KAIXIN

DCU10

Full Digital Color Doppler Ultrasonic Diagnostic Instruments (Vet)

User's Manual

XUZHOU KAIXIN Electronic Instrument Co., Ltd.

Contents

Introduction

Thank you for purchasing DCU10 Full Digital Color Doppler Ultrasonic Diagnostic Instruments (Vet).

Users shall carefully read through this manual and fully understand the text before operating the equipment.

Please keep this manual after reading so that you can access at any time when needed.

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For the changes of appearance, this manual is subject to change without further notice!

Statement

Kaixin has the final explanation right of this user's manual.

Kaixin was considered responsible for the safety, reliability and performance in case of meeting all the following requirements:

1. Assembly, expansion, readjustment, improve and repair are all performed by professionals recognized by Kaixin;
2. All replacement parts and accessories, consumables involved repairs are Kaixin company (original) or approved by Kaixin;
3. Related electrical equipment complies with national standards and the requirements of the user's manual;
4. Operate the product in accordance with the user's manual.

Warranty and repair service

Purchased the product warranty, sees the company's service policies.

The qualified service personnel who get Kaixin written authorization can repair the instrument out of warranty by themselves. But this should be agreed by Xuzhou Kaixin Electronic Instrument Co., Ltd. We will provide circuit diagrams, component part lists or other information to assist service personnel to repair those parts of our equipment that are designated by our company as repairable by service personnel.

Manufacturer's Information

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Chapter 1 Technical Specifications

1.1 Technical Parameters

1. Monitor: 15" LED screen
2. Dimension: 400mm (L) x 394mm (H) x 172 (D)
3. Weight: approximately 8.1 kg

1.2 Functions

1. System preset: hospital name, language, date and time format, image and film type, TI, video mode, printer, brightness and color temperature, system date and time, system wait, reset configure, key sound, backlight, UI style;
2. Probe and exam mode preset;
3. Image menu preset;
4. Measure preset;
5. Comment preset;
6. DICOM preset;
7. Report template preset;
8. Preset data;
9. System information display;
10. Patient information input function;
11. Selecting the probe and exam type function;
12. Ending the exam;
13. B, B/M, M, Color, PDI, PWmode conversion function;
14. B mode image adjustment functions: gain, TGC, focus position/number, frequency, depth, gray map, colorize, dynamic range, scan scope, scan density, speckle reduction, frame correlation, line average, space compound, edge enhance, image enhance, acoustic power, vertical reverse, horizontal reverse, body type;
15. Color image adjustment functions: gain, frequency, scale, sensitivity, baseline, flow speed, wall filter, color reverse, frame correlation, scan density, steer, color map, post process, acoustic power, dual live;
16. PDI image adjustment functions: gain, frequency, scale, sensitivity, flow speed, wall filter, frame correlation, scan density, steer, color map, post process, acoustic power, dual live;
17. M mode image adjustment functions: gain, depth, sweep speed, focus position, dynamic range, gray map, colorize, speckle reduction, line average, edge enhance, full screen, vertical reverse, acoustic power;
18. PW image adjustment functions: gain, frequency, scale, baseline, SV, angle, sweep speed, scale unit, reverse, steer, colorize, wall filter, dynamic range, full screen, acoustic power, smooth;
19. Displaying the image (dual-splitting, quad-splitting display);
20. Magnifying the image;
21. Image freeze/unfreeze function;
22. Viewing and cropping the cine;
23. Text/arrow annotation, body marks function and delete the annotation;
24. B mode conventional measurement function: distance, area and circumference, volume, area ratio, distance ratio, angle;

25. M mode conventional measurement function: distance, time, heart rate, slope rate;
26. Color/PDI mode conventional measurement function: distance, area and circumference, volume, area ratio, distance ratio, angle;
27. PW mode conventional measurement function: flow speed ratio, velocity, time, heart rate, acceleration, spectrum trace;
28. Abdomen application measurement function: liver, gallbladder, pancreas, spleen, kidney;
29. Obstetric application measurement and GA/EDD calcualtion function;
30. Cardiac application measurement function: left ventricle, inner diameter of right ventricle end diastole, inner diameter of main pulmonary artery, mitral valve, aorta, ejection time, left ventricle mass weight;
31. Vascular application measurement function: CCA, ICA, ECA, VA, upper ext vein, lower ext vein;
32. Small parts thyroid and isthmus application measurement function;
33. Backfat, loin and swine's lean percentage application measurement function;
34. Automatically generate report, view the report, add the diagnostic information, save the report, print the report;
35. Managing images function: save, review, delete, print;
36. Data storage and sending function;
37. Puncture guide function;
38. OPU guide function.

Chapter 2 System Outline

You should familiar with the structure composition, operation of the keys and buttons, the general work flow before using this instrument.

2.1 Structure composition of the instrument

DCU10 full digital color Doppler ultrasonic diagnostic instruments (Vet) are composed of main unit and probe, etc.

2.2 Main Unit Overviews

Figure 2-1 Main Unit Overview

2.2.1 Left View

Figure 2-2 Left View

2.2.2 Rear View

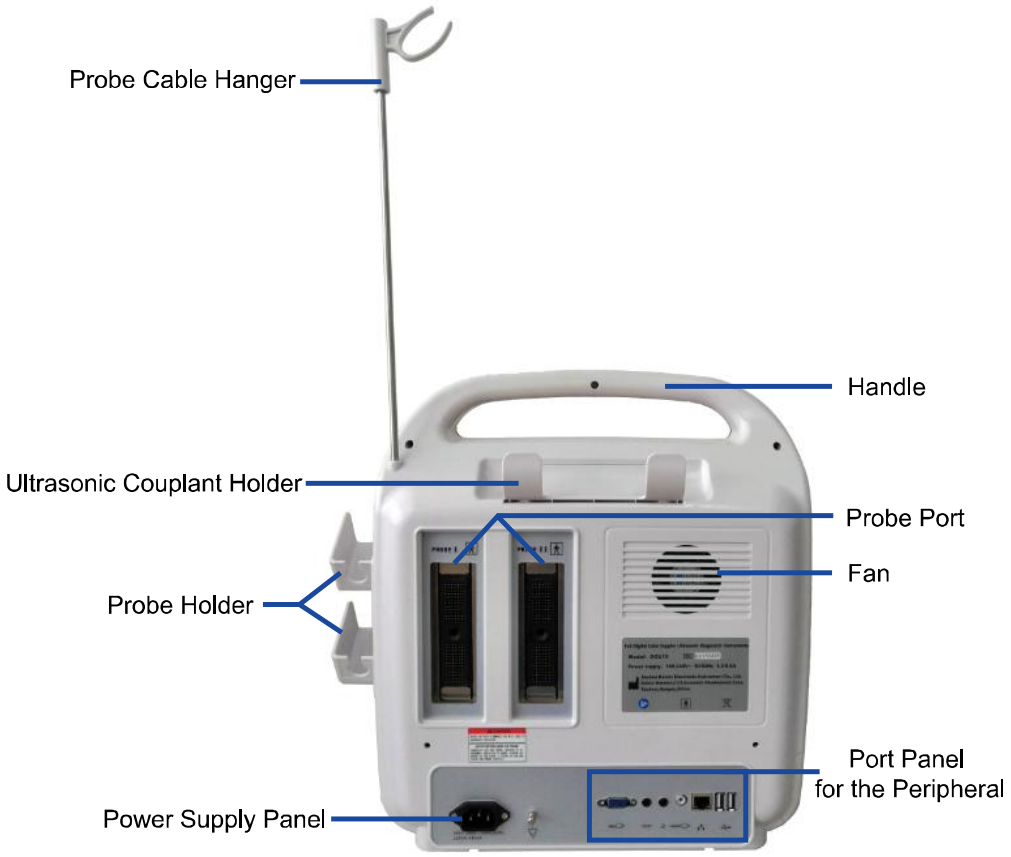


Figure 2-3 Rear View

2.3 Peripherals Ports View

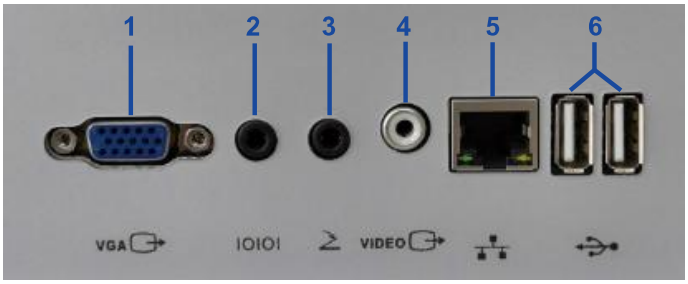


Figure 2-4 Peripherals Ports

No.	Name	Function
1	VGA port	Used for connecting the video equipment generating VGA signals, such as monitor and projector.
2	Serial port	Used for connecting the debugging cable and exporting the debugging information for after-sales servicing.
3	Footswitch port	Used for connecting the footswitch.
4	Video output port	Used for connecting the video equipment generating the composite video signals, such as video printer.
5	Network port	Used for connecting DICOM3.0 server or network.
6	USB port	Used for connecting the usb2.0 equipment,such as u disk and usb printer.

2.4 Power Supply Port

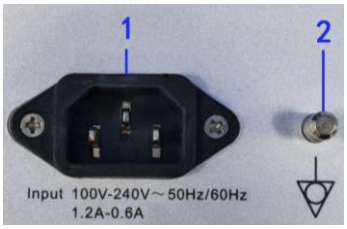


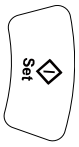
Figure 2-5 Power Supply Port

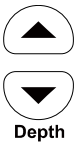
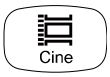
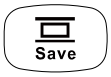
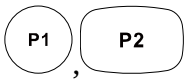
No.	Name	Function
1	AC power input port	Used for connecting the AC power supply.
2	Equipotential Terminal	Used for balancing the protective earth potentials between this instrument and other electrical equipment.

2.5 Control Panel

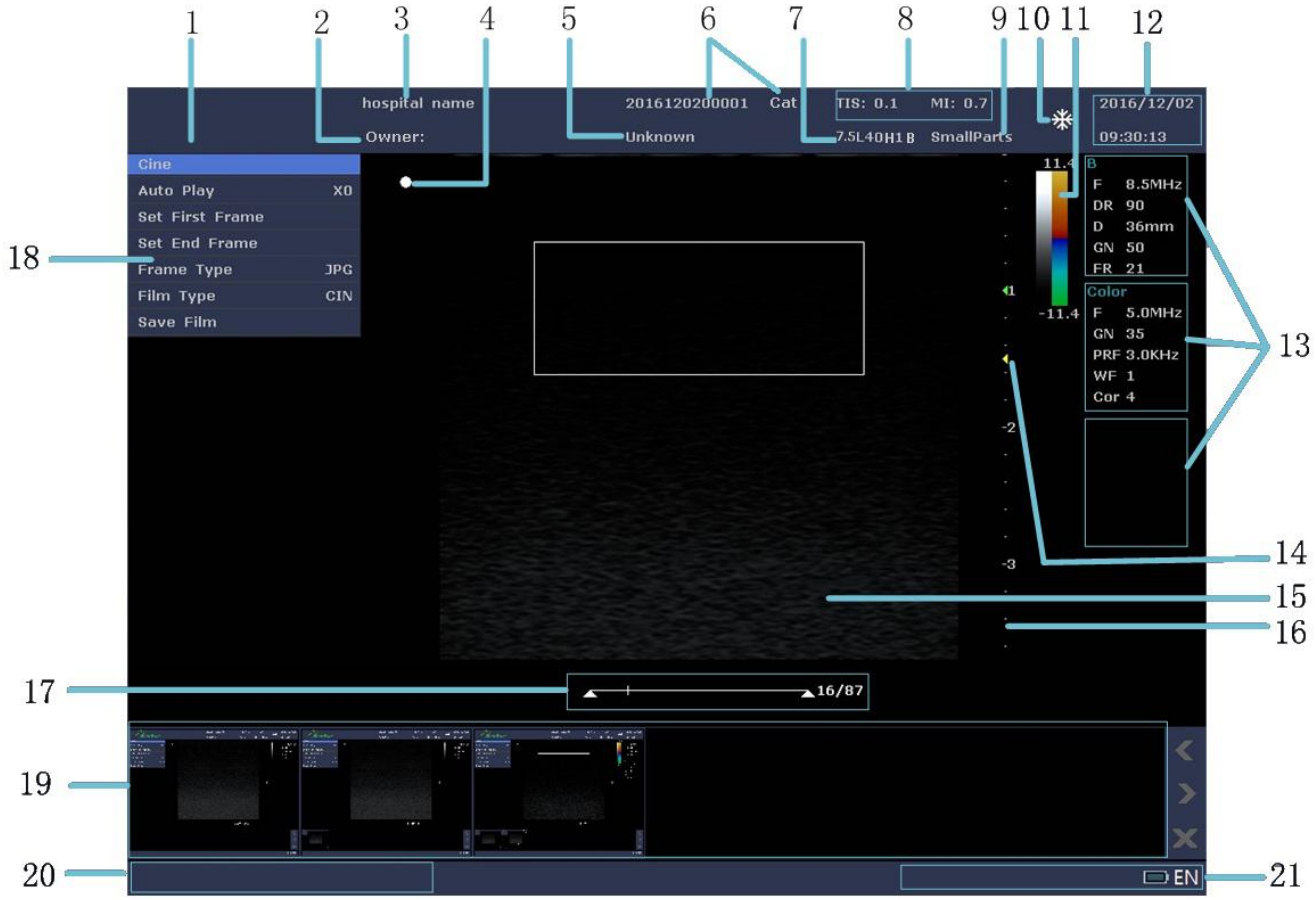
SN	Sign	Name	Functions
Indicators Area			
1		Power indicator	The indicator lights on when the system is powered by the alternative current.
2		Battery capacity indicator	The indicator lights on the when the system is powered by the battery.
3		Battery charge indicator	The indicator lights on when the battery is charged and lights off when the battery is fully charged.
Keyboard Area			
1	ESC	ESC Key	1. When dialog is open, press it to close the opened dialog. 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.
2	Help	Help Key	Press it to display help information.
3	Report	Report key	Press it to enter the report screen.
4	Station	Station key	Press it ot enter the workstation screen.
5	Preset	Preset key	Press it to enter the system preset screen.
6	Save IP	Save current image parameters key	Press it to save the parameters setting of the current imaging mode.
7	Reset IP	Restore the preset image parameters key	Press it to restore the parameters setting of the current imaging mode from preset.

8	Lito	Lito key	Press it to activate the lito function.
9	Biopsy	Biopsy key	Press it to activate the biopsy function.
10	Menu	Menu key	Press it to hide/display the menu function.
11	Body Mark	Body mark key	Press it to enter/exit the body mark status.
12	Arrow	Arrow annotation key	Press it to enter/exit the arrow annotation status.
13	ABC Comment	Text annotation key	Press it to enter/exit the text annotation status.
14	Clear	Clear key	Press it to remove all the annotations and measurements from the screen.
15	Steer- Steer+	Left/right key	● Adjust the left and right positions of the curosr under the text comment state. ●Press it to adjust the steer angle in Color/PDI status. ●Press it to adjust the sampling line angle in PW status.
16		Up/down key	Press it to adjust the volume of the frequency spectrum in the real time PW mode.
17	Ctrl + blank	Typewriting selection key	In Chinese screen, press the combined keys to select the desired typewriting.
18	-	Other keys	Achieve the functions similar with the keys on the keyboard of the computer.
Function Keys			
1		Power on/Standby key	Press it to power on or off the instrument or to enable standby mode.
2		TGC slide pot	There are 8 TGC slide pot. Move it to adjust the gain of the specified depth.
3	Patient	Patient key	Press it to enter the patient information screen to create or edit the patient information.
4	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.
5	Review	Review key	Press it to enter the file review screen.
6	End Exam	End the exam key	Press it to end the exam of the current patient.
7	Select	Select knob	Rotate this knob to select a menu item and press the knob to adjust the menu parameters.

8		B mode key	Press it to enter the B mode.
9		Color mode key	Press it to enter/exit the color flow Doppler mode.
10		PDI mode key	Press it to enter the PDI mode.
11		PW mode key	Press it to enter/exit the pulsed wave Doppler mode.
12		M mode key	Press it to enter/exit the M mode.
13		Dual display key	Press it to enter the dual display.
14		Quad-display key	● If it is not in four images view, press this key to enter four images view. ● If it is in four images view, press this key to switch real time display image.
15	 Gain	Gain knob	Rotate it to adjust the gain of the current mode.
16		Cursor key	Press it to display or hide the cursor.
17		Measurement key	Press it to activate or deactivate the measurement.
18		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. Non-measurement state, real-time scanning: ● In PW mode, it is used to switch the real-time/ freeze display status of 2D image and PW image.
19		General measurement key	Press it to enter/exit the general measurement.
20		Confirmation key	Press it to confirm the current operation.
21	 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 delete or restore the last trace during the trace measurement.
22		Depth key	Used for increasing or decreasing the depth of the image.
23		Magnification key	Used for magnifying the interest area of the image.
24		Play back key	Press it to inactivate/activate the manual review of the cine in the cine mode.
25		Save key	Press it to save the current image in the frozen mode.
26		Freeze key	Press it to freeze/unfreeze the image.
27		User-defined shortcut key	Press it to enable the shortcut function defined by the user. For details, refer to Section 6.1 System Preset.

2.6 Main Screen



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

2.7 Regular Examination Workflow

The regular examination workflow is as shown in Figure 2-6. If you are not familiar with any of the operations, please consult the relevant chapter.

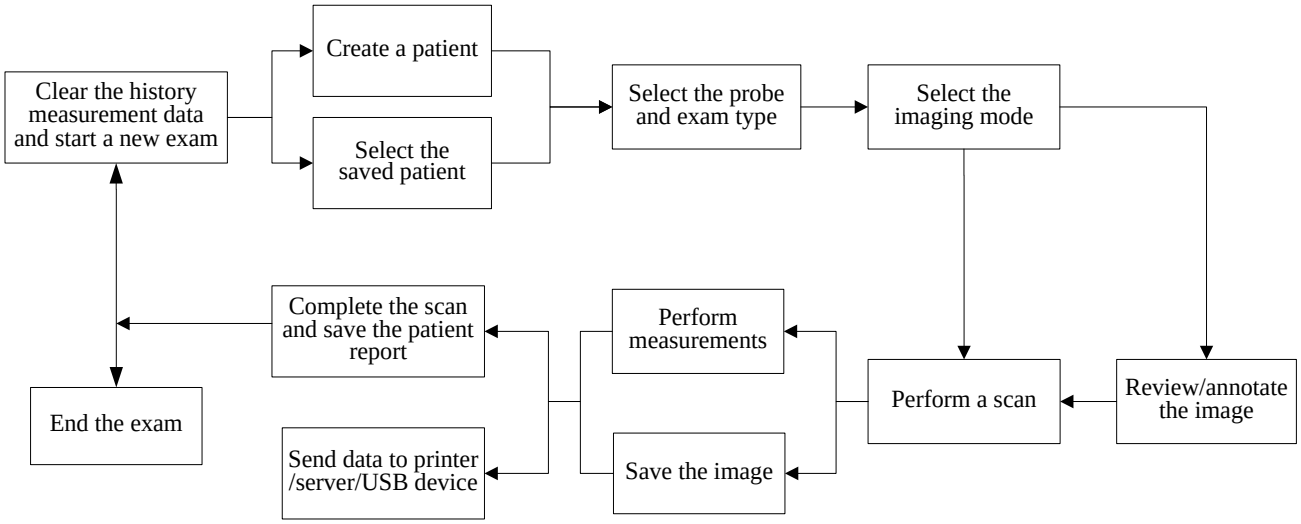


Figure 2-6 Regular Examination Workflow

- For creating a patient, refer to Section 7.1 Registering a Patient.
- For selecting the probe and exam type, refer to Section 7.2 Selecting the Probe and Exam type.
- For selecting the imaging mode, refer to Chapter 8 Optimizing the Image.
- For reviewing/annotating the image, refer to Chapter 9 Processing the Images.
- For performing measurements, refer to Chapter 10 Measurements and Calculations.
- For saving the image, refer to Section 12.1 Saving the Image/Cine.
- For sending data to printer/server/USB storage device, refer to Section 12.4 Printing the Image and Section 12.5 Saving Data.
- For completing the scan and saving the patient report, refer to Chapter 11 Report.
- For ending the exam and clearing the history measurement and starting a new exam, refer to Section 7.3 Ending the Exam.

Chapter 3 System Configuration

3.1 Typical configuration

1. Main unit	1 unit
2. 6.5 MHz micro-convex probe	1 PC
3. 7.5 MHz high frequency linear array probe	1 PC
4. Built-in battery	1 PC
5. Power supply cable	1 PC
6. Equipotential wire	1 PC
7. Network cable	1 PC

3.2 Optional parts

1. 3.5MHz convex array probe
2. 6.5MHz animal transrectal linear array probe
3. 3.5MHz animal loin linear array probe
4. 6.5MHz animal OPU probe
5. 5.0MHz animal phased array probe
6. Foot switch

Chapter 4 Operation Condition

4.1 Power supply

Power supply: 100V-240V~ 50Hz /60Hz，1.2A-0.6A

4.2 Operation Environment

Ambient temperature: 10℃-40℃
Relative humidity: 30%-75% (without condensation)
Atmospheric pressure: 700hPa-1060hPa

4.3 Storage and Transportation

4.3.1 Storage and Transportation Environment

Ambient temperature: -20℃-55℃
Relative humidity: 30%-93% (without condensation)
Atmospheric pressure: 700hPa-1060hPa

4.3.2 Storage and Transportation

1. If the instrument is stored over 3 months, take out the instrument from the packing case, connect it to power supply for 4 hours, and then disconnect the power and place it in the case again following the direction indicated by arrows on the package. Store the case in the warehouse. Do not pile the case. The instrument case should have adequate space from ground, walls and ceiling of the warehouse.
2. Environment requirement
   Ambient temperature: -20℃-55℃; Relative humidity: 30%-93% (without condensation);
   Atmospheric pressure: 700hPa-1060hPa. The warehouse should be well ventilated and free of direct sunlight and corrosive gas.
3. Shockproof measures have been taken inside the packing case to allow for transport by air, railway, land and sea. The goods shall not be exposed to poor weather conditions like rain and snow, nor shall the goods be placed upside down, bumped, knocked or over-stacked.

Chapter 5 System Installation and Check

5.1 System installation

Please carefully read through and fully understand the safety cautions before install and place the system.

1. Unpack the instrument case and check the goods for its completeness according to the packing list.
2. Place the instrument on a stable and leveled position.
3. Put the ultrasonic couplant holder on the main unit and fasten it with the buckle; then screw the probe cable hanger to the corresponding hole and tighten it.
4. Leave adequate space of 20 centimeters as minimum from rear, left and right side of the instrument.

⚠Attention: Adequate space from rear, left and right side of the machine shall be reserved, or the machine may malfunction under excessive heat inside the enclosure.

5.2 Ultrasonic probe installation

⚠Warning: Do not use the probe not provided by our company, otherwise the equipment and the probe will cause damage, and may cause fire in extreme cases.

⚠Attention:

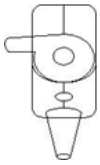
1. **Turn off the ultrasonic system before disconnecting the probe. Disconnecting the probe with system power on may damage the system or probe.**
2. **Before disconnecting the probe, place the probe on the probe holder and put its cable on the probe cable hanger so that the probe may not be damaged or injury person by unexpected fall.**
3. **Freeze the instrument when instrument is start-up without operation to increase of service life of probe.**
4. **Repeat available machine time should be more than one minute to avoid turn on/off power supply in short time.**
5. **Disconnect the probe from the system after freezing an image or powering off the system. Otherwise, the system or the probe could be damaged.**

5.2.1 Connecting the probe

⚠Warning: Before connecting or using the probe, make sure that the probe, connecting cable and connector are in normal condition (free of cracks or drop). Use of defective probe may cause electric shock.

Steps for connection are as follows.

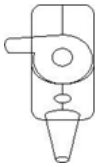
1. Shutdown the system, place the probe cable downward and rotate the probe lock on the probe connector to the horizontal direction, as shown below.



2. Insert the connector into the probe port until squeeze it.
3. Rotate the probe lock on the probe connector to vertical direction position to make it fixed, as shown below.

5.2.2 Disconnecting the probe

Shutdown the system, rotate the probe lock on the probe connector to the horizontal direction and remove the probe connector, as shown below.



5.3 Connect to equipotential wire

Shutdown the system, connect one end of the equipotential wire to the equipotential terminal (⏚) and the other end to the earth.

5.4 Connect to power

There are two ways to power on the instrument: mians supply and battery.

The device's battery is automatically charged while the power is connected to the mains supply. Once the charge is completed, the power supply will no longer continue to charge the battery.

Shutdown the system, insert the power plug (jack) into the power input port on the rear panel of the main unit, the other end to the mains socket-outlet.

The instrument uses three-core power line. It connects with the protective earth line when power plug inserts into the power socket.

5.5 Assembling and Disassembling the battery

Disassembling and assembling the battery have a certain risk, non-technical personnel or authorized qualified personnel by the manufacturer shall not disassemble the battery.

5.5.1 Disassembling the battery

1. Shutdown the system; hold your finger firmly on the battery cover icon and follow the arrow to push the battery cover;

2. Remove the battery cover, use a cross screwdriver to remove the two screws on the triangular metal parts;

3. Remove the battery cable and remove the battery.

5.5.2 Assembling the battery

1. Shutdown the system; first connect the battery cable, then put the battery into the battery slot;

2. Then use a cross screwdriver to install the two screws on the triangular metal parts, and finally install the battery cover.

5.6 Connecting the Peripherals

5.6.1 Connecting the foot switch

> ⚠**Use the foot switch provided by the manufacturer only. Otherwise, system and footswitch may be damaged.**

Shutdown the system, insert the foot-switch plug into the foot-switch socket on the rear panel of the main unit. Step on the foot switch to freeze/unfreeze the image.

> ⚠**Attention: The waterproof grade of foot switch is IPX1.**

5.6.2 Connecting the video printer

Please use the printer model recommended by the manufacturer to connect the instrument. The video printer is purchased by the user.

1. Shutdown the system, connect the equipotential terminal (⏚) of the video printer to the earthing;

2. Connect the printer to the mains supply with power cable, with AV video cable connect composite video output interface (VIDEO) of the system to the printer video input interface. You can use the video printer when the connection is completed.

> ⚠**Attention:**
>
> 1. **By using factory default settings, according to actual situation, please adjust the default parameters of graphic printer to get the best quality printed image.**
> 2. **Please check user instruction to install the printer. If the printer doesn't work, please press Preset key and choose [System Preset] to check related printer preset.**
> 3. **The system supports composite video output, video mode can select NTSC or PAL.**

5.6.3 Connecting the graphic printer

Please use the printer model recommended by the manufacturer to connect the instrument. The graphic printer is purchased by the user.

Shutdown the system, connect the printer to the mains supply with power cable, and then use a USB data cable to connect the USB port of the main unit (USB port transmission protocol: USB 2.0) to the USB port of the printer.

You can use the graphic printer when the connection is completed and set the graphic printer model in the System Preset.

5.7 Booting/Standby/Powering off

- **Booting the system**

  Press the **Power on/Standby** key in the upper-left corner of the control panel to boot the system.

  Note: The probe must be connected before power on.

- **Standby**

  In standby mode, screen is closed, system is in low power status, the **Power on/Standby** key is blinking in green backlight.

  Go to sleep:

  - Press the **Power on/Standby** key in the upper-left corner of the control panel, and select the [Standby] to enter the standby mode.
  - Press **Preset** key → [System Preset] → [Standby] and [Wait]. The system enters the standby mode automatically when the user does not perform any operaton within the set time.

  Go to sleep:

- Press the **Power on/Standby** key in the upper-left corner of the control panel to exit the standby mode.

■ **Powering off the system**

Press the **Power on/Standby** key in the upper-left corner of the control panel, and select the [Shut off] to shut down the system.

> ⚠**Attention:**
>
> **1. The instrument can not be powered on again after the power is turned off for one minute or it may be faulty.**
> **2. Do not power off the system during system upgrade or data transmission.**
> **3. Do not disconnect the power cable before the power off information disappears. Otherwise, the files may be damaged and patient data may be lost.**
> **4. For safety and functionality of the system, regular maintenance should be performed as described in the section "System Maintenance".**
> **5. Long-press the Power on/Standby key, you can turn off the system forcibly but may cause data damaged or lose, avoid turn off the system in this way unless it is necessary.**
> **6. When the device crashes, press the Power on/Standby key in the upper-left corner of the control panel to restart the system.**

5.8 Ultrasonic probe check before and after operation

Check if there are any exceptionally on the surface of the probe or cable jacket, such as peeling, cracks, bulge, or if the acoustic lens is reliable, disinfected or cleaned.

5.9 Main unit check before and after operation

5.9.1 Inspection before start-up

Check the following items before starting the machine:

1. The temperature, humidity and atmospheric pressure shall meet the requirements of operation condition.
2. No condensation occurs.
3. No distortion, damage or contamination on system and peripheral. Clean the parts as specified in relevant sections, if the contaminant is present.
4. Check the control panel, LED screen and enclosure to ensure they are in good working condition and free of abnormity (such as cracks and loosened screws).
5. No damage on cable (power cable, etc.), and hard up on its connection.
6. Check probe and its connections to ensure they are free of abnormity (such as scuffing, drop-off or contamination). If the contaminant is present, clean, disinfect the contaminated objects as specified in relevant sections.
7. Check all the ports of the machine for possible damage or blockage.

5.9.2 Inspection after start-up

Check the following items after starting the machine:

1. No abnormal voice, strange smell and overheating appear.
2. Check the machine to ensure a normal start-up: The power indication light is on and startup picture is shown on the screen. Then the machine will automatically enter B mode.
3. Check the acoustic lens for abnormal heat when the probe is in use. This can be done by hand touching the probe to feel the temperature of the lens.
4. Check the image to ensure trouble-free display (no excessive noise or flicker).
5. Check the control panel to ensure normal operation condition.
6. Check the instrument to ensure that the phenomenon of local high temperature will not appear.

Chapter 6 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 run even after you rebooting the system.

Press the **Preset** key on the control panel, the preset menu is displayed at the top left of the screen, as shown in Figure 6-1.

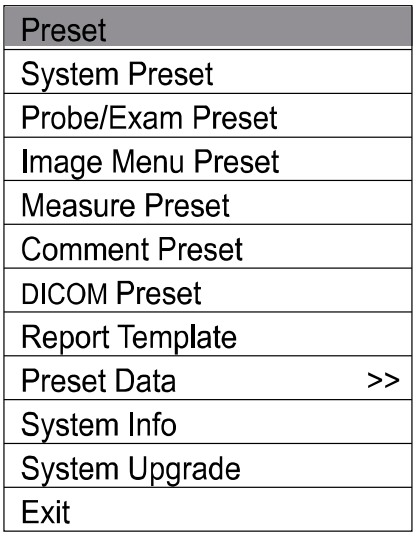


Figure 6-1 Preset Menu

- 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 Preset menu, move the trackball to [Exit] and press the **Set** key.

6.1 Presetting the System

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

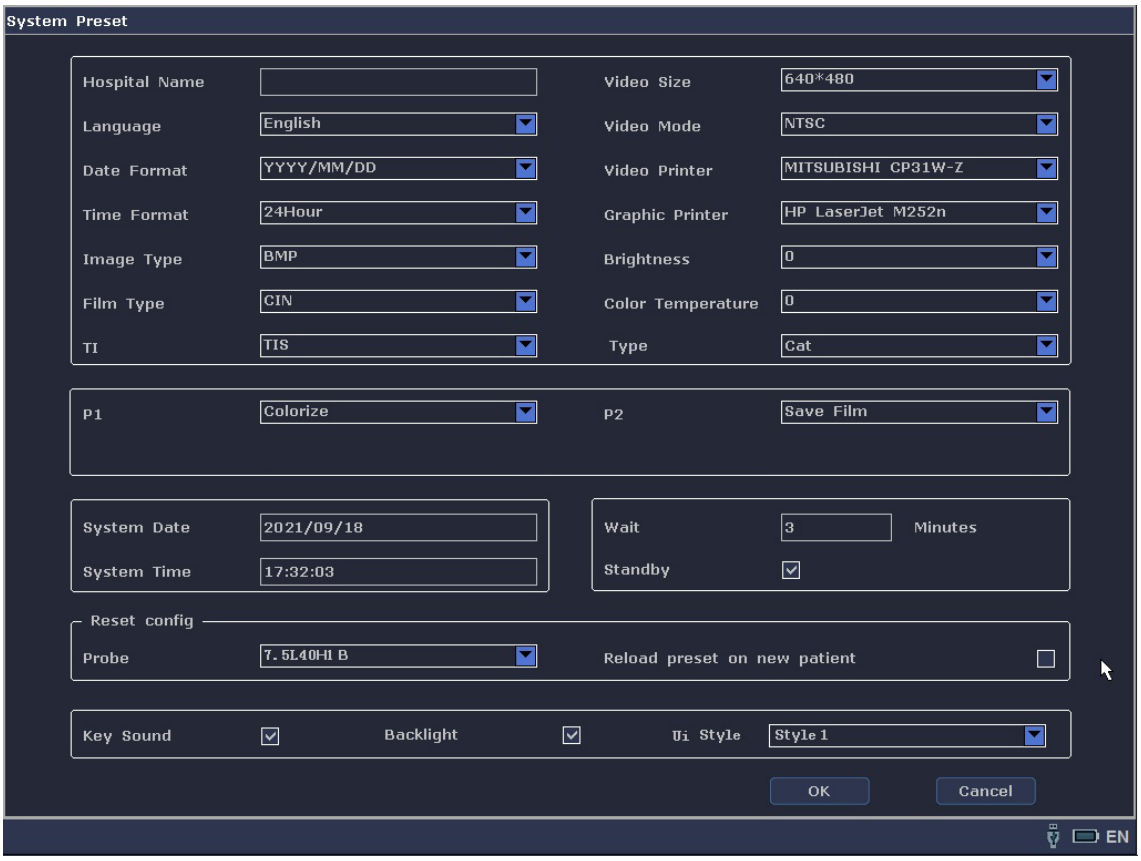


Figure 6-2 System Preset Screen

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
TI	Set the TI index. Options: TIS, TIB or TIC.
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.

Type	Set the animal types. Options: Cat, Dog, Cattle, Horse, Sheep, Swine, Other. Set the animal type need to restart the machine, the animal type can take effect.
P1~ P2	Set the functions of shortcut key. Options: Save Film, Colorize
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.
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.
Ui Style	Set the background color of the title bar. Optional: Style 1, Style 2.

6.2 Presetting the Probe/Exam

As shown in Figure 6-3, you can select the probe for the specified exam and defined the exam type in the Probe/Exam Preset screen, and the presetting will display on the Probe/Exam screen.

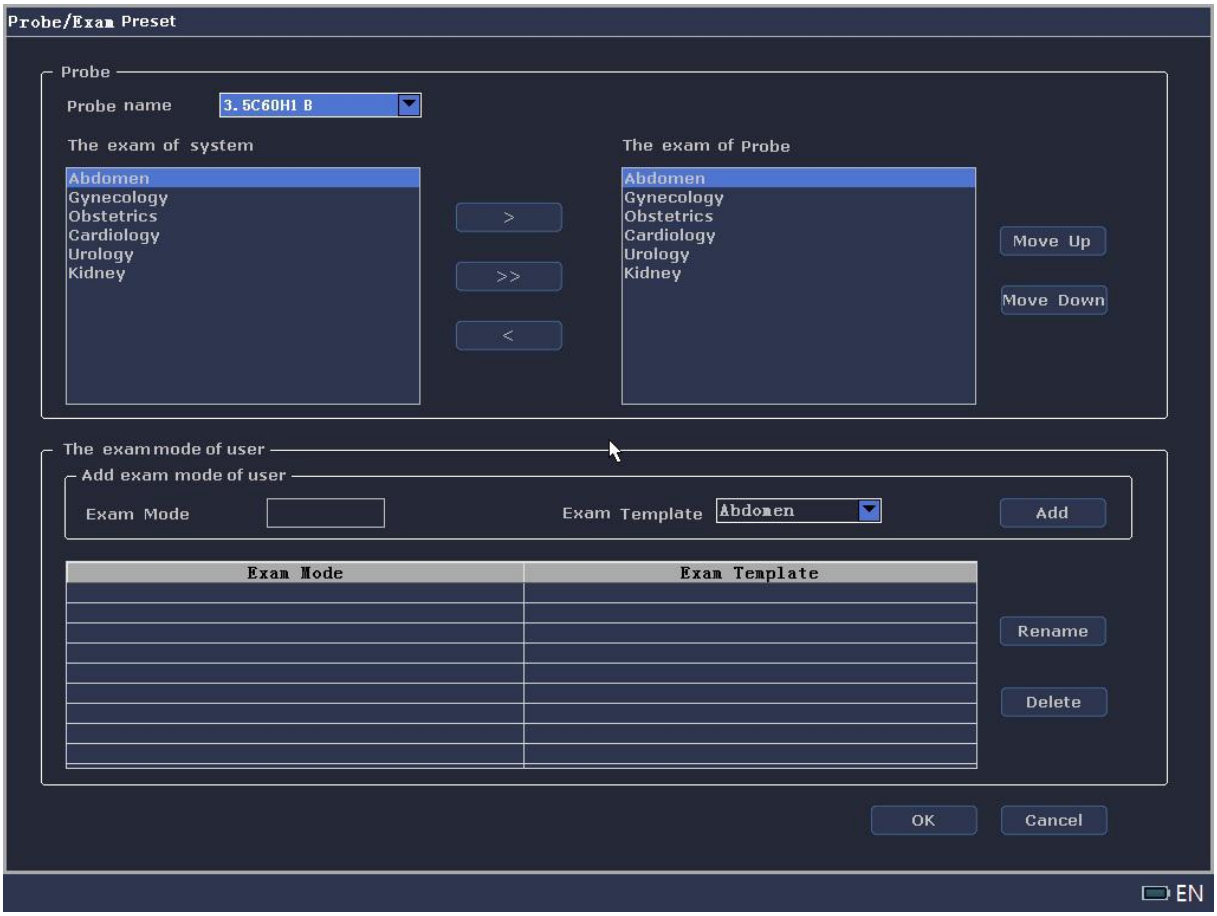


Figure 6-3 Probe/Exam Preset Screen

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 in the list of [The exam of probe] and click < to delete it.
   - Click [Move Up] or [Move 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.

6.3 Presetting the Image Menus

You can preset the image menus in the Image Menu Preset screen.

In real-time mode, the image menu of B, Color, PDI, M, PW mode can be set; in the frozen state, the cine menu can be set.

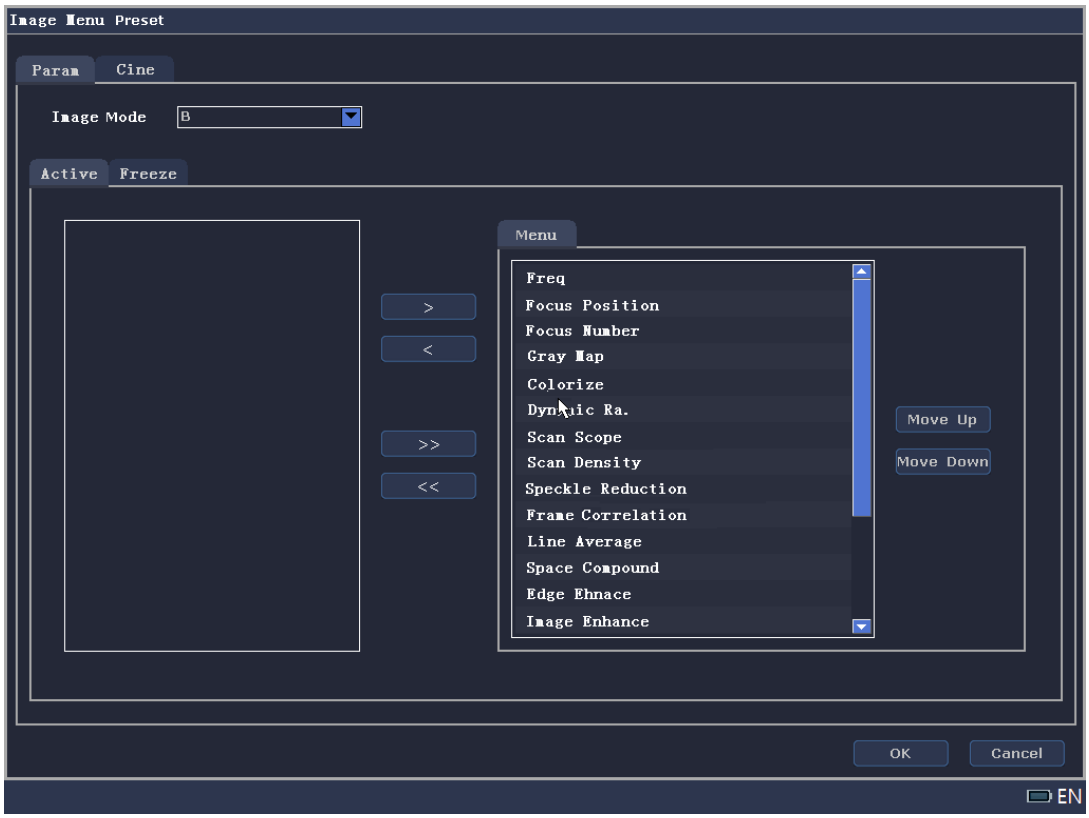


Figure 6-4 Image Menu Preset Screen

6.4 Presetting the Measurements

You can preset the heart rate and the cursor line display in the Measure Preset screen.

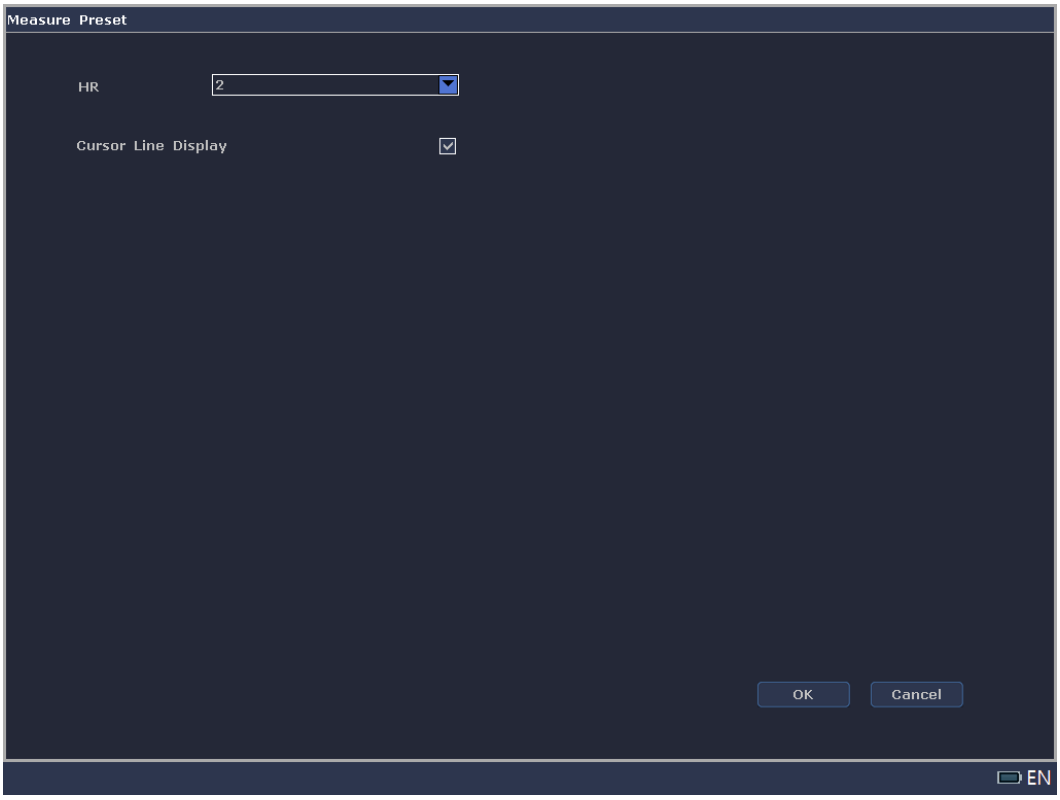


Figure 6-5 Measurement Preset Screen

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

6.5 Presetting the Annotations

You can create, edit or delete the defined text annotations in the Comment Preset screen.

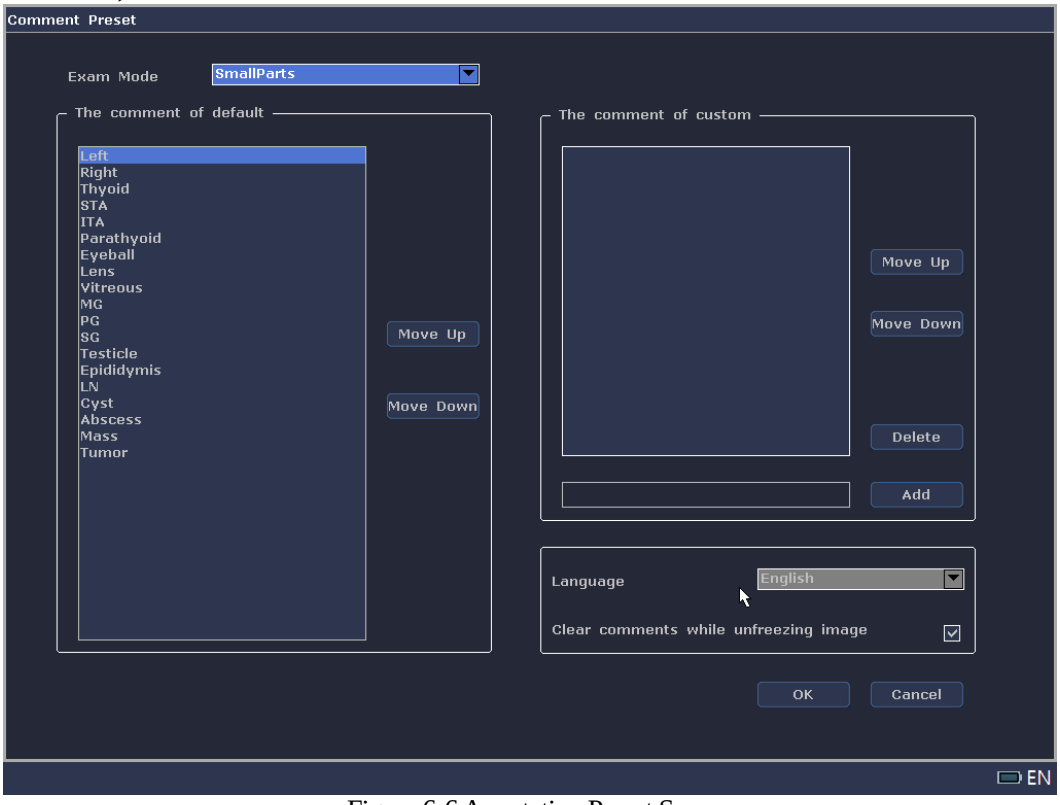


Figure 6-6 Annotation Preset Screen

- 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 custom].
- To move an annotation up or down
  Select one annotation in the list of [The comment of default] or [The comment of custom] and click [Move Up] or [Move Down] to move it up or down.
- To delete an annotation
  Select one annotation in the list of [The comment of custom] and click [Delete] to delete it.
- To select the language of annotation
  Click the [Language] and select the desired language of annotation.
  Note: In English screen, only use English annotation.
- 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.

6.6 Presetting DICOM

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

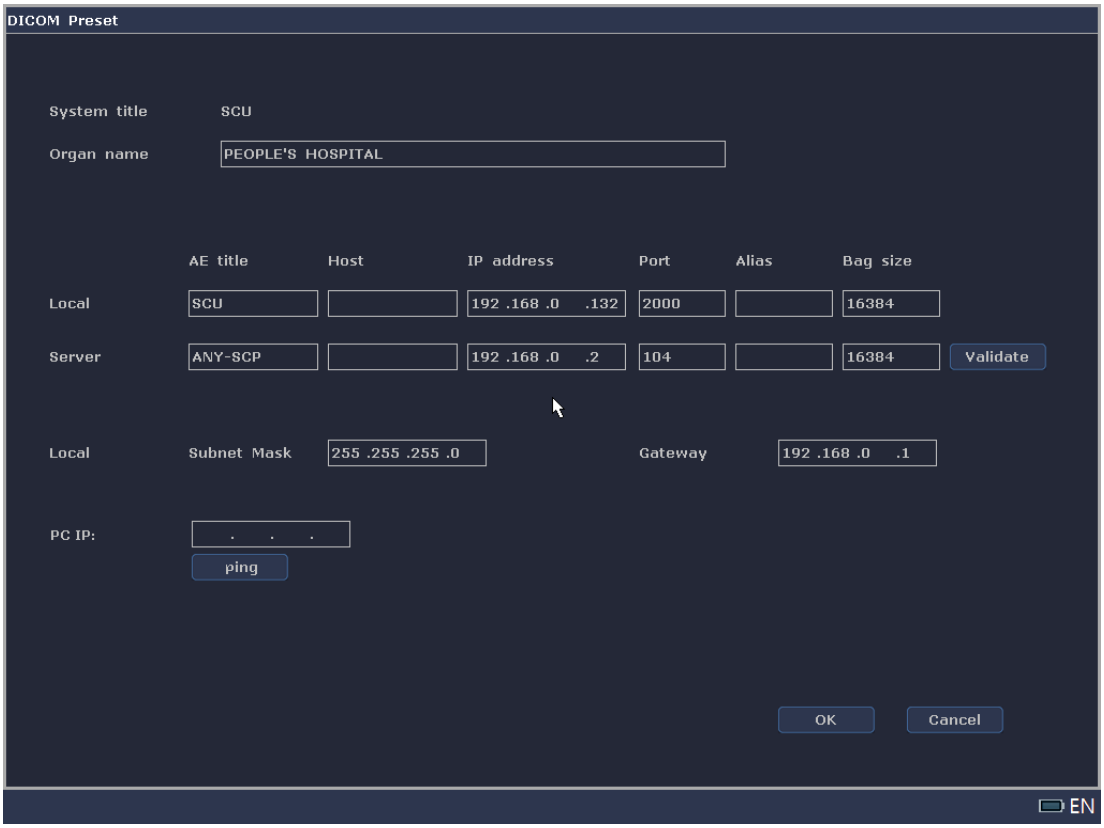


Figure 6-7 DICOM Preset Screen

Item		Descriptions
System title		The system title is the same as the local AE title by default.
Organ name		Enter the hospital's name.
	AE title	Enter the name of AE title and the system title changes with it.
	Host	Enter the host name of the system.

Local	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.
	Host	Enter the host 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.
PC IP		Enter the IP address of the PC.
ping		Click it to confirm that the system is connected to the PC.

Steps for connecting DIOCM server are as follows.

1. Connect the system to the network of the server with a network 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 images to the server.

> ⚠**Attention: Ensure that the system is successfully connected to the DICOM server before use. Otherwise, the information can't be saved to the DICOM server. DICOM interface transmission protocol: DICOM 3.0; Storage format: DCM.**

6.7 Presetting the Report Template

You can add, edit, delete or import report template in the Report Template screen.

- To add a report template: Click [Add] to pop up the dialog box, input new report template, click the following [Save], new added report template appears in the [Template Item].
- To edit a report template:
  1. In the [Template Item], select the report template to be edited, click [Rename], pop up input box, input new name, click the following [Save] to rename of template item;
  2. After editing the "Findings" and "Prompt", click [Save], prompt Save successfully, click [OK] to complete the editing of report template.
- To delete report template:
  In the [Template Item], select the report template to be deleted, click [Delete], pop up warning box, click [OK] to delete the selected report template.
  Click [Delete all], pop up warning box, click [OK] to delete all the report templates.
- To import a report template:
  Click [Import], select the imported template to be imported.
- Restore factory
  Click [Restore Factory] to restore the report template to factory state.

6.8 Presetting the Data

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.

> ⚠**Attention: You can only import the system settings data to the ultrasound system with the same type provided by the manufacturer.**

6.9 System Information

You can view the current system software version in the System Info screen.

6.10 System Upgrade

Click [System Upgrade] to enter the system upgrade screen, click "Upgrade" to perform the system upgrade, and an upgrade progress bar will be displayed. After the system upgrade is completed, click "OK" and the machine will automatically shut down.

- The system upgrade service must be provided by Kaixin company.

Chapter 7 Patient Information

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

> ⚠**Attention: System time and the current time inconsistency may cause misdiagnosis.**

7.1 Registering a Patient

Press the **Patient** key on the control panel to enter the Patient Info screen, as shown in Figure 7-1.

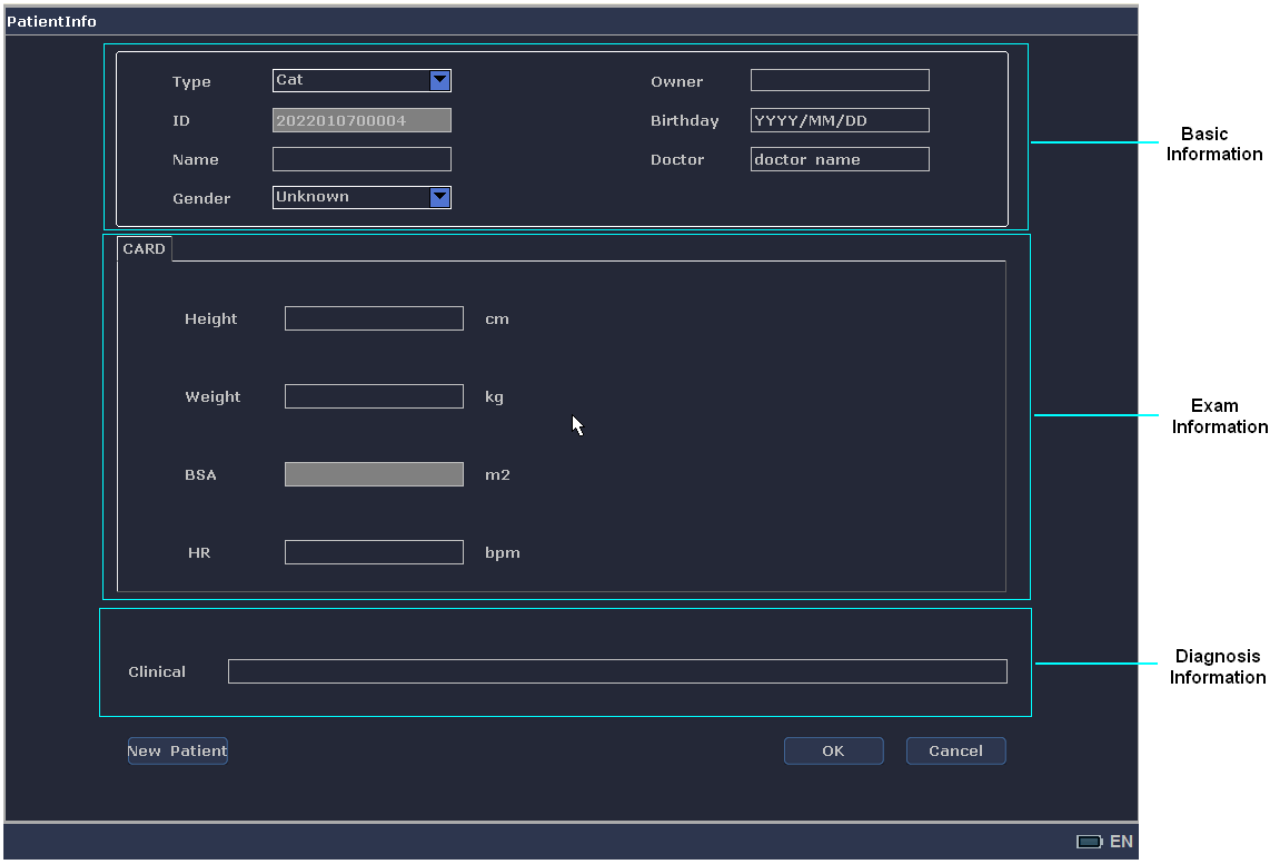


Figure 7-1 Patient Information Screen

Steps for creating a new patient are as follows:

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

> ⚠**Attention: Patient ID is a very important identification. Once it is saved, you can't edit it.**

2. When measuring cardiac, you can input the patient's height and weight, BSA will be calculated by the system automatically. You also can input heart rate as necessary.
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.

7.2 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 7-2. Click the exam type in the list below the probe or click the probe to select it.

Figure 7-2 Probe and Exam Type Selection Screen

> ⚠**Attention: Probe types and icons display on the LED screen when the probe are connected. If the LED 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.**

7.3 Ending the Exam

Press the **End Exam** key and a prompt box pops up. Select [OK] to end the current patient exam, and the system enters into Patient Info screen to start the next exam. Or, press the **Patient** key, select [New Patient] and [OK] to start the next exam.

Chapter 8 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.

8.1 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.

8.1.1 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 8-1.Or, press the **B** key on the control panel to enter the B mode from other modes.

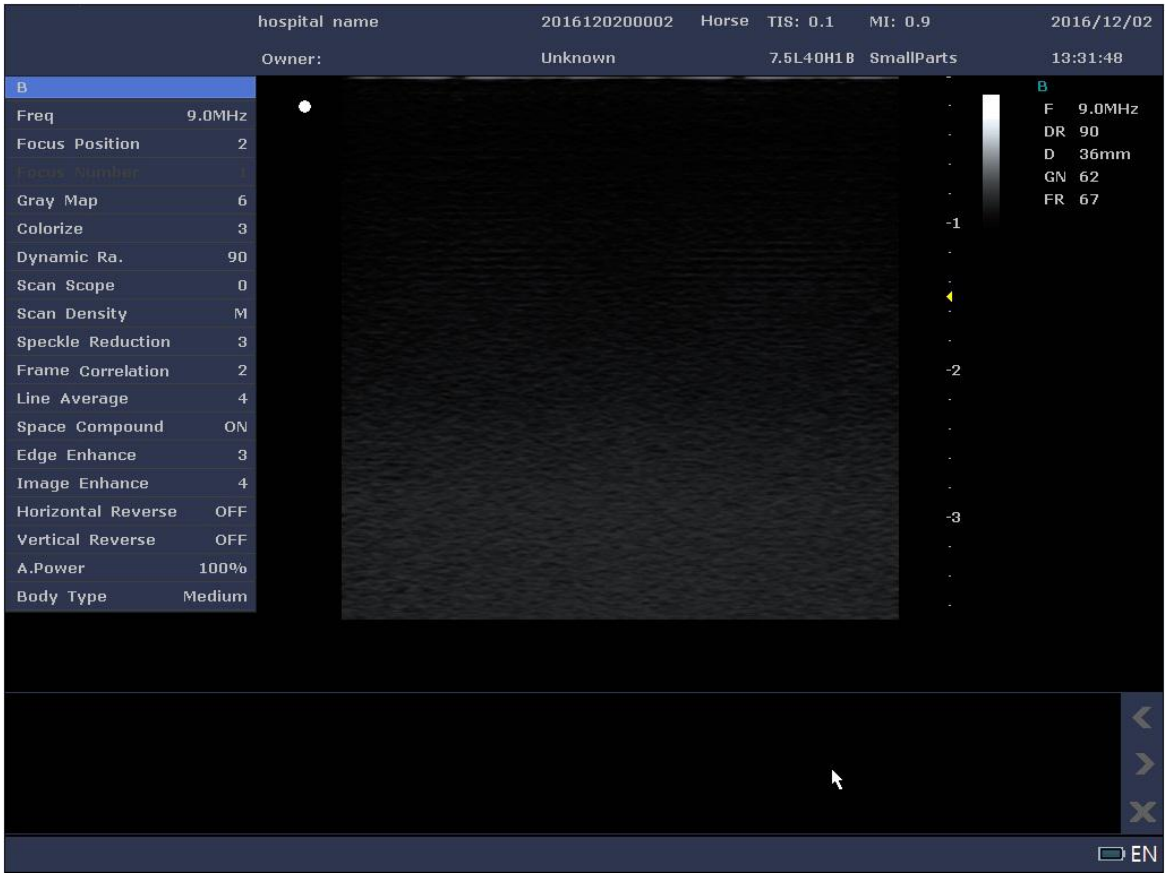


Figure 8-1 B Mode Image

For details about the description of the main screen, refer to Section 2.6 Main Screen.

2. Optimize the image. For details, refer to Section 8.1.2 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.

8.1.2 Optimizing the B Mode Image

Methods of optimizing the B mode image are as follows:

Method 1: 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.

Method 2: Select the B mode parameter on the menu at the top left of the screen by using the **Select** knob, press **Select** knob change state between "parameter item select state" and "parameter item adjust state", rotate the **Select** knob change parameter item for "parameter item select state" or paramter value for "parameter item adjust state". Press the **Menu** key to display/hide this menu.

Parameters Adjustment in the B Mode

8.1.2.1 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.

8.1.2.2 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.

8.1.2.3 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 scale of the image.

Steps:

- Move cursor to [Focus Position] menu item and press **Set** key to adjust the focus position.
- Rotate **Select** knob to highlight the [Focus Position] menu item, press **Select** knob item to confirmation select [Focus Position] item, and then rotate **Select** knob to adjust the focus position.

The same method to adjust the Focus Number.

8.1.2.4 Adjusting the Frequency

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

Steps:

- Move cursor to [Freq] menu item and press **Set** key to adjust the frequency.
- Rotate **Select** knob to highlight the [Freq] menu item, press **Select** knob item to confirmation select [Freq] item, and then rotate **Select** knob to adjust the frequency of the probe.

8.1.2.5 Adjusting the Depth

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

Step:

Press the **Depth** key on the control panel to adjust the depth.

8.1.2.6 Adjusting the Grayscale

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

Steps:

- Move cursor to [Gray Map] menu item and press **Set** key to adjust the grayscale.
- Rotate **Select** knob to highlight the [Gray Map] menu item, press **Select** knob item to confirmation select [Gray Map] item, and then rotate **Select** knob to adjust the grayscale.

> ⚠**Attention: Select the grayscale first before adjusting other parameters. Because of the interdependence among the grayscale, gain, and dynamic range. If you change the grayscale, you have to reset the gain and dynamic range.**

8.1.2.7 Adjusting the Chroma

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

Steps:

- Move cursor to [Colorize] menu item and press **Set** key to choose the color.
- Rotate **Select** knob to highlight the [Colorize] menu item, press **Select** knob item to confirmation select [Colorize] item, and then rotate **Select** knob to choose the color.

8.1.2.8 Adjusting the Dynamic Range

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

Steps:

- Move cursor to [Dynamic Ra.] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Dynamic Ra.] menu item, press **Select** knob item to confirmation select [Dynamic Ra.] item, and then rotate **Select** knob to adjust it.

8.1.2.9 Adjusting the Scan Scope

Scan range is used to gain the maximum frame rate.

Steps:

- Move cursor to [Scan Scope] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Scan Scope] menu item, press **Select** knob item to confirmation select [Scan Scope] item, and then rotate **Select** knob to adjust it.

8.1.2.10 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.

Steps:

- Move cursor to [Scan Density] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Scan Density] menu item, press **Select** knob item to confirmation select [Scan Density] item, and then rotate **Select** knob to adjust it.

8.1.2.11 Adjusting the Noise Repression

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

Steps:

- Move cursor to [Speckle Reduction] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Speckle Reduction] menu item, press **Select** knob item to confirmation select [Speckle Reduction] item, and then rotate **Select** knob to adjust it.

8.1.2.12 Adjusting the Frame Correlation

Persistence is used to average consecutive frames to provide a smoother appearance with less noise.

Use lower persistence values for fast-moving organs or tissues and higher persistence values for smoother appearance.

Steps:

- Move cursor to [Frame Correlation] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Frame Correlation] menu item, press **Select** knob item to confirmation select [Frame Correlation] item, and then rotate **Select** knob to adjust it.

8.1.2.13 Adjusting the Line Average

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

Steps:

- Move cursor to [Line Average] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Line Average] menu item, press **Select** knob item to confirmation select [Line Average] item, and then Rotate **Select** knob to adjust it.

8.1.2.14 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.

Steps:

- Move cursor to [Space Compound] menu item and press **Set** key to enable or disable it.
- Rotate **Select** knob to highlight the [Space Compound] menu item, press **Select** knob item to confirmation select [Space Compound] item, and then rotate **Select** knob to enable or disable it.

8.1.2.15 Adjusting the Edge Enhance

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

Steps:

- Move cursor to [Edge Enhance] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Edge Enhance] menu item, press **Select** knob item to confirmation select [Edge Enhance] item, and then rotate **Select** knob to adjust it.

8.1.2.16 Adjusting the Image Enhance

Increase the image resoultion by reduce the speckle noise.

Steps:

- Move cursor to [Image Enhance] menu item and press **Set** key to adjust it.

- Rotate **Select** knob to highlight the [Image Enhance] menu item, press **Select** knob item to confirmation select [Image Enhance] item, and then rotate **Select** knob to adjust it.

8.1.2.17 Adjusting the Acoustic Power

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

Steps:

- Move cursor to [A. Power] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [A. Power] menu item, press **Select** knob item to confirmation select [A. Power] item, and then rotate **Select** knob to adjust it.

8.1.2.18 Adjusting the Vertical Reverse

Vertical reverse is used to adjust two-dimensional image flip up/down.

Steps:

- Move cursor to [Vertical Reverse] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Vertical Reverse] menu item, press **Select** knob item to confirmation select [Vertical Reverse] item, and then rotate **Select** knob to adjust it.

8.1.2.19 Adjusting the Horizontal Reverse

Horizontal reverse is used to adjust two-dimensional image flip left/right.

Steps:

- Move cursor to [Horizontal Reverse] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Horizontal Reverse] menu item, press **Select** knob item to confirmation select [Horizontal Reverse] item, and then rotate **Select** knob to adjust it.

8.1.2.20 Adjusting the Body Type

Set the appropriate image parameters by adjusting the body type.

Steps:

- Move cursor to [Body Type] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Body Type] menu item, press **Select** knob item to confirmation select [Body Type] item, and then rotate **Select** knob to adjust it.

8.2 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.

8.2.1 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 8-2.

Figure 8-2 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 8.2.2 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.

8.2.2 Optimizing the Color Mode Image

Methods for optimizing the Color mode image are as follows:

Method 1: 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.

Method 2: Select the Color mode parameter on the menu at the top left of the screen by using the **Select** knob, press **Select** knob change state between "parameter item select state"and "parameter item adjust state", rotate the knob change parameter item for "parameter item select state"or paramter value for "parameter item adjust state". Press the **Menu** key to display/hide this menu.

8.2.2.1 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.

8.2.2.2 Adjusting the Frequency

The working frequency of the probe can be adjusted.

Steps:

- Move cursor to [Freq] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Freq] menu item, press **Select** knob item to confirmation select [Freq] item, and then rotate **Select** knob to adjust the frequency of the probe.

8.2.2.3 Adjusting the Scale

The value of scale on the color map can be adjusted.

Steps:

- Move cursor to [Scale] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Scale] menu item, press **Select** knob item to confirmation select [Scale] item, and then rotate **Select** knob to adjust it.

8.2.2.4 Adjusting the Sensitivity

The higher the sensitivity is, the lower the frame rate.

Steps:

- Move cursor to [Sensitivity] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Sensitivity] menu item, press **Select** knob item to confirmation select [Sensitivity] item, and then rotate **Select** knob to adjust it.

8.2.2.5 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.

Steps:

- Move cursor to [Baseline] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Baseline] menu item, press **Select** knob item to confirmation select [Baseline] item, and then rotate **Select** knob to adjust it.

8.2.2.6 Adjusting the Flow Speed

The flow speed that can be detected in the Color mode is adjusted.

Steps:

- Move cursor to [Flow Speed] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Flow Speed] menu item, press **Select** knob item to confirmation select [Flow Speed] item, and then rotate **Select** knob to adjust it.

8.2.2.7 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.

Steps:

- Move cursor to [Wall Filter] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Wall Filter] menu item, press **Select** knob item to confirmation select [Wall Filter] item, and then rotate **Select** knob to adjust it.

8.2.2.8 Enabling/Disabling the Color Reverse

Flow reverse is used to view blood flow from a different perspective.

Steps:

- Move cursor to [Reverse] menu item and press **Set** key to enable or disable it.
- Rotate **Select** knob to highlight the [Reverse] menu item, press **Select** knob item to enable or disable it

8.2.2.9 Adjusting the frame correlation

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 persistence values for smoother appearance.

Steps:

- Move cursor to [Frame Correlation] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Frame Correlation] menu item, press **Select** knob item to confirmation select [Frame Correlation] item, and then rotate **Select** knob to adjust it.

8.2.2.10 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.

Steps:

- Move cursor to [Scan Density] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Scan Density] menu item, press **Select** knob item to confirmation select [Scan Density] item, and then rotate **Select** knob to adjust it.

8.2.2.11 Adjusting the Steer Angle

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

Steps:

- Move cursor to [Steer] menu item and press **Set** key to adjust the angle of the ROI.
- Rotate **Select** knob to highlight the [Steer] menu item, press **Select** knob item to confirmation select [Steer] item, and then rotate **Select** knob to adjust the angle of the ROI.
- Press "**Steer-**" or "**Steer+**" key to decrease or increase the angle of the ROI.

> ⚠**Attention: The feature is only available with the linear probe.**

8.2.2.12 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.

Steps:

- Move cursor to [Color Map] menu item and press **Set** key to change the color.
- Rotate **Select** knob to highlight the [Color Map] menu item, press **Select** knob item to confirmation select [Color Map] item, and then rotate **Select** knob to change the color.

8.2.2.13 Adjusting the Post-Process

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

Steps:

- Move cursor to [Post Proc] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Post Proc] menu item, press **Select** knob item to confirmation select [Post Proc] item, and then rotate **Select** knob to adjust it.

8.2.2.14 Adjusting the Acoustic Power

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

Steps:

- Move cursor to [A. Power] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [A. Power] menu item, press **Select** knob item to confirmation select [A. Power] item, and then rotate **Select** knob to adjust it.

8.2.2.15 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.

Steps:

- Move cursor to [Dual Live] menu item and press **Set** key to enable or disable it.
- Rotate **Select** knob to highlight the [Dual Live] menu item, press **Select** knob item to enable or disable it.

8.3 PDI Mode

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.

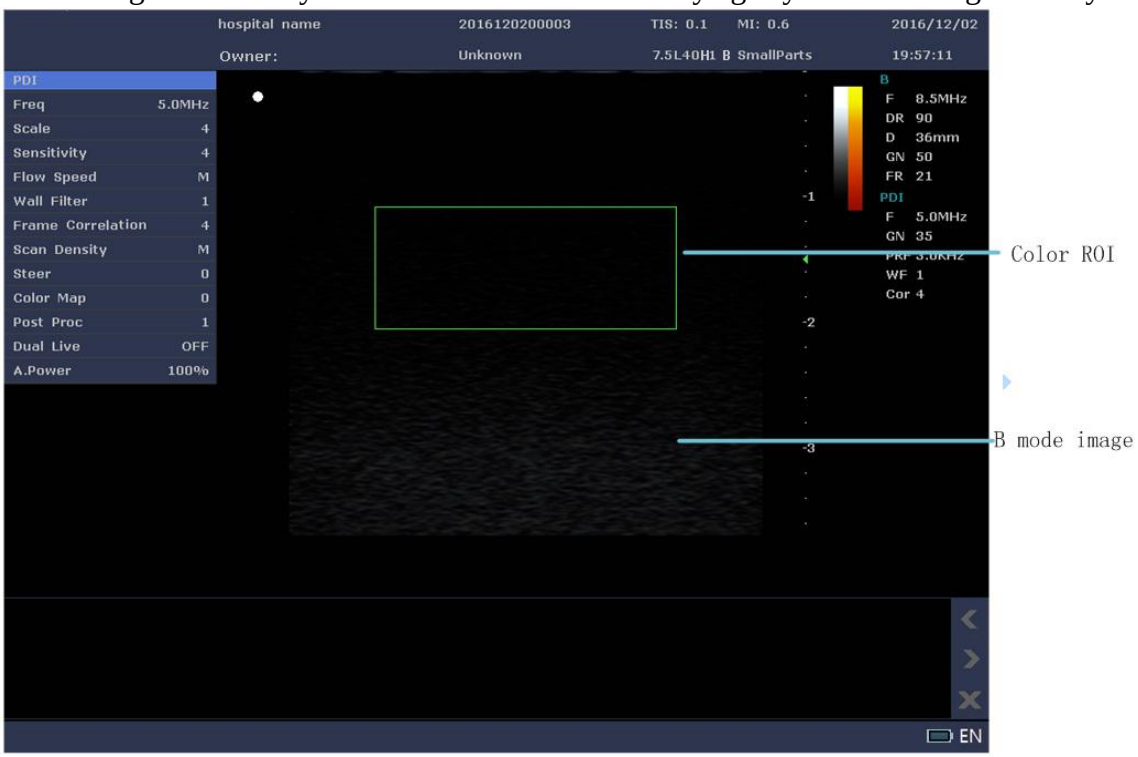


Figure 8-3 PDI Mode Image

8.3.1 Entering the PDI Mode

Steps for entering the PDI mode are as follows:

1. Select the appropriate probe and exam type, and optimize the B mode image.
2. Press the **PDI** key on the control panel to enter the PDI mode, as shown in Figure 8-3.
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 PDI mode image. For details, refer to Section 8.3.2 Optimizing the PDI Mode Image.
   Press the **Save IP** key to save the parameter settings in the PDI mode as the default settings.
5. Press the **PDI** key again to exit the PDI mode.

8.3.2 Optimizing the PDI Mode Image

Methods for optimizing the PDI mode image are as follows:

Method 1: 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.

Method 2: Select the PDI mode parameter on the menu at the top left of the screen by using the **Select** knob, press **Select** knob change state between "parameter item select state"and "parameter item adjust state", rotate the knob change parameter item for "parameter item select state"or paramter value for "parameter item adjust state". Press the **Menu** key to display/hide this menu.

The adjustments of parameters in the specific PDI mode are similar to the Color mode, refer to Section 8.2.2 Optimizing the Color Mode Image.

8.4 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.

8.4.1 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 8-4.

Figure 8-4 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.

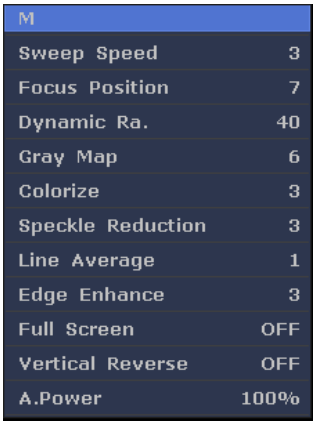
3. Move the trackball to adjust the position of the M-line.
4. Optimize the M mode image. For details, refer to Section 8.4.2 Optimzing the M Mode Image.
   Press the **Save IP** key to save the parameter settings in the M mode as the default settings.
5. Press the **M** key again to exit the M mode.

8.4.2 Optimzing the M Mode Image

Methods for optimizing the M mode image are as follows.

Method 1: 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.

Method 2: Select the M mode parameter on the menu at the top left of the screen by using the **Select** knob, press **Select** knob change state between "parameter item select state"and "parameter item adjust state", rotate the knob change parameter item for "parameter item select state"or paramter value for "parameter item adjust state". Press the **Menu** key to display/hide this menu.



Parameters Adjustment in the M Mode

8.4.2.1 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.

8.4.2.2 Adjusting the Depth

Depth is used to adjust the distance over which the M mode image is anatomized.

Step:

Press the **Depth** key on the control panel to adjust the depth.

8.4.2.3 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.

Steps:

- Move cursor to [Sweep Speed] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Sweep Speed] menu item, press **Select** knob item to confirmation select [Sweep Speed] item, and then rotate **Select** knob to adjust it.

8.4.2.4 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.

Steps:

- Move cursor to [Focus Position] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Focus Position] menu item, press **Select** knob item to confirmation select [Focus Position] item, and then rotate **Select** knob to adjust it.

8.4.2.5 Adjusting the Dynamic Range

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

Steps:

- Move cursor to [Dynamic Ra.] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Dynamic Ra.] menu item, press **Select** knob item to confirmation select [Dynamic Ra.] item, and then rotate **Select** knob to adjust it.

8.4.2.6 Adjusting the Grayscale

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

Steps:

- Move cursor to [Gray Map] menu item and press **Set** key to adjust it.

- Rotate **Select** knob to highlight the [Gray Map] menu item, press **Select** knob item to confirmation select [Gray Map] item, and then rotate **Select** knob to adjust it.

8.4.2.7 Adjusting the Chroma

Chroma is used to colorize the grayscale image.
Steps:

- Move cursor to [Colorize] menu item and press **Set** key to select the color.
- Rotate **Select** knob to highlight the [Colorize] menu item, press **Select** knob item to confirmation select [Colorize] item, and then rotate **Select** knob to select the color.

8.4.2.8 Adjusting the Speckle Reduction

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

- Move cursor to [Speckle Reduction] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Speckle Reduction] menu item, press **Select** knob item to confirmation select [Speckle Reduction] item, and then rotate **Select** knob to adjust it.

8.4.2.9 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.
Steps:

- Move cursor to [Line Average] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Line Average] menu item, press **Select** knob item to confirmation select [Line Average] item, and then rotate **Select** knob to adjust it.

8.4.2.10 Adjusting the Edge Enhance

Edge enhance is used to distinguish the image outline and optimize the smoothness of the image edge.
Steps:

- Move cursor to [Edge Enhance] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Edge Enhance] menu item, press **Select** knob item to confirmation select [Edge Enhance] item, and then rotate **Select** knob to adjust it.

8.4.2.11 Enabling/Disabling the Full-Screen Display

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

- Move cursor to [Full Screen] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Full Screen] menu item, press **Select** knob item to confirmation select [Full Screen] item, and then rotate **Select** knob to adjust it.

8.4.2.12 Adjusting the Vertical Reverse

Vertical reverse is used to adjust two-dimensional image flip up/down.
Steps:

- Move cursor to [Vertical Reverse] menu item and press **Set** key to adjust it.
  Rotate **Select** knob to highlight the [Vertical Reverse] menu item, press **Select** knob item to confirmation select [Vertical Reverse] item, and then rotate **Select** knob to adjust it.

8.4.2.13 Adjusting the Acoustic Power

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

- Move cursor to [A. Power] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [A. Power] menu item, press **Select** knob item to confirmation select [A. Power] item, and then rotate **Select** knob to adjust it.

8.5 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.

8.5.1 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 8-5.

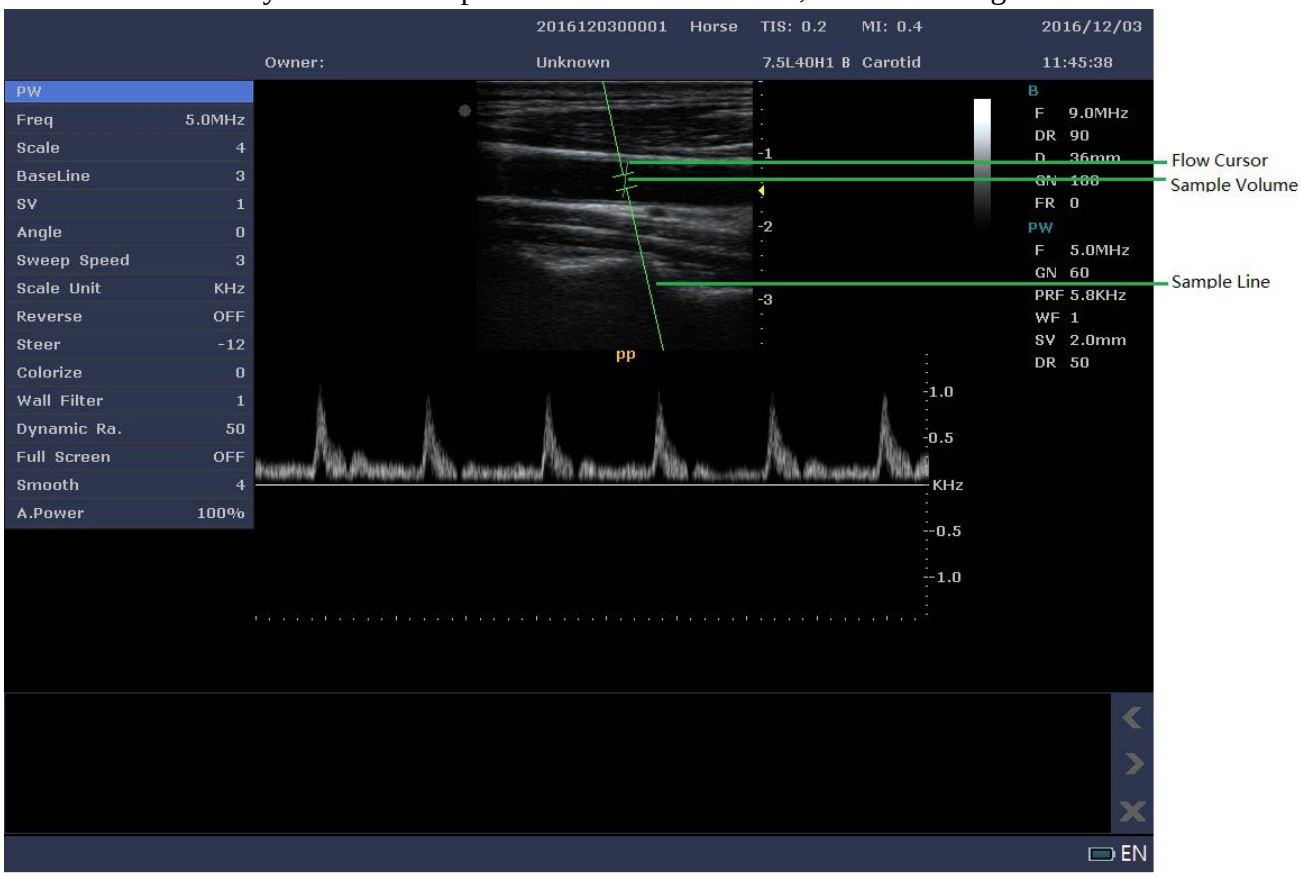


Figure 8-5 PW Mode Image

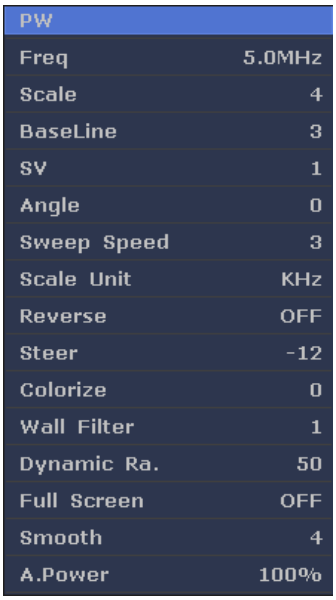
- The Spectral Doppler line and the sample volume gate are used to locate the qualitative analysis on the image.
- The flow cursor needs to be adjusted parallel to the flow when measuring the velocity.
- X-axis: Indicates the time.
- Y-axis: Indicates Doppler frequency scale, including a positive and 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.
   - Rotate **Select** highlight the [Steer] menu item, press **Select** knob item to confirmation select [Steer] item, and then rotate **Select** knob to adjust the sample volume.
   - 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.
   - Rotate **Select** knob to highlight the [SV] menu item, press **Select** knob item to confirmation select [SV] item, and then rotate **Select** knob to adjust the sample volume.
   - Rotate the **Angle** knob on the control panel to adjust the direction of the flow cursor.

5. Optimize the PW mode image. For details, refer to Section 8.5.2 Optimizing the PW Mode Image.
   Press the **Save IP** key to save the parameter settings in the PW mode as the default settings.
   Press  key on the keyboard to adjust the Doppler sound.
6. Press the **PW** key again to exit the PW mode.

8.5.2 Optimizing the PW Mode Image

Methods for optimizing the PW mode image are as follows:
Method 1: 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.
Method 2: Select the PW mode parameter on the menu at the top left of the screen by using the **Select** knob, press **Select** knob change state between "parameter item select state"and "parameter item adjust state", rotate the knob change parameter item for "parameter item select state"or paramter value for "parameter item adjust state". Press the **Menu** key to display/hide this menu.



Parameters Adjustment in the PW Mode

8.5.2.1 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.

8.5.2.2 Adjusting the Frequency

The working frequency of the probe can be adjusted.
Steps:

- Move cursor to [Freq] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Freq] menu item, press **Select** knob item to confirmation select [Freq] item, and then rotate **Select** knob to adjust the frequency of the probe.

8.5.2.3 Adjusting the Scale

Scale is adjusted to change the range of the speed displayed.
Steps:

- Move cursor to [Scale] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Scale] menu item, press **Select** knob item to confirmation select [Scale] item, and then rotate **Select** knob to adjust it.

8.5.2.4 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.

Steps:

- Move cursor to [Baseline] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Baseline] menu item, press **Select** knob item to confirmation select [Baseline] item, and then rotate **Select** knob to adjust it.

8.5.2.5 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.

Steps:

- Move cursor to [SV] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [SV] menu item, press **Select** knob item to confirmation select [SV] item, and then rotate **Select** knob to adjust it.

8.5.2.6 Adjusting the Angle

Angle is used to adjust the angle of the flow cursor.

Steps:

- Move cursor to [Angle] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Angle] menu item, press **Select** knob item to confirmation select [Angle] item, and then rotate **Select** knob to adjust it.

8.5.2.7 Adjusting the Scan Speed

Time scale and the refresh speed of the spectrum vary with the scan speed.

Steps:

- Move cursor to [Sweep Speed] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Sweep Speed] menu item, press **Select** knob item to confirmation select [Sweep Speed] item, and then rotate **Select** knob to adjust it.

8.5.2.8 Adjusting the Unit of Speed

It is used to select the unit of the flow speed.

Steps:

- Move cursor to [Scale Unit] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Scale Unit] menu item, press **Select** knob item to confirmation select [Scale Unit] item, and then rotate **Select** knob to adjust it.

8.5.2.9 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.

Steps:

- Move cursor to [Reverse] menu item and press **Set** key to enable or disable it.
- Rotate **Select** knob to highlight the [Reverse] menu item, press **Select** knob item to confirmation select [Reverse] item, and then rotate **Select** knob to enable or disable it.

8.5.2.10 Adjusting the Steer

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

Steps:

- Move cursor to [Steer] menu item and press **Set** key to adjust the angle of the spectral Doppler line.
- Rotate **Select** knob to highlight the [Steer] menu item, press **Select** knob item to confirmation select [Steer] item, and then rotate **Select** knob to adjust the angle of the spectral Doppler line.
- Press"**Steer-**"or"**Steer+**"key on the control panel to adjust the angle of the spectral Doppler line.

⚠Attention: The feature is only available with the linear probe.

8.5.2.11 Adjusting the Chroma

Chroma is used to colorize the grayscale image.

Steps:

- Move cursor to [Colorize] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Colorize] menu item, press **Select** knob item to confirmation select [Colorize] item, and then rotate **Select** knob to adjust it.

8.5.2.12 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.

Steps:

- Move cursor to [Wall Filter] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Wall Filter] menu item, press **Select** knob item to confirmation select [Wall Filter] item, and then rotate **Select** knob to adjust it.

8.5.2.13 Adjusting the Dynamic Range

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

Steps:

- Move cursor to [Dynamic Ra.] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Dynamic Ra.] menu item, press **Select** knob item to confirmation select [Dynamic Ra.] item, and then rotate **Select** knob to adjust it.

8.5.2.14 Enabling/Disabling the Full-Screen Display

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

Steps:

- Move cursor to [Full Screen] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Full Screen] menu item, press **Select** knob item to confirmation select [Full Screen] item, and then rotate **Select** knob to adjust it.

8.5.2.15 Adjusting the Acoustic Power

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

Steps:

- Move cursor to [A. Power] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [A. Power] menu item, press **Select** knob item to confirmation select [A. Power] item, and then rotate **Select** knob to adjust it.

8.5.2.16 Adjusting the Spectrum Smoothness

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

Steps:

- Move cursor to [Smooth] menu item and press **Set** key to adjust it.
- Rotate **Select** knob to highlight the [Smooth] menu item, press **Select** knob item to confirmation select [Smooth] item, and then rotate **Select** knob to adjust it.

Chapter 9 Processing the Images

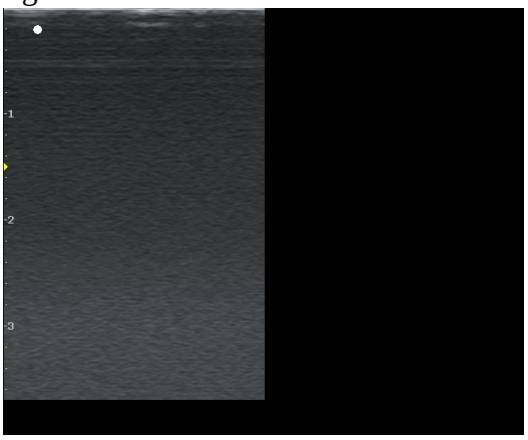
You can work with the acquired images by using the features provided by the ultrasound system, such as reviewing, magnifying and freezing the image, cropping the cine, and making annotations on the image.

9.1 Displaying the image

9.1.1 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, Color or PDI on the control panel to enter the real time scan.
2. Press Dual 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 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 Dual in turn will freeze the current real-time image, the other image gets into real-time status.

   Press other imaging mode keys to exit the dual-splitting display.

9.1.2 Quad-splitting Display

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

1. Press B, Color or PDI on the control panel to enter the real time scan.
2. Press to enter the quad-splitting display. The image is spitted by four parts with a real time scan on the top-left and no image on the rest parts.
3. Repeatedly press to freeze the real time scan and unfreeze other images.

   The probe direction mark is highlighted in real time scan and becomes gray in the frozen mode.
4. Press other imaging mode keys to exit the quad-splitting display.

9.2 Magnifying the Image

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

1. Press **B** 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.
4. Adjust the position of ROI by moving the trackball. If you are not satisfied with the size, 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.

You can press the **Zoom** to directly magnify the image in the Color/PDI mode, and press **Zoom** again to exit it.

9.3 Freezing the Image

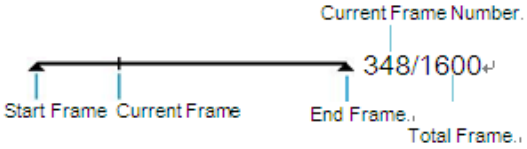
Press the **Freeze** key on the control panel, ✳ displays on the screen and the current real time scan is frozen.

You can perform measurement, make annotation or enter the cine mode in the frozen mode.

Press the **Freeze** key again to return to the real time scan.

9.4 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.

9.4.1 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.

9.4.2 Cropping the Cine

Steps are as follows:

1. Move the trackball to select the starting point, select [Set First Frame] by the **Select** knob to confirm.
2. Move the trackball to select the end point, and select [Set End Frame] by the **Select** knob to confirm.
3. Select [Auto Play] menu item by the **Select** knob to review the cropped cine.

9.5 Annotating the Image

The annotation feature provides free text 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.

9.5.1 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.
5. Press the **Comment** key again to exit the annotation status.You can define the annotation in the Preset screen. For details, refer to Section 6.5 Presetting the Annotations.

9.5.2 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.
4. Press the **Arrow** key again to exit the annotation status.

9.5.3 Bodymark Annotation

Steps are as follows:

1. Press the **Body Mark** key on the control panel to activate the body mark 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.
3. Press **Set** or **Body Mark** key again to exit the annotation status.

9.5.4 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** on the keyboard to delete one annotation.
  - When you have added the text annotation, press **Backspace** to delete the annotations from the last one to the first one.

  Delete all the annotations:

  On all non-dialog interface, press the **Clear** on the keyboard to empty all annotation, including text, arrow, body mark, measuring scale and results.Please operate carefully!

  If you want to delete all the text and arrow annotations after freezing the image, make a setting in Preset screen-> [Comment Preset] -> [Clear comments while unfreezing image].
- Deleting the body mark annotation

  Refer to Deleting the text annotation.
- Deleting the arrow annotation

  Refer to Deleting the text annotation.

> ⚠**Attention: On all non-dialog interfaces, press the Clear on the keyboard to empty all annotation, including text, arrow, body mark, measuring scale and results. Please operate carefully!**

Chapter 10 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.

10.1 Measurement Screen and Keys

■ Measurement Screen

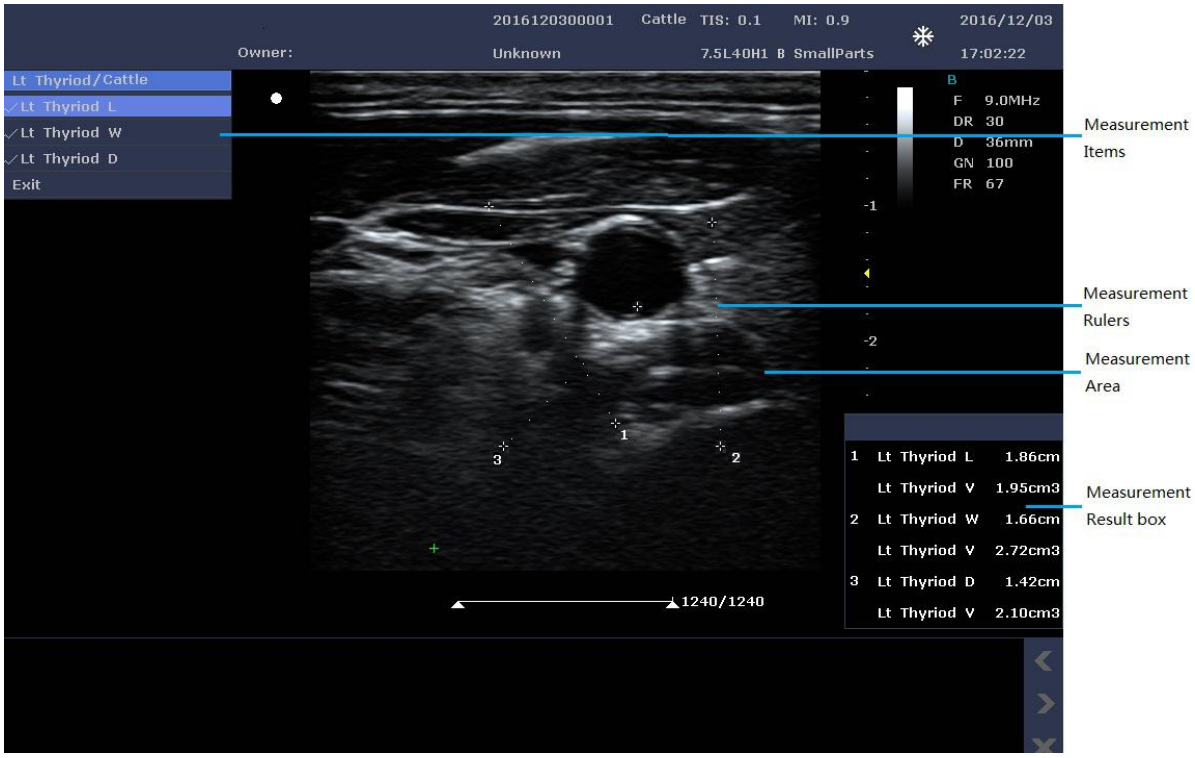


Figure 10-1 Measurement Screen

Measurement Menu: Displays the measurement items and sub-items. For details, refer to Section 10.2 Measurement Menu.

Measurement Area: The user performs a measurement in the ultrasound image area.

Measurement Result box: After the user makes a measurement, the measurement and calculation results are displayed in the result box. Press **Clear** key to delete the measurement results and measurement ruler.

■ 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. Used to move the measurement marker during the measurement.
Set	Used to confirm the operation. Used to fix the position of the measurement marker during the measurement.
Change	Used to exchange the measurement point.
Clear	Used to remove all the measurement and calculation results on the screen.
Report	Used to view the measurement report.

10.2 Measurement Menu

In the real-time scanning or freezing state, press **Caliper** to pop up the general measurement menu, press **Measure** key to pop up the specific measurement menu. Taking small parts measurement as an example to introduce the specific measurement menu:

Figure 10-2 Measurement Menu

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

- Exam Type
  Display the name of the exam type. You can select it on the [Select exam] screen. Different exam types consist of different measurement items.
- Measurement items and sub-items
  The measurement items display under the exam type. If there is an icon >> on the right side of the measurement item, this measurement item contains the measurement sub-item. Move the trackball on this measurement item and press the **Set** key to display them.
  The following sections are described according to the measurement menu.

10.3 Measurement Preset

You can preset the measurement. For details, refer to Section 6.4 Presetting the Measurements.

10.4 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 ±10%
- Error of speed (slope) measurement: within ±15%
- Error of area measurement: within ±8%
- Error of circumference measurement: within ±5%

You should make a diagnosis with a clinical analysis and the measurement results together.

10.5 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. The operations of Color/PDI mode and the B mode measurements are similar. These two modes measurements are called BC measurement hereafter.

10.5.1 B Mode Measurements

10.5.1.1 Distance

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

Steps:

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** to confirm. A marker displays on the image.
3. Move the marker to the starting point by using the trackball, press **Set** to fix the marker and the second marker displays.
4. Move the second marker to the end point by using the trackball, you can also press **Change** on the control panel to exchange the starting point and end point, press **Set** to confirm the distance between 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.

10.5.1.2 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.

Steps:

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** 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** 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**. An ellipse displays on the image.

   If you are not satisfied with the lengths of axes during measurement, press the **Change** on the control panel to readjust.
5. Move the trackball to adjust their lengths of axes, then press **Set** to confirm.The system automatically calculates the area and circumference, and the measurement result displays in the result box.
6. If necessary, you can repeat step 3-5 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.

Steps:

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** 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** 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** 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 3-5 to perform the next area and circumference measurement.

10.5.1.3 Volume

■ **Three-distance**

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

Steps:

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** 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** 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** to confirm. Determine the distance of the first line.
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**

Steps:

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** 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** 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**. An ellipse displays on the image.
   If you are not satisfied with the lengths of axes during measurement, press the **Change** on the control panel to readjust.
5. Move the trackball to adjust their lengths of axes, then press **Set** to confirm.
6. Rescan an image which is perpendicular to the previous image.
7. Perform a distance measurement. The system automatically calculates the volume, and the measurement result displays in the result box.

■ **Ellipse**

Steps:

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** 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** 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**. An ellipse displays on the image.
   If you are not satisfied with the lengths of axes during measurement, press the **Change** on the control panel to readjust.
5. Move the trackball to adjust their lengths of axes, then press **Set** to confirm.
6. The system automatically calculates the volume, and the measurement result displays in the result box.

10.5.1.4 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.

Steps:

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** 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** 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**. An ellipse displays on the image.
   If you are not satisfied with the lengths of axes during measurement, press the **Change** on the control panel to readjust.
5. Move the trackball to adjust their lengths of axes, then press **Set** to confirm the first ellipse.
6. 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.

Steps:

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** 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** 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** to confirm the first trace.
6. Repeat step 3-5 to perform a second trace measurement. The system automatically calculates the trace ratio, and the measurement result displays in the result box.

10.5.1.5 Distance Ratio

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

Steps:

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** to confirm. A marker displays on

the image.

3. Move the marker to the starting point by using the trackball, press **Set** 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.
4. Move the second marker to the end point by using the trackball and press **Set**. Determine the distance of the first line.
5. Repeat step 3-4 to perform a second distance measurement. The system automatically calculates the distance ratio, and the measurement result displays in the result box.

10.5.1.6 Angle

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

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** to confirm. A marker displays on the image.
3. Move the marker to the starting point by using the trackball, press **Set** 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.
4. Move the second marker to the end point by using the trackball and press **Set**. Determine one line of the included angle.
5. Repeat step 3-4 to draw a second line to create an angle. The system automatically calculates the angle, and the measurement result displays in the result box.

10.5.2 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 B mode. For details, please refer to Section 10.5.1 B Mode Measurements.

10.5.2.1 Distance

It is used to measure the vertical distance between two points on the M mode image.
Steps:

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** to confirm. A marker displays on the image.
4. Move the marker to the starting point by using the trackball, press **Set** 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**. 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.

10.5.2.2 Time

It is used to measure the time interval between two points on the M mode image.
Steps:

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** to confirm. A marker displays on the image.
4. Move the marker to the starting point by using the trackball, press **Set** 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**. The measurement result displays in the result box.
6. Repeat step 3-5 to perform the next time measurement.

10.5.2.3 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].

Steps:

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** to confirm. A marker displays on the image.
4. Move the marker to the starting point by using the trackball, press **Set** 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**. The measurement result displays in the result box.
6. Repeat step 3-5 to perform the next heart rate measurement.

10.5.2.4 Slope Rate

It is used to measure the change in distance over time on the M mode image.

Steps:

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** to confirm. A marker displays on the image.
4. Move the marker to the starting point by using the trackball, press **Set** 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**. The measurement result displays in the result box.
6. Repeat step 3-5 to perform the next slope rate measurement.

10.5.3 Color/PDI Mode Measurements

The operations of Color/PDI mode and the B mode measurements are similar. For details, please refer to Section 10.5.1 B Mode Measurements.

10.5.4 PW Mode Measurements

Flow speed 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 B mode. For

details, please refer to Section 10.5.1 B Mode Measurements.

10.5.4.1 Flow Speed Ratio

It is used to calculate the flow speed ratio and resistance index on the Doppler-mode image by measuring the flow speed of peak systole (PS) and end diastole (ED).

Steps:

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** 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** 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**. The measurement result displays in the result box.

10.5.4.2 Velocity

It is used to measure the velocity of one point on the spectral Doppler waveform.

Steps:

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** to confirm. A marker displays on the image.
4. Move the marker to the desired point by using the trackball and press **Set**. The measurement result displays in the result box.

10.5.4.3 Time

It is used to measure the time interval between two points on the spectral Doppler image.

Steps:

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** to confirm. A marker displays on the image.
4. Move the marker to the starting point by using the trackball, press **Set** 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**. The measurement result displays in the result box.

10.5.4.4 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.

Steps:

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** to confirm. A marker displays on the image.
4. Move the marker to the starting point by using the trackball, press **Set** 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**. The measurement result displays in the result box.

10.5.4.5 Acceleration

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

Steps:

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 [Accelation] on the menu by moving the trackball and press **Set** to confirm. A marker displays on the image.
4. Move the marker to the starting point by using the trackball, press **Set** 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**. The measurement result displays in the result box.

10.5.4.6 Spectrum Trace

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

> **⚠Attention:**
>
> 1. **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.**
> 2. **Spectrum trace can only be performed in frozen PW mode.**

■ **Manual trace**

Steps:

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** 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** 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**. The measurement result displays in the result box.

■ **Auto trace**

Steps:

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 [D Trace] on the menu by moving the trackball and press **Set** 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** to fix the marker and the second marker displays.
5. 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**. The system automatically traces the waveform and the measurement result displays in the result box.

10.6 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.

10.6.1 Abdomen Measurements

Abdominal measurements can be performed in B/Color/PDI 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 on the menu by moving the trackball, such as [Liver], and press **Set** to confirm.
3. Select the measurement sub-item on the pop-up sub-menu, such as [R Liver Max], and press **Set**, 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 10.5.1.1 Distance.
	R Liver W	
	R Liver D	
	L Liver L	
	L Liver D	
Gallbladder (GB)	CBD	Refer to Section 10.5.1.1 Distance.
	CHD	
	GB L	
	GB W	
	GB Wall D	
Pancreas	Pancr. Head	Refer to Section 10.5.1.1 Distance.
	Pancr. Corus	
	Pancr. Tail	
	Pancr. Duct	
Spleen	SP L	Refer to Section 10.5.1.1 Distance.
	SP D	
	SP W	
Right kidney	RK L	Refer to Section 10.5.1.1 Distance.
	RK D	
	RK W	
Left kidney	LK L	Refer to Section 10.5.1.1 Distance.
	LK D	
	LK W	

■ Kidney measurement

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 [Left kidney] or [Right kidney] on the menu by moving the trackball and press **Set** 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.

$$\text{Kidney volume} = 0.49 \times \text{length} \times \text{width} \times \text{depth}$$

10.6.2 Obstetrics Measurements

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

> ⚠**Attention: Ensure the date of the system is correct, otherwise, GA and EDD calculated will be wrong.**

10.6.2.1 Obstetrics Measurements in the B/Color/PDI 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 on the menu by moving the trackball, such as [CRL], and press **Set** to confirm.
3. Follow the methods in the following table to perform the measurement, and the measurement results display in the result box.

Type	Measurement Item	Description	Measurement Method
Cat	BD	Body Diameter	Refer to Section 10.5.1.1 Distance.
	HD	Head Diameter	Refer to Section 10.5.1.1 Distance.
Dog	CRL	Crown Rump Length	Refer to Section 10.5.1.1 Distance.
	GSD	Gestational Sac Diameter	Refer to Section 10.5.1.1 Distance.
	HD	Head Diameter	Refer to Section 10.5.1.1 Distance.
	BD	Body Diameter	Refer to Section 10.5.1.1 Distance.
Cattle	CRL	Crown Rump Length	Refer to Section 10.5.1.1 Distance.
	TD	Trunk diameter	Refer to Section 10.5.1.1 Distance.
	HD	Head Diameter	Refer to Section 10.5.1.1 Distance.
Horse	HSD-H	Gestational Sac Diameter-Horizontal	Refer to Section 10.5.1.1 Distance.
	GSD-V	Gestational Sac Diameter-Vertical	Refer to Section 10.5.1.1 Distance.
Sheep	CRL	Crown Rump Length	Refer to Section 10.5.1.1 Distance.
	BPD	Biparietal Diameter	Refer to Section 10.5.1.1 Distance.
Other	CRL	Crown Rump Length	Refer to Section 10.5.1.1 Distance.
	GSD	Gestational Sac Diameter	Refer to Section 10.5.1.1 Distance.
	HD	Head Diameter	Refer to Section 10.5.1.1 Distance.
	BD	Body Diameter	Refer to Section 10.5.1.1 Distance.

10.6.2.2 GA/EDD

The gestational age (GA) and expected date of deliver (EDD) can be calculated by measuring BD, HD, CRL, GSD, TD, HSD-H, GSD-V and BPD.

10.6.2.3 Obstetrics Measurements 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 on the menu by moving the trackball, such as [UmbA], and press **Set** to confirm.
3. Select the sub-menu on the pop-up menu, such as [Auto]. A marker displays on the image.
4. 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 10.5.4.6 Spectrum Trace.
MCA	Middle Cerebral Artery	
FetalAO	Fetal Aorta	
Desc.AO	Descending Aorta	
Placent A	Placent Aorta	
Ductus V	Ductus Vein	

10.6.3 Cardiology Measurements

Cardiology measurement can be performed in the B/Color/PDI mode or M mode.

10.6.3.1 Cardiology Measurements in the B/Color/PDI Mode

Cardiology measurements in the B/Color/PDI mode include left ventricle measurement, left ventricle weight measurement, inner diameter of right ventricle end diastole measurement, inner diameter of main pulmonary artery measurement, EPSS (Distance between point E and Interventricular Septum when mitral valve is fully open) and FS (Fractional Shortening).

10.6.3.2 Left Ventricle

The methods for measuring left ventricle in the 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** 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 10.5.1.1 Distance.
	LVLd	LV long axis area at end-diastole	Refer to Section 10.5.1.2 Area and Circumference.

	LVLs	Left Ventricle Systolic Major Axis	Refer to Section 10.5.1.1 Distance.
	LVALs	Left Ventricle Systolic Area	Refer to Section 10.5.1.2 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)

Attention: 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** 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 10.5.1.1 Distance.
	LVIDs	LV short axis diameter at end systole	
	LVAMd	LV short axis area at mitral value at end diastole	Refer to Section 10.5.1.2 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(cm²)×LVALs(cm²)/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(m²)
CO	Cardiac Output	CO(l/min)=SV(ml)×HR(bpm)/1000
CI	Cardiac Index	CI=CO(l/min)/BSA(m²)

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

■ 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** 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 10.5.1.1 Distance.
	LVLs	LV long axis length at end systole	
	LVAMd	LV short axis are at mitral value at end diastole	Refer to Section 10.5.1.2 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(cm²)
ESV	End- systolic Left Ventricular Volume	ESV(ml)=(5/6) ×LVLs(cm)×LVAMs(cm²)
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(m²)
CO	Cardiac Output	CO(l/min)=SV(ml)×HR(bpm)/1000
CI	Cardiac Index	CI=CO(l/min)/BSA(m²)

■ 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** 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 10.5.1.1 Distance.
	LVLs	LV long axis length at end systole	
	LVAMd	LV short axis area at mitral value at end diastole	Refer to Section 10.5.1.2 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× $\{4 \times \mathrm{LVAMd}(cm^2) + 2 \times \mathrm{LVAPd}(cm^2) + \sqrt{LVAMd(cm^2) \times \mathrm{LVAPd}(cm^2)}\ \}$
ESV	End- systolic Left Ventricular Volume	ESV(ml)=LVLs (cm)/9× $\{4 \times \mathrm{LVAMs}(cm^2) + 2 \times \mathrm{LVAPs}(cm^2) + \sqrt{LVAMs(cm^2) \times \mathrm{LVAPs}(cm^2)}\ \}$
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)

10.6.3.3 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 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** 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 section10.5.1.1 Distance.
	IVSTd	Interventricular septal thickness at end diastole	
	LVIDd	LV internal dimension at end diastole	Refer to section 10.5.1.1 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× ((LVPWd(cm) + IVSTd (cm) + LVIDd(cm))³- (LVIDd(cm))³)-13.6
LVMWI	Left Ventricle Mass Weight Index	LVMWI = LVMW(g) / BSA(m^2)

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

10.6.3.4 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** to confirm. A marker displays on the image.
3. Perform a distance measurements and the measurement results displays in the result box.

10.6.3.5 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** to confirm. A marker displays on the image.
3. Perform a distance measurements and the measurement results displays in the result box.

10.6.3.6 EPSS

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 [EPSS] on the menu by moving the trackball and press **Set** to confirm. A marker displays on the image.
3. Perform a distance measurements and the measurement result displays in the result box.

10.6.3.7 FS

FS can be calculated by measuring LVIDd and LVIDs.

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 [FS] on the menu by moving the trackball and press **Set** to confirm. A marker displays on the image.
3. Perform the LVIDd→ LVIDs measurements one by one and the measurement results display in the result box.

Measurement item	Measurement sub-item	Description	Measurement method
Fractional Shortening	LVIDd	Left Ventricle internal diameter at end diastole	Refer to section10.5.1.1 Distance
	LVIDs	Left Ventricle internal diameter at end systole	

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

Calculation item	Description	Formula
FS	Fractional Shortening	FS = LVIDd(cm)- LVIDs(cm)/ LVIDd(cm)

10.6.3.8 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.

10.6.3.9 Left Ventricle

The methods for measuring left ventricle in the M mode are as follows:

- Teichholz method
- Cube method

> ⚠**Attention: 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** to confirm.
3. Select [Teichholz] 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 10.5.2.1 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** 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 10.5.2.1 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))

10.6.3.10 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** to confirm.
3. Select a sub-item on the pop-up sub-menu, such as [EF], press **Set** 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 10.5.2.4 Slope Rate.
	MV AC	
	A/E	Refer to Section 10.5.2.1 Distance;
	QMV	Refer to Section 10.5.2.4 Slope Rate; Refer to Section 10.5.2.2 Time.

■ Mitral valve volume

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** to confirm.
3. Select a sub-item [QMV] on the pop-up sub-menu, press **Set** and a marker displays on the image.
4. Perform the measurement according to the following table. The system automatically calculates the mitral valve volume by the following formula, and the measurement results displays in the result box.

QMV(ml) = 4 * DEV(cm/s) * DCT(s)

Measurement Item	Description	Measurement Method
DEV	Minimum flow of end diastole	Refer to Section 10.5.2.4 Slope Rate.
DCT	Descending Time	Refer to Section 10.5.2.2 Time.

10.6.3.11 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** to confirm.
3. Select [LAD/AOD] on the pop-up menu, press **Set** 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.

■ Vavle outflow

> ⚠**Attention: You should input the ejection time before performing the aorta vavle outflow measurement, otherwise AVSV cannot be calculated.**

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** to confirm.
3. Select [AVSV] on the pop-up menu, press **Set** 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
MAVO1	Aorta valve begin opening diameter	Refer to Section 10.5.2.1 Distance.

MAVO2	Aorta valve end opening diameter	Refer to Section 10.5.2.1 Distance.
AA	Aorta posterior wall amplitude	Refer to Section 10.5.2.1 Distance.

AVSV(ml) = (MAVO1(cm)+MAVO2(cm))*ET(s)*50+AA(cm)

10.6.3.12 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 10.5.2.2 Time.

10.6.3.13 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 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** 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 Section 10.5.2.1 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)

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

10.6.4 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 on the menu by moving the trackball , such as [CCA], and press **Set** 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 10.5.4.6 Spectrum Trace.

ICA	
ECA	
VA	
Upper Ext Vein	
Lower Ext Vein	

10.6.5 Small Parts Measurements

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

10.6.5.1 Thyroid

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 [Lt Thyroid] or [Rt Thyroid] on the menu by moving the trackball and press **Set** 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.

$$\text{Thyroid volume} = 0.479 \times \text{length} \times \text{width} \times \text{depth}$$

10.6.5.2 Isthmus

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 [Isthmus] on the menu by moving the trackball and press **Set** to confirm.
3. Perform a distance measurement of the isthmus. The measurement result displays in the result box.

10.6.6 Backfat, Loin and Lean percentage Measurements

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 [Fat] on the menu by moving the trackball and press **Set** to confirm.
3. Perform a distance measurement of the fat. The measurement result displays in the result box.
4. Select [Loin] on the menu by moving the trackball and press **Set** to confirm.
5. Use ellipse or trace methods to measure the loin. The circumference and area measurement results displays in the result box.
6. Select [LEAN] on the menu by moving the trackball and press **Set** to confirm.
7. Use distance method to measure the fat and loin, the lean percentage will be calcuated automatically. The measurement result displays in the result box.

⚠Attention:

1. Backfat, loin and lean percentage are measured using an animal lion linear array probe.

2. Lean percentage measurement is only applicable to swine. You should input the swine's weight before performing the LEAN measurement.

Chapter 11 Report

The report will be generated after you perform the specific measurements but not the general measurements. It contains patient information, measurement results, findings and prompt.

11.1 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.

11.2 Editing the Report

11.2.1 Entering Ultrasound Comments

In the report screen, you can input the diagnosis information in the textbox beside [Findings] and [Prompt] by moving the trackball and press the **Set** key to confirm.

If [Findings] and [Prompt] are set in the report template, you can input corresponding information in the report interface. For report preset, see "6.7 Preset of Report Template".

11.2.2 Adding Ultrasound Images

Image(s) saved in current exam can be added to the report.

1. In the report screen, click the [Add Image] to pop up the add image dialog box.
   Left column: Image(s) saved in current exam.
   Right column: Images selected to add into the report.
2. Select the image.
   - Click >, to add the selected image in the left column into the right column.
   - Click >>, to add all images in the left column into the right column.
   - Click <, to remove selected image in the right column.
   - Click <<, to remove all images in the right column.
   - Select an image in the right column and click [Move Up] or [Move Down] to adjust the image sequence.
3. Click [OK] to confirm.

11.3 Saving the Report

The reports can be saved in PDF documents, which can be viewed and edited on a PC.
Click [SavePDF] in the Report screen to save the report.

11.4 Printing the Report

Ensure that the printer is connected well with the system before printing the report. For detailed description, refer to Section 5.6.3 Connecting the graphic printer.
Click [Print] in the Report screen to print the report.

Chapter 12 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.

12.1 Saving the Image/Cine

> ⚠**Attention: 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 12.5 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 **Cine** key on the control panel in the frozen mode to activate the cursor, move the cursor to [Save Film] by using the trackball, and press the **Set** key to save the cine.

12.2 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 Figure12-1. The thumbnail images display in the [File List].

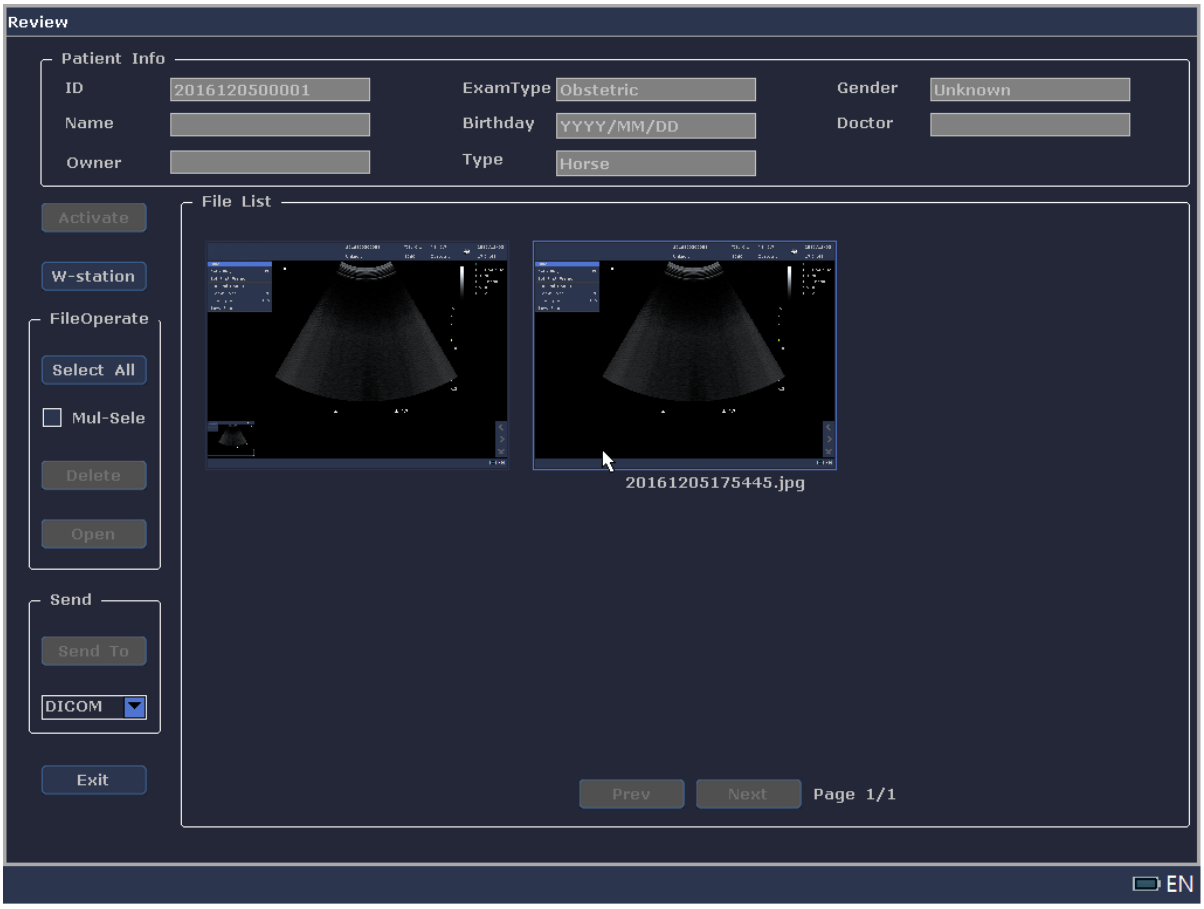


Figure 12-1 Review Screen

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.

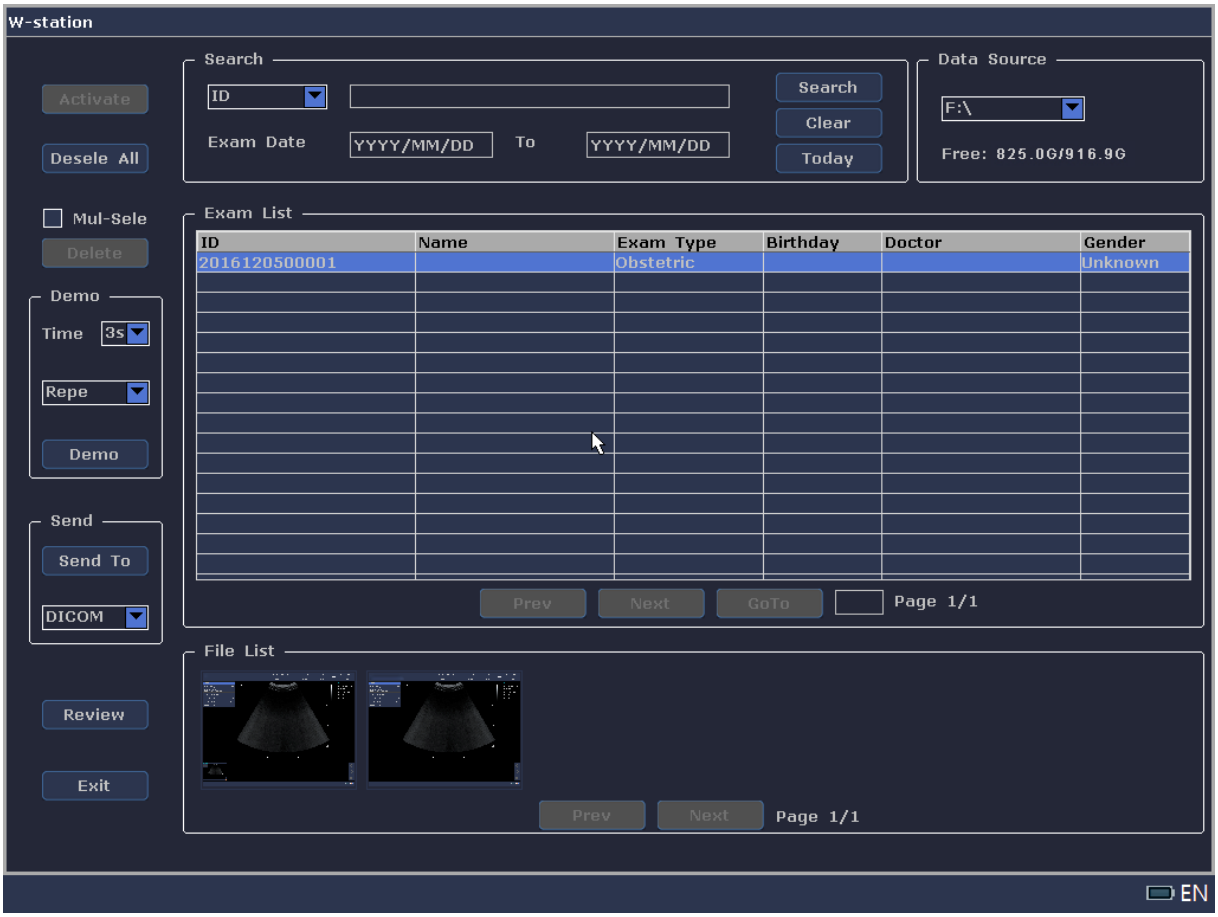


Figure 12-2 Working Station

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 **Freeze** key to return to the main screen.

12.3 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.

12.4 Printing the Image

Ensure that the printer is connected well with the system before printing the report. For detailed connection description, refer to Section 5.6.2 Connecting the Video Printer. Click [Print] in the video printer to print the current image.

12.5 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.

12.5.1 Saving to USB Storage Devices

Steps are as follows:

1. Connect the USB storage device to the system and the bottom right of the screen displays the icon of USB.
2. Save the images or cines as described in Section 12.1 Saving the Image/Cine.
3. Press **Review** to enter the Review screen and select the images/cines. Click [Select All] or enable [Mult Sele] at the left to select the images/cines.
4. Click ▼ beside the drop-down menu under the [Send to] to select [A:\] and click[Send to] to save the images/cines in the USB storage device.

12.5.2 Saving to DICOM Server

> ⚠**Attention: Ensure that the DICOM server is connected with the system before sending the images.**

- Current patient images

  Steps are as follows:

1. Press **Review** to enter the Review screen and select the images. Or, click [Select All] or enable [Mult Sele] at the left to select the images.
2. Click ▼ beside the drop-down menu under the [Send to] to select [DICOM] and click [Send to] to save the images 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 Wstation 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 Sele] at the left to select the images.
3. Click ▼ beside the drop-down menu under the [Send to] to select [DICOM] and click [Send to] to save the images in the DICOM server.

Chapter 13 Puncture guide/OPU guide

⚠**Attention: During the operation of puncture guide or OPU guide, do not freeze the image.**

13.1 Operation of puncture guide line

1. In the real time B mode, press the **Biopsy** key on the control panel, the Biopsy menu is displayed at the top left of the screen.
2. Press **Cursor** key, move the cursor to [Biopsy], press the **Set** key to display Biospy menu, move the cursor to [BGL Type], press the **Set** key to select the BGL-1, BGL-2 or BGL-3.
   - Move the cursor to [Visiable], press the **Set** key to turn on or turn off the puncture guide line.
   - Move the cursor to [Position], press the **Set** key to set the position of the puncture guide line BGL-1, BGL-2 or BGL-3.
   - Move the cursor to [Angle], press the **Set** key to set the angle of the puncture guide line BGL-1, BGL-2 or BGL-3.
   - Move the cursor to [Save parameter], press the **Set** key to save the parameters.
   - Move the cursor to [Restore factory], press the **Set** key to restore to the factory.
3. Press the **Biopsy** key to exit the biopsy states.

13.2 Operation of OPU guide line

1. In the real time B mode, rotate **Select** knob to highlight the [OPU] menu item, press **Select** knob, the OPU menu is displayed at the top left of the screen.
2. The adjustment of OPU guide line refers to the operation of puncture guide line.
3. Move the cursor to [Exit] on the OPU menu, press the **Set** key to exit the OPU states.

Chapter 14 System Maintenance

The system maintenance should be performed by the user. Users shall be in full charge of maintenance and operation of the system after purchasing the product. Please check the status of the machine regularly and perform a preventive check for the system.

14.1 Daily maintenance

Daily maintenance should be performed by the user.

14.1.1 System cleaning and disinfection

> ⚠**Warning: Turn off the instrument and pull out the power supply wire before cleaning the instrument. It may cause electric shock if clean it under power is on.**

> ⚠**Warning: There is no any water-proof device in the system. Do not splash any water or liquor into the system when cleaning or maintenance; otherwise it will cause malfunction or electric shock.**

> ⚠**Warning: Do not place the ultrasonic probe connector into water or disinfectant as it may cause electric shock or the malfunction of probe.**

1. Clean the probe

(1) Rinse the probe with water or soapy water to remove all contaminants, or use a soft urethane sponge to wipe the probe. Do not use brushes as it may damage the probe.

(2) After finishing the rinsing, use a sterilized cloth or gauze to wipe the water on the surface of probe. Do not dry the probe by heating it.

2. High-level disinfection

Please follow the disinfection method provided in this user's manual for disinfection.

(1) Before disinfection, wear sterilized gloves to prevent possible infection;

(2) You must clean the probe before disinfection. Recommend the solution to disinfect in the following table.

Glutaraldehyde-based disinfectant:

Chemical Name	Reagent Name	Step
Glutaraldehyde (2.4%)	Cidex Glutaraldehyde disinfectant	Please refer to the instructions of the solution for details.

Non-glutaraldehyde-based disinfectant:

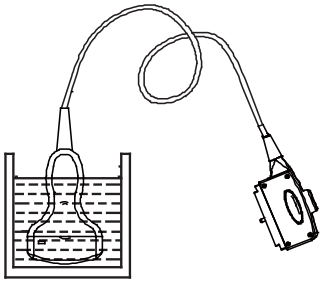
Chemical Name	Reagent Name	Step
Phthalaldehyde solution (0.55%)	Cidex OPA	Please refer to the instructions of the solution for details.

- **Please follow the instructions about disinfectant concentration and disinfection method, as well as the precautions about disinfectants provided by disinfectant provider. But do not rinse or soak the probe connector or close to connector cable.**
- **The soaking time of probe in the disinfectant is limited to the minimum time recommended by disinfectant manufacturer (e.g., Cidex OPA manufacturer recommended minimum 12 minutes).**

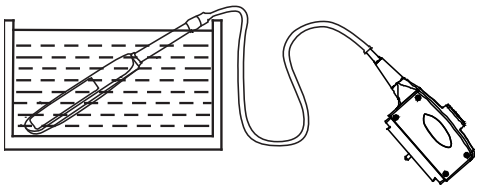
- **Please follow local laws and regulations to choice the disinfectants.**

(3) After disinfection, rinse the probe with a large number of sterile water (about 2 gallons) for at least one minute to remove the residual chemicals. You may follow the recommended method by the disinfectant manufacturer to rinse.

(4) After finishing the rinsing, use a sterilized cloth or gauze to wipe the water on the surface of probe. Do not dry the probe by heating it.



Immersion disinfection of probe (except transrectal probe)



Immersion disinfection of transrectal probe (sketch map)

⚠Attention:

1. **It is a normal phenomenon that color of the acoustic lens may change and color of the probe label may fade away.**
2. **The periodical disinfection times should be minimized as it may lead to degrade of the probe safety and performance.**

3. Check probe after cleaning and disinfection

(1) Check the probe enclosure and its cable to ensure they are free of abnormity (such as scuffing, cracks or drop-off);

(2) The sound window of probe is thin; ensure that there are no any abnormity on the sound window, such as scuffing, cracks, peeling, and bulge.

4. Clean the probe cable and its connector

(1) Clean the probe cable and its connector with soft, dry cloth.

(2) In case of die-hard blots, clean with soft cloth dipped in moderate detergent and then air-dry it.

5. Clean the LED screen

(1) Use a soft cloth to clean the display screen;

(2) In case of die-hard blots, clean with soft cloth dipped in glass cleaner and then air-dry it.

6. Clean the control panel, shell and probe bracket

Clean the instrument surface with soft, dry cloth or with soft cloth dipped in moderate water cleaning media to remove the blots, and then dry the instrument with soft, dry cloth or with air.

14.2 Replace 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.

14.3 Replacement of power supply cord

Before replacing the power supply cord, please contact us; replace the power supply cord under the guidance of our company. Please use the power supply cord provided by us.

14.4 Using the Battery

⚠Danger:

1. **Do not assemble or disassemble the battery, because there is danger of explosion.**
2. **Charge the battery through the diagnostic ultrasound system only. Otherwise, there is danger of explosion.**
3. **Replace the battery provided by the manufacturer only, and can only be replaced by technical personnel.**

14.4.1 Precautions

The excess high or low temperature will affect the charging and discharging performance, and short the battery life and capacity.

⚠Attention: Battery is consumable; the battery cycle-life is based on the times of charge and discharge as unit. When the use time reduced significantly compared with normal conditions, the battery should be promptly replaced.

⚠Attention:

1. **Do not throw the battery into water or be wet, which will lead to the battery leakage, explosion or fire;**
2. **Do not use or store the battery near the heat source, such as fire or heater, which will lead to the battery leakage, explosion or fire;**
3. **Do not heat up or throw the battery into fire, which will lead to the leakage, explosion or fire;**
4. **Do not hammerblow, throw or mechanically shake the battery, which will lead to the leakage, explosion or fire;**
5. **Do not insert the battery with nail or other spiculate objects; do not hammerblow or trample the battery, which will lead to the leakage, explosion or fire;**
6. **Do not disassemble the battery in any way, which will lead to the leakage, explosion or fire;**
7. **Do not charge the battery near the heat source or extra-hot environment, which will lead to the leakage, explosion or fire;**
8. **Do not put the battery into the microwave oven or pressure vessel, which will lead to the leakage, explosion or fire;**
9. **Do not use the abnormal battery with particular smell or abnormal heat or distortion or turn colors or abnormal phenomena, which will lead to the leakage, explosion or fire;**
10. **Do stop the charge and pull out the battery from the charger at once if any abnormal phenomenon happens to the battery, such as particular smell or abnormal heat or distortion or turn colors. Otherwise, each of above will lead to the leakage, explosion or fire;**
11. **Do remove the battery from the near fire if any leakage or particular smell happens, which will lead to the leakage, explosion or fire;**
12. **If any leakage splash into eye, do not wipe the eye, instead of washing it and get help from the doctor as soon as possible. Otherwise, the eye will be injured;**
13. **If use the battery beyond the listed environment on the manual, it will worsen its performance or shorten its life, even lead to extreme heat or explosion or fire.**

14.4.2 Battery specifications and charging

⚠Warning:

1. **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.**
2. **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.**
3. **When the battery capacity is low (the battery capacity indicator icon at the bottom right corner of the screen is red) 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.**

⚠Attention: Don't throw away the exhausted battery anywhere; especially throw it in the fire. Please deal with it according to local statutes.

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: 11.1V

Battery capacity: 7500mAh

Limited charging voltage: 12.6V

14.5 Troubleshooting

User shall prepare a proper maintenance plan to ensure normal operation.

If the following problems occur on starting up the machine, try to make corrections following the method in the table. If the problem remains unsolved, contact Kaixin for support.

SN	Trouble	Correction
1	No response after pressing power on switch	1. Check power supply. 2. Check power cable and connections.
2	Character and gray scale are displayed, but no ultrasonic image on the screen.	Probe is not properly connected. Turn off the power and reconnect the probe.
3	Interference like strips or snowflake are in use display on screen	1. Check power supply. 2. Check whether 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
4	Not clean image in near field	Adjust total gain and TGC slider near the bottom right edge
5	Not clean image in far field	Adjust total gain and TGC slider near the bottom right edge
6	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
7	Control panel malfunction	Shut down the machine and restart it again.

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