About This Manual

P/N: 4710-03219A04

Product Model: P40 Elite/P40E

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- 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.
NOTE	Indicates precautions or recommendations that should be used in operating the system.

Item	Meaning
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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Contents

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.

1.1 Intended Use

The Digital Color Doppler Ultrasound System is a general-purpose ultrasonic imaging instrument intended for use by a qualified physician for evaluation of 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), Trans-esoph (Cardiac), Laparoscopic, 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.

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

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

1.2 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.

1.2.1 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 water is spilled onto the system carelessly, stop using the system 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.

1.2.2   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.

1.2.3 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 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 the cleaner, disinfectant and sterilant 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.

1.2.4 Biohazard Considerations

☣
- To minimize the risk of cross-contamination or infectious diseases when performing a biopsy, the operator should wear disposable gloves, protective clothing or protective goggles if it is needed. Follow the working regulations strictly in case the skin contacts the samples.
- Some disinfectants or sterilants are acid or alkaline. Use them with caution, and prevent hands or clothing from coming into direct contact with them. Wash hands or eyes immediately in case of any contamination by disinfectants.
- Dispose of cleaners, disinfectants or solutions in accordance with local standards or regulations.

1.3 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.

1.3.1 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.

1.3.2 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".

1.3.3 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.

1.3.4 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

1.3.5 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.

1.4 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
CE 0197	This product is provided with a CE marking in accordance with the regulations stated in Council Directive 93/42/EEC.

Symbol	Meaning
EC REP	Authorized representative in the European community
	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
	Remote control
	USB Port
	Video Input
	Video Output

Symbol	Meaning
	Audio
	Fragile, handle with care
	Keep away from rain
	No stacking
	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

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2　System Overview

This ultrasound system adopts advanced ultrasonic Doppler technologies.

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 key panel 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

● Lifting range: 0-230mm
● System dimensions: 550 mm (W) × 743 mm (D) × 1360 mm (H)
● System weight: approx. 84 kg

2.3　System Components

Figure 2-1 Overview of the System

1	Monitor	13	Front Panel
2	Touch Screen	14	Probe Cable Hanger
3	Speaker	15	Control Panel
4	Probe Holder	16	Probe Holder
5	Document Basket	17	Cable Hanger
6	Probe Holder Hanger/ Coupling Gel Heater	18	Dust Filter
7	Cable Hanger	19	Power Supply Panel
8	On/Off Button	20	Peripheral Device Panel
9	Dust Filter	21	Ventilation Holes
10	Caster	22	Cable Hanger
11	Footswitch Port	23	Handle
12	Probe Port		

2.3.1   Peripheral Device Panel
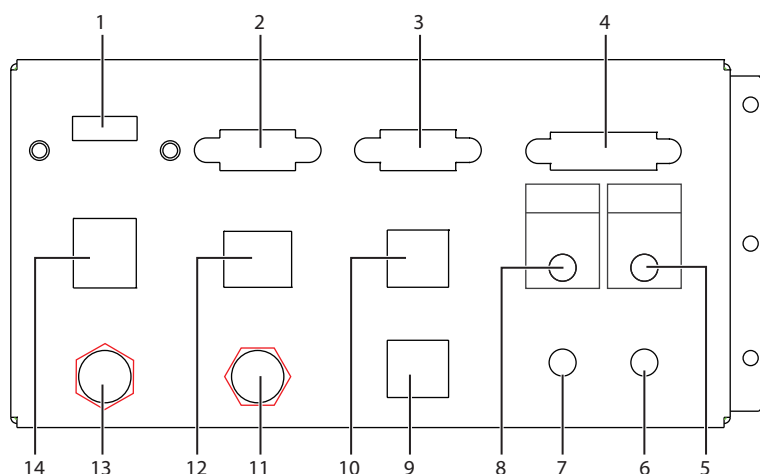
Figure 2-2 Peripheral Device Panel

No.	Name	Description
1	**HDMI** port	Connect a video device to acquire HDMI signals.
2	**VGA OUT** port	Connect a video device to acquire VGA signals, such as a monitor or projector.
3	**RGB OUT** port	Connect a video device to acquire VGA signals, such as a monitor or projector.
4	**DVI** port	Connect a video device to acquire DVI signals.
5	**PRINT** port	Connect a video printer.
6	**MIC IN** port	Reserved function
7	**AUDIO IN** port	Reserved function
8	**AUDIO OUT** port	Connect an audio device.

No.	Name	Description
9	**S-VIDEO IN** port	Reserved function
10	**S-VIDEO OUT** port	Connect a video device to acquire S-VIDEO signals, such as a monitor or projector.
11	**VIDEO IN** port	Reserved function
12	Net port	Connect to the DICOM server or network.
13	**VIDEO OUT** port	Connect a video device to acquire standard signals, such as a video printer.
14	USB port	Connect USB devices.

2.3.2   Power Supply Panel
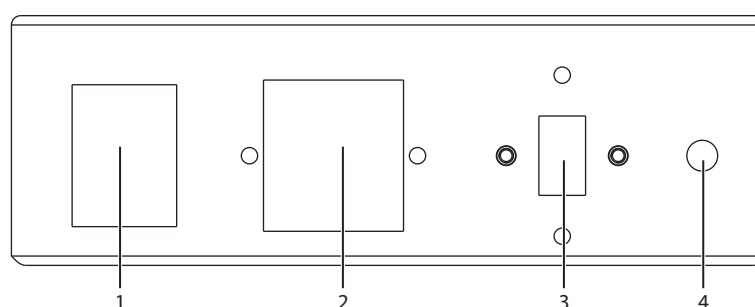
Figure 2-3 Power Supply Panel

No.	Name	Description
1	POWER switch	Power on or off the system.
2	Power input	Connect the power cable.
3	Voltage conversion switch	Convert the voltage.
4	Equipotentiality	Balance the protective earth potentials between the system and the other electrical equipment for equipotential connection.

2.3.3   Front Panel
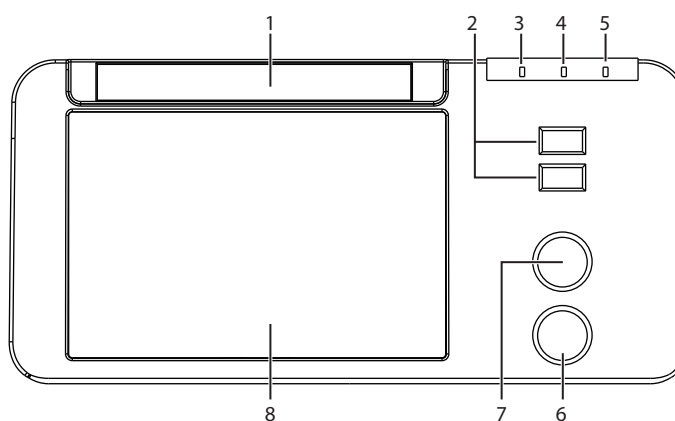
Figure 2-4 Front Panel

No.	Name	Description
1	DVD drive	Backup data or images.
2	USB ports	Connect the USB drives.
3	Mains supply indicator	Indicate the mains supply status.
4	Battery charging indicator	Indicate the battery charging status.
5	Battery discharging indicator	Indicate the battery power status.
6	Pencil probe port	Connect the pencil probe.
7	ECG port	Connect the ECG cable.
8	Printer compartment	Place the video printer.

2.3.4 Control Panel
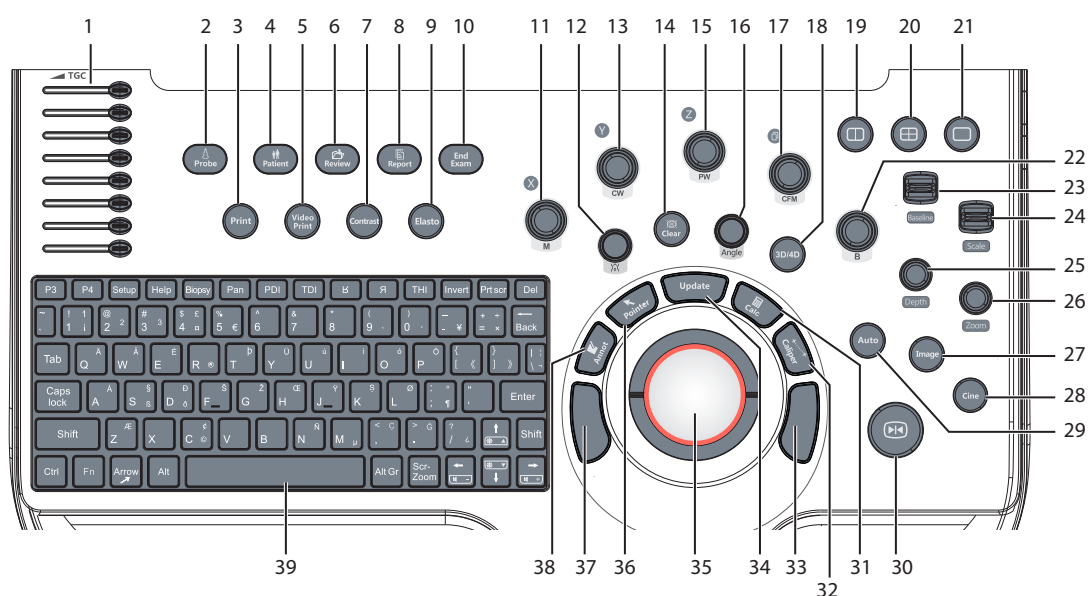
Figure 2-5 Control Panel

No.	Name	Description
1	TGC slider	Use these sliders to adjust the TGC settings at different scan depths.
2	Probe	Press it to select a probe and an icon for the corresponding exam type.
3	Print	Press it to trigger the network printer if a network printer is successfully connected.
4	Patient	Press it to enter the **New Patient** screen.
5	Video Print	Press it to print the current screenshot if the video printer is successfully connected.
6	Review	Press it to display the **Patient Exam List** screen. Press it to enter the **Review Image** screen after creating a new patient exam.
7	Contrast	Press it to enter or exit the contrast imaging mode.

No.	Name	Description
8	Report	Press it to enter the **Report** screen.
9	Elasto	Press it to enter or exit the elastography mode.
10	End Exam	Press it to end the exam for the current patient in the real-time mode.
11	M	Press it to enter the pre-activated M mode. Rotate it to adjust the gain value in the M mode.
12	Body Mark ( )	Press it to add body marks on an image.
13	CW	Press it to enter the pre-activated CW mode. Rotate it to adjust the gain value in the CW mode.
14	Clear	Press it to remove all measurement results, annotations and body marks from the display.
15	PW	Press it to enter the pre-activated PW mode. Rotate it to adjust the gain value in the PW mode.
16	Angle	Rotate it to adjust the flow direction in the PW/CW mode. Rotate it to adjust the angle of M line in the M mode. Rotate it to adjust the arrow direction if the arrow annotation feature is activated. Rotate it to adjust the probe direction if the body mark feature is activated. Rotate it to adjust the angle of hip joint when performing a pediatrics measurement.
17	CFM	Press it to enter or exit the CFM mode. Rotate it to adjust the gain value in the CFM mode, or to move the 3D image horizontally in 3D/4D mode.
18	3D/4D	Press it to enter or exit the 3D/4D mode.
19	Dual Split Display ( )	Press it to enter the dual split display. Press it to activate the desired image in the dual split display.
20	Quad Split Display ( )	Press it to enter the quad split display. Press it to activate the desired image in the quad split display.
21	Single Display ( )	Press it to enter the single display.
22	B	Press it to enter the B mode. Rotate it to adjust the gain value in the B mode.
23	Baseline	Flip it to adjust the baseline position in the CFM/TDI/PW/CW mode.
24	Scale	Flip it to adjust the PRF value in the CFM/TDI/PDI/PW/CW mode.
25	Depth	Rotate it to adjust the scan depth. Press it to restore to the default scan depth.

No.	Name	Description
26	Zoom	Press it to activate the zoom feature.
27	Image	In the real-time mode or frozen mode, press it to save an image.
		In the real-time contrast imaging mode, press it to set the start frame for a cine of blood flow, and press it again to set the end frame.
28	Cine	Press it to save a cine in the frozen mode.
29	Auto	Press it to optimize an image automatically.
30	Freeze (⏮)	Press it to freeze an image in the real-time mode.
		Press it again to restore the real-time scan.
31	Calc	Press to activate the application-specific measurement and calculation features.
32	Caliper	Press to activate the basic measurement and calculation features.
		Press it to perform the distance measurement in the 2D (B/CFM/PDI/TDI)/M/3D/4D mode.
		Press it to activate a velocity measurement in the PW/CW mode.
33	Set key	Press it to confirm the current operation.
34	Update	Press it to enter the M/PW/CW mode in an 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.
35	Trackball	Use it to move the cursor and adjust ROI.
36	Pointer	Press it to activate the clipboard in the 2D (B/CFM/PDI/TDI)/M mode.
		Press it to activate the cursor in the 3D/4D mode.
37	Set key	Press it to confirm the current operation.
38	Annot	Press it to annotate an image with typed words.
39	Key panel	Use it to enter the patient information. For details, refer to Section 2.3.5 Key Panel.

2.3.5   Key Panel

Figure 2-6 Key Panel

No.	Name	Description
1	**P3** key	Press it to save images, cine or volume, or to enable the sonogram navigation feature. For details, refer to Section 4.1.3 Multikey Settings.
2	**P4** key	
3	**Setup** key	Press it to enter the **System Setting** menu.
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	ꓘ 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** menu. ● 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   Basic Screen
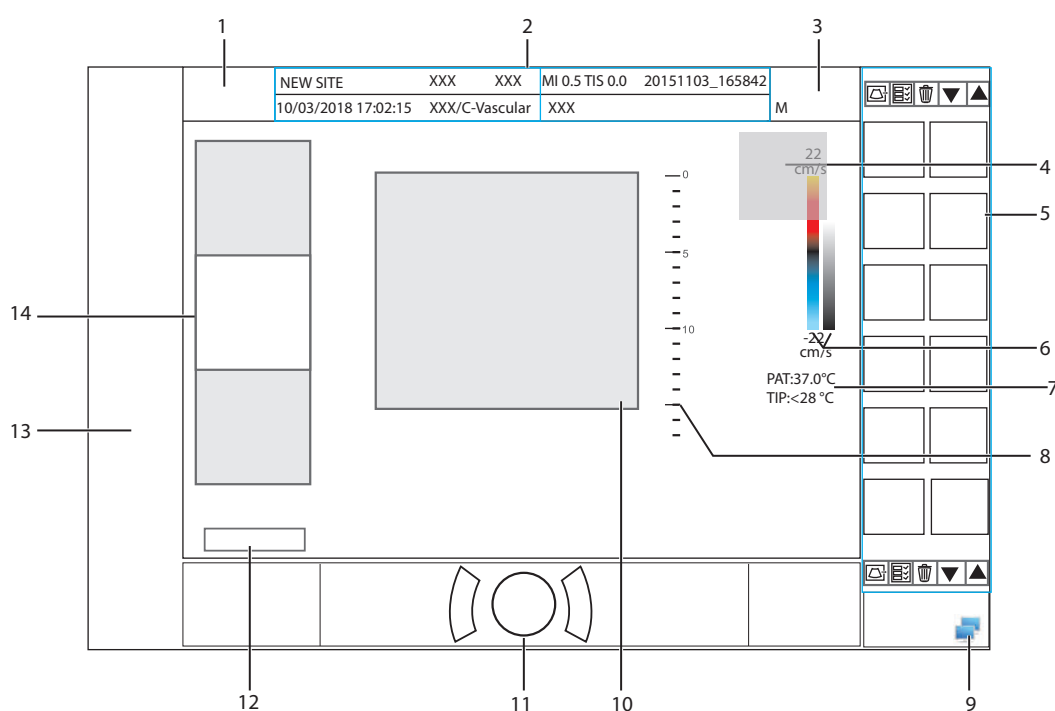
Figure 2-7 Basic Screen

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

NOTE:

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

2.3.7   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 knobs located on the control panel and the key panel 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:
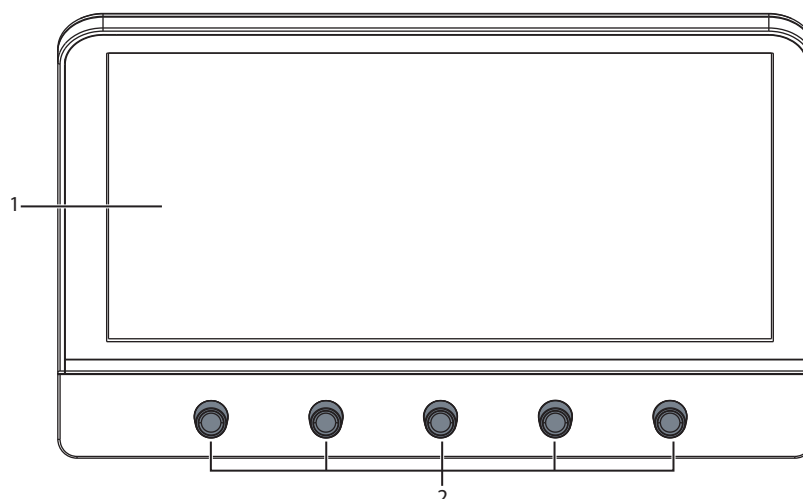
Figure 2-8 Touch Screen

No.	Name	Description
1	Touch Screen	The display varies with the feature to be performed: application mode screen, imaging mode menu, annotation/bodymark menu, measurement menu, and sonogram navigation menu.
2	Image Optimization Knob	Rotate the knob 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.

■ **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. Press the **Probe** key on the control panel to return to the following screen when you enter other screens.
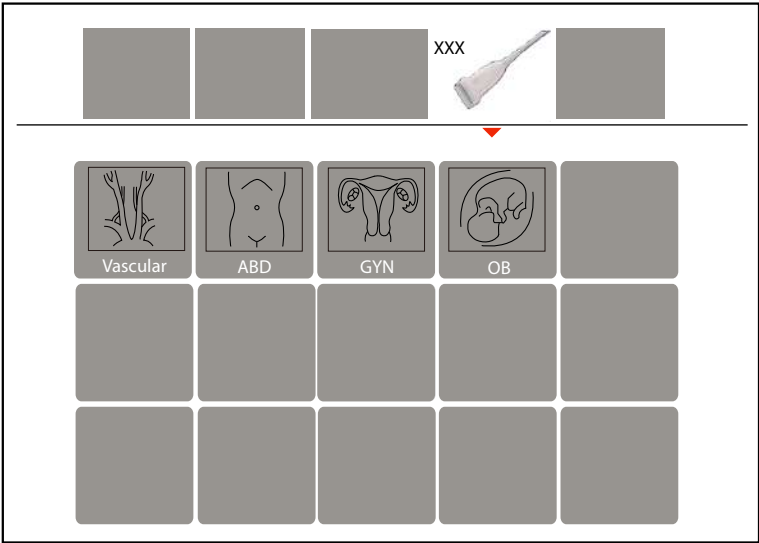
Figure 2-9 Application Mode Screen

■   **Imaging Mode Menu**

The imaging mode menu 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.
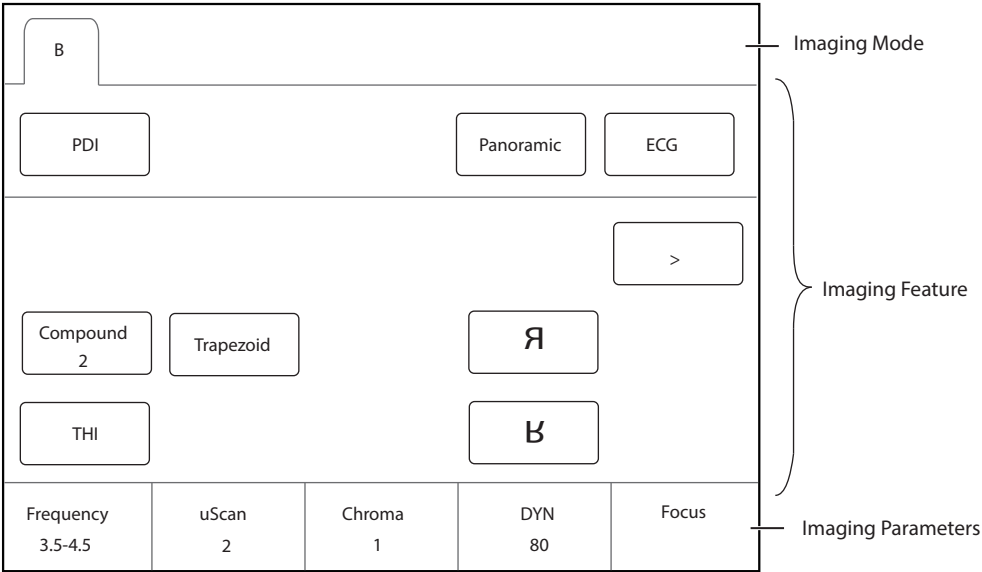
Figure 2-10 Imaging Mode Menu

■   **Annotation/Body Mark Menu**

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

Press the **Annot** key or rotate the **Body Mark** key on the control panel to enter the menu. For example, the following screen will be displayed on the touch screen if you rotate the **Body Mark** key.
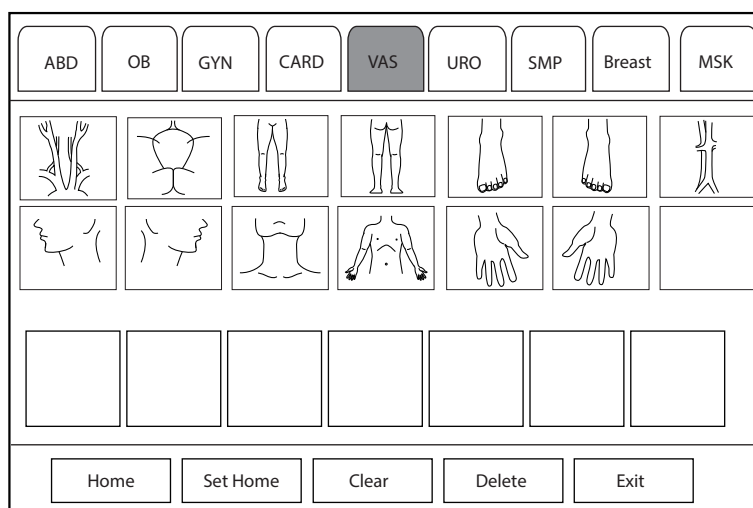
Figure 2-11 Body Mark Menu

■   **Measurement Menu**

The measurement menu is used to select the measurement item to be performed.

Press the **Caliper** key on the control panel to enter the basic measurement menu. Or, press the **Calc** key on the control panel to enter the application-specific measurement menu.
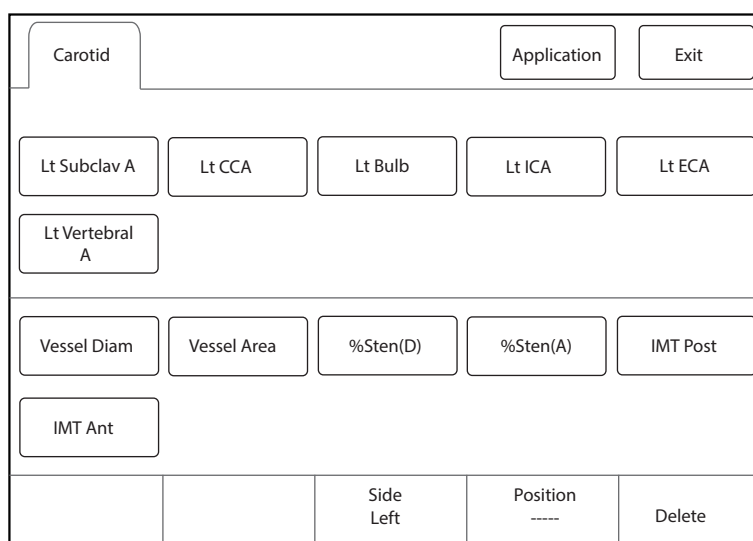
Figure 2-12 Application-Specific Measurement Menu

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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.
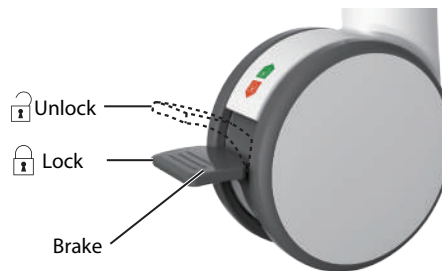
🔓 Unlock

🔒 Lock

Brake

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 it in the desired location.

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 connect or disconnect the system with the mains supply.

● The ⏻ button on the side panel is used to start up or shut down 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.

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 supply cable.

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

A fully charged battery can work continuously for more than 1 hour.

Two built-in batteries are used for system power supply. If you need to disassemble or change the battery, please contact the local distributor.

When the power supply time of the battery is less than 10 minutes, the screen displays the prompt information and low battery icon 🔋 (flashing once per second) at the bottom right, and the system makes an alarm sound simultaneously. At this time, please 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°F).
- 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 capacity 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
☀	Battery Charging Indicator	Yellow, charging	Off
		Green, fully charged	

Indicator	Name	Mains Supply	Battery Supply
⎓	Mains Supply Indicator	Green	Off
🔋	Battery Discharging Indicator	Off	Green, full capacity
			Yellow, low capacity
			Extremely low capacity. The system will automatically shut down. The buzzer beeps.

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 15 System Maintenance.

3.3.1   Powering On the System

1. Set the power switch on the power supply panel to the ❙ position.
2. Press the ⏻ button on the side panel to power on the system.

All operating indicators illuminates, the initial screen and the application mode screen appear after the system completes the initialization.

3.3.2   Powering Off the System

1. Press the ⏻ button on the left side 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

If the ultrasound system is idle for a set period, the screen saver will be activated. For details, refer to Section 4.1.2 Display Settings.

3.4   Adjusting the System

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.
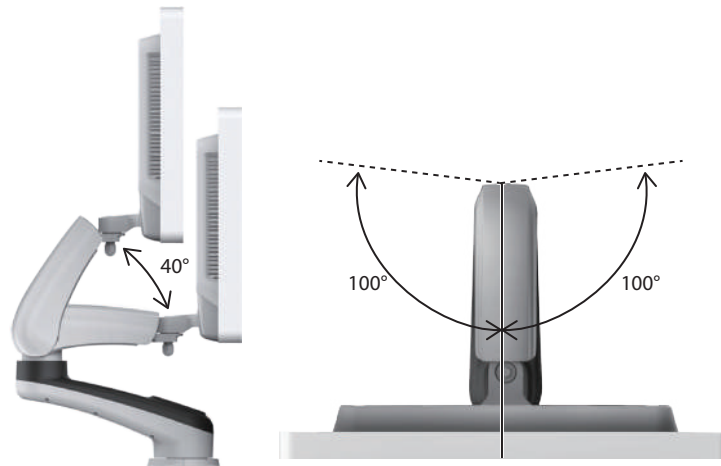
- To adjust the monitor vertically, move the upper arm towards to or backwards from the lower arm.
- To adjust the monitor horizontally, swivel the upper arm left or right.

3.4.2   Adjusting the Display Monitor

■   **To swivel the LCD monitor**

Grip the upper and lower sides of the monitor, tilt the monitor forward or backward.
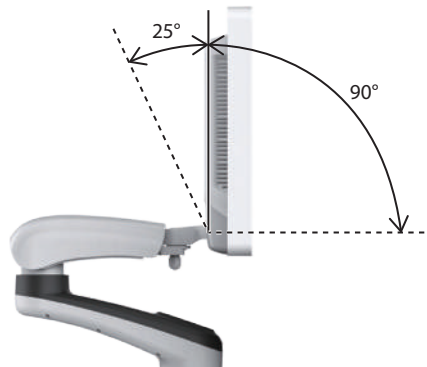
Grip the left and right sides of the monitor, and swivel the monitor left or right.
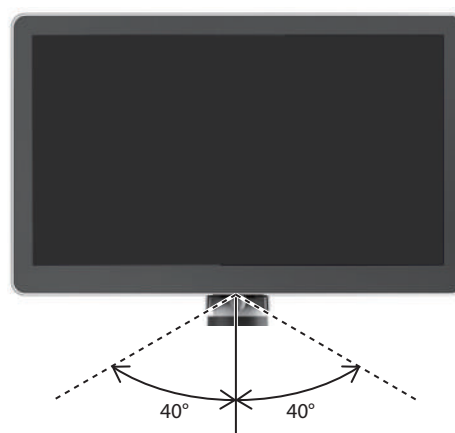
■   **To adjust the brightness and contrast**

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.

Use the buttons located on the right side of the monitor to adjust the brightness and contrast settings.

- Pres**s** ○ button **to** enter the monitor menu.
- Press **–** button to display the setting menu for **Contrast**. Pressing **+** can increase the value of the contrast; pressing **–** can decrease the value.
- Press **+** button to display the setting menu for **Brightness**. Pressing **+** can increase the value of the brightness; pressing **–** can decrease the value.
- Press the **Fn** key and the Up/Down arrow key simultaneously to adjust the display 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.

Up/Down Control Lever

Swivel Button
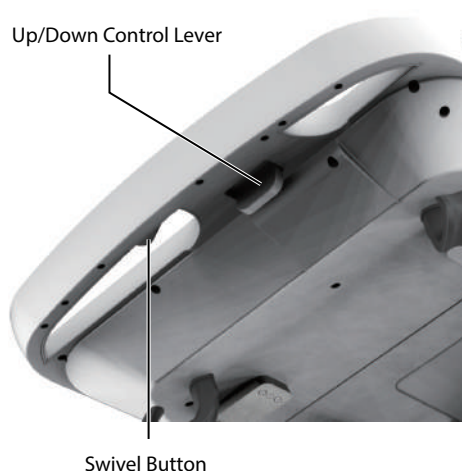
■ **To adjust the vertical position**

- Move and hold the up/down control lever towards the front handle to reach a desired height, then release.
- Move and hold the up/down control lever towards the front handle, and press down the control panel to reach a desired height, then release.

■ **To adjust the horizontal position**

Hold down the swivel button towards the front handle and use the front handle to adjust the control panel in any directions, then release.

3.5 Connecting the Probe

⚠ CAUTION
- Disconnect the probe from the system after freezing an image or powering the system off. Otherwise, the probe of the system could be damaged.
- Freeze the image at any time if you do not operate the ultrasound system for a long period.

3.5.1 Connecting the Probe

1. Rotate the locking lever 90° anticlockwise to the ⬚⌒ position, and then insert the probe connector into the probe port firmly.
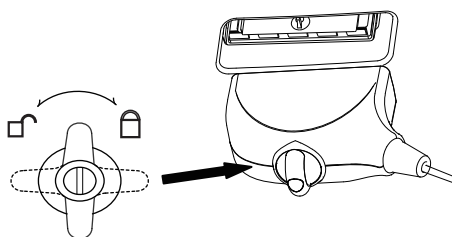
2. Rotate the locking lever 90° clockwise to lock it securely.

3.5.2   Connecting the Pencil Probe

Connect the pencil probe to the port located on the front panel of the system.

3.5.3   Disconnecting the Probe

Rotate the locking lever 90° anticlockwise to the horizontal position, and then pull the probe connector out directly.

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 to the foot switch port of the ultrasound system as the figure shows below.
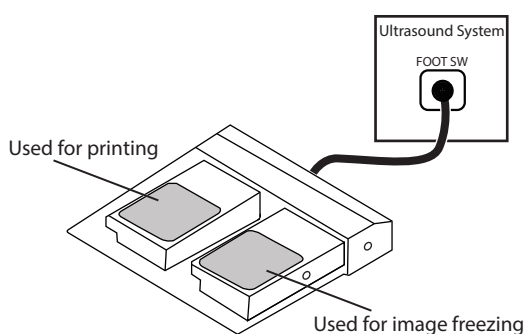
3.6.2   Connecting the Video Printer
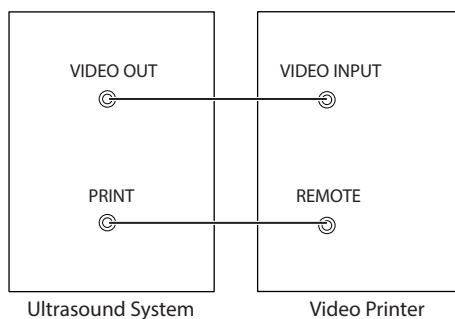
Connect the video printer to the system by BNC cable and Remote Control cable provided by the manufacturer. You can refer the installation method as the above figure shown. The video printer can work without any configurations after a successful connection.

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.
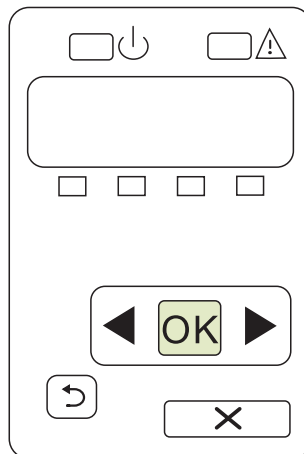
2. Press **OK** on the control panel menu of the printer.

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.

■　**Connecting to a Printer**

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. Press the **Setup** key to enter the **System Settings** menu and click **Connect > Basic** tab.

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

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. Press the **Setup** key to enter the **System Settings** menu and click **Connect > Basic** tab.

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.

3.6.5   Connecting the Endocavitary Probe Holder (Optional)

For details on the installation and operations of the endocavitary probe holder, refer to endocavitary probe holder user instructions.

3.6.6   Connecting the Coupling Gel Heater (Optional)

For details on the installation and operations of the coupling gel heater, refer to coupling gel heater user instructions.

4   Customizing Your System

The **System Setting** menu 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 system desktop and the touch screen displays the application mode screen. Press the **Setup** key on the key panel to enter the **System Settings** menu.

To make settings in the **System Settings** menu,

- Select one tab, and press the Set key on the control panel to enter a setting menu.
- 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 key panel 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 Setting** menu.
- Select **Exit** to quit the **System Setting** menu.

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 Menu - Basic Settings Tab

Item	Description
Hospital Name	Enter the institution's name.
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**, the focal depth varies with the depth in the B mode. ● Set it to **Off**, the focal depth never change.
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.
Switch Contrast Agent Parameters	Enable or disable the contrast agent parameters switching feature. ● Set it to **On**, in contrast imaging mode, tap buttons on the touch screen to switch the contrast agent. ● Set it to **Off**, the feature is disabled.
Move PW/CW sample line to activate B/B&Color mode	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 Menu - 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 the intraoperative or laparoscopic probe to exit the current scan mode when the temperature is too high.

■   **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.
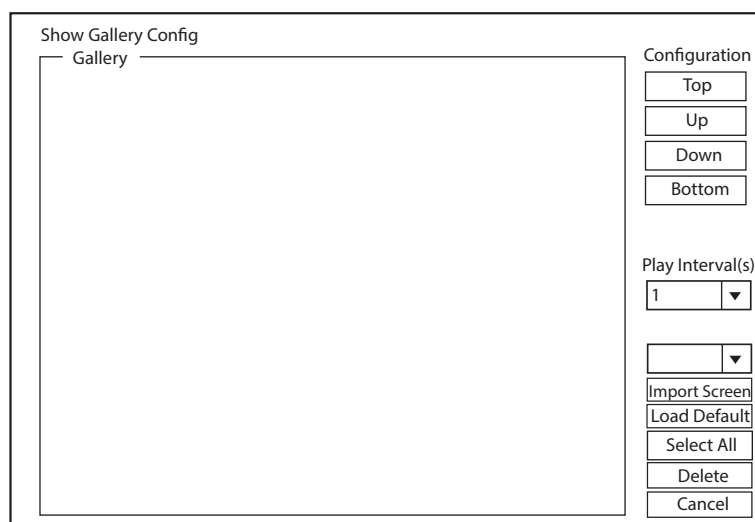
Figure 4-3 Show Gallery Menu

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

■   **Image/Cine/P3/P4 Key Settings**
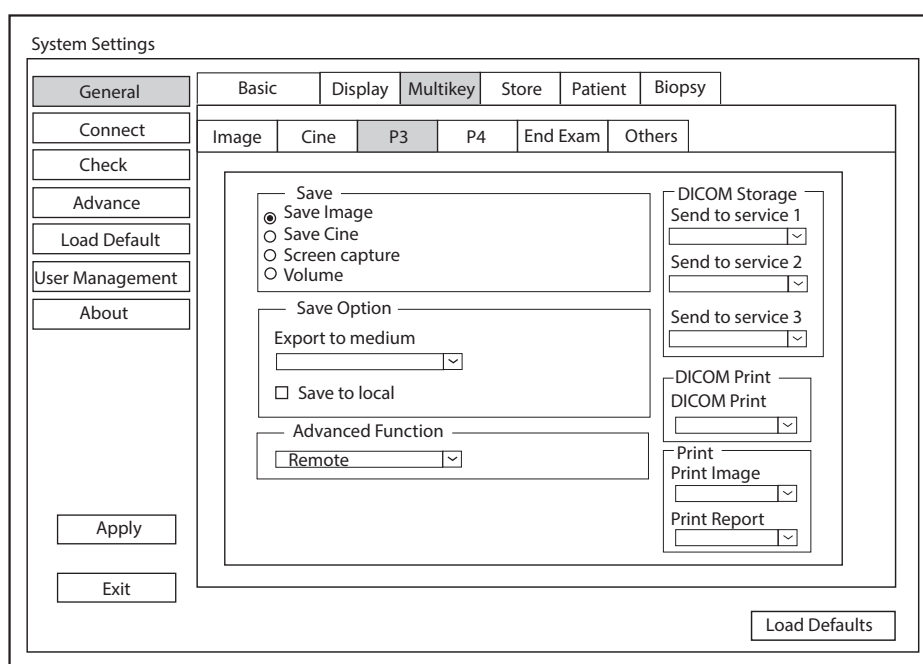
Figure 4-4 Multikey Settings - Image/Cine/P3/P4 Tab

Item	Description
Save	• **Image**: The default storage type for **Image** key is **Save Image**. • **Cine**: The default storage type for **Cine** key is **Save Cine**. • **P3/P4**: Set the storage type, including **Save Image**, **Save Cine**, **Screen Capture** and **Volume**.
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	Tick **DICOM Print** and select the desired DICOM print server from the drop-down list.
Print Image	Tick **Print Image** and select the desired printer from the drop-down list, and then press **Print** key to print the images.
Print Report	Tick **Print Report** and select the desired printer from the drop-down list, and then press **Print** key to print the reports.
Advanced Function	Set the features of **P3** or **P4** key.

■ **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 press the **End Exam** key.
Patient Info View	Tick it and the **Patient Information** menu will automatically appear after you press the **End Exam** key.

Item	Description
Current System Status	Tick it and the system enters current system status after you press the **End Exam** key.
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	Tick **DICOM Print** and select the desired DICOM print server from the drop-down list.
Print Image	Select the desired printer from the drop-down list under **Print Image**, and print the images after the exam is finished.
Print Report	Select the desired printer from the drop-down list under **Print Report**, and print the reports after the exam is finished.

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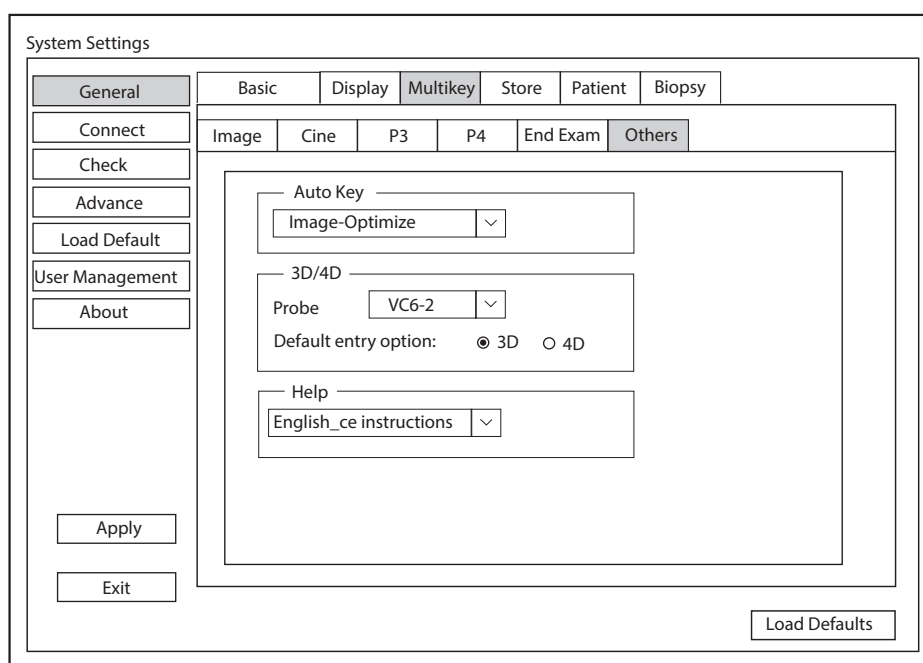
Figure 4-6 Multikey Settings - Others Tab

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

4.1.4 Storage Settings

Figure 4-7 General Settings Menu - 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 exported cine.
Export Image Format	Set the format for exported image.
Freeze Storage Time(s)	Set the storage time for cine after pressing Freeze key.
Print & Save Area	Set the print and storage area.

4.1.5   Patient Settings
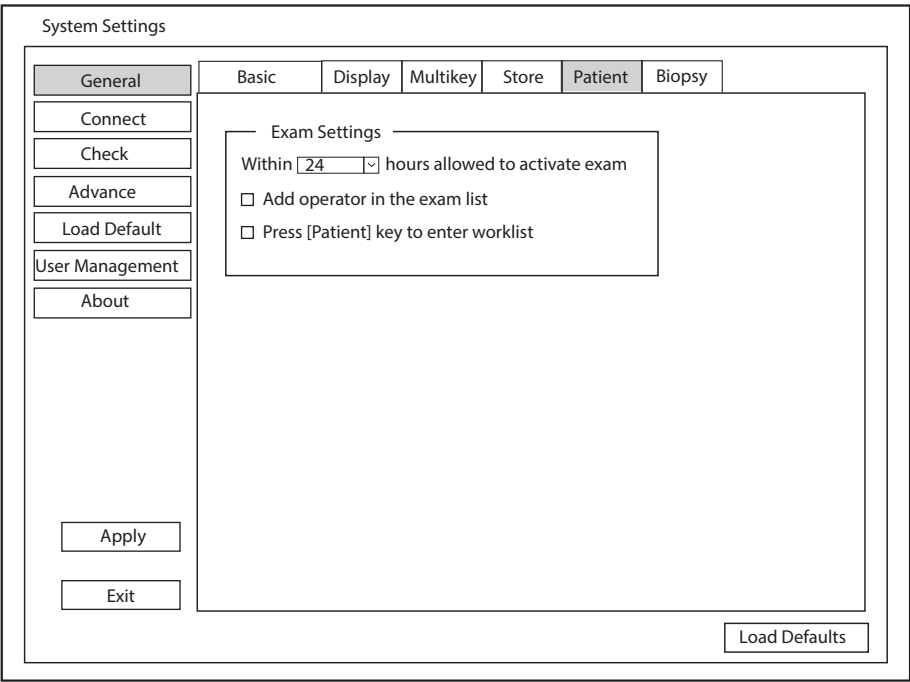
Figure 4-8 General Settings Menu - Patient Tab

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 pressing the **Patient** key.

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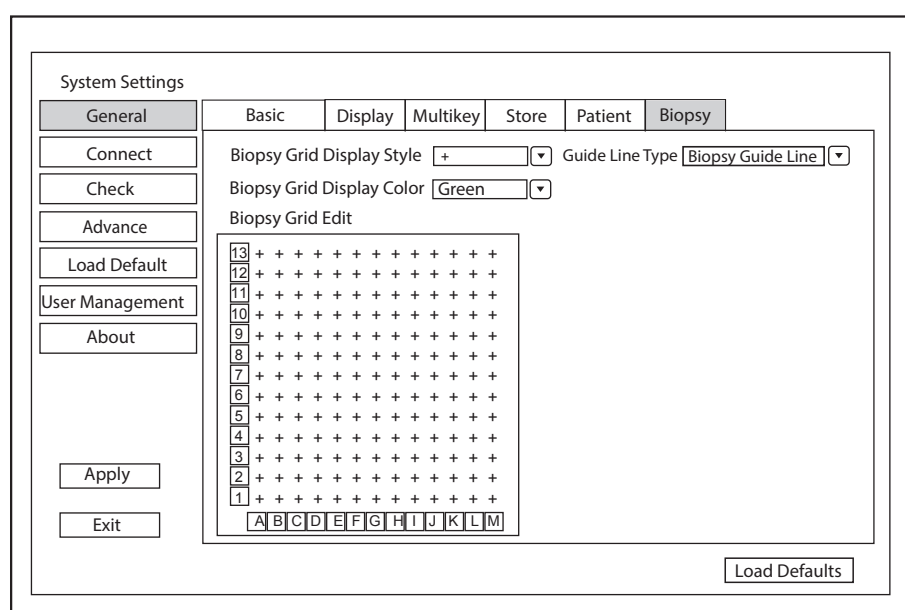
Figure 4-9 General Settings Menu - Biopsy Tab

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 menu. The wireless network takes priority when wired network and wireless network are available at the same time.

4.2.1   Basic Settings
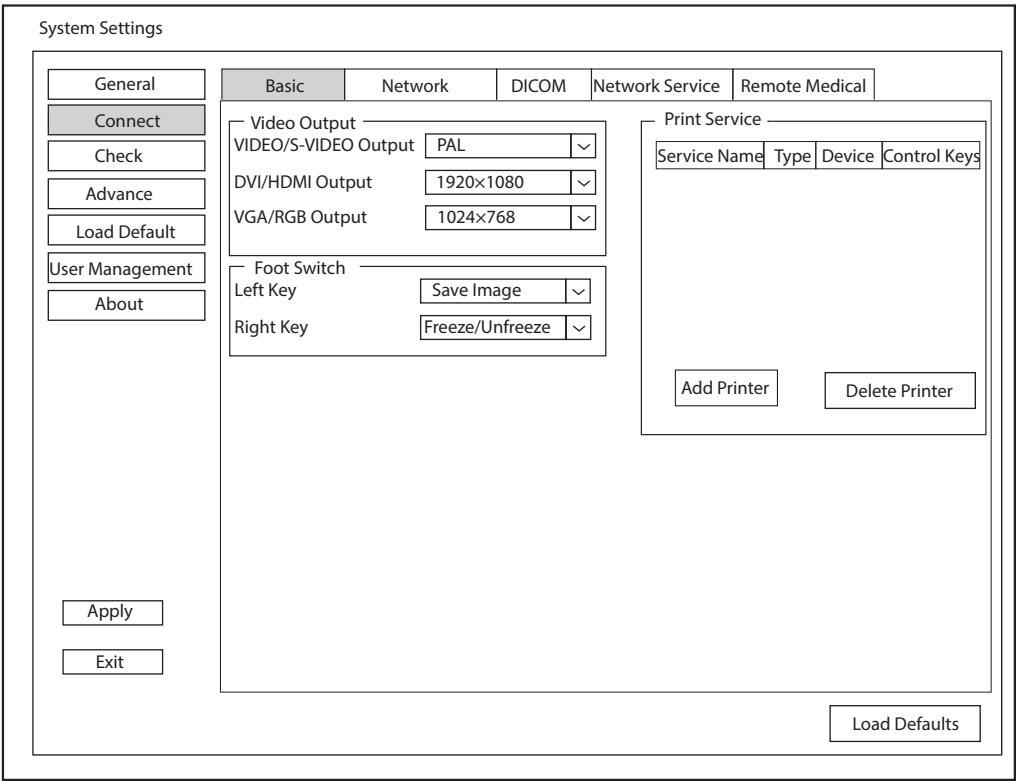
Figure 4-10 Basic Settings Menu

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

4.2.2   Network Settings

System Settings

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

Basic | Network | DICOM | Network Service | Remote Medical

— Local Network —
Local Network ○ Disable ○ Enable
○ DHCP   ○ Static IP
IP Address   .   .   .
Netmask   .   .   .
Default Gateway   .   .   .
Advance

Mac Address
Ping IP Address
Ping

Speed   100M ▼
Duplex   Full Duplex ▼
Search   Settings

— Wireless Network —
Wireless Network ○ Disable ○ Enable

| Name | Status | Level |
| Mr.Wu | Unconnected | 📶 |

WLAN MAC
Connect | Disconnect | Add Network
Refresh | Advance
— Ultrasound Hotspot —
Hotspot Config

Apply

Exit

Load Defaults

Figure 4-11 Network Settings

- ■   **Local Network Settings**

Item	Description
Local Network	Enable or disable 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.
Mac Address	View the MAC address of the system.
Ping IP Address	Type an IP address and click **Ping** to test the connection.
Speed/Duplex	Click **Advance**, **Speed** and **Duplex** text boxes are displayed on the menu. You can adjust the settings of these items to change the speed and communication mode of local network. Click **Set** to save the settings, and then you can click **Search** to view your settings.

- ■   **Wireless Settings**

Item	Description
Wireless Network	Enable or disable access to wireless network.
Name	Displays the name of the wireless network.
Status	Displays the connection status of the wireless network.

Item	Description
Level	Displays the signal strength of the wireless network.
Advance	Click **Advance** to view the information of your current network, and make settings of your local network.

Connect the wireless network as follows:

1. Click **Refresh** to display all wireless networks on the menu. 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 dialogue box if needed and click **OK**.

To ensure the wireless transmission effect, the following network configuration requirements should be met.

Configuration Item	Minimum Configuration Requirements
Wireless Signal	> 80%, with stable wireless network signal
Router	- Wireless standard: 802.11n - Maximum transmission speed: ≥300M - Use AP (access point) setting - Number of the devices connected to the same router: ≤5

■ **Ultrasound Hotspot**

Item	Description
Hotspot Config	Configure the ultrasound network hotspot.

4.2.3 Configuring DICOM

■ **Server Settings**

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

● Click **Add**, and select a DICOM server type and input server information in the pop-up dialog box. Click **Confirm** to add a new DICOM server. The created DICOM server will be listed on the **Service List**.

● Select the desired DICOM sever in the **Service List**, click **Edit** and edit server information in the pop-up dialog box.

● Select the desired DICOM sever in the **Service List** and click **Delete** to delete the server.

● Select the desired DICOM sever in the **Service List** and click **Control Key Setting** to back to the Multikey Settings menu for settings.

● Select the desired DICOM sever in the **Service List** and click **Ping** to test network connection. Or, click **Verify** to test the connection between the system and the DICOM server.
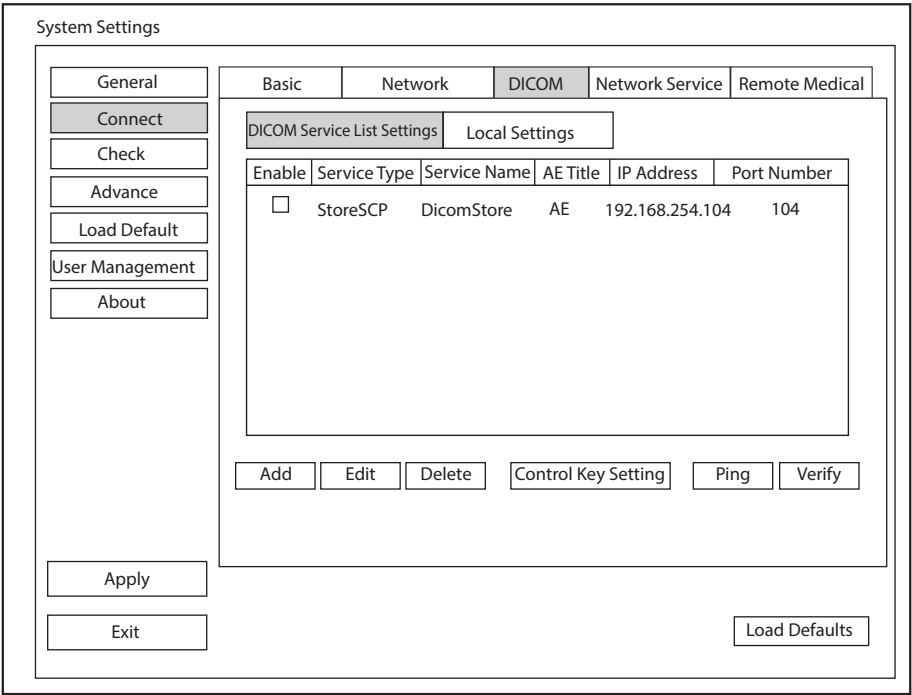
Figure 4-12 DICOM Services Settings Menu

- **Storage Server Settings**

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

After finishing the settings, click **Verify** to verify the connection between the system and the DICOM 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        192.168.93.1           Ping

    Port Number       0                      Verify

    Storage Commitment  [          ] [∨]

              Save      Cancel     Reset
```

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

After finishing the settings, click **Verify** to verify the connection between the system and the DICOM 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        192.168.93.1           Ping

    Port Number       0                      Verify

              Save      Cancel     Reset
```

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

After finishing the settings, click **Verify** to verify the connection between the system and the DICOM 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            [ 192.168.93.1     ]  [ Ping ]  │
│                                                  │
│   Port Number           [ 0                ]  [ Verify ]│
│                                                  │
│   Exam Type             [ Only Ultrasound  ▽]    │
│                                                  │
│   Query Date Automatically [ Today      ▽]       │
│                                                  │
│   Max Results           [ 100              ]     │
│                                                  │
│            [ Save ]   [ Cancel ]   [ Reset ]     │
└─────────────────────────────────────────────────┘
```

Item	Description
Service Name	Enter the name of the DICOM worklist server.
AE Title	Set the Application Entity (AE) title of the DICOM worklist server.
IP Address	Set the IP address of the DICOM worklist server. Click **Ping** to test the connection.
Port Number	Set the port number of the DICOM worklist server.
Exam Type	Set the type of worklist that can be searched automatically for information.
Query Date Automatically	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 DICOM 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            [ 192.168.93.1     ]  [ Ping ]  │
│                                                  │
│   Port Number           [ 0                ]  [ Verify ]│
│                                                  │
│   Storage service       [ DicomStore    ▽]       │
│                                                  │
│   SR server             [              ▽]        │
│                                                  │
│            [ Save ]   [ Cancel ]   [ Reset ]     │
└─────────────────────────────────────────────────┘
```

Item	Description
Service Name	Enter the name of the DICOM worklist server.

Item	Description
AE Title	Set the Application Entity (AE) title of the DICOM worklist server.
IP Address	Set the IP address of the DICOM worklist server. Click **Ping** to test the connection.
Port Number	Set the port number of the DICOM worklist server.
Storage service	Set the related DICOM storage server.
SR server	Set the related DICOM structured report server.

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

- **Query Retrieve 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	Set the server name of target ultrasound system that retrieve patient information of the DICOM query retrieve server.
AE Title	Input the Application Entity (AE) title of target ultrasound system that retrieve patient information of the DICOM query retrieve server.
IP Address	Input the IP address of target ultrasound system that retrieve patient information of the DICOM query retrieve server. Click Ping to test the connection.
Port Number	Input the port number of target ultrasound system that retrieve patient information of the DICOM 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 DICOM 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	undefine		
IP Address	192.168.93.1		Ping
Port Number	0		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 DICOM printer server.
AE Title	Set the Application Entity (AE) title of the DICOM printer server.
IP Address	Set the IP address of the DICOM printer server. Click **Ping** to test the connection.
Port Number	Set the port number of the DICOM 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.

Item	Description
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 DICOM print server. And a dialog box pops up if it is successfully connected.

- **Local Settings**

Figure 4-13 DICOM Local Settings Menu

- **Local Device Settings**

Item	Description
Station Name	Enter the name of the system.
AE Title	Set the Application Entity (AE) title of the system.
Port Number	Set the port number of the system.
Timeout(sec)	Set 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.

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

4.2.4   Network Service Settings
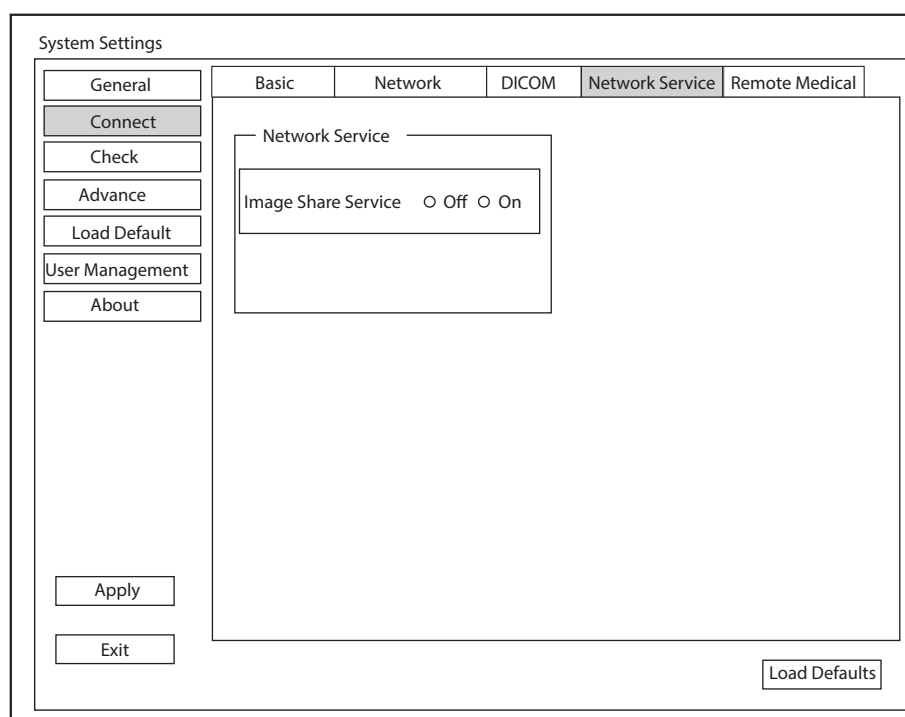
Figure 4-14 Network Service Settings Menu

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.

4.2.5   Remote Medical Settings

Figure 4-15 Remote Medical Settings Menu

You can view the history patient information on this menu.

4.3   Item Preset

4.3.1   Touch Screen Settings

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

Figure 4-16 Touch Screen Settings Menu

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

■   **To add a parameter**

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

■   **To modify a parameter**

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

■   **To delete a parameter**

Click a parameter, and then click **...** in the **Special Items** list to delete the desired parameter.

4.3.2   Measurement Settings

You can adjust measurement settings on the **General**, **Application**, **List** and **Calculation** tabs.

■   **General Measurement Settings**

Figure 4-17 Measurement Settings Menu - 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.

Item	Description
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.
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.
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 4-18 Measurement Settings Menu - Application Tab

- Trace Results

After selecting an exam type from the application drop-down list, set the measurement items of Auto/Semi/Manual trace in the spectral Doppler mode.

- Dept Unit

Set the unit for velocity and distance.

● Heart Rate

Set the cardiac cycle for calculation of heart rate.

● Shortcut Key

Select **OB, GYN** or **Cardiac** from the drop-down list beside **Application**, and then select a measurement item from the drop-down list beside **Num 0** to **Num 9**. After adjusting these settings, you can perform the measurement by using the defined shortcut key.

● Measurement Settings
  − Small Parts Measurement Settings: Select **SMP** from the drop-down list beside **Application** and set the calculation coefficient of the thyroid volume formula.
  − Obstetrics Measurement Settings: Select **OB** from the drop-down list beside **Application** and set the formula for obstetrics measurement as shown in the following table.

Item	Description
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.
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 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.

● Equation Settings

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

Perform the following steps:

1. Click **GA** or **Growth** and then the screen shown in Figure 4-19 or Figure 4-20 pops up.

Figure 4-19 GA Table

Figure 4-20 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 4-21 Measurement Settings Menu - List Tab

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

● **To add a collection or measurement**

Perform the following steps:

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

2. Select **Caliper** or **Calc**.

3. Select the measurement category in the List frame and click the Collection or Measurement.

4. Click **Add** to add the desired collection or measurement on the pop-up screen.

5. Click **Close** to complete.

● **To delete a collection or measurement**

Perform the following steps:

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

2. Select **Caliper** or **Calc**.

3. Select an imaging mode in the **List** frame and select the collection item or measurement item that you wish to delete.

4. Click **Delete**.

● **To reorder the list of collections or measurements**

Perform the following steps:

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

2. Select **Caliper** or **Calc**.

3. Select an imaging mode in the **List** frame and click **Collection** or **Measurement**.

4. Click **Reorder** and adjust the sequence of the collection or measurement on the pop-up screen.

● **To select the measurement result, unit and precision**

Perform the following steps:

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 list of **Unit** and **Precision**.

■ **Calculation Settings**

Figure 4-22 Measurement Settings Menu - 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 dialogue 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 4-23 Measurement Settings Menu - 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 4-24 Comment Settings Menu -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 4-25 Comment Settings Menu - 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
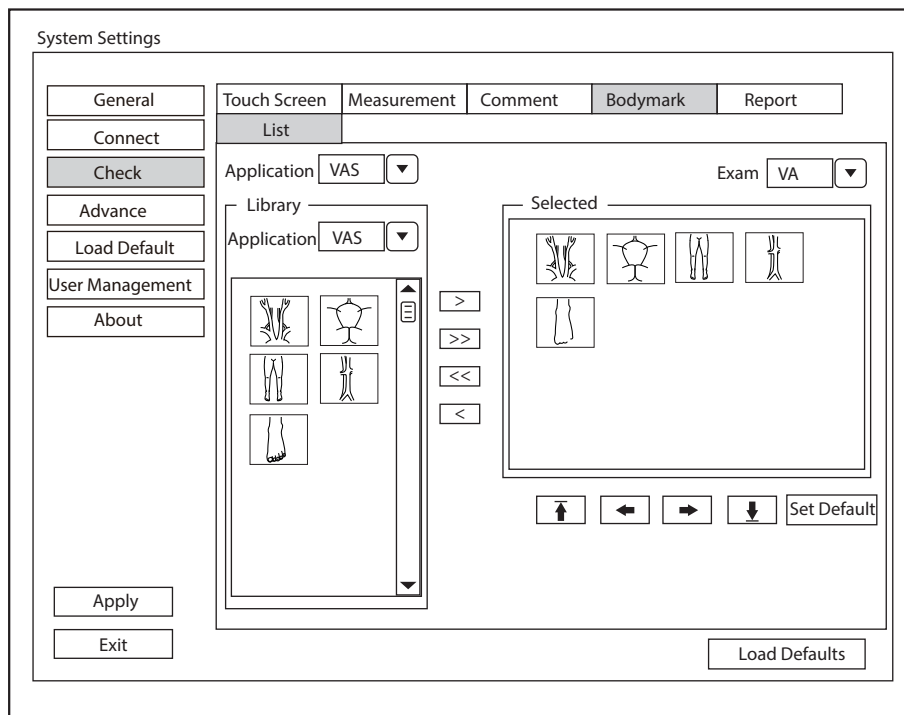
Figure 4-26 Body Mark Settings Menu

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. Select a body mark in the **Selected** list and then click ⬆, ⬅ , ➡ or ⬇ to arrange its display.

4.3.5   Report Settings

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

Figure 4-27 Report Settings Menu

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 dialogue 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 **Freeze** key on the control panel to exit.

4.4　Advanced Function Settings

4.4.1　Stress Echo Settings

Figure 4-28 Stress Echo Settings Menu

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 knob 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 4-29 Scan Assistant Settings Menu

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

4.4.3   MQA Settings

Figure 4-30 MQA Settings Menu

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**

```
┌─────────────────────────────────────────────────────────────────────┐
│ System Settings                                                       │
│ ┌──────────────┐  ┌──────────┬──────────┬──────────┬─────────────┐    │
│ │   General    │  │Stress Echo│Scan Asst.│   MQA    │Sono Assistant│   │
│ ├──────────────┤  ├──────────┴─┬────────┴──┬───────┴─────────────┤    │
│ │   Connect    │  │  Section    │ Protocol  │   Import/Export     │    │
│ ├──────────────┤  │                                               │    │
│ │    Check     │  │ Application  [OB        ⌄]                     │    │
│ ├──────────────┤  │ Protocol     [Early OB  ⌄] [Copy Protocol][Rename Protocol][Delete Protocol]│
│ │   Advance    │  │                            ┌Apply to─────────┐│    │
│ ├──────────────┤  │ ┌─────────────────────┐    │ Default Exam    ││    │
│ │ Load Default │  │ │Longit.Uterus (B)    │ ⬆  │ ☑ 1st Trim.     ││    │
│ ├──────────────┤  │ │Trans.Uterus (B)     │    │ ☐ 1st Trim. Cardiac││  │
│ │User Management│ │ │Meas.Embryo/CRL (B)  │ ⬆  │ ☑ 2nd Trim.     ││    │
│ ├──────────────┤  │ │                     │    │ ☐ 2nd Trim. Cardiac││  │
│ │    About     │  │ │                     │ ⬇  │                 ││    │
│ └──────────────┘  │ │                     │    │                 ││    │
│                   │ │                     │ ⬇  │                 ││    │
│                   │ │                     │    │                 ││    │
│                   │ │[Settings][Rename Section][Delete Section]   ││   │
│ ┌──────────────┐  │ └─────────────────────┘    └─────────────────┘│   │
│ │    Apply     │  │ ☑ Freeze Response      ☑ Advance on save (Sono Assistant)│
│ └──────────────┘  │ ☐ Press [↑]/[←] key to respond to the previous step, press [↓]/[→] key to respond to the next step│
│ ┌──────────────┐  │                                               │    │
│ │     Exit     │  │                              [Load Defaults]  │    │
│ └──────────────┘  └───────────────────────────────────────────────┘   │
└─────────────────────────────────────────────────────────────────────┘
```

Figure 4-31 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
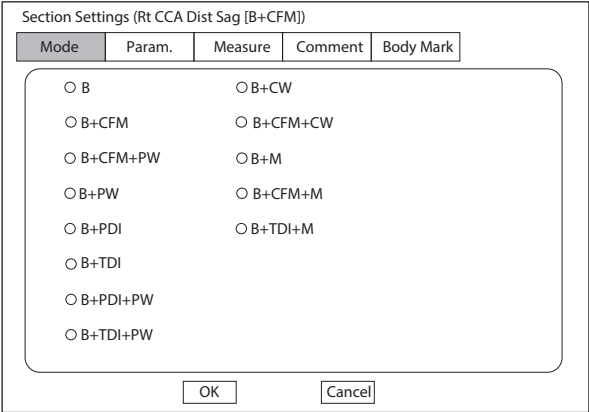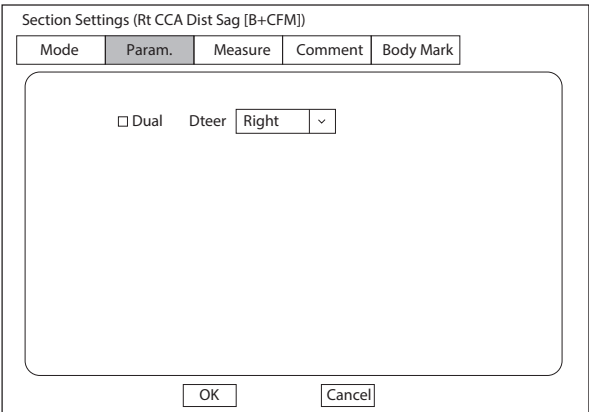
Item	Description
Freeze Response	Tick it and enable the Sono Assistant. Select the section configured with measurement items, the system enters the measurement status automatically when the image is frozen.
Advance on save (Sono Assistant)	Tick it and enable the Sono Assistant. The system switches to 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 key panel to respond to the previous step, press [↓] / [→] key to respond to the next step.
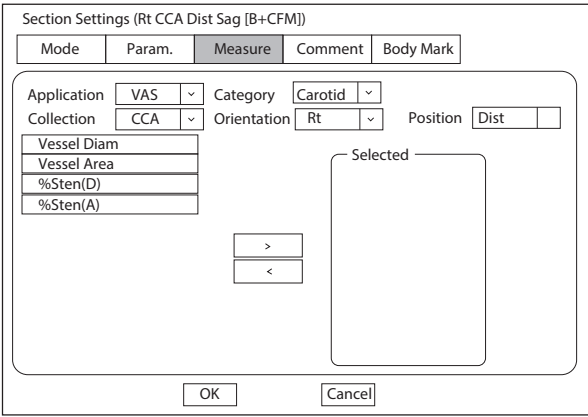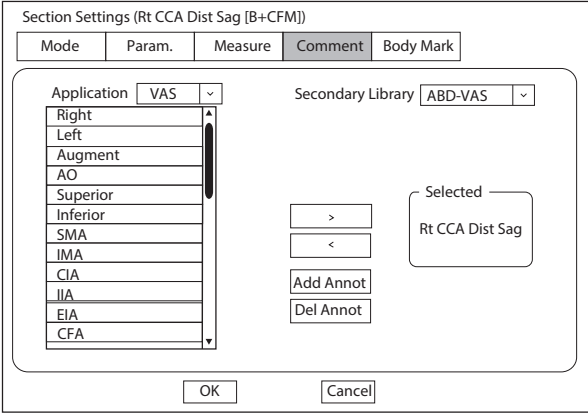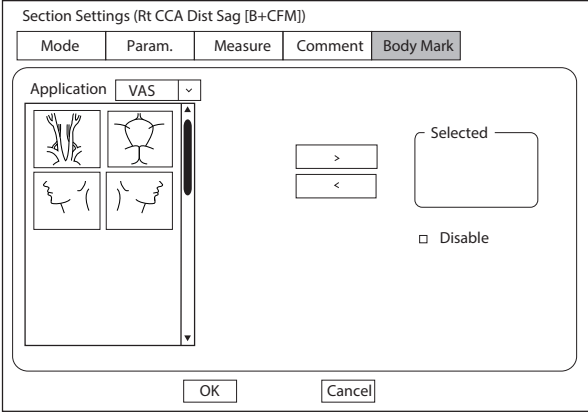
● To create a user-defined protocol

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**
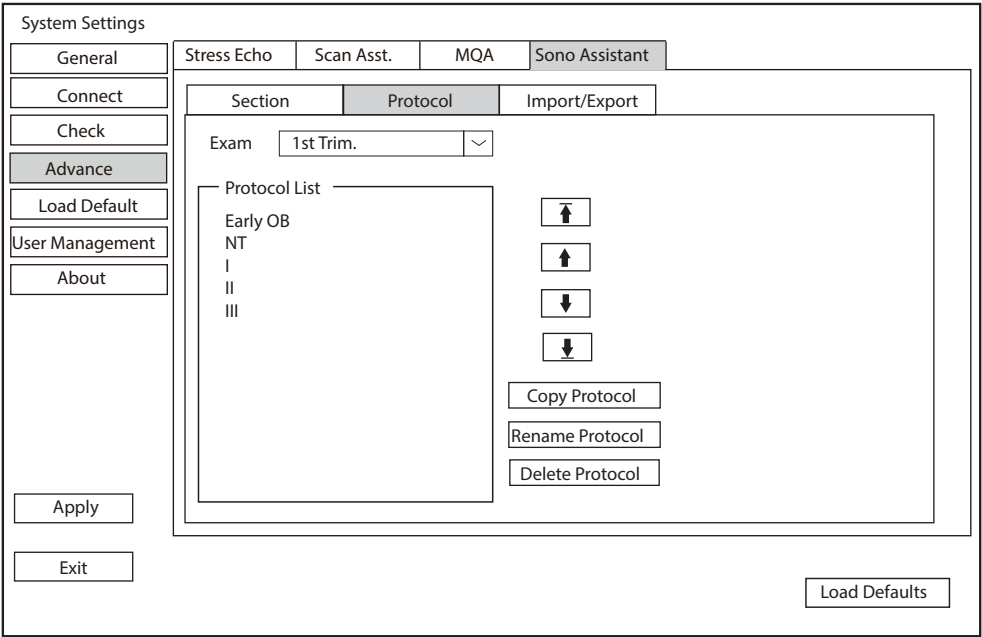
Figure 4-32 Protocol Settings

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**
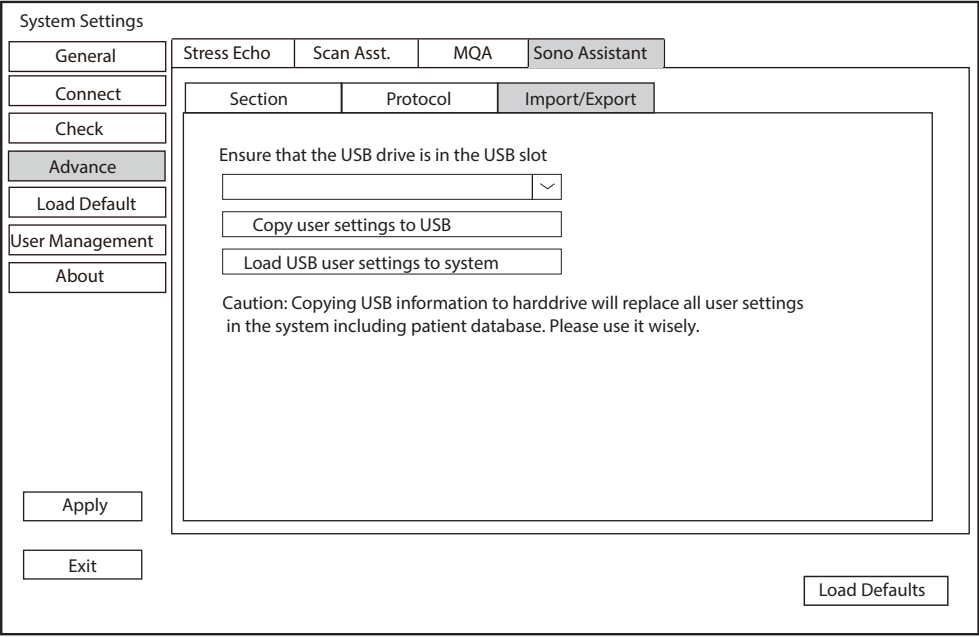
Figure 4-33 Import/Export Settings

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 Loading Defaults menu.
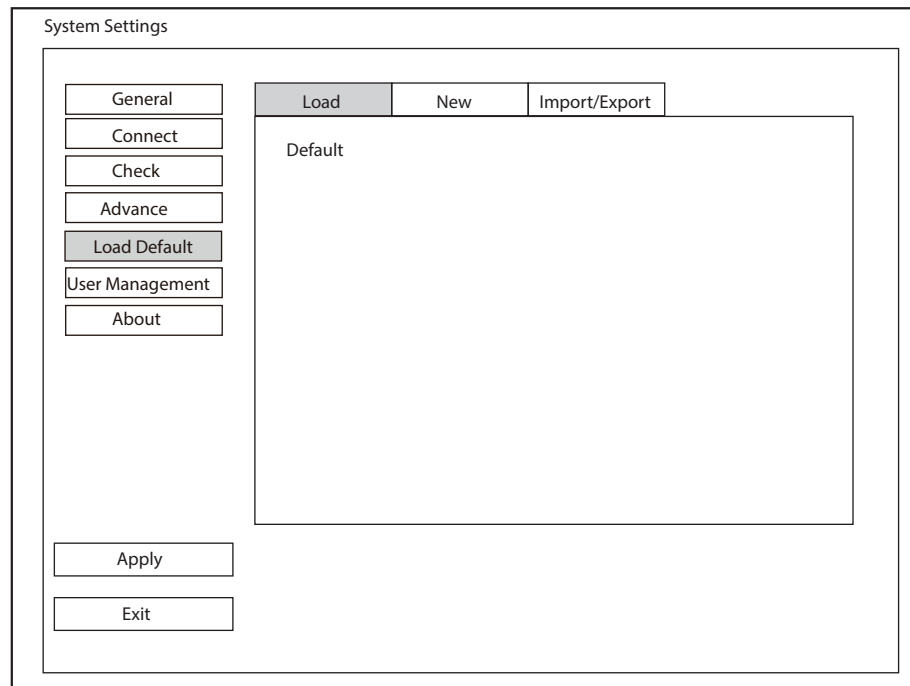
Figure 4-34 Loading Defaults Menu

■ **Loading System Defaults**

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

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

   Or, click **Cancel** to cancel loading;

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

■ **Creating System Defaults**

Click **New** tab to enter the menu 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 Defaults menu.

■ **Importing or Exporting System Defaults**

Click **Import/Export** to enter the following menu.
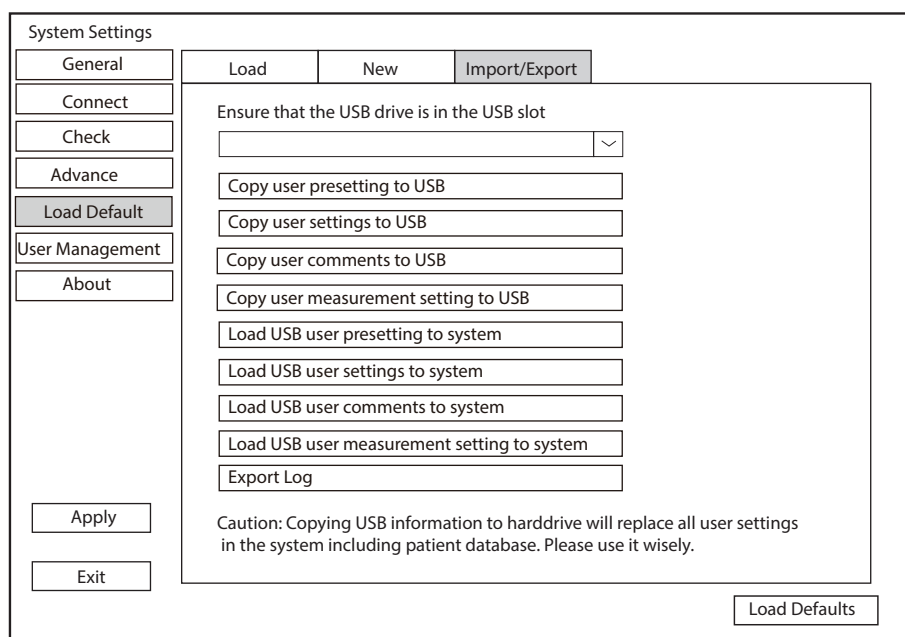
Figure 4-35 Import/Export System Defaults

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

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

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

- Click **Copy user comments 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 settings to system** to copy the system settings to the system.

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

- Click **Load USB user comments 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
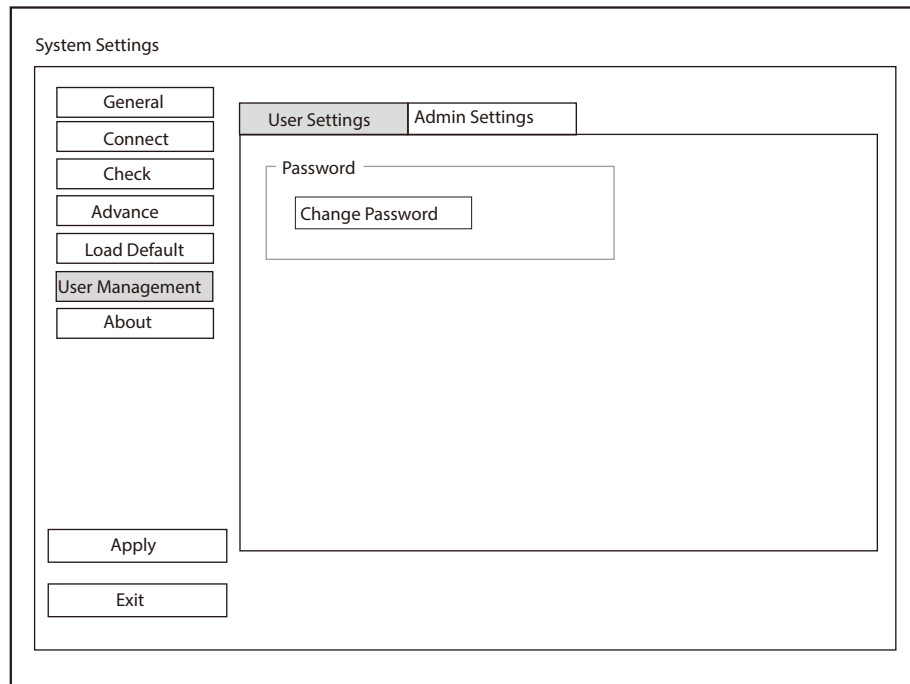
Figure 4-36 User Settings Menu

Ordinary user can modify password on **User Settings** tab.

4.6.2   Administrator Settings

Only administrator account can enter **Admin Settings** tab. The default administrator name is Admin, and the password is Sonoscape123.

NOTE:

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

Figure 4-37 Administrator Settings Menu

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 **Change Password** and modify the selected password according to the system prompt.
	Import users: Click **Import Users**> **Import to Medium** on the pop-up dialog box, and 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** > **Export to Medium** on the pop-up dialog box, and 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 addresses)**, 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 dialogue 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 system information menu.

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.

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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
- Receive patient information using the DICOM worklist

5.1.1   Beginning a New Patient

Press the **Patient** key on the control panel to display the **New Patient** screen.

Figure 5-1 New Patient Screen

NOTE:

You can move the cursor by using the trackball, and then press the Set key on the control panel to select the desired item.

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.
DOB		Enter the date of birth for the current patient. You can set **Date Format** on the **General Settings** menu.
Age		The patient's age will be automatically calculated if you enter the information in the **DOB** textbox.
Sex		Enter the gender for the current patient.
Accession#		Enter the exam ID for the current patient, special characters are prohibited to be entered.
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 dialogue 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, press the **Patient** key on the control panel to enter the **New Patient** screen and click **Patient List** to enter the **Exam List** screen as shown in Figure 5-2.

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 13.4 DICOM Worklist.

5.2 Pausing/Resuming/Activating an Exam

5.2.1 Pausing an Exam

Press the **Patient** key on the control panel 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. Press the **Patient** key on the control panel 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.

   Click **New Exam** to continue the current exam.

5.2.3   Activating an Exam

1. Press the **Patient** key on the control panel to enter the **New Patient** screen, and click **Patient List** to enter the **Exam List** screen.

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

5.3   Completing/Discontinuing an Exam

5.3.1   Completing an Exam

Perform the following steps.

1. Press the **End Exam** key on the control panel.

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

5.3.2   Discontinuing an Exam

Perform the following steps.

1. Press the **Patient** key on the control panel 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 press the **Probe** key on the control panel to return to the following mode 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.
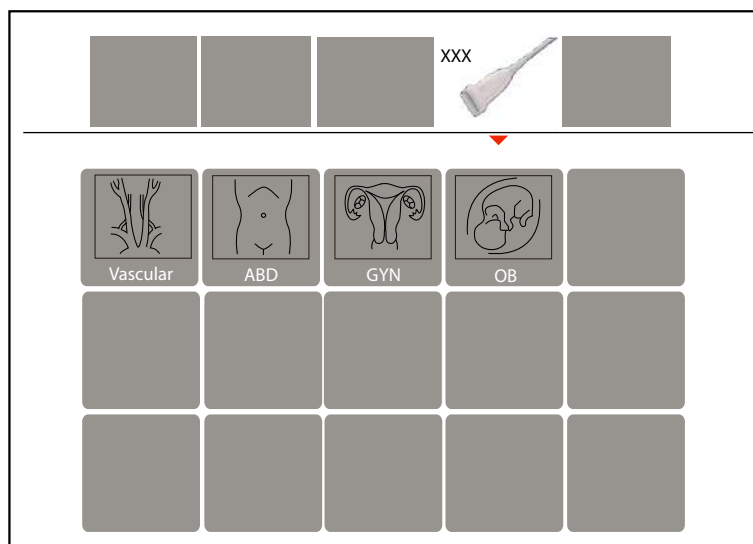
Figure 6-1 Application Mode Screen

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 the desired probe and exam type.

2. Select an imaging mode and optimize the image.

   NOTE:

   Parameter optimizing is only available for the current imaging mode.

3. Press the **S** key on the key panel and then a dialogue box pops up.

4. Click **Yes** to enter the **User Presetting Menu**.
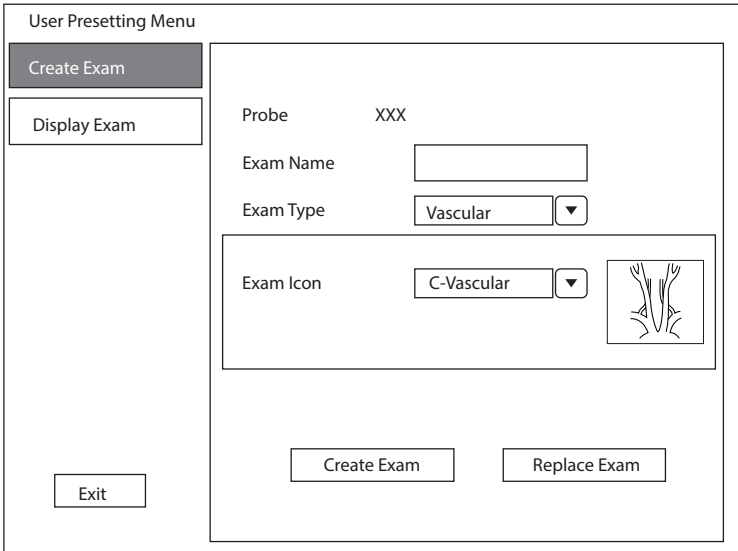
Figure 6-2 User Presetting Menu

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

6. Select the application and exam type from the **Exam Type** and **Exam Icon** lists.

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 **Display Exam** 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.
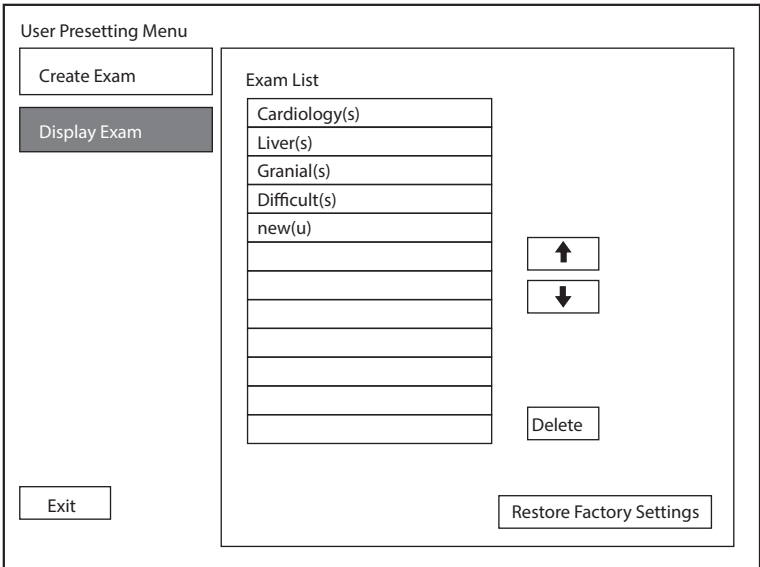
Figure 6-3 Preset Display Menu

● 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 **Restore Factory Settings** > **Yes** in the pop-up dialogue 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:
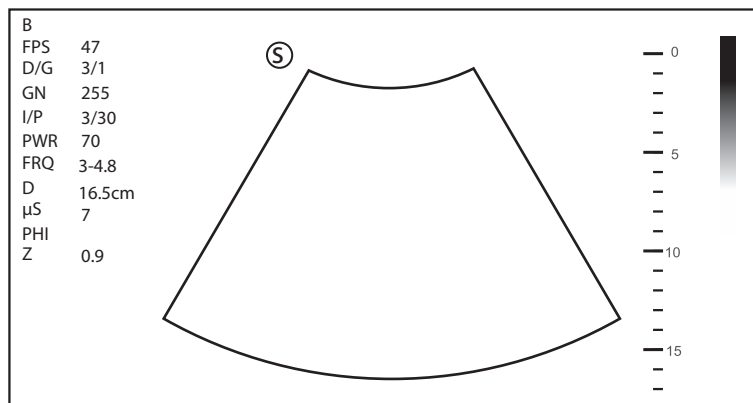
Figure 6-4 B-Mode Imaging Screen

For details about the basic screen, refer to Section 2.3.6 Basic Screen.

6.2.2   Optimizing B-Mode Images

The touch screen displays all controls related to the B-mode imaging (as shown in the figure), you can use them to optimize B-mode images.
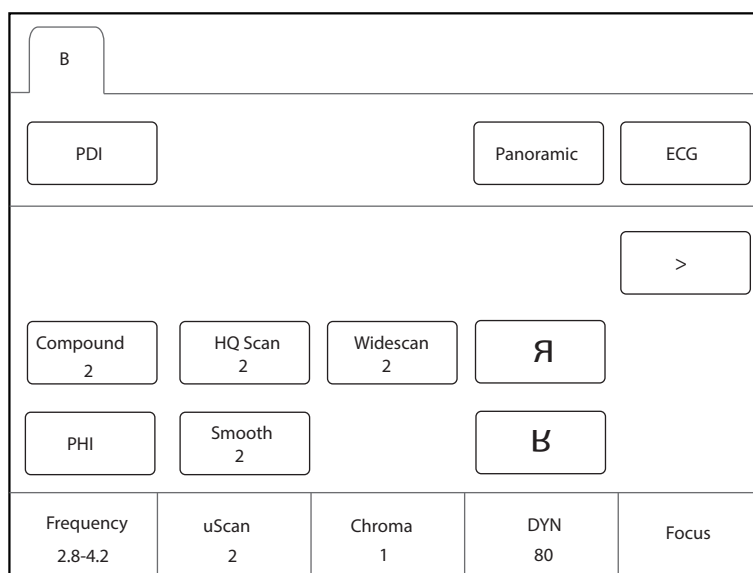
Figure 6-5 B-Mode Imaging Parameters Menu

You can tap > on the touch screen to turn the current menu to the previous or the next page if it displays over one page.

To optimize the image, rotate the knobs on the control panel that are directly below the selected item.

■ **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.

To adjust the gain, rotate the **B** key on the control panel to increase or decrease the 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.

To adjust TGC, move the desired slider to the left or right to decrease or increase the value.

NOTE:
• *Modifications of TGC values cannot be saved if you shift to use another imaging mode.*
• *The TGC curve is displayed in the top right corner of the imaging area when you adjust TGC values, and the curve disappears if TGC values are not adjusted for more than 3 seconds.*

■ **LGC**

LGC is used to adjust the gain on the left or right part of the ultrasound image.

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.

■ **Focal Position/Number/Span**

The focal position/number/span is used to tighten up the beam for a specific area and the focus identified by a red triangle displays on the right side of the image.

Focus optimizes the image by increasing the resolution for a specific area.

To adjust the focal position/number/span:
● Rotate the knob located directly below **Focus** to increase or decrease the depth of focal zone.
● Rotate the knob located directly below **Foc. Num** to increase or decrease the number.
● Rotate the knob located directly below **Foc. Span** to increase or decrease the value.

■ **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.*

■ **Frequency**

The probe is capable of generating a broadband signal with a certain start frequency and a certain bandwidth. A higher frequency brings about higher resolution and lower penetration.

To adjust the frequency, rotate the knob located directly below **Frequency** to increase or decrease the value.

■   **Chroma**

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

To adjust the chroma, rotate the knob located directly below **Chroma** to adjust the value.

■   **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.

To use compound imaging, tap **Compound** on the touch screen to enable or disable the compound imaging function or adjust the level.

■   **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.

A higher line density is useful in obtaining a very high resolution, such as the thyroid or testicles. A lower line density is useful when scanning fetal heart beat and adult cardiac applications.

To adjust the line density, tap **Line Density** on the touch screen to increase or decrease 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.

To adjust the persistence, rotate the knob located directly below **Persist** to increase or decrease the value.

■   **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.

To adjust the dynamic range, rotate the knob located directly below **DYN** to increase or decrease the value.

■   **Grayscale Curve**

Grayscale curve optimizes the brightness of each pixel in accordance with the corresponding echo.

To adjust the grayscale curve, rotate the knob located directly below **Gray Map** to increase or decrease the value.

■   **Adaptive Image Fusion**

Adaptive image fusion provides choices of optimization methods to improve image quality through boundary enhancement, image smoothing and system optimization.

To adjust the adaptive image fusion, rotate the knob located directly below **AdaptFusion** to increase or decrease the value.

■   **Sector Width/Angle**

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.

To adjust the sector width/angle, rotate the knob located directly below **Sector Width** or **Sector Angle** to change the sector width or sector angle.

■   **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 ±1% can be adjusted each time. The real-time value of the power is displayed in the imaging information area on the basic screen.

To adjust the power, rotate the knob located directly below **Power%** to increase or decrease the value.

NOTE:

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

■   **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.

To adjust tissue acoustic characteristics, rotate the knob located directly below **Tissue Acou** to increase or decrease the value.

■   **Image Rotation**

You can rotate the image to get more information. Only transvaginal and transrectal exams are available for this feature.

To rotate the image, tap the left or right part of **Rotation** to rotate the image.

NOTE:

Take notice of the depth calibration displayed at the bottom of the basic screen when the image is rotated by 90º or 270º.

■   **μScan**

μScan is used to improve the image quality.

To use μScan, rotate the knob located directly below **μScan** to increase, decrease the value or disable the feature.

■   **Trapezoidal Imaging/Widescan**

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

To use trapezoidal imaging or widescan, tap **Trapezoid** or **Widescan** on the touch screen to enable, adjust or disable the feature.

■   **Steer**

Steer can be adjusted to change the direction of the acoustic beam when performing a real-time scan by using the linear probes.

To adjust the steer, rotate the knob located directly below **Steer** to change the direction of the acoustic beam.

NOTE:

Only the linear probes are capable of using steer.

■   **Smooth**

Smooth is used to adjust the smoothness of the image.

To adjust smoothness, tap **Smooth** on the touch screen to enable, adjust or disable the feature.

■ **NSI**

NSI can be adjusted to acquire the image of high signal-to-noise ratio.

To adjust the noise suppression image, rotate the knob located directly below **NSI** to increase or decrease the value.

■ **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.

To use HQ Scan, tap **HQ Scan** on the touch screen to enable, adjust or disable the feature.

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 **CFM** key on the control panel to enter the CFM mode.

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 6.3.6 Optimizing CFM/PDI/TDI/Micro F/SR-Flow Mode Images.

5. Press the **CFM** 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 key panel, and then disable **SRF** on the touch screen to enter the PDI mode.
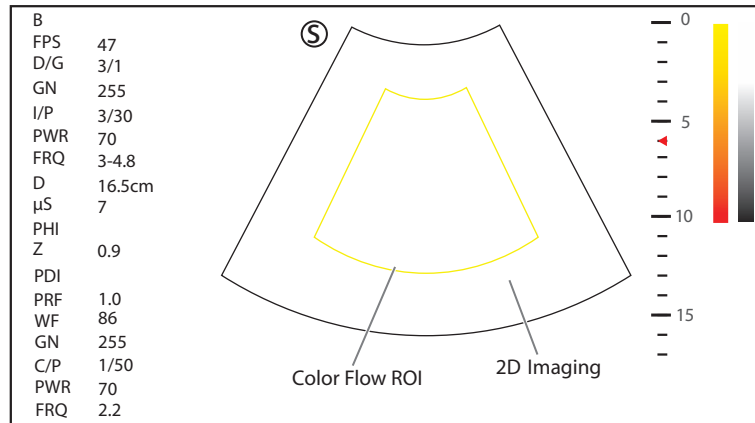
Figure 6-7 PDI-Mode Imaging Screen

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 6.3.6 Optimizing CFM/PDI/TDI/Micro F/SR-Flow Mode Images.

5. Press the **PDI** key on the key panel or tap **PDI** on the touch screen to exit the screen.

6.3.3   Micro F Mode

In Micro F mode, the sensitivity and spatial resolution of micro vessels can be promoted, and the situation of the blood perfusion in tissue and mass can be reflected in a more authentic way.

Perform the following steps to acquire Micro-F mode image.

1. Optimize a B-mode image.

2. Tap **Micro-F** on the touch screen to enter the Micro-F mode.

B	
FPS	47
D/G	3/1
GN	255
I/P	3/30
PWR	70
FRQ	3-4.8
D	16.5cm
µS	7
PHI	
Z	0.9
Micro-F	
PRF	1.0
WF	86
GN	255
C/P	1/50
PWR	70
FRQ	2.2

Color Flow ROI   2D Image
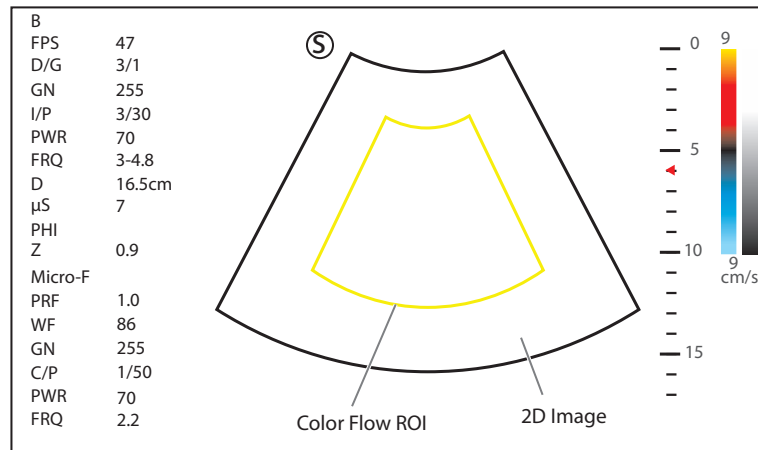
Figure 6-8 Micro-F Mode Image

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 Micro-F-mode image. For details, refer to Section 6.3.6 Optimizing CFM/PDI/TDI/Micro F/SR-Flow Mode Images.

5. Tap **Micro-F** on the touch screen again to exit the screen.

6.3.4   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. Press the **PDI** key on the key panel to enter the SR-Flow mode.

B	
FPS	47
D/G	3/1
GN	255
I/P	0/0
PWR	70
FRQ	3-4.8
D	16.5cm
µS	7
PHI	
Z	0.9
SRF	
PRF	1.0
WF	85
GN	40
C/P	1/50
PWR	70
FRQ	3.0

Color Flow ROI   2D Image
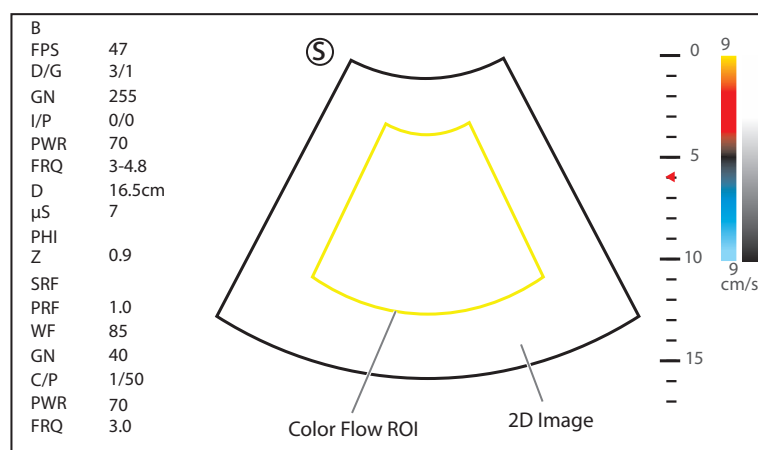
Figure 6-9 SR-Flow Mode Image

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 6.3.6 Optimizing CFM/PDI/TDI/Micro F/SR-Flow Mode Images.

5. Press the PDI key on the key panel to exit the SR-Flow mode.

6.3.5   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 key panel to enter the TDI mode.
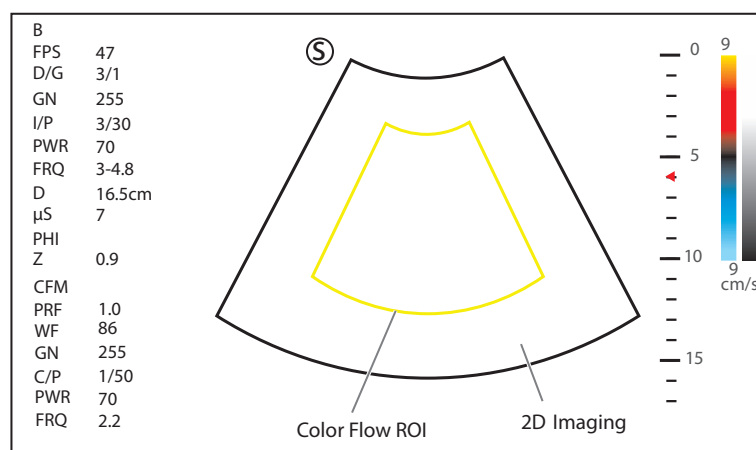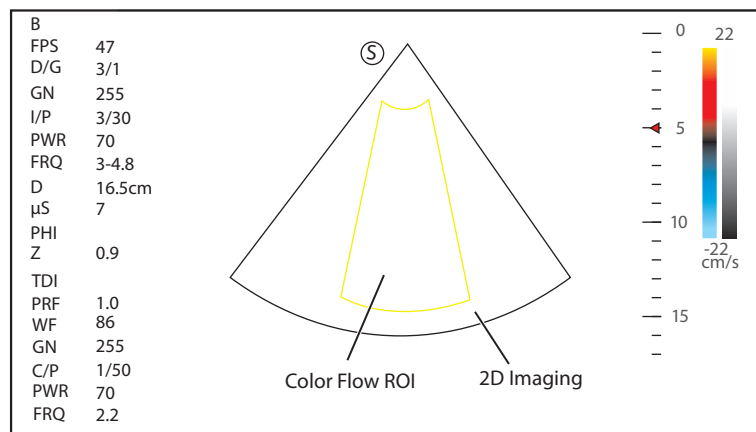

Figure 6-10 TDI-Mode Imaging Screen

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 6.3.6 Optimizing CFM/PDI/TDI/Micro F/SR-Flow Mode Images.

5. Press the **TDI** key on the key panel or tap **TDI** on the touch screen to exit the screen.

6.3.6   Optimizing CFM/PDI/TDI/Micro F/SR-Flow Mode Images

The touch screen displays all controls related to the CFM/PDI/TDI/Micro F/SR-Flow mode imaging (as shown in the figure), you can use them to optimize CFM/PDI/TDI/Micro F/SR-Flow mode images.
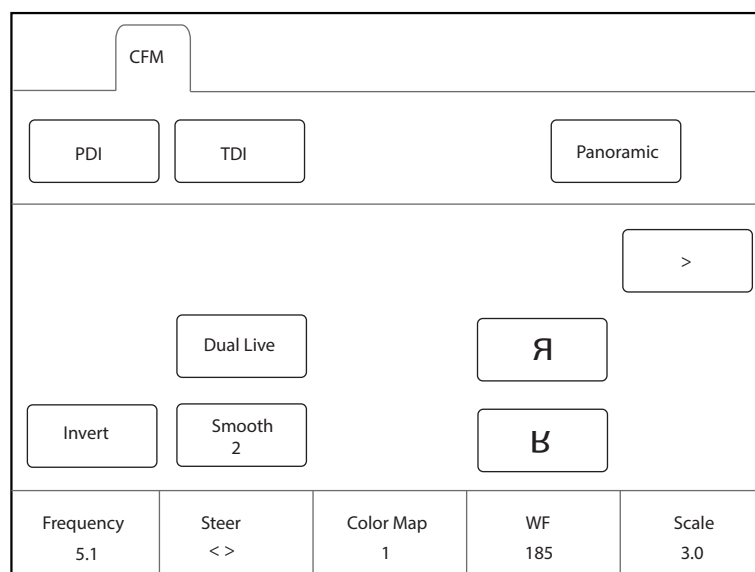
Figure 6-11 CFM/PDI/TDI Mode Imaging Parameters Menu

You can tap > on the touch screen to turn the current menu to the previous or the next page if it displays over one page.

To optimize an image, you can rotate the knob on the control panel that is directly below the selected item to adjust the value.

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

■   **Gain**

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

To adjust the gain, rotate the **CFM** key on the control panel to adjust the gain in CFM/PDI/TDI/Micro F/SR-Flow mode.

■   **Frequency**

Frequency optimizes the penetrability and the sensitivity of the color flow.

To adjust the frequency, rotate the knob located directly below **Frequency** to increase or decrease the value.

■   **Wall Filter**

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

To adjust the frequency, rotate the knob located directly below **WF** to increase or decrease the value.

■   **Pulse Repetition Frequency**

Pulse repetition frequency is used to adjust the velocity scale.

To adjust the pulse repetition frequency:

- Rotate the knob located directly below **Scale** to increase or decrease the value.
- Flip the **Scale** switch downwards or upwards to decrease or increase the value.

■ **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.

A lower line density is useful in fetal heart beat, adult cardiac applications and in clinical radiology applications. A higher line density is useful in obtaining a very high resolution, such as for the thyroid or testicles.

To adjust the frequency, rotate the knob located directly below **Line Density** to increase or decrease the value.

■ **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. This feature is not available in the PDI/SR-Flow/Micro F mode.

To adjust the baseline:

- Rotate the knob located directly below **Baseline** to move the baseline.
- Flip the **Baseline** switch upwards or downwards to move the baseline towards the positive or negative direction.

■ **Color Map**

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

To adjust the color map in the CFM/TDI mode, rotate the knob located directly below **Color Map** to change the image color.

NOTE:

When **Color Map/DPDI** *is set to* **8** *or above in the PDI mode, the system automatically enters the DPDI mode and* **DPDI** *appears. 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.

To adjust the persistence, rotate the knob located directly below **Persistent** to increase or decrease the value.

■ **Sector Width/Angle**

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 angle.

To adjust the sector width/angle, rotate the knob located directly below **Sector Width** to change the sector width or angle.

■ **Power**

Power is used to select the amount of ultrasound acoustic power produced by the probe. The adjustment range of the power is 0-100%, and ±10% can be adjusted each time. The real-time value of the power is displayed in the imaging information area of the basic screen.

To adjust the power, rotate the knob located directly below **Power% to** increase or decrease 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.

To adjust B Reject, rotate the knob located directly below **B Reject** to increase or decrease the value.

■   **Steer**

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

To adjust the steer,the knob 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 **Invert** is set to **OFF**, red pixels represent flow to the probe; blue pixels represent flow away from the probe.

When **Invert** is set to **ON**, blue pixels represent flow to the probe; red pixels represent flow away from the probe.

To enable or disable the flow invert:

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

●   Or, tap **Invert** again on the touch screen to disable flow invert.

NOTE:

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

■   **Smooth**

Smooth is used to adjust the smoothness of the image.

To adjust the smoothness, tap **Smooth** on the touch screen to enable, adjust or disable the feature.

■   **Bright Flow**

In the CFM/PDI/Micro-F/SR-Flow mode, Bright Flow is enabled to automatically adjust the 2D flow and acquire the stereo image.

To adjust the bright flow, tap **Bright Flow** on the touch screen to enable, disable the feature or adjust the value.

■   **Transparency**

Transparency allows you to adjust the level of transparency within the color ROI in Micro-F mode.

To adjust the transparency, rotate the knob located directly below **Transparency** to increase or decrease the value.

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 the following figure shows.
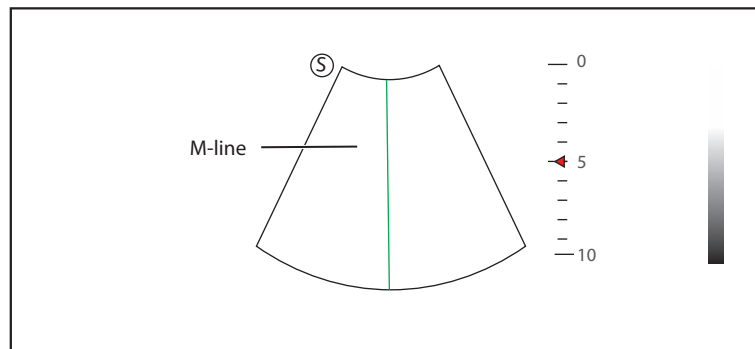
Figure 6-12 Pre-activated B+M-Mode Imaging Screen

3. Adjust the 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 a 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 being activated, as shown in Figure 6-13.
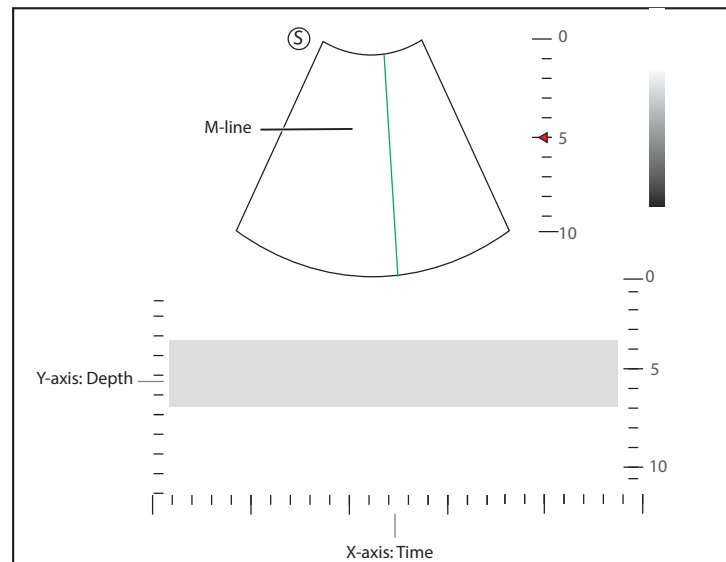
Figure 6-13 M-Mode Imaging Screen

 – 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 6.4.3 Optimizing M-Mode Images.

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

6.4.2   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.

Perform the following steps to acquire anatomical M-mode images.

1.   In the pre-activated M mode, rotate the knob located directly below **AMM Angle** to enter the pre-activated anatomical M-mode.

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

Multiple M lines are displayed after selecting the desired number as the following figure shows.
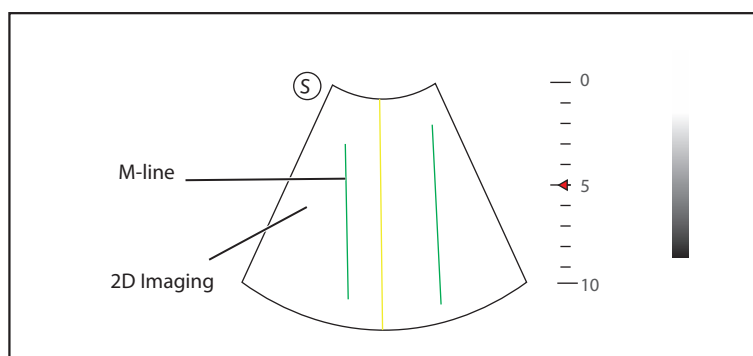
Figure 6-14 Pre-activated Anatomical M-Mode Imaging Screen

3.   Adjust the position and the 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 knob located directly below **AMM Angle** or rotate the **Angle** key on the control panel to adjust the angle of M line.

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

After the anatomical M-mode is activated, the anatomical M-mode image is displayed on the X-axis and Y-axis plane.

5.   Optimize anatomical M-mode images. For details, refer to Section 6.4.3 Optimizing M-Mode Images.

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

6.4.3   Optimizing M-Mode Images

The touch screen displays all controls related to the M-mode imaging (as shown in the figure), you can use them to optimize M-mode images.
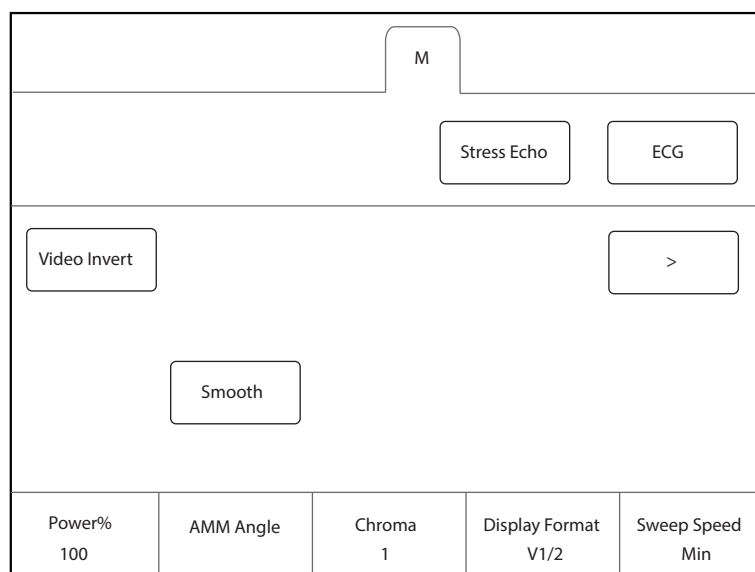
Figure 6-15 M-Mode Imaging Parameters Menu

You can tap > on the touch screen to turn the current menu to the previous or the next page if it displays over one page.

To optimize an image, you can rotate the knob on the control panel that is directly below the selected item to adjust the value.

NOTE:

In real-time M mode, you can adjust all parameters. In frozen M mode, you can adjust **Chroma**, **Gray Map**, **Smooth**, **Video Invert** *and* **Display Format** *.*

■   **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.

■   **M Process**

M process is used to set the processing method for the M trace display.

To set M process, rotate the knob located directly below **M Process** to set the M process as **Ave** or **Peak**.

■   **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.

To adjust the sweep speed, rotate the knob located directly below **Speed** to increase or decrease the value.

■   **Chroma**

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

To adjust the chroma, rotate the knob located directly below **Chroma** to adjust the value.

■   **Display Format**

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

To set the display format, rotate the knob located directly below **Display Format** to adjust the display format.

■   **Power**

Power is used to select the amount of ultrasound acoustic power produced by the probe. The adjustment range of the power is 30%-100%, and ±10% can be adjusted each time. The real-time value of the power is displayed in the imaging information area on the basic screen.

To adjust the power, rotate the knob located directly below **Power%** to increase or decrease the value.

NOTE:

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

■   **Video Invert**

Video invert is used to invert the M trace display related to brightness.

To enable or disable the video invert:

● Tap **Video Invert** on the touch screen to enable flow invert.

● Or, tap **Video Invert** again on the touch screen to disable flow invert.

■   **Smooth**

Smooth is used to adjust the smoothness of the image.

To adjust the smoothness, tap **Smooth** on the touch screen to enable, adjust or disable the feature.

■   **Gray Map**

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

To adjust the gray map, rotate the knob located directly below Gray Map to increase or decrease the value.

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.
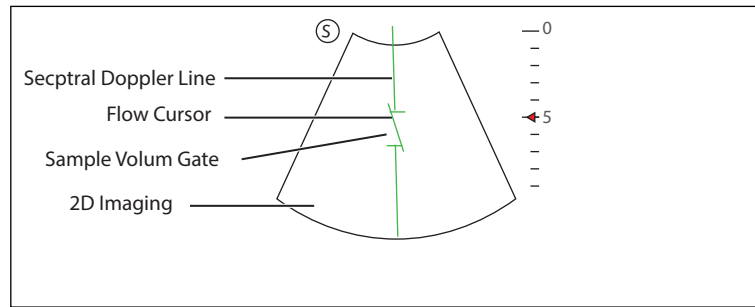
Figure 6-16 Pre-activated B+PW Mode 1 Imaging Screen

- − 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 moving the trackball upwards or downwards.
- − Adjust the angle of the spectral Doppler line by moving the trackball to the left or the right.

4. Adjust the sample volume gate.

- − Adjust the size of the sample volume gate by using the trackball.
- − Rotate the **Angle** key on the control panel 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 is displayed at the lower part of the screen after being activated, as shown in Figure 6-17.
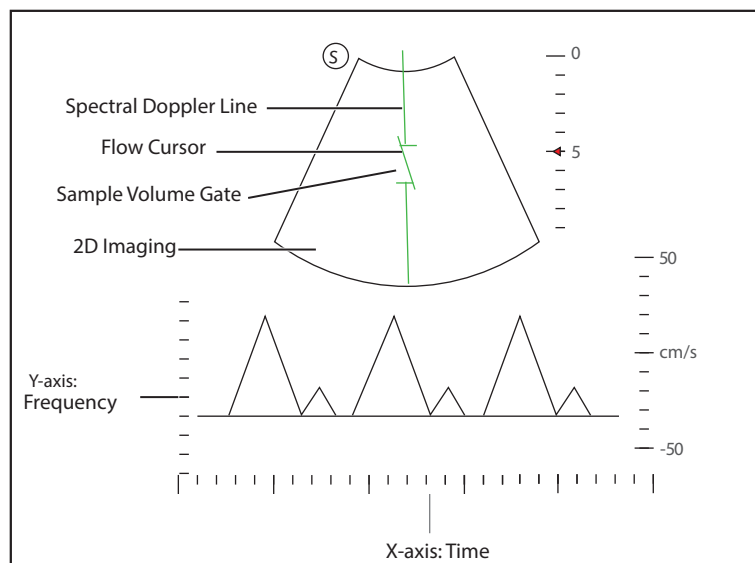
Figure 6-17 PW-Mode Imaging Screen

- − 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 key panel simultaneously or rotate the knob located directly below the **Volume** on the touch screen to adjust the audio volume.

NOTE:

Once the PW-mode is activated, you can move the trackball to stop the Doppler trace and adjust the sample volume gate. The system continues tracing if the trackball is idle for more than 0.5s.

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.

Perform the following steps to acquire CW-mode images.

1. Optimize a B-mode image.

2. Press the **CW** key on the control panel to enter the pre-activated B+CW mode 1.
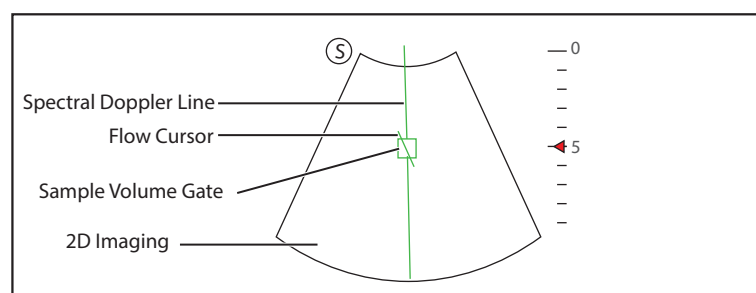
Figure 6-19 Pre-activated B+CW-Mode 1 Imaging Screen

-   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 moving the trackball upwards or downwards.

    -   Adjust the angle of the spectral Doppler line by moving the trackball to the left or the right.

– Press the Set key on the control panel to confirm.

4. Rotate the **Angle** key on the control panel 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 is displayed at the lower part of the screen after being activated, as shown in Figure 6-20.
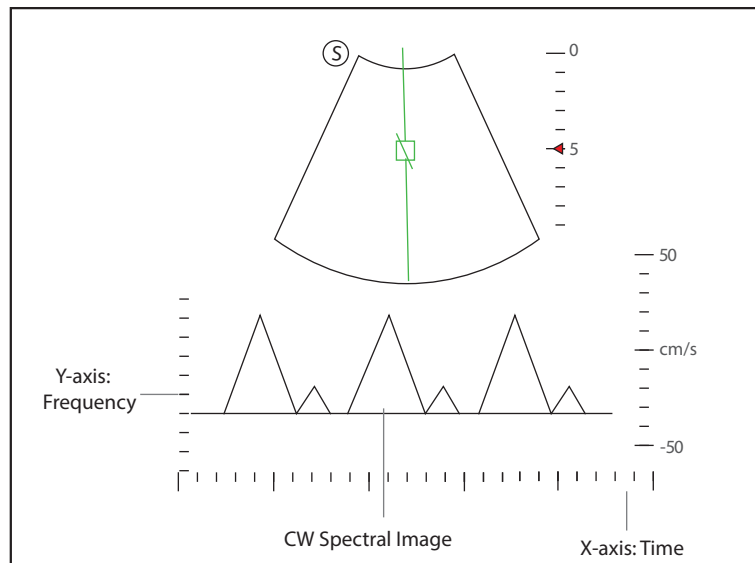
Figure 6-20 CW-Mode Imaging Screen

– 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 key panel simultaneously or rotate the knob located directly below the **Volume** on the touch screen to adjust the audio volume.

NOTE:

Once the PW-mode is activated, you can move the trackball to stop the Doppler trace and adjust the sample volume gate. The system continues tracing if the trackball is idle for more than 0.5s.

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, the following screen appears.
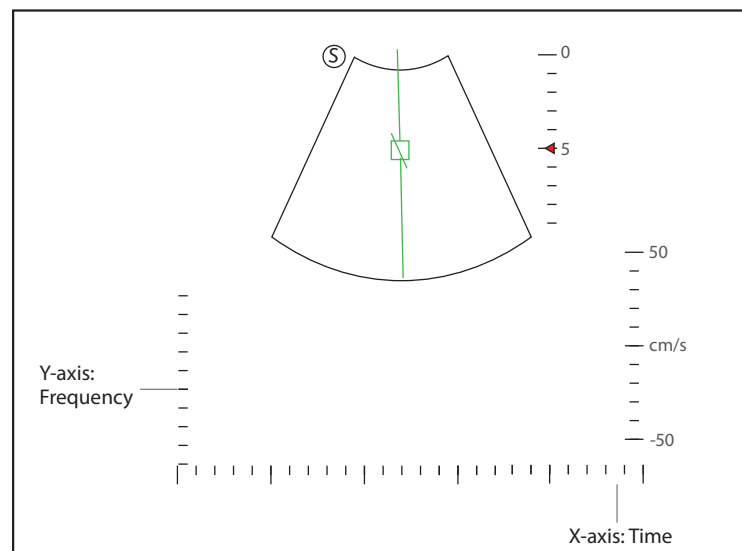
Figure 6-21 Pre-activated B+CW Mode 2 Imaging Screen

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

The touch screen displays all controls related to the PW/CW-mode imaging (as shown in the figure), you can use them to optimize PW/CW-mode images.
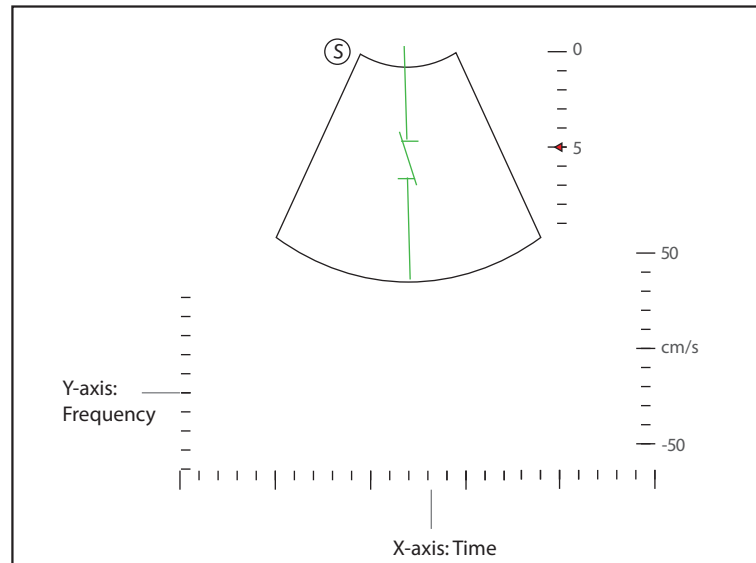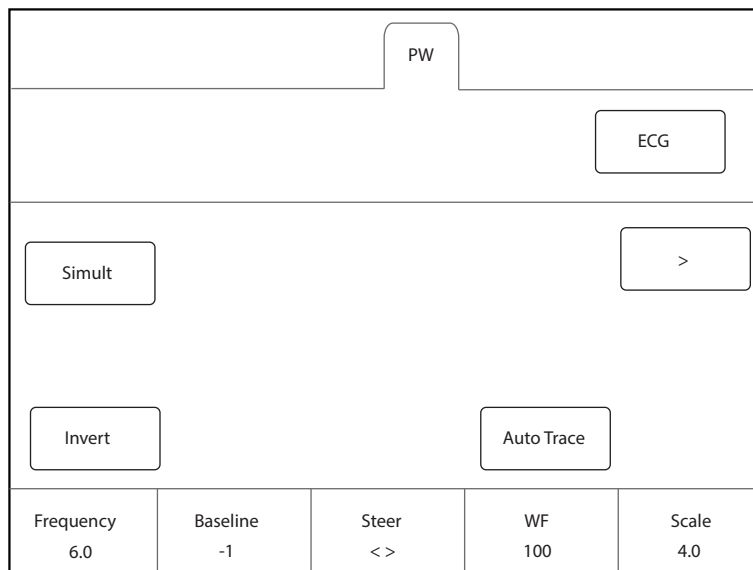

Figure 6-22 Spectral Doppler Mode Imaging Parameters Menu

You can tap > on the touch screen to turn the current menu to the previous or the next page if it displays over one page.

To optimize an image, you can rotate the knob on the control panel that is directly below the selected item to adjust the value.

NOTE:

In real-time PW/CW mode, you can adjust all parameters. In frozen PW/CW mode, you can adjust **Display Format***,* **NSI***,* **Chroma***,* **Smooth***,* **Invert** *and* **Video Invert***.*

■   **Gain**

PW/CW gain 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.

To adjust the gain, rotate the **PW** or **CW** key on the control panel to increase or decrease the gain in the corresponding mode.

■   **Pulse Repetition Frequency**

Pulse repetition frequency is used to adjust the velocity scale, filter the unnecessary low frequency signal or the disturbance made by non-flow movements, such as breath, heart beat or sweeps of the probe.

The range of PRF value varies with the probe model and the exam type.

To adjust the pulse repetition frequency:

● Rotate the knob located directly below **Scale** to increase or decrease the value.
● Flip the **Scale** switch downwards or upwards to decrease or increase the value.

NOTE:

The value of wall filter is also changed when adjusting PRF.

■   **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 knob 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.

To adjust the baseline:
- Rotate the knob located directly below **Baseline** to move the baseline.
- Flip the **Baseline** switch downwards or upwards to move the baseline towards the negative or positive direction.

■   **Wall Filter**

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

To adjust the wall filter, rotate the knob located directly below **WF** to increase or decrease the value.

■   **Frequency**

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

To adjust the frequency, rotate the knob located directly below **Frequency** to increase or decrease the value.

■   **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.

To adjust the sweep speed, rotate the knob located directly below **Sweep Speed** to increase or decrease 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 30%-100%, and ±10% can be adjusted each time. The real-time value of the power is displayed in the image parameter area on the basic screen.

To adjust the power, rotate the knob located directly below **Power%** to increase or decrease 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.

To adjust the chroma, rotate the knob located directly below **Chroma** to adjust the value.

■   **Dynamic Range**

Dynamic range increases the adjustable range of contrast by enhancing the intensities of parts in the grayscale. It is useful for optimizing the ultrasound image texture.

To adjust the dynamic range, rotate the knob located directly below **DYN** to decrease the value.

■   **Display Format**

Display format is used to view the image better.

To set the display format, rotate the knob located directly below **Display Format** to adjust the setting.

■   **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.

■   **Video Invert**

Video invert is used to view the background of the spectral display from a different perspective.

To enable or disable the flow invert:

● Tap **Video Invert** on the touch screen to enable the feature, and a brighter background appears.

● Or, tap **Video Invert** again on the touch screen to disable the feature, and a darker background appears.

■   **Quick Angle Correction**

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

To enable the feature, tap **Quick Angle** on the touch screen to set the angle of the flow cursor to 60˚, -60˚, or 0˚.

NOTE:

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

■   **Simult**

Simult is used to synchronously display two real-time scans in the 2D and the PW modes.

To enable or disable the feature:

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

NOTE:

Simult *is only available in the PW mode.*

■   **NSI**

NSI optimizes the image by suppressing the background noise.

To adjust the noise suppression image, rotate the knob located directly below **NSI** to increase or decrease the value.

■   **Smooth**

Smooth is used to adjust the smoothness of the image.

To adjust the smoothness, tap **Smooth** on the touch screen to enable, adjust or disable the feature.

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 mode includes B+CFM/TDI+M, B+CFM/PDI/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.
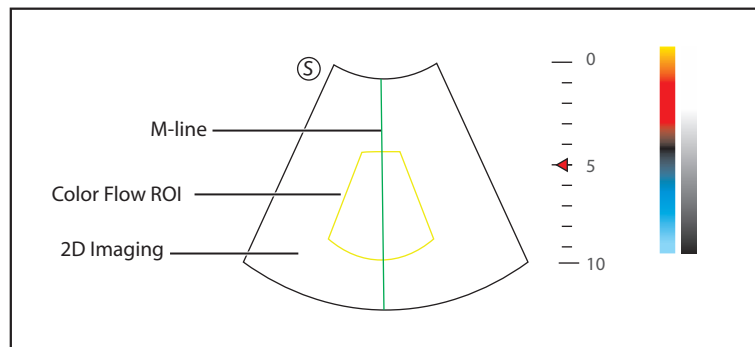
Figure 6-23 Pre-activated B+CFM/TDI +M-Mode Imaging Screen

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

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

    The basic screen displays the following after being activated.
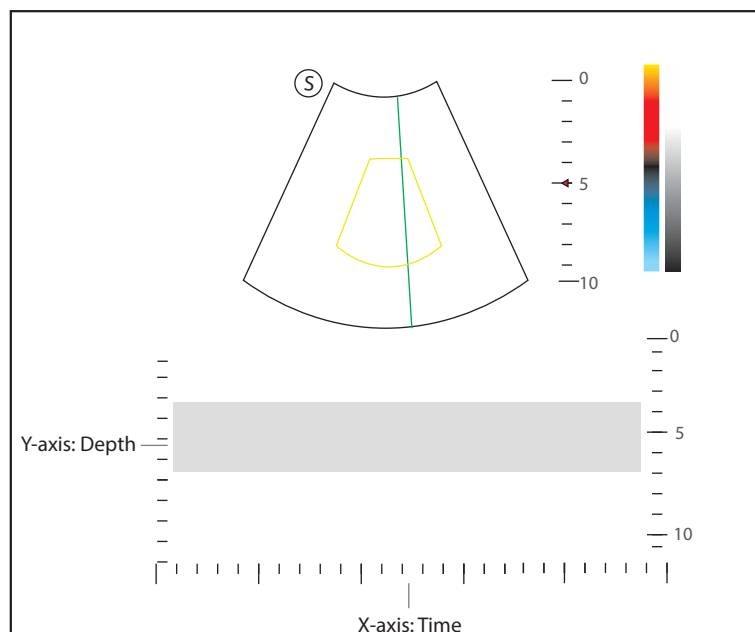
Figure 6-24 B+CFM/TDI +M-Mode Imaging Screen

5. Optimize the M-mode image. For details, refer to Section 6.4.3 Optimizing M-Mode Images.

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

6.6.2   B+CFM/PDI/TDI +PW

Perform the following steps to acquire the image.

1. Optimize a CFM/PDI/TDI-mode image.

2. Press the **PW** key on the control panel to enter the pre-activated B+CFM/PDI/TDI+PW mode 1.
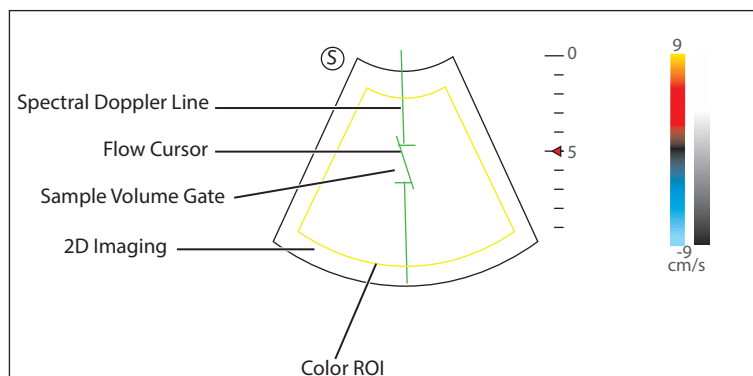
Figure 6-25 Pre-activated B+CFM/PDI/TDI+PW-Mode 1 Imaging Screen

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

4. Adjust the sample volume gate.
   - Move the trackball to adjust the size of the sample volume gate.
   - Rotate the **Angle** key on the control panel 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 is displayed at the lower part of the screen after being activated, as shown in Figure 6-26 B+CFM/PDI/TDI+PW-Mode Imaging Screen.
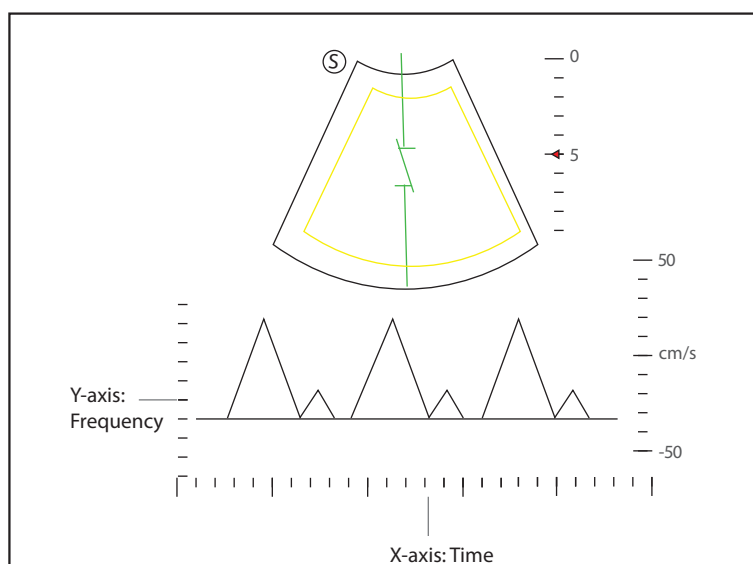
Figure 6-26 B+CFM/PDI/TDI+PW-Mode Imaging Screen

Press the **Fn** key and the Left/Right arrow key on the key panel simultaneously or rotate the knob located directly below the **Volume** 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, the following screen appears.
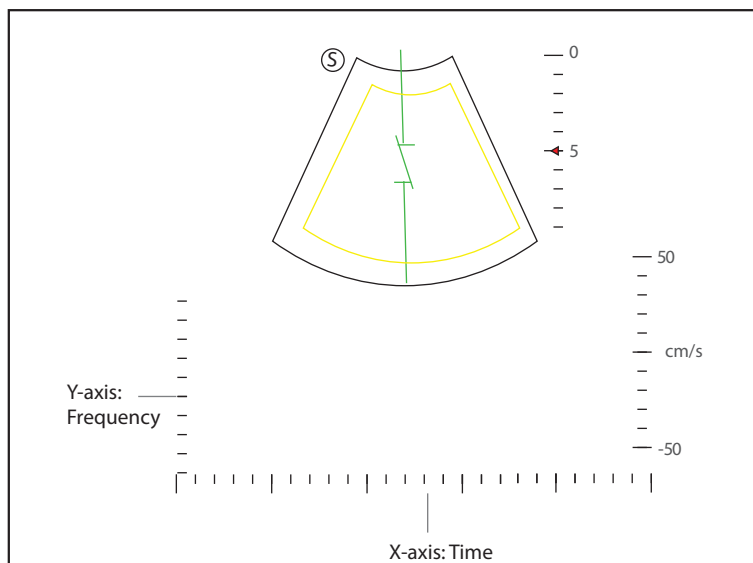
Figure 6-27 Pre-activated CFM/PDI/TDI+PW Mode 2 Imaging Screen

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/TDI +PW.

6.7   Auto Image Analysis

6.7.1   S-Fetus

S-Fetus is used to automatically identify and acquire the standard sections during the real-time scan, and automatically measure the sections with measurement items. The confirmed measurement results are automatically recorded into the report. This function supports S-Fetus (basic edition) and S-Fetus adv. (advanced edition), and the supported sections and measurement items are as follows respectively.

● S-Fetus adv. (advanced edition)

Sections	Measurement Items
Trans. Thalamus	HC
	BPD
Trans. Cerebellum	Cereb.
Trans. LV	Vp
Nose & Lips	/
Trans. Orbit	/
Sag. Baby Face	/

Sections	Measurement Items
AP4C	CTAR (section selected by the physician)
	CTDR (section selected by the physician)
	Cardiac axis (section selected by the physician)
Trans. Upper Abd	AC
Trans. Kidneys	/
Trans. Abd (Cord insert)	/
Trans. Bladder (UA)	/
Longit. Femur	FL
Sag. Spine (C&T)	/
Sag. Spine (L&S)	Sp
Meas. Placenta	PL (section selected by the physician)
Meas. AF	AFI (section selected by the physician)

- S-Fetus (basic edition)

Sections	Measurement Items
Trans. Thalamus	HC
	BPD
Trans. Upper Abd	AC
Longit. Femur	FL
Meas. Placenta	PL (section selected by the physician)
Meas. AF	AFI (section selected by the physician)

NOTE:

- *S-Fetus function is not recommended after rotating the image.*
- *S-Fetus function is only applicable to 2nd Trim, 3nd Trim and 2nd Trim Cardiac examinations performed with curved array probe or abdominal volume probe.*
- *When S-Fetus function is used to scan the bony structures, you need to confirm whether the femur or humerus is scanned according to the actual application. You can select* **FL** *or* **HL** *for confirmation during the real-time scan or section confirmation.*

■   **Operation Procedures of S-Fetus and S-Fetus adv.**

The following description uses 2nd Trim examination performed with the VC6-2 probe as an example.

Perform the following steps.

1. Select a probe and an exam type (2nd Trim).
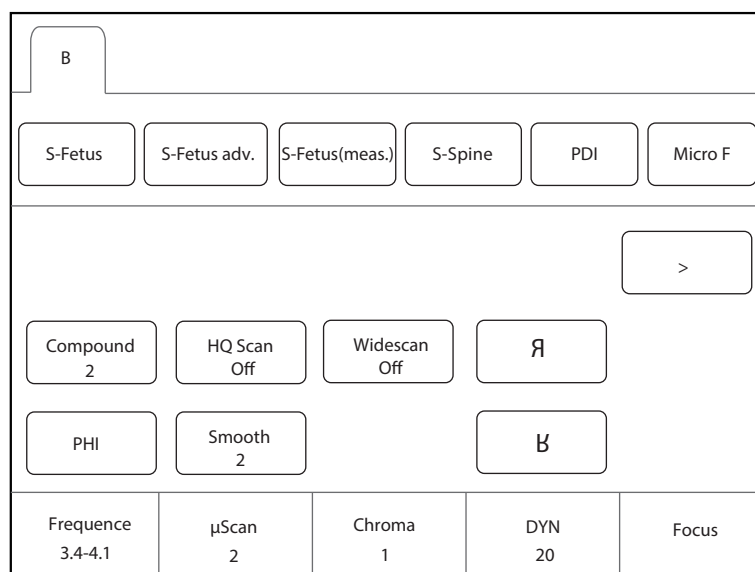
Figure 6-28 Parameter Screen _ S-Fetus

2. In real-time B mode, tap **S-Fetus** or **S-Fetus adv.** on the touch screen to automatically identify and acquire standard sections.

    NOTE:

    • *During the section identification, the section with high score will replace the section with low score.*

    • *When freezing the image, the sections with measurement items will respond to automatic measurement.*

3. Confirm the sections. For the detailed operations, refer to "To confirm sections". The confirmed measurement results are saved into the report.

    If necessary, you can enter the S-Fetus or S-Fetus adv. tab and tap **Auto AFI** or **Auto PL** on the touch screen to perform automatic measurement of amniotic fluid or placenta. For the detailed operations, refer to "Operation Procedures of Auto AFI and Auto PL".

■   **Operation Procedures of Auto AFI and Auto PL**

Perform the following steps.

1. In real-time B mode, tap **S-Fetus** or **S-Fetus adv.** tab on the touch screen.

2. Press the ⏮ key on the control panel to freeze the image, and tap **Auto AFI** or **Auto PL** on the touch screen to perform automatic measurement of amniotic fluid or placenta.

    NOTE:

    Auto AFI supports single display and quad-split display.

3. Rotate the trackball to adjust the trace line.

    You can press the **Update** key on the control panel to switch the measurement markers.

4. Press the Set key on the control panel to confirm the measurement result. The measurement result is displayed in the result box on the basic screen and saved into the report simultaneously.

5. Press the **Image** key on the control panel to save the image.

■   **Operation Procedures of Auto UmbA**

Perform the following steps.

1. In frozen PW mode, tap **Auto UmbA** on the touch screen to automatically measure the fetal heart rate.

2. Press the Set key (left key) on the control panel to complete the measurement. The measurement result is displayed in the result box on the basic screen and saved into the report simultaneously.

3. Press the **Image** key on the control panel to save the image.

■   **Operation Procedures of S-Fetus(meas.)**

The following description uses 2nd Trim examination performed with the VC6-2 probe as an example.

Perform the following steps.

1. Select a probe and an exam type (2nd Trim).

2. In real-time B mode, tap **S-Fetus(meas.)** on the touch screen to perform automatic measurement, and the measurement results are displayed in the result box on the basic screen, as shown in Figure 6-29.

    S-Fetus(meas.) is available in real-time scan mode, in frozen mode, or when the image or cine is reviewed. It is used to automatically identify the current section and perform automatic measurement.
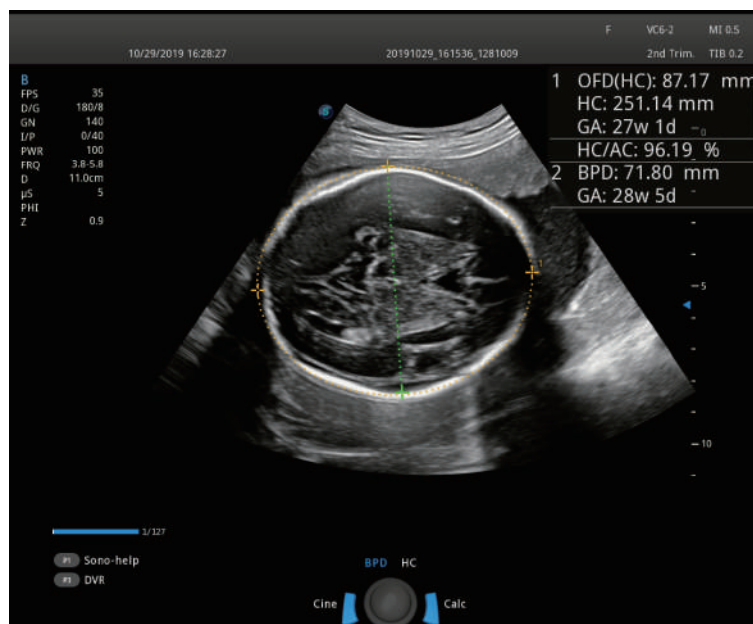
Figure 6-29 Image Display _ S-Fetus(meas.)

3. Rotate the trackball to adjust the trace line, and perform the following operations.

    −   When the horizontal transverse section of thalamus is measured, you can press the Set key (right key) on the control panel to switch between BPD measurement and HC measurement, and then adjust the trace line.

    −   When you need to switch the measurement markers, you can press the **Update** key on the control panel.

4. Press the Set key on the control panel to confirm the measurement results. The measurement results are displayed in the result box on the basic screen and saved into the report simultaneously.

■   **Screen Display**
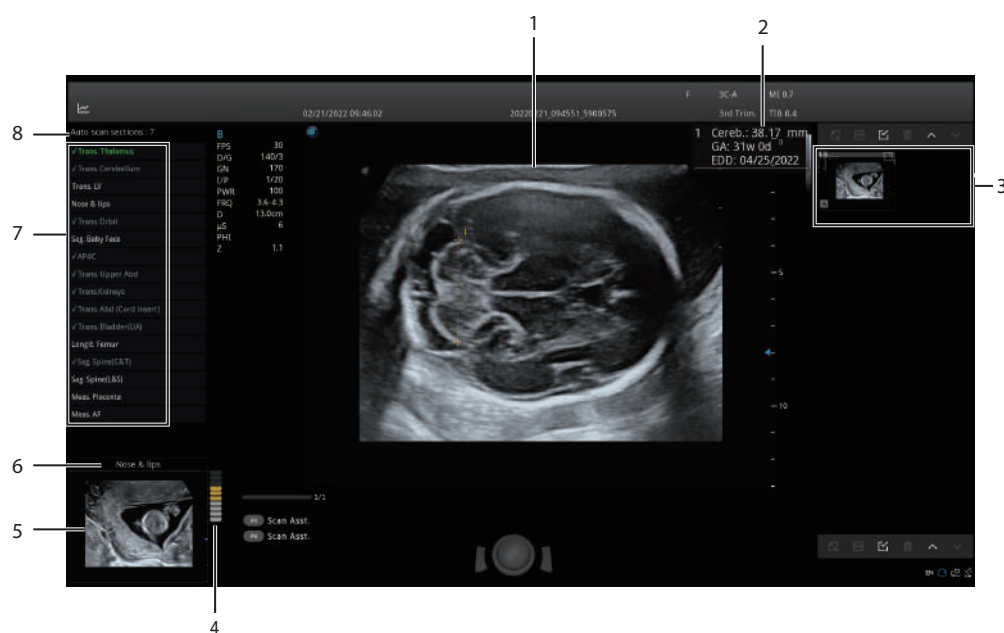
Figure 6-30 Image Display _ S-Fetus adv

No.	Description
1	Image area
2	Measurement results
3	Clipboard **NOTE:** • *The automatically acquired section is marked with "A" at the bottom left.* • *The automatically acquired section with high score will replace the section with low score in the original storage location.*
4	Score of current preview section
5	Section preview
6	Section name
7	List of auto scan sections. There are following three display statuses in the list. ● Not ticked: Represents the section is not acquired. ● Grey and ticked: Represents the section is acquired automatically. ● Green and ticked: Represents the section is confirmed.
8	Number of sections that are not acquired

■   **To confirm sections on the scan screen**

The following description uses S-Fetus adv. as an example.

Perform the following steps.

1. Press the key on the control panel to freeze the image.
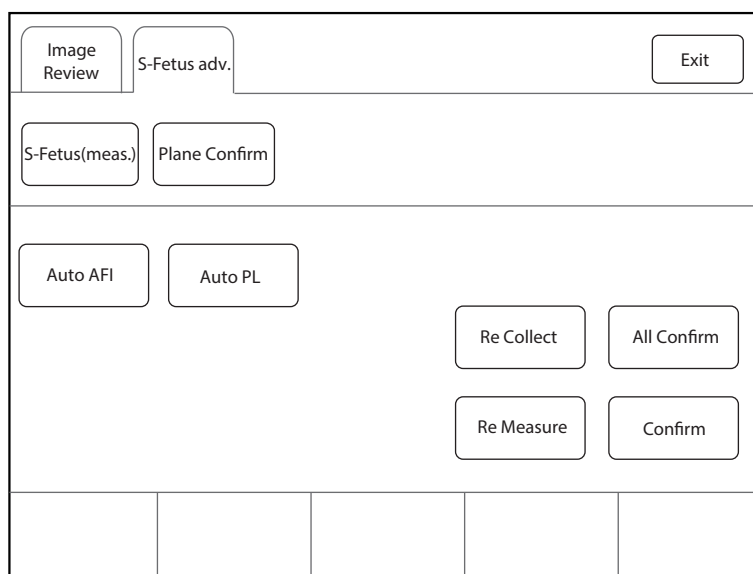
Figure 6-31 Confirming the Section

2. Tap **Plane Confirm** on the S-Fetus adv. tab to enter the confirmation status.

3. Tap **Confirm** at the bottom right to confirm the current section and the system automatically calls back the next section. The measurement result of the confirmed section is saved into the report.

  − If you need to confirm all sections, tap **All Confirm** and all measurement results are saved into the report.

  − If you need to reacquire the section, tap **Re Collect** to return to the real-time scan screen.

  − If you need to adjust the measurement result, tap **Re Measure** to call back the current section and perform the measurement again.

■ **To confirm sections on the Review Exam screen**

Perform the following steps.

1. Press the **Review** key on the control panel to enter the **Review Exam** screen.
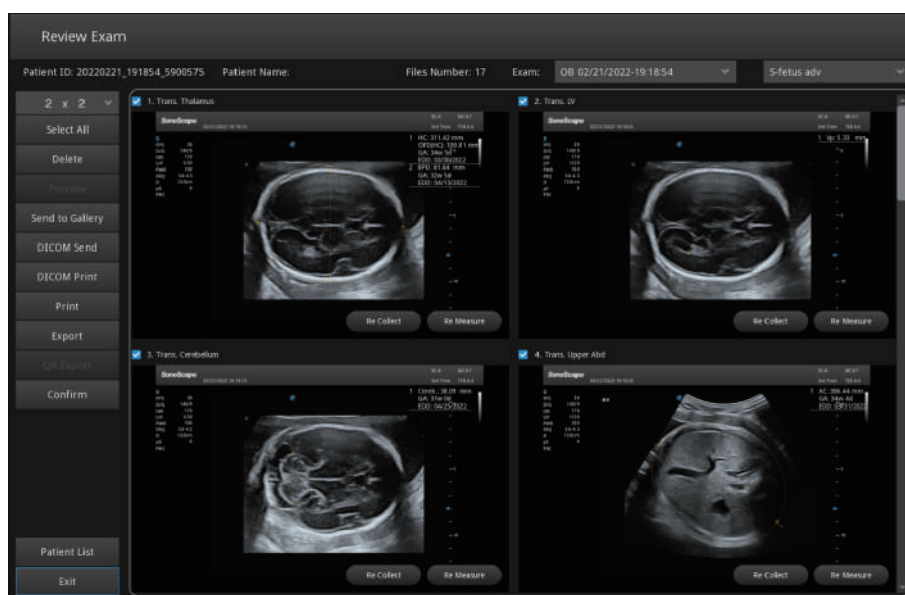
Figure 6-32 Confirming the Section on the Review Exam Screen

2. Tick the sections to be confirmed, and click **Confirm** on the left side of the screen to confirm the sections. The measurement results of the confirmed sections are saved into the report.

- If you need to confirm all sections, click **Select All** > **Confirm** and all measurement results are saved into the report.
- If you need to reacquire the section, click **Re Collect** on the section to return to the real-time scan screen.
- If you need to adjust the measurement result, click **Re Measure** to call back the current section and perform the measurement again.
- If you need to view sections under different scan types, select a scan type at the top right of the **Review Exam** screen.

6.7.2   S-Thyroid

S-Thyroid is used to automatically identify, trace and measure the thyroid nodules, and perform TI-RADS analysis, grading and risk evaluation. The results are displayed on the basic screen.

NOTE:

- *S-Thyroid should be used when the largest section of the thyroid nodule is acquired.*
- *S-Thyroid is not applicable to diffuse lesions.*
- *To ensure the accuracy of automatic trace, the part to be measured should be completely displayed on the image.*
- *If the measurement results on the current section cannot be obtained when S-Thyroid is used, you should adjust the scanning angle and try again.*

■   **Operation Procedures**

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

Perform the following steps.

1. Select a probe and an exam type (Thyroid).
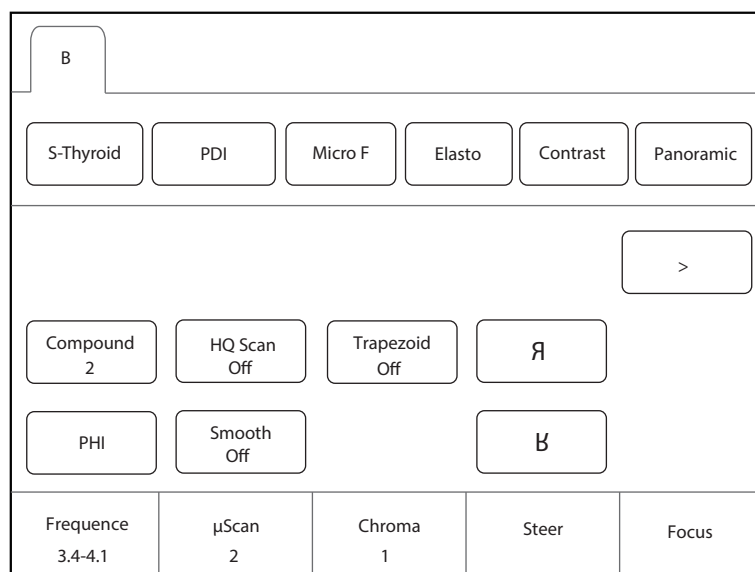
Figure 6-33 Parameter Screen _ S-Thyroid

2. Tap **S-Thyroid** on the touch screen. The system automatically identifies the current section, traces and measures the nodules, and displays the results.

   S-Thyroid is available in real-time scan mode, in frozen mode, or when the image or cine is reviewed.
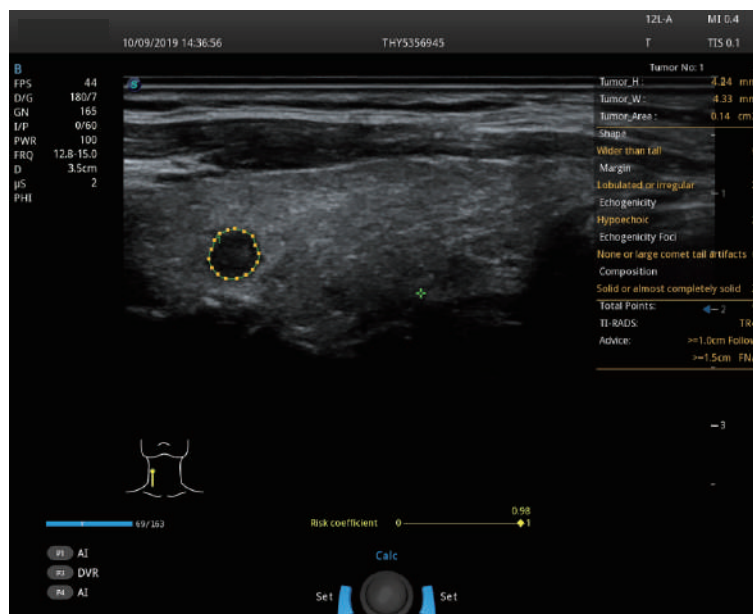
Figure 6-34 Image Display _ S-Thyroid

3. If necessary, perform the following operations to adjust the trace area and analysis results.

    –   Adjust the trace area: 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 position of the point and press the Set key again to confirm the position.

    –   Adjust the analysis results: Tap **Categories** on the touch screen, select the desired items and tap **Exit**. The analysis results are synchronously updated to the result display area.

4. Press the Set key on the control panel to confirm the measurement results. The nodule trace and feature information are displayed on the basic screen.

5. Press the **Image** key on the control panel to save the image and measurement results.

■   **Result Grading**

The system supports grading and risk evaluation of thyroid analysis results. If you need to display the grading results, you can perform the settings on the system settings screen.

Perform the following steps.

1. Set the **Application** to **SMP** on the **System Settings** > **Check** > **Measurement** > **Application** screen.

2. Set the **Thyroid Results** to **On** in the **Results** box.

Figure 6-35 Grading Settings

6.7.3   S-Pelvic Floor

S-Pelvic Floor (S-PF) is used to evaluate the pelvic floor dysfunctions. It includes 2D automatic anterior pelvic evaluation system and 3D levator hiatus evaluation system. In 2D mode, the standard section of anterior pelvic is automatically acquired and measured. In 3D mode, the minimum levator hiatus plane is automatically displayed through one key, and the corresponding measurement information is acquired.

- S-PF(2D): At rest or valsalva state, it is used to automatically measure bladder neck-symphysis distance, retrovesical angle (RA-r/RA-v), bladder descent max (BD max-r/BD max-v) and urethral tilt angle (UTA-r/ UTA-v), and the system automatically calculates the bladder neck distance (BND) and urethral rotation angle (Uret.rot).

- S-PF(3D): At rest, valsalva or contraction state, it is used to automatically measure levator hiatus area (Lev. Hiat. A-r/ Lev. Hiat. A-v/ Lev. Hiat. A-c), levator hiatus height (Lev. Hiat. H-r/ Lev. Hiat. H-v/ Lev. Hiat. H-c), levator hiatus width (Lev. Hiat. W-r/ Lev. Hiat. W-v/ Lev. Hiat. W-c), left levator urethra gap (Lt-LUG -r/ Lt-LUG -v/ Lt-LUG -c) and right levator urethra gap (Rt-LUG -r/ Rt-LUG -v/ Rt-LUG -c).

The following description uses PF examination performed with the VE9-5 probe as an example.

■   **S-PF(2D)**

The system provides two kinds of reference lines for measurement, including screen horizontal line and 135° to the axis of SP. You can select the reference line according to your need and set the reference line as follows.

Set the **Application** to **GYN** on the **System Settings** > **Check** > **Measurement** > **Application** screen, and select a reference line from the drop-down list beside **PF measurement reference line**.

Figure 6-36 Reference Line Settings

Perform the following steps.

1. Select a probe and an exam type (PF).

Figure 6-37 Parameter Screen _ S-PF

2. According to the patient condition, tap **S-PF-Rest(2D)** or **S-PF-Val.(2D)** on the touch screen to perform automatic measurement at the corresponding state, and the measurement results are displayed in the result box on the basic screen.

    S-PF(2D) is available in real-time scan mode, in frozen mode, or when the image or cine is reviewed. S-PF-Rest(2D) is used at rest state and S-PF-Val.(2D) is used at valsalva state.
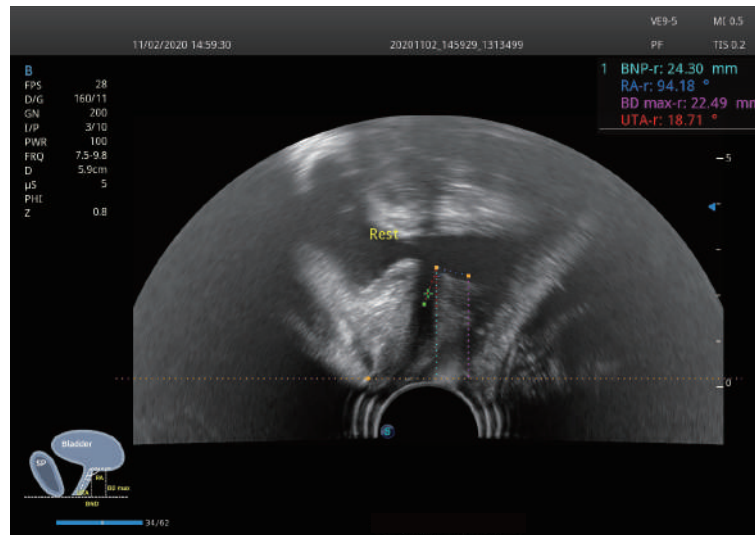
Figure 6-38 Image Display _ S-PF(2D)

3. If necessary, perform the following operations to adjust the trace line.

    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 position of the point and press the Set key again to confirm the position.

4. Press the Set key on the control panel to confirm the measurement results. The measurement results are displayed in the result box on the basic screen and saved into the report simultaneously.

■   **S-PF(3D)**

Perform the following steps.

1. Select a probe and an exam type (PF).

2. In real-time B mode, tap **S-PF-Rest(3D)**, **S-PF-Val.(3D)** or **S-PF-Con.(3D)** on the touch screen according to the patient condition to acquire 3D images at the corresponding state. Or press the **3D/4D** key on the control panel and press the ⏮ key to acquire 3D images.
    − S-PF-Rest(3D) is used at rest state.
    − S-PF-Val.(3D) is used at valsalva state.
    − S-PF-Con.(3D) is used at contraction state.

3. After image acquisition, tap a desired measurement item on the touch screen to perform the automatic measurement at the corresponding state, and the measurement results are displayed in the result box on the basic screen.
    − Auto-PF-Rest(acq.)/Auto-PF-Val.(acq.)/Auto-PF-Con.(acq.) are available in real-time 3D or 4D mode, or when the cine is reviewed. It is used to automatically identify the standard section and perform automatic measurement.
    − Auto-PF-Rest(meas.)/Auto-PF-Val.(meas.)/Auto-PF-Con.(meas.) are available in real-time 3D or 4D mode, or when the cine is reviewed. It is used to automatically identify the current section and perform automatic measurement.

Figure 6-39 Image Display _ S-PF(3D)

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

   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 position of the point and press the Set key again to confirm the position.

5. Press the **Image** key on the control panel to save the image and measurement results.

6.7.4 S-Endo.

S-Endo. (S-Endometrium) is used to automatically measure the endometrium thickness on the median sagittal section of the uterus.

NOTE:

- *S-Endo. should be used when the standard median sagittal section of the uterus is acquired.*
- *To ensure the accuracy of automatic measurement, the part to be measured should be moderate in size and completely displayed on the image.*
- *If the 2D endometrium measurement is failed or the measurement position is improper when S-Endo. is used, it may result from unclear or incomplete endometrum edge in the current section, causing that correct results cannot be obtained. You should adjust the scanning angle and try again.*

The following description uses GYN examination performed with the 6V3 probe as an example.

Perform the following steps.

1. Select a probe and an exam type (GYN).
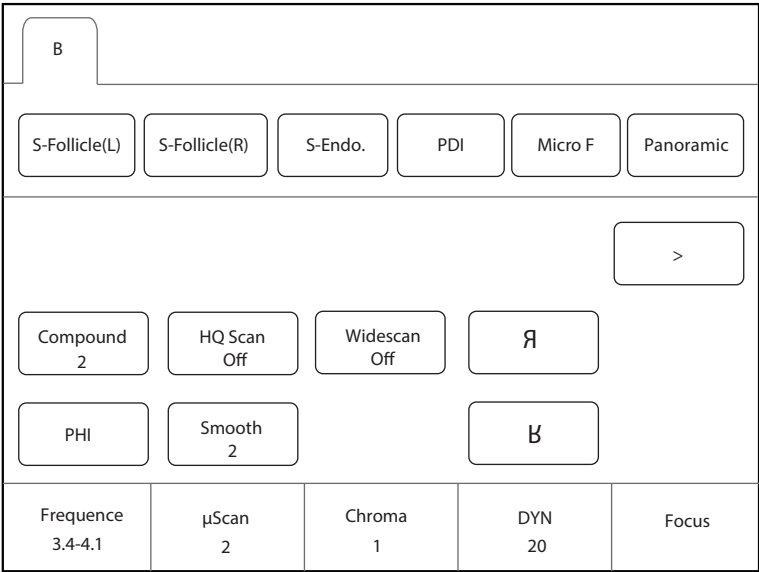
Figure 6-40 Parameter Screen _ S-Endo.

2. Tap **S-Endo.** on the touch screen. The system automatically measures the endometrium thickness on the current section. The measurement results are displayed in the result box on the basic screen.

   S-Endo. is available in real-time scan mode, in frozen mode, or when the image or cine is reviewed.
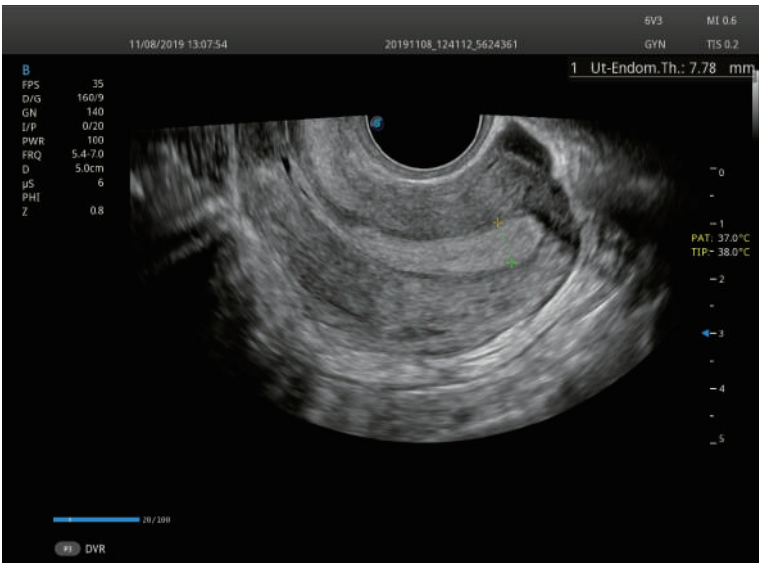
Figure 6-41 Image Display _ S-Endo.

3. If necessary, perform the following operations to adjust the trace line.
   – Rotate the trackball to adjust the measurement line.
   – Press the **Update** key on the control panel to switch the measurement marker.

4. Press the Set key on the control panel to confirm the measurement results. The measurement results are displayed in the result box on the basic screen and saved into the report simultaneously.

6.7.5   S-Follicle

S-Follicle is used to automatically identify the follicles in the ultrasonic image, measure the size, area and volume of the follicles, and count the number of the follicles.

The following description uses GYN examination performed with the 6V3 probe as an example.

Perform the following steps.

1. Select a probe and an exam type (GYN).

Figure 6-42 Parameter Screen _ S-Follicle

2. Tap **S-Follicle(L)** or **S-Follicle(R)** on the touch screen. The system automatically detects the follicle on the current section. If the follicle is detected, the system indicates that follicle is detected successfully. Otherwise, the system indicates that auto follicle calc is failed.

3. If the follicle is detected, rotate the trackball to move the cursor to the follicle and press the Set key on the control panel. The system automatically measures the follicle and displays the measurement results in the result box on the basic screen.

   S-Follicle is available in real-time scan mode, in frozen mode, or when the image or cine is reviewed.
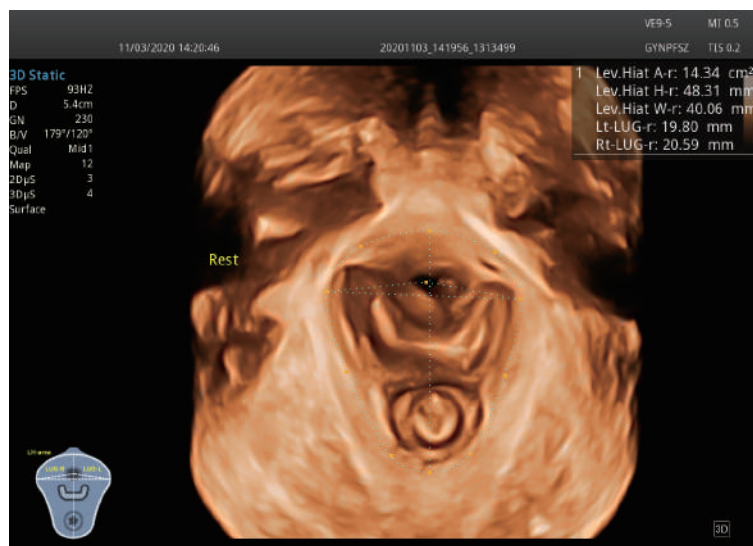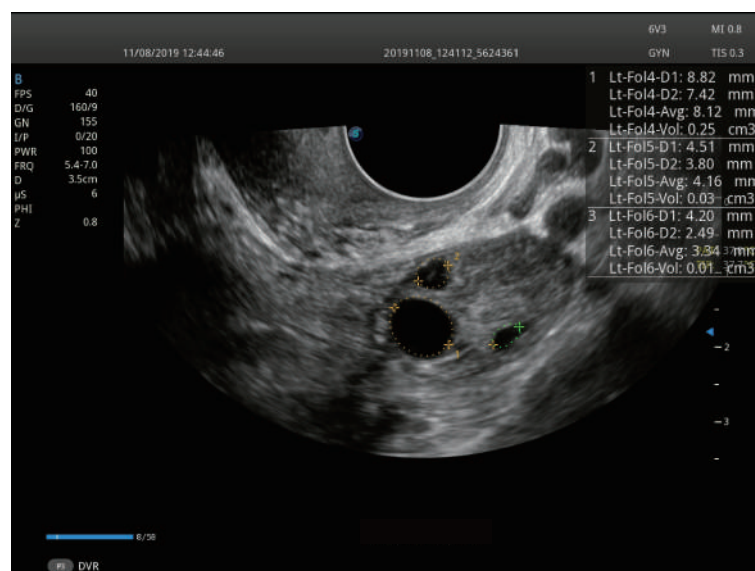

Figure 6-43 Image Display _ S-Follicle

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

   Rotate the trackball to adjust the trace line and press the Set key on the control panel to confirm the trace area and measurement results.

5. Repeat step 3 and step 4 to measure other follicles on the current section.

6.7.6   S-Spine

S-Spine is used to automatically identify the fetal spine, adjust the size and position of ROI in the background system, and acquire 3D image of the fetal spine directly.

The following description uses 2nd Trim examination performed with the VC6-2 probe as an example.

Perform the following steps.

1. Select a probe and an exam type (2nd Trim).
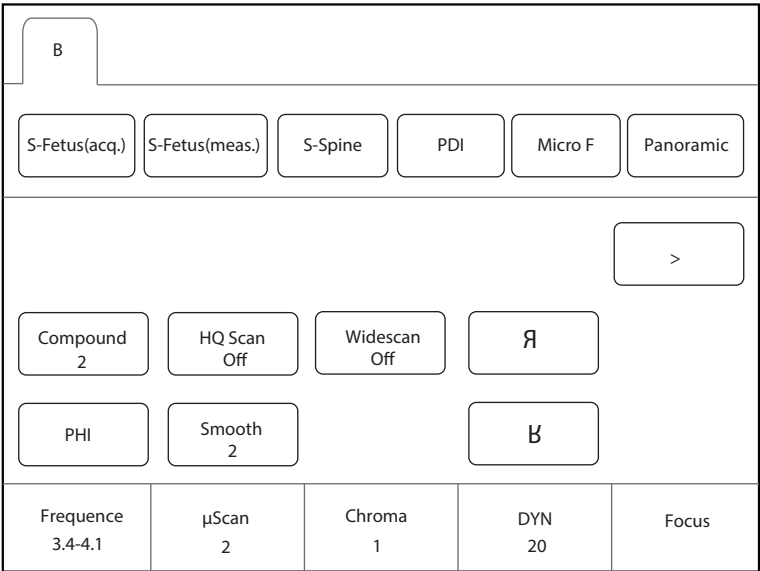
Figure 6-44 Parameter Screen _ S-Spine

2. In real-time B mode, tap **S-Spine** on the touch screen. The system automatically identifies the fetal spine and acquires the image, and then enters the frozen 3D mode after acquisition.

    For detailed operations on images, refer to Section 9.2 Working with 3D Images.

Figure 6-45 Image Display _ S-Spine

6.7.7   S-MSK

S-MSK is used to automatically acquire the musculoskeletal standard section and annotate the relevant tissue structures on the standard section. It combines the teaching diagram, section anatomy diagram and standard ultrasound image to guide the musculoskeletal scan.

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

1. Select a probe and an exam type (MSK).
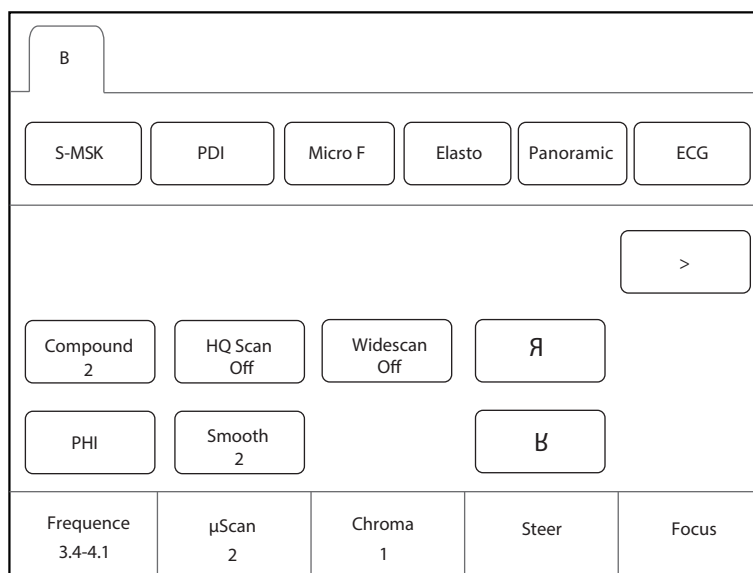
Figure 6-46 Parameter Screen _ S-MSK

2. Tap **S-MSK** on the touch screen to enter the section selection screen and select the left or right side for scanning as required.
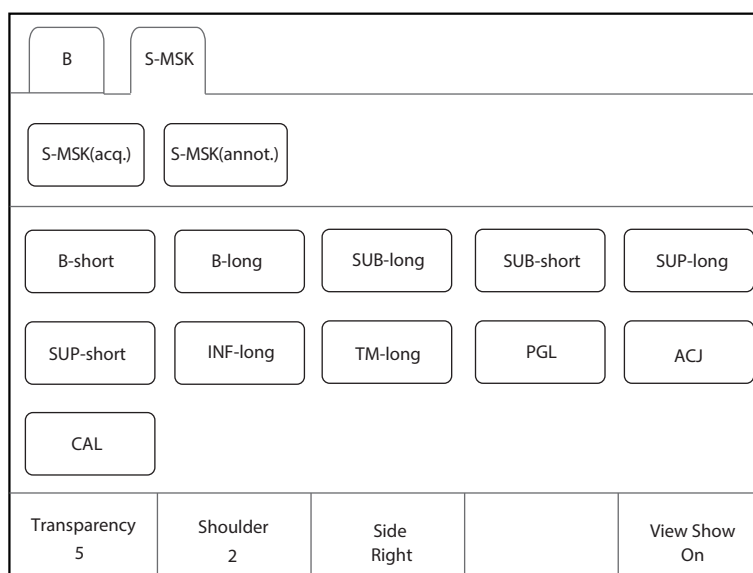
Figure 6-47 Musculoskeletal Section Selection

3. Tap a desired item on the touch screen to select a section, and the corresponding teaching diagram, section anatomy diagram and standard ultrasound image are displayed on the screen.

    −   If you need to disable the Sono-help, rotate the knob located directly below **View Show**.

- If you need to adjust the transparency of the image, rotate the knob located directly below **Transparency**.

4. Tap **S-MSK(acq.)** or **S-MSK(annot.)** on the touch screen to perform the corresponding operation, as shown in Figure 6-48.

- S-MSK(acq.) is available in real-time scan mode, in frozen mode, or when the cine is reviewed. It is used to automatically acquire the standard section and annotate the relevant tissue structures, and the annotations are displayed on the basic screen.

- S-MSK(annot.) is available in real-time scan mode, in frozen mode, or when the image or cine is reviewed. It is used to automatically identify and annotate the relevant tissue structures on the current section, and the annotations are displayed on the basic screen.
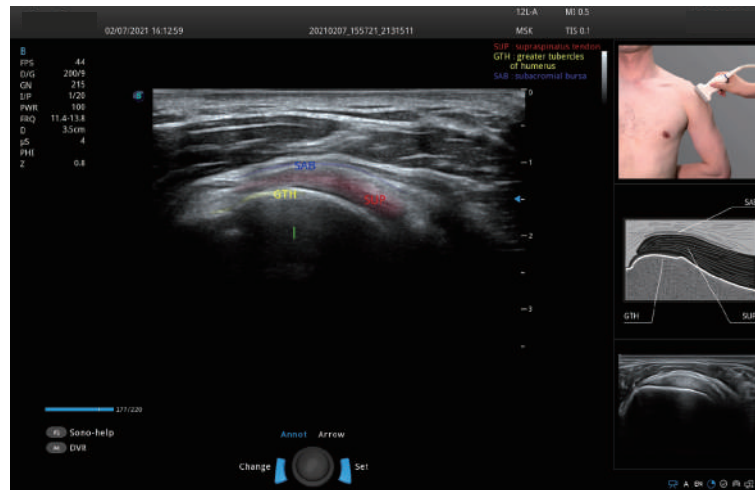
Figure 6-48 Image Display _ S-MSK

6.8 Using the Sono-help

Sono-help is used to view the operation diagram and other information of the exam.

■ **User-defined Key Settings**

You can set **P3/P4** keys as **Sono-help**. The following description takes **P3** key settings as an example.

Perform the following steps.

1. Press the **Setup** key on the key panel to enter the system settings screen.

2. Click **General** > **MultiKey** to enter the user-defined key settings screen.

3. Click **P3** 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 **P3** key to enable the Sono-help. Click **Exit** or press the **P3** key again to exit the screen.

Real-time Ultrasound Image

Exam Type Selection

Liver
By subxiphoid
By right intercostal space
By below right costal margin
By right chest wall

Study Section
> Sagittal view
By abdominal aorta long axis
> Inferior vena cava view
Trans
Second liver portal view
Transverse pancreas views

Section Selection

Exit

Operating Technique Figure

Lt-Lobe

Anatomical Position Drawing

Demonstration

Figure 6-49 Sono-help Screen

6.9   Using the Sono Assistant

The system provides Sono Assistant (Workflow Protocol) function 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 **P3**/**P4** keys as **Sono Assistant**. The following description takes **P3** key settings as an example.

Perform the following steps.

1. Press the **Setup** key on the key panel to enter the system settings screen.

2. Click **General** > **MultiKey** to enter the user-defined key settings screen.

3. Click **P3** 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 **P3** 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 key panel 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
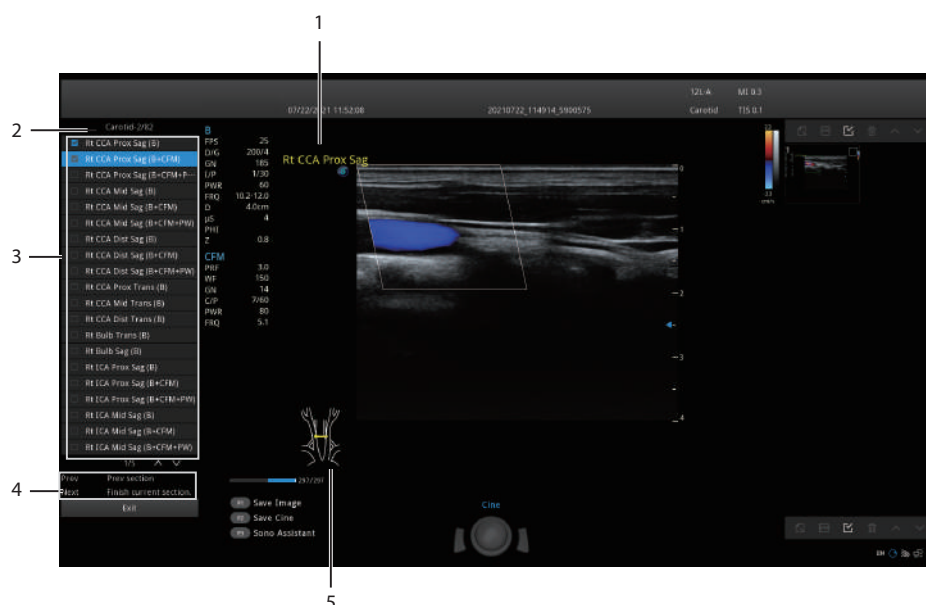
Figure 6-50 Sono Assistant_Vascular Application

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 6-51 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.

■   **Touchscreen Display**

In Sono Assistant status, you can select and lock the section, and select, add or edit the protocol through the touch screen.
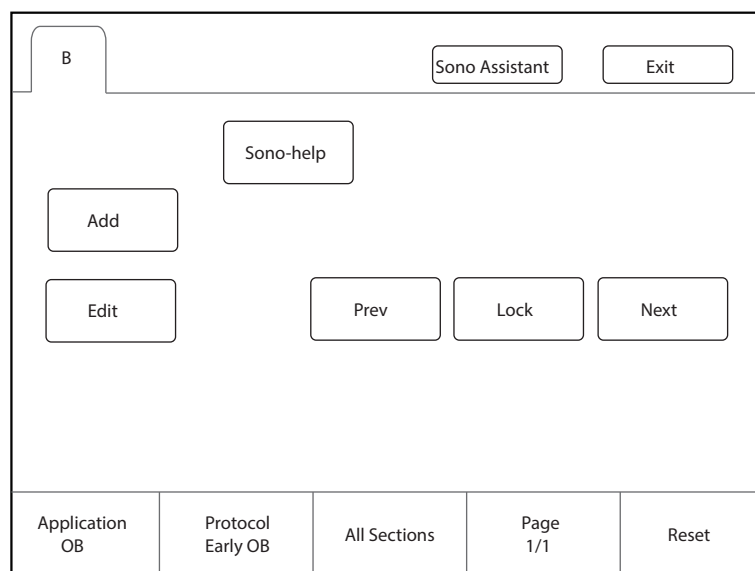
Figure 6-52 Sono Assistant Screen

Functions	Operations
Select the section	Rotate the knob 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 knob 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 knob 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 knob located directly below **Application** to switch the application.
Select the protocol	If the current exam mode is bound to multiple protocols, rotate the knob 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.

6.10   Using the 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 **P3/P4** keys as **Remote**. The following description takes **P3** key settings as an example.

Perform the following steps.

1. Press the **Setup** key on the key panel to enter the system settings screen.

2. Click **General** > **MultiKey** to enter the user-defined key settings screen.

3. Click **P3** tab and select **Remote** 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 **P3** key to open the request dialog box.

```
┌─ Request Remote Medical ──────────────┐
│                                        │
│   Patient Name                         │
│   ┌──────────────────────────────┐     │
│   │ NewPatient                   │     │
│   └──────────────────────────────┘     │
│   Select Doctor:                       │
│   ┌────────────────────────┬─────┐     │
│   │                        │  ∨  │     │
│   └────────────────────────┴─────┘     │
│              ┌──────────┐              │
│              │  Start   │              │
│              └──────────┘              │
│                                        │
│                                        │
│   ┌──────────────┐   ┌──────────┐      │
│   │ Server Config│   │  Close   │      │
│   └──────────────┘   └──────────┘      │
└────────────────────────────────────────┘
```

Figure 6-53 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 6-54 Consultation Mode

7.   After the consultation is finished, press the **P3** key again to exit.

■   **To review the record**

Press the **Setup** key on the control panel to enter the system settings screen and click **Connect** > **Remote Medical** to enter the remote medical screen for reviewing the history records.

6.11   Using the DVR

DVR recording is available to record the full screen of the monitor. After setting the user-defined key on the **System Settings** > **General** > **MultiKey** tab, 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 menu and the recorded DVR thumbnail is displayed on the clipboard.

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 tumor examination performed with the 12L-A probe as an example.

7.1　Acquiring Elastography Images

Perform the following steps to acquire the elastography image.

1. Select 12L-A and Breast as the probe and exam type, the system automatically enters the real-time B mode.

2. Acquire a high quality B-mode image.

3. Press the **Elasto** key on the control panel to enter the elastography mode.

    As Figure 7-1 Elastography Screen shows, the elastography image is displayed on the left and a real-time B-mode image is displayed on the right.

    Press the ⬚ key or the ⬚ key on the control panel to enter the single or dual split screen.
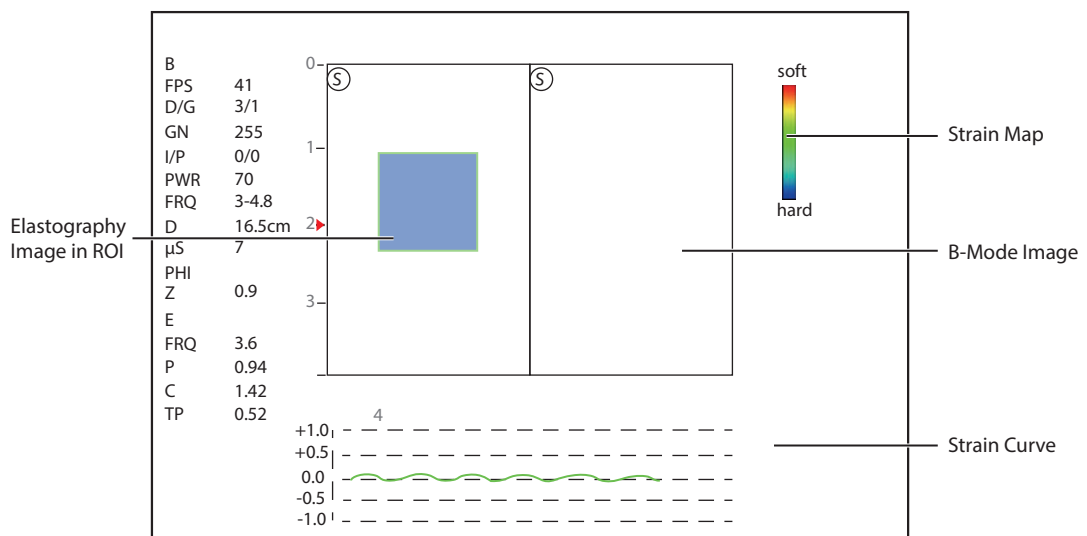
Figure 7-1 Elastography Screen

−　Elastography 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 it regularly.

    Operation Concerns:

    −   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

    −   Move the trackball to position elastography ROI.

    −   Press the Set key on the control panel 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 7.2 Optimizing Elastography Images.

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

7.2   Optimizing Elastography Images

The touch screen displays all controls related to the elastogrphy imaging (as shown in the figure), you can use them to optimize elastogrphy images.
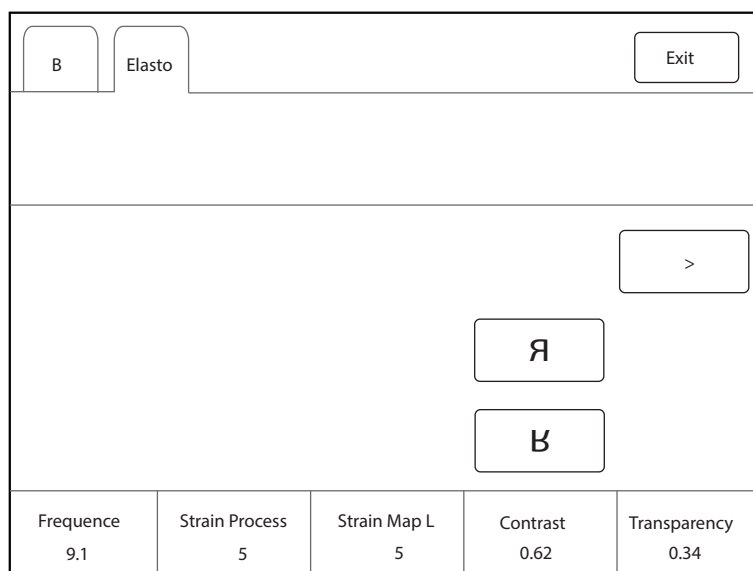

Figure 7-2   Elastography Parameters Menu

You can tap > on the touch screen to turn the current menu to the previous or the next page if it displays over one page.

To optimize the image, you can rotate the knob on the control panel that is directly below the selected item to adjust the value.

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**

Strains map allows you to select and apply a color map to the elastography or B-mode image on the left or right during the elastography. 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).

To adjust the strain map:

● Rotate the knob located directly below **Strain Map L** to choose the color scheme for the elastography image.

● Rotate the knob located directly below **Strain Map R** to apply or choose the color scheme for the B-mode image.

■ **Strain Process**

Strain process is used to set relative parameters of the elastography algorithm, the elastography image varies with this setting.

To adjust the strain process, rotate the knob located directly below **Strain Process** to increase or decrease the value.

■ **Transparency**

Transparency allows you to bring out the tissue behind the color data.

To adjust the transparency, rotate the knob located directly below **Transparency** to increase or decrease the value.

■ **Contrast**

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

To adjust the contrast, rotate the knob located directly below **Contrast** to increase or decrease 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.

To adjust the persistence, rotate the knob located directly below **Persistence** to increase or decrease the value.

■ **Frequency**

The transducer is capable of generating a broadband signal with a certain start frequency and a certain bandwidth. A higher frequency brings about higher resolution and lower penetration.

To adjust the frequency, rotate the knob located directly below **Frequency** to increase or decrease the value.

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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 an abdomen examination performed with the 3C-A probe as an example.

8.1 Entering Contrast Imaging

Perform the following steps to enter the contrast imaging.

1. Select 3C-A and Abdomen as the desired probe and exam type, 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, tap **Contrast** on the touch screen or press the **Contrast** key on the control panel to enter the contrast imaging.

   As Figure 8-1 Contrast Imaging Screen shows, a real-time contrast image is displayed on the left and a B-mode in real-time mode is displayed on the right.
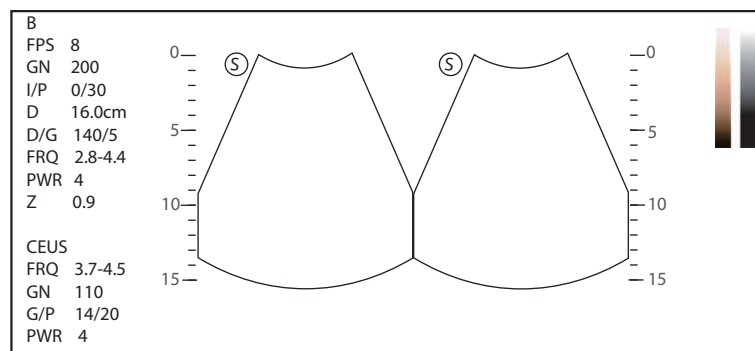
Figure 8-1 Contrast Imaging Screen

- Press the ▢ key or tap ⬡ on the touch screen to enter the single display.
- Press the ▢▢ key or tap ⬡|⬡ on the touch screen to enter the dual split display.
- Tap **Exit** or press the **Contrast** key to exit the contrast imaging.

8.2 Optimizing Contrast Images

The touch screen displays all controls related to the contrast imaging as shown in the figure, you can use them to optimize contrast images.
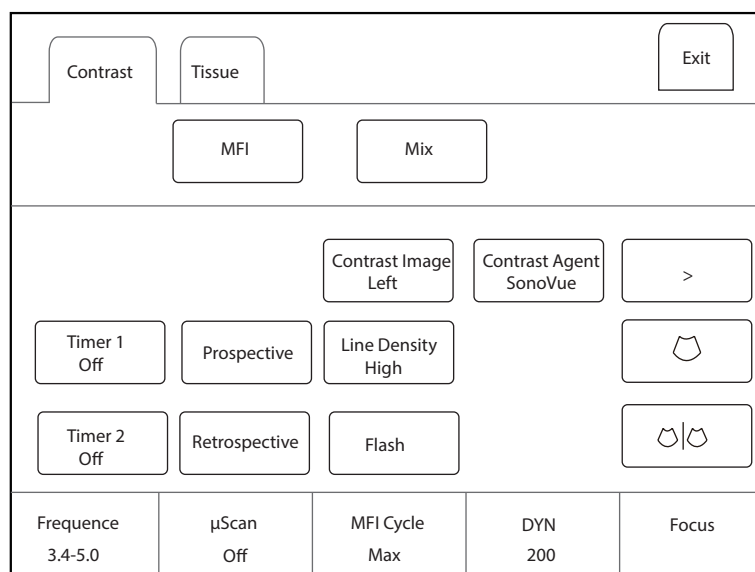
Figure 8-2   Contrast Imaging Parameters Menu

You can tap > on the touch screen to turn the current menu to the previous or the next page if it displays over one page.

You can also tap **Contrast** or **Tissue** to make settings of the relevant tab.

To optimize the image, rotate the knob on the control panel that is directly below the selected item to adjust the value.

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.

To adjust the gain, 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.

To adjust the flash power, tap the left side or right side of **Flash Power** on the touch screen to decrease or increase the flash power value.

■ **Flash Time**

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

To adjust the time, tap the left side or right side of **Flash Time** on the touch screen to decrease or increase 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 menu** > **Store** *tab.*

■ **Contrast Image**

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.

To adjust the position of the image, tap the left or right part of **Contrast Image** to make the setting.

■ **Contrast Agent**

Contrast agent parameters can be set.

To set the contrast agent, tap **Contrast Agent** on the touch screen to switch the contrast agent.

■ **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.

To adjust the MFI cycle, rotate the knob located directly below **MFI Cycle** to make the setting.

■ **Set First/Last**

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

To adjust the first/last frame, rotate the knob located directly below **Set First/Last** to make the setting.

■ **To First/Last**

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

To use this feature, tap **To First/Last** on the touch screen to turn to the first or last frame of the saved cine.

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 **Cine** key on the control panel to set the start frame for cine review.

      Press the **Cine** key 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.

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 11.4 Using Cine, Section 11.5 Annotations and Body Marks, Chapter 12 Managing Images/Data and the relevant sections in the advanced user manual.

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 on the bottom, and colors of TIC curve and ROI are consistent, as shown in Figure 8-3.
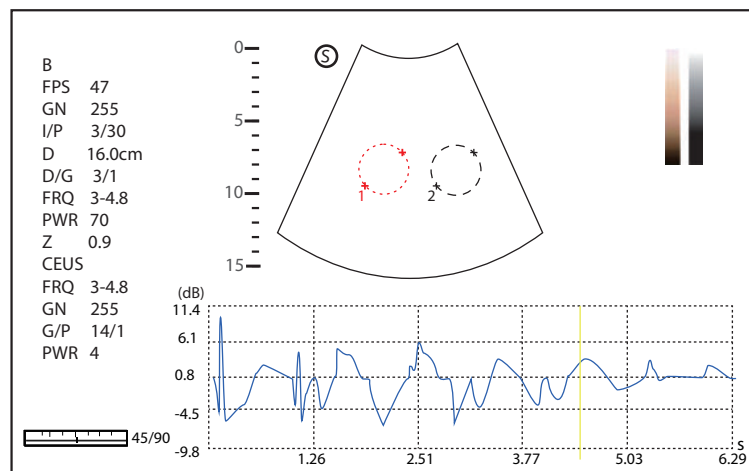
Figure 8-3 TIC Analysis Screen

   – 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** 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, the indication line on the corresponding TIC varies with the frame.

4. Tap **Exit** on the touch screen or press ⏮ key on the control panel to return to the frozen dual split display.

8.5   Contrast 3D/4D Imaging

The system supports 3D/4D HyCoSy. The following description uses GYN examination performed with the VE9-5 probe as an example.

8.5.1   Scan before Contrast Imaging

Perform the following steps.

1. Select a probe and an exam type (GYN), and the system enters B mode by default.

2. Scan the region of interest and perform relevant evaluation and analysis. For the scan methods, refer to Chapter 6 Acquiring Images.

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

4. Tap **Start** on the touch screen or press the � key on the control panel to enter the 3D mode to acquire 3D images of the region of interest.

5. Evaluate and analyze the images by using FreeVue and VCI functions.

8.5.2   Contrast 2D Imaging

Perform the following steps.

1. In B mode, tap **Contrast** on the touch screen or press the **Contrast** key on the control panel to enter the contrast imaging mode.

2. If necessary, adjust the parameters to optimize the image, including gain, TGC, DYN, depth, focus, frequence. For the adjustment methods, refer to Section 6.2.2 Optimizing B-Mode Images.

8.5.3   Contrast 4D imaging

Perform the following steps.

1. In contrast imaging mode, press the **3D/4D key** on the control panel to enter the pre-activated contrast 3D mode and adjust the relevant parameters.

2. Tap **Contrast 4D** tab on the touch screen to enter the pre-activated contrast 4D mode.

Figure 8-4 Pre-activated Contrast 4D Imaging

3. Select the 4D HyCoSy mode and tap **Start** on the touch screen or press the � key on the control panel to enter the real-time 4D HyCoSy mode.

4. Press the ⏮ key to freeze the cine, and check with the physician or nurse that contrast agent and syringe are ready.
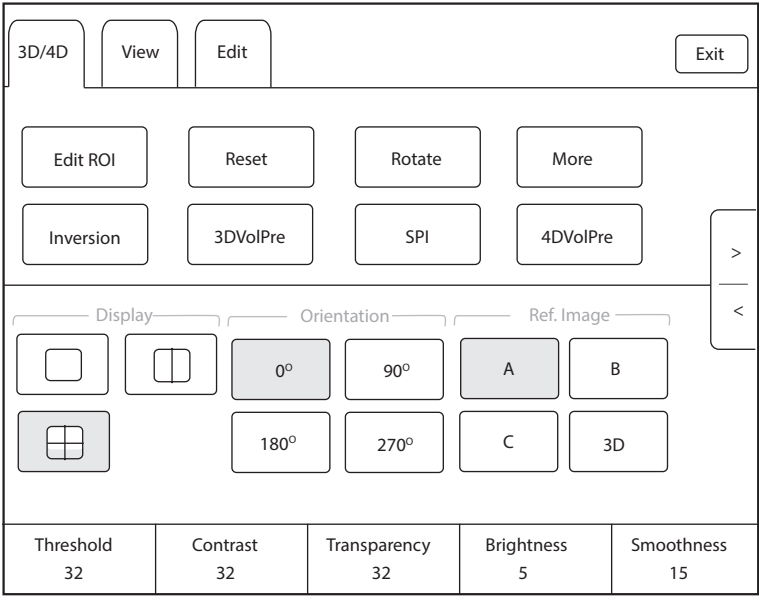
Figure 8-5 Touch Screen Display_4D HyCoSy

5. Press the ⏮ key to unfreeze the cine, and press the **Cine** key on the control panel to start prospective storage of the cine. After 2 seconds, push the contrast agent into the uterine cavity evenly.

6. Keep the probe in the same position and rotate the **M** key (X axis) on the control panel to adjust the 4D cine to display the region of interest.

7. Adjust the parameters to optimize the cine during the scan.

8. After the contrast 4D imaging is finished, press the ⏮ key or the **Cine** key to stop cine storage.

8.5.4 Contrast 3D imaging

Perform the following steps.

1. In contrast imaging mode, press the **3D/4D** key on the control panel to enter the pre-activated contrast 3D mode and adjust the relevant parameters.
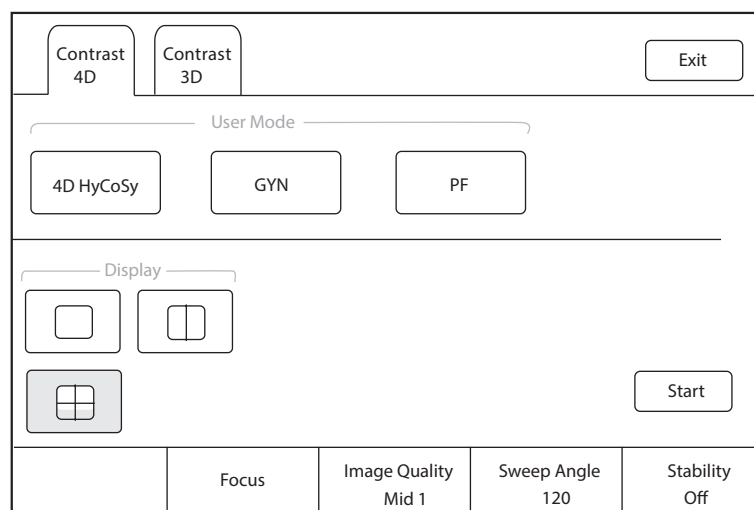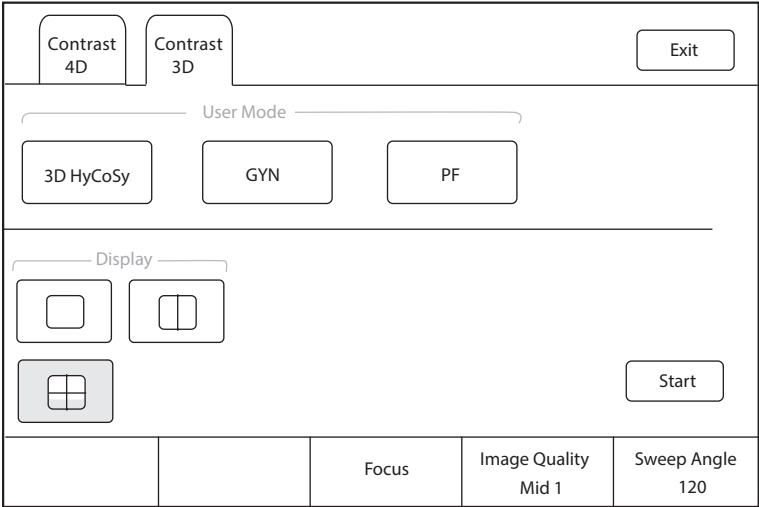

Figure 8-6 Pre-activated Contrast 3D Imaging

2. Tap **Start** on the touch screen or press the ⏮ key on the control panel to acquire 3D images.

8.5.5 Making a Comparison

You can press the ⬚ key on the control panel to enable the dual-split display, and compare and observe the two images, and acquire the images as required.

8.5.6 Working with Images

You can display the single image and rotate the uterine fundus to face up, and then optimize the image by adjusting the gain, selecting the render mode and cut method, and performing other operations. For detailed operations, refer to Section 9.2 Working with 3D Images.

■   **SPI**

SPI (Spatio-temporal Perfusion Imaging) uses different colors to distinguish the time when the contrast agent reaches the target positions. The color bar is displayed on the basic screen for observing the flow of contrast agent in each time period.

In 4D HyCoSy mode, tap **SPI** on the touch screen to enable the feature.
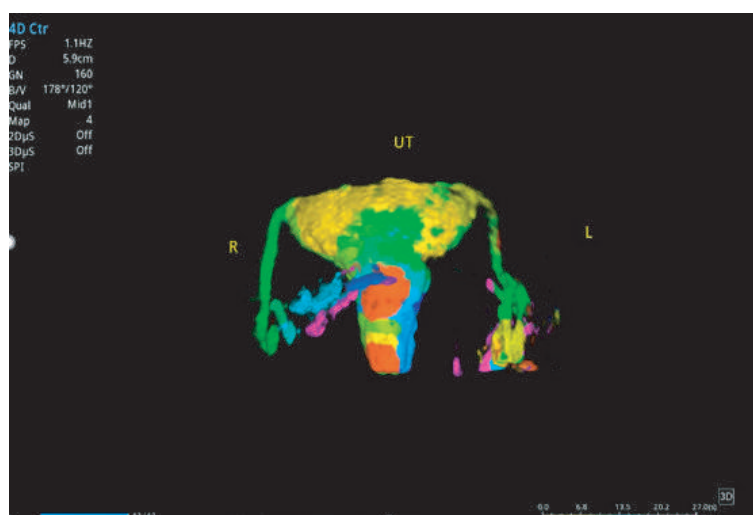
■   **SPI Time Span**

SPI time span is used to adjust the color distribution of the image in SPI mode.

In SPI mode, rotate the knob located directly below **SPI Time Span** to set the time, and the time corresponding to the color bar on the screen adjusts with the set time.

■   **Color Cut**

Color cut is used to crop the image region with the same color as the set color in SPI mode.

Perform the following steps.

1. In SPI mode, tap **Edit** tab on the touch screen to enter the edit screen.
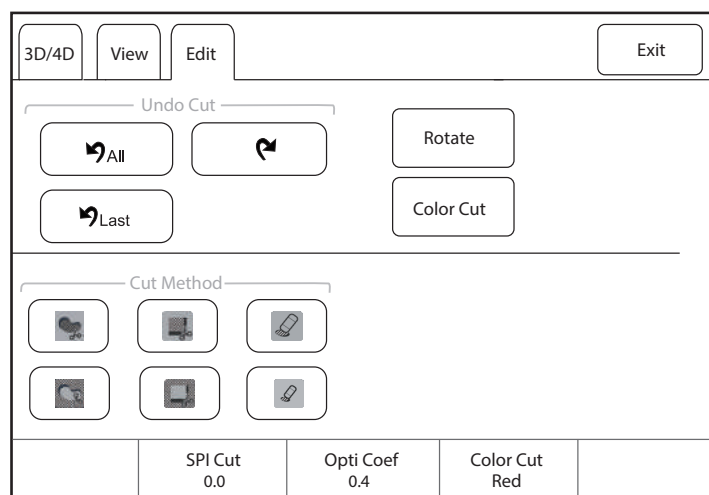
Figure 8-7 Touch Screen Display _ Color Cut

2. Tap **Color Cut** on the touch screen and rotate the knob located directly below **Color Cut** to select the desired color.

3. Select a cut method and select a desired region on the image.

4. Press the Set key on the control panel to acquire the cropped image, and ensure that the region with the same color as the set color is cropped.

■   **SPI Cut**

SPI cut is used to crop the images acquired before the set frame in SPI mode, and interacts with the optimization coefficient.

Perform the following steps.

1. In SPI mode, tap **Edit** tab on the touch screen to enter the edit screen.

2. Rotate the knobs located directly below **SPI Cut** and **Opti Coef** respectively to select the desired time and optimization coefficient to acquire the cropped image.

■   **Time Cut**

Time cut is used to crop the images acquired before the set time in SPI mode, and interacts with the optimization coefficient.

Perform the following steps.

1. Tap **Edit** tab on the touch screen to enter the edit screen.

2. Press the **Auto** key on the control panel to optimize the image, and **Time Cut** is displayed on the touch screen simultaneously.

3. Rotate the knobs located directly below **Time Cut** and **Opti Coef** respectively to select the desired time and optimization coefficient to acquire the cropped image.

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.

9.1 Acquiring 3D Images

Before entering the 3D imaging mode, optimize the 2D images to ensure the high contrast and low noise. The following description uses 3D imaging performed with the VC6-2 probe as an example.

Perform the following steps to acquire 3D images.

1. Enter the patient information, select the VC6-2 probe and an exam type (such as the obstetric exam used throughout this chapter) to enter 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.

   – CFM 3D: Press the **CFM** key on the control panel and press the **3D/4D** key on the control panel to enter the pre-activated CFM 3D mode.

   – PDI 3D: Press the **PDI** key on the key panel, tap **SRF** on the touch screen and press the **3D/4D** key on the control panel to enter the pre-activated PDI 3D mode.

   – SR-Flow 3D: Press the **PDI** key on the key panel and the **SRF** button on the touch screen is highlighted by default. Press the **3D/4D** key on the control panel to enter the pre-activated SR-Flow 3D mode.

   NOTE:

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

   • *When using a non-volume probe, you should press the* ⏮ *key in the B mode and then press the* **3D/4D** *key on the control panel to enter the 3D imaging mode.*

6. Tap **3D** tab to enter the pre-activated 3D mode.

   The 2D imaging with a ROI and a sample line is displayed in the pre-activated 3D mode. Only the data in the ROI is acquired for 3D imaging, as shown in Figure 9-1.
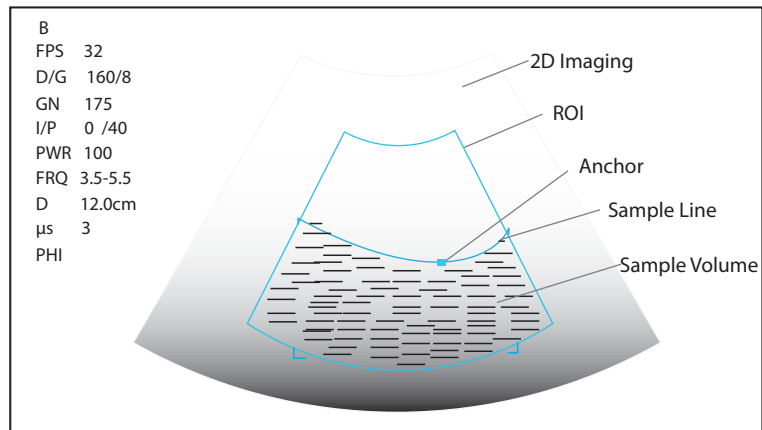
Figure 9-1 Pre-activated 3D Imaging Screen

7. 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 on the control panel again, and use the trackball to position the anchor to change the shape of sample line.

   – If needed, press the Set key on the control panel to position the ROI by using the trackball.

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

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

   – Rotate the knob located directly below **Sweep Angle** to adjust the sweep angle of probe.

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

   – Rotate the knob located directly below Image Quality to adjust quality of images.

9. Tap ⬜, ⬜, or ⬜, 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.
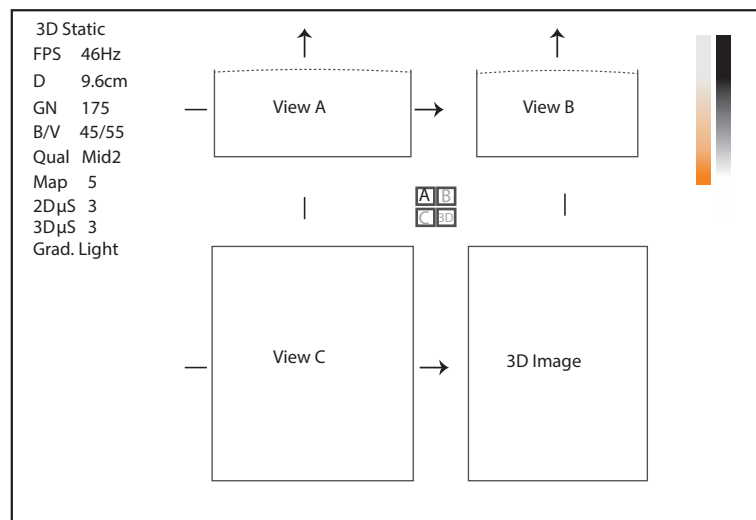
Figure 9-2 3D Imaging Screen

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 9-3 shows, the touch screen displays all controls related to the 3D imaging.
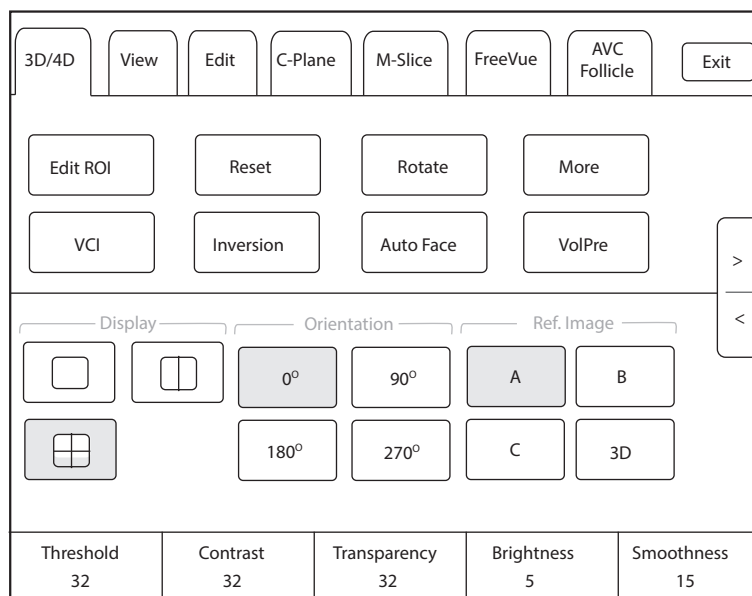
Figure 9-3 3D Imaging Parameters Menu

- Tap < or > to turn the current menu 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.

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.

9.2.1   Adjusting the ROI

You can adjust the sample volume by adjusting ROIs of View A, View B, View C and 3D image.

Perform the following steps to adjust the ROI.

1. Tap **3D/4D** tab on the touch screen and tap **A**, **B**, **C** or **3D** to select the desired reference image.

2. Adjust images inside the ROI on the reference image.
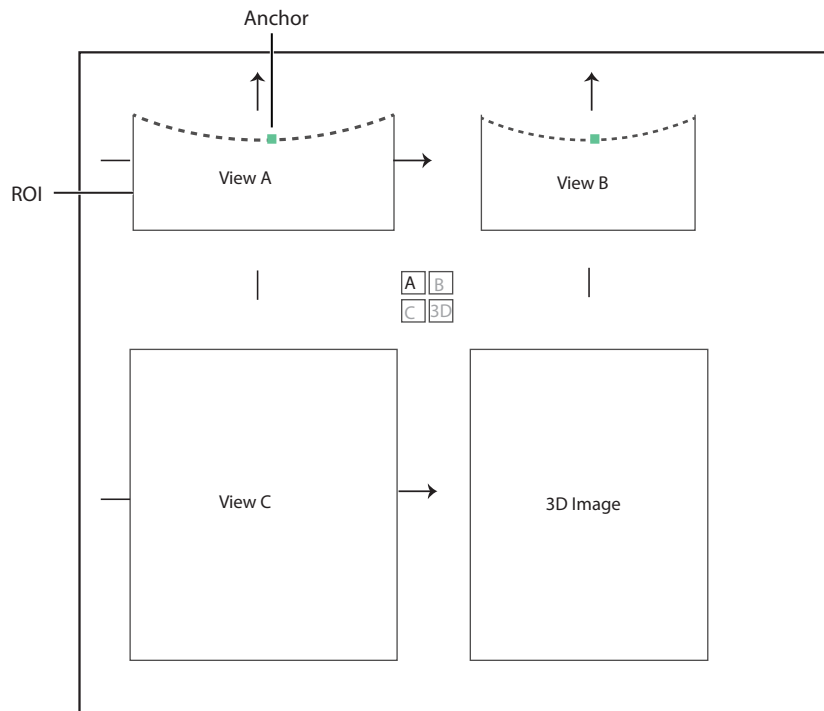
Figure 9-4 Adjusting the ROI Screen

‒   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 on the control panel again, and use the trackball to position the anchor to change the shape of sample line.

‒   If needed, press the Set key on the control panel to position the image by using the trackball.

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

9.2.2   Setting Display Format

To set the display format, tap **3D/4D**, and tap ▢, ▢▢, or ⊞ to enter the full, dual or quad split screen display mode.

9.2.3   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.

9.2.4   Setting Render Mode

Tap **3D/4D >** 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 choose **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 choose **S-Live**, **S-Live Silhouette** or **S-Line Contour**.

In CFM 3D, PDI 3D or SR-Flow 3D mode, there are three types of render mode, including Color, Glass and Gray.

- In Color render mode, only the flow in 3D image is rendered. Surface, X-ray, MIP and Grad.Light are available in CFM 3D and SR-Flow 3D modes. Surface and Grad.Light are available in PDI 3D mode.

- In Glass render mode, both the grayscale and the flow in 3D image are rendered. Surface + Surface and Surface+MIP are available.

- In Gray render mode, only the grayscale in 3D image is rendered. Surface and Grad.Light are available.

9.2.5   Cropping Reviews

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

■   **Cropping 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.

Perform the following steps to crop a review.

1. Tap **Edit** > 🐦 or 🐦 to enable the feature.
    - Tap 🐦 to remove all data inside the traced area from the image.
    - Tap 🐦 to remove all data outside the traced area from the image.

2. Move the cursor on the 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, 🐦 is enabled.

NOTE:

- *Tapping* ⮌All *can restore the review.*
- *Taping* ⮌Last *can undo the last cut.*

- *Taping* ⟦↻⟧ *can redo the last cut.*

■ **Cropping 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.

Perform the following steps to crop a review.

1. Tap **Edit** > ⟦▦⟧ or ⟦▢⟧ to enable the feature.
   - Tap ⟦▦⟧ to remove all data inside from the image.
   - Tap ⟦▢⟧ to remove all data outside from the image.

2. Move the cursor to the 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.

NOTE:

- *Tapping* ⟦↺All⟧ *can restore the review.*
- *Taping* ⟦↺Last⟧ *can undo the last cut.*
- *Taping* ⟦↻⟧ *can redo the last cut.*

■ **Cropping 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.

Perform the following steps to crop a review.

1. Tap **Edit** > ⟦⬙⟧ big eraser or ⟦⬙⟧ small eraser to enable the feature.

2. Move the cursor on the 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.*

■ **Cut Part**

In CFM 3D, PDI 3D or SR-Flow 3D mode, you can tap **Edit** on the touch screen to select the cut part, including Color, Gray+Color and Gray.

NOTE:

Only when the render mode is Glass, the Cut Part feature is enabled.

9.2.6 Moving/Rotating/Magnifying Images

■ **To select an image**

Tap **3D/4D** > **A**, **B**, C or **3D** to select the desired image.

■ **To move images**

- Tap View, and rotate the knob located directly below Move L/R to move images Left/Right.
- Tap View, and rotate the knob located directly below Move U/D to move images up/down.
- Rotate the **CFM** key on the control panel to move images Left/Right.

■ **To rotate images**

- Tap **3D/4D or Edit** and then tap **Rotate** to rotate images by using the trackball.
- **Tap View** and then tap **0º/45º/90º/180º/270º/360º** 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.
- Tap **View** > **Top**, **Bottom**, **Left**, **Right**, **Front** or **Back** to rotate all images.
- Tap **View,** and rotate the knob located directly below **Rotate X**, **Rotate Y** or **Rotate Z** to manually rotate all images along x, y or z axis.
- Rotate the **M/CW/PW** knob to manually rotate all images along x, y or z axis.
- Tap **3D/4D** > **0º/90º/180º/270º** to rotate all images in a preset angle.
- Tap **Rotate** on the touch screen to rotate the image by using the trackball.

■ **To zoom out/in all images**

Rotate the **Zoom** key on the control panel to zoom in or zoom out the image. 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.

■ **To inverse images**

Tap **3D/4D** > **Inversion** to inverse the gray values of anechoic structures on 3D image.

9.2.7 Optimizing 3D Image

■ **To choose the color**

- Tap **3D/4D**, and rotate the knob located directly below **3D Chroma** to choose the color scheme for the 3D image.
- Tap **3D/4D**, and rotate the knob located directly below **B Chroma** to choose the color scheme for reference images.
- Tap **M-Slice**, and rotate the knob located directly below **B Chroma** to choose the color scheme for slices.

The grayscale or color map on the top right of the imaging area varies with this setting.

■ **To set the contrast and transparency**

- Tap **3D/4D**, and rotate the knob located directly below **Contrast** to set the contrast of the 3D image.
- Tap **3D/4D**, and rotate the knob located directly below **Transparency** to set the transparency of the 3D image.

■ **To set threshold, smoothness and brightness**

- Tap **3D/4D**, and rotate the knob located directly below **Threshold** to set the threshold value of the 3D image.
- Tap **3D/4D**, and rotate the knob located directly below **Smoothness** to set the smoothness of the 3D image.
- Tap **3D/4D**, and rotate the knob located directly below **Brightness** to set the brightness of the 3D image.

■ **To use μScan**

- Tap **3D/4D** and rotate the knob located directly below **2D μScan** to set the image quality of three reference images.
- Tap **3D/4D** and rotate the knob located directly below **3D μScan** to set the image quality of the 3D image.

■ **To adjust the light position**

- In S-Live mode, tap **Edit Light** on the touch screen, and locate the light position using the trackball, then press the Set key on the control panel.

● You can rotate the knob located directly below **Light Pos.** to set 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.

■ **Color Map**

In CFM 3D, PDI 3D or SR-Flow 3D mode, tap **3D/4D** on the touch screen and rotate the knob located directly below **Color Map** to adjust the chroma of the color flow.

■ **Color Off**

In CFM 3D, PDI 3D or SR-Flow 3D mode, tap **Color Off** on the touch screen to turn off the color flow. View A, View B and View C only display grayscale images.

NOTE:

Only when the render mode is Color or Glass, the feature is enabled.

■ **Gray/Color**

In CFM 3D, PDI 3D or SR-Flow 3D mode, tap **3D/4D** on the touch screen and rotate the knob located directly below **Gray/Color** to adjust the percentage of grayscale to color.

NOTE:

Only when the render mode is Glass, the Gray/Color feature is enabled.

■ **Color Thres.**

In CFM 3D, PDI 3D or SR-Flow 3D mode, tap **3D/4D** on the touch screen and rotate the knob located directly below **Color Thres.** to adjust the color threshold.

9.2.8 Observing Reference Image by the Plane

You can observe reviews by using the plane.

Perform the following steps to observe a review.

1. Tap **C-Plane** to enable this feature as shown in Figure 9-5.
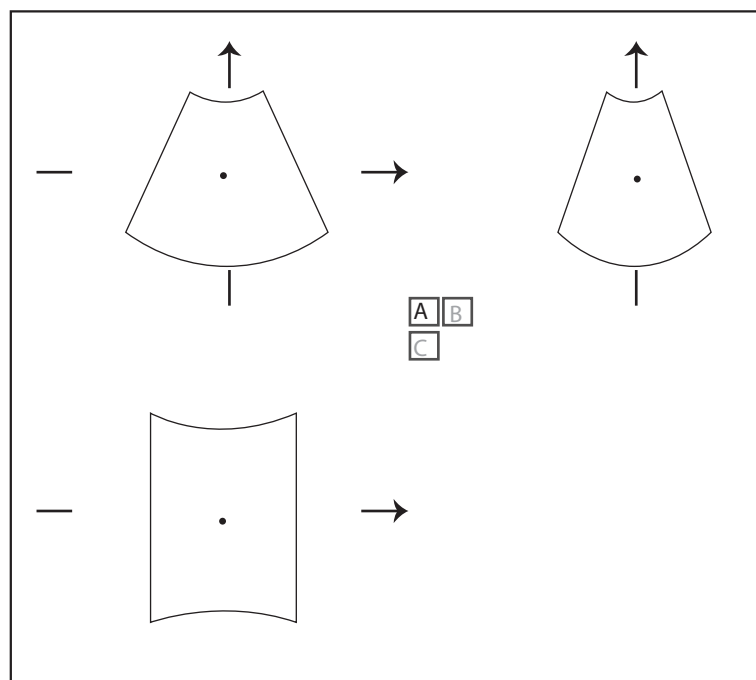
Figure 9-5 C-Plane Image Screen

2. Tap **A**, **B** or **C** to select the desired reference image, and then tap ⊞ A B , ⊞ A C , ⊞ B C or ⊞ to select the display format.

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

9.2.9 Observing Reviews by the 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 slice number.

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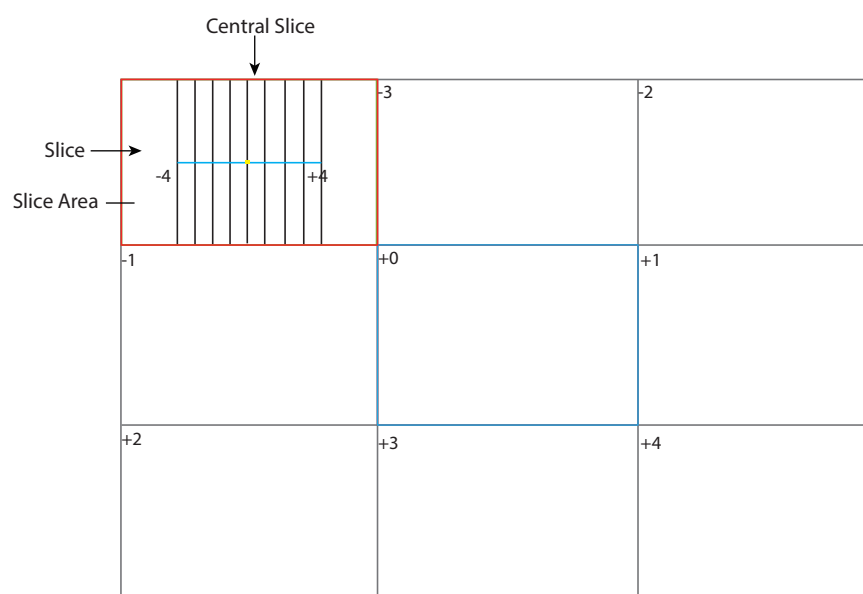
Figure 9-6 Multi-Slice Imaging Screen

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 knob located directly below **Display** on the touch screen to move all the slices in the slice area left or right.

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

To adjust the slice position/slice distance/slice number,

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

● Rotate the knob located directly below **Distance** to adjust the span among the slices. The span and content vary with this setting.

● Rotate the knob located directly below **Slice Num** to decrease or increase the number of slice.

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

9.2.10   Performing the 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 is straight line and line one.

    Tap **Line**, **Curve**, **Trace** or **Poly Line** to select the line type, and tap **One**, **Two** or **Three** to change the line number.

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

3. Move the trackball to display the line and the start point, and press the Set key to confirm the end point.

    –   If the line type is **Curve**, move the trackball to adjust curvature and press the Set key to finish drawing the line.

    –   If the line type is **Trace**, move the trackball to display the movement track and press the Set key to finish drawing the line.

    –   If the line type is **Poly Line**, move the trackball and press the Set key to confirm a control point. Repeat the operation to confirm many control points and move the trackball to form multiple 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 **Left/Right/Top/Bottom** on the touch screen to change the viewing orientation.

    –   Tap **Acture/Project** on the touch screen to change the viewing type.

9.2.11   Volume Contrast Imaging

Volume contrast imaging provides the homogeneous, low-noise and contrast-enhanced images, and displays the section tissue information of different thickness. It is often used to diagnose fetal dominant spina bifida and fetal cleft palate.

Perform the following steps.

1. In frozen 3D/4D mode, tap **VCI** on the touch screen to enter the imaging menu.

2. Tap **Surface**, **Skeleton**, **Transp. Min**, **X-Ray** or **S-Depth** to select a desired render mode.

3. Rotate the knob located directly below **Thickness** to adjust the slice thickness or tap **2mm**, **5mm**, **8mm**, **12mm** or **20mm** on the touch screen to select the slice thickness, and the thickness of the image on the basic screen changes accordingly.

9.2.12   Setting the Scan Mode

Set **Scan Mode** in accordance with your preference.

Tap **Sector** or **Linear** to set the sweep mode.

NOTE:

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

9.2.13   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 **Scan Mode** is set to **Sector**, you can adjust the sweep angle when performing the scan with the probe. Rotate the knob located directly below **ZAngle** to adjust the angle.

●   If **Scan Mode** is set to **Linear**, you can adjust the sweep span when performing the scan with the probe. Rotate the knob located directly below **ZScale** to adjust the scale.

NOTE:

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

9.2.14 Restoring the Image

Tap **3D/4D** > **Reset** to restore the views and cutting lines to the default position.

9.2.15 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.

NOTE:

Only the volume probes are capable of this feature.

For details, refer to Section 6.1 Selecting a Probe and an Exam Type.

The application presets can be displayed as options of the **User Mode** item in the pre-activated 3D mode.

9.2.16 Performing Follicle Auto-Measurement

Tap **AVC Follicle** > **Left Ovary/Right Ovary** to automatically measure the number and the volume of follicles. The positions of follicles are displayed on three reference images and 3D image.

● Tap **Show Num** to display or hide the number of follicle.

● Tap **Min Follicle** and **Max Follicle** to set the range of follicle display.

● Tap **Add to Report** to add the follicle measurement result to the report.

9.2.17 Performing Pelvic Floor Auto-Measurement

Select an appropriate probe and an exam type, tap **Auto PF** on the touch screen in the 3D imaging mode and select a desired measurement item to automatically measure the area, height and width of the levator ani hiatus, the left levator ani hiatus-urethral gap and the right levator ani hiatus-urethral gap. The measurement result is displayed on the basic screen.

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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 the fetal imaging as an example, the other imaging options are as the same.

10.1   Acquiring 4D Images

Before entering the 4D imaging mode, optimize the 2D images to ensure the high contrast. The following description uses 4D imaging performed with the VC6-2 probe as an example.

10.1.1   Entering the Real-Time 4D Imaging

Perform the following steps.

1. Enter the patient information, select the VC6-2 probe and an exam type (such as the obstetric exam used throughout this chapter) to enter the 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.

6. 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 imaging with a ROI and a sample line is displayed in the pre-activated 4D mode. Only the data in the ROI is acquired for 4D imaging.
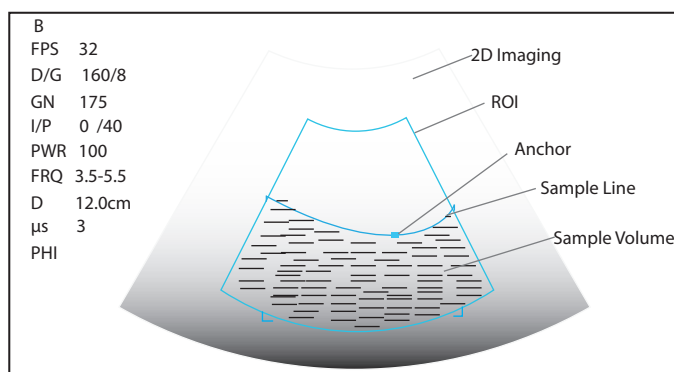
Figure 10-1 Pre-activated 4D Imaging Screen

7. 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 on the control panel again, and use the trackball to position the anchor to change the shape of sample line.

– If needed, press the Set key on the control panel to position the ROI by using the trackball.

8. Set the sweep angle, focus position, image quality and stability.

– Rotate the knob located directly below **Sweep Angle** to adjust the sweep angle of probe.

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

– Rotate the knob located directly below **Image Quality** to adjust quality of images.

– Rotate the knob located directly below **Stability** to enable or disable the image quality feature.

For other parameters, refer to Section 9.2 Working with 3D Images.

9. Display the 4D imaging in the following instructions.

– Tap ⬜, ⬜, or ⬛, 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.
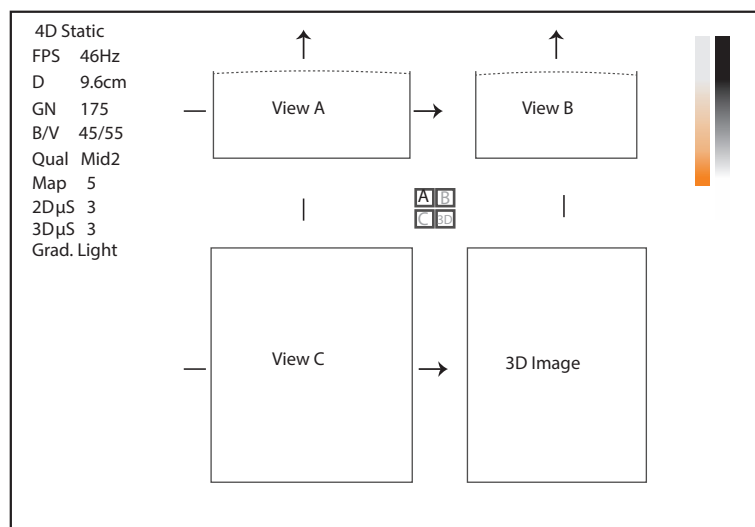
Figure 10-2 4D Imaging Screen

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 10-3 shows, the touch screen displays all controls related to the 3D imaging.
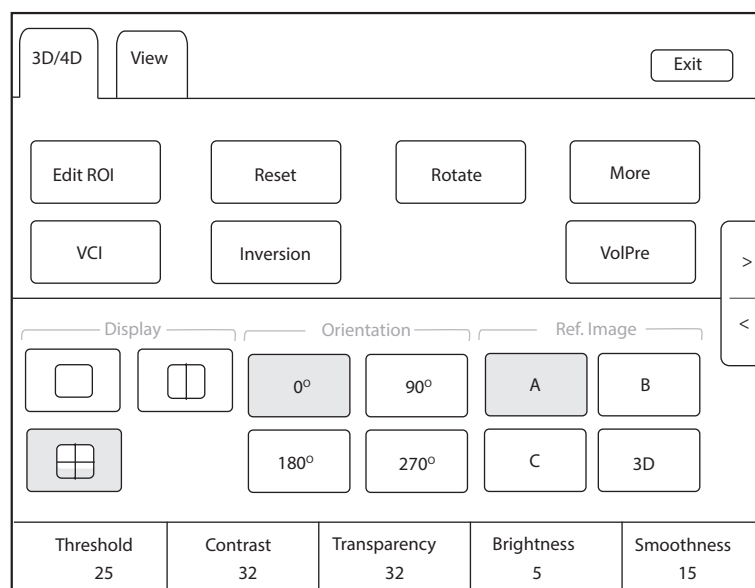
Figure 10-3 4D Imaging Parameters Menu

- Tap > or < to turn the current menu 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.

10.1.2 Entering the STIC Imaging

Spatio-temporal image correction (STIC) acquires multiple cardiac cycles and superimposes the cine to obtain a frame rate with higher cardiac cycle. STIC, STIC CFM, STIC PDI and STIC SR-Flow are available for the system.

STIC imaging is mainly used to perform 4D imaging for fetal heart.

The operation of STIC imaging is similar to that of 4D imaging. For details, refer to Section 10.1.1 Entering the Real-Time 4D Imaging.

1. Press the **3D/4D** key on the control panel and tap **STIC** tab on the touch screen to enter the pre-activated STIC imaging.

2. Rotate the knob located directly below **Acqu. time** on the touch screen to set the acquisition time.

3. Tap **Start** to enter the real-time STIC imaging and start acquiring images.

   After the set acquisition time is finished, system pops up the following dialog box.
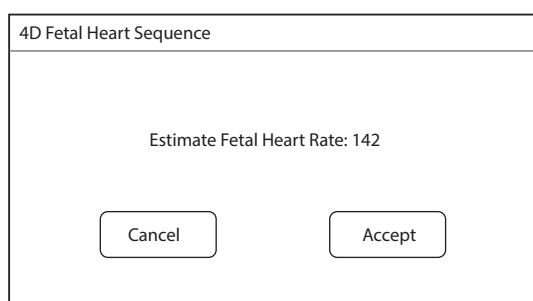
   - Tap **Cancel** to return to the pre-activated mode and tap **Start** to recalculate the heart rate.
   - Tap **Accept** to enter the frozen mode and the cine is played automatically.

To enter the STIC CFM mode:

Press the **CFM** key on the control panel, and press the **3D/4D** key, and then tap **STIC** tab to enter the pre-activated STIC CFM mode.

To enter the STIC PDI mode:

Press the **PDI** key on the key panel, and press the **3D/4D** key, and then tap **STIC** tab to enter the pre-activated STIC PDI mode.

To enter the STIC SR-Flow mode:

Press the **PDI** key on the key panel and the **SRF** button on the touch screen is highlighted by default. Press the **3D/4D** key and tap **STIC** tab to enter the pre-activated STIC SR-Flow mode.

10.1.3 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 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.

10.2 Working with 4D Images

You can review, optimize or save 4D images in the frozen mode. For details, refer to Section 9.2 Working with 3D Images.

11   Working with Images

You can work with the acquired images by using the features provided by the system, such as the split screen, panoramic display and annotations.

11.1   Imaging Features

11.1.1   Imaging Reverse

Tap Я on the touch screen to reverse the real-time scan left or right.

Tap Ƽ on the touch screen to reverse the real-time scan up or down.

11.1.2   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, Micro F or TDI imaging mode, press the ⬚ 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 in the following figure.
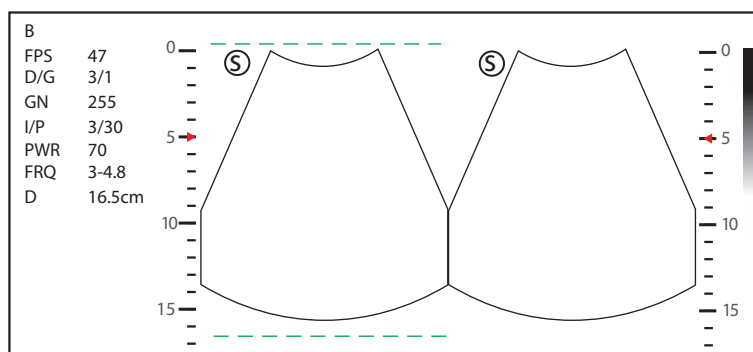
Figure 11-1 Real-time B+Frozen B

–   Press the ⬚ 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 **B/C Dual Live** to display two real-time scans.

    The image is duplicated into two parts with two real-time scans.
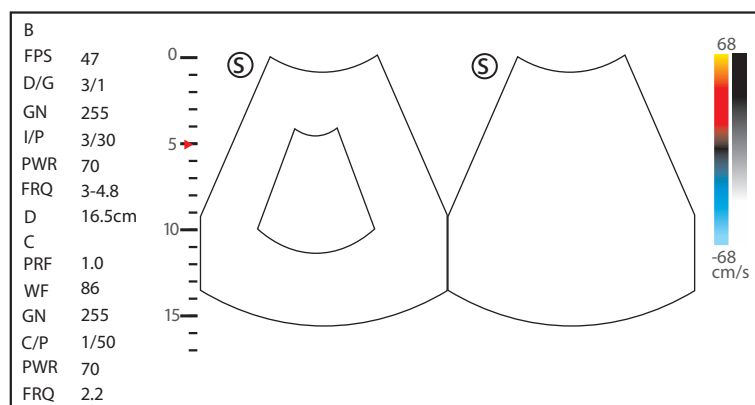
Figure 11-2 Real-time CFM + Real-time B

■   **Quad-Split Screen Display**

1. In the real-time B, CFM, PDI, SR-Flow, Micro F or TDI imaging mode, press the ⊞ key on the control panel to enter the quad split screen display.

The B-mode image is taken as an example in the following figure.
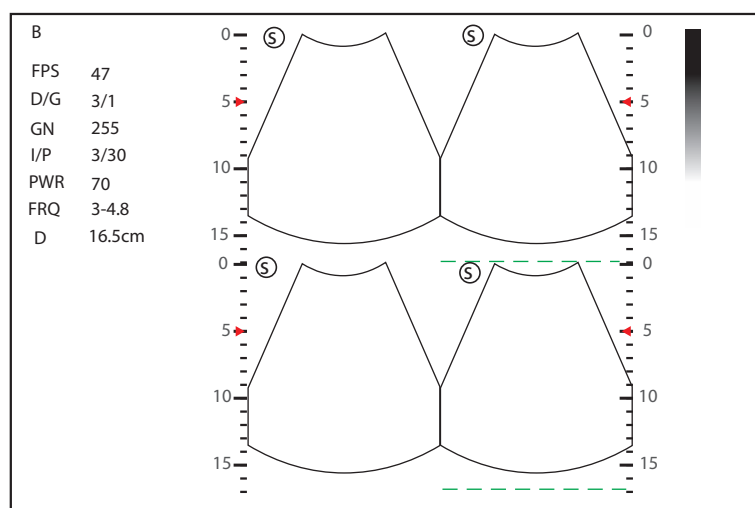
Figure 11-3 Quad-Split Screen Display

–   Press the ⊞ key on the control panel 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.

11.1.3   Auto Optimization

This feature is used to optimize the image.

To enable the auto optimization, press the **Auto** key on the control panel to optimize the image.

11.1.4   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.

In real-time scan of B mode, tap **THI** on the touch screen or press the **THI** key on the key panel to enable the THI mode, and **THI or PHI** appears at the lower left corner of the screen. Optimize the image the same way you did in the B mode.

Tap **THI** on the touch screen or press the **THI** key on the key panel again to exit the imaging, and **THI** disappears from the screen.

NOTE

• *The system optimizes certain parameters (B-mode gain and 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.*

11.1.5   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.*

■   **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 the same with that of B mode.

Perform the following steps to apply real-time panoramic imaging.

1. Optimize the B-mode image.

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.

4. Perform the scan.

   A real-time stitched image is generated, on which probe a speed box and a hint are displayed. A blue speed box indicates a slower scanning speed, a green speed box indicates a normal scanning speed and a red speed box indicates a faster scanning speed.

5. Press the ⏯ key to freeze the image and the image is displayed in full view on the screen as shown in Figure 11-4.

   You can press the ⏯ key again to return to the pre-activated mode.

B
FPS   47
D/G   3/1
GN   255
I/P   3/30
PWR   70
FRQ   3-4.8
D   16.5cm
μS   5
PHI
Z   1.2
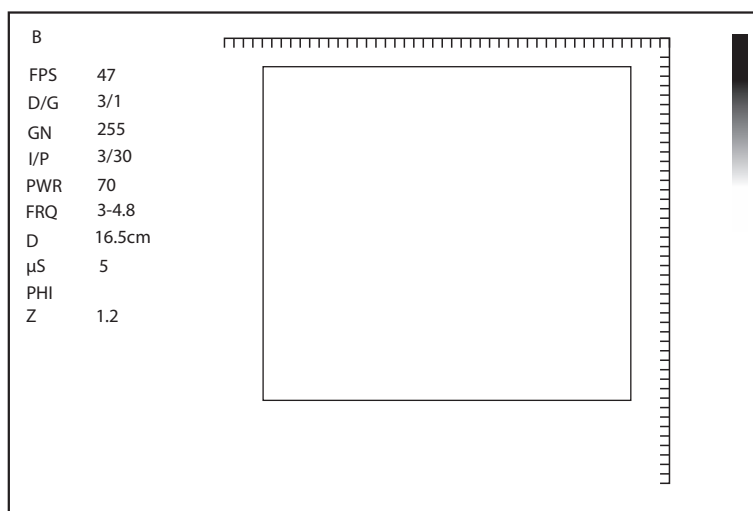
Figure 11-4 Real-Time Panoramic Imaging Screen

6. Work with the image.

   − Rotate the knob located directly below **ZOOM** on the touch screen to zoom in or out images. The thumbnail box is displayed on the thumbnail. You can use the trackball to position the interest area.

   − Rotate the knob located directly below **Rotate** on the touch screen to rotate the image clockwise or counterclockwise.

   − Tap **Overview** on the touch screen to restore the image to the default setting.

   − Make measurements, annotations and body marks.

   − Tap **Ruler** on the touch screen to display or hide the ruler.

7. Tap **Exit** on the touch screen to exit panoramic imaging.

11.2   Magnifying an Image

11.2.1   Filling the Full Screen

Press the **Scr-Zoom** key on the key panel to magnify the imaging area to fill the full screen. Or, press the **Scr-Zoom** key again to exit the full-screen display.

11.2.2   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.

11.2.3   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.

    –   Position the ROI by using the trackball.

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

    –   After adjusting the ROI, press the Set key.

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.

11.3　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.

11.4　Using Cine

The cine review is available by pressing the ⏯ key on the control panel and the progress bar appears on the screen.

```
0            249          498
  |   |   |   |   |   |   |
  |_____|_____|
          |
```
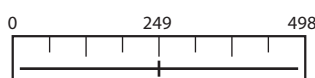
You can play back the cine by tapping **Auto Play** on the touch screen or review the cine by using the trackball. Moreover, the cine can also be cut for your actual use.

11.4.1　Reviewing Cine

■ **To view cine manually**

You can review the cine frame by frame by using the trackball or tapping **F By F** on the touch screen in the frozen B 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**

Tap **Auto Play** on the touch screen to play or stop the cine review automatically.

Or, rotate the knob located directly below **Cine Speed** on the touch screen to adjust the review speed during the cine review.

11.4.2　Cutting Cine

To cut the cine:

1. In the frozen mode, rotate the knobs located respectively below **Set First/Last** on the touch screen to select the start frame and the end frame.

2. Press the **Cine** key on the control panel to save the cut cine.

11.5　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.

11.5.1 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 key panel.

    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 key panel.

    − Move the cursor to an annotation, and press the Set key. Then move the annotation to the desired position by using the trackball, and press the Set key.

    − Move the cursor onto an annotation to edit it by using the key panel.

    − Press the Set key at the left side of the trackball to switch to arrow annotation.

3. Repeat the above steps to add more annotations if necessary.

4. Press the **Annot** key again to exit.

■ **Annotating an Image with Arrows**

Perform the following steps.

1. Press the **Arrow** key on the key panel, and the cursor becomes an arrow.

2. Move the arrow to the desired place by using the trackball.

    − Rotate the **Angle** key to adjust the arrow angle.

    − Press the **Del** key on the key panel to delete the arrow.

3. Press the Set key to add it 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. Press the **Annot** key on the control panel and the cursor becomes **|** 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.

11.5.2 Body Mark

Perform the following steps.

1. Press or rotate the **Body Mark** key on the control panel.

    The first body mark of the exam type is added to the image by default.

2. Tap a body mark on the touch screen to add it to the image.

3. Press the **Update** key and adjust the position of the body mark by using the trackball.

4. Position the probe marker to the desired place by using the trackball.

    If necessary, rotate the **Body Mark** key **or Angle** key on the control panel to adjust the angle.

5. Press the Set key to add it to the image.

11.5.3   Deleting Annotations and Body marks

■   **To delete annotations**

Perform the following steps.

1. Press **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 key panel 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 key panel to enter the arrow annotation screen.

2. Press the **Del** key on the key panel.

■   **To delete body marks**

Perform the following steps.

1. Press the **Body Mark** key to enter the body mark editing mode.

2. Tap Delete on the touch screen or press the Del key on the key panel.

■   **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.

11.6   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.

11.6.1 ECG

Perform the following steps.

1. Power off the system, and connect the ECG cable to the specific port of the system.

2. Power on the system, and attach the ECG electrodes on the patient's body, as shown in the following figure.
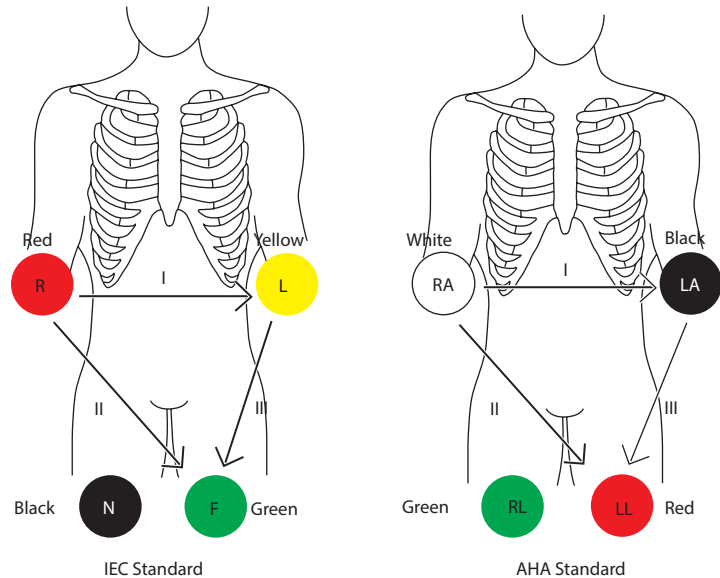
Figure 11-5 Electrode Placement

3. Tap **ECG** on the touch screen to display the submenu of the ECG module. Or, tap **ECG** again to hide it.

4. Make the relevant ECG settings.

Item	Description
ECG	Display or hide the ECG waveform.
ECG Gain	Set the amplitude of the ECG waveform.
ECG Position	Set the vertical position of the ECG waveform.
ECG Invert	Enable or disable the waveform inversion function.
R-Trigger	Enable or disable the R-trigger function. After enable the R-trigger function, the **R-Trigger** menu pops up, the menu contains Trigger Delay and **Frame Count**. **NOTE:** *Before enabling the R-trigger function, you should disable the compounding imaging function first.*
Trigger Delay	Delay of trigger after the 2D refresh.
Frame Count	Image frames transferred per second.

5. Press the ⏮ key on the control panel to freeze an image, and the ECG waveform is frozen at the same time. The ECG waveform is the reference for time.

6. Exit the ECG mode, and remove ECG electrodes from the patient.

11.6.2 PCG

You can view the phonocardiogram with the help of a microphone connected to the system.

Perform the following steps.

1. Connect the PCG microphone to the USB port of the system.

2. Position the PCG microphone on the patient's skin.

3. Tap **ECG** on the touch screen to display two waveforms at the bottom. The electrocardiogram represents in blue and the phonocardiogram represents in red.

11.6.3   Pulse Wave

You can view the pulse wave with the help of a pulse sensor connected to the system.

Perform the following steps.

1. Connect the pulse sensor to the USB port of the system.

2. Attach the pulse sensor to the patient.

3. Tap **ECG** on the touch screen to display two waveforms at the bottom. The electrocardiogram represents in blue and the pulse wave represents in green.

11.7   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.

11.7.1   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 4P-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.
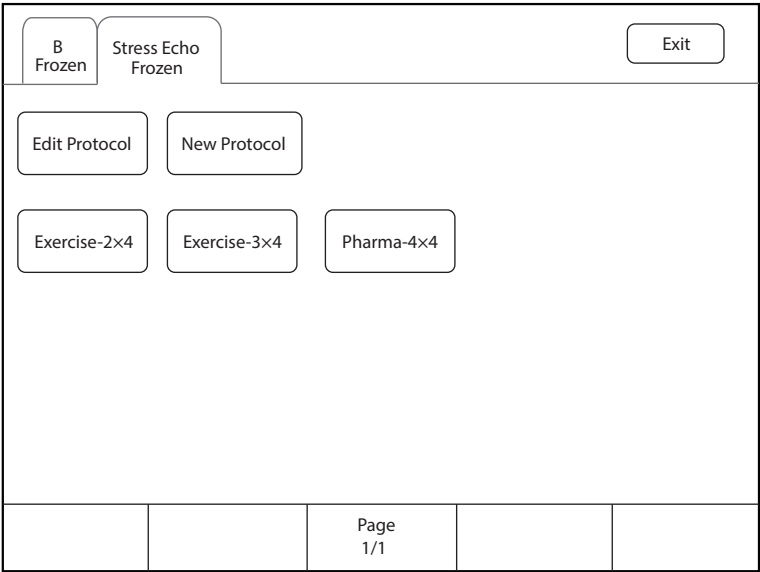
Figure 11-6 Protocol Selection Screen

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 **Cine** 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 **Cine** key again to start acquisition for next view. Or rotate the knob located directly below **Views** to select other views.

Acquisition Modes	Operations

Continuous	1. At continuous stage, tap **Acquire** on the touch screen or press the **Cine** 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 **Cine** key on the control panel.
	2. During the acquisition, rotate the knob 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 11.7.4 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.

11.7.2 Screen Display
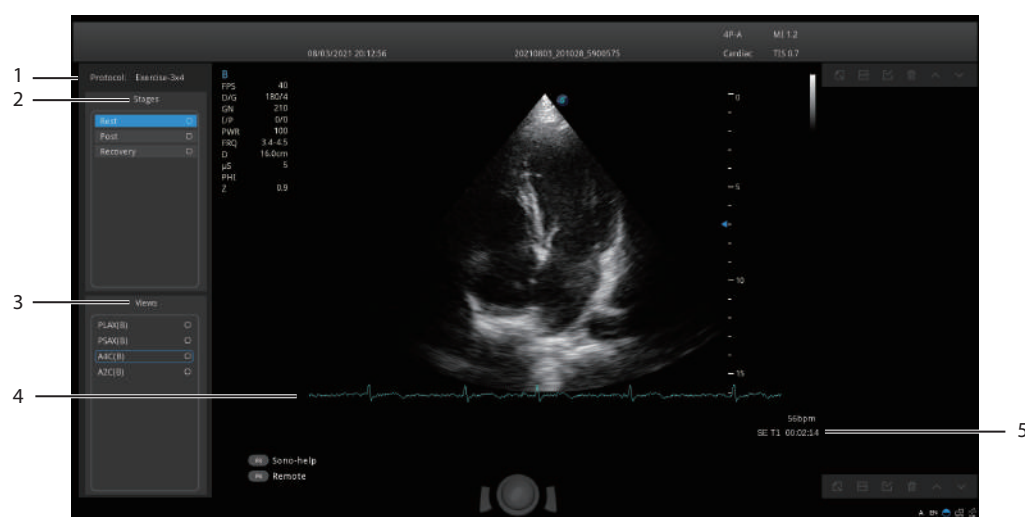
Figure 11-7 Stress Echo Screen

No.	Description
1	Protocol type

No.	Description
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.

11.7.3   Acquiring Echocardiograms
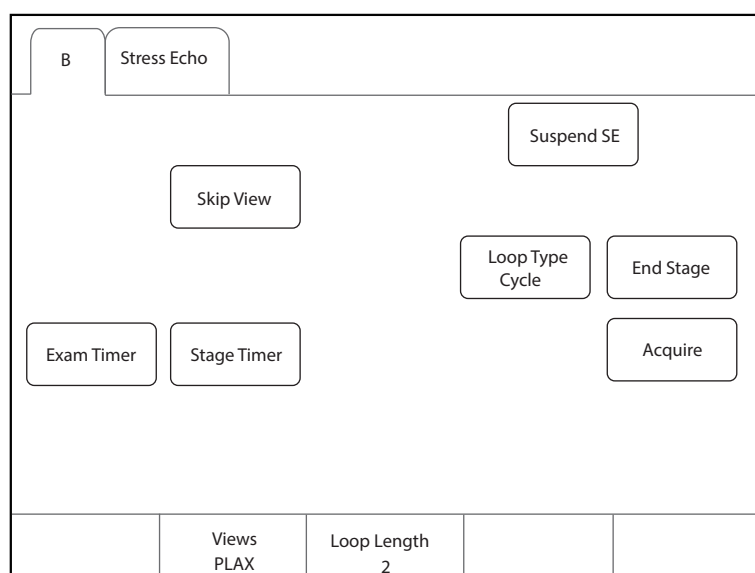
Figure 11-8 Acquisition Screen

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 and the kipped stage is mark with "×" at the right side.
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.

Item	Description
Acquire	Tap it to start acquisition.
Views	Rotate the knob located directly below it to select a view.
Loop Length	Rotate the knob located directly below it to set the cardiac cycle or time.

11.7.4 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.
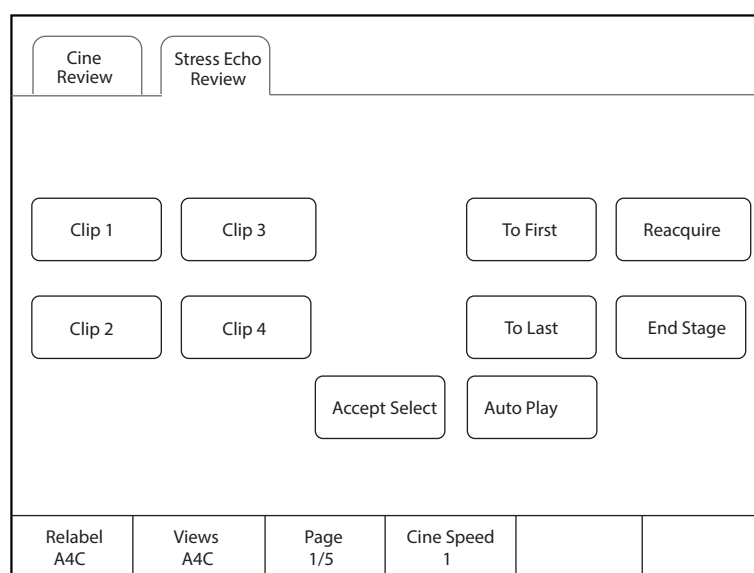
Figure 11-9 Clip Selection Screen

If necessary, perform the following operations on the clip selection screen.

Functions	Operations
Select a view	Rotate the knob 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.

Functions	Operations
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 knob located directly below **Rename** to rename the selected clip.
Adjust the play speed	Rotate the knob 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.

11.7.5 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 knob 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.
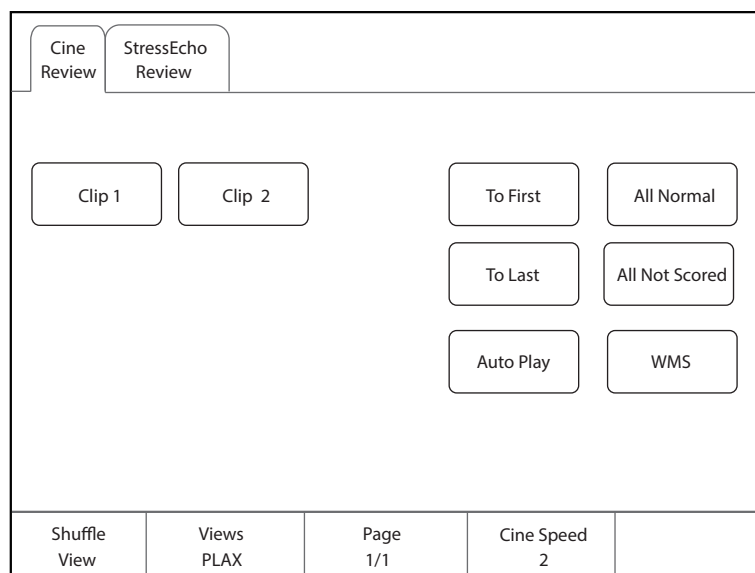
Figure 11-10 Echocardiogram Comparison

■ **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.
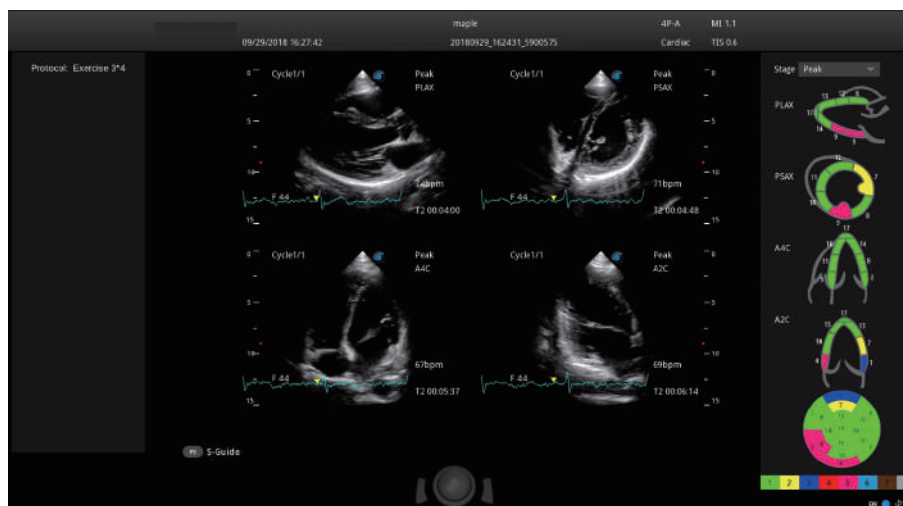
Figure 11-11 Segment Scoring Screen

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.

11.7.6   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.

11.7.7   Ending the Stress Echo Exam

Press the **End Exam** key on the control panel to exit the current Stress Echo exam.

11.7.8   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.

Press the **Report** key on the control panel to enter the measurement report screen. You can preview the report, view the Bull's eye diagram and perform other operations.

11.8   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.

11.8.1   Global Myocardial Quantitative Analysis

Global myocardial quantitative analysis (G-MQA) is available in B mode and myocardial contrast echocardiography (MCE) 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 knob located directly below **F By F** to browse the images and determine the desired image.
    b. Rotate the knobs 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
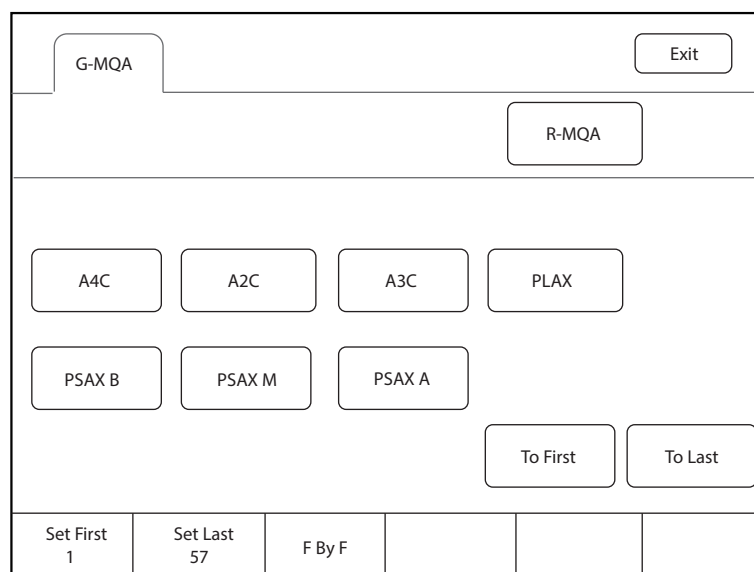
Figure 11-12 View Selection Screen

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**
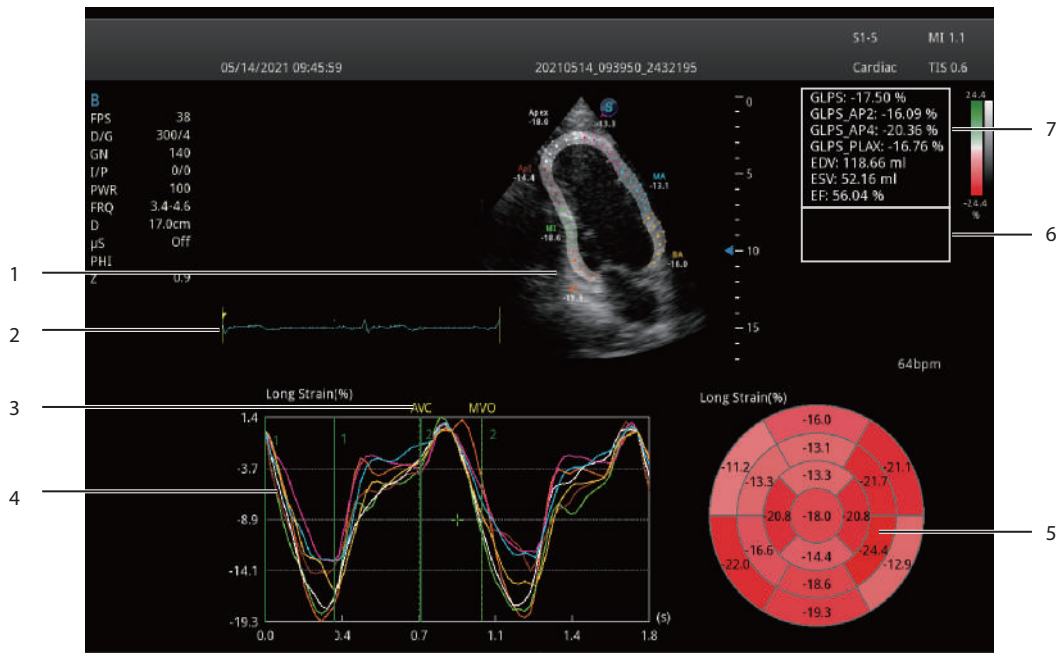
Figure 11-13 G-MQA Analysis Screen

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).
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 or MCE 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**
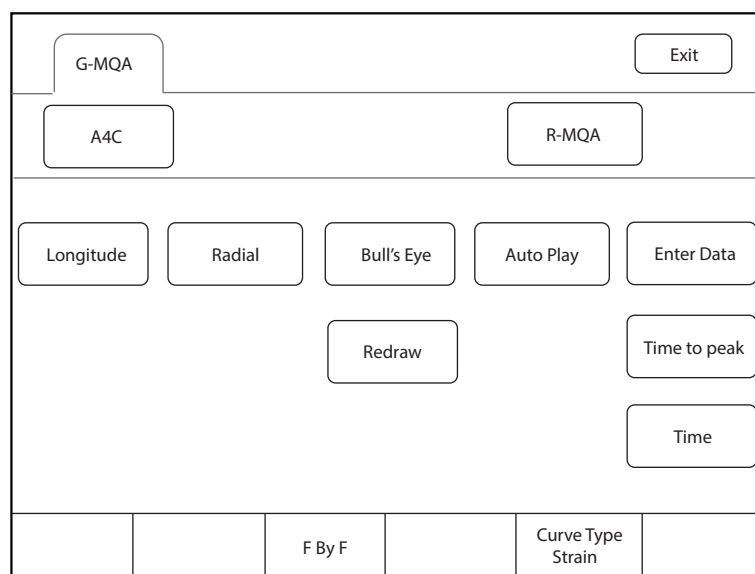
Figure 11-14 Touchscreen Display

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.

Item	Description
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 knob located directly below it to change the curve type, including Strain, Strain Rate, Velocity, Displacement and Volume.
F By F	Rotate the knob located directly below it to view the cine frame by frame.

11.8.2 Regional Myocardial Quantitative Analysis

Regional myocardial quantitative analysis (R-MQA) is available in B mode, myocardial contrast echocardiography (MCE) 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 knob located directly below **F By F** to browse the images and determine the desired image.
    b. Rotate the knobs 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**
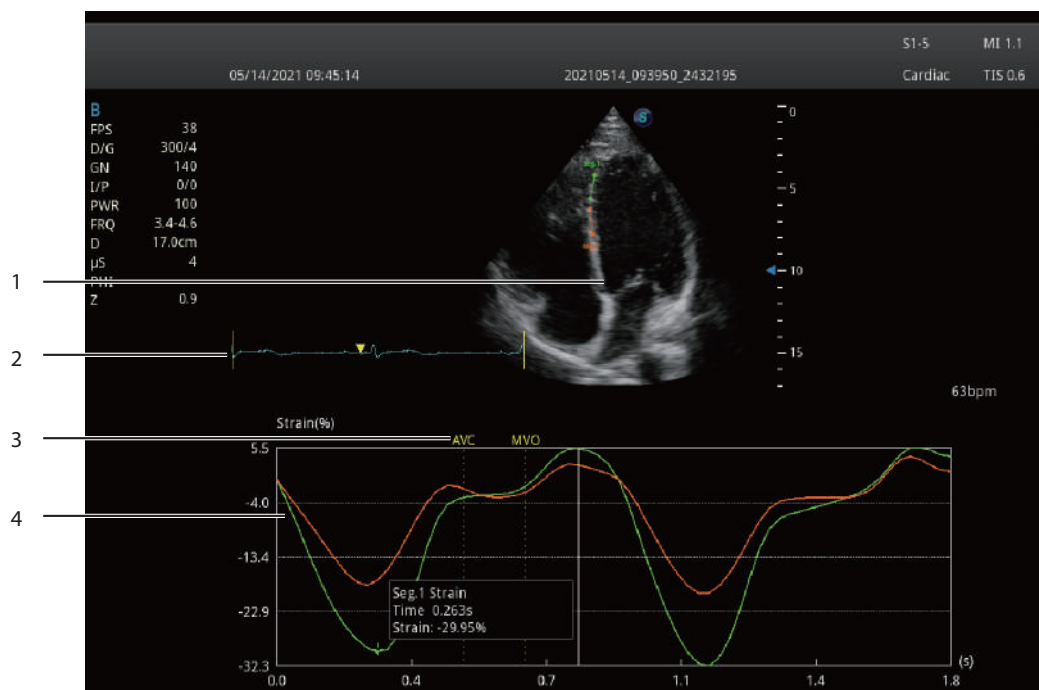
Figure 11-15 R-MQA Analysis Screen

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).
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, MCE 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**
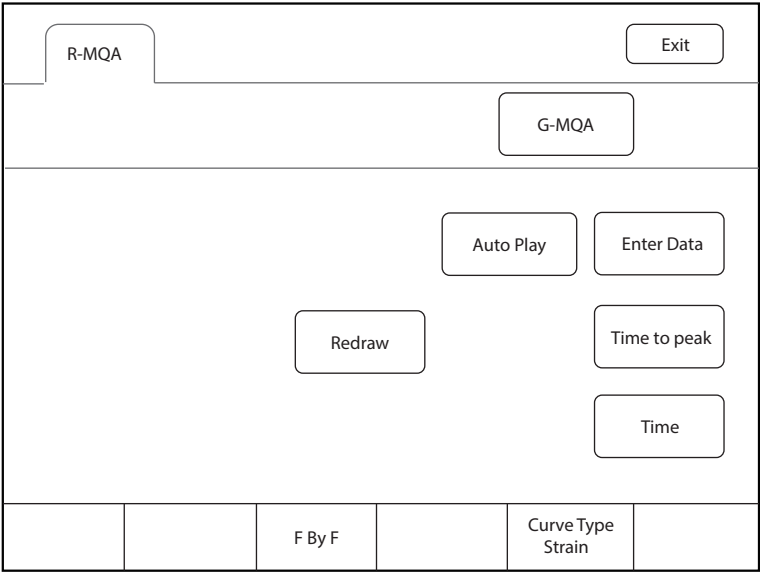
Figure 11-16 Touchscreen Display

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.
Curve Type	Rotate the knob located directly below it to change the curve type, including Strain, Strain Rate, Velocity, Displacement and Volume.
F By F	Rotate the knob located directly below it to view the cine frame by frame.

12   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.

12.1   Storing an Image

NOTE:

- *You can define the keys on the **System Settings** > **General** menu > **Multikey** tab. For details, refer to Section 4.1.3 Multikey Settings.*
- *The system saves all data by default. If **Export to medium** is ticked on the **General** menu > **Multikey** tab, connect a USB drive, and the saved data will be stored to the USB drive synchronously.*

12.1.1   Storing 2D Image

Press the **Image** key on the control panel in the real-time or frozen mode to save the current image. In frozen mode, press the **Cine** key on the control panel to save the current cine. In frozen mode, if **P3/P4** is set as the key to store screen capture on the **General** menu > **Multikey** tab, and press **P3/P4** on the key panel to save the screen capture.

The system beeps if the image is saved successfully. Meanwhile, the corresponding thumbnails for the stored image, cine or screen capture also appears in the clipboard.

12.1.2   Storing 3D/4D Image

1. In 3D mode, press the **Image** key on the control panel to save the current image.

2. In 4D mode, press the **Cine** key on the control panel to save the current cine.

3. In 3D/4D mode, if **P3/P4** is set as the key to store volume data or screen capture on the **General** menu > **Multikey** tab, press **P3/P4** on the key panel to save the volume data or screen capture.

The system beeps if the image is saved successfully. Meanwhile, the corresponding thumbnails for the stored image, cine, volume data or screen capture also appears in the clipboard.

12.2   Viewing an Image

You can view the images for the current or a previously examined patient by using the clipboard or the **Review** screen.

12.2.1   Viewing an Image by Using the Clipboard

1. Press the **Pointer** key on the control panel in the real-time or the 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 computer.

   − Click 🗑 to delete the desired image or cine.

You can also amplify the image or review the cine and perform a measurement.

12.2.2 Viewing an Image on the Review Exam Screen

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

   The following screen is displayed with images and cine thumbnails.
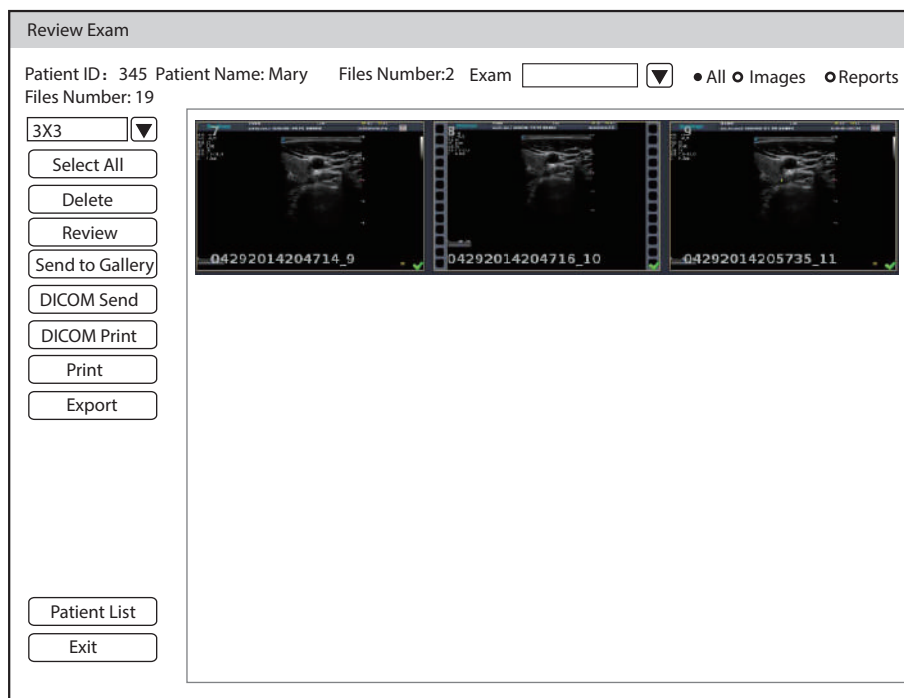
Figure 12-1 Review Exam Screen

   − If the patient has had 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. These three items are ticked by default.

2. Move the trackball to the desired thumbnail and click Set key to select the desired image.

3. View the image.

   − Press the Set key twice to view the image.

      You can press the ⏮ key at any time to return to the **View Image** screen.
   − Click **Preview** to view the image.

      You can preview other images of the patient through the clipboard.

4. Click **Patient List** to enter Exam List and view the image and cine of selected patient.

12.3 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.

2. Set **Image Share Service** to **On** on the **System Settings** > **General** menu > **Multikey** tab.

3. Type the IP address in the search box of the computer and press **Enter**.

4. Type the user name and password in the pop-up dialogue box.

12.4   Backing up Data

⚠️ **WARNING**
- The system save all data by default. To avoid data loss due to unexpected system breakdown or software update, it is recommended to back up the data.
- Complete all exams before backing up the data.

12.4.1   Backing up Data to a USB drive

Perform the following steps.

1. Connect a USB drive to the system.

2. Press the **Patient** key 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.

12.4.2   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. Press the **Patient** key 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.

12.5   Importing Data to the System

NOTE:
- *Only data generated by this ultrasound system can be imported.*
- *Ensure the current exam is completed before importing data. Otherwise, data importing may be failed.*

Perform the following steps.

1. Connect the USB drive to the system.

    Or, place an empty DVD in the CD-ROM drive.

2. Press the **Patient** key 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 information to the system.

12.6   Using the 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	Android 10 and above
Bandwidth	2Mbit/s and above
Network type	Wireless local area network

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 key panel to open the QR code screen.
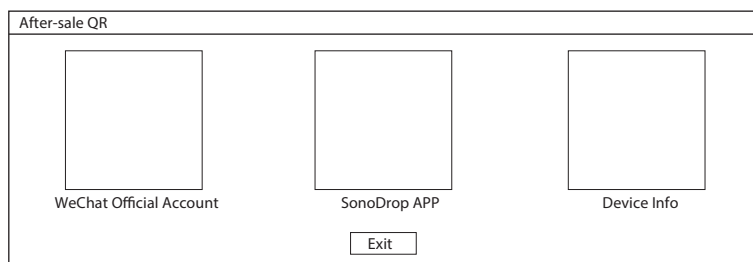
Figure 12-2 Downloading the App

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 Config** on the **System Settings** > **Connect** > **Network** screen and enable the hotspot on the pop-up screen.

```
Hotspot

Hotspot:                    ◉ On          ○ Off

    ┌─────────────────────────────┐
    │   Configure WLAN hotspot    │
    └─────────────────────────────┘

Share internet is visible now.
Other users can find your shared network through "Wi-Fi".
The network name is "xxxx".

    ┌──────────────┐          ┌──────────────┐
    │     Save     │          │    Cancel    │
    └──────────────┘          └──────────────┘
```
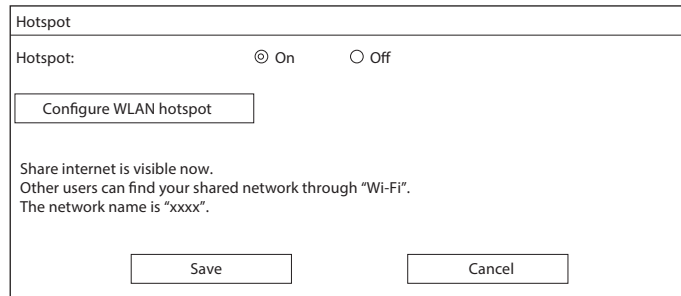
Figure 12-3 Enabling the Hotspot

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 12-4 Sending the Data

5. Tap **ALBUM** on the Sono-Drop App to enter the ultrasound album screen and browse the downloaded patient data.
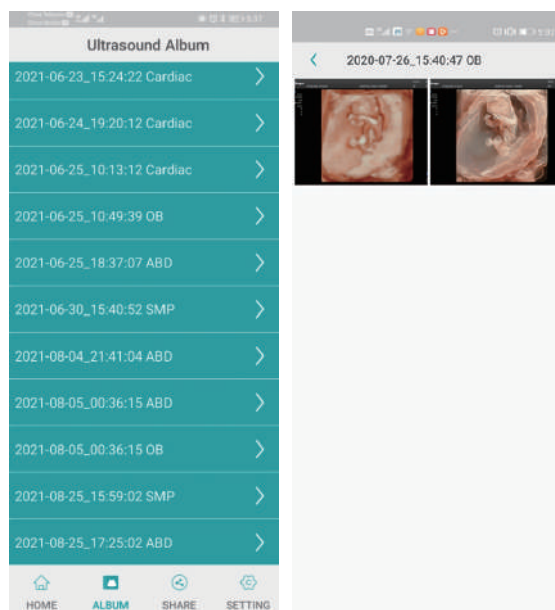
Figure 12-5 Ultrasound Album Screen

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 **P3**/**P4** keys as **Screen Sharing**. The following description takes **P3** key settings as an example. On the **System Settings** > **General** > **MultiKey** screen, click **P3** 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 Config** 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 **P3** key to enable the screen sharing function, and the system displays the QR code.
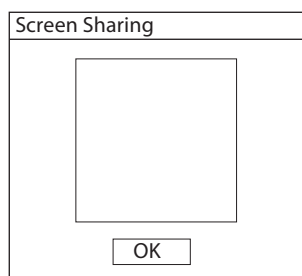
Figure 12-6 QR Code of Screen Sharing

4. Open the Sono- Drop App on the mobile device and tap **Enter Screen Share** on the share screen.
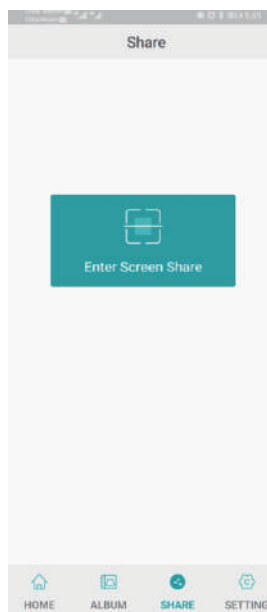
Figure 12-7 Screen Sharing Screen

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 **End Exam** key on the control panel to end the screen sharing.

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13   Working with DICOM

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 service of the system consists of DICOM storage, DICOM print, DICOM worklist, MPPS, storage commitmen, DICOM queue and Q/R list.

If you need *DICOM 3.0 Compatibility Declaration*, please contact the manufacturer.

13.1   Verifying Connectivity

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 4.2.3 Configuring DICOM.

3. If the verification 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.

13.2   DICOM Storage

DICOM Storage is used to send patient data to the DICOM storage server for storage.

■ **Storing the Current Image**

1. Select **Image** on the **System Settings** > **General** menu > **Multikey** tab and select a DICOM storage server. The default storage type for **Image** key is **Save Image**.

2. Press the **Image** key in the real-time or frozen mode to send the current image to the DICOM storage server.

■ **Storing the Current Cine**

1. Select **Cine** on the **System Settings** > **General** menu > **Multikey** tab and select a DICOM storage server. The default storage type for **Cine** key is **Save Cine**.

2. Press the **Cine** key in the frozen mode to send the current cine to the DICOM storage server.

■ **Storing the Screen Capture**

1. Select **P3** or **P4** on the **System Settings** > **General** menu > **Multikey** tab, and select **Screen Capture** as the storage type, and then select a DICOM storage server.

2. Press the **P3** or **P4** key in the frozen mode to send the current screen capture to the DICOM storage server.

■   **Storing the Patient Data**

1. Press the **Patient** key on the control panel 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 dialogue 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, press the **Patient** key and click **Patient List** > **DICOM Queue** for viewing.

13.3   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 4.2.3 Configuring DICOM.

■   **Printing the Current Image**

1. Select **Image** on the **System Settings** > **General** menu > **Multikey** tab, and tick **DICOM Print** and then select a DICOM print server. The default storage type for **Image** key is **Save Image**.

2. Press the **Image** key in the real-time or frozen mode to send the current image to the DICOM print server.

■   **Printing the Current Cine**

1. Select **Cine** on the **System Settings** > **General** menu > **Multikey** tab, and tick **DICOM Print** and then select a DICOM print server. The default storage type for **Cine** key is **Save Cine**.

2. Press the **Cine** key in the frozen mode to send the current cine to the DICOM print server.

■   **Printing the Screen Capture**

1. Select **P3** or **P4** on the **System Settings** > **General** menu > **Multikey** tab, and select **Screen Capture** as the storage type, and then select a DICOM print server.

2. Press the **P3** or **P4** key in the frozen mode to send the current screen capture to the DICOM print server.

■   **Printing the Patient Data**

1. Press the **Patient** key on the control panel 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 dialogue 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, press the **Patient** key and click **Patient List** > **DICOM Queue** for viewing.

13.4   DICOM Worklist

The DICOM Worklist is used to search the archived patient information on the DICOM server, and copy the patient information to the system so that the correct patient can be examined.

Press the **Patient** key on the control panel to enter the **New Patient** screen and then click **WorkList** to enter the **WorkList** screen.

Figure 13-1 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.

13.5 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, press the **End Exam** key on the control panel 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, press the **Patient** key and click **Patient List** > **DICOM Queue** for viewing.
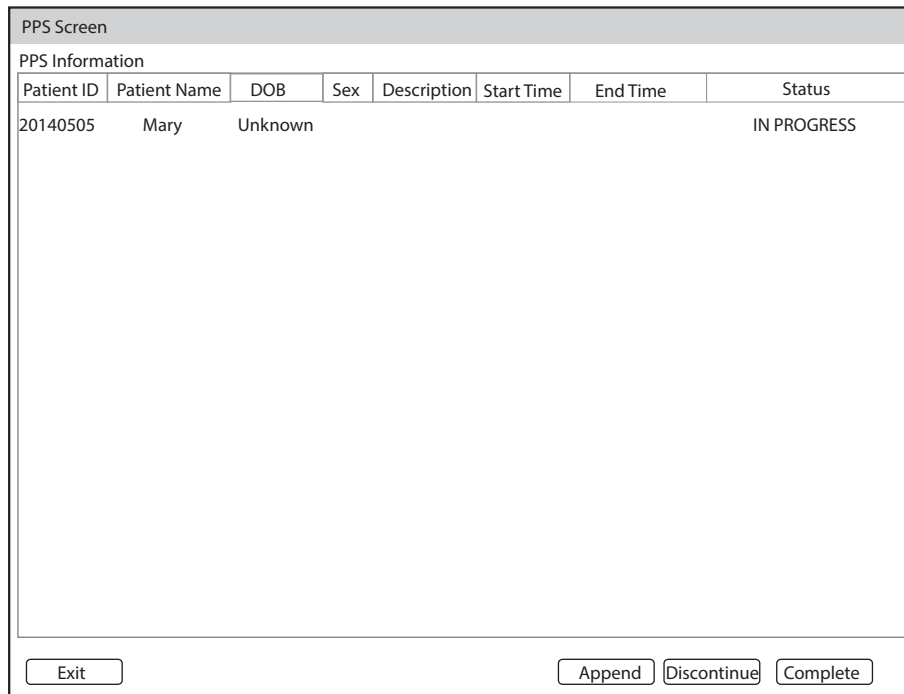
You can add MPPS manually to check the processing status of the discontinued exam or other order operations.

NOTE:

MPPS can only be added when you perform the scan or other order operations.

Perform the following steps.

1. Press the **Patient** key on the control panel to enter the **New Patient** screen, and click **Patient List** to enter the **Exam List** screen.

2. Click **PPS Screen** to enter the **PPS** screen.

PPS Screen							
PPS Information							
Patient ID	Patient Name	DOB	Sex	Description	Start Time	End Time	Status
20140505	Mary	Unknown					IN PROGRESS

Exit   Append Discontinue Complete

Figure 13-2 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.

13.6   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, press the **Patient** key and click **Patient List** > **DICOM Queue** for viewing.

13.7   DICOM Queue

The DICOM queue is used to check the sending status of DICOM storage, DICOM print, MPPS and Storage Commitment.

Press the **Patient** key on the control panel to enter the **New Patient** screen, and click **Patient List** > **DICOM Queue** to enter the DICOM Queue screen, as shown in Figure 13-3.

Figure 13-3 DICOM Queue Screen

Perform the following steps.

1. Search for the patient information

    Enter the search requirements, such as **Patient Name**, **Patient ID**, **Type** or **Date Range** to search for the desired information, and the search 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.

13.8   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.

Press the **Patient** key on the control panel to enter **New Patient** list. Click **Patient List** to enter **Exam List** screen and click **DICOM Q/R** to enter **Query/Retrieve List** screen, as shown in Figure 13-4.

Figure 13-4 Query/Retrieve List

Perform the following steps.

1. Search the patient information.

   Select a search condition, such as Patient ID, and enter the related information. Click **Query Patients**, and patient information is displayed on the **Patient List**.
   - Click **Reset** to delete the entered search condition.
   - Click **Last Time**, the system will arrange 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 on the **Exam List**.
   Click **Exam Time**, the system will arrange the exams in chronological order.

3. Retrieve images

   Select an exam type in the **Exam List** and click **Retrieve Exams**, the thumbnails of the saved image and cine are displayed in the bottom display box.

4. Import the patient information.

   a. Select the image or cine to be imported with the trackball and press the Set key.

   You can click ∧ or ∨ to turn the current menu 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.

14 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.

14.1 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

Intraoperative probe
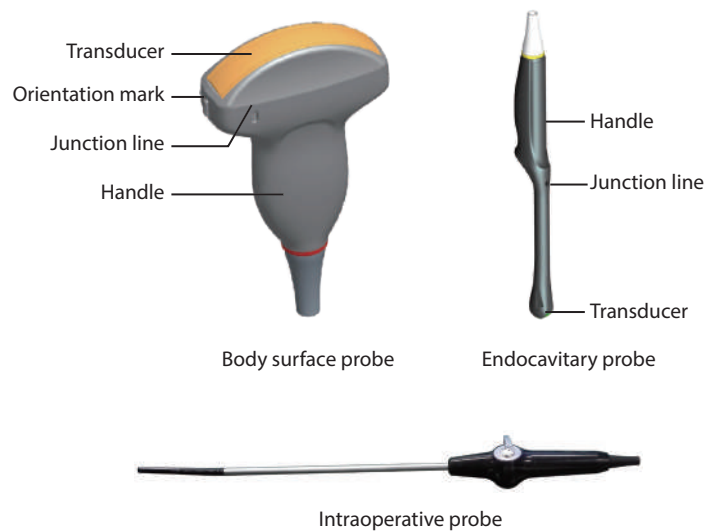
14.1.1 Available Probes

The available probes are listed as follows.

Probe Model	Application
3C-A, C1-6, C1-6A, C2-9, C322, C613, 13L-A, 12L-A, 12L-B, 9L-A, 4P-A, S1-5, 7P-A, 18L-A, VC2-9, 10I2, 12LT-A, 12LI-A, 6CT-A, 6CI-A, 3P-A, 7P-B, L3-9, CWD2.0, L741, 8P1, VC6-2, L742, L752, 2P1	Body surface
VE9-5, 6V3, C3-10V, BCC9-5, BCL10-5, 6V7, 6V3A, 6V1, EC9-5, MPTEE, MPTEE mini	Intracavitary
LAP7	Intraoperative

14.1.2 Probe Usage

⚠ WARNING

- 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.1 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 sterile medical 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.

■ **Intraoperative probe usages**

1. Wear sterile medical gloves.

2. Ensure the bending section of intraoperative probe is free and can bend freely.

a. Rotate two angulation knobs to adjust the probe distal end to the desired angle.
b. Lock the angulation knobs if they are adjusted properly.
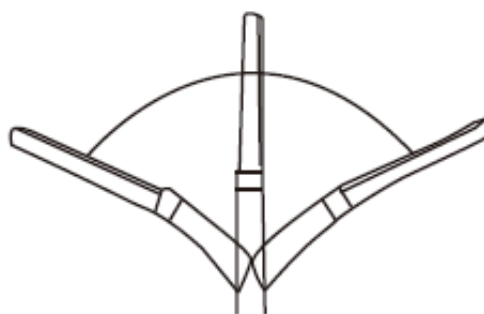
3. Perform a scan.

14.1.3 Cleaning the Probe

⚠ **WARNING** ● To avoid electrical shock, disconnect the probe from the system before cleaning.
● To avoid potential disease transmission, you should wear sterile medical gloves and protective goggles while cleaning.

⚠ **CAUTION** ● Do not use the cleaner that contains sodium sulfate and/or sodium hypochlorite to clean the probe. Otherwise, the probe may be damaged.
● To avoid probe damages, do not bump the probe on hard surfaces.
● Use only the cleaner recommended by the manufacturer to clean the probe. Otherwise, the probe may be damaged.

You should clean the probe after each use. Probe cleaning is an essential step of the disinfection and sterilization.

Perform the following steps to clean the probe.

1. Remove the coupling gel from the probe surface after exam.

2. Disconnect the probe from the system and remove the probe sheath and biopsy bracket from the probe.

3. Use a lint-free soft cloth dampened with mild soapy water or the recommended cleaner (see Appendix D.2 Cleaner) to wipe the probe.

   If there are dried stains on the surface or in the grooves of the probe, remove them by a brush dampened with an enzymatic cleaner.

4. Rinse the surfaces of the probe with the fresh running water to completely remove any residual cleaner.

5. Dry the probe with a lint-free soft dry cloth.

14.1.4 Disinfecting or Sterilizing the Probe

⚠ WARNING
- 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 liquid disinfectant/sterilant that meets local laws and regulations or the recommended disinfectant/sterilant.

- The probe sheath may be damaged during exam and contamination risk level caused by the damaged sheath is difficult to estimate. Therefore, probe sheath cannot change the level of disinfection for a probe. Please clean and sterilize (or high level disinfect) the endocavitary probe and clean and sterilize the probe for biopsy and coming into contact blood after exam.

- Do not use an expired disinfectant/sterilant.

- Store the probe in a sterile environment, and review its expiration date before use.

⚠ CAUTION
- If you use the recommended disinfectant/sterilant, ensure the requirements for the disinfection level and probe soaking period are met. Otherwise, the probe could be damaged and your warranty may be void. If you have further use or needs for the probe, ensure the level of the make-up disinfectant/sterilant and the probe soaking period are suitable for the intended clinical application.

- Do not use the following methods to sterilize the probe.
  - Autoclave
  - Ultraviolet sterilizer
  - Gamma ray sterilizer
  - Ethylene oxide gas
  - Ethylene oxide
  - Thermal disinfection/sterilization. Temperature higher than 66°C (150°F) will damage the probe.
- Do not allow any disinfectant/sterilant to be air-dried on the probe.

■ **Disinfection Levels**

To choose an appropriate disinfectant, you must first determine the required level of disinfection, based on the probe classification.

Classification	Definition	Level of Disinfection	Application
Critical	A device that enters normally sterile tissue or the vascular system.	Sterilization	Intraoperative, biopsy use or blood contacting probe

Classification	Definition	Level of Disinfection	Application
Semi-critical	A device that comes into contact with intact mucous membranes and does not ordinarily penetrate sterile tissue.	High	Endocavitary probe
Noncritical	Devices that do no ordinarily touch the patient or touch only intact skin.	Medium or low	Body surface probe

■ **Soaking Requirements**

Do not immerse the probe beyond its junction line.

■ **To disinfect the body surface probe**

You should disinfect the body surface probe after each use.

Perform the following steps.

1. Clean the probe.

   For details, refer to Section 14.1.3 Cleaning the Probe.

2. Perform the medium-level disinfection to the body surface probe as shown in Table 14-1.

   Or select a recommended disinfectant (see Appendix D.3 Disinfectant) to disinfect the probe by following the instruction provided by disinfectant's manufacturer.

3. Rinse the probe with fresh running water to completely remove the residual disinfectant.

4. Dry the probe with a lint-free soft dry cloth.

Table 14-1 Recommended Method for Medium-level Disinfection

Disinfectant	Manufacturer	Active Ingredient	Level for Active Ingredient	Contact Type	Contact Period
70% Isopropyl alcohol	ALL	Isopropyl alcohol	70%	Spray/Wipe	<10 minutes
T-spray II	Pharm. Inc.	Quat. Ammonia	/	Spray/Wipe	<10 minutes
T-spray	Pharm. Inc.	Quat. Ammonia	/	Spray/Wipe	<10 minutes

■ **To disinfect the endocavitary probe**

You should disinfect the endocavitary probe before and after each use.

Perform the following steps.

1. Clean the probe.

   For details, refer to Section 14.1.3 Cleaning the Probe.

2. Perform the high-level disinfection to the endocavitary probe as shown in Table 14-2.

   Or select the recommended disinfectant (see Appendix D.3 Disinfectant) to disinfect the probe by following the instruction provided by disinfectant's manufacturer.

3. Rinse the probe with running sterile water to completely remove the residual disinfectant.

4. Dry the probe with a lint-free soft dry cloth.

<div align="center">**Table 14-2 Recommended Method for High-level Disinfection**</div>

Disinfectant	Manufacturer	Active Ingredient	Level for Active Ingredient	Contact Type	Contact Period
Cidex™ Activated Dialdehyde Solution	J&J	Glutaraldehyde	2.4%	Soak	45-50 minutes
Resert XL HLD	STERIS	H_2O_2	2.0%	Soak	8 minutes
Tristel Duo for Ultrasound	Tristel	Chlorine dioxide	0.02%	Wipe	0.5 minutes
Tristel Sporicidal Wipe* (* part of the Tristel Trio Wipes System)	Tristel	Chlorine dioxide	0.02%	Wipe	0.5 minutes

14.1.5 Sterilizing the Probe

You should sterilize the intraoperative, biopsy use probe or any probe that comes into contact with blood after each use.

Perform the following steps.

1. Clean the probe.

   For details, refer to Section 14.1.3 Cleaning the Probe.

2. Sterilize the intraoperative probe as shown in Table 14-3.

   Or select the recommended disinfectant (see Appendix D.3 Disinfectant) to sterilize the probe by following the instruction provided by disinfectant's manufacturer.

3. Rinse the probe with running sterile water to completely remove the residual sterilant.

4. Dry the probe with a lint-free soft dry cloth.

<div align="center">**Table 14-3 Recommended Method for Sterilization**</div>

Disinfectant	Manufacturer	Active Ingredient	Level of Active Ingredient	Contact Type	Contact Period
Cidex™ Activated Dialdehyde Solution	J&J	Glutaraldehyde	2.4%	Soak	10 hours

14.1.6 Disinfecting and Sterilizing the Probe Cable

⚠ **WARNING** To avoid potential disease transmission, you should wear sterile medical gloves and protective goggles during disinfection or serialization.

⚠ **CAUTION** Do not immerse the probe cable in alcohol or isopropyl alcohol at any concentration for a long period of time. 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.

■ **Daily Disinfection**

Perform the following steps to clean the probe cable.

1. Use a lint-free soft dry cloth dampened with mild soapy water to wipe the probe cable.

2. Perform the medium-level disinfection to the probe cable as shown in Table 14-4.

3. Rinse the surfaces of the probe cable with fresh running water to completely remove the residual disinfectant.

4. Dry the probe cable with a lint-free soft dry cloth.

Table 14-4 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	/	S p r a y / Wipe	<10 minutes
T-spray	Pharm. Inc.	Quat. Ammonia	/	S p r a y / Wipe	<10 minutes

■ **Sterilization**

If the probe cable comes into contact with any blood or body fluid, you should sterilize it. For details, refer to Section 14.1.5 Sterilizing the Probe.

14.1.7 Storage and Transportation

You should store or transport the probe in accordance with Appendix A Specifications.

■ **To store the probe**

Follow the following items to store the probe.
- Store the probe in a probe holder or specific package when not in use.
- Ensure the probe holder is clean before storing it.
- To avoid contaminating the package, disinfect or sterilize the probe before storage or store it in a disposable probe package.
- Do not expose it to direct sunlight or sudden environmental 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. Clean and disinfect the probe before transportation.

2. Place the probe fully into the carrying case and carefully wind the cable.

3. Close the cover of the carrying case.

4. Pack the carrying case with sponge and place it in a carton.

14.2 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.

14.2.1 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	NGBC1-6	C1-6	14G, 16G, 18G, 20G, 22G	Body surface
5	NGB12L-A	12L-A	14G, 16G, 18G, 20G, 22G	Body surface
6	NGB4P-A	4P-A	14G, 16G, 18G, 20G, 22G	Body surface
7	NGBS1-5	S1-5	14G, 16G, 18G, 20G, 22G	Body surface
8	NGB9L-A	9L-A	14G, 16G, 18G, 20G, 22G	Body surface
9	NGB6V3-2	6V3	16G, 18G, 20G, 22G	Intracavity
10	NGB6V7	6V7	16G, 18G, 20G, 22G	Intracavity
11	NGBBCL10-5	BCL10-5	14G, 16G, 18G, 20G, 22G	Intracavity
12	NGB12L-B	12L-B	14G, 16G, 18G, 20G, 22G	Body surface
13	NGBC1-6A	C1-6A	14G, 16G, 18G, 20G, 22G	Body surface
14	NGB7P-A	7P-A	14G, 16G, 18G, 20G, 22G	Body surface
15	NGBBCC9-5	BCC9-5	16G, 18G, 20G, 22G	Intracavity
16	NGB3P-A	3P-A	14G, 16G, 18G, 20G, 22G	Body surface
17	NGB7P-B	7P-B	14G, 16G, 18G, 20G, 22G	Body surface
18	NGB6V1	6V1	16G, 18G, 20G, 22G	Intracavity

No.	Biopsy Bracket Model	Available Probe Model	Available Biopsy Needle	Application
19	NGBL741	L741	14G, 16G, 18G, 20G, 22G	Body surface
20	NGBEC9-5	EC9-5	16G, 18G, 20G, 22G	Intracavity
21	NGB18L-A	18L-A	14G, 16G, 18G, 20G, 22G	Body surface
22	NGBC2-9	C2-9	14G, 16G, 18G, 20G, 22G	Body surface
23	NGBVC6-2	VC6-2	14G, 16G, 18G, 20G, 22G	Body surface
24	NGBVE9-5	VE9-5	16G, 18G, 20G, 22G	Intracavity
25	NGBL742-2	L742	14G, 16G, 18G, 20G, 22G	Body surface
26	NGBL752	L752	14G, 16G, 18G, 20G, 22G	Body surface
27	NGB2P1	2P1	14G, 16G, 18G, 20G, 22G	Body surface

14.2.2   Assembling the Biopsy Bracket

■   **To assemble the surface biopsy bracket**
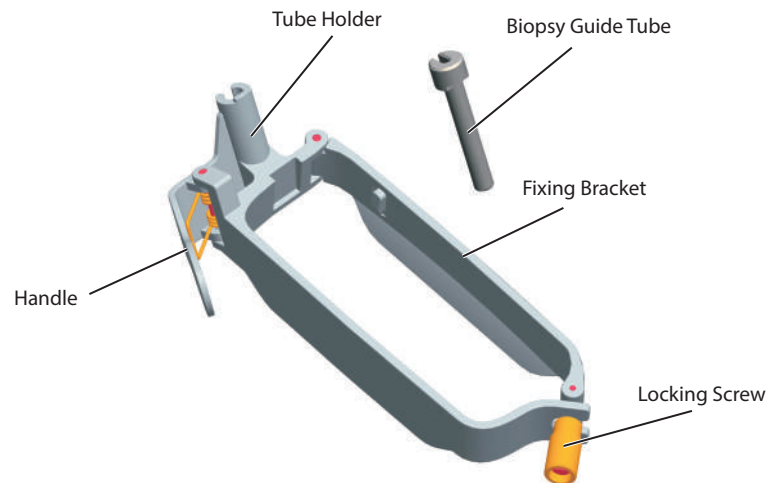
Perform the following steps.

1. Check and ensure that there is no damage, deformation, malfunction, loose or missing parts on the biopsy bracket before assembly.

2. Wear 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
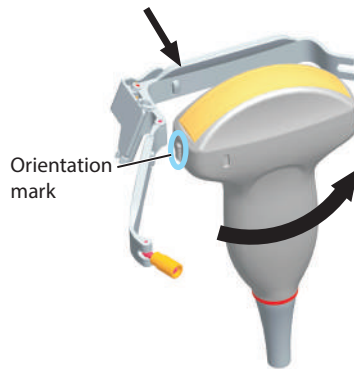
6. Attach the biopsy bracket to the probe and fasten the biopsy bracket with the locking screw.

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**
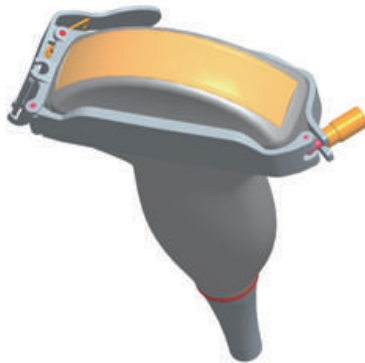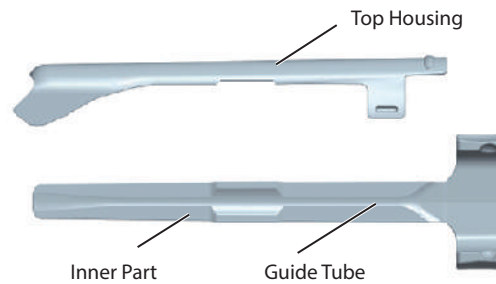
Top Housing

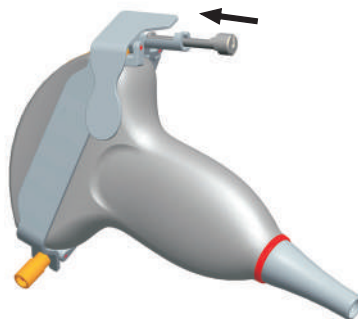Inner Part   Guide Tube

Perform the following steps.

1. Check and ensure that there is no damage, deformation, malfunction, loose or missing parts on the biopsy bracket before assembly.

2. Wear 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.
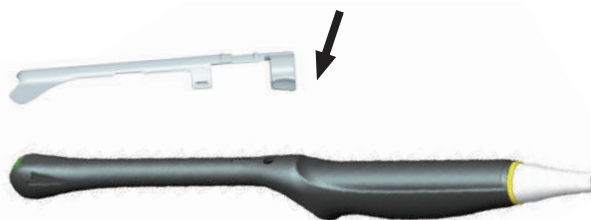
8. Insert the biopsy needle into the guide tube.

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.

14.2.3   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

14.2.4 Verifying the Biopsy Bracket

NOTE:

Ensure the biopsy bracket is properly attached to a compatible probe before verification.

Perform the following steps.

1. Select **Biopsy** on the control panel 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.

14.2.5 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 Guide Line Type to **Biopsy Guide Line** or **Biopsy Safe Range** on the **System Settings** > **General** menu > **Biopsy** tab.

2. In the real-time B mode, press **Biopsy** on the control panel or tap Biopsy on the touch screen to enable the biopsy feature. Tap it again, you can preset 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 to 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.

Biopsy Cali.				Exit
User Mode				
		Save	Load Default	

Angle Select	Angle	Position		
Min	12°	41.4		
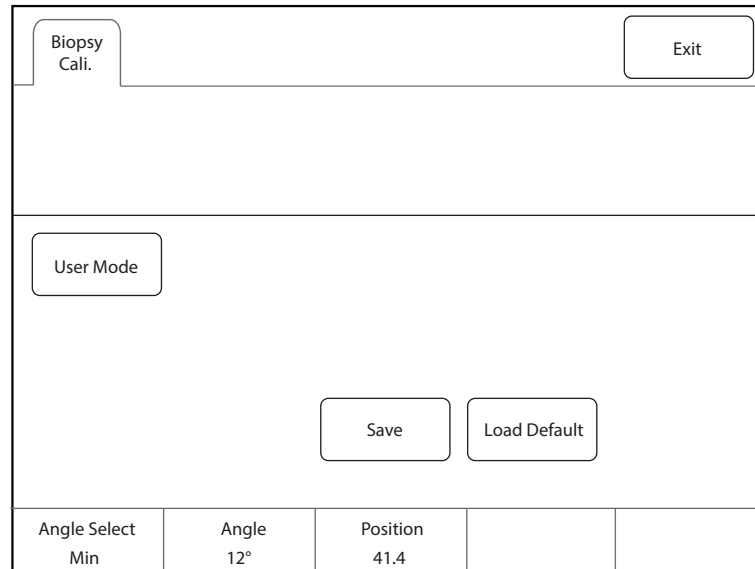
You can select **Bio Cali.** to adjust the biopsy guideline.

- Rotate the knob located directly below **Angle Select** to adjust the angle of the biopsy guideline freely.
- Rotate the knob located directly below **Offset** or **Angle** to adjust the position or angle of the biopsy guideline gradually.
- Tap **Save** to save settings of the biopsy guideline.
- Tap **Load Default** to restore defaults.

6. Adjust the brightness of the biopsy needle on the image.

- For linear probes, you can select **Vis-Needle** to enhance the brightness for the biopsy needle.

Biopsy Needle

Ultrasound Image

Biopsy Enhanced Region Line

a
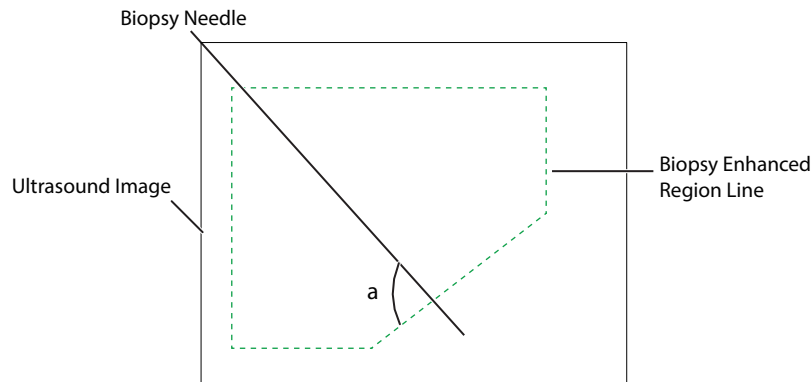
- You can select **Steer Angle** or rotate the **Angle** key on the control panel to adjust the angle of the biopsy enhanced region line. The closer to a 90° angle, the stronger brightness the biopsy needle will be.
- You can select **Dual Live** to activate the dual-split display for better observation.

7. Gently remove the probe from the patient after completing the biopsy.

The biopsy feature is also available in CFM/PDI/TDI mode, and the operation is the same with that of B mode.

14.2.6 Cleaning the Biopsy Bracket

⚠ WARNING
- Clean the biopsy bracket after each use.
- Wear sterile medical gloves and protective goggles during cleaning.

Perform the following steps.

1. Disconnect the probe from the ultrasound system, and remove the biopsy bracket and biopsy guide tube from the probe.

2. Brush and rinse the bracket with an enzymatic cleaner to remove any residue.

3. Dry the bracket with a lint-free soft dry cloth.

14.2.7   Sterilizing the Biopsy Bracket

⚠ **WARNING**
- Disinfect the biopsy bracket after each use.
- Use the liquid sterilant that meets local laws and regulations.
- If you use the recommended sterilant, ensure the requirements for the sterilant level and probe soaking period are met. Otherwise, the biopsy bracket could be damaged and your warranty may be void. If you have further use or needs for the probe, ensure the level of the make-up sterilant and the biopsy bracket soaking period are suitable for the intended clinical application.
- Do not use the expired sterilant.
- If you use other contact type to sterilize the biopsy bracket, ensure it is guaranteed by the manufacturer or the local distributor.
- Do not sterilize the biopsy bracket with any ethylene oxide.
- Do not allow any sterilant to be air-dried on the biopsy bracket.

You should sterilize the biopsy bracket after each use.

Perform the following steps.

1. Clean the biopsy bracket.

    For details, refer to Section 14.2.6 Cleaning the Biopsy Bracket.

2. Sterilize the biopsy bracket as shown in Table 14-5 for the entire recommended soaking period.

3. Rinse the bracket with running sterile water to completely remove any sterilant residue.

4. Dry the bracket with a lint-free soft dry cloth.

Table 14-5 Recommended Method for Sterilization

Sterilant	Manufacturer	Active Ingredient	Level for Active Ingredient	Contact Type	Contact Period
Cidex™ Activated Dialdehyde Solution	J&J	Glutaraldehyde	2.4%	Soak	10 hours

14.2.8   Storage

Ensure the biopsy bracket is cleaned, sterilized and completely dried before storing it. Store the biopsy bracket in a sterile environment and keep it away from the environment of sudden temperature changes or direct sunlight.

14.3   Microwave Ablation

With ultrasound guidance, Microwave Ablation (MWA) directly places an ablation needle into the tumor, uses electromagnetic waves in the microwave energy spectrum to produce tissue-heating and magnetic effects within solid tumors to treat cancer. MWA is generally used for the treatment of solid tumors in primary and secondary liver disease, primary and secondary lung malignancies, renal and adrenal tumors, pancreatic, breast, thyroid and uterine tumors, or bone metastases.

KY-2000 ablation device (KY-2000) is recommended to be used with the system. For details on operating KY-2000, refer to the relevant manuals.

All operating information or settings of KY-2000 can be displayed and configured on the system. This is convenient for you to know the working conditions of KY-2000 and the system at the same time.

14.3.1   Connecting the Ablation Device

Perform the following steps.

1. Connect the ablation device to mains supply as instructed in the relevant user manual.

2. Connect the ablation needle and temperature sensor to the ablation device and test the needle to ensure the firm connection.

3. Connect the system to mains supply with the power cable.

4. Connect the ablation device to the specified USB port of the system.

5. Power on the system and the ablation device.

14.3.2   Ablation Procedures

⚠ WARNING
- Only physicians training under ultrasound and ablation guidance can perform the microwave ablation. During the operation, the operator must observe proper needle insertion sequencing with the needle guide in order to avoid undue discomfort and unnecessary risk and injury to the patient.
- Do not freeze an image when performing the ablation.
- To avoid hurt the patient accidentally, the operator should be highly concentrated when performing the ablation.
- To avoid possible personnel injury, ensure temperature of the temperature sensor not exceed 45℃.
- Select an appropriate type of the ablation needle for treatment.
- Only ablation needle and temperature sensor provided or recommended by the manufacturer can be used.
- The ablation needle is disposable.
- To avoid the infection, disinfect the probe and wear it with the probe sheath when performing the ablation.
- The disposable ablation needle is sterilized by epoxy ethane before it is provided by the manufacturer. Therefore, it can be used directly.
- Do not use the ablation needle with damaged package.
- Notice the expiry date of ablation needle on packaging before use.

Perform the following steps.

1. Enter the patient information and select the desired probe and exam type to enter the real-time B mode.

2. Acquire a B-mode image of high quality.

3. Tap **MWA** on the touch screen to display the **MWA** menu.

    Operating information and settings of KY-2000 are displayed on this menu in real time.

4. Press the **Pointer** key on the control panel to make relevant settings of KY-2000.

    - Tap [▲] or [▼] beside **POWER** to set the power consumption.
    - Tap [▲] or [▼] beside **TIME** to set the ablation time.
    - Tap [▲] or [▼] beside **TEMPE** to set the ablation temperature.

5. Perform the scan.

6. Identify the target tumor and place the ablation needle into the tumor.

7. Select a working mode to start the ablation. Meanwhile, KY-2000 automatically starts the cooling and recirculation system.

    - Tap **Continuous**, KY-2000 emits continuous wave.
    - Tap **Pulse**, KY-2000 emits pulse wave.
    - Press the working mode to pause the ablation.
    - Tap **Reset**, press the working mode to select another mode.

8. Observe the ablation status and place the temperature sensor into adjacent tissue to the target tumor, and then take the temperature.
    – Tap **Cool** to stop the working of the cooling and recirculation system.
    – Tap **Reset** to restore defaults.

9. Gently remove the ablation needle from the patient after completing the ablation.

It is prohibited to discard the ablation needle at will. You should dispose of the ablation needle in accordance with the local laws or regulations.

14.4 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.

15 System 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 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.

15.1　Cleaning the System

■ **To clean the system surface**

1. Power off and unplug the system from the AC power outlet.

2. Dampen a lint-free soft cloth with 75% ethanol.

3. Use this lint-free soft cloth to clean the surfaces of the monitor screen, the touch screen, the control panel, the keyboard and the main unit. Take special care and avoid to scratch the screens.

4. Use a cotton swab to remove solids from between keys and controls.

■ **To clean the dust filter**
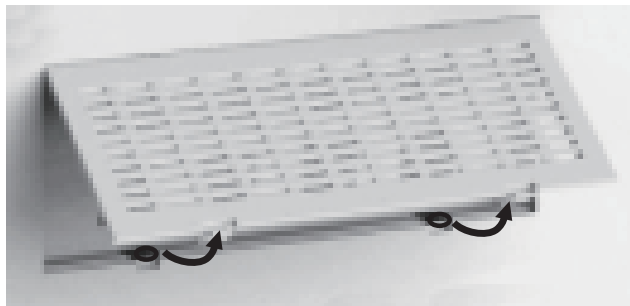
The dust filter must be cleaned at least once every 3 months for ventilation.

1. Power off and unplug the system from the AC power outlet.

2. Pinch the dust filter with fingers as the figure shown above.

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.

■ **To clean the trackball**

1. Power off and unplug the ultrasound 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.
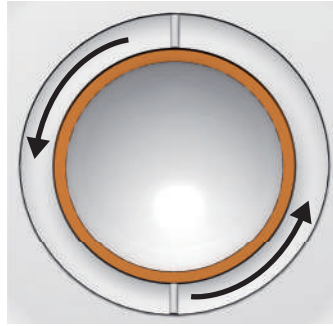
4. Take out the dust ring, the fixing ring and the ball (careful not to drop the ball) from the control panel.

5. Use a lint-free soft cloth dampened with 75% ethanol to clean the dust ring, the fixing ring and the ball.

6. Use a cotton swab dampened with 75% ethanol to remove stains from the surrounding area and edge.

7. Place the ball, the fixing ring and the dust ring back to the control panel, and turn the fixing ring clockwise to install the trackball.

15.2 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.

■ **Electric 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 key panel 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 key panel
  ● Control of foot brake
  ● Connectivity of interfaces

■ **Image Recording**
  ● Images in each mode
  ● Image recording using the standard probe

15.3 Troubleshooting

Q1: Cannot start the system.

A1: Check whether the system is plugged in, the main power switch is located to Ⅰ position and the fuse is intact. If the fuse is blown, replace it as described in Section 15.4 Replacing the Fuse.

Q2: No images are displayed on the monitor.

A2: Check whether the power supply cable and video cable are securely connected.

Q3: The monitor displays abnormal.

A3: Check whether probe and a compatible exam type are selected, or the imaging parameters are optimized correctly. For details, refer to Chapter 6 Acquiring Images.

Q4: The measurement cannot be performed after pressing the **Calc** key on the control panel.

A4: Ensure you pressing the **Calc** key in the frozen mode.

If any of the above problems still exist, please contact the Customer Service Department of the manufacturer for help.

15.4   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-T5AH 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.

15.5   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.

15.6   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**	**Storage and Transportation**
	Ambient Temperature	10℃ ~ 40℃	-20℃ ~ +55℃
	Relative Humidity	30% ~ 75% (no condensation)	20% ~ 90% (no condensation)
	Atmospheric Pressure	700hPa ~1060hPa	700hPa ~1060hPa
Power Supply	Voltage: 100-127V/220-240V~ Frequency: 50/60Hz Power consumption: 500VA		
Battery	The following specifications are available: ● Nominal voltage: 14.8V, Battery capacity: 9.6Ah/142.08Wh ● Nominal voltage: 14.4V, Battery capacity: 9.6Ah/138.24Wh		
Fuse	Type: 50CT Breaking capacity: 1500 amperes at 250V AC Blowing time rating: 30 minutes (Max.) Current rating: 5A		
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: $d = 1.2\sqrt{p}$ $d = 1.2\sqrt{p}$ 80MHz-800 MHz
Radiated RF IEC 61000-4-3	10 V/m 80 MHz to 2,7 GHz	10V/m	$d = 2.3\sqrt{p}$ 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,

$$In\ Situ = In\ Situ\ Intensity\ Value$$

$$Water = Water\ Value\ Intensity$$

$$e = 2.7183$$

$$a = Attenuation\ Factor$$

$$Tissue = a\ (dB/cm\text{-}MHz)$$

$$Amniotic\ Fluid = 0.006$$

$$Brain = 0.53$$

$$Heart = 0.66$$

$$Kidney = 0.79$$

$$Liver = 0.43$$

$$Muscle = 0.55$$

$$l = Skin\ line\ to\ measurement\ depth\ (cm)$$

$$f = Center\ frequency\ of\ the\ transducer/system/mode\ combination\ (MHz)$$

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, Cleaner and Disinfectant

NOTE:

- *Coupling gels, cleaners and disinfectants listed in this manual are recommended because of their chemical compatibility with product materials, not their biological effectiveness. For the biological effectiveness of a disinfectant, refer to the guidelines and recommendations of the disinfectant manufacturer, Association for Practitioners in Infection Control, U.S. Food and Drug Administration, and U.S. Centers for Disease Control.*
- *This appendix contains the latest information about the recommended coupling gels, cleaners and disinfectants when the user manual is released. The appendix is subject to change without prior notice.*
- *Some of the probe models listed in the following tables can be used with this system. For details, refer to Section 14.1 Probe.*

D.1 Coupling Gel

Probe Model	Applicable
MPTEE, MPTEE mini, 12C-ER	Aquasonic 100, Aquasonic Clear, Sterile Aquasonic, Clear Image/Single, Sterile Ultraphonic Gel
LAP7, 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, BCL10-5, 6V1A, 6V3A, 6V7	Aquasonic 100, Aquasonic Clear, Sterile Aquasonic, Clear Image/Single, Sterile Ultraphonic Gel, Transonic gel, Clear Scanning Gel
VC6-2, VE9-5, CWD2.0, 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

D.2 Cleaner

Probe Model	Applicable	Remark (contact type)
MPTEE, MPTEE mini, 12C- ER	Mild soapy water	Spray / Wipe
LAP7	Mild soapy water	Spray / Wipe
VC6-2, VE9-5, VC2-9	Mild soapy water	Spray / Wipe
CWD2.0, CWD5.0	Mild soapy water	Spray / Wipe

Probe Model	Applicable	Remark (contact type)
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, 10I2, 6CI-A, 6CT-A, 10L-I, 12LI-A, 12LT-A, EC9-5, 6V1, 6V3, BCC9-5, BCL10-5, 6V1A, 6V3A, 6V7	Mild soapy water, Transeptic, 70% Isopropyl alcohol, T-spray, T-spray II	Spray / Wipe

D.3   Disinfectant

Probe Model	Applicable	Remark (contact type)
MPTEE, MPTEE mini, 12C-ER	Cidex OPA Solution, Cidex, Metricide 14	Soak
LAP7, 10I2, 6CI-A, 6CT-A, 10L-I, 12LI-A, 12LT-A	Cidex	Soak
CWD2.0, CWD5.0	Cidex OPA Solution, Cidex, Metricide 14	Soak
VC2-9, VC6-2, VE9-5	Cidex OPA Solution, Cidex, Metricide 14	Soak
	Tristel Sporicidal Wipe*, Tristel Duo for Ultrasound	Wipe
EC9-5, 6V1, 6V3, BCC9-5, BCL10-5, 6V1A, 6V3A, 6V7, 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	Cidex OPA Solution, Cidex, Metricide 14, Resert XL HLD	Soak
	Tristel Sporicidal Wipe*, Tristel Duo for Ultrasound	Wipe

* Part of the Tristel Trio Wipes System

Appendix E Acoustic Output Data

Please refer to Section 4.7.2   Acoustic Output.