OWNER´S MANUAL

EVUS 8

SAEVO

MANUAL PRESENTATION

Technical Name: Ultrasound device
Trade Name: Ultrasound Diagnostic Equipment
Model: Evus 8
Brand: Saevo

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CREA-SP: 5062199650

ANVISA Registration nº: 10069210070

Statement

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This manual is based on the maximum configuration and therefore some contents may not apply to your product.

This manual is subject to change without prior notice and legal obligation.

Manufacturer's Responsibility

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

- All installation operations, expansions, changes, modifications and repairs of this product are conducted by the manufacturerauthorized personnel.
- The use or application of the product or the use of parts or accessories is approved by the manufacturer.
- 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

The manufacturer 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.
Boldfaced Word	Indicates controls on the control panel, or on-screen objects such as menu items or keys.

Item	Meaning
Click	Move the cursor to the controls on the display and press the confirm key on the control panel.
>	Select a menu item or a key following the path.

Contents

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1 Safety

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

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

1.1 Intended Use

The device 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 the system from the mains supply.

- 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 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.

⚠ 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.

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

1.2.4   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 is available in a document from the AIUM (American Institute of Ultrasound Medicine) title "Medical Ultrasound Safety".

1.3.3 Mechanical and Thermal Indices

The display of the ultrasound 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 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 the real time scan 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　Probe Surface Temperature Limits

For probes intended for internal applications, e.g. the endocavitary probe or transesophageal probes, 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 lower left side of the screen.

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PAT: 37℃ ———————|—— Patient Threshold Temperature
TIP: <28℃ ———————|—— Transducer Tip Temperature
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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 ultrasound system.

Symbol	Meaning
⚠	Caution
⚡	Dangerous voltage
🚫	Risk of explosion if used in the presence of flammable anesthetics
🧍	Type BF applied part
○	Main switch OFF
|	Main switch ON
⏻	Power On/Off button

Symbol	Meaning
	Protective earth (ground)
	Equipotentiality
	Alternating current
	Direct current
IPN_1N_2	Degree of IP protection
	Non-ionizing electromagnetic radiation.
	Manufacturer
	Date of manufacture
	Follow instructions for use
	Network port
	USB port
	Fragile
	AUDIO output
	Keep dry
	Maximum stacking limit of packages Maximum of two layers allowed for the system
	Keep this way upward
SN	Serial number

Symbol	Meaning
	Use it in ventilated and dry indoor environment (for power supply adapter only).
	Rechargeable (for battery only)
	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.

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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   System Configuration

The standard system configuration mainly consists of the followings items:

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

2.2   Physical Specifications

- LCD monitor: 15'' color display
- System dimension: approx. 413mm(L)×357mm(W)×391mm(H)
- System weight: approx. 7.9kg (including battery)

2.3   System Components

Figure 2-1 System Overview

2.3.1   Front Panel
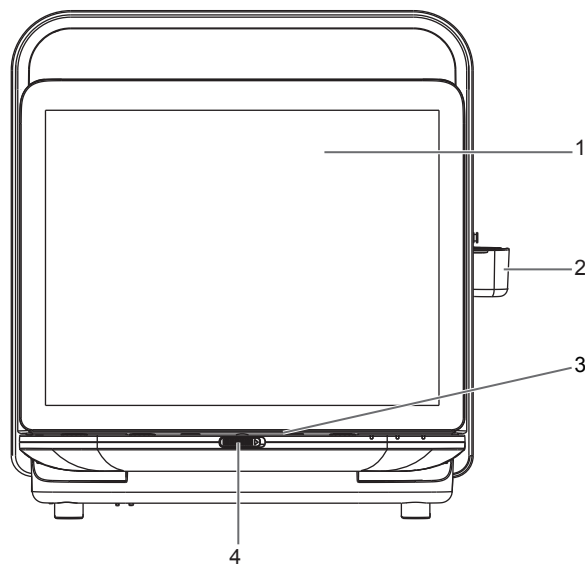
Figure 2-2 Front View

1	LCD Monitor	3	Control Panel
2	Probe Holder	4	Release Latch

2.3.2   Side View
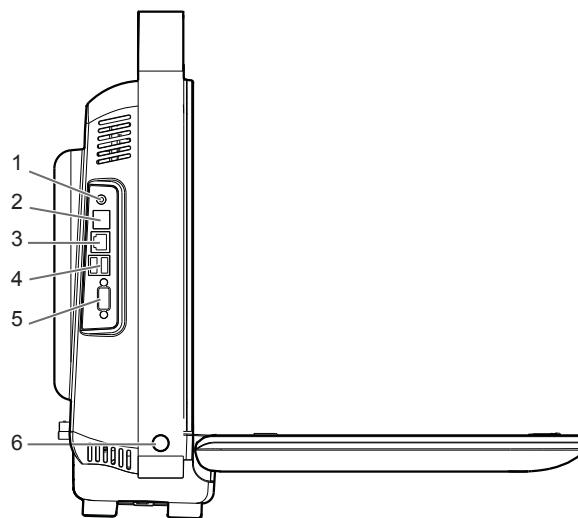
Figure 2-3 Side View

1	Audio Output Port	4	USB Port
2	S-VIDEO Port	5	VGA Video Output Port
3	Network Port (DICOM)	6	Power On/Off Button

2.3.3   Rear Panel
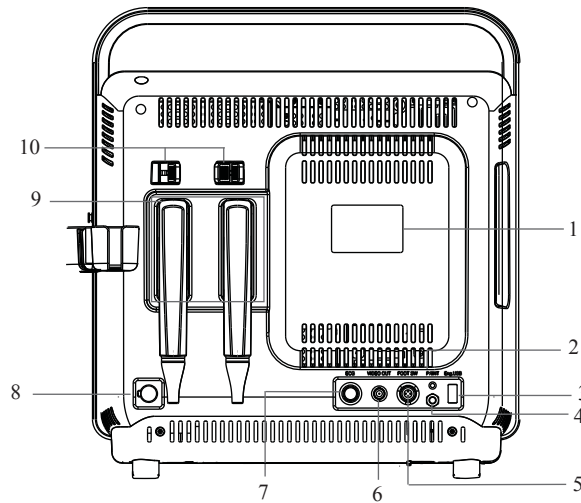
Figure 2-4 Rear Panel

1	Rating Label	6	BNC Video Output Port
2	Video Printer Port	7	ECG Port
3	Engineering USB Port	8	AC Adapter Port
4	Grounding Terminal	9	Probe Port
5	Foot switch Port	10	Probe Lock

2.3.4   Battery Compartment
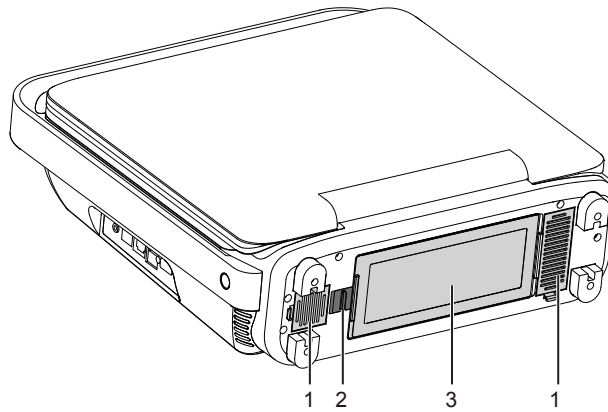
Figure 2-5 Battery Compartment View

1	Dust Filter	3	Battery
2	Battery Lock		

2.3.5 Control Panel
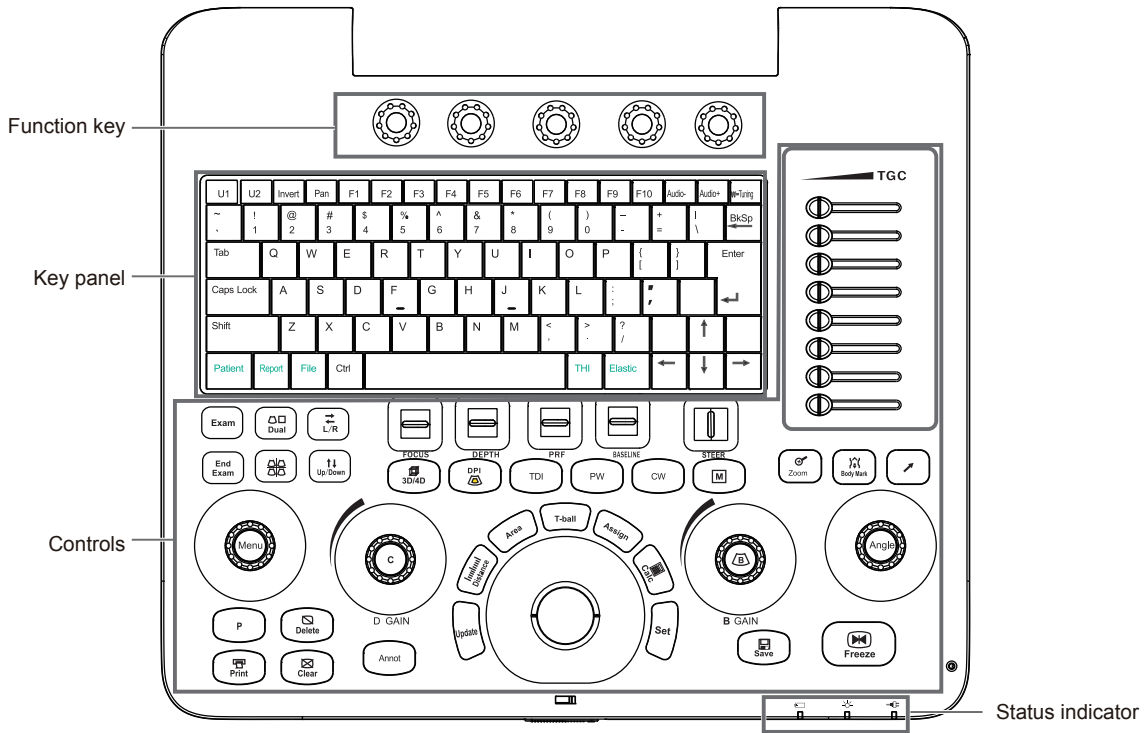
Figure 2-6 Control Panel

■ **Function Key**

Name	Description
Function Key	Five function keys are located below the selected item on the screen. ● Press it to select the corresponding menu item at the bottom of the screen. ● Rotate it to make the setting of the selected menu item.

■ **Key Panel**

Name	Description
Patient	Select it to enter the **New Patient** screen.
Report	Select it to enter the **Report** screen.
File	● Select it to display the **Patient Exam List** screen. ● Or, select it to enter the **View Image** screen when creating a new patient exam.
Pan	Select it to enter the real time panoramic imaging mode.
Audio +	Select it to increase the volume in the PW mode.
Audio -	Select it to decrease the volume in the PW mode.
m-Tuning	Select it to optimize an image automatically.
U1	User-defined save keys.
U2	Select it to save images, cine or volume data. For details, refer to Section 4.1.4 Defined-Key Settings.

Name	Description
Elastic	Select it to enter or exit the elastography imaging mode.
Invert	Select it to enable or disable the flow invert in the Color mode or frequency spectrum invert in the PW/CW mode.
THI	Select it to enter the Harmonic Imaging mode in the real time mode.

■ **Controls Area**

Name	Description
Exam	Select it to choose a probe and an icon for the corresponding exam type in the real time mode or frozen mode.
End Exam	Select it to end the exam for the current patient.
Dual	Select it to enter the dual split display. Or, select it to activate the desired image in the dual split display.
	Select it to enter the quad split display. Or, select it to activate the desired image in the quad split display.
L/R	Select it to reverse the image left or right.
Up/Down	Select it to reverse the image up or down.
DEPTH	Use it to adjust the scan depth. Flip it downwards or upwards to adjust the depth.
FOCUS	Use it to adjust the position of the focus.
BASELINE	Use it to adjust the position of the baseline.
STEER	Use it to adjust the direction of the acoustic beam when performing a real time scan by using the linear probe.
PRF	Use it to adjust the pulse repetition frequency.
3D/4D	Select it to enter or exit the 3D/4D imaging mode.
DPI	Select it to enter or exit the DPI mode.
TDI	Select it to enter or exit the TDI mode.
PW	Select it to enter or exit the PW mode.
CW	Select it to enter or exit the CW mode.
M	Select it to enter or exit the M mode.
Zoom	Select it to magnify the interest area of the ultrasound image.
Body Mark	Select it to add a body mark onto the ultrasound image.
	Select it to add arrow on the ultrasound image.
Menu	Select it to enter the **System Setting** screen.

Name	Description
B	• Select it to activate the B mode. • Rotate it to adjust the gain value in the B mode.
C	• Select it to activate the C mode. • Rotate it to adjust the gain value in the C mode.
Angle	• Rotate it to adjust the magnification if the zoom feature is activated. • 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 annotation feature is activated. • Rotate it to adjust the measurement angle of the hip joint when performing a pediatrics measurements.
P	Reserved function key
Print	Select it to print the current screenshot if a video printer is successfully connected.
Delete	• Press it to delete the last annotation or body mark when annotating an image. • Or, 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.
Clear	Select it to remove all measurement results, annotations and body mark symbols from the display.
Annot	Select it to annotate an image with typed words.
Distance	• Select it to activate the basic measurement and calculation functions. • Select it to perform a distance measurement in the 2D (B/C/PDI/TDI), M, 3D or 4D mode. • Select it to perform a velocity measurement in the PW/CW mode.
Update	• Select it to save modifications made on the **System Settings** or **New Patient** screen. • Select it to enter the M/PW/CW mode in an inactivated M/PW/CW mode. • Select it to switch between measurement markers when performing a distance or an ellipse measurement. • Select it to undo the trace when performing a trace measurement.
Area	• Select it to perform circumference and area measurements in the 2D (B/C/PDI/TDI), 3D or 4D mode. • Select it to perform a slope measurement in the M mode. • Select it to perform a manual trace measurement in the PW/CW mode.
T-ball	• Select it to activate the clipboard in the 2D (B/C/PDI/TDI) or M mode. • Select it to activate the trackball cursor in the 3D/4D mode.
Assign	Reserved function key
Calc	Select it to activate the application-specific measurement and calculation functions.
Set	Select it to confirm the current operation.
Save	Select it to save the image or cine in the frozen mode.
Trackball	Use it to move the cursor and adjust ROI.

Name	Description
Freeze	Select it to freeze the image in the real time mode. Or, select it again to restore the real time scan.
TGC	Use these 8 TGC sliders to adjust the gain value of the specific area on the image.

■ **Status Indicator**

Indicator	Description
	Indicates the battery discharging status.
	Indicates the battery charging status.
	Indicates the connecting status of the mains supply.

2.3.6 Basic Screen
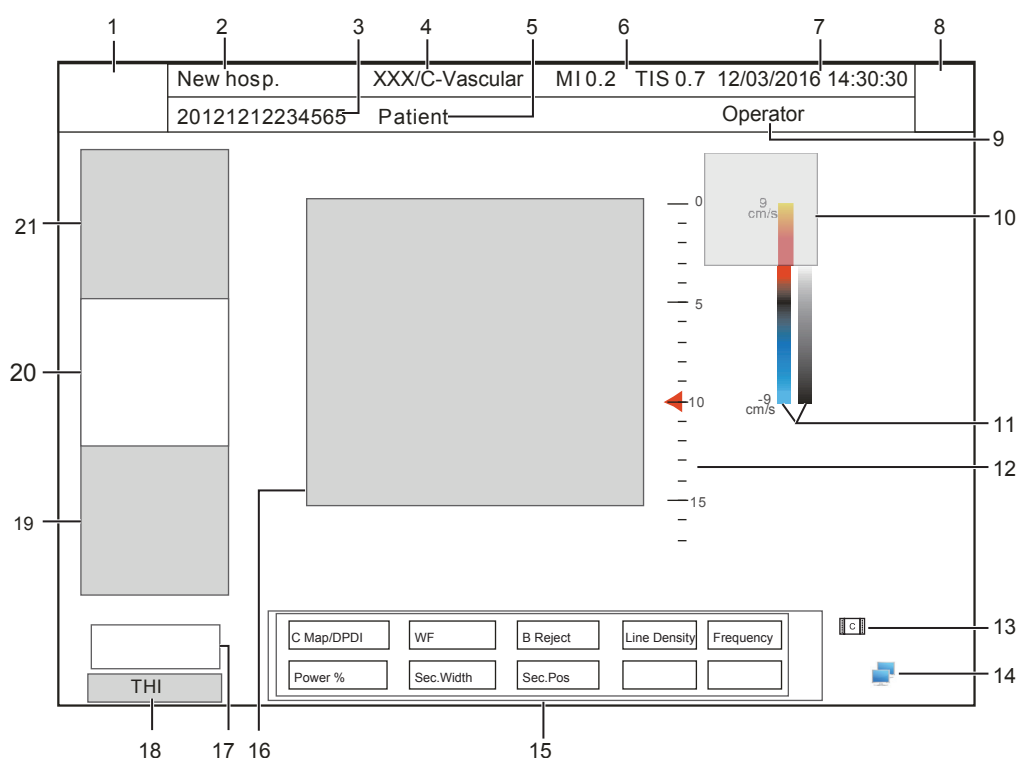
Figure 2-7 Basic Screen

1	Logo	12	Depth Scale and Focal Position
2	Institution Name	13	Cine Loop Icon (in frozen mode)
3	Patient ID	14	Network Connection Status
4	Probe Model/Exam Type	15	Image Parameters
5	Patient Name	16	Imagining Area
6	MI and TIS Indices	17	Cine Loop Status (in frozen mode)
7	System Date and Time	18	THI/PHI Status
8	Exam Type Icon	19	PW/CW/M Mode Imaging Information
9	Operator	20	Color Flow Mode Imaging Information
10	Measurement Result Area	21	B Mode Imaging Information
11	Color Map (in C/PDI mode) /Grayscale Map (Right)		

3 Preparing the System

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

3.1 Positioning the System

⚠ CAUTION Leave at least 20cm at the back and both sides of the ultrasound system for ventilation. Otherwise, the temperature rise could cause failures.

Place this system on a level surface.

You can place the system on the trolley (sold separately) provided by manufacturer. For details on positioning the system, please refer to the relevant user manual.

3.2 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

⚠ WARNING
- The accompanying AC adapter can only be used for power supply or battery charge of the system. Other usages may damage the adapter or even cause an electric shock.
- Ensure that the adapter is not damaged before use. If damage exists, stop using it immediately and contact the manufacturer or the local distributor.

⚠ CAUTION
- Use only the adapter provided by the manufacturer.
- Do not hang the adapter in the air.
- The adapter should be placed in a well ventilated area during use. Do not cover the AC adapter with any other objects.

■ **To connect the adapter**

1. Connect the grounding terminal to the protective ground using the power grounding cable.
2. Connect one end of the adapter to the system and connect the other end to the mains supply firmly.

After use, disconnect the cable from the mains supply and then disconnect the grounding cable.

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 type recommended by the manufacturer.
- 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 the 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 damaged, severely degraded or used for 3 years, dispose of it in accordance with local laws or regulations.

If the system is connected to the mains supply with the adapter, the battery is charged automatically. If the adapter is disconnected, the system is powered by the battery.

A fully charged battery can work continuously for more than one hour. The specifications of the battery is as follows.

- Rated voltage: 14.8V
- Capacity: 9.6Ah/142Wh

When the battery can only work for 5 to 15 minutes, a prompt and low voltage icon (flashes once in every second) display at the lower right corner of the screen, while an alarm sends out. You should charge the battery or save the data in time to avoid data missing.

⚠ **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 in a fire.
- Do not expose the battery under the sunlight or leave it in the environment over 60°C.
- Keep the battery away from fire and other heat sources during use and charge.
- Do not pierce the battery with a sharp object, hit or step on it.
- Do not place the battery into a microwave oven or other pressure vessels.

⚠ **CAUTION**
- Only use the battery if there is an emergency or no reliable AC power supply. It is recommended to use the AC supply instead of the battery.

- If you do not attempt to use the battery within 3 months, fully charge the battery and store it in the temperature of -20°C to 45°C. If the battery has been stored for more than 3 months, it is recommended to charge the battery at least once every 3 months to avoid liquid leakage.

- Charge the battery in the temperature of 0°C to 45°C and discharge it the temperature of 0°C to 60°C to prolong the service life of the battery.

- Always charge the battery to full to maintain the lifespan of the battery.

- It is highly recommended to perform one full discharge/charge cycle before first time usage. A full discharge/charge cycle means the system is turned on using battery power until the battery loses its charge completely and the system shuts down. Thereafter, fully charge the battery until the charging indicator illuminates in green.

- 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   Assembling/Disassembling the Battery

■   **To Assemble the Battery**

Switch the battery lock on the bottom to the ⬛ position, and install the battery on the system as shown in Figure 3-1.
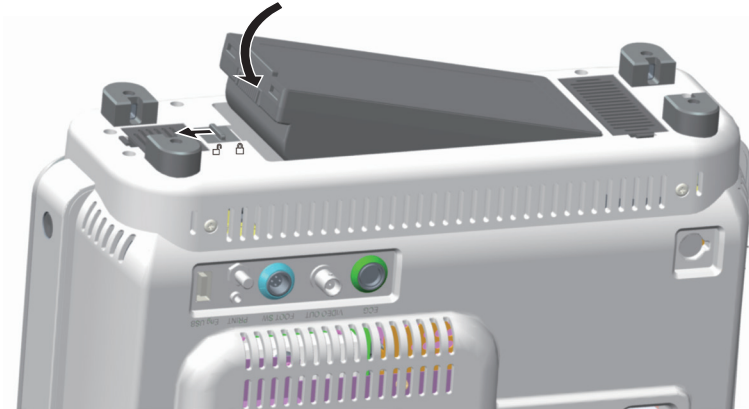
Figure 3-1 Battery Assembly

■ **To Disassemble the Battery**

Switch the battery lock on the bottom to the ⌐ position, and take out the battery as shown in Figure 3-2.
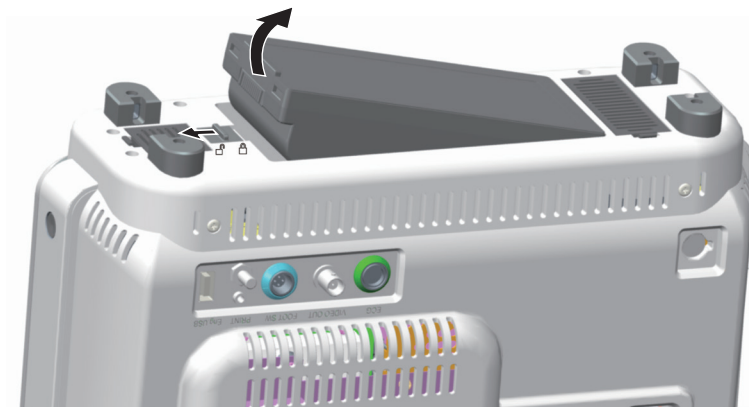
Figure 3-2 Battery Disassembly

3.2.4 Status Indicator

The indications of each status indicator are shown in Table 3-1.

Table 3-1 Status Indicator

Status Indicator	Mains Supply	Battery
Battery Charging Indicator	Yellow, charging	Off
	Green, fully charged	
Mains Supply Indicator	Always green	Off
Battery Discharging Indicator	Off	Green, full capacity
		Yellow, low capacity
		Blinking yellow, extremely low capacity, and the system is going to power off, and buzzer alarms.

3.3 Powering On/Off the System

⚠ CAUTION
- 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 ultrasound system again after powering it off. Otherwise, a failure may result.
- To maintain the safety and functionality of the ultrasound system, regular maintenance must be performed as described in Chapter 14 System Maintenance.
- Ensure the system works in accordance with requirements in Appendix A Specifications.

■ **To power on the system**

1. Connect to the adapter to system and the mains supply.

2. Press the ⏻ button on the left side of the system to power on the system.

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

■ **To power off the system**

Press the ⏻ button on the left side of the system to power off the system.

■ **System standby**

If the ultrasound system is idle for a set period, the system enters the standby mode automatically.

3.4 Adjusting the System

Grip the left and right sides of the screen and swivel the screen forwards or backwards.

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.

■ **To connect the probe to the system**

1. Switch the probe lock above the probe port to the ⌐ position, and then insert the probe connector into the probe port firmly.

2. Switch the probe lock to the ⌐ position to lock it securely.
   If the probe cable is too long, hang it on the probe cable hanger.

■ **To connect the probe to the transducer extender**

1. Switch the probe lock on the system to the ⌐ position, and then insert the probe connector of the transducer extender into the probe port firmly.

2. Switch the probe lock to the ⌐ position to lock the extender securely.

3. Switch the probe lock on the transducer extender to the ⌐ position, and then insert the probe connector of into the probe port of the extender firmly.

4. Switch the probe lock to the ⌐ position to lock the probe securely.

■   **To disconnect the probe**

Switch the probe lock on the system or on the transducer extender to the ⌐⌐ position, and 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 be malfunctioning.

Connect the foot switch to the foot switch port of the ultrasound system as the figure shows below.
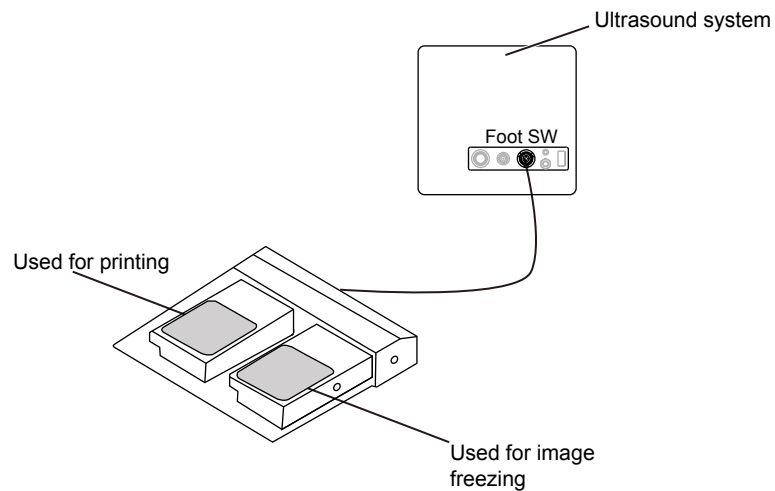
3.6.2　Connecting the Video Printer
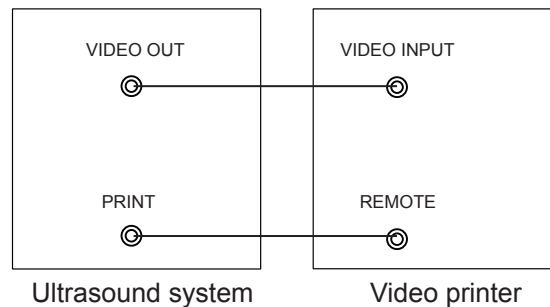
The video printer can work immediately without any configurations after a successful connection.

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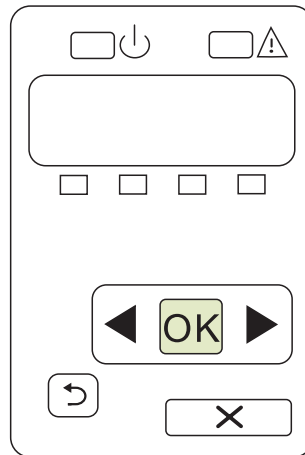
2. Press **OK** on the control panel menu of the printer.

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.

■   **Ultrasound System Setup**

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 ultrasound system, and then start up the ultrasound system.

3. Select the **Menu** key to enter the **System Setting** menu, and click **Peripheral**.

4. Tick **Static IP** and input the settings for **IP Address**, **Netmask**, **Default Gateway** and **DICOM AE Title**.

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

5. Set **Default Printer** to **Net Printer**, and set the IP address of the printer.

6. Click **Add Printer** and reboot the ultrasound system after the installation is complete.

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 ultrasound system, and then start up the ultrasound system.

4. Select the **Menu** key on the control panel to enter the **System Setting** menu, and click **Peripheral**.

5. Set **Default Printer** to **USB Printer**, and Click **Add Printer**.

6. Reboot the ultrasound system after the installation is completed.

4   Customizing Your System

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

After the ultrasound system is powered on, the LCD monitor displays the available probe and the application mode screen as shown in Figure 4-1.
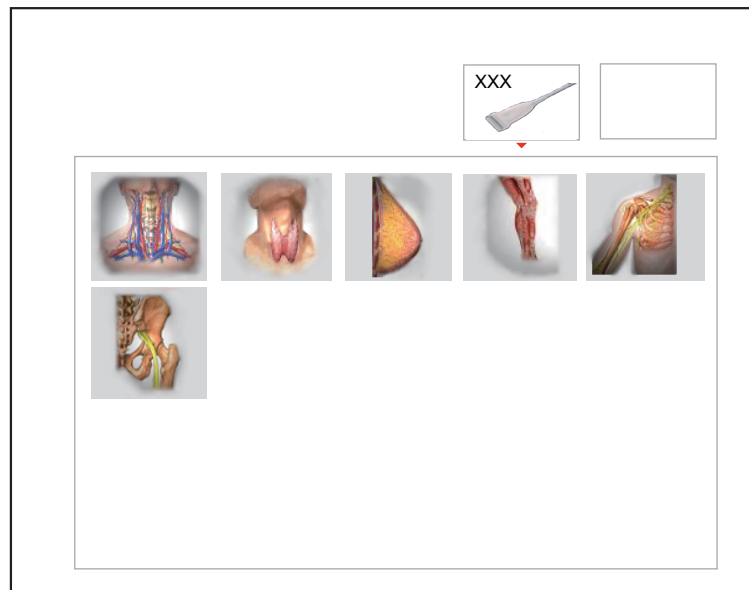
Figure 4-1 LCD Monitor

Select the **Menu** key on the control panel to enter the **System Setting** menu.

To make settings on the **System Setting** menu,

- Select one tab by using the trackball to enter a setting menu.
- Move the cursor to a textbox beside an item and use the key panel to type the value.
- Select an option from each drop-down list.
- Select **Save&Exit** to save any changes and exit the **System Setting** menu.
- Select **Exit** to exit the **System Setting** menu.

4.1 General System Settings

You can make general system settings on the **General**, **Display**, **Storage** and **KeyConfig** tabs.

4.1.1 General Settings

Figure 4-2 General Settings Menu - General Tab

Item	Description
Hospital Name	Enter the institution's name.
Freeze Response	Select the feature to be enabled after you select the ⏮ key.
Trackball Sensitivity	Adjust the sensitivity for the trackball movement. A greater value brings about a higher sensitivity.
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 ultrasound system.
Date/Time Setting	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 ultrasound system.
Time Format	Set the time format between 12 Hour and 24 Hour.
Monitor type	Set the video type.

Item	Description
Caps Lock	Enable or disable the capital letter feature. ● Set it to **On**, all the typed letters are capital. Pressing Shift + X can enter a lower-case letter. ● Set it to **Off**, all the typed letters are lowercase. Pressing Shift + X can enter a capital letter.
Clear Annot On Unfreeze	Enable or disable the annotation-cleared feature after you unfreeze the image in the annotation editing mode. ● Set it to **ON**, all annotations are cleared after you press the **Freeze** key in the annotation editing mode. ● Set it to **OFF**, all annotations are not cleared.
Guide Line Type	Select a type for the biopsy guidelines. ● Set it to **Gun**, one biopsy guideline is displayed when performing the biopsy. ● Set it to **Needle**, two parallel biopsy guidelines are displayed when performing the biopsy. These guidelines make up the guide zone within which is used to guide a safe biopsy.
Focal Auto	Enable or disable the auto-focus feature. ● Set it to **On**, the focal depth varies with the depth in the B mode. The focal depth varies with the ROI position in the CFM/PDI/TDI mode. ● Set it to **Off**, the system never adjusts the focal depth.

4.1.2 Display Settings
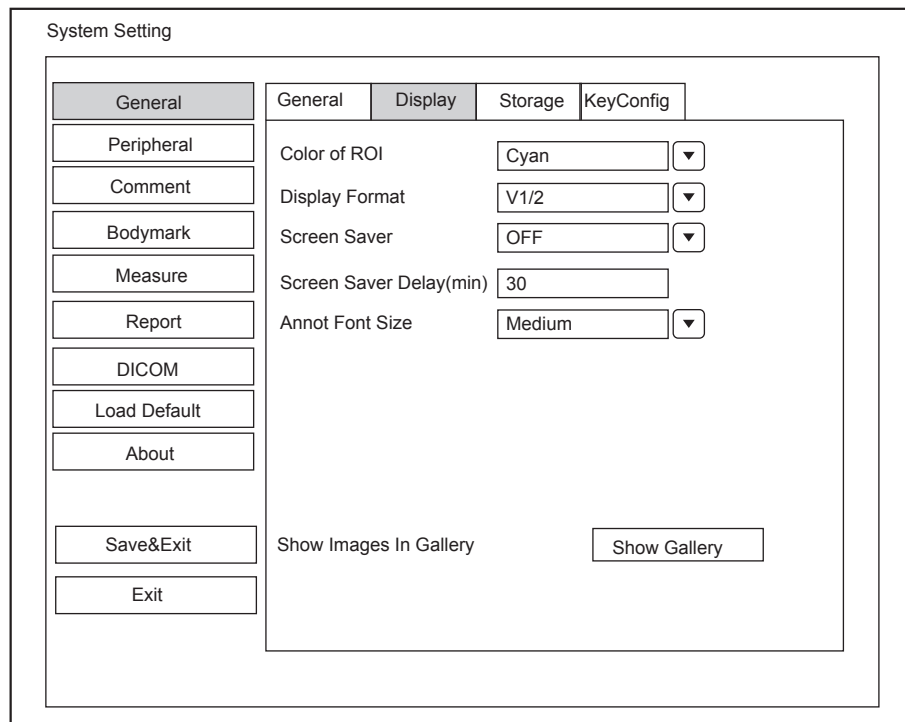
Figure 4-3 General Settings Menu - Display Tab

Item	Description
Color of 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 (min)	Set the period to activate the screen saver.
Annot Font Size	Set the font size of the annotations.
Show Images In Gallery	View images and cines coming with the system or imported from external storage devices.

■　　**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 4-4.
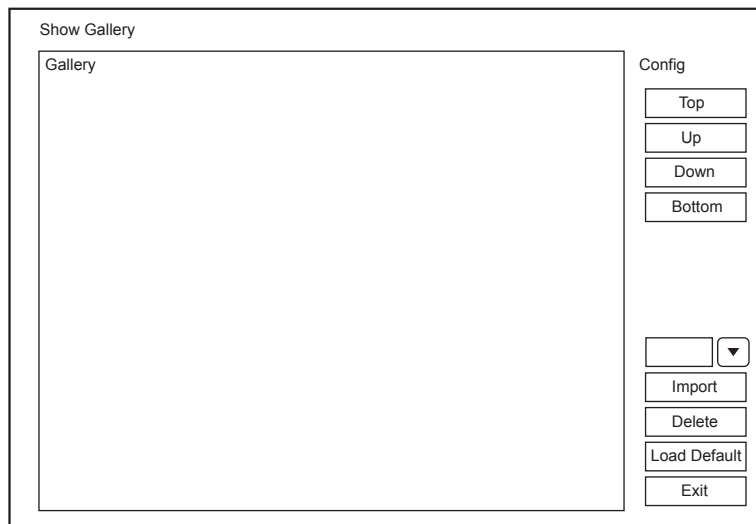
Figure 4-4 Show Gallery

2. Load default demos or import demos stored in an external storage device.

    − Select a demo and then click **Top**, **Up**, **Down** or **Bottom** to arrange the order.

    − Select a demo and then click **Delete** to remove it from the gallery.

3. Select a demo and press the confirm key on the control panel twice to start a demonstration.

    − Select the Up/Down/Left/Right arrow key to go to the previous or next demo.

    − Select the confirm key to pause or resume the demonstration.

    − Select the **Freeze** key to stop the demonstration.

4.1.3 Storage Settings
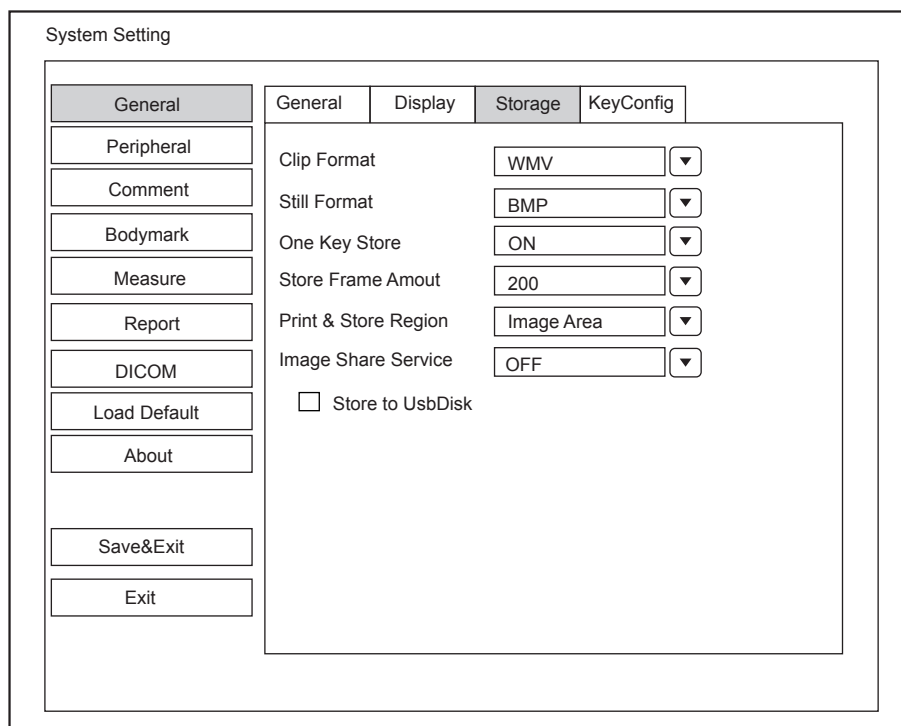
Figure 4-5 General Settings Menu - Storage Tab

Item	Description
Clip Format	Set the cine storage format.
Still Format	Set the image storage format.
One Key Store	Enable or disable the one key save function. • Set it to **ON**, the image or cine is saved automatically by selecting the **Save** key on the control panel in the frozen mode. • Set it to **OFF**, you need to manually save the image or cine in the frozen mode. Operation refers to Section 11.1 Storing an Image.
Store Frame Amount	Set the maximum number of frames for cine. The range is 100-1000 frames.
Print&Store Region	Set the area to be printed out.
Image Share Service	Enable or disable the share feature. • Set it to **ON**, you can remotely access to a computer for shared files. • Set it to **OFF**, you disable the feature.
Store To UsbDisk	Tick it, after you connect the USB drive to the ultrasound system, saved image are synchronously stored to the USB drive.

4.1.4 Defined-Key Settings
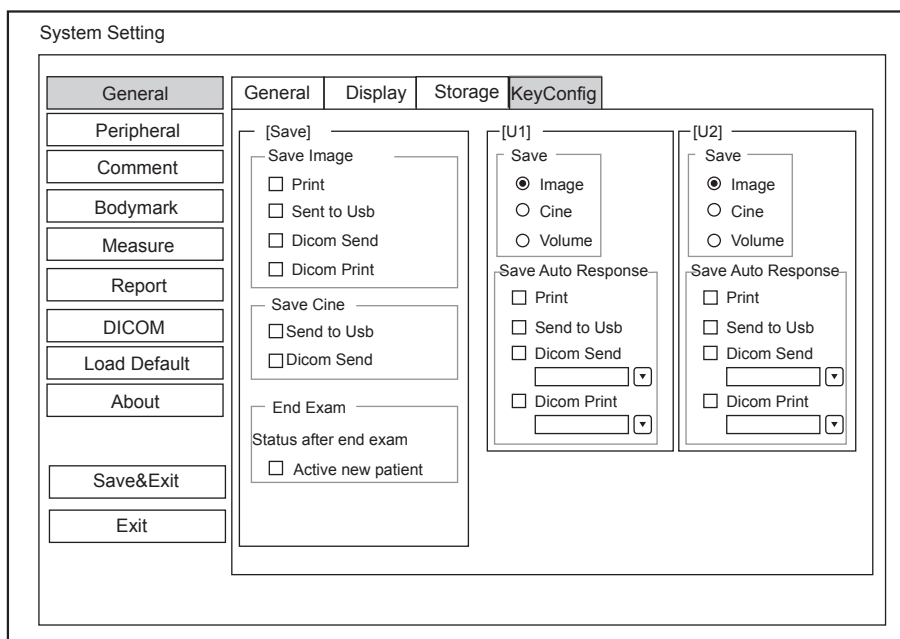
Figure 4-6 General Settings Menu - Key Configuration Tab

Item	Description
Image	Tick it and select the **U1** or **U2** key to save the desired image.
Cine	Tick it and select the **U1** or **U2** key to save the desired cine.
Volume	Tick it and select the **U1** or **U2** key to save the desired volume data.
Print	Tick it and select the **Save**, **U1** or **U2** key to save the desired image and print it out.
Send to USB	Tick it and select the **Save**, **U1** or **U2** key to save the desired data to the USB drive.
DICOM Send	Tick it and select the **Save**, **U1** or **U2** key to send the desired data to the DICOM storage server. You can select the specific DICOM storage server from the drop-down list when defining the **U1** or **U2** key.
DICOM Print	Tick it and select the **Save**, **U1** or **U2** key to send the desired image to the DICOM printer server. You can select the specific DICOM printer server from the drop-down list when defining the **U1** or **U2** key.
Activate new patient	Tick it and the **New Patient** screen will automatically appear after you end the exam by pressing the **End Exam** key.

4.2 Peripheral Device Settings

You can set the local network, wireless network and printer on this menu.

Figure 4-7 Peripheral Device Settings Menu

■   **Local Network**

Item	Description
Address Mode	Select an IP address mode.
IP Address	Set the IP address of the ultrasound system.
NetMask	Set the netmask address of the ultrasound system.
Default Gateway	Set the gateway address of the ultrasound system.
Speed/Duplex	Click **Advance**, **Speed** and **Duplex** textboxes is displayed on the menu. You can adjust the settings of these items to change the speed and communication mode of the local network. Click **Set** to save the settings, and then you can click **Search** to view your settings.
DICOM AE Title	Set the Application Entity (AE) title of the ultrasound system.
Mac Address	View the MAC address of the ultrasound system.
Ping IP Addr.	Type an IP address and click **Ping** to test the connection.

■   **Wireless Settings**

Item	Description
Wireless Network	Enable or disable access to wireless network.
Name	Displays the name of the wireless network.
State	Displays the connection status of the wireless network.
Level	Displays the signal strength of the wireless network.

Item	Description
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.

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

3. Input the password in the pop-up dialogue box if needed and click **OK**.

■   **Printer Settings**

Item	Description
Printer Driver	The default option is the most recently installed printer driver.
Video Invert	Color is inverted when printing the report.
Default Printer	Set the type of the default printer.
Net Printer IP	Set an IP address of the network printer.
Add Printer	Click the button and follow the on-screen instructions to install a printer driver.

4.3   Defining Annotation Library

You can add, modify, delete or arrange the predefined annotation on this menu.
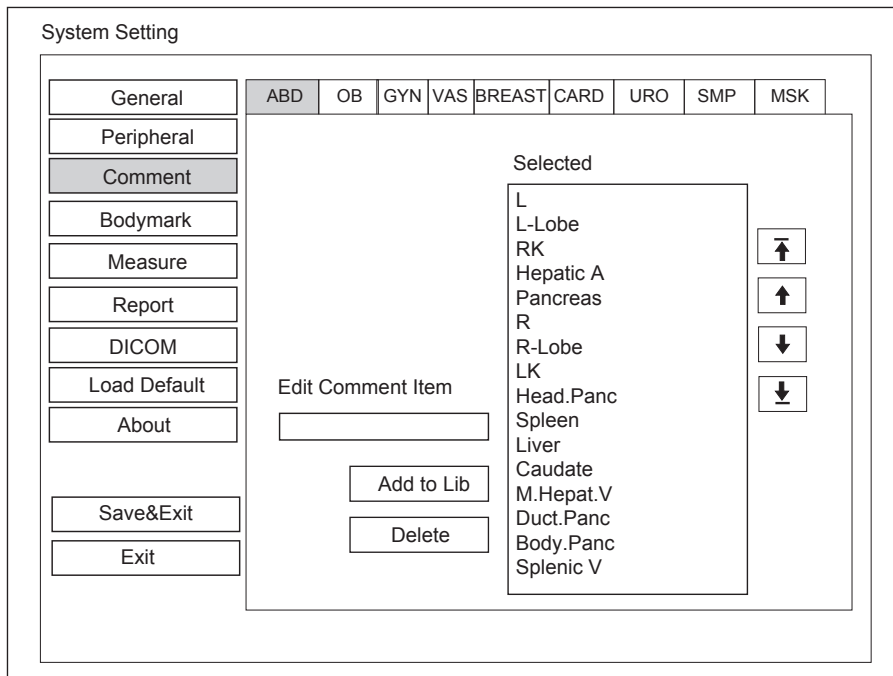
Figure 4-8 Annotation Settings Menu

●   Enter an annotation in the **Edit Comment Item** textbox, and then click **Add to Lib** to create a new annotation in the library.

●   Click on an annotation in the Selected list, and then click **Delete** to delete it from the library.

●   Click on an annotation in the Selected list, and then click ⬆, ⬇, ⤒ or ⤓ to arrange its display.

4.4   Body Mark Settings
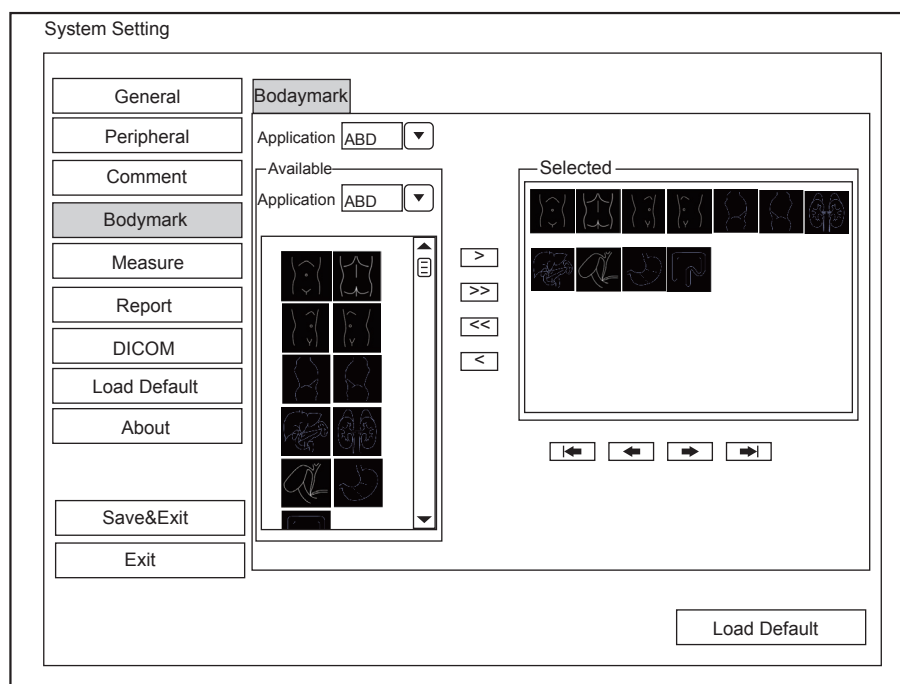
Figure 4-9 Body Mark Settings Menu

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 **Available**.

3. Add desired body marks in the selected 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 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 body marks from the **Selected** list.

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

4.5   Measurement Settings

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

4.5.1　General Measurement Settings
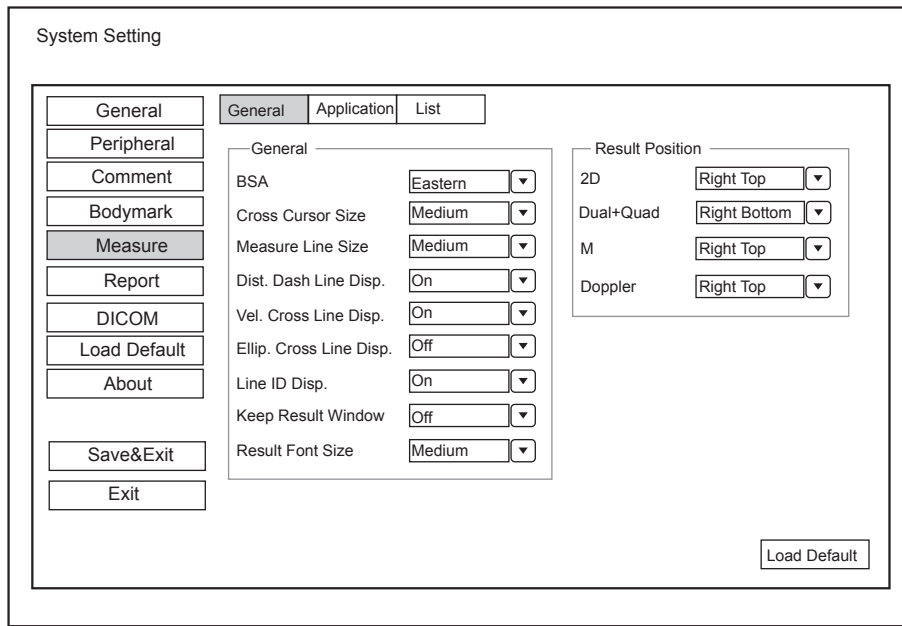
Figure 4-10 Measurement Settings Menu - General Tab

■　**General Measurement Items**

Item	Description
BSA	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 Disp.	Enable or disable the display of a dash line between two points when performing a distance measurement.
Vel. Cross Line Disp.	Enable or disable the display of a reticle between two points when performing a velocity measurement.
Ellip. Cross Line Disp.	Enable or disable the display of dash lines for long and short axes when performing an ellipse measurement.
Line ID Disp.	Enable or disable the display of line number when performing the 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 Position**

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

4.5.2   Application Settings

Figure 4-11 Measurement Settings Menu - Application Tab

■   **Auto/Man Trace**

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

■   **Small Parts Measurement Settings**

Select **SMP** from the drop-down list beside **Application** and set the coefficient of the thyroid volume formula.

■   **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 making these settings, you can perform the Obstetrics, Gynecology or Cardiology measurement by using the defined shortcut key.

■   **Measurement Settings**

Set the formula for obstetrics measurement.

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 is displayed on the measurement report.
Unit	Set the weight unit.
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 Setting**

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

Perform the following steps as follows:

1. Click **New Table** to bring up the **New Table** dialogue box.

2. Select **New GA Table** or **New Growth Table** and click the **OK** button. The screen shown in Figure 4-12 or Figure 4-13 pops up.

Figure 4-12 GA Table

Figure 4-13 Growth Table

3. Select or input the **Measurement**, **Author**, **Deviation** and the corresponding **Unit**.

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

5. Click **Save&Exit** to save the customized formula and exit.

4.5.3   List Settings
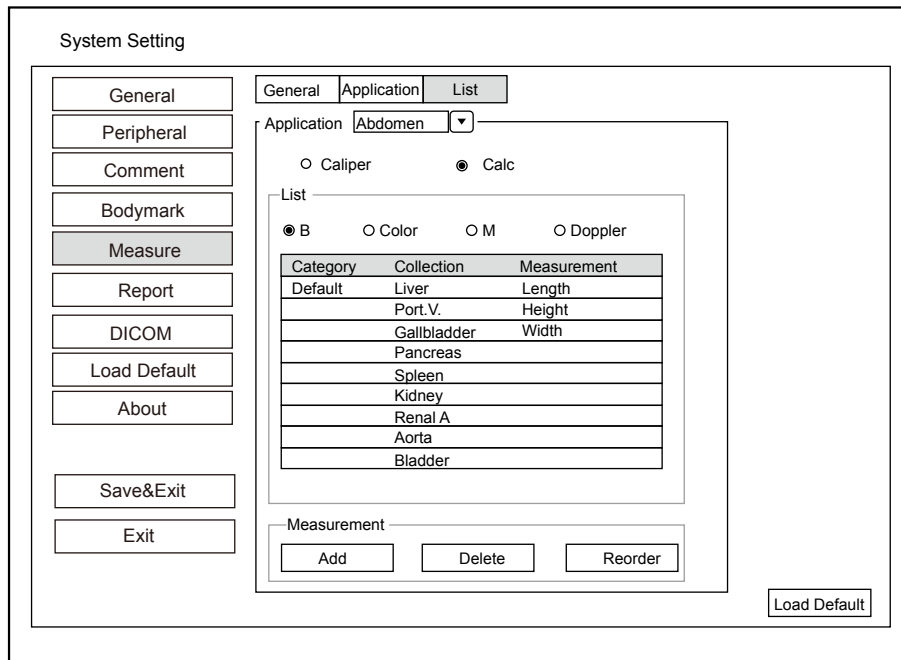
Figure 4-14 Measurement Settings Menu - List Tab

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 as follows:

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

2. Select **Distance** or **Calc**.

3. Select an imaging mode in the **List** frame and click **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 as follows:

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

2. Select **Distance** or **Calc**.

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

4. Click **Delete**.

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

Perform the following steps as follows:

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

2. Select **Distance** 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.

4.6   Report Settings

Figure 4-15 Report Settings Menu

Item	Description
Logo	Connect the USB drive containing the report logo (170×60 pixels, bmp format) to the ultrasound system. **Operation LOGO** is highlighted after the USB drive is successfully detected by the ultrasound system. Click **Operation LOGO**, 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.
Title1/2/3	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.
Context	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 **Measurements**, **Image**, **Graphs** or **Comments**.

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

4.7   Configuring DICOM

4.7.1   Storage Service Settings

You can connect the ultrasound system to the DICOM storage server and adjust the relevant settings on the Store Service tab.

Figure 4-16 DICOM Settings Menu - Storage Service Tab

Item	Description
Service List	• Select **Append** from the drop-down list beside **Service List**, input the relevant parameters information and click **Add** to add a new server. • Select any server from the drop-down list and click **Delete** to delete the server.
Remote HostName	Enter the name of the DICOM storage server.
IP Address	Set the IP address of the DICOM storage server. Click **Ping** to test the connection.
DICOM AE Title	Set the Application Entity (AE) title of the DICOM storage server.
Port Number	Set the port number of the DICOM storage server.
Connect Timeout(sec)	Set the time limit for the network connection timeout.
Repeat Count	Set the number of repeated attempts for connecting to the DICOM storage server.
Dimse Timeout(sec)	Set the timeout time for sending the Dimse command.
Acse Timeout(sec)	Set the timeout time for sending the Acse command.

Item	Description
Relate to CommitStore	Select the desired DICOM commitment storage server to be associated with the DICOM storage server.
Send After Every Image Stored	Tick this item and the system sends an image to the DICOM storage server every time the image is saved.
Send At End of Exam	Tick this item and the system sends all saved images to the DICOM storage server after the exam is complete.

Click Echo to verify the connection between the ultrasound system and the DICOM storage server after you input the settings for the **Remote HostName**, **IP address**, **DICOM AE Title**, **Port Number**. A summary displays if the connection is verified.

4.7.2 Commitment Settings

You can connect the ultrasound system to the DICOM commitment storage server and adjust the relevant settings on the Commitment Storage tab.

Figure 4-17 DICOM Settings Menu - Commitment Storage Tab

Item	Description
Service List	- Select **Append** from the drop-down list beside **Service List**, input the relevant parameters information and click **Add** to add a new server. - Select any server from the drop-down list and click **Delete** to delete the server.
Remote HostName	Enter the name of the DICOM commitment storage server.
IP Address	Set the IP address of the DICOM commitment storage server. Click **Ping** to test the connection.

Item	Description
DICOM AE Title	Set the Application Entity (AE) title of the DICOM commitment storage server.
Port Number	Set the port number of the DICOM commitment storage server.
Connect Timeout(sec)	Set the time limit for the network connection timeout.
Repeat Count	Set the number of repeated attempts for connecting to the DICOM commitment storage server.
Dimse Timeout(sec)	Set the timeout time for sending the Dimse command.
Acse Timeout(sec)	Set the timeout time for sending the Acse command.
Synchronously Receive N-EVENT-REPORT Message	Tick this item and the system receives the N-EVENT-REPORT messages synchronously with the storage server.

Click **Echo** to verify the connection between the ultrasound system and the DICOM commitment storage server after you input the settings for the **Remote HostName**, **IP address**, **DICOM AE Title**, **Port Number**. A summary displays if the connection is verified.

4.7.3   DICOM Worklist Settings

You can connect the ultrasound system to the DICOM worklist server and make the relevant settings on the Worklist tab.
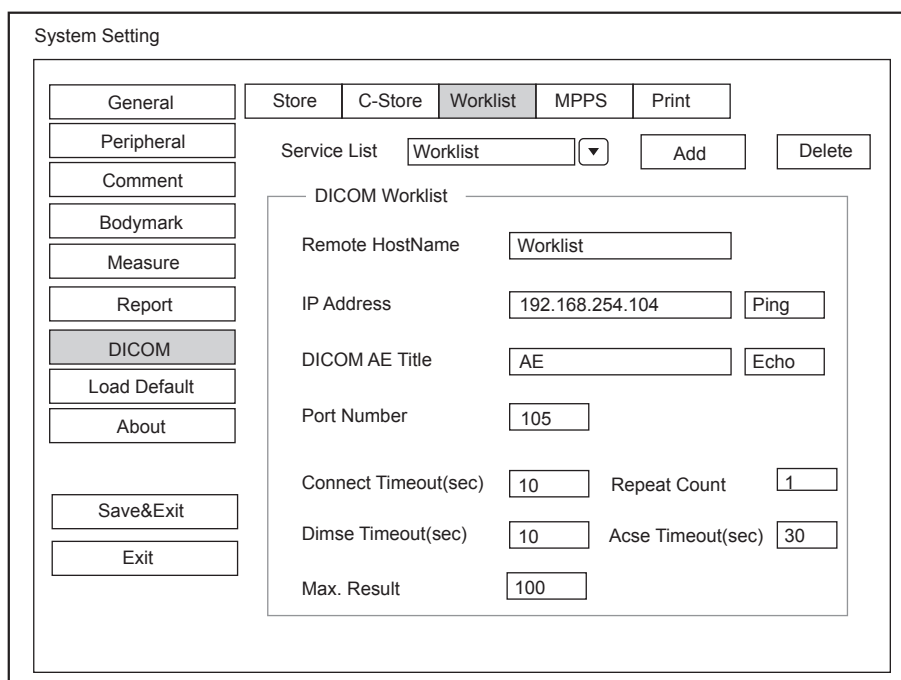
Figure 4-18 DICOM Settings Menu - Worklist Tab

Item	Description
Service List	● Select **Append** from the drop-down list beside **Service List**, input the relevant parameters information and click **Add** to add a new server. ● Select any server from the drop-down list and click **Delete** to delete the server.

Item	Description
Remote HostName	Enter the name of the DICOM worklist server.
IP Address	Set the IP address of the DICOM worklist server. Click **Ping** to test the connection.
DICOM AE Title	Set the Application Entity (AE) title of the DICOM worklist server.
Port Number	Set the port number of the DICOM worklist server.
Connect Timeout(sec)	Set the time limit for the network connection timeout.
Repeat Count	Set the number of repeated attempts for connecting to the DICOM worklist server.
Dimse Timeout(sec)	Set the timeout time for sending the Dimse command.
Acse Timeout(sec)	Set the timeout time for sending the Acse command.
Max. Result	Set the maximum number of patient records that can be sent to the ultrasound system.

Click **Echo** to verify the connection between the ultrasound system and the DICOM worklist after you input the settings for the **Remote HostName**, **IP address**, **DICOM AE Title**, **Port Number**. A summary displays if the connection is verified.

4.7.4   MPPS Settings

You can connect the ultrasound system to the MPPS server and adjust the relevant settings on the MPPS tab.

Figure 4-19 DICOM Settings Menu - MPPS Tab

Item	Description
Service List	• Select **Append** from the drop-down list beside **Service List**, input the relevant parameters information and click **Add** to add a new server. • Select any server from the drop-down list and click **Delete** to delete the server.
Remote HostName	Enter the name of the MPPS server.
IP Address	Set the IP address of the MPPS server. Click **Ping** to test the connection.
DICOM AE Title	Set the Application Entity (AE) title of the MPPS server.
Port Number	Set the port number of the MPPS server.
Connect Timeout(sec)	Set the time limit for the network connection timeout.
Repeat Count	Set the number of repeated attempts for connecting to the MPPS server.
Dimse Timeout(sec)	Set the timeout time for sending the Dimse command.
Acse Timeout(sec)	Set the timeout time for sending the Acse command.

Click **Echo** to verify the connection between the ultrasound system and the MPPS server after you input the settings for the **Remote HostName**, **IP address**, **DICOM AE Title**, **Port Number**. A summary displays if the connection is verified.

4.7.5 Print Service Settings

You can connect the ultrasound system to the print service server and adjust the relevant settings on the Print Service tab.

Figure 4-20 DICOM Settings Menu - Print Service Tab

Item	Description
Service List	● Select **Append** from the drop-down list beside **Service List**, input the relevant parameters information and click **Add** to add a new server. ● Select any server from the drop-down list and click **Delete** to delete the server.
Remote HostName	Enter the name of the DICOM print server.
IP Address	Set the IP address of the DICOM print server. After the setting, click **Ping** to test the connection.
DICOM AE Title	Set the Application Entity (AE) title of the DICOM print server.
Port Number	Set the port number of the DICOM print server.
Format	Set the print format.
Trim	Set to 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.

Item	Description
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 the print.
Configure 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.

Click **Echo** to verify the connection between the ultrasound system and the DICOM print server after you input the settings for the **Remote HostName**, **IP address**, **DICOM AE Title**, **Port Number**. A summary displays if the connection is verified.

4.8   Defining System Defaults

You can define your system defaults on the Load Defaults menu.
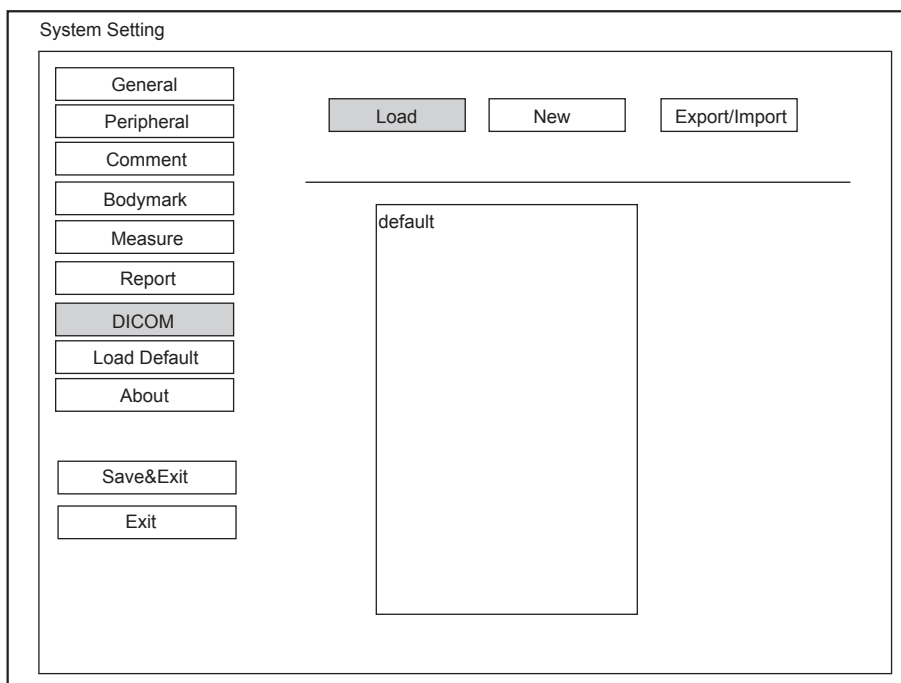
Figure 4-21 Load Defaults Menu

■　**To load system defaults**

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

2. Type **Y** on the control panel to confirm and begin loading;

   Type **N** to cancel loading.
   Select **Delete** on the control panel to delete the system defaults.

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

■　**To create system defaults**

Click **New**, enter a setting name in the text box. The created setting name will be listed on the Loading Defaults Menu.

■　**To export or import system defaults**

Click **Export/Import** to enter the following menu, as shown in Figure 4-22.

```
┌──────────────────────────────────────────────────────────────┐
│  System Setting                                                │
│  ┌────────────────────────────────────────────────────────┐    │
│  │   ┌──────────────┐                                       │    │
│  │   │   General     │    ┌────────┐  ┌────────┐  ┌──────────┐│    │
│  │   ├──────────────┤    │  Load  │  │  New   │  │Export/Import││   │
│  │   │  Peripheral   │    └────────┘  └────────┘  └──────────┘│    │
│  │   ├──────────────┤                                         │    │
│  │   │   Comment     │     Make sure USB drive in the USB slot│    │
│  │   ├──────────────┤                                         │    │
│  │   │  Bodymark     │     ┌──────────────┐ ┌─┐               │    │
│  │   ├──────────────┤     └──────────────┘ └▼┘               │    │
│  │   │   Measure     │                                        │    │
│  │   ├──────────────┤     ┌──────────────────────┐           │    │
│  │   │    Report     │     │ Copy user setting to USB │         │    │
│  │   ├──────────────┤     └──────────────────────┘           │    │
│  │   │    DICOM      │     ┌──────────────────────┐           │    │
│  │   ├──────────────┤     │ Copy user preset to USB │          │    │
│  │   │ Load Default  │     └──────────────────────┘           │    │
│  │   ├──────────────┤     ┌──────────────────────────┐       │    │
│  │   │    About      │     │ Load USB user setting to system │   │    │
│  │   └──────────────┘     └──────────────────────────┘       │    │
│  │                        ┌──────────────────────────┐       │    │
│  │   ┌──────────────┐     │ Load USB user preset to system │    │    │
│  │   │  Save&Exit    │     └──────────────────────────┘       │    │
│  │   ├──────────────┤     ┌──────────────┐                    │    │
│  │   │    Exit       │     │  Export Log   │                    │    │
│  │   └──────────────┘     └──────────────┘                    │    │
│  │                        Caution: Copy USB to hard drive will replace all user setting│
│  │                        in the sytem including patient database, Please use it wisely │
│  └────────────────────────────────────────────────────────┘    │
└──────────────────────────────────────────────────────────────┘
```

Figure 4-22 Export/Import Menu

Ensure the USB drive is connected to the ultrasound system before exporting or importing the system defaults.

● Click **Copy user setting to USB** to back up the system defaults to the USB drive.

● Click **Copy user preset to USB** to back up the customized system defaults to the USB drive.

● Click **Load USB user setting to system** to copy the system settings to the ultrasound system.

● Click **Load USB user preset to system** to copy the customized system to the ultrasound system.

● Click **Export Log** to export the log to the USB drive.

4.9　Viewing System Information

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

4.9.1　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 number for the system.

4.9.2 Acoustic Output

You can view the acoustic output data of probes in different modes on the **Acoustic Output** tab.
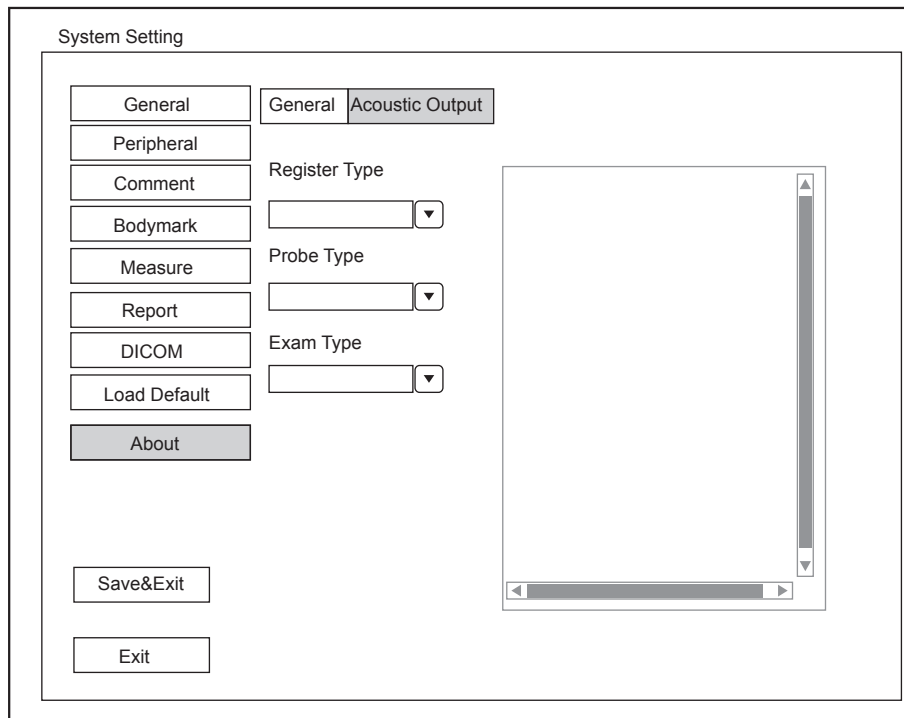
Figure 4-23 About Menu - Acoustic Output Tab

5 Preparing for an Exam

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

5.1 Acquiring Patient Information

You can acquire the patient information in the following ways:

- Create new patient information
- Retrieve archived patient information
- Receive patient information using the DICOM worklist

5.1.1 Beginning a New Patient

Select the **Patient** key on the control panel to display the **New Patient** screen in Figure 5-1.

Figure 5-1 New Patient Screen

NOTE:

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

Perform the following steps to begin a new patient.

1. Enter relevant patient information.

Patient ID	Enter the patient ID, special characters are prohibited to be entered.
	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** 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. Select the exam type.

Exam type	Select an exam type for the current patient, including Abdomen, Obstetrics, Gynecology, Cardiology, Vascular, Urology, Small Parts, Pediatrics, Musculoskeletal, Neurology, Orthopedics and others.
Description	Enter the information related to the exam type.
Primary Indications	Enter the related information.
Secondary Indications	Enter the related information.

NOTE:

-   You must enter the height and weight for the current patient when you select Cardiology as the exam type. **BSA** will be automatically calculated in accordance with the **BSA** set on the **Measure** menu.
-   You must enter **LMP** or **EDD** for the current patient when you select Obstetrics as the exam type. **AUA** will be automatically calculated.

3. Enter the related operating information.

Refering.M.D/Performing.M.D/ Sonographer	Enter the name.
Comment	Enter the notice or necessary information.

4. Click **OK** to save the modifications.

    If the last patient exam is not completed, the system will remind you to complete or discontinue the exam. For details, refer to Section 5.3.2 Discontinuing an Exam.

5.1.2   Retrieving Archived Information

You can retrieve the archived information by choosing the **Patient** key > **Patient List** > **Exam Review**.

Figure 5-2 Exam Review Screen

Perform the following steps to retrieve information.

1. Search for the archived information

    Enter the search requirements, such as Patient ID, First/Last Name, Sex, Exam Date/Time or Age, and then click **Search** to search for the desired information.

Figure 5-3 Patient Review Screen

2. Select the desired information

   Move the cursor to the desired information, and select 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 ultrasound system is configured with the DICOM module. For details, refer to Section 12.4 DICOM Worklist.

5.2 Pausing/Resuming an Exam

■ **To pause an exam**

Select the **Patient** key on the control panel to enter the **New Patient** screen, and then click on **Suspend Exam** to pause the exam.

■ **To resume an exam**

1. Select the **Patient** key on the control panel to enter the **New Patient** screen, and then click **Patient List** > **Patient Review** to enter the **Patient Review** screen.

2. Select the desired patient information, and then click on **View** to enter the **Exam Review** screen.

3. Select the desired exam, and then click on **Resume Exam** to resume the exam.

5.3 Completing/Discontinuing an Exam

5.3.1 Completing an Exam

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

   A dialogue box pops up as follows:

Do you wish to end the current exam?

| OK | | Cancel |

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

5.3.2   Discontinuing an Exam

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

2. Click **New Patient** to enter the **New Patient** screen. Input the new patient information and click **OK**.

    A dialogue box pops up as follows:

PPS

☐ Assisted Acquisition Protocol Setting

Code

Meaning

Designator

Reason Doctor cancelled procedure ▼

| Completed | | Discontinued |

If you tick the **Assisted Acquisition Protocol Setting**, you can send the latest patient information to MPPS after entering the relevant information to code, meaning and designator.

3. Select the reason from the corresponding drop-down list, and then click **Discontinued**.

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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 ultrasound system is started up, the LCD monitor displays the available probes and the exam types (as shown in Figure 6-1). You can select the desired probe by using the trackball. You can also select the **Exam** key to enter the application mode screen from other screens.

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.
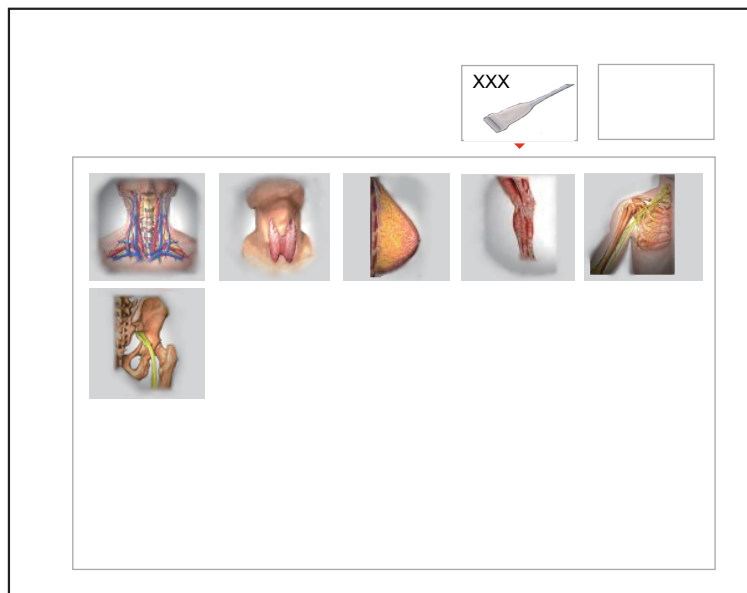
Figure 6-1 Application Mode Screen

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.

■   **To customize 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. Select the **S** key on the key panel to display the following dialogue box.

```
Going to
User Pre-Set Menu
Are you sure(Y/N)?
```

4. Select the **Y** key to enter the **User preset** screen, as shown in Figure 6-2.

Figure 6-2 User Preset Menu

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

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

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

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

■   **To arrange the presets display**

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

NOTE:

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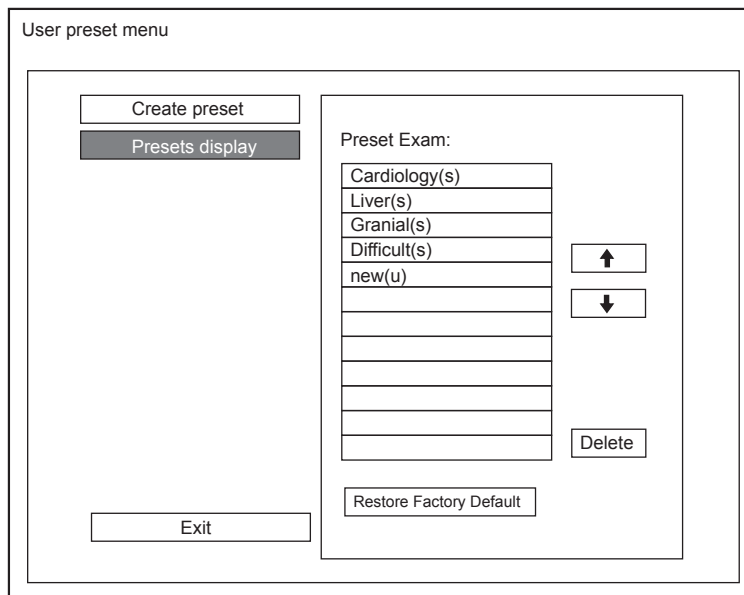
Figure 6-3 Preset Display Screen

- Click one desired application preset, click ↑ or ↓ to arrange the preset on the application mode screen.
- Click one desired application, click **Delete** > **Yes** to delete the application preset.
- Click **Restore Factory Default** > **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 select the **B** key on the control panel to enter B mode from other imaging modes.

The basic screen in the B mode is displayed as follows.
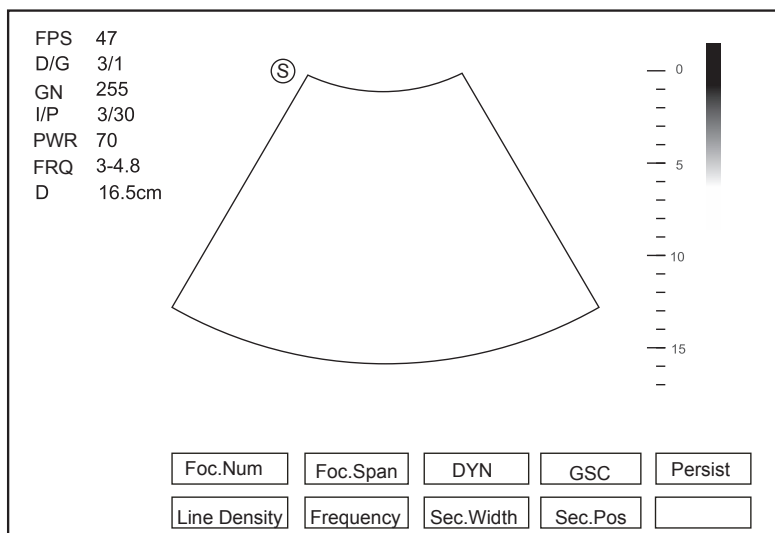
Figure 6-4 B-Mode Imaging Screen

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

6.2.2 Optimizing B-Mode Images

After entering the B mode, the imaging parameters display at the bottom of the LCD monitor as shown in Figure 6-4, you can use them to optimize B-mode images.

You can adjust other parameters and select display modes on the pop-up menu by selecting the **Menu** key.

NOTE:
You can adjust all parameters in the real time B mode, but can only adjust **Chroma** and **GSC** in the frozen B mode.

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

■ **TGC**

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

TGC balances the image so that the density of echoes is the same throughout the image.

To adjust TGC:

- Move the desired TGC slider left to decrease the value.
- Move the desired TGC slider right to 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 brightness on the left or right part of the ultrasound image.

To adjust LGC:

1. Select the **Menu** key in the real time scan. A menu pops up on the screen.

2. Select **LGC Left** or **LGC Right** by using the trackball or the ↑ or ↓ key.

3. Rotate the **Menu** key or select the ← or → key to adjust the value.

■ **Focal Position/Number/Span**

It is used to adjust the depth range of the ultrasound beam, the focus number and the focal span. 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:

- Flip the **FOCUS** switch to adjust the depth of focal zone(s).
- Select **Foc.Num** by pressing the corresponding function key, and rotate it to adjust the value.
- If two or more focuses are displayed, select **Foc.Span** by pressing the corresponding function key, and rotate it to adjust the value.

■ **Depth**

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

To adjust the depth:

● Flip the **DEPTH** switch upwards to decrease the depth range of the 2D image and the size of image is magnified.

● Flip the **DEPTH** switch downwards to increase the depth range of the 2D image and the ultrasound image is reduced.

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.

■ **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:

1. Select **Frequency** by pressing the corresponding function key.

2. Rotate it clockwise or anticlockwise to adjust the value.

■ **Chroma**

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

To adjust the chroma:

1. Select the **Menu** key in the real time scan. A menu pops up on the screen.

2. Select **Chroma** by using the trackball or the ↑ or ↓ key.

3. Rotate the **Menu** key or select the ← or → key to choose a color scheme.

■ **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:

1. Select the **Menu** key in the real time scan. A menu pops up on the screen.

2. Select **Compound** by using the trackball or the ↑ or ↓ key.

3. Rotate the **Menu** key or select the ← or → key to enable or disable the feature.

■ **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, adult cardiac applications and in clinical Radiology applications.

To adjust the line density:

1. Select **Line Density** by pressing the corresponding function key.

2. Rotate it to make the setting.

■ **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:

1. Select **Persist** by pressing the corresponding function key.

2. Rotate it to adjust 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:

1. Select **DYN** by pressing the corresponding function key.

2. Rotate it to adjust the value.

■ **Grayscale Curve**

Grayscale curve optimizes the brightness of each pixel in accordance with the corresponding echo. To adjust the grayscale curve:

1. Select **GSC** by pressing the corresponding function key.

2. Rotate it to adjust 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:

1. Select the **Menu** key in the real time scan. A menu pops up on the screen.

2. Select **Adapt.Fusion** by using the trackball or the ↑ or ↓ key.

3. Rotate the **Menu** key or select the ← or → key to increase or decrease the value.

■ **Sector Position/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 position/width/angle:

● Select **Sec.Pos** by pressing the corresponding function key and rotate it to horizontally move or rotate the interest area.

● Select **Sec.Width** by pressing the corresponding function key and rotate it to increase or decrease the width or angle of the interest area.

■ **Power**

Power is used to select the amount of ultrasound acoustic power produced by the probe in the B mode. 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:

1. Select the **Menu** key in the real time scan. A menu pops up on the screen.

2. Select **Power%** by using the trackball or the ↑ or ↓ key.

3. Rotate the **Menu** key or select the ← or → key 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 Characteristics**

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:

1. Select the **Menu** key in the real time scan. A menu pops up on the screen.

2. Select **Tissue Acou** by using the trackball or the ↑ or ↓ key.

3. Rotate the **Menu** key or select the ← or → key to increase or decrease the value.

■ **Image Rotation**

You can rotate the image to get more information. This item is applicable in transvaginal and transrectum scan.

To rotate the image:

1. Select the **Menu** key in the real time scan. A menu pops up on the screen.

2. Select **Image Rotate** by using the trackball or the ↑ or ↓ key.

3. Rotate the **Menu** key or select the ← or → key to increase or decrease the rotation angle.

NOTE:

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

■ **µScan**

µScan is used to improve the image quality.

To use µScan:

1. Select the **Menu** key in the real time scan. A menu pops up on the screen.

2. Select **µScan** by using the trackball or the ↑ or ↓ key.

3. Rotate the **Menu** key or select the ← or → key to increase or decrease the value.

   NOTE:

   Ensure the dongle is inserted before you enable the µScan feature.

■ **Trapezoidal Imaging**

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

To use trapezoidal imaging:

1. Select the **Menu** key in the real time scan. A menu pops up on the screen.

2. Select **Trapezoid** by using the trackball or the ↑ or ↓ key.

3. Rotate the **Menu** key or select the ← or → key to enable 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:

Flip the **STEER** switch to change the direction of the acoustic beam.

NOTE:

Only linear probes are capable of adjusting steer.

6.3 Acquiring Color Flow Images

Color Flow imaging 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 C Mode

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

Perform the following steps to acquire C-mode images.

1. Optimize a B-mode image.

2. Select the **C** key on the control panel to enter the C mode.
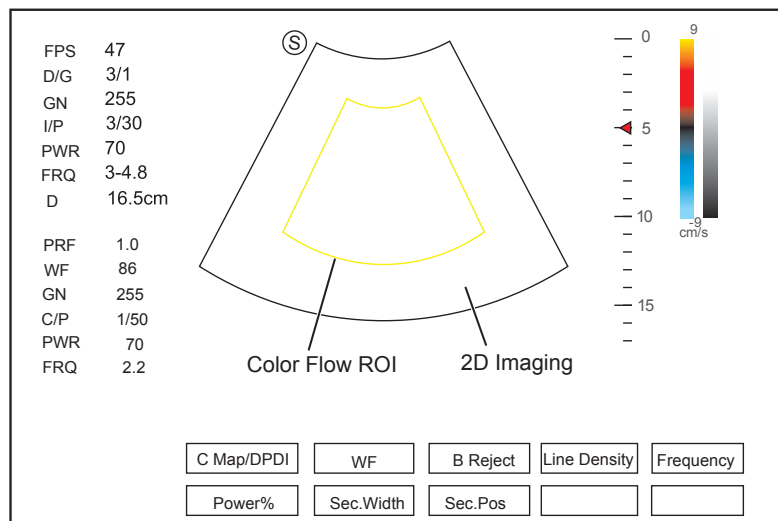
Figure 6-5 C-Mode Imaging Screen

3. Adjust color flow ROI.

    − Move the trackball to position color flow ROI.

    − Select the **Set** key to adjust the size of color flow ROI.

    − Select the **Set** key to reposition color flow ROI.

4. Optimize the C-mode image. For details, refer to Section 6.3.4 Optimizing C/PDI/TDI Mode Images.

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

6.3.2 PDI Mode

PDI (Power Doppler Imaging) is a color flow imaging technology which adds the flow signal in the C-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. Select the **DPI** key on the control panel to enter the PDI Mode.
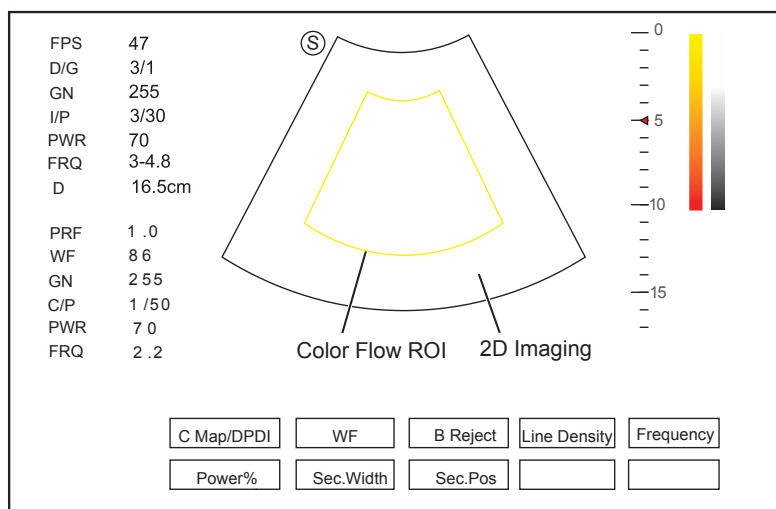
Figure 6-6 PDI-Mode Imaging Screen

3. Adjust color flow ROI.

    − Move the trackball to position color flow ROI.

    − Select the **Set** key to adjust the size of color flow ROI.

    − Select the **Set** key to reposition color flow ROI.

4. Optimize the PDI-mode image. For details, refer to Section 6.3.4 Optimizing C/PDI/TDI Mode Images.

5. Select the **DPI** key again to exit the screen.

6.3.3   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. Select the **TDI** key on the control panel to enter the TDI mode.

FPS   47
D/G   3/1
GN   255
I/P   3/30
PWR   70
FRQ   3-4.8
D   16.5cm

PRF   1.0
WF   8 6
GN   2 55
C/P   1 /5 0
PWR   7 0
FRQ   2 .2

S

0

9

5

10

15

−9
cm/s

Color Flow ROI   2D Imaging

| C Map/DPDI | WF | B Reject | Line Density | Frequency |
| Power% | Sec.Width | Sec.Pos | | |

Figure 6-7 TDI-Mode Imaging Screen

3. Adjust color flow ROI.

   − Move the trackball to position color flow ROI.

   − Select the **Set** key to adjust the size of color flow ROI.

   − Select the **Set** key to reposition color flow ROI.

4. Optimize the TDI-mode image. For details, refer to Section 6.3.4 Optimizing C/PDI/TDI Mode Images.

5. Select the **TDI** key again to exit the screen.

6.3.4   Optimizing C/PDI/TDI Mode Images

After entering the C/PDI/TDI-mode, the imaging parameters display at the bottom of the LCD monitor as shown in Figure 6-6, you can use them to optimize C/PDI/TDI-mode images.

You can adjust other parameters and display modes on the pop-up menu by selecting the **Menu** key.

NOTE:

You can adjust all parameters in the real time C/PDI/TDI mode, but can only adjust **Baseline**, **C Map** and **B Reject** in the frozen C/PDI/TDI mode.

■   **Gain**

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

To adjust the gain:

● Rotate the **C** knob clockwise to increase the gain value in the C/PDI/TDI mode.

● Rotate the **C** knob anticlockwise to decrease the gain value in the C/PDI/TDI mode.

■   **Frequency**

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

To adjust the frequency:

1. Select **Frequency** by pressing the corresponding function key.

2. Rotate it to adjust the value.

■   **Wall Filter**

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

To adjust the wall filter:

1. Select **WF** by pressing the corresponding function key.

2. Rotate it to adjust the value.

■ **Pulse Repetition Frequency**

Pulse repetition frequency is used to adjust the velocity scale.

To adjust the pulse repetition frequency:

- Flip the **PRF** switch upwards to increase the value.
- Flip the **PRF** switch downwards to decrease 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 line density:

1. Select **Line Density** by pressing the corresponding function key.

2. Rotate it to adjust 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.

To adjust the baseline:

1. Select the **Menu** key in the real time scan. A menu pops up on the screen.

2. Select **Baseline** by using the trackball or the ↑ or ↓ key.

3. Rotate the **Menu** key or select the ← or → key to move the baseline towards the positive or negative direction.

You can also flip the **BASELINE** switch on the control panel upward or downward to adjust the baseline position.

■ **Color Map**

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

To change the color map:

1. Select **C Map/DPDI** by pressing the corresponding function key.

2. Rotate it to adjust the setting.

NOTE:
When **C Map/DPDI** is set to **4** or above in the PDI mode, the system automatically enters the DPDI mode with a **DPDI** icon. 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 smoother appearance.

To adjust the persistence:

1. Select the **Menu** key in the real time scan. A menu pops up on the screen.

2. Select **Persist** by using the trackball or the ↑ or ↓ key.

3. Rotate the **Menu** key or select the ← or → key to increase or decrease the value.

■   **Sector Position/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 position/width/angle:

●   Select **Sec.Pos** by pressing the corresponding function key and rotate it to horizontally move or rotate the interest area.

●   Select **Sec.Width** by pressing the corresponding function key and rotate it to adjust the width or angle of the interest area.

■   **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:

1. Select **Power%** by pressing the corresponding function key.

2. Rotate it to adjust the value.

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

■   **B Reject**

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

To adjust B Reject:

1. Select **B Reject** by pressing the corresponding function key.

2. Rotate it to adjust the value.

■   **Steer**

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

To adjust the steer:

●   Flip the **STEER** switch left to rotate the ROI clockwise.

●   Flip the **STEER** switch right to rotate the ROI anticlockwise.

NOTE:
Only linear probes are capable of adjusting steer.

■   **Flow Invert**

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

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

When **Flow 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:

Select **Invert** to enable or disable the feature.

NOTE:

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

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. Select the **M** key on the control panel to enter the inactivated B+M mode.
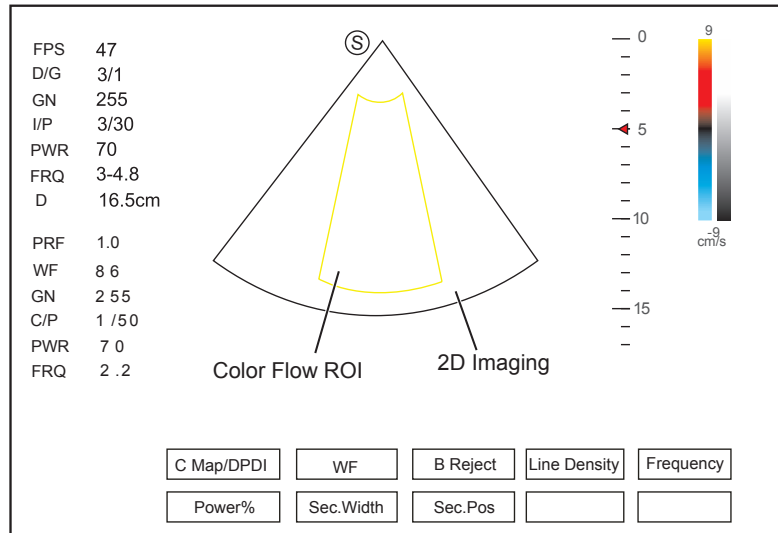

Figure 6-8 Inactivated B+M-Mode Imaging Screen

3. Adjust the M line by using the trackball.

4. Select the **Update** key 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 6-9.
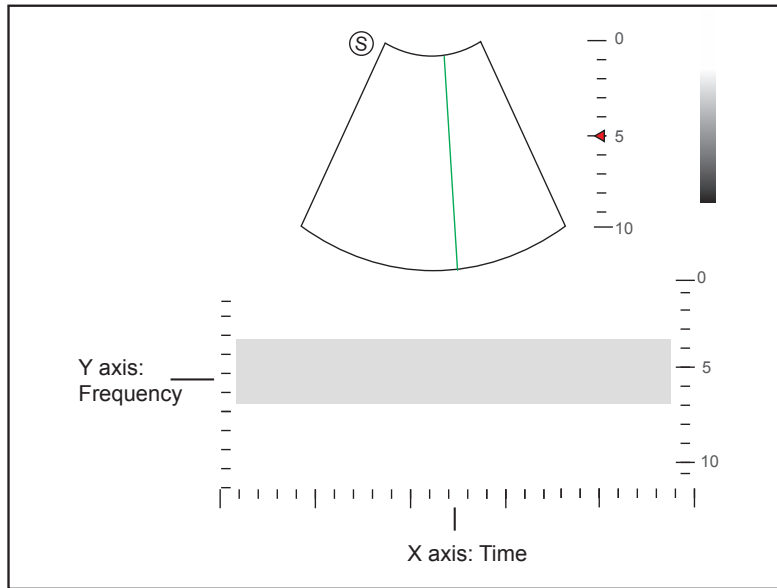
Figure 6-9 M-Mode Imaging Screen

− 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. Select the **M** key to exit.

6.4.2   Anatomical M-Mode

Anatomical M-mode is used for fetal cardiac applications. Anatomical M-mode can be used with phased array probes when performing cardiac exams or convex probes when performing abdominal exams. In the anatomical M-mode, the M line 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. Enter the inactivated B+M mode, and select the **Menu** key. A menu pops up on the screen.

2. Select **Steer M** by using the trackball or the ↑ or ↓ key.

3. Rotate the **Menu** key or select the ← or → key to set the number of M lines.

Multiple M lines display after selecting the desired number as the following figure shows.
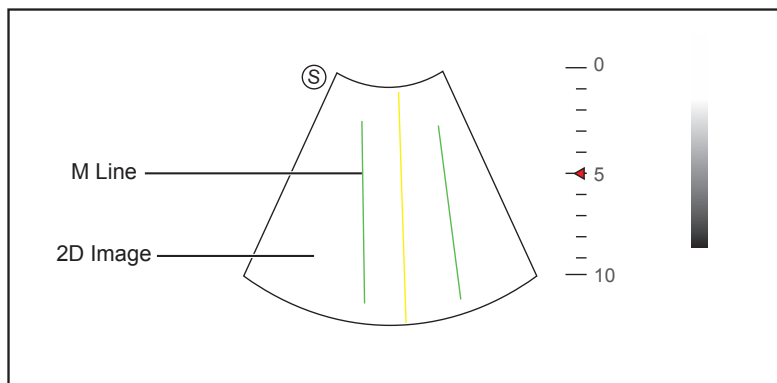
Figure 6-10 Inactivated Anatomical M-Mode Imaging Screen

4. Adjust the position and the angle of M line.

- Position the desired M line by using the trackball.

- Select the **Set** key on the control panel to select the desired M line.

5. Select the **Update** key on the control panel to activate the anatomical M-mode.

NOTE:

Once the anatomical M-mode is activated, anatomical M-mode imaging will display on the X-axis and Y-axis.

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

7. Select the **M** key to exit.

6.4.3   Optimizing M-Mode Images

After activating the M trace, the imaging parameters display at the bottom of the LCD monitor, you can use them to optimize M-mode images.

You can adjust other parameters and display modes on the pop-up menu by selecting the **Menu** key.

NOTE:

You can adjust all parameters in the real time M mode, but can only adjust **Chroma** and **Dis Format** in the frozen M mode.

■   **Gain**

M gain controls the overall brightness of the M trace.

To adjust the gain:

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

■   **M Process**

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

To set M process:

1. Select **M Process** by pressing the corresponding function key.

2. Rotate it to adjust the setting.

■   **Sweep Speed**

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

To adjust the sweep speed:

1. Select **Sweep Speed** by pressing the corresponding function key.

2. Rotate it to adjust the value.

■   **Chroma**

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

To adjust the chroma:

1. Select **Chroma** by pressing the corresponding function key.

2. Rotate it to choose a color scheme.

■   **Display Format**

Display format is used to view the image better.

To set the display format:

1. Select the **Menu** key in the real time scan. A menu pops up on the screen.

2. Select **Dis Format** by using the trackball or the ↑ or ↓ key.

3. Rotate the **Menu** key or select the ← or → key to adjust the setting.

■　　**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 ±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:

1. Select **Power%** by pressing the corresponding function key.

2. Rotate it to adjust the value.

NOTE:

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

■　　**Video Invert**

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

To enable or disable the video invert:

1. Select **Video Invert** by pressing the corresponding function key.

2. Rotate it to enable or disable the feature.

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. Select the **PW** key on the control panel to enter the inactivated B+PW mode 1.
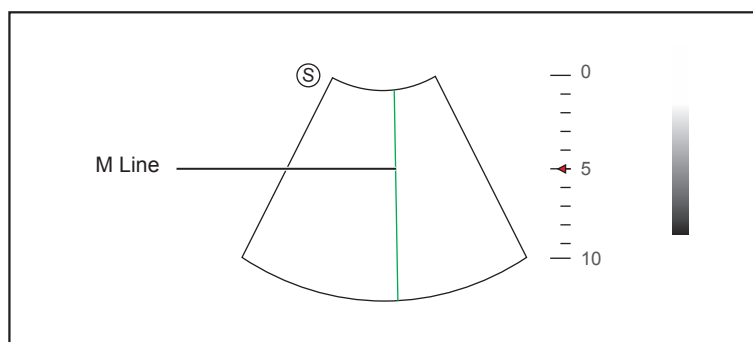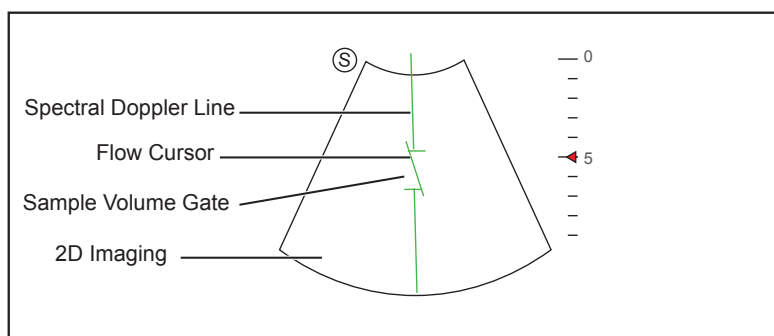
Figure 6-11 Inactivated B+PW Mode 1 Imaging Screen

- − 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 up or down.
   - − Adjust the angle of the spectral Doppler line by moving the trackball left or right.

4. Adjust the sample volume gate.
   - − Adjust the size of the sample volume gate by moving the trackball.
   - − Rotate the **Angle** knob to increase or decrease the angle of the flow cursor.

5. Select the **Update** key to activate the PW mode.

   The PW spectrum is displayed at the lower part of the screen after being activated, as shown in Figure 6-12.
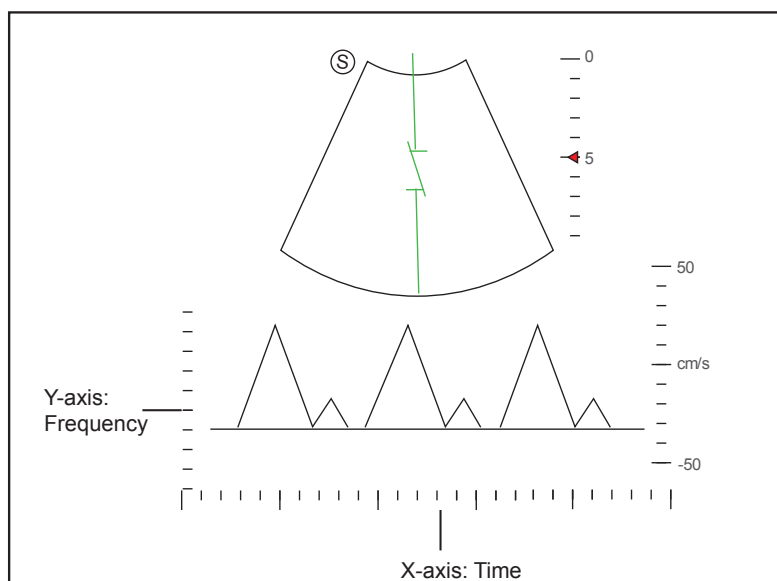
Figure 6-12 PW-Mode Imaging Screen

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

Select the **Audio +** or **Audio -** key 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, select the **Update** key on the control panel to enter the inactivated B+PW mode 2, the following screen appears.
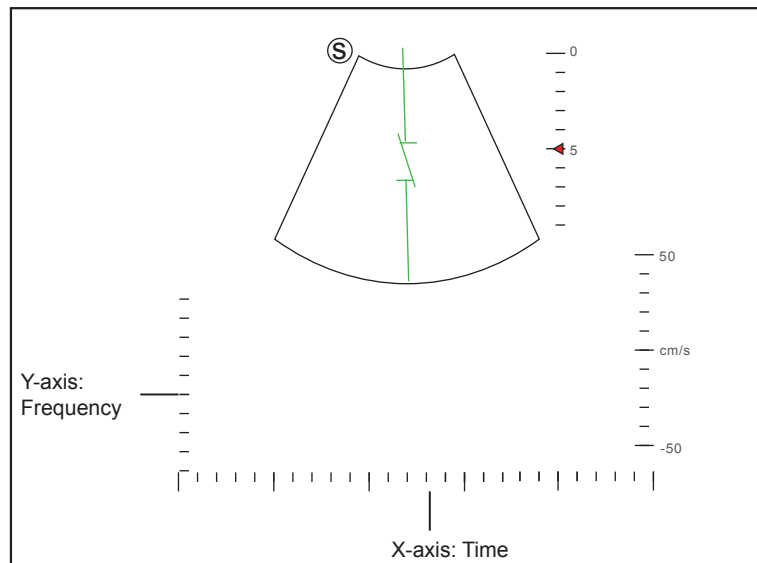
Figure 6-13 Inactivated B+PW Mode 2 Imaging Screen

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. Select the **PW** key to exit.

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. Select the **CW** key on the control panel to enter the inactivated B+CW mode 1.
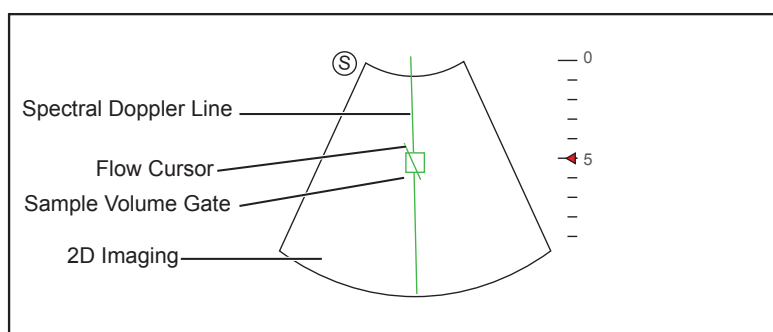
Figure 6-14 Inactivated B+CW-Mode 1 Imaging Screen

– 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 up or down.

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

4. Rotate the **Angle** knob to increase or decrease the angle of the flow cursor.

5. Select the **Update** key to activate the CW mode.

The CW spectrum is displayed at the lower part of the screen after being activated, as shown in Figure 6-15.
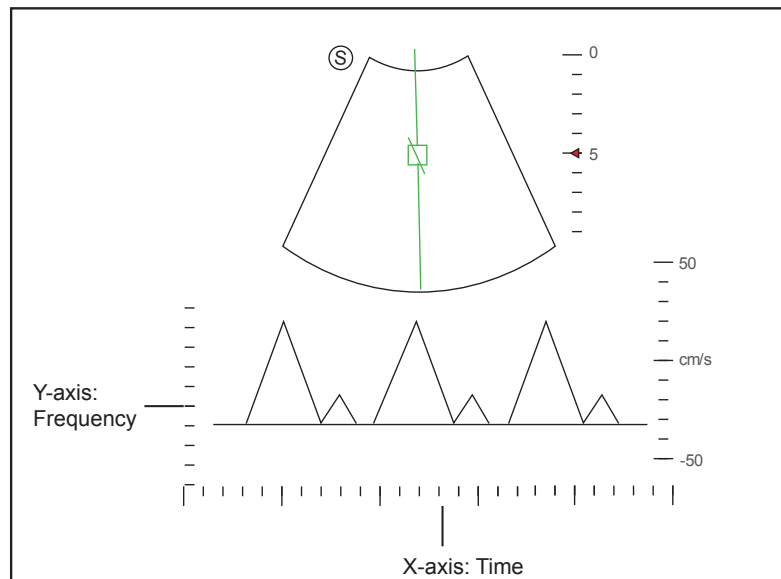
Figure 6-15 CW-Mode Imaging Screen

– X-axis is the time scale.

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

Select the **Audio +** or **Audio -** key to adjust the audio volume.

NOTE:

Once the CW-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, select the **Update** key on the control panel to enter the inactivated B+CW mode 2, the following screen appears.
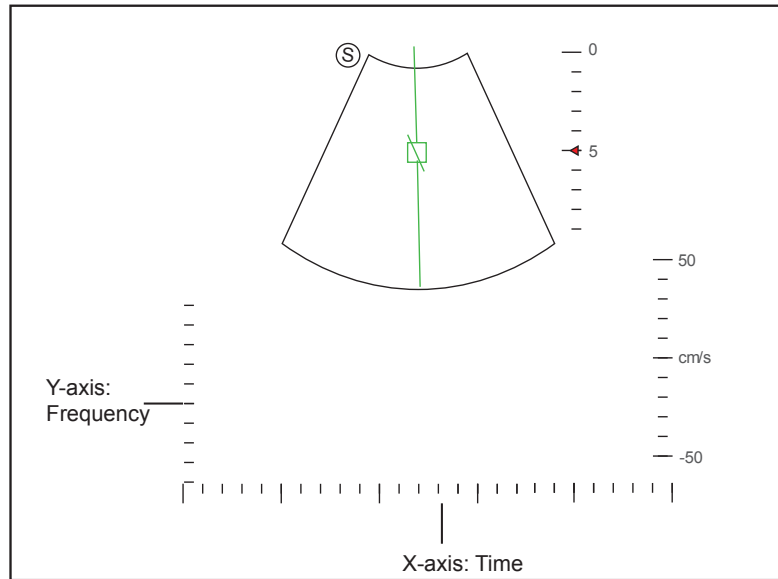
Figure 6-16 Inactivated B+CW Mode 2 Imaging Screen

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

7. Select the **CW** key again to exit.

6.5.3   Optimizing Spectral Doppler Images

After activating the PW/CW mode, the imaging parameters display at the bottom of the LCD monitor, you can use them to optimize PW/CW-mode images.

You can adjust the **Dis Format**, **Baseline** and **Angle Correct** on the pop-up menu by selecting the **Menu** key.

NOTE:

You can adjust all parameters in the real time PW/CW mode, but can only adjust **Chroma**, **Video Invert** and **Dis Format** in the frozen PW/CW mode.

■   **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 **C** knob clockwise to increase the value.

●   Rotate the **C** knob anticlockwise to decrease the value.

■   **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:

●   Flip the **PRF** switch upwards to increase the value.

●   Flip the **PRF** switch downwards to decrease 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:

Flip the **PRF** switch upwards to increase the value continuously, 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:

1. Select the **Menu** key in the real time PW/CW mode. A menu pops up on the screen.

2. Select **Baseline** by using the trackball or the ↑ or ↓ key.

3. Rotate the **Menu** key or select the ← or → key to move the baseline towards the positive or negative direction.

4. The speed scale on the y-axis at the bottom right of the screen varies with the baseline.

   You can also flip the **BASELINE** switch to change the position of the baseline.

■ **Wall Filter**

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

To adjust the wall filter:

1. Select **WF** by pressing the corresponding function key.

2. Rotate it to adjust 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:

1. Select **Frequency** by pressing the corresponding function key.

2. Rotate it to adjust 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:

1. Select **Sweep Speed** by pressing the corresponding function key.

2. Rotate it to adjust the value.

■ **Power**

Power is used to select the amount of ultrasound acoustic power produced by the probe. The adjustment range of the power is 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:

1. Select **Power%** by pressing the corresponding function key.

2. Rotate it to adjust the value.

NOTE:

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

■ **Chroma**

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

To adjust the chroma:

1. Select **Chroma** by pressing the corresponding function key.

2. Rotate it to choose a color scheme.

■ **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:

1. Select **DYN** by pressing the corresponding function key.

2. Rotate it to adjust the value.

■ **Display Format**

Display format is used to view the image better.

To set the display format:

1. Select the **Menu** key in the real time PW/CW mode. A menu pops up on the screen.

2. Select **Dis Format** by using the trackball or the ↑ or ↓ key.

3. Rotate the **Menu** key or select the ← or → key 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:

● Select the **Invert key** to enable the feature, and **Invert** appears on the top right corner of the image.

● Select the **Invert key** to disable the feature, and **Invert** disappears on the top right corner of the image.

■ **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:

1. Select **Video Invert** by pressing the corresponding function key.

2. Rotate it to enable or disable this feature.

■ **Angle Correction**

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

To set the angle correction:

1. Select the **Menu** key in the real time PW mode. A menu pops up on the screen.

2. Select **Angle Correct** by using the trackball or the ↑ or ↓ key.

3. Rotate the **Menu** key or select the ← or → key to adjust the angle.

You can also select the **Angle** key on the control panel to adjust the angle.

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:

Select **Simult** in the activated PW mode or in the inactivated 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.

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+C/TDI +M, B+C/PDI/TDI +PW and B+C/PDI+CW.

6.6.1 B+C/TDI +M

NOTE:

Only the phased array probe is available for B+C/TDI +M.

Perform the following steps to acquire the image.

1. Optimize a C/TDI mode image.

2. Select the **M** key on the control panel to enter the inactivated C+M/TDI +M mode.
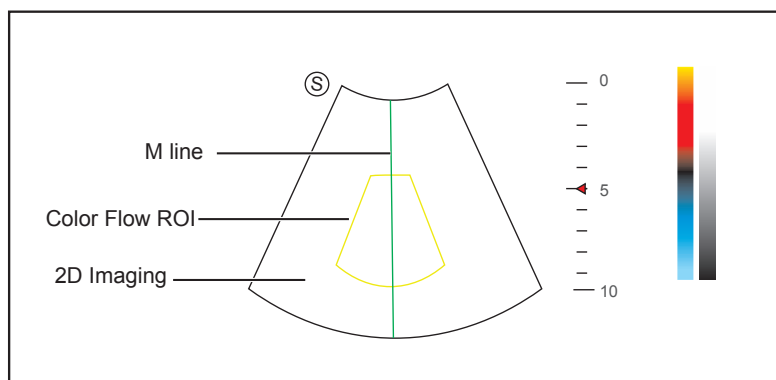
Figure 6-17 Inactivated B+C/TDI +M-Mode Imaging Screen

3. Adjust the ROI and M line by using the trackball.

4. Select the **Update** key to activate the C+M/TDI+M mode.

    The M + color flow mode image is displayed at the lower part of the screen after being activated, as shown Figure 6-18.
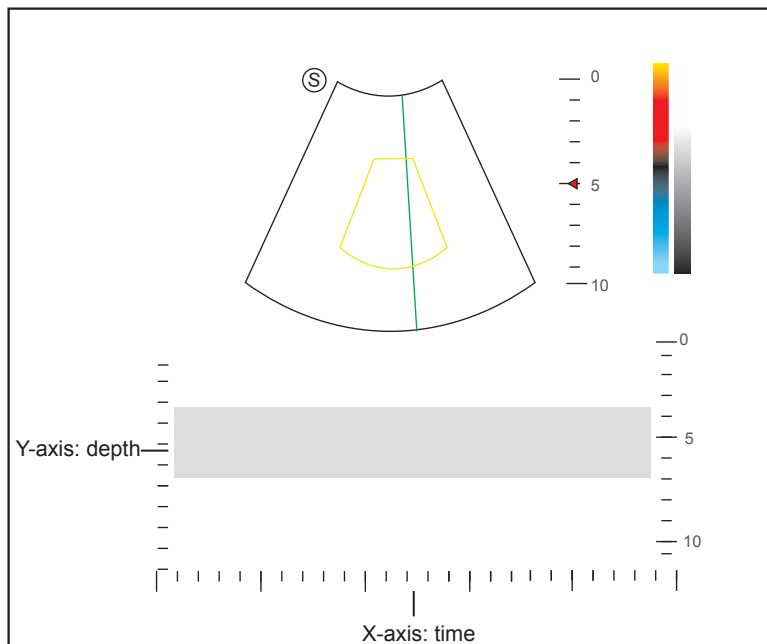
Figure 6-18 B+C/TDI +M-Mode Imaging Screen

- X-axis is the time scale.
- Y-axis is the depth scale.

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

6. Select the **M** key to exit.

6.6.2   B + C/PDI/TDI + PW

Perform the following steps to acquire the image.

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

2. Select the **PW** key to enter the inactivated C/PDI/TDI+PW mode 1.
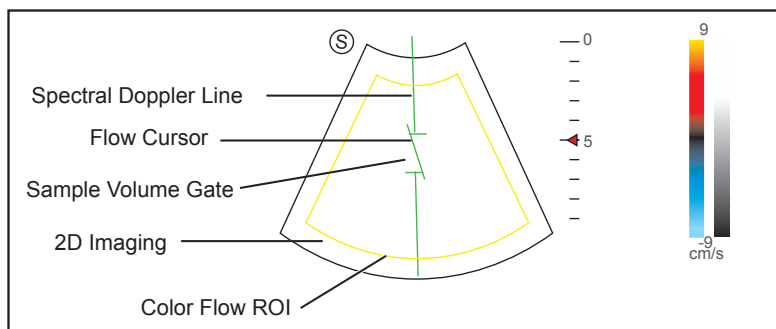
Figure 6-19 Inactivated B+C/PDI/TDI+PW-Mode 1 Imaging Screen

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

4. Adjust the sample volume gate.

    - Adjust the size of the sample volume gate by using the trackball.

– Rotate the **Angle** knob to increase or decrease the angle of the flow cursor.

5. Select the **Update** key to activate the PW mode.

The PW spectrum is displayed at the lower part of the screen after being activated, as shown Figure 6-20.
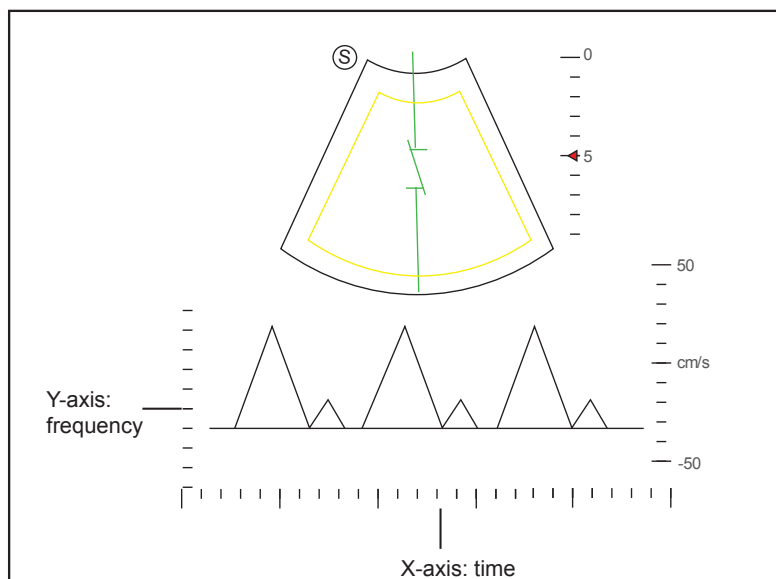
Figure 6-20 B+C/PDI/TDI+PW-Mode Imaging Screen

Select the **Audio +** or **Audio -** key 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, select the **Update** key on the control panel to enter the inactivated C/PDI/TDI+PW mode 2, the following screen appears.
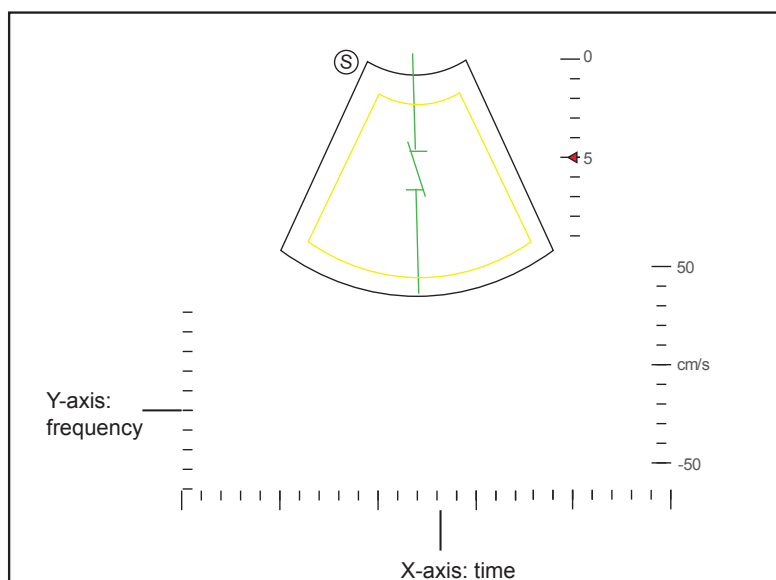
Figure 6-21 Inactivated B+C/PDI/TDI+PW-Mode 2 Imaging Screen

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. Select the **PW** key to exit.

6.6.3 B+C/PDI+CW

For details, refer to Section 6.6.2 B + C/PDI/TDI + PW.

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7 Elastography Imaging

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.

NOTE:

The following description uses a breast examination performed with the L752 probe as an example.

7.1   Acquiring Elastography Images

Perform the following steps to acquire elastography image.

1. Select **L752** and **Breast** as the desired probe and exam type, the system automatically enters the real-time B mode.

2. Acquire a high quality B-mode image.

3. Select the **Elastic** key on the key panel to enter the elastography imaging.

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

    Select the **Dual** key on the control panel to enter the single or dual-split screen display.
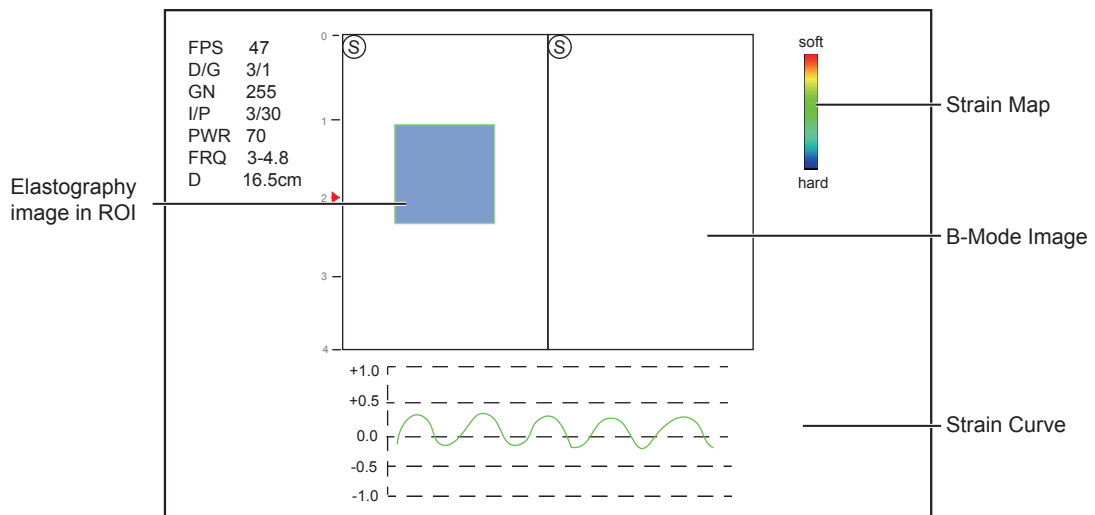
Figure 7-1 Elastography Imaging Screen

– 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 strain 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 tissue, and compress it regularly.

    Operation Concerns:

- Ensure the compression is applied perpendicularly, and all parts of the target tissue 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 imaging 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 tissue.
- 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 incorrect elastography results.

5. Adjust the elastography ROI.

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

- Move the trackball to position elastography ROI.
- Select the **Set** key on the control panel to adjust the size of elastography ROI.
- Select the **Set** key to reposition elastography ROI.

6. Optimize the elastography image. For details, refer to Section 7.2 Optimizing Elastography Images.

7. Select the **Elastic** key again to exit.

7.2   Optimizing Elastography Images

After entering the elastography imaging, the imaging parameters display at the bottom of the LCD monitor, you can use them to optimize elastography images.

You can also adjust the parameters on the pop-up menu by selecting the **Menu** key.

NOTE:

All parameters can only be adjusted in real-time elastography imaging.

7.2.1   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 imaging. 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:

1. Select the **Menu** key in the real time scan. A menu pops up on the screen.

2. Select **Strain Map L** or **Strain Map R** by using the trackball or the ↑ or ↓ key.

3. Rotate the **Menu** key or select the ← or → key to choose the color scheme for the B-mode image.

7.2.2   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:

1. Select the **Menu** key in the real time scan. A menu pops up on the screen.

2. Select **Strain Proce.** by using the trackball or the ↑ or ↓ key.

3. Rotate the **Menu** key or select the ← or → key to adjust the value.

7.2.3   Transparency

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

To adjust the transparency:

1. Select the **Menu** key in the real time scan. A menu pops up on the screen.

2. Select **Transparency** by using the trackball or the ↑ or ↓ key.

3. Rotate the **Menu** key or select the ← or → key to adjust the value.

7.2.4   Contrast

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

To adjust the contrast:

1. Select the **Menu** key in the real time scan. A menu pops up on the screen.

2. Select **Contrast** by using the trackball or the ↑ or ↓ key.

3. Rotate the **Menu** key or select the ← or → key to adjust the value.

7.2.5   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 smoother appearance.

To adjust the persistence:

1. Select the **Menu** key in the real time scan. A menu pops up on the screen.

2. Select **Persist** by using the trackball or the ↑ or ↓ key.

3. Rotate the **Menu** key or select the ← or → key to adjust the value.

7.2.6   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:

1. Select the **Menu** key in the real time scan. A menu pops up on the screen.

2. Select **Frequency** by using the trackball or the ↑ or ↓ key.

3. Rotate the **Menu** key or select the ← or → key to adjust the value.

7.3   Working with Elastography Images

You can work with the elastography images by using the features in the frozen mode, such as cine review, annotations, data storage or measurements. For details, refer to Section 10.4 Using Cine, Section 10.5 Annotations and Body Marks, Chapter 11 Managing Images/Data and the relevant sections in the advanced user manual.

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8   Using 3D

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.

8.1   Acquiring 3D Images

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 B mode.

2. Optimize imaging parameters in the B mode.

3. Apply adequate gel on the patient.

4. Acquire a B-mode image of high quality.

5. Select the **3D/4D** key on the control panel to enter the inactivated 3D mode.

   NOTE:

   You should select the **Freeze** key and select the **3D/4D** key to enter the inactivated 3D mode when using a non-volume probe.

   The 2D imaging with ROI and sample line is displayed in the inactivated 3D mode, only the data in ROI is acquired for 3D imaging.
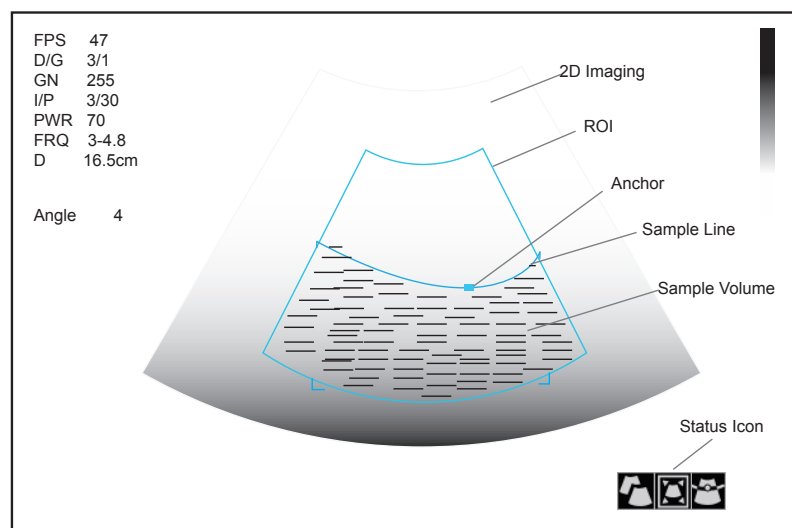
Figure 8-1 Inactivated 3D Imaging Screen

6. Adjust ROI and sample line.

   You can select the **Set** or **Update** key to highlight and select the desired status icon.

   - If ▨ is highlighted, use the trackball to position the ROI.
   - If ▨ is highlighted, use the trackball to resize the ROI.

– If 🖼 is highlighted, adjust the sample line by positioning the anchor with the trackball.

7. Select the **Menu** key and set **User Mode**, **Render Mode**, **Image Quality**, **Sweep Angle** or **Stabilization** in the pop-up menu.

– Select **User Mode**, rotate the **Menu** key or press the ← or → key to select a user mode.

– Select **Stabilization**, rotate the **Menu** key or press the ← or → key to enable or disable the stabilization.

– Select **Image Quality**, rotate the **Menu** key or press the ← or → key to adjust quality of images.

– Select **Sweep Angle**, rotate the **Menu** key or press the ← or → key to adjust the sweep angle of probe.

8. Select the **Freeze** key to display the 3D imaging.

The imaging area of the screen is divided into 3 reference images and a 3D image by default.
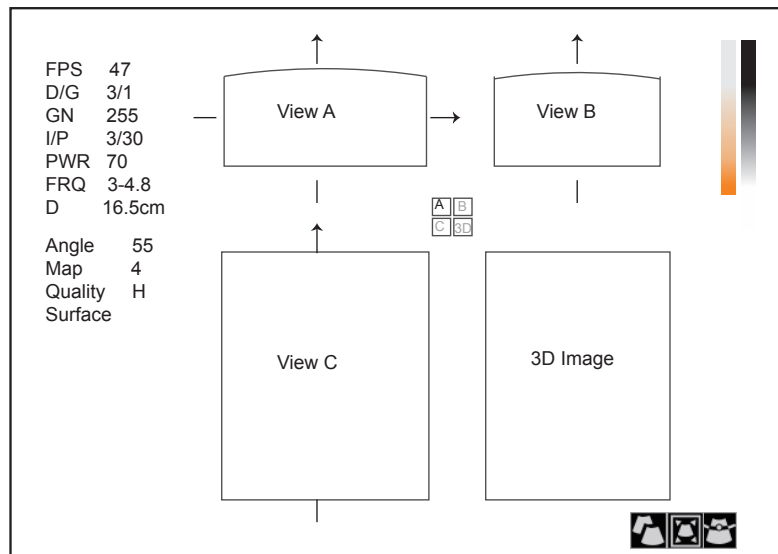
Figure 8-2 3D Imaging Screen

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.

– Select the **Freeze** key again to display the 4D imaging.

– Select **Full Disp.2D** by pressing the corresponding function key to return to the 3D inactivated mode.

– Select the **3D/4D** key on the control panel to exit the 3D imaging mode and return to a real time B-mode.

8.2   Working with 3D Images

You can review, optimize or save 3D images.

8.2.1   Adjusting ROI

You can crop the 3D image by adjusting the ROI on the reference images to remove areas outside from the area of interest. This feature is suitable for cropping regular reviews.

Perform the following steps to crop a review.

1. Select the **T-ball** key to activate the cursor.

2. Move the cursor to the image of View A, View B or View C by using the trackball, and select the **Set** or **Update** key to choose the desired reference image.

3. Crop the image of View A, View B or View C, as shown in Figure 8-3.
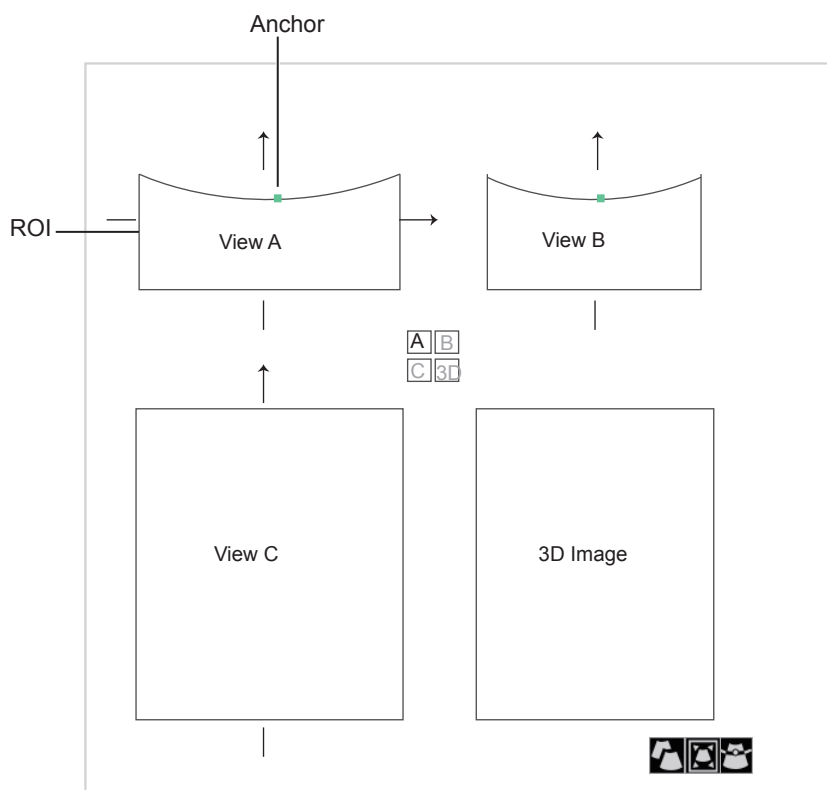
Figure 8-3 Cropping Review Screen

You can select the **Set** or **Update** key to highlight and select the desired status icon.

- If ⬜ is highlighted, use the trackball to position the ROI.
- If ⬜ is highlighted, use the trackball to resize the ROI.
- If ⬜ is highlighted, adjust the sample line by positioning the anchor with 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.

If necessary, repeat steps 1-3 above to crop the image again.

8.2.2   Setting Display Format

The 3D imaging area is divided into four parts by default.

- Select **Dual Display** by pressing the corresponding function key to activate the dual split screen display format.
- Select **Full Disp.3D** by pressing the corresponding function key to activate the 3D full display format.
- Select **Quad Display** by pressing the corresponding function key to activate the quad split screen display format.

You can also change the display format by using the following two ways:

- Select the **Menu** key to display the menu, select **Display** and rotate the **Menu** key or select the ← or → key to change the display format.
- Or, select 1, 2 or 4 key on the key panel to activate **Full Disp.3D**, **Dual Display** or **Quad Display**.

8.2.3   Reviewing Cine

Perform the following steps to review the cine.

1. Select the **Menu** key. A menu pops up on the screen

2. Select **Cine Review** by using the ↑ or ↓ key.

3. Rotate the **Menu** key or select the ← or → key to review the cine.

NOTE:

Only volume probes are capable of using this feature.

8.2.4 Setting Render Mode

Surface, Skel and X-Ray can be set.

- **Surface** is used to display the contour of fetus.
- **Skel** is used to display the spinal column and skeleton of the fetus.
- **X-Ray** is used to display the tissues of different structure and tumor tissues.

Perform the following steps to set the render mode.

1. Select the **Menu** key and a menu pops up on the screen.

2. Select **Render Mode** by using the ↑ or ↓ key.

3. Rotate the **Menu** key or select the ← or → key to make the setting.

NOTE:

The imaging render mode can also be set in the inactivated 3D mode.

8.2.5 Cropping Reviews

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

■   **Cropping reviews with trace**

You can crop the 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. Select the **Menu** key and a menu pops up on the screen.

2. Select **Edit** by using the ↑ or ↓ key.

3. Select **TraceI** or **TraceO** by rotating the **Menu** key or selecting the ← or → key.
    - Set it to **TraceI** to enable the feature and remove all data inside the traced area from the image.
    - Set it to **TraceO** to enable the feature and remove all data outside the traced area from the image.

4. Move the cursor to the image by using the trackball, select the **Set** key, and then trace the border of the object.

5. Select the **Set** key to acquire the desired image.

    In the following figure, Trace cut is set to **TraceI**.
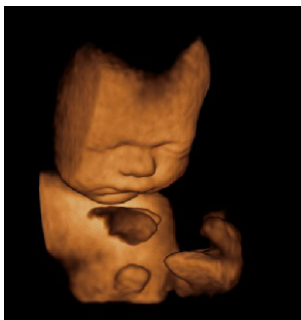
NOTE:

Selecting **Undo Cut** can restore the cutting by using Trace Cut.

■   **Cropping reviews by the box**

You can crop 3D image by adjusting a box on the 3D image to remove irrelevant areas from the area of interest. This feature is suitable for cropping regular reviews.

Perform the following steps to crop a review.

1. Select the **Menu** key and a menu pops up on the screen.

2. Select **Edit** by using ↑ or ↓ key.

3. Select **BoxI** or **BoxO** by rotating the **Menu** key or selecting the ← or → key.

    −   Set it to **BoxI** to enable the feature and remove all data inside from the image.
    −   Set it to **BoxO** to enable the feature and remove all data outside from the image.

4. Move the cursor to the image by using the trackball, select the **Set** key, and then trace the border of the object.

5. Select the **Set** key to acquire the desired image.

NOTE:

Selecting **Undo Cut** can restore the cutting by using Trace Cut.

■   **Cropping reviews by the eraser**

You can crop 3D image by using the eraser to remove irrelevant areas from the area of interest. This feature is suitable for cropping irregular reviews.

Perform the following steps to crop a review.

1. Select the **Menu** key and a menu pops up on the screen.

2. Select **Edit** by using the ↑ or ↓ key.

3. Select **EraB** or **EraS** by rotating the **Menu** key or selecting the ← or → key.

4. Move the cursor on the image by using the trackball, select the **Set** key, and then use the eraser to remove irrelevant areas.

5. Select the **Set** key to acquire the desired image.

NOTE:

Selecting **Undo Cut** can restore the cutting by using Trace Cut.

8.2.6   Moving/Rotating/Magnifying Images

■   **To select an image**

1. Select the **T-ball** key and a cursor appears on the screen.

2. Move the cursor on an image and select the **Set** or **Update** key to select the desired reference image.

■ **To move images**

1. Select **Move L-R** or **Move U-D** by pressing the corresponding function key.

2. Rotate this function key to move the images.

   You can also use the ↑, ↓, ← or → key to move three sectional planes and the image.

■ **To rotate images**

Rotate the images in the following four ways.

- Select **Rotate X**, **Rotate Y** or **Rotate Z** by pressing the corresponding function key and turn it to rotate the image along x, y or z axis.

- Move the cursor on one image and select the **Set** or **Update** key, and rotate the 3D image by using the trackball.

- Select the menu item of **Direction** and rotate the **Menu** key or select the ← or → key to rotate the images 90°, 180° or 270°.

- Select the menu item of **Orientation** and rotate the **Menu** key or select the ← or → key to rotate the images to the defined angle of view.

- Select the menu item of **Auto Rotate** and rotate the **Menu** key or select the ← or → key to make the setting. 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.

■ **To zoom in/out all images**

Zoom in/out the images in the following ways.

- Select the **Zoom** key and rotate the **Angle** key to zoom in or zoom out the images.

- Select **Zoom** by pressing the corresponding function key and rotate this function key to zoom in or zoom out the images.

   Meanwhile, a size multiplier is displayed in the information area of the basic screen.

8.2.7 Optimizing 3D Image

■ **To choose the color**

- Select the menu item of **3D Chroma** and rotate the **Menu** key or select the ← or → key to choose the color scheme for the 3D image.

- Select the menu item of **B Chroma** and rotate the **Menu** key or select the ← or → key to choose the color scheme for the image on the View A, B or C .

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

■ **To set the smoothness and brightness**

- Select the menu item of **Smooth** and rotate the **Menu** key or select the ← or → key to adjust the smooth of the 3D image.

- Select the menu item of **Lightness** and rotate the **Menu** key or select the ← or → key to adjust the brightness of the 3D image.

■ **To set the threshold and contrast**

- Select the menu item of **Threshold** and rotate the **Menu** key or select the ← or → key to adjust the value.

- Select the menu item of **Contrast** and rotate the **Menu** key or select the ← or → key to adjust the contrast of the 3D image.

8.2.8 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. Select the menu item of **Multi-Slice** and rotate the **Menu** key or select the ← or → key to chose one slice.

   After selection, the slice on the corresponding axis is displayed on the screen.

2. Select the menu item of **Slice Num** and rotate the **Menu** key or select the ← or → key to set the slice number to 9, 16 or 25.

   In the following figure, the slice on the X axis (Ref A, number: 9) is taken as an example.
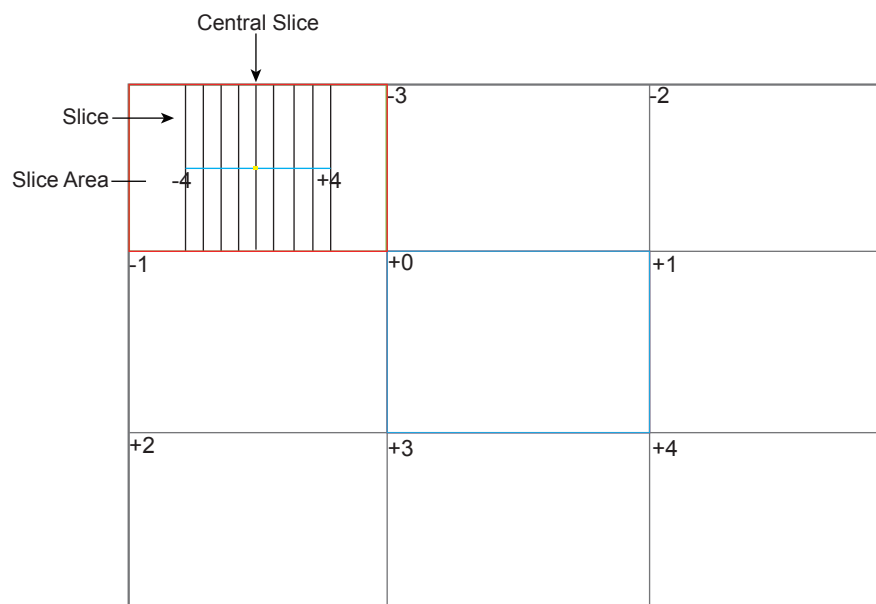
Figure 8-4 Multi-Slice Imaging Screen

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.

Move the cursor to one slice by using the trackball to select it, and the selected slice will be red in the slice area.

■ **To adjust the slice distance**

1. Select the menu item of **Multi-Slice** and rotate the **Menu** key or select the ← or → key to choose the desired slice.

2. Select the menu item of **Distance** and rotate the **Menu** key or select the ← or → key to adjust the distance among the slices. The distance and content vary with this setting.

8.2.9 Setting the Scan Mode

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

Select the menu item of **Scan Mode** and rotate the **Menu** key or select the ← or → key to set the sweep mode to **Linear** or **Sector.**

NOTE:

This setting is only effective when entering 3D imaging from a frozen B image.

8.2.10 Adjusting Z Angle/Z Scale

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 **Z Angle**/**Z Scale** before the scan.

- If **Scan Mode** is set to **Sector**, you can adjust the sweep angle when performing the scan by the probe. Select the menu item of **Z Angle** and rotate the **Menu** key or select the ← or → key to adjust the angle.

- If **Scan Mode** is set to **Linear**, you can adjust the sweep span when performing the scan by the probe. Select the menu item of **Z Scale** and rotate the **Menu** key or select the ← or → key to adjust the scale.

NOTE:

This setting is only effective when entering 3D imaging from a frozen B image.

8.2.11 Restoring the Image

Select the menu item of **Reset** and rotate the **Menu** key or select the ← or → key to restore the image to the original position.

8.2.12 Customizing Presets

You can modify parameters, adjust sample volume or ROI in the 3D mode and save them as an application preset for future use. Moreover, the customized layout of the application mode screen can be modified and restored to factory defaults.

NOTE:

Only volume probes are capable of using 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 inactivated 3D mode.

9 Using 4D

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.

9.1 Acquiring 4D Images

The following description uses 4D imaging performed by the VC6-2 probe as an example.

9.1.1 Entering the Real-Time 4D Imaging

Perform the following steps as follows.

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.

3. Apply adequate gel on the patient.

4. Acquire a high quality B-mode image.

5. Select the **3D/4D** key on the control panel to enter the inactivated 4D mode.

   The 2D imaging with a ROI and a sample line is displayed in the inactivated 4D mode, only the data in the ROI is acquired for 4D imaging.
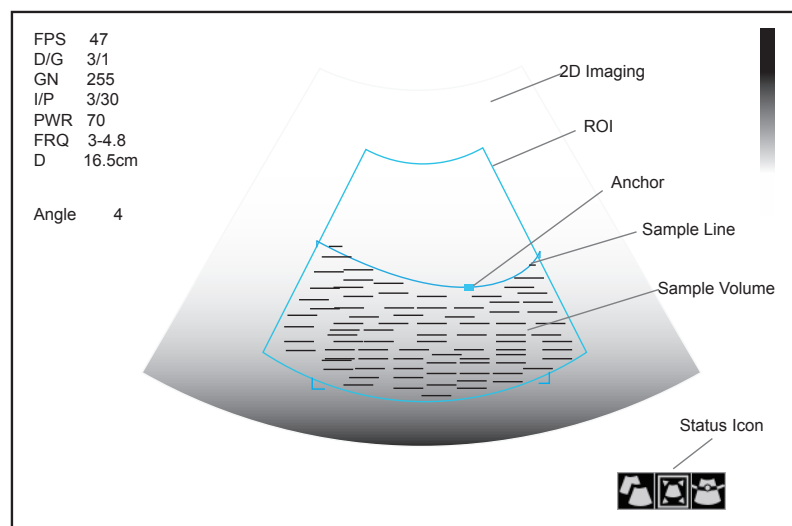
Figure 9-1 Inactivated 4D Imaging Screen

6. Adjust the ROI and sample line.

   You can select the **Set** or **Update** key to highlight the desired status icon.

   − If ⬚ is highlighted, use the trackball to position the ROI.

- If ⬚ is highlighted, use the trackball to resize the ROI.
- If ⬚ is highlighted, adjust the sample line by positioning the anchor with the trackball.

7. Select the **Menu** key, set **User Mode**, **Render Mode**, **Image Quality**, **Sweep Angle** and **Stabilization** in the pop-up menu. For details, refer to Section 8.1 Acquiring 3D Images.

8. Display the 4D imaging in the following ways.

    - Select **Dual Display**, **Full Disp.3d** or **Quad Display** by pressing the corresponding function key to activate the corresponding display format.
    - Select **1**, **2** or **4** on the key panel to display the 4D imaging in a full, dual or quad display.

    You can also select the **Freeze** key in the 3D imaging mode to enter the 4D imaging mode.
    The imaging area of the screen is divided into 3 reference images and a dynamic 3D image by default.
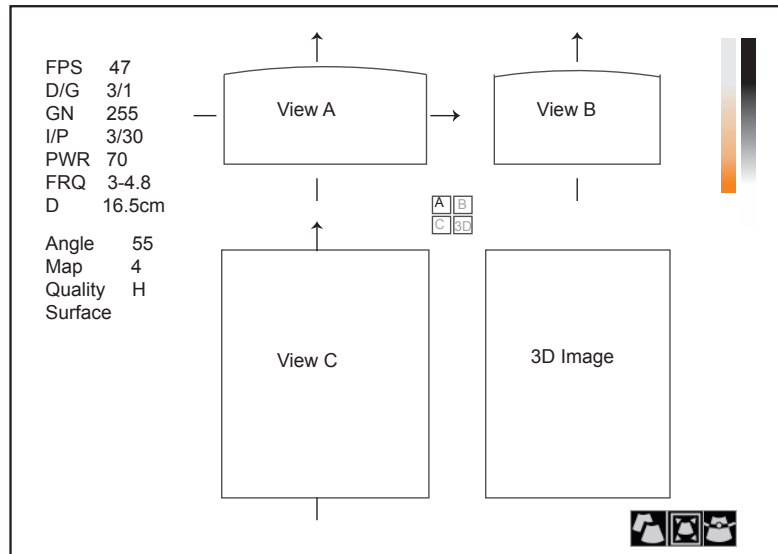
Figure 9-2 4D Imaging Screen

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.
- Select **Full Disp.2D** by pressing the corresponding function key to return to the 4D inactivated mode.
- Select the **3D/4D** key on the control panel to exit the 4D imaging mode and return to a real time B mode.

9.1.2   Acquiring Dynamic 3D Image

You can acquire a dynamic 3D image of high quality by applying the features described in Section 8.2 Working with 3D Images.

Select the **Freeze** key on the control panel to enter the cine review mode after acquiring the image. Select the **Menu** key on the control panel, select **Auto Play** on the menu, rotate the **Menu** key or press the ← or → key to select **On** or **Off** to review/stop reviewing the cine.

9.2   Working with 4D Images

You can review, optimize or save 4D images in the frozen mode. For details, refer to Section 8.2 Working with 3D Images.

10 Working with Images

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

10.1   Imaging Features

10.1.1   Imaging Reverse

■   **To reverse left or right**

Select the **L/R** key on the control panel to reverse the real time scan left or right.

Or, select the **Menu** key and select **LT-RT** on the pop-up menu. Rotate the **Menu** key or select the ← or → key to reverse the real time scan left or right.

■   **To reverse up or down**

Select the **Up/Down** key on the control panel to reverse the real time scan up or down.

10.1.2   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. Select the **B**, **C**, **DPI** or **TDI** key on the control panel to enter a real time scan.

2. Select the **Dual** key on the control panel to enter the dual-split screen display.

The image is duplicated into two parts with a frozen image on the left and a real time scan on the right. The real time B-mode is taken as an example in the following figure.
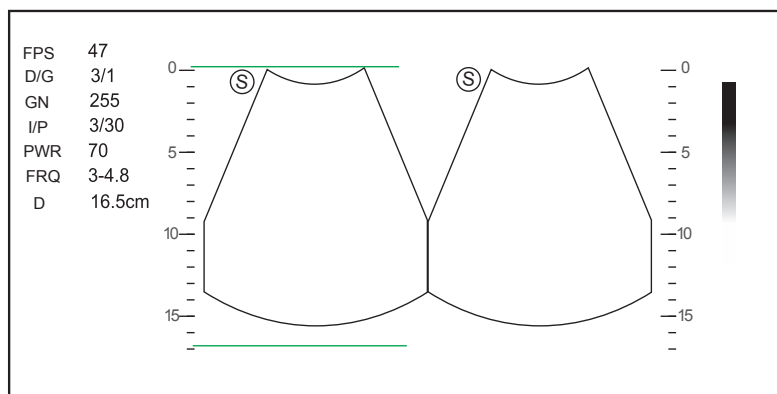
Figure 10-1 Real Time + Frozen B

–   Select the **C**, **DPI**, **PW**, **M** or **THI** key on the control panel to enter the corresponding mode for the real time scan.

–   Select the **Dual** key to freeze the real time scan and unfreeze the other image.

–   Select the **B** key to exit the dual display.

- Select the **Menu** key and then select **Dual Live** to display two real time scans if one of the two images is a Color Flow mode (C, PDI or TDI) image.

The image is duplicated into two parts with two real time scans.
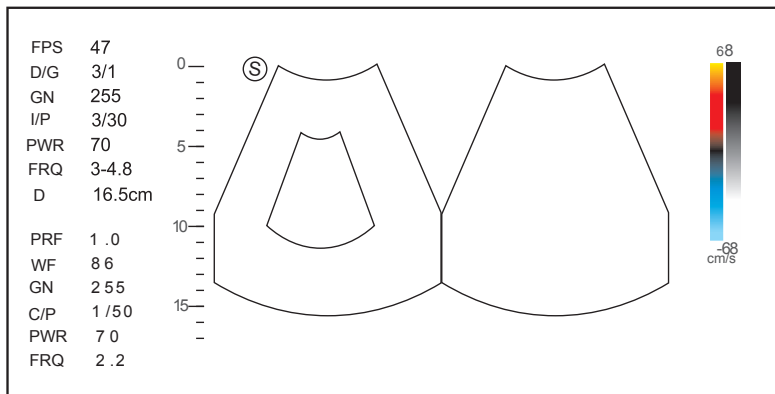
Figure 10-2 Real Time C + Real Time B

■ **Quad-Split Screen Display**

1. Select the **B**, **C**, **DPI** or **TDI** key on the control panel to enter a real time scan.

2. Select [icon] on the control panel to enter the quad-split screen display.
   The B-mode image is taken as an example in the following figure.
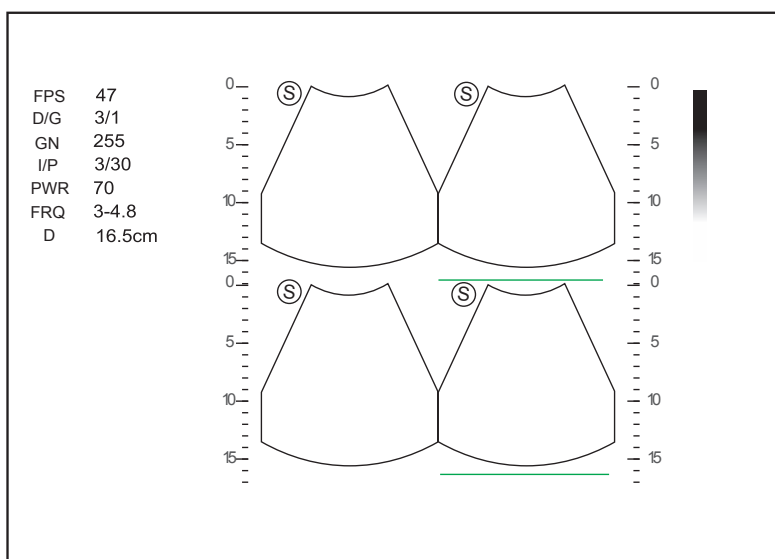
Figure 10-3 Quad-Split Screen Display

- Select [icon] on the control panel to freeze the real time scan and unfreeze the other images.
- Select the **B**, **C** or **DPI** key on the control panel to enter the corresponding mode for the real time scan.

3. Select the **B** key to exit the quad-split screen display.

10.1.3 M-Tuning

M-Tuning optimizes the image quality.

To enable M-Tuning,

Select the **m-Tuning** key on the key panel to optimize image quality.

10.1.4 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 contains THI and PHI.

In real time B mode, select 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.

Select the **THI** key again to exit the imaging, and **THI** disappears from the screen.

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

10.1.5 Panoramic Imaging

Panoramic imaging broadens the scope of spatial relationships, thereby sequentially aligning individual images in their anatomical context. Panoramic imaging has the ability to display an entire abnormality and show its relationship to adjacent structures on a single, static image.

NOTE:
- Panoramic imaging is only available with linear and convex 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.
- Do not change the scan direction or move the probe backward or forwards.
- When the scan depth increases, it is generally required to decrease the scan speed.

■ **Real time Panoramic Imaging Mode**

Perform the following steps to apply panoramic imaging.

1. Optimize the B-mode image.

2. Select the **Pan** key on the control panel to enter the inactivated Panoramic Imaging mode.

   You can select the **Freeze** key on the control panel to exit and return to the B mode.

3. Select the **Update** key on the control panel to enter the real-time panoramic imaging.

   Select **Exit** by rotating the corresponding function key to exit the real-time panoramic imaging.

4. Perform the scan.

   A real-time stitched image is generated, on which probe speed box and 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. Select the **Freeze** key to display the panorama.
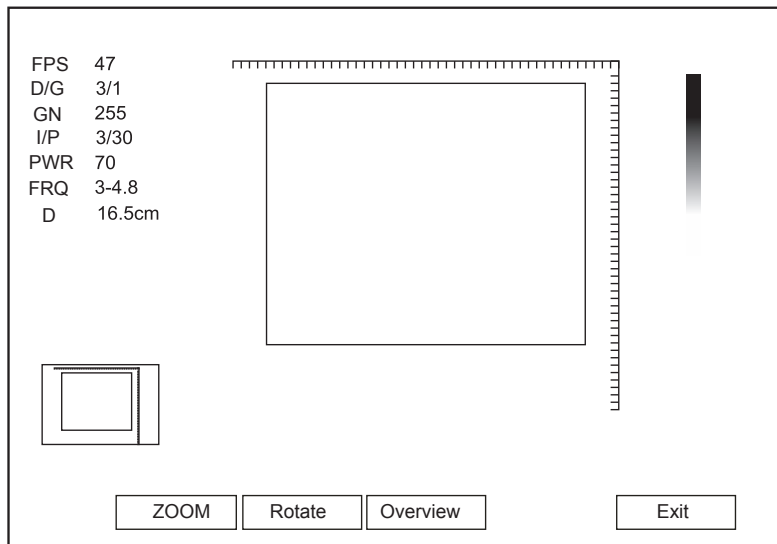
Figure 10-4 Real Time Panoramic Imaging

You can select the **Freeze** key again to back to the inactivated mode.

6. Work with the image.

   − Zoom in/out the image

   a. Rotate the function key corresponding to **ZOOM** and the ROI is displayed on the thumbnail.

   b. Use the trackball to position the interest area, and rotate the function key corresponding to **ZOOM** to zoom in or out this area.

   − Rotate the function key corresponding to **Rotate** to rotate the image.

   − Rotate the function key corresponding to **Overview** to restore the image to the default setting.

   − Make measurements, annotations and body marks.

7. Rotate the function key corresponding to **Exit** to exit Panoramic Imaging.

■ **Frozen Panoramic Imaging**

NOTE:

Ensure you disable the compound imaging feature before you apply the frozen panoramic image.

1. Optimize the B-mode image, and select the **Freeze** key to freeze the image.

2. Rotate the function key corresponding to **Panoramic**, and the initialization message appears on the screen.
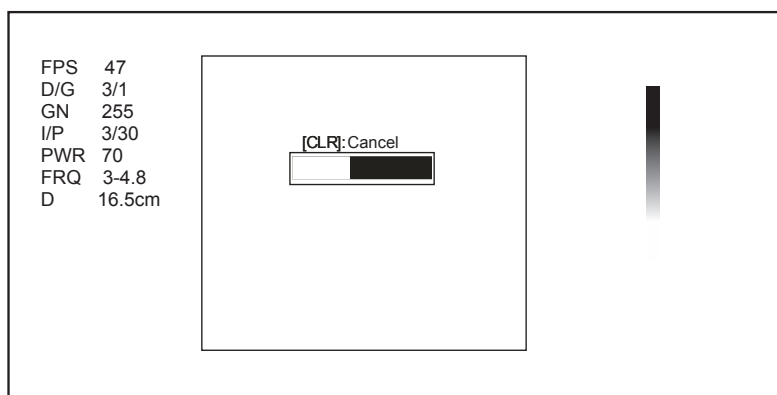
Figure 10-5 Panoramic Imaging Screen

Selecting the **Clear** key on the control panel can abort the initialization.

3. Work with the image.

− Zoom in/out the image

a. Rotate the function key corresponding to **ZOOM** and the ROI is displayed on the thumbnail.

b. Use the trackball to position the interest area, and rotate the function key corresponding to **ZOOM** to zoom in or out this area.

− Rotate the function key corresponding to **Rotate** to rotate the image.

− Rotate the function key corresponding to **Overview** to restore the image to the default setting.

− Make measurements, annotations and body marks.

4. Rotate the function key corresponding to **Exit** to exit Panoramic Imaging.

10.2 Magnifying an Image

You can magnify an interest region on the imaging area.

NOTE:

The image can also be magnified in the frozen mode.

To magnify an image:

1. Select the **Zoom** key on the control panel to enable this feature.

   A size multiplier is displayed on the information area of the basic screen, a thumbnail is displayed in the lower left corner of the basic screen, and the magnified image is displayed on the imaging area of the basic screen.

2. Position the ROI by using the trackball.

3. Rotate the **Angle** knob on the control panel to adjust the magnification.

10.3 Freezing an Image

Select the Freeze 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 details, refer to Section 4.1.1 General 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.

10.4 Using Cine

The cine review is available by selecting the **Freeze** key in the real time scan, and the ⟦c⟧ icon appears on the screen.
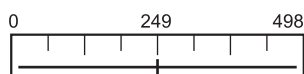
You can review the cine manually or automatically, and can also cut the desired cine segments.

10.4.1 Reviewing Cine

■ **To review the cine manually**

You can review the cine frame by frame by using the trackball.

Or, select the **Menu** key, and select **F By F** on the pop-up menu. Rotate the **Menu** key or select the ← or → key to review the cine frame by frame.

Each image is identified by a number which indicates its position in the cine.

NOTE:
- You can adjust **Chroma** and **GSC** parameters when reviewing cine.
- You can select **To First** or **To Last** on the pop-up menu, rotate the **Menu** key or select the ← or → key to review the first or last frame.

■   **To review the cine automatically**

Rotate the function key corresponding to **Auto Play** in the frozen B mode to play or stop the cine review automatically.

Or, rotate the function key corresponding to **Cine Speed** to adjust the review speed during the cine review.

10.4.2   Cutting Cine

To cut the cine:

1.   Use the trackball to move the cursor to the start frame in the frozen mode and select the **Update** key.

2.   Move the cursor to the end frame and select the **Update** key.

3.   Select **Save** on the control panel to save the cut cine.

10.5   Annotations and Body Marks

The annotation feature allows you to type or add an annotation from the predefined annotation library. Arrows and body marks are also provided to annotate the image.

10.5.1   Annotating an Image with Typed Words

Perform the following steps.

1.   Select the **Annot** key on the control panel in any mode. A yellow vertical mark appears on the screen. And the predefined annotations appears at the left of the screen.

2.   Select an annotation and select the **Set** key, then move the annotation to the desired place by using the trackball.

3.   Select the **Set** key to add the annotation on the image.

     Repeat the above steps to add more annotations if necessary.

4.   Select **Exit** at the left of the screen or select the **Annot** key again to exit.

You can also perform the following operations when adding annotation.

●   To input the annotation manually

    Move the cursor to the desired place by using the trackball and input the predefined word on the screen to add it to the image.

●   To move the annotation

    Move the cursor on one annotation. Select the **Set** key to activate this annotation and move it to the desired place by using the trackball. Then select the **Set** key to confirm.

●   To revise the annotation

    Move the cursor to one annotation and revise it by using the key panel.

10.5.2   Annotating an Image with Arrows

Perform the following steps.

1.   Select ➚ on the control panel in any mode, and an arrow displays on the screen.

2.   Position the arrow to the desired place by using the trackball, and select the **Set** key to add it on the image.

     −   If necessary, rotate the **Angle** knob to adjust the arrow angle.

     −   Select the **Delete** key on the control panel to delete the arrow.

3.   Select **Set** to confirm.

Repeat the above steps to add more arrows if they are needed.

10.5.3   Body Mark

Perform the following steps.

1. Select the **Body Mark** key on the control panel in any mode, and the cursor becomes |.

2. Position the body mark to the desired place by using the trackball, and select the **Set** key to add it to the image. If necessary, rotate the **Angle** knob to adjust the angle.

3. Select the **Set** key to confirm.

10.5.4 Deleting Annotations and Body Marks

■ **To delete annotations**

Perform the following steps.

1. Select the **Annot** key on the control panel to enter the Text Annotation screen.

2. Move the cursor to the desired annotation and then select the **Delete** key on the control panel to remove it from the screen.

NOTE:

You can enable the annotation-cleared feature. For details, refer to Section 4.1.1 General Settings.

■ **To delete arrows**

Perform the following steps.

1. Select the **Arrow** key on the control panel to enter the Arrow Annotation screen.

2. Select the **Delete** key on the control panel to remove an arrow from the screen.

■ **To delete body marks**

Perform the following steps.

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

2. Select the **Delete** key on the control panel to remove a body mark from the screen.

■ **To delete all annotations and body marks**

You can select the **Clear** key on the control panel to delete all annotations and body marks from the image. Perform this deletion with caution.

10.6   Using ECG

Using an optional ECG module (Type BF), 3-channel ECG signals are provided in cardiac applications.

During a cardiac application, you can configure the ECG-control so that the ECG trace is displayed at the bottom of the screen. The ECG module provided by this ultrasound system is for collecting and displaying 3-lead ECG trace.

The ECG cable includes three color-coded ECG electrode connectors, i.e., LL (left leg, red), LA (left arm, black), and RA (right arm, white). Among them, LA is the reference cable, receiving the signal from the ECG module and providing the bias voltage. LL and RA receive signals from the patient body and connect to the different output terminals of ECG isolation amplifier.

⚠ WARNING
- This ECG module is not suitable for intracardiac use or direct cardiac contact.
- This ECG module provides 3-channel ECG signals and 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.
- Power off the ultrasound system if the patient is found to use a pacemaker or implantable cardioverter-defibrillators, because the ultrasound system may interfere with these devices.

10.6.1   Basic Procedures of ECG Operation

Perform the following steps.

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

2. Power on the ultrasound system and attach the ECG electrodes on the patient's body (as shown in the following figure).
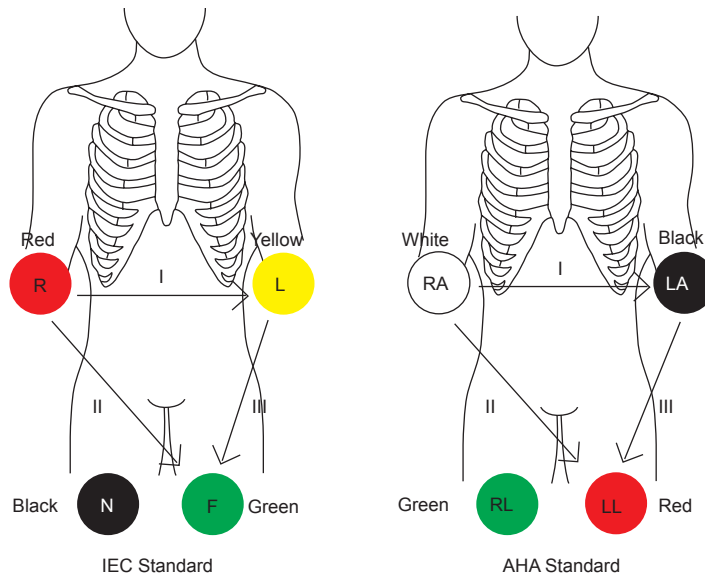
Figure 10-6 Electrode Placement

3. Make the relevant settings of the ECG module. For details, refer to Section 10.6.2 Optimizing Parameters.

4. Freeze the images and review them. For details, refer to Section 10.6.3 Reviewing ECG.

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

10.6.2   Optimizing Parameters

Select the **Menu** key and then select **ECG** on the pop-up menu. Rotate the **Menu** key or select the ← or → key to display the submenu of the ECG module.

Item	Description
ECG	Enable or disable the ECG function.
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. When enabled, the **R-Trigger** menu pops up, including several items to be chosen. **NOTE:** In order to enable the R-trigger function, you should disable the compounding imaging function first.
Trigger Delay	Delay of trigger after the 2D refresh.
Frame Count	Set the number of the image transmitted in one second.
Frame Int.	Set the refresh interval of 2D image.

10.6.3 Reviewing ECG

Select the **Freeze** key on the control panel to freeze an image and the ECG waveform is frozen at the same time. Using the trackball to review the ECG waveform frame by frame. The ECG waveform is the reference for time.

10.6.3 Reviewing ECG

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11   Managing Images/Data

Images in this ultrasound system include frame images and cine, you can save or review them after the acquisition. Meanwhile, images can also be backed up to a USB drive or a DVD for future review if it is needed.

11.1   Storing an Image

NOTE:

- Keys can be defined on the General Settings menu - Key Configuration tab. For details, refer to Section 4.1.4 Defined-Key Settings.
- All data is saved to the ultrasound system by default. If a USB drive is connected and **Store to UsbDisk** is ticked on the General Settings menu - Key Configuration tab, the saved data will be synchronously stored to the USB drive.

11.1.1   Storing an Image Automatically

Except images acquired in the 3D and 4D modes, other images or data can be saved by one defined key. Perform the following steps to store an image.

1. Set **One Key Store** to **ON** on the **System Setting > General > Storage** menu.

2. Select the **Save** key on the control panel in the real time mode or frozen mode, and then the current image can be saved.

   Or, select the **Save** key in the frozen mode for 3 seconds, and then the current cine can be saved.

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

11.1.2   Storing an Image Manually

All images and cine can be saved manually, they are named after the saving date and time.

Perform the following steps to store an image.

1. Set **One Key Store** to **OFF** on the **System Setting > General > Storage** menu.

2. Select the **Save** key in the frozen mode, a dialogue box pops up on the screen.

3. Select **Image** in the pop-up dialogue box, and select **Set** to save the current image.

4. Select **Cine** in the pop-up dialogue box and then select **Set** to save the current cine.

   Or, select **Volume** in the dialogue box in the 3D/4D mode and then select **Set** to save the volume data.

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

Selecting the **Save** key in the real time mode can only save the current image.

11.2   Viewing an Image/Cine

You can view an image or a cine for the current or a previously examined patient by using the clipboard or the **REVIEW** screen.

11.2.1   Viewing the Current Image/Cine

■   **To view an image/cine by using the clipboard:**

1. Select the **T-ball** key in the real time scan or frozen mode.

2. Select an image or a cine in the clipboard at the bottom of the screen by using the trackball and select the **Set** key to view the image/cine.

   − Click ▤ to select all images/cines.
   − Click ▲ or ▼ key to go to the previous or next clipboard page.
   − Click ▱ to export images to the USB drive or DICOM server.
   − Click 🗑 to delete the selected image/cine.
   − You can also amplify the image or review the cine and perform a measurement.

■   **To view the image on the view image screen**

1. Select the **File** key on the control panel to enter the **View Image** screen.

   The following screen is displayed with images and cine thumbnails.
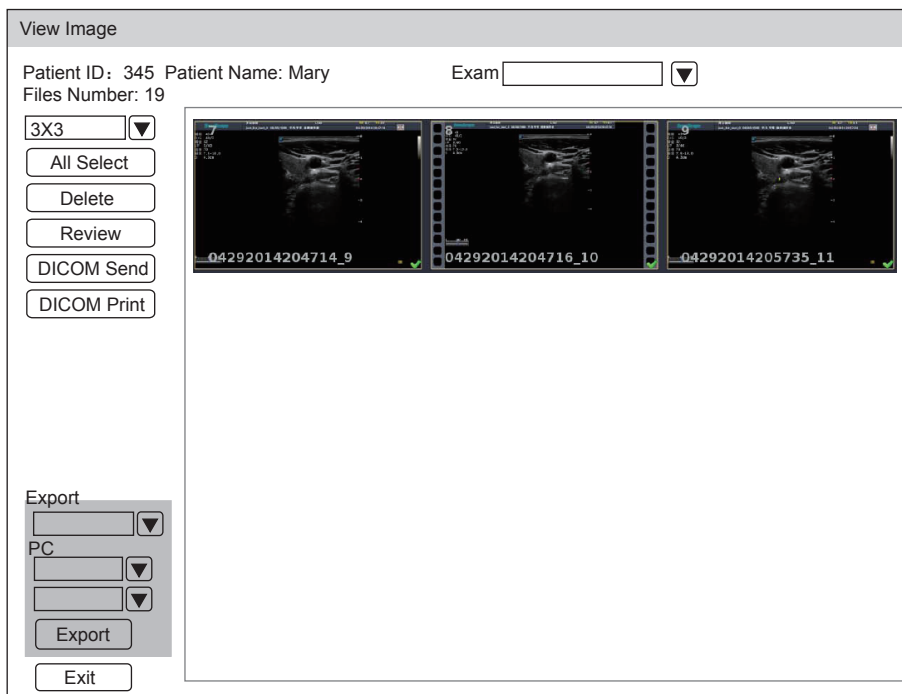
   If the patient has had more than one exam, you can select the desired exam from the **Exam** drop-down list.

2. Move the trackball to the thumbnails and select the **Set** key to choose one image.

3. View the image.

   − Double-click the **Set** key to view an image.

   You can select the **Freeze** key at any time to return to the **View Image** screen.
   − Click **Review** to view the image.

11.2.2   Retrieving an Image

Perform the following steps.

1. Choose the **Patient** key > **Patient List** > **Patient Review** to enter the **Patient Review** screen.

2. Select the desired patient, and then click **View** to enter the **Exam Review** screen.

3. Select the desired exam, and click **View Image** to retrieve the image.

11.3 Sharing Data

You can remotely access to the data stored in the system through a computer.

Perform the following steps.

1. Connect the computer to the ultrasound system.

2. Set **Image Share Service** to **On** on the **General** Settings menu > **Storage** 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.

11.4 Backing up Data

All data is saved to the ultrasound system by default. To avoid data loss due to unexpected system breakdown or software update, it is highly recommended you back up data to the USB drive, DVD or DICOM server. For details about DICOM server backup, please refer to Section 12.2 DICOM Storage.

NOTE:

Complete all exams before backing up the data.

11.4.1 Backing up Data to the USB Drive

Perform the following steps.

1. Connect a USB drive to the ultrasound system.

2. Choose the **Patient** key > **Patient List** > **Patient Review** to enter the **Patient Review** screen.

3. Select **USB** from the **Import/Export** drop-down list.

4. Click **Export Screen** and then select the exported image format.

   If you select PC image format, you can also select the exported image or cine format.

5. Select the desired patient.

6. Click **Patient Export** to back up all data relevant to the patient.

If only images are needed to be exported, you can export them on the **View Image** screen.

11.4.2 Backing up Data to DVD

NOTE:

You can use a DVD with the ultrasound system. DVD (DVD-R/RW, DVD+R/RW, 4.7GB capacity or more) manufactured by SONY is recommended.

Perform the following steps.

1. Connect the USB port of the ultrasound system to that of the DVD drive using the USB cable.

   NOTE:

   Ensure the DVD drive is successfully connected to the ultrasound system. Otherwise, the DVD cannot be read.

2. Place an empty DVD in the CD-ROM drive.

   NOTE:

   Please make sure the DVD is facing upward in the CD-ROM drive.

3. Choose the **Patient** key > **Patient List** > **Patient Review** to enter the **Patient Review** screen.

4. Select **DVD** from the **Import**/**Export** drop-down list.

5. Click **Export Screen**, and then select the exported path.

6. Select the desired patient.

7. Click **Patient Export** to back up all data relevant to the patient.

   DVD ejects after a successful data backup export prompt is displayed.

8. Take out the DVD from the CD-ROM drive and close the tray.

If only images are needed to be exported, you can export them on the **View Image** screen.

11.5   Importing Data to the System

NOTE:

•   Only data generated by this system can be imported.

•   Ensure the current exam is completed before you import data. Otherwise, you may have a failure data import.

Perform the following steps.

1. Connect a USB drive to the ultrasound system.

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

2. Choose the **Patient** key > **Patient List** > **Patient Review** to enter the **Patient Review** screen.

3. Select the imported device from the **Import/Export** drop-down list.

4. Click **Export Screen** and then select the imported patient information.

5. Click **Patient Import** to import the desired data.

12 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 ultrasound 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 ultrasound system so that the correct patient can be examined.
- Send stored images or data on the ultrasound system to the DICOM server.
- Print images on a DICOM printer.

DICOM service of the ultrasound system consists of DICOM storage, storage commitment, DICOM worklist, MPPS and DICOM print.

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

12.1 Verifying Connectivity

Perform the following steps.

1. Access the ultrasound system to the local DICOM network server by using an network cable.

2. Edit the relative settings for the local network and DICOM server. For details, refer to Section 4.2 Peripheral Device Settings and Section 4.7 Configuring DICOM.

3. If the verification is successful, you can use the DICOM services.

NOTE:
Ensure the ultrasound system is connected to the server before using the DICOM service. Otherwise, the service cannot be used.

12.2 DICOM Storage

DICOM Storage is used to send patient information and the relevant images to the DICOM storage server for storage.

■ **To store the current image**

1. Define the **Save** key or the **U1/U2** key as **Dicom Send** on the **General Settings** menu > **Key Configuration** tab.

2. Select the **Save** key or the **U1/U2** key in the real-time or frozen mode to send the current image to DICOM storage server.

■ **To store patient data**

1. Choose the **Patient** key > **Patient List** > **Patient Review** to enter the **Patient Review** screen.

2. Select the desired patient, and then click **View** to enter the **Exam Review** screen.

3. Select the desired exam.

4. Click **DICOM Send** to send the patient information and the relevant images to the DICOM storage server.

If you only want to send images, press the **File** key on the control panel to enter the **View Image** screen, select the desired images, and then click **DICOM Send**.

If you want to check the status of items sent to the DICOM storage server, choose the **Patient** key > **Patient List** > **DICOM Queue**.

12.3   DICOM Print

DICOM Print is used to send images to the DICOM print server for printing.

You should properly connect the ultrasound system to the print server and edit the relevant settings. For details, refer to Section 4.4.5 Print Service Settings.

- **To print the current image**

  1. Define the **Save** key or the **U1/U2** key as **Dicom Print** on the General Settings menu - Key Configuration tab.

  2. Select the **Save** key or the **U1/U2** key in the real-time or frozen mode to send the current image to the DICOM printer server.

- **To print patient data**

  1. Choose the **Patient** key > **Patient List** > **Patient Review** to enter the **Patient Review** screen.

  2. Select the desired patient, and then click **View** to enter the **Exam Review** screen.

  3. Select the desired exam.

  4. Click **DICOM Print** to send the patient information and the relevant images to the DICOM print server.

If you only want to send images, press the **File** key on the control panel to enter the **View Image** screen, select the desired images and then click **DICOM Send**.

If you want to check the status items sent to the DIOCM print server, choose the **Patient** key > **Patient List** > **DICOM Queue**.

12.4   DICOM Worklist

The DICOM Worklist is used to search the archived patient information on the DICOM server, and copy the patient information to the ultrasound system so that the correct patient can be examined.

Select the **Patient** key on the control panel to enter the **New Patient** screen and then click **WorkList** to enter the **WorkList** screen.

Figure 12-1 WorkList Screen

Perform the following steps.

1. Search for the patient information.

   Enter the search requirements, such as Patient Name, Patient ID, Accession#, Exam Date/Time or Requested Procedure ID, and then 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.

   a. Select the desired patient.

   b. Click **Select** to start an exam. If the desired patient has taken more than one exam, click **Group Case** to start the exam.

3. Enter patient information.

12.5   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 by pressing the **End Exam** key on the control panel, the system sends the status information "Complete" or "Discontinue" to the MPPS server.

If you want to check the status items sent to the MMPS server, choose the **Patient** key > **Patient List** > **DICOM Queue**.

■   **To add MPPS**

You can manually add MPPS 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. Choose the **Patient** key > **Patient List** > **Patient Review** to enter the **Patient Review** screen.

2. Click **PPS Screen** to enter the **PPS** screen.

PPS Screen						
Information						
Patient ID	Patient Name	Birth Date	Sex	Description	Date/Time	State
20140505	Mary	Unknown				IN PROGRESS

Scheduled Procedure Step Information

Code	Description	Meaning

Append   Exit

Figure 12-2 PPS Screen

The **PPS** screen displays MPPS information about the current patient. If the patient information is acquired from the DICOM WorkList, the **PPS** screen will also display the relevant acquisition protocol.

3. Click **Append** to display the following dialogue box.

PPS

☐ Assisted Acquisition Protocol Setting

Code [_____]

Meaning [_____]

Designator [_____]

Reason [Doctor cancelled procedure ▼]

Completed   Discontinued

4. Click **Assisted Acquisition Protocol Setting**, and then enter the relevant information to code, meaning and designator.

5. Click **Completed** to end the order operation.

Or, you can also click **Discontinued** if needed.

12.6　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, choose the **Patient** key > **Patient List** > **DICOM Queue**.

12.7   DICOM Queue

The DICOM Log is used to check the sending status of DICOM storage, DICOM print, MPPS and DICOM commitment.

Choose the **Patient** key > **Patient List** > **DICOM Queue** to enter the DICOM Queue screen.

Figure 12-3 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 Exam Date/Time, and then click **Search** to search for the desired information.

2. Check the sending status.

    You can check the sending status by viewing **Run State**, **Status** or **Details**.

3. Deal with the failure sending information.

    − Select the desired patient information and click **Refresh** to refresh the patient information. If it does not work, you can click **Resend** to resend the information.

    − Click **All Select** > **Resend Fail** to resend all information.

    − Select the desired patient information and click **Delete** to delete the information.

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13 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 is provided in this manual. For details, refer to the relevant manuals.

13.1 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
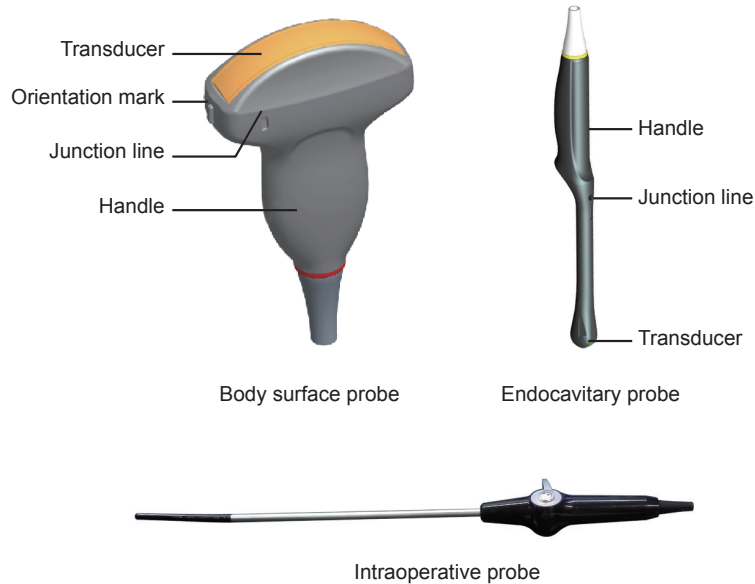
13.1.1 Available Probes

The available probes are listed as follows.

Probe Model	Application
C322, C344, C345, C353, C354, C362, C542, C544, C5-1, VC6-2, VC8-3, C611, C613, L541, L741, L742, L743, L744, L752, 10L1, VL12-5, 2P1, 2P2, 5P2, 8P1, 3P1, 5P1, P5-1, CWD2.0, CWD5.0, CWD8.0, PWD2.0, 3C-A, 4P-A, C1-6, S1-5, 7P-A, 18L-A, 6CT-A, 12LT-A, 6CI-A, 12LI-A, 9L-A, 13L-A, 3C-B, 4P-B, 12P-A	Body surface
6V3, 6V1, 6V7, 6V1A, 6V2A, EC9-5, BCL10-5, BCC9-5, VE9-5, MPTEE mini, MPTEE, 12C-ER, 6V-A, 8V-A	Intracavitary
6CT4, 10I2, 10I3, LAP7, 7LI4, 10L-I	Intraoperative

13.1.2 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 medical sterile gloves.
2. Wear the probe sheaths
   a. Remove the packaging and unfold the probe sheath.

b. Apply an appropriate amount of coupling gel to the inside of the sheath and onto the face of the probe.
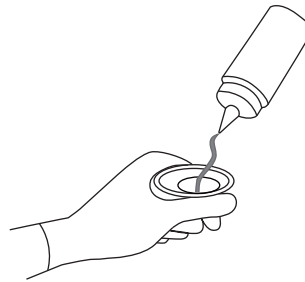
c. Hold the probe and unroll the sheath onto the probe.

d. Pull the probe sheath tightly over the face of the probe to remove wrinkles.

e. Secure the sheath to the probe with the adhesive tapes or elastic bands.

3. Orient the probe.

Check the probe orientation mark before the scan.

4. Perform a scan.

■   **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.
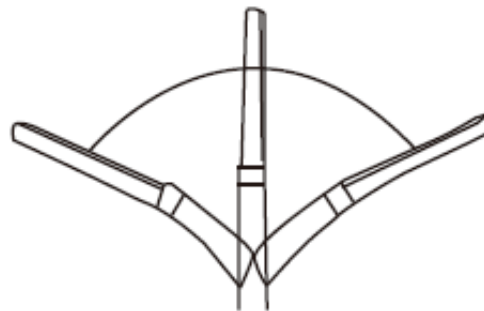
3. Perform a scan.

13.1.3   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 before and 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 clearer.

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.

13.1.4   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 entracavitary probe and clean and sterilze 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 might 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
Semi-critical	A device that comes into contact with intact mucous membranes and does not ordinarily penetrate sterile tissue.	High	Endocavitary probe

Classification	Definition	Level of Disinfection	Application
Noncritical	Devices that do not 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.

NOTE:

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

■ **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 13.1.3 Cleaning the Probe.

2. Perform the medium-level disinfection to the body surface probe as shown in Table 13-1.

    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 13-1 Recommended Method for Medium-level Disinfection

Disinfectant	Manufacturer	Active Ingredient	Level for Active Ingredient	Contact Type	Contact Period
70% Isopropyl alcohol	ALL	70% 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 13.1.3 Cleaning the Probe.

2. Perform the high-level disinfection to the endocavitary probe as shown in Table 13-2.

    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.

Table 13-2 Recommended Method for High-level Disinfection

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

13.1.5 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 steps as follows:

1. Clean the probe.

   For details, refer to Section 13.1.3 Cleaning the Probe.

2. Sterilize the intraoperative probe as shown in Table 13-3.

   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.

Table 13-3 Recommended Method for Sterilization

Disinfectant	Manufacturer	Active Ingredient	Level of Active Ingredient	Contact Type	Contact Period
Cidex™ Activated Dialdehyde Solution	J&J	Glutaraldehyde	2.4%	Soak	10 hours

13.1.6 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 13-4.

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 13-4 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 13.1.5 Sterilizing the Probe.

13.1.7   Storage and Transportation

You should operate, store and 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.

13.2   Biopsy

You should properly assemble 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 distributer 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.

- To avoid possible personnel injury, the operator should perform the biopsy using an appropriate biopsy bracket.

13.2.1   Available Biopsy Brackets

Biopsy Bracket Model	Available Probe Model	Available Biopsy Needle	Application
NGBC322	C322	14G, 16G, 18G, 20G	Body surface
NGBC344	C344	14G, 16G, 18G, 20G, 22G	Body surface
NGBC353	C353	14G, 16G, 18G, 20G, 22G	Body surface
NGBC354	C354	14G, 16G, 18G, 20G, 22G	Body surface
NGBC362	C362	14G, 16G, 18G, 20G, 22G	Body surface
NGBC5-1	C5-1	14G, 16G, 18G, 20G, 22G	Body surface
NGBC611	C611	14G, 16G, 18G, 20G, 22G	Body surface
NGBC613	C613	14G, 16G, 18G, 20G, 22G	Body surface
NGBL741	L741	14G, 16G, 18G, 20G, 22G	Body surface
NGBL742	L742	14G, 16G, 18G, 20G, 22G	Body surface
NGBL743	L743	14G, 16G, 18G, 20G, 22G	Body surface
NGBL752	L752	14G, 16G, 18G, 20G, 22G	Body surface
NGB2P1	2P1	14G, 16G, 18G, 20G, 22G	Body surface
NGB2P2	2P2	14G, 16G, 18G, 20G, 22G	Body surface
NGB3P1	3P1	14G, 16G, 18G, 20G, 22G	Body surface
NGB3C-A	3C-A	14G, 16G, 18G, 20G, 22G	Body surface
NGB4P-A	4P-A	14G, 16G, 18G, 20G, 22G	Body surface
NGBC1-6	C1-6	14G, 16G, 18G, 20G, 22G	Body surface
NGBS1-5	S1-5	14G, 16G, 18G, 20G, 22G	Body surface

Biopsy Bracket Model	Available Probe Model	Available Biopsy Needle	Application
NGB18L-A	18L-A	14G, 16G, 18G, 20G, 22G	Body surface
NGB9L-A	9L-A	14G, 16G, 18G, 20G, 22G	Body surface
NGB13L-A	13L-A	14G, 16G, 18G, 20G, 22G	Body surface
NGB3C-B	3C-B	14G, 16G, 18G, 20G, 22G	Body surface
NGB4P-B	4P-B	14G, 16G, 18G, 20G, 22G	Body surface
NGB6V-A	6V-A	14G, 16G, 18G, 20G, 22G	Intracavity
NGB8V-A	8V-A	14G, 16G, 18G, 20G, 22G	Intracavity
NGB6V1	6V1	16G, 18G, 20G, 22G	Intracavity
NGB6V3	6V3	16G, 18G, 20G, 22G	Intracavity
NGB6V7	6V7	16G, 18G, 20G, 22G	Intracavity
NGBEC9-5	EC9-5	16G, 18G, 20G, 22G	Intracavity
NGBBCL10-5	BCL10-5	14G, 16G, 18G, 20G, 22G	Intracavity
NGBBCC9-5	BCC9-5	16G, 18G, 20G, 22G	Intracavity

13.2.2   Assembling the Biopsy Bracket

■   **To assemble the surface biopsy bracket**
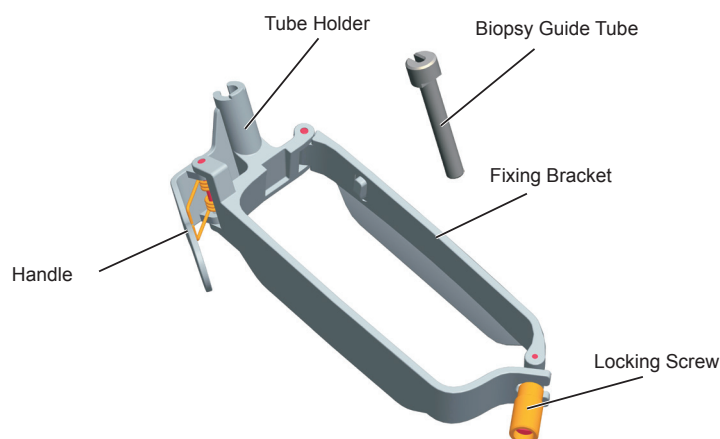
Perform the following steps.

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
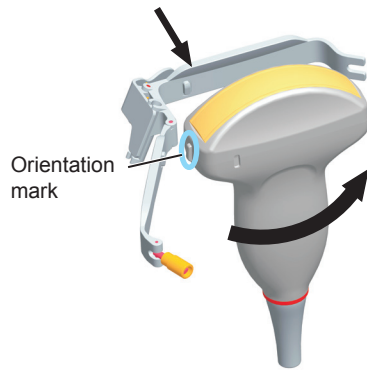
6. Attach the biopsy bracket to the probe and fasten the biopsy bracket with the locking screw.

7. Press the handle and insert the biopsy bracket tube into the biopsy bracket.
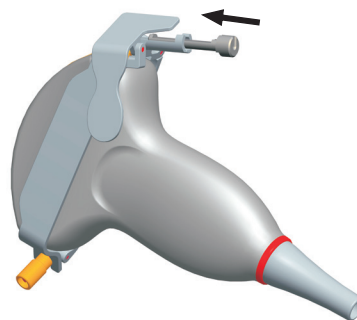
8. Insert the biopsy needle into the guide tube and make sure that the biopsy bracket is firmly attached to the probe.
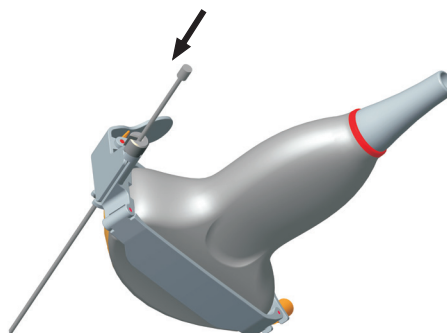
9. Unfold another probe sheath, and apply an appropriate amount of coupling gel to the inside of the sheath.

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**
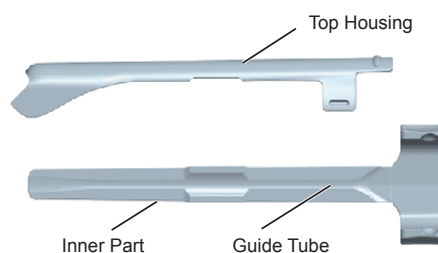
Perform the following steps.

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.
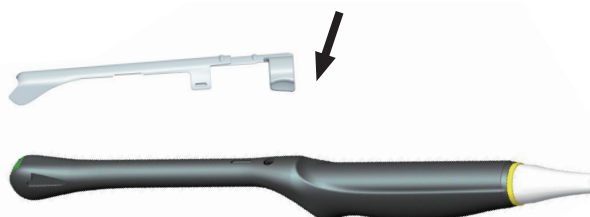
8. Insert the biopsy needle into the guide tube.

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.

13.2.3 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

13.2.4 Verifying the Biopsy Bracket

NOTE:

Ensure the biopsy bracket is properly attached to a compatible probe before verification.

Perform the following steps.

1. Select the **Menu** key to display the menu and then select **Biopsy** in a 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.

13.2.5 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. Choose **Menu** > **General** > **General**, set **Guide Line Type** to **Gun** or **Needle**.

2. Select the **Menu** key to display the menu and then select **Biopsy** in a real time B-mode.

   For C322, C353, 3P1 or L742 probe, you can preset the biopsy angle.

3. Perform a scan to locate the target.

4. Perform the puncture by sliding the needle through the groove in the guide until the needle, as shown on the display, intercepts the target.

   You can select **Biopsy Cali.** to adjust the biopsy guideline.
   - For C322, C353, 3P1 or L742 probe, select the menu item of **Angle Select**, and rotate the **Menu** key or select the ← or → key to adjust the angle of the biopsy guideline freely.
   - Select the menu item of **Angle** or **Offset**, and rotate the **Menu** key or select the ← or → key to adjust the position or angle of the biopsy guideline gradually.
   - Set the menu item of **User Mode** to **On** to adjust the position and angle of the biopsy guideline freely.
   - Select the menu item of **Save** and rotate the **Menu** key or select the ← or → key to save settings of the biopsy guideline.
   - Select the menu item of **Load Default** and rotate the **Menu** key or select the ← or → key to restore defaults.

5. Adjust the brightness of the biopsy needle on the image.
   - For linear probes, you can select the menu item of **Vis-Needle** to enhance the brightness for the biopsy needle.
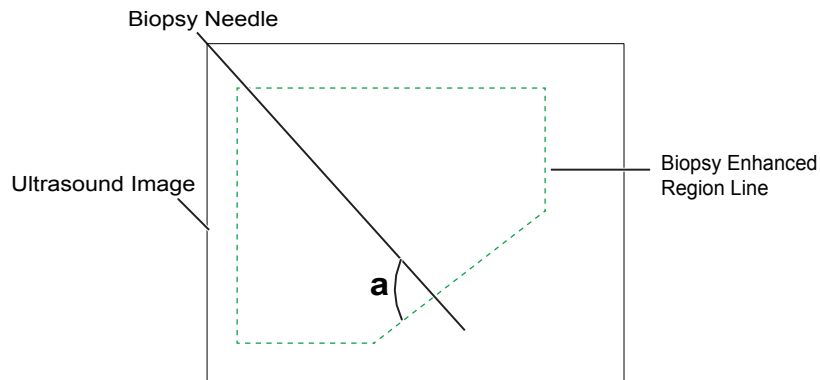
- You can select the menu item of **Steer Angle**, and rotate the **Menu** key or select the ← or → key to adjust the angle of the biopsy enhanced region line. The more closely to 90° of angle a, the stronger brightness of the biopsy needle.
- You can select the menu item of **Dual Live**, and rotate the **Menu** key or select the ← or → key to activate the dual-split display for better observation.

6. Gently remove the probe from the patient after completing the biopsy.

13.2.6   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.

13.2.7   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 distributer.
- 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 13.2.6 Cleaning the Biopsy Bracket.

2. Sterilize the biopsy bracket as shown in Table 13-5 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 13-5 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 hour

13.2.8 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 System Maintenance

To maintain the safety and functionality of the ultrasound system, you should periodically perform the maintenance for the ultrasound system and accessories.

⚠ **WARNING**
- To avoid electric shock and damage to the ultrasound system, power off and unplug the system from the AC power outlet before cleaning.
- To maintain the safety and functionality of the ultrasound system, maintenance must be performed at least every 1 year. Electrical safety tests must also be performed at regular intervals as specified by local safety regulations

14.1 Cleaning the System

■ **To clean the system surface**

1. Power off and unplug the ultrasound system from the AC power outlet.

2. Dampen a lint-free soft cloth with 75% ethyl alcohol.

3. Use this lint-free soft cloth to clean the surfaces of the monitor 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.

5. In case of blood or any infectious fluids or materials, use a lint-free soft cloth dampened with 70% isopropyl alcohol.

■ **To clean the trackball**

1. Power off and unplug the ultrasound system from the AC power outlet.

2. Press the bulges in the ring with both hands.

3. Turn the ring anticlockwise until the ring lifts.
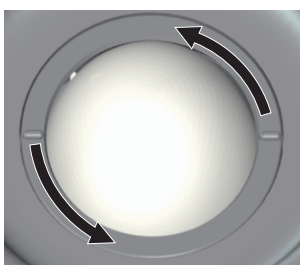
4. Take out the ring and ball (be careful not to drop the ball) from the control panel.

5. Use a lint-free soft cloth dampened with 75% ethyl alcohol to clean the trackball.

6. Use a cotton swab dampened with 75% ethyl alcohol to remove stains from the ring.

7. Place the trackball and the ring back in the control panel, press the bulges in the ring with both hands and turn the ring clockwise to install the trackball.

■ **To clean the dust filter**
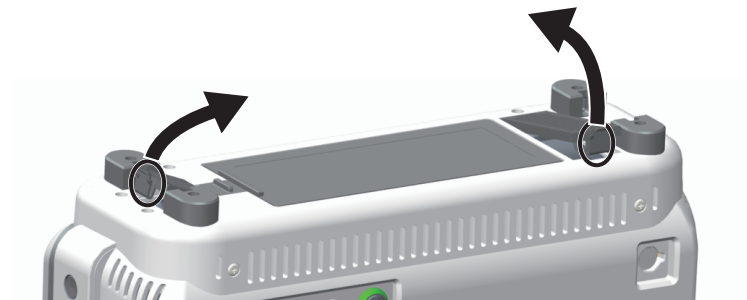
The dust filter must be cleaned at least every 3 months for ventilation. Power off and unplug the ultrasound system from the AC power outlet.

1. Pinch the dust filter with fingers as the figure shown above.

2. Rinse the taken out sponge with refresh running water, and use a brush to rinse the dust filter with refresh running water.

3. Place the sponge and dust filter back to the ultrasound system after a thorough airing.

14.2   Maintenance Checks

To maintain the safety and functionality of the ultrasound system, the following maintenance checks must be performed by service personnel at least every 1 year.

■ **Electrical Safety**

- Integrity of power cable
- Protective conductor resistance
- Ground line leakage current
- Patient leakage current
- Patient auxiliary leakage current

■ **Battery Safety**

- Battery Appearance

    Ensure there is no bulging, cracks, damage, leakage or corrosion.

- Battery Performance

    a. Power on the system by using the AC adapter to fully charge the battery.

    b. Disconnect the system from the AC adapter to power on the system by the battery until the system automatically shuts down.

    c. The powering time of the battery indicates the battery performance. If the powering time of the battery is much shorter than 30 minutes, you should replace the battery or contact Service Department of the manufacturer.

■ **Mechanical Safety**

- Appearance of the system enclosure
- Appearance of the control panel

    NOTE:

    The surfaces of the control panel may be abrasive because of the split liquid or other cleaning sprays. Take care to find the potential problem when performing maintenance checks.

- Connectivity of interfaces

■ **Image Recording**

- Images in each mode

● Image recording using the standard probe

14.3 Troubleshooting

Q1: Cannot start the ultrasound system.

A1: Check whether the battery capacity is exhausted, the ultrasound system is connected to the mains supply, or the main power button is pressed down.

Q2: No images are displayed on the LCD monitor.

A2: Check whether the power supply cable is securely connected.

Q3: The LCD monitor displays abnormal.

A3: Check whether you select the appropriate probe and a compatible exam type, or optimize imaging parameters correctly. For details, refer to Chapter 6 Acquiring Images.

Q4: The measurement cannot be performed after selecting the **Calc** key on the control panel.

A4: Ensure you press the **Calc** key in the frozen mode.

If the above problems still exist, please contact the Customer Service Department of the manufacturer for help.

14.4 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.

14.5 Precautions for the Reduction of the Environment Impact

Alliage S/A aims to reach an environmental politics to prompt the supply of the medical product environmental conscious that continuously minimize the environmental impact and that are more friendly to the environment and to the human health.

To keep a minimum impact on the environment, observe the following recommendations:

● After installation, forward the recyclable materials for the recycling process.

● During the life circle of the equipment, turn it off when it is not being used.

● To prevent environmental contamination, the disposal of the protective plastic covers and other consumables must be according to the normal procedure of the clinic or hospital for biomedical waste.

The biomedical waste comprises nonhigh material susceptible to cause disease or house pathogenic organisms that must be stored in a yellow bag properly labeled with the symbol of biological hazard, or stored in a container resistant to perforation, tight and even collection and incineration.

NOTE:

The packaging of the ultrasound system is composed of cardboard and plastic, which are 100% recyclable materials.

14.6 Precautions in Case of Destruction of the System

⚠ WARNING The system must not be disposed of as domestic waste.

To avoid environmental contamination or inappropriate use of the ultrasound system when it is destroyed, they must be disposed of (according to the current legislation) in an appropriate place. Otherwise, it may contaminate the environment.

For the European Economic Area (EEA), this system is subject to the Directive 2012/19/EU, as well as the correspondent national laws. This directive requires that the system and accessories must be taken to a special waste collection site at the end of their lifespans. Contact the retailer if the final disposition of the product is necessary.

14.7   Customer Service

Only the service personnel of or authorized by the manufacturer can service the ultrasound system. Any feedback or inquires concerning our product or services should be directed to the manufacturer.

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 60601-2-37:2008 (IEC 60601-2-37:2007), Medical Electrical Equipment Part 2-37: Particular Requirements for the Basic Safety and Essential Performance of Ultrasonic Medical Diagnostic and Monitoring Equipment - EN 60601-1-2:2007 (IEC 60601-1-2: 2007), Class A, Medical electrical equipment-Part 1-2: General requirements for basic safety and essential performance - Collateral standard: Electromagnetic compatibility - Requirements and tests - EN 60601-1-9 (IEC 60601-1-9). Medical Electrical Equipment Part 1-9 General requirements for basic safety and essential performance-Collateral standard: Requirements for environmentally conscious design		
Classifications	Type of protection against electrical shock	Class I	
	Degree of protection against electrical shock	Type-BF applied part	
	Installation Type	Portable equipment	
	Degrees of protection against harmful liquid	System is IP00 Probe (from the acoustic window to the junction line) is IPX7 Probe cable is IPX1 Foots witch is IPX2	
	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
	Relative Humidity	30%~75% (no condensation)	20%~90% (no condensation)
	Ambient Temperature	10°C~+40°C	-20°C~+55°C
	Atmospheric Pressure	700hPa~1060hPa	700hPa~1060hPa
Power Supply	Voltage: 110-240V~ Frequency: 50/60Hz Power consumption: 110-240V~, 3.0-1.2A		
Applied Parts	Probe, ECG electrodes		

Appendix B EMC Guidance and Manufacturer's Declaration

The EUT is classified as Group 1, Class A medical equipment according to CISPR 11.

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.

The ultrasound system is suitable for use in a professional health care environment, not including areas where there are sensitive equipment or sources of intense electromagnetic disturbances, such as the RF shielded room of an imaging system magnetic resonance imaging, operating rooms near active AF surgical equipment, electrophysiology laboratories, armored rooms or areas where short wave therapy equipment is used.

⚠ WARNING
- Do not use the system around strong electric filed, electromagnetic filed (e.g. MRI scan room) and mobile wireless communication devices. Using the device in an improper environment may cause malfunction or damage.
- The compliance with EMC and EMI regulation can not be guaranteed by the use of modified cables or those which do not comply with the same standards under what the equipment was validated.
- The system must not be used adjacent or supported by other equipment. The recommendations of this manual must be followed.
- Do not use accessories, transducers, internal parts of components and other cables other than those previously specified by the manufacturer. This may result in increased emission or decreased electromagnetic immunity and improper operation.
- Portable RF communications equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30 cm to any part of the ultrasound system, including cables specified by the manufacturer. Otherwise, degradation of the performance of this equipment could result.
- To maintain basic safety in relation to electromagnetic disturbances during the expected service life, always use the system in the specified electromagnetic environment and follow the maintenance recommendation described in this manual.

The following tables provide information on compliance of the equipment according to the standard EN 60601-1-2:2015.

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 A	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	

Phenomenon	Basic Standard of EMC	Immunity Test Level	Level of Conformity
Electrostatic discharge	IEC 61000-4-2	±8 KV contact ±2 KV, ±4 KV, ±8 KV, ±15KV air	±8 KV contact ±2 KV, ±4 KV, ±8 KV, ±15KV air
Radiated RF EM fields	IEC 61000-4-3	3V/m 80 MHz-2.7 GHz 80% AM at 1 KHz	3V/m 80 MHz-2.7 GHz 80% AM at 1 KHz
Proximity fields from RF wireless communication equipment	IEC 61000-4-3	See table	See table
Electrical Fast/Transients bursts	IEC 61000-4-4	±1 KV 100 KHz repetition frequency	±1 KV 100 KHz repetition frequency
Conducted disturbances induced by RF fields.	IEC 61000-4-6	3V 0.15 MHz-80 MHz 6 Vm in ISM bands between 0.15 MHz and 80 MHz 80% AM at 1KHz	3V 0.15 MHz-80 MHz 6 Vm in ISM bands between 0.15 MHz and 80 MHz 80% AM at 1KHz
Rated power frequency magnetic fields	IEC 61000-4-8	30 A/m 50 Hz or 60 Hz	30 A/m 50 Hz or 60 Hz

Test Frequency (MHz)	Band (MHz)	Service	Modulation	Maximum Power (W)	Distance (m)	Immunity Test Level (V/m)
385	380-390	TETRA 400	Pulse modulation 18 Hz	1.8	0.3	27
450	430-470	GMRS 460, FRS 460	FM ±5 KHz deviation 1KHz sine	2	0.3	28
710	704-787	LTE 13, 17 Band	Pulse modulation 217 Hz	0.2	0.3	9
745						
780						

Test Frequency (MHz)	Band (MHz)	Service	Modulation	Maximum Power (W)	Distance (m)	Immunity Test Level (V/m)
810	800-960	GSM 800/900, TETRA 800, iDEN 820, CDMA 850, LTE 5 Band	Pulse modulation 18 Hz	2	0.3	28
870						
930						
1720	1700-1990	GSM 1800, CDMA 1900, GSM 1900, DECT, LTE 1, 3, 4 , 25 Band, UMTS	Pulse modulation 217 Hz	2	0.3	28
1845						
1970						
2450	2400-2570	Bluetooth, WLAN 802.11 b/g/n, RFID 2450, LTE 7 Band	Pulse modulation 217 Hz	2	0.3	28
5240	5100-5800	WLAN 802.11 a/n	Pulse modulation 217 Hz	0.2	0.3	9
5500						
5785						

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$[e^{-0.23\text{alf}}]$

where: In Situ = In Situ Intensity Value

Water = Water Value Intensity

e = 2.7183

a = Attenuation Factor

Tissue = a (dB/cm-MHz)

Amniotic Fluid = 0.006

Brain = 0.53

Heart = 0.66

Kidney = 0.79

Liver = 0.43

Muscle = 0.55

l = Skin line to measurement depth (cm)

f = Center frequency of the transducer/system/mode combination (MHz)

Since the ultrasonic path during an examination is likely to pass through varying lengths and types of tissue, it is difficult to estimate the true In Situ intensity. An attenuation factor of 0.3 is used for general reporting purposes; therefore, the In Situ value which is commonly reported uses the formula:

In Situ derated = Water$[e^{-0.069\text{lf}}]$

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 13.1.1 Available Probes.

D.1 Coupling Gel

Probe Model	Applicable	Inapplicable
MPTEE Mini 7-4, MPTEE 7-4, MPTEE, MPTEE mini, 12C-ER	Aquasonic 100, Aquasonic Clear, Sterile Aquasonic, Clear Image/Single, Sterile Ultraphonic Gel	Transonic gel, Clear Scanning Gel, Multigel Gel
LAP7, C9-5, 10I2, 6CI-A, 6CT-A, 7LI4, 10I3, 10L-I, 12L-I, 12LI-A, 12LT-A, 11L-I	Aquasonic 100, Aquasonic Clear, Sterile Aquasonic, Clear Image/Single, Sterile Ultraphonic Gel, Transonic gel	Clear Scanning Gel, Multigel Gel
EC2, EC9-5, 5V1, 6V1, 6V3, 6V4, 6V5, BCC9-4, BCC9-5, BCL10-5, 6V-A, 6V1A, 6V2A, 6V3A, 6V7, 8V-A, 6CT4	Aquasonic 100, Aquasonic Clear, Sterile Aquasonic, Clear Image/Single, Sterile Ultraphonic Gel, Transonic gel, Clear Scanning Gel	Multigel Gel
VC6-2, VC8-3, VC311, VE9-5, VC6-2, VL12-5, CWD2.0, CWD4.0, CWD5.0, CWD8.0, PWD2.0	Aquasonic 100, Aquasonic Clear, Sterile Aquasonic, Clear Image/Single, Sterile Ultraphonic Gel, Transonic gel	Clear Scanning Gel, Multigel Gel
2P1, 5P1, 10L1, C311, C321, C343, C344, C351, C352, C361, C362, C511, C521, C541, C542, C543, C611, C612, C721, L541, L561V, L662V, L741, L741V, L742, L743, L745, L746, L751, L752, L761V, L744, C312, C322, C345, C353, C354, C544, C613, C5-1, 3C-A, C1-6, 2P2, 3P1, 3P-A, 4P-A, 4P-B, 5P2, 7P-A, 7P-B, 8P1, 12P-A, 12P-B, P5-1, 3C-B, 9L-A, 13L-A, 18L-A, LAP7, S1-5, 12L-A	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	Inapplicable
MPTEE Mini 7-4, MPTEE 7-4, MPTEE, MPTEE mini, 12C-ER	Mild soapy water	T-spray, T-spray II, Transeptic, 70% IPA
LAP7, C9-5, 10I2, 6CI-A, 6CT-A, 7LI4, 10I3, 10L-I, 12L-I, 12LI-A, 12LT-A, 11L-I	T-spray, T-spray II, mild soapy water	Transeptic, 70% IPA
EC2, EC9-5, 5V1, 6V1, 6V3, 6V4, 6V5, BCC9-4, BCC9-5, BCL10-5, 6V-A, 6V1A, 6V2A, 6V3A, 6V7, 8V-A, 6CT4	T-spray, T-spray II, mild soapy water	Transeptic, 70% IPA,
VC6-2, VC8-3, VC311, VE9-5, VC6-2, VL12-5, CWD2.0, CWD4.0, CWD5.0, CWD8.0, PWD2.0	T-spray, T-spray II, mild soapy water	Transeptic, 70% IPA
2P1, 5P1, 10L1, C311, C321, C343, C344, C351, C352, C361, C362, C511, C521, C541, C542, C543, C611, C612, C721, L541, L561V, L662V, L741, L741V, L742, L743, L745, L746, L751, L752, L761V, L744, C312, C322, C345, C353, C354, C544, C613, C5-1, 3C-A, C1-6, 2P2, 3P1, 3P-A, 4P-A, 4P-B, 5P2, 7P-A, 7P-B, 8P1, 12P-A, 12P-B, P5-1, 3C-B, 9L-A, 13L-A, 18L-A, LAP7, S1-5, 12L-A	T-spray, T-spray II, mild soapy water, 70% IPA	Transeptic

D.3   Disinfectant

Probe Model	Applicable	Inapplicable
MPTEE Mini 7-4, MPTEE 7-4, MPTEE, MPTEE mini, 12C-ER	Cidex OPA Solution, Cidex, Metricide 14	Metricide 28, Metricide 30, Resert XL HLD
LAP7, C9-5, 10I2, 6CI-A, 6CT-A, 7LI4, 10I3, 10L-I, 12L-I, 12LI-A, 12LT-A, 11L-I	Cidex OPA Solution, Cidex, Metricide 14	Metricide 28, Metricide 30, Resert XL HLD
EC2, EC9-5, 5V1, 6V1, 6V3, 6V4, 6V5, BCC9-4, BCC9-5, BCL10-5, 6V-A, 6V1A, 6V2A, 6V3A, 6V7, 8V-A, 6CT4	Cidex OPA Solution, Cidex, Metricide 14, Resert XL HLD	Metricide 28, Metricide 30
VC6-2, VC8-3, VC311, VE9-5, VC6-2, VL12-5, CWD2.0, CWD4.0, CWD5.0, CWD8.0, PWD2.0	Cidex OPA Solution, Cidex, Metricide 14	Metricide 28, Metricide 30, Resert XL HLD

Probe Model	Applicable	Inapplicable
2P1, 5P1, 10L1, C311, C321, C343, C344, C351, C352, C361, C362, C511, C521, C541, C542, C543, C611, C612, C721, L541, L561V, L662V, L741, L741V, L742, L743, L745, L746, L751, L752, L761V, L744, C312, C322, C345, C353, C354, C544, C613, C5-1, 3C-A, C1-6, 2P2, 3P1, 3P-A, 4P-A, 4P-B, 5P2, 7P-A, 7P-B, 8P1, 12P-A, 12P-B, P5-1, 3C-B, 9L-A, 13L-A, 18L-A, LAP7, S1-5, 12L-A	Cidex OPA Solution, Cidex, Metricide 14, Resert XL HLD	Metricide 28, Metricide 30

Appendix E Acoustic Output Data

Please refer to Section 4.9.2 Acoustic Output.