system will attempt to connect. Once connected, the status column will display **[Connected]**.
 - The encryption status column will show the network's encryption status and signal strength.
 - 3) Click **[Setting]**, and set the working mode for the wireless network.
 - **STA mode:** Set the ultrasound device as a wireless client (Station, STA) to connect to an existing Wi-Fi network.
 - **AP mode:** Set the ultrasound device as a wireless Access Point (AP) to provide Wi-Fi access to other devices.
3. Connect the electronic device to the same network as the ultrasound device.
 - The ultrasound device can be connected to the same wireless network as the electronic device in two ways: STA mode and AP mode.
 - In STA mode, enable Wi-Fi in your electronic device, and look for the same wireless network that the ultrasound device is connected to. Select this network and enter the Wi-Fi password if prompted.
 - In AP mode, the system displays a **[WLAN]** dialog box with the device's Wi-Fi QR code and network name. Scan the QR code with your electronic device to join the network shared by the ultrasound device.
4. Send the animal data to be shared on the electronic device to zStorage.
 - 1) Send images/data to zStorage via the following screens:

- Select the thumbnail you want to send in the clipboard. Selected images are marked with a “- 2) A sending dialog box pops up. Select the destination to send image/data.
 - Select **[zStorage]** in the destination list on the left side of the sending screen.
- 3) Set the export parameters.
 - **[Export Image]**: Check the box to send animal images/cines, then select the image/cine type below: JPG/AVI, BMP/AVI, TIFF/AVI, JPG/MP4, BMP/MP4, TIFF/MP4
 - **[Cine Zoom Mode]**: Select the zoom mode for the cines to be sent.
 - **[Export Report]**: Check the box to send animal reports, then select the report type from the drop-down list.
- 4) Click **[OK]** and the image/data will be sent to zStorage.
 - The system displays the **[Task Management]** interface when sending a cine, displaying the sending progress, status, and related information.
- 5. On the Home screen, Station screen or Review screen, select the animal data that has been sent to zStorage and click the “

11.5.2.3 Transfer Animal Data to Computer via LAN

1. Configure the transfer assistant client on the computer.
 - 1) Install the software package of the transfer assistant: TransmissionAssistant-setup.exe.
 - 2) Set the storage path and port, then click **[Start]** to activate the transfer assistant service.
2. Configure the transfer assistant on the ultrasound device, see "4.5.2.1 Configure the Transfer Assistant Service".
3. Send the animal data to be shared on the computer to zLink.
 - 1) Images/data can be sent to zLink via the following interface:
 - Select the thumbnail you want to send in the clipboard. Selected images are marked with a “

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- Press the **<Station>** key on the keyboard to enter the Station screen. Select desired animal and click **[Send Exam]**.
- 2) A sending dialog box pops up. Select the destination to send image/data.
 - Select **[zLink]** in the destination list on the left side of the sending screen.
 - In the service list on the right, select the configured service name.
 - 3) Set the export parameters.
 - **[Export Image]**: Check the box to send animal images, then select the image type: JPG/AVI, BMP/AVI, TIFF/AVI, JPG/MP4, BMP/MP4, TIFF/MP4
 - **[Cine Zoom Mode]**: Select the zoom mode for the cines to be sent.
 - **[Export Report]**: Check the box to send animal reports, then select the report type from the drop-down list.
 - **[Hide Animal Info]**: Set whether to hide animal information. If selected, the system hides all animal information by default; you can click **[Name]** to hide only the name.
 - 4) Click **[OK]** to send.
 - The system displays the **[Task Management]** interface when sending a cine, displaying the sending progress, status, and related information.
4. View the images, videos, and reports that are sent to the storage path set on the computer.

11.5.2.4 One-Click Transfer Image/Cine to Computer via LAN

1. Configure the transfer assistant on the computer and ultrasound device, see "11.5.2.3 Transfer Animal Data to Computer via LAN".
2. Set user-defined buttons for sending animal image/cine to the computer via the LAN, see "4.2.5 Customize" for details.
 - **Save Image and Send to Computer**: Save the single frame image on the ultrasound device and send it synchronously to the default service via transfer assistant.
 - **Save Cine and Send to Computer**: Save the cine on the ultrasound device and send it synchronously to the default service via transfer assistant. The saved cine length is the same as the retrospective cine length set in system preset.
3. Create a new animal and scan images, and then click the user-defined button(s) that you have set.
 - The system displays the **[Task Management]** interface when sending a cine, displaying the sending progress, status, and related information.
4. View the image/cine that has been sent to the storage path set on the computer.

11.5.3 Exporting to DICOM Server

The DICOM Server is purchasable. Please confirm the function is purchased and installed before use.

Export animal images to the DICOM server, refer to "12.2.1 DICOM Storage" for details.

Chapter 12 DICOM

Digital Imaging and Communications in Medicine (DICOM) Standard is an international normative protocol for communication of medical digital images. DICOM service enables you to:

- Search for animal information archived on the DICOM server (working list) and copy the animal information to the device for reviewing.
- Send animal information and images on the system to the DICOM storage server.
- Send the image saved on the system to the DICOM print server for image printing.

NOTE : The DICOM Server is purchasable. Please confirm the function is purchased and installed before use.

12.1 DICOM Preset

12.1.1 DICOM Local Preset

Preset the network properties for DICOM server connection.

Enter the DICOM local preset screen via **[Preset]** (press **<Setup>**) → **[Network Preset]** → **[DICOM Local]**.

Figure 40 DICOM Local
Table 37 DICOM Local

Item	Description
AE Title	Application Entity title which is used for device identification. The AE title should be consistent with that of the acceptable SCU preset in the server.
Port	Always the same as the server port.
PDU	The maximum PDU data package size.
Device	Name of the device supporting DICOM services.

Item	Description
IP	IP address of the DICOM Server.
Add	Add the server to the server list.
Ping	Check network connectivity between the system and DICOM server.
Device List	Display the added devices.
DICOM Service	Set the DICOM servers. For details, refer to “12.1.2 Service Preset”.
Delete	Remove the selected server from the device list.

To connect DICOM server, perform the following steps:

1. Use a network cable to connect the device to the LAN of DICOM server.
2. Set the local network. (Refer to “4.5 Network Preset” for details)
3. Set DICOM server properties.
 - Enter the AE title, port, PDU, device name and IP address.
4. Click **[Add]** to add the server to the device list.
5. Click **[Ping]** to check the connection, the prompt information is displayed in the status bar at the bottom of the screen.
6. Click **[Save]** to save current setting and return to the Home screen.

NOTE : The AE Title should be consistent with the SCU AE Title preset in the server (PACS/RIS/HIS), for example, if the AE Title preset of the printer server is “Printer”, and the SCU AE Title is “Machine”, then the AE Title of local should be “Machine” in the figure above, while the AE Title of the printer server should be “Printer”.

12.1.2 Service Preset

The service preset is mainly used to add or delete DICOM services in a DICOM server, set the service name, port address, and so on.

DICOM service consists of Storage, Print, Worklist, MPPS, Storage Commitment, and Query/Retrieve.

12.1.2.1 Storage

Storage server connection properties and image storage format settings can be found in the Storage Service Preset screen.

Enter the Storage Service Preset screen via **[Preset]** (press **<Setup>**) → **[Network Preset]** → **[DICOM Service]** → **[Storage]**.

Figure 41 DICOM Service-Storage
Table 38 DICOM Service-Storage

Item	Description
Device	Click the drop-down box to select an added device.
Service Name	Enter a service name.Default is storage-default.
AE Title	Enter the AE title. The AE Title here should be consistent with that of the storage server.
Port	Enter the port number for the storage server.
Maximum Retries	Set the maximum retries.
Interval Time (Sec)	Set the interval time for connection retry.
Timeout(Sec)	Refers to the amount of time after which the system will stop trying to establish a connection to the service.
Cine Zoom Mode	Select the cine zoom mode.
Compression Mode	Select the compression mode.
Compression Ratio	Select the compression ratio.
Color Mode	Select the color mode.
Allow Multiframe	Select if support multi-frame saving.
Max Frame Rate	Set the frame range of transferring cine file into DCM multi-frame file.
3D/4D	Set the 3D/4D image transfer mode.
Storage Options	Enable or disable structured reporting sending.
Encapsulated PDF	Select whether to encapsulate PDF reports in DICOM standard format.
Add	Add a server to the server list.
Cancel	Cancel parameter preset.

Item	Description
Update	Select a server in the service list, change the parameters and click [Update] to update the parameters of the server.
Services List	Display the connected storage server list.
Delete	Remove the selected server from the device list
Default	Select an item in the server list as the default server, and the default server is marked with a “Y”.
Verify	Verify the network connectivity between the system and storage server.

➤ **Preset Storage Server**

To preset a storage server, please perform the following steps:

1. Click **[Device]** drop-down box to select an added device.
2. Enter AE Title which is consistent with that of the storage server, port and other properties.
3. Select certain service in the service list; click **[Verify]** to verify the network connectivity.
4. Click **[Save]**, the system saves the settings and returns to the Home screen.

NOTE : Not all SCP support verification. Please confirm whether the SCP supports the verification before verification.

➤ **Change Server Parameters**

1. Double click the server you want to change parameter to display parameter dialog.
2. Change the parameters as needed, and click **[Update]** to update and save the current parameters.

➤ **Set Default Server**

Select a server in the service list, click **[Default]** and the default server is marked with a “Y”.

12.1.2.2 Print

Service and print attributes, and print server connection can be found in print service screen. Print server setting is similar to storage server setting, refer to “12.1.2.1 Storage” for details.

Enter the print service preset screen via **[Preset]** (press **<Setup>**) → **[Network Preset]** → **[DICOM Service]** → **[Print]**.

Figure 42 DICOM Service-Print
Table 39 DICOM Service-Print

Item	Description
Device	Click the drop-down box to select an added device.
Service Name	Enter a service name. Default is print-default.
AE Title	Enter the AE title. The AE Title here should be consistent with that of the print server.
Port	Enter the port number for the print server.
Maximum Retries	Set the maximum retries.
Interval Time (Sec)	Set the interval time for connection retry.
Timeout (Sec)	Refers to the amount of time after which the system will stop trying to establish a connection to the service.
Copies	Copies of each page.
Settings	Set the printer type of the printer
Film Orientation	Set the film orientation.
Priority	Set the priority of color printing.
Film Size	Set the film size.
Display Format	Specify the quantity of images per page to print. E.g. STANDARD\2, 3 means 6 images are printed for each page.
Medium Type	Set the medium type of the printer.
Trim	Set whether to print the trim box around each image of the film.
Min Density	Enter the minimum density of the film.
Max Density	Enter the maximum density of the film.
Configuration Info	Enter configuration information.

Item	Description
Print Target	Set where the file is exposed.
Magnification Type	Set the magnification type for image printing.
Add	Add a server to the server list.
Cancel	Cancel parameter preset.
Update	Select a server in the service list, change the parameters and click [Update] to update the parameters of the server.
Service List	Display the connected print server list.
Delete	Remove the selected server from the device list
Default	Select an item in the server list as the default server, and the default server is marked with a “Y”.
Verify	Verify the network connectivity between the system and print server.

Set the print attribute related parameters based on the actual printer requirements, for example:

- If the printer does not support **[Film Size]** as 8N*10N, do not set this size to the printer film size.
- As to **[Medium Type]**, Blue Film or Clear Film is usually used for black and white printing, and Paper is usually used for color printing. For details, please refer to the printer conformance statement.
- Other parameters can be reminded as default. If the printer has special requirements, please change the parameters according to the requirements of the printer.

12.1.2.3 Worklist

Worklist server connection properties and relevant settings can be found in the Worklist service preset screen. Worklist server setting is similar to storage server setting, refer to “12.1.2.1 Storage” for details.

Enter the Worklist service preset screen via **[Preset]** (press **<Setup>**) → **[Network Preset]** → **[DICOM Service]** → **[Worklist]**.

Figure 43 DICOM Service-Worklist
Table 40 DICOM Service-Worklist

Item	Description
Device	Click the drop-down box to select an added device.
Service Names	Enter a service name. Default is worklist-default.
AE Title	Enter the AE title. The AE Title here should be consistent with that of the worklist server.
Port	Enter the port number for the worklist server.
Maximum Retries	Set the maximum retries.
Interval Time (Sec)	Set the interval time for connection retry.
Timeout (Sec)	Refers to the amount of time after which the system will stop trying to establish a connection to the service.
Add	Add a server to the server list.
Cancel	Cancel parameter preset.
Update	Select a server in the service list, change the parameters and click [Update] to update the parameters of the server.
Services List	Display the connected worklist server list.
Delete	Remove the selected server from the device list
Default	Select an item in the server list as the default server, and the default server is marked with a “Y”.
Verify	Verify the network connectivity between the system and the worklist server.

12.1.2.4 MPPS

MPPS server connection properties and relevant settings can be found in the MPPS service preset screen. MPPS server setting is similar to storage server setting, refer to “12.1.2.1 Storage” for details.

Enter the MPPS service preset screen via **[Preset]** (press **<Setup>**) → **[Network Preset]** → **[DICOM Service]** → **[MPPS]**.

NOTE : When using MPPS, you need to set the MPPS server as the default server.

Figure 44 DICOM Service-MPPS

Table 41 DICOM Service-MPPS

Item	Description
Device	Click the drop-down box to select an added device.
Service Name	Enter a service name. Default is mpps-default.
AE Title	Enter the AE title. The AE Title here should be consistent with that of the mpps server.
Port	Enter the port number for the print server.
Maximum Retries	Set the maximum retries.
Interval Time (Sec)	Set the interval time for connection retry.
Timeout (Sec)	Refers to the amount of time after which the system will stop trying to establish a connection to the service.
Add	Add a server to the server list.
Cancel	Cancel parameter preset.
Update	Select a server in the service list, change the parameters and click [Update] to update the parameters of the server.
Delete	Remove the selected server from the device list
Default	Select an item in the server list as the default server, and the default server is marked with a “Y”.
Service List	Display the connected mpps server list.
Verify	Verify the network connectivity between the system and the mpps server.

12.1.2.5 Storage Commitment

Storage Commitment server connection properties and relevant settings can be found in the storage commitment service preset screen. Storage commitment server setting is similar to storage server setting, refer to “12.1.2.1 Storage” for details.

Enter the MPPS service preset screen via **[Preset]** (press **<Setup>**) → **[Network Preset]** → **[DICOM Service]** → **[Storage Commitment]**.

Figure 45 DICOM Service-Storage Commitment
Table 42 DICOM Service-Storage Commitment

Item	Description
Device	Click the drop-down box to select an added device.
Service Name	Enter the service name. Default is sc-default.
AE Title	Enter the AE title. The AE Title here should be consistent with that of the Storage Commitment server.
Port	Enter the port number for the Storage Commitment server.
Maximum Retries	Set the maximum retries.
Interval Time (Sec)	Set the interval time for connection retry.
Timeout (Sec)	Refers to the amount of time after which the system will stop trying to establish a connection to the service.
Associated Storage Service	The associated storage server should be preset before storage commitment, only after the exam is sent out, can storage commitment be created.
Cancel	Cancel parameter preset.
Add	Add a server to the server list.
Update	Select a server in the service list, change the parameters and click [Update] to update the parameters of the server.
Service list	Display the connected storage commitment server list.

Item	Description
Delete	Remove the selected server from the device list
Default	Select an item in the server list as the default server, and the default server is marked with a “Y”.
Verify	Verify the network connectivity between the system and the storage commitment server.

12.1.2.6 Query / Retrieve

Query/Retrieve server connection properties and relevant settings can be found in the Query/Retrieve service preset screen. Query/Retrieve server setting is similar to storage server setting, refer to “12.1.2.1 Storage” for details.

Enter the Query/Retrieve service preset screen via **[Preset]** (press **<Setup>**) → **[Network Preset]** → **[DICOM Service]** → **[Query/Retrieve]**.

Figure 46 DICOM Service-Query/Retrieve
Table 43 DICOM Service-Query/Retrieve

Item	Description
Device	Click the drop-down box to select an added device.
Service Name	Enter a service name. Default is qr -default.
AE Title	Enter the AE title. The AE Title here should be consistent with that of the query/retrieve server.
Port	Enter the port number for the query/retrieve server.
Maximum Retries	Set the maximum retries.
Interval Time (Sec)	Set the interval time for connection retry.
Timeout (Sec)	Refers to the amount of time after which the system will stop trying to establish a connection to the service.
Add	Add a server to the server list.
Cancel	Cancel parameter preset.

Item	Description
Update	Select a server in the service list, change the parameters and click [Update] to update the parameters of the server.
Service List	Display the connected query/retrieve server list.
Delete	Remove the selected server from the device list
Default	Select an item in the server list as the default server, and the default server is marked with a “Y”.
Verify	Verify the network connectivity between the system and the query/retrieve server.

12.2 DICOM Service

After completed all DICOM presets, you are ready for DICOM image storage, DICOM image printing, worklist, MPPS, storage commitment and query/retrieve services.

NOTE : Before using DICOM services, please perform verification to ensure that the system is properly connected to the DICOM server.

12.2.1 DICOM Storage

DICOM storage service sends animal image or data to storage server for remote storage.

Perform the following steps:

1. Save images. Refer to “11.1 Storage” for details.
2. Send images/data to the DICOM storage server via following screens:
 - Select the thumbnail you want to send in the clipboard. Selected images are marked with a “”, and then click “” icon.
 - Press **[Review]** button on the control panel to enter the Review screen. Move the cursor over the thumbnail you want to send. Selected images are marked with a “”, and then click **[Send]** to send the selected images.
 - Press the **<Station>** key on the keyboard to enter the Station screen. Select desire animal and click **[Send Exam]**.
3. A sending dialog box pops up. Select DICOM and storage server as needed. Click **[OK]** to send the image/ data to the storage server.

12.2.2 DICOM Print

DICOM Print service sends animal image to print server for remote printing. Preset the print server before using DICOM Print service.

Perform the following steps:

1. Save images. Refer to “11.1 Storage” for details.
2. Send image to DICOM Print Server via following screens:
 - Select the thumbnail you want to send in the clipboard. Selected images are marked with a “

12.2.3 DICOM Worklist

The DICOM Worklist Service is used to query or retrieve animal information stored in the server, which can be imported into the system for viewing and performing new exam. Preset the DICOM Worklist server before using DICOM Worklist service.

To retrieve Animal information (DICOM), perform the following steps:

1. Press the **[Patient]** button on the control panel to enter the animal information screen. Click **[Worklist]** to display Worklist screen.

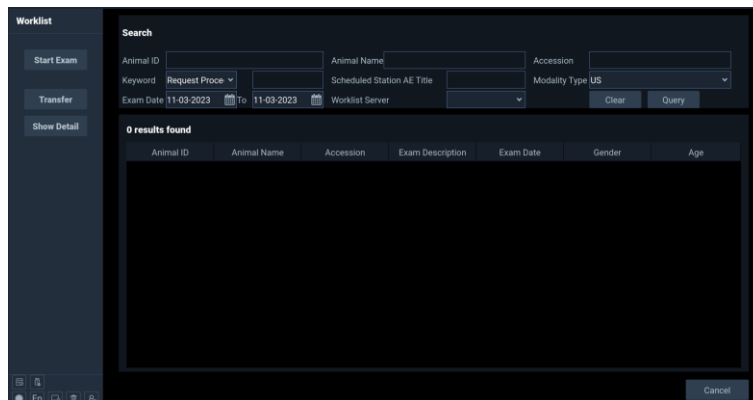


Figure 47 Worklist Screen

2. Query animal information:
 - 1) Set search condition among animal ID, animal name, accession number, keyword, scheduled station AE Title, device type, exam date, worklist server and other information to search for animals.
 - 2) Click **[Query]** to display animal information which meets the search conditions in the lower part of the screen. Or click **[Clear]** to clear the entered query criteria and the query results.
3. Select desired animal record in the displayed animal list:
 - **[Start Exam]**: click to return to the Home screen and start a new exam for the selected animal.

- **[Transfer]**: click to import the selected animal information into the **[Animal Information]** screen for editing. After editing, click **[Save]** to start a new exam. Or click **[Cancel]** to return Home Screen without a new exam.
- **[Show Detail]**: click to view the detailed animal information.
- **[Cancel]**: click to exit worklist screen and return to the animal information screen.

12.2.4 DICOM MPPS

MPPS is used to send animal exam status to the MPPS server. This will facilitate the other systems to obtain the exam progress in time. Preset the DICOM MPPS server before using DICOM MPPS service.

When MPPS preset is done, the animal exam status will be sent to the MPPS server as follows:

- When start a new exam, the system sends an “N-CREATE” message to the MPPS server.
- After the normal image acquisition completes, the system sends an “N-SET COMPLETED” message to the MPPS server.
- When the image acquisition is abnormally terminated, the system sends “N-SET DISCONTINUED” to the MPPS server.

12.2.5 DICOM Storage Commitment

After the animal exam information or the structured report on the system is sent to the storage server, the system can detect whether the information transmission is successful through the storage commitment server. Preset the DICOM Storage Commitment server before using DICOM Storage Commitment service.

12.2.5.1 Send animal exam to DICOM storage server

Perform the following steps:

1. After completing the exam, press the **[EndExam]** button on the control panel to end the current exam.
2. Press the **<Station>** key on the keyboard to enter the Station screen.
3. Select the desired animal in the animal list, click **[Send Exam]**.
4. A sending dialog box pops up. Select DICOM and storage server as needed.
5. Click **[OK]**, the image and data will be sent to the DICOM storage server, and the storage commitment server will prompt the sending status in the prompt bar.

12.2.5.2 Auto send animal exam to DICOM storage server

Send images automatically to the DICOM storage server and perform storage commitment when the exam is done.

Set the auto function via **[Preset]** (press **<Setup>**) → **[System Preset]** → **[General]** →

[Send exam to DICOM after exam ends].

When the exam completes, the system prompts whether the exam information was successfully sent to the DICOM storage server.

12.2.6 DICOM Query / Retrieve

The query/retrieve server is used to query and retrieve the animal exam information from the designated server, so as to remotely obtain other exam information of the animal.

Preset the query/retrieve server before using DICOM query/retrieve service.

To query / retrieve animal information, please perform the following steps:

1. Press the **<Station>** key on the keyboard to enter the Station screen.
2. Click **[Query/Retrieve]** to enter query/retrieve screen.
3. Select the source server (query location) for accessing animal information, and the target server (retrieve location) in **[Server & Service]**.
4. Enter query information, such as an animal ID, animal name, serial number, keyword, or the time period to screen the animal.
 - Click **[Clear]** to clear the entered query conditions and results.
5. Click **[Query]** and the qualified animals are displayed in the animal list.
 - If the list is more than one page, roll the right slider bar of the list to find the animal information.
 - Move the trackball and press the **<Ctrl> + left [Set]** button to select more than one animals.
 - Click **[Select All]** to select all animals.
 - Click **[Cancel All]** to cancel several selected or all animals selected in the list.
6. Click **[Retrieve]**, the system will retrieve the selected animal record to the target server or local and the animal information displays in the animal list after completion.
7. After completing retrieve, click **[Exit]** to see the retrieved animal records in the Station screen.

12.3 Structured Report

The system provides a common structured report that supports DICOM storage, DICOM storage commitment, and export to external storage devices in DCM format.

12.3.1.1 Send Structured Report to DICOM

NOTE : Structured reports cannot be sent separately and can only be sent with DICOM images.

Perform the following steps:

1. Select “Send DICOM SR” option.
 - Setting path: **[Preset]** (press **<Setup>**) → **[Network Preset]** → **[DICOM Service]** → **[Storage]** → **[Storage Option]** → **[Send DICOM SR]**.
2. After the setting is done, when the image is sent to the DICOM storage server, the structured report is also sent together.

12.3.1.2 Send Structured Report to DICOM via Station screen

Perform the following steps:

1. Select “Send DICOM SR” option.
 - Setting path: **[Preset]** (press **<Setup>**) → **[Network Preset]** → **[DICOM Service]** → **[Storage]** → **[Storage Option]** → **[Send DICOM SR]**.
2. After completing the exam, press the **[EndExam]** button on the control panel to end the current exam.
3. Press the **<Station>** key on the keyboard to enter the Station screen.
4. Click **[Send Exam]** to pop up the sending exam dialog box.
5. Select **[DICOM]** and storage server, and then click **[OK]** to confirm.

12.3.1.3 Export Structured Report to External Storage

Structured reports cannot be exported separately and can only be exported with animal data. When export animal data, if there is a structured report, the structured report will be exported to the external storage device as well.

Perform the following steps:

1. After completing the exam, press the **[EndExam]** button on the control panel to end the current exam.
2. Press the **<Station>** key on the keyboard to enter the Station screen.。
3. Click **[Send Exam]** to pop up the sending exam dialog box.
4. Select **[Disk]**, check **[Export Report]** as needed and click **[OK]** to start exporting.

Chapter 13 Probe and Biopsy

Prior to the exam, the user must fully understand the function of the probe.

To ensure the performance and safety of the probe, regular cleaning, disinfection, and maintenance shall be taken.

13.1 Probe

This section mainly introduces the general operation of the probe.

13.1.1 Structure of Probe

The ultrasonic probes suitable for this system are all electronic scanning probes, which generates high-resolution images by transmitting ultrasonic waves into the human body and receiving echoes. The system also supports surface probes and intracavitary probe.

The basic structure of the probe is shown in the figure below. The orientation mark on the probe is consistent with the direction indicated by the probe mark “●” on the ultrasonic image.

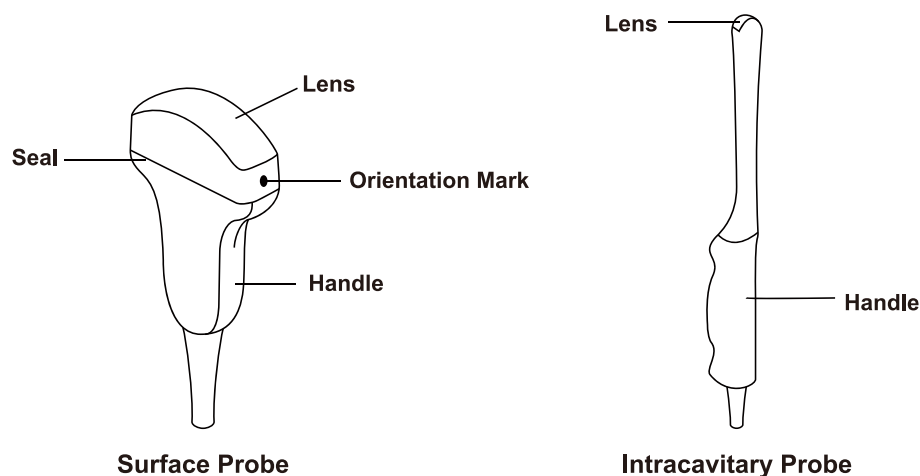


Figure 48 Structure of Probe

13.1.2 Probe Usage



- **DO NOT** use any probe not provided by the manufacturer, otherwise the console and probe will be damaged. In serious cases, fire and other accidents may result.
- Use the probe with care. Stop use immediately if the probe appears to be malfunctioning. Otherwise, electric shock and burns may result.
- Carefully inspect the probe sheath for damage or breakage before using. Do not use a damaged probe sheath to prevent infection.
- **DO NOT** use mineral oils, oily coupling gel, gels with any type of

detergent or softener, and other unapproved materials to replace coupling gel supplied or recommended by the manufacturer. Otherwise, probe damage may result.

- **The intracavitary probe is not suitable for examinees without sexual history.**
- **Use qualified ultrasonic coupling gel and read the coupling gel manual carefully before using.**
- **Wear medical gloves when using the intracavity probe.**

Perform the following steps:

1. Check the probe. The probe may have potential damage during use and cleaning. Therefore, the following checks should be performed on the probe before use to ensure:
 - No cracks on the probe
 - No cracks on the front part of the probe
 - No scratch on the lens
 - No expansion on the lens
 - No cracks or any other damage on the strain relief
 - No cracks or any other damage on the connector
 - No bent or broken pins
 - No cable damage
2. Connect the probe to the system. Refer to “3.6.1 Connect the Probe” for details.
3. A protective probe sheath should be used when using an intracavity probe.
 - 1) Remove the package, take out and unfold the probe sheath.
 - 2) Add an appropriate amount of coupling gel to the probe sheath.
 - 3) Insert the probe into the sheath.
 - 4) Fit the sheath by hand and ensure the cover is free from creases and bubbles.
 - 5) Secure the sheath with an elastic band.
 - 6) Check the probe sheath to ensure there is no hole or crack.



Figure 49 Add coupling gel into the probe sheath

4. Recognize the direction of probe and perform the exam.
5. After completing each exam, clean and disinfect the probe as required. Remove the probe sheath and dispose the sheath in accordance with the medical specifications for bio-hazardous waste.

13.1.3 Probe Cleaning

After completing each exam, the probe and reusable parts should be thoroughly cleaned as required. Fail to do so may result in the probe and the bracket becoming sources of infection.



Warning

- **Never immerse the probe connector into liquid such as water or disinfectant. Immersion may cause electrical shock or malfunction.**
- **Prior to clean the probe, disconnect the probe from the ultrasonic system to avoid electric shock.**
- **When clean the probe, avoid impacting the probe with sharp or hard objects.**
- **Always wear sterile gloves to prevent infection when performing cleaning of probe.**
- **No cleaning and disinfecting may result in the probe becoming a source of infection.**

NOTE:

- **After the examination, wipe off the coupling agent thoroughly. Otherwise, the coupling agent may solidify and degrade the image quality of the transducer.**
- **DO NOT make the probe overheated (more than 55 °C) during cleaning procedure. High temperature may result in probe deformation or damage.**

After each exam, the probe should be cleaned as required:

1. Disconnect the probe from the system.
2. Wear sterile gloves to prevent infection.
3. Wash the transducer with clean water or soapy water to remove all the foreign matters, or, wipe the transducer with a soft ethyl carbamate sponge. Avoid using

a brush, because it may damage the transducer.

4. Dry the transducer using a sterile cloth or gauze after rinsing. Do not dry the transducer by heating.

13.1.4 Probe Disinfection

After each exam, the probe and reusable parts should be thoroughly disinfected as required. Fail to do so may result in the probe and the bracket becoming sources of infection.



Warning

- It is recommended to use the disinfectant listed in this manual and ensure that its concentration and probe immersion time meet the recommended requirements. Fail to do so may damage the probe and void the probe warranty; if the user has special purpose and requirements, ensure that the formulated solution concentration and probe immersion time are appropriate for the intended clinical use.
- The probe must be disinfected with a liquid chemical disinfectant that complies with local regulations.
- DO NOT use high pressure steam or ethylene oxide to contact with the probe.
- DO NOT the probe by heating under any circumstances. If the temperature exceeds 55 °C, the probe will be damaged
- DO NOT allow any disinfectant to air dry on the probe.
- Before disinfecting the probe, please pay attention to the expiration date of the disinfectant and never use expired disinfectant.
- Always wear sterile gloves and to prevent infection.

NOTE: Repeated disinfection will eventually damage the probe, please check the probe performance periodically.

13.1.4.1 Disinfection Level Definition

The disinfection category can be divided into the following two categories based on the application of the probe.

Table 44 Disinfection Category

Disinfection level	Application scope	Application probe
High Level Disinfection	Contact with mucous membranes	Intraoperative probe
low level disinfection	Only contact with intact skin	Surface probe

13.1.4.2 Immersion Disinfection Limit

Never immerse the probe deeper than the line shows below for disinfection.

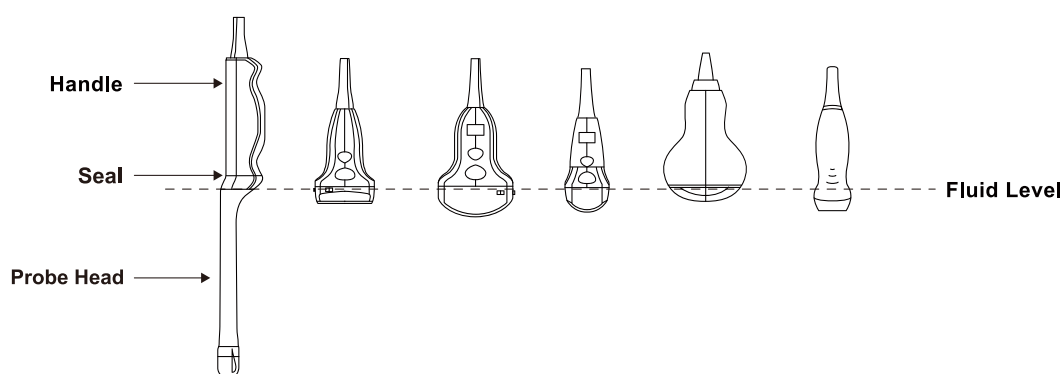


Figure 50 Immersion limitation for Different Probe Type

13.1.4.3 Disinfection for Surface Probe

After each exam, the surface probe should be disinfected as required.

Perform the following steps:

1. Wear sterile gloves to prevent infection.
2. Cleaning the probe. (Refer to “13.1.3 Probe Cleaning” for details)
3. Disinfect the probe according to the low-level disinfection method recommended in the table below.

Table 45 Low-level Disinfection

Disinfectant	Manufacturer	Active ingredient	Concentration	Manner of contact	Contact time
Cidex	J&J	Glutaraldehyde	2.4%	Wipe/soak	<20min
ResertXLHLD	STERIS	Hydrogen Peroxide	2.0%	Wipe/soak	<8min

4. Rinse the transducer with plenty of sterile water for at least 1 minute to remove all chemical residues. Or follow the rinsing method recommended by the disinfectant manufacturer to rinse the transducer.
5. Wipe off water on the transducer using a sterile cloth or gauze after rinsing. Do not dry the transducer by heating.

NOTE :

- The recommended disinfectants listed in this manual are recommended because they are chemically compatible with the materials of the products, not because of their biological effects. For the biological effects of disinfectants, please refer to the guidance and recommendations provided by the disinfectant manufacturer, the US Food and Drug Administration, and the US Centers for Disease Control.
- If the disinfectant recommended in this manual is not selected, prepare the solution according to the disinfectant manufacturer’s instructions.

13.1.4.4 Disinfection for Intracavitary Probe

Before and after each exam, the intracavitary probe should be disinfected as required.

Please refer to the instructions in the manual and follow your hospital policy and procedures for disinfection.

1. Wear sterile gloves to prevent infection.
2. Cleaning the probe. (Refer to “13.1.3 Probe Cleaning” for details)
3. Disinfect the probe according to the high-level disinfection method recommended in the table below.

Table 46 High-level Disinfection

Disinfectant	Manufacturer	Active ingredient	Concentration	Manner of contact	Contact time
Cidex	J&J	Glutaraldehyde	2.4%	Soak	45-50min
ResertXLHLD	STERIS	Hydrogen	2.0%	Soak	8min

4. Rinse the transducer with plenty of sterile water for at least 1 minute to remove all chemical residues. Or follow the rinsing method recommended by the disinfectant manufacturer to rinse the transducer.
5. Wipe off water on the transducer using a sterile cloth or gauze after rinsing. Do not dry the transducer by heating.

NOTE :

- The recommended disinfectants listed in this manual are recommended because they are chemically compatible with the materials of the products, not because of their biological effects. For the biological effects of disinfectants, please refer to the guidance and recommendations provided by the disinfectant manufacturer, the US Food and Drug Administration, and the US Centers for Disease Control.
- If the disinfectant recommended in this manual is not selected, prepare the solution according to the disinfectant manufacturer's instructions.

13.1.5 Probe Maintenance

The probe should be used, stored or transported under the conditions of “Appendix A Technical Specifications”.

13.1.5.1 Probe Transportation

To properly store the probe for transportation, please perform the following steps:

1. Before place the probe in the shipping container, make sure the probe is cleaned and sanitized to avoid contaminating the liner foam of the shipping container.
2. Carefully place the probe in the probe box.
3. Ensure the probe is totally in the box before covering the probe box.
4. Wrap the probe box in a plastic material with air bag (such as foam) and place the wrapped probe box into the cardboard box.

13.1.5.2 Probe Storage

To protect the probe, follow the guidelines below:

- Place the probe in the probe holder when the probe is temporarily idle.
- If the probe is not used for a long time, clean and disinfect the probe to ensure that the probe is completely dry before storing in the probe box.

- Prior to place the probe, make sure the probe holder is clean and dry.
- Separately store the probe from other medical devices.

13.2 Biopsy



Warning

- Physicians who use this system for biopsy must undergo professional ultrasound guidance training and strictly observe the operation requirements of biopsy to avoid unnecessary harm to animals.
- Before a biopsy procedure is performed, confirm that the needle-guided bracket is in good condition, and the biopsy guide line and the bracket must be calibrated.
- The biopsy guide line displayed on the ultrasound image is for reference only. During biopsy procedure, the operator should always monitor the position of the needle and confirm the correct needle position.
- DO NOT freeze the image during the biopsy procedure to avoid positioning errors.
- The operator should maintain a high concentration of attention during the biopsy procedure to avoid medical accidents.
- Gloves should be worn when performing biopsy procedure.
- Never allow to reuse the biopsy needle.
- A probe with sheath must be used during the biopsy procedure.

13.2.1 Optional Bracket

Table 47 Optional Bracket

Bracket Model	Applicable Probe
ZNG-07	3C5PD
ZNG-08	7L4PD
ZNG-09	6E1PD

13.2.2 Bracket Installation

13.2.2.1 Bracket for Surface Probe

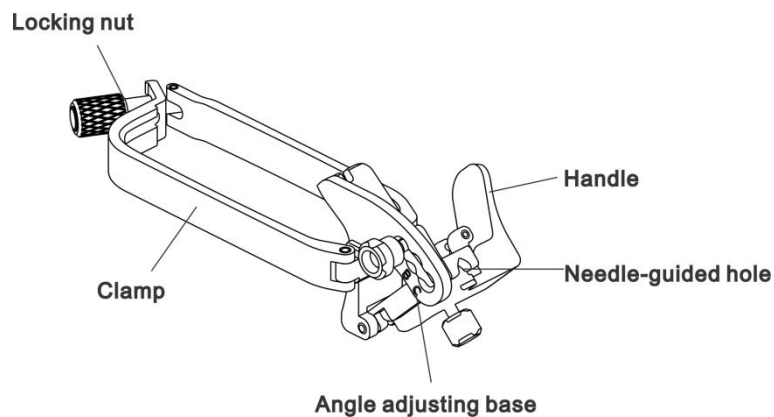


Figure 51 **Bracket for Surface Probe**

➤ Installation Method

Perform the following steps:

1. Wear gloves.
2. Inspect the bracket. Ensure that each part of the bracket is free of damage, deformation, stripping, malfunction, loose, or missing parts.
3. Add a proper amount of coupling gel into the probe sheath and secure the sheath with an elastic band.
4. Loosen the locking nut, open the clamp.
5. Align the needle-guided hole with the round convex of the probe and cover the probe with the probe sheath. Make sure that the round bulge of the probe is aligned with the locating groove inside of the bracket, and the long-shaped bulge on the other side is aligned with the groove on the outside of the bracket.
6. Close the clamp and fasten the locking nut to secure the probe.

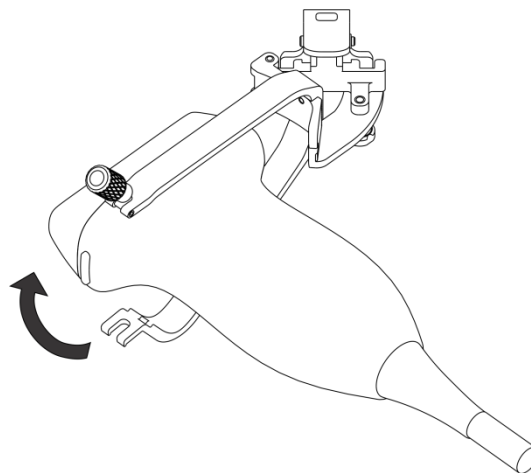


Figure 52 **Secure the Surface Probe**

7. Remove the plastic tube and take out the puncture needle.
8. Press the handle and insert the puncture needle into the needle-guided hole.

To release the needle, rotate the knob above the needle guide hole clockwise.

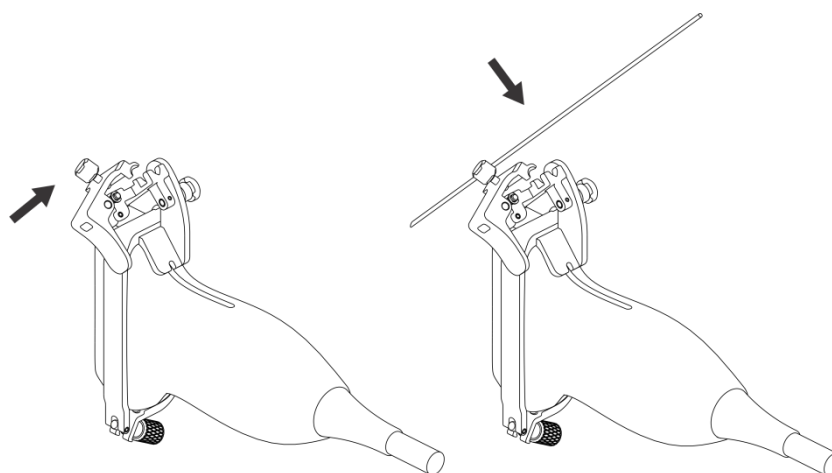


Figure 53 Install Puncture Needle

9. Make sure that the bracket is fastened to the probe.

➤ **Adjust the Bracket Angle**

There are three positions (A, B and C) for angle adjustment, which corresponds to the biopsy angle in the biopsy screen. If the angle of bracket is changed, the corresponding angle on the screen also needs to be modified.

Perform the following steps:

1. Rotate the knob counterclockwise to release the angle adjusting base.
2. Move the base to the A, or B, or C position.
3. Rotate the knob clockwise to fix the angle.

13.2.2.2 Bracket for Intracavitary Probe

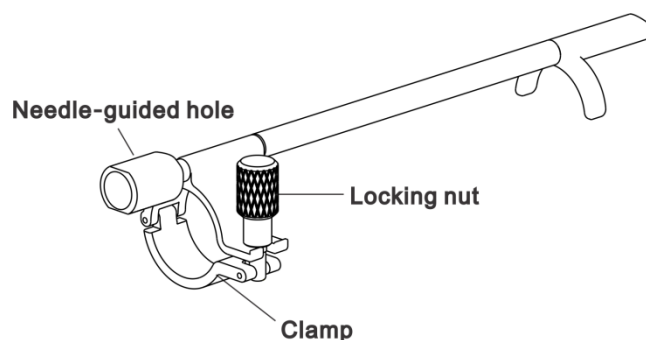


Figure 54 Bracket for Intracavitary Probe

➤ **Installation Method**

Perform the following steps:

1. Wear gloves
2. Inspect the bracket. Ensure that each part of the bracket is free of damage, deformation, stripping, malfunction, loose, or missing parts.
3. Add a proper amount of coupling gel into the probe sheath and secure the sheath with an elastic band.
4. Loosen the locking nut, open the clamp.

- Align the needle-guided bracket with the probe to locate the locating bulge to the locating grooves on the probe. Match the retaining clamp with the probe.

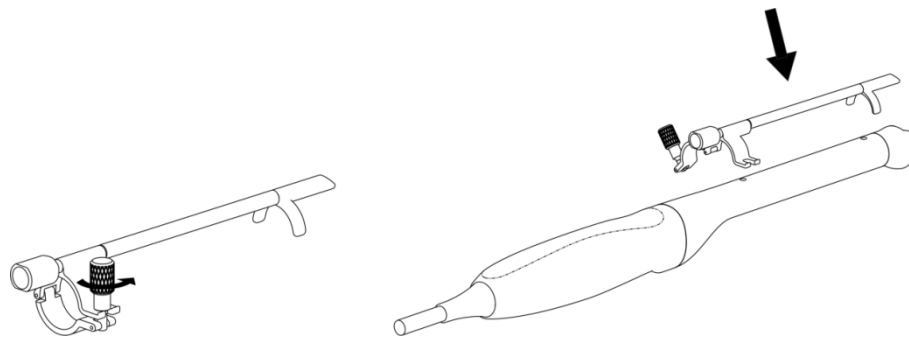


Figure 55 Install the Bracket

- Mount the retaining clamp to the right position and fasten the locking nut to secure the probe.
- Remove the plastic tube and take out the puncture needle.
- Press the handle and insert the puncture needle into the needle guide hole.

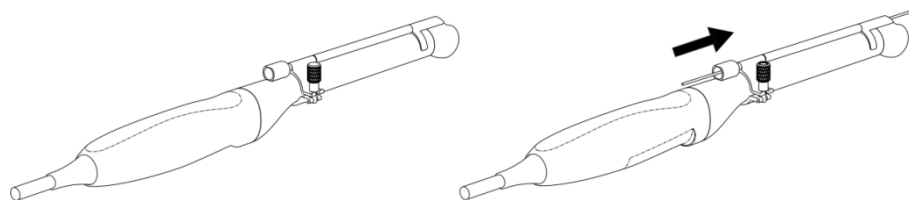


Figure 56 Install Puncture Needle

- Make sure that the bracket is fastened to the probe.

13.2.3 Calibrate the Biopsy Guide Line

Calibrating the guide line is necessary before each biopsy procedure or changing biopsy angle.

Perform the following steps:

- Install the needle-guided bracket.
- Place the head of the probe in a liquid tank with distilled water.
- Insert the puncture needle along the needle-guided bracket until the tip of the puncture needle is at the maximum depth of the water.
- In B mode, press the **<Biopsy>** key to enter the Biopsy screen.

Item	Description
Biopsy Kit	Rotate the knob under [Biopsy Kit] to select bracket kit and angle
Calibrate	Press the knob under [Calibrate] to enter the biopsy calibration screen
Double Line	Press the knob under [Double Line] to enable / disable double guide line function
Line Type	Rotate the knob under [Line Type] to select the biopsy guide line type
Exit	Press the knob under [Exit] to exit the biopsy screen

5. Rotate the knob under **[Biopsy Kit]** to select appropriate kit and angle.
6. T Press the knob under **[Calibrate]** to enter the biopsy guide line calibration screen.
7. Verify that the needle displayed on the ultrasound image matches the guide line. If not, adjust the guide line angle and position.
 - Rotate the knob under **[Position]** to adjust the guide line position.
 - Rotate the knob under **[Angle]** to adjust the guide line angle.
8. After calibration, press the knob under **[Save]** to save the adjustment.
 - To restore the factory settings, press the knob under **[Restore]**.
9. Press the knob under **[Exit]** to exit the biopsy screen.

13.2.4 Biopsy Procedure

Before performing a biopsy procedure, determine the size of the biopsy target and the practicability of the biopsy procedure.

Perform the following steps:

1. Connect the probe to the ultrasonic system and install the needle-guided bracket to the probe.
2. In B mode, press the **<Biopsy>** key to enter the Biopsy screen, a guide line displayed on the ultrasound image.
3. Select appropriate needle-guided bracket and perform the guide line calibration. Refer to “13.2.3 Calibrate the Biopsy Guide Line” for details.
4. Position the sampling target and make the target or lesion displayed on the guide line.

NOTE: DO NOT freeze the image when scanning or adjusting, otherwise the real-time biopsy process may fail to display.
5. Insert the needle through the needle guide hole and take a sample at the appropriate location.
6. After the biopsy procedure is completed, carefully remove the puncture needle from the animal.
7. Remove the needle-guided bracket from the probe and dispose the disposable contaminated waste such as probe sheath as required by local regulations.
8. Press the **<Biopsy>** key again to exit the Biopsy screen.

13.2.5 Bracket Cleaning and Disinfection

To avoid cross-infection, please strictly follow the infection control policy formulated by the local hospital and clean and disinfect the needle-guided bracket after each biopsy.

- NOTE :**
- **Never disinfect the needle-guided bracket with a disinfectant containing chloride ion (Cl-) or fluoride ion (F-).**
 - **Always wear sterile gloves to avoid infection during cleaning and**

disinfection.

- **Low performance may result due to repeated disinfection, please change the needle-guided bracket as needed.**

Perform the following steps to clean and disinfect the needle-guided bracket:

1. After each use, remove the bracket from the probe. Use a small, soft brush to remove visible foreign matters from bracket surface and clean the metal lumen with the attached cleaning brush. Clean as soon as possible to avoid parts being dry and difficult to clean.
2. Immerse the bracket for at least five minutes in neutral pH low foam enzyme cleaner. When soaking, brush off the residual foreign matter. If visible foreign matters are difficult to remove, repeat the soaking procedure for another five minutes. Remove the bracket from the cleaning solution and wipe off all residues with a sterile cloth. Please follow the manufacturer's instructions for cleaner solution.
3. Immerse the bracket in 2% glutaraldehyde based solution for 10 hours at room temperature.
4. High-pressure steam sterilization. Autoclaving ($134^{\circ}\text{C} \pm 4^{\circ}\text{C}$) for 20 minutes.

13.2.6 Bracket Storage and Transportation

The bracket is packed in non-steriled packaging. After sterilization, it should be properly stored in a sterile environment.

When using 2% glutaraldehyde based solution for disinfection and sterilization, the service life of the bracket is 2 years. When using High-pressure steam sterilization for disinfection and sterilization, the service life of the puncture frame is 5 years. Before discarding or returning to the manufacturer for maintenance, please disinfect and sterilize the bracket first.

Chapter 14 System Maintenance

To avoid the long-term exposure to dust and moisture which may result in poor performance and safety of the system, routine system maintenance should be performed by the user.



Warning

When cleaning the system, pay special attention not to let liquid enter any part of the system. Otherwise, electric shock may result. If liquid is accidentally into the system, stop cleaning the system immediately and shut down the system, contact Zoncare Customer Service Department or sales representative.

NOTE :

- **Before cleaning procedure, shut down the system and unplug the power cord. Otherwise, electric shock may result.**
- **Maintenance shall be taken regularly to ensure the performance of the system, and ensure that the system is well grounded and meets the safety requirements.**
- **Except for the basic cleaning and maintenance described in this section, only personnel authorized by the manufacturer may perform other maintenance.**

14.1 External Cleaning

Perform the following steps:

1. Shut down and unplug the system.
2. Apply a few drops of 75% alcohol to moist a piece of lint-free cloth.
3. Gently wipe the display, control panel, and other panel surfaces of the console with the lint-free cloth.

NOTE : Do not use cleaners or other cleaning fluids to clean the surface of the monitor.

4. Use a cotton swab to remove dirt from the control panel buttons to ensure that solid material does not fall into the console.
5. If blood or other infectious materials contact with the buttons or other parts of the system, wipe them with a 70% isopropyl alcohol solution.

14.2 Clean the Trackball

Perform the following steps:

1. Shut down and unplug the system.
2. Press the bulges on the clamping ring by two figures and turn the ring counterclockwise until it unlocked.

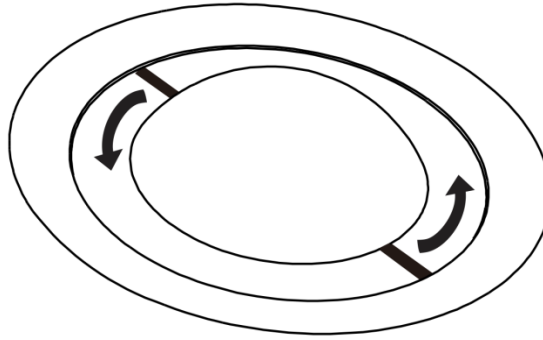


Figure 57 Unlock the Clamping Ring

3. Remove the clamping ring and take out the rotary ball.
4. Remove stains from the trackball and the ring with a soft, lint-free cloth to draw 75% alcohol.
5. Use a cotton swab to draw 75% alcohol to wipe the slot of the trackball.
6. After cleaning, put the trackball and clamping ring back and rotate it clockwise to fix it.

14.3 Safety Check

To guarantee a high degree of operational reliability, regular inspection of the system by the maintenance and operating personnel is necessary for the following:

Table 48 Security Checklist

No.	Scope	Check item
1	Electrical safety	Inspect the cables for being broken or cracked.
		Check the grounding impedance.
		Check the leakage current.
		Check the animal leakage current.
		Check the animal auxiliary leakage current.
2	Mechanical Safety	Check the appearance.
		Check the control panel and keyboard.
		Check the knob and button.
		Check the ports.
3	Image Recording	Check display of each mode.
		Check parameter of each mode.
		Check image and report.

NOTE : Liquid or other substances penetrating into the electronic components under the panel may result intermittent failure of the control panel and keyboard. Visually inspect for potential problems.

14.4 Troubleshooting

Table 49 Troubleshooting

No.	Failure	Measure
1	Power-on failure	● Check if the power cord is properly plugged into the power connector. ● Check if the main power switch on the power supply panel is turned on.
2	No display on the monitor	Check if the system is well powered on.
3	The buzzer sounds and the button do not function.	Check if there is any button stuck on the control panel. If so, press the button to release the stuck button, and check if there is dirt under the stuck button and clean it promptly.
4	Abnormal image quality	● Check if the appropriate probe and mode are selected. ● Check if the relevant parameters are adjusted. For details, please refer to “Chapter 6 Optimizing the Image”. ● Check the related settings. For details, see “4.2 System Preset”.
5	Missing of application measurement item	● Check if the selected probe is applicable for current exam. ● Check if the application item is added.

When the above failures occur, and the corresponding measures still cannot solve, please contact the manufacturer or authorized personnel for further support. In the case of more difficult situations, please contact the manufacturer or authorized personnel.

14.5 Disposal

When the system, probe, needle-guide bracket and other accessories reach the end of their service period, they shall be disposed according to the regulations on waste electrical and electronic equipment (WEEE) or local regulations.

Refer to manufacturer or supplier for information on disposal or recycle.

The manufacturer does not assume liability for any damage caused by unauthorized handling of the system without consulting.

14.7 After Sales Service

Service should only be provided by qualified technical personnel authorized by the manufacturer.

Contact the after-sales service department via following ways when you need technical support:

Manufacturer: Wuhan Zoncare Bio-medical Electronics co., Ltd

Address: #380, High-tech 2nd road, Eastlake high-tech district, Wuhan, Hubei, P. R. China

Zip code: 430206

Telephone: +86(27)87770581

Fax: +86(27)87770203

Website: <http://www.zoncare.com>

Appendix A. Technical Specifications

Standard Reference	EN 60601-1:2006/A1:2013	Medical electrical equipment - Part 1: General requirements for basic safety and essential performance
	EN 60601-1-2:2015	General requirements for basic safety and essential performance-Collateral standard: Electromagnetic compatibility-Requirements and tests
	EN 62304:2006/A1:2015	Medical device software - Software life-cycle processes
	EN 60601-2-37:2008+A1:2015	Medical electrical equipment-Part 2-37: Particular requirements for the basic safety and essential performance of ultrasonic medical diagnostic and monitoring equipment
	ISO10993-1:2009/AC:2010	Biological evaluation of medical devices –part 1:Guidance on Selection of Tests
	EN ISO 13485:2016	Medical devices - Quality management systems - Requirements for regulatory purposes
	EN ISO14971:2012	Medical devices-Application of risk management to medical devices
	EN1041:2008	Information supplied by the manufacturer with medical devices
	EN ISO 15223-1:2016	Medical devices - Symbols to be used with medical device labels, labelling and information to be supplied
	EN 62366-1:2015-1:2015	Medical devices - Application of usability engineering to medical devices
	EN 60601-1-6:2010	Medical electrical equipment - Part 1-6: General requirements for basic safety and essential performance - Collateral standard: Usability
	/	Provisions on the Management of Instructions and Labels of Medical Devices (CFDA Notice No.6)
Safety Classification	Electrical shock	Class I (equipment with battery)
	Degree of shock	Type BF Equipment
	Operating mode	Continuous
	EMC	CISPR 11 Class A
	Installation and usage	Portable equipment
	Degree of protection, ingress	Console: IPX0 Probe: IPX7 Foot Switch: IPX4

	Flammable mixtures	Not for use in presence of flammable anesthetic mixture with oxygen or nitrous oxide. Store the product in a dry and well-ventilated room. External grounding protection must be used to reduce possible external AC interference.	
Environment Requirements	/	Operating	Transport and storage
	Relative humidity	25%~85%	10%~95%
	Ambient temperature	5℃~+40℃	-20℃~+55℃
	Atmospheric pressure	700hPa~1060hPa	700hPa~1060hPa
Hardware/ Software	Minimum Hardware Configuration	CPU: Intel Celeron G3902E Graphics Card: Intel HD Graphics 510 Chipset: Intel Q170 Memory: 8G DDR4 Hard disk: ≥500GB	
	Software Configuration	Operating system: Xubuntu 16.04.2 LTS 64bit Kernel version: 4.15.0-142	
	Software Version	Issue version: V1	
Network	Network Condition	Cable network, transmission data format: TCP, IP, DICOM	
	Data Interface	Cable network: 10M/100M/1000M adaptive; USB: USB2.0 and USB3.0 protocols;	
	User Access Control	Supports three levels of user access authorization, including administrator, operator and emergency user; users are able to login/out and switchover with username and password.	
	Security Software	/	/
	System Software	Software: SELinux (Security-enhanced Linux) Model: Linux	
	Support Software	Software: UFW (UncomplicatedFirewall) Model: Linux	
	Application Software	Software: AppArmor Model: Linux	
Specification	Monitor	15.6" LCD	
	Dimension	380mm*157.2mm*361.5mm	
	Weight (without accessories)	About 7.8kg	
Power Requirement	Power Supply	100-240V~	
	Input Power	150VA	
	Power Supply Frequency	50Hz/60Hz	
Battery	14.4V/9500mAh		

Appendix B. EMC Statement

Electromagnetic compatibility (EMC) is defined as the ability of a product, device, or system to function satisfactorily in its electromagnetic environment; and, in addition, to not introduce intolerable electromagnetic disturbances to anything in that same environment.

Electromagnetic immunity is the ability of a product, device, or system to function satisfactorily in the presence of electromagnetic interference (EMI).

The system has been designed and manufactured in compliance with existing electromagnetic compatibility requirements. Use of the system in the presence of an electromagnetic field can cause performance degradation such as abnormal output. If this occurs often, review the environment in which the system is being used to identify possible sources of radiated emissions. These emissions could be from other electrical devices used within the same room or an adjacent room, or from portable and mobile RF communications equipment such as cellular phones and pagers, or from the existence of radio, TV, or microwave transmission equipment located nearby. In cases where electromagnetic interference (EMI) is causing disturbances, it may be necessary to relocate your system or take other measures to mitigate EMI.

 Warning	● Use of this equipment adjacent to or stacked with other equipment should be avoided because it could result in improper operation. If such use is necessary, this equipment and the other equipment should be observed to verify that they are operating normally. ● Use of accessories, probes and cables other than those specified or provided by the manufacturer of the Ultrasound system could result in increased electromagnetic emissions or decreased electromagnetic immunity of this equipment and result in improper operation. ● Portable RF communications equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30 cm (12 inches) to any part of the Ultrasound machine, including cables specified by the manufacturer. Otherwise, degradation of the performance of this equipment could result.
NOTE:	● The system needs special precautions regarding EMC and needs to be installed and used according to the information provided in this section. ● The EMISSIONS characteristics of this equipment make it suitable for use in industrial areas and hospitals (CISPR 11 class A). If it is used in a residential environment (for which CISPR 11 class B is normally required) this equipment might not offer adequate protection to radio-frequency communication services. The user might need to take mitigation measures, such as relocating or re-orienting the equipment. ● Position system further from source of conducted RF noise to prevent conducted RF immunity.

If the system is operated within the electromagnetic environment specified in following

tables, the system will remain safe and provide the following basic performance:

- Key input is normal;
- Image is continuously collected;
- Related value results are displayed.

B.1 Electromagnetic Interference

Electromagnetic interference (EMI) may appear in many ways within the system, depending on the operating mode of the equipment, the imaging control settings, the type of probes being used, the type of electromagnetic phenomena, and the intensity level of the phenomena.



Warning

If electromagnetic interference is present or intermittent, use caution when continuing to use the system.

NOTE: Electromagnetic phenomena are not always present and may be transitory in nature, making it extremely difficult to identify the source of the interference.

The table below outlines some common types of interference observed in imaging systems. Due to the numerous parameters of the transmitting device—such as the type of modulation used by the signal carrier, the source type, and the transmission level—it is impossible to describe all possible manifestations of interference. Interference may also degrade the imaging system's performance without being visible in the image. If diagnostic results appear suspicious, use alternative means to confirm the diagnosis.

B.1.1 Typical Interference on Ultrasound System

Imaging Mode	ESD ¹	RF ²	Power Line ³
2D or 3D	Change of operating mode, system settings, or system reset. Brief flashes in the displayed or recorded image.	For phased array probes, white radial bands or flashes in the center lines of the image. For linear array probes, white vertical bands, sometimes more pronounced on the sides of the image.	White dots, dashes, or diagonal lines near the center of the image.
Color	Change of operating mode, system settings, or system reset. Brief flashes in the displayed or recorded image.	Color flashes, radial or vertical bands, increase in background noise, or changes in image color.	Color flashes, dots, dashes, or changes in the color noise level.
Doppler	Change of operating mode, system settings, or system reset. Brief flashes in the displayed or recorded image.	Horizontal lines in the spectral display or tones, abnormal noise in the audio, or both.	Vertical lines in the spectral display, "popping" noise in the audio, or both.
M-mode	Change of operating mode, system settings, or system reset. Brief flashes in the displayed or recorded image.	Increase in the image background noise or white M-mode lines.	White dots, dashes, diagonal lines, or increase in image background noise.

1. Electrostatic discharge (ESD) caused by discharging of electric charge buildup on insulated surfaces or persons.
2. Radio frequency (RF) energy from RF transmitting equipment such as portable phones, handheld radios, wireless devices, commercial radio and TV stations, and so on.
3. Conducted interference on power lines or connected cables caused by other equipment, such as switching power supplies, electrical controls, and natural phenomena such as lightning.

B.1.2 Precautions to Protect from EMI

This medical equipment is approved to be used in hospitals, clinics, and other environmentally qualified institutions to prevent radio wave interference. Using this equipment in an inappropriate environment may cause electronic interference with nearby radios and televisions.

To protect the ultrasound system console from electromagnetic interference, take the following precautions:

- Operate the console at least 4.5 m (15 feet) away from motors, typewriters, elevators, and other sources of strong electromagnetic radiation.
- Operating in an enclosed area (with wood, plaster or concrete walls, floors and ceilings) helps prevent electromagnetic interference.
- Special shielding may be required if the console is to be operated in the vicinity of radio broadcast equipment.

B.2 Declaration of Emissions

Guidance and manufacturer's declaration – electromagnetic emissions		
The ultrasound system is intended for use in the electromagnetic environment specified below. The customer or the user of ultrasound system should assure that it is used in such an environment.		
Emissions test	Compliance	Electromagnetic environment - guidance
RF emissions CISPR 11	Group 1	The ultrasound system uses RF energy only for its internal function. There for, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class A	The ultrasound system is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes. It provides the following warning is heeded: WARNING: The system is intended for use by healthcare professionals only. The system may cause radio interference or may disrupt the operation of nearby equipment. Mitigation measures may be necessary, such as re-orienting or relocating the system or shielding the location.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations flicker emissions IEC 61000-3-3	Complies	

The approved accessories which meet the electromagnetic standard:

Accessories for Ultrasound System may affect their radiation levels. The accessories listed in this section have been tested in accordance with international standards for use in Ultrasound System and have been verified to meet radiation standards. Please use only the attachments listed in this section.

The user should ensure the electromagnetic compatibility of the Ultrasound System when attaching accessories to Ultrasound System. Unless otherwise specified, use only EMC compliant equipment.

No.	Item	Cable length	Shield or not
1	Power cable	<2 m	No
2	Probe cable	<3 m	Yes
3	Printer cable	≅ 3 m	No
4	Printer signal cable	≅ 2.5 m	Yes
5	Foot switch cable	≅ 3 m	Yes

B.3 Declaration of Immunity

Guidance and manufacturer's declaration – electromagnetic immunity			
The ultrasound system is intended for use in the electromagnetic environment specified below. The customer or the user of the ultrasound system should assure that it is used in such an environment.			
Phenomenon	Basic EMC Standard or Test Method	Regulatory Acceptable Level	EMC Environment and Guidance
Electrostatic discharge	IEC 61000-4-2	± 8 kV contact ± 2 kV, ± 4 kV, ± 8 kV, ± 15 kV air	Floors should be wood, concrete, or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%. Mains power quality should be that of a typical commercial and/or hospital environment. Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial and/or hospital environment. Separation distance to radio communication equipment must be maintained according to the method below. Interference may occur in the vicinity of equipment marked with the symbol:  Image degradation or interference may occur due to conducted RF noise on the equipment mains power supply or other signal cable. Such interference is easily recognized and distinguishable from patient anatomy and physiological waveforms. Interference of this type may delay the examination without affecting diagnostic accuracy. Additional mains/signal RF isolation or filtering may be needed if this type interference occurs frequently.
Radiated RF EM fields	IEC 61000-4-3	3 V/m 80 MHz - 2.7 GHz 80% AM at 1 kHz	
Proximity fields from RF wireless communications equipment	IEC 61000-4-3	See the RF wireless communication equipment table in "Minimum Separation Distances".	
Rated power frequency magnetic fields	IEC 61000-4-8	30 A/m 50 Hz or 60 Hz	
Electrical fast transients/bursts	IEC 61000-4-4	Power supply Port : ± 2 kV, 100 kHz repetition frequency; Signal input/output parts Port: ± 1 kV, 100 kHz repetition frequency	
Surges	IEC 61000-4-5	Line to line: ±0.5 kV, ±1 kV Line to earth: ±0.5 kV, ±1 kV, ±2 kV	
Conducted disturbances induced by RF fields	IEC 61000-4-6	3 V in 0.15 MHz - 80 MHz 6 V in ISM and/or amateur radio bands between 0.15 MHz and 80 MHz 80 % AM at 1kHz	
Voltage dips	IEC 61000-4-11	0% U _T : 0.5 cycle at 0°, 45°, 90°, 135°, 180°, 225°, 270°, and 315° 0% U _T : 1 cycle and 70% U _T : 25/30 cycles Single phase at 0°	

Guidance and manufacturer's declaration – electromagnetic immunity			
Voltage interruptions	IEC 61000-4-11	0% U_T : 250/300 cycle	
NOTE 1. U_T is the a.c. mains voltage prior to application of the test level. 2. When the interference signal is injected into the machine through the power line and generates interference on the transducer, the imaging system may have regular points or broken lines or line segments, but it will not be recognized as a physiological signal and does not affect the diagnosis. 3. During the discharge, the device has signal interference, and returns to the normal operation of the previous operating mode within 10 seconds without losing any user settings or stored data, and can continue to provide its expected functions and maintain basic performance, this phenomenon is acceptable. 4. These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people. 5. If noise generated from other electronic equipment is near the probe's center frequency, noise may appear on the image. Good power line isolation is required.			

B.4 Minimum Separation Distances

Minimum separation distances between portable and mobile RF communications equipment and the ultrasound system						
The ultrasound system is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the ultrasound system can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the ultrasound system as recommended below, according to the maximum output power of the communications equipment. Portable and mobile RF communications equipment (e.g. two-way radio, cellular/cordless telephones and similar equipment) should be used no closer to any part of the ultrasound system, including cables, than determined according to the following method:						
Test frequency (MHz)	Band (MHz)	Service	Modulation	Maximum power (W)	Distance (m)	Immunity test level (V/m)
385	380 - 390	TETRA 400	Pulse modulation 18Hz	1.8	0.3	27
450	430 -470	GMRS 460, FRS 460	FM ±5 kHz deviation 1 kHz sine	2	0.3	28
710	704 - 787	LTE Band 13, 17	Pulse modulation 217 Hz	0.2	0.3	9
745						
780						
810	800 - 960	GSM 800/900, TETRA 800, iDEN 820, CDMA 850, LTE Band 5	Pulse modulation 18 Hz	2	0.3	28
870						
930						
1720	1700 - 1990	GSM 1800, CDMA 1900, GSM 1900, DECT, LTE Band 1, 3, 4, 25, UMTS	Pulse modulation 217 Hz	2	0.3	28
1845						
1970						
2450	2400 - 2570	Bluetooth, WLAN, 802.11 b/g/n, RFID 2450, LTE Band 7	Pulse modulation 217 Hz	2	0.3	28
5240	5100 - 5800	WLAN, 802.11 a/n	Pulse modulation 217 Hz	0.2	0.3	9
5500						
5785						
For transmitters rated at a maximum output power not listed above the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.						
NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.						
NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.						

Appendix C. Toxic and Hazardous Substances or Elements

Parts	Toxic and harmful substances or elements					
	Plumbum (Pb)	Mercury (Hg)	Cadmium (Cd)	Chromium 6 (Cr6+)	PBB	PBDE
Plastic case	○	○	○	○	○	○
Metal bracket	○	○	×	×	○	○
Keyboard silicone	○	○	○	○	○	○
Trackball	×	○	○	○	○	○
Cables	×	○	○	○	○	○
PCBA	×	○	○	○	○	○
Hard disk	○	○	○	○	○	○
○: Means that the content of the toxic and harmful substance in all homogeneous materials of the part is below the limit specified in local standard. ×: It means that the content of the toxic and harmful substance in at least one homogeneous material of the part exceeds the limit requirement specified in the local standard. For products sold since the date of sale, this table shows that products in our supply chain may contain these substances. Note: all listed components may or may not be included in the products sold.						

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