The following conventions are available throughout the manual to show special emphasised information.

Sign	Meaning
Warning	Indicates a potentially hazardous situation which, if not avoided, may result in death or serious injury
Caution	Indicates a potentially hazardous situation which, if not avoided, may result in malfunction or damage of the system.
Note	Indicates precautions or recommendations should be used when operating the system.
[ ]	Indicates on-screen objects such as menu items and prompt.
Boldfaced Word	Indicates keys on the control panel.

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Chapter 1 Safety

The operation safety is the most important concern of the designe . To ensure the safety and efficiency of the system, the operator should read carefully about this chapter before using the system.

1.1 Safety Instructions

Read and understand all precautions in this manual before using the system.Keep this manual with the system at all times. Periodically review the procedures for operation and safety precautions.
To maintain the performance and safety of the system, electric and mechanical safety inspections for the system should be performed periodically by professional technicians in less than 6 months.

Warning

- Do not use the system in the applications other than those listed in the intended use.Otherwise, it may result in system damage or serious injury.
- This equipment can only be used for diagnosis, cannot be used for treatment.

1.1.1 Electric Safety

Warning

- Only qualified physicians or sonographers can perform ultrasound scanning on human body formedical diagnosis.
- The system can only be maintained by the person authorized or trained by the manufacturer.
- The transducer is treated as the applied part.
- Do not operate this system in an atmosphere containing flammable gases or liquids such as anesthetic gases, hydrogen, and ethanol, because there is an danger of explosion.
- Do not use this system at the same time with other equipment such as electric knife, defibrillator, and other high-frequency therapy equipment. Otherwise, there is danger of electric shock.
- keep the system dry, avoid beding transported to the field with a great temperature change to prevent condensation or water droplets from resulting in short circuit
- Connect the earth conductor before powering on the system, Disconnect the grounding cable after powering off the system. Otherwise, there is a danger of electric shock.
- The AC power connector plug for the ultrasound system is a three-pin plug and should never be adapted to any two-pin outlet. The AC power connector plug should be plugged into a hospital- grade power outlet.
- Do not place the multi-socket outlet on the floor.
- Do not connect other devices to multi-socket outlet; otherwise, the rated output power may be exceeded and failure may be resulted.
- The multi-socket outlet can only be used to provide power to the recommended peripheral devices of this system.
- Select the qualified multi-socket outlet with protective grounding, and ensure its maximum output power doesn't exceed the required one of this system.

- If the non-medical electric equipment connected to the system is powered by the movable multi- socket outlet with the isolation transformer, you should connect the plug of the system to the hospital-graded standard socket. Meanwhile, please consult the professional technician to ensure that the connection meets the safety requirements.
- The video printer should be connected to the cable provided by the manufacturer, otherwise, there is a danger of electric shock.
- It is recommended to connect this equipment to equipotential system. Use yellow and greenequipotential grounding cables, one end is connected to position with symbol, and other end is connected to equipotential system. Use of potential equalization conductor together with areference to requirements of IEC 60601-1 for Medical Electrical System.
- Do not pour any fluid onto the ultrasound system surfaces, as fluid seepage into the electrical circuitry may cause excessive leakage current or system failure. If carelessly pour any water onto the system, immediately stop using the ultrasound system and contact Service Representative immediately.
- Only use the probes provided by the manufacturer. Otherwise, the ultrasound system cannot be performed, and an accident such as a fire may result in the worst case.
- The machine that are not serviced or maintained while in use with the patient.
- Make sure the system is powered off and power cable is disconnected before cleaning the system. Otherwise, an electric shock may happen.

- Do not use this system in the strong electromagnetic field. Using the system in the improperenvironment may result in malfunction or damage.
- Only the peripherals and accessories (such as probes, peripherals or cables) provided or recommended by the manufacturer can be used. Using other devices or accessories may degrade the system performance and even cause an electrical shock.

1.1.2 Mechanical Safety

- Please make sure that the system is powered off and the power cable and the relevant accessories are disconnected before moving or transporting the system.
- Place the system on a level desk.
- The plug is used as disconnect to the mains supply, do not to position the machine so that it is difficult to operate the disconnection device.
- Do not place the system on a tilted plane with the angle larger than 10° . Otherwise, the systemwill fall off to cause system damage or personal injury.

1.1.3 Accessories Safety

- Use the probe carefully. If any part of the transducer surface is scratched, immediately stop using the probe. Otherwise, there is a danger of electric shock.
- After disinfecting the accessories, chemicals must be washed out from the accessories. Remaining residual chemicals or gases could not only result in damage to the accessories but also can beharmful to human bodies.
- You should use the legally marketed rubber latex (probe sheath)when performing trans-esophagus or intracavitary exam, or biopsy exam. Please check the ingredient of the rubber latex on the package before purchasing the rubber latex. Contact with natural rubber latex may cause a severe anaphylactic reaction in persons sensitive to the natural latex protein. Refer to package labeling to check latex content and FDA's March 29,1991 Medical Alert on latex products
- Do not use the footswitch in the operating room.
- Only the trained physicians or sonographers can handle the biopsy needle guides under ultrasound guidance. During the operation, the operator must observe proper needle insertion sequencing with the needle guide in order to avoid undue discomforts, unnecessary risks or injuries to patient.
- You should use the legally marketed medical ultrasound couplants. Please check the user instruction carefully before using it,please manage and use the ultrasound couplants correctly to prevent it being polluted.

- Disconnect the probe from the system after freezing an image or powering off the system. Otherwise, the system or the probe could be damaged.

1.2 Principles of Using Acoustic Power

- Perform ultrasound procedures prudently under the guidance of the ALARA (as low as reasonably achievable) principle. Expose the patient to the lowest practical transmit power levels in the shortest possible period to achieve a satisfactory diagnosis.
- The operator should notice the effect of the heat on the patient body when the exam is performed around the bones and the nearby soft tissues which can transform the ultrasound energy to heat energy. Take special care to the fetal whose bones are growing.

1.2.1 Biological Safety

Diagnostic ultrasound is recognized as being safe, but the risk of biological effects exists when using it in high exposure levels and long exposure times. Thus ultrasound should be used in a prudent manner to provide medical benefit to the patient.

1.2.2 Mechanical and Thermal Indices

The ultrasound system displays two parts: thermal Index (TI) and Mechanical Index (MI). The MI/TI value of the machine is real time displayed at the upper right corner, regarding how to change TI

display type, please choose: Preset → [System Preset] → [TI].

- Meaning of MI/TI

Mechanical bioeffects are threshold phenomena that occur when a certain level of output is exceeded. The threshold level varies with tissue type. The potential mechanical bioeffects varies with peak pressure and ultrasound frequency. The higher the MI value, the greater the likelihood of mechanical bioeffects occurring. There is no specific MI value theat means that amechanical effect is actually occurring. The MI should be used as guide for implementing the ALARA principle.

The TI value informs the operator about the conditions that might lead to an increase in temperature at surface of the body, within the body tissue, or at the point of focus of the ultrasound beam on bone. That is, the TI value informs the operator about the potential temperature rise in body tissue. It is an estimate of temperature increase in body tissue with specific properties. The actual amount of an temperature rise is influenced by factor such as tissue type, vascularity, mode of operation and others. The TI value should be used as a guide for implementing the ALARA principle. Depending on the examination and type of tissue involved, TI could be one of three types.

Soft Tissue Thermal Index (TIS) is used when imaging soft tissue only, it provides an estimate of potential temperature rise in soft tissue.

- Bone Thermal Index (TIB) is used when bone is near the focus of the image as in the third cropester OB examination, it provides an estimate of potential temperature rise in the bone or adjacent soft tissue.
- Cranial Bone hermal Index (TIC) is used when bone is near the skin surface as in transcranial examination, it provides an estimate of potential temperature rise in the bone or adjacent soft tissue.

- Precision of MI/TI

TI and MI values are displayed in real time on the screen. The operator should observe these index values during examinations and ensure that exposure time and output values are maintained at minimum amounts needed for effective diagnosis. The MI and TI precision is 0.1.

1.2.3 Acoustic Output Statement

1.2.3.1 The Influencing Factors of Acoustic Uncertainty

When estimating accuracy of displayed numerical values,many factors are considered:

- The probe changeability
- The system changeability
- Changeability and accuracy of measurement
- Possible operating conditions and testing numbers needed to obtain displayed result accuracy of the diagnostic system
- Whether the display accuracy depends on specific system combination, mode combination , probe component and launch mode combination, or all of above
- Algorithm accuracy of the system software used to calculate the MI/TI
- Approximation engineering method used in real time computation

1.2.3.2 Differences between Actual and Displayed MI and TI

For many assumptions used in the process of measurement and calculation, actually they are conservative. For most organizations path, high estimate is made in the measurement and calculation process of tissue exposure intensity. For example, using attenuation coefficient 0.3dB cm MHz1 much lower than the actual human tissue attenuation coefficient, choosing conservative values of tissue characteristic. Therefore, displayed MI and TI values should be relative information for reference, they serve to indicate to the operator whether a particular setting of the system increases or decreases the possibility of Thermal or Mechanical effect, used to help the operator be careful to use ultrasonic diagnostic system and follow the ALARA principle, these values can not be equal to actual values.

1.2.3.3 Uncertainty of Measurement

Sound pressure is the most basic data of sound field measurement, and other sound field parameters can be deduced from sound pressure, so when analysing measurement uncertainty, only take sound pressure for analysis and uncertainty of other parameters can be deduced from the sound pressure.

Measurement uncertainty mainly include repeated measurement uncertainty and the system uncertainty, the system uncertainty is an order of magnitude higher than repeated measurement uncertainty, so the main analysis is the system uncertainty. Mainly decided by the following factors:

1. The sensitivity of hydrophone:According to hydrophone calibration report provided by ONDA company, the maximum allowable error of sound pressure for hydrophone is plus or minus 12%;
2. Scope: according to agilent DSO6502A specifications, its effect on the sound pressure is plus or minus 2%;
3. Temperature: effect of the thermocouple on sound pressure error is plus or minus 4%;

Above all uncertainty components are not related, synthetic standard uncertainty of sound pressure is:plus or minus 13%.

1.2.4 Operator Control Property

There are three types of operation control related to the generation of mechanical/thermal effect: direct control and indirect control, receiver control. Qualified operator should try to cut down the acoustic output in the premise of effective diagnostic images.

- Direct control

  The direct control of the acoustic output of this system is adjusting voltage size.But its maximum acoustic output shouldn't be more than displayed acoustic output limit in any modes.

- Indirect control

  The controls that indirectly affect output are many imaging parameters. These are operating modes, frequency,focal point number/position, image depth and pulse repetition frequency (PRF)(By adjusting the [Scale] of the toolbar).

  The operating mode determines whether the ultrasound beam is scanning or non-scanning. Thermal effect is closely connected to M Mode, PW Doppler and Color Mode.

  Acoustic attenuation of tissue is directly related to transducer frequency.

  The focal point number and position is related to active aperture of transducer and beam width.

  For the pulse repetition frequency(PRF)(By adjusting the [Scale] of the toolbar), the higher the PRF, the more acoustic output power increased over a period of time.

- The receiver control

  The receiver control does not affect the acoustic output, including gain, dynamic range, and image processing, etc. Therefore, in the image optimization, should adjust the receiver control to optimize images firstly, the second are through direct control and indirect control.

  When acquiring images, it is recommended to use the default (or as low as possible) acoustic output location, and use the gain control to compensate. The default setting is commonly 70% of maximum allowed acoustic output value, which will not cause harm to the operator, and for the probe is the most effective value

1.2.5 Acoustic Power Settings

The ultrasound system has been preset the parameters for each exam mode with different probes

before shipment. When the ultrasound system is powered on, a new patient is created or the application mode is changed, the system will retrieve the default settings. You can also reset the parameters.

1.2.6 ALARA

It is required to practice ALARA when using ultrasound energy. Practicing ALARA ensures that the total energy level is controlled below a low level at which bioeffects are not generated while diagnostic information is being accumulated. The total energy is controlled by output intensity and total radiation time. The output intensity necessary for examinations differs depending on the patient and clinical case.

Not all examinations can be performed with an extremely low level of acoustic energy.Controlling the acoustic level at an extremely low level leads to low-quality images or insufficient Doppler signals, adversely affecting the reliability of the diagnosis. However,increasing the acoustic power more than necessary does always contribute to an increase in quality of information required for diagnosis, rather increasing the risk of generating bioeffects.

The operator must take responsibility for the safety of patients.

1.3 Electromagnetic Compatibilities

Electromagnetic compatibilities are the abilities of the system or equipment to operate normally in the electromagnetic environment and not to radiate any electromagnetic interruptions to any other objects which are in the same environment.

This system is designed in accordance with the current EMC requirement. And the ultrasound image will degrade instantly if the system is used in the electromagnetic field environment. If the degradation of the image is found, it is recommended to inspect the operation environment to confirm the radiation source.

1.3.1 Electromagnetic Radiation

This system is applicable for the following environment. You should use this system under the suggested environment.

Emission Test	Compliance	Electromagnetic Environment and Guidance
RF emission CISPR 11	Group 1 ClassA	The equipment use RF energy only for its internal function. Therefore, its RF emission is very low and not likely to cause any interference to nearby electronic equipment.
Harmonic emission IEC 61000-3-2	Class A	
Voltage fluctuations/ flicker emissions	Complies	

IEC 61000-3-3		

1.3.2 Electromagnetic Immunity

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment and Guidance
Electrostatic discharge (ESD) IEC 61000-4-2	±6kV Contact ±8kV Air	±6±6kV Contact ±8kV Air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient burst IEC 61000-4-4	±2 kV for power supply lines, ±1 kV for input output lines	±2 kV for power supply lines, ±1 kV for input output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±1kV line to line ±2kV line to earth	±1kV line to line ±2kV line to earth	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips and Short interruptions IEC 61000-4-11	< 5%UT(>95% dip in UT) for 0.5 period; 40%UT(60% dip in UT) for5 period; 70%UT(30% dip in UT) for25 period) < 5%UT(>95% dip in UT) for 5 seconds	< 5%UT(>95% dip in UT) for 0.5 period; 40%UT(60% dip in UT) for5 period; 70%UT(30% dip in UT) for25 period) < 5%UT(>95% dip in UT) for 5 seconds	Mains power quality should be that of a typical commercial or hospital environment. If the user of the equipment requires contained operation during power mains interruptions, it is recommended for the equipment to be powered from an uninterruptible power supply.
Power frequency(50/60 Hz) IEC 61000-4-8	3 A/m	3 A/m	Power frequency of magnetic fields should be at leveled characteristic of a typical location in a typical commercial or hospital environment.
NOTE: U is the a.c. mains voltage prior to application of the test level.			

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment and Guidance
Conducted RF IEC 61000-4-6	3Vrms 150kHz-80 MHz	1 Vrms	Portable and mobile RF communications equipment should be used no closer to any part of the EQUIPMENT, including cables, than the recommended separation distance calculated form the equation applicable to the frequency of the
Radiated RF IEC 61000-4-3	3V/m 80 MHz-2.5GHz	3 Vrms	

			transmitter. Recommended separation distance: $d = 3.5\sqrt{p}$ $d = 1.2\sqrt{p}$ 80MHz-800 MHz $d = 2.3\sqrt{p}$ 80 MHz-2.5GHz Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, "should be less than the compliance level in each frequency range." Interference may occur in the vicinity of equipment marked with the following symbol:
NOTE 1: At 80 MHz and 800MHz, 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.			
Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To access the electromagnetic environment due to fixed RF transmitters, and electromagnetic site survey should be considered. If the measured filed strength in the location in which the EQUIPMENT is used exceeds the applicable RF compliance level above, the EQUIPMENT should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocationing the EQUIPMENT. Over the frequency range 150kHz to 80MHz, field strengths should be less than 3 V/m.			

1.3.3 Recommended Minimum Distance Between Device and Mobile RF Equipment

The equipment is intended for use in an electromagnetic environment in which radiated RF disturbance are controlled. The customer or the user of the equipment can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the equipment as recommended below, according to the maximum output power of the communications equipment.

Rated Maximum Output Power ofTransmitter (W)	Separation distance according to frequency of transmitter (m)		
	150 kHz to 80 MHz $d = 1.2\sqrt{p}$	80 MHz to 800 MHz $d = 1.2\sqrt{p}$	800 MHz to 2.5 GHz $d = 2.3\sqrt{p}$
0.01	0.12	0.12	0.23

0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23
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.			

If the system has generated the interference (confirmed by powering on and off the system), you or the qualified service personnel should solve the problem by following the steps as below:

- Reposition the affected system.
- Place this system further away from the affected system.
- Supply power to this system in other ways other than the way used currently.
- Contact the manufacturer as soon as possible.

1.3.4 Signs and Meaning

Sign	Meaning
	Caution! Please consult the accompanying document.
	Warning, danger of electric shock!
	Type BF applied part
	Disconnect (the mains supply)
	Connect (the mains supply)
Sign	**Meaning**
	Power on/standby button
	Footswitch
	Cable connecting the video printer

	Protective earth
IOIOI	Serial port
	Equipotentiality
	Alternating current
IPN_1N_2	Degree of IP protection
	Non-ionizing electromagnetic radiation
	Manufacturer
	Date of manufacturer
	Consult the user manual
	Network port
	USB port
	Video output
	Fragile
	Keep dry
	Keep this way upward
	Atmospheric pressure range of the transportation
	Relative humidity range of the transportation
	Ambient temperature rang of the transportation
Sign	**Meaning**
4	Maximum of 4 layers allowed for the system
	Do not roll.

	Keep in shade
	Indicates the presence of hazardous substance (s) above the maximum concentration value(s) as set in SJ/T11364-2006. "10" indicates the number of years during which the hazardous substance(s) will not leak or mutate so that the use of this product will not result in ay severe environmental pollution, bodily injury, or damage to any assets.
SN	Serial number
	Unrecyclable
EC REP	Authorized EU Representative

Chapter 2 System Overview

You should familiar with the components, physical specification, operation of the keys and buttons, the general work flow before using this system.

2.1 Intended Use

The ultrasound system is intended for animal ultrasound diagnosis, can be applied to Cannine,Feline,Equine,Bovine, Ovine and Other animals. The application parts are as follows: abdomen, obstetrics, cardiac, smallparts, vascular.
vascular, pediatrics, thyroid, breast, carotid, kidney.

Contraindication: The ultrasound system is not intended for ophthalmic use or any use causing the acoustic beam to pass through the eye.

2.2 System Configuration

2.2.1 Standard Configuration

- Main Unit
- Accessories:
  - Micro Convex Array Transducer(6C15A)、Linear Array Transducer(7L4A)
  - Adapter
  - Operation Manual
  - Power Supply Cable

2.2.2 Options

2.2.2.1 Optional Probes

Name	Probe Types	Applications
7L4A	Linear Array Transducer	SmallPart, Vascular
3C6A	Convex Array Transducer	Abdomen,Obstetrics, Cardiac
6C15A	Micro Convex Array Transducer	Abdomen, Obstetrics,Cardiac

2.2.2.2 Optional accessories

NO.	Accessories
1	Graphic printer

2	Blackwhite video printer
3	Color video printer
4	Biopsy bracket
5	Mobile Trolley

2.3 Physical Specifications

Monitor: 15" LED screen
Machine size: 370mm(length) × 350mm(width) × 70mm(thickness)
Package size: 455mm(length) ×455mm(width) × 210mm(height)
Machine Weight: approximately 5.5kg (Excluding probe and adapter);
Packaging weight: ≤9kg ,Including machine, adapter, two probes and package

2.4 Main Unit Overviews

Figure 2-1 Main Unit Overview

2.4.1 Right Side View

Figure 2-2 Right Side View

2.4.2 Back View

Figure 2-3 Back View

2.5 Peripherals Ports View

Figure 2-4 Peripherals Ports

No.	Name	Function
1	Power input port	Used for connecting the Power adapter,supply power.
2	Footswitch port	Used for connecting the footswitch.
3	VGA port	Used for connecting the video equipment generating VGA signals, such as monitor and projector.
4	Network port	Used for connecting DICOM server or network.
5	USB port	Used for connecting the usb equipment,such as u disk and usb printer.

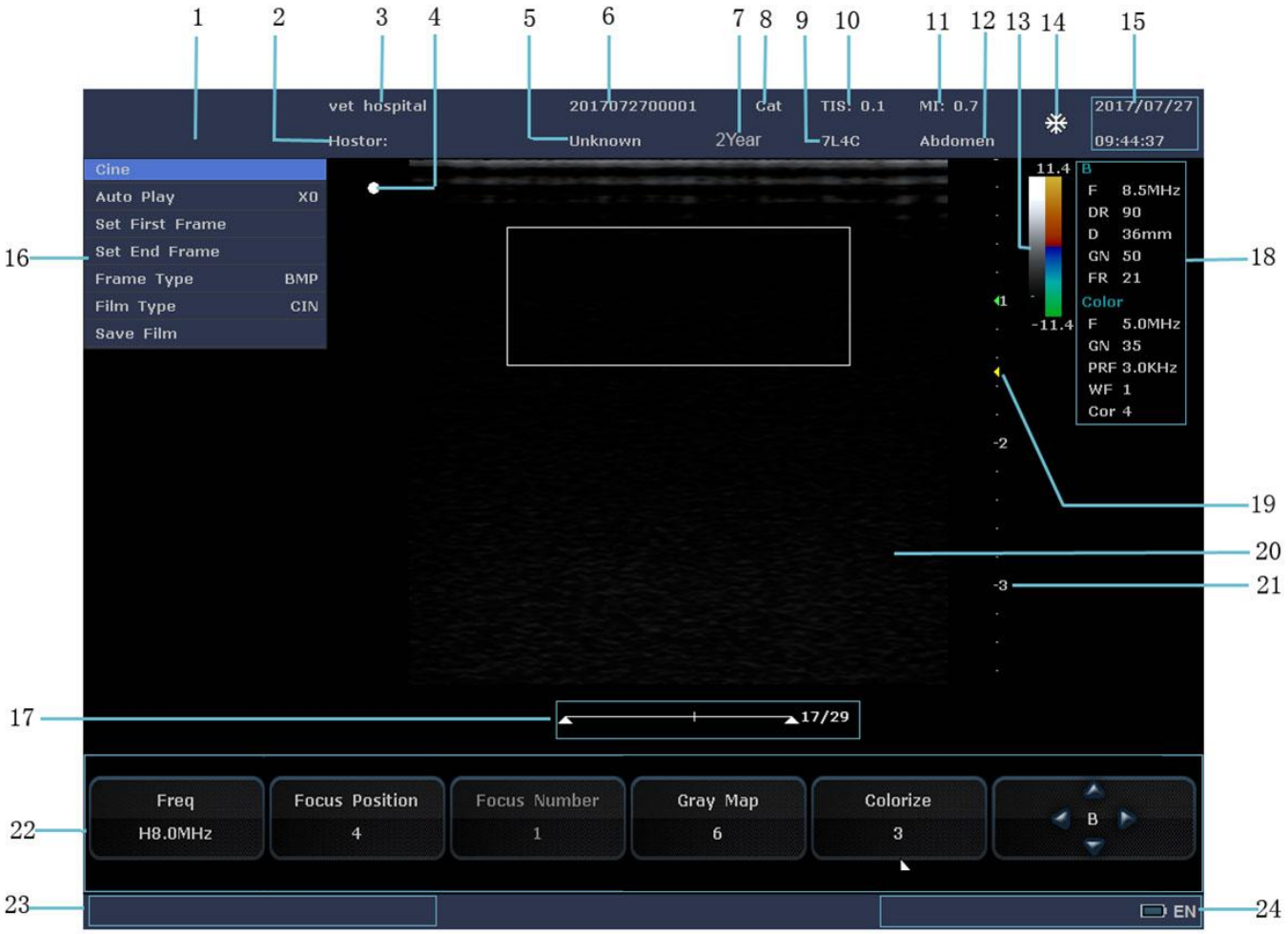
2.6 Control Panel

Sign	Name	Functions
Indicators Area		
	Power indicator	The indicator lights on when the system is powered by the alternative current.
	Battery capacity indicator	The indicator lights on the when the system is powered by the battery. ● The indicator flashes when the battery capacity is lower than 30%. ● The indicator lights on solid when the battery is in full capacity.
	Battery charge indicator	The indicator lights on when the battery is charged and lights off when the battery is fully charged.

Keyboard Area		
ESC	ESC Key	1. When dialog is open, press it to close the opendialog. 2. When preset submenu is displayed, press it to exit preset submenu and return to previous menu 3. When preset primary menu is displayed, press it to exit preset primary menu.
Help	Help Key	Press it to display help information
Report	Report key	Press it to enter the report screen.
Review	Review key	Press it to enter the file review screen.
Station	Station key	Press it ot enter the workstation screen.
Preset	Preset key	Press it to enter the system setting screen.
Save IP	Save current image parameters key	Press it to save the parameters setting of the current imaging mode.
Reset IP	restore the preset image parameters key	Press it to restore the parameters setting of the current imaging mode from preset.
Biopsy	Biopsy key	Press it to activate the biopsy function.
Lito	Lito key	Press it to activate the lito function.
Menu	Menu key	Press it to hide/display the menu function.
Clear	Clear key	Press it to remove all the annotations and measurements from the screen.
Comment	Text annotation key	Press it to enter/exit the text annotation status.
Arrow	Arrow annotation key	Press it to enter/exit the arrow annotation status.
Body Mark	Body mark key	Press it to enter/exit the body mark status.
← →	Left/right key	● Press it to adjust the brightness of screen. ● Press it to move the cursor left or right in other status.
↑ ↓	Up/down key	Press it to adjust the volume of the frequency spectrum in the real time PW mode.
Ctrl + blank	Typewriting selection key	Press the combined keys to select the desired typewriting.
-	Other keys	Achieve the functions similar with the keys on the keyboard of the computer.
Function Keys		
◉/○	Power key	Press it to power on or off the system or to enable standby mode.
	TGC slide pot	● There are 8 TGC slide pot. ● Move it to adjust the gain of the specified depth.

Patient	Patient key	Press it to enter the patient information screen to create or edit the patient information.
Probe/ Exam	Probe and exam mode selection key	Press it to enter the probe and exam selection mode to select the probe and the application part.
End Exam	End the exam Key	Press it to end the exam of the current patient.
B	B mode key	Press it to enter the B mode.
	Dual display key	Press it to enter the dual display.
Color	Color mode key	Press it to enter/exit the color flow Doppler mode.
PW	PW mode key	Press it to enter/exit the pulsed wave Doppler mode.
M	M mode key	Press it to enter/exit the M mode.
	Gain knob	Rotate it to adjust the gain of the current mode. Press it to change the current image menu in B/C mode.
Angle	Angle knob	● Rotate it to adjust the direction mark of the probe in the body mark annotation status. ● Rotate it to adjust the direction of the arrow in the annotation status. ● Rotate it to adjust the calibrated angle in the PW mode. ● Rotate it to adjust the angle in the rthopaedic measurement. ● Rotate it to delete or restore the last trace in the trace measurement.
Cursor	Cursor key	Press it to display or hide the cursor.
Measure	Measurement key	Press it to activate or deactivate the measurement.
Change	Change key	When measuring, ● Press it to switch between the ending point and the starting point in the distance measurement. ● Press it to switch between the long axis and the short axis in the ellipse measurement.
Caliper	General measurement key	Press it to enter/exit the general measurement.
Set	Confirmation key	Press it to confirm the current operation.
Depth	Depth key	Used for increasing or decreasing the depth of the image.
Zoom	Magnification key	Used for magnifying the interest area of the image.
Cine	Play back key	Press it to inactivate/activate the manual review of the cine in the cine mode.
Save	Save key	Press it to save the current image in the frozen mode.
Freeze	Freeze key	Press it to freeze/unfreeze the image.
P1~P4	User-defined shortcut key	Press it to enable the shortcut function defined by the user. For details, refer to Section 4.1 Presetting the System.

2.8 Main Screen



1. LOGO	2. Hostor name
3. Hospital Name	4. Direction mark of the probe
5. Gender	6. Patient ID
7.Age	8. Animal species
9. Probe model	10.TI indices
11. MI indices	12.Exam type
13. Gray map and color map (Color/PDI mode)	14. Frozen image
15. Date and time	16. Menu
17. Cine schedule bar	18. Imaging parameters
19. Focus	20. Imaging area
21. Scale bar	22.Thumbnail area
23. Prompt	24. Status

2.9 Regular Examination Workflow

The regular examination workflow is as shown in Figure 2-7. If you are not familiar with any of the operations, please consult the relevant chapter.

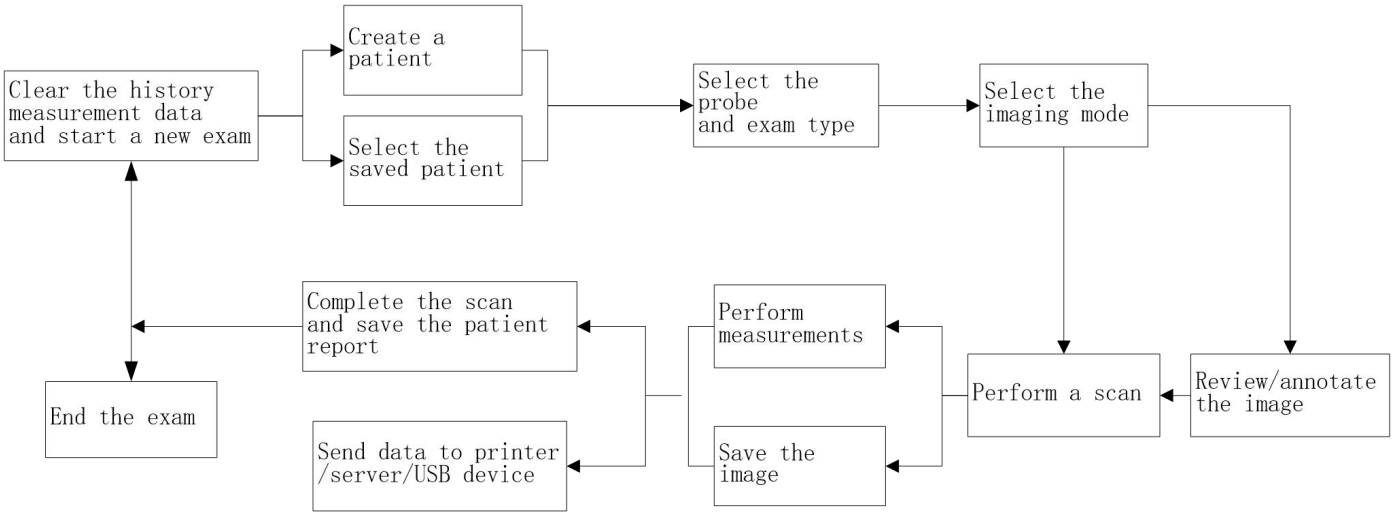


Figure 2-7 Regular Examination Workflow

- For creating a patient, refer to Section 5.1 Creating a Patient.
- For selecting the probe and exam type, refer to Section 5.2 Selecting the Probe and Exam type.
- For selecting the imaging mode, refer to Chapter 6 Optimizing the Image.
- For reviewing/annotating the image, refer to Chapter 7 Working with the Images.
- For performing measurements, refer to Chapter 8 Measurements and Calculations.
- For saving the image, refer to Section 10.1 Saving the Image/Cine.
- For sending data to printer/server/USB storage device, refer to Section 10.4 Printing the Image and Section 10.5 Saving Data.
- For completing the scan and saving the patient report, refer to Chapter 9 Report.
- For ending the exam and clearing the history measurement and starting a new exam, refer to Section 5.3 Ending the Exam.

Chapter 3 Preparing an Exam

You should complete the preparations before the exam, such as move, position and adjust the system, connect the power supply, probe or other peripherals.

3.1 Positioning the system

Caution

Keep the distance of 20cm from the left side and rear of the system to the walls during use. Otherwise, the temperature inside the system will increase and cause system malfunction.

Place the system on a level desk carefully.

3.2 Booting the system

Two methods can be used to supply power for the system: mains supply and battery.
When the adapter is connected to the mains supply, the battery is charged until full.

Note

The battery life will be affected if the battery is used frequently. Please use the adapter as often as possible.

Connecting to the mains supply:

System Specifications: 100V-240V~50Hz/60Hz, 120VA-140VA

Warning

- The AC power plug for the ultrasound system is a three-pin grounded plug and should never beconnected to any two-pin outlet or an adapter. Otherwise, there is danger of electric shock.
- Ensure the potential-equalization lead wire is connected before inserting the equipment power plug. Otherwise, there is danger of electric shock.

Steps for connecting the mains supply are as follows:

Connect two ends of the power cable to the hospital-graded mains supply and the power input port at the rear panel of the system respectively, and ensure the connections are secure.

3.3 Using the Battery

3.3.1 Precautions

- Do not assemble or disassemble the battery, because there is danger of explosion.
- Charge the battery through the diagnostic ultrasound system only. Otherwise, there is danger of explosion.
- Replace the battery provided by the manufacturer only， and Can only be replaced by technical personnel
- Do not short-circuit the battery by directly connecting the system with metal objects.
- If the battery emits an odor or heat, is deformed or discolored, or appears abnormal during use, charging or storage, stop using it immediately. If you have any questions about the battery, please contact the manufacturer.
- Do not use a battery if it leaks. If your skin or clothing is stained with the fluid from the battery, thoroughly wash the area immediately with clean water. If the fluid comes in contact with your eyes, immediately flush the eyes with water and seek the oculist for help.
- To avoid the battery damage causing the system damage, observe the following precautions:
  * Do not immerse the battery in water or allow it to get wet.
  * Do not discard the battery in a fire.
  * Do not expose the battery under the sunlight or leave it in the environment over 60°C.
  * Keep the battery away from fire and other heat sources during its usage and charge.
  * Do not pierce the battery with a sharp object, hit or step on it.

3.3.2 Charging the Battery

- If the battery has not been used for more than 3 months, it is recommended to store the battery in a temperature range from -20°C to 45°C with fully charged. If the battery has been used for more than 3 months, it is recommended to charge the battery once at least every 3 months to avoid of liquid leakage.
- Charge the battery in the temperature range from 0°C to 45°C and discharge it in a temperature range from 0°C to 60°C to maintain the lifespan of the battery.
- It is highly recommended to perform one full discharge/charge cycle before first time usage. A full discharge/charge cycle means the system works by using battery power until the battery loses its charge completely and the system shuts down. Thereafter, fully charge the battery
- When the battery capacity is low (battery status indicator flashes in green) and the battery cannot be charged in time, you need to save all unsaved data before the system automatically shuts down. Otherwise, you may lose useful information.
- If there is only a batterry inside, the battery can't be charged and supply power to the system.

When the system is connected to mains supply with the power cable, the battery is charged automatically.
A fully charged battery can work continuously for more than 1 hour. Exact time of endurance depends on image modes and screen brightness
Battery Specifications:

Rated voltage: 11.v V
Battery capacity: 6000mAh
Limited charging voltage:12.6V
Please deal with damaged, poor, or discarded batteries according to law or local decrees.

3.3.3 Assembling and Disassembling the Battery

Disassembling and assembling the battery have a certain risk, can only be replaced by technical personnel 。

3.4 Booting/Standby/Powering off

- Booting the system

Press the Power on/Standby button on the system to boot the system.

- Standby

In standby mode, screen is closed, system is in low power status, the Power on/Standby button led flickers in green back light.
The system enters the standby mode automatically when it is not used for a certain time.
You can also press the Power on/Standby button and select the [Standby] to enter the standby mode.
You can set the standby by the Preset key -> [System Preset] -> [Standby and Wait Time].

- Powering off the system

- Extra 20 seconds are needed for powering on the system if it is powered off in abnormal way last time.
- Do not power off the system during system upgrade or data transmission.
- Do not disconnect the power cable before the power off information disappears. Or, the files may be damaged and patient data may be lost.
- For safety and functionality of the system, regular maintenance should be performed as described in Chapter 12 System Maintenance.
- Long-click the Power on/Standby button can turn off the system forcely but may cause data lose, avoid turn off the system in this way unless it is necessary.

Press the Power on/Standby button on the system and select [Power off] to shut down the system.

3.5 Connecting the Probe

Note

Disconnect the probe when the image is frozen or the system is shut down. Otherwise, probe and system damage may happen.

Probe connection method: Insert the probe connector into one of the probe socket and compress。

3.6 Connecting the Peripherals

3.6.1 Connecting the Footswitch

Note

Use the footswitch provided by the manufacturer only. Otherwise, system and footswitch may be damaged.
Connect the cable of the footswitch to the footswitch port of the system. Step on the footswitch to freeze/unfreeze the image.

3.6.2 Connecting the Video Printer

Use the type of the printer recommended by the manufacturer to connect to the system.
Connect the printer to the mains supply with power cable, With AV video cable connect composite Video output interface of the system to the printer Video input interface
You can use the printer when the connection is completed.

Note

- By using factory efaulit settings,according to actual situation, please adjust the default parameters of graphic printer to get the best quality printed image.
- Please check user instruction to install the printer. If the printer don't work, please press Preset and choose [system preset] to check related preset.
- the system supports composite Video output, video mode can select NTSC or PAL.

3.6.3 Connecting the Graphic Printer

Use the type of the printer recommended by the manufacturer to connect to the system.
Connect the printer to the mains supply with power cable, then connect the system and printer by USB signal cable.
You can use the printer when the connection is completed.

Chapter 4 Presetting System

The Preset menu allows you to specify general system settings, printer, probe, scan, measurement method, text annotation and DICOM server. All your customized settings can be saved and can function even after you rebooting the system.Press the **Preset** key on the control panel and see the manual shown in Figure 4-1.

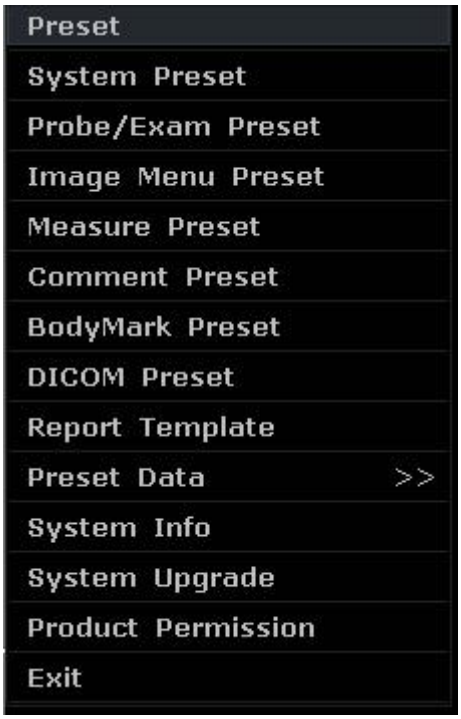


Figure 4-1 Presettings Menu

- Move the trackball to one of the menu items and press the **Set key** to enter the screen of this menu item.
- Move the trackball to at the right of one menu item and press the **Set key**, the submenu items are displayed. Move the trackball to one of the submenu items and press the **Set key** to confirm.
- To add one of the settings, move the trackball to the input box at the right of the desired menu item and press the **Set key**. A cursor displays in the input box, you can use the keyboard to type the characters.
- To exit the Presettings menu, move the trackball to [Exit] and press the **Set** key.

4.1 Presetting the System

You can perform the general settings such as institution name, language or date format and the printer settings in the System Preset screen.

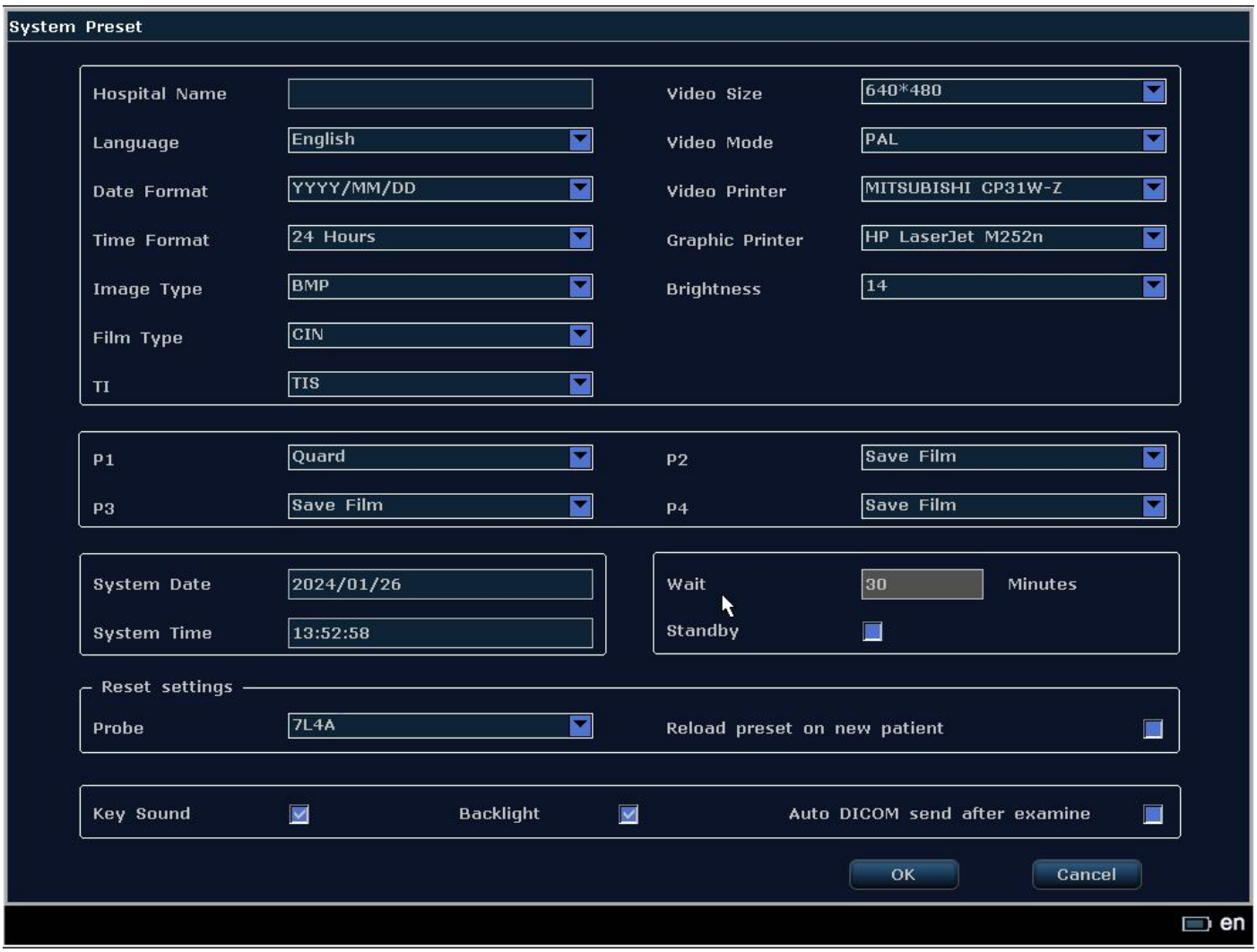


Figure 4-2 System Presettings Screen

Item	Descriptions
Hospital Name	Enter the hospital name.
Language	Choose a system language of the user interface.
Date Format	Set the date format of the system. Options: YYYY/MM/DD, MM/DD/YYYY or DD/MM/YYYY.
Time Format	Set the time format of the system. Options: 12Hour/24Hour
Image Type	Set the saving format of the image. Options: JPG, BMP or FRM Format
Film Type	Set the saving format of cine. Options: CIN or AVI Format
Video Size	Set the resolution of the printer. Options: 640*480 or 800*600.
Video Mode	Set the video output format. Options: NTSC or PAL.
Video Printer	Set the type of the video printer.

	Options: MITSUBISHI CP31W-Z or MITSUBISHI P93W-Z
Graphic Printer	Set the type of the graphic printer. Option:HP LaserJet M252n、HP LaserJet P1108、HP DeskJet 1111
Brightness	Set the brightness of the display screen. Options: 0-14.
Color Temperature	Set the color temperature of the display screen. Options: 0 or 1.
TI	Set the TI index. Options: TIS, TIB or TIC.
Type	Set type of animal. Option: Cat、Dog、Cattle、Horse、Sheep、Other
F1~F4	Set the functions of shortcut key P1~P4. Options: Save Film, Colorize
Key Sound	Enable or disable the sound when pressing the keys on the control panel.
Backlight	Enable or disable the background light on the control panel.
System Date, System Time	Set the system date and time. Move the cursor to change the date or time by using the trackball and input the desired date or time by using the keyboard.
Wait, standby	Enable or disable the standby mode and set the time to enable the standby mode.
Probe	Set the default probe to be used when the system is powered on.
Reload Preset on New Patient	Enable or disable the function of retrieving the saved imaging parameters for a new patient exam.

4.2 Presetting the Probe/Exam

As shown in Figure 4-3, you can select the probe for the specified exam and defined the exam type in the Probe/Exam Preset screen, and the presettings will display on the Probe/Exam screen.

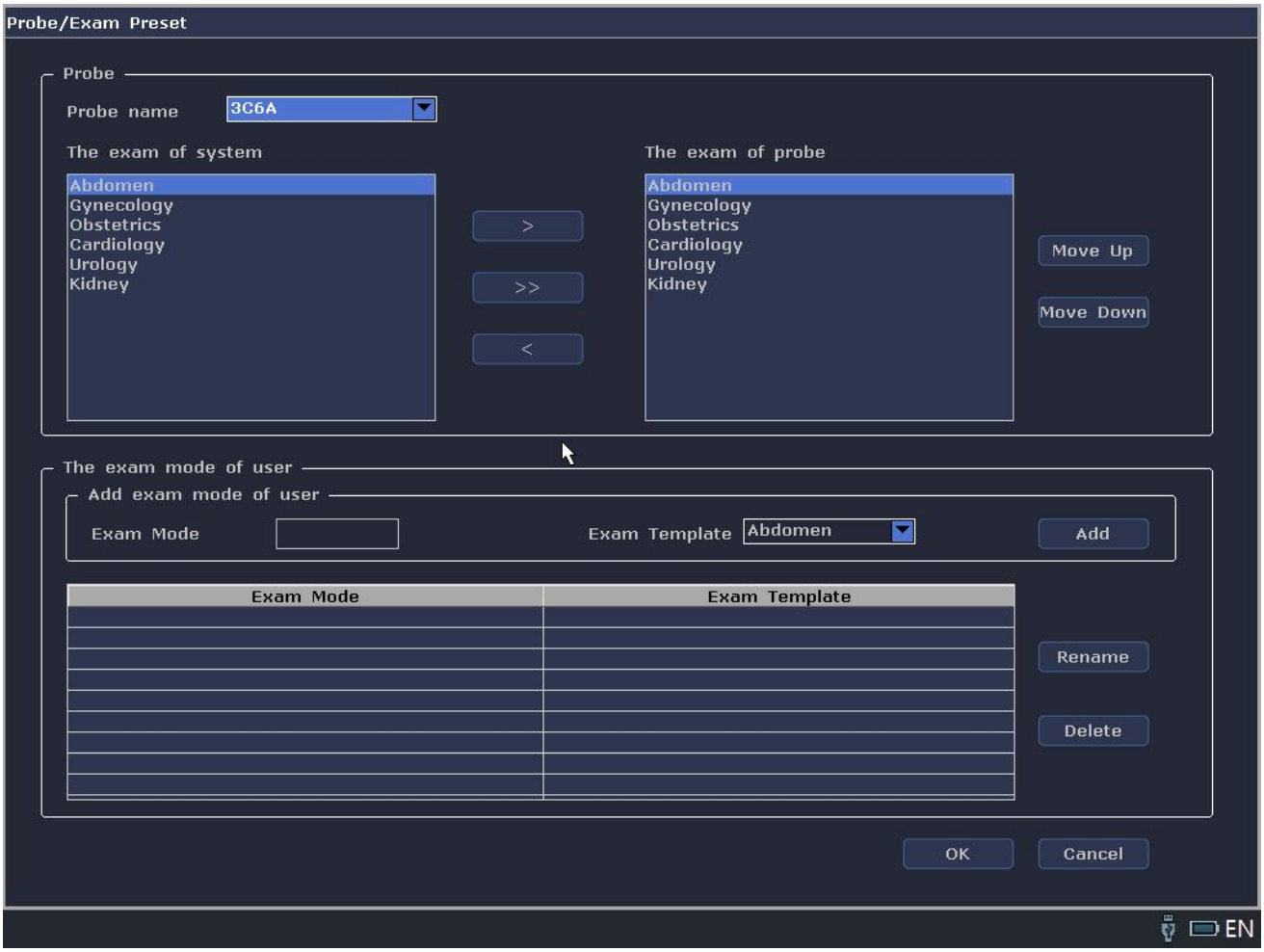


Figure 4-3 Probe/Exam Presetttings Screen

Steps for editing the exam type are as follows.

1. Click the drop-down menu beside [Probe name] to select the desired probe.
2. Select the exam type in the list of [The exam of system] and click > to add the selected exam type to the list of [The exam of probe].
   - Click >> to add all the exam types.
   - Select one exam type the list of [The exam of probe] and click < to delete it.
   - Click [Up] or [Down] to move the selected exam type up or down.

Steps for defining an exam are as follows.

1. Click [Exam Template] to select one template.
2. Input the defined name for the selected exam template at [Exam Mode] and click [Add] to add it. The defined exam type displays in the list below.
   - Select exam type in the list and click [Rename], a prompt box pops up. Input the new name in this prompt box and click [OK] to rename an exam type.
   - Select the desired exam type in the list and click [Delete], a prompt box pops up. Click [OK] in the prompt box to delete an exam type.

4.3 Presetting the Measurements

You can preset the obstetric formulas, the heart rate and the distance between the measurement scales in the Measure Preset screen.

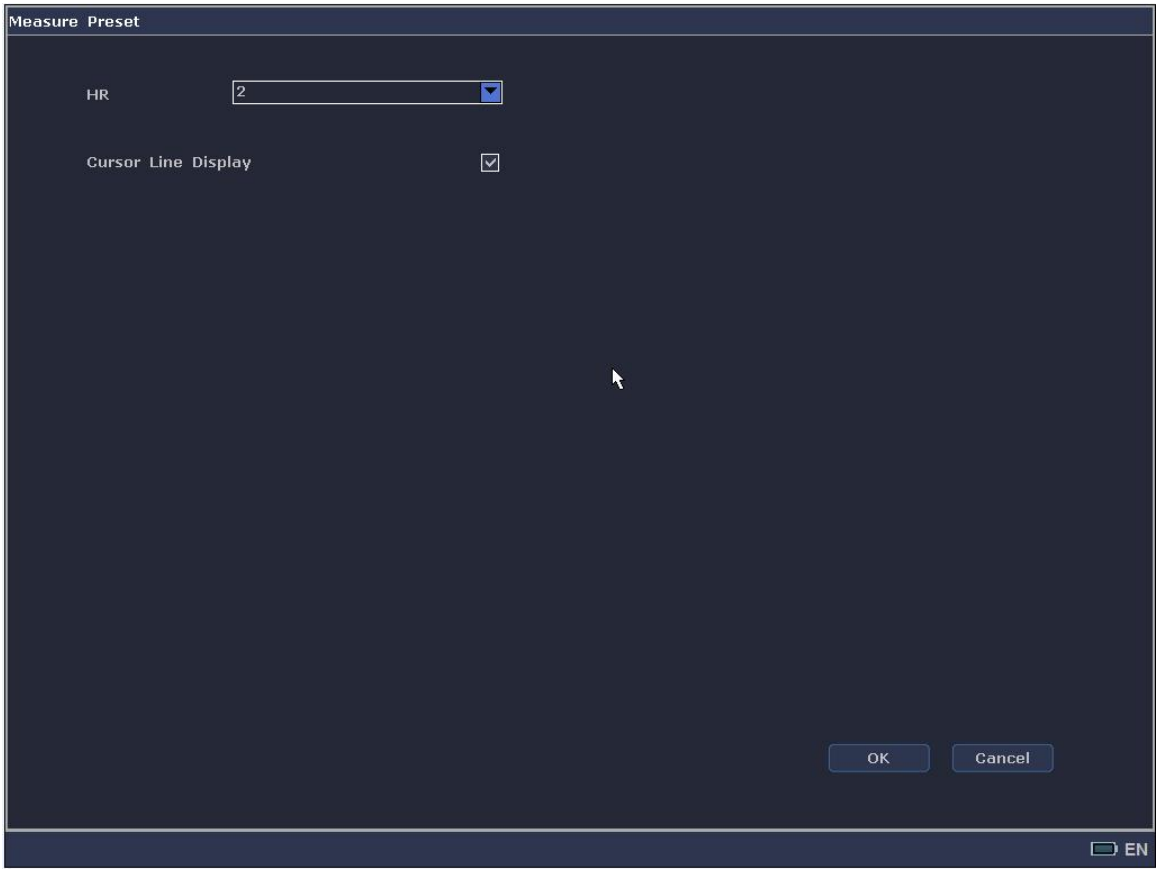


Figure 4-4 Measurement Presettings Screen

Item	Descriptions
HR	Set the heart rate. Options: 1-8.
Cursor Line Display	Enable or disable the dotted line between two markers.

4.4 Presetting the Annotations

You can create, edit or delete the defined text annotations in the Comment Preset screen. The user-defined annotations display behind the default annotation in text annotation status.

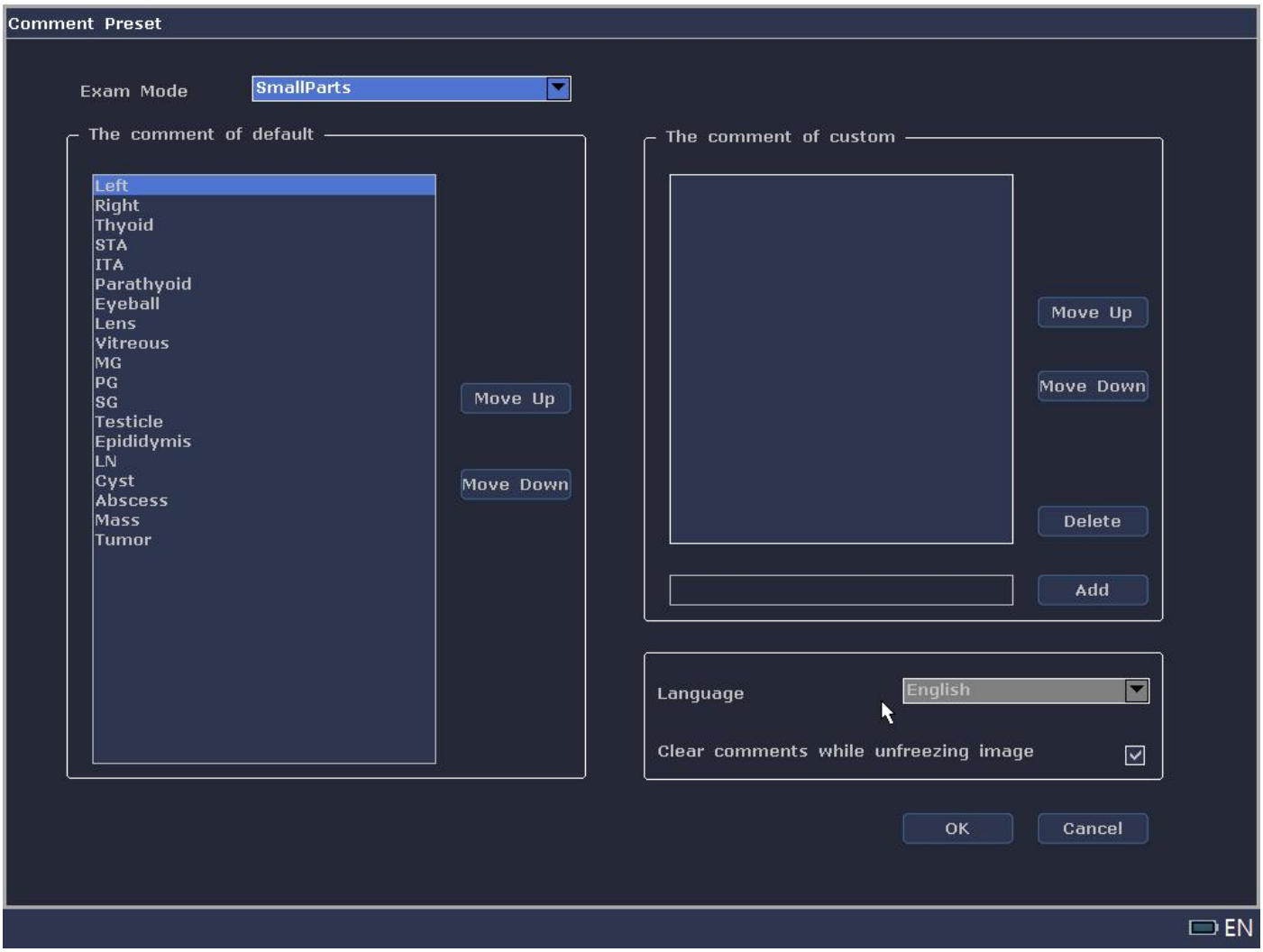


Figure 4-5 Annotation Presettings Screen

- To add an annotation

  Click the [Exam Mode] to select one exam type.

  Input the characters beside [Add] and click [Add] to add the defined annotation to the list of [The comment of user].

- To move an annotation up or down

  Select one annotation in the list of [The comment of default] or [The comment of user] and click [Up] or [Down] to move it up or down.

- To delete an annotation

  Select one annotation in the list of [The comment of user] and click [Delete] to delete it.

- To select the language of annotation

  Click the [Language] and select the desired language of annotation. You can choose from Chinese or English.

- To set the method for clearing the annotation

  If enabled, the annotation will be cleared when the image is unfrozen.

  If disabled, the annotation will be left.

4.5 Presetting DICOM

You can preset the local network and the storage server network of this system in the DICOM Preset screen.

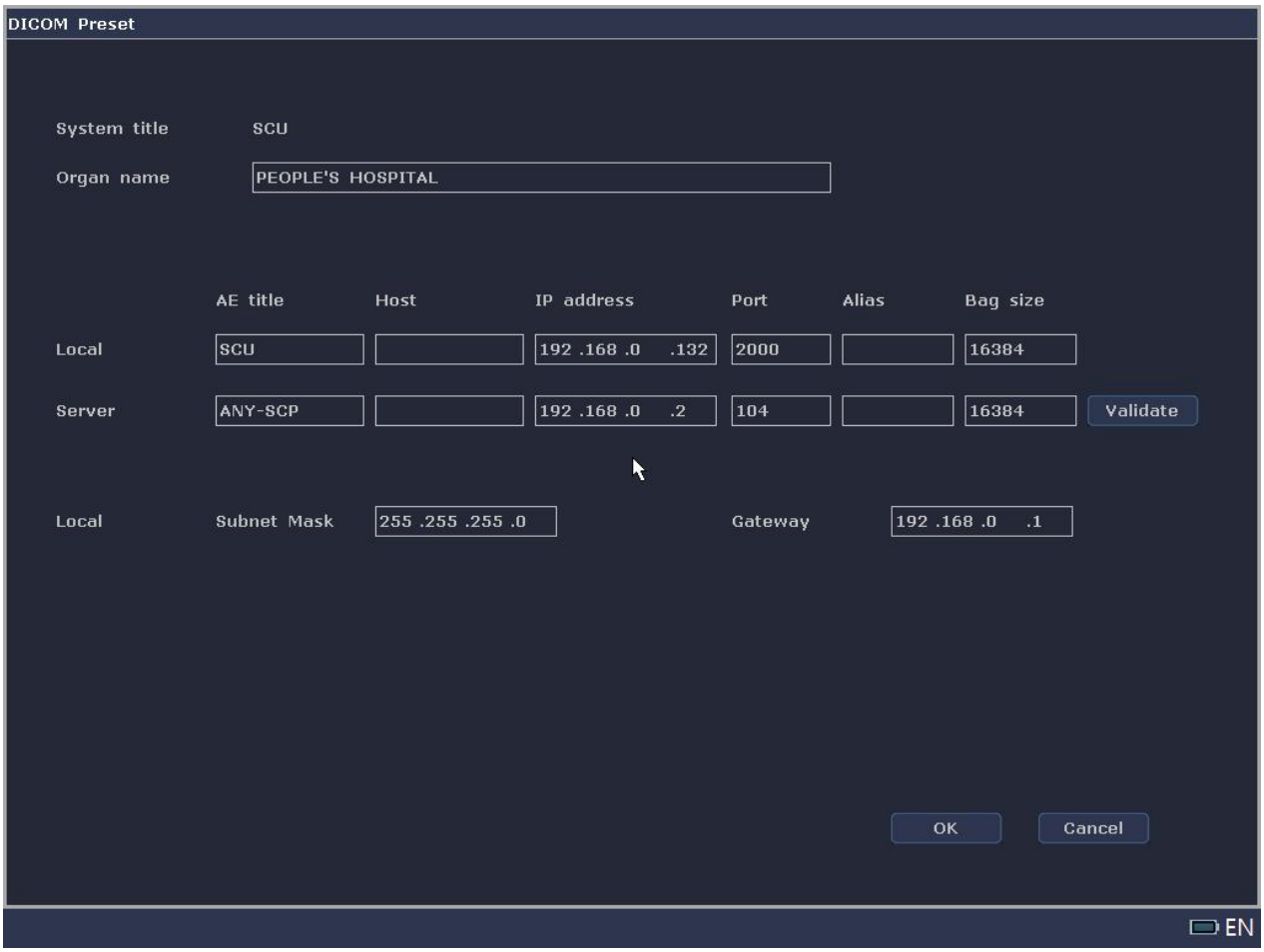


Figure 4-6 DICOM Presettings Screen

`		Descriptions
System title		The system title is the same as the local AE title by default.
Organ name		Enter the hospital's name.
Local	AE title	Enter the name of AE title and the system title changes with it.
	Hose	Enter the hose name of the system.
	IP address	Enter the IP address of the system.
	Port	Enter the port number of the system.
	Alias	Enter the alias of the system.
	Bag size	Enter the size of the PDU transmission pocket of the system.
	Subnet Mask	Enter the subnet mask of the system.
	Gateway	Enter the gateway of the system.
Server	AE title	Enter the name of AE title.
	Hose	Enter the hose name of the server.
	IP address	Enter the IP address of the server.
	Port	Enter the port number of the server.
	Alias	Enter the alias of the server.

	Bag size	Enter the size of the PDU transmission pocket of the server.
Validate		Click it to verify the connection between the system and the server after all information is provided.

Steps for connecting DIOCM server are as follows.

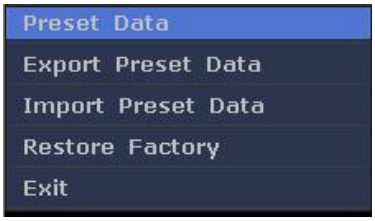
1. Connect the system to the network of the server with a cable.
2. Set the network of the system and the server. Input AE title, host, IP address and the information in the table above.
3. Click [Validate] to verify the connection between the system and the sever. A prompt box will pop up to indicate the verification information.
4. If the connection is successful, you can save the patient information and cines to the server.

Note

Ensure that the system is successfully connected to the DICOM server before use. Otherwise, the information can't be saved to the DICOM server.

4.6 Presetting the Data Import/Export

You can import or export the data in the system by the USB storage devices or restore the factory default setting in the Preset Data screen.



- After presetting the system, click [Export Preset Data] to export the data to the USB storage device.
- Click [Import Preset Data] to import the system settings data in the USB storage device to the system.
- Click [Restore Factory] to restore the system settings data to the factory default setting.

Note

You can only import the system settings data to the ultrasound system with the same type provided by the manufacturer.

4.7 System Information

You can view the hardware version, software version, probe information and other information in the System Info screen.

Chapter 5 Preparing for an Exam

You should enter the relevant information about the patient, select the appropriate probe and exam type before examining. A complete patient information helps to define the exam.

5.1 Registering a Patient

Press the **Patient** key on the control panel to enter the Patient Info screen, as shown in Figure 5-1.

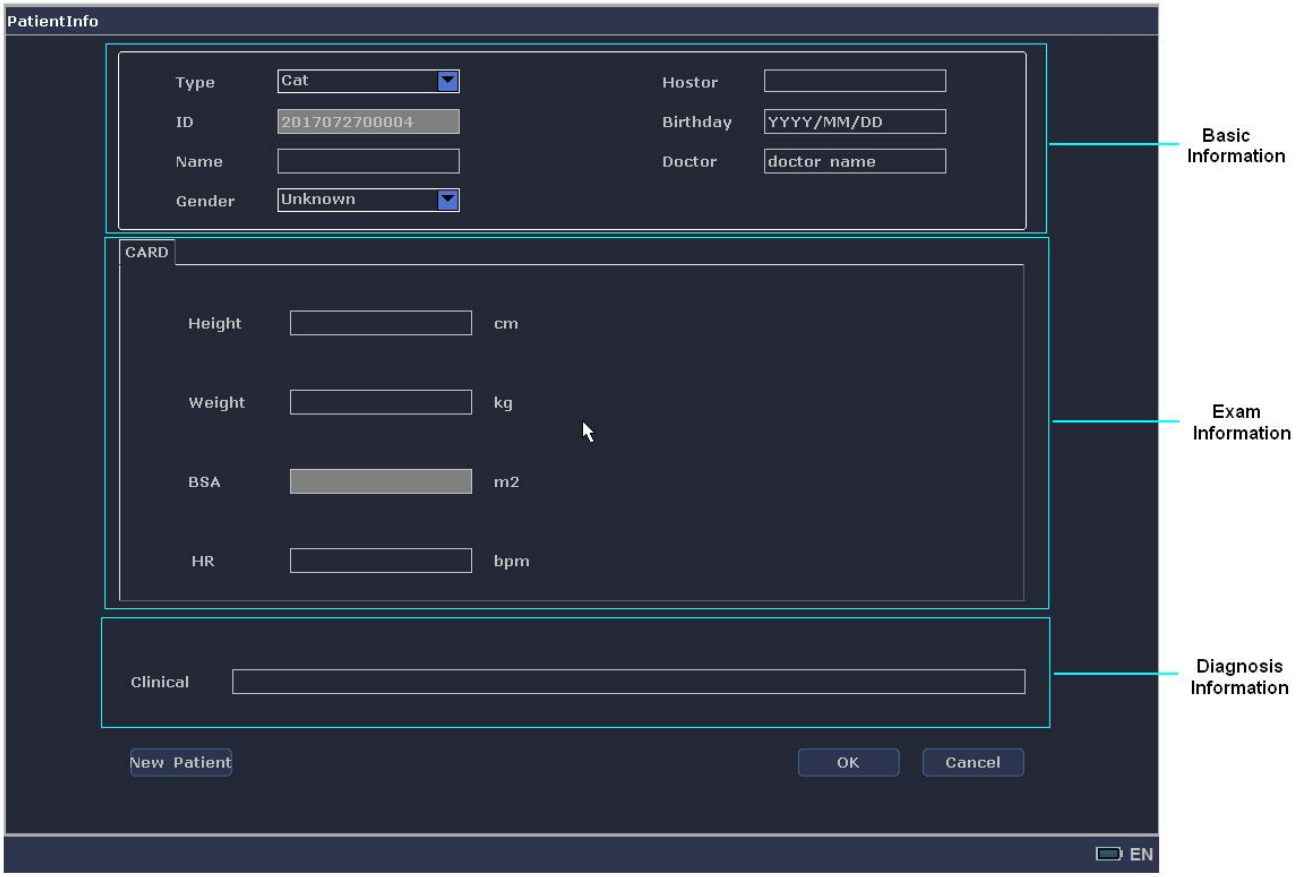


Figure 5-1 Patient Information Screen

Steps for creating a new patient are as follows.

1. Input the patient's basic information, such as patient name, patient ID, gender and date of birth by the keyboard.

Note

Patient ID is a very important identification. Once it is saved, you can't edit it.

2. Select the exam type and the exam information. For example, select [ABD] and input [Height] and [Weight].
   - You can input the patient's height and weight when selecting [ABD] and [CARD], BSA will be calculated by the formula preset in [Preset]-> [Measure Preset]-> [BSA] automatically.
   - You can input the [LMP] when selecting [OB], the system will calculate the GA and EDD automatically.

3. Input the diagnostic information in the textbox beside [Clinical] as necessary.
4. Click [OK] to save the patient information and return to the main screen.

5.2 Selecting the Probe and Exam Type

Press the **Probe/Exam** key on the control panel to enter the Select exam screen, as shown in Figure 5-2. Click the exam type in the list below the probe or click the probe to select it.

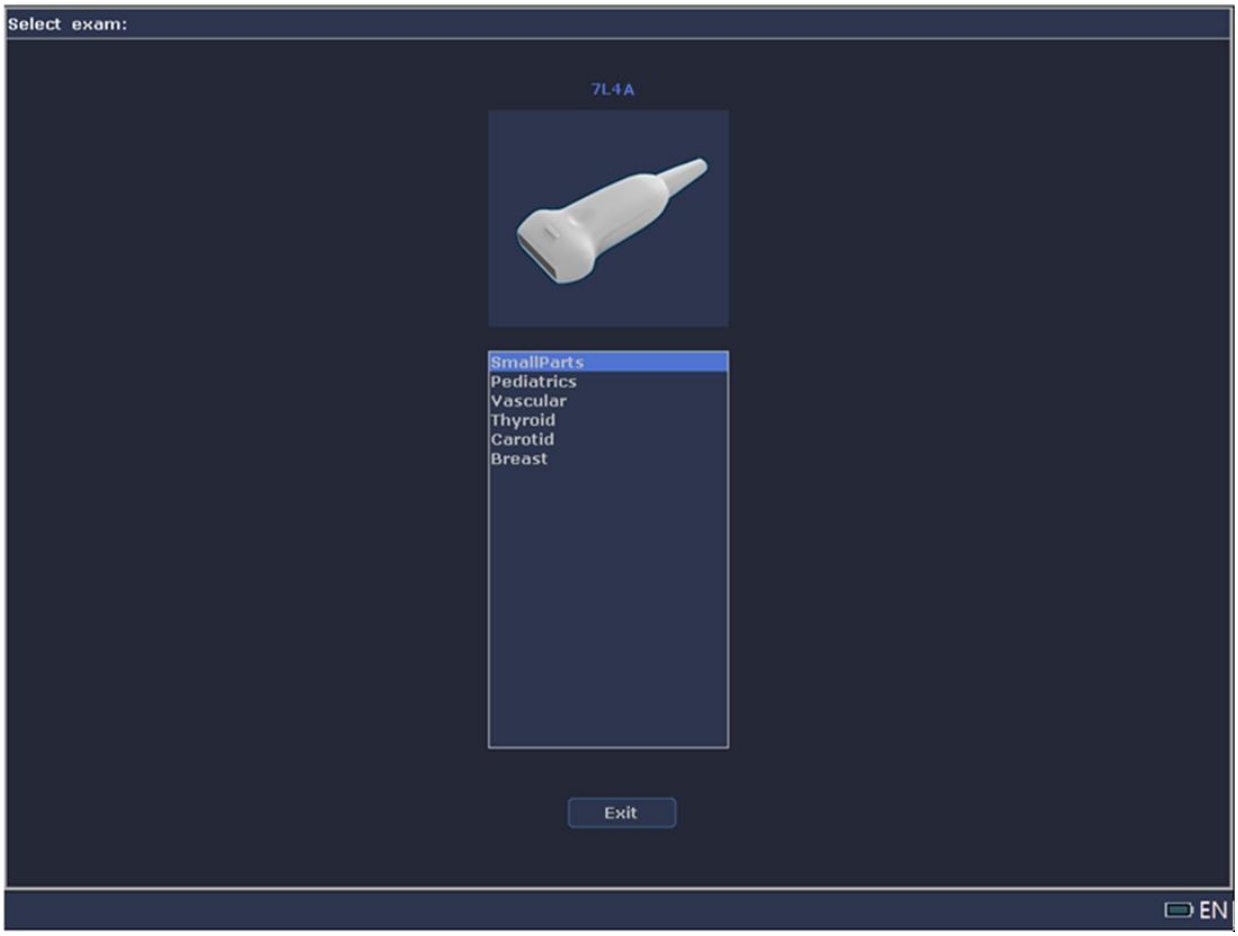


Figure 5-2 Probe and Exam Type Selection Screen

Note

Probe types and icons display on the LCD screen when the probe are connected. If the LCD screen displays nothing, check the connections of the probe. If problem still exists, please stop using the ultrasound system immediately and contact the manufacturer or the authorized service engineer.

5.3 Ending the Exam

press the **Patient** key, select,**[New Patient**] and [**OK**] to end current exam and start the next exam.

Chapter 6 Optimizing the Image

After the patient information, probe and exam type are selected, you can select the imaging mode to optimize the image for exact diagnosis.

6.1 B Mode

B mode is the most frequently used two-dimension imaging mode. It is intended to provide information of anatomical structure of soft tissue and the image is in gray color in this mode.

6.1.1 Entering the B Mode

Steps for entering the B mode are as follows.

1. Select the appropriate probe and exam type, and the system automatically enters the B mode, as shown in Figure 6-1.Or, press the **B** key on the control panel to enter the B mode from other modes.

Figure 6-1 B Mode Image

For details about the description of the main screen, refer to Section 2.8 Main Screen.

2. Optimize the image. For details, refer to Section 6.1.2 Optimizing the B Mode Image.

   To save the image parameter settings as the default setting, press the **Save IP** key on the control panel.

3. Select other image modes to exit the B mode.

6.1.2 Optimizing the B Mode Image

Methods of optimizing the B mode image are as follows.

- Select the B mode parameter on the menu at the top left of the screen by using the trackball, press the **Set key** to adjust it. Press the Menu key to display/hide this menu.
- Press the toolbar keys to adjust the corresponding parameters, and use the navigation key to turn up and down the page to change the adjustable image parameters of the current toolbar.

6.1.2.1 Adjusting the Gain

The B mode gain determines the amplifying factors of the received echoes and the brightness of the ultrasound image. The echoes are amplified with the same gain value regardless of depth.

Steps:

- Rotate the **Gain** knob clockwise to increase the value.
- Rotate the **Gain** knob anticlockwise to decrease the value.

6.1.2.2 Adjusting the TGC

TGC (Time Gain Compensation) is used to adjust the gain that allows compensation for attenuation of the echoes over time (depth).It is adjustable during the real time scan regardless of the imaging mode and display format.TGC balances the image so that the density of echoes is the same throughout the image.

Steps:

- Move the TGC slide pot left to dimmer the B mode image of the corresponding depth.
- Move the TGC slide pot right to brighten the B mode image of the corresponding depth.

6.1.2.3 Adjusting the Focus Position/Number

It is used to adjust the focal position and the focus number. The focus identified by a triangle displays in the right corner of the image.

Operation:

- Press the keys corresponding to **[Focus Position]** on the toolbar to change focus position.

The same method to adjust the Focus Number。

6.1.2.4 Adjusting the Frequency

The probe is capable of generating a broadband signal with a certain start frequency and a certain bandwidth.

Operation:

- Press the keys corresponding to **[Freq]** on the toolbar to adjust the frequency of the probe.

6.1.2.5 Adjusting the Depth

Depth is used to adjust the distance over which the B-Mode image is anatomized.

Operation:

- Press the **Depth** keys to adjust the depth.

6.1.2.6 Adjusting the Grayscale

The image is optimized by adjusting the grayscale, but some parameters in the B mode will be affected.
Operation:

- Press the keys corresponding to **[Gray Map]** on the toolbar to adjust the grayscale.

Note:

The gain and dynamic range vary with the grayscale.

6.1.2.7 Adjusting the Chroma

Chroma is used to colorize the gray scale image to enhance the discrimination capability.
Operation:

- Press the keys corresponding to **[Colorize]** on the toolbar to choose the color.

6.1.2.8 Adjusting the Dynamic Range

Dynamic range increases the adjustable range of contrast by enhancing the intensities of parts of the grayscale.
Operation:

- Press the keys corresponding to **[Dynamic Ra.]** on the toolbar to adjust the dynamic range.

6.1.2.9 Adjusting the Scan Range

Scan range is used to gain the maximum frame rate.

Operation:

- Press the keys corresponding to **[Scan Scope]** on the toolbar to adjust it.

6.1.2.10 Adjusting the Scan Density

Line density refers to the amount of ultrasound beam that makes up the image. Increasing the value of line density improves the resolution and decreases frame rate. Therefore, you have to balance the frame rate and the image quality when adjusting the line density.
Operation:

- Press the keys corresponding to **[Scan Density]** on the toolbar to adjust it.

6.1.2.11 Adjusting the Noise Repression

Noise repression is used to clear the noise caused by the low echo.

Operation:

- Press the keys corresponding to **[Speckle Reduction]** on the toolbar to adjust it.

6.1.2.12 Adjusting the Frame Persistance

Frame correlation is used to average consecutive frames to provide a smoother appearance with less noise. Use lower correlation values for fast-moving organs or tissues and higher correlation values for smoother appearance.
Operation:

- Press the keys corresponding to **[Freame Correlation]** on the toolbar to adjust it.

6.1.2.13 Adjusting the Line Average

Line average is used to adjust smoothness of the image. A higher line average brings lower contrast and smoother image.
Operation:

- Press the keys corresponding to **[Line Average]** on the toolbar to adjust it.

6.1.2.14 Enabling/Disabling the Compound Imaging

Compound imaging is used to acquire a series of overlapping image frames from substantially differing spatial directions and combining these images to reduce speckle and improve contrast resolution.
Operation:

- Press the keys corresponding to [**Space Compound**]] on the toolbar to enable or disable it.

6.1.2.15 Adjusting the Edge Enhance

Optimize the image by enhancing image contour to make image boundary more clear.

Operation:

- Press the keys corresponding to **[Edge Enhance]** on the toolbar to adjust it.

6.1.2.16 Adjusting the Image Enhance

Increase the image resoultion by reduce the speckle noise.

Operation:

- Press the keys corresponding to **[Image Enhance]** on the toolbar to adjust it.

6.1.2.17 Adjusting the Acoustic Power

Acoustic power is adjusted to increase or decrease the transmitting frequency of the probe.

Operation:

Press the keys corresponding to **[A. Power]** on the toolbar to adjust it.

6.2 Color Doppler Flow Imaging (Color) Mode

Color is a color flow imaging technology which adds the color-coded qualitative information concerning the relative velocity and direction of fluid motion in the B-Mode image.

6.2.1 Entering the Color Mode

Steps for entering the Color mode are as follows.

1. Select the appropriate probe and exam type, and optimize the B mode image.
2. Press the **Color key** on the control panel to enter the color mode, as shown in Figure 6-3.

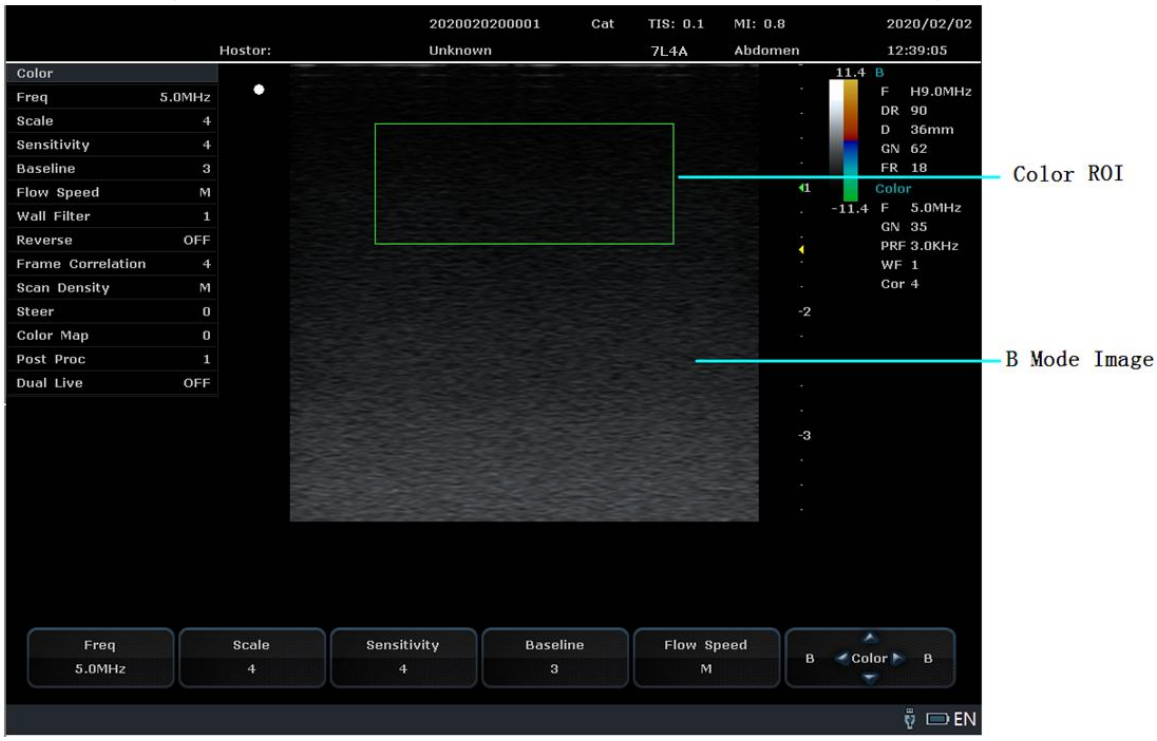


Figure 6-3 Color Doppler Mode Image

3. Adjust the color ROI
   Move the trackball to adjust the position of the color ROI. Press the **Set key** and move the trackball to adjust the size of the ROI, or press the **Set key** again to adjust the position of ROI.
4. Optimize the Color mode image. For details, refer to Section 6.2.2 Optimizing the Color Mode Image.Press the **Save IP** key to save the parameter settings in the Color mode as the default settings.
5. Press the **Color key** again to exit the Color mode.

6.2.2 Optimizing the Color Mode Image

Methods for optimizing the Color mode image are as follows.

- Select the Color mode parameter on the menu at the top left of the screen by using the trackball, press the Set key to adjust it. Press the Menu key to display/hide this menu.
- Press the toolbar keys to adjust the corresponding parameters, and use the navigation key to turn up and down the page to change the adjustable image parameters of the current toolbar.

6.2.2.1 Adjusting the Gain

Chrominance gain control color signal strength.
Steps:
- Rotate the **Gain** knob clockwise to increase the value.
- Rotate the **Gain** knob anticlockwise to decrease the value.

6.2.2.2 Adjusting the Frequency

The working frequency of the probe can be adjusted.

Operation:
- Press the keys corresponding to **[Freq]** on the toolbar to adjust it.

6.2.2.3 Adjusting the Scale

The value of scale on the color map can be adjusted.
Operation:
- Press the keys corresponding to **[Scale]** on the toolbar to adjust it.

6.2.2.4 Adjusting the Sensitivity

The higher the sensitivity is, the lower the frame rate.
Operation:
- Press the keys corresponding to **[Sensitivity]** on the toolbar to adjust it.

6.2.2.5 Adjusting the Baseline

Baseline is used to unwraps the alias in the color flow imaging, and display higher velocities without reversal of colors. Baseline represents the position of zero velocity or frequency. The velocity range in one direction can be increased or decreased by adjusting the baseline. The maximum value and the minimum value of the flow speed display on the top and bottom of the color map respectively.
Operation:
- Press the keys corresponding to **[Baseline]** on the toolbar to adjust it.

6.2.2.6 Adjusting the Flow Speed

The flow speed that can be detected in the Color mode is adjusted.
Operation:
- Press the keys corresponding to **[Flow Speed]** on the toolbar to adjust it.

6.2.2.7 Adjusting the Wall Filter

Wall filter is used to filter the low frequency noise from the tissue activities of the patient and clear

the fake image.
Operation:
- Press the keys corresponding to **[Wall Filter]** on the toolbar to adjust it.

6.2.2.8 Enabling/Disabling the Color Invert

Flow invert is used to view blood flow from a different perspective.
Operation:
- Press the keys corresponding to **[Reverse]** on the toolbar to enable or disable it.

6.2.2.9 Adjusting the frame average

Frame correlation is used to average consecutive frames to provide a smoother appearance with less noise. Use lower frame correlation values for fast-moving organs or tissues and higher correlation values for smoother appearance.
Operation:
- Press the keys corresponding to **[Frame Correlation]** on the toolbar to adjust it.

6.2.2.10 Adjusting the Scan Density

density improves the resolution and decreases frame rate. Therefore, you have to balance the frame rate and the image quality when adjusting the line density.
Operation:
- Press the keys corresponding to **[Scan Density]** on the toolbar to adjust it.

6.2.2.11 Adjusting the Steer Angle

Steer angle is used to adjust the angle of the color ROI.

Operation:
- Press the keys corresponding to **[Steer]** on the toolbar to adjust it.

The feature is only available with the linear probe.

6.2.2.12 Adjusting the Color Map

Color map is used to select the method for the color-coding of blood flows.
For the color flow image, the change of the color tone represents the change of the speed rate. Darker color tone represents the lower speed rate and vice versa. And the red and blue color represent the different flow direction respectively.
Operation:
- Press the keys corresponding to **[Color Map]** on the toolbar to adjust it.

6.2.2.13 Adjusting the Post-Process

Post-process is used to optimize the quality of the image.
Operation:

- Press the keys corresponding to **[Post Proc]** on the toolbar to adjust it.

6.2.2.14 Adjusting the Acoustic Power

Acoustic power is adjusted to increase or decrease the transmitting frequency of the probe.
Operation:

- Press the keys corresponding to **[A. Power]** on the toolbar to adjust it.

6.2.2.15 Enabling/Disabling the Dual Real Time Mode

Dual real time mode can display the dual real time mode image simultaneously. The left part displays the B mode image and the right part is the Color mode image.
Operation:

- Press the keys corresponding to **[Dual Live]** on the toolbar to enable or disable it.

6.3 PDI Mode

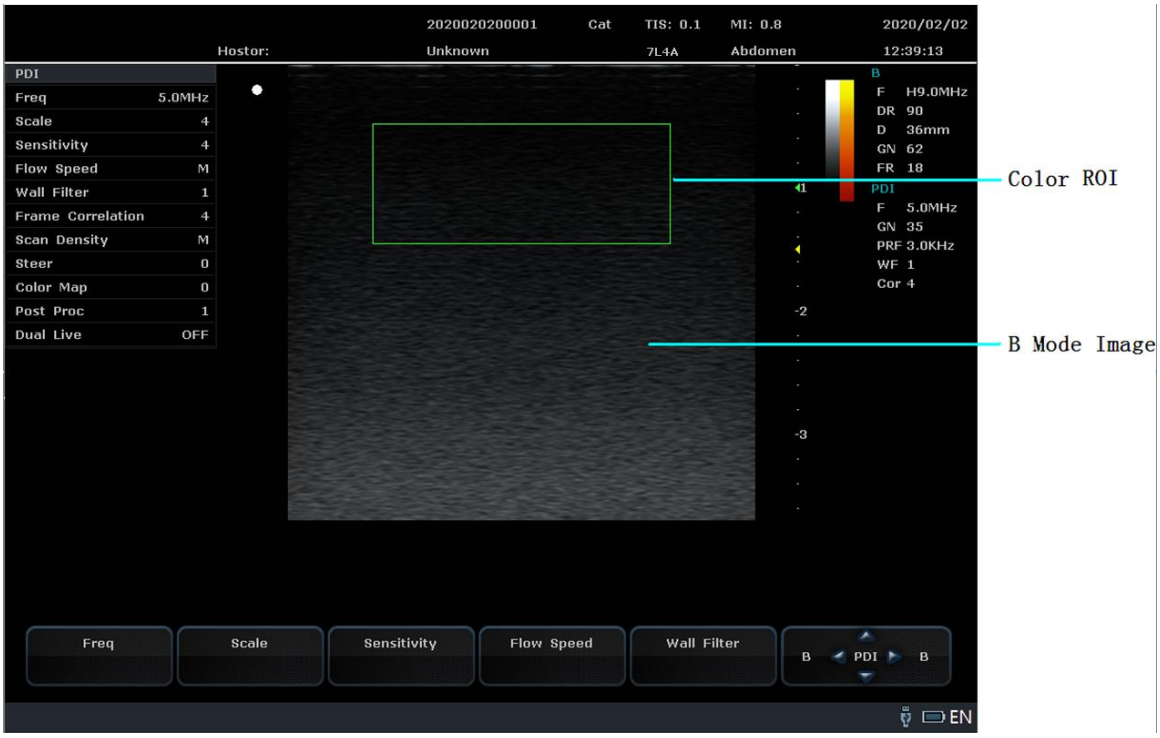


Figure 6-5 PDI Mode Image

PDI (Power Doppler Imaging) is a color flow imaging technology which adds the flow signal in the Color mode image. PDI uses the number and amplitude of red blood cell going through in the flow to create the color-coded imaging. The flow with slow velocity and small rate could be displayed in PDI. Therefore, the

flow with a higher sensitivity can be detected without overlaying any flows with high velocity.

6.3.1 Entering the PDI Mode

Steps for entering the color mode are as follows.

1. Select the appropriate probe and exam type, and optimize the B mode image.
2. Press the **Color** key on the control panel to enter the Color mode;
3. Press the keys corresponding to **[PDI]** on the toolbar to enter the PDI mode, as shown in Figure 6-5.
4. Adjust the color ROI.
   Move the trackball to adjust the position of the color ROI.
   Press the Set key and move the trackball to adjust the size of the ROI, or press the Set key again to adjust the position of ROI.
5. Optimize the PDI mode image. For details, refer to Section 6.3.2 Optimizing the PDI Mode Image.Press the Save IP key to save the parameter settings in the PDI mode as the default settings.
6. Press the Other image mode key to exit the PDI mode.

6.3.2 Optimizing the PDI Mode Image

Methods for optimizing the PDI mode image are as follows.

- Select the PDI mode parameter on the menu at the top left of the screen by using the trackball, press the Set key to adjust it. Press the Menu key to display/hide this menu.
- Press the toolbar keys to adjust the corresponding parameters, and use the navigation key to turn up and down the page to change the adjustable image parameters of the current toolbar.

6.4 M Mode

M mode is generally used for cardiac applications. In the M mode, you can position the M-line in the 2D image on the anatomy of interest, and then learn about the tissue motion along that line in an M-mode trace.

6.4.1 Entering the M Mode

Steps for entering the M mode are as follows.

1. Select the appropriate probe and exam type, and optimize the B mode image.
2. Press the **M** key on the control panel to enter the M mode, as shown in Figure 6-7.

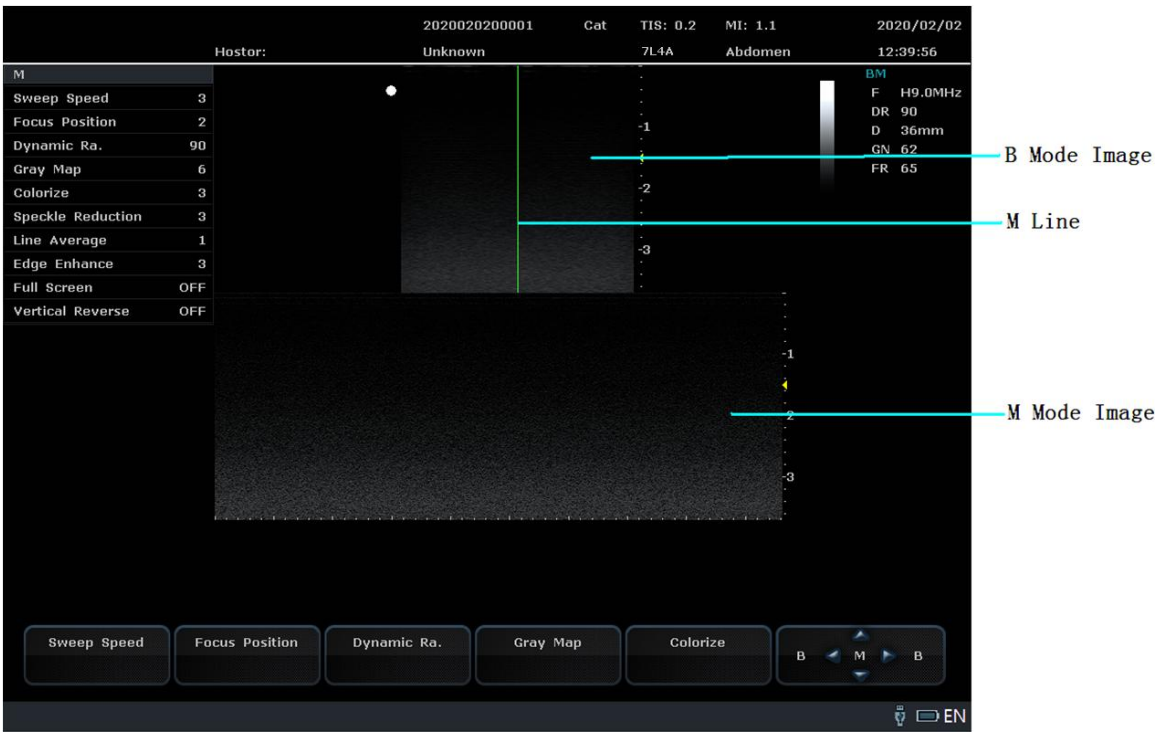


Figure 6-7 M Mode Image

- M-line: Displays the position of the M-line.
- X-axis: Indicates the time.
- Y-axis: Indicates the position or depth of the tissue structure.

3. Adjust the position of the M-line.
4. Optimize the M mode image. For details, refer to Section 6.4.2 Optimzing the M Mode Image. Press the **Save IP** key to save the parameter settings in the M mode as the default settings.
5. Press the **M** key again to exit the M mode.

6.4.2 Optimzing the M Mode Image

Methods for optimizing the M mode image are as follows.

- Select the M mode parameter on the menu at the top left of the screen by using the trackball, press the Set key to adjust it. Press the Menu key to display/hide this menu.
- Press the toolbar keys to adjust the corresponding parameters, and use the navigation key to turn up and down the page to change the adjustable image parameters of the current toolbar.

6.4.2.1 Adjusting the Gain

M gain controls the overall brightness of the M trace.
Steps:

- Rotate the **Gain** knob clockwise to increase the value.
- Rotate the **Gain** knob anticlockwise to decrease the value.

6.4.2.2 Adjusting the Depth

Depth is used to adjust the distance over which the M mode image is anatomized.
Operation:
Press the **Depth** key to adjust the depth.

6.4.2.3 Adjusting the Sweep Speed

Sweep speed is used to set the sweep speed of the M trace. Faster speed is suitable to view the motion.
Operation:

- Press the keys corresponding to **[Sweep Speed]** on the toolbar to adjust it.

6.4.2.4 Adjusting the Focus Position

Focal position is used to adjust the position of the ultrasound beam. The focus displays as a triangle on the scale.
Operation:

- Press the keys corresponding to **[Focus Position]** on the toolbar to adjust it.

6.4.2.5 Adjusting the Dynamic Range

Dynamic Range increases the adjustable range of contrast by enhancing the intensities of parts of the grayscale.

- Press the keys corresponding to **[Dynamic Ra.]** on the toolbar to adjust it.

6.4.2.6 Adjusting the Grayscale

Grayscale is adjusted to correct the image, but the display of information in the M mode may be affected.
Operation:

- Press the keys corresponding to **[Gray Map]** on the toolbar to adjust it.

6.4.2.7 Adjusting the Chroma

Chroma is used to colorize the grayscale image.
Operation:

- Press the keys corresponding to **[Colorize]** on the toolbar to adjust it.

6.4.2.8 Adjusting the Speckle Reduction

Speckle Reduction is used to clear the low frequency echo cause by noise.

Operation:

- Press the keys corresponding to **[Speckle Reduction]** on the toolbar to adjust it.

6.4.2.9 Adjusting the Line Average

Line Average is used to average consecutive line to provide a smoother appearance with less noise.
Use lower line average values for fast-moving flow and higher line average values for smoother appearance.

Operation:

- Press the keys corresponding to **[Line Average]** on the toolbar to adjust it.

6.4.2.10 Adjusting the Edge Enhance

Edge enhance is used to distinguish the image outline and optimize the smoothness of the image edge.
Operation:
Press the keys corresponding to **[Edge Enhance]** on the toolbar to adjust it.

6.4.2.11 Enabling/Disabling the Full-Screen Display

Full-screen display is used to display the image in full screen.
Operation:

- Press the keys corresponding to **[Full Screen]** on the toolbar to enable or disable it.

6.4.2.12 Adjusting the Acoustic Power

Acoustic power is adjusted to increase or decrease the transmitting frequency of the probe.
Operation:

- Press the keys corresponding to **[A. Power]** on the toolbar to adjust it.

6.5 PW Mode

Pulsed Wave Doppler (PW) is a Doppler mode that measures velocity in a PW sample volume and displays that information in a spectral trace with audio output.

6.5.1 Entering the PW Mode

Steps for entering the PW mode are as follows.

1. Select the appropriate probe and exam type, and optimize the B mode image.
2. Press the **PW** key on the control panel to enter the PW mode, as shown in Figure 6-9.

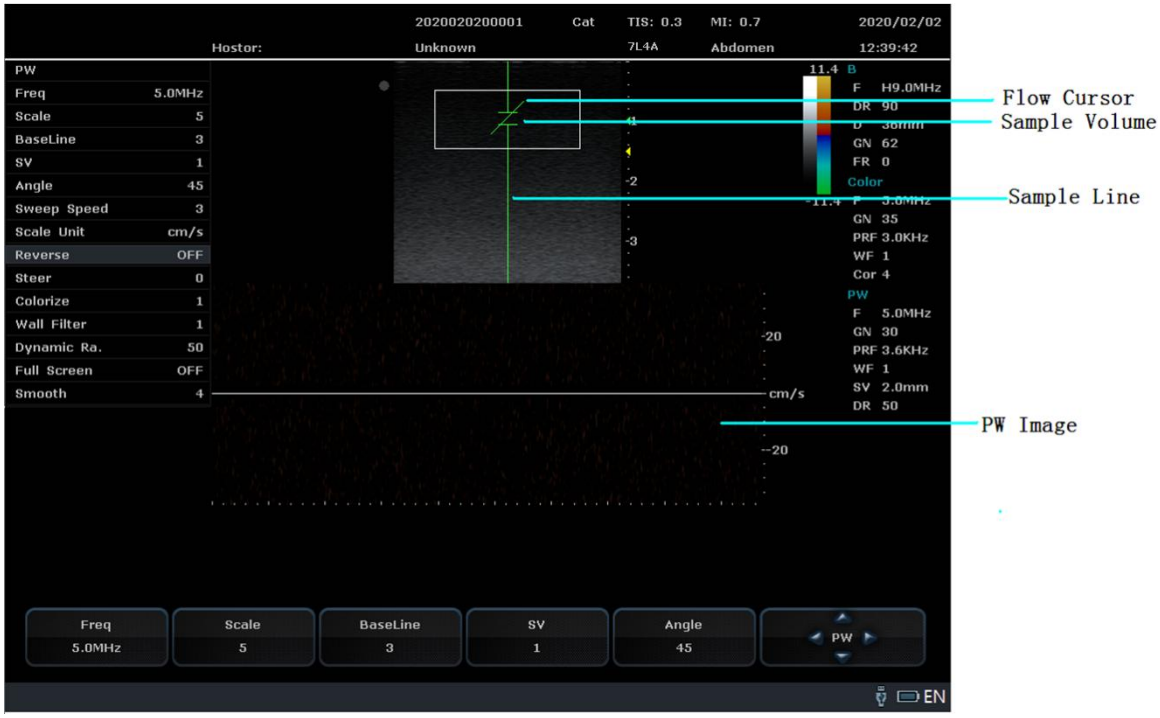


Figure 6-9 PW Mode Image

- The Spectral Doppler line and the sample volume gate are used to locate the qualitative analysis on the image.
- The flow cursor needs to be adjusted parallel to the flow when measuring the velocity.
- X-axis: Indicates the time.
- Y-axis: Indicates Doppler frequency scale, including a positive and negative indicator.

3. Adjust the position and angle of the spectral Doppler line.
   - Move the trackball to adjust the position of the spectral Doppler line.
   - Press“**Steer-**”or“**Steer+**”key corresponding to [Steer] to adjust the angle of the spectral Doppler line.
4. Adjust the sample volume and flow cursor.
   - Move cursor to [SV] menu item and press **Set key** to adjust the sample volume.
   - Press the keys corresponding to **[SV]** on the toolbar to adjust SV size.
   - Press the keys corresponding to **[Angle]** on the toolbar to adjust the direction of the flow cursor.
5. Optimize the PW mode image. For details, refer to Section 6.5.2 Optimizing the PW Mode Image.
   Press the **Save IP** key to save the parameter settings in the PW mode as the default settings.
   Press the keys corresponding to **[Volume]** on the toolbar to adjust the Doppler sound.
6. Press the **PW** key again to exit the PW mode.

6.5.2 Optimizing the PW Mode Image

Methods for optimizing the PW mode image are as follows.

- Select the PW mode parameter on the menu at the top left of the screen by using the trackball, press the Set key to adjust it. Press the Menu key to display/hide this menu.
- Press the toolbar keys to adjust the corresponding parameters, and use the navigation key to turn up and down the page to change the adjustable image parameters of the current toolbar.

6.5.2.1 Adjusting the Gain

Adjust PW gain can increase or decrease received signals,the brightness will changed accordingly.
Steps:

- Rotate the **Gain** knob clockwise to increase the value.

- Rotate the **Gain** knob anticlockwise to decrease the value.

6.5.2.2 Adjusting the Scale

Scale is adjusted to change the range of the speed displayed.
Operation:
- Press the keys corresponding to **[Scale]** on the toolbar to adjust it .

6.5.2.3 Adjusting the Baseline

Baseline represents the position of zero velocity or frequency.The velocity range in one direction can be increased or decreased by adjusting the baseline.
Operation:
- Press the keys corresponding to **[Baseline]** on the toolbar to adjust it .

6.5.2.4 Adjusting the Sample Volume

Used to adjusted the position and width of the sample valume gate,current SV value is displayed on the right side image parameters area. Small sample valume gate can help get more accurate result,larger sample valume gate expand the detection range.
Operation:
- Press the keys corresponding to **[SV]** on the toolbar to adjust it .

6.5.2.5 Adjusting the Angle

Angle is used to adjust the angle of the flow cursor.
Operation:
- Press the keys corresponding to **[Angle]** on the toolbar to adjust it .

6.5.2.6 Adjusting the Scan Speed

Time scale and the refresh speed of the spectrum vary with the scan speed.
Operation:
- Press the keys corresponding to **[Sweep Speed]** on the toolbar to adjust it .

6.5.2.7 Adjusting the Unit of Speed

It is used to select the unit of the flow speed.
Operation:
- Press the keys corresponding to **[Scale Unit]** on the toolbar to adjust it .

6.5.2.8 Enabling/Disabling the Spectrum Invert

Spectrum invert is used to view the flow velocity from a different perspective. The spectrum image above the baseline represents the flow movement to the probe and the spectrum image below the baseline represents the flow movement against the probe. If the spectrum invert is On, the spectrum image above and below the baseline are inverted.
Operation:

- Press the keys corresponding to **[Reverse]** on the toolbar to enable or disable it.

6.5.2.9 Adjusting the Steer

Steer angle is used to adjust the angle of the spectral Doppler line.
Operation:

- Move cursor to [Steer] menu item and press **Set key** to adjust the angle of the spectral Doppler line.
- Press the Keys corresponding to **[Steer]** on the toolbar to adjust the angle of the spectral Doppler line.

The feature is only available with the linear probe.

6.5.2.10 Adjusting the Chroma

Chroma is used to colorize the grayscale image.
Operation:

- Press the keys corresponding to **[Colorize]** on the toolbar to adjust it .

6.5.2.11 Adjusting the Wall Filter

Wall filter is used to filter the low frequency noise from the tissue activities of the patient and clear the fake image.
Operation:

- Press the keys corresponding to **[Wall Filter]** on the toolbar to adjust it .

6.5.2.12 Adjusting the Dynamic Range

Dynamic range increases the adjustable range of contrast by enhancing the intensities of parts of the grayscale.
Operation:

- Press the keys corresponding to **[Dynamic Ra.]** on the toolbar to adjust it .

6.5.2.13 Enabling/Disabling the Full-Screen Display

Full-screen display is used to display the image in full screen.

Operation:

- Press the keys corresponding to **[Full Screen]** on the toolbar to enable or disable it.

6.5.2.14 Adjusting the Acoustic Power

Acoustic power is adjusted to increase or decrease the transmitting frequency of the probe.
Operation:

- Press the keys corresponding to **[A. Power]** on the toolbar to adjust it .

6.5.2.15 Adjusting the Spectrum Smoothness

Spectrum smoothness is used to decrease the spectrum noise and make the image display smoother.
Operation:

- Press the keys corresponding to **[Smooth]** on the toolbar to adjust it .

Chapter 7 Processing the Images

You can work with the acquired images by using the features provided by the ultrasound system, such as reviewing, magnifying and freezing the image, cropping the cine, and making annotations on the image.

7.1 Displaying the image

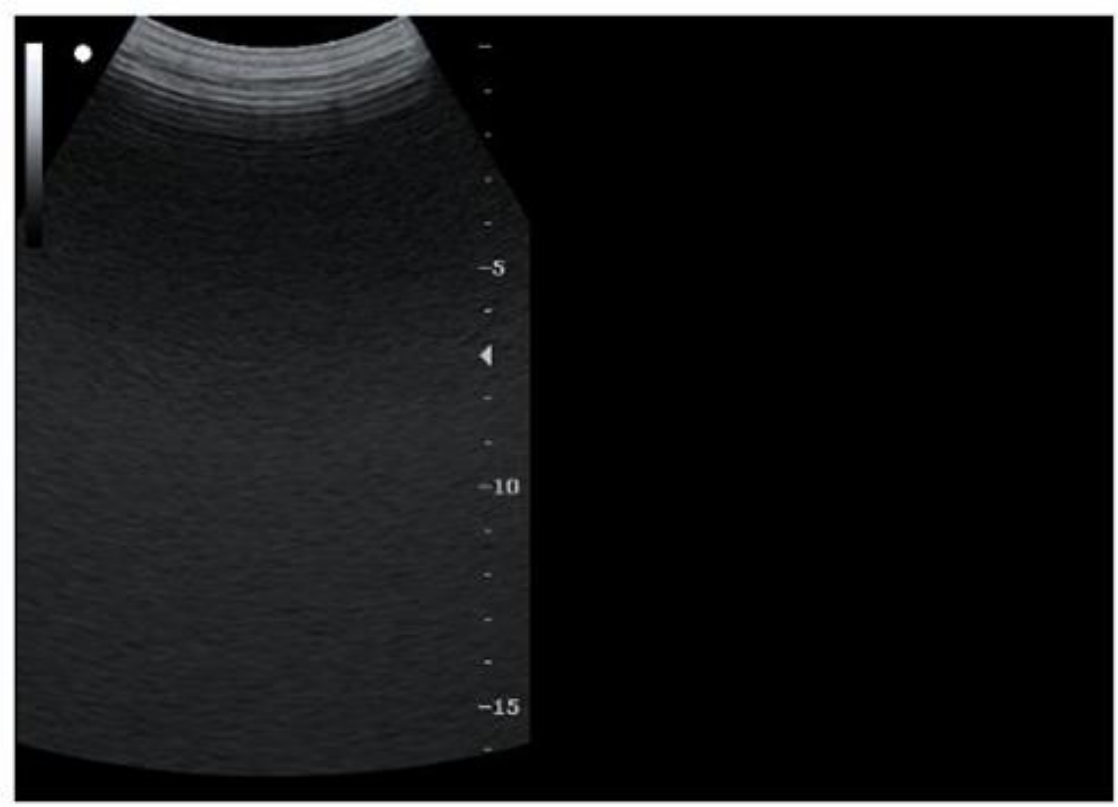
7.1.1 Reversing the Image

- Press“Horizontal Reverse”on the B image mode menu to reverse the 2D image left or right.
- Press“Vertical Reverse”on the B image mode menu to reverse the 2D image up or down.

7.1.2 Dual-splitting Display

You can position two images side by side on the screen to compare the images acquired at different times. Steps are as follows.

1. Press **B** or **Color** key on the control panel to enter the real time scan.
2. Press **Dual** key to enter the dual-splitting display.
   The image is spitted by two parts with a real time scan on the left and no image on the right.



3. Press **Dual** key again to freeze the real time scan and unfreeze the frozen image.
   The probe direction mark is highlighted in the a real time scan and becomes gray in the frozen mode.
4. Press other imaging mode keys to exit the dual-splitting display.

7.2 Magnifying the Image

You can magnify an interest region on the imaging area.
Steps are as follows.

1. Press the **B** key to enter the real time B mode.
2. Press the **Zoom** key on the control panel to activate the magnification feature.
3. A ROI displays on the imaging area. Adjust the size of ROI by moving the trackball and press the **Set key** to confirm. Adjust the position of ROI by moving the trackball.
4. Press the **Set key** again to adjust the size of ROI.
5. Press the **Zoom** key to magnify the interest region.You can adjust the interest region, make annotation on the region or perform measurement.
6. Press the **Zoom** key again to exit the magnification feature.
7. You can press the **Zoom** key to directly magnify the image in the Color/PDI mode, and press **Zoom** key again to exit it.

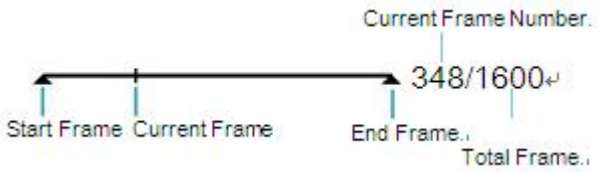
7.3 Freezing the Image

Press the **Freeze** key on the control panel, ❄ displays on the screen and the current real time scan is frozen.

You can perform measurement, make annotation or enter the cine mode in the frozen mode.
Press the **Freeze** key again to restore to the real time scan.

7.4 Viewing and Cropping the Cine

The cine review is available by pressing the **Freeze** key in the real time scan, and schedule bar appears on the screen.



You can review or crop the cine.

7.4.1 Reviewing the Cine

- Reviewing it manually
  You can review the cine frame by frame by using the trackball.
- Reviewing it automatically
  Press **[Auto Play]** menu item to playback the cine automatically and you can adjust the review speed during playback.To stop playback, set the value of auto play as X0.

7.4.2 Cropping the Cine

Steps are as follows.

1. Move the trackball to select the starting point, press **[Set First Frame]** to confirm.

2. Move the trackball to select the end point, and press **[Set End Frame]** to confirm.
3. Press **[Auto Play]** menu item to review the cropped cine.

7.5 Annotating the Image

The annotation feature provides you to type or add an annotation from the predefined annotation library. Arrows and body marks are also provided to annotate the image. You can make annotations, arrows or bodymark on the image in the frozen or real time scan.

7.5.1 Text Annotation

Steps are as follows.

1. Press the **Comment** key on the control panel to activate the annotation. Annotation library appears on the left of the screen.
2. Select the desired annotation by using the trackball and press the **Set key** to add the annotation on the image. You can also type an annotation into the annotation library.
3. Press the **Set key**, and move the annotation to the desired position by using the trackball and then press the **Set key** again to confirm.
4. If necessary, repeat step 2 - 3 to add more annotations.

Press the **Comment** key again to exit the annotation status.You can define the annotation in the Preset screen. For details, refer to Section 4.4 Presetting the Annotations.

7.5.2 Arrow Annotation

Steps are as follows.

1. Press the **Arrow** key on the control panel to activate the annotation.
2. An arrow appears on the screen. Adjust the position of the arrow by using the trackball and press the **Set key** to confirm.You can also adjust the direction of the arrow by rotating the **Angle** knob.
3. If necessary, repeat step 2 to add more annotations.

Press the **Arrow** key again to exit the annotation status.

7.5.3 Bodymark Annotation

Steps are as follows.

1. Press the **Body Mark** key on the control panel to activate the annotation and a body mark appears on the screen.
2. Select one body mark by using the trackball and press the **Set key** to confirm. The selected body mark displays on the bottom left of the screen.You can also adjust the direction of the probe by rotating the **Angle** knob.

Press **Set** or **Body Mark** key again to exit the annotation status.

7.5.4 Deleting the Annotation

- Deleting the text annotation
  When you are adding a text annotation, move the trackball to the desired text annotation and press **Backspace** key on the keyboard to delete one annotation or press **Clear** key on the keyboard to delete all annotations.

When you have added the text annotation, press **Backspace** key to delete the annotations from the last one to the first one, or press **Clear** key to delete all the annotations.
Delete all the annotations: It is not dialog box interface. press the **Clear** key on the keyboard to empty all annotation, including text, arrow, body scale, measuring scale and results.Please operate carefully!
Arrow, body scale, measuring scale and results.Please operate carefully!
If you want to delete all the annotations after freezing the image, make a setting in Preset screen-> [Comment Preset] -> [clear comments while unfreeze image].

- Deleting the body mark annotation：Refer to Deleting the text annotation.
- Deleting the arrow annotation：Refer to Deleting the text annotation.

It is not dialog box interface. press the Clear on the keyboard to empty all annotation, including text, arrow, body scale, measuring scale and results.Please operate carefully!

Chapter 8 Measurements and Calculations

You can perform measurements on the ultrasound image, and the system automatically calculates the measurement results. You can use the results to conclude the precise diagnostic information.
General measurements and specific measurements are provided.
Before measuring, you should be familiar with the measurement screen, measurement keys and menus and preset the necessary parameters used in measurements.

8.1 Measurement Screen and Keys

- Measurement Screen

Figure 8-1 Measurement Screen

Measurement Menu: Displays the measurement items and sub-items. For details, refer to Section 8.2 Measurement Menu.

■ Keys

The following keys are used to perform the measurements and calculations

Name	Functions
Caliper	Used to activate the general measurement and calculation
Measure	Used to activate the specific measurement and calculation
Trackball	Used to select the measurement item, Or, used to move the measurement marker during the measurement.
Set	Used to confirm the operation. Or, Used to fix the position of the measurement marker during the measurement
Change	Used to move to the next measurement point
Clear	Used to remove all the measurement and calculation results on the screen.
Report	Used to view the measurement report

8.2 Measurement Menu

Caliper Measure

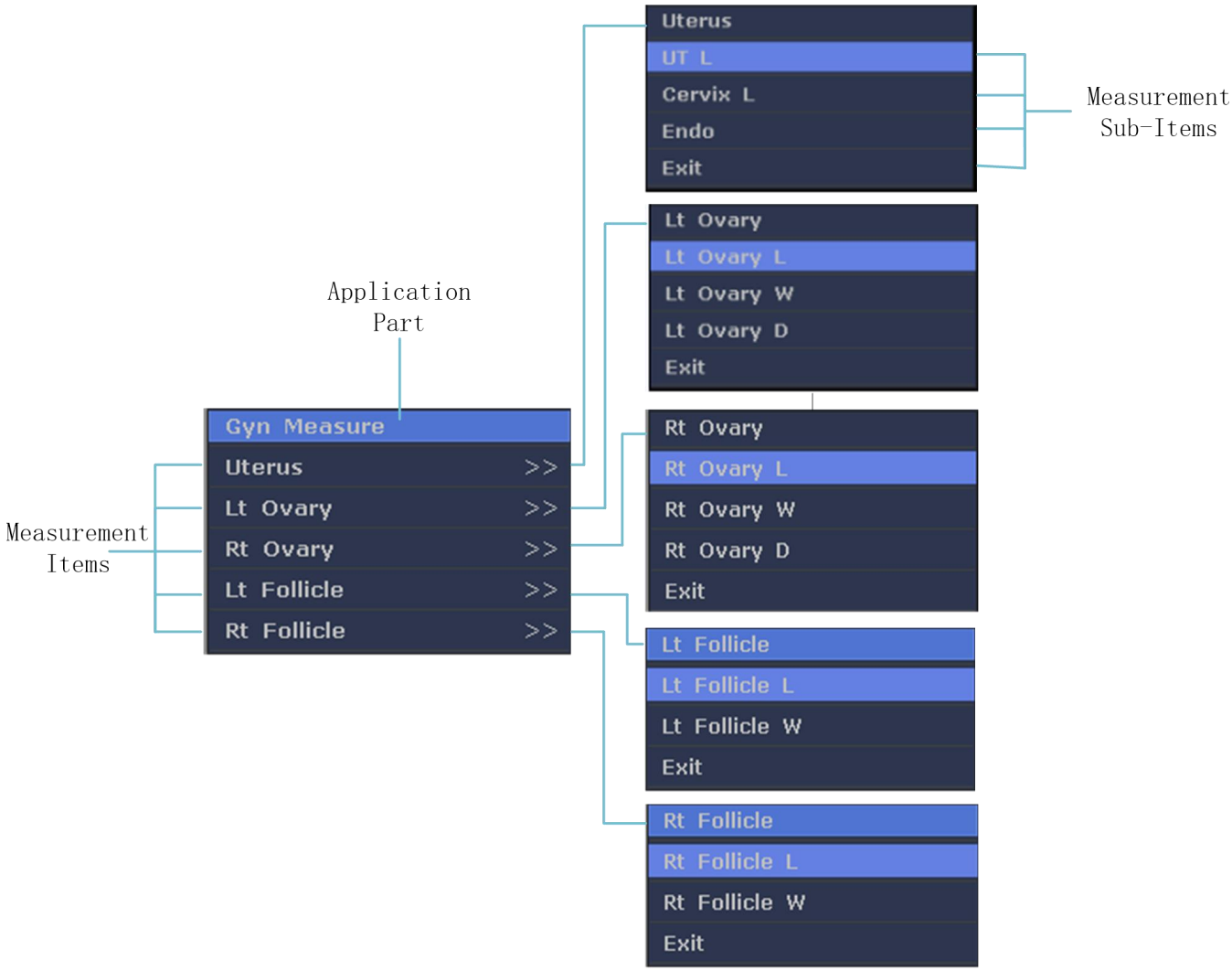


Figure 8-2 Measurement Menu

The measurement menu consists of exam type, measurement items and measurement sub-items.

- Exam Type

  The name of the exam type is displayed. You can select it on the Probe and Exam Type screen. The measurement items vary with the exam type.

- Measurement Items and Sub-items

  The measurement items display under the exam type. >> after a measurement item indicates you can select it to display the sub-items. Move the trackball on this measurement item and press the **Set key** to display them.

  Measurement items and sub-items also display in the toolbar. You can press the corresponding buttons to activate it. The following sections are described according to the measurement menu.

8.3 Measurement Error

Ultrasound scan and measurements are highly precise, but the measurement errors can still exist due to the features of the ultrasound signal, the scanning structures and the features of the tissues and liquid. You can follow the methods below to decrease the errors as little as possible.

- Select the probe in accordance with the depth range of the tissue to be measured.
- Adopt the higher image magnification during the measurement.

- Select the appropriate imaging mode and optimize the image quality.
  The following measurement errors should be considered during the measurements. The measurement accuracy is only valid in the range shown as below.
- Error of distance measurement: within ±5%
- Error of depth measurement: within ±5%
- Error of time measurement: within ±5%
- Error of sweep (slope) measurement: within ±15%
- Error of area measurement: within ±8%
- Error of circumference measurement: within ±4%
- You should make a diagnosis with a clinical analysis and the measurement results together.

8.4 General Measurement

The measurement results of the general measurements are not recorded in the measurement report, but all the specific measurements are based on the general measurements.
General measurements can be performed in the B mode, M mode, Color/PDI mode and PW mode.
And the operations of Color/PDI mode and the B mode measurements are similar. These two modes are called 2D mode hereafter.

8.4.1 2D Mode Measurements

8.4.1.1 Distance

It is used to measure the distance between two points on the image.

Operation:

1. Press the **Caliper** key on the control panel to activate the measurement, and the measurement menu displays on the top left of the screen.
2. Select **[Distance]** on the menu by moving the trackball and press Set key to confirm. A marker displays on the image.
3. Move the marker to the starting point by using the trackball, press **Set key** to fix the marker and the second marker displays.You can also press **Change** key on the control panel and move the trackball to adjust the starting point.
4. Move the second marker to the end point by using the trackball and press **Set key**. A line connects the two points, and the measurement result displays in the result box.
5. If necessary, you can repeat step 2-4 to perform the next distance measurement.

8.4.1.2 Area and Circumference

If the target object is similar with an ellipse, ellipse measurement can be performed to measure the area and circumference. If the target object is irregular, trace measurement can be performed to measure the area and circumference.

- Ellipse
  It is used to measure the circumference and area of a blocked area on the image.

Operation:

1. Press the **Caliper** key to activate the measurement,and the measurement menu displays on the top left of the screen.
2. Select **[Circle/Area]** on the menu by moving the trackball and press **Set key** to confirm. Select **[Ellipse]** on

the pop-up menu. A marker displays on the image.
3. Move the marker to the starting point by using the trackball, press **Set key** to fix the marker and the second marker displays.
4. Move the second marker to the end point by using the trackball and press **Set key**. An ellipse displays on the image.You can also press **Change** key on the control panel, move the trackball to the axes to adjust their lengths. Then press **Set key** to confirm.
5. The system automatically calculates the area and circumference, and the measurement result displays in the result box.
6. If necessary, you can repeat step 2-5 to perform the next area and circumference measurement.

■ Trace

It is used to measure the circumference and area by operating the trackball along the target object.

Operation:

1. Press the **Caliper** key to activate the measurement,and the measurement menu displays on the top left of the screen.
2. Select **[Circle/Area]** on the menu by moving the trackball and press **Set key** to confirm. Select **[Trace]** on the pop-up menu. A marker displays on the image.
3. Move the marker to the starting point by using the trackball, press **Set key** to fix the marker and the second marker displays.
4. Move the second marker along the target object by using the trackball.
5. Press **Set key** to confirm and the system automatically calculates the area and circumference, and the measurement result displays in the result box.
6. If necessary, you can repeat step 2-5 to perform the next area and circumference measurement.

8.4.1.3 Volume

■ Three-distance

It is used to measure the volume of a cuboid shaped object by measuring the length, the width and the depth.

Operation:

1. Press the **Caliper** key to activate the measurement, and the measurement menu displays on the top left of the screen.
2. Select **[Volume]** on the menu by moving the trackball and press **Set key** to confirm. Select **[3 Dist]** on the pop-up menu. A marker displays on the image.
3. Move the marker to the starting point by using the trackball, press **Set key** to fix the marker and the second marker displays.
4. Move the second marker to the end point by using the trackball and press **Set key** to confirm. A line connects these two points.
5. Repeat step 3-4 to perform a distance measurement for the width.
6. Rescan an image which is perpendicular to the previous image and repeat step 3-4 to perform a distance measurement for the depth.The system automatically calculates the volume, and the measurement result displays in the result box.

■ Ellipse distance

Operation:

1. Press the **Caliper** key to activate the measurement, and the measurement menu displays on the top left of the screen.
2. Select **[Volume]** on the menu by moving the trackball and press **Set key** to confirm. Select **[EDist]** on the pop-up menu. A marker displays on the image.
3. Move the marker to the starting point by using the trackball, press **Set key** to fix the marker and the second marker displays.
4. Move the second marker to the end point by using the trackball and press **Set key**. An ellipse displays on the image.You can also press **Change** key on the control panel,move the trackball to the axes to adjust heir lengths. Then press **Set key** to confirm.
5. Rescan an image which is perpendicular to the previous image.
6. Perform a distance measurement. The system automatically calculates the volume, and the measurement result displays in the result box.

■ Ellipse

Operation:

1. Press the **Caliper** key to activate the measurement,and the measurement menu displays on the top left of

the screen.
2. Select **[Volume]** on the menu by moving the trackball and press **Set key** to confirm. Select **[Ellipse]** on the pop-up menu. A marker displays on the image.
3. Move the marker to the starting point by using the trackball, press **Set key** to fix the marker and the second marker displays.
4. Move the second marker to the end point by using the trackball and press **Set key**. An ellipse displays on the image. You can also press **Change** key on the control panel,move the trackball to the axes to adjust their lengths. Then press **Set key** to confirm.
5. The system automatically calculates the volume, and the measurement result displays in the result box.

8.4.1.4 Area Ratio

The value of area ratio between two ellipses and trace areas can be measured.

- Ellipse ratio
  It is used to measure the value of area ratio between two ellipses.

Operation:
1. Press the **Caliper** key to activate the measurement, and the measurement menu displays on the top left of the screen.
2. Select **[Ratio(A)]** on the menu by moving the trackball and press **Set key** to confirm. Select **[Ellipse]** on the pop-up menu. A marker displays on the image.
3. Move the marker to the starting point by using the trackball, press **Set key** to fix the marker and the second marker displays.
4. Move the second marker to the end point by using the trackball and press **Set key**. An ellipse displays on the image. You can also press **Change** key on the control panel, move the trackball to the axes to adjust their lengths. Then press **Set key** to confirm.
5. Repeat step 3-5 to draw the second ellipse. The system automatically calculates the area ratio, and the measurement result displays in the result box.

- Trace ratio

It is used to measure the value of area ratio between two trace areas.

Operation:
1. Press the **Caliper** key to activate the measurement, and the measurement menu displays on the top left of the screen.
2. Select **[Ratio(A)]** on the menu by moving the trackball and press **Set key** to confirm. Select **[Trace]** on the pop-up menu. A marker displays on the image.
3. Move the marker to the starting point by using the trackball, press **Set key** to fix the marker and the second marker displays.
4. Move the second marker along the target object by using the trackball.
5. Press **Set key** to confirm.
6. Repeat step 2-5 to perform a second trace measurement. The system automatically calculates the trace ratio, and the measurement result displays in the result box.

8.4.1.5 Distance Ratio

It is used to measure the value of distance ratio between two lines.

Operation:
1. Press the **Caliper** key to activate the measurement, and the measurement menu displays on the top left of the screen.
2. Select **[Ratio(D)]** on the menu by moving the trackball and press **Set key** to confirm. A marker displays on the image.
3. Move the marker to the starting point by using the trackball, press **Set key** to fix the marker and the second marker displays.
   You can also press **Change** key on the control panel, move the trackball to adjust the starting point.
4. Move the second marker to the end point by using the trackball and press **Set key**. A line connects these two

points.
5. Repeat step 3-5 to perform a second distance measurement. The system automatically calculates the distance ratio, and the measurement result displays in the result box.

8.4.1.6 Angle

It is used to measure the value of angle between two intersection planes.

Operation:
1. Press the **Caliper** key to activate the measurement, and the measurement menu displays on the top left of the screen.
2. Select **[Angle]** on the menu by moving the trackball and press **Set key** to confirm. A marker displays on the image.
3. Move the marker to the starting point by using the trackball, press **Set key** to fix the marker and the second marker displays.
   You can also press **Change** key on the control panel, move the trackball to adjust the starting point.
4. Move the second marker to the end point by using the trackball and press **Set key**. A line connects these two points.
5. Repeat step 3-5 to draw a second line to create an angle. The system automatically calculates the angle, and the measurement result displays in the result box.

8.5.2 M Mode Measurements

Distance, time, heart rate and slope measurements can be performed in the M mode. You can also press **[BC Caliper]** to enter the general measurements in the 2D mode. For details, please refer to Section 8.5.1 2D Mode Measurements.

8.4.2.1 Distance

It is used to measure the vertical distance between two points on the M mode image.
Operation:
1. Press the **M** key on the control panel to enter the M mode.
2. Press the **Caliper** key to activate the measurement, and the measurement menu displays on the top left of the screen.
3. Select **[Distance]** on the menu by moving the trackball and press **Set key** to confirm. A marker displays on the image.
4. Move the marker to the starting point by using the trackball, press **Set key** to fix the marker and the second marker displays.You can also press Change on the control panel, move the trackball to adjust the starting point.
5. Move the second marker to the end point by using the trackball and press **Set key**. A line connects these two points. The measurement result displays in the result box.
6. Repeat step 3-5 to perform the next distance measurement.

8.4.2.2 Time

It is used to measure the time interval between two points on the M mode image.
Operation:
1. Press the **M** key on the control panel to enter the M mode.
2. Press the **Caliper** key to activate the measurement, and the measurement menu displays on the top left of the screen.
3. Select **[Time]** on the menu by moving the trackball and press **Set key** to confirm. A marker displays on the

image.
4. Move the marker to the starting point by using the trackball, press **Set key** to fix the marker and the second marker displays.
5. Move the second marker to the end point by using the trackball and press **Set key**. The measurement result displays in the result box.

8.4.2.3 Heart Rate

It is used to measure the time interval between heart cycles based on the number of heartbeats per minute on the M mode image.
You can preset the heart cycle in [Preset] -> [Measure Preset] -> [HR].
Operation:
1. Press the **M** key on the control panel to enter the M mode.
2. Press the **Caliper** key to activate the measurement, and the measurement menu displays on the top left of the screen.
3. Select **[HR]** on the menu by moving the trackball and press **Set key** to confirm. A marker displays on the image.
4. Move the marker to the starting point by using the trackball, press **Set key** to fix the marker and the second marker displays.
5. Move the second marker to the end point by using the trackball and press **Set key**. The measurement result displays in the result box.

8.4.2.4 Slope Rate

It is used to measure the change in distance over time on the M mode image.
Operation:
1. Press the **M** key on the control panel to enter the M mode.
2. Press the **Caliper** key to activate the measurement, and the measurement menu displays on the top left of the screen.
3. Select **[Slope]** on the menu by moving the trackball and press **Set key** to confirm. A marker displays on the image.
4. Move the marker to the starting point by using the trackball, press **Set key** to fix the marker and the second marker displays.
5. Move the second marker to the end point by using the trackball and press **Set key**. The measurement result displays in the result box.

8.4.3 PW Mode Measurements

Flow sweep ratio, speed, time, heart rate, acceleration and spectrum trace measurements can be performed in the PW mode. You can also press [BC Caliper] to enter the general measurements in the 2D mode. For details, please refer to Section 8.5.1 2D Mode Measurements.

8.4.3.1 Flow Speed Ratio

It is used to calculate the flow speed ratio and Pressure Gradient (PG) on the Doppler-mode image by measuring the flow speed of peak systole and end diastole.
Operation:
1. Press the **PW** key on the control panel to enter the PW mode.
2. Press the **Caliper** key to activate the measurement, and the measurement menu displays on the top left of the screen.

3. Select **[S/D]** on the menu by moving the trackball and press **Set key** to confirm. A marker displays on the image.
4. Move the marker to the flow speed of peak systole by using the trackball, press **Set key** to fix the marker and the second marker displays.
5. Move the second marker to the flow speed of end diastole by using the trackball and press **Set key**. The measurement result displays in the result box.

8.4.3.2 Speed

It is used to measure the speed of one point on the spectral Doppler waveform.
1. Press the **PW** key on the control panel to enter the PW mode.
2. Press the **Caliper** key to activate the measurement, and the measurement menu displays on the top left of the screen.
3. Select **[Velocity]** on the menu by moving the trackball and press **Set key** to confirm. A marker displays on the image.
4. Move the marker to the desired point by using the trackball and press **Set key**. The measurement result displays in the result box.

8.4.3.3 Time

It is used to measure the time interval between two points on the spectral Doppler image.
Operation:
1. Press the **PW** key on the control panel to enter the PW mode.
2. Press the **Caliper** key to activate the measurement, and the measurement menu displays on the top left of the screen.
3. Select **[Time]** on the menu by moving the trackball and press **Set key** to confirm. A marker displays on the image.
4. Move the marker to the starting point by using the trackball, press **Set key** to fix the marker and the second marker displays.

Move the second marker to the end point by using the trackball and press **Set key**. The measurement result displays in the result box.

8.4.3.4 Heart Rate

It is used to measure the time interval between heart cycles based on the number of heartbeats per minute on the PW mode image.
Operation:
1. Press the **PW** key on the control panel to enter the PW mode.
2. Press the **Caliper** key to activate the measurement, and the measurement menu displays on the top left of the screen.
3. Select **[HR]** on the menu by moving the trackball and press **Set key** to confirm. A marker displays on the image.
4. Move the marker to the starting point by using the trackball, press **Set key** to fix the marker and the second marker displays.
5. Move the second marker to the end point by using the trackball and press **Set key**. The measurement result displays in the result box.

8.4.3.5 Acceleration

It is used to calculate the flow speed difference in the time interval from two measured flow speeds on the PW

mode image.
Operation:
1. Press the **PW** key on the control panel to enter the PW mode.
2. Press the **Caliper** key to activate the measurement, and the measurement menu displays on the top left of the screen.
3. Select **[Acceleration]** on the menu by moving the trackball and press **Set key** to confirm. A marker displays on the image.
4. Move the marker to the starting point by using the trackball, press **Set key** to fix the marker and the second marker displays.

Move the second marker to the end point by using the trackball and press **Set key**. The measurement result displays in the result box.

8.4.3.6 Spectrum Trace

It used to measure the velocity or other indexes for clinical diagnosis purposes by tracing one or more Doppler waveforms. Manual trace and auto trace are available.

- To ensure the measurement accuracy, you should position the first marker on peak systole and position the second marker on end diastole during the trace measurements.
- Spectrum trace can only be performed in frozen PW mode.

■ Manual trace

Operation:
1. Press the **PW** key on the control panel enter the PW mode, then press **Freeze** key.
2. Press the **Caliper** key to activate the measurement, and the measurement menu displays on the top left of the screen.
3. Select **[D Trace]** on the menu by moving the trackball and press **Set key** to confirm. Select **[Manual]** on the pop-up menu. A marker displays on the image.
4. Move the marker to the starting point of peak waveform of the end systole by using the trackball, press **Set key** to fix the marker and the second marker displays.
5. Trace the waveform and move the second marker to the end diastole which is one cardiac cycle adjacent to the first marker by using the trackball and press **Set key**. The measurement result displays in the result box.

■ Auto trace

Operation:
1. Press the **PW** key on the control panel to enter the PW mode, then press **Freeze** key.
2. Press the **Caliper** key to activate the measurement, and the measurement menu displays on the top left of the screen.
3. Select **[Spectrum Trace]** on the menu by moving the trackball and press **Set key** to confirm. Select **[Auto]** on the pop-up menu. A marker displays on the image.
4. Move the marker to the starting point of peak waveform of the end systole by using the trackball, press **Set key** to fix the marker and the second marker displays.

Move the second marker to the end diastole which is one cardiac cycle adjacent to the first marker by using the trackball and press **Set key**. The system automatically traces the waveform and the measurement result displays in the result box.

8.5 Specific Measurements and Calculations

Specific measurement and calculations corresponds to the measurement and calculation of each exam type. The measurement results are recorded in the report.
You should confirm the following items before measurement.

- Confirm that the current probe is applicable for the current application part.

- Confirm that the current date is the correct.
- Confirm that the patient information is input.
- Confirm that the exam type is selected.

8.5.1 Abdomen Measurements

Abdominal measurements can be performed in 2D (B/Color/PDI) mode.
Operation:
1. Press the **Measure** key in the real time or frozen B/Color/PDI mode, and the measurement menu displays on the top left of the screen.
2. Select a measurement item, such as **[Liver]**, on the menu by moving the trackball and press **Set key** to confirm.
3. Select the measurement sub-item, such as **[R Liver Max],** on the pop-up sub-menu and a marker displays on the image.
4. Follow the methods in the following table to perform the measurement, and the measurement result displays in the result box.

Measurement Item	Measurement Sub-item	Measurement Method
Liver	R Liver Max	Refer to Section 8.4.1.1 Distance.
	R Liver W	
	R Liver D	
	L Liver L	
	L Liver D	
Gallbladder (GB)	CBD	Refer to Section 8.4.1.1 Distance.
	CHD	
Gallbladder (GB)	GB L	Refer to Section 8.4.1.1 Distance.
	GB W	
	GB Wall D	
Pancreas	Pancr. Head	Refer to Section 8.4.1.1 Distance.
	Pancr. Corus	
	Pancr. Tail	
	Pancr. Duct	
Spleen	SP L	Refer to Section 8.4.1.1 Distance.
	SP D	
	SP W	
Right kidney	RK L	Refer to Section 8.4.1.1 Distance.
	RK D	
	RK W	
Left kidney	LK L	Refer to Section 8.4.1.1 Distance.
	LK D	
	LK W	

- Kidney measurement

Operation:
1. Press the **Measure** key in the real time or frozen B/Color/PDI mode, and the measurement menu displays on the top left of the screen.
2. Select **[Left kidney]** or **[Right kidney]** on the menu by moving the trackball and press **Set key** to confirm.

3. Perform the three distance measurements for the length, width and depth of the kidney. The system automatically calculates the volume of the kidney by the following formula, and the measurement results displays in the result box.

Kidney volume = 0.49 × length × width × depth

8.5.2 Obstetrics Measurements

Obstetrics measurements and calculations can be performed in the 2D (B/Color/PDI) mode and PW mode.

8.5.2.1 Obstetrics Measurements in the 2D Mode

Steps:

1. Press the **Measure** key in the real time or frozen B/Color/PDI mode, and the measurement menu displays on the top left of the screen.
2. Select a measurement item, such as [HD], on the menu by moving the trackball and press **Set key** to confirm.
3. Follow the methods in the following table to perform the measurement, and the measurement results display in the result box.

Note:

Different animal species corresponds to different obstetric measurement items.

Animal species	Measurement Item	Measurement Method	GA Formula(Unit:day)
Cat	BD	Refer to Section 8.5.1.1 Distance	GA=(11×BD(cm))+21
	HD		GA=(25×HD(cm))+3
dog	CRL	Refer to Section 8.5.1.1 Distance	GA=(3×CRL(cm))+27,40days before
	GSD		GA=(6×GSD(cm))+20,40days before
	HD		GA=(15×HD(cm))+20,40days after(contain 40 days)
	BD		GA=(7×BD(cm))+29,40days after(contain 40 days)
	HD&BD		GA=(6×HD(cm))+(3×BD(cm))+30, 40days after(contain 40 days)
Cattle	CRL	Refer to Section 8.5.1.1 Distance	GA=CRL(cm)×16.73+27.5,50days before
	TD		GA=TD(cm) × 37.21+39.7,50 days after(contain 50 days)
	HD		GA=HD(cm) × 45.23+37.7,50 days ater(contain 50 days)
Horse	GSD-H	Refer to Section 8.5.1.1 Distance	GA=(GSD-H(cm)+0.55)/0.15
	GSD-V		GA=(GSD-V(cm)+0.10)/0.14
Sheep	CRL	Refer to Section 8.5.1.1 Distance	GA=14.05+1.16×CRL(cm)-0.012×CRL$(cm)^2$, 20~40days(contain 20 days)
	BPD		GA=21.4+1.85×BPD(mm), 40days after(contain 40 days)
Others	Same as dog	Same as dog	Same as dog

8.5.2.2 EDD

Standard of pregnancy varies with different animal species, combining gestational age and the corresponding standard of pregnancy to calculate expected date of confinement.Standard of pregnancy for different animal species are as follows:

Animal species	Standard of pregnancy
Cat	64 days
Dog	58 days
Cattle	330 days
Horse	285 days
Sheep	145 days
Others	Same as dog

8.5.2.3 Obstetrics Measurements in the PW Mode

1. Press the **Measure** key in the frozen PW mode, and the measurement menu displays on the top left of the screen.
2. Select a measurement item, such as [UmbA], on the menu by moving the trackball and press **Set key** to confirm.
3. Follow the methods in the following table to perform the measurement, and the measurement results display in the result box.

Measurement Item	Description	Measurement Method
UmbA	Umbilical Artery	Refer to Section 8.4.3.6 Spectrum Trace.
MCA	Middle Cerebral Artery	
FetalAO	Fetal Aorta	
Desc.AO	Descending Aorta	
Placent A	Placent Aorta	
Ductus V	Ductus Vein	

8.5.3 Cardiology Measurements

Cardiology measurement can be performed in the 2D (B/Color/PDI) mode or M mode.

8.5.3.1 Cardiology Measurements in the 2D Mode

Cardiology measurements in the 2D (B/Color/PDI) mode include left ventricle measurement, left ventricle weight measurement, inner diameter of right ventricle end diastole measurement and inner diameter of main pulmonary artery measurement.

8.5.3.2 Left Ventricle

The methods for measuring left ventricle in the 2D (B/Color/DPI) mode are as follows.

- Single Plane
- Bi Plane
- Bullet
- Mod. Simpson

■ Single plane

This measurement method calculates the LV volume by measuring the ellipse covering the long axis of the left ventricle.

Steps:

1. Press the **Measure** key in the real time or frozen B/Color/PDI mode, and the measurement menu displays on the top left of the screen.
2. Select [LV] on the menu by moving the trackball and press **Set key** to confirm.
3. Select [Single Plane] on the pop-up menu and a marker displays on the image.
4. Perform the LVLd → LVALd→LVLs→LVALs measurements one by one and the measurement results displays in the result box.

Measurement Item	Measurement Sub-item	Description	Measurement Method
Left Ventricle/ Single Plane Method	LVLd	Left Ventricle Diastolic Major Axis	Refer to Section 8.4.1.1 Distance.
	LVALd	LV long axis area at end-diastole	Refer to Section 8.4.1.2 Area and Circumference.
	LVLs	Left Ventricle Systolic Major Axis	Refer to Section 8.4.1.1 Distance.
	LVALs	Left Ventricle Systolic Area	Refer to Section 8.4.1.2 Area and Circumference.

The system automatically calculates the following items according to the measurement results.

Calculation Item	Description	Formula
EDV	End-diastolic Left Ventricular Volume(ml)	EDV(mL)=(8/3/π)×{LVALd(cm^2)}^{2}/LVLd(cm)
ESV	End-systolic Left Ventricular Volume(ml)	ESV(mL)=(8/3/π)×{LVALs(cm^2)}^{2}/LVLs(cm)
SV	Stroke Volume	SV = EDV(ml) - ESV(ml)
EF	Ejection Fraction	EF=100%×SV(ml)/EDV(ml)
SI	Stroke Volume Index	SI=SV(ml)/BSA(m^2)
CO	Cardiac Output	CO(l/min)=SV(ml)× HR(bpm)/1000
CI	Cardiac Index	CI=CO(l/min)/BSA(m^2)

Note:

You should input the height, weight and heart rate before performing the cardiac measurement. Otherwise, CO, CI and SI cannot be calculated.

■ Bi plane

This measurement method calculates the LV volume by measuring the images covering the long axis and the short axis of the left ventricle.

Steps:

1. Press the **Measure** key in the real time or frozen B/Color/PDI mode, and the measurement menu displays on the top left of the screen.

2. Select [LV] on the menu by moving the trackball and press **Set key** to confirm.
3. Select [Bi Plane] on the pop-up menu and a marker displays on the image.
4. Perform the LVIDd→LVIDs→LVAMd→LVAMs→ LVALd→LVALs measurements one by one and the measurement results displays in the result box.

Measurement Item	Measurement Sub-item	Description	Measurement Method
Left Ventricle/ Bi Plane Method	LVIDd	LV internal dimension at end diastole	Refer to Section 8.4.1.1 Distance.
	LVIDs	LV short axis diameter at end systole	
	LVAMd	LV short axis area at mitral value at end diastole	Refer to Section 8.4.1.2 Area and Circumference
	LVAMs	LV short axis area at mitral value at end systole	
	LVALd	LV long axis area at end diastole	
	LVALs	LV long axis area at end systole	

The system automatically calculates the following items according to the measurement results.

Calculation Item	Description	Formula
EDV	End- diastolic Left Ventricular Volume	EDV(ml)=(8/3/π)×LVAMd(cm^2)×LVALd(cm^2)/LVIDd(cm)
ESV	End- systolic Left Ventricular Volume	ESV(ml)=(8/3/π) ×LVAMs(cm^2)×LVALs(cm^2)/LVIDs(cm)
SV	Stroke Volume	SV = EDV(ml) - ESV(ml)
EF	Ejection Fraction	EF=100%×SV(ml)/EDV(ml)
SI	Stroke Volume Index	SI=SV(ml)/BSA(m^2)
CO	Cardiac Output	CO(l/min)=SV(ml)× HR(bpm)/1000
CI	Cardiac Index	CI=CO(l/min)/BSA(m^2)

- Bullet

  This measurement method calculates the LV volume by measuring the image covering the long axis and the short axis of the left ventricle at level of the mitral value.

  Steps:

  1. Press the **Measure** key in the real time or frozen B/Color/PDI mode, and the measurement menu displays on the top left of the screen.
  2. Select [LV] on the menu by moving the trackball and press **Set key** to confirm.
  3. Select [Bullet] on the pop-up menu and a marker displays on the image.
  4. Perform the LVLd→LVLs →LVAMd → LVAMs measurements one by one and the measurement results displays in the result box.

Measurement Item	Measurement Sub-item	Description	Measurement Method
Left Ventricle/ Bullet Method	LVLd	LV long axis length at end diastole	Refer to Section 8.4.1.1 Distance.
	LVLs	LV long axis length at end systole	
	LVAMd	LV short axis are at mitral value at end diastole	Refer to Section 8.4.1.2 Area and Circumference
	LVAMs	LV short axis are at mitral value at end systole	

The system automatically calculates the following items according to the measurenment results.

Calculation Item	Description	Formula
EDV	End- diastolic Left Ventricular Volume	EDV(ml)= (5/6)×LVLd(cm)×LVAMd(cm^2)
ESV	End- systolic Left Ventricular Volume	ESV(ml)= (5/6)×LVLs(cm)× LVAMs(cm^2)
SV	Stroke Volume	SV = EDV(ml) - ESV(ml)

EF	Ejection Fraction	EF=100%×SV(ml)/EDV(ml)
SI	Stroke Volume Index	SI=SV(ml)/BSA(m^2)
CO	Cardiac Output	CO(l/min)=SV(ml)× HR(bpm)/1000
CI	Cardiac Index	CI=CO(l/min)/BSA(m^2)

- Mod.Simpson
  This measurement method calculates the LV volume by using the LV long axis view, the LV short axis at the level of the mitral value and the LV short axis view at level of the papillary muscles.
  Steps:
  1. Press the **Measure** key in the real time or frozen B/Color/PDI mode, and the measurement menu displays on the top left of the screen.
  2. Select [LV] on the menu by moving the trackball and press **Set key** to confirm.
  3. Select [Mod.Simpson] on the pop-up menu and a marker displays on the image.
  4. Perform the LVLd→LVLs →LVAMd → LVAMs →LVAPd →LVAPs measurements one by one and the measurement results displays in the result box.

Measurement Item	Measurement Sub-item	Description	Measurement Method
Left Ventricle/ Mod. Simpson Method	LVLd	LV long axis length at end diastole	Refer to Section 8.4.1.1 Distance.
	LVLs	LV long axis length at end systole	
	LVAMd	LV short axis area at mitral value at end diastole	Refer to Section 8.4.1.2 Area and Circumference
	LVAMs	LV short axis area at mitral value at end systole	
	LVAPd	Area of LV short axis view at the level of papillary muscles at end diastole	
	LVAPs	Area of LV short axis view at the level of papillary muscles at end systole	

The system automatically calculates the following items according to the measurement results.

Calculation Item	Description	Formula
EDV	End- diastolic Left Ventricular Volume	EDV(ml)=LVLd(cm)/9×$\left\{4 \times \mathrm{LVAMd}(cm^2) + 2 \times \mathrm{LVAPd}(cm^2) + \sqrt{LVAMd(cm^2) \times \mathrm{LVAPd}(cm^2)}\right\}$
ESV	End- systolic Left Ventricular Volume	ESV(ml)=LVLs (cm)/9×$\left\{4 \times \mathrm{LVAMs}(cm^2) + 2 \times \mathrm{LVAPs}(cm^2) + \sqrt{LVAMs(cm^2) \times \mathrm{LVAPs}(cm^2)}\right\}$
SV	Stroke Volume	SV = EDV(ml) - ESV(ml)
EF	Ejection Fraction	EF=100%×SV(ml)/EDV(ml)
SI	Stroke Volume Index	SI=SV(ml)/BSA(m^2)
CO	Cardiac Output	CO(l/min)=SV(ml)× HR(bpm)/1000
CI	Cardiac Index	CI=CO(l/min)/BSA(m^2)

8.5.3.3 Left Ventricle Mass Weight

LV mass weight can be calculated by measuring LVPWd, IVSTd and LVIDd.

Steps:

1. Press the **Measure** key in the real time or frozen B/Color/PDI mode, and the measurement menu displays on the top left of the screen.
2. Select [LVMW] on the menu by moving the trackball and press **Set key** to confirm. A marker displays on the image.
3. Perform the LVPWd→IVSTd→ LVIDd measurements one by one and the measurement results displays in the result box.

Measurement Item	Measurement Sub-item	Description	Measurement Method
Left Ventricle Mass Weight	LVPWd	LV posterior wall thickness at end diastole	Refer to Section 8.4.1.1 Distance.
	LVSTd	Interventricular septal thickness at end diastole	
	LVIDd	LV internal dimension at end diastole	Refer to Section 8.4.1.1 Distance.

The system automatically calculates the following items according to the measurement results.

Calculation Item	Description	Formula
LVMW	Left Ventricle Mass Weight	LVMW(g) =1.04× $((\mathrm{LVPWd(cm)} + \mathrm{LVSTd(cm)} + \mathrm{LVIDd(cm)})^3 - (\mathrm{LVIDd(cm)})^3)$-13.6
LVMWI	Left Ventricle Mass Weight Index	LVMWI = LVMW(g) / BSA(m^2)

Note

You should input the height and weight on the PatientInfo screen before performing the LVMW measurement. Otherwise, LVMWI cannot be calculated.

8.5.3.4 Inner Diameter of Right Ventricle End Diastole

Steps:

1. Press the **Measure** key in the real time or frozen B/Color/PDI mode, and the measurement menu displays on the top left of the screen.
2. Select [RV] on the menu by moving the trackball and press **Set key** to confirm. A marker displays on the image.
3. Perform a distance measurements and the measurement results displays in the result box.

8.5.3.5 Inner Diameter of Main Pulmonary Artery

Steps:

1. Press the **Measure** key in the real time or frozen B/Color/PDI mode, and the measurement menu displays on the top left of the screen.
2. Select [PA] on the menu by moving the trackball and press **Set key** to confirm. A marker displays on the image.
3. Perform a distance measurements and the measurement results displays in the result box.

8.5.3.6 Cardiology Measurement in the M mode

Cardiology measurements in the M mode include left ventricle measurement, mitral valve measurement, aorta measurement, ejection time measurement, LVMW measurement and HR measurement.

8.5.3.7 Left Ventricle

The methods for measuring left ventricle in the M mode are as follows.
● Teichholz method
● Cube method

You should input the height, weight and heart rate before performing the cardiac measurement. Otherwise, CO, CI and SI cannot be calculated. You should measure the ET, otherwise MVCF cannot be calculated.

■ Teichholz method

This measurement method approximates the LV volume by measuring a cube.

Steps:

1. Press the **Measure** key in the real time or frozen M mode, and the measurement menu displays on the top left of the screen.
2. Select [LV] on the menu by moving the trackball and press **Set key** to confirm.
3. Select [Teichholze] on the pop-up menu and a marker displays on the image.
4. Perform the LVIDd -> LVIDs measurements one by one and the measurement results displays in the result box.

Measurement Item	Measurement Sub-item	Description	Measurement Method
Left Ventricle/ Teichholz Method	LVIDd	LV internal dimension at end diastole	Refer to Section 8.4.2.1 Distance.
	LVIDs	LV internal dimension at end systole	

The system automatically calculates the following items according to the measurement results.

Calculation Item	Description	Formula
EDV	End-diastolic Left Ventricular Volume	EDV(ml)=(7×LVIDd$(cm)^3$)/(2.4 + LVIDd(cm))
FS	Fractional Shortening	FS = 100%×(LVIDd(cm)- LVIDs(cm))/ LVIDd(cm)
ESV	End-systolic Left Ventricular Volume	ESV(ml)=(7×LVIDs$(cm)^3$)/(2.4+LVIDs(cm))
SV	Stroke Volume	SV = EDV(ml) - ESV(ml)
EF	Ejection Fraction	EF=100%×SV(ml)/EDV(ml)
SI	Stroke Volume Index	SI=SV(ml)/BSA(m^2)
CO	Cardiac Output	CO(l/min)=SV(ml)× HR(bpm)/1000
CI	Cardiac Index	CI=CO(l/min)/BSA(m^2)
MVCF	Mean Velocity of Circumferential Fiber Shortening	MVCF(circ/s)=(LVIDd(cm)–LVIDs(cm))/ ((LVIDd(cm)×ET(s))

■ Cube method

This measurement method approximates to the LV volume by measuring a cube.

Steps:

1. Press the **Measure** key in the real time or frozen M mode, and the measurement menu displays on the top left of the screen.

2. Select [LV] on the menu by moving the trackball and press **Set key** to confirm.
3. Select [Cube] on the pop-up menu and a marker displays on the image.
4. Perform the LVIDd → LVIDs measurements one by one and the measurement results displays in the result box.

Measurement Item	Measurement Sub-item	Description	Measurement Method
Left Ventricle/ Cube Method	LVIDd	LV internal dimension at end diastole	Refer to Section 8.4.2.1 Distance.
	LVIDs	LV internal dimension at end systole	

The system automatically calculates the following items according to the measurement results.

Calculation Item	Description	Formula
EDV	End-diastolic Left Ventricular Volume	EDV(ml)=LVIDd$(cm)^3$)
FS	Fractional Shortening	FS = 100%×(LVIDd(cm)- LVIDs(cm))/ LVIDd(cm)
ESV	End-systolic Left Ventricular Volume	ESV(ml)=LVIDs$(cm)^3$)
SV	Stroke Volume	SV = EDV(ml) - ESV(ml)
EF	Ejection Fraction	EF=100%×SV(ml)/EDV(ml)
SI	Stroke Volume Index	SI=SV(ml)/BSA(m^2)
CO	Cardiac Output	CO(l/min)=SV(ml)× HR(bpm)/1000
CI	Cardiac Index	CI=CO(l/min)/BSA(m^2)
MVCF	Mean Velocity of Circumferential Fiber Shortening	MVCF(circ/s)=(LVIDd(cm)–LVIDs(cm))/ ((LVIDd(cm)×ET(s))

8.5.3.8 Mitral Valve

Steps:
1. Press the **Measure** key in the real time or frozen M mode, and the measurement menu displays on the top left of the screen.
2. Select [MV] on the menu by moving the trackball and press **Set key** to confirm.
3. Select a sub-item, such as [EF] on the pop-up sub-menu and a marker displays on the image.
4. Perform the measurement according to the following table and the measurement results displays in the result box.

Measurement Item	Measurement Sub-item	Measurement Method
Mitral Valve	EF	Refer to Section 8.4.2.4 Slope Rate.
	AC	
	A/E	Refer to Section 8.4.2.1 Distance.

8.5.3.9 Aorta

- Ratio between left atria diameter and aortic diameter

Steps:
1. Press the **Measure** key in the real time or frozen M mode, and the measurement menu displays on the top left of the screen.
2. Select [AV] on the menu by moving the trackball and press **Set key** to confirm.
3. Select [LAD/AOD] on the pop-up menu and a marker displays on the image.
4. Perform two distance measurements for the diameters of LAD and AOD and the measurement results

displays in the result box.

- Value outflow

Steps:

1. Press the **Measure** key in the real time or frozen M mode, and the measurement menu displays on the top left of the screen.
2. Select [AV] on the menu by moving the trackball and press **Set key** to confirm.
3. Select [AVSV] on the pop-up menu and a marker displays on the image.
4. Perform the measurement according to the following table and the measurement results displays in the result box.

Measurement Item	Description	Measurement Method
DEV	Minimum flow of end diastole	Refer to Section 8.4.2.4 Slope Rate.
DCT	Descending Time	Refer to Section 8.4.2.2 Time.

8.5.3.10 Ejection Time

Ejection time measurement in the M mode is the same as time measurement in the general M mode measurement. For details, refer to Section 8.4.2.2 Time.

8.5.3.11 Left Ventricle Mass Weight

LV mass weight can be calculated by measuring LVPWd, LVSTd and LVIDd.

Steps:

1. Press the **Measure** key in the real time or frozen M mode, and the measurement menu displays on the top left of the screen.
2. Select [LVMW] on the menu by moving the trackball and press **Set key** to confirm. A marker displays on the image.
3. Perform the LVPWd → IVSTd → LVIDd measurements one by one and the measurement results displays in the result box.

Measurement Item	Measurement Sub-item	Description	Measurement Method
Left Ventricle Mass Weight(LVMW)	LVPWd	LV posterior wall thickness at end diastole	Refer to Section8.4.2.1 Distance.
	IVSTd	Interventricular septal thickness at end diastole	
	LVIDd	LV internal dimension at end diastole	

The system automatically calculates the following items according to the measurement results.

Calculation Item	Description	Formula
LVMW	Left Ventricular Mass Weight	LVMW(g) = 1.04×((LVPWd(cm) + IVSTd(cm) + LVIDd(cm))^3 -(LVIDd(cm))^3) -13.6
LVMWI	Left Ventricular Mass Weight Index	LVMWI = LVMW(g) / BSA(m^2)

Note:

You should input the height and weight before performing the LVMW measurement. Otherwise, LVMWI cannot be calculated.

8.5.4 Vascular Measurements

Vascular measurements and calculations should be performed in the PW mode.

Steps:

1. Press the **Measure** key in the frozen PW mode, and the measurement menu displays on the top left of the screen.
2. Select a measurement item, such as [CCA] on the menu by moving the trackball and press **Set key** to confirm.
3. A marker displays on the image. Perform the measurement according to the following table and the measurement results displays in the result box.

Measurement Item	Measurement Method
CCA	Refer to Section 8.4.3.6 Spectrum Trace.
ICA	
ECA	
VA	
Upper Ext Vein	
Lower Ext Vein	

8.5.5 Small Parts Measurements

Small parts measurements and calculations should be performed in the 2D (B/Color/PDI) mode. The measurements include thyroid and isthmus measurement.

Steps:

1. Press the **Measure** key in the real time or frozen 2D (B/Color/PDI) mode, and the measurement menu displays on the top left of the screen.
2. Select [Lt Thyroid] or [Rt Thyroid] on the menu by moving the trackball and press **Set key** to confirm.
3. Perform three distance measurements for the length, width and depth of the thyroid. The system automatically calculates the volume according to the following formula and the measurement results displays in the result box.

Thyroid volume = 0.479 × length × width × depth

Chapter 9 Report

The report will be generated after you perform the specific measurements but not the general measurements. It contains patient information, measurement results and doctor's diagnosis results.

9.1 Reviewing the Report

Press the **Report** key on the control panel to enter the Report screen. You can view the patient information and measurements results. If the report has more than one page, you can click [Next] or[Prev] to turn to the next or previous page.

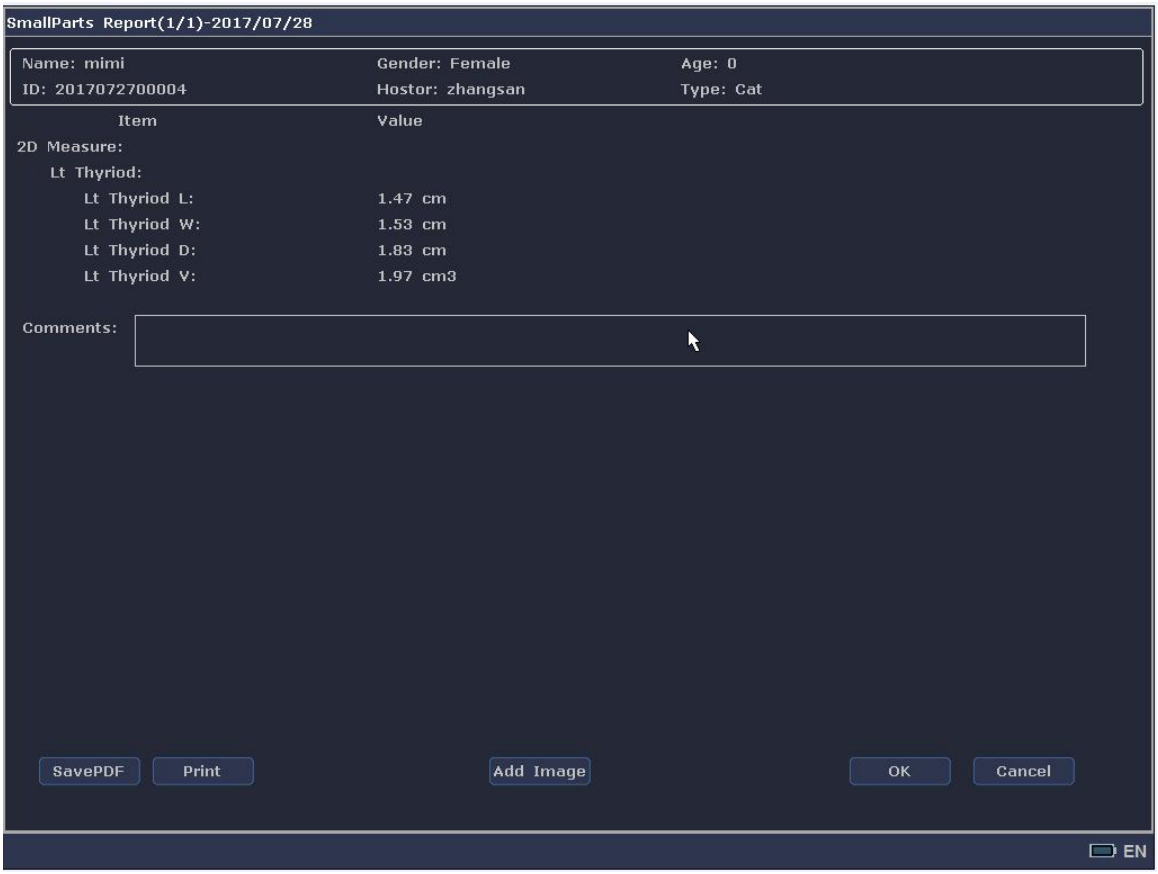


Figure 9-1 Figure Report Screen

9.2 Editing the Report

After entering the Report screen,you can input the diagnosis information in the textbox beside[Comments] by moving the trackball and press the **Set key** to confirm.

9.3 Printing the Report

Ensure that the printer is connected well with the system before printing the report. For detailed description, refer to Section “3.6.3 Connecting the Graphic Printer”.Click [Print] button to print the report.

Chapter 10 Managing Images/Data

You can save images after scanning the images. The saved patient data can be backup to the USB storage devices for future use.

10.1 Saving the Image/Cine

The data is saved to the built-in disk of the system by default. You can also export the data to the USB storage devices or DICOM server. For details, refer to Section 10.5 Saving Data.

Press the **Save** key on the control panel in the frozen mode to save the current screen as an image.

Press the **Cursor** or **CinePlay** key on the control panel in the frozen mode to activate the marker, move the marker to [Save Film] by using the trackball, and press the **Set key** to save the cine.

10.2 Reviewing the Image/Cine

- Current patient

  You can view the saved images or cines in the Review screen.

  Steps are as follows.

  1. Press the **Review** key on the control panel to enter the Review screen, as shown in Figure10-1. The thumbnail images display in the [File List].

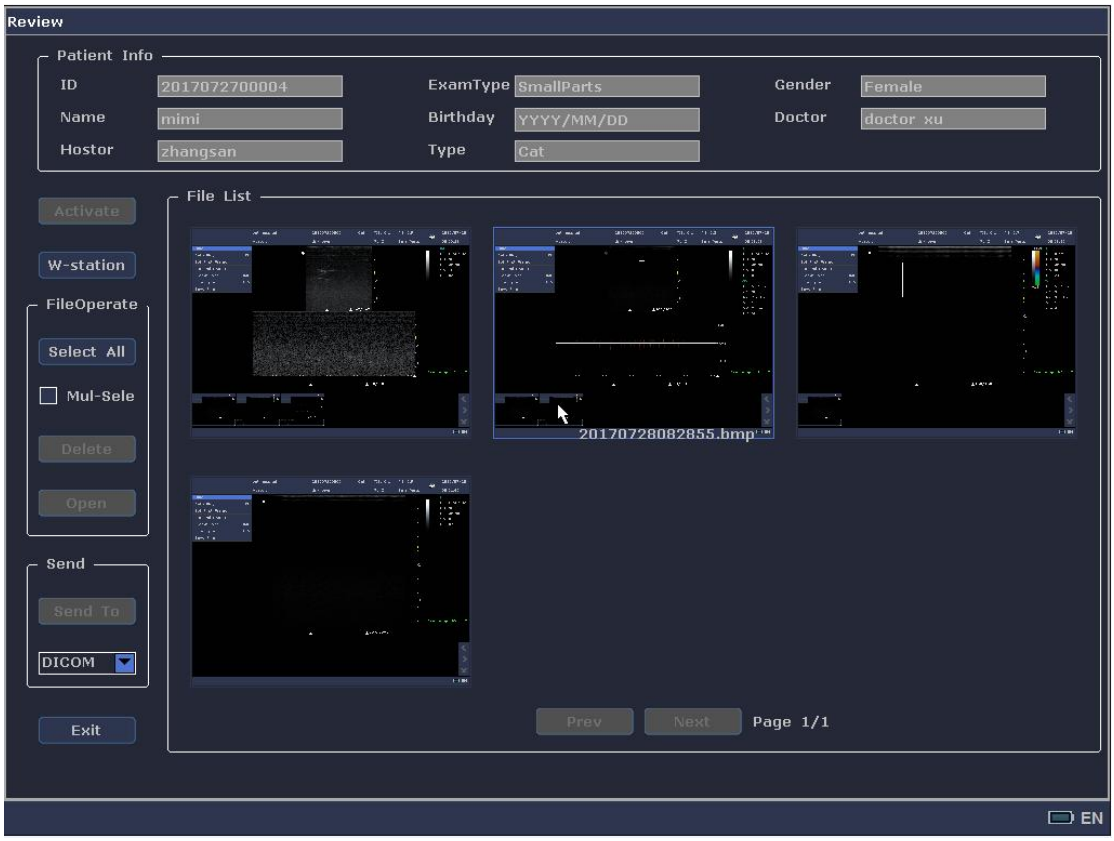


Figure 10-1 Review Screen

  2. Select the image or cine by using the trackball and double click the **Set key** or click [Open] at the left to view the image or cine.
  3. Press the **Freeze** key to return to the main screen.

- Saved patient

  1. Press the **Station** key on the control panel to enter the Station screen.

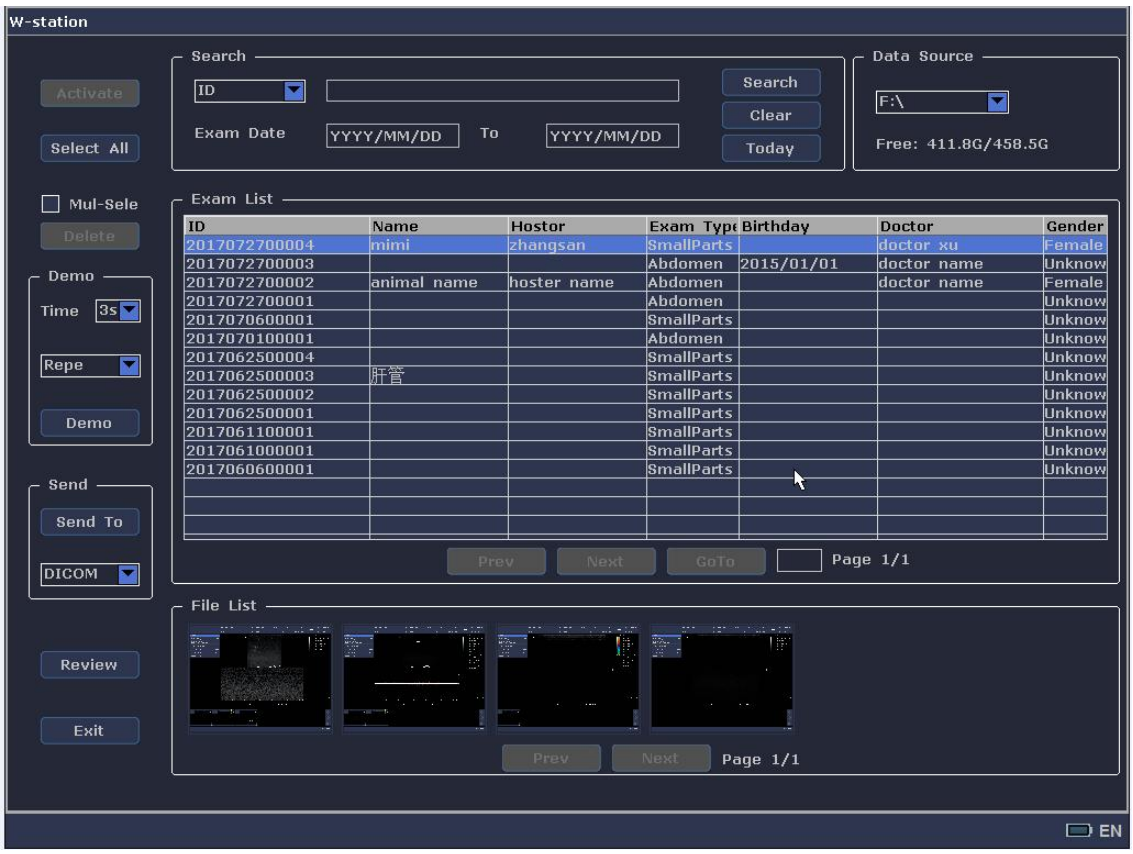


Figure 10-2 Working Station

2. Select one patient in the [Exam List] by using the trackball and press the **Set** key, the thumbnail images display in the [File List]. Click [Review] to enter the Review screen and view the saved patient images or cines.
3. Select the desired image or cine by using the trackball, and double click the **Set key** or click[Open] at the left to view the image or cine.
4. Press the **ESC** key to return to the main screen.

10.3 Deleting the Image/Cine

You can delete the saved image or cines in the Review screen.

1. Press the **Review** key on the control panel to enter the Review screen, the thumbnail images display in the [File List].
2. Select the desired image/cine and click [Delete] to delete it.

10.4 Printing the Image

Ensure that the printer is connected well with the system before printing the report. For detailed connection description, refer to Section 3.6.2 Connecting the Video Printer.Click [Print] in the video printer to print the current image.

10.5 Saving Data

You can save the patient data, images or cines to the hard disk and send them to the USB storage devices and DICOM server.

10.5.1 Saving to USB Storage Devices

Steps are as follows.
Connect the USB storage device to the system and the bottom right of the screen displays the icon of USB.
Save the images or cines as described in Section 10.1 Saving the Image/Cine.
Press Review to enter the Review screen and select the images/cines.
Or click [Select All] or enable [Mult Sel] at the left to select the images/cines.
Click beside the drop-down menu under the [Send to] to select [USB storage device] and click[Send to] to save the images/cines in the USB storage device.

10.5.2 Saving to DICOM Server

Note

Ensure that the DICOM server is connected with the system before sending the images/cines.

- Current patient images/cines
  Steps are as follows.
1. Press Review to enter the Review screen and select the images/cines.Or, click [Select All] or enable [Mult Sel] at the left to select the images/cines.
2. Click beside the drop-down menu under the [Send to] to select [DICOM] and click [Send to] to save the images/cines in the DICOM server.

- All patients data
  Steps are as follows.
1. Press Review to enter the Review screen and click [W-station] to enter the W-station screen.
2. Select patient in the [Exam List] by using the trackball and press the **Set key** to confirm. Or, click [Select All] or enable [Mult Sel] at the left to select the images/cines.
3. Click beside the drop-down menu under the [Send to] to select [DICOM] and click [Send to] to save the images/cines in the DICOM server.

Chapter 11 Probes and Biopsy

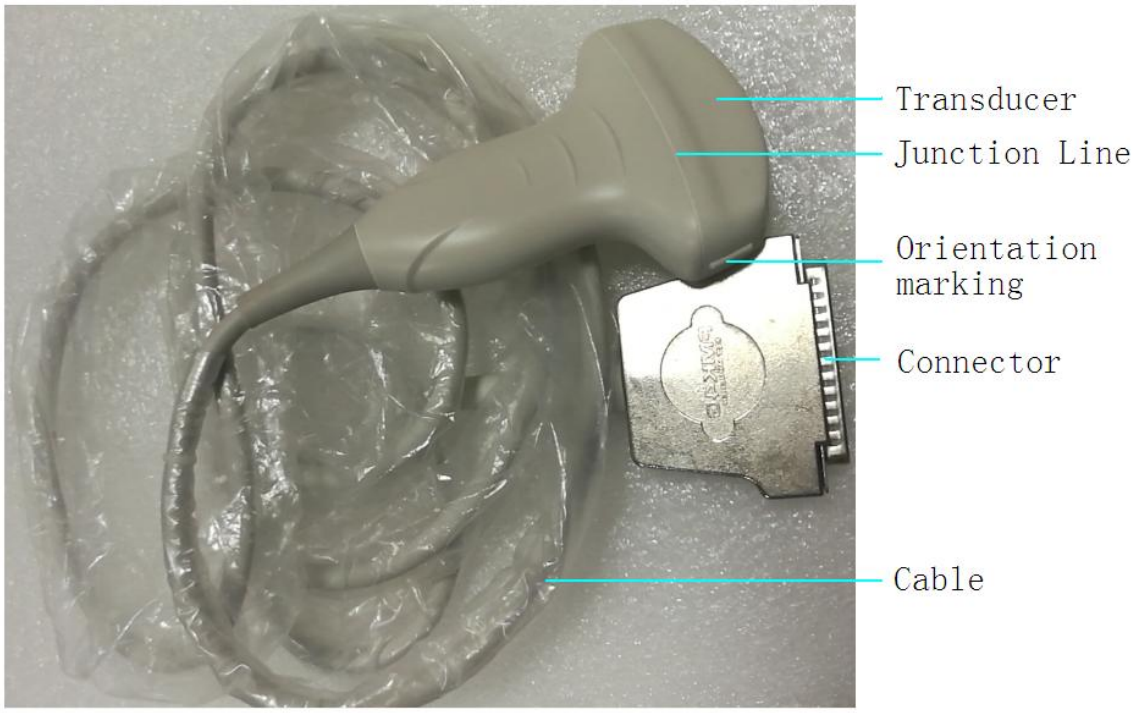
You should be thoroughly familiar with the operations of the probe and the biopsy bracket before using them. To ensure the performance and availability of the probe and the biopsy bracket, you should also periodically check, clean, disinfect or maintain them.

11.1 Probes

The probes that are applicable for this ultrasound system are all electronic scanning probes. It emits the pulsed wave into the patient body and receives the echo from the body to generate high resolution images.
In normal use or performance evaluation, only parts between acoustic window and integration of a shell and cable bushing can be under water or other liquid.

11.1.1 Appearance Overview

Body surface probes and intracavitary probes are available for this ultrasound system. The following picture takes body surface probes as an example to introduce the structure and composition of the probe.



11.1.2 Using the Probe

- Confirm that the probe sheath is not damaged before using it. Do not use the damaged or cracked probe. Otherwise, there is a danger of infection.
- Use the probes provided by the manufacturer. Othewise, the system and the probe may be damaged, and there is a danger of fire in worst case.
- Use the probe carefully. If the surface of the transducer is scratched, stop using the probe immediately. Otherwise, there is a danger of electric shock.
- Before using the probe, wait for 1 or 2 minutes and confirm that its surface temperature is not too high. Otherwise, you should stop using it immediately, especially the intracavitary probes.
- It has been tested maximum surface temperature can reach 42.8 degrees.

Caution

- Please use ultrasound complants that comply with local regulations. Do not use mineral oil, oily coupling gel, any kind of lotions, gel or other unapproved material instead of the coupling gel provided or recommended by the manufacturer. Otherwise, the probe may be damaged.

■ To inspect the probe
Steps are as follows.

1. Inspect all parts of the probe carefully before using it.
2. Check that the surface of the transducer is not bulge, scratch or damaged.
3. Check that the front end, handle of the probe, and the cable is not scratched, damaged or cracked.
4. Check that the connector is not cracked and damaged and the pins inside the connector is not bent or damaged.

■ To use the probe

Steps are as follows.

1. Connect the probe, see Section “3.5 Connecting the Probe”.
2. Put on the protective gloves.
3. Put on the probe sheath.(The intracavitary probes must use with it.)
   a. Unpack the probe sheath, and take it out.
   b. Apply the appropriate coupling gel on the inside of the probe sheath.
   c. Hold the probe sheath and cover the probe with it.
   d. Pull the probe sheath tightly over the face of the probe to remove wrinkles.
   e. Secure the sheath to the probe with the adhesive tapes or elastic bands provided.

Take off the probe sheath when the exam is ended, and dispose it in accordance with the local laws and regulations.

4. Make sure the direction of the probe is ok.
5. Perform a scan.

11.1.3 Cleaning the Probe

Warning

- To avoid the electric shock, disconnect the probe from the ultrasound system before the cleaning.
- To avoid the potential disease transmission, you should wear medical sterile gloves and protective goggle during the cleaning.

Caution

- To avoid probe damages, do not bump the probe on hard surfaces during the cleaning.

You should clean the probe after each use. Steps are as follows：

1. Disconnect the probe from the system, take off the probe sheath and biopsy bracket.
2. Clean the probe with neutral soap or warm clean water.
3. Clean the surface of the probe with soft cotton ball or cloth. If the residues solidify on the surface, you can clean them with a soft dampened brush (such as toothbrush).
4. Clean the probe with enough drinking water.
5. Air or dry off the probe with the lint-free cloth.

After cleaning the probe, functions of probe will not be affected, check approach is: connect the probe to main unit and switch on, check image, the image is ok.

11.1.4 Disinfecting the Probe

Caution

- Use the liquid disinfectant that meets local laws and regulations.
- If you use the recommended disinfectant, ensure its level and the probe soaking period meets the requirements. Otherwise, the probe may be damaged and your warranty might be void. If you have other use or needs, ensure the level of the make-up disinfectant and the probe soaking period are suitable for the intended clinical application.
- Do not use the expired disinfectant.
- Do not disinfect the probe through autoclaving or contact with ethylene oxide.
- Do not use thermal disinfection. Temperatures higher than 66°C or 150°F will damage the probe.
- Do not air the probe with the disinfectant sticking on it.

11.1.4.1 Disinfecting the Body Surface Probe

You should disinfect the body surface probe after each use.
Steps are as follows.

1. Clean the probe, see Section 11.1.3 Cleaning the Probe.
2. Perform the intermediate level disinfection to the surface of the probe in accordance with the recommended method in Table 11-1.

   Note

   - If you do not use the recommended disinfectant, make up it as to the manufacturer's instructions.
   - Do not immerse the probe over the junction line.
3. Take out the probe from the disinfectant when the recommended soak period expires.
4. Rinse the probe with the fresh running water, and then dry it with a soft dry cloth.

Table 11-1 Recommended Method for Medium-level Disinfection

Disinfectant	Manufacturer	Active Ingredient	Level for Active Ingredient	Contact Type	Contact Period
Cidex	J&J	Glutaraldehyde	2.4%	Wipe/ Soak	<20min
ResertXLHLD	STERIS	Hydrogen peroxide	2.0%	Wipe/ Soak	<8min
T-spray	Pharm. Inc.	Quaternary ammonium salts	2.0-2.2%	Spray/ Wipe	<10min
T-spray	Pharm. Inc.	Quaternary ammonium salts	/	Spray/ Wipe	<10min

11.1.4.2 Disinfecting the Intracavitary Probe

You should disinfect the intracavitary probe after each use.
Steps are as follows.

1. Clean the probe, see Section 11.1.3 Cleaning the Probe.
2. Perform the high level disinfection to the surface [ro in accordance with the recommended method in Table 11-2.

Note

- If you do not use the recommended disinfectant, make up it as to the manufacturer's instructions.
- Do not immerse the probe over the junction line.

3. Take out the probe from the disinfectant when the recommended soak period expires.
4. Rinse the probe with the fresh running water, and then dry it with a soft dry cloth.

Table 11-2 Recommended Method for High-level Disinfection

Disinfectant	Manufacturer	Active Ingredient	Level for Active Ingredient	Contact Type	Contact Period
Cidex	J&J	Glutaraldehyde	2.4%	Soak	45-50min
ResertXLHLD	STERIS	Hydrogen eroxide	2.0%	Soak	<8min
T-spray	Pharm. Inc.	Quaternary ammonium salts	2.0-2.2%	Soak	45-50min

Note

- Disinfectants listed in this manual are recommended because of their chemical compatibility with product materials,not their biological effectiveness.For the biological effectiveness of a disinfectant, refer to the guidelines and recommendations of the disinfectant manufacturer,Association for Practitioners in Infection Control,U.S. Food and Drug Administration, and U.S. Centers for Disease Control.

After disinfecting tehe probe, functions of probe will not be affected, check approach is: connect the probe to main unit and switch on, check image, the image is ok.

11.1.5 Probe Transportation and Maintenance

The probe should be used, stored or transported under the conditions listed in Appendix A Specifications.

■ To transport the probe

To safely transport the probe, please perform the following steps.

1. Ensure that the probe is cleaned and disinfected before placing it in the carrying case.
2. Wrap the case with the plastic material (such as foam package) and place the wrapped case in the carton.
3. To protect the transducer, stick the soft adhesive plaster to the transducer before placing it in the carrying case.

■ To store the probe

To safely store the probe, please be care of the following precautions.

- If the probe is not used, you should place it in the probe cup on the system or in the package.
- Avoid storing the probe at the extreme temperature or in the direct sunlight.
- Ensure that the probe cup is clean before placing the probe in it.
- Ensure that the probe is dry before storing it.
- To avoid probe damage, separate the probe from other equipment to store it.

11.2 Biopsy

Warning

- Only the trained physicians or sonographers under ultrasound guidance can handle the biopsy needle guides. During the operation,the operator must observe proper needle insertion sequencing with the needle guide in order to avoid undue discomfort and unnecessary risk and injury to the patient.
- The biopsy guidelines that display on the monitor are intended as a reference. It is the operator's responsibility to verify correct positioning of the needle during a biopsy.
- Do not freeze an image when performing a biopsy.
- To avoid hurt to patient accidentally, the operator should be highly concentrated during a biopsy.
- The biopsy needle is disposable.
- To avoid the infection, disinfect the probe and wear it with the probe sheath before performing a biopsy.
- You should verify the biopsy bracket before performing a biopsy.

11.2.1 Preparing a Biopsy

Prepare the following items before the biopsy.

- New and straight biopsy needle
- Sterile container filled with sterilized and degassed water
- Properly assembled biopsy bracket
- Activated on-screen guidelines

11.2.2 Verifying the Biopsy Bracket

Note

Ensure that the biopsy bracket is properly assembled before verifying the biopsy bracket.
Steps are as follows.

1. Enter the real time B mode, and press Biopsy.
2. Place the probe in the sterile container filled with sterilized and degassed water.
3. Insert the biopsy needle into the maximum depth of the water.
4. Verify that the path of the needle displays according to the guidelines shown on the image screen.

11.2.3 Performing a Biopsy

Note

Ensure that the biopsy bracket is properly assembled and verified before performing the biopsy.
Steps are as follows.

1. Enter the real time B mode, and press Biopsy.
2. Perform a scan and position and biopsy object.
3. Insert the biopsy needle and observe the ultrasound image to confirm the position of the needle.
4. Perform a biopsy and then take out the needle carefully. Remove the probe from the patient body.

11.2.4 Cleaning and Disinfecting the Biopsy

1. Remove the probe bracket from the probe and take off the biopsy tube.
2. Brush the biopsy bracket with the brush and water to remove the residues on it.
3. Wipe off the water drops on the biopsy bracket with a lint-free cloth.
4. After each use, perform the high-level disinfection in accordance with Table 11-2. For details, refer to Section 11.1.4 Disinfecting the Probe.

11.2.5 Storing the Probe

The probe must be stored in the sterile environment after disinfection.

Chapter 12 System Maintenance

To maintain the performance and reliability of the system, the operator should clean and maintain the system and the accessories periodically.

12.1 Cleaning the System

- To maintain the performance of the system,the system should be maintained periodically(less than half a year),and ensure the system is well grounded and complies with the safety requirements.

- Power off the system and disconnect it from the power supply before cleaning it.Or, electric shock or system damage may result.

Steps are as follows.

1. Wipe the screen, control panel and the surface of the system with a lint-free cloth dampened with75% alcohol.
2. Wipe the solidified objects around the keys on the control panel with the cotton swab and ensure that the objects will not come into the inside of the system.
3. If the blood or contaminated objects adhere to the keys, wipe them with 70% isopropyl alcohol.

After cleaning the machine, functions of the machine will not be affected, check approach is: connect the probe to main unit and switch on, the machien can be booted up and image is ok.

12.2 Replacing the Fuse

The type of the fuse used in this system is 5HTP3.15-R (250V~, T3.15AH). The fuse should be replaced by the service personnel or the designated technical personnel.

12.3 System Disposal

If the system,probes, biopsy brackets and other accessories have reached to validity period (The system's validity period is 5 years), you should dispose them in accordance with Waste Electrical and Electronic Equipment (WEEE) Directive (2002/96/EC) or the requirements of the local laws.

For detailed information about disposing the electrical and electronic equipment, please consult the manufacture or the local distributor. The manufacturer is not responsible for any damages caused by improper disposal.

Chapter 13 Trouble shooting

13.1 Check

1. Check whether power input is in normal range, check whether power cable is connected well and connected to socket.
2. Check whether the probe is connected to main unit in right way.

13.2 Trouble shooting

Trouble shooting :

NO.	Problem	Solution
1	No responce after pressing power on	1. Check input power

	switch	2. Check power cable and related connectors
2	Interference like strips or snowflake are in use display on screen	1. Check power 2. Check whetehr other electronic instruments 3. Check electric field or magnetic field interference in the surrounding environment 4. Check power socket and probe whether they are connected well
3	Not clean image in near field	Adjust total gain and TGC slider near the bottom right edge
4	Not clean image in far field	Adjust total gain and TGC slider near the bottom right edge
5	Dark image	1. Check probe being used is connected to main unit well 2. Adjust brightness 3. Check whether the TGC sliders are at the left side, if yes, please drag them to the right side

Appendix A Specifications

Complied Standards	EN 60601-1 (IEC 60601-1), Medical electrical equipment Part 1: General requirements for basic safety and essential performance, Class I, BF, continuous operation EN 60601-2-37:2008 (IEC 60601-2-37:2007), Medical Electrical Equipment Part2-37: Particular Requirements for the Basic Safety and Essential Performance of Ultrasonic Medical Diagnostic and Monitoring Equipment EN 60601-1-2:2007 (IEC 60601-1-2: 2007), Class A	
	Type of protection against electric shock	Class I Equipment
	Degree of protection against electric shock	Type-BF applied part
	Operation mode	Continuous working
	Installation and operation type	Mobile Equipment

Safety Types	Degrees of protection against harmful liquid	System is IPX0 Probe (from the acoustic window to the junction line) is IPX7 Footswitch is IPX4	
	Degree of safety of application	The equipment is not suitable for use in the presence of a flammable anesthetic mixture with air, oxygen or nitrous oxide.	
Environmental Requirement		Operations	Storage and Transportation
	Relative Humidity	25% to 80%, non-condensing	25% to 93%, non-condensing
	Ambient Temperature	5°C to +40°C	-20°C to +55°C
	Atmospheric Pressure	700hPa to 1060hPa	700hPa to 1060hPa
	Max. Altitude	3000m	3000m

Appendix B Acoustic Output Data

Transducer Model: 3C6A Operating Mode: B mode
SN: TC122-130520001

Index Label			MI	TIS			TIB	TIC
				Scan	Non-scan		Non-scan	
					$A_{aprt} \leqslant 1cm^2$	$A_{aprt} > 1cm^2$		
Global Maximum Index Value			1.03	0.28	#	#	#	(a)
Associated acoustic parameters	$p_{r,\alpha}$	(Mpa)	1.61					
	P	(mW)		38	#		#	(a)
	min of [$P_\alpha(Z_s)$, $I_{ta,\alpha}(Z_s)$]	(mW)				#		
	z_s	(cm)				#		
	z_{bp}	(cm)				#		
	Z_b	(cm)					#	
	z at max $I_{pi\,\alpha}$	(cm)	4.28					
	$d_{eq}(z_b)$	(cm)					#	

	f_{awf}	(MHz)	2.45	2.45	#	#	#	(a)
	Dim of A_{aprt} X	(cm)		1.10	#	#	#	(a)
	Y	(cm)		1.20	#	#	#	(a)
Other information	t_d	(μsec)	0.67					
	prr	(Hz)	4004.4					
	p_r at max I_{pi}	(Mpa)	2.15					
	d_{eq} at max I_{pi}	(cm)					#	
	$I_{pi\,\alpha}$ at max MI	(W/cm)	149.3					
	Focal Length FL_x	(cm) ²			#	#		
	FL_y	(cm)			#	#		
Operating Control conditions	Freq (MHz)		2.5	2.5	#	#	#	(a)
	A.Power (%)		100	100	#	#	#	(a)
	Depth (mm)		166	166	#	#	#	(a)
	Focus Postion (mm)		70	70	#	#	#	(a)
	Focus Number		1	c	#	#	#	(a)
	Scan Density		H	H	#	#	#	(a)
a) Intended use does not include cephalic so TIC is not computed # No data reported								

Transducer Model: 3C6A Operating Mode: M mode
SN: TC122-130520001

Index Label			MI	TIS			TIB	TIC
				Scan	Non-scan		Non-scan	
					$A_{aprt} \leqslant 1cm^2$	$A_{aprt} > 1cm^2$		
Global Maximum Index Value			1.02	#	#	0.03	0.08	(a)
Associated Acoustic parameters	$p_{r,\alpha}$	(Mpa)	1.59					
	P	(mW)		#	#		4	(a)
	min of [$P_\alpha(Z_s)$, $I_{ta,\alpha}(Z_s)$]	(mW)				2.52		
	z_s	(cm)				2.73		
	z_{bp}	(cm)				1.94		
	Z_b	(cm)					4.18	
	z at max $I_{pi\,\alpha}$	(cm)	4.43					
	$d_{eq}(z_b)$	(cm)					0.55	
	f_{awf}	(MHz)	2.45	#	#	2.45	2.45	(a)
	Dim of A_{aprt} X	(cm)		#	#	1.10	1.10	(a)
	Y	(cm)		#	#	1.20	1.20	(a)
	t_d	(μsec)	0.67					

Other information	prr	(Hz)	83.33					
	p_r at max I_{pi}	(Mpa)	2.15					
	d_{eq} at max I_{pi}	(cm)					0.54	
	$I_{pi\,\alpha}$ at max MI	(W/cm)	148.2					
	Focal Length FL_x	(cm) [2]			#	7		
	FL_y	(cm)			#	8		
Operating Control conditions	Freq (MHz)		2.5	#	#	2.5	2.5	(a)
	A.Power (%)		100	#	#	100	100	(a)
	Depth (mm)		166	#	#	166	166	(a)
	Focus Postion (mm)		70	#	#	70	70	(a)
	Focus Number		1	#	#	1	1	(a)
(a) Intended use does not include cephalic so TIC is not computed # No data reported								

Transducer Model: 3C6A Operating Mode: C mode
SN: TC122-130520001

Index Label			MI	TIS			TIB	TIC
				Scan	Non-scan		Non-scan	
					$A_{aprt} \leqslant 1cm^2$	$A_{aprt} > 1cm^2$		
Global Maximum Index Value			0.36	0.69	#	#	#	(a)
Associated Acoustic parameters	$p_{r,\alpha}$	(Mpa)	0.57					
	P	(mW)		62	#		#	(a)
	min of [$P_\alpha(Z_s)$, $I_{ta,\alpha}(Z_s)$]	(mW)				#		
	z_s	(cm)				#		
	z_{bp}	(cm)				#		
	Z_b	(cm)					#	
	z at max $I_{pi\,\alpha}$	(cm)	9.40					
	$d_{eq}(z_b)$	(cm)					#	
	f_{awf}	(MHz)	2.49	2.49	#	#	#	(a)
	Dim of A_{aprt} X	(cm)		3.00	#	#	#	(a)
	Y	(cm)		1.20	#	#	#	(a)
	t_d	(μsec)	1.11					
	prr	(Hz)	3343.8					

Other information	p_r at max I_{pi}	(Mpa)	1.28					
	d_{eq} at max I_{pi}	(cm)					#	
	$I_{pi\,\alpha}$ at max MI	(W/cm)	67.61					
	Focal Length FL_x	(cm) ²			#	#		
	FL_y	(cm)			#	#		
Operating Control conditions	Freq (MHz)		2.5	2.5	#	#	#	(a)
	Depth (mm)		166	166	#	#	#	(a)
	Scale		8	8	#	#	#	(a)
	Packet Size		4	4	#	#	#	(a)
	Flow Speed		H	H	#	#	#	(a)
	Scan Density		H	H	#	#	#	(a)
(a) Intended use does not include cephalic so TIC is not computed # No data reported								

Transducer Model: 3C6A Operating Mode: PW mode
SN: TC122-130520001

Index Label			MI	TIS			TIB	TIC
				Scan	Non-scan		Non-scan	
					$A_{aprt} \leqslant 1cm^2$	$A_{aprt} > 1cm^2$		
Global Maximum Index Value			0.32	#	#	0.51	2.28	(a)
Associated Acoustic parameters	$p_{r,\alpha}$	(Mpa)	0.57					
	P	(mW)		#	#		64	(a)
	min of [$P_\alpha(Z_s)$,$I_{ta,\alpha}(Z_s)$]	(mW)				34.57		
	z_s	(cm)				2.90		
	z_{bp}	(cm)				2.87		
	Z_b	(cm)					4.90	
	z at max $I_{pi\,\alpha}$	(cm)	4.90					
	$d_{eq}(z_b)$	(cm)					0.22	
	f_{awf}	(MHz)	3.07	#	#	3.07	3.07	(a)
	Dim of A_{aprt} X	(cm)		#	#	2.40	2.40	(a)
	Y	(cm)		#	#	1.20	1.20	(a)
	t_d	(μsec)	4.75					

Other information	prr	(Hz)	9061.6					
	p_r at max I_{pi}	(Mpa)	0.98					
	d_{eq} at max I_{pi}	(cm)					0.22	
	$I_{pi\,\alpha}$ at max MI	(W/cm)	13.39					
	Focal Length FL_x	(cm) ²			#	5.5		
	FL_y	(cm)			#	8.0		
Operating Control conditions	Freq (MHz)		3.0	#	#	3.0	3.0	(a)
	SV (mm)		8.0	#	#	8.0	8.0	(a)
	Scale		11	#	#	11	11	(a)
(a) Intended use does not include cephalic so TIC is not computed # No data reported								

Transducer Model: 6E1C Operating Mode: B mode
SN: TE060-140527005

Index Label			MI	TIS			TIB	TIC
				Scan	Non-scan		Non-scan	
					$A_{aprt} \leqslant 1cm^2$	$A_{aprt} > 1cm^2$		
Global Maximum Index Value			0.64	0.28	#	#	#	(a)
Associated Acoustic parameters	$p_{r,\alpha}$	(Mpa)	1.55					
	P	(mW)		12	#		#	(a)
	min of [$P_\alpha(z_s)$, $I_{ta,\alpha}(z_s)$]	(mW)				#		
	z_s	(cm)				#		
	z_{bp}	(cm)				#		
	z_b	(cm)					#	
	z at max $I_{pi\,\alpha}$	(cm)	2.30					
	$d_{eq}(z_b)$	(cm)					#	
	f_{awf}	(MHz)	5.98	5.98	#	#	#	(a)
	Dim of A_{aprt} X	(cm)		0.98	#	#	#	(a)
	Y	(cm)		0.50	#	#	#	(a)
	t_d	(μsec)	0.36					
	prr	(Hz)	11016					

Other information	p_r at max I_{pi}	(Mpa)	2.35					
	d_{eq} at max I_{pi}	(cm)					#	
	$I_{pi\,\alpha}$ at max MI	(W/cm)	86.68					
	Focal Length FL_x	(cm) ²			#	#		
	FL_y	(cm)			#	#		
Operating Control conditions	Freq (MHz)		6.5	6.5	#	#	#	(a)
	A.Power (%)		100	100	#	#	#	(a)
	Depth (mm)		46	46	#	#	#	(a)
	Focus Postion (mm)		30	30	#	#	#	(a)
	Focus Number		1	1	#	#	#	(a)
	Scan Density		H	H	#	#	#	(a)
(a) Intended use does not include cephalic so TIC is not computed # No data reported								

Transducer Model: 6E1C Operating Mode: M mode
SN: TE060-140527005

Index Label			MI	TIS			TIB	TIC
				Scan	Non-scan		Non-scan	
					$A_{aprt} \leqslant 1cm^2$	$A_{aprt} > 1cm^2$		
Global Maximum Index Value			0.61	#	0.06	#	0.03	(a)
Associated Acoustic parameters	$p_{r,\alpha}$	(Mpa)	1.49					
	P	(mW)		#	2		2	(a)
	min of [$P_\alpha(Z_s)$, $I_{ta,\alpha}(Z_s)$]	(mW)				#		
	z_s	(cm)				#		
	z_{bp}	(cm)				#		
	Z_b	(cm)					1.95	
	z at max $I_{pi\,\alpha}$	(cm)	2.10					
	$d_{eq}(z_b)$	(cm)					0.79	
	f_{awf}	(MHz)	5.95	#	5.95	#	5.95	(a)
	Dim of A_{aprt} X	(cm)		#	0.98	#	0.98	(a)
	Y	(cm)		#	0.50	#	0.50	(a)

Other information	t_d	(μsec)	0.35					
	prr	(Hz)	83.33					
	p_r at max I_{pi}	(Mpa)	2.10					
	d_{eq} at max I_{pi}	(cm)					0.72	
	$I_{pi\,\alpha}$ at max MI	(W/cm)	66.46					
	Focal Length FL_x	(cm) ²			3.0	#		
	FL_y	(cm)			3.0	#		
Operating Control conditions	Freq (MHz)		6.5	#	6.5	#	6.5	(a)
	A.Power (%)		100	#	100	#	100	(a)
	Depth (mm)		46	#	46	#	46	(a)
	Focus Postion (mm)		30	#	30	#	30	(a)
	Focus Number		1	#	1	#	1	(a)
(a) Intended use does not include cephalic so TIC is not computed # No data reported								

Transducer Model: 6E1C Operating Mode: C mode
SN: TE060-140527005

Index Label			MI	TIS			TIB	TIC
				Scan	Non-scan		Non-scan	
					$A_{aprt} \leqslant 1cm^2$	$A_{aprt} > 1cm^2$		
Global Maximum Index Value			0.45	0.19	#	#	#	(a)
Associated Acoustic parameters	$p_{r,\alpha}$	(Mpa)	1.01					
	P	(mW)		10	#		#	(a)
	min of [$P_\alpha(z_s)$, $I_{ta,\alpha}(z_s)$]	(mW)				#		
	z_s	(cm)				#		
	z_{bp}	(cm)				#		
	z_b	(cm)					#	
	z at max $I_{pi\,\alpha}$	(cm)	2.15					
	$d_{eq}(z_b)$	(cm)					#	
	f_{awf}	(MHz)	4.97	4.97	#	#	#	(a)
	Dim of A_{aprt} X	(cm)		0.66	#	#	#	(a)

	Y	(cm)		0.50	#	#	#	(a)
Other information	t_d	(μsec)	0.65					
	prr	(Hz)	11058					
	p_r at max I_{pi}	(Mpa)	1.37					
	d_{eq} at max I_{pi}	(cm)					#	
	$I_{pi\,\alpha}$ at max MI	(W/cm)	54.92					
	Focal Length FL_x	(cm) ²			#	#		
	FL_y	(cm)			#	#		
Operating Control conditions	Freq (MHz)		5.0	5.0	#	#	#	(a)
	Depth (mm)		46	46	#	#	#	(a)
	Scale		9	9	#	#	#	(a)
	Packet Size		4	4	#	#	#	(a)
	Flow Speed		H	H	#	#	#	(a)
	Scan Density		H	H	#	#	#	(a)
(a) Intended use does not include cephalic so TIC is not computed # No data reported								

Transducer Model: 6E1C Operating Mode: PW mode
SN: E060-140527005

Index Label			MI	TIS			TIB	TIC
				Scan	Non-scan		Non-scan	
					$A_{aprt} \leqslant 1cm^2$	$A_{aprt} > 1cm^2$		
Global Maximum Index Value			0.15	#	0.29	#	0.45	(a)
Associated Acoustic parameters	$p_{r,\alpha}$	(Mpa)	0.34					
	P	(mW)		#	12		12	(a)
	min of [$P_\alpha(Z_s)$, $I_{ta,\alpha}(Z_s)$]	(mW)				#		
	z_s	(cm)				#		
	z_{bp}	(cm)				#		
	Z_b	(cm)					2.75	
	z at max $I_{pi\,\alpha}$	(cm)	2.95					
	$d_{eq}(z_b)$	(cm)					0.23	
	f_{awf}	(MHz)	5.00	#	5.00	#	5.00	(a)
	Dim of A_{aprt} X	(cm)		#	1.15	#	1.15	(a)
	Y	(cm)		#	0.50	#	0.50	(a)
	t_d	(μsec)	2.90					
	prr	(Hz)	11058					

Other information	p_r at max I_{pi}	(Mpa)	0.57					
	d_{eq} at max I_{pi}	(cm)					0.22	
	$I_{pi\,\alpha}$ at max MI	(W/cm)	3.42					
	Focal Length FL_x	(cm) ²			3.0	#		
	FL_y	(cm)			3.0	#		
Operating Control conditions	Freq (MHz)		5.0	#	5.0	#	5.0	(a)
	SV	(mm)	5.0	#	5.0	#	5.0	(a)
	Scale		11	#	11	#	11	(a)
(a) Intended use does not include cephalic so TIC is not computed # No data reported								

Transducer Model: 7L4A Operating Mode: B mode
SN: TL040-111227001

Index Label			MI	TIS			TIB	TIC
				Scan	Non-scan		Non-scan	
					$A_{aprt} \leqslant 1cm^2$	$A_{aprt} > 1cm^2$		
Global Maximum Index Value			0.67	0.66	#	#	#	(a)
Associated Acoustic parameters	$p_{r,\alpha}$	(Mpa)	1.77					
	P	(mW)		28	#		#	(a)
	min of [$P_\alpha(Z_s)$, $I_{ta,\alpha}(Z_s)$]	(mW)				#		
	z_s	(cm)				#		
	z_{bp}	(cm)				#		
	Z_b	(cm)					#	
	z at max $I_{pi\,\alpha}$	(cm)	1.60					
	$d_{eq}(z_b)$	(cm)					#	
	f_{awf}	(MHz)	6.95	6.95	#	#	#	(a)
	Dim of A_{aprt} X	(cm)		0.66	#	#	#	(a)
	Y	(cm)		0.40	#	#	#	(a)
	t_d	(μsec)	0.34					
	prr	(Hz)	12080					

Other information	p_r at max I_{pi}	(Mpa)	2.49					
	d_{eq} at max I_{pi}	(cm)					#	
	$I_{pi\,\alpha}$ at max MI	(W/cm)	94.56					
	Focal Length FL_x	(cm) ²			#	#		
	FL_y	(cm)			#	#		
Operating Control conditions	Freq (MHz)		7.5	7.5	#	#	#	(a)
	A.Power (%)		100	100	#	#	#	(a)
	Depth (mm)		36	36	#	#	#	(a)
	Focus Postion (mm)		20	20	#	#	#	(a)
	Focus Number		1	1	#	#	#	(a)
	Scan Density		H	H	#	#	#	(a)
(a) Intended use does not include cephalic so TIC is not computed # No data reported								

Transducer Model: 7L4A Operating Mode: M mode
SN: TL040-111227001

Index Label			MI	TIS			TIB	TIC
				Scan	Non-scan		Non-scan	
					$A_{aprt} \leqslant 1cm^2$	$A_{aprt} > 1cm^2$		
Global Maximum Index Value			0.59	#	0.07	#	0.03	(a)
Associated Acoustic parameters	$p_{r,\alpha}$	(Mpa)	1.56					
	P	(mW)		#	2		2	(a)
	min of [$P_\alpha(Z_s)$,$I_{ta,\alpha}(Z_s)$]	(mW)				#		
	z_s	(cm)				#		
	z_{bp}	(cm)				#		
	Z_b	(cm)					1.05	
	z at max $I_{pi\,\alpha}$	(cm)	1.05					
	$d_{eq}(z_b)$	(cm)					0.98	
	f_{awf}	(MHz)	7.00	#	7.00	#	7.00	(a)
	Dim of A_{aprt} X	(cm)		#	0.66	#	0.66	(a)
	Y	(cm)		#	0.40	#	0.40	(a)
	t_d	(μsec)	0.29					

Other information	prr	(Hz)	83.33					
	p_r at max I_{pi}	(Mpa)	1.95					
	d_{eq} at max I_{pi}	(cm)					0.97	
	$I_{pi\,\alpha}$ at max MI	(W/cm)	66.48					
	Focal Length FL_x	(cm) ²			2.0	#		
	FL_y	(cm)			1.9	#		
Operating Control conditions	Freq (MHz)		7.5	#	7.5	#	7.5	(a)
	A.Power (%)		100	#	100	#	100	(a)
	Depth (mm)		36	#	36	#	36	(a)
	Focus Postion (mm)		20	#	20	#	20	(a)
	Focus Number		1	#	1	#	1	(a)
(a) Intended use does not include cephalic so TIC is not computed # No data reported								

Transducer Model: 7L4A Operating Mode: C mode
SN: T L040-111227001

Index Label			MI	TIS			TIB	TIC
				Scan	Non-scan		Non-scan	
					$A_{aprt} \leqslant 1cm^2$	$A_{aprt} > 1cm^2$		
Global Maximum Index Value			0.57	0.48	#	#	#	(a)
Associated Acoustic parameters	$p_{r,\alpha}$	(Mpa)	1.35					
	P	(mW)		26	#		#	(a)
	min of [$P_\alpha(Z_s)$, $I_{ta,\alpha}(Z_s)$]	(mW)				#		
	z_s	(cm)				#		
	z_{bp}	(cm)				#		
	Z_b	(cm)					#	
	z at max $I_{pi\,\alpha}$	(cm)	1.90					
	$d_{eq}(z_b)$	(cm)					#	
	f_{awf}	(MHz)	5.64	5.64	#	#	#	(a)
	Dim of A_{aprt} X	(cm)		0.96	#	#	#	(a)
	Y	(cm)		0.40	#	#	#	(a)
	t_d	(μsec)	0.64					
	prr	(Hz)	8065.8					

Other information	p_r at max I_{pi}	(Mpa)	1.96					
	d_{eq} at max I_{pi}	(cm)					#	
	$I_{pi\,\alpha}$ at max MI	(W/cm)	88.71					
	Focal Length FL_x	(cm) ²			#	#		
	FL_y	(cm)			#	#		
Operating Control conditions	Freq (MHz)		5.7	5.7	#	#	#	(a)
	Depth (mm)		36	36	#	#	#	(a)
	Scale		9	9	#	#	#	(a)
	Packet Size		4	4	#	#	#	(a)
	Flow Speed		H	H	#	#	#	(a)
	Scan Density		H	H	#	#	#	(a)
(a) Intended use does not include cephalic so TIC is not computed # No data reported								

Transducer Model: 7L4A Operating Mode: PW mode
SN: TL040-111227001

Index Label			MI	TIS			TIB	TIC
				Scan	Non-scan		Non-scan	
					$A_{aprt} \leqslant 1cm^2$	$A_{aprt} > 1cm^2$		
Global Maximum Index Value			0.13	#	0.38	#	0.66	(a)
Associated Acoustic parameters	$p_{r,\alpha}$	(Mpa)	0.31					
	P	(mW)		#			14	(a)
	min of [$P_\alpha(Z_s)$, $I_{ta,\alpha}(Z_s)$]	(mW)				#		
	z_s	(cm)				#		
	z_{bp}	(cm)				#		
	Z_b	(cm)					1.10	
	z at max $I_{pi\,\alpha}$	(cm)	1.10					
	$d_{eq}(z_b)$	(cm)					0.31	
	f_{awf}	(MHz)	5.71	#	5.71	#	5.71	(a)
	Dim of A_{aprt} X	(cm)		#	0.96	#	0.96	(a)
	Y	(cm)		#	0.40	#	0.40	(a)
	t_d	(μsec)	2.53					

Other information	prr	(Hz)	15139					
	p_r at max I_{pi}	(Mpa)	0.38					
	d_{eq} at max I_{pi}	(cm)					0.31	
	$I_{pi\,\alpha}$ at max MI	(W/cm)	3.06					
	Focal Length FL_x	(cm) ²			2.0	#		
	FL_y	(cm)			1.9	#		
Operating Control conditions	Freq (MHz)		5.7	#	5.7	#	5.7	(a)
	SV (mm)		8.0	#	8.0	#	8.0	(a)
	Scale		11	#	11	#	11	(a)
(a) Intended use does not include cephalic so TIC is not computed # No data reported								

EC	REP

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