About This Manual

Statement

Manufacturer's Responsibility

SonoScape is responsible for the effects on safety, reliability and performance of this product, only if all the following requirements are met.

- All installation operations, expansions, changes, modifications and repairs of this product are conducted by SonoScape authorized personnel.
- The use or application of the product or the use of parts or accessories is approved by SonoScape.
- The electrical installation of the relevant room complies with the applicable national and local requirements.
- The product is used in accordance with the instructions for use.

Documentation

SonoScape provides the documentation consisting of various manuals:

- The basic user manual describes the basic functions and operating procedures of the system.
- The advanced user manual provides information about the measurements and calculations available in each mode.

Understand the meanings of the following items clearly before reading this manual.

Item	Meaning
⚠ WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in malfunction or damage of the system.
☣	Indicates a potentially biological hazardous situation which, if not avoided, may result in disease transmission.

Item	Meaning
NOTE	Indicates precautions or recommendations that should be used in operating the system.
Boldfaced Word	Indicates controls on the control panel, or on-screen objects such as menu items or keys.
Click	Move the cursor to the controls on the display and press the Set key on the control panel.
>	Select a menu item or a key following the path.

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1   Safety

This chapter describes the important information for operating this ultrasound system. To ensure the safety of both operator and patient, please read the relevant details in this chapter carefully before using this system.

You should be thoroughly familiar with the precautions provided in this manual. Otherwise, the manufacturer is not responsible for the effects on safety, reliability and performance of the system.

⚠CAUTION Federal law restricts this device to sale by or on the order of a physician. Please read the user manual carefully prior to use.

1.1   Intended Use

The Digital Color Doppler Ultrasound System is a general-purpose ultrasonic imaging instrument intended for use by a qualified and trained physician for ultrasound imaging, measurement, display and analysis of the human body and fluid, which is intended to be used in a hospital or medical clinic. The system is applicable for people who need clinical ultrasound examination. Age, weight, health condition and race are unlimited.

The system is intended for use in the following clinical applications: Fetal, Abdominal, Pediatric, Small Organ (breast, testes, thyroid), Cephalic (neonatal and adult), Trans-rectal, Trans-vaginal, Peripheral Vascular, Cerebral Vascular, Musculo-skeletal (Conventional and Superficial), Cardiac (pediatric and adult), OB/Gyn and Urology.

The ultrasound system also provides the measurement and calculation packages used for clinical diagnosis purposes. For details, please refer to the advanced user manual.

⚠WARNING Precautions must be considered in the use of any application. Otherwise, it may result in system damage or serious injury.

1.2   Contraindication

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

1.3   Safety Precautions

Read and understand all precautions in this manual before attempting to use the system. Keep this manual with the system at all times. Review the procedures for operation and safety precautions periodically.

1.3.1   Electrical Safety

⚠WARNING
- Only qualified physicians or sonographers can perform ultrasound scanning on human subjects for medical diagnostic reasons.
- Any unauthorized personnel should not tamper with the main unit of the system.
- Do not service or maintain the system while it is in use with a patient.
- Do not position the system to make it difficult to disconnect it.
- Do not use the system with flammable anaesthetics (category AP) or flammable anaesthetics with oxidants (category APG).

- Do not use the system with other equipment such as an electric knife, high-frequency therapy equipment, or a defibrillator. Otherwise, electrical shock may occur.
- Connect the protective earth conductor only before powering on the system. Disconnect the ground wire only after powering off the system. Otherwise, electrical shock may occur.
- Connect the system to the other electrical equipment by using the potential-equalization lead wire before connecting the power plug of the system to an electrical outlet.
- Do not place the multiple socket-outlet on the floor.
- The video printer should be connected to the specific interface by using the cable provided by the manufacturer. Otherwise, electrical shock may occur.
- Within the environment that is 1.8 meters (6 feet) around a patient, connect peripherals to the auxiliary power outlet which is capable of isolation protection; or, power the peripherals by the auxiliary output cable or the isolation transformer complied with EN/IEC 60601-1, or the power input of the same safety level.
- Within the patient environment, when removing the covers or the connectors from the non-medical electrical equipment without tools during maintenance, calibration or other operations, do not touch the parts of the non-medical electrical equipment and the patient simultaneously.
- Use only the probes provided by the manufacturer. Otherwise, the system will not perform, and an accident such as a fire may result in the worst case.
- Only the peripherals and accessories provided or recommended by the manufacturer can be used. Using other devices or accessories may degrade the system's performance and even cause electrical shock.
- Do not pour any fluid onto the system surfaces, as fluid seepage into the electrical circuitry may cause excessive electrical current leakage or system failure. If any fluid is spilled onto the system carelessly, disconnect the system form the power supply and contact the local distributor immediately.
- The AC power plug for the system is a three-prong grounded plug and should never be adapted to any two-prong outlet or by using an adapter. Connect the AC power plug of the multiple socket-outlet to a hospital-grade power outlet.

⚠ CAUTION
- If the system is transported to the operating environment with a great temperature change, leave it for approximately 4 hours before powering it on. Ensure that the temperature and humidity inside and around the system are equivalent before an operation.
- Do not use the system around a strong electric field, a strong electromagnetic field, or the devices which generate radio waves, such as a radio, cellular telephones, or transceivers. Using the system in an improper environment may result in malfunction or damage.
- Select the conformed multiple socket-outlet with protective grounding, and ensure that its maximum output power exceeds the requirement of the system.
- The multiple socket-outlet can only be used to provide power to the recommended peripherals of the system.
- Do not connect other devices to the multiple socket-outlet. Otherwise, the rated output power of the multiple socket-outlet may be exceeded, and it may result in failure.
- Accessory equipment connected to the analog and digital interfaces must be certified according to the respective EN/IEC standards (for example, EN/IEC 60950 for data processing equipment and EN/IEC 60601-1 for medical equipment). Furthermore, all configurations shall comply with the system standards EN/IEC 60601-1.
- Do not use an endocavitary probe on the body surface of a patient. Otherwise, the electromagnetic compatibility of the probe may be degraded.
- If the non-medical electrical equipment used with the system is supplied by a multiple socket-outlet with separating transformer, connect the AC power plug of the multiple socket-outlet to a hospital-grade power outlet. Consult a professional to ensure that the connection complies with the safety standards.

1.3.2 Mechanical Safety

⚠ WARNING
- To avoid possible personnel injury and system damage, move the system slowly and carefully.
- During the movement, the system could cause injury if the casters roll over feet or into shins. Exercise extreme caution while moving the system for a long distance, and up or down the ramp.
- Lock the foot brakes after arrival.

⚠ CAUTION
- Do not place other objects on top of the control panel. Do not sit on the control panel or any other part of the system.
- Disconnect the foot switch and the power cable before moving the system.
- Do not knock or shake the system.
- Ensure that the casters are intact and can rotate well before moving the system.
- Always use the handle to move the system.
- Ensure that the foot brakes are released and all cables are away from the casters before moving the system.

1.3.3 Accessories Caring

⚠ WARNING
- Do not use the foot switch in the operating room.
- Use the probe carefully. If any part of the transducer surface is scratched, stop using the probe immediately. Otherwise, electrical shock may occur.
- After cleaning or disinfecting the accessories, wash out chemicals or discharge gases thoroughly from the accessories. Residual chemicals or gases could result in damage to the accessories, and be harmful to human bodies.
- Only trained physicians or sonographers under ultrasound guidance can handle the biopsy needle guides. During the operation, the operator must observe proper needle insertion sequencing with the needle guide to avoid undue discomforts, unnecessary risks or injuries to the patient.
- Use the legally marketed probe sheath. Refer to package labeling to determine latex content. Natural rubber latex may cause anaphylactic reactions in some individuals. Avoid contact with items containing natural rubber latex. Refer to the FDA Medical Alert, March 29, 1991.
- Use the legally marketed coupling gel in accordance with relevant local regulations. Read and understand all precautions in the relevant manual of the coupling gel before use.
- Prepare, use, store and dispose of the cleaning solution and disinfectant according to the instructions provided by manufacturers.

⚠ CAUTION
- Disconnect the probe from the system after freezing an image or powering off the system. Otherwise, the system or the probe could be damaged.
- Do not disconnect the probe during the real-time scan. Otherwise, it may damage the probe and the system.

1.3.4 Biohazard Considerations

☣
- Patient debris and chemicals for cleaning, disinfection or sterilization are potentially dangerous. The operator should wear the medical protective clothing, goggle or medical sterile gloves to minimize the risk of cross-contamination and disease infection. Take off the medical protective barriers before leaving the cleaning and disinfection room.
- The operator should take cautions in preventing hands from being directly contacted with the disinfectant (or sterilant) and patient samples. If your skin is stained with them, thoroughly wash the area immediately with clean water. If the fluid comes in contact with your eyes, immediately flush your eyes with clean water and seek the oculist for help.

- Dispose of the disinfectant (or sterilant), cleaning solution and waste solution in accordance with local laws or regulations. For details, please consult the relevant manufacturer or local distributor.

1.4 Acoustic Power Principle

⚠ WARNING
- Perform ultrasound procedures prudently under the guidance of the ALARA (as low as reasonably achievable) principle. Only expose the patient to the lowest practical transmit power levels in the shortest possible period to achieve a satisfactory diagnosis.
- Freeze the image at any time if you are not operating the system for a long period of time.
- Do not scan the same part of an patient continuously or expose the patient to prolonged scanning. Doing so may harm the patient.
- Do not expose the fetus to prolonged scanning in the Doppler mode.
- Although the output power is automatically controlled for the selected applications, high TI values should be kept to a minimum or avoided in obstetric applications.
- You should be familiar with the performances and operations of the system, observe the ultrasound output parameters on the screen at all times.

1.4.1 Biological Safety

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

1.4.2 ALARA

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

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

The operator must take responsibility for the safety of the patient and utilize the ultrasound deliberately. Deliberate use of the ultrasound means that output power of the ultrasound must be selected based on ALARA. Additional information regarding the concept of ALARA and the possible bioeffects of Ultrasound are available in a document from the AIUM (American Institute of Ultrasound in Medicine) titled "Medical Ultrasound Safety".

1.4.3 Mechanical and Thermal Indices

The display of the system consists of two parts: Thermal Index (TI) and Mechanical Index (MI).

■ **MI/TI Explanation**

In October 1987, the American Institute of Ultrasound in Medicine (AIUM) ratified a report prepared by its Bioeffects Committee (Bioeffects Considerations for the Safety of Diagnostic Ultrasound, J Ultrasound Med.,Sept. 1988: Vol. 7, No. 9 Supplement), sometimes referred to as the StoweReport, which reviewed available data on possible effects of ultrasound exposure. Another report "Bioeffects and Safety of Diagnostic Ultrasound" dated January28, 1993, provides more current information.

- **Mechanical Index (MI)**

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

- **Thermal Index (TI)**

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

  Depending on the examination and type of tissue involved, TI could be one of three types:

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

  - Bone Thermal Index (TIB) is used when bone is near the focus of the image as in the third trimester, it provides an estimate of potential temperature rise in the bone or adjacent soft tissue.

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

■ **MI/TI Display**

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

The MI and TI precision is 0.1.

1.4.4 Transducer Surface Temperature Limits

For probes intended for internal applications, e.g. the endocavitary probe or transesophageal probe, the surface temperature of the probe may change by adjusting system parameters.

The maximum surface temperature of the endocavitary probes is 43°C. To protect the patient against the harm of excessive temperature, the probe stops working automatically when its temperature reaches the limit. The surface temperature of the probe is displayed on the right side of the screen.

PAT：37.0°C —————— Patient Threshold Temperature
TIP：< 28°C —————— Transducer Tip Temperature

1.4.5 Imaging Functions that Change Acoustic Output

The qualified operator may use the system controls to limit the ultrasound output and to adjust the quality of the images. The operator should observe the acoustic output display for possible effects.

There are three categories of system controls relative to output. They are controls that have direct effect on the output, controls that indirectly control output and controls that are receiver controls.

1.5 Safety Symbols

The following table is provided for your identification of important symbols located in labels on the system.

Symbol	Meaning
	General warning
	Warning; Electricity
	Warning; Crushing of hands
	Risk of explosion if used in the presence of flammable anesthetics
	Type BF Applied Part
	OFF (Power)
	ON (Power)
	Stand-by
	Foot switch connector
	Protective earth (ground)
	Equipotentiality
	Alternating current
IPN_1N_2	Degree of IP protection
	Non-ionizing electromagnetic radiation
	Manufacturer
	Date of manufacture
	Refer to instruction manual
	Network Port

Symbol	Meaning
	Remote control
	USB Port
	Video Input
	Video Output
	Audio
	Fragile, handle with care
	Keep away from rain
	Do not stack
	This way up
	This symbol indicates that waste electrical and electronic equipment must not be disposed of as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of your equipment.
SN	Serial Number
	Transfer of heat in general
	Rotate the control panel left or right
▲ ▼	Adjust the control panel up or down
CE 0197	This product is provided with a CE marking in accordance with the regulations stated in Council Directive 93/42/EEC.
EC REP	Authorized representative in the European community
	Temperature limit

Symbol	Meaning
	Humidity limitation
	Atmospheric pressure limitation

2 System Overview

To ensure the performance and availability of this ultrasound system, you should be thoroughly familiar with the operations of system components, the control panel, the keyboard and the basic screen.

2.1 Standard System Configuration

The standard system configuration mainly consists of the following items:

- Main unit
- Probes
- Others: See the Packing List in the packaging box.

2.2 Physical Specifications

Physical specifications of differently configured systems are different. The detailed specifications are as follows.

Monitor specifications	21.5 inches	23.8 inches
Lifting range of control panel	0 - 70 mm	
Width	526 mm ± 10 mm	567 mm ± 10 mm
Height (The height is measured when the control panel and monitor are in their lowest positions.)	1415 mm ± 30 mm	1455 mm ± 30 mm
Depth	740 mm ± 10 mm	
Weight	65 kg ± 5kg	

2.3 System Components
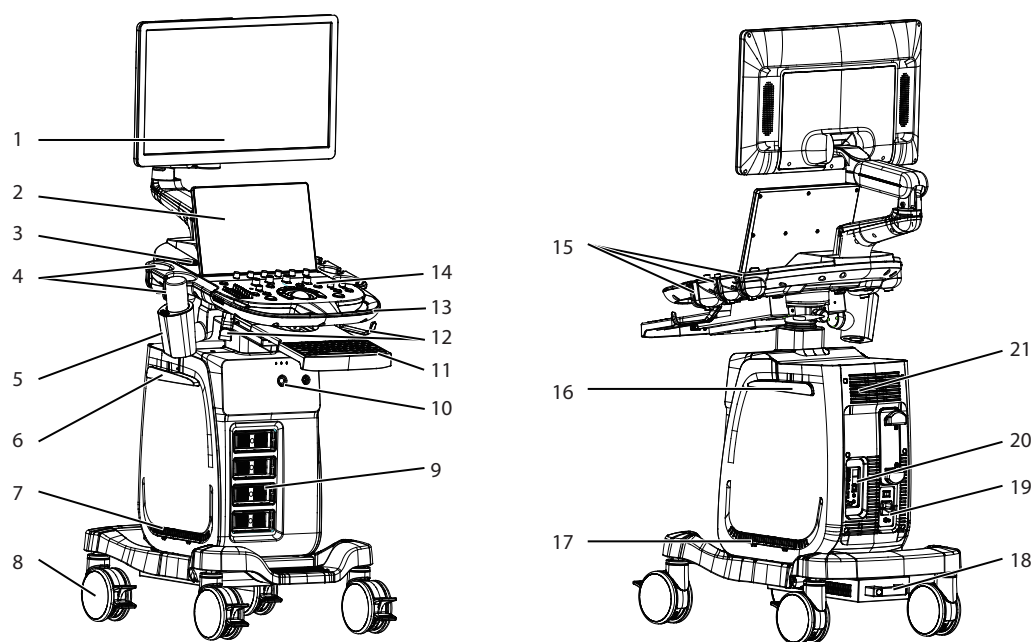
Figure 2-1 Overview of the System

1	Monitor	12	Probe Cable Hanger
2	Touch Screen	13	Handle
3	Speaker	14	Control Panel
4	Probe Holder	15	Probe Holder
5	Coupling Gel Heater (Optional)	16	Cable Hanger
6	Cable Hanger	17	Dust Filter
7	Dust Filter	18	Air Inlet
8	Caster	19	Power Supply Panel
9	Probe Port	20	Peripheral Device Panel
10	Front Panel	21	Ventilation Holes
11	Keyboard (Optional)		

2.3.1   Peripheral Device Panel
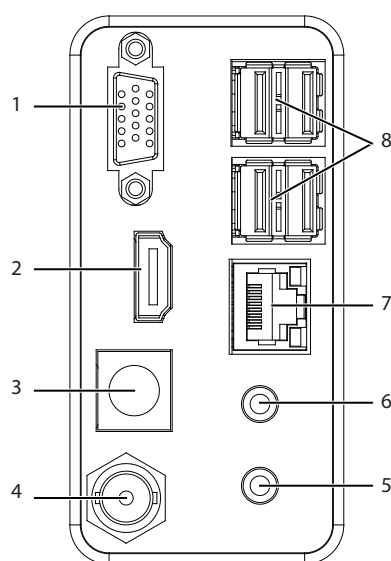
Figure 2-2 Peripheral Device Panel

No.	Name	Description
1	**VGA** Port	Connect a video device to acquire VGA signals.
2	**HDMI** Port	Connect a video device to acquire HDMI signals.
3	**S-VIDEO OUT** Port	Connect a video device to acquire S-VIDEO signals.
4	**VIDEO OUT** Port	Connect a video device to acquire VIDEO signals.
5	**AUDIO OUT** Port	Connect an audio device.
6	**MIC IN** Port	Reserved
7	Network Port	Connect the network.
8	USB Port	Connect the USB devices.

2.3.2   Power Supply Panel
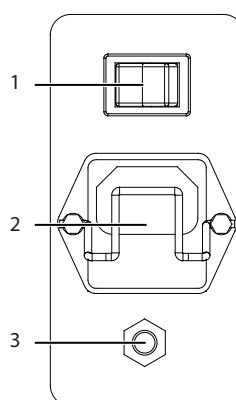
Figure 2-3 Power Supply Panel

No.	Name	Description
1	Power Switch	Power on or off the system.
2	Power Input	Connect the power cable.
3	Equipotentiality	Balance the protective earth potentials between the system and the other electrical equipment for equipotential connection.

2.3.3 Front Panel
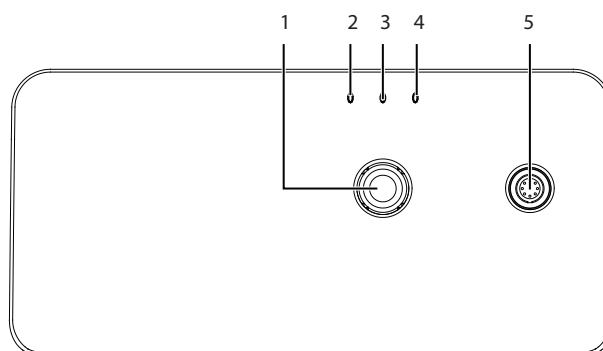
Figure 2-4 Front Panel

No.	Name	Description
1	ECG Port	Connect the ECG cable.
2	Mains Supply Indicator	Indicate the mains supply status.
3	Battery Charging Indicator	Indicate the built-in battery charging status.
4	Battery Discharging Indicator	Indicate the built-in battery power status.
5	Pencil Probe Port	Connect the pencil probe.

2.3.4 Control Panel
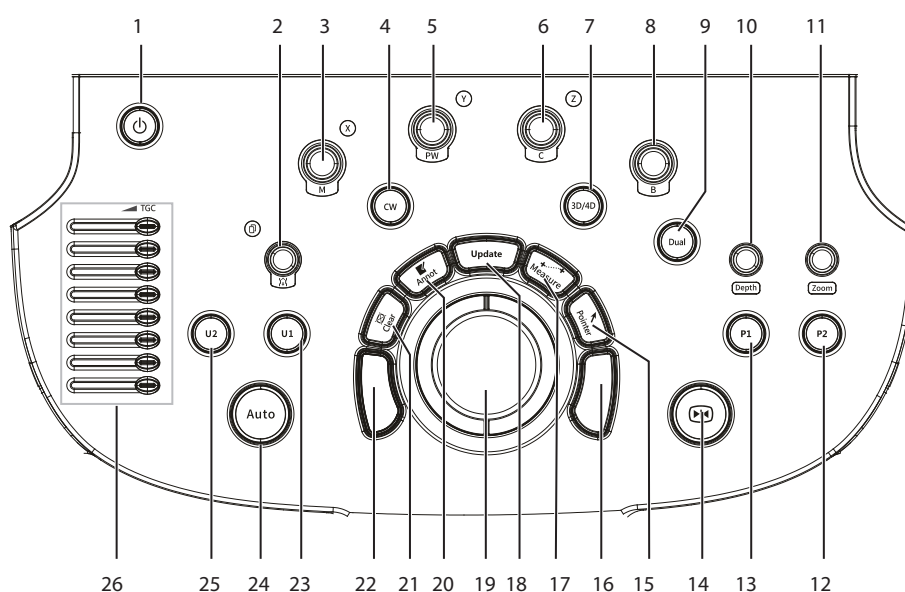
Figure 2-5 Control Panel

No.	Name	Description
1	Power Key (⏻)	Press it to power on or power off the system, or enter the standby mode.
2	Body Mark Key (⌇⌃⌇)	Press it to add body marks on an image.
3	**M** Key	• Press it to enter the pre-activated M mode and press the **Update** key to enter the M mode. • Rotate it to adjust the gain value in the M mode. • Rotate it to make the slice or the volume data rotate around X axis in 3D/4D mode.
4	**CW** Key	Press it to enter the pre-activated CW mode and press the **Update** key to enter the CW mode.
5	**PW** Key	• Press it to enter the pre-activated PW mode and press the **Update** key to enter the PW mode. • Rotate it to adjust the gain value in the PW mode. • Rotate it to make the slice or the volume data rotate around Y axis in 3D/4D mode.
6	**C** Key	• Press it to enter or exit the CFM mode. • Rotate it to adjust the gain value in the CFM mode. • Rotate it to move the 3D image horizontally in 3D/4D mode.
7	**3D/4D** Key	Press it to enter or exit the 3D/4D mode.
8	**B** Key	• Press it to enter the B mode. • Rotate it to adjust the gain value in the B mode.
9	**Dual** Key	• Press it to enter the dual-split display. • In elastography mode, press it to switch to single display.
10	**Depth** Key	• Rotate it to adjust the scan depth. • Press it to restore to the default scan depth.
11	**Zoom** Key	• Rotate it to magnify the image. • Press it to select the area to be magnified.
12	**P2** Key (User-defined Key)	In the default status, press it to save a cine in the real-time mode or frozen mode. Customize the key. For details, refer to Section 4.1.3 MultiKey Settings. **NOTE:** *For operations about **P2** key in this manual, the function of **P2** key is the same as the default.*

No.	Name	Description
13	**P1** Key (User-defined Key)	In the default status, ● press it to save an image in the real-time mode or frozen mode,. ● press it to set the start frame for a cine of blood flow, and press it again to set the end frame in the real-time contrast imaging mode. ● press it to save the volume data in the frozen 3D/4D mode. Customize the key. For details, refer to Section 4.1.3 MultiKey Settings. **NOTE:** *For operations about* **P1** *key in this manual, the function of* **P1** *key is the same as the default.*
14	Freeze Key (▶◀)	● Press it to freeze an image in the real-time mode. ● Press it again to restore the real-time scan.
15	**Pointer** Key	● In the 2D (B/CFM/PDI/TDI) or M mode, press it to activate the clipboard. ● In the 3D or 4D mode, press it to activate the trackball cursor.
16	Set Key	Press it to confirm the current operation.
17	**Measure** Key	Press it to enter the basic measurement or application-specific measurement.
18	**Update** Key	● Press it to enter the M/PW/CW mode in the pre-activated M/PW/CW mode. ● Press it to switch between measurement markers when performing a distance or an ellipse measurement. ● Press it to undo the trace when performing trace measurement. ● In dual-split display mode, press it to switch the images.
19	Trackball	Use it to move the cursor, and adjust the position and size of ROI.
20	**Annot** Key	Press it to annotate an image with typed words.
21	**Clear** Key	Press it to remove all measurement results, annotations and body marks from the display.
22	Set Key	Press it to confirm the current operation.
23	**U1** Key (User-defined Key)	Set it to save the image, cine, screen capture and volume, or set it as other functions as required. For details, refer to Section 4.1.3 MultiKey Settings.
24	**Auto** Key	Press it to optimize an image automatically.
25	**U2** Key (User-defined Key)	Set it to save the image, cine, screen capture and volume, or set it as other functions as required. For details, refer to Section 4.1.3 MultiKey Settings.
26	TGC Slider	Use these sliders to adjust the TGC settings at different scan depths.

2.3.5   Keyboard
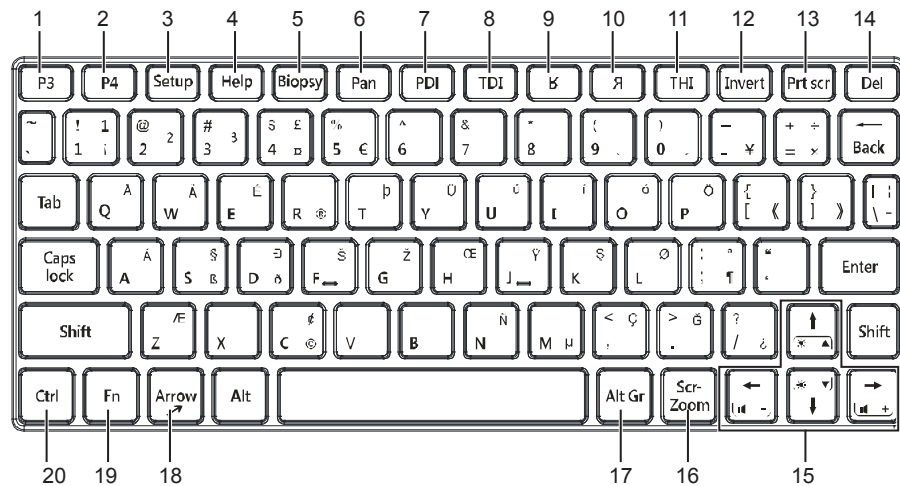
Figure 2-6 Keyboard

No.	Name	Description
1	**P3** Key	Set it to save the image, cine, screen capture and volume, or set it as other functions as required. For details, refer to Section 4.1.3 MultiKey Settings.
2	**P4** Key	
3	**Setup** Key	Press it to enter the **System Setting** screen.
4	**Help** Key	Press it to open the built-in documents.
5	**Biopsy** Key	Press it to activate the biopsy feature.
6	**Pan** Key	Press it to enter or exit the real-time panoramic imaging mode.
7	**PDI** Key	Press it to enter or exit the PDI mode.
8	**TDI** Key	Press it to enter or exit the TDI mode.
9	ʁ Key	Press it to reverse the image up or down.
10	Я Key	Press it to reverse the image left or right.
11	**THI** Key	Press it to enter or exit the THI/PHI mode.
12	**Invert** Key	• Press it to enable or disable reversing the flow in the CFM/PDI/TDI mode. • Press it to enable or disable reversing the spectrum in the PW/CW mode.
13	**Prtscr** Key	Reserved
14	**Del** Key	• Press it to delete the last annotation or body mark when annotating an image. • Press it to delete the last measurement marks and results (the results in the report will not be deleted) when performing the manual trace measurement.
15	Up/Down/ Left/Right Arrow Key	• Press it to make options for an item when configuring the **System Setting** screen. • Press it and the **Fn** key simultaneously to adjust the audio volume and display brightness.
16	**Scr-Zoom** Key	Press it to zoom in/out a selected zone.

No.	Name	Description
17	**Alt GR** Key	Use it in combination with other keys.
18	**Arrow** Key	Press it to add arrows on an image.
19	**Fn** Key	• Press it and the Up/Down arrow key simultaneously to adjust the display brightness. • Press it and the Left/Right arrow key simultaneously to adjust the volume in PW mode.
20	**Ctrl** Key	Use it in combination with other keys.

2.3.6   Touch Screen

The touch screen above the control panel provides controls which can be used to select the probe model in accordance with the exam type, annotate the image or perform the measurement. The touch screen contains several types of controls, depending on the feature to be performed.

NOTE:

A same effort can be achieved by using controls on the touch screen or controls and keys located on the control panel and the keyboard if they are of the same name. In such condition, only the system operated with the touch screen is described in this manual.

⚠ CAUTION To avoid damaging the touch screen,

- Do not expose it in direct sunlight.
- Tap it gently with fingers.
- Do not operate it with a sharp or hard object.
- Do not locate it in environmental temperature of sudden changes.
- Do not locate it near static electricity or high voltage.
- Keep the screen clean without any adhesive tapes.

Controls located below the touch screen are displayed as follows:
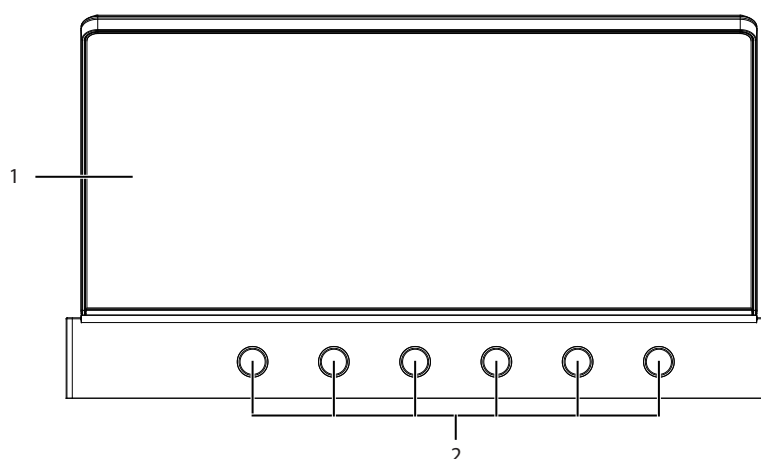
Figure 2-7 Touch Screen

No.	Name	Description
1	Touch Screen	The display varies with the feature to be performed: application mode screen, imaging mode screen, annotation/bodymark screen, measurement screen, and sonogram navigation screen.
2	Function Key	Rotate the key that is directly below the desired item to adjust the value when optimizing the image.
		Generally, rotate it clockwise to enable the feature or increase the value of the corresponding parameter; rotate it anticlockwise to disable the feature or decrease the value of the corresponding parameter.

2.4   Screen Display

2.4.1   Basic Screen
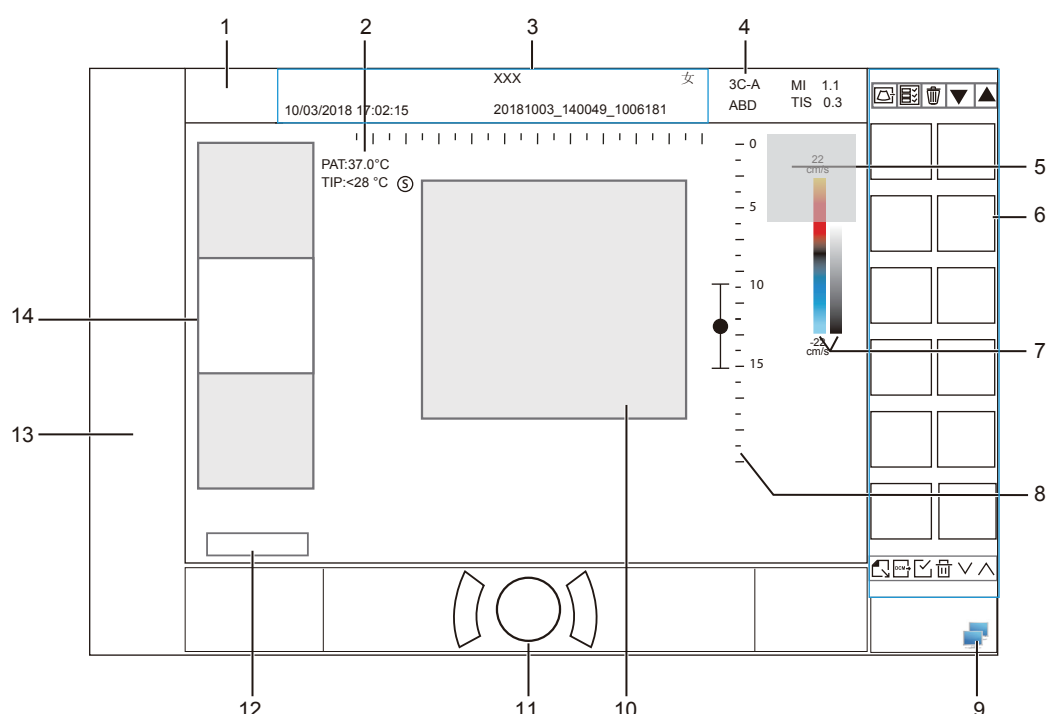
Figure 2-8 Basic Screen

1	Manufacturer Logo	8	Depth Scale and Focus Area
2	Temperature Display Area	9	Network Connection Status
3	Information Bar	10	Imaging Area
4	Exam Type Icon	11	Trackball Prompt Area
5	Measured Result Box	12	Cine Loop Status (in frozen mode)
6	Clipboard	13	Measurement/Annotation Area
7	Color Map/Grayscale Map	14	General Parameters Area

NOTE:

If the temperature of intracavity probe or intraoperative probe is 6ºC higher than the initial temperature of the patient, a prompt pops up in the temperature display area.

2.4.2   Touch Screen Display
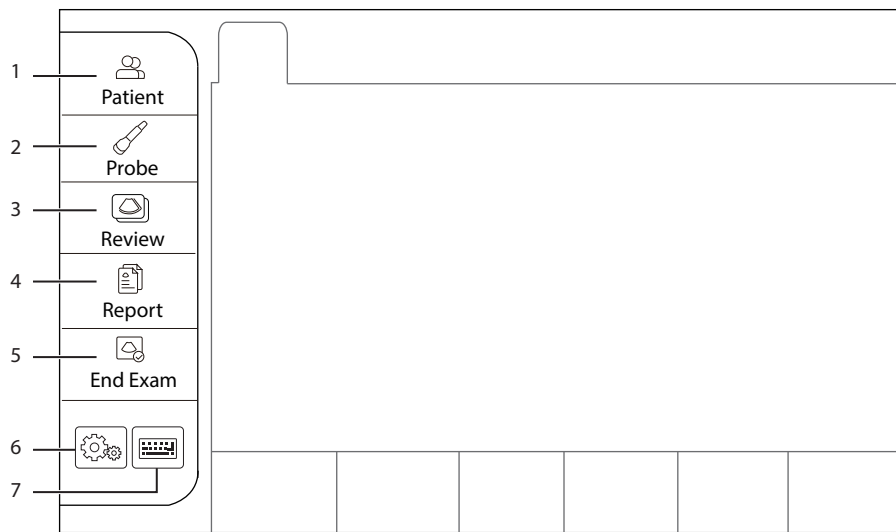
Figure 2-9 Touch Screen Display

No.	Name	Description
1	Patient	Tap it to enter the **New Patient** screen.
2	Probe	Tap it to select a probe and an icon of exam type.
3	Review	• Tap it to display the **Exam List** screen. • Tap it to enter the **Review Exam** screen after creating a new patient exam.
4	Report	Tap it to enter or exit the **Report** screen.
5	End Exam	Tap it to end the current exam in the real-time mode.
6	Settings (⚙)	Tap it to enter the **System Settings** screen.
7	Soft Keyboard (⌨)	Tap it to enter the soft keyboard input screen.

■   **Application Mode Screen**

The application mode screen as shown below is used to select the probe model or exam type.

The system enters the following screen by default once it is started. Tap **Probe** on the touch screen to return to the following screen when you enter other screens.
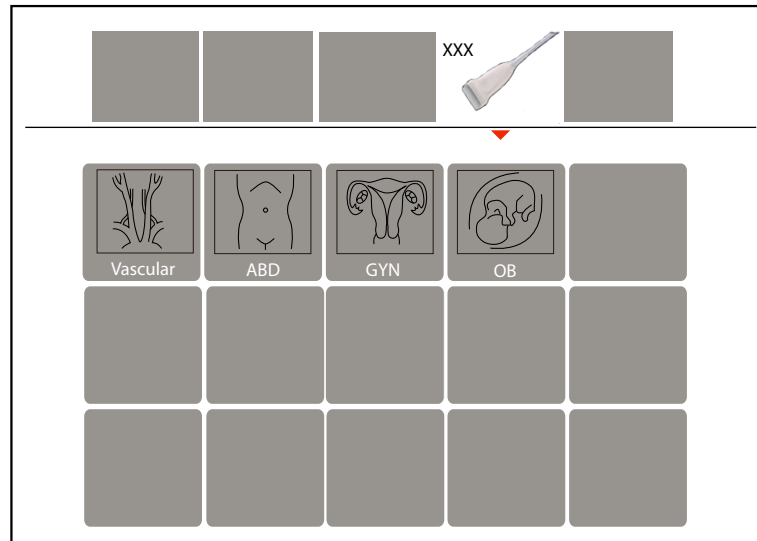
Figure 2-10 Application Mode Screen

■ **Imaging Mode Screen**

The imaging mode screen as shown below is used to select the imaging mode, optimize the image or adjust parameters. Select an exam type from the application mode screen to enter the following screen.
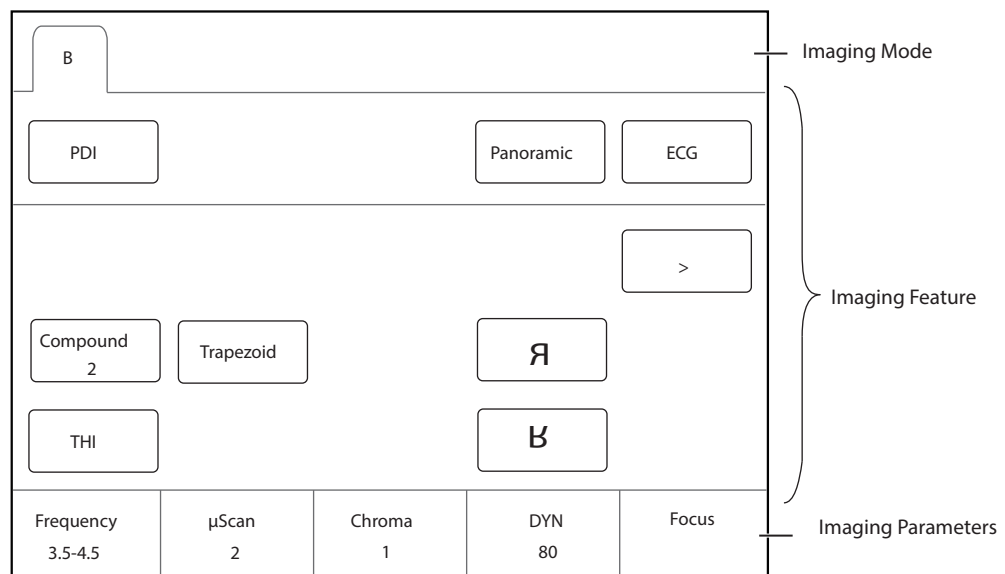
Figure 2-11 Imaging Mode Screen

■ **Annotation/Body Mark Screen**

The **Annotation/Body Mark** screen is used to select an annotation or a body mark.

Press the **Annot** key or press the key on the control panel to enter the corresponding screen. For example, the following screen will be displayed on the touch screen if you press the key.
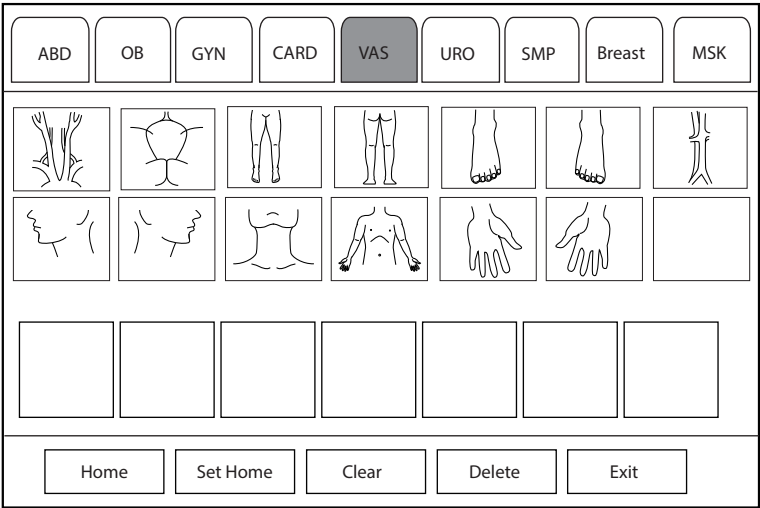
Figure 2-12 Body Mark Selection Screen

■   **Measurement Selection Screen**

The measurement selection screen is used to select the calculation package (measurement package) and measurement item.

Press the **Measure** key on the control panel to enter the measurement selection screen, as shown in the figure below.
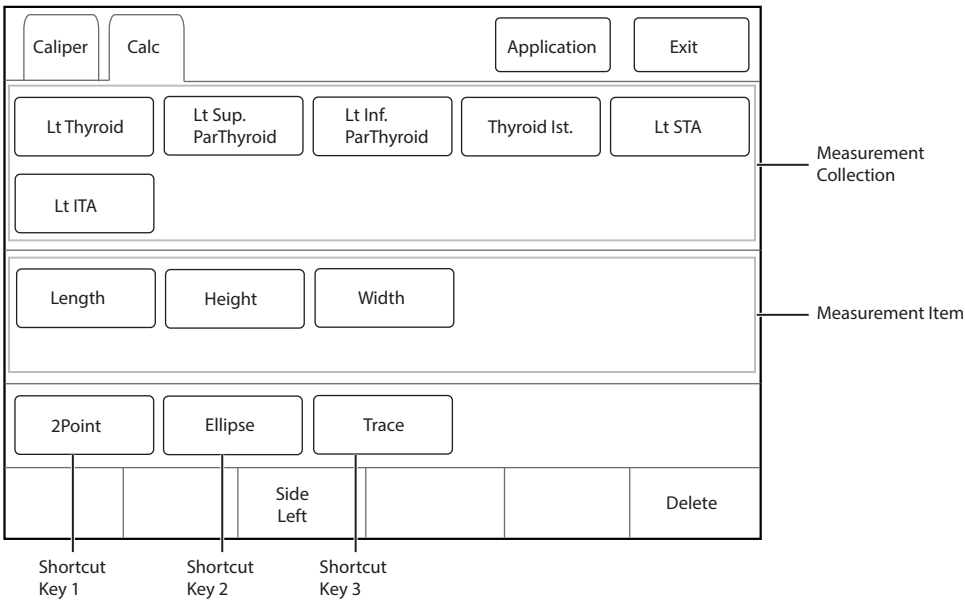
Figure 2-13 Measurement Selection Screen

3 Preparing the System

System preparation is necessary before using the system. The preparation includes but is not limit to moving, positioning or adjusting the system, connecting the probe and the peripheral devices.

NOTE:

You should connect and use the ultrasound system in accordance with EMC requirements provided in this manual.

3.1   System Moving/Positioning

⚠ **CAUTION** Leave at least 20 cm at the back and both sides of the ultrasound system for ventilation. Otherwise, the system could over heat and fail.

Perform the following steps to position the system.

1. Unlock the four foot brakes.

2. Move the system with the handle.

3. Lock the four foot brakes after placing the system in the desired location.
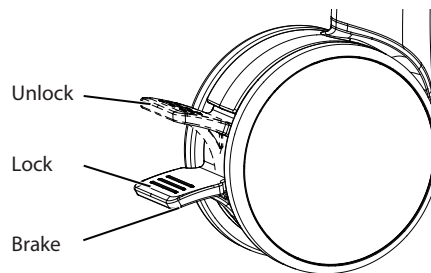
Figure 3-1 Caster

3.2   Connecting and Powering the System

Two methods can be used to supply power for the system: mains supply and built-in rechargeable lithium battery.

When the adapter is connected to the mains supply, the battery is charged until it is full.

3.2.1   Using the Mains Supply

Two switches are provided for the system.

- The power switch located on the power supply panel is used to control the connection or disconnection between the system and the mains supply.

- The power key (⏻) on the control panel is used to power on or power off the system.

⚠ **WARNING**
- Ensure the ultrasound system works with the required voltage before you connect it to the mains supply.

- If the system is connected to the mains supply through a power supply cable, the battery is automatically charged.

- If the system is disconnected from the mains supply, the system is automatically powered by the battery.

1. Connect the power input port on the rear panel to the medical mains supply by using a power supply cable attached with the system.

2. Set the power switch on the power supply panel to the ▌position.

3.2.2   Using the Battery

⚠ WARNING
- Do not disassemble or alter the battery. Otherwise, there is a danger of explosion.
- Replace the battery with the same or the equivalent type.
- Do not short-circuit the battery by directly connecting the system with metal objects.
- If the battery emits an odor or heat, is deformed or discolored, or appears abnormal during use, charging or storage, remove it and stop using it immediately. If you have any questions about the battery, please contact the manufacturer.
- Do not use a battery if it leaks. If your skin or clothing is stained with the fluid from the battery, thoroughly wash the area immediately with clean water. If the fluid comes into contact with your eyes, immediately flush your eyes with water and seek an oculist for help.
- If the battery is found damaged, severely degraded or used for 3 years, dispose of it in accordance with the local laws or regulations.

The battery is automatically charged when the system is connected to the mains supply through a power cable. If the system is disconnected from the mains supply, the system is automatically powered by the battery.

Under normal operating conditions, a fully charged battery can work continuously for not less than 45 minutes, and two fully charged batteries can work continuously for not less than 90 minutes. The battery specifications are as follows:

- Nominal voltage: 14.4V
- Battery capacity: 6.5Ah/93.6Wh
- Limited charging voltage: 16.8V

The system uses the built-in battery. If you need to disassemble or change the battery, please contact the local distributor.

When the battery is low, the screen displays the prompt information, and the system makes an alarm sound simultaneously. At this time, you should charge the battery and save the data in time to avoid data loss.

⚠ WARNING To avoid the battery damage causing the system damage, observe the following precautions:
- Do not immerse the battery in water or allow it to get wet.
- Do not discard the battery it in fire.
- Do not leave the battery in direct sunlight or expose it to temperature over 60℃ (140℉).
- Keep the battery away from fire and other heat sources during use and charge.
- Do not place the battery into a microwave oven or other pressure vessels.
- Do not pierce the battery with a sharp object, hit it, or step on it.

⚠ CAUTION
- Use only the battery when there is an emergency or no reliable mains supply is available. You are always recommended to use the AC supply instead of the battery to guarantee the battery life.
- Charge the battery in an area with a temperature range from 0℃ to 45℃ and discharge it an area with a temperature range from 0℃ to 60℃ to maintain the lifespan of the battery.
- Always charge the battery to full to maintain the lifespan of the battery.
- When the battery is low 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.

3.2.3   Indicators

The status of indicators is shown in Table 3-1.

Table 3-1 Indicator Descriptions

Indicator	Name	Mains Supply	Battery Supply
⎓⊏⊐	Mains Supply Indicator	Green	Off
▮⊞▯	Battery Charging Indicator	Yellow, charging	Off
		Green, fully charged	
▮▮▮▯	Battery Discharging Indicator	Off	Green, full capacity
			Yellow, low capacity
			Extremely low capacity. The system makes an alarm sound and automatically shuts down.

3.3   Powering On/Off the System

⚠ **WARNING**
- Do not power off the system during a system upgrade or a data transmission.
- An extra 30-60 seconds are needed for powering on the system if it is powered off in an abnormal way previously.
- If the system is configured with the μScan feature, do not connect the USB drive to the system before system startup.
- Wait approximately 20 seconds before powering on the system again after powering it off. Otherwise, a failure may result.
- Do not unplug the system from the AC power outlet before the shutdown hint disappears. Otherwise, the data may be lost or corrupted.
- To maintain the safety and functionality of the system, maintenance must be performed at least once every year. For details, refer to Chapter 12 Maintenance.

3.3.1   Powering On the System

1. Set the power switch on the power supply panel to the ▮ position.

2. Press the power key (⏻) on the control panel to power on the system.

3.3.2   Powering Off the System

1. Press the power key (⏻) on the control panel and click **Shutdown** in the pop-up dialog box to power off the system.

2. Set the power switch on the power supply panel to the ○ position.

3.3.3   System Standby

Press the power key (⏻) on the control panel and click **Standby** in the pop-up dialog box, and the system enters the standby status. In the standby status, press the power key (⏻) to restore the system to the previous status.

3.3.4   Screen Saver

If the system is idle for a set period, the screen saver will be activated automatically. You can press any key to exit. For the detailed settings, refer to Section 4.1.2 Display Settings.

3.4   Adjusting the System

NOTE:

When the system is configured with the unadjustable arm, the monitor height cannot be adjusted.

3.4.1   Adjusting the Monitor Arm

NOTE:

- *Be careful with your fingers when adjusting the monitor arm.*
- *Lock four casters before you adjust the monitor arm.*
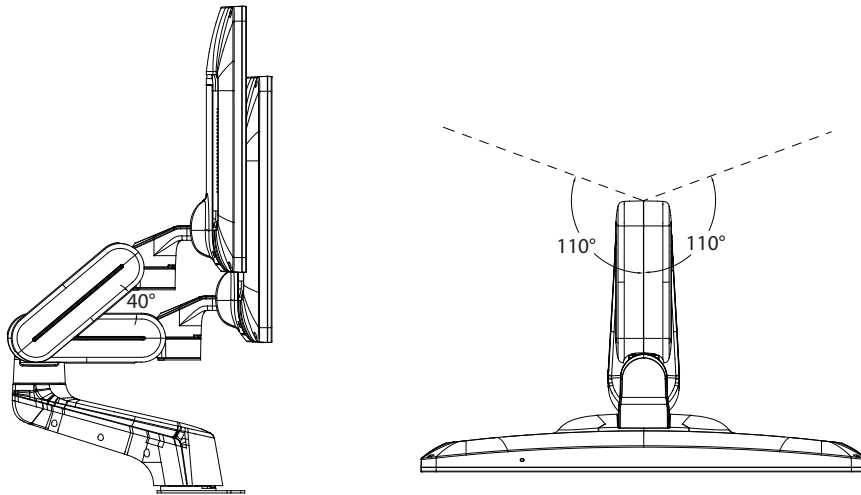
- To adjust the monitor vertically, move the upper arm up or down.
- To adjust the monitor horizontally, swivel the upper arm left or right.

3.4.2   Adjusting the Display Monitor

- ■   **To swivel the LCD monitor**
  - Grip the upper and lower sides of the monitor, and tilt the monitor forward or backward. The tilt angles of 23.8 inch monitor are as follows.
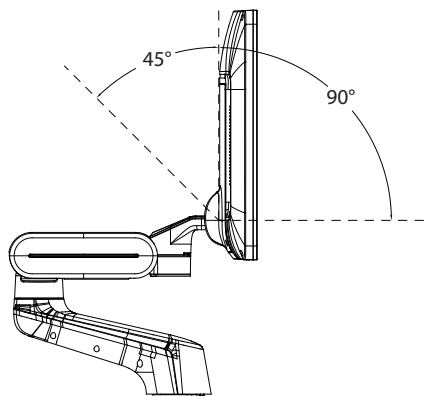
NOTE:

The 21.5 inch monitor can be adjusted backward to an angle of 25°.

- Grip the left and right sides of the monitor, and swivel the monitor left or right.

40°   40°
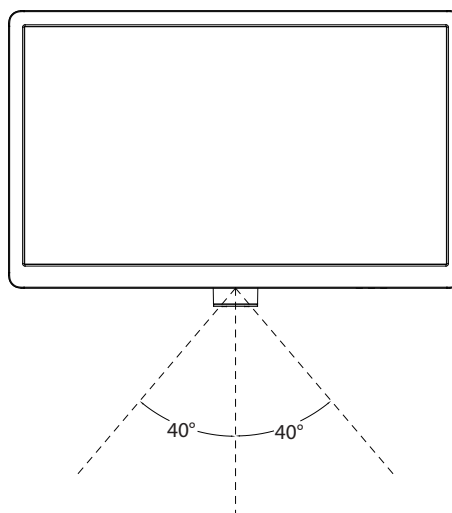
■   **To adjust the brightness and contrast**

Adjusting the LCD monitor's brightness and contrast is one of the most important factors for obtaining the optimum image.

The proper setup displays a complete gray scale. The lowest level of black should just disappear into the background and the highest white should be bright, but not saturated.

Perform the following steps.

1. Press the ○ button on the side of the monitor to enter the monitor menu, and press the **–** / **+** button to select the contrast or brightness.

2. Press the ○ button to activate the corresponding function, and press the **–** / **+** button to adjust the parameter value.

3. Press the ○ button to confirm the value.

Hold down the **Fn** key on the keyboard and press the Up/Down arrow key simultaneously to adjust the brightness.

3.4.3   Adjusting the Control Panel

Use the up/down control lever and the swivel button to adjust the control panel.

NOTE:

Lock four casters before you adjust the control panel.

■   **To adjust the vertical position**

Up/Down Control Lever
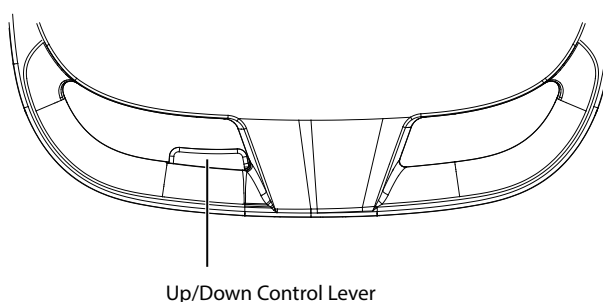
Figure 3-2 Adjusting the Height

●   Hold down the up/down control lever to raise the control panel to a desired height and release the lever.

- Hold down the up/down control lever and press down the control panel to lower the control panel to a desired height, and release the lever.

■ **To adjust the horizontal position**
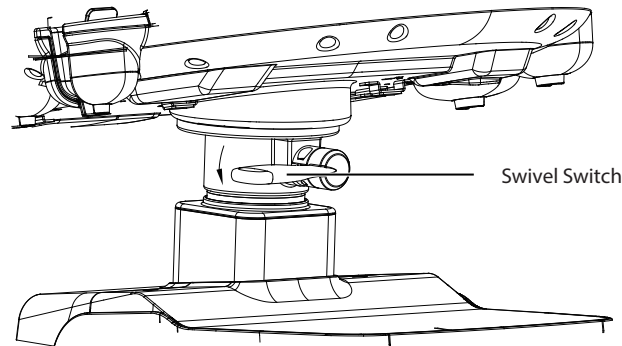
Swivel Switch

Figure 3-3 Adjusting the Horizontal Position

Rotate the swivel switch in the direction of the arrow and adjust the control panel horizontally. When the control panel is adjusted to a desired position, rotate the swivel switch in the opposite direction of the arrow.

3.5 Connecting the Probe

⚠ CAUTION
- Do not unplug the probe in use during the real-time scan. Otherwise, it may damage the system and the probe.
- Do not pull the probe cable forcibly. Otherwise, it may damage the probe.

Perform the following steps.

1. As shown in the figure below, rotate the locking lever on the probe connector anticlockwise to the ⌐ position, and insert the probe connector into the probe port firmly.
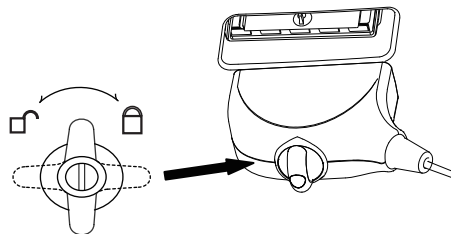
2. Rotate the locking lever clockwise to the ⌐ position to lock the probe connector securely.

If you need to disconnect the probe, rotate the locking lever on the probe connector anticlockwise to the ⌐ position to unlock and unplug the probe connector.

NOTE:

If you need to connect the pencil probe, insert the pencil probe to the pencil probe port on the front panel of the system.

3.6 Connecting the Peripheral Device

3.6.1 Connecting the Foot switch

⚠ CAUTION
- To avoid damaging the foot switch, do not place the foot switch on the ultrasound system.
- Use only the foot switch provided by the manufacturer. Otherwise, the ultrasound system or the foot switch may malfunction.

Connect the foot switch cable to the USB port of the ultrasound system as the figure shows below.

Left pedal

Right pedal
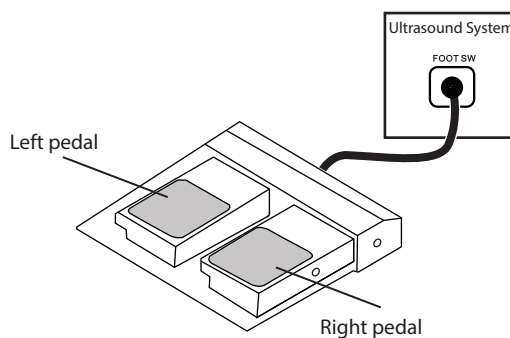
3.6.2 Connecting the Video Printer

Connect the video printer to the system by using the video cable and press the **Print** key on the printer to print the image.
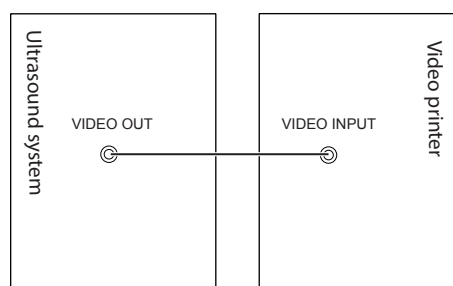
3.6.3 Connecting the Network Printer

■ **Printer Setup**

1. Connect the printer to the ultrasound system, and turn on the printer. The printer settings are displayed as below.
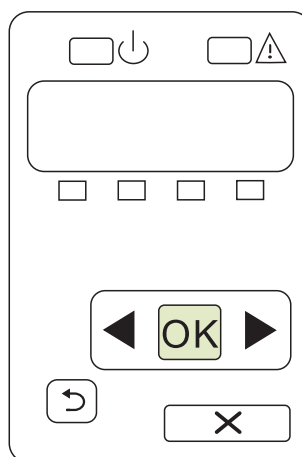
2. Press **OK** on the control panel screen of the printer.

3. Press ◀ or ▶ to select **Network Config**, and then press **OK** to confirm.

4. Press ◀ or ▶ to select **TCP IP Config**, and then press **OK** to confirm.

5. Press ◀ or ▶ to select **Manual**, and then press **OK** to confirm.

6. An IP address is displayed, change it to **192.168.254.103** by pressing ◀ or ▶ , and then press **OK**.

7. If the IP address is correct, use ◀ or ▶ to select **Yes**, and then press **OK**.

    If the IP address is incorrect, use ◀ or ▶ to select **No**, and then press **OK**. Repeat step 6 to enter a correct address.

8. After setting the IP address, set the subnet mask to **255.255.255.0** and the default gateway to **192.168.254.104** in the same way as described above.

■ **Printer Connection**

Perform the following steps.

1. Copy the driver file **deskjet.ppd** provided by the manufacturer into the directory of the USB drive.

2. Connect the USB drive to the USB port of the ultrasound system.

3. Tap 🛠 on the touch screen to enter the **System Settings** screen and click **Connect > Basic Settings**.

4. Click **Add Printer** and set the service name, IP address and driver in the pop-up dialog box. Select **Net Printer** in the drop-down list of **Type**, and select the corresponding driver file in the drop-down list of **Driver**.

    NOTE:

    IP address and **Printer IP** should be set in the same network segment.

5. Click **OK** to connect the printer. The printer can be used after the connection is completed.

3.6.4 Connecting the USB Printer

Perform the following steps.

1. Connect the USB printer to the system by using the USB cable.

2. Copy the driver file **deskjet.ppd** provided by the manufacturer into the directory of the USB drive.

3. Connect the USB drive to the USB port of the ultrasound system.

4. Tap 🛠 on the touch screen to enter the **System Settings** screen and click **Connect > Basic Settings**.

5. Click **Add Printer** and set the service name in the pop-up dialog box. Select **USB Printer** in the drop-down list of **Type**, and select the corresponding driver file in the drop-down list of **Driver**.

6. Click **OK** to connect the printer. The printer can be used after the connection is completed.

3.7 Heating the Coupling Gel

Perform the following steps.

1. Place the coupling gel into the coupling gel heater.

2. Adjust the heater to an appropriate angel.

3. Flip the switch on the heater to the desired level and the coupling gel is heated. The indicator illuminates in yellow during heating, and turns green after completing heating.

4　Customizing Your System

The **System Settings** screen allows you to specify general system settings, printing, measurement and calculation settings. You can also define the annotation library and shortcut keys. All your customized settings can remain even after rebooting the system.

After starting up the system, the monitor displays the background desktop and the touch screen displays the application mode screen. Tap ⚙ on the touch screen to enter the **System Settings** screen.
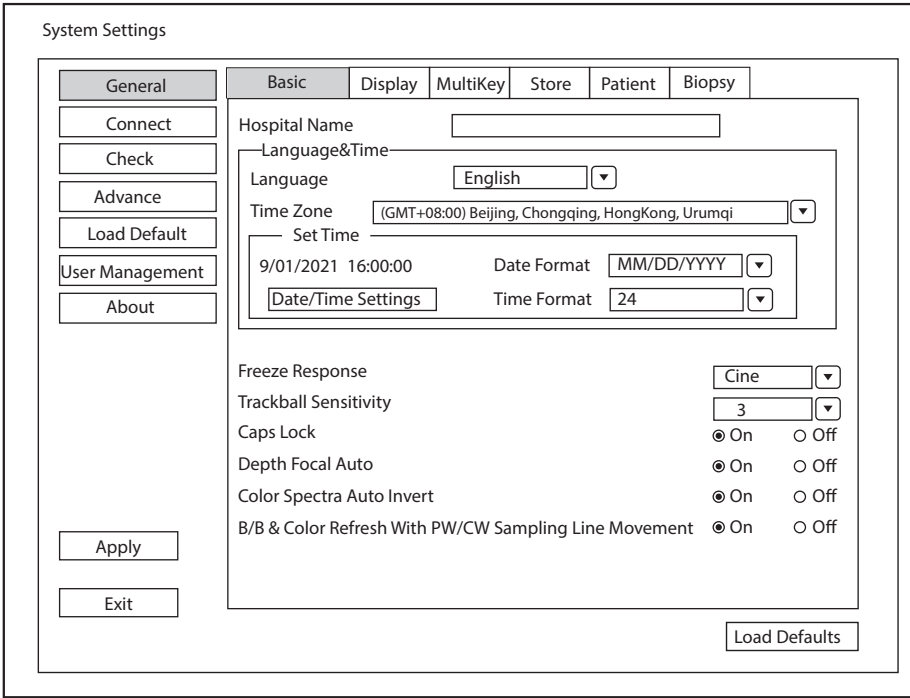
To make settings on the **System Settings** screen,

- Select one tab, and press the Set key on the control panel to enter a setting screen.
- Move the cursor to an item by using the trackball and press the Set key on the control panel to select one item.
- Move the cursor to a text box beside an item and use the keyboard to manually type the value.
- Select an option from each drop-down list for the item.
- Select **Apply** to save any changes and exit the **System Settings** screen.
- Select **Exit** to quit the **System Settings** screen.

4.1　General System Settings

You can make general system settings on the **Basic**, **Display**, **MultiKey**, **Store**, **Patient** and **Biopsy** tabs.

4.1.1　Basic Settings

Figure 4-1 General Settings Screen - Basic Settings Tab

Item	Description
Hospital Name	Enter the name of the institution.
Language	Choose a system language for the user interface, and reboot the system for it to take effect.
Time Zone	Set the local time zone.
Date Format	Set the date format for the system.
Date/Time Settings	Set the system date and time. Select this item to set the system date and time manually in the pop-up text box. **NOTE:** *You should set the system date and time for your initial use of the system.*
Time Format	Set the time format between 12 Hour and 24 Hour.
Freeze Response	Select the feature to be enabled after you press the ⏮ key.
Caps Lock	Enable or disable the capital letter feature. ● Set it to **On** to enable the upper-case mode. ● Set it to **Off** to disable the upper-case mode.
Trackball Sensitivity	Adjust the sensitivity for the trackball movement. A greater value brings about a higher sensitivity.
Depth Focal Auto	Enable or disable the auto-focus feature. ● Set it to **On**. In the B mode, the focus position adaptively changes with depth during depth adjustment. ● Set it to **Off**. In the B mode, the focus position does not change during depth adjustment. When the depth is below the focus, the focus position changes with the maximum depth.
Color Spectra Auto Invert	Enable or disable the color spectra auto invert feature. ● Set it to **On**. When the color ROI/PW sample line is steered from one side to another, the auto invert feature is enabled. ● Set it to **Off**. The auto invert feature is disabled.
B/B & Color Refresh With PW/CW Sampling Line Movement	Enable or disable the feature of moving PW/CW sample line to activate B/B&Color mode. ● Set it to **On**. When PW/CW sample line is moved, the real-time B/B&Color mode is activated. ● Set it to **Off**. When PW/CW sample line is moved, the image in B/B&Color mode is not refreshed, and sampling position is not limited by ROI of Color mode.

4.1.2   Display Settings

Figure 4-2 General Settings Screen - Display Tab

Item	Description
Color ROI	Set the color for the interest region box.
Display Format	Set the default display format for the M and PW/CW modes.
Screen Saver	Enable or disable the screen saver feature.
Screen Saver Delay (mins)	After the screen saver feature is enabled, the waiting time can be set. If the system is idle for a set period, it automatically enters screen saver mode.
Show Gallery	View images and cines coming with the system or imported from external storage devices.
Image Settings	Set the display format of the dual image.
Inner Probe Settings	Set the initial ripple direction of the intracavitary probe.
High Temperature Exit	Enable or disable this feature. When this feature is enabled, the temperature threshold should be set. When the probe temperature is higher than the threshold, the system automatically exits the current scan mode.
Width Ruler	Enable or disable the width ruler of the image.
TGC Curve	Set the display status of TGC curve. ● Close: Hide the TGC curve. ● Close in 3 secs: Display the TGC curve when adjusting the TGC parameter and then hide the curve 3 seconds later.

Item	Description
LGC Curve	Set the display status of LGC curve. • Close: Hide the LGC curve. • Close in 3 secs: Display the LGC curve when adjusting the LGC parameter and then hide the curve 3 seconds later.

■   **Show Images in Gallery**

Perform the following steps to perform a demonstration.

1. Click **Show Gallery** to enter the **Show Gallery** screen, as shown in Figure 4-3.
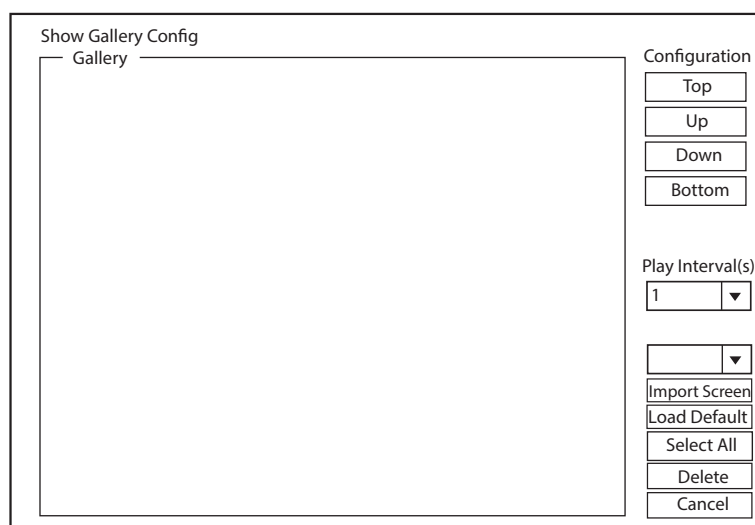
Figure 4-3 Show Gallery Screen

2. Load default demos or import demos from an external storage device.
   − Configuration: Select a demo and click **Top**, **Up**, **Down** or **Bottom** to arrange the order.
   − Play Intervals: Select the desired interval between cine play from the drop-down list.
   − Select All: Select all images and cines.
   − Delete: Tick a desired demo and click Delete to remove it from the gallery.

3. Select a demo and press the Set key twice on the control panel to start a demonstration.
   − Press the Up/Down/Left/Right arrow key to go to the previous or next demo.
   − Press the Set key to pause or resume the demonstration.
   − Press the ⏮ key to stop the demonstration.

4.1.3 MultiKey Settings

■ **User-defined Key Settings**

Figure 4-4 User-defined Key Settings

Item	Description
Save	Set the storage type.
Save Option	• Export to medium: Export the image, cine and data to the selected medium. • Save to local: Save the image, cine and data to the local.
DICOM Storage	Select the desired server from the drop-down list, and up to three servers can be selected simultaneously.
DICOM Print	Select the desired DICOM print server from the drop-down list.
Print Image	Select the desired printer from the drop-down list.
Print Report	Select the desired printer from the drop-down list.
Advanced Function	Set the features of the user-defined keys (P1/P2/P3/P4/U1/U2).

■ **End Exam Settings**

Figure 4-5 MultiKey Settings - End Exam Tab

Item	Description
Show End Exam Dialog	Tick it and the prompt text box will automatically appear after you tap **End Exam** on the touch screen.
Patient Info View	Tick it and the **New Patient** screen will automatically appear after you tap **End Exam** on the touch screen.
Current System Status	Tick it and the system enters current system status after you tap **End Exam** on the touch screen.
DICOM Storage	Select the desired server from the drop-down list, and up to three servers can be selected simultaneously.
Structured Report	Select the desired server from the drop-down list, and up to three servers can be selected simultaneously.
DICOM Print	Select the desired DICOM print server from the drop-down list.
Print Image	Select the desired printer from the drop-down list and the image is printed after the exam is finished.
Print Report	Select the desired printer from the drop-down list and the report is printed after the exam is finished.

■   **Other Settings**
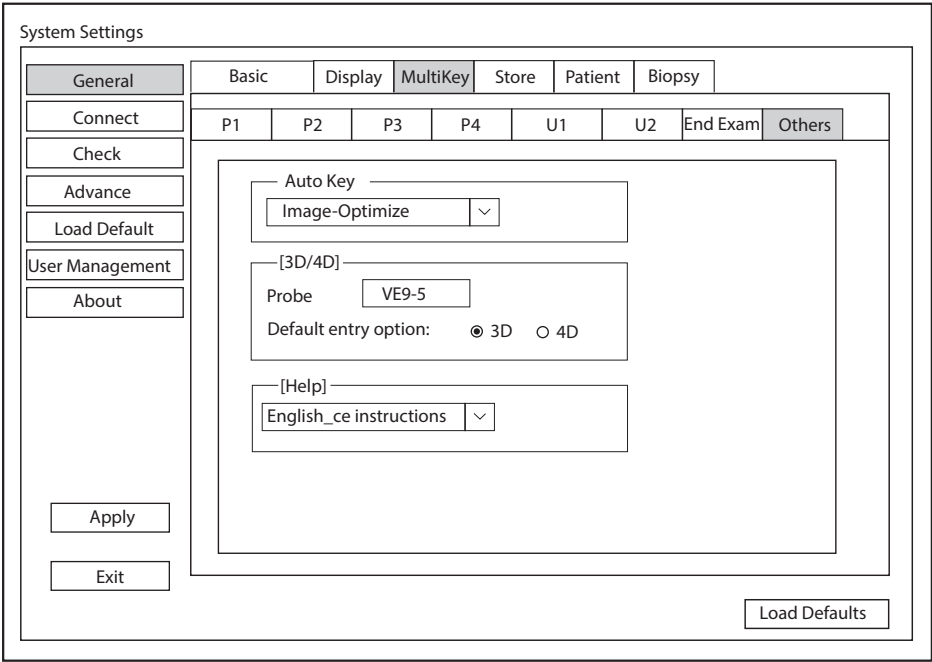
Figure 4-6 MultiKey Settings - Others Tab

Item	Description
Auto Key	Set the feature of the Auto key.
3D/4D	Select a probe and set the pre-activated mode to enter by default when performing the 3D/4D imaging.
Help	Select the desired instructions from the drop-down list.

4.1.4   Storage Settings

Figure 4-7 General Settings Screen - Store Tab

Item	Description
Retrospective	Tick it to enable retrospective storage for cine storage.
Prospective	Tick it to enable prospective storage for cine storage.
2D	Set the storage time and cycle of the 2D cine.
4D	Set the storage time of the 4D cine.
Export Cine Format	Set the format for the cine to be exported.
Export Image Format	Set the format for the image to be exported.
Freeze Store Time(s)	Set the storage time for the cine after pressing the ⏮ key.
Print & Save Region	Set the region to be printed and saved.

4.1.5   Patient Settings

```
┌─────────────────────────────────────────────────────────────────┐
│  System Settings                                                  │
│  ┌──────────────┐  ┌───────┬─────────┬─────────┬───────┬───────┬────────┐
│  │   General    │  │ Basic │ Display │ MultiKey│ Store │Patient│ Biopsy │
│  ├──────────────┤  │       └─────────┴─────────┴───────┘       └────────┘
│  │   Connect    │  ┌─ Exam Settings ──────────────────────────┐
│  ├──────────────┤  │  Within [ 24    ▽] hours allowed to activate exam
│  │    Check     │  │  □ Add operator in the exam list
│  ├──────────────┤  │  □ Press [Patient] key to enter worklist
│  │   Advance    │  │
│  ├──────────────┤  └──────────────────────────────────────────┘
│  │ Load Default │
│  ├──────────────┤
│  │User Management│
│  ├──────────────┤
│  │    About     │
│  └──────────────┘
│
│  ┌──────────────┐
│  │    Apply     │
│  └──────────────┘
│  ┌──────────────┐
│  │    Exit      │                              ┌──────────────┐
│  └──────────────┘                              │ Load Defaults│
│                                                └──────────────┘
└─────────────────────────────────────────────────────────────────┘
```
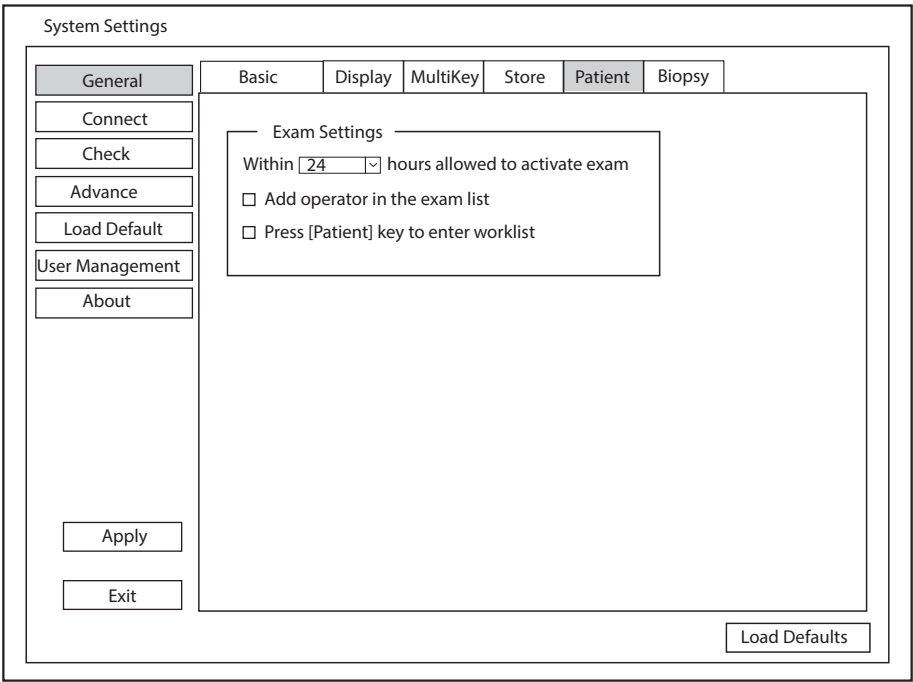
Figure 4-8 General Settings Screen - Patient Tab

Item	Description
Exam Settings	• Set the maximum time allowed to activate an exam.
	• Tick **Add operator in the exam list**, the operator information is displayed in the patient list and the operator can be set as a search condition in the search box.
	• Tick **Press [Patient] key to enter worklist**, you can enter the worklist by tapping **Patient** on the touch screen.

4.1.6   Biopsy Settings
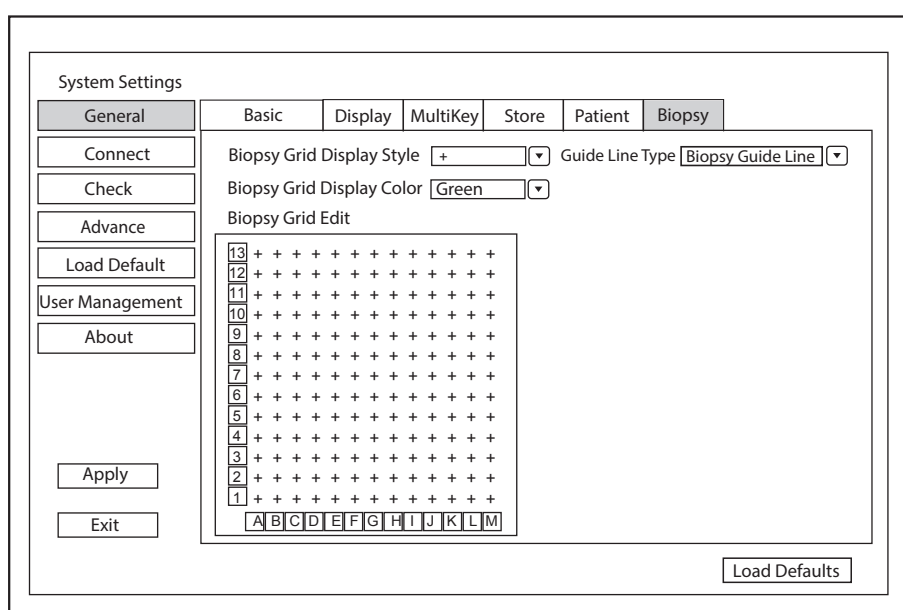
Figure 4-9 General Settings Screen - Biopsy Tab

Item	Description
Biopsy Grid Display Style	Set the display style of the biopsy grid.
Biopsy Grid Display Color	Set the display color of the biopsy grid.
Biopsy Grid Edit	Set the code of the point on the horizontal axis and the vertical axis of the biopsy grid. **NOTE:** *The code can be uppercase letters, lowercase letters and numbers. And the numbers include decimals.*
Guide Line Type	Set the type of the guide line. ● **Biopsy Guide Line**: One guide line is displayed on the screen during the biopsy. ● **Biopsy Safety Range**: Two parallel guide lines are displayed on the screen during the biopsy. The area between the two parallel guide lines is the safety biopsy range.

4.2   Connection Settings

You can make basic settings, network settings, DICOM settings, network service settings and remote medical settings on the connection settings screen. The wireless network takes priority when wired network and wireless network are available at the same time.

4.2.1   Basic Settings

Figure 4-10 Basic Settings Screen

Item	Description
Left Key/Right Key	Set the functions of the left key/right key of the foot switch.
VIDEO/S-VIDEO Output	Set the video output format.
HDMI/VGA Output	Set the HDMI/VGA output resolution.
Add Printer	Click **Add Printer** to set a desired printer and add the printer to the print service list.
Delete Printer	Select a printer in the list and click **Delete Printer** to delete it.

4.2.2   Network Settings

Figure 4-11 Network Settings

■   **Local Network Settings**

Item	Description
Local Network	Enable or disable the local network.
DHCP/Static IP	Select an IP address mode.
IP Address	Set the IP address of the system.
Netmask	Set the netmask address of the system.
Default Gateway	Set the gateway address of the system.
Speed/Duplex	Click **Advance**, and the screen displays **Speed** and **Duplex** items used to set the speed and communication mode of the local network. ● **Auto**: Match the speed and communication mode automatically. ● **Manual**: Click **Set** to save the settings, and click **Search** to view the speed and communication mode of the current network.
Mac Address	View the MAC address of the system.
Ping IP Address	Type an IP address and click **Ping** to test the connection.

■   **Wireless Network Settings**

Item	Description
Wireless Network	Enable or disable the wireless network.
Name	Display the name of the wireless network.

Item	Description
Status	Display the connection status of the wireless network.
Level	Display the signal strength of the wireless network.
Advance	Click **Advance** to view the information of the current network, and make settings of the local network.

Perform the following steps to connect the wireless network:

1. Click **Refresh** to display all wireless networks in the list. Or click **Add Network** and enter the network name and password in the pop-up dialog box, and click **OK** to add the network.

2. Select the desired wireless network and click **Connect**.

3. Input the password in the pop-up dialog box and click **OK**.

   If the password is not required for the connection, click **Connect** in the dialog box directly.

■ **Ultrasound Hotspot**

Item	Description
Hotspot Configuration	Configure the ultrasound network hotspot.

4.2.3   Network Service Settings
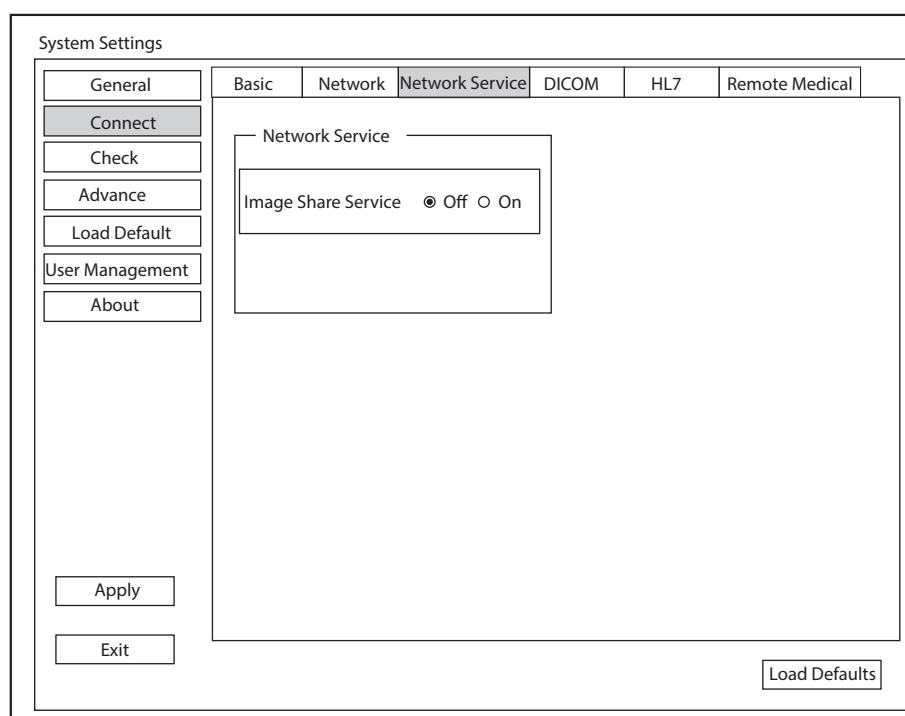
Figure 4-12 Network Service Settings Screen

Item	Description
Network Service	Enable or disable the image sharing service. ● Set it to **On**, you can view the image saved in the system through remote access with a computer. ● Set it to **Off**, you cannot view the image saved in the system through remote access with a computer.

4.2.4   DICOM Settings

■   **DICOM Service List Settings**

You can add, edit or delete DICOM servers and test connectivity on the **DICOM Service** screen.

● Click **Add**, and select a service type and input the service information in the pop-up dialog box. The relevant information about the new server is displayed in the service list.

● Select a service in the service list, click **Edit** and edit the information in the pop-up dialog box.

● Select a service in the service list and click **Delete** to delete it.

● Select a service in the service list and click **Control Key Setting** to return to the MultiKey settings screen to make settings.

● Select a service in the service list and click **Ping** to test network connection. Click **Verify** to check that the system is successfully connected to the service.

Figure 4-13 DICOM Service Screen

- **Storage Server Settings**

Add DICOM Service

Service Type	Storage Service ▼
Service Name	
AE Title	
IP Address	[ ] Ping
Port Number	[ ] Verify
Storage Commitment	▼

Save   Cancel   Reset

Item	Description
Service Name	Enter the name of the storage server.
AE Title	Enter the Application Entity (AE) title of the storage serve
IP Address	Enter the IP address of the storage server. Click **Ping** to test the connection.
Port Number	Enter the port number of the storage server.
Storage commitment	Select a storage commitment server.

After finishing the settings, click **Verify** to verify the connection between the system and the storage server. And a dialog box pops up if it is successfully connected.

- **Structured Report Server Settings**

Add DICOM Service

Service Type	Structure report ▼
Service Name	
AE Title	
IP Address	[ ] Ping
Port Number	[ ] Verify
Storage Commitment	▼

Save   Cancel   Reset

Item	Description
Service Name	Enter the name of the structured report server.
AE Title	Enter the Application Entity (AE) title of the structured report server.
IP Address	Enter the IP address of the structured report server. Click **Ping** to test the connection.
Port Number	Enter the port number of the structured report server.
Storage commitment	Select a storage commitment server.

After finishing the settings, click **Verify** to verify the connection between the system and the structured report server. And a dialog box pops up if it is successfully connected.

- **Storage Commitment Server Settings**

Add DICOM Service	
Service Type	Storage Commitment ▽
Service Name	
AE Title	
IP Address	Ping
Port Number	Verify
	Save Cancel Reset

Item	Description
Service Name	Enter the name of the storage commitment server.
AE Title	Enter the Application Entity (AE) title of the storage commitment server.
IP Address	Enter the IP address of the storage commitment server. Click **Ping** to test the connection.
Port Number	Enter the port number of the storage commitment server.

After finishing the settings, click **Verify** to verify the connection between the system and the storage commitment server. And a dialog box pops up if it is successfully connected.

- **Worklist Server Settings**

Add DICOM Service	
Service Type	Worklist ▽
Service Name	
AE Title	
IP Address	Ping
Port Number	Verify
Exam Type	Only Ultrasound ▽
Query Date	Today ▽
Max Results	100
	Save Cancel Reset

Item	Description
Service Name	Enter the name of the worklist server.
AE Title	Enter the Application Entity (AE) title of the worklist server.
IP Address	Enter the IP address of the worklist server. Click **Ping** to test the connection.

Item	Description
Port Number	Enter the port number of the worklist server.
Exam Type	Set the type of worklist that can be searched automatically for information.
Query Date	Set the time range of worklist that can be searched automatically for information.
Max Results	Set the maximum number of patient records that can be sent to the system.

After finishing the settings, click **Verify** to verify the connection between the system and the worklist server. And a dialog box pops up if it is successfully connected.

- **MPPS (Modality Performed Procedure Step) Server Settings**

```
Add DICOM Service

    Service Type      MPPS              [∨]
    Service Name      [              ]
    AE Title          [              ]
    IP Address        [              ]   [ Ping ]
    Port Number       [              ]   [ Verify ]
    Storage service   [        ][∨]
    SR server         [        ][∨]
              [ Save ]  [ Cancel ]  [ Reset ]
```

Item	Description
Service Name	Enter the name of the MPPS server.
AE Title	Enter the Application Entity (AE) title of the MPPS server.
IP Address	Enter the IP address of the MPPS server. Click **Ping** to test the connection.
Port Number	Enter the port number of the MPPS server.
Storage service	Select a storage server.
SR server	Select a structured report server.

After finishing the settings, click **Verify** to verify the connection between the system and the MPPS server. And a dialog box pops up if it is successfully connected.

● **Query Retrieve Server Settings**

```
Add DICOM Service

    Service Type       Query Retrieve    [∨]

    Service Name      [                ]

    AE Title          [                ]

    IP  Address       [                ]      [ Ping ]

    Port Number       [                ]      [ Verify ]

    Max Results       [            ]

                  [ Save ]   [ Cancel ]   [ Reset ]
```

Item	Description
Service Name	Enter the name of the query retrieve server.
AE Title	Enter the Application Entity (AE) title of the query retrieve server.
IP Address	Enter the IP address of the query retrieve server. Click **Ping** to test the connection.
Port Number	Enter the port number of the query retrieve server.
Max Results	Set the maximum number of patient records that can be sent to the system.

After finishing the settings, click **Verify** to verify the connection between the system and the query retrieve server. And a dialog box pops up if it is successfully connected.

● **Print Server Settings**

```
Add DICOM Service

    Service Type     Print           [∨]

    Service Name    [              ]

    AE Title        [              ]

    IP Address      [              ]     [ Ping ]

    Port Number     [              ]     [ Verify ]

   ┌ Print Advance Config ──────────────────────────┐
   │ Format        1x1        [∨]   Trim          Yes      [∨] │
   │ Priority      Low        [∨]   Border        Black    [∨] │
   │ Medium        Blue Film  [∨]   Empty Image   Black    [∨] │
   │ Orientation   Portrait   [∨]   Color         Color    [∨] │
   │ Film Size     8INx10IN   [∨]   Min Density   20       [∨] │
   │ Film Destination Magazine [∨]  Max Density   320      [∨] │
   │ Magnification Replicate  [∨]   Config Information [      ] │
   │ Copies        1                Film Session Label [      ] │
   │ Smoothing Type 1                                          │
   └──────────────────────────────────────────────┘

              [ Save ]   [ Cancel ]   [ Reset ]
```

Item	Description
Service Name	Enter the name of the printer server.

Item	Description
AE Title	Enter the Application Entity (AE) title of the printer server.
IP Address	Enter the IP address of the printer server.
Port Number	Enter the port number of the printer server.
Format	Set the print format.
Trim	Set print or not print a crop box around each image.
Priority	Set the print job priority.
Border	Set the color of the border to fill in the gap between the images.
Medium	Select the print medium.
Empty Image	Set the color of the empty images.
Orientation	Set the print orientation.
Color	Set the color of the image.
Film Size	Set the film size.
Min Density	Set the minimum density level of the film.
Film Destination	Set the film destination. ● Set it to **MAGAZINE**, the image will be stored in a film magazine. ● Set it to **PROCESSOR**, the image will be processed in a film processor.
Max Density	Set the maximum density level of the film.
Magnification	Set the method used for magnifying images during printing.
Config Information	Make special image quality settings.
Copies	Set the number of copies to print.
Film Session Label	Enter a name to be applied on a group of the film labels.
Smoothing Type	Set the value of magnification interpolation for the printer.

After finishing the settings, click **Verify** to verify the connection between the system and the print server. And a dialog box pops up if it is successfully connected.

■   **Local Settings**

Figure 4-14 DICOM Local Settings Screen

● **Local Device Settings**

Item	Description
Station Name	Enter the name of the system.
AE Title	Enter the Application Entity (AE) title of the system.
Port Number	Enter the port number of the system.
Timeout(sec)	Enter the time limit for connecting to the system.

● **Storage Settings**

Item	Description
2D Compression	Set the compression format for images.
2D JPEG Quality	Set the compression quality for images.
Cine Compression	Set the compression format for cines.
Cine JPEG Quality	Set the compression quality for cines.
DICOM Log	Set it to record the DICOM communication information to the log file.

4.2.5   HL7 Settings

```
System Settings
┌──────────────┐   ┌───────┬─────────┬────────────────┬────────┬──────┬───────────────┐
│   General    │   │ Basic │ Network │Network Service │ DICOM  │ HL7  │Remote Medical │
├──────────────┤   │       │         │                │        │      │               │
│   Connect    │   │  ☐    HL7                                                          │
├──────────────┤   │                                                                   │
│    Check     │   │  Port Number:  [_____]                                 │
├──────────────┤   │                                                                   │
│   Advance    │   │                                                                   │
├──────────────┤   │                                                                   │
│ Load Default │   │                                                                   │
├──────────────┤   │                                                                   │
│User Management│  │                                                                   │
├──────────────┤   │                                                                   │
│    About     │   │                                                                   │
└──────────────┘   │                                                                   │
                   │                                                                   │
┌──────────────┐   │                                                                   │
│    Apply     │   │                                                                   │
└──────────────┘   │                                                       ┌──────────┐│
┌──────────────┐   │                                                       │Load Defaults│
│    Exit      │   └───────────────────────────────────────────────────────┴──────────┘
└──────────────┘
```

Figure 4-15 HL7 Settings Screen

Item	Description
HL7	Tick **HL7** to enable the protocol and enter the port number of HL7 server in the text box. The data on the server will be synchronized to the system.

4.2.6   Remote Medical Settings

```
System Settings
┌──────────────┐   ┌───────┬─────────┬────────────────┬────────┬──────┬───────────────┐
│   General    │   │ Basic │ Network │Network Service │ DICOM  │ HL7  │Remote Medical │
├──────────────┤   │ Request History                                                   │
│   Connect    │   │  ┌──────┬─────────────┬────────────┬────────────┬───────────┐     │
├──────────────┤   │  │  ID  │ Patient Name│ Participant │ Session ID │ Start Time│     │
│    Check     │   │  ├──────┴─────────────┴────────────┴────────────┴───────────┤     │
├──────────────┤   │  │                                                           │     │
│   Advance    │   │  │                                                           │     │
├──────────────┤   │  │                                                           │     │
│ Load Default │   │  │                                                           │     │
├──────────────┤   │  │                                                           │     │
│User Management│  │  │                                                           │     │
├──────────────┤   │  │                                                           │     │
│    About     │   │  │                                                           │     │
└──────────────┘   │  │                                                           │     │
                   │  │                                                           │     │
                   │  │                                                           │     │
┌──────────────┐   │  │                                                           │     │
│    Apply     │   │  └───────────────────────────────────────────────────────────┘     │
└──────────────┘   │                                                       ┌──────────┐ │
┌──────────────┐   │                                                       │Load Defaults│
│    Exit      │   └───────────────────────────────────────────────────────┴──────────┘
└──────────────┘
```

Figure 4-16 Remote Medical Settings Screen

You can view the history patient information on this screen.

4.3   Item Preset

4.3.1   Touch Screen Settings

You can adjust the parameter display in different modes on the touch screen settings screen.

Figure 4-17 Touch Screen Settings Screen

You can add, modify, delete the parameter displayed on the first or second page of the touch screen after selecting the probe type, imaging mode and status.

■   **To add a parameter**

Click a blank box and click the desired parameter in the **Special Items** list to add it.

■   **To modify a parameter**

Click a parameter and click the desired parameter in the **Special Items** list to replace it.

■   **To delete a parameter**

Click a parameter and click **...** in the **Special Items** list to delete it.

4.3.2 Measurement Settings

■ **General Measurement Settings**

Figure 4-18 Measurement Settings Screen - General Tab

● General Measurement Items

Item	Description
BSA Calc	In accordance with the setting of this item, the system calculates BSA value automatically after you enter the height and weight of the patient on the **Patient Information** screen.
Cross Cursor Size	Set the size of the cross cursor.
Measure Line Size	Set the thickness of the measurement line.
Dist. Dash Line Display	Enable or disable the display of a dash line between two points when performing a distance measurement.
Vel. Cross Line Display	Enable or disable the display of a reticle between two points when performing a velocity measurement.
Ellip. Cross Line Display	Enable or disable the display of dash lines for long and short axes when performing an ellipse measurement.
M-Mode Cross Line Display	Enable or disable the display of M-mode cross line.
Volume Flow Compensation With TAmax	Set the coefficient for calculation method TAmax.
Line ID Display	Enable or disable the display of line number when performing a measurement.

Item	Description
Keep Result Window	Enable or disable the display of the current result box when unfreezing the image.
Result Font Size	Set the font size of the result box.
Result Font Color	Set the font color of the result box.

- Result Position

Item	Description
2D	Set the position of the result box.
M+D	

■ **Application Settings**

Figure 4-19 Measurement Settings Screen - Application Tab

Item	Description
Application	Select an application.
Measure Key Func	Set the measurement mode entered by pressing the **Measure** key on the control panel when performing an exam under the selected application.
Trace Results	Set the measurement results of Auto/Semi/Manual trace in the spectral Doppler mode.
TouchScreen ShortCut	Set the functions of the shortcut keys 1/2/3 on the touch screen in the calculation measurement mode.
Dept Unit	Set the unit for velocity and distance.

Item	Description
Shortcut Key	In the OB, GYN or CARD application mode, set the measurement items responded by numeric keys (0 - 9) on the keyboard.
Heart Rate	Set the cardiac cycle for calculation of heart rate.
Vas Preview Report Layout	In the VAS application mode, set the preview layout of the vascular report.
IMT	In the VAS application mode, set the IMT maximum value and the display of IMT maximum value.
Measurement Settings	• CUA/AUA: Set to display CUA or AUA on the measurement report. **CUA** stands for Composite Ultrasound Age, and **AUA** stands for Average Ultrasound Age. • Add 1 week to EDD: Enable to add one week to EDD. • Show EDD on screen: Enable to display EDD in the measured result box. • Growth Dev. Display: Set the display format of GA deviation in the measurement report and growth graph.
Equation	In the OB application mode, • GA & Growth Customize the calculation formulas for gestational age and growth curve. • EFW – Estimation: Set the formula to estimate EFW. If it is set to **None**, the system will not estimate fetal weight and no corresponding value displays on the measurement report. – Age by EFW: Set the formula to estimate GA by EFW. If it is set to **None**, the system will not estimate GA by EFW and no corresponding values are displayed on the measurement report. – EFW GP/SD: Set the formula of the fetal growth curve. If it is set to **None**, no values of the fetal growth curve are displayed on the measurement report. – Unit: Set the unit of fetal weight. • CUA Set the CUA formula. If it is set to **None**, the system will not estimate CUA and no corresponding values are displayed on the measurement report.
	In the SMP application mode, set the thyroid volume calculation coefficient.

You can customize the formulas for gestational age and growth curve.

Perform the following steps:

1. Click **GA** or **Growth** and the screens shown in Figure 4-20 and Figure 4-21 pop up.

Figure 4-20 GA Table

Figure 4-21 Growth Table

2. Select or fill in the **Measurement**, **Author**, **Deviation** and the corresponding **Unit**.

3. Enter the gestational weeks and the values of measurement items in the table.

4. Click **Save** to save the modification.

5. Click **Add Line** to add a new line to the table. You can also select a line and click **Delete Line** to delete it.

6. Click **Clear All** to clear all the customized settings.

7. Click **Cancel** to cancel the customized formula.

8. Select a storage device from the drop-down list beside **USB**, and then you can click **Import** to import a table from the storage medium, or click **Export** to export the table to the storage device.

9. Click **New** to create a new table.

10. Click Exit to exit the screen.

■   **List Settings**

Figure 4-22 Measurement Settings Screen - List Tab

You can add, delete or reorder the measurement collections and items in each imaging mode of the selected application.

Functions	Operations
Add a collection or measurement	1. Select an application and select **Caliper** or **Calc**. 2. Select an imaging mode in the list. 3. Click an item below **Collection** or **Measurement**. 4. Click **Add** to add the desired collection or measurement in the pop-up screen.
Delete a collection or measurement	1. Select an application and select **Caliper** or **Calc**. 2. Select an imaging mode in the list. 3. Click an item below **Collection** or **Measurement**. 4. Click **Delete**.
Reorder the list of collections or measurements	1. Select an application and select **Caliper** or **Calc**. 2. Select an imaging mode in the list. 3. Click an item below **Collection** or **Measurement**. 4. Click **Reorder** and adjust the display order of the collection or measurement in the pop-up screen.
Select the measurement result, unit and precision	1. Tick the checkbox before the result item to select the measurement result. 2. Select the unit and precision of the selected result from the drop-down lists of **Unit** and **Precision**.

■   **Calculation Settings**

Figure 4-23 Measurement Settings Screen - Calculation Tab

You can set the calculation formula in the calculation screen by performing the following steps.

1. Select an exam type from the drop-down list, and the corresponding calculation items appear in the **Calc List**.

2. Click **New**, and you can enter the calculation formula in the pop-up edit text boxes and add it in the **Calc List**.

3. Select a calculation item from the **Calc List** and click **Copy**, and then you can click **Done** in the pop-up dialog box to copy the calculation item.

4. Select a calculation item from the **Calc List** and click **Edit**, and then you can edit the calculation item.

5. Select a calculation item from the **Calc List** and click **Delete**, and then you can delete the calculation item.

6. Tick **Show calc in the result box**, and then the calculation item will be displayed in the result box.

■   **Growth Curve**

Figure 4-24 Measurement Settings Screen - Growth Curve Tab

- OB graph show
  - − Select **Last Measure** and the growth curve related to last measurement items is displayed.
  - − Select **None** and the growth curve is not displayed by default.
  - − Select the curve displayed on the growth curve from the drop-down list.
- Trend
  - − Select **On** to display the current data and history data on the growth curve.
  - − Select **Off** to only display the current data on the growth curve.
- Measurement item show
  - − Select a measurement item and click > to add the item to the result display list.
  - − Select a measurement item from the result display list and click < to remove the item form the list.
  - − Click << to clear all the measurement items in the result display list.

4.3.3　Comment Settings

■　**Tools Settings**

Figure 4-25 Comment Settings Screen -Tools Tab

● Annotation Settings

Item	Description
Select Annotation Language	Set the language for text annotation.
Font Size	Set the font size of text annotation.
Clear annotation while unfreezing images	● Set it to **ON**, all annotations will be cleared after you press the ⏮ key while editing annotations. ● Set it to **OFF**, all annotations will not be cleared after you press the ⏮ key while editing annotations.

● Arrow Settings

Item	Description
Arrow Size	Set the size of arrow.
Clear arrow while unfreezing images	● Set it to **ON**, all arrows will be cleared after you press the ⏮ key while editing annotations. ● Set it to **OFF**, all arrows are not cleared after you press the ⏮ key while editing annotations.

■ **List Settings**

Figure 4-26 Comment Settings Screen - List Tab

1. Select an exam type from the drop-down list beside **Application** and **Secondary Library**. Or you can type the name of a new exam type in the text box, and then click **Add** to create a new one, or click **Delete** to delete it.

2. Add desired annotations in the annotation library to the **Annotation Selected** list.
   – Select a body mark and then click > to add it to the **Annotation Selected** list.
   – Click >> to add all the annotations in the annotation library to the **Annotation Selected** list.
   – Select an annotation in the **Annotation Selected** list and click < to remove it from the list.
   – Click << to remove all the annotations from the **Annotation Selected** list.

3. Add or delete annotations created by user.
   – Type a new annotation in the text box, and then click **Add** to the **Annotation Selected** list.
   – Click on a user-defined annotation in the library, and then click **Delete** to delete it from the **Annotation Selected** list.

4. Click on an annotation in the **Annotation Selected** list, and then click ⬆, ⬇, ➡ or ⬅ to arrange its display.

4.3.4   Body Mark Settings
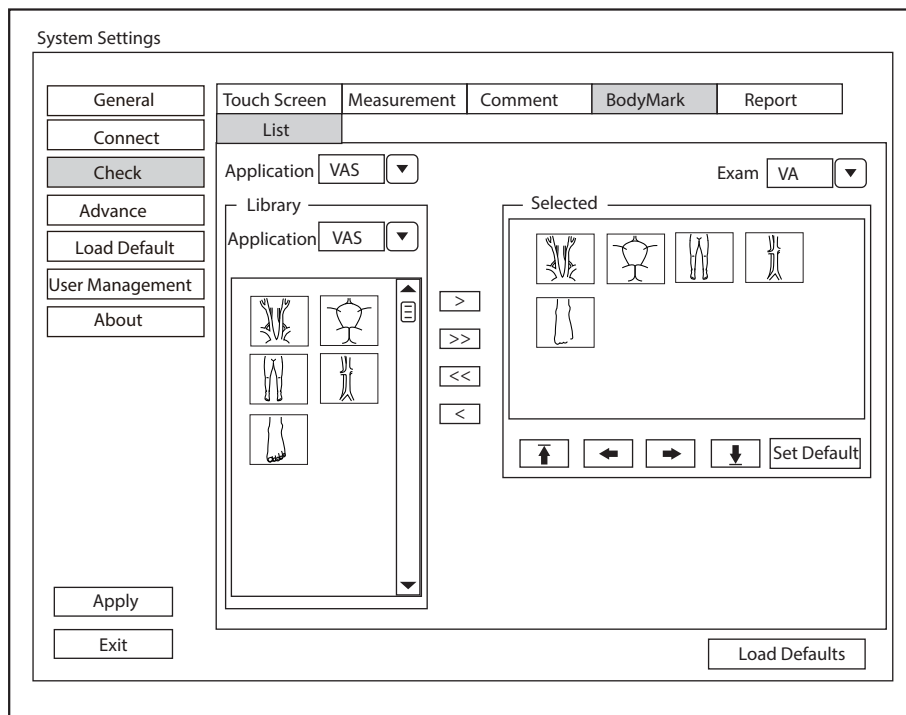
Figure 4-27 Body Mark Settings Screen

1. Select an exam type from the drop-down list beside **Application**.

2. Select a body mark library from the drop-down list beside **Application** of **Library**.

3. Add desired body marks in the body mark library to the **Selected** list.

    – Select a body mark and then click > to add it to the **Selected** list.
    – Click >> to add all the body marks in the selected body mark library to the **Selected** list.
    – Select a body mark in the **Selected** list and click < to remove it from the **Selected** list.
    – Click << to remove all the body marks from the **Selected** list.

4. Perform the following settings in the **Selected** list.

    – Select a body mark and click ⤒, ⬅, ➡ or ⬇ to adjust its display order.
    – Select a body mark and click **Set Default** to set it to the default body mark. When enabling the body mark feature, the set body mark is added by default.

4.3.5   Report Settings

You can set the logo, title, font, color and display items of the report on the report settings screen.

Figure 4-28 Report Settings Screen

Item	Description
Import/Export	Connect the USB drive containing the report logo (170×60 pixels, bmp format) to the system. **Import/Export** is highlighted after the USB drive is successfully detected by the system. Click **Import/Export**, and then click the desired logo in the pop-up dialog box to add the logo. If there is more than one logo, you can click `<<` or `>>` to select the desired logo.
Title 1, Title 2, Title 3	Input the title name in the textbox and then set the font size using the drop-down list.
Title	Set the font size of the headline.
Subtitle	Set the font size of the subtitle.
Content	Set the text font size.
Background Color	Set the background color of the measurement report.
Text Color	Set the text color.
Display Items for Report	Select items to be displayed on the measurement report. Patient and exam information is displayed on the report by default. Other information can also be displayed on the report after you tick **Measurement**, **Images**, **Graphs**, **Comment** and **Diagnosis/Summary**.

After settings, you can click **Preview** to preview the report. Press the ⏮ key on the control panel to exit.

4.4   Advanced Function Settings

4.4.1   Stress Echo Settings

Figure 4-29 Stress Echo Settings Screen

Item	Description
Protocol Name	Select a protocol name.
Number of Stages	Select the stage number.
Number of Views	Select the view number.
WMS Segment Type	Select the WMS segment type.
WMS Mechanism	Select the WMS mechanism.
Auto start exam timer	If it is ticked, the exam timer is enabled automatically after this protocol is selected. Otherwise, you need to tap **Exam Timer** on the touch screen to enable the timer.
Auto start WMS	If it is ticked, the wall motion scoring is enabled automatically after entering the comparison screen. Otherwise, you need to tap **WMS** on the touch screen to enable the scoring.
Auto end stage	If it is ticked, the system ends the cine acquisition automatically after completing the acquisition at a stage. Otherwise, you need to tap **End Stage** on the touch screen.
Stages (Rest, Impost, etc.)	Displays the name of each stage. Click it to edit the name.

Item	Description
Views (PLAX/PSAX/A4C/A2C)	Select a desired view. If necessary, click **New View** or **Delete View** to add or delete the view. **NOTE:** *The default views cannot be deleted.*
Mode (B, CFM, TDI, M, etc.)	Select a desired imaging mode at the non-continuous stage.
Loop Length	Select the length of the acquired cine at this stage. When the storage type is set as cardiac cycle, the cine is stored in the unit of cardiac cycle. When the storage type is set as time, the cine is stored in the unit of time.
Continuous (Cont.)	If it is ticked, the cine is acquired continuously at this stage. You can select the view by rotating the key located directly below **Views** on the touch screen during acquisition. Otherwise, the system goes to the next view automatically after completing acquisition for the current view. You need to tap **Acquire** on the touch screen to start acquisition.
Time (s)	If the continuous acquisition is set, you can select the total acquisition time.
Select	If the continuous acquisition is set or the number of loops per view is not less than 2, this option is available. If it is ticked, the system goes to the clip selection screen automatically after acquisition. Otherwise, the screen does not jump.
Loops Per View	If the continuous acquisition is not ticked, you can select the number of the acquired cine for each view.
Timer	If it is ticked, the stage timer is enabled automatically after entering this stage. Otherwise, you need to tap **Stage Timer** on the touch screen to enable the timer.
Stress Echo Report Display Options	Tick the items to be displayed in the Stress Echo report.

■   **To add a protocol**

Perform the following steps.

1. Tap **New Protocol** on the touch screen or click **Advance** > **Stress Echo** > **New Protocol** on the system settings screen.

2. Enter a protocol name in the pop-up dialog box and click **OK** to add a protocol.

3. Select the number of stages, number of views, WMS segment type and WMS mechanism.

4. Tick the items to be enabled automatically.

5. Perform the following operations to set the stages.
   – Select a view name and an imaging mode. You can select a standard view or add a view. If necessary, click **New View** and enter a view name in the pop-up dialog box, and click **OK** to add a view.
   – Click the stage name to set or modify the name.
   – Select the loop length.

      – Select the acquisition mode. If the continuous acquisition is selected, you need to select the acquisition time and can determine to select or unselect the loops. If the non-continuous acquisition is selected, you need to select number of loops for each view, and if the loops are more than one, you can determine to select or unselect the loops.

      – Select or unselect the stage timer.

6. Tick the items to be displayed in the Stress Echo report.

7. Click **Apply** to save the protocol.

■ **To edit a protocol**

Perform the following steps.

1. Tap **Edit Protocol** on the touch screen to enter the Stress Echo settings screen or click **Advance** > **Stress Echo** on the system settings screen and select the desired protocol.

2. Refer to steps 3-6 described in Section "To add a protocol" to edit relevant items.

3. Click **Apply** to save the protocol.

■ **To delete or rename a protocol**

NOTE:

The default protocols cannot be deleted or renamed.

Perform the following steps.

1. Click **Advance** > **Stress Echo** on the system settings screen and select the desired protocol.

2. Click **Delete Protocol** or **Rename Protocol**, and click **OK** to delete or rename the protocol.

4.4.2 Scan Assistant Settings

Figure 4-30 Scan Assistant Settings Screen

After selecting a user-defined key, set the quick function of the key in different modes.

4.4.3   MQA Settings

Figure 4-31 MQA Settings Screen

Item	Description
Color Map	Set the color of color map.
G-MQA	• Position: Set it to analyze the global myocardial motion in the selected direction. • Default Curve: Set the default analysis curve of global myocardial motion. • Results: Set the curve type of global myocardial motion. • G-MQA Period: Set the period for G-MQA curve results.
R-MQA	• Default Curve: Set the default analysis curve of regional myocardial motion. • Results: Set the curve type of regional myocardial motion.

4.4.4   Sono Assistant Settings

Sono Assistant is used to select the standard section and modify its status to achieve the sonogram navigation feature.

■ **Section Settings**

Figure 4-32 Section Settings

● To manage the protocol

Functions	Operations
Select the protocol	Select an application from the drop-down list beside **Application** and select a protocol under this application from the drop-down list beside **Protocol**.
Copy the protocol	Select a protocol from the drop-down list beside **Protocol** and click **Copy Protocol**, the system copies this protocol automatically. The protocol copy is same with the original one and you can modify the copy.
Rename / delete the protocol	For the user-defined protocol, click **Rename Protocol** to rename it, or click **Delete Protocol** to delete it.
Correlate to the exam mode	Tick the exam mode correlated to the selected protocol in the exam mode list, and Sono Assistant is available in the ticked exam mode.

● To manage the section

Functions	Operations
Adjust the section order	Select a section and click ↑ or ↓ to adjust the section order.
Move the section to the top or bottom	Select a section and click ↑ or ↓ to move the section to the top or bottom.
Rename the section	Select a section and click **Rename Section** to rename it in the pop-up dialog box.
Delete the section	Select a section and click **Delete Section** to delete it.
Set the section	Select a section and click **Settings** to set the image mode, parameter, measurement, annotation and body mark.

● To set the quick operation
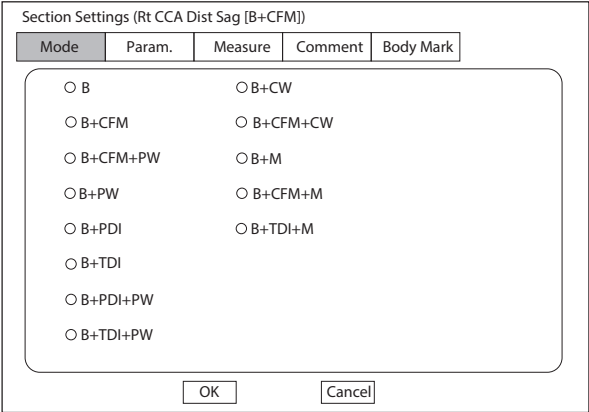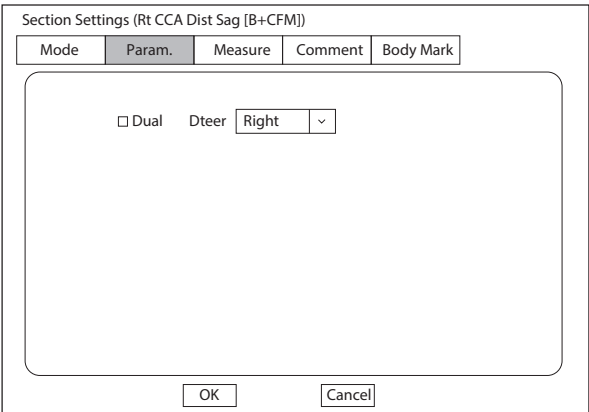
Item	Description
Freeze Response	Tick it and enable the Sono Assistant. Select the section configured with measurement items, the system enters the measurement status automatically when the image is frozen.
Advance on save (Sono Assistant)	Tick it and enable the Sono Assistant. The system switches to the next section when the image or cine is stored.
Press [↑] / [←] key to respond to the previous step, press [↓] / [→] key to respond to the next step	Tick it and enable the Sono Assistant. Press [↑] / [←] key on the keyboard to respond to the previous step, press [↓] / [→] key to respond to the next step.

● To create a user-defined protocol

You can create a user-defined protocol and customize the standard process of the scan.

Perform the following steps.

a. Click **Copy Protocol** on the section settings screen and customize the copied protocol.

b. Select a desired section and click **Rename Section** to rename it.

c. Click **Settings** and perform relevant settings on the corresponding tabs, as shown in the table below.

Tab	Screen	Description
Mode	Section Settings (Rt CCA Dist Sag [B+CFM]) Mode | Param. | Measure | Comment | Body Mark ○ B ○ B+CW ○ B+CFM ○ B+CFM+CW ○ B+CFM+PW ○ B+M ○ B+PW ○ B+CFM+M ○ B+PDI ○ B+TDI+M ○ B+TDI ○ B+PDI+PW ○ B+TDI+PW OK Cancel	Set the image mode of this section.
Parameter	Section Settings (Rt CCA Dist Sag [B+CFM]) Mode | Param. | Measure | Comment | Body Mark □ Dual Dteer [Right ˅] OK Cancel	Set the dual-split display and set the steer direction of ROI and sample line in Color Flow mode. **NOTE:** • *The parameter settings are only applicable for the protocols in the vascular application.* • *The steer direction settings are only available when the linear array probe is used.*

Tab	Screen	Description
Measure	Section Settings (Rt CCA Dist Sag [B+CFM]) Mode | Param. | **Measure** | Comment | Body Mark Application: VAS · Category: Carotid · Collection: CCA · Orientation: Rt · Position: Dist Vessel Diam Vessel Area %Sten(D) %Sten(A) Selected \> \< OK Cancel	Set the measurement items of the section.
Comment	Section Settings (Rt CCA Dist Sag [B+CFM]) Mode | Param. | Measure | **Comment** | Body Mark Application: VAS · Secondary Library: ABD-VAS · Right Left Augment AO Superior Inferior SMA IMA CIA IIA EIA CFA \> \< Add Annot Del Annot Selected Rt CCA Dist Sag OK Cancel	Set the annotation of the section and the annotation is displayed on the scan screen after settings.
Body Mark	Section Settings (Rt CCA Dist Sag [B+CFM]) Mode | Param. | Measure | Comment | **Body Mark** Application: VAS · \> \< Selected ☐ Disable OK Cancel	Set the body mark of the section and the body mark is displayed on the scan screen after settings.

   d. Click **OK** to save the settings and back to the section settings screen.

■   **Protocol Settings**

System Settings

| General |
| Connect |
| Check |
| Advance |
| Load Default |
| User Management |
| About |

Stress Echo | Scan Asst. | MQA | Sono Assistant

Section | Protocol | Import/Export

Exam   1st Trim.

Protocol List

Early OB
NT
I
II
III

Copy Protocol
Rename Protocol
Delete Protocol

Apply

Exit

Load Defaults
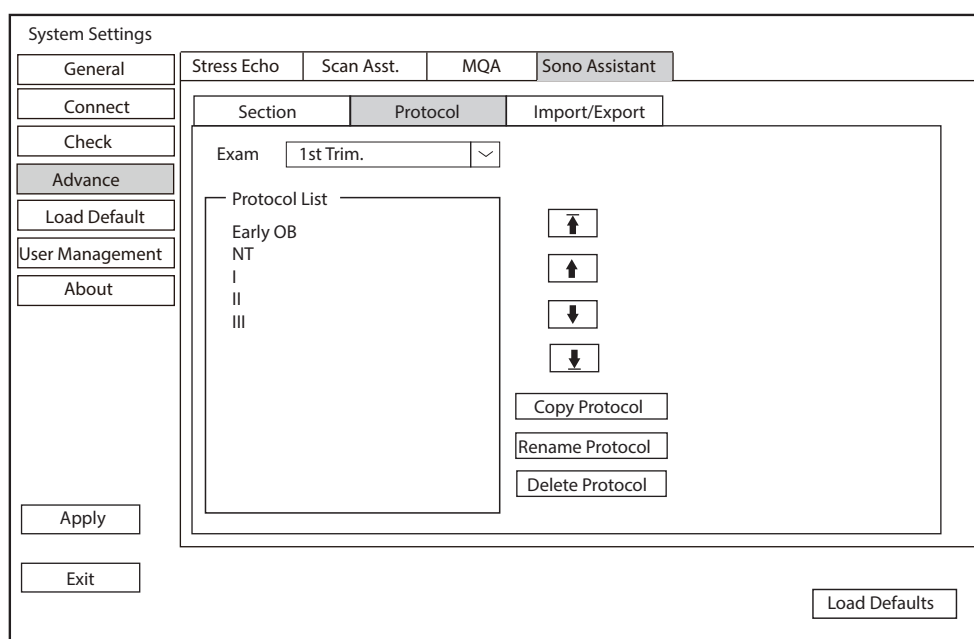
Figure 4-33 Protocol Settings

You can perform the following operations on the protocol settings screen.

Functions	Operations
Adjust the protocol order	Select a protocol and click ↑ or ↓ to adjust the protocol order.
Move the protocol to the top or bottom	Select a protocol and click ↑ or ↓ to move the protocol to the top or bottom.
View the protocol list	Select an exam mode from the drop-down list beside **Exam** and view the protocol list in this exam mode.
Copy the protocol	Select a protocol in the protocol list and click **Copy Protocol**, the system copies this protocol automatically. The protocol copy is same with the original one and you can modify the copy.
Rename or delete the protocol	For the user-defined protocol, click **Rename Protocol** to rename it, or click **Delete Protocol** to delete it.

■   **Import/Export**
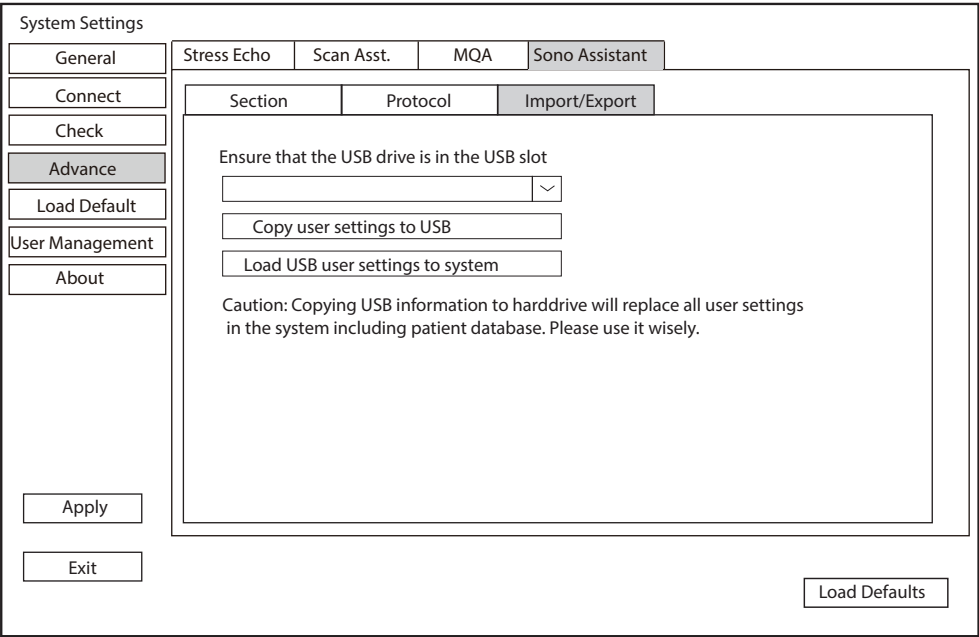
Figure 4-34 Import/Export Settings

You can import or export the protocol through the USB drive. Select the desired USB drive from the drop-down list on the import/export screen and perform the following operations.

Functions	Operations
Copy user settings to USB	Click it to back up the current protocols in the system to the USB drive.
Load USB user settings to system	Click it to import the protocols in the USB drive to the system.

4.5   **Defining System Defaults**

You can define your system defaults on the **Load Default** screen.
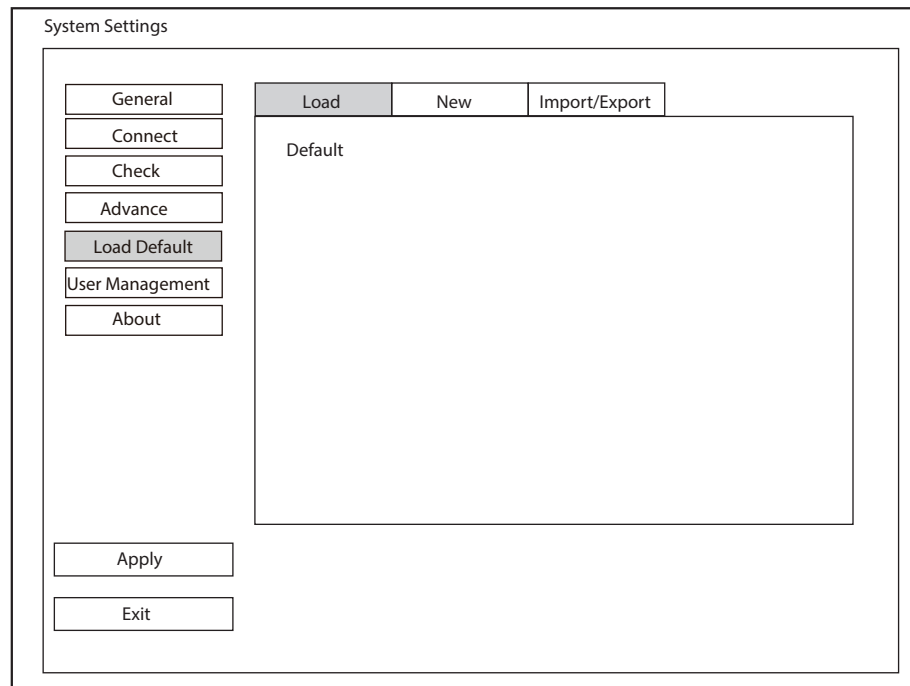
Figure 4-35 Loading Defaults Screen

■   **Loading System Defaults**

1. Click **Load**, select a setting name and a dialog box appears.

2. Click **Load** to confirm and begin loading;

   Click **Cancel** to cancel loading, or click **Delete** to delete the setting.

3. Select **OK** to confirm it.

■   **Creating System Defaults**

Click **New** tab to enter the screen and enter a setting name in the text box, and then click **New** below the text box. The created setting name is listed on the **Load** screen.

■   **Importing or Exporting System Defaults**

Click **Import/Export** to enter the following screen.
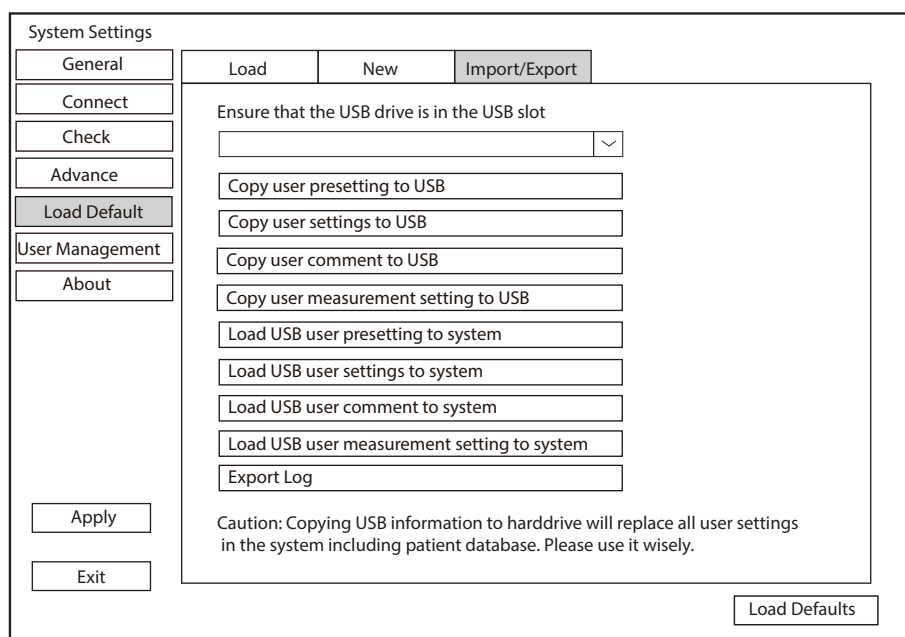
Figure 4-36 Import/Export System Defaults

Click the drop-down list to select the desired USB drive and perform the following operations.

- Click **Copy user presetting to USB** to back up the customized system defaults to the USB drive.

- Click **Copy user settings to USB** to back up the system defaults to the USB drive.

- Click **Copy user comment to USB** to back up the comments of the current user to the USB drive.

- Click **Copy user measurement setting to USB** to back up the current user measurement settings to the USB drive.

- Click **Load USB user presetting to system** to copy the customized system to the system.

- Click **Load USB user settings to system** to copy the system settings to the system.

- Click **Load USB user comment to system** to copy the user comments in the USB drive to the system.

- Click **Load USB user measurement setting to system** to copy the user measurements in the USB drive to the system.

- Click **Export Log** and select the storage device and the exported information type in the dialog box to export the log to the USB drive.

4.6   User Management

The user security settings can be used to protect patient data and the feature is disabled by default. If the feature is enabled, user can log in the system by the following two ways.

- Account Login

  Account login contains administrator account login and ordinary user account login. User can log in the system by inputting user name and password. When you enter the system, the 🔒 icon pops up on the main screen. Click the 🔒 icon to lock the current user or switch to other users.

- Emergency Login

  User can log in the system through emergency mode without inputting user name or password. But user can not access previous patient data in the system.

4.6.1 User Settings
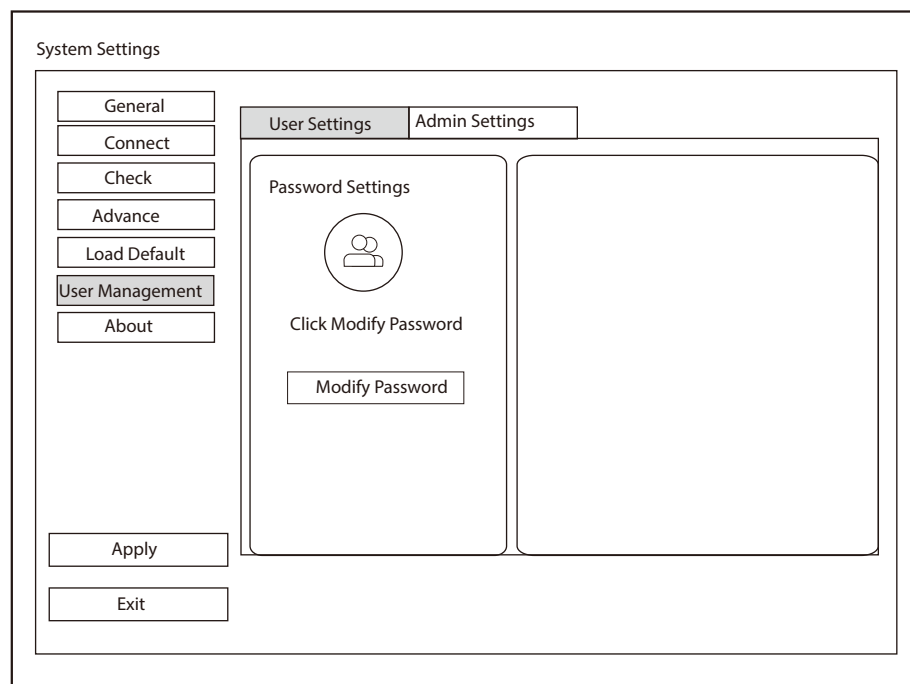
Figure 4-37 User Settings Screen

Ordinary user can modify password on the **User Settings** screen.

4.6.2 Administrator Settings

When you log in the **Admin Settings** screen for the first time, you need to enter the user name and the password of the administrator account.

NOTE:

- *It is recommended to modify the password after the administrator logs in the system for the first time.*
- *The username is case-sensitive.*

Figure 4-38 Administrator Settings Screen

Item	Description
User Authorization	User can enable or disable the user authorization function on Admin Settings tab.
	When user authorization function is enabled, user should input the user name and password on login screen.
User List	Add user: Click **Add User,** input the user name and set the password in the pop-up dialog box.
	NOTE:
	• *Only ordinary user account can be added. The added user account can access the patient data.*
	• *Password can contain 8 -16 characters, at least including two combinations of number, letter or special character. Letters are case-sensitive. Chinese characters and space are not allowed.*
	Delete user: Click **Delete User** and delete the selected user according to the system prompt.
	Modify password: Click **Modify Password** and modify the password of the selected user according to the system prompt.
	Import users: Click **Import Users**, and select the import medium and path in the pop-up dialog box, and then click **Import**.
	NOTE:
	Only account data exported from the system in the same series models produced by the manufacturer can be imported.
	Export users: Click **Export Users**, and select the export medium and path in the pop-up dialog box, and then click **Export**.

Item	Description
Auto Log Off	User can enable or disable the auto logout function.
	Set the wait time before the system log out automatically when the system is idle.
	If the system is idle for a set period of wait time, the system will automatically lock the current user and return to the login screen.
Data Security Log	Data security log is used to record the operation performed by user, including login, logout, patient data viewing, modification, export, and operation time, date and user name, but no patient information will be recorded.
	Only administrator can export data security log to an external storage device or delete the data security log.
Medium Output	When user authorization function is enabled, administrator can enable or disable the medium output feature.
	NOTE: *When the user authorization function is disabled, the medium output is enabled by default.*
QR Code Output	Enable or disable the QR code export feature.
User Access Control	User access control is used to set the access authorization for patient data.
	● If **All Data** is selected, both administrator and ordinary user can access all patient data.
	● If **Private Data** is selected, administrator can access all patient data and ordinary user can only access the patient data collected by the user itself.
Firewall	Set the feature of firewall.
	● Tick **Enable Firewall (allow all IP)**, and then all IP addresses can access the system.
	● Tick **Allow IP White List**, and then click **Settings** to set the IP address allowed to access the system in the pop-up dialog box.
DICOM 3.0 (Need Reboot)	Enable or disable the feature of sending the image and the structured report through DICOM 3.0 port.
File Sharing	Enable or disable the file sharing feature.
Printer	Enable or disable the print feature.

4.7   Viewing System Information

You can view the system information and acoustic output data on the **About** screen.

4.7.1   General Information

You can view the current hardware version, the software version and the control number on the **General** tab. The control number is a unique identification code for the system.

4.7.2   Acoustic Output

You can view the acoustic output data of probes in different modes on the **Acoustic Output** tab.

4.7.3   Help Manual

You can view the user manual of the system on the **Help** tab.

5   Preparing for an Exam

You can start an exam without entering any patient information. To avoid patient identification errors, you should always verify the identification information with the patient.

5.1   Acquiring Patient Information

You can acquire the patient information in the following instructions:

● Create new patient information
● Retrieve archived patient information
● Retrieve patient information using the DICOM worklist

5.1.1   Beginning a New Patient

Tap **Patient** on the touch screen to enter the **New Patient** screen, as shown in Figure 5-1.

Figure 5-1 New Patient Screen

NOTE:

• *You can move the cursor by using the trackball, and press the Set key on the control panel to select the desired item.*
• *You can enter the information manually by using the keyboard.*

Perform the following steps to begin a new patient.

1. Enter relevant patient information

New Patient ID		Enter the patient ID. The system will generate the patient ID automatically according to the current system time if this item is left blank.
		NOTE:
		The patient ID is an important identification. Once it is saved, you cannot modify it.
Name		Enter first name, middle name or last name of the patient.
Gender		Select the gender of the patient from the drop-down list.
DOB		Enter the date of birth for the current patient. You can set **Date Format** on the **General Settings** screen.
Age		The age will be automatically calculated if you enter the information in the **DOB** textbox.
Accession#		Enter the exam ID for the current patient.
Weight and Height		Enter the weight and height for the current patient.
BSA		The system will automatically calculate the body surface area after you enter the weight and height. You can select the calculation formula from the corresponding drop-down list.
BP		Enter the blood pressure for the current patient.
Comments		Make comments for the current patient.

2. Enter the exam information

Exam Type	Select an exam type for the current patient, including **ABD**, **OB**, **GYN**, **Cardiac**, **Vascular**, **Urology**, **SMP**, **Breast**, **MSK** and **PED**.
Description	Enter the information related to the exam type.
Chief Compliant	Enter the related information manually.
Past History	Enter the related information manually.

NOTE:
- *You must enter the height and weight for the current patient when you select **Cardiac** as the exam type. **BSA** is calculated according to the selected formula.*
- *You must enter LMP or EDD for the current patient when you select **OB** as the exam type. **AUA** is automatically calculated.*

3. Enter the related operating information

Ref. Physician/Diagnostician/Sonographer	Enter the name.
Comments	Enter the notice or necessary information.

4. Click **OK** to save the patient information and create a new patient.
   - Click **Hide Patient Info**, the patient ID and patient name will not be displayed on the screen.
   - Click **Clear Data** to delete the patient information and exam information of current application.
   - Click **Cancel** to abort editing the patient information and exit the **New Patient** screen.

If the last exam is not ended, you can select the end status for the last patient in the pop-up dialog box. For details, refer to 5.3.2 Discontinuing an Exam.

5.1.2 Retrieving Archived Information

If you need to retrieve the archived information, tap **Patient** on the touch screen to enter the **New Patient** screen and click **Patient List** to enter the **Exam List** screen as shown in Figure 5-2.

Exam List								
New Exam	Item	[▼]					Reset	
Activate Exam	Patient ID	Patient Name	Exam Type	Gender	Exam Date/Time	Exam Status	Image	Cine	Age
Suspend Exam	☐ 20180909		ABD	Male	05/05/2014-16:04:03	Suspend	2	1	25
Resume Exam									
Select All									
Delete									
Import/Export									
Import									
Export									
QR Export									
HD: Available: Total: Selected Exams:									
Exit	DICOM Q/R	DICOM Queue	DICOM Send	DICOM Print	PPS Screen	Report Review	Image Review	

Figure 5-2 Exam List Screen

Perform the following steps to retrieve information.

1. Search for the archived information

   Select the search requirements from the drop-down list beside **Item**, such as Patient ID, Patient Name, Exam Type and Gender and the searched result is displayed in the list.

2. Select the desired information

   Move the cursor to the desired information, and press the Set key on the control panel to select it.

3. Exam the desired patient

   Click **New Exam** to start a new exam.

5.1.3 Using DICOM Worklist

You can acquire the patient information using the DICOM worklist if the system is configured with the DICOM module. For details, refer to Section 9.4 DICOM Worklist.

5.2 Pausing/Resuming/Activating an Exam

5.2.1 Pausing an Exam

Tap **Patient** on the touch screen to enter the **New Patient** screen, and click **Suspend Exam** to pause the exam of the current patient.

5.2.2 Resuming an Exam

1. Tap **Patient** on the touch screen to enter the **New Patient** screen, and click **Patient List** to enter the **Exam List** screen.

2. Select the desired exam, and click **Resume Exam** to resume the exam.

5.2.3   Activating an Exam

1. Tap **Patient** on the touch screen to enter the **New Patient** screen, and click **Patient List** to enter the **Exam List** screen.

2. Select the desired exam, and click **Activate Exam** to activate the exam.

5.3   Completing/Discontinuing an Exam

5.3.1   Completing an Exam

Perform the following steps.

1. Tap **End Exam** on the touch screen.

2. Click **OK** to end the exam.

5.3.2   Discontinuing an Exam

Perform the following steps.

1. Tap **Patient** on the touch screen to enter the **New Patient** screen and click **Patient List** to enter the **Exam List** screen.

2. Click **PPS Screen**, and click **Discontinue** in the pop-up PPS screen to end the exam.

6 Acquiring Images

You can acquire images by optimizing the relevant parameters for clinical diagnosis.

6.1 Selecting a Probe and an Exam Type

Once the system is started up, the monitor displays the background desktop, and the touch screen displays the available probes and the exam types (as shown in Figure 6-1). You can tap **Probe** on the touch screen to return to the application mode screen when you enter other screens. The system automatically enters the basic screen after you select the desired probe and exam type by tapping the touch screen.

NOTE:

Ensure the probe model and icon displayed on the application mode screen are consistent with the connected probe. If a problem is found, check that the probe is connected to the system firmly. If the problem still exists, please stop using the system immediately and contact the manufacturer.
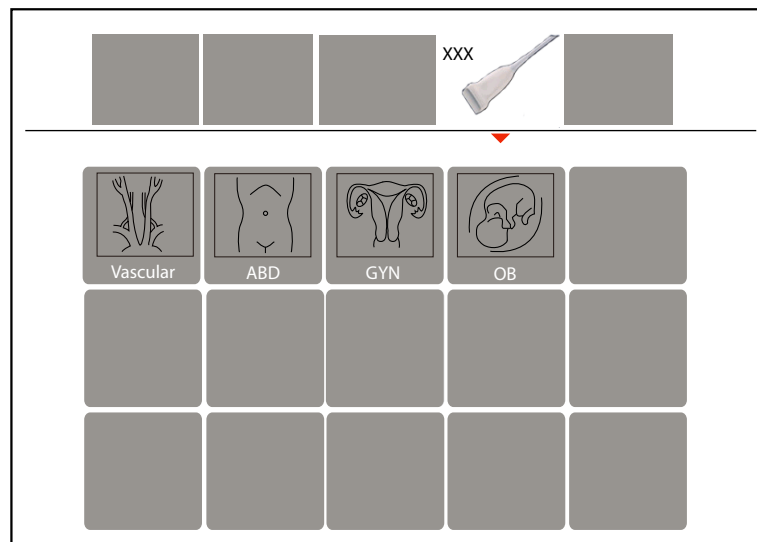
Figure 6-1 Application Mode Screen

You can also make modifications in an exam type and save them as an application preset for future use. Moreover, the layout of the application mode screen can be modified and factory defaults can be restored.

6.1.1 Customizing a Preset

1. Select a probe and an exam type.
2. Select an imaging mode and adjust the parameters.

   NOTE:

   Parameter optimizing is only available for the current imaging mode.

3. Tap ⌨ on the touch screen to display the soft keyboard and tap **S** to display a dialog box.
4. Click **Yes** to enter the **User Presetting Screen** as shown in Figure 6-2.
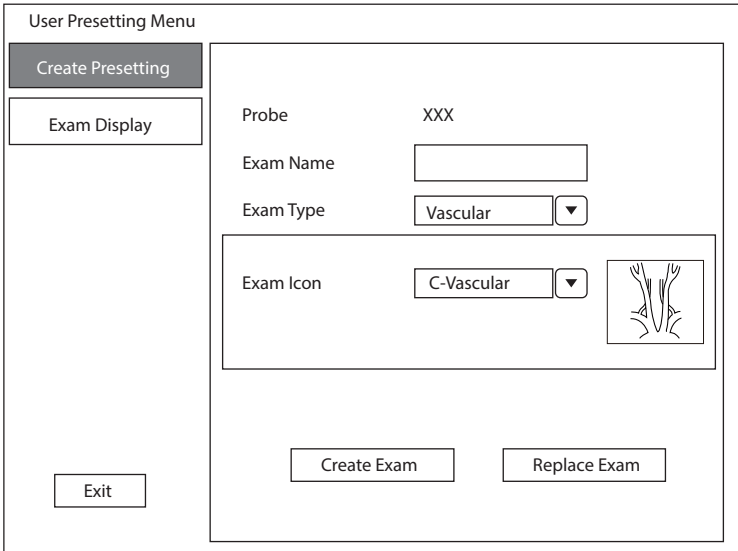
Figure 6-2 User Presetting Screen

5. Enter the name of the application preset in the **Exam Name** text box.

6. Select the application and exam type from the drop-down lists beside **Exam Type** and **Exam Icon**.

7. Click **Create Exam** to create application preset.

   If the name of the application preset exists, you can click **Replace Exam** to replace it.

6.1.2 Arranging the Presets Display

Click **Exam Display** to arrange presets display. The customized application presets, not the system application presets, can be also deleted.

NOTE:

An exam type suffixed with (s) is a system application preset, suffixed with (u) is a customized application preset.
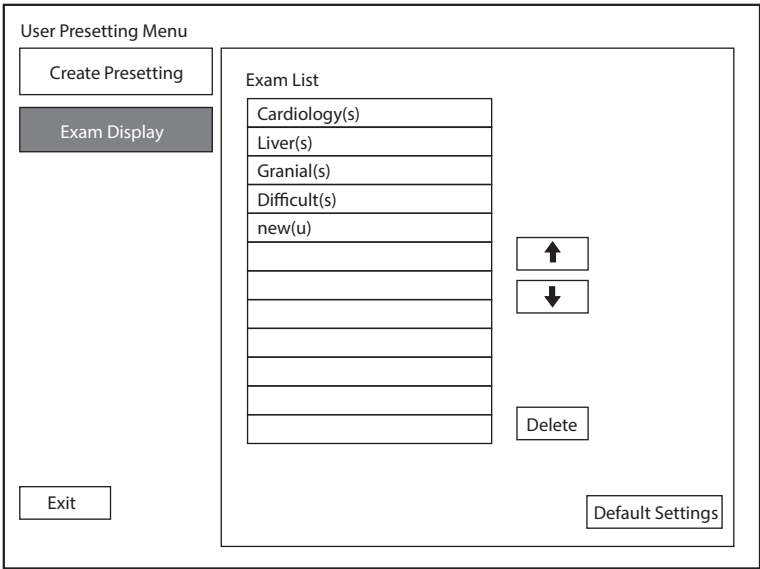
Figure 6-3 Preset Display Screen

- Click one desired application preset, click ⬆ or ⬇ to arrange the preset on the application mode screen.

- Click one desired application, click **Delete** > **Yes** to delete the application preset.

- Click **Default Settings** > **Yes** in the pop-up dialog box to restore factory defaults.

6.2   Acquiring B-Mode Images

B-mode imaging is intended to provide information of anatomical structure of soft tissue.

6.2.1   Entering B Mode

The system enters B mode by default after you select a probe model and an exam type. You can press the **B** key on the control panel to enter the B mode from other imaging modes. The basic screen in the B mode is displayed as follows:
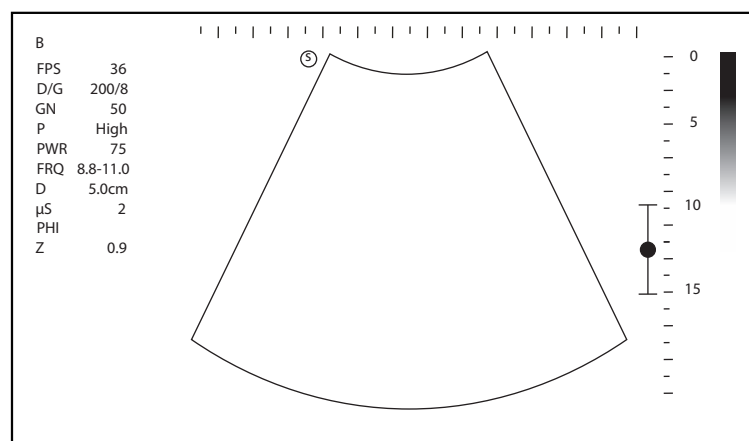
Figure 6-4 B-Mode Imaging Screen

For details about the basic screen, refer to Section 2.4.1 Basic Screen.

6.2.2   Optimizing B-Mode Images

As shown in Figure 6-5, you can adjust the following parameters in B mode. You can tap > on the touch screen to turn the page.
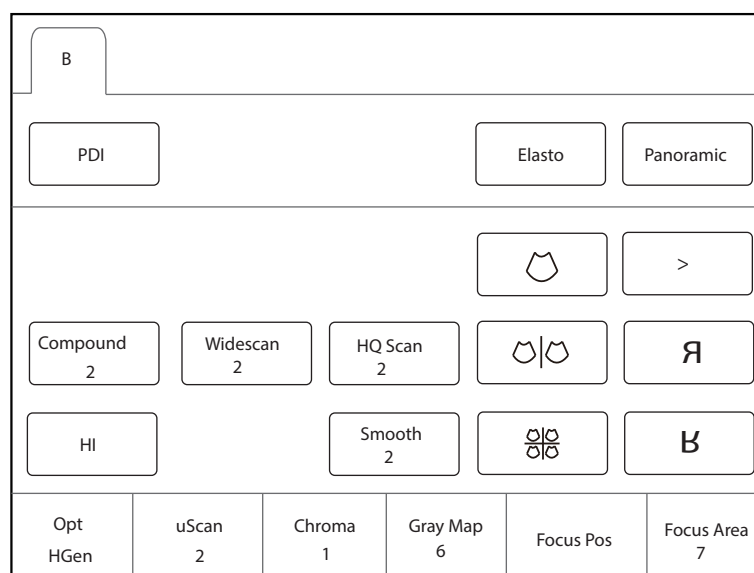
Figure 6-5   B-Mode Imaging Parameters Screen

■   **Gain**

The B mode gain (2D gain) determines the amplifying factors for the received echoes and the brightness of the ultrasound image. The echoes are amplified with the same gain value regardless of depth.

Rotate the **B** key on the control panel to adjust the gain value.

■ **TGC**

Time Gain Compensation (TGC) 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.

Move the desired TGC slider to the left or right to adjust the brightness of B-mode images.

NOTE:

Modifications of TGC values cannot be saved if you shift to use another imaging mode.

■ **LGC**

LGC is used to compensate the lateral gain of the ultrasound image so that the brightness of the ultrasound image is consistent from left to right.

To adjust LGC:

● Tap **LGC** on the touch screen to enter the 8-band gain adjustment screen.

● Move the sliders upwards or downwards to adjust the gain.

■ **Depth**

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

To adjust the depth:

● Rotate the **Depth** key on the control panel to adjust the depth range of the 2D image and the size of image.

● Press the **Depth** key to restore the image scan depth.

NOTE:

• *The frame rate varies with the depth.*

• *The range of the scanning depth varies with the probe. D (depth) is displayed in the 2D Image Info area and is represented in unit of cm.*

■ **Focus Area/Focus Position**

The focus area/focus position is used to adjust the focus range of the ultrasound beam to increase the resolution for a specific area to optimize the image.

● Rotate the key located directly below **Focus Area** to expand or narrow the focus area.

● Rotate the key located directly below **Focus Pos** to adjust the focus position.

■ **Persistence**

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 a smoother appearance.

Rotate the key located directly below **Persistence** to adjust the persistence.

■ **Optimization (Opt)**

It is used to adjust the frequency of the fundamental and harmonic waves. The following levels are selectable and H represents harmonic imaging mode.

● SRes (HSRes): The image with ultra-high resolution and slightly poor penetration can be acquired.

● Res (HRes): The image with high resolution and slightly poor penetration can be acquired.

● Gen (HGen): The image effect is medium and meets the general use.

● Pen (HPen): The image with better penetration and slightly poor resolution can be acquired.

- SPen (HSPen): The image with extremely better penetration and slightly poor resolution can be acquired.

Rotate the key located directly below **Opt** to adjust the frequency.

■ **μScan**

μScan is used for noise suppression while enhancing the edge to improve the image detail resolution and signal-to-noise ration.

Rotate the key located directly below **μScan** to increase or decrease the value, or disable the feature.

■ **Gray Map**

Gray map is used to adjust the gray scale display of 2D image to obtain the image with different detail resolution and contrast resolution.

Rotate the key located directly below **Gray Map** to adjust the value.

■ **Chroma**

Chroma is used to set images with different contrast and detail resolutions.

Rotate the key located directly below **Chroma** to adjust the chroma level.

■ **Dynamic Range**

Dynamic range increases the adjustable range of contrast by enhancing the intensities of parts in the grayscale. It optimizes the ultrasound image texture.

Rotate the key located directly below **Dyn Range** to adjust the dynamic range.

■ **U/D or L/R Flip**

It is used to flip the 2D image up/down or left/right.

Tap Я or К on the touch screen to flip the image.

■ **Line 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.

Rotate the key located directly below **Line Density** to adjust the line density.

■ **Harmonic Imaging**

Harmonic Imaging uses the harmonic frequencies generated by tissue. The fundamental transmit frequency results in a harmonic frequency echo. The harmonic frequency received from the tissue is a multiple of the fundamental transmit frequency. The fundamental and any accompanying artifacts are missing from the harmonic frequency that the system receives. The artifact reduction, and the concomitant reduction in haze and clutter, increases contrast resolution and improves border delineation. THI is useful in difficult-to-image patients. Harmonic Imaging includes THI and PHI.

Tap **HI** on the touch screen or press the **THI** key on the keyboard to enter or exit the harmonic imaging mode. When the system enters the harmonic imaging mode, **THI** or **PHI** appears at the top left corner of the screen.

NOTE:
- *The system optimizes certain parameters (B-mode gain, frequency, and frame rate) upon enabling harmonic imaging automatically.*
- *Compared to the B-mode imaging, harmonic imaging improves image resolution but decreases the frame rate. Therefore, you should make an optimal balance when choosing an imaging mode.*
- *Harmonic imaging is only available with compatible probes.*

■ **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.

Tap **Compound** on the touch screen to select the level of compound imaging.

■ **Steer**

It is used to change the direction of the acoustic beam.

Rotate the key located directly below **Steer** to change the direction of the acoustic beam.

NOTE:

Only the linear probes are capable of using steer.

■ **Sector Width**

Sector width (for linear probes) or sector angle (for curved and phased array probes) is used to adjust the frame rate. You can adjust the sector width or angle to get more information without moving the probe.

The region of interest of the object can be adjusted after you adjust the sector width or sector.

Rotate the key located directly below **Sector Width** to change the width or angle of region of interest.

■ **Widescan**

Trapezoidal imaging or wide scan is used to enlarge the imaging area when performing a real-time scan by using the linear or convex probes.

Tap **Widescan** on the touch screen to enable or disable the feature.

■ **Tissue Acoustic Index**

Tissue acoustic characteristics refers to the speed of ultrasound passing through the tissue. Tissue acoustic characteristics optimize the image used for measurements and calculations. The greater tissue acoustic characteristics the faster the ultrasound passes through the tissues.

Rotate the key located directly below **Tissue Acou** to adjust the value.

■ **Power**

Power is used to select the amount of ultrasound acoustic power produced by the probe. The adjustment range of the power is 1-100%, and ±5% can be adjusted each time. The real-time value of the power is displayed in the imaging information area on the basic screen.

Rotate the key located directly below **Power%** to adjust the acoustic power value.

NOTE:

Expose the patient to the lowest practical transmit power level for the shortest possible period of time to achieve a satisfactory diagnosis.

■ **Image Rotation**

It is used to rotate the image.

Tap **Rotation** on the touch screen to enable or disable the feature, or adjust the rotation angle.

■ **Smooth**

Smooth is used to adjust the smoothness of the image.

Tap **Smooth** on the touch screen to select the level of smooth.

■   **HQ Scan**

HQ Scan is used to improve the signal-to-noise ratio of B-mode images and enhance the edge to highlight the image details.

Tap **HQ Scan** on the touch screen to select the level of HQ Scan.

6.3   Acquiring Color Flow Images

Color Flow Mapping (CFM) adds the color-coded qualitative information in the B-Mode image. Color Flow imaging is helpful to see the flow, the relevant qualitative information and the flow velocity.

6.3.1   CFM Mode

CFM 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.

Perform the following steps to acquire CFM-mode images.

1. Optimize a B-mode image.

2. Press the **C** key on the control panel to enter the CFM mode. The basic screen is shown in Figure 6-6.

B	
FPS	18
D/G	200/2
GN	105
P	High
PWR	100
FRQ	8.8-11.0
D	3.0cm
uS	1
PHI	
Z	0.8
CFM	
PRF	1.0
WF	86
GN	255
C/P	3/High
PWR	70
FRQ	2.2

Color Flow ROI   2D Imaging
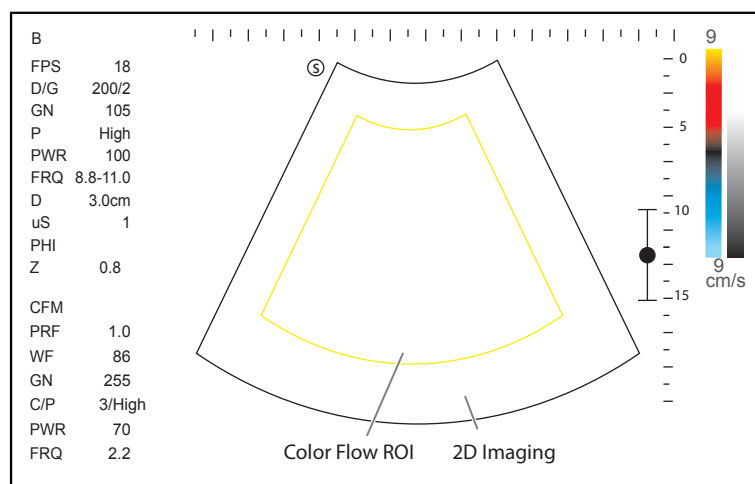
Figure 6-6 CFM-Mode Imaging Screen

3. Adjust color flow ROI.

   −   Use the trackball to position color flow ROI.

   −   Press the Set key on the control panel and use the trackball to adjust the size of color flow ROI.

   −   Press the Set key again to reposition color flow ROI.

4. Optimize the CFM-mode image. For details, refer to Section 6.3.5 Optimizing Color Flow Images.

5. Press the **C** key again to exit the screen.

6.3.2   PDI Mode

PDI (Power Doppler Imaging) is a color flow imaging technology which adds the flow signal in the CFM-mode image. PDI uses the number and amplitude of red blood cells going through in the flow to create the color-coded imaging. A flow with slow velocity and small rate can be displayed in PDI. Therefore, a flow with a higher sensitivity can be detected without overlaying any flows with high velocity.

The direction of flow, the flow velocity and flow properties cannot be reflected in the PDI-Mode image.

Perform the following steps to acquire PDI-mode images:

1. Optimize a B-mode image.

2. Tap **PDI** on the touch screen or press the **PDI** key on the keyboard to enter the PDI mode. The basic screen is shown in Figure 6-7.
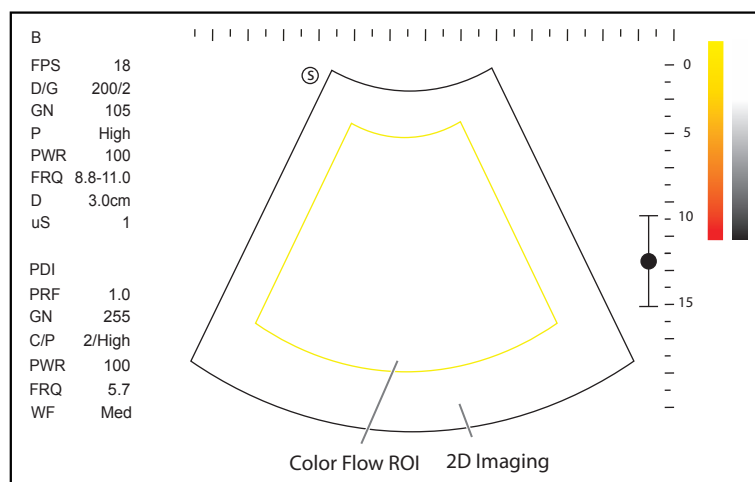
Figure 6-7 PDI-Mode Imaging Screen

3. Adjust color flow ROI.
   – Use the trackball to position color flow ROI.
   – Press the Set key on the control panel and use the trackball to adjust the size of color flow ROI.
   – Press the Set key again to reposition color flow ROI.

4. Optimize the PDI-mode image. For details, refer to Section 6.3.5 Optimizing Color Flow Images.

5. Tap **PDI** on the touch screen or press the **PDI** key on the keyboard again to exit the screen.

6.3.3 SR Flow Mode

SR Flow is a directional power doppler imaging (DPDI) mode that adds the direction of blood flow to the ultrasound image. The focus set by SR Flow can achieve the high spatial resolution and low pseudo image visibility to reduce the vascular overflow and display better details.

Perform the following steps to acquire SR Flow-mode image.

1. Optimize a B-mode image.

2. Tap **SRF** on the touch screen to enter the SR Flow mode.
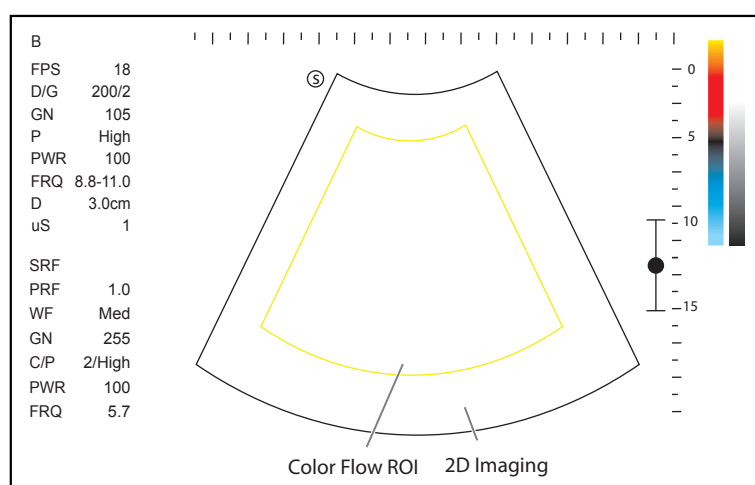
Figure 6-8 SR Flow Mode Imaging Screen

3. Adjust color flow ROI.

   – Use the trackball to position color flow ROI.

   – Press the Set key on the control panel and use the trackball to adjust the size of color flow ROI.

   – Press the Set key again to reposition color flow ROI.

4. Optimize the SR Flow mode image. For details, refer to Section 6.3.5 Optimizing Color Flow Images.

5. Tap **SRF** on the touch screen again to exit the SR Flow mode.

6.3.4   TDI Mode

NOTE:

TDI imaging is only applied to cardiac applications by using the phased array probes.

TDI (Tissue Doppler Imaging) is a color flow imaging technique which detects the low frequency signal reflected from the cardiac muscle. TDI provides the flow information of velocity and direction for cardiac movement.

TDI uses the low velocity and the high amplitude adjusted from the wall filter to create a color-coded tissue imaging.

Perform the following steps to acquire TDI-mode images.

1. Optimize a B-mode image.

2. Tap **TDI** on the touch screen or press the **TDI** key on the keyboard to enter the TDI mode. The basic screen is shown in Figure 6-9.
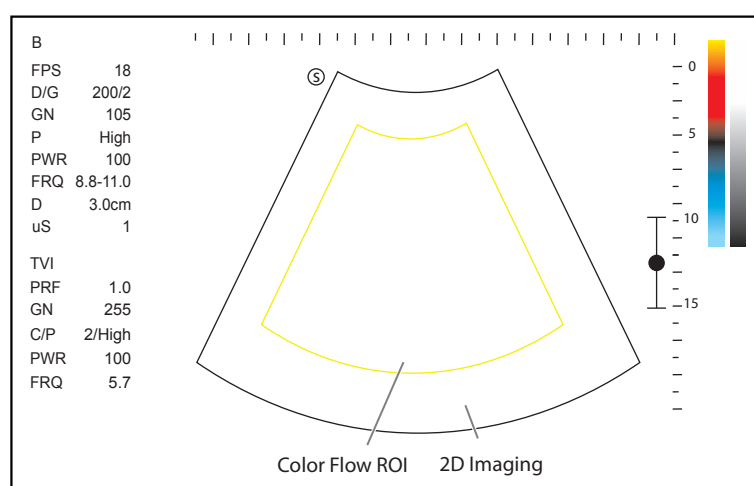
Figure 6-9 TDI-Mode Imaging Screen

3. Adjust color flow ROI.

   – Use the trackball to position color flow ROI.

   – Press the Set key on the control panel and use the trackball to adjust the size of color flow ROI.

   – Press the Set key again to reposition color flow ROI.

4. Optimize the TDI-mode image. For details, refer to Section 6.3.5 Optimizing Color Flow Images.

5. Tap **TDI** on the touch screen or press the **TDI** key on the keyboard to exit the screen.

6.3.5   Optimizing Color Flow Images

As shown in Figure 6-10, you can adjust the following parameters in color flow modes. You can tap > on the touch screen to turn the page.
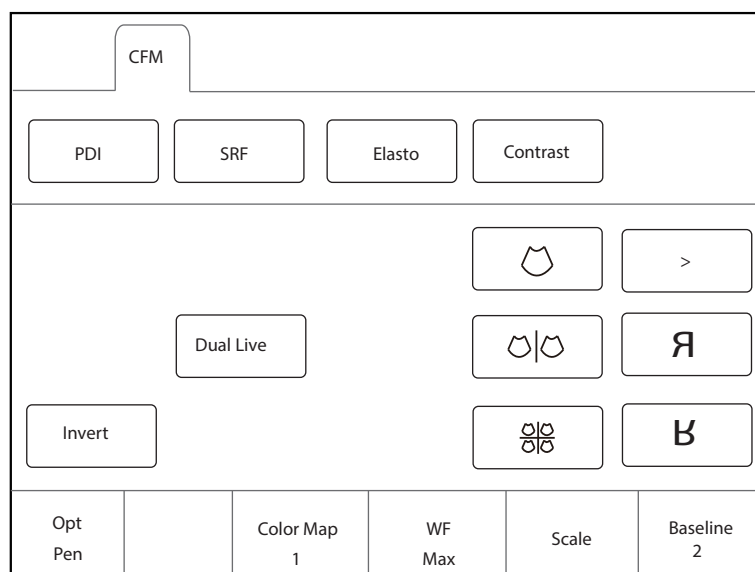
Figure 6-10 Color Flow Mode Imaging Parameters Screen

NOTE:

- *In real-time CFM/TDI mode, you can adjust all parameters. In frozen CFM/TDI mode, you can adjust* **Baseline**, **Color Map**, **B Reject**, **Invert**, **Rotation** *and* **Hide Flow**.

- *In real-time PDI mode, you can adjust all parameters. In frozen PDI mode, you can adjust* **Color Map**, **B Reject** *and* **Hide Flow**.

- *In real-time SR Flow mode, you can adjust all parameters. In frozen SR Flow mode, you can adjust* **Color Map**, **B Reject** *and* **Hide Flow**.

■ **Gain**

Color flow gain optimizes the color flow continuity with less noise interference.

Rotate the **C** key on the control panel to adjust the gain in color flow modes.

■ **Optimization (Opt)**

It is used to adjust the pulse frequency emitted by the system in the real-time mode to change the working frequency of the probe.

- Res: The image with high resolution and slightly poor penetration can be acquired.
- Gen: The image effect is medium and meets the general use.
- Pen: The image with better penetration and slightly poor resolution can be acquired.

Rotate the key located directly below **Opt** to optimize the images.

■ **Wall Filter**

Wall filter is used to filter the low frequency noise from tissues, such as the vascular wall.

Rotate the key located directly below **WF** to adjust the wall filter.

■ **Scale**

The velocity range of blood flow imaging can be changed by adjusting the velocity scale.

Rotate the key located directly below **Scale** to adjust the velocity range.

■ **Line 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.

Rotate the key located directly below **Line Density** to adjust the line density.

■ **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.

Baseline is used to eliminate the alias in the color flow imaging, and display higher velocities without reversal of colors.

Rotate the key located directly below **Baseline** to adjust the baseline position.

NOTE:

Baseline adjustment is not available in PDI and SR Flow modes.

■ **Color Map**

Color map is used to select the method for the color-coding of blood flows.

Rotate the key located directly below **Color Map** to change the image color.

NOTE:

*When **Color Map/DPDI** is set to **6** or above in the PDI mode, the system automatically enters the DPDI mode and **DPDI** appears in the general parameters area. At this time, you can view the flow direction and velocity.*

■ **Persistence**

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 a smoother appearance.

Rotate the key located directly below **Persistence** to select the level of persistence.

■ **Power**

It is used to adjust the acoustic output power of the probe. The real-time value of the power is displayed in the general parameters area on the basic screen.

Rotate the key located directly below **Power%** to adjust the value.

NOTE:

Expose the patient to the lowest practical transmit power level for the shortest possible time to achieve a satisfactory diagnosis.

■ **B Reject**

B Reject is used to set the display priorities of the color and 2D grayscale pixels. A larger B Reject value suppresses more grayscale pixels.

Rotate the key located directly below **B Reject** to adjust the value.

■ **Steer**

Steer is used to adjust the angle of CF ROI when performing a real-time scan by using the linear probes.

Rotate the key located directly below **Steer** to rotate the angle clockwise or anticlockwise.

NOTE:

Only the linear probes are available when adjusting steer.

■ **Flow Invert**

Flow invert is used to view blood flow from a different perspective. When disabling the flow invert, red pixels represent flow to the probe; blue pixels represent flow away from the probe. When enabling the flow invert, blue pixels represent flow to the probe; red pixels represent flow away from the probe.

Tap **Invert** on the touch screen to enable or disable the flow invert.

NOTE:

The color flow and the color map are also inverted when reversing the flow.

■ **Image Rotation**

It is used to rotate the image.

Tap **Rotation** on the touch screen to enable or disable the feature, or adjust the rotation angle.

■ **Hide Flow**

It is used to display or hide the blood flow information on the CFM-mode image, PDI-mode image or SR Flow-mode image. When the blood flow information is hidden, the screen displays the B-mode image. The blood flow information and the tissue information can be compared by enabling or disabling the feature.

Tap **Hide Flow** on the touch screen to enable or disable the feature.

NOTE:

- *This feature is only available in frozen mode.*
- *The parameter is **Hide TDI** in TDI mode.*

6.4 Acquiring M-Mode Images

M mode is generally used with 2D imaging, and is helpful 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 M-mode trace. In M-mode, y-axis is used to display the position or depth of the tissue, and x-axis is the time scale.

6.4.1 M Mode

The M-line can be only positioned 90° within the ultrasound beam. Therefore, the M mode is used to view motion patterns for regular objects.

Perform the following steps to acquire M-mode images.

1. Optimize a B-mode image.

2. Press the **M** key on the control panel to enter the pre-activated B+M mode.

    The basic screen displays B mode image and M-line as shown in Figure 6-11.
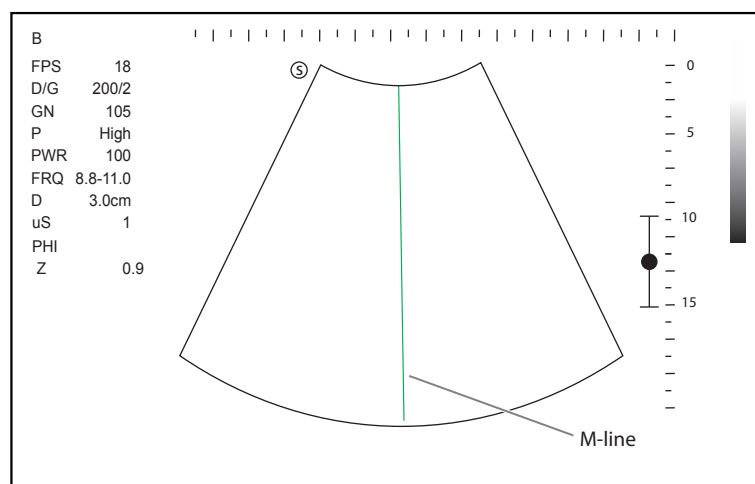
Figure 6-11 Pre-activated B+M-Mode Imaging Screen

3. Adjust the position of M-line by using the trackball.

4. Press the **Update** key on the control panel to activate the M mode.

   The B-mode image with M-line is displayed at the upper part of the screen and the M-mode image is displayed at the lower part of the screen after activating the M mode, as shown in Figure 6-12.
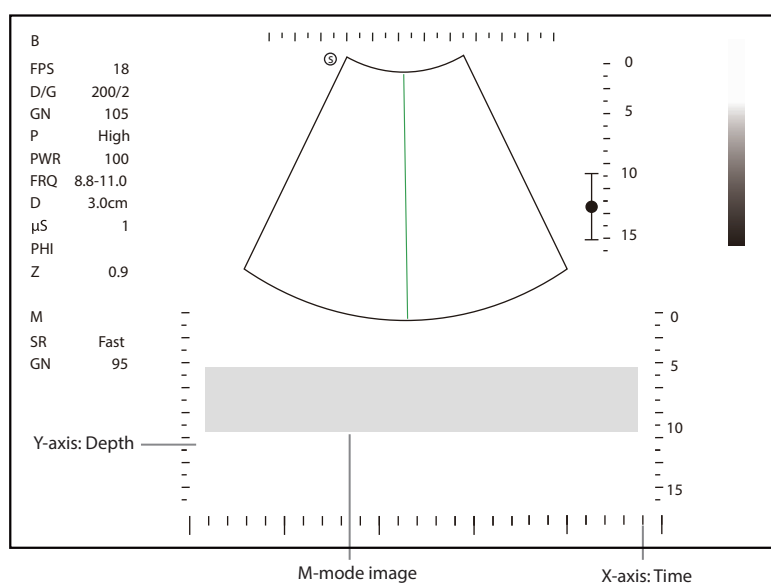
Figure 6-12 M-Mode Imaging Screen

   – X-axis is the time scale.

   – Y-axis is the depth scale.

   NOTE:

   Once the M mode is activated, you can move the trackball to stop the M trace and adjust the M line. The system continues tracing if the trackball is idle for more than 0.5s.

5. Optimize M-mode image. For details, refer to Section 6.4.4 Optimizing M-Mode Images.

6. Press the **M** key again to exit the screen.

6.4.2 Linear Anatomical M-Mode

Anatomical M-mode is mainly used for fetal cardiac applications. In the anatomical M-mode, the M-mode cursor can be positioned perpendicular to the anatomical structure and be adjusted 360° even when viewing motion patterns for irregular objects. It is used to study the ventricular function of the heart.

The following description uses Cardiac examination performed with the 2P1 probe as an example.

Perform the following steps.

1. In the activated M mode, rotate the key located directly below **AMM Angle** to enter the linear anatomical M-mode. The linear anatomical M-mode image is displayed on the X-axis and Y-axis plane.

2. Tap **AMM Number** on the touch screen to set the number of M-line.

    After settings, multiple M-lines are displayed on the B-mode image as shown in Figure 6-13.
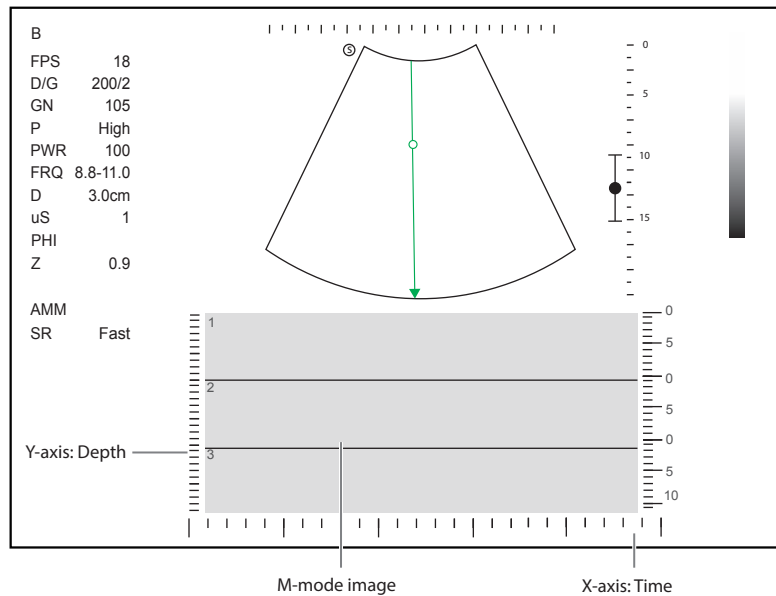
Figure 6-13 Linear Anatomical M-Mode Imaging Screen

3. Adjust the position and angle of each M-line.

    –   Position the selected M-line by using the trackball.

    –   Press the Set key on the control panel to change the selected M-line.

    –   Rotate the key located directly below **AMM Angle** to adjust the angle of the selected M-line.

4. Optimize the linear anatomical M-mode image. For details, refer to Section 6.4.4 Optimizing M-Mode Images.

5. Tap **Exit AMM** on the touch screen to exit the screen.

6.4.3 Curved Anatomical M-Mode

Curved anatomical M-mode is used to observe the motion status of any myocardial segment.

The following description uses Neo Cardiac examination performed with the 7P-A probe as an example.

Perform the following steps.

1. In the activated M mode, tap **CAMM** on the touch screen to enter the curved anatomical M-mode. The cross cursor appears on the image as shown in Figure 6-14.
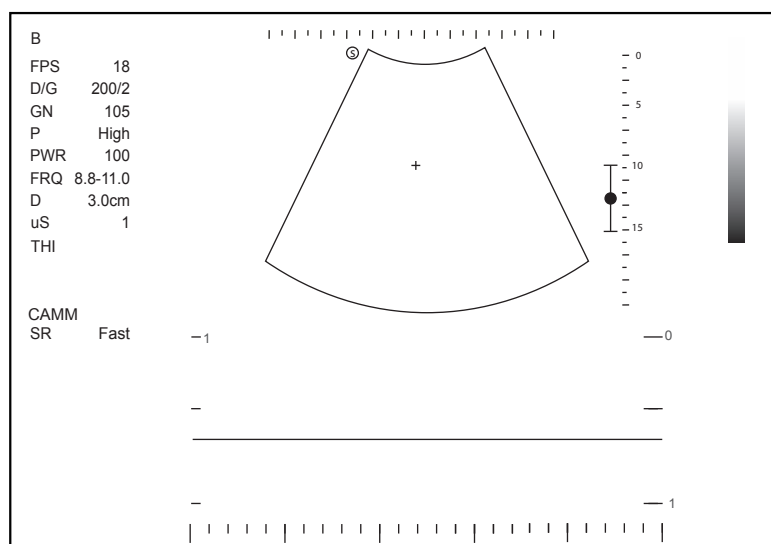
Figure 6-14 Curved Anatomical M-Mode Imaging Screen

2. Rotate the trackball to move the cursor and press the Set key on the control panel to enable the curve trace.

3. Press the **Update** key on the control panel to complete the curve trace.

4. If necessary, perform the following operations to adjust the trace curve.

    NOTE:

    In frozen mode, you need to press the Set key on the control panel to activate the cursor and adjust the trace curve.

    −   Rotate the trackball to move the cursor to a desired trace point and press the Set key on the control panel to select the point. Rotate the trackball to adjust the point position and press the Set key again to confirm the position.

    −   Tap **Move Curve** on the touch screen, rotate the trackball to move the whole trace curve and press the Set key to confirm the position.

5. Optimize the curved anatomical M-mode image. For details, refer to Section 6.4.4 Optimizing M-Mode Images.

6. Tap **CAMM** on the touch screen to exit the screen.

6.4.4 Optimizing M-Mode Images

As shown in Figure 6-15, you can adjust the following parameters in M mode. You can tap > on the touch screen to turn the page.
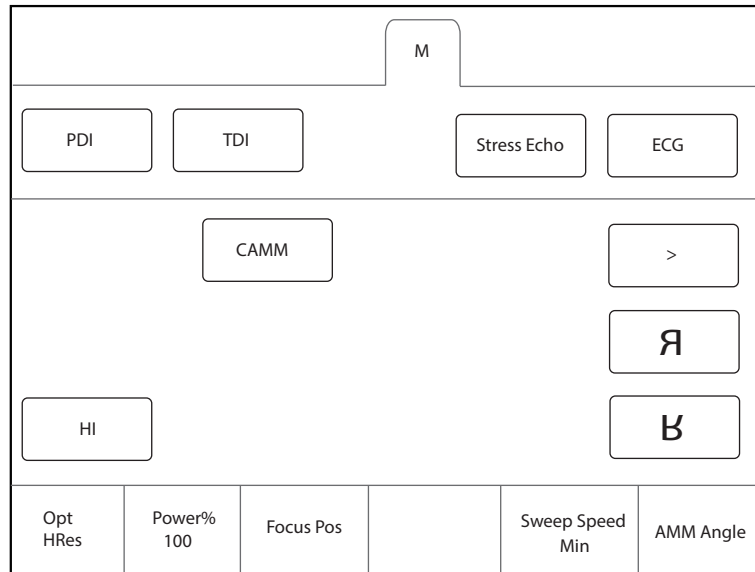
Figure 6-15 M-Mode Imaging Parameters Screen

NOTE:

In real-time M mode, you can adjust all parameters. In frozen M mode, you can adjust chroma, gray map, Up/Down and Left/Right flip.

■ **Gain**

M gain controls the overall brightness of the M trace.

To adjust the gain:

● Rotate the **M** key on the control panel to adjust the gain in the M mode.

● Rotate the **B** key on the control panel to adjust the gain in the anatomical M mode.

■ **Optimization (Opt)**

It is used to adjust the pulse frequency emitted by the system in the real-time mode to change the working frequency of the probe.

● Res: The image with high resolution and slightly poor penetration can be acquired.

● Gen: The image effect is medium and meets the general use.

● Pen: The image with better penetration and slightly poor resolution can be acquired.

Rotate the key located directly below **Opt** to adjust the frequency.

■ **Focus Position**

The focus position is used to adjust the focus range of the ultrasound beam to increase the resolution for a specific area to optimize the image.

Rotate the key located directly below **Focus Pos** to adjust the focus position.

■ **Sweep Speed**

Sweep speed is used to set the sweep speed of the M trace. A faster speed is more suitable to view the motion.

Rotate the key located directly below **Sweep Speed** to adjust the sweep speed.

■ **Chroma**

Chroma is used to set images with different contrast and detail resolutions.

Rotate the key located directly below **Chroma** to select the level of chroma.

■ **Display Format**

Display format is selected according to the image. The images of different formats can be viewed by switching the display format.

Rotate the key located directly below **Display Format** to adjust the display format.

■ **Power**

It is used to adjust the acoustic output power of the probe in M mode. The real-time value of the power is displayed in the general parameters area on the basic screen.

Rotate the key located directly below **Power%** to adjust acoustic power value.

NOTE:

Expose the patient to the lowest practical transmit power level for the shortest possible time to achieve a satisfactory diagnosis.

■ **Gray Map**

Gray map optimizes the brightness of each pixel in accordance with the corresponding echo.

Rotate the key located directly below **Gray Map** to adjust the value.

■ **Persistence**

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 a smoother appearance.

Rotate the key located directly below **Persistence** to select the level of persistence.

■ **Harmonic Imaging**

Harmonic Imaging uses the harmonic frequencies generated by tissue. The fundamental transmit frequency results in a harmonic frequency echo. The harmonic frequency received from the tissue is a multiple of the fundamental transmit frequency. The fundamental and any accompanying artifacts are missing from the harmonic frequency that the system receives. The artifact reduction, and the concomitant reduction in haze and clutter, increases contrast resolution and improves border delineation. THI is useful in difficult-to-image patients. Harmonic Imaging includes THI and PHI.

Tap **HI** on the touch screen or press the **THI** key on the keyboard to enter or exit the harmonic imaging mode. When the system enters the harmonic imaging mode, **THI** or **PHI** appears at the top left corner of the screen.

NOTE:

• *After switching M mode to harmonic imaging mode, the system automatically adjusts the frame rate, gain and frequency of the image.*
• *Compared to the M-mode imaging, harmonic imaging improves image resolution but decreases the frame rate. Therefore, you should make an optimal balance when choosing an imaging mode.*
• *Harmonic imaging is only available with compatible probes.*

6.5   Acquiring Spectral Doppler Images

Spectral Doppler imaging is intended to provide measurement data concerning the velocity, the direction, and the category of the arterial or vein flow. It contributes a more accurate qualitative analysis than the color flow imaging.

Spectral Doppler includes Pulsed Wave Doppler (PW) mode and Continuous Wave Doppler (CW) mode.

6.5.1   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. PW includes conventional PW and High Pulse Repetition Frequency (HPRF). PW Doppler can be combined with the B mode for rapidly selecting the anatomical site for PW Doppler examination. The site where PW Doppler data is derived appears graphically on the B-Mode image.

Perform the following steps to acquire PW-mode images

1. Optimize a B-mode image.

2. Press the **PW** key on the control panel to enter the pre-activated B+PW mode 1. The basic screen is shown in Figure 6-16.
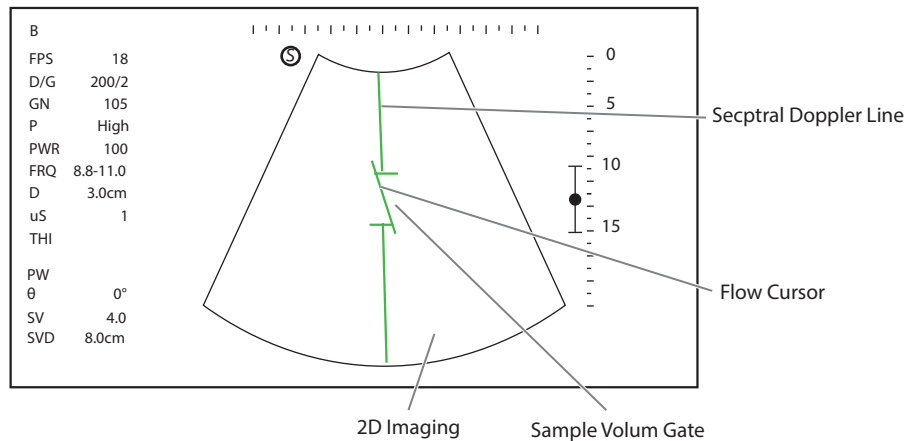
Figure 6-16 Pre-activated B+PW Mode 1 Imaging Screen

– 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.

3. Adjust the position and angle of the spectral Doppler line.

– Position the sample volume gate on the spectral Doppler line by rotating the trackball upwards or downwards.

– Adjust the angle of the spectral Doppler line by rotating the trackball to the left or the right.

4. Adjust the sample volume gate.

– Adjust the size of the sample volume gate by rotating the trackball.

– Rotate the key located directly below **Angle** to adjust the angle of the flow cursor.

5. Press the **Update** key on the control panel to activate the PW mode.

The PW spectrum image is displayed at the lower part of the screen after activating the PW mode, as shown in Figure 6-17.
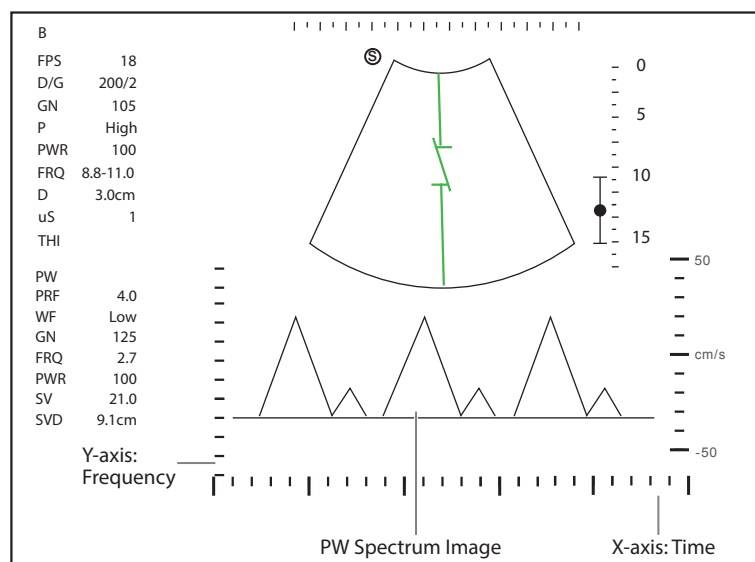
Figure 6-17 PW-Mode Imaging Screen

- – X-axis is the time scale.
- – Y-axis is Doppler frequency scale, including positive and negative indicators.

Press the **Fn** key and the Left/Right arrow key on the keyboard simultaneously or rotate the key located directly below the **Audio** on the touch screen to adjust the audio volume.

6. Optimize the PW-mode image. For details, refer to Section 6.5.3 Optimizing Spectral Doppler Images.

If needed, press the **Update** key on the control panel to enter the pre-activated B+PW mode 2, the following screen appears.
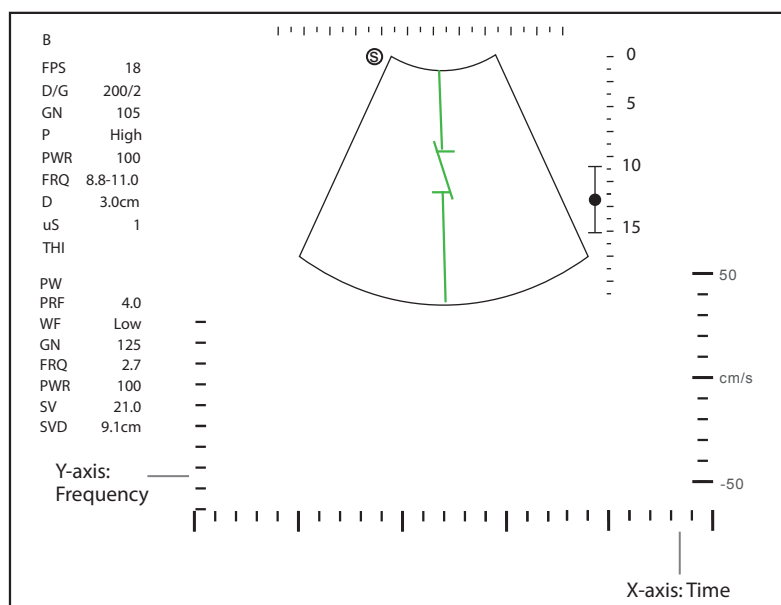
Figure 6-18 Pre-activated B+PW Mode 2 Imaging Screen

You can also adjust the position and angle of spectral Doppler line, the size of sample volume gate, and the direction of the flow cursor.

7. Press the **PW** key again to exit the screen.

6.5.2 CW Mode

Continuous Wave Doppler (CW) uses continuously transmitted and received ultrasound energy to generate a spectral display. CW Doppler is used to measure a high velocity, the highest velocity at a specific site, but no aliasing is created.

The following description uses Cardiac examination performed with the 2P1 probe as an example.

Perform the following steps.

1. Optimize a B-mode image.

2. Press the **CW** key on the control panel to enter the pre-activated B+CW mode 1. The basic screen is shown in Figure 6-19.

Figure 6-19 Pre-activated B+CW-Mode 1 Imaging Screen

- 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.

3. Adjust the position and angle of the spectral Doppler line.

- Position the sample volume gate on the spectral Doppler line by rotating the trackball upwards or downwards.
- Adjust the angle of the spectral Doppler line by rotating the trackball to the left or the right.

4. Rotate the key located directly below **Angle** to adjust the angle of the flow cursor.

5. Press the **Update** key on the control panel to activate the CW mode.

The CW spectrum image is displayed at the lower part of the screen after activating the CW mode, as shown in Figure 6-20.
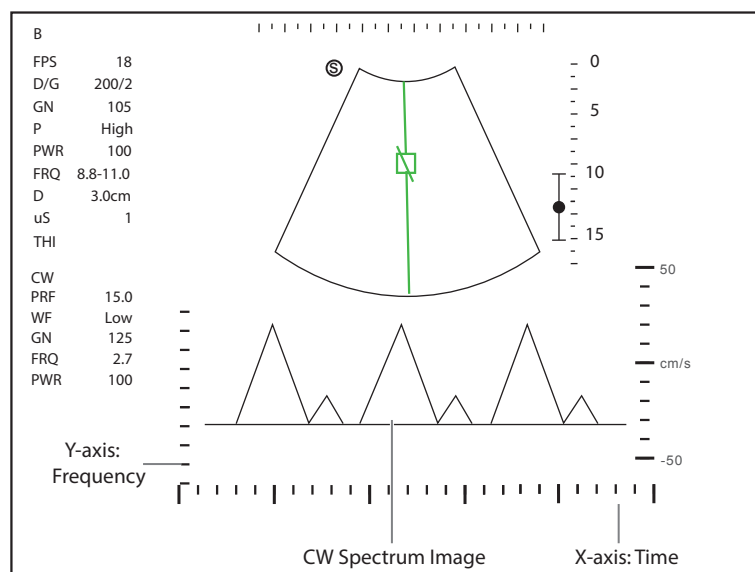
Figure 6-20 CW-Mode Imaging Screen

- X-axis is the time scale.
- Y-axis is Doppler frequency scale, including positive and negative indicators.

Press the **Fn** key and the Left/Right arrow key on the keyboard simultaneously or rotate the key located directly below the **Audio** on the touch screen to adjust the audio volume.

6. Optimize the CW-mode image. For details, refer to Section 6.5.3 Optimizing Spectral Doppler Images.

If needed, press the **Update** key on the control panel to enter the pre-activated B+CW mode 2, and the following screen appears.
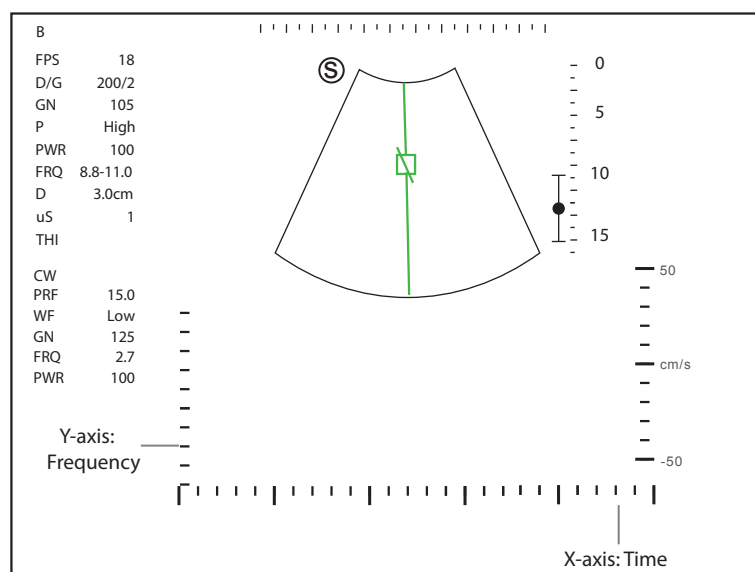
Figure 6-21 Pre-activated B+CW Mode 2 Imaging Screen

You can also adjust the position and angle of spectral Doppler line, and the direction of the flow cursor.

7. Press the **CW** key again to exit the screen.

6.5.3   Optimizing Spectral Doppler Images

As shown in Figure 6-22, you can adjust the following parameters in PW/CW mode. You can tap > on the touch screen to turn the page.
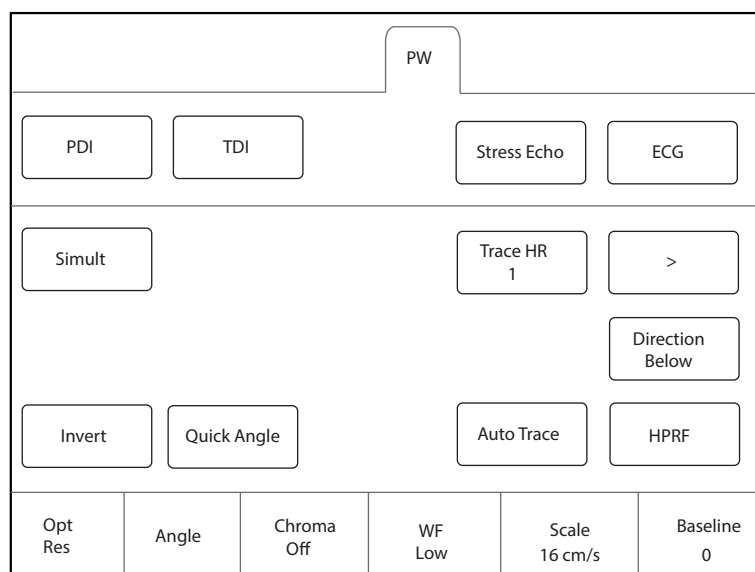
Figure 6-22 Spectral Doppler Mode Imaging Parameters Screen

NOTE:

*In real-time PW/CW mode, you can adjust all parameters. In frozen PW/CW mode, you can adjust **Display Format**, **Chroma**, **Invert**, **Angle**, **Quick Angle** and **Baseline**.*

■ **Gain**

It is used to adjust the gain of the spectrum map. Increasing the gain will brighten the image allowing you to see more received signals with less noise.

Rotate the **PW** key on the control panel to adjust the gain in PW or CW mode.

■ **Scale**

The velocity range of blood flow imaging can be changed by adjusting the velocity scale.

Rotate the key located directly below **Scale** to adjust the velocity range.

NOTE:

The value of wall filter may be also changed when adjusting the scale.

■ **High Pulse Repetition Frequency**

Once HPRF is enabled, besides the original sample volume gate, one or more sample volume gates appear at shallower positions on the 2D image. The unnecessary low frequency signal or the disturbances made by non-flow movements, such as breath, heart beat or sweeps of the probe will be filtered.

To enable the high pulse repetition frequency, tap **HPRF** on the touch screen, and rotate the key located directly below **Scale** to adjust the frequency. HPRF is automatically enabled when a certain value is reached.

■ **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.

Baseline is used to eliminate the alias during color flow imaging, and display higher velocities without reversal of colors.

Rotate the key located directly below **Baseline** to adjust the baseline position.

- ■ **Wall Filter**

  Wall filter is used to filter the low frequency noise from tissues, such as the vascular wall.

  Rotate the key located directly below **WF** to adjust the level.

- ■ **Optimization (Opt)**

  The probe is capable of generating a broadband signal with a certain frequency and bandwidth. The frequency optimizes the edges when scanning deeper locations with Doppler imaging.

  - ● Res: The image with high resolution and slightly poor penetration can be acquired.
  - ● Gen: The image effect is medium and meets the general use.
  - ● Pen: The image with better penetration and slightly poor resolution can be acquired.

  Rotate the key located directly below **Opt** to adjust the frequency.

- ■ **Sweep Speed**

  Sweep speed is used to set the sweep speed of the Doppler trace. The refresh speeds of the time scale and the frequency scale vary with the sweep speed.

  Rotate the key located directly below **Sweep Speed** to adjust the sweep speed.

- ■ **Power**

  It is used to adjust the acoustic output power of the probe in PW/CW mode. The real-time value of the power is displayed in the general parameters area on the basic screen.

  Rotate the key located directly below **Power%** to adjust the value.

  NOTE:

  Expose the patient to the lowest practical transmit power level for the shortest possible time to achieve a satisfactory diagnosis.

- ■ **Chroma**

  Chroma is used to set images with different contrast and detail resolutions.

  Rotate the key located directly below **Chroma** to select the level of chroma.

- ■ **Display Format**

  Display format is used to view the image better.

  Rotate the key located directly below **Display Format** to set the display format.

- ■ **Flow Invert**

  Flow invert is used to view the flow velocity from a different perspective.

  To enable or disable the flow invert:

  - ● Tap **Invert** on the touch screen to enable the feature, and **Invert** appears on the top right corner of the image.
  - ● Or, tap **Invert** again on the touch screen to disable the feature, and **Invert** disappears from the display.

- ■ **Angle Correction**

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

  - ● Rotate the key located directly below **Angle** to adjust the angle of the flow cursor.
  - ● Tap **Quick Angle** on the touch screen to adjust the angle of the flow cursor quickly.

NOTE:

You only need to set it when performing measurements related to velocity.

■   **Simult**

It is used to display the real-time 2D image and PW-mode image simultaneously

Tap **Simult** on the touch screen in the activated PW mode or in the pre-activated B+PW mode 2, and the real-time 2D image and PW-mode image are displayed on the screen simultaneously.

NOTE:

Simult *is only available in the PW mode.*

■   **Auto Trace**

The system automatically traces one or more Doppler waveforms on the image to obtain clinical indicators such as velocity, pressure gradient and index.

Tap **Auto Trace** on the touch screen to enable this feature, and the measurement results are displayed on the screen simultaneously.

■   **Audio**

It is used to adjust the spectral Doppler volume.

Rotate the key located directly below **Audio** to adjust the value.

6.6   Acquiring Triplex-Mode Images

The triplex mode is overlapped by three different imaging modes, and can be applied to view the image. The triplex modes include B+CFM/TDI+M, B+CFM/PDI/SR Flow/TDI+PW and B+CFM/PDI+CW.

6.6.1   B+CFM/TDI +M

NOTE:

Only the phased array probes and the convex array probes are available in B+CFM/TDI+M mode.

Perform the following steps to acquire the image.

1. Optimize a CFM/TDI mode image.

2. Press the **M** key on the control panel to enter the pre-activated B+CFM/TDI+M mode. The basic screen is shown in Figure 6-23.
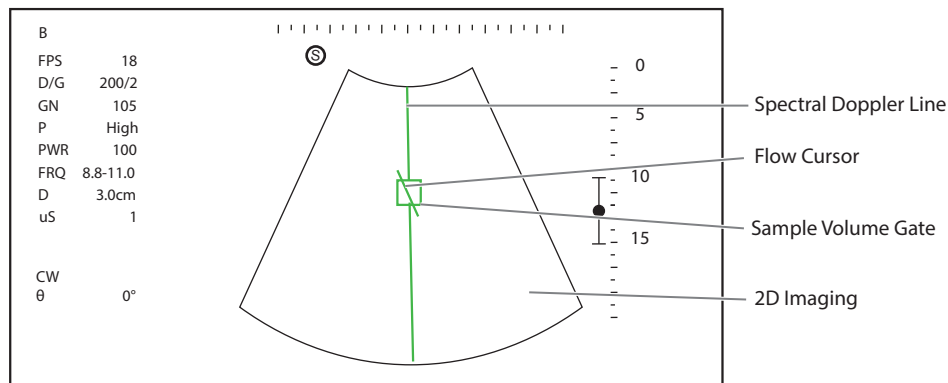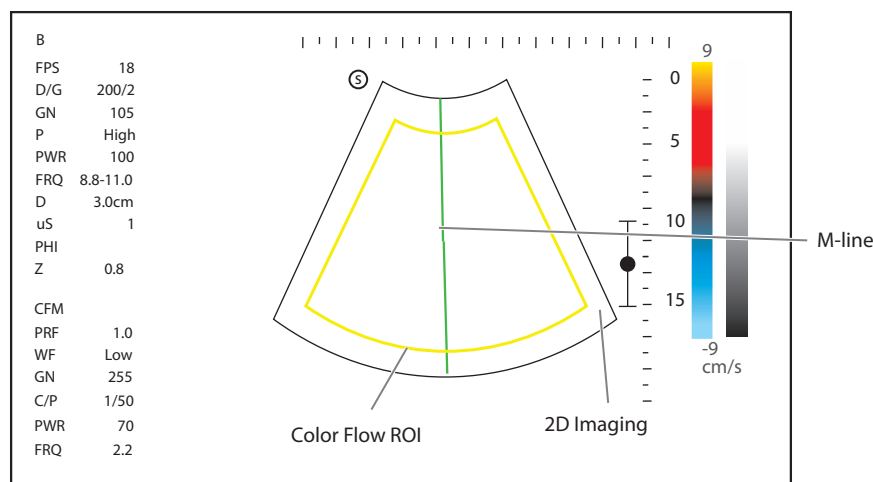

Figure 6-23 Pre-activated B+CFM/TDI +M-Mode Imaging Screen

3. Adjust the position of M-line and color flow ROI by rotating the trackball.

4. Press the **Update** key on the control panel to activate the B+CFM/TDI+M mode.

The basic screen displays the following after being activated.

The M-mode color flow image is displayed at the lower part of the screen after activation, as shown in Figure 6-24.
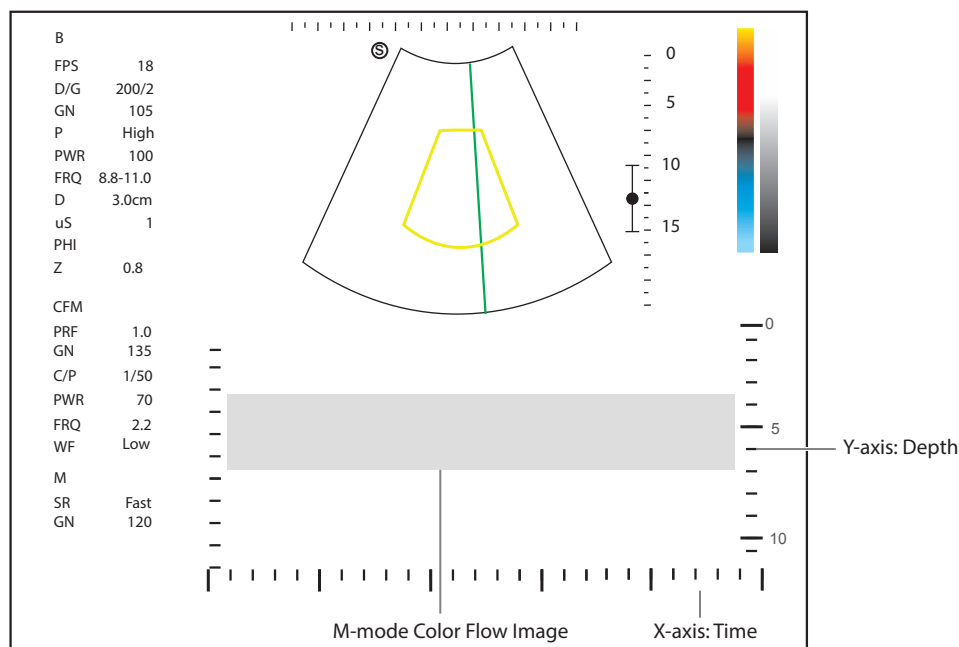
Figure 6-24 B+CFM/TDI +M-Mode Imaging Screen

5. Optimize the M-mode image. For details, refer to Section 6.4.4 Optimizing M-Mode Images.

6. Press the **M** key again to exit the screen.

6.6.2 B+CFM/PDI/SR Flow/TDI+PW

Perform the following steps to acquire the image.

1. Optimize a color flow image.

2. Press the **PW** key on the control panel to enter the pre-activated B+CFM/PDI/SR Flow/TDI+PW mode 1. The basic screen is shown in Figure 6-25.
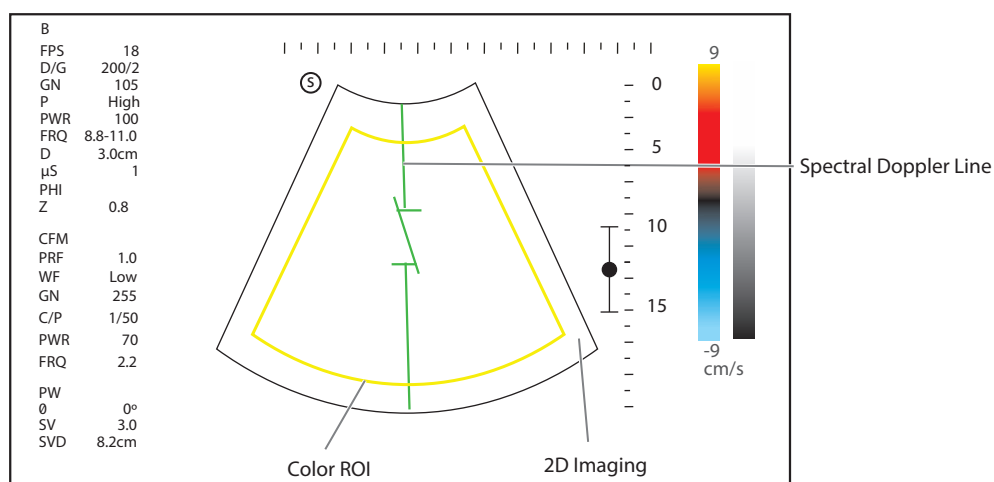
Figure 6-25 Pre-activated B+CFM/PDI/SR Flow/TDI+PW-Mode 1 Imaging Screen

3. Adjust the position and angle of the spectral Doppler line.

- Position the sample volume gate on the spectral Doppler line by rotating the trackball upwards or downwards.
- Adjust the angle of the spectral Doppler line by rotating the trackball to the left or the right.

4. Adjust the sample volume gate.

- Rotate the trackball to adjust the size of the sample volume gate.
- Rotate the key located directly below **Angle** to adjust the angle of the flow cursor.

5. Press the **Update** key on the control panel to activate the PW mode.

The PW spectrum image is displayed at the lower part of the screen after activating the PW mode, as shown in Figure 6-26.
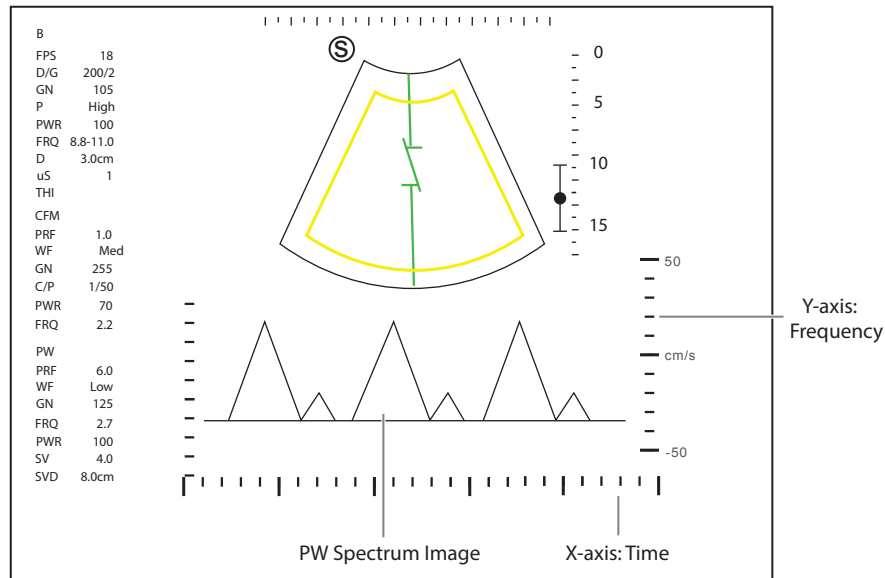
Figure 6-26 B+CFM/PDI/SR Flow/TDI+PW-Mode Imaging Screen

Press the **Fn** key and the Left/Right arrow key on the keyboard simultaneously or rotate the key located directly below the **Audio** on the touch screen to adjust the audio volume.

6. Optimize the PW-mode image. For details, refer to Section 6.5.3 Optimizing Spectral Doppler Images.

If needed, press the **Update** key on the control panel to enter the pre-activated CFM/PDI/TDI+PW mode 2, and the following screen appears.
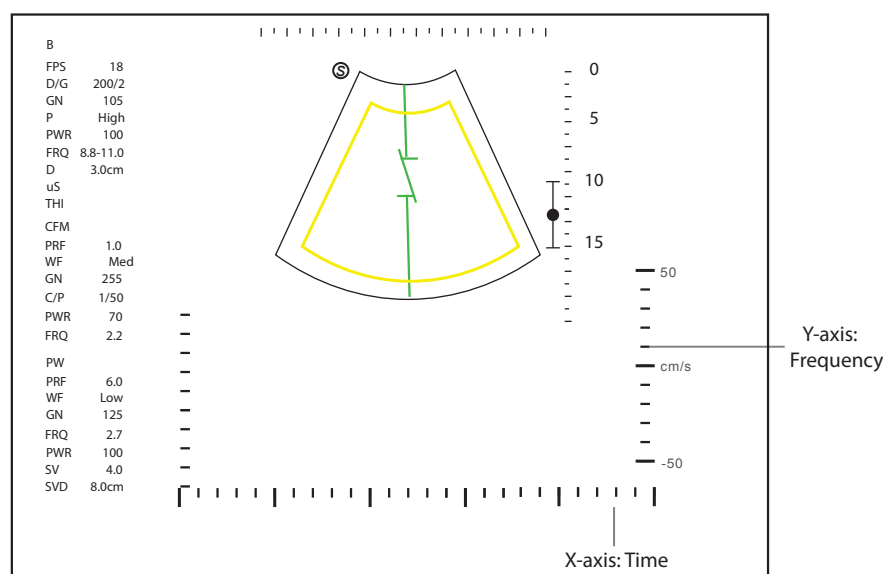
Figure 6-27 Pre-activated CFM/PDI/SR Flow/TDI+PW Mode 2 Imaging Screen

You can also adjust the position and angle of spectral Doppler line, the size of the sample volume gate, and the direction of the flow cursor.

7. Press the **PW** key again to exit the screen.

6.6.3   B+CFM/PDI+CW

For details, refer to Section 6.6.2 B+CFM/PDI/SR Flow/TDI+PW.

6.7   Elastography

As an adjunct technique for clinical practice, the elastography determines if an area of tissue is hard or soft when compared with its surroundings. The elastography image displays a range of map shades from the softest tissue in the image to the stiffest in a given field of view. Elastography is used in ultrasound diagnosis for small parts applications, such as breast and thyroid examinations.

The following description uses Breast examination performed with the 12L-B probe as an example.

6.7.1   Acquiring Elastography Images

Perform the following steps to acquire the elastography image.

1. Select a probe and an exam type, and the system automatically enters the real-time B mode.

2. Acquire a high quality B-mode image.

3. Tap **Elasto** on the touch screen to enter the elastography mode.

    As shown in Figure 6-28, the elastography image and ROI are displayed on the left and the real-time B-mode image is displayed on the right.
    Press the **Dual** key on the control panel to enter the single or dual-split screen.
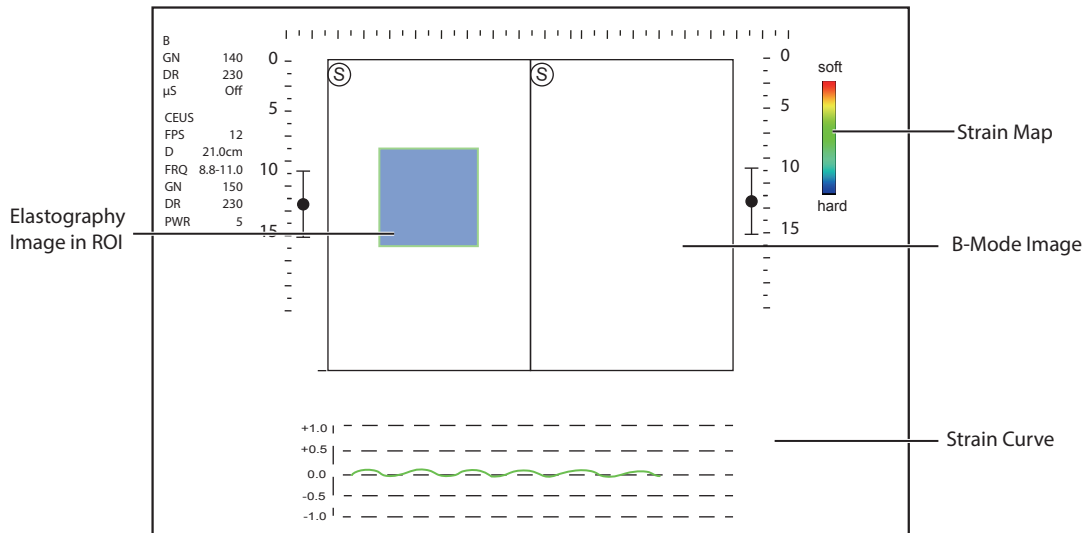
Figure 6-28 Elastography Screen

– Strain map provides color information for tissue stiffness.

– B-mode image is compared with the elastography image for a real-time assessment.

– Strain curve displays the compressing frequency and its corresponding displacement. X axis is the frame number, Y axis is the displacement of the corresponding frame.

– The elastography image in the ROI is translucent and overlapped on the B-mode image.

4. Hold the probe perpendicular to the target lesion, and compress the probe regularly.

   NOTE:

   • *Ensure the compression is applied perpendicularly, and all parts of the target lesion are compressed uniformly.*

   • *Ensure the compression is a dynamic intermittent force, i.e. alternate tension with relaxation, which could keep the distorted tissue back to normal status. If the distorted tissue is not relaxed, the tissue cannot be distorted and the elastography cannot be performed.*

   • *The compressing frequency is recommended to be 1.5-3 times per second. Lift the probe up after each pressure, and ensure the probe is not away from the target lesion.*

   • *The absolute value of positive and negative maximums on strain curves should be 0.5-1. If the absolute value is below 0.5 or over 1, the compression is too hard or too low for correct elastography results.*

5. Adjust the elastography ROI.

   To acquire accurate tissue stiffness information, you are recommended to adjust the elastography ROI to two times of the target lesion

   – Rotate the trackball to position elastography ROI.

   – Press the Set key on the control panel and rotate the trackball to adjust the size of elastography ROI.

   – Press the Set key to reposition elastography ROI.

6. Optimize the elastography image. For details, refer to Section 6.7.2 Optimizing Elastography Images.

7. Tap **Exit** or tap **Elasto** on the **B** tab to exit the elastography mode.

6.7.2   Optimizing Elastography Images

As shown in Figure 6-29, you can adjust the following parameters in elastography mode.
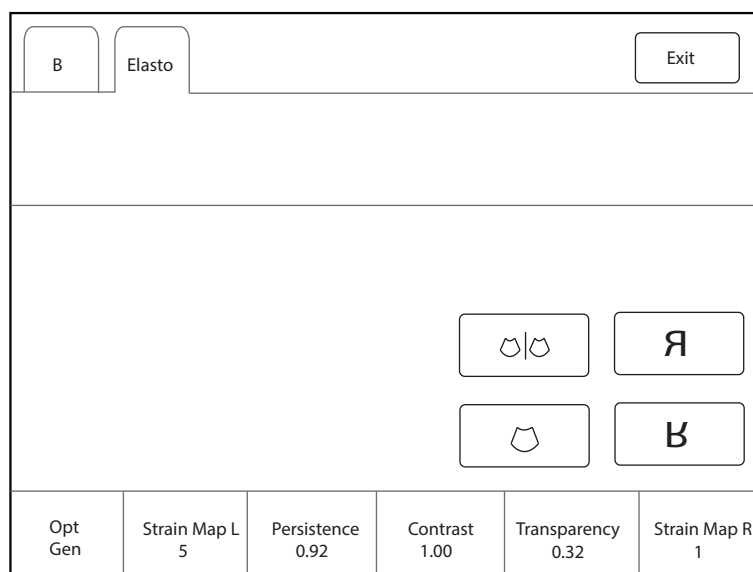
Figure 6-29 Elastography Parameters Screen

NOTE:

In real-time elastography mode, you can adjust all parameters. In frozen mode, you can adjust **Transparency**, **Strain Map L** *and* **Strain Map R**.

■ **Strain Map L/R**

Strains map allows you to select and apply a color map to the elastography image. The image will be displayed with the use of 256-color mapping for each pixel according to the degree of strain using a scale from red (highest strain, softest), green (average strain, intermediate), to blue (no strain, hardest).

Rotate the key located directly below **Strain Map L / Strain Map R** to choose the color scheme for the elastography image.

■ **Transparency**

Transparency is used to set the overall brightness of the elastography Image. The transparency of the elastography Image changes with adjustment.

Rotate the key located directly below **Transparency** to adjust the value.

■ **Contrast**

Contrast enhances the color contrast for more accurate tissue stiffness information.

Rotate the key located directly below **Contrast** to adjust the value.

■ **Persistence**

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 a smoother appearance.

Rotate the key located directly below **Persistence** to adjust the value.

■ **Optimization (Opt)**

It is used to adjust the pulse frequency emitted by the system to change the working frequency of the probe. The parameter can be adjusted only in real-time elastography mode.

● Res: The image with high resolution and slightly poor penetration can be acquired.

● Gen: The image effect is medium and meets the general use.

- Pen: The image with better penetration and slightly poor resolution can be acquired.

Rotate the key located directly below **Opt** to adjust the frequency.

6.8 Contrast Imaging

Contrast imaging is used in conjunction with ultrasound contrast agents to increase the acoustic impedance difference between blood flow and tissue, improve 2D imaging resolution for myocardial, liver, kidney and cephalic applications and enhance Doppler signals for blood flow. Contrast imaging helps in observing normal and abnormal tissue and blood flow.

⚠ **WARNING** Contrast imaging is only used in conjunction with commercial contrast agents legally approved by laws and local regulations. Do not use the contrast agent not got any legal permits or official registrations. The manufacturer would not guarantee the safety and reliability for any contrast agents.

The following description uses ABD examination performed with the 3C-A probe as an example.

6.8.1 Entering Contrast Imaging

Perform the following steps to enter the contrast imaging.

1. Select a probe and an exam type, and the system automatically enters the real-time B mode.

2. Position the target tissue in the B+Color mode, and observe the blood flow.

3. Return to the B mode and tap **Contrast** on the touch screen to enter the contrast imaging.

   As shown in Figure 6-30, the system enters dual-split display mode by default. The real-time contrast image is displayed on the left and the B-mode in real-time mode is displayed on the right.
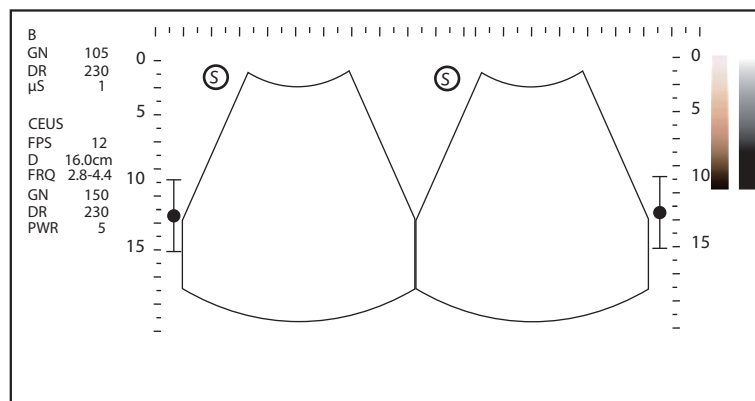
Figure 6-30 Contrast Imaging Screen

- – Tap ⬡ on the touch screen to enter the single display.
- – Tap ⬡|⬡ on the touch screen to enter the dual-split display.
- – Tap **Exit** on the touch screen to exit the contrast imaging.

6.8.2 Optimizing Contrast Images

As shown in Figure 6-31, you can adjust the following parameters in contrast imaging mode. You can tap > on the touch screen to turn the page.
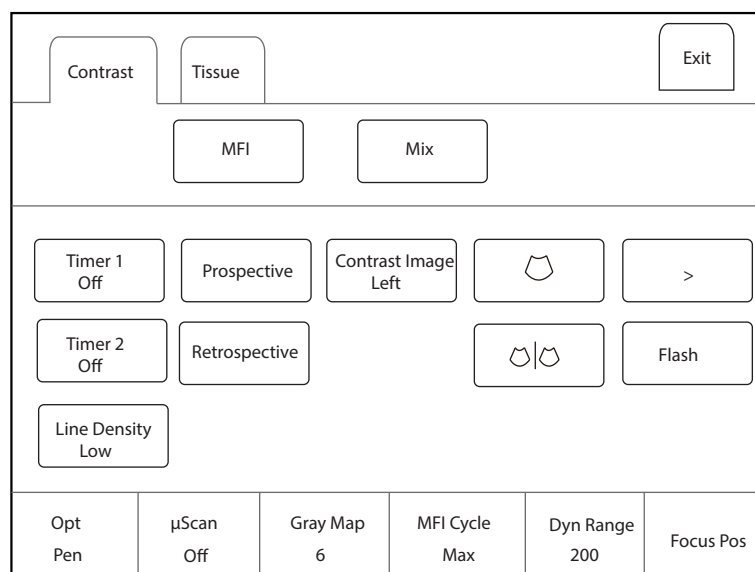
Figure 6-31 Contrast Imaging Parameters Screen

Tap **Tissue** tab on the touch screen, and you can adjust the parameters, including persistence, dynamic range, gray map, μScan, sector width, line density, power, focus position and chroma.

In frozen mode, tap **MFI Time** on the touch screen to display the changing process of time imaging.

Tap **MFI** to display the effect of microvascular flow imaging. Tap **MIX** to display a mixed image of the contrast image and the tissue image, which is helpful for determining the anatomical location of the contrast region of interest in the tissue.

NOTE:

In real-time contrast imaging mode, you can adjust all parameters. In frozen mode, you can adjust **μScan**, **Chroma**, **Gray Map** *and* **Sensitivity**. *For details about parameter adjustment, refer to Section 6.2.2 Optimizing B-Mode Images.*

■   **Gain**

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

Rotate the **B** key on the control panel to adjust the image gain.

■   **Flash Power**

Flash power allows you to select the maximum transmit power level produced by the transducer in the contrast imaging.

Rotate the key located directly below **Flash Power** to adjust the flash power value.

■   **Flash Time**

Flash time allows you to set the transmit duration of high-voltage pulse.

Rotate the key located directly below **Flash Time** to adjust the flash time.

■   **Prospective**

Prospective allows you to save a cine starting from the moment you tap **Prospective**.

To use prospective,

● Tap **Prospective** on the touch screen to start cine storage.
● Tap **Prospective** again on the touch screen to stop cine storage.

■   **Retrospective**

Retrospective allows you to save a cine starting from a time point in the past to the moment you tap **Retrospective**.

To use retrospective, tap **Retrospective** on the touch screen to save the cine.

NOTE:

You can set the time length of the saved cine on the **System Settings** > **General** > **Store** *tab.*

■   **Contrast Image (Left/Right)**

In dual display mode, the position of the contrast image and the tissue image can be switched. The contrast image is displayed on the left and the tissue image is displayed on the right by default.

Tap **Contrast Image** to adjust the position of the images.

■   **MFI Cycle**

MFI cycle allows you to set the cycle of the microvascular flow imaging. The default cycle is **Max**. **MFI Cycle** only can be adjusted in MFI mode.

Rotate the key located directly below **MFI Cycle** to adjust the MFI cycle.

■   **Set First/Last**

Set First/Last allows you to set the first or last frame of the saved cine.

Rotate the key located directly below **Set First/Set Last** to set the first or last frame of the cine.

■   **To First/Last**

To first/last allows you to turn to the first or last frame of the saved cine.

Tap **To First/To Last** on the touch screen to turn to the first or last frame of the saved cine.

6.8.3   Acquiring Contrast Images

Perform the following steps to acquire contrast images.

1. Inject contrast agents, and select **Timer1** or **Timer2** on the touch screen to start timing.

    Once the timer is started, **Timer** displays on the screen and the system starts timing for contrast agent duration.
    –   Press the **P2** key on the control panel to set the start frame for cine review. Press the **P2** key again to set the end frame of cine. The corresponding thumbnails for the stored cine appears in the clipboard.
    –   Press the ⏮ key on the control panel to freeze the image. Freezing time is displayed on the screen, and the timer continues timing. Press the ⏮ key again to return to the real-time mode.
    –   Tap **Timer1** or **Timer2** again to exit.

2. Observe and record circulation and perfusion of the target tissue.

    If the second perfusion is needed, tap **Flash** on the touch screen to enter the flash contrast imaging and destruct microbubbles. Tap **Flash** repeatedly to destruct the residual microbubbles. After the destruction, inject contrast agents and observe the perfusion of the target tissue.

3. Press the ⏮ key to freeze the image.

6.8.4   Working with Contrast Images

You can work with the contrast images by using the features in the frozen mode, such as cine review, annotations, data storage or measurement. For details, refer to Section 7.4 Using Cine, Section 7.5 Annotations and Body Marks, Chapter 8 Managing Images/Data and the relevant sections in the advanced user manual.

■   **TIC Curve**

You can also get more information about blood flow characteristics through observing TIC curves. TIC curve indicates the contrast agent intensity variation with duration. To make a TIC analysis, you should position ROI (8 at most), and then make a detailed analysis of the contrast agent intensity variation with duration.

Perform the following steps to make a TIC analysis.

1. Tap **TIC** in the frozen mode to enter the TIC analysis screen.

2. Position one or more ROIs on the contrast image.

   – Tap **Ellipse** on the touch screen and position a region of interest by an ellipse.

   – Tap **Trace** on the touch screen and position a region of interest by the manual trace.

   Once you position a ROI, the corresponding TIC curve is displayed below the image, and the colors of TIC curve and ROI are consistent, as shown in Figure 6-32.
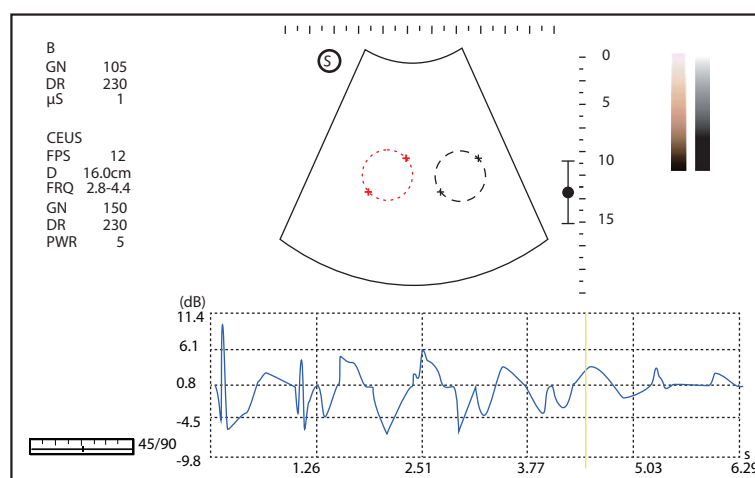
Figure 6-32 TIC Curve Analysis

   – X axis is the contrast agent duration, represents in s.

   – Y axis represents the contrast agent intensity, represents in dB.

   You can press the **Clear** key on the control panel or tap **Clear All** on the touch screen to delete all ROIs and TIC curves. You can tap **Delete** on the touch screen to delete the last curve.

3. Analyze TIC curves for more information about circulation and perfusion.

   Use the trackball to observe contrast images frame by frame, and the indication line on the corresponding TIC curve varies with the frame.

4. Tap **Exit** on the touch screen or press the ⏮ key on the control panel to return to the contrast image.

6.9   3D Imaging

3D imaging allows you to see width, height and depth of the anatomical structure. 3D imaging can be performed by all probes, but the quality of the images is closely related to 2D imaging. 3D imaging mainly applies to obstetric, gynecologic and abdominal exams.

The following description uses obstetric examination (1st Trim.) performed with the VC6-2 probe as an example.

6.9.1   Acquiring 3D Images

Before entering the 3D imaging mode, optimize the 2D images to ensure the high contrast and low noise.

Perform the following steps to acquire 3D images.

1. Enter the patient information and select a probe and an exam type, and the system enters the real-time B mode.

2. Optimize imaging parameters in the B mode to ensure the high contrast, high gain and low noise.

3. Apply adequate gel on the patient.

4. Acquire a 2D-mode image of high quality.

5. Press the **3D/4D** key on the control panel to enter the pre-activated 3D mode.

    – Volume probes: The basic screen displays 2D image, ROI and sample line, as shown in Figure 6-33. Only the data in the sample volume can be used to generate the 3D image.

    – Non-volume probes: The basic screen displays 2D image, and does not display ROI and sample line.

    NOTE:

    When using a volume probe, you can set the default pre-activated mode. For details, refer to 4.1.3 MultiKey Settings.

2D Imaging   Sample Volume   Anchor   Sample Line   ROI
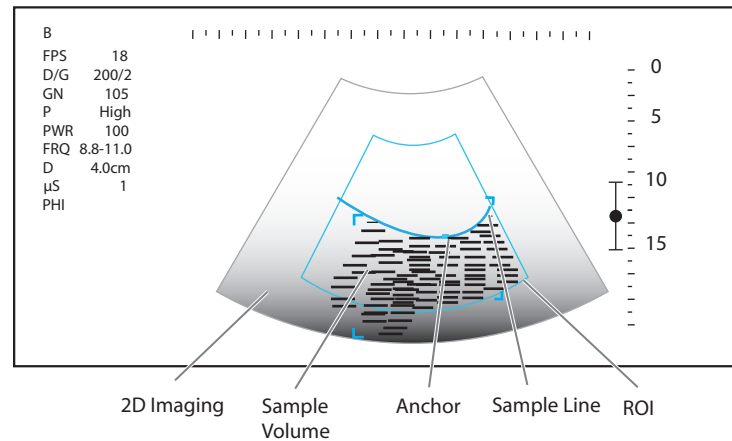
Figure 6-33 Pre-activated 3D Imaging Screen

6. Adjust the ROI and the sample line.

    – Use the trackball to position the ROI.

    – Press the Set key on the control panel and use the trackball to resize the ROI.

    – Press the Set key again and use the trackball to position the anchor to change the shape of sample line.

    – If needed, press the Set key and use the trackball to position the ROI.

7. Set the user mode, sweep angle, focus position and image quality.

    NOTE:

    For non-volume probes, user mode is not available.

    – Tap an item under **User Mode** to select a user mode.

    – Rotate the key located directly below **Sweep Angle** to set the sweep angle of the probe.

    – Rotate the key located directly below **Focus** to decrease or increase the depth of focal zone.

    – Rotate the key located directly below **Image Quality** to set the display quality of the image.

8. Tap ▭, ▯, or ⊞ to select a display format, and tap **Start** or press the ⏮ key to display the 3D imaging in a full, dual or quad display. The system automatically enters the 3D imaging in a quad display by default.

    Take 3-dimensional gray-scale image in quad display as an example, the imaging area of the screen is divided into 3 reference images and a 3D image by default, as shown in Figure 6-34.
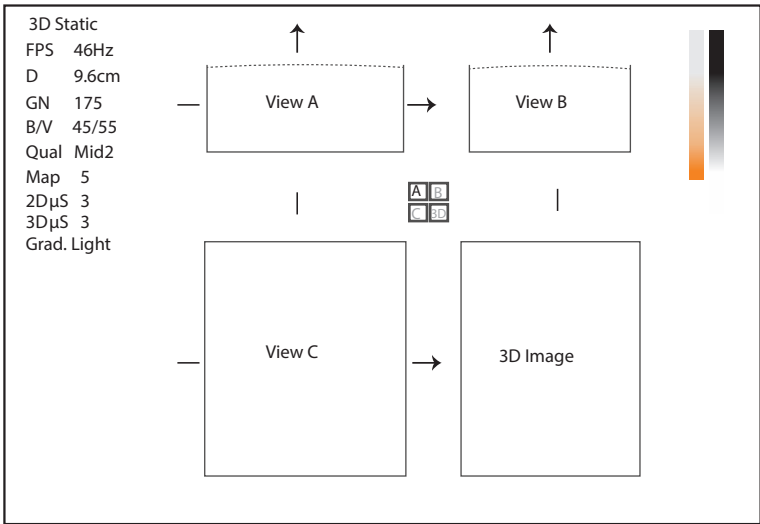
Figure 6-34 3D Imaging Screen

As the above figure shows,

- View A on the top left shows the image on the X-axis.

- View B on the top right shows the image on the Y-axis.

- View C on the bottom left shows the image on the Z-axis.

- The image on the bottom right shows the 3D image.

As Figure 6-35 shows, the touch screen displays all controls related to the 3D imaging.
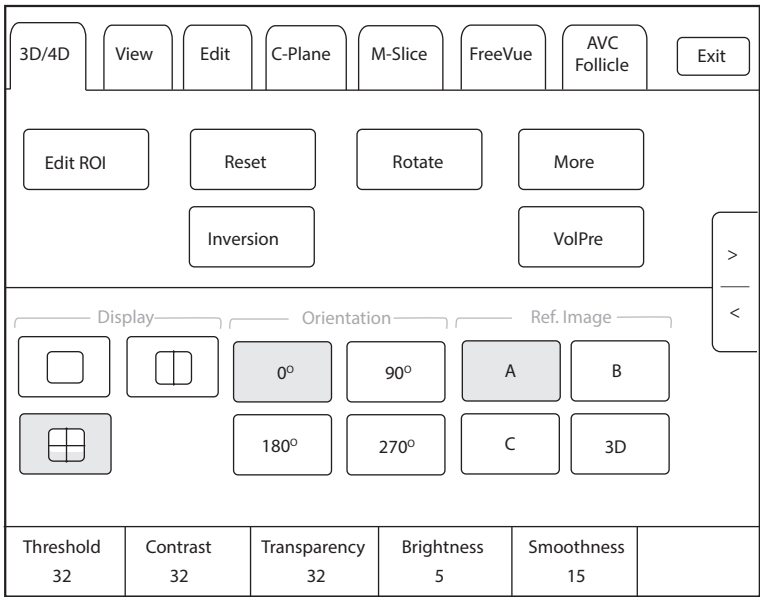
Figure 6-35 Touch Screen Display_3D Imaging

- Tap < or > to turn the current screen to the previous or the next page.

- Tap **More** on the touch screen to adjust the relevant parameters, including **2D GSC**, **3D GSC**, **Contrast Pos.** and **Transp. Gray**.

- Tap **VolPre** or press the ⏮ key to return to the pre-activated 3D mode.

- Tap **Exit** on the **3D/4D** tab to return to the real-time B mode. Tap **Exit** on other tabs to switch to the **3D/4D** tab.

6.9.2 Working with 3D Images

You can view, optimize, save or review 3D images in 3D imaging mode.

You can enable the **Edit ROI** feature to adjust the image position, VOI size and cutting line.

■ **Adjusting the ROI**

You can adjust the image position, size and anchor by selecting View A, View B, View C and 3D image to adjust the sample volume.

Perform the following steps to adjust the ROI.

1. On **3D/4D** tab, tap **A**, **B**, **C** or **3D** to select the desired reference image.

2. Adjust images inside the ROI on the reference image, as shown in Figure 6-36.

   NOTE:

   You can adjust the position and size of 3D image, but cannot adjust the anchor.
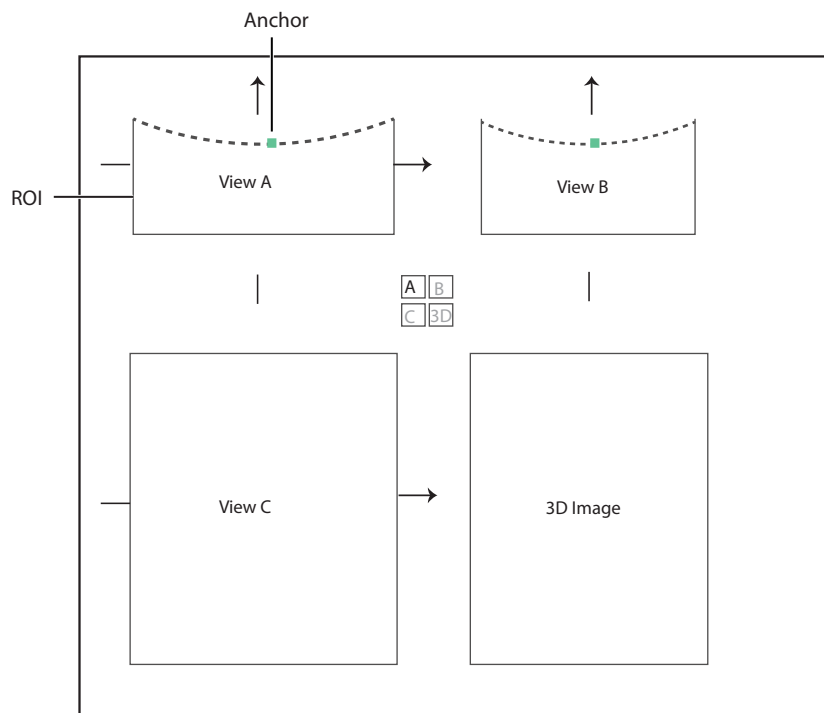
Figure 6-36 Adjusting the ROI

– Use the trackball to position the ROI.

– Press the Set key on the control panel and use the trackball to resize the ROI.

– Press the Set key again and use the trackball to position the anchor to change the shape of sample line.

– If needed, press the Set key and use the trackball to position the image.

Only images inside the ROI are generated to a 3D image, and the real-time 3D image is also displayed when cropping reviews.

■ **Setting Display Format**

On **3D/4D** tab, tap ▭, ▯▯, or ⊞ to enter the full, dual or quad split display mode respectively.

■ **Auto Face**

When viewing the fetal images, the fetal face is often obscured by the placenta, umbilical cord, uterine adnexa or hands. In frozen mode, tap **Auto Face** on the touch screen to automatically remove the obstructions before the fetal face in the image. Tap **Auto Face** again to restore to the previous image.

■ **Setting Render Mode**

On **3D/4D** tab, tap **>** on the touch screen to turn the page and tap an item under **Render Mode** to select a render mode.

Surface	Displays gray values of the surface structures. It is suitable for observing the contour (eyes, ears, nose, lip) of fetus.
Grad. Light	Displays the surface structures in a strengthen light intensity. It is suitable for observing the contour (eyes, ears, nose, lip) of fetus.
Skeleton	Displays the highest intensity of echo along the ultrasound beam. It is suitable for observing the spinal column and skeleton of the fetus. You can select Skeleton or Skeleton Depth.
X-Ray	Displays all gray values within ROI. It is suitable for observing tissue or tissue mass.
S-Depth	Displays color signals of the echoes along the ultrasound beam. It is suitable for observing the contour (eyes, ears, nose, lip) of fetus.
Transp. Min	Displays the minimum gray value within ROI. It is suitable for observing dark areas (vessels, cysts).
S-Live	Displays sides of the surface structures in a strengthen light intensity. The icon appears at the lower-right corner of the screen when S-Live mode is selected. It is suitable for observing 3D surface. You can select S-Live or S-Live Silhouette.

■ **Cropping Reviews**

You can crop the 3D image by tracing its border, adjusting a box or using the eraser.

Cut Method	Description	Operations

Crop reviews with trace	You can crop 3D image by tracing its border to remove areas outside the area of interest. This feature is suitable for cropping irregular reviews.	1. Tap **Edit** > ![icon] or ![icon] to enable the feature.
		  – Tap ![icon] to remove all data inside the traced area from the image.
		  – Tap ![icon] to remove all data outside the traced area from the image.
		2. Move the cursor onto 3D image by using the trackball, press the Set key on the control panel, and then trace the border of the object.
		
		3. Press the Set key to acquire the desired image.
		In the following figure, ![icon] is enabled.

Crop reviews by the box	You can crop 3D image by adjusting a box on the 3D image to remove irrelevant areas from interest area. This feature is suitable for cropping regular reviews.	1. Tap **Edit** > ![icon] or ![icon] to enable the feature.
		  – Tap ![icon] to remove all data inside from the image.
		  – Tap ![icon] to remove all data outside from the image.
		2. Move the cursor onto 3D image by using the trackball, press the Set key on the control panel, and then trace the border of the object.
		3. Press the Set key to acquire the desired image.

Crop reviews by the eraser	You can crop 3D image by using the eraser to remove irrelevant areas from interest area. This feature is suitable for cropping irregular reviews.	1. Tap **Edit** > ![icon] (big eraser)or ![icon] (small eraser) to enable the feature. 2. Move the cursor onto 3D image by using the trackball, press the Set key on the control panel, and then use the eraser to remove irrelevant areas. 3. Press the Set key to acquire the desired image.

NOTE:

- *Tapping* ⟨🔁All⟩ *can restore the review.*
- *Taping* ⟨🔁Last⟩ *can undo the last cut.*
- *Taping* ⟨↪⟩ *can redo the last cut.*

■   **Moving/Rotating/Magnifying Images**

Function	Operations
Select an image	On **3D/4D** tab, tap **A**, **B**, **C** or **3D** to select an image.
Move images	On **View** tab, rotate the key located directly below **Move L/R** or **Move U/D**, or rotate the ⟨⟩ key on the control panel to move images.
Rotate images	• On **3D/4D** or **Edit** tab, tap **Rotate** and rotate the 3D image by using the trackball. • On **View** tab, tap an item below **Auto Rotate** to set the rotation angle. All images are automatically rotated from the original position to the position of 1/2 preset angle and then rotated in a reversed way in turns. • On **View** tab, tap an item below **Direction** to change the observation direction. • On **View** tab, rotate the key located directly below **Rotate X**, **Rotate Y** or **Rotate Z** to rotate the images along X, Y or Z axis respectively. • Rotate the **M**, **PW** or **C** key on the control panel to rotate the images along X, Y or Z axis respectively. • On **3D/4D** tab, tap an item below **Orientation** to rotate the 3D image.
Zoom out/in all images	Rotate the **Zoom** key on the control panel to zoom in or zoom out the images. Meanwhile, a size multiplier is displayed in the information area of the basic screen. Press the **Zoom** key on the control panel to restore to the default size.
Inverse images	On **3D/4D** tab, tap **Inversion** to inverse the gray values of anechoic structures on 3D image.

■   **Optimizing the Images**

Function	Operations
Change the image color	On **3D/4D** tab, • Rotate the key located directly below **3D Chroma** to select the color scheme for the 3D image. • Rotate the key located directly below **B Chroma** to select the color scheme for reference images. The grayscale or color map on the top right of the imaging area varies with this setting.
Adjust the contrast and transparency	On **3D/4D** tab, • Rotate the key located directly below **Contrast** to adjust the contrast of the 3D image. • Rotate the key located directly below **Transparency** to adjust the transparency of the 3D image.

Function	Operations
Adjust the threshold, smoothness and brightness	On **3D/4D** tab, • Rotate the key located directly below **Threshold** to adjust the threshold value of the 3D image. • Rotate the key located directly below **Smoothness** to adjust the smoothness of the 3D image. • Rotate the key located directly below **Brightness** to adjust the brightness of the 3D image.
µScan	On **3D/4D** tab, • Rotate the key located directly below **2D µScan** to adjust the image effect of three reference images. • Rotate the key located directly below **3D µScan** to adjust the image effect of the 3D image.
Adjust the light position	In S-Live mode, • Tap **Edit Light** on the touch screen and rotate the trackball to adjust the light position. • Rotate the key located directly below **Light Pos.** to adjust the light position. The light icon at the lower-right of the screen will change accordingly, and the shined area of 3D image will be brightened.

■ **C-Plane**

You can observe reviews by using the plane.

Perform the following steps to observe a review.

1. Tap **C-Plane** tab on the touch screen to enable this feature as shown in Figure 6-37.
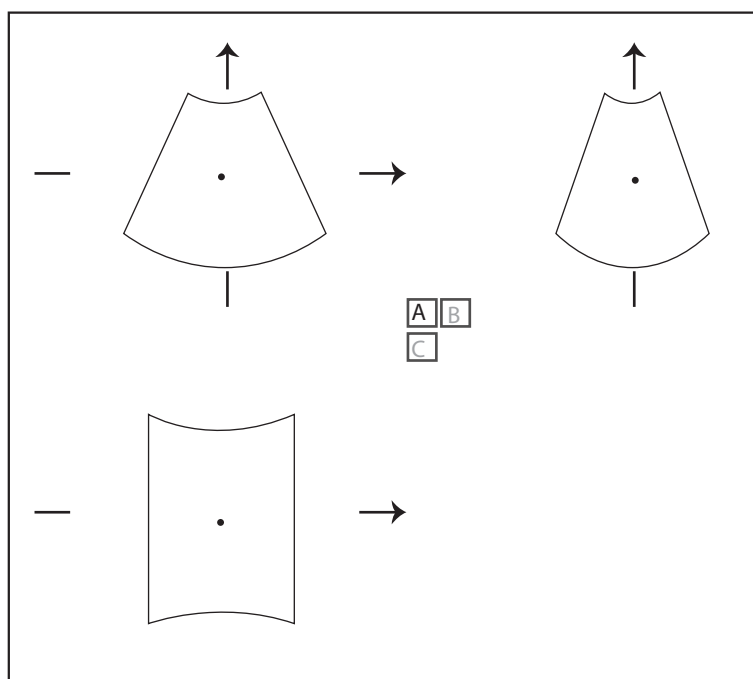
Figure 6-37 C-Plane Image Screen

2. Tap **A**, **B** or **C** to select the desired reference image, and then tap $\boxed{\text{A}|\text{B}}$, $\boxed{\text{A}|\text{C}}$, $\boxed{\text{B}|\text{C}}$, $\boxed{\substack{\text{A}|\text{B}\\\text{C}}}$ or $\boxed{}$ to select the display format.

3. Move the cursor on the desired reference image by using the trackball, and observe other reference images on the screen.

■ **M-Slice**

You can observe reviews by using two or more slices. For example, each layer of an irregular tumor can be observed by applying this feature.

Perform the following steps to observe a review.

1. Tap **M-Slice** > **A**, **B** or **C** to select the desired image.

   After the selection, the desired image on the corresponding axis is displayed on the screen.

2. Tap **1*2, 2*2, 3*3, 3*4, 4*4** or **5*5** to set the display format.

   In the following figure, 9-slice imaging on the X axis is taken as an example.
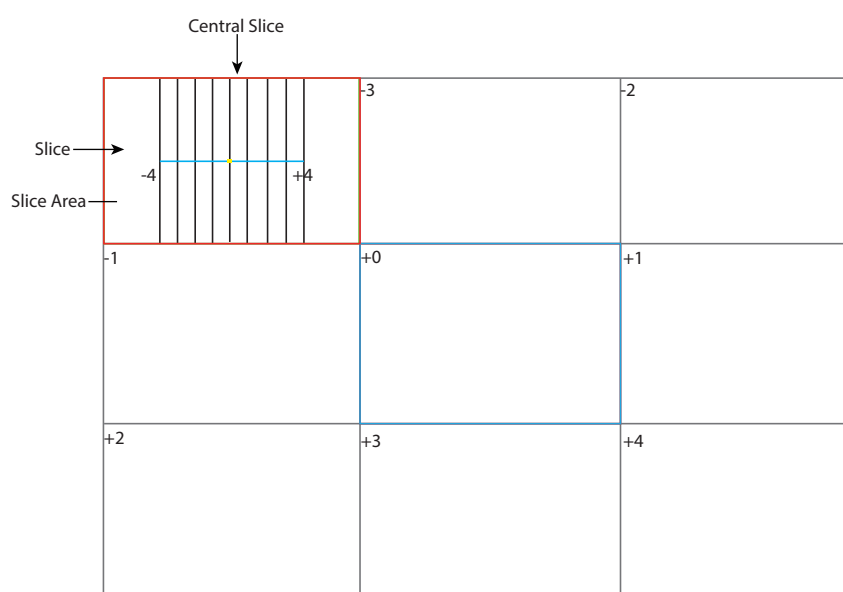
Figure 6-38 Multi-Slice Imaging Screen

Nine slices and the corresponding number are displayed on the slice imaging. The middle full line is the central slice in the current slice axis, and it is numbered as 0.

Except for the central slice, the other eight slices are indicated by the number at the top left corner of the slice and are displayed on the screen. Rotate the key located directly below **Display** on the touch screen to move all the slices in the slice area left or right.

Move the cursor on one slice by using the trackball to select it.

You can also adjust the following parameters on **M-Slice** tab. The operations are as follows.

● Rotate the key located directly below **Adjust Pos.** to fine-tune the positions of all slices.

● Rotate the key located directly below **Distance** to adjust the span among the slices.

● Rotate the key located directly below **Slice Num** to adjust the number of slices.

● Rotate the key located directly below **B Chroma** to change the color of slices.

After adjustment, the slice position, slice distance, slice number, and the corresponding image of the slice will change accordingly.

■   **FreeVue**

You can acquire the coronal section by cutting any section. FreeVue is often used to display the endometrium and view the fetal malformatuions.

Perform the following steps.

1. Tap **FreeVue** tab on the touch screen. The default line type is straight line and the line number is one.

    −   Tap an item below **Line Type** on the touch screen to select a line type.

    −   Tap an item below **Line Num** on the touch screen to select a line number.

2. Rotate the trackball and press the Set key to confirm the start point.

3. Rotate the trackball, and the line and the start point marker appear. Press the Set key (right key) to confirm the end point.

    −   If the line type is **Curve**, rotate the trackball to adjust curvature and press the Set key (right key) to finish drawing the line.

    −   If the line type is **Trace**, rotate the trackball to display the movement track and press the Set key (right key) to finish drawing the line.

    −   If the line type is **Poly Line**, rotate the trackball and press the Set key (right key) to confirm a control point. Repeat the operation to confirm many control points and rotate the trackball to form multi-segment curves.

4. After drawing the line, perform the following operations as needed.

    −   Tap **Clear** on the touch screen to clear the lines and restore to the previous status.

    −   Tap **Icon** on the touch screen to display or cancel the line and line number on the extracted slice.

    −   Tap and item below **Orientation** on the touch screen to change the viewing orientation.

    −   Tap and item below **View** on the touch screen to change the viewing type.

■   **Setting the Scan Mode**

Set the scan mode in accordance with your preference.

In the pre-activated freehand 3D, tap an item below **Scan Mode** on the touch screen to set the scan mode.

NOTE:

This feature is only effective when entering the freehand 3D imaging mode from B mode.

■   **Adjusting ZAngle/ZScale**

The image may be distorted if you perform the scan too quickly by using the probe. To acquire a vivid image, you can adjust the value of **ZAngle**/**ZScale** before the scan.

●   If the scan mode is set to **Sweep**, you can adjust the sweep angle when performing the scan with the probe. Rotate the key located directly below **ZAngle** to adjust the angle.

●   If the scan mode is set to **Parallel**, you can adjust the sweep span when performing the scan with the probe. Rotate the key located directly below **ZScale** to adjust the scale.

NOTE:

This feature is only effective when entering the freehand 3D imaging mode from B mode.

■   **Restoring the Image**

Tap **3D/4D** > **Reset** to restore the views and cutting lines to the default position.

■   **Customizing Presets**

You can modify parameters, adjust sample volume or ROI in the 3D mode and save them as the application preset for future use. Moreover, the customized layout of the application mode screen can be modified

and restored to factory defaults. For the detailed operations about the application preset, refer to Section 6.1.1 Customizing a Preset.

The application presets can be displayed as options of the **User Mode** items in the pre-activated 3D mode.

NOTE:

Only the volume probes are capable of this feature.

6.10   4D Imaging

4D imaging enables the display of real-time 3D anatomical structures.

4D imaging can only be performed by compatible volume probes. 4D imaging adds the dimension of "movement" to a 3D image by providing continuous, real-time displays of internal organs or fetus. 3D imaging provides single frame images, while 4D imaging provides continuous, high volume acquisition of 3D images.

The following description uses obstetric examination (1st Trim.) performed with the VE9-5 probe as an example.

6.10.1   Acquiring 4D Images

Before entering the 4D imaging mode, optimize the 2D images to ensure the high contrast.

■   **Entering the Real-Time 4D Imaging**

Perform the following steps.

1. Enter the patient information and select a probe and an exam type, and the system automatically enters the real-time B mode.

2. Optimize imaging parameters in the B mode to ensure the high contrast, high gain and low noise.

3. Apply adequate gel on the patient.

4. Acquire a high quality B-mode image.

5. Press the **3D/4D** key on the control panel and tap **4D** tab on the touch screen to enter the pre-activated 4D mode.

    NOTE:

    For volume probes, you can set the default pre-activated mode. For details, refer to 4.1.3 MultiKey Settings.

    The 2D image, ROI and sample line are displayed on the basic screen, as shown in Figure 6-39. Only the data in the sample volume can be used to generate the 4D image.
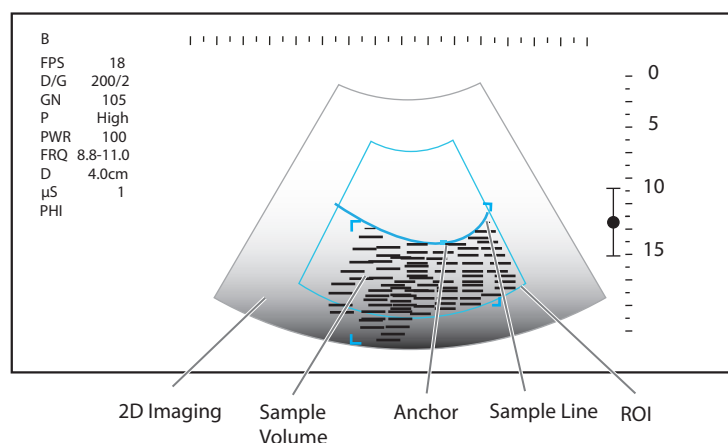
Figure 6-39 Pre-activated 4D Imaging Screen

6. Adjust the ROI and sample line.

    − Use the trackball to position the ROI.

    − Press the Set key on the control panel and use the trackball to resize the ROI.

– Press the Set key again and use the trackball to position the anchor to change the shape of sample line.

– If needed, press the Set key and use the trackball to position the ROI.

7. Set the sweep angle, focus position, image quality and stability.

– Rotate the key located directly below **Sweep Angle** to adjust the sweep angle of the probe.

– Rotate the key located directly below **Focus** to decrease or increase the depth of focal zone.

– Rotate the key located directly below **Image Quality** to set the quality of images.

– Rotate the key located directly below **Stability** to enable or disable the image stability.

8. Tap ▭, ⬚, or ⊞ on the touch screen to select a display mode, and tap **Start** or press the ⏮ key to display the 4D imaging in a full, dual or quad display. The system automatically enters the 4D imaging in a quad display by default.

The imaging area of the screen is divided into 3 reference images and a dynamic 3D image by default.
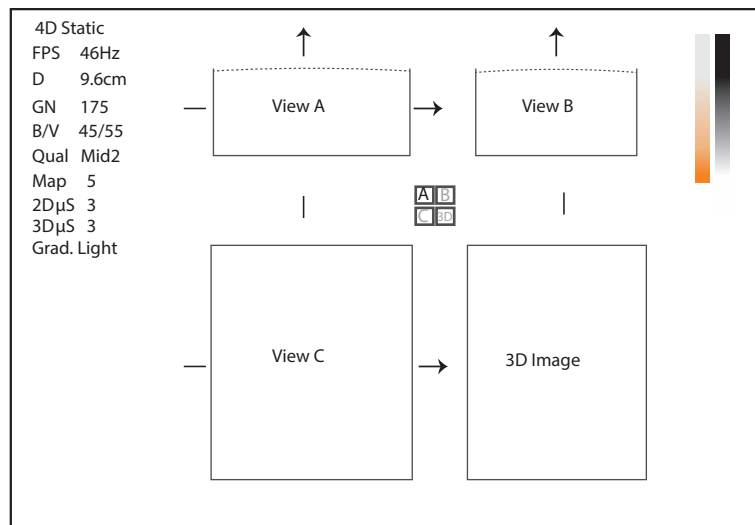
Figure 6-40 4D Imaging Screen

As the above figure shows,

● View A on the top left shows the image on the X-axis.

● View B on the top right shows the image on the Y-axis.

● View C on the bottom left shows the image on the Z-axis.

● The image on the bottom right shows the dynamic 3D image.

As Figure 6-41 shows, the touch screen displays all controls related to the 4D imaging.
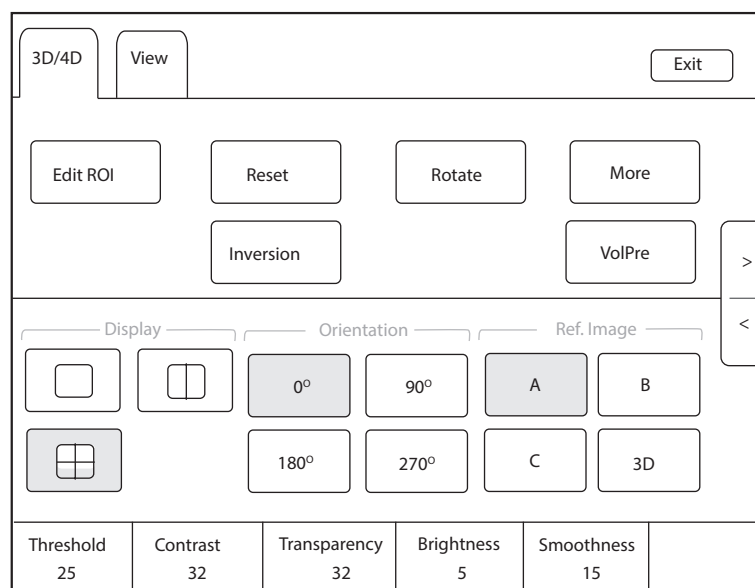
Figure 6-41 Touch Screen Display_4D Imaging

- Tap > or < to turn the current screen to the previous or the next page.
- Tap **VolPre** to return to the pre-activated 4D mode.
- Tap **Exit** on the **3D/4D** tab to return to the real-time B mode. Tap **Exit** on other tabs to switch to the **3D/4D** tab.

■ **Acquiring Dynamic 3D Image**

You can acquire a dynamic 3D image of high quality in the real-time 4D mode by applying the features described in Section 6.9.2 Working with 3D Images. You can also tap **Edit ROI** on the touch screen to freeze three reference images and then use the trackball to view the 3D image for better observation. Tap **Edit ROI** again to unfreeze three reference images.

After acquiring an appropriate image, press the ⏮ key on the control panel, and tap **Cine** tab on the touch screen, and then tap **Auto Play** to automatically play the cine.

6.10.2 Working with 4D Images

You can review, optimize or save 4D images in the frozen 4D mode. For details, refer to Section 6.9.2 Working with 3D Images.

6.11 Panoramic Imaging

Panoramic imaging is an imaging process that produces a panoramic image by using certain probes. The panoramic image provides sequentially and individually aligned 2D images on a static image. The 2D images are real-time, showing their anatomical context of an adjacent structure. Panoramic imaging allows you to display, view and measure a new stitched image constantly.

NOTE:

- *Panoramic imaging is available with linear, curved and phased array probes.*
- *Apply an adequate amount of coupling gel along the intended path of the scan.*
- *Do not shake, rotate or tilt the probe during the scan.*
- *Ensure the probe remains to be in contact with the skin perpendicularly during the scan.*
- *When the scan depth increases, it is generally required to decrease the scan speed.*

6.11.1   Real-Time Panoramic Imaging

Panoramic imaging is available in B mode, CFM mode and PDI mode. The operation for panoramic imaging in CFM and PDI mode is similar to that of B mode. The following description uses B-mode panoramic imaging as an example.

Perform the following steps.

1. Optimize the B-mode image to ensure the high contrast, high gain and low noise.

2. Tap **Panoramic** on the touch screen to enter the pre-activated panoramic imaging mode.

3. Press the **Update** key on the control panel or tap **Start** on the touch screen to enter the real-time panoramic imaging mode.

4. Acquire the images, and the real-time stitched image is displayed on the screen.

5. After acquisition, press the ⏮ key to freeze the image and the image is displayed in full view on the screen as shown in Figure 6-42.

    You can tap **Ruler** on the touch screen to display or hide the ruler.
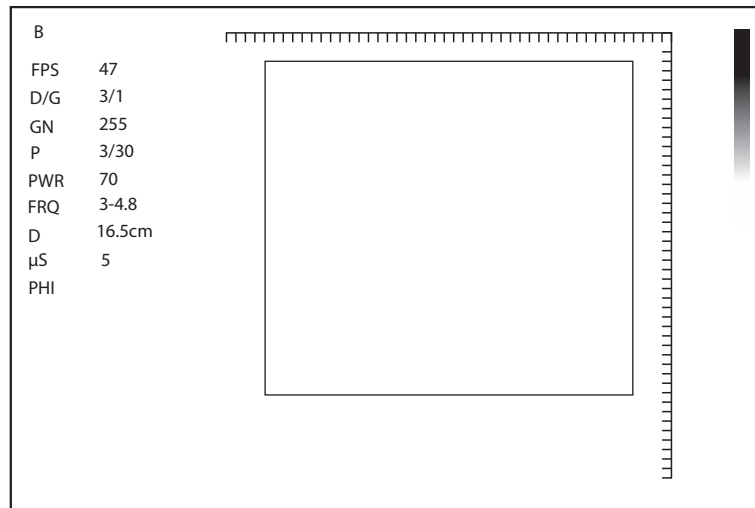
Figure 6-42 Panoramic Imaging in Frozen Mode

You can press the ⏮ key again to return to the pre-activated mode.

6. Tap **Exit** on the touch screen to exit panoramic imaging.

6.11.2   Optimizing the Images

■   **Zoom**

Rotate the key located directly below **Zoom** to zoom in or zoom out the image. Rotate the trackball to select the region of interest and the zoom box is displayed on the thumbnail.

■   **Rotation**

Rotate the key located directly below **Rotate** to rotate the image clockwise or anticlockwise.

■   **Full View**

Tap **Overview** on the touch screen to restore the processed image to the original status.

■   **Chroma**

Rotate the key located directly below **Chroma** to adjust the chroma of the image.

■   **Grap Map**

Rotate the key located directly below **Gray Map** to adjust the grayscale value.

6.12   Stress Echocardiography

Stress Echocardiography (hereinafter called Stress Echo) is one of the ways to diagnose cardiovascular diseases. Stress Echo uses exercise stress or pharmacological stress to induce myocardial ischemia, and then uses ultrasound images of cardiac views at rest stage and stress stage for comparative analysis and scoring, to determine segmental motion abnormalities of the left ventricular wall. It can also help to diagnose and evaluate myocardial ischemia and ischemic degree, coronary flow reserve, exercise ability, occurrence and prognosis of cardiovascular events.

NOTE:

Only phased array probes support Stress Echo.

6.12.1   Operation Procedures

Before using the Stress Echo function, you should enable the ECG function and ensure that ECG wave is normally displayed on the screen. The following description uses Cardiac examination performed with the 3P-A probe as an example.

Perform the following steps.

1. Select a probe and an exam type.

2. Tap **Stress Echo** on the touch screen and create new patient information to enter the protocol selection screen. If the patient information already exists, the system directly enters the protocol selection screen.

Figure 6-43 Protocol Selection Screen

3. Tap the button on the touch screen to select a protocol. The system supports the following protocols by default.

– Exercise-2×4: It is an exercise stress protocol that supports Rest and Impost stages. Each stage supports cine acquisition for PLAX, PSAX, A4C and A2C views.

– Exercise-3×4: It is an exercise stress protocol that supports Rest, Post and Recovery stages. Each stage supports cine acquisition for PLAX, PSAX, A4C and A2C views.

– Pharma-4×4: It is a pharmacological stress protocol that supports Base, Low Dose, Base Dose and Recovery stages. Each stage supports cine acquisition for PLAX, PSAX, A4C and A2C views.

4. Acquire the cine, and the selected protocol, stages and views are displayed on the left of the screen. The system supports non-continuous and continuous acquisition modes and the operations are as follows.

   NOTE:
   - *When the system is connected to the ECG, the cine is acquired in the unit of cardiac cycle by default. If the cine needs to be acquired in the unit of time, tap* **Loop Type** *on the touch screen to switch.*
   - *Before ending the stage, you can reacquire the cine.*
   - *For acquisition mode settings, refer to Section 4.4.1 Stress Echo Settings.*

Acquisition Modes	Operations
Non-continuous	1. At non-continuous stage, tap **Acquire** on the touch screen or press the **P2** key on the control panel to start acquisition. The acquired view is marked with "√" and the system goes to the next view for acquisition by default. 2. Tap **Acquire** or press the **P2** key again to start acquisition for next view. Or rotate the key located directly below **Views** to select other views.

Continuous	1. At continuous stage, tap **Acquire** on the touch screen or press the **P2** key on the control panel to start acquisition. The progress bar is displayed on the left of the screen.
	   − If you need to pause acquisition, tap **Pause Acquire** on the touch screen.
	   − If you need to continue acquisition, tap **Continue Acquire**.
	   − If you need to stop acquisition at the current stage in advance, tap **End Acquire** or press the **P2** key on the control panel.
	2. During the acquisition, rotate the key located directly below **Views** to select views.

5. Set the exam timer or stage timer.
   − If necessary, tap **Stage Timer** on the touch screen to enable or disable the stage time record. The stage timer is displayed as SE T2 on the screen.
   − If **Auto start exam timer** is not ticked on the Stress Echo settings screen, tap **Exam Timer** on the touch screen to enable the exam time record. The exam timer is displayed as SE T1 on the screen.

6. Select the cine. For the detailed operations, refer to Section 6.12.4 Selecting the Clips.

7. End the acquisition and storage of cines at the current stage.
   − If **Auto end stage** is ticked in the protocol, the system ends the cine acquisition after completing the acquisition at the current stage.
   − If **Auto end stage** is not ticked in the protocol, you need to tap **End Stage** on the touch screen to end the cine acquisition after completing the acquisition at the current stage.

8. Repeat the acquisition procedures to complete acquisition and storage of cines at all stages. The system enters the comparison screen automatically.

9. Perform the comparative analysis and scoring of cines.

6.12.2   Screen Display
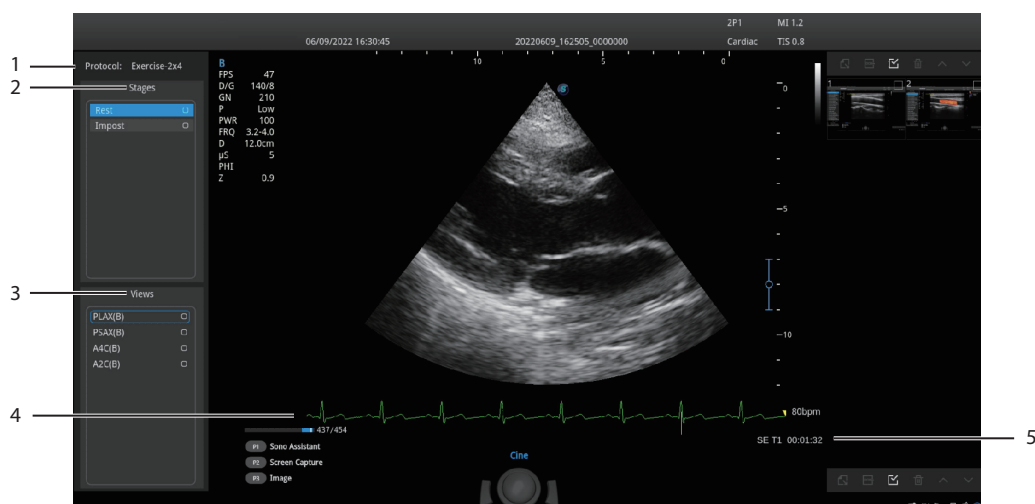
Figure 6-44 Stress Echo Screen

No.	Description
1	Protocol type
2	Acquisition stages and the completion status of stages
3	Views and the completion status of views ● PLAX: Parasternal long-axis ● PSAX: Parasternal short-axis ● A4C: Apical four-chamber ● A2C: Apical two-chamber
4	ECG wave
5	Displays timer. ● SE T1: Displays the accumulated time of whole exam. ● SE T2: Displays the acquisition time at the current stage.

6.12.3   Acquiring Echocardiograms
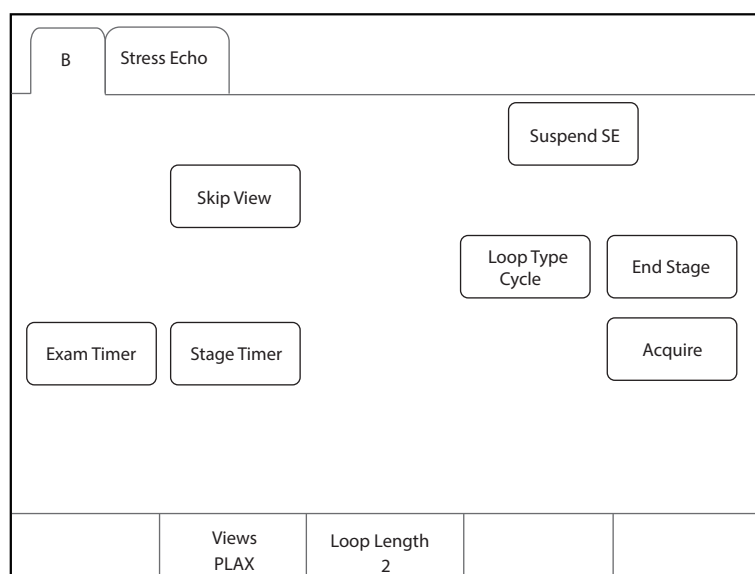
Figure 6-45 Acquisition Screen

Item	Description
Suspend SE/ Resume SE	Tap it to suspend or resume the current stress echo exam.
Skip View	Tap it to go to the next view and the skipped view is mark with "✕" at the right side.
Loop Type	Tap it to switch the storage type. You can select the storage type to store the cine in the unit of **Cycle** or **Time**.
End Stage	Tap it to go to the next stage for acquisition.
Exam Timer	Tap it to start recording the time of whole stress echo exam.
Stage Timer	Tap it to start or stop recording the acquisition time at a stage.
Acquire	Tap it to start acquisition.
Views	Rotate the key located directly below it to select a view.
Loop Length	Rotate the key located directly below it to set the cardiac cycle or time.

6.12.4   Selecting the Clips

The selected clips are used for analysis and wall motion scoring. You can select the clips acquired for each view and stage.

- If the non-continuously acquired clips for each view are more than one and **Select** on the Stress Echo settings screen is ticked, the system enters the clip selection screen automatically after acquisition, and you can select the desired clips for the view.

- If the continuous acquisition mode is selected and **Select** on the Stress Echo settings screen is ticked, the system enters the clip selection screen automatically after acquisition, and you can select the desired clips for the stage.

The operation of selecting clips for views is the same as that of stages. The following description takes clip selection for stages as an example.
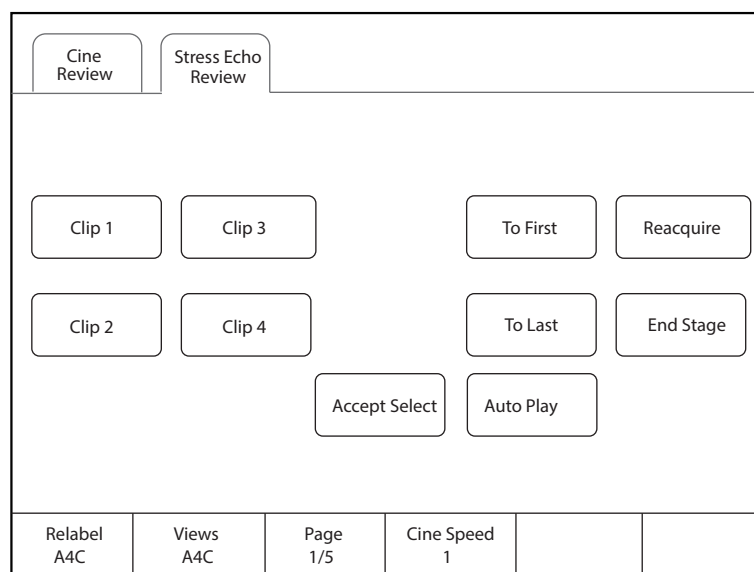
Figure 6-46 Clip Selection Screen

If necessary, perform the following operations on the clip selection screen.

Functions	Operations
Select a view	Rotate the key located directly below **Views** to select a view.
Select a clip	Tap **Clip 1**/**Clip 2**/**Clip 3**/**Clip 4** on the touch screen and tap **Accept selection** to select the clip. Multiple clips can be selected simultaneously.
View the first frame image or the lase frame image	Tap **To First**/**To Last** on the touch screen to view the first frame image or the lase frame image of the clip.
End acquisition at the current stage	Tap **End Stage** on the touch screen to end acquisition at the current stage.
Reacquire the clip at the current stage	Tap **Reacquire** on the touch screen to discard the acquired clips of the current view and reacquire the clip.
Rename the selected clip	Rotate the key located directly below **Rename** to rename the selected clip.
Adjust the play speed	Rotate the key located directly below **Cine Speed** to adjust the play speed.
Play the clips automatically	Tap **Auto Play** on the touch screen to play all clips automatically.
Display the selected clips	After selecting the clips, **Display Selected** button appears on the touch screen. Tap **Display Selected** on the touch screen and the accepted clips are displayed on the basic screen. If the clips are not selected, this button does not appear.

6.12.5   Comparative Analysis and Wall Motion Scoring

■   **Comparative Analysis**

After acquisition at all stages, you can make a diagnosis and assessment for the cardiac function by comparing the echocardiograms for all chambers at all stages.

On the comparison screen, rotate the key located directly below **Shuffle** to select the comparison type. The system provides the following comparison types.

- **View**: Compare the clips of the same view at different stages.
- **Stage**: Compare the clips of all views at the same stage.
- **Sequence**: Compare the clips of all views at all stages in order.
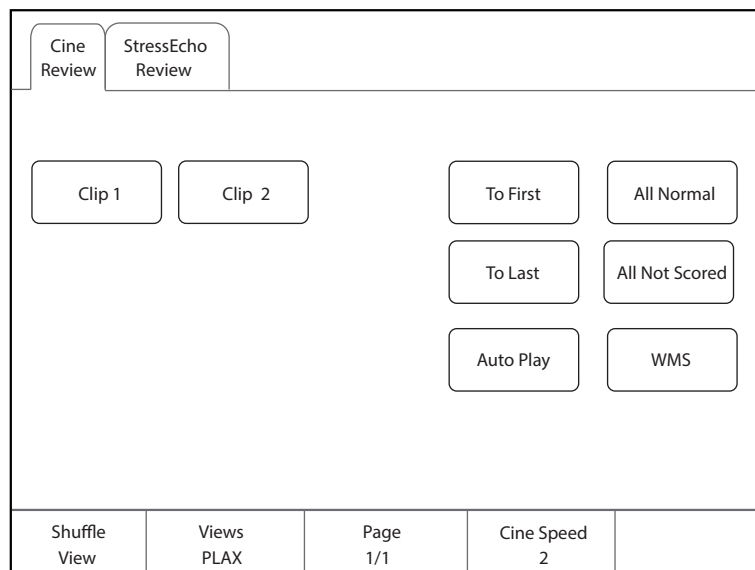
Figure 6-47 Echocardiogram Comparison

■ **Wall Motion Scoring**

Wall motion scoring is used to assist in stress echo exams for semi-quantitative evaluations of abnormalities with left ventricular wall motion. The left ventricle is divided into segments for scoring to evaluate the degree of abnormality and the scoring result is displayed in the report. You can score the specified segment of each view. You can give the normal score or default score to all segments.

The system supports two kinds of WMS segment types, including 16 and 17. Each segment has two kinds of WMS mechanisms, including 5 and 7 points. You can make relevant settings on the system settings screen. For details, refer to Section 4.4.1 Stress Echo Settings.

Perform the following steps.

1. Click the drop-down list beside **Stages** on the right of the scoring screen to select a stage.
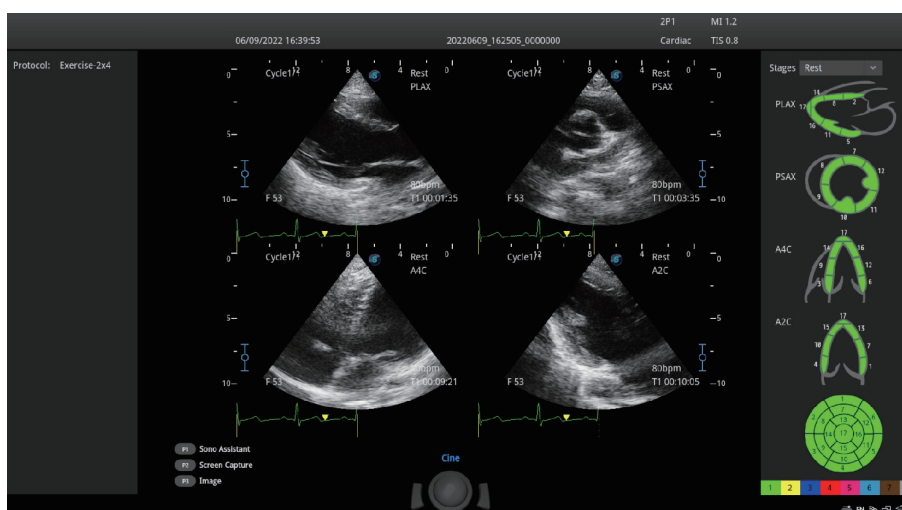
Figure 6-48 Segment Scoring Screen

2. Click a segment and the system displays the scores and the corresponding meanings. Rotate the trackball to select a score and press the Set key, and this segment is filled with the corresponding color.

The following description takes 7-point WMS mechanism as an example.

Score	Meaning	Color
1	Normal	Green
2	Hypokinesis	Yellow
3	Akinesis	Dark blue
4	Dyskinesis	Red
5	Aneurysm	Pink
6	Akinesis with scar	Light blue
7	Dyskinesis with scar	Brown
8	Not seen	Grey

3. Repeat step 2 to score all segments.
   - If necessary, tap **All Normal** on the touch screen to give the normal score to all segments of the currently displayed views.
   - If necessary, tap **All Not Scored** on the touch screen to restore the scores of all segments to the default.

6.12.6 Storing the Stress Echo Data

Stress Echo data contains Stress Echo clips, wall motion scores and all other information about Stress Echo exam. When the exam is ended, the system saves all data by default.

6.12.7 Ending the Stress Echo Exam

Tap **End Exam** on the touch screen to exit the current Stress Echo exam.

6.12.8 Stress Echo Report

The Stress Echo information, Stress Echo time, description of exercise stress examination or pharmacological stress examination, segment scoring and Bull's eye can be displayed in the report. You can set these items on the Stress Echo settings screen and the ticked information will be displayed in the report.

Tap **Report** on the touch screen to enter the measurement report screen. You can preview the report, view the Bull's eye diagram and perform other operations.

6.13 Myocardial Quantitative Analysis

The myocardial quantitative analysis is designed to analyze deformation of wall motion for segments of four chambers. It mainly focuses on analysis of wall motion velocity, displacement, strain, strain rate and volume, to detect global and regional wall motion abnormalities in patients with myocardial dysfunction. It is mainly used for cardiac exams.

The system provides curves of strain, strain rate, velocity, displacement, volume and time for myocardial quantitative analysis.

NOTE:
Only phased array probes support this feature.

6.13.1 Global Myocardial Quantitative Analysis

Global myocardial quantitative analysis (G-MQA) is available in B mode.

■ **Operation Procedures**

The following description uses Cardiac examination performed with the S1-5 probe as an example.

Perform the following steps.

1. Select a cardiac cine that contains at least 2 cardiac cycles.
   − Press the ⏮ key on the control panel to freeze the real-time cine.
   − Open a saved cine.

   NOTE:
   • *The current frozen cine or the saved cine can be used for myocardial quantitative analysis.*
   • *The single frame image cannot be used for myocardial quantitative analysis.*

2. Tap **G-MQA** on the touch screen to enter the view selection screen.
   a. Rotate the trackball or rotate the key located directly below **F By F** to browse the images and determine the desired image.
   b. Rotate the keys located directly below **Set First** and **Set Last** to select the desired image. (When the system is connected to ECG, the system selects the complete cardiac cycles automatically for image analysis.)

3. Select a view on the touch screen. The following views are available.
   − A2C: Apical two-chamber
   − A3C: Apical three-chamber
   − A4C: Apical four-chamber
   − PLAX: Parasternal long-axis
   − PSAX B: Basal short axis view at mitral valve level
   − PSAX M: Mid short axis view at papillary muscle level
   − PSAX A: Apical short axis view
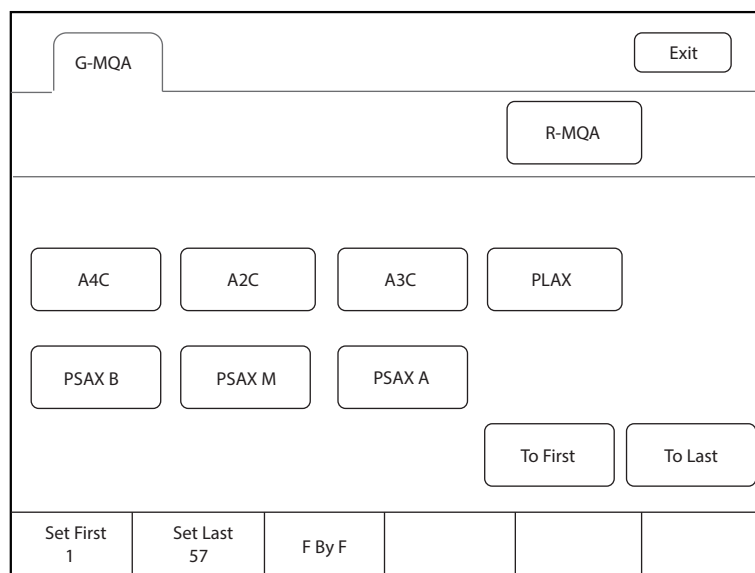
Figure 6-49 View Selection Screen

4. After a view is selected, the cursor appears on the screen. Set the reference points on the screen.
   − Long axis view (A2C/A3C/A4C/PLAX): Use three-point method to set the reference points of long axis myocardium. Place three points respectively on the bilateral mitral valve rings and the cardiac apex, and the system generates the trace curves automatically.
   − Short axis view (PSAX B/PSAX M/PSAX A): The system identifies short axis myocardium automatically.

5. After the reference points are set, the system displays the trace curves of boundary of the endocardium and epicardium automatically. If necessary, adjust the trace curves.

    If you are not satisfied with the trace result, tap **Redraw** on the touch screen to clear the current trace points and set the reference points again, or make fine adjustment to the points. For the detailed operations about fine adjustment, refer to "Trace Boundary Adjustment".

6. Tap **Done** on the touch screen to start analysis.

7. After analysis, the system displays the analyzed curves on the screen. If necessary, adjust the relevant parameters.

8. Tap **Bull's Eye** on the touch screen to view the result.

9. Tap **Exit** on the touch screen to exit G-MQA.

■ **Screen Display**
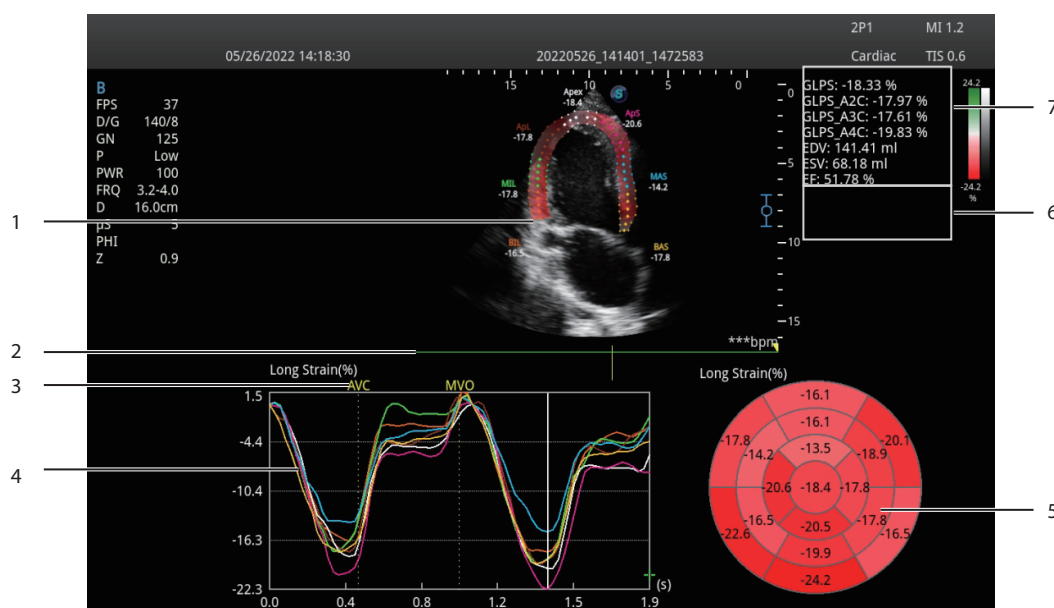
Figure 6-50 G-MQA Analysis Screen

No.	Description
1	Image used for tracing
2	ECG wave
3	Displays the time of AVO (aortic valve open), AVC (aortic valve close), MVO (mitral valve open) and MVC (mitral valve close).
4	Displays curves of the analyzed segments. Curve types contain strain, strain rate, velocity, displacement and volume. Each curve is corresponding to the divided segment of the view, and the color of each curve is same with that of each segment. ● Strain curve: X-axis represents time (s) and Y-axis represents deformation of the tissue (%). ● Strain rate curve: X-axis represents time (s) and Y-axis represents strain by time (1/s). ● Velocity curve: X-axis represents time (s) and Y-axis represents velocity (cm/s). ● Displacement curve: X-axis represents time (s) and Y-axis represents displacement (cm). ● Volume curve (long axis view): X-axis represents time (s) and Y-axis represents volume (ml).

No.	Description
5	Bull's eye diagram
6	Displays result of time measurement
7	Displays analysis results • GLPS: Global longitudinal peak strain • GRPS: Global radial peak strain • EDV: Maximum value of the end-diastolic volume during the view analysis • ESV: Maximum value of the end-systolic volume during the view analysis • EF: Ejection fraction

■　**Cine Selection**

You can select the cine with high-quality images to assure the accuracy of analysis results.

● To select a real-time cine

a. In B mode, press the ⏯ key on the control panel to freeze the target cine.

b. Tap **G-MQA** on the touch screen to enter the view selection screen.

● To select a saved cine

Select a saved cine file and press the Set key on the control panel twice, and then tap **G-MQA** on the touch screen to enter the view selection screen.

■　**Trace Boundary Adjustment**

You can adjust the trace curve according to the steps below.

1. After initial trace, move the cursor onto the desired trace point by using the trackball, and the trace point becomes larger.

2. Press the Set key on the control panel to select the trace point.

3. Rotate the trackball to move the selected trace point to the desired position, and press the Set key again to confirm the position.

4. Repeat steps 1-3 to complete adjustment of trace points.

■   **Image Analysis**
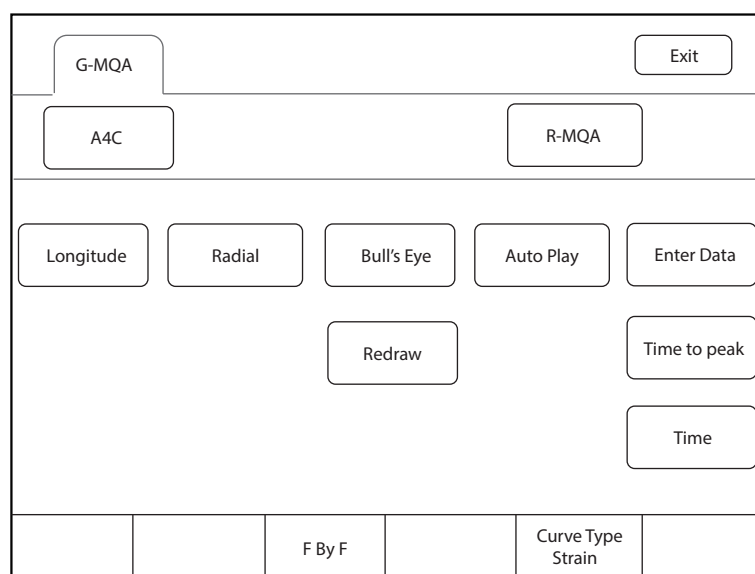
Figure 6-51 Touch Screen Display

Item	Description
Longitude/Radial/Circumference/Rotate	Tap it to analyze the global myocardial motion in this direction.
Bull's Eye	Tap it to display or hide the analysis result of bull's eye diagram.
Auto Play	Tap it to play the cine automatically.
Enter Data	Tap it to enter the time of AVO, AVC, MVO or MVC in the pop-up dialog box.
Redraw	Tap it to re-trace.
Time to peak	Tap it to display the time to peak.
Time	Tap it and select two points on the curves to calculate the time difference between two points.
Curve Type	Rotate the key located directly below it to change the curve type, including Strain, Strain Rate, Velocity, Displacement and Volume.
F By F	Rotate the key located directly below it to view the cine frame by frame.

6.13.2 Regional Myocardial Quantitative Analysis

Regional myocardial quantitative analysis (R-MQA) is available in B mode and TDI mode.

■   **Operation Procedures**

The following description uses Cardiac examination performed with the S1-5 probe as an example.

Perform the following steps.

1. Select a cardiac cine that contains at least 1 cardiac cycle.
    −   Press the ⏯ key on the control panel to freeze the real-time cine.
    −   Open a saved cine.

NOTE:

- *The current frozen cine or the saved cine can be used for myocardial quantitative analysis.*
- *The single frame image cannot be used for myocardial quantitative analysis.*

2. Tap **R-MQA** on the touch screen to enter the trace screen.

   a. Rotate the key located directly below **F By F** to browse the images and determine the desired image.
   b. Rotate the keys located directly below **Set First** and **Set Last** to select the desired image.

3. The cursor appears on the screen. Set the reference points on the screen.

4. Perform the straight line trace by using the trackball and the Set key to determine the segment of interest. A view can contain 20 segments of trace at most.

   If you are not satisfied with the trace result, tap **Redraw** on the touch screen to clear all segments and set the reference points again. Tap **Delete** to delete the previous segment.

5. Tap **Done** on the touch screen to start analysis.

6. After analysis, the system displays the analyzed curves on the screen. If necessary, adjust the relevant parameters.

7. Tap **Exit** on the touch screen to exit R-MQA.

■   **Screen Display**
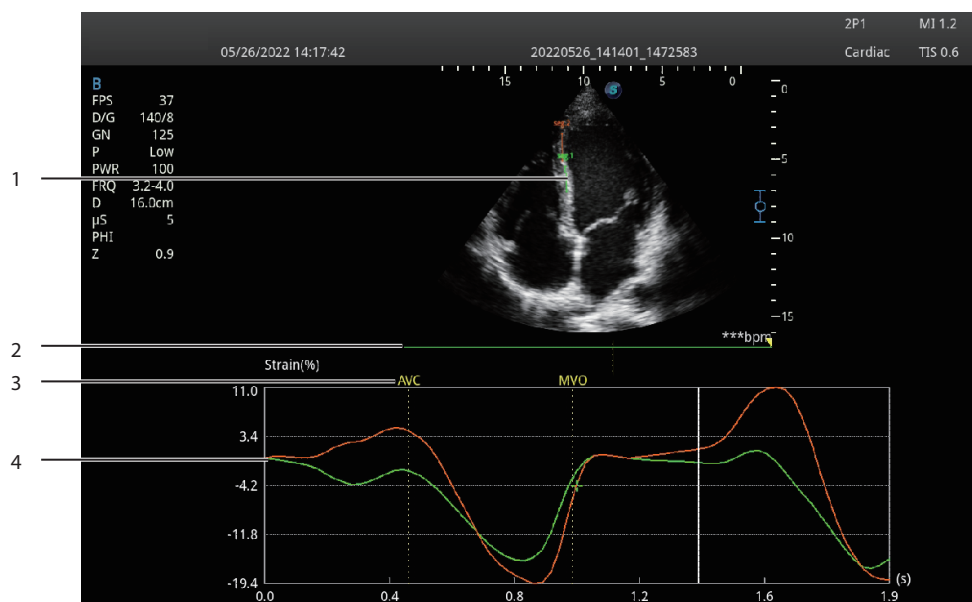
Figure 6-52 R-MQA Analysis Screen

No.	Description
1	Image used for tracing
2	ECG wave
3	Displays the time of AVO (aortic valve open), AVC (aortic valve close), MVO (mitral valve open) and MVC (mitral valve close).

No.	Description
4	Displays curves of the analyzed segments. Curve types contain strain, strain rate, velocity and displacement.
	Each curve is corresponding to the divided segment of the view, and the color of each curve is same with that of each segment.
	● Strain curve: X-axis represents time (s) and Y-axis represents deformation of the tissue (%).
	● Strain rate curve: X-axis represents time (s) and Y-axis represents strain by time (1/s).
	● Velocity curve: X-axis represents time (s) and Y-axis represents velocity (cm/s).
	● Displacement curve: X-axis represents time (s) and Y-axis represents displacement (cm).

■   **Cine Selection**

You can select the cine with high-quality images to assure the accuracy of analysis results.

● To select a real-time cine

In B mode or TDI mode, press the ⏯ key on the control panel to freeze the target cine.

● To select a saved cine

Select a saved cine file and press the Set key on the control panel twice, and then tap **R-MQA** on the touch screen to enter the trace screen.

■   **Image Analysis**
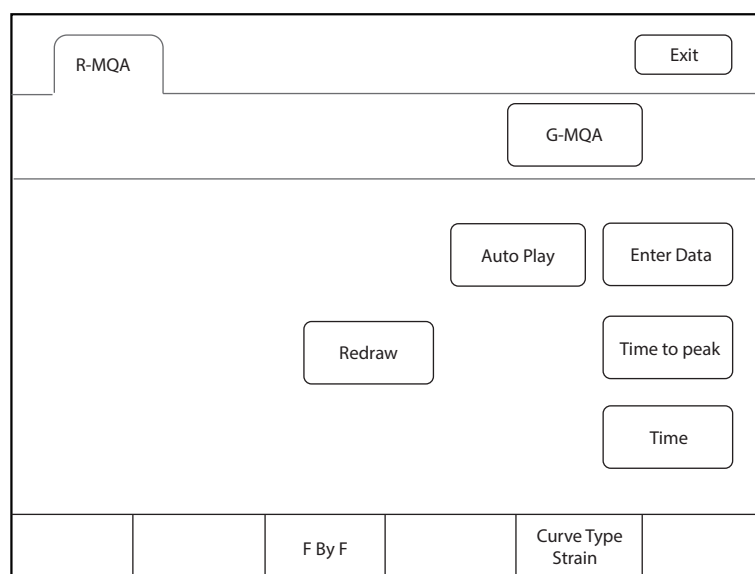
Figure 6-53 Touch Screen Display

Item	Description
Auto Play	Tap it to play the cine automatically.
Enter Data	Tap it to enter the time of AVO, AVC, MVO or MVC in the pop-up dialog box.
Redraw	Tap it to re-trace.
Time to peak	Tap it to display the time to peak.
Time	Tap it and select two points on the curves to calculate the time difference between two points.

Item	Description
Curve Type	Rotate the key located directly below it to change the curve type, including Strain, Strain Rate, Velocity and Displacement.
F By F	Rotate the key located directly below it to view the cine frame by frame.

6.14 Sono Assistant

The system provides Sono Assistant (Workflow Protocol) feature in obstetric and vascular applications. Each protocol contains a series of workflow templates. The physicians can customize the workflow templates, such as image mode, parameter, measurement, annotation and body mark, and complete the scan in accordance with the set workflow protocol.

■ **User-defined Key Settings**

You can set **P1/P2/P3/P4/U1/U2** key as **Sono Assistant**. The following description takes **U1** key settings as an example.

Perform the following steps.

1. Tap ⚙ on the touch screen to enter the system settings screen.

2. Click **General** > **MultiKey** to enter the user-defined key settings screen.

3. Click **U1** tab and select **Sono Assistant** in the drop-down list of **Advanced Function**.

4. Click **Apply** to save the settings, and the prompt information of the user-defined key is displayed on the basic screen.

■ **Operation Procedures**

The following description uses carotid examination performed with the 9L-A probe as an example.

Perform the following steps.

1. Create new patient information.

2. Select a probe and an exam type.

3. According to the screen prompt, press the **U1** key to enable the Sono Assistant, and the workflow protocol is displayed on the left side of the screen. (The first section is selected by default.)

4. Perform the scan and you can also perform the following operations during the scan.
   - Select the annotation and body mark on the section settings screen, the selected annotation and body mark will be displayed on the screen.
   - Tick **Freeze Response** on the section settings screen. If the section is configured with measurement items, the system activates measurement automatically when the image is frozen.
   - Tick **Press [↑] / [←] key to respond to the previous step, press [↓] / [→] key to respond to the next step** on the section settings screen, and press the ↓ / → key on the keyboard to activate the measurement.
   - Tap **Sono-help** on the touch screen to enable the reference image used for scan reference.

5. After the current scan is completed, press the **Pointer** key on the control panel to activate the trackball cursor and select other section, or tap **Next** on the touch screen to switch to other section.

   NOTE:

   *If you tick **Advance on save (Sono Assistant)** on the section settings screen, the system switches to the next section simultaneously when you save image or cine.*

6. Repeat steps 4-5 to acquire all section images.

7. Tap **Exit** on the touch screen to exit.

■   **Screen Display**

● Sono Assistant in Vascular Application
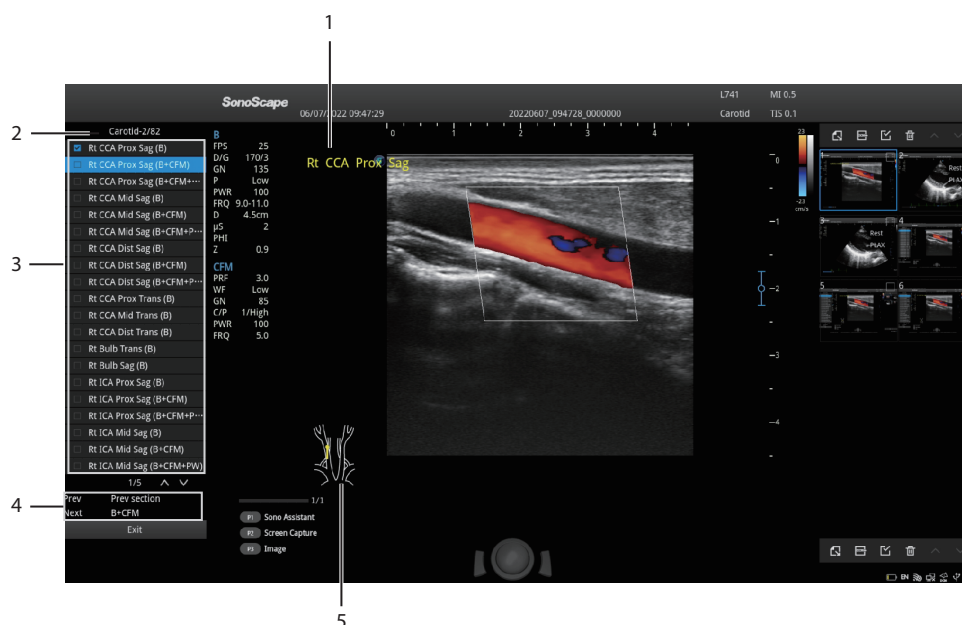
Figure 6-54 Sono Assistant_Vascular Application

No.	Description
1	Displays the annotation. Set it on the section settings screen.
2	Displays the protocol name, the current section order and the number of sections.
3	Displays all sections contained in the protocol and section completion status.
4	Displays the functions of **Prev** and **Next** on the touch screen.
5	Displays the body mark. Set it on the section settings screen.

● Sono Assistant in Obstetric Application

Figure 6-55 Sono Assistant_Obstetric Application

No.	Description
1	Displays the diagram of the current section.
2	Displays the protocol name, the current section order and the number of sections.
3	Displays all sections contained in the protocol and section completion status.
4	Displays the functions of **Prev** and **Next** on the touch screen.

■   **Touch Screen Display**

In Sono Assistant status, you can select and lock the section, and select, add or edit the protocol through the touch screen.
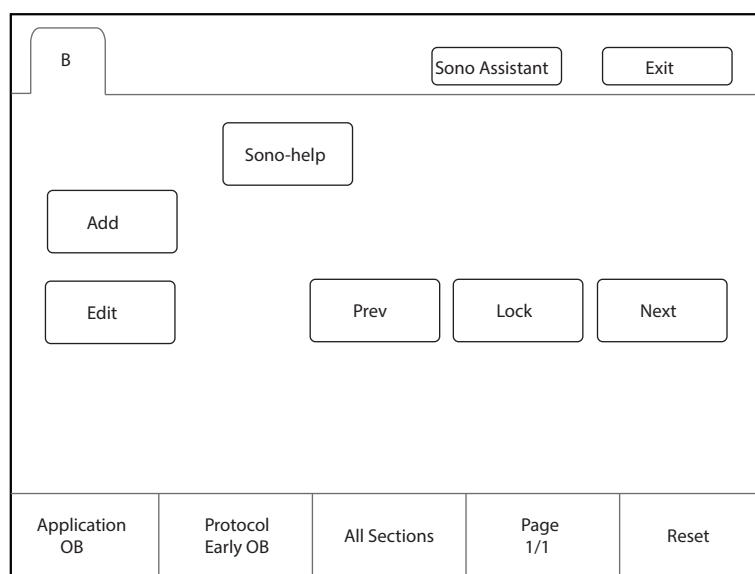
Figure 6-56 Sono Assistant Screen

Functions	Operations
Select the section	Rotate the key located directly below **Page** to view the sections on different pages. Tap **Prev** or **Next** on the touch screen to select a section to be scanned, and the current active section is highlighted.
Lock the section	If you need repeated scan of the same section during the scan, tap **Lock** on the touch screen to lock the section.
View the unfinished sections	Rotate the key located directly below **All Sections**, and all unfinished sections are displayed on the screen. Select the desired section to start scanning.
Add a section	Tap **Add** on the touch screen and enter the section name in the pop-up dialog box. If you want to set the current image as the diagram of the new section, click **Cur. Image** in the dialog box.
Reset the section	Rotate the key located directly below **Reset** to reset all sections.
Select the application	If the current exam mode is bound to the protocols of multiple applications, rotate the key located directly below **Application** to switch the application.

Functions	Operations
Select the protocol	If the current exam mode is bound to multiple protocols, rotate the key located directly below **Protocol** to select the corresponding protocol according to the current exam type.
Edit the section	Tap **Edit** on the touch screen to enter the section settings screen. For the detailed operations, refer to Section 4.4.4 Sono Assistant Settings.
Enable the Sono-help	Tap **Sono-help** on the touch screen to enable the reference image used for scan reference.

6.15 Sono-help

Sono-help is used to view the operation diagram and other information of the exam.

■ **User-defined Key Settings**

You can set **P1/P2/P3/P4/U1/U2** key as **Sono-help**. The following description takes **U1** key settings as an example.

Perform the following steps.

1. Tap ⚙ on the touch screen to enter the system settings screen.

2. Click **General** > **MultiKey** to enter the user-defined key settings screen.

3. Click **U1** tab and select **Sono-help** in the drop-down list of **Advanced Function**.

4. Click **Apply** to save the settings, and the prompt information of the user-defined key is displayed on the basic screen.

■ **Operation Procedures**

According to the prompt on the basic screen, press the **U1** key to enable the Sono-help. Click **Exit** or press the **U1** key again to exit the screen.
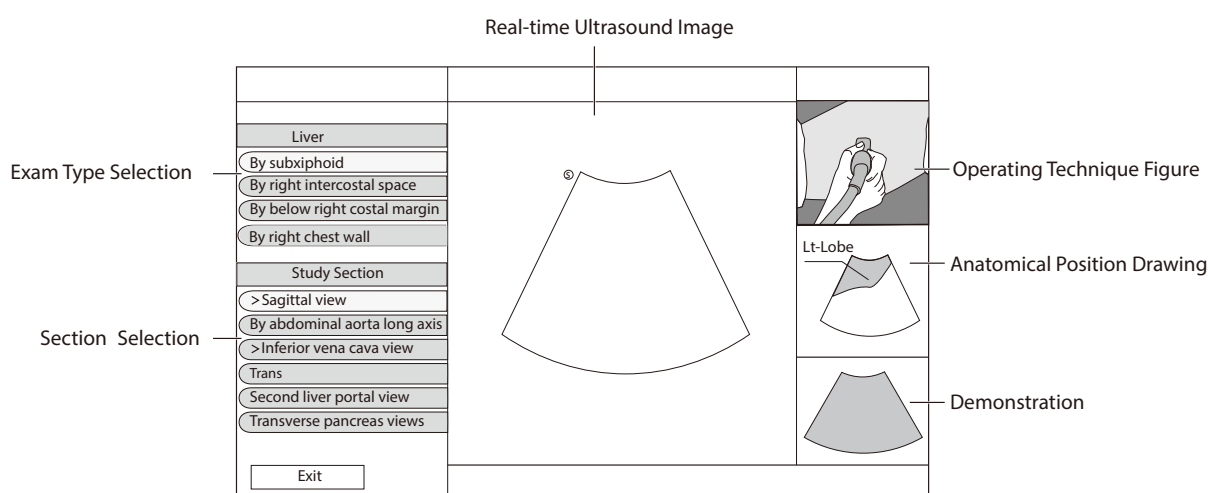
Figure 6-57 Sono-help Screen

6.16 DVR Recording

DVR recording is available to record the full screen of the monitor. After setting the user-defined key on the **System Settings** > **General** > **Multikey** screen, press the key to enable the DVR recording, and the recording

time is displayed on the right side of the monitor. Press the key again to exit the screen and the recorded DVR thumbnail is displayed on the clipboard.

7   Working with Images

You can work with the acquired images by using the features provided by the system, such as the split screen and annotations.

7.1   Imaging Features

7.1.1   Imaging Reverse

Tap Я on the touch screen to reverse the real-time scan left or right.

Tap Ʀ on the touch screen to reverse the real-time scan up or down.

7.1.2   Split Screen Display

You can position two or four images side by side on the screen to compare the images by using the split screen display.

■   **Dual-Split Screen Display**

1. In the real-time B, CFM, PDI, SR Flow or TDI mode, press the **Dual** key on the control panel to enter the dual-split screen display.

   The image is duplicated into two parts with a frozen image on the left and a real-time scan on the right. The real-time scan in B-mode is taken as an example, as shown in Figure 7-1.
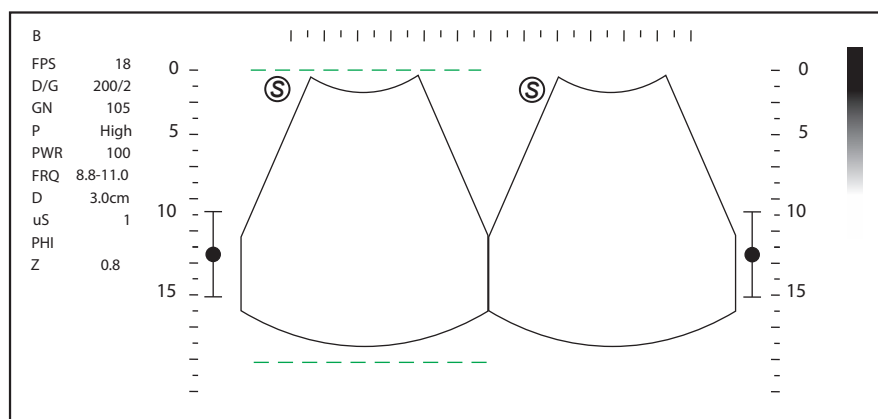
Figure 7-1   Real-time B+Frozen B

– Press the **Dual** key on the control panel to freeze the real-time scan and unfreeze the other image.

– Press the **B** key on the control panel to exit the dual-split display.

– If one of the two images is a color-mode image, tap **Dual Live** to display two real-time scans.

The image is duplicated into two parts with two real-time scans, as shown in Figure 7-2.
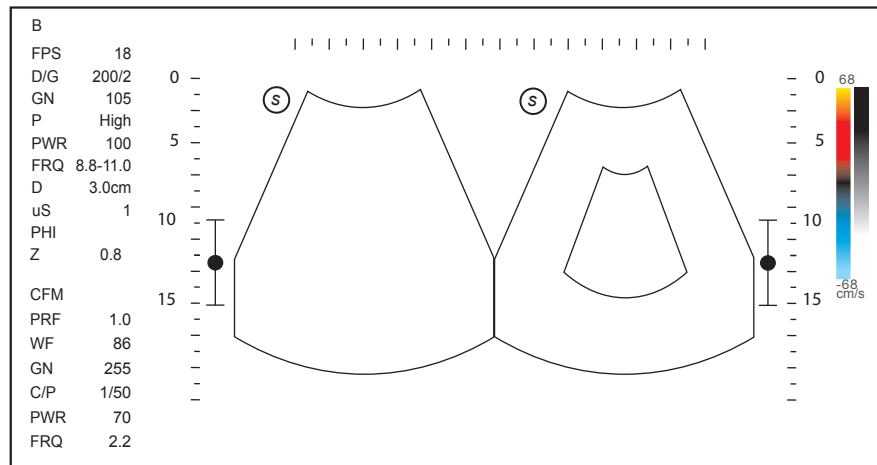
Figure 7-2 Real-time CFM + Real-time B

■   **Quad-Split Screen Display**

1. In the real-time B, CFM, PDI, SR Flow or TDI mode, tap ⊞ on the touch screen to enter the quad-split screen display. The current image size is a quarter of the original one.

    The B-mode image is taken as an example, as shown in Figure 7-3.
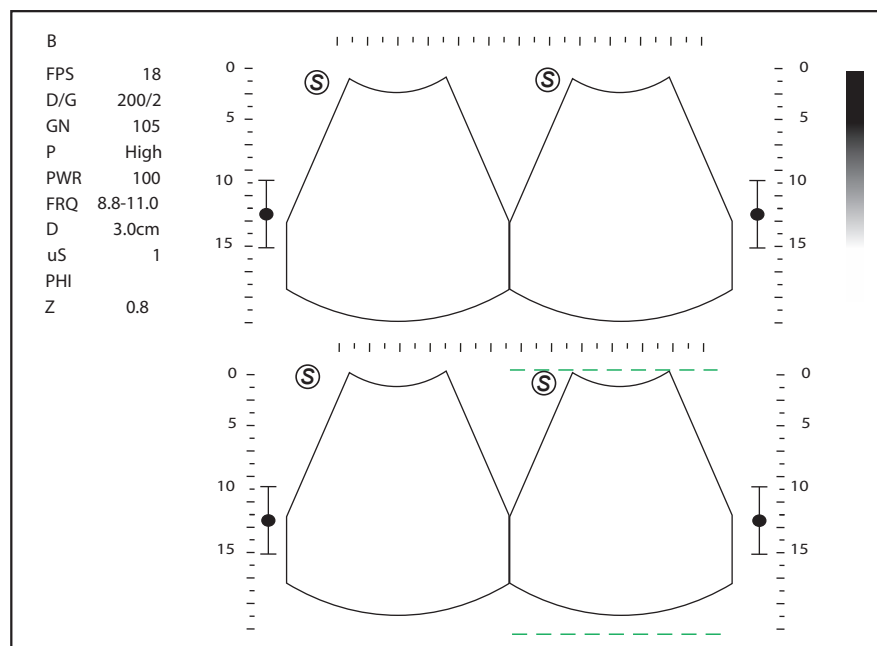
Figure 7-3 Quad-Split Screen Display

    −   Tap ⊞ on the touch screen to freeze the current image and unfreeze the following clockwise image.
    −   Press the **B** key on the control panel to exit the quad-split screen display.

7.1.3   Auto Optimization

This feature is used to optimize the image.

Press the **Auto** key on the control panel to optimize the image.

7.2   Magnifying an Image

7.2.1   Filling the Full Screen

Press the **Scr-Zoom** key on the keyboard to magnify the imaging area to fill the full screen. Or, press the **Scr-Zoom** key again to exit the full-screen display.

7.2.2 Magnifying the Whole Image

You can magnify the whole image in the real-time or frozen mode.

Perform the following steps.

1. Rotate the **Zoom** key on the control panel to magnify the image.

    A size multiplier is displayed on the general parameters area.

2. Rotate the **Zoom** key to adjust the size multiplier and use the trackball to select a desired area on the thumbnail.

3. Press the **Zoom** key or **B** key to disable this feature.

7.2.3 Magnifying the ROI

You can magnify the ROI in a real-time or frozen mode.

Perform the following steps.

1. Press the **Zoom** key on the control panel to enter the pre-activated magnifying ROI mode.

2. Adjust the ROI to set an interest area.

    Use the trackball to adjust the ROI position. Press the Set key and use the trackball to adjust the ROI size.

3. Press the **Zoom** key or **Update** key to magnify the interest area.

4. Press the **B** key or press the **Zoom** key again to disable this feature.

7.3 Freezing an Image

Press the ⏯ key on the control panel to capture an image in a real-time scan or dual/quad split screen display and the feature to be applied is also activated. For this setting, refer to Section 4.1.1 Basic Settings.

You can select any desired image mode, magnify the image, perform measurements, add annotations and body marks and adjust imaging parameters in the frozen mode.

7.4 Using Cine

The cine review is available by pressing the ⏯ key on the control panel and the progress bar appears on the screen, as shown in the figure below.

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You can play back the cine by tapping **Auto Play** on the touch screen or review the cine by using the trackball. Moreover, the cine can also be cut for your actual use.

7.4.1 Reviewing Cine

■ **To view cine manually**

You can review the cine frame by frame by using the trackball or rotating the key located directly below **F By F** on the touch screen in the frozen mode. Each image is identified by a number which indicates its position in the cine.

NOTE:
*   *You can adjust the parameter settings when review cine.*
*   *You can tap **To First** or **To Last** on the touch screen to review the first or last frame.*

■ **To review cine automatically**

In the frozen mode, tap **Auto Play** on the touch screen to play the cine review automatically, and tap **Auto Play** again to stop playing the cine.

During the cine review, rotate the key located directly below **Cine Speed** on the touch screen to adjust the review speed.

7.4.2 Cutting Cine

To cut the cine:

1. In the frozen mode, rotate the keys located respectively below **Set First/ Set Last** on the touch screen to select the start frame and the end frame.

2. Press the **P2** key on the control panel to save the cut cine.

7.5 Annotations and Body Marks

The annotation feature allows you to type or add an annotation from the predefined annotation library. You can annotate the cine, real-time image or frozen image. Arrows and body marks are also provided to annotate the image.

NOTE:

You should define an annotation library before applying this feature. For details, refer to Section 4.3.3 Comment Settings.

7.5.1 Annotating an Image

■ **Annotating an Image with Typed Words**

Perform the following steps.

1. Press the **Annot** key on the control panel or the **Space bar** on the keyboard.

   The cursor becomes on the screen and the predefined words appears on the touch screen.

2. Move the cursor to the desired place by using the trackball, and tap the predefined word on the touch screen to add it to the image.

   − Move the cursor to the desired place, and input an annotation by using the keyboard.

   − Move the cursor to an annotation, and press the Set key (right key). Then move the annotation to the desired position by using the trackball, and press the Set key (right key).

   − Move the cursor onto an annotation to edit it by using the keyboard.

   − Press the Set key (left key) to switch to arrow annotation.

3. If necessary, repeat the above steps to add more annotations.

4. Press the **Annot** key again to exit.

■ **Annotating an Image with Arrows**

Perform the following steps.

1. In any mode, press the **Arrow** key on the keyboard, or press the **Annot** key and the Set key (left key) on the control panel, and an arrow is displayed on the image.

2. Move the arrow to the desired place by using the trackball.

   − Rotate the key located directly below **Angle** to adjust the arrow angle.

   − Press the **Del** key on the keyboard or rotate the key located directly below **Delete** to delete the arrow.

3. Press the Set key to add the arrow to the image

   Repeat the above steps to add more arrows if needed.

■ **Setting an Initial Position for an Annotation**

Perform the following steps.

1. In any mode, press the **Annot** key on the control panel and the cursor appears on the screen.

2. Move the cursor to the desired position by using the trackball, and tap **Set Home** to set the initial position for an annotation.

   After the settings,
   - If a text annotation is being edited, tap **Home** to move the cursor to the initial position.
   - If a text annotation is being moved, tap **Home** to move the text annotation to the initial position.
   - After entering the text or arrow annotation screen next time, the cursor appears in the initial position.

7.5.2   Body Mark

Perform the following steps.

1. In any mode, press the ⟩⌢⟨ key on the control panel. The body mark appears on the screen.

2. Tap a body mark on the touch screen to add it to the image.

3. If necessary, perform the following operations to adjust the body mark.
   - Rotate the trackball to adjust the position of the probe marker.
   - Rotate the ⟩⌢⟨ key on the control panel to adjust the angle of the probe marker.
   - Press the **Update** key on the control panel and rotate the trackball to adjust the position of the body mark.

4. After adjustment, press the Set key to add the body mark to the image.

7.5.3   Deleting Annotations and Body marks

■   **To delete text annotations**

Perform the following steps.

1. Press the **Annot** key on the control panel to enter the text annotation screen.

2. Move the cursor to the annotation, and tap **Delete Word** on the touch screen or press the **Del** key on the keyboard to delete the annotation.

NOTE:

You can enable the annotation-cleared feature. For details, refer to Section 4.1.1 Basic Settings.

■   **To delete arrows**

Perform the following steps.

1. Press the **Arrow** key on the keyboard, or press the **Annot** key and the Set key (left key) on the control panel to enter the arrow annotation screen.

2. Press the **Del** key on the keyboard to delete the arrow annotation.

■   **To delete body marks**

Perform the following steps.

1. Press the ⟩⌢⟨ key on the control panel to enter the body mark editing mode.

2. Tap **Delete** on the touch screen or press the **Del** key on the keyboard to delete the body mark.

■   **To delete all annotations and body marks**

Press the **Clear** key on the control panel to delete all annotations from the image. Press the **Clear** key on the control panel or tap **Clear** on the touch screen to delete all body marks from the image. Perform the operation with caution.

7.6   ECG Module

By using an optional ECG module (Type BF), 3-channel ECG signals are provided in cardiac applications. During an cardiac application, you can configure the ECG-control so that the ECG trace is displayed at the bottom of the screen.

The ECG cable includes three color-coded ECG electrode connectors: LL (left leg, red), LA (left arm, black), and RA (right arm, white).

The ECG module provided by this ultrasound system is for collecting and displaying 3-lead ECG trace.

⚠ **WARNING**
- This ECG module is not suitable for intracardiac use or direct cardiac contact.
- This ECG module provides 3-channel ECG signals, and it cannot be used for diagnosis and monitoring.
- To avoid electrical shock, ensure the ECG cable is intact and correctly connected.
- Conductive parts of electrodes and connectors for ECG should not come into contact with other conductive parts including earth/grounding.
- Stop using the system, if the patient use a pacemaker or implantable cardioverter-defibrillators. This system may interfere with these devices.
- If the ECG waveform is abnormal, check if the ECG cable and electrodes are connected properly.

NOTE:

ECG feature is available for cardiac related examinations performed with phased array probes and C613 probe, and the CVC and PICC examinations performed with 10L-I probe.

The following description uses Cardiac examination performed with the S1-5 probe as an example.

Perform the following steps.

1. Connect the ECG cable to the ECG port of the system.

2. Attach the ECG electrodes on the body of the patient, as shown in the figure below. The system enables the ECG feature automatically.
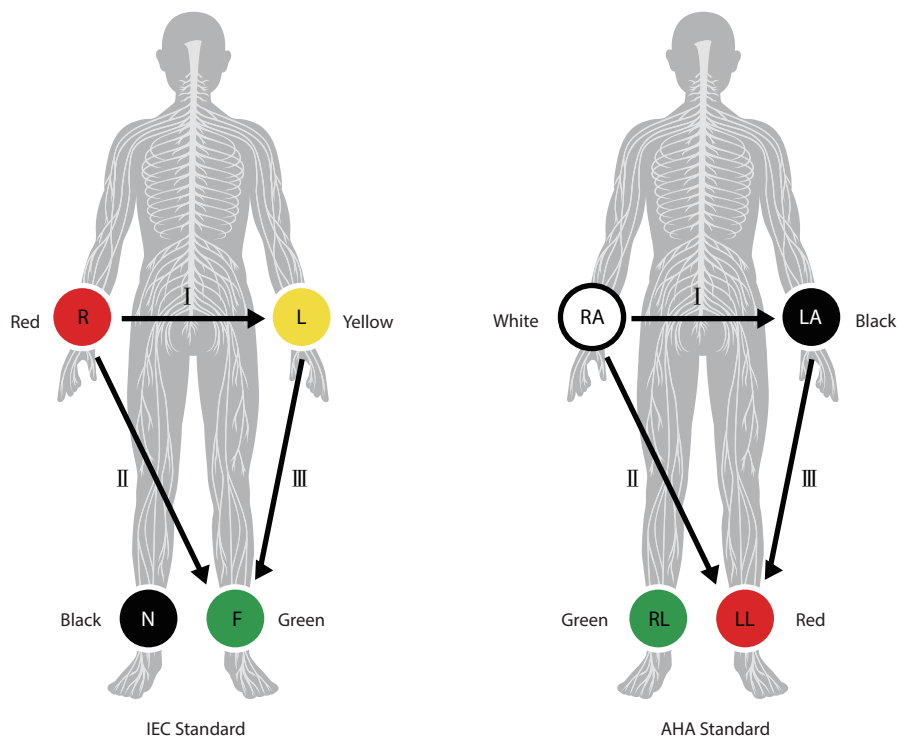
Figure 7-4 Electrode Placement

3. Adjust the parameters.

Item	Description
ECG	Enable or disable the ECG feature.
ECG Gain	Adjust the ECG gain.
ECG Position	Set the position of the ECG waveform.
ECG Invert	Enable or disable the waveform inversion feature.
ECG Speed	Adjust the speed of the ECG waveform.

4. Press the ⏮ key on the control panel to freeze an image, and the ECG waveform is frozen at the same time. You can view the ECG waveform in each timeline frame by frame by using the trackball.

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8   Managing Images/Data

In this ultrasound system, images include frame images and cine. You can save or review images after the acquisition. Meanwhile, images can also be backed up to a USB drive for future review if it is needed.

8.1   Storing an Image

NOTE:

- *You can customize the keys on the* **System Settings** > **General** > **Multikey** *screen. For details, refer to Section 4.1.3 MultiKey Settings.*
- *The system saves all data by default. If a USB drive is connected to the system and the USB drive is selected for storage on the* **System Settings** > **General** > **Multikey** *screen, the saved data will be stored to the USB drive synchronously.*

8.1.1   Storing 2D Image

Perform the following steps.

1. In real-time or frozen mode, press the **P1** key on the control panel to save the current image.

2. In frozen mode, press the **P2** key on the control panel to save the current cine.

3. In frozen mode, set the **P3/P4/U1/U2** key as **Screen capture** on the **System Settings** > **General** > **Multikey** screen, and press the **P3/P4/U1/U2** key to save the screen capture.

The system makes a prompt sound after successful storage. Meanwhile, the corresponding thumbnails for the stored image, cine or screen capture also appears in the clipboard.

8.1.2   Storing 3D/4D Image

Perform the following steps.

1. In frozen 3D mode, press the **P1** key on the control panel to save the image.

2. In 4D mode, press the **P2** key on the control panel to save the current cine.

3. In 3D/4D mode, set the **P3/P4/U1/U2** key as **Volume** or **Screen capture** on the **System Settings** > **General** > **Multikey** screen, and press the **P3/P4/U1/U2** key to save the volume data or screen capture.

The system makes a prompt sound after successful storage. Meanwhile, the corresponding thumbnails for the stored image, cine or screen capture also appears in the clipboard.

8.2   Viewing an Image

You can view the images for the current or a previously examined patient by using the clipboard or the **Review** screen.

8.2.1   Viewing an Image by Using the Clipboard

1. Press the **Pointer** key on the control panel in the real-time or frozen mode.

2. Select the image in the clipboard by using the trackball, and then press the Set key to view the image/cine.

   - Click ☑ to select all images.

   - Click ⌄ or ⌃ to go to the previous or the next page.

- Click [DCM] to export images to the USB drive or DICOM server.
- Click ⬑ to export images or cine on the clipboard to the USB device.
- Click 🗑 to delete the desired image or cine.

You can also amplify the image or review the cine and perform a measurement.

8.2.2 Viewing an Image on the Review Exam Screen

1. Tap **Review** on the touch screen to enter the **Review Exam** screen, as shown in Figure 8-1. The thumbnails of images and cines are displayed in the list.
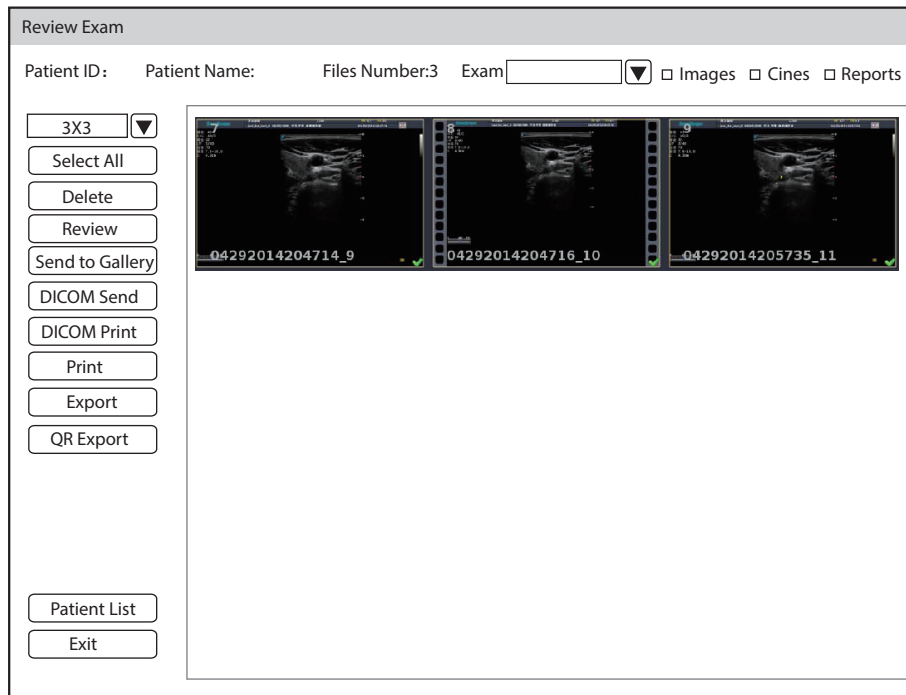
Figure 8-1 Review Exam Screen

- If the patient has more than one exam, you can select the desired exam from the **Exam** drop-down list.
- Tick **Images**, **Cines** or **Reports** to view the images, cine or reports respectively.

2. Rotate the trackball to move the cursor to the desired thumbnail and press the Set key on the control panel to select the desired image.

3. Preview the image.
   - Press the Set key twice to preview the image.
   - Click **Review** to preview the image on the basic screen.
     You can preview other images of the patient through the clipboard.

4. Click **Patient List** to enter the exam list screen and view the image and cine of the selected patient.

8.3 Sharing Data

You can remote access to the data stored in the system through a computer.

Perform the following steps

1. Connect the computer to the system by using the network cable.

2. Set **Image Share Service** to **On** on the **System Settings** > **Connect** > **Network Service** tab. The user name and password at the computer end are displayed on the screen of the system.

3. Type the IP address in the search box of the computer and press the **Enter** key on the keyboard.

4. Type the user name and password in the pop-up dialog box.

8.4   Backing up Data

The system saves all data by default. To avoid data loss, please back up data in time. You can back up the data to the USB drive, DVD or DICOM server. For operations about backup to DICOM server, refer to Section 9.2 DICOM Storage.

8.4.1   Backing up Data to a USB drive

Perform the following steps.

1. Connect a USB drive to the system.

2. Tap **Patient** on the touch screen to enter the **New Patient** screen.

3.   Click **Patient List** to enter the **Exam List** screen. Select the desired exam and click **Export**.

4. Select a **USB** drive from the **USB devices** drop-down list, and then select the exported image format, including System Format, PC Format, DICOM, DICOMDIR and DVR.

    If you select PC image format, you can also select the exported image, cine or report format.

5. Click **Export** to back up all data relevant to the USB drive.

If only images are exported, you can enter the **Review Exam** screen for exporting.

8.4.2   Backing up Data to DVD

You can back up data to a DVD. DVD (DVD-R/RW, DVD+R/RW, 4.7GB capacity or more) manufactured by SONY is recommended.

Perform the following steps.

1. Place an empty DVD in the CD-ROM drive.

    NOTE:

    Make sure the DVD is facing upward in the CD-ROM drive.

2. Tap **Patient** on the touch screen to enter the **New Patient** screen.

3. Click **Patient List** to enter the **Exam List** screen. Select the desired exam and click **Export**.

4. Select **DVD** from the **USB devices** drop-down list.

5. Click **Export** to back up all data relevant to the DVD.

    DVD ejects after a successful data backup export prompt is displayed.

6. Take the DVD out from the CD-ROM drive, and close the tray.

If only images are exported, you can enter the **Review Exam** screen for exporting.

8.5   Importing Data to the System

NOTE:
• *Only the patient data from the ultrasound system of the same model can be imported.*
• *Only the patient data in system format can be imported.*

Perform the following steps.

1. Connect the USB drive to the system.

    Or, place an empty DVD in the CD-ROM drive.

2. Tap **Patient** on the touch screen to enter the **New Patient** screen.

3. Click **Patient List** > **Import** to enter the **Import Screen**.

4. Select the imported device from the drop-down list below **Import Screen**.

5. Select the patient information to be imported.

6. Click **Import Patient** to import the selected patient data to the system.

8.6   Sono-Drop

Sono-Drop is used to connect the mobile device to the ultrasound system through a hotspot. The patient data can be sent to the mobile device for review. During the exam, the screen of the ultrasound system can be shared to the mobile device to facilitate patients to view real-time images. To use the Sono-Drop, the following requirements for operating environment should be met.

Configuration	Minimum Configuration Requirements
Hardware configuration	Compatible with Android 5.1
Bandwidth	2Mbit/s and above
Network type	Wireless local area network
Network architecture	Point to point

NOTE:

- *Only the mobile device with Android operating system supports Sono-Drop App.*
- *Before transmitting the data, update the App version through the* **Version Update** *button on the* **Setting** *screen of Sono-Drop App.*
- *Ensure that there is enough space on the mobile device for storing data. The system memory should not be less than 3G byte.*
- *Delete the images with caution. The images cannot be restored after deletion.*

■   **To download an App**

Before using the Sono-Drop, you need to install the Sono-Drop App on the mobile device.

Perform the following steps.

1. Press the **Ctrl+Q** keys on the keyboard to open the QR code screen.
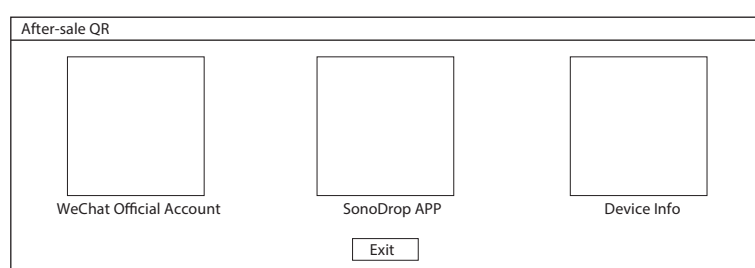
Figure 8-2 Downloading the App

2. Use the mobile device to scan the QR code to download the Sono-Drop App.

3. Install the App according to the prompts.

■   **To transmit the patient data**

NOTE:

- *During data transmission, keep the mobile device and the hotspot of the ultrasound system connected. Otherwise, it may cause failure of data transmission and you need to scan the QR code again to transmit the data.*
- *To ensure signal stability, the distance between the mobile device and the ultrasound system should not exceed 5 meters.*

Perform the following steps.

1. Click **Hotspot Configuration** on the **System Settings** > **Connect** > **Network** screen and enable the hotspot on the pop-up screen.

```
Hotspot
Hotspot:              ◉ On        ○ Off

   Configure WLAN hotspot

Now it can be found.
Other users can find your shared network by the "Wi-Fi", network name is "xxxx".

        Save                      Cancel
```
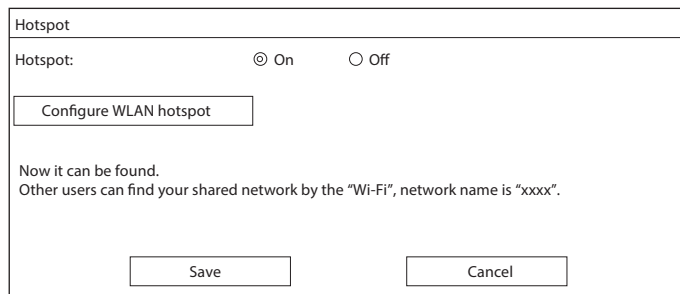
Figure 8-3 Enabling the Hotspot

2. Click **Save** to return to the network settings screen.

3. Click **Apply** to return to the basic screen.

4. Send the patient data to the App. The following paths are available.

No.	Type	Operation Procedures
1	Send the patient data on the basic screen	1. Tick the desired image or cine in the clipboard on the basic screen. 2. Click ⬚ at the bottom right. 3. Click **QR Export** in the pop-up dialog box and the system displays the OR code. Select Export Type Export PC QR Export Cancel 4. Open the Sono-Drop App on the mobile device and tap **SCAN QR CODE** on the home page to scan the QR code. The mobile device is connected to the hotspot of the ultrasound system, and the patient data is sent to the App automatically.
2	Send the patient data in the patient list	1. Tick the desired patient data on the patient list screen. (You can tick the image individually or tick the entire patient data.) 2. Click **QR Export** at the left of the screen, and the system displays the OR code. Import/Export Import Export QR Export 3. Open the Sono-Drop App on the mobile device and tap **SCAN QR CODE** on the home page to scan the QR code. The mobile device is connected to the hotspot of the ultrasound system, and the patient data is sent to the App automatically.

3	Send the patient data on the image review screen	1. Select a desired patient on the patient list screen and click **Image Preview** to enter the image review screen.
		2. Tick the desired patient data.
		3. Click **QR Export** at the left of the screen, and the system displays the OR code.
		4. Open the Sono-Drop App on the mobile device and tap **SCAN QR CODE** on the home page to scan the QR code. The mobile device is connected to the hotspot of the ultrasound system, and the patient data is sent to the App automatically.

Figure 8-4 Sending the Data

5. Tap **ALBUM** on the Sono-Drop App to enter the ultrasound album screen and browse the downloaded patient data.
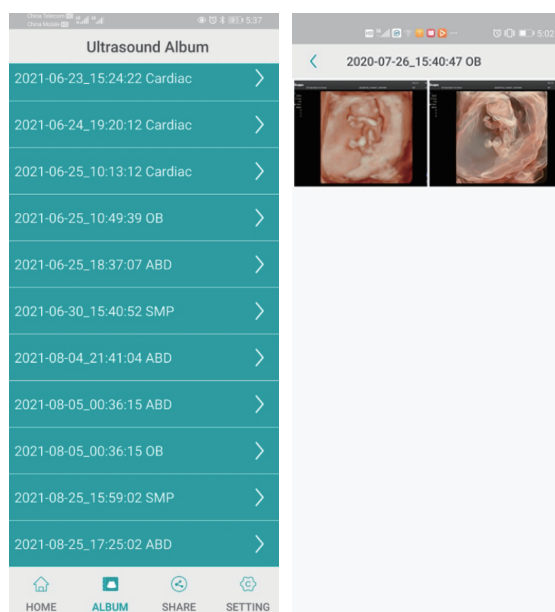
Figure 8-5 Ultrasound Album Screen

6. Tap the desired patient data to enter the details screen.

7. Tap an image, a video or a report for details, and tap the top right corner to save the data to the mobile device.

■ **Screen Sharing**

Before sharing the screen, you need to set the user-defined key. You can set **P1**/**P2**/**P3**/**P4**/**U1**/**U2** key as **Screen Sharing**. The following description takes **U1** key settings as an example. On the **System Settings** > **General** > **MultiKey** screen, click **U1** tab and select **Screen Sharing** in the drop-down list of **Advanced Function**, and then click **Apply** to save the settings.

Perform the following steps.

1. Click **Hotspot Configuration** on the **System Settings** > **Connect** > **Network** screen and enable the hotspot on the pop-up screen.

2. Select a probe and an exam type, and perform a scan.

3. According to the screen prompt, press the **U1** key to enable the screen sharing function, and the system displays the QR code.
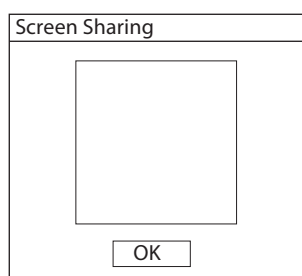
Figure 8-6 QR Code of Screen Sharing

4. Open the Sono- Drop App on the mobile device and tap **Enter Screen Share** on the share screen.
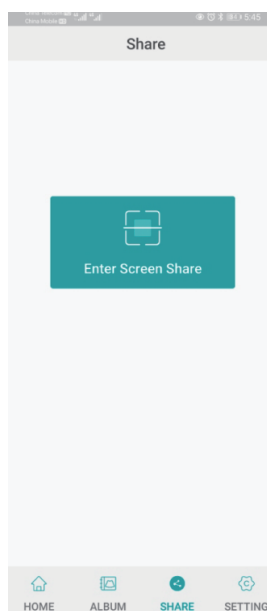
Figure 8-7 Screen Sharing Screen

5. Scan the QR code of the ultrasound system. The mobile device is connected to the hotspot of ultrasound system and enters the sharing screen. If the screen sharing is successful, the real-time image from the ultrasound system is displayed on the mobile device.

6. After completing the screen sharing, press the **U1** key on the control panel or tap **End Exam** on the touch screen to end the screen sharing.

8.7   Sono-Synch

Sono-Synch is used to achieve audio and video communication between ultrasound systems, and between the ultrasound system and the experts through the network. Real-time transmission of ultrasound images is available to achieve the remote functions among physicians, patients and medical staff, including long-distance communication, training and teaching, live surgery and joint consultation.

To ensure the quality, the following requirements should be met.

Configuration	Minimum Configuration Requirements
Hardware Property	4G Memory
Operating System Version	Win 7
Peripherals	Camera, Microphone and Capture Card
Safety Control	Firewall

NOTE:

Before enabling the Sono-Synch, ensure that remote microphone and camera are well connected, and that peripherals of the browser are authorized, and that the speaker can be normally used.

■   **User-defined Key Settings**

You can set **P1**/**P2**/**P3**/**P4**/**U1**/**U2** key as **Remote**. The following description takes **U1** key settings as an example.

Perform the following steps.

1. Tap 🔧 on the touch screen to enter the system settings screen.

2. Click **General** > **MultiKey** to enter the user-defined key settings screen.

3. Click **U1** tab and select **Sono-Synch** in the drop-down list of **Advanced Function**.

4. Click **Apply** to save the settings, and the prompt information of the user-defined key is displayed on the basic screen.

■   **Operation Procedures**

The following only describes the operation on the equipment side. For details about the operation on the expert side, contact the local distributor or the manufacturer for instructions.

Perform the following steps.

1. Connect the system to the network. For connection method, refer to Section 4.2.2 Network Settings.

2. Connect the camera and the microphone to the system firmly.

3. According to the screen prompt, press the **U1** key to open the request dialog box.

Figure 8-8 Remote Consultation Request

4. Enter the patient name and select a physician.

5. Click **Start** to send a request.

6. After the expert accepts the request, the system enters the real-time consultation mode. Real-time guidance can be performed through video and voice.
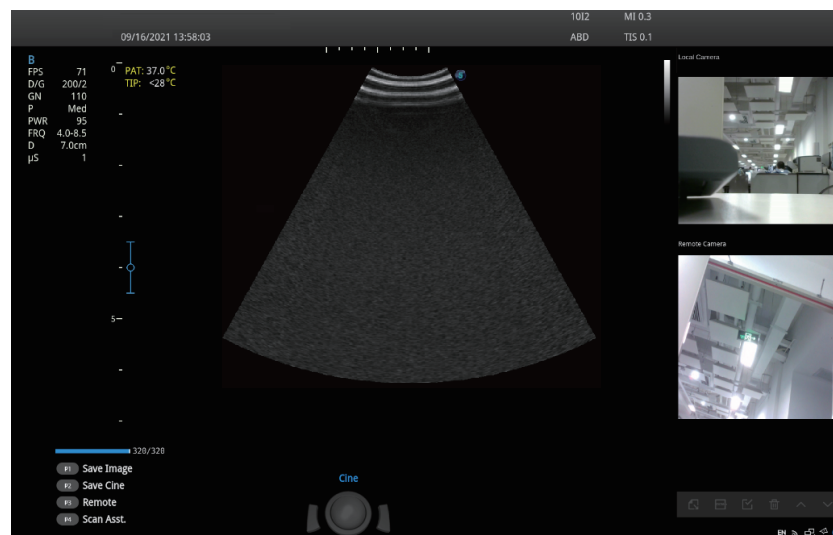
Figure 8-9 Consultation Mode

7. After the consultation is finished, press the **U1** key again to exit.

■   **To review the record**

Tap ⚙ on the touch screen to enter the system settings screen and click **Connect** > **Remote Medical** to enter the remote medical screen for reviewing the history records.

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9   DICOM/HL7

DICOM (Digital Imaging and Communications in Medicine) is a standard created by National Electrical Manufacturers Association (ACR-NEMA) to regulate the distribution and viewing of medical images such as ultrasound images and cine.

If the system is configured with the DICOM module, you can:

- Search the archived patient information set on the DICOM server, and copy the patient information to the system so that the correct patient can be examined.
- Send stored images or data on the system to the DICOM server.
- Print images on a DICOM printer.

DICOM services of the system include DICOM storage, DICOM print, DICOM worklist, MPPS, storage commitmen, DICOM queue and Q/R list.

If you need *DICOM 3.0 Compatibility Declaration*, contact the manufacturer.

9.1   DICOM Connection

Perform the following steps.

1. Connect the system to the local DICOM network server by using a network cable.

2. Edit the relative settings for the local network and DICOM server. For details, refer to Section 4.2.2 Network Settings and 4.2.4 DICOM Settings.

3. If the connection is successful, you can use the DICOM services.

NOTE:

Connect the system to the server before using the DICOM service. Otherwise, the service cannot be used.

9.2   DICOM Storage

DICOM Storage is used to send patient data to the DICOM storage server for storage.

■   **To store the current image**

1. Select the **P1** tab on the **System Settings** > **General** > **Multikey** screen and select a DICOM storage server. The default storage type for **P1** key is **Image**.

2. On the image scan screen, press the **P1** key on the control panel to send the current image to the DICOM storage server.

■   **To store the current cine**

1. Select the **P2** tab on the **System Settings** > **General** > **Multikey** screen and select a DICOM storage server. The default storage type for **P2** key is **Cine**.

2. On the image scan screen, press the **P2** key on the control panel to send the current cine to the DICOM storage server.

■ **To store the screen capture**

1. Select the **P3/P4/U1/U2** tab on the **System Settings** > **General** > **Multikey** screen, and select **Screen Capture** as the storage type, and then select a DICOM storage server.

2. On the image scan screen, press the corresponding user-defined key to send the current screen capture to the DICOM storage server.

■ **To store the patient data**

1. Tap **Patient** on the touch screen to enter the **New Patient** screen, and click **Patient List** to enter the **Exam List** screen.

2. Select the patient data to be stored.

3. Click **DICOM Send** and select the desired storage device from the drop-down list beside **Storage Destination** in the pop-up dialog box.

4. Click **Send** to send the patient data to the DICOM storage server.

If you want to check the sending status of patient data, tap **Patient** on the touch screen and click **Patient List** > **DICOM Queue** for viewing.

9.3   DICOM Print

DICOM Print is used to send images to the DICOM print server for printing.

You should properly connect the system to the print server and edit the relevant settings. For details, refer to Section 4.2.4 DICOM Settings.

■ **To print the current image**

1. Select the **P1** tab on the **System Settings** > **General** > **Multikey** screen, and select a DICOM print server. The default storage type for **P1** key is **Image**.

2. Press the **P1** key on the control panel in the real-time or frozen mode to send the current image to the DICOM print server.

■ **To print the current cine**

1. Select the **P2** tab on the **System Settings** > **General** > **Multikey** screen, and select a DICOM print server. The default storage type for **P2** key is **Cine**.

2. Press the **P2** key on the control panel in the frozen mode to send the current cine to the DICOM print server.

■ **To print the screen capture**

1. Select the **P3/P4/U1/U2** tab on the **System Settings** > **General** > **Multikey** screen, and select **Screen Capture** as the storage type, and then select a DICOM print server.

2. Press the corresponding user-defined key in the frozen mode to send the current screen capture to the DICOM print server.

■ **To print the patient data**

1. Tap **Patient** on the touch screen to enter the **New Patient** screen, and click **Patient List** to enter the **Exam List** screen.

2. Select the patient data to be printed.

3. Click **DICOM Print** and select the desired print device from the drop-down list beside **Print Destination** in the pop-up dialog box.

4. Click **Print** to send the patient data to the DICOM print server.

If you want to check the printing status of patient data, tap **Patient** on the touch screen and click **Patient List** >
DICOM Queue for viewing.

9.4   DICOM Worklist

Worklist is used to search the archived patient information in the server, and copy the patient information to
the system so that the correct patient can be examined. If HL7 protocol is enabled, the patient information in
Worklist is the data in HL7 server.

Tap **Patient** on the touch screen to enter the **New Patient** screen and click **Worklist** to enter the **Worklist**
screen as shown in Figure 9-1. The patient information in the worklist server can be searched for examination.

Figure 9-1 Worklist Screen

Perform the following steps.

1. Search for the patient information.

     Enter the search requirements, such as patient name, and click **Search** to search for the desired information.
     Clicking **Reset** can clear all the search information.
     Clicking **Date/Time** can display the patient data by order of oldest or newest input date/time.

2. Start an exam.

     Select the desired patient.
     – Click **Select** to enter the **New Patient** screen, and then input the relevant patient information and select
        the desired exam type.
     – Click **Start Exam** to start the exam for the selected patient.

9.5   MPPS

MPPS is used to send exam status information to the MPPS server, which facilitates the other systems to obtain
the exam progress in time.

The status information is described as below:

● When the exam is started, the system sends the status information "In Process" to the MPPS server.

● When the exam is completed, tap **End Exam** on the touch screen to finish the current exam, and the system sends the status information "Complete" to the MPPS server.

If you want to check the sending status, tap **Patient** on the touch screen and click **Patient List** > **PPS Screen** for viewing.

■ **Adding the MPPS**

You can add MPPS manually to check the processing status of the discontinued exam or other order operations.

NOTE:

MPPS can only be added when you perform the scan or other order operations.

Perform the following steps.

1. Tap **Patient** on the touch screen to enter the **Patient Information** screen, and click **Patient List** to enter the **Exam List** screen.

2. Click **PPS Screen** to enter the PPS screen, as shown in Figure 9-2.

Patient ID	Patient Name	DOB	Sex	Description	Start Time	End Time	Status
20140505	Mary	Unknown					IN PROGRESS

PPS Screen

PPS Information

Exit   Append   Discontinue   Complete

Figure 9-2 PPS Screen

The **PPS** screen displays MPPS information about the current patient.
– Click **Discontinue** to discontinue the current exam.
– Click **Complete** to complete the current exam.
– Click **Append** to restart the exam.

9.6 Storage Commitment

Storage commitment is used to confirm whether the images or structured reports are successfully stored to the DICOM storage server.

If you want to check the status of items sent to the DICOM storage server, tap **Patient** on the touch screen and click **Patient List** > **DICOM Queue** for viewing.

9.7   DICOM Queue

The DICOM queue is used to check the sending status of DICOM storage, DICOM print, MPPS and Storage Commitment.

Tap **Patient** on the touch screen to enter the **New Patient** screen, and click **Patient List** > **DICOM Queue** to enter the DICOM Queue screen, as shown in Figure 9-3.

Figure 9-3 DICOM Queue Screen

Perform the following steps.

1. Search for the patient information

    Search for the desired information by using the search conditions such as patient ID, patient name, date and type, and the searched result is displayed in the list below.

2. Check the sending status

    You can check the sending status by viewing **Running Status**, **Status** or **Details**.

3. Deal with the patient information

    − If the patient information fails to be sent, click **Refresh** to refresh the DICOM queue information list. If it still fails, click **Resend** to resend the information.

    − If all the patient information needs to be resent, click **Select All** > **Resending Failed** to resend the information.

    − If you need to delete the sending status of the patient information, select the information and click **Delete** to delete it.

9.8   DICOM Q/R

The **Query/Retrieve List** is used to retrieve patient information from the query server. User can import the retrieved patient exam information to the system and view it.

Tap **Patient** on the touch screen to enter **New Patient** list. Click **Patient List** > **DICOM Q/R** to enter **Query/ Retrieve List** screen, as shown in Figure 9-4.

Figure 9-4 Query/Retrieve List

You can perform the following operations on the **Query/Retrieve List** screen.

1. Search the patient information.

   Select a search condition, such as Patient ID, and enter the relevant information. Click **Query Patients** and the searched patient information is displayed in the patient list.
   - Click **Reset** to delete the entered search condition.
   - Click **Last Exam**, and the system arranges the patient information in chronological order of exams.

2. Search the exam type.

   Select a patient in the patient list and click **Query Exams**, and then all the exam types of the patient are displayed in the exam list.
   Click **Exam Time**, and the system arranges the exams in chronological order.

3. Retrieve images

   Select an exam type in the exam list and click **Retrieve Images**. The thumbnails of the saved images and cines are displayed in the bottom display box.

4. Import the patient information.

   a. Rotate the trackball to select the image or cine to be imported and press the Set key on the control panel.
      You can click ⋀ or ⋁ to turn the current screen to the previous or the next page if it displays over one page, or click ☑ to select all images and cines.
   b. Select the exam type from the drop-down list below **Exam Type**, and then click **Import Screen**.
      The selected patient information and the corresponding images and cines are imported into the system.

10 Probes and Biopsy

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

NOTE:

A general instruction for the probe and the biopsy bracket is provided in this manual. For details, refer to the relevant manuals.

10.1 Probe

This ultrasound system supports a wide range of probes which make the system remarkably versatile.

The schematic diagrams of probes are as follows.

Body surface probe   Endocavitary probe
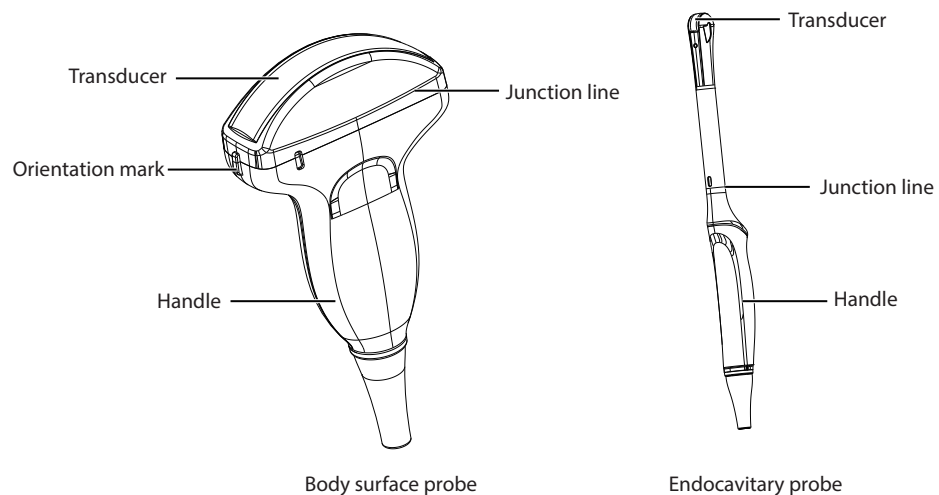
10.1.1 Available Probes

The available probes are listed as follows.

Probe Model	Application
3C-A, C1-5, C361, 12L-B, 10L-I, 9L-A, 10I2, 10L1, L741, L742, L752, S1-5, 7P-A, 3P-A, 2P1, VC6-2, C322, C613, 12LT-A, 12LI-A, 6CT-A, 6CI-A, CWD5.0	Body surface
VE9-5, 6V3, 6V3A, 6V7, EC9-5, 6V1, BCC9-5	Intracavitary

10.1.2   Probe Usage

⚠️ **WARNING**

- Strictly inspect the probe as described in this section before use. If there is any abnormality, do not use, clean, disinfect or sterilize the probe and contact the local distributor or the manufacturer immediately.
- Use only the probes provided by the manufacturer. Otherwise, the system may not perform and an accident such as a fire may result.
- Use the probe carefully. If any part of the probe surface is scratched, immediately stop using the probe. Otherwise, electrical shock may occur.
- A legally marketed probe sheath is required for intracavitary operations. If lubricant is used, it must be water-soluble. Do not apply coupling gel directly on the patient's skin. Please dispose of the sheath in accordance with local laws and regulations.
- Use a sterile probe sheath and sterile coupling gel when performing an intraoperative, trans-vaginal, trans-rectal or trans-esophageal (Cardiac) exam. If lubrication is insufficient because of age and personal reason during the exam, you need to apply a sufficient amount of sterile coupling gel on the surface of the sheath.
- To avoid contamination, please use the coupling gel and probe sheath before performing an exam.
- Use legally marketed coupling gel in accordance with relevant local regulations. Read and understand all precautions in the relevant manual of the coupling gel before use. For recommended coupling gels, please refer to Appendix D Recommended Coupling Gel.
- Latex or natural rubber contained inside medical equipments or accessories can cause severe anaphylactic reactions in some individuals. It's suggested by the FDA that the operator should identify latex-sensitive patients and be prepared to treat anaphylactic reactions promptly.
- After being contaminated by pathogenic bacterium that is hard to kill, such as cryptosporidium or prion virus, the probe and its accessories should be destroyed by melting or burning when necessary because they cannot be completely disinfected or sterilized.

⚠️ **CAUTION**

- Avoid immersing the transducer surface in the coupling gel for a long period of time. Otherwise, damage to the probe may occur.
- Avoid any fluid flowing into the probe or probe connector when cleaning, disinfecting or sterilizing the probe and probe cable.

■ **Special concerns before probe usage**

Inspect the probe before each use. If the following damage is found, stop using the probe immediately.

- Cracks on the probe handle (user section).
- Cracks on the transducer surface (applied section).
- Scratches on the transducer surface (acoustic window surface).
- Swelling of the acoustic window material.
- Cracks or wear on the probe cable.
- Cracks on the probe connector or any other kinds of visible damage.
- Deformed pins or broken pins inside the probe connectors.

■ **Body surface probe usages**

1. Wear medical sterile gloves.
2. Orient the probe.
3. Perform a scan.

■ **Endocavitary probe usages**

1. Wear medical sterile gloves.

2. Wear the probe sheaths

   a. Remove the packaging and unfold the probe sheath.

   b. Apply an appropriate amount of coupling gel to the inside of the sheath and onto the face of the probe.

   c. Hold the probe and unroll the sheath onto the probe.

   d. Pull the probe sheath tightly over the face of the probe to remove wrinkles.

   e. Secure the sheath to the probe with the adhesive tapes or elastic bands.

3. Orient the probe.

Check the probe orientation mark before the scan.

4. Perform a scan.

10.2 Biopsy

You should properly assembly and verify the biopsy bracket before performing a biopsy.

⚠ **WARNING**
- Only use the biopsy bracket in conjunction with the probe provided by the manufacturer. Otherwise, the system and probe may be damaged, an accident such as a fire may result in the worst case.

- Only trained physicians or sonographers under ultrasound guidance can handle the biopsy needle guides. During operation, the operator must observe the proper needle insertion sequencing with the needle guide in order to avoid undue discomfort and unnecessary risk and injury to the patient.

- The biopsy guidelines that display on the monitor are intended as a reference. It is the operator's responsibility to verify the correct positioning of the needle during a biopsy.

- Do not use a needle guide if the path of the needle is not accurately indicated by the on-screen guidelines. The path of the needle must be displayed within the guidelines. Contact the manufacturer or the local distributor if the needle path is not accurately indicated.

- Do not freeze an image when performing a biopsy.

- To avoid hurting the patient accidentally, the operator should be highly focused during a biopsy.

- You should activate the biopsy guidelines before performing a biopsy.

- The biopsy needle is disposable.

- To avoid infection, disinfect the probe and cover it with the probe sheath when performing a biopsy.

- You should perform the biopsy using the biopsy bracket provided by the manufacturer and applicable for the probe. Otherwise, it may cause patient injury.

10.2.1 Available Biopsy Brackets

No.	Biopsy Bracket Model	Available Probe Model	Available Biopsy Needle	Application
1	NGBC322	C322	14G, 16G, 18G, 20G, 22G	Body surface
2	NGBC613	C613	14G, 16G, 18G, 20G, 22G	Body surface
3	NGB3C-A	3C-A	14G, 16G, 18G, 20G, 22G	Body surface
4	NGBC1-5	C1-5	14G, 16G, 18G, 20G, 22G	Body surface

No.	Biopsy Bracket Model	Available Probe Model	Available Biopsy Needle	Application
5	NGBS1-5	S1-5	14G, 16G, 18G, 20G, 22G	Body surface
6	NGB9L-A	9L-A	14G, 16G, 18G, 20G, 22G	Body surface
7	NGB6V3-2	6V3	16G, 18G, 20G, 22G	Intracavity
8	NGB6V7	6V7	16G, 18G, 20G, 22G	Intracavity
9	NGB12L-B	12L-B	14G, 16G, 18G, 20G, 22G	Body surface
10	NGB7P-A	7P-A	14G, 16G, 18G, 20G, 22G	Body surface
11	NGBBCC9-5	BCC9-5	16G, 18G, 20G, 22G	Intracavity
12	NGB3P-A	3P-A	14G, 16G, 18G, 20G, 22G	Body surface
13	NGB6V1	6V1	16G, 18G, 20G, 22G	Intracavity
14	NGBEC9-5	EC9-5	16G, 18G, 20G, 22G	Intracavity
15	NGBVE9-5	VE9-5	16G, 18G, 20G, 22G	Intracavity
16	NGBL742-2	L742	14G, 16G, 18G, 20G, 22G	Body surface
17	NGBL752	L752	14G, 16G, 18G, 20G, 22G	Body surface
18	NGB2P1	2P1	14G, 16G, 18G, 20G, 22G	Body surface
19	NGBC361	C361	14G, 16G, 18G, 20G, 22G	Body surface
20	NGBL741-2	L741	14G, 16G, 18G, 20G, 22G	Body surface
21	NGB10L1-2	10L1	14G, 16G, 18G, 20G, 22G	Body surface

10.2.2 Assembling the Biopsy Bracket

■ **To assemble the surface biopsy bracket**
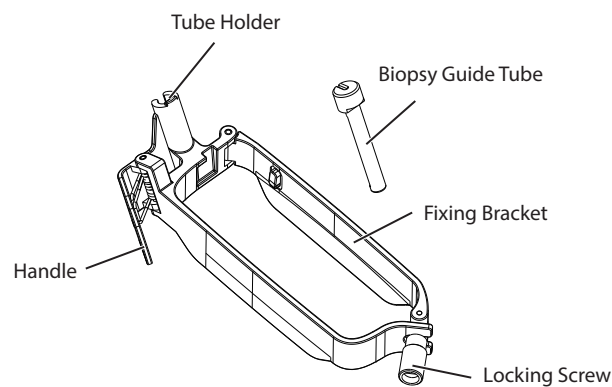
Perform the following steps.

1. Check and ensure that there is no damage, deformation, malfunction, looseness or missing parts on the biopsy bracket before assembly.

2. Wear medical sterile gloves.

3. Unfold the probe sheath and apply an appropriate amount of coupling gel to the inside of the sheath and onto the face of the probe.

4. Hold the probe and unroll the sheath onto the probe. Pull the probe sheath tightly over the face of the probe to remove any wrinkles.

5. Align the biopsy bracket with the orientation mark of the probe.

Orientation
mark
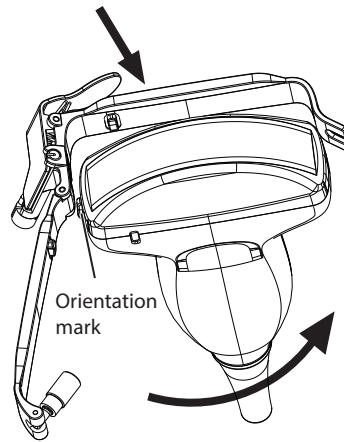
6. Attach the biopsy bracket to the probe and fasten the biopsy bracket with the locking screw.
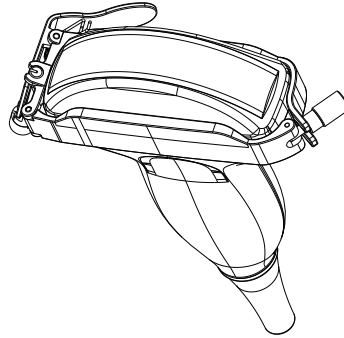
7. Press the handle and insert the biopsy bracket tube into the biopsy bracket.
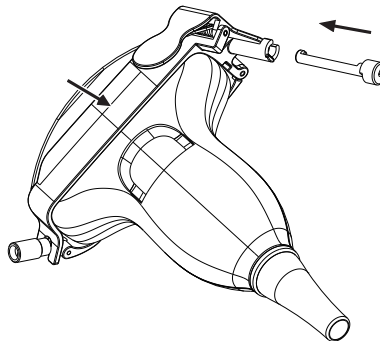
8. Insert the biopsy needle into the guide tube and make sure that the biopsy bracket is firmly attached to the probe.
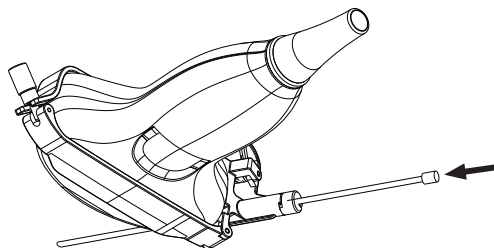
9. Unfold another probe sheath, and apply an appropriate amount of coupling gel to the inside of the sheath.

10. Hold the probe attached with the biopsy bracket and unroll the sheath onto both the probe and attached biopsy bracket.

■ **To assemble the endocavitary biopsy bracket**
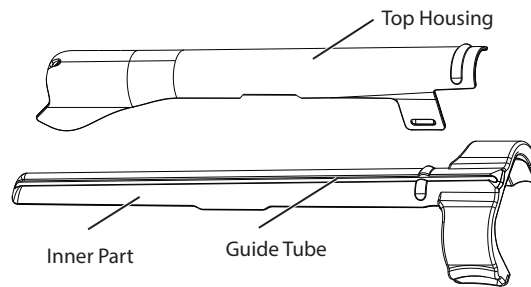
Top Housing

Inner Part   Guide Tube

Perform the following steps.

1. Check and ensure that there is no damage, deformation, malfunction, looseness or missing parts on the biopsy bracket before assembly.

2. Wear medical sterile gloves.

3. Unfold the probe sheath, and apply an appropriate amount of coupling gel into the sheath.

4. Hold the probe and unroll the sheath onto it. Pull the probe sheath tightly over the face of the probe to remove any wrinkles.

5. Assemble the metal top housing and the biopsy bracket. Slide the inner part into the top housing and push forward until it clicks.
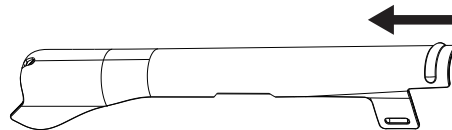
6. Align the tip of the biopsy bracket with the left and right grooves on the head of the probe.

7. Hold the tip of the bracket and the head of the probe, and push the other end of the bracket towards the probe to attach it on the probe.
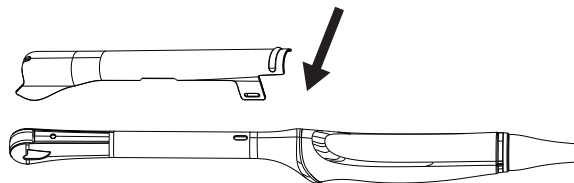
8. Insert the biopsy needle into the guide tube.

9. Check if the bracket has been firmly attached to the probe. If it is loose, reattach the biopsy bracket.

10. Unfold another probe sheath, and apply an appropriate amount of coupling gel into the sheath.

11. Hold the probe attached with the biopsy bracket, and unroll the sheath onto the probe and attached biopsy bracket.

10.2.3 Preparing for a Biopsy

⚠ WARNING Before and after using a rectal or transvaginal probe to perform a biopsy, you should clean and sterilize the probe and all the biopsy accessories. Otherwise, it may cause a infection risk to the next patient who uses the probe and accessories.

You should prepare the following items before performing a biopsy.

● New, straight, biopsy needle

- Sterilized container of sterile and degassed water
- Probe attached with biopsy needle
- Activated biopsy guidelines
- Sterile probe sheath

10.2.4 Verifying the Biopsy Bracket

NOTE:

Ensure the biopsy bracket is properly attached to a compatible probe before verification.

Perform the following steps.

1. Tap **Biopsy** on the touch screen in the real time B mode.

2. Immerse the probe (the part that is not beyond the junction line) in the degassed water.

3. Insert the biopsy needle into the maximum depth of the water.

4. Verify that the path of the needle is displayed according to the guidelines shown on the image screen. After verification, the needle guide is ready for use.

⚠ WARNING
- If the needle of the reusable biopsy bracket is out the range between the two parallel guide lines, stop using the biopsy bracket and contact the manufacturer or the local distributor.
- For the verification method of the biopsy grid, refer to the relevant instructions.

10.2.5 Performing a Biopsy

NOTE:

Ensure the biopsy bracket is properly attached to the compatible probe and be verified before you perform a biopsy.

Perform the following steps.

1. Set the biopsy grid or guide line type on the **System Settings** > **General** > **Biopsy** tab.

2. In the real-time B mode, tap **Biopsy** on the touch screen to enable the biopsy feature, and tap **Biopsy** again to adjust the biopsy angle.

3. Tap **Dot Size** on the touch screen to adjust the size of the dot on the biopsy line.

4. Perform a scan and locate the target.

5. Perform the puncture by sliding the needle through the groove in the guide until the needle, as shown on the display, intercepts the target.
   - For the biopsy grid, adjust its position by using the arrow keys on the keyboard.
   - For the biopsy guideline, tap **Bio. Cali.** on the touch screen and perform the following operations.
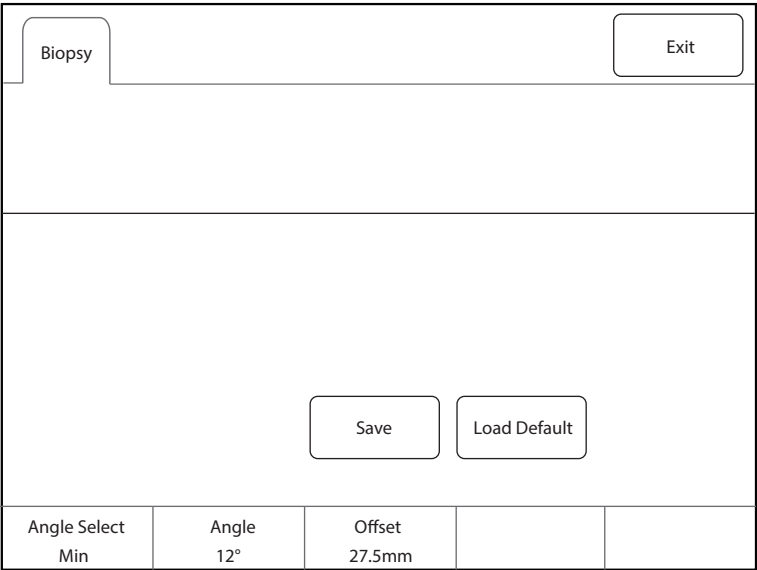
Figure 10-1 Biopsy Calibration

Angle Select	Rotate the key located directly below it to adjust the preset biopsy angle quickly.
Angle	Rotate the key located directly below it to adjust the angle of the biopsy guideline.
Offset	Rotate the key located directly below it to adjust the position of the biopsy guideline.
Save	Tap it to save the current angle and position of the biopsy guideline.
Load Default	Tap it to restore the current angle and position of the biopsy guideline to the default settings.

6. Adjust the brightness of the biopsy needle on the image.

   – For linear probes, tap **Vis-Needle** on the touch screen to enhance the brightness of the biopsy needle in the biopsy enhanced region, as shown in the figure below.
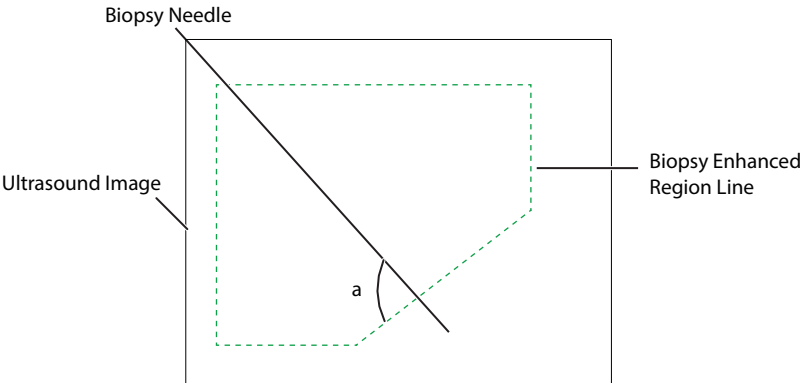
   – Tap **Steer Angle** on the touch screen to adjust the angle of the biopsy enhanced region line.

   – Tap **Dual Live** to activate the dual-split display for better observation.

7. After successful biopsy, remove the biopsy needle carefully and remove the probe from the patient.

The biopsy feature is also available in CFM/PDI/TDI mode, and the operation is the same with that of B mode.

10.3   Lithotripsy

The lithotripsy guideline is used to assist a lithotriptic device to destruct hardened masses.

1. In the real-time B mode, tap **Biopsy** to enable the biopsy feature.

2. Tap **Biopsy** repeatedly to select **Mid Line to** enter lithotripsy guideline screen. The lithotripsy guideline appears on the center of image.

3. Use the trackball to adjust the depth identifier. The depth is displayed on the lower part of image.

4. Tap **Biopsy** and select **Off** to disable the feature.

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11 Cleaning, Disinfection and Sterilization

To ensure the performance and safety of the system, probe and biopsy bracket, you should periodically clean, disinfect and maintain them.

⚠ **WARNING** Patient debris, cleaning solution and disinfectant are potentially dangerous. During cleaning, disinfection or sterilization, follow the rules for safe operations in the cleaning and disinfection room and wear the personal protective equipment, such as medical protective clothing, face mask, medical sterile gloves and goggle. Before leaving the cleaning and disinfection room, take off the contaminated personal protective equipment.

11.1 Cleaning the System

To maintain the safety and functionality of the system, periodically perform the maintenance for the system and accessories.

⚠ **WARNING**
- To avoid electric shock and damage to the system, power off and unplug the system from the AC power outlet before cleaning.
- To maintain the safety and functionality of the system, maintenance must be performed at least once every year. Electrical safety tests must also be performed at regular intervals as specified by local safety regulations.

■ **To clean the system surface**

1. Power off and unplug the system from the AC power outlet.

2. Dampen a soft lint-free cloth with 75% ethyl alcohol.

3. Use this soft lint-free cloth to gently clean the surfaces of the monitor screen, touch screen, control panel, and main unit.

4. Use a cotton swab to remove solids from between keys and controls.

■ **To clean the trackball**

1. Power off and unplug the system from the AC power outlet.

2. Press the bulges in the fixing ring by both hands.

3. Turn the fixing ring anticlockwise until the ring lifts.
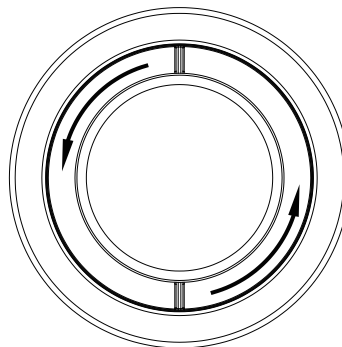
Figure 11-1 Cleaning the Trackball

4. Take out the dust ring, the fixing ring and the trackball (be careful not to drop the ball) from the control panel.

5. Use a soft lint-free cloth dampened with 75% ethyl alcohol to clean the dust ring, the fixing ring and the trackball.

6. Use a cotton swab dampened with 75% ethyl alcohol to remove stains from the surrounding area and edge.

7. Place the trackball, the fixing ring and the dust ring back to the control panel, and turn the fixing ring clockwise to install the trackball.

■   **To clean the dust filter**

The dust filter must be cleaned at least once every 3 months for ventilation.

1. Power off and unplug the system from the AC power outlet.

2. Pinch the dust filter with fingers as shown in the figure below.
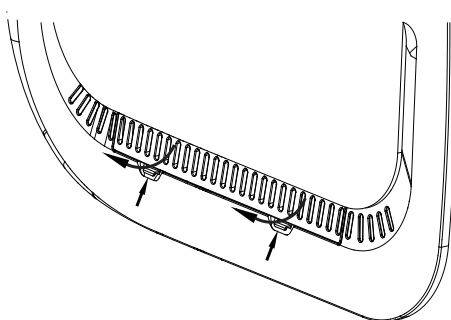
Figure 11-2 Cleaning the Dust Filter

3. Rinse the taken out sponge with refresh running water, and use a brush to rinse the dust filter with refresh running water.

4. Place the sponge and dust filter back to the system after a thorough airing.

11.2   Cleaning, Disinfecting and Sterilizing the Probe

⚠ CAUTION Do not brush the acoustic window with a soft brush during cleaning, disinfection and sterilization.

Materials used in the cleaning and disinfection room should meet the requirements or standards of the corresponding nations.

The probes are divided into three classifications according to their intended uses. Based on the intended uses and the possibility of cross-contamination, the required level of disinfection is determined, as shown in Table 11-1.

Table 11-1 Level of Disinfection

Level of Disinfection	Disinfection Effect	Probe Classification
Sterilization	Free from viable micro-organisms, including bacterial spores.	Probe in contact with sterile tissue or blood, such as intraoperative probe
High-level disinfection	Kill or inactivate most pathogenic micro-organisms such as bacterial propagules (including mycobacteria), viruses, fungi and their spores.	Probe in contact with mucous membranes, such as endocavitary probe

Level of Disinfection	Disinfection Effect	Probe Classification
Medium-level disinfection	Kill or inactivate most pathogenic micro-organisms such as bacterial propagules, viruses and fungi.	Probe in contact with intact skin, such as body surface probe
Low-level disinfection	Kill or inactivate bacterial propagules, lipophilic viruses and fungi.	

11.2.1 Preparations

⚠
- There is a cleared list of sterilants and high-level disinfectants for use in processing reusable medical and dental devices on the FDA website. That list can be consulted to find agents that may be useful for probe disinfection. Please refer to the following URL for FDA-Cleared Sterilants and High Level Disinfectants: http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/ReprocessingofSingle-UseDevices/ucm133514.htm.
- Use the effective cleaning solution and disinfectant that meet local laws and regulations.
- Use the cleaning solution and disinfectant recommended by the manufacturer, and ensure that the conditions for use meet the recommended conditions in this chapter. Otherwise, the probe may be damaged or the expected disinfection effect cannot be achieved. If you have any special purpose or requirement, contact the manufacturer.
- Prepare, use, store and dispose of the cleaning solution and disinfectant according to the instructions provided by the relevant manufacturers.
- Do not use the expired cleaning solution and disinfectant.
- Do not use the following methods to sterilize the probe.
  - Ultraviolet sterilizer
  - Gamma ray sterilizer
  - Steam sterilizer
  - Ethylene oxide gas
  - Ethylene oxide
- Do not disinfect the probe by heating. Temperature higher than 66℃ may damage the probe.
- To avoid potential disease transmission, you should wear medical sterile gloves and protective goggles during disinfection or sterilization of the probe cable.

⚠CAUTION Do not immerse the probe cable in alcohol or isopropyl alcohol at any concentration. Avoid any contact with iodine or phenols. Otherwise, it will accelerate the aging of the cable and decrease the service time of the probe, or even result in cable damages.

■ **Flush Fluid**

The sterile water is recommended as the flush fluid. After high-level disinfection, rinse the probe with sterile water thoroughly to remove the residual disinfectant. If no sterile water is available, the filtered water can also be used for terminal rinsing. If the filtered water is used, immediately use 75% ethyl alcohol to clean and dry the probe to avoid bacteria.

After high-level disinfection, use the filtered water or the sterile water for terminal rinsing.

NOTE:
- *The water quality of flush fluid should meet the requirements of AAMI TIR34.*
- *Do not reuse the flush fluid.*

■ **Cleaning Solution**

The medical cleaning solution or enzymatic cleaning solution is recommended to clean the probe. The cleaning solution should be used according to the concentration and temperature recommended by the manufacturer. For details on preparation, usage, storage and disposal of the cleaning solution, refer to instructions of the manufacturer.

NOTE:

- *Do not reuse the cleaning solution.*
- *Excessive cleaning solution foaming may cause inadequate contact between the interior of the channels and the cleaning solution. Consequently, the probe cannot be cleaned thoroughly.*

■ **Disinfectant**

Select an appropriate method to disinfect the probe according to the probe type. For each probe, the recommended disinfection methods are described in Table 11-6 and Table 11-7.

■ **Tools**

Table 11-2 Tools

Tools	Specifications	Quantities
Medical sterile gloves	/	Several
Brush	/	Several
Soft brush	/	Several
Cleaning tank	Refer to packaging size of the probe	1
Rinse tank	Refer to packaging size of the probe	1
Disinfection tank	Refer to packaging size of the probe	1
Syringe	10 mL	1
Clean lint-free cloth	/	Several
Sterile lint-free cloth	/	Several

11.2.2 Initial Treatment at Point of Use and Pre-cleaning

⚠ CAUTION The probe should be pre-cleaned immediately after use. If not, use a lint-free cloth dampened with filtered water to wipe the probe, and dry the probe. Any residue solidified on the probe may damage the probe.

Perform the following steps.

1. Disconnect the probe from the system after use.

2. Remove the probe sheath.

3. Use a clean soft lint-free cloth to wipe off the coupling gel on the probe surface.

4. Use a soft lint-free cloth dampened with filtered water to wipe off the residues on the probe surface and ensure that the probe surface is free of any residue.

NOTE:

- *Wipe the acoustic window gently.*
- *The soft lint-free cloth is single-use. Change it after each use.*

5. Wrap a soft brush in a clean soft lint-free cloth dampened with filtered water and use the wrapped brush to wipe the grooves of the probe.

11.2.3 Manual Cleaning

Before manual cleaning, you should ensure that there are no abnormalities, such as cracks on the handle and the front part of the probe, swellings and scratches on the acoustic lens, and cracks or other damages on the cable sheath. If you find any abnormality, please contact the local distributor of the manufacturer.

■ **Probe Cable**

Perform the following steps.

1. Wipe the probe cable as the method recommended in Table 11-3.

Table 11-3 Recommended Cleaning Solution for Body Surface Probes

Cleaning Solution	Manufacturer	Contact Type
3E-Zyme	Medisafe UK limited	Wipe

2. Clean the probe cable with sufficient filtered water.

■ **Body Surface Probe**

Perform the following steps to manually clean the probe after pre-cleaning.

1. Use a clean soft lint-free cloth to repeatedly wipe the probe surface in the running filtered water for at least 3 minutes and wipe the acoustic window gently.

2. Change the medical sterile gloves and wipe the probe as the method recommended in Table 11-3.

3. Use a soft lint-free cloth dampened with cleaning solution to repeatedly wipe the probe surface for at least 5 times.

4. Inspect the probe surface. If there are residues, repeat step 3 until the residues are removed.

5. Use a clean soft brush to brush the probe in the running filtered water for at least 3 minutes.

   NOTE:

   Do not brush the acoustic window with a soft brush.

6. Inspect the probe surface. If there is residual cleaning solution, repeat step 5 until the cleaning solution is removed.

7. Dry the probe with a clean soft lint-free cloth.

   NOTE:

   Do not dry the probe by heating.

■ **Endocavitary Probe**

Perform the following steps to manually clean the probe after pre-cleaning.

1. Use a clean soft lint-free cloth to repeatedly wipe the probe surface in the running filtered water for at least 3 minutes and wipe the acoustic window gently.

2. Change the medical sterile gloves and fill the cleaning tank with filtered water.

3. Prepare sufficient cleaning solution according to Table 11-4 and ensure that the probe can be immersed.

Table 11-4 Recommended Cleaning Solution for Endocavitary Probes

Cleaning Solution	Concentration	Temperature	Contact Time
Metrex EmPower	1:128	20℃ - 40℃	≥ 1 minute

4. Immerse the probe in the cleaning solution as shown in Figure 11-3. The endocavitary probe BCC9-5 is taken as an example.

50mm
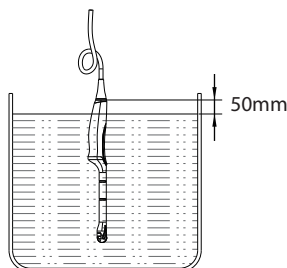
BCC9-5

Figure 11-3 Probe Immersion

5. Use a clean soft brush to repeatedly brush the probe surface in the cleaning solution for at least 5 times.

6. Inspect the probe surface. If there are residues, repeat step 5 until the residues are removed.

7. Immerse the probe according to the temperature and time recommended in Table 11-4 and ensure that there are no bubbles on the probe surface.

8. After immersion, take out the probe.

9. Use a clean soft brush to brush the probe in the running filtered water for at least 3 minutes.

   NOTE:

   Do not brush the acoustic window with a soft brush.

10. Inspect the probe surface. If there is residual cleaning solution, repeat step 9 until the cleaning solution is removed.

11. Dry the probe with a clean soft lint-free cloth.

   NOTE:

   Do not dry the probe by heating.

11.2.4 Disinfection

After manual cleaning, disinfect the probe cable and the probe as described below.

■ **Probe Cable**

Perform the following steps.

1. Spray or wipe the probe cable for disinfection according to Table 11-5.

2. After disinfection, rinse the probe cable with running filtered water, and dry the probe cable with a soft dry lint-free cloth.

Table 11-5 Recommended Method for Medium-level Disinfection

Disinfectant	Manufacturer	Active Ingredients	Level of Active Ingredients	Contact Type	Contact Period
T-spray II	Pharm. Inc.	Quat. Ammonia	/	Spray/Wipe	<10 minutes

Disinfectant	Manufacturer	Active Ingredients	Level of Active Ingredients	Contact Type	Contact Period
T-spray	Pharm. Inc.	Quat. Ammonia	/	Spray/Wipe	<10 minutes

■ **Body Surface Probe**

Perform the following steps.

1. Change the medical sterile gloves and place the probe into the disinfection tank.

2. Spray or wipe the probe for disinfection according to Table 11-6.

Table 11-6 Recommended Disinfectant for Body Surface Probe

Disinfectant	Manufacturer	Active Ingredients	Level of Active Ingredients	Contact Type	Contact Period
T-spray II	Pharm. Inc.	Quat. Ammonia	/	Spray/Wipe	<10 minutes
T-spray	Pharm. Inc.	Quat. Ammonia	/	Spray/Wipe	<10 minutes
70% Isopropyl alcohol	ALL	Isopropyl alcohol	70%	Spray/Wipe	<10 minutes

3. After disinfecting the probe as the recommended condition, place the probe into the rinse tank.

4. Fill the rinse tank with sufficient sterile water and rinse the probe in the sterile water for at least 1 minute.

5. Take out the probe, change the sterile water and rinse the probe twice.

6. Rinse the probe thoroughly with the running sterile water for at least 1 minute to remove the residual disinfectant.

7. Use a sterile soft lint-free cloth to wipe the probe surface thoroughly and ensure that the probe surface is dry.

■ **Endocavitary Probe**

If the endocavitary probe only contacts mucous membranes and does not contact sterile tissues or blood, you should disinfect the probe after cleaning.

Perform the following steps.

1. Change the medical sterile gloves and place the probe into the disinfection tank.

2. Prepare sufficient disinfectant according to Table 11-7 and ensure that the probe can be immersed.

Table 11-7 Recommended Disinfectant for Endocavitary Probe

Disinfectant	Concentration	Temperature	Contact Time
Lionser Glutaraldehyde	2.0 - 2.5%	25℃	45 minutes

3. Immerse the part 50mm below the cable sheath at the handle end in the disinfectant and shake the probe appropriately to remove the bubbles on the probe surface. The probe BCC9-5 is taken as an example and is immersed as shown in the following figure.
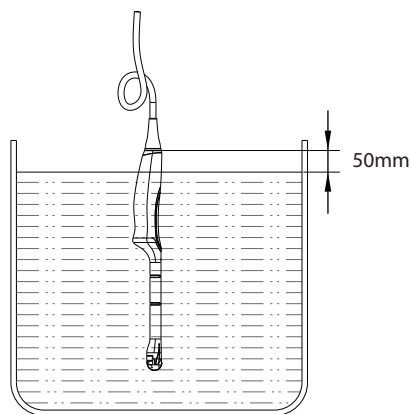
Figure 11-4 Endocavitary Probe Immersion 2

4. After disinfecting the probe as the recommended condition, place the probe into the rinse tank.

5. Fill the rinse tank with sufficient sterile water and rinse the probe in the sterile water for at least 1 minute.

6. Take out the probe, change the sterile water and rinse the probe twice.

7. Rinse the probe thoroughly with the running sterile water for at least 1 minute to remove the residual disinfectant.

8. Use a sterile soft lint-free cloth to wipe the probe surface thoroughly and ensure that the probe surface is dry.

11.3 Cleaning, Disinfecting and Sterilizing the Biopsy Bracket

The cleaning and sterilization procedures of double-wing vaginal dilator are same with the cleaning and steam sterilization procedures of biopsy bracket. Therefore, the biopsy bracket is taken as an example.

For preparations of biopsy bracket before cleaning, disinfection and sterilization, refer to Section 11.2.1 Preparations.

11.3.1 Initial Treatment at Point of Use and Pre-cleaning

NOTE:

The biopsy bracket should be cleaned immediately after use. Otherwise, the biopsy bracket should be cleaned with a soft lint-free cloth dampened with filtered water and then be dried.

Perform the following steps.

1. Remove the biopsy bracket and probe sheath from the probe.

2. Use a clean soft lint-free cloth to wipe off the residues on the biopsy bracket surface.

3. Use a soft brush to clean the grooves and connections of the biopsy bracket.

11.3.2 Manual Cleaning

Perform the following steps to manually clean the biopsy bracket after pre-cleaning.

1. Remove all detachable parts of the biopsy bracket.

2. Flush the biopsy bracket and all its parts with filtered water for at least 2 minutes to remove all visible residues.

3. Prepare the cleaning solution according to Table 11-8, and immerse all disassembled parts in the cleaning solution completely.

Table 11-8 Recommended Cleaning Solution

Cleaning Solution	Concentration	Temperature	Contact Time
Neodisher MediClean forte	5 - 20 ml/l (0.5% - 2%)	max. 40°C	10 - 30 minutes

4. Use a soft brush to clean the biopsy bracket surface, connections and all its parts in the cleaning solution until there are no visible residues.

   NOTE:

   If the biopsy bracket contains the tube holder or the biopsy guide tube (For example, NGBL741 containing the tube holder and the biopsy guide tube, and NGB6V3 containing the tube holder), use a round nylon cleaning brush to clean the tube holder and the biopsy guide tube.

5. Use a 10 mL syringe to inject the cleaning solution into the tube holder and the biopsy guide tube until the tube holder and the biopsy guide tube are cleaned.

6. Place the biopsy bracket and all its parts in the ultrasonic cleaner for 3min - 5min cleaning.

7. Take out the biopsy bracket and all its parts from the ultrasonic cleaner.

8. Rinse the biopsy bracket and all its parts with the running filtered water for at least 2 minutes to remove the cleaning solution.

9. Dry the biopsy bracket with a sterile soft lint-free cloth.

10. Ensure that there are no residues and cleaning solution on the biopsy bracket surface. Otherwise, repeat step 6 - 8 until the biopsy bracket is cleaned.

11.3.3 Automated Cleaning and Disinfection

After manual cleaning, the biopsy bracket should be cleaned and disinfected by using the washer-disinfector. The detailed information about the washer-disinfector recommended by the manufacturer is shown in Table 11-9.

Table 11-9 Recommended Washer-Disinfector

Device Name	Model	Manufacturer
Washer-Disinfector	Amsco® 2532	STERIS

Perform the following steps.

1. Place the biopsy bracket and its parts in the washer-disinfector.

2. Prepare the cleaning solution according to Table 11-10, and add sufficient cleaning solution into the storage chamber of the washer-disinfector.

Table 11-10 Recommended Cleaning Solution

Cleaning Solution	Concentration	Temperature
Neodisher MediClean forte	2 - 10 ml/l (0.2%-1%)	43.3 - 60°C

3. Log in the washer-disinfector to enter the user interface and set the procedure of the corresponding tank. The procedure parameters are shown in Table 11-11.

Table 11-11 Parameter Settings

Procedure	Temperature	Time
Pre-cleaning	< 30 ℃ (cold)	10 minutes
Cleaning	43.3 - 60℃	10 minutes
Rinsing	< 30℃ (cold)	10 minutes
Moist heat disinfection	93℃	10 minutes
Drying	82.2℃	10 minutes

4. Ensure that the door of the washer-disinfector is closed and start up the washer-disinfector.

5. After automated cleaning and disinfection, take out the biopsy bracket and its parts from the washer-disinfector.

11.3.4 Sterilization

After automated cleaning and disinfection, perform steam sterilization for biopsy bracket as described below.

NOTE:
- *The biopsy bracket should be cleaned and sterilized after each use.*
- *For use of steam sterilizer, refer to the instructions provided by the manufacturer of the sterilizer.*
- *You should wear protective goggles and medical sterile gloves when cleaning the biopsy bracket.*

Pre-vacuum steam sterilization is recommended by the manufacturer for the biopsy brackets. Flash steam sterilization procedure is not allowed. The approved and validated sterilizer should be selected.

The biopsy bracket NGB6V3-2 is taken as an example.

Perform the following steps.

1. Place the biopsy bracket and all its parts in the high-pressure sterile package as required.

   NOTE:
   The packaging materials should comply with the requirements of ISO 11607.

2. Place the packaged biopsy bracket in the sterilizer and strictly follow the operation procedure of the sterilizer, and monitor the sterilization effect by using the biological or chemical indicator.

Table 11-12 Recommended Method for Steam Sterilization

Sterilization Method	Sterilizer Type	Steam Pressure	Temperature	Exposure Time	Dry Time
Steam Sterilization	Pre-vacuum	184.4kPa - 210.7kPa	132℃	4 minutes	30 minutes
		201.7kPa - 229.3kpa	134℃	5 minutes	

3. After sterilization, take out the packaged biopsy bracket and let it cool down to room temperature naturally. Otherwise, the biopsy bracket may be damaged.

4. Inspect the integrity of the sterile package. If the sterile package is damaged, the seal is opened, or the biological or chemical indicator indicates invalid sterilization, re-sterilize the biopsy bracket.

12   Maintenance

To maintain the safety and functionality of the system, periodically perform the maintenance for the system and accessories.

⚠ **WARNING**
- To avoid electrical shock and damage to the system, power off and unplug the system from the AC power outlet before maintenance.
- To maintain the safety and functionality of the system, maintenance must be performed at least once every year. Electrical safety tests must also be performed at regular intervals as specified by local safety regulations.

12.1   Maintenance Checks

To maintain the safety and functionality of the system, the following maintenance checks must be performed by service personnel at least once every year. During use, any serious incident that has occurred in relation to the system should be reported to the local distributor and the competent authority of the Member State.

■ **Electrical Safety**
- Integrity of power cable
- Protective conductor resistance
- Ground line leakage current
- Enclosure leakage current
- Patient leakage current
- Patient auxiliary leakage current

■ **Mechanical Safety**

NOTE:

The surfaces of the control panel or the keyboard may be abrasive because of the split liquid or other cleaning sprays. Check the potential problems carefully during maintenance checks.

- Appearance of the system enclosure
- Appearance of the control panel and the keyboard
- Control of foot brake
- Connectivity of interfaces

■ **Image Recording**
- Images in each mode
- Image recording using the standard probe

12.2   Troubleshooting

No.	Fault Description	Solution
1	The system cannot be powered on.	• Check whether the power cable is securely connected. • Check whether the main power switch is located to Ⅰ position. • Check whether the fuse is intact. If the fuse is blown, replace it as described in Section 12.3 Replacing the Fuse.
2	No images are displayed on the monitor.	Check whether the power cable and video cable are securely connected.
3	The image is abnormal.	• Check whether the appropriate probe and exam type are selected. • Check whether relevant parameters are adjusted. For details, refer to Chapter 6 Acquiring Images.

If any of the above problems still exist, please contact the Customer Service Department of the manufacturer for help.

12.3   Replacing the Fuse

⚠ WARNING Power off the system and disconnect the power cable from the socket before replacing the fuse.

Two fuses with specifications of 50CT-T3.15AH-250V are provided by the manufacturer. You can also purchase the fuse with the same specifications for the fuse replacement.

You can replace the fuse under the instructions of the service personnel if the fuse is blown.

If the fuse is blown again after a replacement, please stop using the system immediately and contact customer service.

12.4   Storage and Transportation

You should store or transport the probe in accordance with Appendix A Specifications.

■   **To store the probe**

Follow the items below to store the probe.

• Store the probe in a probe holder or specific package when the probe is not in use.
• Ensure the probe holder is clean before storing the probe.
• To avoid contaminating the package, clean, disinfect or sterilize the probe before storage or store it in a disposable probe package.
• Do not store the probe in direct sunlight or the environment of sudden temperature changes.
• Store the probe alone to avoid any impact on the probe head.
• Carefully wind the probe cable.
• Dry the probe before storing it.

■   **To transport the probe**

Perform the following steps to transport the probe.

1. Place the probe into the required package after cleaning, disinfection or sterilization.

2. Place the packaged probe into the carrying case completely.

3. Close the cover of the carrying case.

4. Pack the carrying case with foam plastics and place the case in a carton.

■   **To store the biopsy bracket**

Ensure that the biopsy bracket is cleaned, sterilized and completely dried before storage. Place the biopsy bracket in a required sterile package and keep the biopsy bracket away from the environment of sudden temperature changes or direct sunlight.

12.5   Equipment Disposal

You should dispose of the main unit, the probe, the biopsy bracket and other accessories in accordance with local laws and regulations.

For the detailed disposal information, consult the manufacturer or the local distributor. The manufacturer is not responsible for any system content or accessories that have been discarded improperly.

12.6   Customer Service

Only the service personnel of or authorized by the manufacturer can service the system. Any feedback or inquires concerning our product or services should be directed to the following address.

Contact address: 2F, 12th Building, Shenzhen Software Park Phase II, Keji Middle 2nd Road, Nanshan District, Shenzhen, 518057, Guangdong, China

Tel: +86-755-26722890

E-mail: service@sonoscape.net

Appendix A Specifications

Comply with	EN 60601-1 (IEC 60601-1), Medical electrical equipment Part 1: General requirements for basic safety and essential performance, Class I, BF, continuous operation EN 60601-2-37 (IEC 60601-2-37), Medical Electrical Equipment Part 2-37: Particular Requirements for the Basic Safety and Essential Performance of Ultrasonic Medical Diagnostic and Monitoring Equipment EN 60601-1-2 (IEC 60601-1-2), Medical electrical equipment- Part 1-2: General requirements for basic safety and essential performance - Collateral standard: Electromagnetic disturbances - Requirements and tests

Classifications	Type of protection against electrical shock	Class I
	Degree of protection against electrical shock	Type-BF applied part
	Installation Type	Mobile equipment
	Degrees of protection against harmful liquid	System is IPX0 Probe (from the acoustic window to the junction line) is IPX7 Foot switch is IPX8
	According to the degree of safety of application	The equipment is not suitable for use in the presence of a flammable anesthetic mixture with air, oxygen or nitrous oxide.

Environmental Requirement	Operations	• Ambient Temperature: 10℃ to 40℃ • Relative Humidity: 30% to 75% (no condensation) • Atmospheric Pressure: 700hPa to1060hPa
	Storage and Transportation	• Ambient Temperature: -20℃ to +55℃ • Relative Humidity: 20% to 90% (no condensation) • Atmospheric Pressure: 700hPa to1060hPa

Power Supply	Voltage: 100-240V~ Frequency: 50/60Hz Power consumption: 250VA (Max.)
Fuse	Type: 50CT Breaking capacity: 1500 amperes at 250V AC Blowing time rating: 30 minutes (Max.) Current rating: 3.15A
Applied Parts	Probes, ECG electrodes

Appendix B EMC Guidance and Manufacturer's Declaration

B.1   Electromagnetic Emissions

The equipment is intended for use in the electromagnetic environment specified below. The customer or the user of the EQUIPMENT should assure that it is used in such an environment.

Emissions Test	Compliance	Electromagnetic Environment and Guidance
RF emissions CISPR 11	Group 1	The equipment uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	The equipment is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

B.2   Electromagnetic Immunity

The equipment is intended for use in the electromagnetic environment specified below. The customer or the user of the equipment should assure that it is used in such an environment.

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment and Guidance
Electrostatic discharge (ESD) IEC 61000-4-2	±8 kV contact ±15 kV air	±8kV Contact ±15kV Air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%. If ESD interfere with the operation of equipment, counter measurements such as wrist strap, grounding shall be considered.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines	±2 kV for power supply lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±1 kV differential mode ±2 kV common mode	±1kV differential mode ±2kV common mode	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	0 % UT (100 % dip in UT) for 0,5 cycle 0 % UT (100 % dip in UT) for 1 cycles 70 % UT (30 % dip in UT) for 25/30cycles 0 % UT (100 % dip in UT) for 250/300 cycles	0 % UT (100 % dip in UT) for 0,5 cycle 0 % UT (100 % dip in UT) for 1 cycles 70 % UT (30 % dip in UT) for 25/30cycles 0 % UT (100 % dip in UT) for 250/300 cycles	Mains power quality should be that of a typical commercial or hospital environment. If the user of the equipment requires continued operation during power mains interruptions, it is recommended for the equipment to be powered from an uninterruptible power supply or a battery.
Power frequency (50/60Hz) magnetic field IEC 61000-4-8	30 A/m	30 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.

NOTE: U_T is the a.c. mains voltage prior to application of the test level.

The equipment is intended for use in the electromagnetic environment specified below. The customer or the user of the equipment should assure that it is used in such an environment.

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment and Guidance
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz (6V in ISM and amateur radio bands between 0.15MHz and 80 MHz)	3 Vrms 150 kHz to 80 MHz (6V in ISM and amateur radio bands between 0.15MHz and 80 MHz)	Portable and mobile RF communications equipment should be used no closer to any part of the EQUIPMENT, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance: $$d = 1.2\sqrt{p}$$ $$d = 1.2\sqrt{p} \quad \text{80MHz-800 MHz}$$
Radiated RF IEC 61000-4-3	10 V/m 80 MHz to 2,7 GHz	10V/m	$$d = 2.3\sqrt{p} \quad \text{800 MHz-2.5GHz}$$ Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,[a] should be less than the compliance level in each frequency range. [b] Interference may occur in the vicinity of equipment marked with the following symbol:

NOTE 1: At 80 MHz and 800 MHz, the higher frequency range applies.

NOTE 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

[a] Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) tele- phones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the EQUIPMENT is used exceeds the applicable RF compliance level above, the EQUIPMENT should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the EQUIPMENT.

[b] Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.

B.3 Recommended Separation Distances between Portable and Mobile RF Communications Equipment and the Equipment

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

Rated Maximum Output Power of Transmitter (W)	Separation distance according to frequency of transmitter (m)		
	150 kHz to 80 MHz $d = 1.16\sqrt{p}$	80 MHz to 800 MHz $d = 1.16\sqrt{p}$	800 MHz to 2.5 GHz $d = 2.33\sqrt{p}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1: At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

NOTE 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

Appendix C In Situ, Derated, and Water Value Intensities

All intensity parameters are measured in water. Since water absorbs very little acoustic energy, these water measurements represent a worst case value. Biological tissue does absorb acoustic energy. The true value of the intensity at any point depends on the amount and type of tissue and the frequency of the ultra-sound that passes through the tissue. The intensity value in the tissue, In Situ, has been estimated by using the following formula:

In Situ = Water[$e^{-0:23alf}$]

Where,

In Situ = In Situ Intensity Value

Water = Water Value Intensity

e = 2.7183

a = Attenuation Factor

Tissue = a (dB/cm-MHz)

Amniotic Fluid = 0.006

Brain = 0.53

Heart = 0.66

Kidney = 0.79

Liver = 0.43

Muscle = 0.55

l = Skin line to measurement depth (cm)

f = Center frequency of the transducer/system/mode combination (MHz)

Since the ultrasonic path during an examination is likely to pass through varying lengths and types of tissue, it is difficult to estimate the true In Situ intensity. An attenuation factor of 0.3 is used for general reporting purposes; therefore, the In Situ value which is commonly reported uses the formula:

In Situ derated = Water[$e^{-0.069lf}$]

Since this value is not the true In Situ intensity, the term "derated" is used.

Appendix D Recommended Coupling Gel

NOTE:

- *Coupling gels listed in this manual are recommended because of their chemical compatibility with product materials, not their biological effectiveness.*
- *This appendix contains the latest information about the recommended coupling gels-when the user manual is released. The appendix is subject to change without prior notice.*
- *Select the recommended coupling gel according to the probe models compatible with the system.*

Probe Model	Applicable
12C-ER	Aquasonic 100, Aquasonic Clear, Sterile Aquasonic, Clear Image/Single, Sterile Ultraphonic Gel
10I2, 6CI-A, 6CT-A, 10L-I, 12LI-A, 12LT-A	Aquasonic 100, Aquasonic Clear, Sterile Aquasonic, Clear Image/Single, Sterile Ultraphonic Gel, Transonic gel
EC9-5, 6V1, 6V3, BCC9-5, 6V1A, 6V3A, 6V7	Aquasonic 100, Aquasonic Clear, Sterile Aquasonic, Clear Image/Single, Sterile Ultraphonic Gel, Transonic gel, Clear Scanning Gel
VC6-2, VE9-5, CWD5.0, VC2-9	Aquasonic 100, Aquasonic Clear, Sterile Aquasonic, Clear Image/Single, Sterile Ultraphonic Gel, Transonic gel
2P1, 5P1, 10L1, C344, C361, C362, C542, C611, L741, L741V, L742, L743, L746, L752, C322, C322V, C353, C354, C613, 3C-A, C1-6, 3P-A, 4P-A, 5P2, 7P-A, 7P-B, 8P1, 9L-A, 13L-A, 18L-A, S1-5, C1-6A, 12L-A, 12L-B	Aquasonic 100, Aquasonic Clear, Sterile Aquasonic, Clear Image/Single, Sterile Ultraphonic Gel, Transonic gel, Clear Scanning Gel, Multigel Gel

Appendix E Acoustic Output Data

Please refer to Section 4.7.2 Acoustic Output.