CTS-7700
Digital Ultrasound Imaging System

OPERATION MANUAL

SIUI

Shantou Institute of Ultrasonic Instruments Co., Ltd.

Contents

DCY2.782.7700SS/V5.0/B-E

Preface

To use this system correctly and safely and to ensure a long life, the user should thoroughly understand the functions, operations, instructions as well as its maintenance. Please read the information in this manual carefully before using the system.

This system has been designed and manufactured safely for the operators and patients. However, for ensuring safety and reliability, please pay attention to the following instructions:

a) This system should be operated only by or under the guidance of a qualified person.

b) This system,belongs to Type BF Class I according to IEC 60601-1:2005. Please operate this system by following the safety requirements described in Chapter 1.

c) Do not try to remodel the system. If necessary, contact our agent or us for help.

d) The system has been completely adjusted and fixed before delivery. Do not try to readjust any adjustable parts that have been well fixed.

e) If any abnormality occurs during operation, turn off the power supply immediately and contact our agent or us for help.

f) Connect the power cable of the unit to a grounded power socket at ground impedance of 0.1Ω or less.

g) Accessory equipment connected to the analog and digital interfaces must be certified according to the respective IEC standards (e.g. IEC 60950 for data processing equipment and IEC 60601-1 for medical equipment). Furthermore all configurations shall comply with the valid version of the system standard IEC 60601-1-1. Everybody who connects additional equipment to the signal input part or signal output part configures a medical system, and is therefore responsible that the system complies with the requirements of the valid version of the system standard IEC 60601-1-1. If in doubt, consult the technical service department or your local representative.

h) The system does not provide special protection functions or measures for use with high frequency operation equipment. The users should be cautious for such application.

i) This Operation Manual may be slightly different from that of your equipment due to system software version, as well as configuration of options and accessories. The

actual system that you purchase shall prevail.

j) The company shall be responsible for accuracy and integrity of this Operation Manual.

k) The company reserves the final right to interpret this Operation Manual.

Chapter 1

Application Scope, Operation Conditions,

Safety and Cautions

1.1 Application Scope

The system is a general-purpose diagnostic ultrasound imaging system designed exclusively for use in a wide variety of extracorporeal body imaging procedures. A general-purpose system supports various transducers and related application software packages allowing for the collection, display and analysis of ultrasound information. Usages include, e.g. general-purpose imaging, cardiac, OB/GYN, breast, prostate, vascular, intra-surgical, depending on the operating system specific software packages and compatible ultrasound transducers (this product does not support intra-surgical and endocavity transducers).

1.2 Operation Conditions

a) The system should be operated under the following ambient conditions for the safe and correct operation :

● Ambient Temperature: 0℃ ~ 40℃;

● Relative Humidity: 30% To 85%;

● Atmospheric Pressure: 700hpa To 1060hpa.

【Note】: If the operation is beyond the ranges above, no normal ultrasound images are ensured.   If the system is stored for a long time, the ventilation of the stored place shall be considered.

b) Strong sources of radiated emissions or electromagnetic waves, from broadcast &TV station for instance, may cause the system to display with noise. Keep this system

away from these kind of radiated emissions or electromagnetic waves.

c) Do not operate this system while other devices are operating with motor or silex switch in the same power phase; otherwise, noise will disturb your system through the power cable.

1.3 Power Requirements

Never use this system when the power supply does not meet the following requirements, otherwise, the system may possibly be damaged.

a) Power Voltage: Single phase, 100-240V~, tolerance±10%; 50Hz/60Hz±1Hz, (230V ± 23V~ for EU countries), 50Hz±1Hz;

b) Connection of grounded device: use a grounded socket. Before connecting to the power supply, connect the additional potential equalization conductor to the equipotential terminal on another grounded system or an external grounded device;

c) The removable multi-jack socket provided together with the system can only be used to supply power for the system equipment. The connection of electric devices that are not part of the system and the removable multi-jack socket may result in danger.

d) If the non-medical electrical equipment, supplied as a part of the system, is intended to be supplied via a multiple portable socket-outlet with a separating transformer, the direct connection of the non-medical electrical equipment to the wall outlet may result in risks；

e) Do not try to deviate any additional multi-jack socket or wire from the removable multi-jack socket of system devices or from the system devices;

f) Any accessories or equipment which are not listed in this manual should not be connected to this system, otherwise, it may result in danger；

g) When the system configured as per this manual is in use, all power supply plugs of the devices shall be connected to the same special removable multi-jack socket if the removable multi-jack socket is powered by a special power supply device, this power supply device shall be in compliance with requirements of EC60601-1 and

IEC60601-1-1; the removable multi-jack socket for the system shall comply with requirements of IEC60601-1-1 Appendix EEE;

h) Do not place the removable multi-jack socket on the ground, otherwise, it may result in danger.

i) The maximum load capacity of the removable multi-jack socket shall not be less than the total load of all the devices consisting of the system, or it may result in danger.

【Tip】: **In regions where mains supply is not stable, it is recommended to use power supply from a stabilizer with output power of 250VA, so as to avoid damage to the system due to mains fluctuation.**

1.4 Safety

The system is designed and manufactured in compliance with the international standard IEC 60601-1:2005 To operate it safely and correctly, please follow the instructions below:

a) This system is not explosion-proof. Do not operate it in a flammable or easy explosive environment(e.g. in the presence of anesthetics, oxygen or hydrogen);

b) The system is not waterproof. Never allow water or other liquid to drip on to the system;

c) The system needs a protective grounding device. Its power cable should be connected to a grounding socket. If the system is powered by a power supply without grounding, its equipotential terminal must be connected to the equipotential terminal on another grounded system or an additional grounded device. Do not use the system where there is no ground terminal is available;

d) Biological safety: the same as other diagnostic ultrasound products, the material used for this products is proved to be innocuous through a long-period trial. It will not result in allergy or stimulation to human body and skin;

e) Ultrasound safety: ALARA（As low as reasonably achievable）should be observed. Patients should always be exposed to the lowest practical transmit power levels for the shortest possible time. Freeze the system and keep the probe away from the patient if no scanning is done. Do not examine the patient with the probe on a

fixed position of the body for a long time; please check the display of acoustic output and MI, when powering on the system, input new patient ID or shift from non-fetal to fetal application.

1.5 Cautions

a) While operating the system, please follow the methods and procedures described in this manual.

b) Always turn off the system and protect it with a dust-proof cover whenever the system is not in use.

c) The system should be operated in a clean environment. Avoid operating it in a place with direct sunshine, impetuous temperature change, full of dust, close to heat source or high humidity; do not put anything on top of the main unit.

d) Avoid severe vibration; otherwise the components in the system might be damaged.

e) Before connecting or disconnecting probe(s), firstly ensure that the main unit is set in frozen state. It would be better to turn off the main unit power supply.

f) Freeze the image whenever no exam is performed.

g) All endocavity probes, when in use, should be covered with probe cover compliant to ISO4074:2002. Biological warning for probe cover: If the covers used for endocavity probes are condoms, they should be nonlubricant and nonmedicated. Practitioners should be aware that condoms have been shown to be less prone to leakage than commercial probe covers, have a six-fold enhanced AQL (acceptable quality level) when compared with standard examination gloves. Their AQL equals to that of surgical gloves. Users should be aware of latex-sensitivity issues and have available nonlatex-containing covers.

h) The transducer assembly specific to endo-cavity use shall be not excited when it is out of the patient's body. Otherwise, such excitation does not comply with

EMC requirements, which might result in harmful interference to other device(s) in the environment

i)   For instructions on probe disinfection and protection, follow the description in 4.2.9.

j)   It is prohibited to scan eyes with the probe. Keep the acoustic power as low as reasonably achievable (ALARA). Scan the body only in a period required for making the diagnosis, rather than scan the body for a long time. An extended scan might result in harm to personal health. Provided that clinical indications are required, the system operator shall be fully acquainted with acoustic output or be accessible to relevant thermal index. The probe, when exposed in the air and noticeable heat from the probe itself, should not be applied to trans-vaginal exam. Pay special attention to minimize exposed acoustic power and exposure period when used on an embryo or a fetus.

k)   To ensure safety, only qualified ultrasound coupling gel compliant to relevant standards shall be applied.

l)   During examination, in case images are interfered by an AC noise (hum-hum) due to the patient, put a shield sheet between the body and the bed as shown in Fig.1-1, and connect the sheet to the equipotential terminal of the main unit. The hum-hum interference noise can be eliminated.

m)   The system operator should not touch any tangible metal parts of any electronic device in the patient environment and the patient at the same time.

n)   The system does not provide special protection functions or measures for use with high frequency surgery equipment. The user should be cautious of such application.

o)   Shut down the system in correct procedures, otherwise it might result in system data loss or system failure.

p)   Except for the USB port, do not disconnect the system or any other peripheral

device (e.g. a printer) from any plug before the system is turned off, otherwise it may result in system damage or electric shock.

q)   The system is not intended for use with a defibrillator.

r)   The system shall not be applied to cardiology directly.

s)   Multiple devices, when interconnected, might result in accumulative leakage current and dangers.

t)   Make sure to use the special components provided by SIUI for system component repair or replacement.
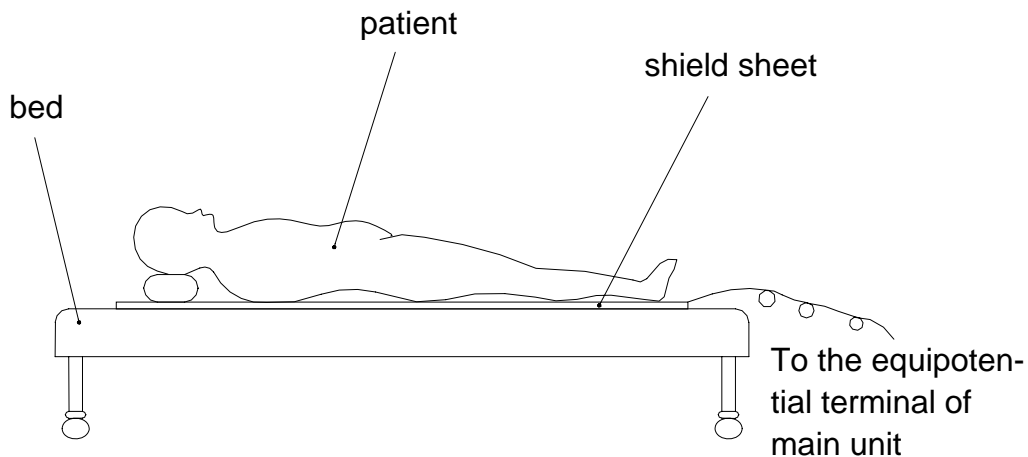

Fig.1-1 Lay a shield sheet to eliminate the hum (AC noise) interference

1.6 Classification

a)   Protection against electric shock

  The system belongs to general equipment, Class I Type BF applied parts.

b)   Protection against ingress of water

  The system belongs to Class IPX0, and the probe head belongs to Class IPX7.

Chapter 2

Composition, Principle and Specification

2.1   Composition and Operation Principle

2.1.1   System Composition

The system consists of a main unit, probes and peripheral devices. The main unit includes Probe Connector Board, Order and Amplification Board, Digital Processing Board, Control Platform, Operation Panel, Monitor and Power Supply. See Fig. 2-1.
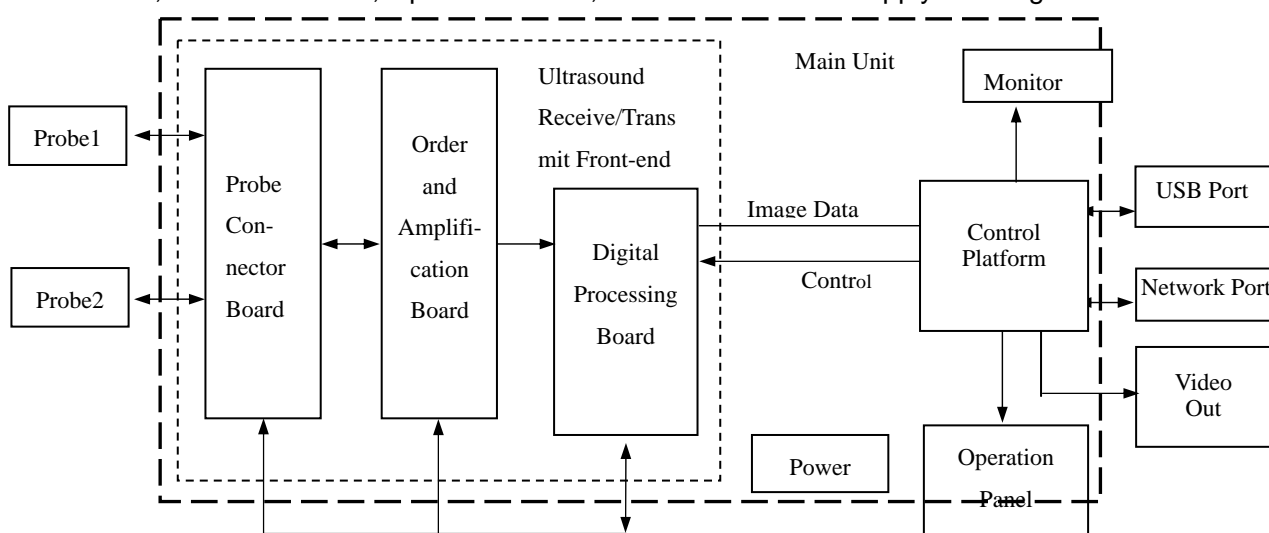
Fig. 2-1 System Composition Block Diagram

2.1.2   Operation Principle

The fundamental operation principle of the main unit:

The probe connector board receives transmit excitation signals from the Digital Processing Board and generates transmit high-voltage pulse through high-voltage drive circuit. The high-voltage pulse then is transmitted to the working elements of the probe to generate ultrasound. The echo of the ultrasound from human body is received by the same working elements and converted into feeble echo electrical signals, which will be transmitted to the Order and Amplification Board through front-end amplification. There are two-probe connectors available on the Probe Connector Board, to which two probes

can be connected at the same time.

The Data Processing Board generates transmit excitation signals of the current transmission to the Probe Connector Board after a series of processing including beam forming, aperture control dynamic apodization, dynamic filter, dynamic range conversion, demodulation, frame correlation processing and scan conversion, and transmitted to the ultrasound control platform through the Digital Processing Board.

The echo signals are firstly converted to digital signals after a series of processing including beam forming, aperture control, dynamic apodization, dynamic filter, dynamic range conversion, demodulation, frame correlation processing echo signals are first converted into digital signals. The Digital Processing Board firstly converts echo signals to digital signals via ADC, and further into digital image signals after a series of processing including beam forming, aperture control, dynamic apodization, dynamic filter, dynamic range conversion, demodulation, frame correlation processing and scan conversion, and transmitted to the ultrasound control platform through the Digital Processing Board.

The Digital Processing Board on one hand transmits digital image signals to the control platform, on the other hand receives control information from the control platform and generates corresponding control data to achieve control of the front end.

The control platform is the managerial center of the whole system, which receives operation command from the operation panel, and control the whole system based on the current state of the system. The other functions that the control platform fulfills also include measurement and calculation, interface display and video processing, management of patient data and image, as well as control of storage, printing and communication.

2.2 Technical Specifications

2.2.1 Scanning Mode: Convex and linear array scanning.

2.2.2 Display Mode: B，2B，4B，M，B/M，ZOOM B

2.2.3 Probe (Basic Configuration)

Super broadband high-density multi-frequency convex probe

2.2.4 Focusing Method:

a） Transmitting focusing method: 1 ~ 4 transmitting focus(es) for selection

transmitting focus(es) for selection, 16 focusing positions for selection

b） Receiving focusing method: continuous dynamic focusing

2.2.5 Gray Scale:256

2.2.6 Beam Forming Method:

Digital beam forming, continuous dynamic focusing, dynamic aperture, dynamic apodization

2.2.7 Display depth: Max 25.2cm

2.2.8 Probe technology:

a) Broadband probe

a) Frequency range: 2.5MHz ~9.0MHz (which can be extended to 2.0MHz~12MHz)

2.2.9 Imaging Parameter Adjustment:

B gain, M gain, 8-step TGC (Time Gain Compensation, also called "STC"), acoustic power, focal point number, dynamic range, Smo/Edg, image persistence (frame correlation), line density and SRT(Speckle Reduction Technology).

2.2.10 Live Zoom: 4 magnifications with the max. of ×4.0, position selectable

2.2.11 Display Parameter Adjustment:

Display depth, display angle (for convex probes), display width (for linear

probes), image orientation (left/right reverse and 90° rotation), image polarity

(positive / negative), mage grayscale curve

2.2.12 Full Screen Sweep Speed In M Mode (s/f): 1.25, 2.5, 5.0 and 10.0 for selection

2.2.13 Cineloop: Current stored image cineloop, and hard disk cineloop; ≥512 frames, and the replay speed is selectable.

2.2.14 Image Storage: Hard disk, USB; Temporal image storage and recall: ≥32 frames

2.2.15 Body Mark: ≥90 types for selection, with probe marks

2.2.16 Annotation: not less than 300 system predefined annotations

2.2.17 System preset

2.2.18 Image Screen Display:

a）Display all parameters related with diagnosis: system model, hospital name, patient name, patient ID, date, time and week, probe model exam type, and probe orientation;

b）Display all the parameters related to imaging: acoustic output power(% or dB), depth, frame rate, imaging angle/ width, focus mark and range, gray scale, probe operating frequency, TGC curve, depth scale, gain, Smo/Edg, frame correlation, grayscale curve, dynamic range, zoom rate, line density and SRT.

2.2.19 Storage and Record:

a) Hard drive, in which images can be stored in the formats of Jpg/Bmp or DICOM file and cineloop files in the format of Cine or Avi.

b) USB connection devices (Option)

c) transmit and receive images and patient data through DICOM3.0 function (Option)

d) Printer (Option)

2.2.20 Measurement and Calculation:

a) General measurement: B mode: Distance, area, circumference, volume, angle, histogram; M mode: Distance, time, heart rate and slope

b) Special measurement and calculation: for abdomen, cardiology, OB/ GYN, urology, small parts, peripheral vascular and orthopedics

2.2.21 Video Port: composite video out, PAL/ NTSC format for selection

2.2.22 Monitor: High resolution and non-interlaced monitor

2.2.23 Probe Sockets: 2 pcs

2.2.24 Power Supply:

a) Power voltage: 100V-240V~，tolerance±10%, or 230±23V~ for EU countries

b) Power frequency: 50Hz±1Hz or 60Hz±1Hz

c) Power input: 250 VA

2.2.25 Physical Dimension and Weight:

a) Physical dimension (LxWxH): 415mm×320mm×310mm

b) Weight: approx. 12kg

2.2.26 Operation: continuous operation

Chapter 3

Introduction to Component Parts

3.1 System Configuration

3.1.1 Basic Configuration

a) Main unit (Monitor included): 1 set

b) Probe: super broadband high-density multi-frequency convex probe: 1 pc

3.1.2 Accessories

a) Power cable

b) Potential equalization conductor

c) Dust cover

d) Fuse

【Note】: The specific accessories are subject to the Packing List.

3.1.3 Options

3.1.3.1 Probes:

a) Linear probes

b) Convex probes

c) Micro-convex probes

3.1.3.2 Storage, Print and Record Devices:

a) USB connection devices

b) Printer

3.1.3.3 DICOM3.0 port and software

3.1.3.4 UPS (Uninterrupted Power Supply)

In some areas, there may be sudden power cut due to power supply shortage, causing system abrupt power-off, loss of data, and thus affect system stability. To avoid such situation, it is recommended to connect a UPS device, with its power consumption at 500 VA or above, to the system.

3.1.3.5 Special system trolley

3.1.4 Connection to Peripheral Devices

a) Video printer, VCR or large-screen monitor can be connected to the main unit via a cable with a high-frequency BNC plug;

b) USB printer can be connected to the main unit via a USB port.

3.1.5 Outside Drawing of Main Unit （**Fig. 3-1**）
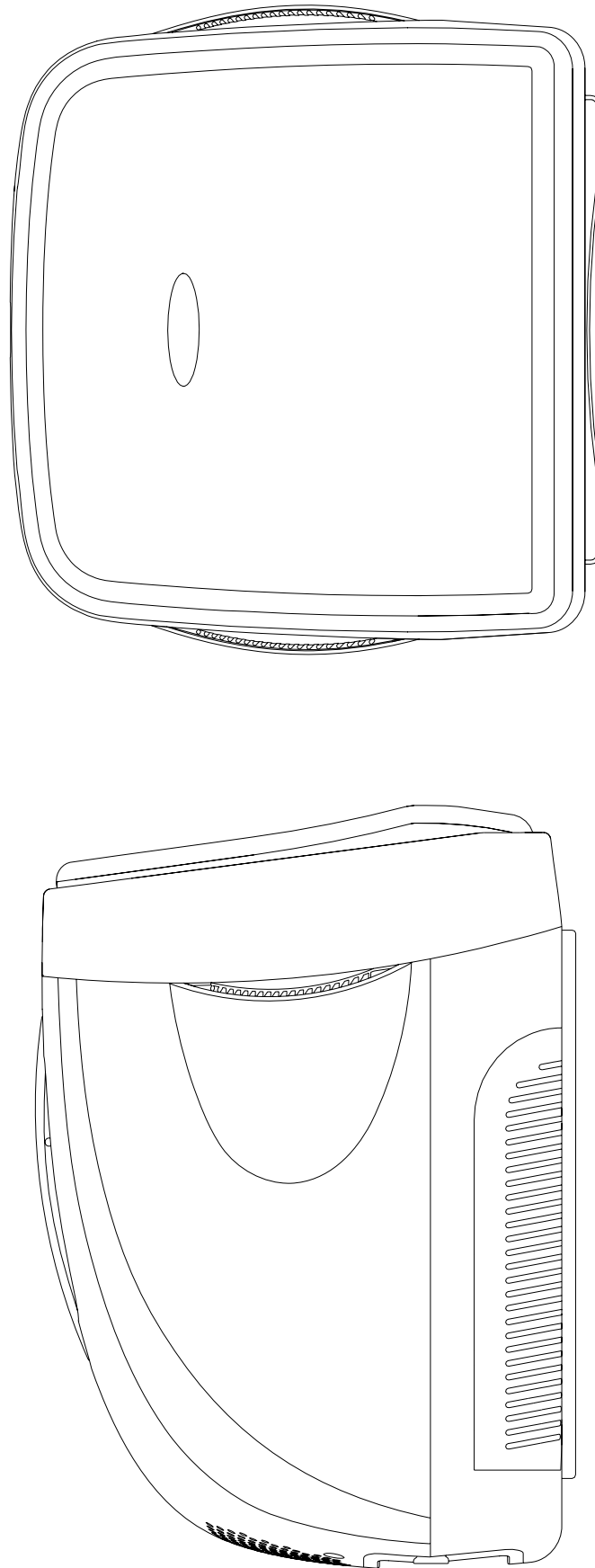
Fig. 3-1 Outside Drawing of Main Unit

3.2 Introduction to Component Parts

3.2.1 Probe

3.2.1.1 The Outside Structure of Convex and Linear Probe

The structure of the configurable convex and linear probe is shown in Fig. 3-2.

Convex Probe   Linear Probe
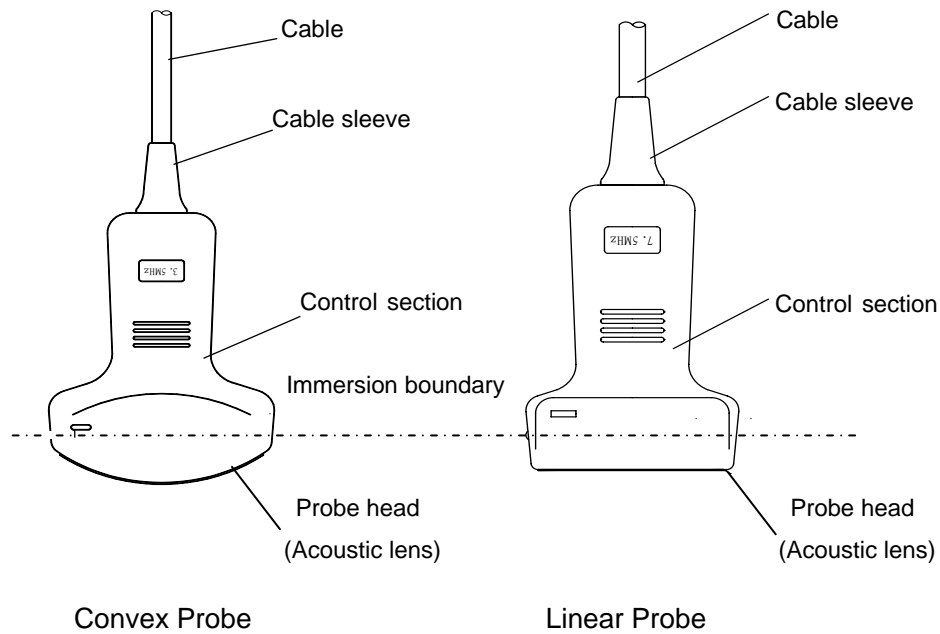
Fig. 3-2   Probe Structure

3.2.1.2 Probe Applications

a) The probe may be damaged even by a slight impact. Use it carefully to avoid shocking or striking against any hard object;

b) When disassembling the probe, ensure that the main unit is in frozen state (it would be better to turn off the power of the main unit.)

c) Be very careful not to scratch the probe head surface (acoustic lens) while operating the system;

d) Use a sponge or soft cloth with water to clean probe after examination. DO NOT use alcohol or cloth containing alcohol or organic solvent like diluent to do the cleaning. For detailed information about the cleaning and sterilization of the probe, please refer to Section 4.2.9;

e) The probe can not be immersed into water over the immersion boundary as shown in Fig.3-2. The waterproof type of the probe is IPX7. If the probe is immersed in water carelessly, it may cause failure or potential problem; in this case, please contact our service personnel immediately;

f) The waterproof type of the probe cable is IPX4 (protected against splashing water). If the probe cable is exposed due to scratch or crack of the coating,

please contact our service personnel immediately and avoid electric shock.

3.2.2 Monitor and display interface

3.2.2.1   Front Panel of the Monitor

The front panel of the monitor is shown in Fig. 3-3:

1—Menu Item   (Up/ down) Select Key

2—Menu Select Key

3—Screen
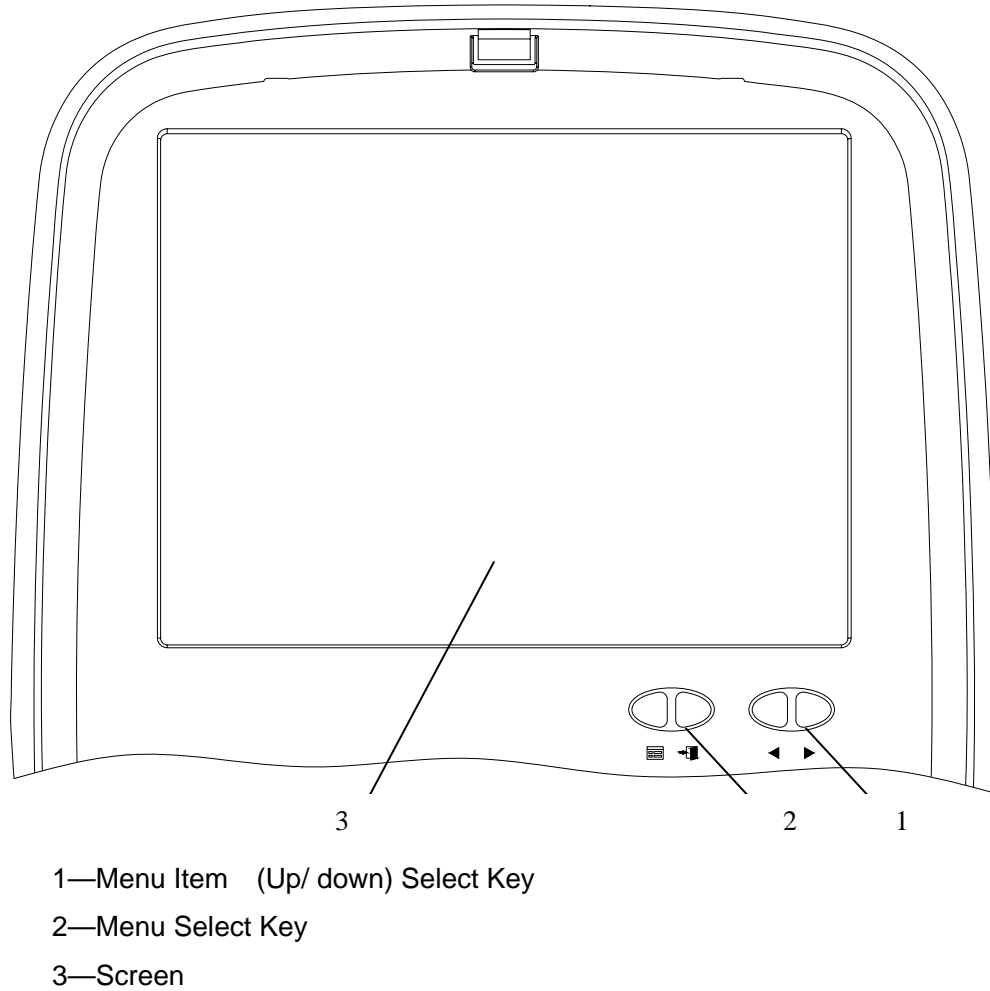
Fig. 3-3 Front Panel of Monitor

3.2.2.2 Display Interface
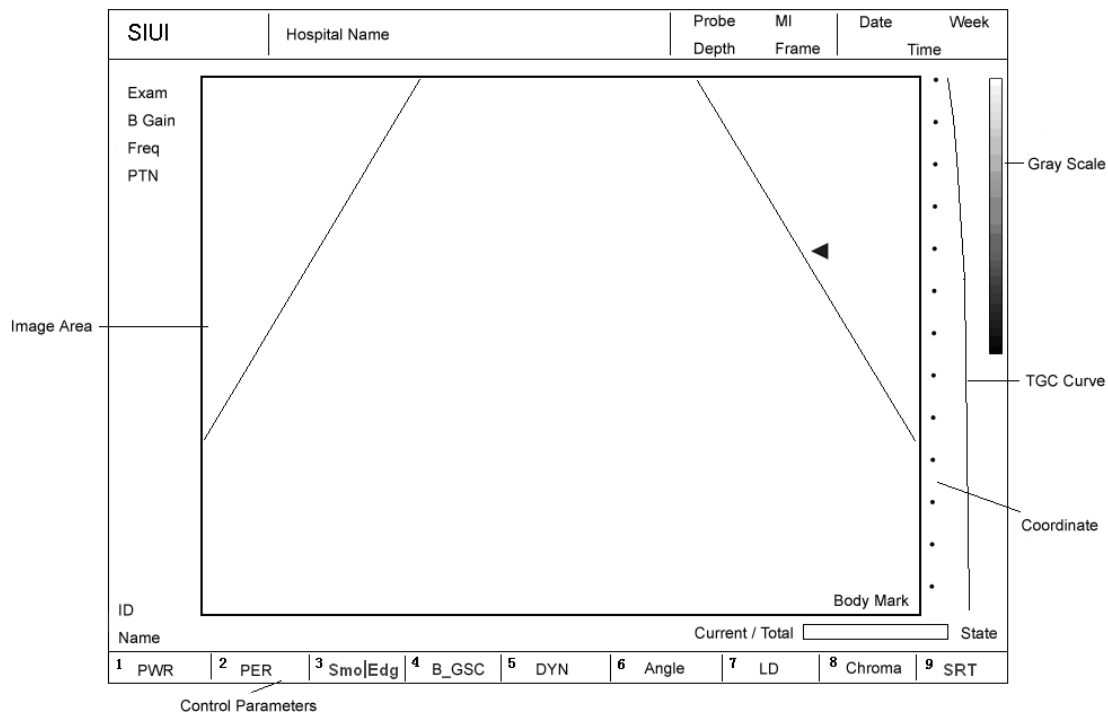
Fig. 3-4 Sketch Map of Display Interface

Some of the curves or marks are automatically displayed, while some of them can be displayed only by operation. By pressing **P** key, the display positions of the body mark and the measured results can be shifted; by pressing **H** key, the display of the exam type can be switched between on and off. The control window can be controlled and activated by numeric keys of 1 to 9, and adjusted by using **Value** key.

Among which, MI gives relevant prompt for the possibility of ultrasound beam mechanical biological effect (e.g. cavitation). When using the convex probe R60, MI ≤1.12.

The parameter items in the control window are slightly different due to different display modes and probe models. The parameter items shown in the control window of Fig. 3-4 are parameters for B mode with convex probe (**Angle** is replaced by **Width** for linear probe).

For M mode, there are: **Depth, M_Gain, PWR** (acoustic power), **Freq** (probe frequency), **PER** (persistence), **Smo/Edg** (smooth/edge enhancement), **M_GSC**(M grayscale curve), **DYN** (dynamic range), **MSP** (M sweep speed), **Chroma** and **SRT**;

For B/M mode, there are: **Depth**, **B_Gain**, **M_Gain**, **PWR** (acoustic power), **Freq** (probe frequency), **PER** (persistence), **Smo/Edg** (smooth/edge enhancement), **M_GSC** (M grayscale curve), **DYN** (dynamic range), **Angle** (which is replaced by **Width** for linear probe), **LD** (line density), **MSP** (M sweep speed), **Chroma** and **SRT**.

3-6

3.2.3 Operation Panel

3.2.3.1 Features of Operation Panel

The system adopts backlit keyboard. The backlight can be turned on/ off through the system menu.

The structure of the operation panel is shown in Fig. 3-5, and the functions of each key are described in Table 3-1.
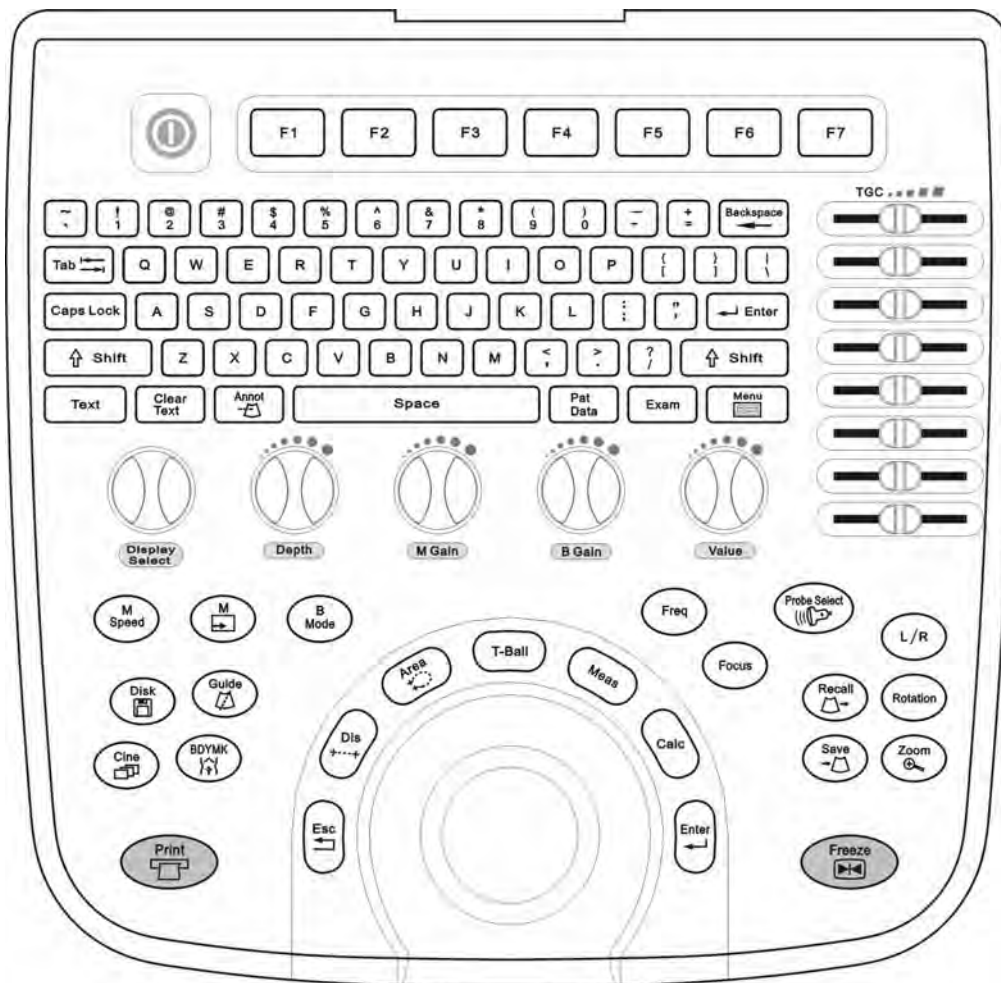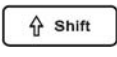

Fig. 3-5
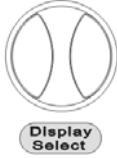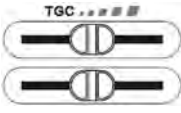
3.2.3.2 Brief Introduction of Keys.

Table 3-1   Key Function

No.	Key	Type	Function
1		Key	Main unit power switch: on the top left of the operation panel; to turn on/ off the system.
2	F1 ~ F6	Key	User-defined key (**F1** ~**F6**): can be assigned as hotkeys for certain functions. Refer to Section 5.2.2.11 for operation.
3	F7	Key	Help info hotkey **F7**: press this key to prompt help info, press it again to exit.
4	Alphanumeric Keys:	Key	To input text or define any key as a certain function key by system configuration.
5	Backspace	Key	Character delete key **Backspace**: to delete characters in front of the cursor in annotation state, or delete traces drawn when using the trace method to measure the circumference/ area.
6	Tab	Key	To shift between different items and different inputs.
7	Caps Lock	Key	Case Toggle Key **Caps Lock**.
8	↵ Enter	Key	Annotation newline key ↵ **Enter**
9	⇧ Shift	Key	Upper/lower case of alphanumeric shift key: **Shift**
10	Text	Key	Annotation Key **Text**: to turn on/ off the free text annotation state .
11	Clear Text	Key	Clear key **Clear**: to clear annotations and measurement results.
12	ANNOT	Key	Annotation Key **ANNOT**: to enter annotation state and open the common vocabulary menu to use the system preset annotations.

13	Space	Key	Space Key **Space.**
14	Guide	Key	Biopsy guideline display key **Guide:** used to toggle between on and off for displaying the biopsy guidelines. While displaying, a couple of parallel broken-line from top to bottom are displayed on the screen as the biopsy guideline. The distance between the two parallel lines is 1cm, and the needle is located at the center of the two parallel lines. The start position and angle are subject to different probes. The start position can be adjusted by **Q** and **W;** the angle by **E** and **R.**
15	BDYMK	Key	Body Mark Key **BDYMK**: to turn on/ off body marks.
16	B Gain	Knob	B gain Knob **B Gain**: to adjust B gain.
17	M Gain	Knob	M Gain Knob **M Gain**: to adjust M gain.
18	Depth	Knob	**Depth** Knob: to adjust display depth within possible range. The change of frame rate is subject to the display depth: the deeper the depth , the lower the frame rate; or the shallower the depth, the higher the frame rate.
19	Value	Knob	**Value** Knob: to change the highlighted parameters or item value and state of different menus and control windows. Besides, when the body mark is displayed, the konb can be used to rotate the probe mark.

20		Knob	**Disp** Knob: under multi-image display mode, it is used to switch to the live image.
21		Slider	8 Gain TGC Slide Potentiometer **TGC**: on the top right of control panel, used to adjust the depth gain of images.
22		Key	M Mode Sweep Speed Key: **M Speed**
23		Key	B/M、M Modes Switch Key **M →**
24		Key	B, 2B, 4B Modes Select Key **B Mode**
25		Key	System Setup Key **Menu**: to enter or exit system setup menu.
26		Key	Storage Key **Disk**
27		Key	Probe Select Key **Probe**: to switch or select the probe connected to the probe connector.
28		Key	Exam Type Select Key **Exam**: to select the application type and exam type supported by the probe in use.
29		Key	Patient Data Management Key **Pat Data**: to turn on/ off the patient data management function.
30		Key	Exit Key **Esc**: to exit from a state; when in measurement & calculation state, press **Esc** to exit the measurement & calculation state and clear the measurement & calculation result at the same time.
31		Key	Distance Measurement Key **Dis**: to measure distance.
32		Key	Area measurement key **Area**: for area measurement
33		Key	Measurement key **Meas**: to recall the measurement menu.

34	Calc	Key	Calculation key **Calc**: to recall the special calculation software package. The package type is subject to probes and exam types.
35	T-Ball	Key	Trackball control target switch key **T-Ball**: to release trackball cursor; to switch between different control targets, of which name is displayed on the bottom right of the screen. The function of this key is similar to that of the left mouse button.
36	Save	Key	Image Save Key **Save**: to store data including images.
37	Recall	Key	Image recall key **Recall**: to read image data.
38	Enter	Key	Confirmation key **Enter**: to confirm the selected state.
39	Freq	Key	Probe frequency switch key **Freq**.
40	Focus	Key	Focus select hotkey **Focus**
41	Cine	Key	Cineloop key **Cine**: to switch between continuous cineloop and cineloop frame by frame.
42	Zoom	Key	Image amplification key **Zoom**: to turn on the image amplification state and adjust the zoom rate.
43	Print	Key	Print key **Print**: for image print when a printer is connected; can be set as other functions.
44	L/R	Key	Image Left/Right reverse key **L/R**.
45	Rotation	Key	Image rotation key **Rotation**: used to rotate the image clockwise or counterclockwise.
46	Freeze	Key	Freeze key **Freeze**: to freeze and unfreeze the image.

47	Trackball	/	To select a certain item in the menu or control window; to change the focal length and focus position; to move the image of the zoom box; to move the cursor when in annotation state; to select an image of certain frame when in cineloop; to move the measurement point when measuring. Its function in the current state is shown at the bottom right of the screen; please refer to Appendix B for specific functions and instructions.

3.2.4 Rear Panel of Power Supply (Fig. 3-6)
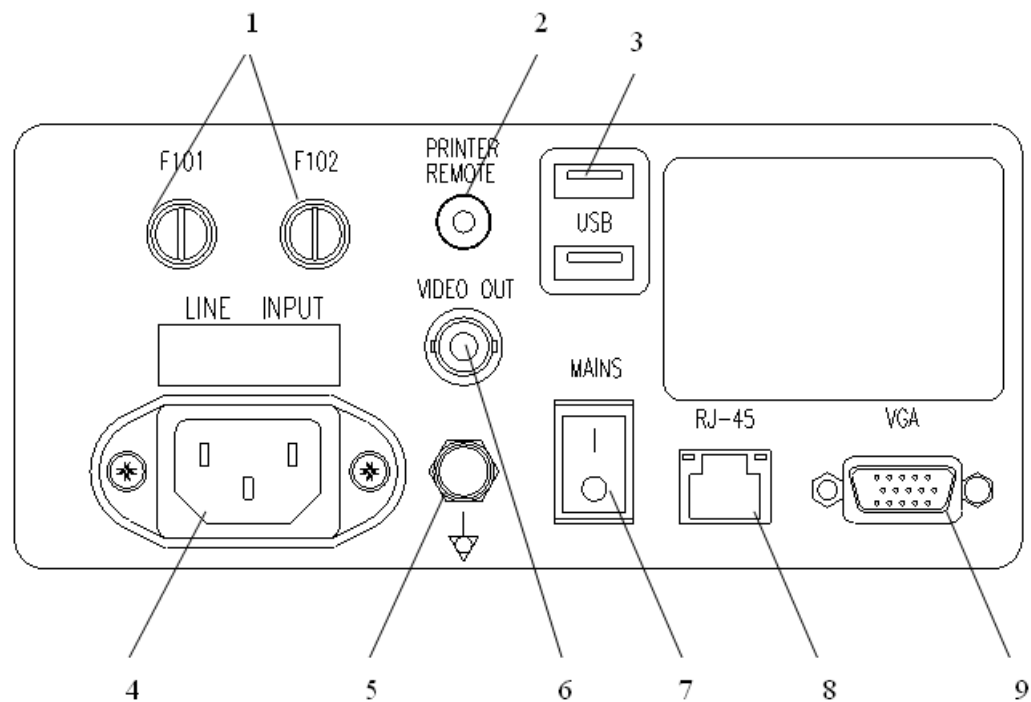
1—Fuse Holders（2 pcs）   4—Power Input Socket   7—Main Power Switch (for system power on/ off control)

2—Printer Remote Port   5—Equipotential Terminal   8—Network Port

3— USB Port（2pcs）   6—Video Out Port   9—VGA Port

Fig. 3-6   Rear Panel of Power Supply

Chapter 4

Installation, Maintenance and Inspection

4.1 System Installation

4.1.1 Components Connection

a) Plug the probe connector right into the probe socket of the main unit.(pay attention to the connector assembly orientation), rotate the handle 90° clockwise to fasten it and counterclockwise to unplug it.

b) To connect video printer, connect VIDEO IN port to VIDEO OUT port via BNC cable, and connects its REMOTE port with PRINTER REMOTE port on the main unit via a print control cable.

c) If a USB printer shall be connected, connect its USB port with the USB port of the main unit.

d) If images shall be transferred via a DICOM 3.0 port, connect a network cable to the network port RJ-45 on the main unit.

4.1.2 Electrical Cable and Wire Connection

a) If the power supply is not from a grounded three-jack socket, to ensure a reliable grounding for the main unit, connect one end of the additional potential equalization conductor to the equipotential terminal on the rear panel of the main unit, and the other end to the equipotential terminal on another grounded system or an additional grounded device meeting the requirement.

b) Always turn off the system before connecting the power cord.

4.2 Maintenance And Inspection

Please follow the methods below to inspect the system. If there were any abnormality, please contact us for help. We would provide detailed consulting service, and take measures to fix the existing problems.

4.2.1 Inspection when the power is on

Make sure that the fan on the rear panel is in normal operation.

4.2.2 Inspection on Knobs & Keys

Referring to Section 3.2.3 "Operation Panel", inspect each knob and key to see whether

they are in normal operation.

4.2.3 Inspection on Image Quality

Referring to Chapter 6 "imaging", adjust the image adjust keys on keyboard, observe the image display to see whether they are in normal operation.

4.2.4 Inspection on measurement function

Referring to Chapter 8 Measurement and Calculation, inspect various measurement & calculation functions to see whether they are in normal operation.

4.2.5 Inspection on Probe and Probe Cable

Inspect whether there is any crack on the water-immersible probe part or any shedding on the probe connector and probe cable.

4.2.6 Inspection on potential equalization conductor and power cable

Inspect them to see whether there is any separated sheath or shedding on them; check the grounding wire to find whether it is correctly and safely grounded. Inspect them carefully to avoid any unexpected danger due to abnormality on these cables.

【Note】: As the above sections 4.2.5 and 4.2.6 involve safety, always do these inspections before operating the system every time. Other items may be inspected every half a year.

4.2.7 Regular Safety Inspection

The following safety inspections should be carried out by an experienced, well-trained qualified person at least once every 24 months:

- Inspect if the equipment and the accessories are damaged in mechanics and functions.
- Inspect if the relevant safety labels are clear for identification.
- Inspect the fuses to ensure they meet requirements of the rated current and break limit.
- Ensure that all functions of the unit meet their operation instructions.
- Inspect if the grounding resistance equal or is less than 0.1Ω.
- Inspect the earth leakage current according to the requirement of IEC 60601.
- Inspect the patient leakage current according to the requirement of IEC 60601.

The leakage current shall not exceed the maximal limit. All data shall be recorded in the system log. If the system does not work properly or pass any of the above tests, the system shall be repaired.

4.2.8 Inspection on Consumables

The items below are consumable. Please inspect them regularly to replenish or replace

them in time.

Table 4-1   List of consumables and tips for replenish/ replacement

Item	When to replenish/replace
Electrical Cable and Connection Cable	Abnormality in Appearance
Switch & Control Key	Wobbled or Swayed
Dust Cover	Worn or Torn
Probe	Abnormal Appearance of Connector or Cable
Fuse	When Running out of spare fuse, use the fuse with specification below: Type: Glass Enclosed Fuse (time-lag, low-breaking) Size: 5mm X 20 mm Rating: T4AL250V

【Note】: No coupling gel is supplied with the system when it is delivered from the factory. The user shall purchase the required coupling gel that complies with regulations of the country where the system is installed. It is recommended to use coupling gel conforming to ISO 10993 requirements.

4.2.9 Probe cleaning and sterilization

The probe shall be cleaned and sterilized every time after it is used.
Please follow the conditions below when cleaning and sterilizing the probe, otherwise the probe may be damaged.

    a)   The probe should not be cleaned or sterilized with alcohol, cleanser containing alcohol or other organic solvent (e.g. thinner);

    b)   The immersion part of the probe should not exceed the orientation mark at the probe housing side;

    c)   Do not process probe with steam high- pressure or ethane oxide;

    d)   Do not immerse the probe for more than one hour.

4.2.9.1 Cleaning

    a)   Clean the probe surface with soft cloth soaked with water after using the probe;

    b)   If the probe is dirty, use soft cloth soaked with cleanser (e.g. neutral soapsuds) to clean it, and then use the cloth soaked with water to remove the soapsuds;

    c)   After cleaning, wipe the probe with clean dry cloth.

4.2.9.2 Sterilization

a) The probe should be sterilized with special liquid disinfectant. It is recommended to use Glutaral solution or Benzalkonium Bromide solution. The disinfectant solution should be formulated and used following their manufacturers; product instruction;

b) After sterilization, remove the disinfectant solution on the probe thoroughly with sterile water, and then wipe the probe with soft dry cloth.

4.3 Relocation of System

Please abide by the following items to move the system safely:

4.3.1 Relocation of system (with trolley)

a) Do not tilt the equipment more than 10 degrees;

b) If the step is higher than 2cm, in order to go across it, place something under the casters.

c) When moving the system, fix the power cable, the potential equalization conductor and the probe cable tightly so as not to be caught by the cart casters;

d) Make sure to fix the main unit tightly on the trolley.

e) Unlock the caster stoppers before moving the cart.

4.3.2 Transportation of the main unit

a) First disconnect the cables at the rear panel of the main unit (except the power cord, the potential equalization conductor and the probe cable);

b) Put the probe tightly into the probe holder.

c) Disassemble the main unit from the trolley and transport it with the power cable, the potential equalization conductor and the probe cable held together.

Chapter 5

System Setup

5.1 Operation Method for System Setup Menu

Press **Menu** to display the main menu on the screen. Use the trackball or rotate **Value** knob to select desired menu item; press **Enter** to enter the submenu; Press **Esc** to exit the current menu and return to the previous menu, or to exit the main menu if it is in the main menu page. Press **Menu** at any menu to save changes and exit the main menu operation. Pressing other valid mode keys or non-mode keys can also exit the menu and enter the corresponding operation. The system menu setups remain available after rebooting the system.

5.2 Setup Menu and Methods

5.2.1 Main Menu

Table 5-1 Main Menu

Menu	Description
System Setup	To set up the system
Image Setup	To set up images
Peripheral Setup	To set up peripheral devices
Calc Setup	To set up calculations
Activate System	To activate the system
Update System	To update the system
*DICOM	DICOM
Body Mark	Body Mark
Quit	To quit setup menu

【**Note**】**:** The item with " * " is an optional function.

5.2.2 System Setup submenu

Table 5-2 System Setup Menu

Menu	Description
Date Time	To set up date and time
Facility Name	To set up facility (hospital) name
AC Power Unit	To switch the acoustic power display unit
Permanent TGC graph	To set up TGC graph display modes
Key Lamp	To set up key lamp of the keyboard
Key Lamp Bright	To set up key lamp brightness
Printer Setting	To set up the printer
Auto Freeze	To set up auto freeze
Screen Saver	To set up screen saver
Language Selection	To select language display on the screen
Patient Information	To set up patient information
Function Key Edit	To define function key edit
Annotation Edit	To edit annotation phrases
Main Menu	Main Menu

There is a submenu for each system setup menu. To enter the corresponding selection or edit screen, select the desired item with the trackball or **Value** knob and press **Enter**. To select or edit, use the trackball or **Value** knob and press **Enter**. To exit, press **Esc**.

5.2.2.1 Date and Time

Table 5-3 Date and Time Setup Menu

Menu	Description
Date Format	To set up date format
Date	To set up date
Time Format	To set up time format
Time	To set up time
Main Menu	Main menu

The system's current date and time are displayed on the first line of the upper right screen.

a) Date Time format and setup

1) Three formats supported by the system for displaying date are available, including YYYY/MM/DD, MM.DD.YYYY and DD-MM-YYYY. Set up Date format: Press **Enter** after selecting *Date Format*, then the Date format can be set by pressing **Enter** repeatedly to toggle among the three optional formats.

2) There are two formats supported by the system for displaying time, including 24 hours display format, and 12 hours plus AM/PM display method. To set up time format: Press **Enter** after selecting *Time Format*, then the Time format can be set up by pressing **Enter** repeatedly to toggle between two optional formats.

b) Date Time Setup

1) Date Setup: Press **Enter** after selecting *Date* to change the system's current date. The cursor will locate at the first date element (which may be year or date depending on the date format), and the cursor can be toggled among three date elements by using **Enter**. The user can input the current system date into these elements. The system date will be setup automatically after completing the last element.

2) Time Setup: The system current time can be changed by pressing **Enter** after selecting *Time*; the cursor will rest on the first element (e.g. hour) of time, and it can be toggled among the three elements of time by pressing **Enter**. The user can enter the current system time into these elements.

5.2.2.2 Facility (hospital) Name

Facility (hospital) name is displayed on the first line on the left of the screen. Up to 24 English characters (i.e. 12 Chinese characters) can be inputted. Press **Enter** after selecting *Facility name*, then the facility name input box is popped up. The user can input the characters directly. The cursor display position can be adjusted by moving the trackball in the input box. Press **Enter** to save the characters and return to system setup menu, then press **Setup** to save the facility(hospital) name and return to ultrasound system or press **Esc** to return to system setup menu without saving.

5.2.2.3 AC Power Unit

There are 2 units *dB* and *%* available for selection. To enter selection menu, select *AC*

Power Unit on the system setup menu and press **Enter**. To select the desired unit, use the trackball and press **Enter**. To exit, press **Esc**.

5.2.2.4 Permanent TGC Graph setup

Three modes for displaying TGC graph are available, including *Always on*: always display; *3 sec*: display for 3 seconds when TGC is adjusted; and *Off*: no display.

Select *Permanent TGC graph* on the system setup menu and then press **Enter** to enter the selection menu. Move the cursor over desired display mode and press **Enter** to determine the display method of TGC graph and return to system setup menu.

5.2.2.5 Key Lamp

Two functions of *On* and *Off* for keyboard backlight are available.

To enter selection menu, you can select *Key Lamp* on system setup menu and then press **Enter**. Its operation processes is the same as setup of Permanent TGC Graph.

5.2.2.6 Key Lamp Bright

Move the cursor over *Key Lamp Bright* and then press **Enter**. Turn the **Value/Cut** knob to change key lamp brightness. The adjust range is 0%～100%.

5.2.2.7 Printer Setting

There are three selections *Vd Printer* and *Pc Printer* and *Save to Udisk* available. The control target of **Print** key depends on the different selection item, If *Save to Udisk* is selected, press **Print** key and the current screen will be saved to the USB disk in "bmp" format.

To enter selection menu, select *Printer Setting* on system setup menu and press **Enter**. Its operation processes is the same as setup of Permanent TGC Graph.

【Note】: If the user purchases a printer from other supplier, a driver program for the printer shall be installed. Please contact us for any assistance.

5.2.2.8 Auto Freeze

Four auto freeze functions are available, including *Off, 10min, 20min* and *30min*; they represent separately that images are never auto frozen, or images are auto frozen after having no operation on the system for 10 minutes, 20 minutes or 30 minutes.

To enter the selection menu, select *Auto Freeze* on system setup menu and then press **Enter**. Its operation processes is the same as setup of Permanent TGC Graph.

5.2.2.9 Screen Saver

Four functions of screen saver are available, including *Off, 10min, 20min* and *30min*; they represent that the screen saver never appears, or appears on the screen after no operation on the system for 10 minutes, 20 minutes or 30 minutes respectively.

To enter the selection menu, select *Screen Saver* on system setup menu and then press **Enter**. Its operation processes is the same as setup of Permanent TGC Graph.

5.2.2.10 Language Selection

Two languages for displaying on the screen are available, including *English* and *Chinese*.

To enter the selection menu, select *Language Selection* on system setup menu and then press **Enter**. Its operation processes is the same as setup of Permanent TGC Graph.

【**Note**】**:** If the operation system is an English version, there is no *Chinese* option for selection.

5.2.2.11 Patient Information

There are 2 selections *On* and *Off* available for the setup of patient information. Select *On* to display a patient's name and ID under exam type on the screen; select *Off* not to display patient information.

To enter the selection menu, select *Patient Information* on system setup menu and press **Enter**. Its operation processes is the same as setup of Permanent TGC Graph.

5.2.2.12 Function Key Edit

Six user-defined keys are available. To enter the screen of function key edit as shown in Fig. 5-1, select *Function Key Edit* on system setup menu and then press **Enter**.

```
Key Name:            F1
Current Function:  Histogram
                   Histogram
                   Exam Type
                   System menu
                   Control window item
                   Calc menu item
                   Meas menu item
   Set                              Cancel
```
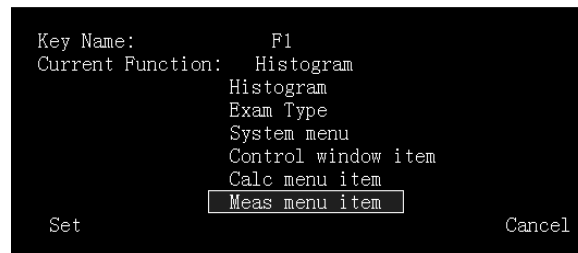
Fig. 5-1 Screen of Function Key Edit

On the screen of function key edit, use **Value** knob, or press any user-defined key from **F1** to **F6** on the operation panel to select a function key name. The function of the selected key is displayed on the edit screen. If that key is not assigned, it will display "NONE".

The cursor is movable among each option, *Set* and *Cancel* keys. After selecting a user-defined key function, to confirm the current setting, select *Set* and press **Enter**. If no such operation is carried out, but switch to other user-defined key setup or exit the edit screen, the previous selection setup is not saved; To cancel the setup of that key, select *Cancel* and press **Enter**, and the current function is "NONE"; Press **Esc** to exit the current setup screen and return to system menu.

a) To define the current key as a histogram hotkey: move the cursor over *Histogram* and press **Enter**. Then select *Set*. Press **Enter** again to finish setup.

b) To enter exam type shown in Fig. 5-2, move the cursor over *Exam type* and press **Enter**. The user can move the cursor to a probe model or an applied type by the trackball, then select a probe model supported by the system, and select the application type corresponding to the selected probe by using the **Value** knob. The application type name changes to reflect a change in the probe model, and the exam type name changes to reflect a change in the application name. After selecting an application type, use the trackball to move the cursor to a certain exam type, press **Enter** to confirm this exam type and exit the screen of function key edit (Fig. 5-1). *Current Function* on the screen is *Exam Type = selected exam type*. Then select *Set*. Press **Enter** again to finish setup.

【**Note**】**:** This key function is not available when the user-defined probe model is different from the current probe model.
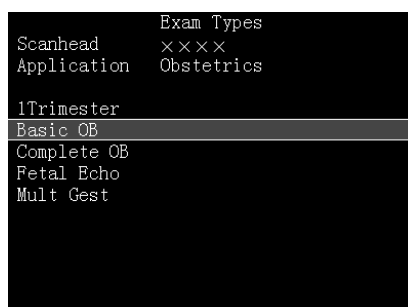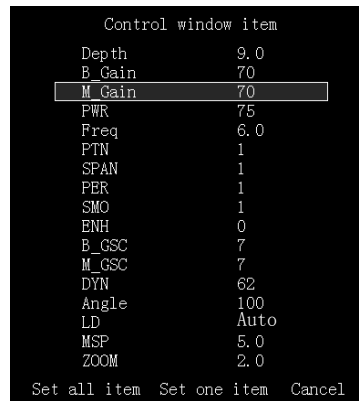
Fig. 5-2 Selection Screen of Exam Type

c) User-defined keys can also be set up as specific options of system menu. The system menu setup can be divided into two types: the first type is to perform settings on certain screens, such as hospital name input, date and time settings, etc; the other type has a group of values for user selection, e.g. auto freeze setting. The option item name of the first type is treated as the function key, e.g. **Facility Name, Date Time**, etc; the option item and its value of another type are treated as the function key, e.g. **Auto Freeze = Off**. Move the cursor over **system menu** and press **Enter** to enter system menu screen. Select or set up the value of a specified option according to the operation steps of system menu, then press **Enter** to return to the screen of function key edit shown in Fig. 5-1. **Current Function** on the screen is **selected menu item** or **selected menu item = selected value**; Then select **Set**. Press **Enter** again to finish setup.

d) To enter control window item screen shown in Fig. 5-3, move the cursor over **Control window item** and press **Enter**. All item options or single item option can be set as one function key. All the values displayed on the edit screen of control window are the current state values (if there is no current state value, all the values are in default). The cursor is movable among all parameter items and **Set all item, Set one item** and **Cancel.**

1) Set all item: Move the cursor over **Set all item** and press **Enter** to return to the screen of function key edit shown in Fig. 5-1. **Current Function** now is **Control window**. Then select **Set**. Press **Enter** again to set all the items on the screen as one function key.

2) Set one item: select one item to be set and press **Enter**, then the cursor will go to **set one item** automatically, press **Enter** to return to the screen of function

key edit in Fig. 5-1. **Current Function** now is **Control item selected item=current value**. Then select **Set**. Press **Enter** to set one item on the screen as one function key.


```
         Control window item
    Depth           9.0
    B_Gain          70
    M_Gain          70
    PWR             75
    Freq            6.0
    PTN             1
    SPAN            1
    PER             1
    SMO             1
    ENH             0
    B_GSC           7
    M_GSC           7
    DYN             62
    Angle           100
    LD              Auto
    MSP             5.0
    ZOOM            2.0
  Set all item  Set one item  Cancel
```

Fig. 5-3 Edit Screen of Control Window

3) Cancel: Move the cursor over **Cancel**, press **Enter** or press **Esc** directly to return to the screen of Function Key Edit (Fig. 5-1).

e) Calc menu item can be set as a function key. For the calc menu item screen (Fig. 5-4), move the cursor over **Calc Item** and press **Enter**. Move the cursor over **Exam Select** and press **Enter** to enter exam type selection screen (Fig. 5-2). Having selected the exam type, press **Enter** key to return to the screen of Fig. 5-4. Then application type, exam type and content of the related calculation item change according to the user selection. Move the cursor over one calculation item, and press **Enter** to confirm that calculation menu item and return to the screen of function key edit (Fig. 5-1). **Current Function** now is **Calc =current selected Calc menu item**. Then select **Set**. Press **Enter** again to set the selected Calc menu item on the screen as a function key.
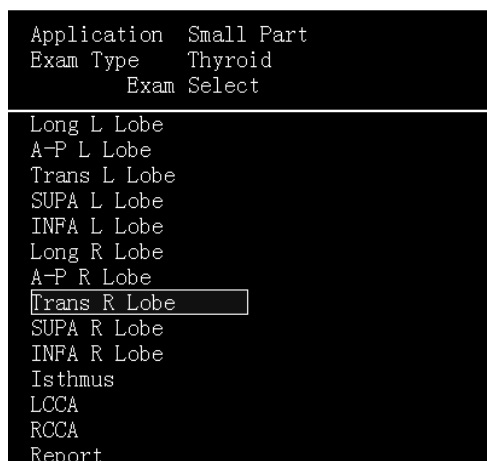
Fig. 5-4 Function Key Edit Screen of Calculation Item

f)   Measurement menu item can be set as a function key. Move the cursor over **Meas Menu item** and press **Enter** key to enter measurement menu screen as shown in Fig. 5-5. Move the cursor over one measurement item, and press **Enter** key to confirm that measurement menu item and return to the screen of function key edit (Fig. 5-1). **Current Function** now is **Meas =current selected Meas menu item**. Then select **Set**. Press **Enter** again to set the selected measurement item on the screen as a function key.
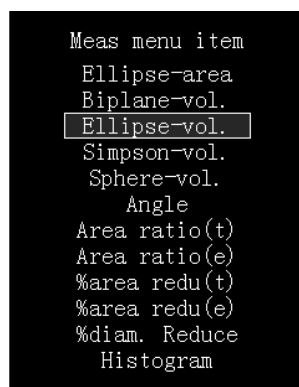
Fig. 5-5 Edit Screen of Measurement Menu

5.2.2.13 Annotation Edit

The system has predefined one set of annotation phrase for each exam type. The user can self-defined annotation phrases for each exam (less than 15).

For the edit screen of annotation shown in Fig. 5-6, select **Annotation Edit** on the system setup submenu and press **Enter**. The cursor is movable among **Exam select**, **Initialize**,

Set, *Cancel* and 15 input boxes.

Move the cursor over *Exam Select* and press **Enter** to enter selection screen of exam type shown in Fig. 5-2. Having selected the exam type, press **Enter** to enter the screen shown in Fig. 5-6. The contents of application type and exam type change with the selection of the user.

Fig. 5-6 Edit Screen of Annotation

Press **Esc** to exit the current setup screen and return to system menu without saving.

Press *Initialize* to clear all the user self-defined annotation phrases of the current exam type.

Press *Set* to confirm the current editing result and return to the ultrasound interface.

Press *Cancel* to delete the current editing result and return to the system menu.

【Note】: In the input box, the length of each annotation shall not exceed 15 English characters. The added user-defined annotations are located before the pre-defined annotations.

5.2.3   Image setup menu

Table 5-4 Image Setup Menu

Menu	Description
B/M Format	To set up B/M mode display
Rotation Direction	To select B mode image rotation direction
2B Format	To set up 2B mode display
User-Defined Gray_Curve Edit	To edit user-defined gray curve
Auto Save Image Parameter	To save image parameter setup automatically
Main Menu	Main Menu

【**Note**】**:** Selection and setup of *B/M Format*, *B-mode Rotation Direction* and *2B Format* are available only in unfrozen state.

5.2.3.1 B/M Format

There are three display formats available for selection: *Horizontal*, *Vertical* and *2B+M*. In unfrozen state, press **Menu** key and select *image setup*, then press **Enter** to go to image setup menu. Select *B/M Format* and press **Enter** to go to the selectable menu. Move the cursor over one option and press **Enter** to confirm B/M mode display format.

5.2.3.2 Rotation Direction

There are two directions available for selection: *Left* and *Right*. Its setup is the same as that of B/M Format.

5.2.3.3 2B Format setup

There are two 2B formats for selection: *Normal* and *Full Screen*. Its setup is the same as that of *B/M Format*.

Normal: The 2B image window is displayed on the right of the screen; the content of the control window is displayed on the left.

Full Screen: The 2B image window covers the whole screen. No control window is displayed on the screen (only when the trackball control focus is switched to the control window, will the content of the control window be displayed).

5.2.3.4 User-Defined Gray_Curve Edit

a) Open user-defined gray curve edit window

There are two methods available for opening the User-Defined Gray_Curve Edit window shown in Fig. 5-7.
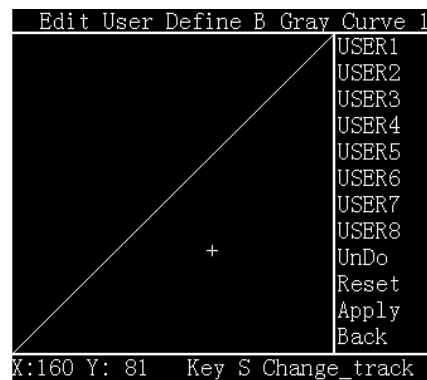
Fig. 5-7 Edit Screen of Gray Curve

Press **Menu** to enter the system menu. Move the trackball to highlight *Image Setup* and press **Enter** to display the submenu *Image Setup*. Move the trackball or use **Value** knob to select *User-Defined Gray_Curve Edit.* Press **Enter** to pop up two options *B Gray* and *M Gray*. If *B Gray* is selected, press **Enter** again to go to *Edit User Define B Gray Curve* edit window (Fig. 5-7), then eight B gray curves are available for edit. If *M Gray* is selected, press **Enter** again to go to *Edit User Define M Gray Curve* edit window (a screen similar to Fig. 5-7, but the title is changed from *Edit User Define B Gray Curve* to *Edit User Define M Gray Curve*), then eight M gray curves are available for edit.

b) Edit user-defined gray curve

After entering the edit window, the current user-defined gray curve will be displayed on top of the window. The left of the window is the curve edit window. On the right, there are 12 buttons for selection, including 8 curves *User-defined 1~User-defined 8* and *UnDo*, *Reset*, *Apply* and *Back*. The coordinates of the cursor in curve edit window are displayed at the bottom: X for input and Y for output.

1) Draw a curve: Select a user-defined curve from the right side. Its default vale is that X equals to Y, i.e. a straight line whose input equals to output. Move "+" cursor with the trackball. Press **Enter** on a desired position. The system will mark a point on this position and draw a gray curve based on the point that the user enters in the edit box. Press **S** key on the keyboard to switch different tracks of the curve.

2) Delete: Move the cursor to any point that the user enters in the edit box. Press **D** key on the keyboard to delete the point.

3) UnDo: Press *UnDo* button on the right of the window then **Enter** to remove operations to the curve in the edit box, including undoing delete and input operations, a maximum of 256 steps can be undone. This function offers convenience for editing user-defined curves.

4) Reset: Press *Reset* button on the right of the window then **Enter** to restore the curve to the default straight line.

5) Apply: After editing the user-defined curve, press *Apply* button on the right of the window then **Enter**, to save the user-defined curve and apply it to the current image. If *Apply* button is not pressed before shifting to another curve, then the modification will not be saved.

6) Back: Press *Back* button on the right of the window then **Enter** or **Esc** on the keyboard to return to the system menu.

5.2.3.5   Auto Save Image Parameter setup

There are two functions of auto save image parameter for selection: *On* and *Off*. Select *On*, then when adjusting control parameters, the parameters will be saved to the current exam type automatically; or select *Off* to quit without saving.

5.2.4   Peripheral Setup Menu

Table 5-5 Peripheral Setup Menu

Menu	Description
Serial Port Setup	To set up serial port
Beep	To set up buzzer action
Main Menu	Main Menu

5.2.4.1 Serial Port Setup

Port:(Serial port number), *Baud* (Baud rate) are available for selection.

【**Note**】**:** Serial port function is a reserved for future use.

5.2.4.2   Beep Setup

There are 3 choices: *Off*: turn off the buzzer; *Message*: beep when system error happens;

On: beep when system error happens, system alarms or pressing keys.

【Note】: Beep function is a reserved for future use.

5.2.5   Calc Setup Menu

Table 5-6 Calc Setup Menu

Menu	Description
Line Type	To set up Meas/Calc connecting line type
Distance Unit	To set up distance unit
Volume Unit	To set up volume unit
Time Unit	To set up time unit
Height Unit	To set up height unit
Weight Unit	To set up weight unit
Age Unit	To set up age unit
Beat Cycle	To set up beat cycle number for heart rate measurement
BSA Function	To select BSA（Body Surface Area）calculation equation
PSAD Coefficient	To set up Prostate Specific Antigen Density coefficient
Fetal Growth Curves Edit	To edit fetal growth curves
Fetal Age Estimating	Fetal age table/equation selection
Fetal Age Estimating Edit	To edit fetal age table/equation
Size of Measure Cross Cursor	Size of measure cross cursor
Main Menu	Main Menu

5.2.5.1 Line Type

There are three options of *Solid* (solid line), *Dot* (dot line) and *Non* (without line).

5.2.5.2 Distance Unit

There are 4 units: *cm* (centimeter), *mm* (millimeter), *ft* (foot) and *in* (inch) for selection.

5.2.5.3 Volume Unit

There are 5 units: cm^3 (cubic centimeter), ft^3 (cubic foot), in^3 (cubic inch), mm^3 (cubic millimeter) and *ml* (millimeter) for selection.

5.2.5.4 Time Unit

There are 2 units: *ms* (millisecond) and *s* (second) for selection.

5.2.5.5 Height Unit

There are 2 units: *cm* (centimeter) and *ft* (foot) for selection.

5.2.5.6 Weight Unit

There are 2 units: *kg* (kilogram) and *lb* (pound) for selection.

5.2.5.7 Age Unit

There are 3 units: *Yrs* (years), *Mns* (months) and *Wks* (weeks) for selection.

5.2.5.8 Beat Cycle

The beat cycles between 2 measurement control points can be set from *1* to *9*.

5.2.5.9 BSA（Body Surface Area）equation.

There are two calculation equations: *Stevenson* and *Grossman* for selection.
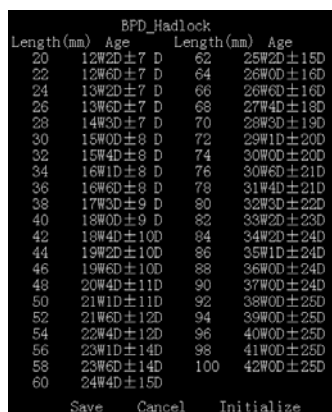
5.2.5.10 PSAD Coefficient

For prostate specific antigen density setup, the default is 1.0. Select *PSAD Coefficient* and press **Enter** to pop up an input box. Press **Enter** after inputting.

5.2.5.11 Fetal Growth Curves Edit

Select *Fetal Growth Curves Edit* on the calculation setup submenu and press **Enter** to enter the edit screen of BPD_Hadlock shown in Fig. 5-8.

Fig. 5-8 Edit Screen of BPD Growth Curve Table

a) To select other types of growth curve tables: rotate **Value** knob.

b) To modify data: use the trackball to move the cursor over the desired number and use the number keys to replace the original data. You can press **Clear** key to delete data.

c) To save data: after modification, move the cursor to *Save* and press **Enter** to save the modified data;

d) To cancel: select *Cancel* to restore the data before modification. If *Save* is pressed before, then *Cancel* is invalid.

e) To initialize: select *Initialize* and press **Enter**.

f) To exit: press **Esc**.

5.2.5.12 Fetal Age Estimating

Select *Fetal Age Estimating* on the calculation setup submenu and press **Enter** to pop up the menu in the first column of Table 5-7. Select a certain menu item and press **Enter**, and the submenu of that menu item will be popped up for user selection. See the second column of Table 5-7. Select *Table* to calculate based on data in fetal age table; select *Equation* to calculate with an equation.

Table 5-7 Fetal Age Estimating Menu

Menu	Submenu
GS（Gestational sac）	Hadlock Equation, Hadlock Table, Hansmann Table, Tokyo Table
CRL（Crown rump length）	Hadlock Equation, Hadlock Table, Hansmann Table, Osaka Table, Tokyo Table, Chitty Table
HC（Head circumference）	Hadlock Equation, Hadlock Table, Chitty Table, Self-defined Table 1、Self-defined Table 2、Self-defined Table 3
AC（Abdominal circumference）	Hadlock Equation, Hadlock Table, Hansmann Table, Chitty Table, Self-defined Table 1、Self-defined Table 2、Self-defined Table 3
BPD（Biparietal diameter）	Hadlock Equation, Hadlock Table, Hansmann Table, Osaka Table, Tokyo Table, Chitty Table, Self-defined Table 1、Self-defined Table 2、Self-defined Table 3
FL（Femur length）	Hadlock Equation, Hadlock Table, Hansmann Table, Osaka Table, Tokyo Table, Chitty Table, Self-defined Table 1、Self-defined Table 2、Self-defined Table 3

5.2.5.13 Fetal Age Estimating Edit

Select *Fetal Age Estimating Edit* on the calculation setup submenu and press **Enter**. There are *Table* and *Equation* for selection.

If *Table* is selected, a figure similar to Fig. 5-8 will show up. And the operation process is the same. The user can modify the data. If the calculation is calculated based on table look-up, then the calculation result changes accordingly.

If *Equation* is selected, the figure as shown in Fig. 5-9 will show up:

Fig. 5-9 Edit Screen of BPD Fetal Age Estimating Edit

The default equation displayed is **BPD Fetal Age Equation**. Other fetal age equations can be selected by rotating **Value** knob.

The value of **a~e** and **Coff** is changeable and the equations in Fig. 5-9 will be changed accordingly.

Select **Save** and the result of calculation will be changed, if the calculation is made with equation.

Select **Initialize** and press **Enter** key to restore the system to its default parameter value.

Select **Cancel** to restore the data before modification. If **Save** is pressed before, then **Cancel** is invalid;

Press **Esc** to return to calculation setup submenu.

5.2.5.14   Size of Measure Cross Cursor

There are three options available for selection, including S (small), M(medium) and L(large).

5.2.6   System activation submenu

Table 5-8   System Activation Submenu

Menu	Description
Export Activation File	Export local activation file
Import LicenseKey File	Import LicenseKey file
Main Menu	Main Menu

a) A function expiry period is included in the software for user trial of certain functions. At the initial operation of every unit, system basic functions and basic report function are

available for a long-term use.

b) To activate a certain function (including basic system functions), press **Menu** and then select *Activate System*. Press **Enter** to enter system activation submenu as shown in Table 5-8:

1) Select *Export Activation File* and press **Enter**. It pops up a storage device select box*.* Select *Hard disk* or *USB disk* and press **Enter** to go to the directory select box (press **T-Ball** to return to storage device select box). Then press **Enter**, and the system creates an SN.txt file under the root directory of the selected storage device. The user can select other directory. When the cursor is in a folder and press **Space** to enter the folder (move the cursor to " _↑" and press **Space** to return to the previous directory); then press **Enter** to create an SN.txt file in the folder and exit the menu.

2) Send the system generated SN.txt file to SIUI, and a license key License.txt will be created and sent to the user.

3) Select *Import LicenseKey File*. Follow the operation in step 1) and find License.txt. Highlight it with the cursor and press **Enter**.

   ●   If the file is correct, press **Enter** to exit the system menu, then import the LicenseKey file, thus a certain function will be activated.

   ●   If the file is incorrect, the interface of the directory selection box remains when pressing **Enter**, and the file cannot be imported.

5.2.7   System Update

5.2.7.1 Preparation for update files

Copy the required exe file for system upgrade to the root directory under USB disk. Insert a USB disk. Select *Update System from USB disk* from the system menu.

5.2.7.2 Update operation

Press **Menu**. Select *Update System* and press **Enter**. The window below will appear:

```
Update System Online
Update System From USB disk
Network Setup
Main Menu
```
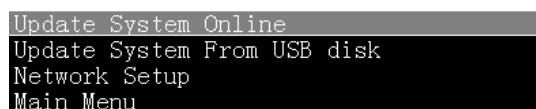
Fig. 5-10 Update System Menu

a) Update system online: *Select Update System Online* and press **Enter**. The

following message will be displayed on the screen:

Connecting, please wait…

1) If network connection fails, the following message will be displayed on the screen:

Network Error! Please press ESC to return menu.

● Press **Esc** to return to Fig. 5-10 window and enter *Network Setup* to check whether the setting of *IP* and *Port* is correct. Then make sure the system is well connected to the network (e.g. check the connection of net cable);

● Select *Update System Online* again. If it still prompts *Network Error*, it may be due to the server failure for file download. Please contact SIUI.

2) If network connection is successful, the following message will be displayed on the screen:

Network connect successfully.

Please press Enter to copy file or press ESC to return menu.

● Cancel system update: Press **ESC** to return to Fig. 5-10 window;

● Copy file: Press **Enter**. The window below will appear, and it starts copying update files. During copying, only **Esc** key is valid.

Copying files 9%
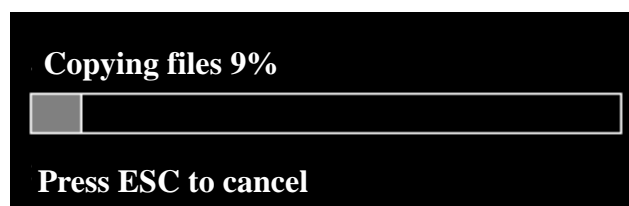
Press ESC to cancel

Fig. 5-11   Copy file window

● Cancel copy: Press **Esc** to cancel copy. The following message will be displayed on the screen:

Please press Enter to cancel copy or press ESC to return.

Press **Esc** key to continue copy, or press **Enter** to cancel copy, and the

following message pops up:

Copy Blackout! Please press ESC to return menu.

- Copy completes: the following message pops up when copy completes:

The files download successfully.

Please press Enter to update system or press ESC to return menu.

If the user does not want to update the system, press **Esc** to return to the window in Fig. 5-10. If the user wants to update the system, press **Enter**, and the system will automatically install the new software and be rebooted to achieve update.

b) Update System From USB disk

1) Select *Update System From USB disk* from the menu and press **Enter**;

2) If a USB disk containing system update files is plugged in the system, the following message will be displayed on the screen:

The Udisk file is ready.

Please press Enter to update or press ESC to return menu.

3) Press **Enter** and the system will install the new software and be rebooted automatically. System update is successful;

4) If the user does not want to update the system, press **Esc** to return to Fig. 5-10 window;

5) If a USB disk is not plugged in the system or there is no update file in the disk, the following message will be displayed on the screen:

The Udisk file is not ready.

Please press ESC to return menu.

Press **Esc** to return to Fig. 5-10 window. Ensure that a USB disk is plugged in and it contains update file. Then continue the update operation.

c) Network setup

1) This option is for setting server IP and port for downloading update files. The system is set up well before delivery. Usually the user does not need to change the setup.

   Correct IP: 218.16.250.64

   Port: 1234

2) If any modification is required, select **Network Setup** and press **Enter.** The window below will appear:

```
┌─────────────────────────┐
│   Update Server SetUp    │
├─────────────────────────┤
│ IP  : 218.16.250.64_     │
│ Port: 1234               │
│      OK    Initialize    │
└─────────────────────────┘
```

Fig. 5-12 Upgrade server setup window

3) Move the cursor to **IP** or **Port**. Use **Backspace** to delete the original **IP** or **Port**. Enter new **IP** or **Port** and move the cursor to select **OK**. Press **Enter** to return to Fig. 5-10 window;

4) If **Initialize** is selected and **Enter** is pressed, then **IP** and **Port** are initialized to factory setup;

5) If **IP** or **Port** is not modified, press **Esc** to return to Fig. 5-10 window.

5.2.8   DICOM setup and transfer (Option)

Press **Menu**. Move the trackball to select **DICOM**. Press **Enter** and the menu for DICOM options will appear. There are three options: **Local, NetWork** and **NetSetup**. See Fig. 5-13.

5.2.8.1 Local

Local is for saving images to or opening image files on the local system. Select **Local** and press **Enter**. The submenu of **Local** will appear, including **Save Image**,**Open Files**. and **Delete Files.** See Fig. 5-13.

Fig. 5-13   Local

a) Save Image. Select *Save Image* and press **Enter**. A dialog box for saving will appear under the menu. Press **Enter** again, and the image is saved.

b) Open Files. Select *Open Files* and press **Enter**. A file lis box will appear. Select one file and press **Enter** again to open the image stored on the local system.

c) Delete Files. If want to delete files in batch, select *Delete File* and press **Enter** key. A dialog box will be displayed as shown in Fig. 5-14. Input start date and end date and click *OK*. The system will delete all DICOM files during the period. If want to delete a designated DICOM file, select *Open Files* and then select the file in the pop-out DICOM local file list box, and press **Clear Text** to delete it.

Fig. 5-14 Delete Files

5.2.8.2 NetWork

NetWork is for sharing information between the local system and a remote system. For example, save images to a remote system, search and read image files from the remote system. Select *NetWork*. Press **Enter** and the submenu of *NetWork* will appear, including five options: *StoreSCP, StoreSCU, QuerySCU* , *PrintSCU* and *Send Quickly.* See Fig. 5-15.

Fig. 5-15 NetWork

a) StoreSCP. Select *StoreSCP* and press **Enter**. The system opens the port and begins listening files transferred to the local system. The remote system can store images to the local system only when this option is turned on.

b) StoreSCU. Select *StoreSCU* and press **Enter**. A dialog box for saving will appear. Press **Enter** again, and the image is stored to the remote system. On how to set up the remote system to connect the local system, please refer to the next section.

c) QuerySCU. Select "QuerySCU" and press **Enter**. An input box for query condition will appear. Input the query condition and press **Enter**. All results that comply with the condition are queried from the remote system and displayed in the file dialog box below. If no query condition is inputted and **Enter** is pressed, the system will list all image files on the remote system in the file dialog box.

d) Send Quickly. Select *Query SCU* and press **Enter**, then the current image will be saved to the remote system.

5.2.8.3 NetSetup

NetSetup is for setting connection parameters between the local system and the remote system. The network operation in Section 5.2.8.2 and information transfer between the local and the remote systems are enabled only after completing NetSetup. Select *NetSetup* and press **Enter**. The submenu of *NetSetup* will appear, including three options *Local* , *Remote* and *Worklist.* See Fig. 5-16.
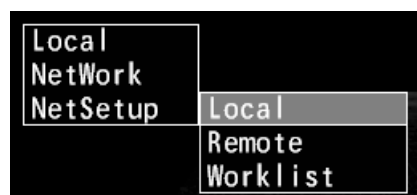
Fig. 5-16   NetSetup

a) Local. Select *Local* and press **Enter**. A setup dialog box will appear. See Fig. 5-16. Input the local IP address in the IP edit box (e.g. 192.168.0.63). Input a name to identify the local system in the AE edit box (e.g. TEST; note: input capital letters only) and a port number (e.g. 104). Press **Enter** to complete the Local setup.

b) Remote. Select *Remote* and press **Enter**. A setup dialog box will appear. Input the IP address of the remote system that will be connected to the local system. Input

an AE name of the remote system (note: capital letters only) that corresponds to the IP address in the AE edit box. Finally, input the port number of the remote system (the IP address, the AE name and the port number can be found in *Local* of the remote system). Press **Enter** to complete Remote setup.

c) Worklist. Select *Worklist* and Ppress **Enter**. In the   to pop- up the dialog box, set up   in which IP, AE and port of the wWorklist server can be set. After setting, select *Query SCU* from *NetWork* to call out the worklist of the Worklist server. Select certain any patient data from item in the query result, and the current patient number ID and name will be automatically updated.

5.2.9 Body Mark

Press **Menu** key and use the trackball to select *BodyMark* , then press **Enter**. A group of schematic diagrams of body marks will be displayed on the screen (See Section 7.3.4). To exit *BodyMark* screen, press **Esc**.

Chapter 6

Imaging

6.1 Preparation

6.1.1 Tools

a) Ultrasound Coupling Gel: to be applied directly to the patient's body parts to be examined;

b) Tissue Paper: to be used to remove ultrasound coupling gel away from the patient skin and the probe after examination;

c) Video Printer or USB Printer: to record diagnostic images or files.

6.1.2 Operation Procedure

a) Power On: Turn on the main power switch on the power panel. Press the main unit power switch button on the operation panel, and the system will complete initialization in about 3 minutes;

【Note】: If the system is in abnormal state and cannot be shut off, press the power switch on the operation panel for more than 8 seconds to force the system shut off completely; if the system is not in use for a long time, toggle the main power switch to OFF position.

b) Gain Control Preset: Adjust Gain knob and the slide potentiometers to bring the gain and the TGC (time gain compensation) to a proper position.

6.2 Selecting Probe and Exam Type

6.2.1   Selecting a Connected Probe

Different probes apply to different application ranges. In unfrozen state, press **Probe Select** key to cycle select one of the probes connected to the probe connector as the

current working probe.

6.2.2   Selecting Probe Frequency

The scanning frequency of each probe is changeable, and can be toggled according to the diagnostic requirements. In unfrozen state, press **Freq** key to change the frequency of the current probe. There are several frequencies available for selection.

6.2.3   Selecting Exam Type

6.2.3.1   Function Description

For each kind of probe on different exam type (including application range and diagnostic position), the system will conduct different initial settings based on its diverse characteristics, so that the system can be in the best situation for a corresponding exam type. These exam types provided by the system can be selected by the user and shown on the bottom left of the screen.

The available exam types are shown in Table 6-1.

Table 6-1   Exam Types

Application Type	Exam Types
Cardiology	Cardiology A, Cardiology AD, Pediatric
Peripheral arteries	Carotid, Peripheral arteries, Peripheral vein
Obstetrics	1st trimester, Basic OB, Complete OB, Fetal Echo, Mult Gest
Abdomen	Liver, Gallbladder, Pancreas
Gynecology	Uterus, Ovary
Small Part	Thyroid, Breast, Eyeball, Testes, Neonate
Urology	Kidney, Prostate
Orthopedics	Orthopedics
Podiatry	Podiatry

The system allows the user defining exam types by themselves; for each application type, the total amount of the exam types defined by system and the exam types defined by the user can not exceed 10. While defining a new exam type, the system will automatically store the current image control parameters to that exam type. Each exam type has a maximum length of 12 characters. On the exam type management interface, the character *U* is attached on the exam type defined by the user.

On the exam type management interface, operations listed in Table 6-2 are defined for user selection.

Table 6-2 Hotkeys for Exam Type Menu

Operation	Hotkey	Function
Delete	D	To delete a user-defined exam type.
New Name	N	To modify the exam type name.
Reset	R	To reset the system's predefined image control parameters of the selected exam type.
Set Default	S	To set the current selected exam type as the current applied default exam type or set the current selected application as default application type.
Update	U	To save the current image control parameters information to the selected exam type.
View	V	To view the image control parameters of the current selected exam type.

6.2.3.2 Display of Exam Type

The exam type name is displayed on the bottom left of the screen. In front of the default exam type, the modified exam type, and the user-defined exam type, *#*, *∗*, and *U* are marked respectively. The special function key **H** is used to toggle between on and off of the exam type.

6.2.3.3 Information of Exam Type

a) Default Exam Type: Each probe supported by the system has a default application. Each application has a default exam type. The user can change the default exam type on the exam type menu. The system uses a default exam type while turning on the power, switching probe, or changing application type.

b) Current Exam Type: The current exam type is displayed as a selected mode in the exam type menu. The current exam type includes a probe name, application name, and exam type information.

6.2.3.4   Exam Type Menu

6.2.3.4.1   Composition of Exam Type Menu (Fig. 6-1)

   a)   Probe model: Probe model is displayed on the first line of the exam type menu. The
        operator cannot change probe in this menu (the probe model can only be changed
        only by pressing **Probe Select** in 'Focus" state).

   b)   Application type: The current application name is displayed under the probe model;
        the cursor will rest on the application type after entering the exam type menu.

   c)   Exam type: All exam types corresponding with the application type are shown in
        this menu.

   d)   Help area: This menu hotkeys and their corresponding operations are listed in the
        Help area. See Fig. 6-1.
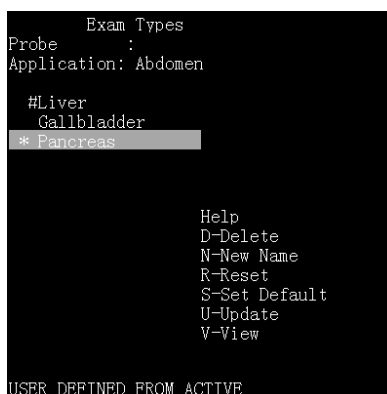
Fig. 6-1 Interface of Exam Type Menu

   e)   Adding new exam type: User defined exam type is displayed on the last line at the
        bottom of the exam type menu. It is used for the user defining new exam types.

6.2.3.4.2 Use of Exam Type Menu

Press **Exam** to enter the exam type menu; pressing **Exam** in the exam type menu can
exit this menu; pressing **Esc** or other key that change the state can also exit this menu.

Use the trackball to shift the cursor between the application type and the exam type. While
the cursor locates on an application type, the user can use the **Value** knob to change the
application type. While the cursor rests on an exam type, pressing Enter can confirm the
exam type and exit the exam type menu. While the cursor rests on the position of adding

new exam type, pressing **Enter** and a box for user entering a new exam type will appear. Press **Enter** to finish the loading and save.

The hotkey **D** can be used to delete a user-defined exam type. Press this key after selecting an exam type to be deleted. The system will prompt whether to delete that exam type or not. Select *OK* then press **Enter** to answer yes, or select *Cancel* then press **Enter** to cancel deletion.

The hotkey **N** is used to modify a user-defined exam type. Press this key after selecting an exam type to be modified. An input box will appear for entering a new exam type. Press **Enter** to finish entering.

The hotkey **R** can be used to load the current exam type system defined parameters. Press this key after selecting an exam type to be reloaded with parameters. The system will prompt whether to reload that exam type parameter. Select *OK* then press **Enter** to answer yes, or select *Cancel* then press **Enter** to cancel loading.

The hotkey **S** can be used to set the current exam type as the current applied default exam type. Press this key after selecting an exam type to be set as the default exam type, and "#" will appear in front of that exam type. Each application type can only have one default exam type.

The hotkey **U** can be used to save the current image control parameter to the selected exam type settings. The system will prompt whether to change the exam type parameters. Select *OK* then press **Enter** to confirm saving, or select *Cancel* then press **Enter** to quit saving.

The hotkey **V** can be used to view the image control parameter setting of a selected exam type.

When adding a new exam type or changing an exam type name, if the inputted name already exists, the system will prompt whether to overwrite the existing exam type. Select *OK* then press **Enter** to answer yes, or select *Cancel* then press **Enter** to quit changing the exam type name.

6.3 Preliminary Imaging

6.3.1 Usage of Probe and Ultrasound Coupling Gel

a) Apply adequate amount of ultrasound coupling gel to the surface of a patient's part to be examined and the probe.

【Note】: If there is air entering between the patient body and the probe, black dots will appear on the image. In this case, apply the coupling gel once more.

b) While a probe is placed on an exam area, an image will appear on the monitor.

6.3.2 Selection of Display Mode

The system has display modes including B, 2B, 4B, B/M and M.

In unfrozen state, the user can press **B Mode** and **M→** mode keys, or turn **Disp** knob for selection and toggle. The default mode is B mode, press **B Mode** to switch to 2B mode. The initial image is on the left. Use **Disp** knob to switch the right image to a live one; Press **B Mode** again to switch to 4B mode. The initial image is on top left. Use **Disp** knob to switch to the live image; And press **B Mode** for the third time to return to B mode. Press **M→** to enter B/M mode, and press **M→** again to enter M mode.

a) Single Image Window: single B, single M and B/M modes are available

- Single B and Single M: The ultrasound image display area on the screen displays the B or M image data sent from the front-end according to the gray scale.

- B/M: B/M means displaying the B and M images on the screen simultaneously. Three display modes are available, including upper-B, lower-M; left-B, right-M; upper-2B, lower-M; which can be selected in the system menu. For detailed setup method, please refer to Section 5.2.3.1.

b) Multi-image window: Multi-image window has 2B and 4B display available at present.

1) 2B

- 2B means that two B images are displayed left and right, one of which is

live, and the other is frozen.

● In 2B mode, use **Disp** knob to toggle the active image. The image with the "➤" mark indicates that it is the current active image.

● Two B modes can have different control parameters and exam types; the control parameters shown in the control-box are the parameters of the current real-time image; if both B are frozen, the shown parameters are control parameters of the last frozen B image.

● All the keyboard operations can only be conducted on the active image. If a frozen B image is released, this image will adopt the control parameters in the current control-box, and the other B image will be frozen simultaneously.

Left-B is Active   Right-B is Active
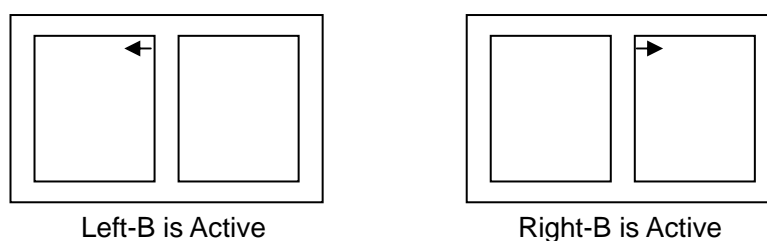
Fig. 6-2 Sketch Map for Indicating the Current Active Image

2) 4B

● 4B means that four B images are displayed on top left, top right, bottom left and bottom right of the screen. Only one of these four images is active, while the others are frozen.

● In 4B mode, use **Disp** knob to toggle the active image. The image with the "➤" mark indicates that it is the current active image. The

toggling order among the four images is shown in Fig. 6-3 by rotating **Disp** knob.
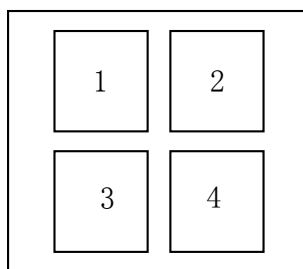
Fig. 6-3 4B Image Arrangement

● Four B modes can have different control parameters and exam types; the control parameters shown in the control-box are the parameters of the current unfrozen image; if all B are frozen, the shown parameters are control parameters of the last frozen B image.

● All the keyboard operations can only be conducted on the active image. If a frozen B image is released, this image will adopt the control parameters in the current control-box, and another B image will be frozen simultaneously.

6.3.3 Moving M Mode Image Sampling Line

In unfrozen state, you can press **M→** to enter B/M mode. The M mode image sampling line will be displayed automatically on the B mode image, and it can be moved left or right by turning the trackball towards left or right. *M LINE* will be displayed on the bottom right of the screen.

After the trackball operating object is shifted to the control window by pressing **T-Ball**, operating the trackball will not act on the sampling line. Press **T-Ball** again, and the trackball control object is shifted back to the sampling line.

6.3.4 Freezing and Unfreezing Image

To freeze the real-time image, press **Freeze**.

In addition, if the system's auto-freeze time is preset at a certain time (see Section 5.2.2.8), and the user has not operated the system during the set time, the system will enter the auto-freeze state, and the image will be frozen.

To release the frozen state, press **Freeze** again.

6.4 Adjusting Image

6.4.1 Adjusting Gain, and TGC (Time Gain Control)

To adjust B Gain and M Gain, rotate **B Gain** knob and **M Gain** knob; rotate the knob counter-clockwise to decrease the overall Gain, rotate the knob clockwise to increase the Total Gain, and the increment is 1dB.

Slide eight TGC (Time Gain Control, also called STC) slide potentiometers (slide control) on the control panel to change separately the amount of TGC applied to the specified area in the image that corresponds to that TGC slide potentiometer; the gain increases while sliding to the right, and decreases while sliding to the left.

6.4.2 Setting Focal Point Number and Position

In unfrozen state, press **Focus** repeatedly to change focal point number (1~4 for selection). If the trackball is moved up or down at this moment, all the focuses will be shifted up or down.

【**Tip**】: Pressing the console **F** key may change the focal span.

6.4.3 Setting Persistence

In unfrozen state, press **T-Ball**, use the trackball to select *PER* on control window, or press the number key as prompt in the control window to activate the item. Then the persistence value can be changed by rotating the **Value** knob; the value will be changed from 0 to 7 while turning clockwise, or from 7 to 0 while turning counterclockwise.

6.4.4 Setting Smooth/Edge Enhancement

In unfrozen state, you can press **T-Ball** to change the *Smo/Edg* value, or press the number key as prompt in the control window to activate the item. Then rotate **Value** knob to change the *Smo/Edg* value. The value will be changed from -3 to 3 while turning clockwise, or from 3 to -3 while turning counterclockwise.

【**Note**】**:** Positive values are for Smooth while negative values are for Edge Enhancement.

6.4.5 Selecting Grayscale

In B mode unfrozen state, press **T-Ball** and operate the trackball to select *B_GSC* in the control window (*M_GSC* in M mode and B/M mode, which can be operated respectively),

or press the number key as prompt in the control window to activate the item. Turn **Value** knob to select different grayscale curves.

In frozen state, press **G** key to toggle select different gray scales

6.4.6 Adjusting Dynamic Range

In unfrozen state, to change dynamic range, press **T-Ball** first, then operate the trackball to select *DYN* in the control window, or press the number key as prompt in the control window to activate the item. Then rotate the **Value** knob to change the dynamic range. The dynamic range will be increased while rotating the trackball clockwise, or decreased while rotating the trackball counterclockwise.

6.4.7 Setting M-mode Sweeping Speed

In unfrozen state, to set the M image sweeping speed, press **M Speed** repeatedly, Four speeds are available, including *1.25*, *2.5*, *5.0*, and *10.0* (second/frame).

6.4.8 IP One-touch-optimization Function

When the current state is *Focus* or *Wcont* in unfrozen state, press **I** to load the first group of optimal parameters (which is prompted over the imagine area) and the image changes accordingly. Press **I** again to load the second group of optimal parameters. Up to 8 groups of optimal parameters are available for selection.

The current system parameters can be saved to optimal parameters by pressing **U** key. Press **U** key to save the current system parameters to that group of optimal parameters loaded previously by pressing **I** key, which is prompted over the imagine area. If no **I** key was pressed previously, the parameters will be saved to the first group of optimal parameters; press **U** again to save the current system parameters to the next group of optimal parameters. Up to 8 groups of optimal parameters are available for update. To save the current system parameters to a desired group of optimal parameters, press **I** key first to select and load to the desired group of optimal parameters and press **U** to save.

The optimal parameters can be restored to default values by pressing **Y** key. Press **Y** key to restore the group of optimal parameters previously loaded by pressing **I** key, which is prompted over the imagine area. If no **I** key was pressed previously, it will default the first group of predefined optimal parameters; press **Y** again to default the next group of

predefined optimal parameters. Up to 8 groups of optimal parameters are available for restore. To restore a desired group of optimal parameters to default values, press **I** key to select and load the desired group of optimal parameters and press **Y** key to restore default values.

6.4.9 Adjusting Power

In unfrozen state, press **T-Ball** key and use the trackball to select *PWR* in the control window, or press the number key as prompt in the control window to activate the item. Turn **Value** knob to change acoustic power. The acoustic output parameter change will affect system parameter of acoustic output.

【Warning】**: To avoid harm to the patient, it is recommended to use as low acoustic power as possible provided that a clear image is obtained.**

6.4.10 Line Density

 In unfrozen state, press **T-Ball** key and use the trackball to select *LD* in the control window, or press the number key as prompt in the control window to activate the item. Turn **Value** knob and there are "normal" and "high" available for selection.

6.4.11 Chroma

In unfrozen state, press **T-Ball**. Then use the trackball to select *Chroma* in the control window; or press the number key as prompt in the control window to activate the item. Turn **Value** knob to change chroma. There are 7 choroma colors for selection: 0 for black and white, turn the value knob clockwise to change from 0 to 7, or counterclockwise to change from 7 to 0.

In frozen state, press **C** key to toggle between different chroma colors.

6.4.12 SRT(Speckle Reduction Technology)

In unfrozen state, press **T-Ball** and use the trackball to select *SRT* in the control window; or press the number as prompt in the control window to activate the item. Rotate **Value/Cut** knob to adjust SRT value. There are three steps available for selection: high, low and non.

6.4.13 Tissue Harmonic Imaging (Option)

In unfrozen state, press **T** key to activate two types of tissue harmonic imaging. ***Harmonic*** is displayed on the upper left screen.

a) Press **T** key once to activate one type of tissue harmonic imaging. Press **T** key again to exit tissue harmonic imaging. There is tissue harmonic for the lowest frequency of each probe.

b) If the convex probe center frequency is 2.5MHz or 3.5MHz, press **T** key for the first time to activate one type of tissue harmonic imaging and press **T** key again to active two types of tissue harmonic imaging. Press **T** key for the third time to exit tissue harmonic imaging.

6.5 Changing Image Display Range

6.5.1 Adjusting Display Depth

In unfrozen state, to adjust the image display depth, rotate **Depth** knob. The Display depth will be increased while rotating **Depth** knob clockwise, and decreased while rotating **Depth** knob counterclockwise; the adjustable range is from 1.6 cm to 24.4cm. The frame rate changes as the display depth changes; the deeper the display depth, the lower the frame rate. Contrarily, the frame rate is higher.

【**Note 1**】**:** The actual range of the display depth depends on probe type.

【**Note 2**】**:** While zooming-in, the display depth cannot be adjusted even by turning the **Depth** knob.

6.5.2 Changing Sweeping Range (Display Angle/Width)

To increase or decrease the sweeping range display angle (for convex probes) /width (for linear probes), press **T-Ball**, select ***Angle/Width*** item in the control window by operating the trackball to enter display angle/width setup. Turn **Value** knob to change the display angle/width; while turning **Value** knob clockwise, the angle/width will be increased at increment of 5°/5mm up to the maximum display angle/width; while turning **Value** knob counterclockwise, the display angle/width will be decreased at increment of 5°/5mm down to 20°/20mm.

6.6 Image Processing

6.6.1 Zooming in and Moving B Mode Image

a) In unfrozen or frozen state, press **Zoom** to enter the zoom state and a zoom-in area select box will be displayed at the bottom left of the screen. See Fig. 6-4.

b) Move the zoom-in area select box within the original image to select the ROI, and the zoom-in image will be displayed in the image area.

c) In the zoom-in state, press **Zoom** again to change the zoom rate. There are four zoom rates for selection.

Press **Esc** to exit the zoom-in state.
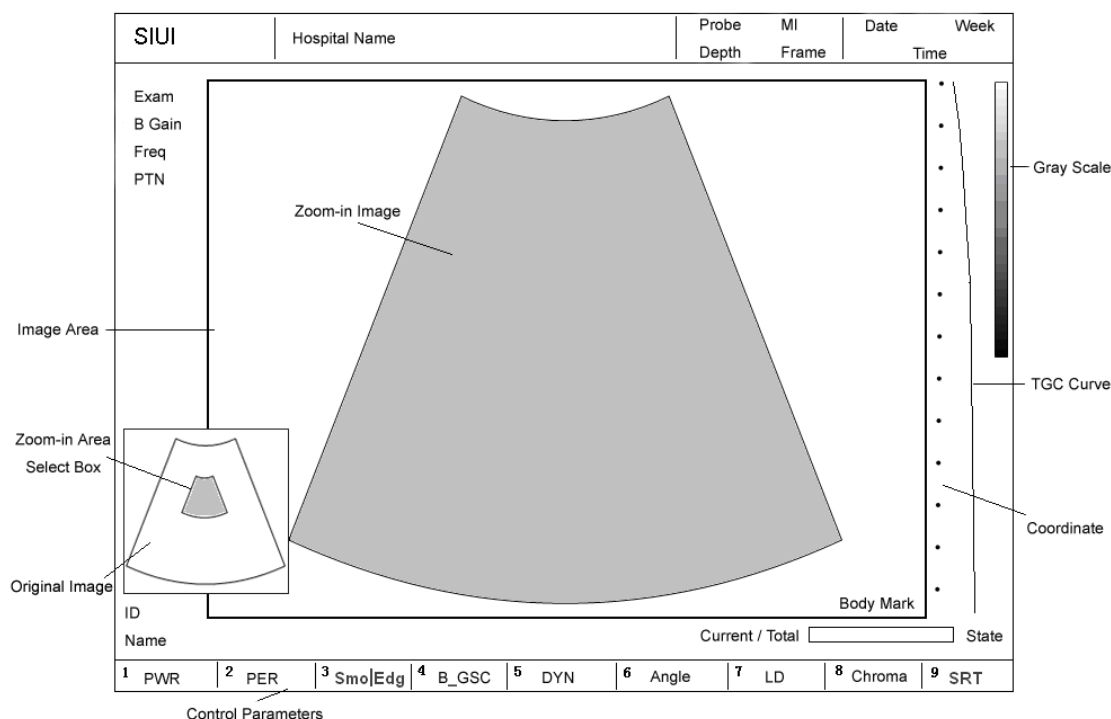
Fig. 6-4   Zoom State Diagram

6.6.2 B-Mode Image Left/Right Reverse

In frozen, unfrozen or scroll cineloop state, the live B mode image can be reversed between left and right against the image center by pressing **L/R** key.

While the image is reversed, the orientation mark attached to the image is reversed with the image; but the body mark, the coordinates, the focal point mark, and the image activity

mark are not reversed.

6.6.3 B-Mode Image 90° Rotation

In frozen, unfrozen or scroll cineloop state, the real-rime B mode image can be rotated 90° against the image center by pressing **Rotation** key. Select to rotate the image clockwise or counterclockwise. See Section 5.2.3.2 for the detailed setup.

While rotating, the orientation mark [the focal point mark, the M line (in B/M or M mode)] attached to the image is rotated along with the image simultaneously; but the body mark, the coordinates, and the image activity mark are not rotated along with the image.

6.6.4 B-Mode Image Positive/Negative Reverse

In frozen, unfrozen or scroll cineloop state, you can press **N** to reverse the image positive/negative. The power-on setup is positive (black background and white characters).

Chapter 7

Annotation of Image Information

7.1 Inputting Patient Information

7.1.1 Description of Functions

The information such as patient's NAME, ID, AGE, SEX, HEIGHT, WEIGHT, LMP and PSA, can be inputted into the system and saved in the database (ID is a must).

7.1.2 Operation Method

a) New: Press **Pat Data** key to pop up the Patient Information screen (Fig. 7-1). Move the cursor over *New* and press **Enter**. All the information in the input boxes will be cleared, and the cursor goes to ID input filed for user manual input.

Fig. 7-1 Edit Interface of Patient Information

b) Edit: Press **Pat Data** to open the Patient Information interface. Move the cursor with the trackball to each input area and edit the information. Finally, select *Set* and press **Enter**.

c) Import: Press **Pat Data** to open Patient Information interface. Select *Import* and press **Enter** to open "ID Input". Input patient ID and press **Enter**. The system will read the patient information that is corresponding to the ID from the database and display it in patient information box.

d) Delete: Press **Pat Data** to open Patient Information interface. Select *Delete* and press **Enter**. If there is existing information in the patient information area, the system will automatically clear it and delete this patient information record from the database.

【**Tip**】: Every time the system is turned on, it will back up patient information database file automatically. If the backup database is damaged, the system will have auto recovery of factory database. In case it cannot recover, please follow the instruction below to perform manual recovery: freeze the system, input *SIUIR* and wait for the prompt box to show up. Then press **Enter** to finish recovery.

7.2 Adding Annotation on Image

7.2.1 Function Description

The user can add texts and annotations to a frozen image. Text function allows the user to input characters and numbers; annotation function allows the user to add predefined phrases on the image. The content of the predefined phrases depends on the current exam type.

7.2.2 Operation Method

Relative keys (or trackball, knobs) to the text function include:

Text : To enter or exit text mode.

ANNOT: To enter or exit annotation menu of the current exam type.

↵**Enter** (⌐↵ Enter ⌐): To change to new line in text state; to attach selected phrases to the cursor or to the image in annotation menu.

Enter (↵): The same function as ⌐↵ Enter⌐ .

Shift : To input other characters assigned to the same key in combination with a letter key or a number key.

Clear : To delete annotations on the screen in different annotation states,

Backspace: To delete one character or annotation arrow before the cursor.

Freeze: Once releasing the freeze state, all the annotations on the screen will be

removed.

A: To add annotation arrows.

Trackball: To move the cursor.

Value knob: To select the annotation phases.

H: In non-text mode, to hide all annotations on the screen.

In order to add text annotation, in frozen state, press **Text** key to show up the cursor on the annotation area, and the system will enter the annotation state. Then move the cursor to the position to be annotated by moving the trackball, and input letters there.

In order to add an annotation, press **ANNOT** key to enter annotation state, then the preset annotation phrases for the diagnostic part will be displayed in the list. Move the trackball to select the desired annotation (highlighted display) and press **Enter**. Then the selected annotation will be shifted with the cursor. Move the cursor to the desired annotation position and press **Enter**. The annotation is displayed on the position where the cursor locates.

7.2.3 System Predefined Annotations

The system predefined annotations are shown in Table 7-1 ~ Table 7-7. The user can also add up to 15 annotations to every exam type（for more details on how to add annotations, see Section 5.2.2.12）; in the list of annotations, the system predefined annotations and the user-defined annotations are separated by one line.

Table 7-1 Predefined Annotations for Abdomen

Abdomen		
LIVER	LONG	HEAD
C.HEP A	TRANS	NECK
SPLEEN	LT KIDNEY	BODY
SPLENIC A	GB	PANCREAS
PORTAL	DUCT	CYST
CELIAC	IVC	STOMACH
HEP V	PANCREAS HEP V	MASS
PANCREAS AORTA	AORTA	TAIL
SPLENIC	RT KIDNEY	CBD
HEP A	LEFT	PV
SMA	CD	AO
HD	CBD	CAUDATE LOBE
EHBD	LTH	QUADRATE LOBE

LFH	CHD	BD
PD	HEPATIC DUCT	VL
WD	POLYP	CHA
IMA	GBF	SD
STONE	CY	ROUND LIGMENT
TUMOR	GDA	

Table 7-2 Predefined Annotations for OB

1st Trimester	2+3 T	Fetal echo
BABY 1	RIGHT	RIGHT
RIGHT	LEFT	LEFT
LEFT	TRANS	TRANS
BLADDER	UMB CORD	UMB CORD
TRANS	HEART	HEART
OVARY	LONG	LONG
LONG	BLADDER	BLADDER
UTERUS	STOMACH	STOMACH
HEART	KIDNEY	KIDNEY
CORD	BODY	BODY
GS	PLACENTA	PLACENTA
ADNEXA	CERV OS	CERV OS
YS	FUNDUS	FUNDUS
EMBRYO	HEAD	HEAD
DECIDUA	AM	
FM	AM C	
CRL	VILLUS	
	CHORION	
	FETUS	
	FETAL HEART	
	FM	
	FH	
	F SP	
	F THX	
	FL	
	HL	
	UC	
	HC	
	AC	
	BPD	
	THC	
	OFD	
	EYE	
	OD	
	TTD	
	FW	
	UA	
	UV	
	PL	

Table 7-3 Predefined Annotations for GYN

GYN	
UTERUS	CERVIX
RIGHT	OVARY
R OV	LONG
ENDOME	EXT IL
ADNEXA	INT IL
ILIAC	FOL 1
L OV	FOL 2
TRANS	FOL 3
BLADDER	FOL 4
LEFT	FOL 5
UTER A	FOL 6
OVAR A	FOL 7
FOLLICLE	FOL 8
CONC	FOL 9
UTO	FOL 10
UTERUS CANAL	LEFT UTO
EN	RIGHT UTO
VAGINA	ROV
ADNEXA	LOV
IUD	ROV A
UTERUS ARTERY	LOV A
POLYP	CY
STONE	OA
TUMOR	

Table 7-4 Predefined Annotations for Urology

Urology	
RIGHT	LOWER
O RRA	PELVIS
P RRA	MID
M RRA	DRRA
INLOB	DLRA
SEG	TRANSPLANT
ARCU	PROST
L KID	TZ
LEFT	EJAC
O LRA	DUCT
P LRA	CZ
M LRA	SEM VESICLE
LONG	BLADDER
TRANS	PZ
CYST	CORONAL
ARTERY	URETHRA
UPPER	RRP
URETHRA	RRC
POLYP	PY
STONE	RCO
CY	AG
TURMOR	LEFT URETERS
RA	RIGHT URETERS
PST A	BLADDER

Table 7-5 Predefined Annotations for Cardiology

Adult cardiology	Adult diff cardiology	Pediatric cardiology
AORTIC	AORTIC	AORTIC
LV	LV	LV
TCHZ	TCHZ	TCHZ
AO ROOT	AO ROOT	AO ROOT
MITRAL	MITRAL	MITRAL
MV	MV	MV
PEAK	PEAK	PEAK
R ATRIUM	R ATRIUM	R ATRIUM
ASC AO	ASC AO	ASC AO
AO	AO	AO
LVOT	LVOT	LVOT
L ATRIUM	L ATRIUM	L ATRIUM
REGURG	REGURG	REGURG
AV	AV	AV
RVAW	RVAW	RVAW
PULMONIC	PULMONIC	PULMONIC
OUTFLW	OUTFLW	OUTFLW
LA	LA	LA
DIAS	DIAS	DIAS
TRICUSPID	TRICUSPID	TRICUSPID
INFLOW	INFLOW	INFLOW
PV	PV	PV
SYST	SYST	SYST
ATRIAL SEP	ATRIAL SEP	ATRIAL SEP
SEPTUM	SEPTUM	SEPTUM
RV	RV	RV
4 CH	4 CH	4 CH
LEFT VENT	LEFT VENT	LEFT VENT
AO ARCH	AO ARCH	AO ARCH
TV	TV	TV
VSD	VSD	VSD
RIGHT VENT	RIGHT VENT	RIGHT VENT
DESC AO	DESC AO	DESC AO
TVI	TVI	TVI
ASD	ASD	ASD

Table 7-6 Predefined Annotations for Small Parts

Thyroid	Galactophore	Testis	Eyeballs	Neonate
RIGHT	MAMMILLA	LEFT	EYEBALL	LIVER
LEFT	CA	VARICOCELE	CORNEA	SAGITTAL
OCULUS	ADENOMA	EPIDIDYMIS	IRLS	3RD VENT
SUPERIOR	LEFT	LONG	SCLERA	L KID
TRANS	FIBROMA	RIGHT	ANTER CH	RIGHT
LONG	UI	TESTICLE	VITREOUS BODY	CORONAL
THYROID	MEDIAL	HYDROCELE	LENS	4TH VENT
ISTHMUS	CYST	TRANS	RETINA	R KID
RT LOBE	LATERAL		OPTIC DISK	LONG
LENS	UO		OPTIC NERVE	SPLEEN
INFERIOR	SUPERIOR		MASS	LAT VENT
THROAT	TAIL			CYST
LT LOBE	AXILLA			CAVUM
PARA	LI			CHOROID
CCA	INFERIOR			THALAMUS
CORNEA	LO RIGHT			LEFT
ANT HAMBER				TRANS
MID				CEREBELLUM
RETINA				PL
PAROTID GLAND				HEMORRHAGE
SUBJAW GLAND				
OPTIC NERVE				

Table 7-7 Predefined Annotations for Carotid and Peripheral Vessels

Carotid	Peripheral Vessels	
BULB	RIGHT	CFV
DISTAL	PERONEAL A	P GSV
MID	ILIAC	M SFV
PROX	CFA	POP
LEFT	EXT IL	P PTV
SUBCLAVIAN	POST TIBIAL A	M PTV
ECA	P PTA	D PTV
CCA	ATA	ATV
RIGHT	INT IL	GASTRO
VERTEBRAL	ANT TIBIAL A	DFV
ICA	PERON	LSV
BIF	POP	D GSV
JUGULAR	LT CIR	M GSV
IA	BRACHIAL A	P SFV
SCA	ARTERY	D SFV
IJV	MID	D PTA
EJV	PROFUN	DR PED
	PROXIMAL	ARTERY
	M SFA	DISTAL
	D SFA	VEIN
	P SFA	LEFT
	RADIUS A	ULNAR A
	M PTA	

7.3 Body Mark

Body marks are a group of pictorial diagrams of human organs. They are used to indicate the current exam parts. One movable and rotatable arrow is used to indicate position and direction of the probe.

7.3.1 Function

Press **BDYMK** key to display body marks. After **BDYMK** key is pressed, all the default body marks of the current exam type will be displayed. Move the cursor to select and press **Enter**, the selected body mark will be displayed at the bottom right of the image.

When a body mark is displayed in the image, an arrow (probe mark) will be shown in the body mark display range. When the trackball control target is on the body mark, use the trackball to shift the arrow, and rotate **Value** knob to adjust angle of the arrow. Up to 12

directions can be adjusted for the arrow, with a difference of 30º for two adjacent directions.

The operation of body mark can be implemented in frozen or unfrozen state. Press **T-Ball** key to switch the state. When it is in "Body Mark" state, press **Enter** key, and all the default body marks of the current exam type will be displayed again. Press **BDYMK** key again to clear the body mark on the screen.

7.3.2 Format

Only one body mark can be displayed on one image element and on every image element of B/B or 4B.

7.3.3 Displayed position

There are 5 displayed positions for user's reference. For B or M mode, the displayed position can be bottom left, middle bottom, bottom right, top right and top left corners; while for multi image elements such as B/M, B/B, 4B, it can be bottom left, bottom right, top right and top left corners. While the body mark is being displayed, its displayed position can be shifted by pressing **P** key directly.

7.3.4 Application

Type of system predefined body mark changes in accordance with different application. Specified pictorial diagrams are shown below:

a) Abdomen Body Marks
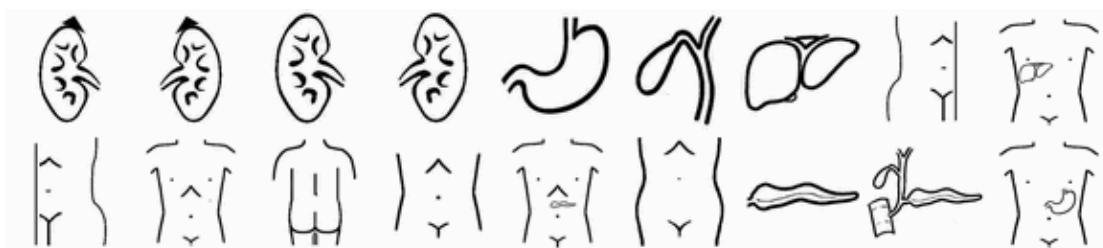
Fig. 7-2 Abdomen Body Marks

b) Cardiology Body Marks

Fig. 7-3 Cardiology Body Marks

c) Gynecology Body Marks

Fig. 7-4 Gynecology Body Marks

d) Obstetrics Body Marks (including 1st Trimester, 2+3T and Fetal echo)

Fig. 7-5 Obstetrics Body Marks

e) Peripheral Vessel Body Marks
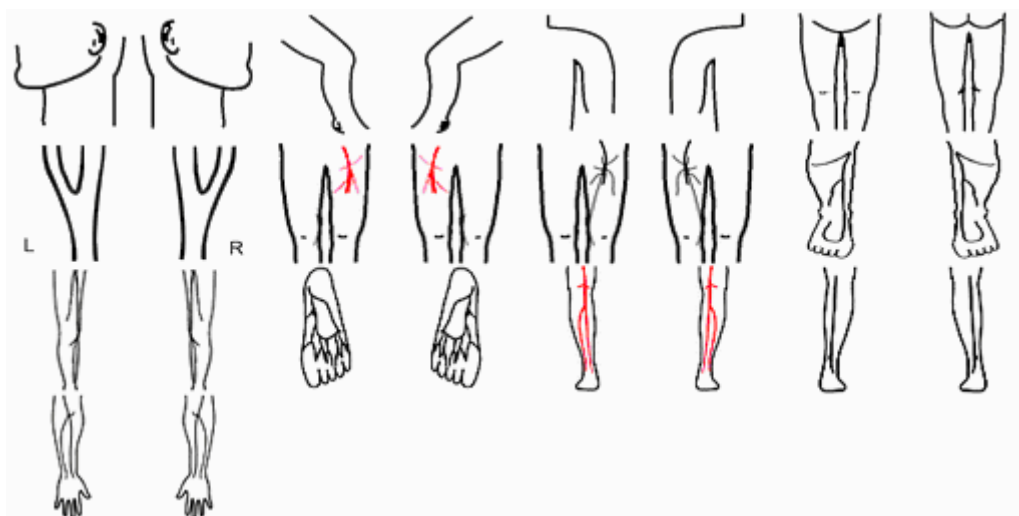
Fig. 7-6 Peripheral Vessel Body Marks

f) Urology Body Marks

Fig. 7-7 Urology Body Marks

g) Small Part Body Marks
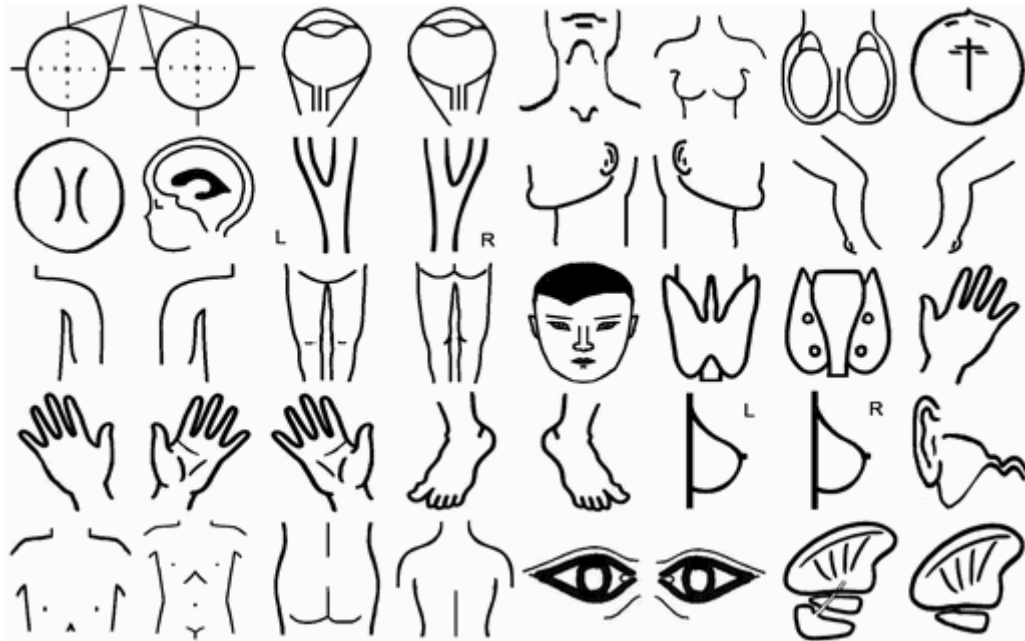
Fig. 7-8 Small Part Body Marks

7.4 Adding Arrow

In non-text mode, press **A**. An arrow appears in the center of the image area.

a) Adjust angle: The angle of the arrow can be adjusted to 12 directions by rotating **Value**. Every step is 30º, from 0~360º.

b) Move: use the trackball to move the arrow.

c) Fix: After pressing **Freeze**, the arrow will be in annotation state and automatically be fixed; in other conditions, the arrow will be fixed only by pressing **Enter**. other wise, the arrow will be clear when entering other states.

d) Exit: If the user does not want to input an arrow, press **Esc or A** to exit before fixing the arrow.

e) Enter multiple arrows: After the first arrow is fixed, press **Enter** again. The same operation can input multiple arrows.

f) Delete: Press **Clear** in unfrozen or single-frame cine state to clear all the arrows. When in arrow annotation state, arrows can be deleted one bye one.

Chapter 8

Measurement and Calculation

The user can do measurement on ultrasound images and obtain various results based on different calculation methods; these results will be automatically and simultaneously entered into reports for the user to generate diagnostic reports.

8.1 Key and Menu for Measurement & Calculation

8.1.1 Keys and Knobs for Meas/Calc

The keys and knobs applied in measurement & calculation (Meas/Calc) and their functions are listed in Table 8-1.

Table 8-1 Operating Keys and Knobs for Measurement & Calculation and Their Functions

Key/knob	Function Description
Trackball	To select menu items in Meas/Calc menu; To move the cursor to the measured position while calculating and measuring.
Value knob	To roll the displayed items up or down while the lines of Meas/Calc menu or the contents in measurement result area exceed the limited lines. To select inputting placenta grade in OB report. To select Prostate Echo in Prostate report.
Dis key	To measure distance In frozen B and B/M modes.
Area key	To measure circumference and area in frozen B and B/M modes.
Meas key	The first press in frozen state brings up the general measurement menu; the second press exits the measurement menu.
Calc key	The first press in frozen state brings up the special calculation menu; the second press exits the calculation menu.
Enter key	To confirm the Meas/Calc item while measuring & calculating. To switch and confirm LMP input in growth charts. To select options in Prostate Report.

Esc key	To exit the current Meas/Calc and return to the previous menu, or exit directly.

The direct measurement keys **Dis** and **Area** can be used to measure distance and area/circumference (trace method) in B and B/M modes.

Meas and **Calc** keys can be used to bring up the Meas/Calc functional menu. To adapt to the width limit, the menu items with many letters are abbreviated. See Appendix A for meanings of abbreviations. Use to trackball to select a Meas/Calc item and then press **Enter** key to start measurement & calculation; pressing **Esc** key will exit the current Meas/Calc menu. On menu select screen or during the measuring & calculating process, pressing other functional key will exit the current Meas/Calc operation and enter other functional operation.

8.1.2 General measurement

The general measurement menus brought up by pressing **Meas** key are diverse under different modes, which are listed as follows:

a) Measurement menu in B mode (including 2B and 4B):

Table 8-2   B mode（including 2B and 4B）Measurement Menu

Menu	Description
Ellipse-area	Area and circumference measurement in Ellipse method
Biplane-vol.	Volume measurement in biplane method
Ellipse-vol.	Volume measurement in ellipsoid method
Simpson-vol.	Volume measurement in Simpson method
Sphere-vol.	Volume measurement in sphere method
Angle	Angle measurement
Area ratio(t)	Area ratio in trace method
Area ratio(e)	Area ratio in ellipse method
%area redu(t)	Area reduction percentage in trace method
%area redu(e)	Area reduction percentage in ellipse method
%diam. Reduce	Diameter reduction percentage
Histogram	Histogram

After entering Histogram calculation screen, a transparent rectangular box (80X80 pixels), which can be moved within the image range by using the trackball, appears in the image

central position. The box is resizable by using the **Value** knob (see Section 8.3.4 for detailed description on Histogram).

b) Measurement menu in M mode:

Table 8-3 M mode Measurement Menu

Menu item	Definition
Mult Distance	Multi-distance (length) measurement
Time	Time measurement
Heart rate	Heart rate
Slope	Slope (velocity) measurement

c) Measurement menu in B/M mode: combining the measurement menus in B mode and M mode.

8.1.3 Special Calculation

The special Calc menu brought up by pressing **Calc** key varies with different exam types. The following are Calc menu for various exam types, in B or B/M mode if not specified.

【**Note**】**:** Some of the special calc menus below may not be available on your system, due to certain suitable probe or software package being not configured.

8.1.3.1 Abdomen Calculation

Abdomen application includes three system pre-defined exam types: liver, gall bladder and pancreas. The contents of their calc menu items are the same. Table 8-4 is the abdomen calc menu for B or B/M mode; there is only *Report* in M mode.

Table 8-4　 Abdomen Calc Menu

Menu	Description
Long L Lobe	Long diameter of left lobe
A-P L Lobe	Antero-posterior diameter of left lobe
Angle L Lobe	Angle of left lobe
Obli. R Lobe	Oblique of right lobe
A-P R Lobe	Antero-posterior diameter of right lobe
Angle R Lobe	Angle of right lobe
Portal Vein	Portal vein
IVC	Inferior vena cava

SMA	Superior mesentery artery
CELIA	Celiac artery
AO	Aorta
Long Spleen	Long diameter of spleen
A-P Spleen	Antero-posterior diameter of spleen
Splenic A	Splenic artery
Splenic V	Splenic vein
Long GB	Long diameter of gallbladder
A-P GB	Antero-posterior diameter of gallbladder
Trans GB	Transversal diameter of gallbladder
Wall GB	Thickness of the wall of gallbladder
CBD	Common bile duct
LHD	Left hepatic duct
RHD	Right hepatic duct
Head	Head
Body	Body
Tail	Tail
MPD	Main pancreatic duct
%D Redu AO	% Diameter reduce of aorta
%A Redu AO	%Area reduce of aorta
Report	Report

8.1.3.2 Urology Calculation

Urology application includes two exam types: kidney and prostate. Their menu items are listed in Table 8-5 and 8-6. Table 8-5 and 8-6 show urology calc menus in B or B/M mode; there is only *Report* in M mode.

Table 8-5 Kidney Calc Menu

Menu	Description
L L Kidney	Long diameter of left kidney
A-P L Kidney	Antero-posterior diameter of left kidney
Trans L Kidney	Transversal diameter of left kidney
L Ureter	Left ureter
LRA	Left renal artery
L R Kidney	Long diameter of right kidney
A-P R Kidney	Antero-posterior diameter of right kidney

T R Kidney	Transversal diameter of right kidney
R Ureter	Right ureter
RRA	Right renal artery
Long Blad	Long diameter of bladder
A-P Blad	Antero-posterior diameter of bladder
Trans Blad	Transversal diameter of bladder
LAU Blad	Long diameter of bladder after urination
A-PAU Blad	Antero-posterior diameter of bladder after urination
TAU Blad	Transversal diameter of bladder after urination
Bladder Volume	Bladder Volume
Report	Report

Table 8-6 Prostate Calc Menu

Menu	Description
Long Blad	Long diameter of bladder
A-P Blad	Antero-posterior diameter of bladder
Trans Blad	Transversal diameter of bladder
LAU Blad	Long diameter of bladder after urination
A-PAU Blad	Antero-posterior diameter of bladder after urination
TAU Blad	Transversal diameter of bladder after urination
Prost Volume	Prost Volume
S-I Prost	Superior-inferior diameter of prostate
A-P Prost	Antero-posterior diameter of prostate
Trans Prost	Transversal diameter of prostate
Project Into Bladder	Project into bladder
SimpsonResidualUrine	Simpson residual urine
A-P IG	Antero-posterior diameter of internal gland
Trans IG	Transversal diameter of internal gland
L L Semi Vesi	Long diameter of left seminal vesicle
A-P L Semi Vesi	Antero-posterior diameter of left seminal vesicle
T L Semi Vesi	Transversal diameter of left seminal vesicle
L R Semi Vesi	Long diameter of right seminal vesicle
A-P R Semi Vesi	Antero-posterior diameter of right seminal vesicle
T R Semi Vesi	Transversal diameter of right seminal vesicle
PSAD	Prostate specific antigen density
Bladder Volume	Bladder Volume

Report	Report

8.1.3.3 Gynecology Calculation

Gynecology application includes two exam types: uterus and ovary. They have the same calc menus. Table 8-7 shows the calc menu in B or B/M mode; there is only **Report** in M mode.

Table 8-7 Gynecology Calc Menu

Menu	Description
Long Uterus	Long diameter of uterus
A-P Uterus	Antero-posterior diameter of uterus
Trans Uterus	Transversal diameter of uterus
Endometrium	Endometrium
Long Cervix	Long diameter of cervix
A-P Cervix	Antero-posterior diameter of cervix
Long L Ovary	Long diameter of left ovary
A-P L Ovary	Antero-posterior diameter of left ovary
T L Ovary	Transversal diameter of left ovary
Long R Ovary	Long diameter of right ovary
A-P R Ovary	Antero-posterior diameter of right ovary
T R Ovary	Transversal diameter of right ovary
Vol Follicle1	Volume of Follicle1
Vol Follicle2	Volume of Follicle2
Vol Follicle3	Volume of Follicle3
Report	Report

8.1.3.4   Obstetrics Calculation

Obstetrics application includes five exam types: early pregnancy, basic OB, complete OB, fetal echo and multi gestations. They have different calc menus. In Table 8-8, items from the first one to **Report** or **Biophy Profile** are calc menus in B mode; items from **Report** to **Heart Rate** are for M mode; and the calc menus in B/M mode combines all the above items.

Table 8-8 Obstetrics Calc Menu

Menu	Description
1st Trimester	
GS	Gestational sac
CRL	Crown rump length
Report	Report
Heart Rate	Heart rate
NT	Nuchal Translucency Thickness
BPD	Biparietal Diameter
HC	Head Circumference
AC	Abdominal Circumference
FL	Femur Length
Basic OB menu	
BPD	Biparietal diameter
HC	Head circumference
AC	Abdominal circumference
FL	Femur length
OFD	Occipito-frontal diameter
TAD	Trans-abdominal diameter
APD	Antero-posterior abdominal diameter
Q1	Amniotic fluid index
Q2	Amniotic fluid index
Q3	Amniotic fluid index
Q4	Amniotic fluid index
Placenta	Placenta thickness
EFW-Shepard	Estimated fetal weight -Shepard's method
EFW-Hadlock1	Estimated fetal weight -Hadlock's method 1
EFW-Hadlock2	Estimated fetal weight -Hadlock's method 2
EFW-Hadlock3	Estimated fetal weight -Hadlock's method 3
EFW-Hadlock4	Estimated fetal weight -Hadlock's method 4
EFW-Campbell	Estimated fetal weight -Campbell's method
EFW-Hansmann	Estimated fetal weight -Hansmann's method
Report	Report
Growth Charts	Fetal growth charts
Biophy Profile	Biophy profile
Heart Rate	Fetal heart rate

NT	Nuchal Translucency Ihickness
CER	Cerebellum diameter
FTA	Fetal Trunk Area
Complete OB menu	
BPD	Biparietal diameter
HC	Head circumference
AC	Abdominal circumference
FL	Femur length
OFD	Occipito-frontal diameter
TAD	Trans-abdominal diameter
APD	Antero-posterior abdominal diameter
HL	Humeral length
TL	Tibial length
UL	Ulnar length
RL	Radial length
FIBL	Fibular length
OOD	Outer orbital diameter
LV	Lateral ventricle
HW	Hemisphere width
Q1	Amniotic fluid index
Q2	Amniotic fluid index
Q3	Amniotic fluid index
Q4	Amniotic fluid index
Placenta	Placenta thickness
EFW-Shepard	Estimated fetal weight -Shepard's method
EFW-Hadlock1	Estimated fetal weight -Hadlock's method 1
EFW-Hadlock2	Estimated fetal weight -Hadlock's method 2
EFW-Hadlock3	Estimated fetal weight -Hadlock's method 3
EFW-Hadlock4	Estimated fetal weight -Hadlock's method 4
EFW-Campbell	Estimated fetal weight -Campbell's method
EFW-Hansmann	Estimated fetal weight -Hansmann's method
Report	Report
Growth Charts	Fetal growth charts
Biophy Profile	Biophy profile
Heart Rate	Fetal heart rate

Fetal echo menu	
AO	Aorta
LVOT	Left ventricular outflow tract
Pulmonary Artery	Pulmonary artery
RVOT	Right ventricular outflow tract
LA	Left atrium
RA	Right atrium
LV	Left ventricle
RV	Right ventricle
IVS	Inter-ventricular septum
ARCH	Aortic arch
SVC	Superior vena cava
IVC	Inferior vena cava
LV AREA	Left ventricle area
RV AREA	Right ventricle area
CD	Cardiac diameter
TD	Thoracic diameter
Report	Report
Biophy Profile	Biophy profile
Heart Rate	Heart rate
Multi gestations menu	
Fetus1 BPD	Biparietal diameter
Fetus1 HC	Head circumference
Fetus1 AC	Abdominal circumference
Fetus1 FL	Femur length
Fetus1 GS	Gestational sac
Fetus1 CRL	Crown rump length
Fetus1 OFD	Occipito-frontal diameter
Fetus1 LV	Lateral ventricle
Fetus1 HW	Hemisphere width
EFW1-Shepard	Estimated fetal weight -Shepard's method
EFW1-Hadlock1	Estimated fetal weight -Hadlock's method 1
EFW1-Hadlock2	Estimated fetal weight -Hadlock's method 2
EFW1-Hadlock3	Estimated fetal weight -Hadlock's method 3
EFW1-Hadlock4	Estimated fetal weight -Hadlock's method 4

EFW1-Campbell	Estimated fetal weight -Campbell's method
EFW1-Hansmann	Estimated fetal weight -Hansmann's method
Fetus2 BPD	Biparietal diameter
Fetus2 HC	Head circumference
Fetus2 AC	Abdominal circumference
Fetus2 FL	Femur length
Fetus2 GS	Gestational sac
Fetus2 CRL	Crown rump length
Fetus2 OFD	Occipito-frontal diameter
Fetus2 LV	Lateral ventricle
Fetus2 HW	Hemisphere width
EFW2-Shepard	Estimated fetal weight -Shepard's method
EFW2-Hadlock1	Estimated fetal weight -Hadlock's method 1
EFW2-Hadlock2	Estimated fetal weight -Hadlock's method 2
EFW2-Hadlock3	Estimated fetal weight -Hadlock's method 3
EFW2-Hadlock4	Estimated fetal weight -Hadlock's method 4
EFW2-Campbell	Estimated fetal weight -Campbell's method
EFW2-Hansmann	Estimated fetal weight -Hansmann's method
Fetus3 BPD	Biparietal diameter
Fetus3 HC	Head circumference
Fetus3 AC	Abdominal circumference
Fetus3 FL	Femur length
Fetus3 GS	Gestational sac
Fetus3 CRL	Crown rump length
Fetus3 OFD	Occipito-frontal diameter
Fetus3 LV	Lateral ventricle
Fetus3 HW	Hemisphere width
EFW3-Shepard	Estimated fetal weight -Shepard's method
EFW3-Hadlock1	Estimated fetal weight -Hadlock's method 1
EFW3-Hadlock2	Estimated fetal weight -Hadlock's method 2
EFW3-Hadlock3	Estimated fetal weight -Hadlock's method 3
EFW3-Hadlock4	Estimated fetal weight -Hadlock's method 4
EFW3-Campbell	Estimated fetal weight -Campbell's method
EFW3-Hansmann	Estimated fetal weight -Hansmann's method
Q1	Amniotic fluid index
Q2	Amniotic fluid index

Q3	Amniotic fluid index
Q4	Amniotic fluid index
Placenta	Placenta thickness
Report	Report
Growth Charts	Growth charts
Biophy Profile	Biophy profile
Fetus1 HR	Fetus1 heart rate
Fetus2 HR	Fetus2 heart rate
Fetus3 HR	Fetus3 heart rate

8.1.3.5 Small parts Calculation

Small parts application includes five exam types: thyroid, galactophore, eyeballs, testis and neonate. They have different calc menus. Menus in B and B/M mode are listed in Table 8-9; there is only **Report** in M mode.

Table 8-9 Small Parts Calc Menu

Menu	Description
Thyroid	
Long L Lobe	Long diameter of left lobe
A-P L Lobe	Antero-posterior diameter of left lobe
Trans L Lobe	Transversal diameter of left lobe
SUPA L Lobe	Superior artery of left lobe
INFA L Lobe	Inferior artery of left lobe
Long R Lobe	Long diameter of right lobe
A-P R Lobe	Antero-posterior diameter of right lobe
Trans R Lobe	Transversal diameter of right lobe
SUPA R Lobe	Superior artery of right lobe
INFA R Lobe	Inferior artery of right lobe
Isthmus	Isthmus
LCCA	Left common carotid artery
RCCA	Right common carotid artery
Report	Report
Galactophore	
UI L Breast	Upper internal of left breast
LI L Breast	Lower internal of left breast

UE L Breast	Upper external of left breast
LE L Breast	Lower external of left breast
UI R Breast	Upper internal of right breast
LI R Breast	Lower internal of right breast
UE R Breast	Upper external of right breast
LE R Breast	Lower external of right breast
Report	Report
Eyeballs	
L Eye OA	Ocular axis of left eyeball
L Eye Lens	Lens of left eyeball
L Eye AC	Anterior chamber of left eyeball
L Eye ON	Optic nerve of left eyeball
R Eye OA	Ocular axis of right eyeball
R Eye Lens	Lens of right eyeball
R Eye AC	Anterior chamber of right eyeball
R Eye ON	Optic nerve of right eyeball
Report	Report
Testis	
Long L Testis	Long diameter of left testis
A-P L Testis	Antero-posterior diameter of left testis
Trans L Testis	Transversal diameter of left testis
Long L Epidi	Long diameter of left epididymis
A-P L Epidi	Antero-posterior diameter of left epididymis
Long R Testis	Long diameter of right testis
A-P R Testis	Antero-posterior diameter of right testis
Trans R Testis	Transversal diameter of right testis
Long R Epidi	Long diameter of right epididymis
A-P R Epidi	Antero-posterior diameter of right epididymis
Report	Report
Neonate	
L LV	Left lateral ventricle
R LV	Right lateral ventricle
3rd	Third cerebral ventricle
HW	Hemisphere width
Report	Report

8.1.3.6 Peripheral vessels Calculation

Peripheral vessels application includes three exam types: carotid artery, peripheral artery and peripheral vein. They have different calc menus. Table 8-10 shows menus in B and B/M mode; in M mode there is only *Report*. Press **Calc** to go to the first-level menu. In the first-level menu, move the cursor to select an item and press **Enter** to go the submenu; In the submenu, press **Esc** to return to the first-level menu.

Table 8-10 Peripheral vessels calc menu

Menu	Description
Carotid artery first-level menu	
Left CCA	Left common carotid artery
Left BIF	Left common carotid artery bifurcation
Left ICA	Left Internal carotid artery
Left ECA	Left external carotid artery
Right CCA	Right common carotid artery
Right BIF	Right common carotid artery bifurcation
Right ICA	Right Internal carotid artery
Right ECA	Right external carotid artery
Report	Report
Carotid artery submenu	
Diameter	Diameter
Intima	Intima
%D Reduce	%Diameter reduce
%A Reduce	%Area reduce
Peripheral artery menu	
Left AXIA	Left axillary artery
Right AXIA	Right axillary artery
Left BRAA	Left brachial artery
Right BRAA	Right brachial artery
Left RADA	Left radial artery
Right RADA	Right radial artery
Left ULNA	Left ulnar artery
Right ULNA	Right ulnar artery
Left FEMA	Left femoral artery
Right FEMA	Right femoral artery

Left POPA	Left popliteal artery
Right POPA	Right popliteal artery
Left DORA	Left dorsal artery
Right DORA	Right dorsal artery
Report	Report
Peripheral artery submenu	
Diameter	Diameter
Intima	Intima
Intima-media	Intima-media
%D Reduce	%Diameter reduce
%A Reduce	%Area reduce
Peripheral vein menu	
Distance	Distance
Area-T	Area in trace method
Area-E	Area in ellipse method
%D Redu	%Distance reduce
%A Redu	%Area reduce in trace method

8.1.3.7 Cardiology Calculation

Cardiology application includes three exam types: adult cardiology, adult difficult cardiology and pediatric cardiology. They have the same measurement menu. Menu items change accordingly with modes. See Table 8-11.

Table 8-11 Cardiology Menu

Menu	Description
B mode menu	
RVAW	Right ventricular anterior wall
RV	Right ventricle
RVOT	Right ventricular outflow tract
AO	Aorta
LA	Left atrium
IVSD	Inter-ventricular septum in diastolic period
LVDD	Diastolic left ventricular diameter
LVPWD	Left ventricular posterior wall thickness at end diastole
IVSS	Inter-ventricular septum in systolic period

LVDS	Systolic left ventricular diameter
LVPWS	Left ventricular posterior wall thickness at end systole
IVC	Inferior vena cava
PA	Pulmonic artery
RA	Right atrium
Report	Report
M, B/M mode menu	
LA/AO	Left atrium/ Aorta
MV	Mitral valve
TV	Tricuspid valve
PV	Pulmonic valve
LV	Left ventricle
LV FUNC	Left Ventricle Function
Report	Report

8.1.3.8 Orthopaedics Calculation

In B and B/M mode, orthopaedics calculation includes two menu items: *Hip Angle* and *Report*. In M mode there is only *Report.*

8.1.3.9 Report Function

Different exam types have different report formats.

● Patient Information in reports cannot be edited except for using **Pat Data** key.

● Gestation Age and Estimated Date of Delivery are calculated automatically based on the result of LMP and measurement.

● Relevant measurement result will be displayed in the report if the user does certain measurement.

● Placenta Grade in the OB report is selectable by rotating **Value** knob.

● The items of Shape Echoes and Inner Echoes in the prostate report can be selected by pressing **Enter** (move the cursor over the desired item and press **Enter** key to have the box in front of the item checked automatically. For items inside (), only one selection can be made; for items without (), multiple selections can be made);

● The operation of annotation in report is the same as that of **Text** key.

● Save report: Press **Save** key in Report displaying screen to pop up the file name input box. If "Patient name" has been inputted, the default file name is "Patient name". The user can also input a new file name. (Press **Clear** to clear all the characters, and press **Backspace** key to clear the character before the cursor.) After inputting the file name, press **Enter** key to save the current report in the hard disk as jpg format (save directory is: "E:\\Report"). Press **Disk** key to open and display the saved report (see Section 9.2.2 for the detailed method to recall images).

8.2 Display and Clear of Meas/Calc Result

8.2.1 Display Meas/Calc Result

When an item of measurement & calculation is selected by the user, the current position of the cursor is displayed on the image as "+" for the user to select the measuring initial and end point. A necessary sketch map is provided for user reference while measuring & calculating, and measurement & calculation results are displayed real-time according to user operation. While calculating or measuring, the measured point coordinate should not be beyond the border of the measured image element. In 2B mode, when there are images with the same depth in both windows, then measurement on the two images can be made at the same time, i.e. coordinates of the measured point can be moved freely in the two image areas. While conducting distance, circumference/area, or items in **Meas** measurements, pressing **Dis**, **Area** or **Meas** key will enter a new measurement as above; in this case, the current measurement results will be reserved on the screen. Up to 9 measuring results can be reserved for each kind of measurement (such as distance, area/circumference, volume and time, etc.); the initial points for one kind of measurement are shown on the screen as a, b, c and so on, and measured items of measuring results are marked with a, b, c and so on for identification.

Change display position of Meas/Calc result:: In state of Calc/Meas, press **P** key to shift the display position.

To revise the results of measurement, rotate **Value** knob in state of Meas or single frame, and move the cursor over a certain measurement result to start a new measurement.

8.2.2 Clear Meas/Calc Result

To clear Meas/Calc result, press **Clear Text** key in Meas/Calc state or single-frame state.

8.3 Operation of Meas/Calc

The units referred to in this section, such as the units of distance, volume, time, height and weight, as well as the units displayed in the figures, are selectable, which can be set up in Calc setup menu. For detailed setup method, please refer to Section 5.2.5.

8.3.1 Distance

In B, B/B, 4B or B/M mode, freeze the image and press **Dis** key to measure the distance between any two points on the image (in unfrozen state, pressing this key will freeze the image automatically). Enter the distance measurement screen, a **+** cursor will appear in the center of the image. **"D1*: 0.00cm"*** (it might be *D2* or *D3* subject to the current measurement time) shows in the measurement result area at the same time. Move the trackball to the measured start point and press **Enter** to fix the first **+** cursor. The second **+** cursor shows on the same point. Use the trackball to move the second **+** cursor. Whether the two **+** cursors are connected with a dotted line can be set up in the Calc menu. The displayed distance value in the measurement result area changes as the cursor moves. Move the second **+** cursor over the second point to be measured and press **Enter** to fix it. The first **+** cursor is movable now. Each press of **Enter** key will toggle the movable and fixed states between the two cursors.

If the user press **Calc** key and select distance-measurement-only options such as "Long Spleen", "A-P R Lobe" or "Trans L Kidney", the calculation process is basically the same as that of the distance measurement. The only difference is "D1" displayed in the measurement result area is replaced by "Dist".

In M or B/M mode, multi-distance can be measured by pressing **Meas** key, and multiple measurement results can be obtained at one time.

8.3.2 Area/Circumference

8.3.2.1 Trace method

In B, B/B, 4B or B/M mode, freeze the image and press **Area** key to measure the area

and the circumference of the selected part on the tomographic image (in unfrozen state, pressing this key will freeze the image automatically). Entering area measurement screen, a **+** cursor will appear in the center of the image. "*1P:0.00cm, 1Area:0.00 cm^2*" is displayed in the measurement result area in two lines. Use the trackball to move the **+** cursor over the desired position to be measured . Press **Enter** key to fix the start point of measurement. Move the cursor to draw out a trace along the desired measuring path. The length of the trace is the circumference, and the circumference value in the measurement display area will change as the cursor moves. Press **Enter** key to display an enclosed area (If the start point does not coincide with the end point, the distance between the start point and the end point will be linked by a straight line), and the area value will be displayed in the result area. The user can also use the **Backspace** key to remove the dotted line along the drawn trace dot by dot.

If **Meas** is pressed and *Area ratio(t)* is selected, "*1Ratio：0.00，1Area1：0.00cm^2，1Area2: 0.00cm^2*" is displayed in the measurement result area in three lines. If *%area redu(t)* is selected, "*1Reduce：0.00％, 1Area1：0.00cm^2, 1Area2：0.00cm^2*" is displayed in the measurement result area in three lines. "*1Area1*" and "*1Area2*" correspond to the two areas drawn by the user on the screen. For other operation, please refer to the above steps.

8.3.2.2　Ellipse method

In B, B/B, 4B or B/M mode, press **Meas** key and a menu will appear. Select *Ellipse-area* in the menu to enter ellipse method area measurement screen. A **+** cursor will appear on the screen. "*1P:0.00cm, 1Area: 0.00cm^2, 1DL: 0.00cm, 1DS: 0.00cm*" will be displayed in four lines in measurement result area. Move the trackball and press **Enter** key to fix the start point of the long axis. Use the trackball to drag the long axis to the end point of measurement and press **Enter** key to fix the long axis. The length of the long axis is displayed in the result area. And then use the trackball to adjust the short axis size to the proper position. The values of short axis length and ellipse area change accordingly. Press **Enter** again, and the **+** cursor jumps to the first fixed point, which is movable to a proper position. Press **Enter** again to fix that point, and the **+** cursor jumps to the second fixed point which becomes movable now. Press **Enter** again to fix the long axis. The user can use the trackball to adjust the short axis to a proper size. The values of short

axis length and ellipse area change accordingly. Press **Enter** key in combination with moving the trackball repeatedly, the two points of the long axis can be shifted and the length of the short axis be adjusted.

8.3.3 Volume

8.3.3.1 Ellipse-vol.

In B, B/B, 4B or B/M mode, press **Meas** key and a menu will appear. Select ***Ellipse-vol.*** to enter ellipse method volume measurement screen. A **+** cursor will appear at the center of the image. "***1Volume: 0.00cm³, 1DL: 0.00cm, 1DS: 0.00cm***" is displayed in three lines in the result area. Measure the long axis DL and the short axis DS on the B-mode image as per ***Ellipse-area***, then ***Volume*** is calculated.

8.3.3.2 Biplane-vol.

max. transversal diameter plane L

:max. longitudinal diameter Plane R
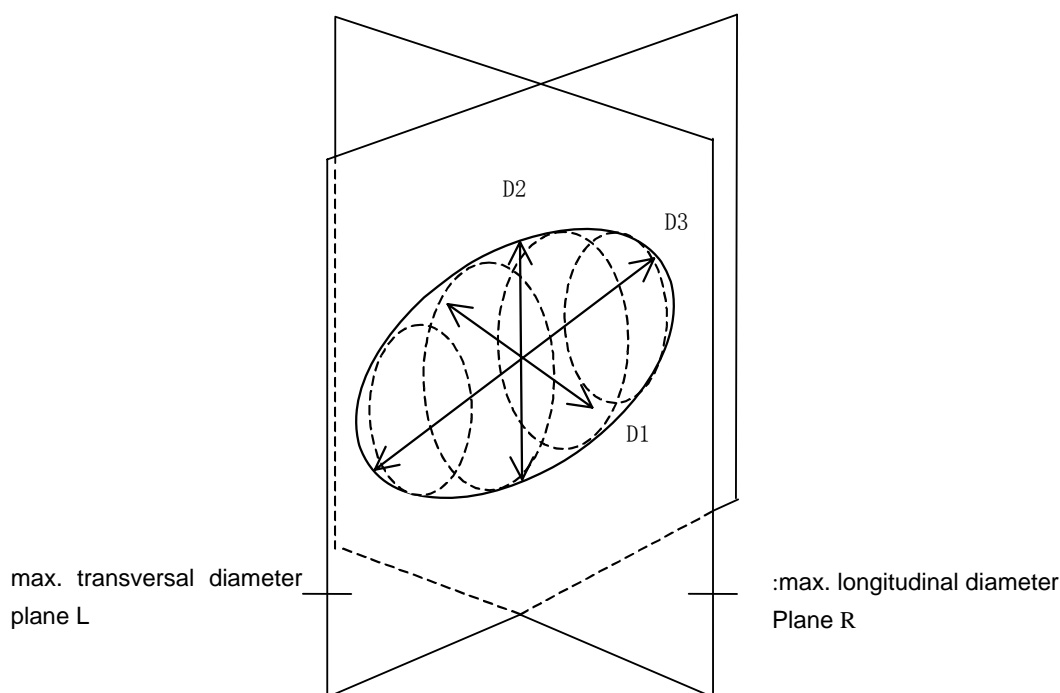
Fig. 8-1   Biplane-Vol. Measurement Theory

Biplane-vol. can be acquired in B, 2B or 4B mode.

a) In B mode unfrozen state: acquire the max. longitudinal diameter plane (plane R in Fig. 8-4) and the max. transversal diameter plane (plane L in Fig. 8-4) of the measured object, then freeze the image. Use cineloop to find plane R. Press **Meas** and select ***Biplane-vol.*** to enter the measurement screen of biplane

volume. Use the trackball to place the **+** cursor over the long axis start point of the max. longitudinal diameter image (plane R). "***1Volume: 0.00cm³***, ***1D1: 0.00cm***, ***1D2: 0.00cm***, ***1D3: 0.00cm***" is displayed in the result area in four lines. Follow Ellipse-area to obtain the values of D1 and D2, namely the longitudinal diameter and the antero-posterior diameter of the object. Press **Esc** to exit the measurement menu and enter single frame cineloop. Use the trackball to find plane L, press **Meas** and select ***Biplane-vol.*** to enter the measurement screen of biplane volume. Turn the **Value** knob to activate the previously measured results (the trackball function is disabled now). Press **Enter** three times and then follow the distance measurement to obtain the value of D3. Now the volume value is displayed in the result area automatically.

b) In 2B mode unfrozen state: In 2B mode unfreeze state, acquire the max. longitudinal diameter plane of the measured object in one of the images (plane R in Fig. 8-4) ; Turn **Disp** knob to activate the other image window, then acquire the max. transversal diameter plane (plane L in Fig. 8-4), and then press **Freeze** key to freeze that image. Press **Meas** key and select ***Biplane-vol.*** to enter the measurement screen of biplane volume. A **+** cursor shows up in the image area. "***1Volume: 0.00cm³***, ***1D1: 0.00cm***, ***1D2: 0.00cm***, ***1D3: 0.00cm***" is displayed in the result area in four lines. Use the trackball to place the **+** cursor over the long axis start point of the max. longitudinal diameter image (plane R). Follow Ellipse-area to obtain the values of D1 and D2, namely the longitudinal diameter and the antero-posterior diameter of the object. Press **Enter** to confirm Ellipse-area measurement and activate a new **+** cursor. Then follow the distance measurement to obtain the value of D3 on plane L. Now the volume value is displayed in the result area automatically.

c) 4B mode: the measurement in 4B mode is the same as that in 2B mode.

【**Note**】**: It is recommended to use *Biplane vol.* in 2B mode instead of B mode, because a big error may occur when finding planes R and L from cineloop in B mode.**

8.3.3.3 Sphere-vol.

Sphere-vol. is used in Obstetrics for measuring ovarian follicle volume in B, B/B, 4B or B/M mode. Its measuring process is similar to that of Ellipse-area, but the length of long axis DL and short axis DS must be the same. *"1Volume：0.00 cm^3 , 1D：0.00 cm"* " will be displayed in two lines in the result area.

8.3.3.4 Simpson-vol.

In Simpson-vol., the enclosed area acquired by Trace method is divided into several equal parts (5 pixels apart here) along the long axis. Each part is regarded approximately as a cylinder for calculating the volume. The accumulated cylinder volume of all parts is an approximate volume of the whole area.

Simpson-vol. can be used in B, B/B, 4B or B/M mode. Follow the steps of Trace-area to acquire an enclosed area. Press **Enter** to confirm and display a dotted line as a long axis between the two points with the longest distance in the area. The user can adjust the position of the long axis. In the adjust process, the two ends of the dotted line are kept on the border of the area. *"1Volume：0.00 cm^3"* is displayed in the result area. The measuring result changes with the adjustment of the long axis position.

8.3.4 Histogram

Based on experiment statistics, the probability distribution density graph comes from statistics is called a histogram. In ultrasound medical imaging, probability distribution refers to grayscale probability distribution.

In B mode, histogram of a desired area can be acquired by calculation. Press **Meas** key to enter measurement menu. Select *Histogram* and enter histogram calculation screen. A transparent rectangular frame will appear at the center of the image. There is a result box of histogram at the bottom right of the image. Move the rectangular frame with the trackball within the image area. Change the size of the frame by rotating **Value** knob.
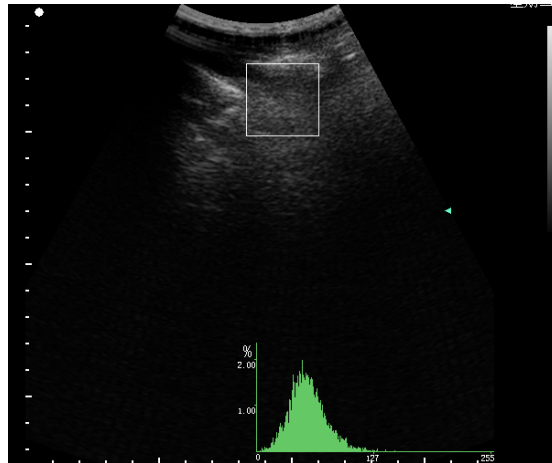
Fig. 8-5 Histogram Display

8.3.5 Time

In M or B/M mode, time between any two points on the image in M mode can be measured after freezing. Press **Meas** key and select *Time* to enter time measurement screen. A vertical calipers with a **+** cursor will appear at the image center. "*1Time: 0.00s*" is displayed in the measurement result area. Move the trackball to place the **+** cursor of the vertical calipers over the first point to be measured. Press **Enter** and the first vertical calipers and its **+** cursor will be fixed. Move the trackball and the second vertical calipers with a **+** cursor will appear. The measured time is displayed in the measurement result area and changes with the cursor moves. Place the **+** cursor of the second vertical calipers over the second desired point to be measured and press **Enter**. Now the second vertical calipers and its **+** cursor are fixed and the first vertical calipers and its **+** cursor are movable. Every press of **Enter** key will toggle the two vertical calipers and their **+** cursors between the states of being fixed or movable.

8.3.6 Heart Rate

Press **Meas** and select *Heart Rate* to enter heart rate measurement screen. "*1Beat number:✕*, *1HR: 0.00bpm*" is displayed in the result area. Other operation is the same as Time measurement.

8.3.7 Slope

In M or B/M mode, slope (velocity) of any two points on the image can be measured after freezing. Press **Meas** and select *Slope* to enter slope measurement screen. A vertical calipers with a **+** cursor will appear on the image. **1** *High: 0.00mm*, *1Slope: cm/s*" (*High* is the depth difference between two points) will be displayed in the result area. Move the trackball to place the **+** cursor of the first vertical calipers over the first point to be measured and press **Enter** to fix the first vertical calipers and its **+** cursor; Move the trackball, the second vertical calipers with a + cursor will appear. High and Slope (velocity) in the result area change with the moving of the cursor. Move the **+** cursor of the second vertical calipers over the second point to be measured and press **Enter** to fix the second vertical calipers and its **+** cursor, now the first vertical calipers and its **+** cursor are movable. Every press of **Enter** key will toggle the two vertical calipers and their **+** cursors between the states of being fixed or movable.

8.3.8 Angle

Angle can be measured in B, B/B, 4B or B/M mode. 9 angles can be measured in the same screen, for example ∠1, ∠2and ∠3. Press **Meas** and select *Angle* to enter angle measurement screen. A **+** cursor will appear on the screen. Move the cursor over the start point of the first line and press **Enter**. The **+** is fixed and a second movable **+** appears. Move the second cursor to the intersecting point of the two lines and press **Enter**. The second **+** is fixed and letter a (or b, c) is displayed. Move the cursor to the end point of the other line and press **Enter**. A third **+** is fixed. Value of the angle is displayed in the format of "∠*a1:   xxx°*" (or ∠b2, ∠c3, etc.) in the result area. The first **+** cursor is movable. Every press of **Enter** key will toggle the first and the third **+** cursors between the states of being fixed or movable.

8.3.9 Obstetrics Calculation

8.3.9.1 Obstetrics Distance

Set the exam type as Obstetrics (the same for the following Obstetrics calculation sections). In B, B/B, 4B or B/M mode, press **Calc** to enter fetal growth and EDD measurement. Its measuring process is the same as that of distance measurement. The measuring result is displayed as the measurement item plus "*Dist: xxx.xx mm*"; For measurement item with EDD empirical equation, the result will also include "*GA:*

xxWxxD " and "*EDD: Y/M/D*".

8.3.9.2 Obstetrics Circumference

In B, B/B, 4B or B/M mode, press **Calc** to enter fetal growth and EDD measurement. Its measuring process is the same as that of Ellipse circumference/area. The measuring result is displayed in three lines as "*C: xxx.xx mm, GA: xxWxxD,   EDD: Y/M/D*".

8.3.9.3 Obstetrics Fetal Weight

There are seven empirical equations for measuring obstetrics fetal weight. When the exam type is Basic OB, Complete OB or Mult Gest, in B, B/B, 4B or B/M mode, press **Calc** key to enter calculation menu. Select *EFW-Shepard*, *EFW-Hadlock1*, *EFW-Hadlock2*, *EFW-Hadlock3*, *EFW-Hadlock4, EFW-Campbell or EFW-Hansmann*, and its corresponding screen will appear.

a) Shepard method: Shepard method estimates fetal weight by the measured AC and BPD. Enter EFW-Shepard. "*Weight: g, GA: xxWxxD, EDD: Y/M/D*" is displayed in three lines in the measurement result area.

b) Hadlock1method: Hadlock1 method estimates fetal weight by the measured AC and FL. Enter EFW-Hadlock1. "*Weight: g, GA: xxWxxD, EDD: Y/M/D*" is displayed in three lines in the measurement result area.

c) Hadlock2 method: Hadlock2 method estimates fetal weight by the measured AC, FL and HC. Enter EFW-Hadlock2. "*Weight: g, GA: xxWxxD, EDD: Y/M/D*" is displayed in three lines in the measurement result area.

d) Hadlock3 method: Hadlock3 method estimates fetal weight by the measured AC, FL, HC and BPD. Enter EFW-Hadlock3. "*Weight: g, GA: xxWxxD, EDD: Y/M*" is displayed in three lines in the measurement result area.

e) Hadlock4 method: Hadlock4 method estimates fetal weight by the measured AC, FL and BPD. Enter EFW-Hadlock4. "*Weight: g, GA: xxWxxD, EDD: Y/M/D*" is displayed in three lines in the measurement result area.

f) Campbell method: Campbell method estimates fetal weight by the measured AC. Enter EFW-Campbell/Wilken. "*Weight: g, GA: xxWxxD, EDD: Y/M/D*" is displayed in three lines in the measurement result area.

g) Hansmann method: Hansmann method estimates fetal weight by the measured BPD and TAD. Enter EFW- Hansmann. "***Weight: g, GA: xxWxxD, EDD: Y/M/D***" is displayed in three lines in the measurement result area.

【**Note**】: When doing OB calculation, calculation result such as BPD, FL, AC can be displayed on the screen at the same time. Up to 9 lines of result can be displayed. Select by rotating **Value** knob.

8.3.9.4 Growth chart

The screen of growth chart is shown in full screen as in Fig. 8-3. The growth chart is drawn according to statistic data, and the position of the measuring result is marked on the growth chart. There are eight curves for selection, such as ***BPD_Hadlock, HC_Hansmann, AC_Hadlock*** and ***AC_Hansmann***. Measurement should be made before the growth chart is displayed. The actual measurement result is marked with * in the growth chart. Press **Esc** to exit.

a) Input LMP in patient information box. Save and exit (the cursor can be toggled between the input boxes of year, month and date of LMP by pressing **Enter** during the input process).

b) In ***Basic OB***, ***Complete OB*** and ***Mult Gest*** exam types in obstetrics application, press **Calc** key to select BPD, HC, AC, FL and EFW for measurement.

c) After completing measurement, select ***Growth Chart*** and press **Enter**. The growth chart menu will appear at the screen center. See Table 8-12.

Table 8-12 Growth Chart Menu

Menu	Description
BPD_Hadlock	Biparietal diameter growth curve—Hadlock
HC_Hadlock	Head circumference growth curve—Hadlock
AC_Hadlock	Abdominal circumference growth curve—Hadlock
FL_Hadlock	Femur length growth curve—Hadlock
EFW_Hansmann	Fetal weight growth curve—Hansmann
BPD_Hansmann	Biparietal diameter growth curve—Hansmann
AC_Hansmann	Abdominal circumference growth curve—Hansmann
FL_Hansmann	Femur length growth curve—Hansmann

d) Select any menu item, e.g. BPD growth curve, and press **Enter** to enter growth chart screen. Two gestational ages and estimated dates of delivery are displayed for user reference and comparison: one is calculated from LMP, the other from BPD. In the growth chart there are three curves: the middle one is fetal age curve, the other two curves are fetal age errors. The actual BPD measurement result is marked with * in the growth chart. If the * is within the range of the curves, the fetal is normal; if the * is above the curve, the fetus is larger than normal; if the * is below the curve, the fetus is smaller than normal.
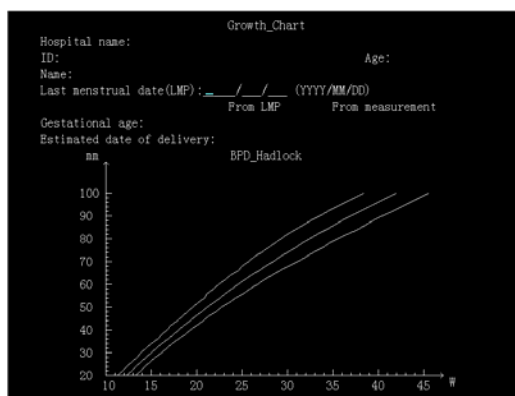
Fig. 8-3 Page of Growth Chart

8.3.9.5 Biophy Profile

When the exam type is Basic OB, Complete OB, Fetal Echo or Mult Gest, press **Calc** and select *Biophy Profile*. Press **Enter** to enter biophy profile screen.

a) Move cursor: rotate **Value** to shift the cursor among input boxes.

b) Data edit: when the cursor is in the input box, press numeric keys to input data. Press **Clear** or **Backspace** key to delete data. The profile is acquired by Mannig method from results such as FBM.

c) Exit Biophy Profile: press **Esc** key.

d) The Biophy Profile result is saved till the system is shut down or new patient information is inputted.

8.3.10 Cardiology Calculation

8.3.10.1 AO Measurement

Press **Calc** and select to enter AO measurement. On the left of the image there is an AO test mode figure. A vertical dot line and a **+** cursor are displayed at the screen center. Move the cursor with the trackball to the corresponding point **A**. Press **Enter** key to input point **A** and the **+** cursor is fixed. Point **B** will be shown. Rotate the trackball to move the **+** cursor to the position corresponding to point **B**. Input points **B** to **I** in order. The Meas/calc value of AO measurement will be displayed in the measurement result area. As Points A~I are displayed in pairs on their vertical dot lines, the cursor can only be moved up or down (rather than left or right) along the positions of points **A, C, E** and **H** when fixing points **B, D, F, G** and **I**.
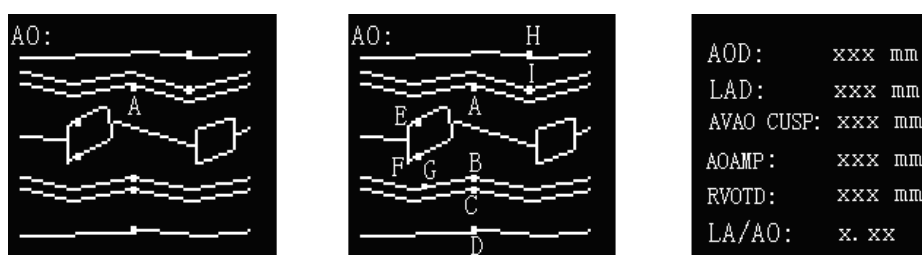
Fig. 8-4 Initial, Final and Result Pages of AO Measurement

8.3.10.2 MV measurement

MV is mitral valve measurement in frozen state in M or B/M mode. Enter MV measurement. On the left of the image there is an MV test mode figure. A **+** cursor appears at the screen center. Move the cursor with the trackball to the corresponding point **A**. Press **Enter** key to input point **A** and the **+** cursor is fixed. Points **B** and **C** will be shown. Rotate the trackball to move the **+** cursor to points **C, D, E, F, G** and **E'** in M mode figure in the same way. The MV Meas/Calc result will be displayed in the measurement result area.
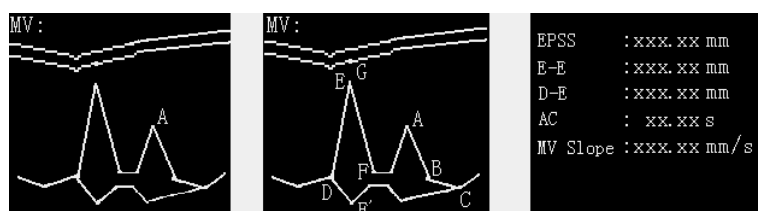
Fig. 8-5 Initial, Final and Result Pages of MV measurement

8.3.10.3 TV measurement

TV is tricuspid valve measurement in frozen state in M or B/M mode. Enter TV

measurement. On the left of the image there is a TV test mode figure. A **+** cursor appears at the screen center. Move the cursor with the trackball to the corresponding point **D**. Press **Enter** key to input point **D** and the **+** cursor is fixed. Point **E** will be shown. Rotate the trackball to move the **+** cursor to point **F** in M mode figure in the same way. The TV Meas/Calc result will be displayed in the measurement result area.
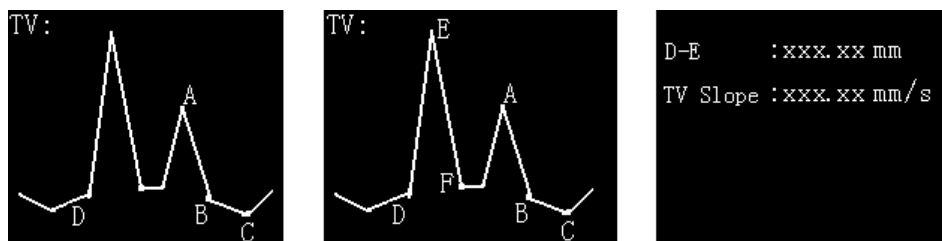
Fig. 8-6 Initial, Final and Result Pages of TV measurement

8.3.10.4 PV measurement

PV is pulmonic valve measurement in frozen state in M or B/M mode. Enter PV measurement. On the left of the image there is a PV test mode figure. A **+** cursor appears at the screen center. Move the cursor with the trackball to the corresponding point **A**. Press **Enter** key to input point **A** and the **+** cursor is fixed. Points **B, C, D** and **F** will be shown. Rotate the trackball to move the **+** cursor to point **B** and **E** in M mode in the same way. The PV Meas/Calc result will be displayed in the measurement result area.
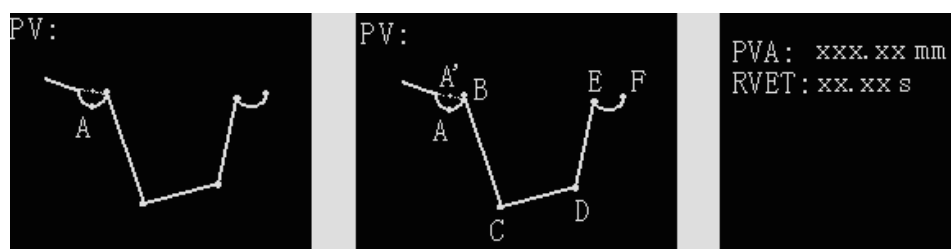
Fig. 8-7 Initial, Final and Result Pages of PV measurement

8.3.10.5 LV measurement

LV is Left Ventricle measurement in frozen state in M or B/M mode. Enter LV measurement and an LV test mode figure appears on the left of the image. A vertical dot line and a **+** cursor are displayed in the screen center. Move the cursor with the trackball to the position corresponding to point **C**. Press **Enter** key to input point **C**, and point **D** will be displayed. Rotate the trackball to move the **+** cursor to the point on M mode figure corresponding to point **D**, in the same way as that for point **C**. Enter other points in order.

When the **+** cursor is placed on the corresponding point **L**, the LV Meas/Calc result will be displayed in the measurement result area. As points **C~F** and **G~J** lie on the vertical dot lines **A** and **B** respectively, the cursor can be moved up or down (rather than left or right) along the positions of points **C** and **G**, when fixing points **D~F** and points **H~J**.

The Meas/Calc result is displayed in seven lines in the measuring result page.
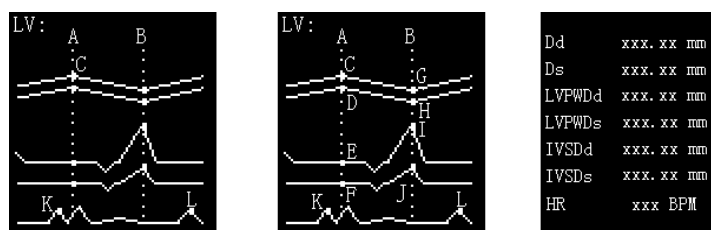
Fig. 8-8 Initial, Final and Result Page of LV measurement

8.3.10.6 LV function (reserved function for future use)

Press **Calc** and select **LV FUNC**. LV function can be calculated based on LV measurement result and BSA calculation result.

The calculation result is displayed in ten lines in result screen. See Fig. 8-9.

Fig. 8-16   LV Function Display

8.3.11 Hip Angle measurement

When the system is configured with a high-frequency linear array probe, press **Calc** key, and the calculation menu **Hip Angle**, **Report** is displayed. Select **Hip Angle**, and a cursor shows up. Press **Enter** key to fix point **A**. Then use the trackball and press **Enter** to fix point **B**. The first line **AB** (baseline) is displayed; Fix the lines **CD** (limbus acetabuli line) and **EF** (slope line) likewise. Having drawn three lines, press **Enter** key, and you can toggle between each end point of the three lines to modify the lines.

The display result is: Angle α: The inclination between line AB and line CD

Angle β: The inclination between line AB and line EF.

Chapter 9

Cineloop, Image Storage and Print

9.1 Cineloop

9.1.1 Function description

In unfrozen state, images are stored continuously into the memory, when the memory is full, new images will replace previous images continuously. After freezing the image, the images stored in the memory before the image is frozen can be played back.

【Note 1】: The number of cine frames depends on the mode.

【Note 2】: When the mode is changed, all the temporarily stored cine images are deleted; when the system is unfrozen or is turned off, all the stored images are erased.

9.1.2 Operation methods

After images are frozen, B mode images can be played back in single frames.Moving the trackball left or right or rotating **B Gain** knob allows the user to view a certain number of previously saved images in the memeory before they are frozen.

Press **Cine** key to start playing back B mode images continuously. Press **Cine** key again to exit cine and enter single-frame cine state. During cine state, rotate **Value** knob to adjust cine speed.

In single-frame cine state, the continuous cine range can be set up. Press **D** key and use the trackball to roll the long vertical line in the cine state indicator. Press **Enter** to confirm the cine start point, then shift the long vertical line and press **Enter** again to confirm the cine end point. Press **D** then **Cine** to achieve continuous cine between the cine start point and the cine end point. Repeat the above steps to reset the range.

9.2 File Storage

Press **Disk** key, and the following window will be shown:

```
Write Image Quickly
Read Image Quickly
Other Operation
Disk Setup
```
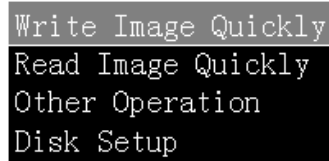
Fig. 9-1 Disk Management window

9.2.1 Write Image Quickly

If *Write Image Quickly* is selected, the file will be saved in a corresponding position as per the preset directory and the preset file type in *Disk Setup* (the file will be named as "Patient ID+ Time") and the Disk Management window is exited.

9.2.2 Read Image Quickly

If *Read Image Quickly* is selected, the following window will be shown:

```
Current directory: 200701\

Name              Type    Create time

jpg.jpg           Jpg     01/17/07 11:01:29
```
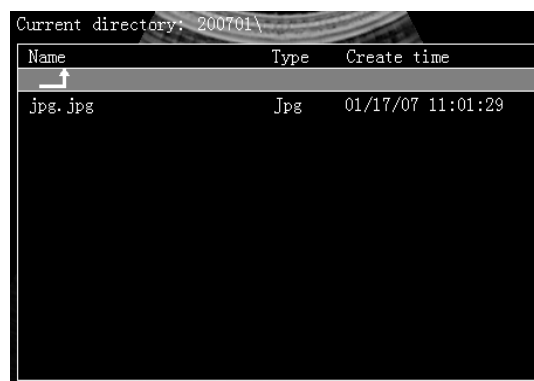
Fig. 9-2 File List

The default file list is the file list preset in the directory of *Disk Setup*.

When the "⬆" is highlighted, press **Space** key to exit the file folder; when the folder is highlighted, press **Space** to enter the folder.

Use the trackball to select the desired files in Bmp, Jpg, Cin or Avi format. Press **Enter** to open the file.

9.2.3 Other Operation

Select *Other Operation* and Disk Management window will be shown. Select storage media, such as *Hard disk, USB disk or CD drive*. Then select *Write image*, *Read image*, *Search, Copy, Rename*, *Create Dir*, or *Delete*. If *Write Image* is selected, the write type needs to be selected, such as Bmp, Jpg, Cine or Avi. Then select the folder

(press **Space** key to enter the desired folder) and input the file name.

During the operation, press **T-Ball** to return to the previous selection area and select again. Press **Esc** to exit the current operation page and quit the operation. When recalling an image, press **Esc** to exit to the frozen state before entering recall state. Press **Freeze** to exit the image display and enter the unfrozen working mode before image recall. Search an image by entering a matching file (or folder) name. In the operation of copy, a pasted directory cannot be the same as a copied directory.

9.2.4 Disk Setup

Select **Disk Setup** and the following window will be shown. Operation object and image type can be set:

```
Destination Setup      Hard disk
Image Type Setup             bmp
Save Recall Mode       Hard disk
Folder Format               Date
```

Fig. 9-3 Disk Setup

Select **Destination Setup** and press **Enter**. The destination list will appear. There are **Hard disk**, **USB disk** and **CD drive** for selection. Move the trackball to select and press **Enter** to confirm. If the setup needs no change, press **Esc** to return.

Select **Image Type Setup** and press **Enter**. The image type list will appear. There are **Bmp, Jpg, Cin** and **Avi** for selection. The operation is the same with that of **Destination Setup**.

Select **Save Recall Mode** and press **Enter**. There are **Hard Disk** and **Memory** for selection.

Select **Folder Format** and press **Enter**. There are four options for selection: **Date**, **Patient ID/ Date**, **Patient Name/ Date**, and **Patient ID- Name/ Date**.

9.3 Temporary Image Store and Recall

9.3.1 Write Image Quickly

In B, 2B, 4B, B/M or M mode, if **Hard Disk** is selected for **Save Recall Mode** in disk

manager window, press **Save** key to store the frozen images in the directory set in the disk manager (if it is in unfrozen state, the images will be frozen and then saved). If *Memory* is selected for *Save Recall Mode* in disk manager window, press **Save** key to temporarily store the frozen images in the memory. (If it is in unfrozen state, the images will be frozen and then saved).

Before storing, enter the single-frame cine state first, and then use the trackball to select and store the desired images

9.3.2 Read Image Quickly

In B, 2B, 4B, B/M or M mode, if *Memory* is selected for *Save Recall Mode* in disk manager window, freeze the image and press **Recall** key to open file list window. Select the desired file and then press **Enter** key to read image quickly. While recalling images, the operation mode cannot be changed. In this case, measurement & calculation as well as annotation can be made on the image, the same as on a normal displayed image (but all the relevant information will be cleared after finishing the recall process). Press **Esc** to exit the recall state.

if *Hard Disk* is selected for *Save Recall Mode* in disk manager window, press **Recall** key to read the latest saved files based on the setup path and file type (Set up the default read path and file type in the Disk Manager window.) Press **Recall** again to read the previous file while pressing **Enter** to read the next file.

9.4 Image Print

Press **Print** key, and the frozen image can be printed out via an external printer.

Chapter 10

Maintenance, Troubleshooting, Transport and Storage

10.1 System Maintenance

Every time before operating the system, the user should inspect the probe cable connector, the probe cable, the potential balance lead, and the power cord carefully to check whether there is any separated sheath, shedding, or other signs of damage on them, verify if the potential balance lead is safely and correctly grounded. As these involve safety, special attention should be paid to these daily inspections so as to avoid any unexpected danger due to abnormality on them.

Every time when turning the system on, the user should inspect if the power pilot lamp and the fan in the main unit are   in good operation. The keys and knobs might be inspected thoroughly every half a year. For detailed information, please refer to Section 4.2 "Maintenance and Inspection".

10.2 Troubleshooting

The following table lists some failures and a number of possible causes (see Table 10-1); the user may refer to the provided solutions for troubleshooting. If the failure cause cannot be identified, or the troubles cannot be solved after trying the methods below, please contact us for help. In order to avoid damaging the system due to incorrect operation, it is not recommended that the user dismantle and repair the system before getting our instructions.

Table 10-1 Troubleshooting List

Failures	Causes and Solutions
No power supply	Inspect if the power cord at the rear of the system is well plugged in, then check if the fuse is broken. If it is broken, replace it with a new fuse in the same specifications.
With power supply, but no image on the monitor	The monitor brightness and contrast are adjusted too low, so the images cannot be seen. Please adjust the brightness controls and the contrast controls to appropriate positions.
No ultrasonic image displayed on screen in any scanning mode, but the characters and grayscale bar are displayed normally	Inspect if the probe is correctly connected to the main unit.
The printer not working	Check if the printer is correctly connected to the main unit, and if its power is on; If there is no reaction by pressing print key on the keyboard, but the print key on the printer responds by pressing, then it is possible that the print remote-control cable is not well connected.
Incorrect date display	Reset the date referring to Section 5.2.2.1.

If any abnormality occurs, please immediately turn off the power, and inform our nearest representative about the abnormal circumstance as detailed as possible,

Please contact us for help whenever it is necessary to repair or readjust the equipment. We shall not be responsible for any failure caused after other people's repairing or readjusting.

【**Note**】: Detailed information on the abnormal condition will be a great help to our service technician to shorten the repairing time greatly for your equipment.

Statement: Circuit schematics and component list may be provided to SIUI

approved qualified service personnel for equipment maintenance.

WARNING: No modification of this equipment is allowed.

10.3 Contact Information

SIUI Service Link

Mailing: Shantou Institute of Ultrasonic Instruments Co., Ltd. (SIUI)

77 Jinsha Road, Shantou, Guangdong 515041, China

Tel: 86-754-88250150   Fax: 86-754-88251499

E-mail: siui@siui.com or service@siui.com

10.4 Transport and storage condition

a) Ambient temperature range: -20℃~60℃；

b) Relative humidity range: 15%~93% ；

c) Air pressure range: 500hPa~1060hPa.

Avoid drench by rain or snow, and mechanical collision during transportation.

10.5 Disposal

The system, as well as its accessories and waste, shall be disposed of or recycled properly at the end of their useful life in accordance with relevant national safety and environmental standards & regulations, so as to reduce the risks arising to the lowest level.

Appendix A Abbreviation

3rd:The third cerebral ventricle

%A Redu: Area reduce percentage

% D Redu: Diameter reduce percentage

AC: Abdominal circumference

AC: Anterior chamber

A-C: The time from A point to C point

AOD: Aortic diameter

AFI: Amniotic fluid index

AO: Aorta

AOAMP: Aortic posterior wall amplitude

A-P: Anterior-posterior

A-PAU: Antero-posterior diameter after urination

APD: Antero-posterior abdominal diameter

Area-E: Measure the area with ellipse method

Area-T: Measure the area with trace method

AVAO CUSP: Aortic valve aortic cusp separation

BIF: Bifurcation

Blad: Bladder

BPD: Biparietal diameter

BSA: Body surface area

CBD: Common bile duct

CD: Cardiac diameter

CELIA: Celiac artery

CI: Cardiac index

CO: Cardiac output

CRL: Crown rump length

D-E: Height from D point to E point

Diam: Diameter

EDD: Estimated date of delivery

EDV: End-diastolic volume

E-E: Height from E point to E' point

EF: Ejection fraction

EFW: Estimated fetal weight

EPSS: E peak separation to septum

ESV: End-systolic volume

FIBL: Fibular length

FL: Femur length

Grow Chart: Growth Chart

GS: Gestational sac

HC: Head circumference

HL: Humeral length

HR: Heart rate

HW: Hemisphere width

IG: Internal gland

INFA: Inferior artery

IVC: Inferior vena cava

IVS: Inter-ventricular septum

IVSD: Inter-ventricular septum in diastolic period

IVSS: Inter-ventricular septum in systolic period

LA: Left atrium

LAD: Left atrial diameter

LAU: Long diameter after urination

L AXIA: Left axillary artery

L BRAA: Left brachial artery

L Breast: Left breast

LCCA: Left common carotid artery

L DORA: Left dorsal artery

L ECA: Left external carotid artery

L Eye: Left eyeball

L FEMA: Left femoral artery

LHD: Left hepatic duct

LI: Lower internal

L ICA: Left Internal carotid artery

L Kidney: Left Kidney

LL: Lower lateral

L Lobe: Left Lobe

L LV: Left lateral ventricle

Long: Long Diameter

L Ovary: Left Ovary

L POPA: Left popliteal artery

LRA: Left renal artery

L RADA: Left radial artery

L Testis: Left Testis

L ULNA: Left ulnar artery

L Ureter: Left ureter

LV: Left ventricle

LV: Lateral ventricle

LVDD: Diastolic left ventricular diameter

LV Func: Left ventricle functions

LVOT: Left ventricular outflow tract

LVPWD: Left ventricular posterior wall thickness at end diastole

LVPWS: Left ventricular posterior wall thickness at end systole

LVDS: Systolic left ventricular diameter

Meas avera: Measurement averaging

MPD: Main pancreatic duct

Mult Dist: Measurement of multiple distances

MV: Mitral valve

MVCF: Mean velocity of circumferential shortening

OA: Ocular axis

OB: Obstetrics

OFD: Occipito-Frontal diameter

OOD: Outer orbital diameter

ON: Optic nerve

PA: Pulmonary artery

P Grade: Placenta grade

Prost: Prostate

PV: Portal vein

PV: Pulmonic valve

PV A: The depth of A peak

RA: Right atrium

R AXIA: Right axillary artery

R BRAA: Right brachial artery

R Breast: Right breast

RCCA: Right common carotid artery

R DORA: Right dorsal artery

R ECA: Right external carotid artery

R Eye: Right eyeball

R FEMA: Right femoral artery

RHD: Right hepatic duct

R ICA: Right Internal carotid artery

R Kidney: Right kidney

RL: Radial length

R Lobe: Right lobe

R LV: Right lateral ventricle

R Ovary: Right ovary

R POPA: Right popliteal artery

RRA: Right renal artery

R RADA: Right radial artery

R Testis: Right Testis

R ULNA: Right ulnar artery

R Ureter: Right Ureter

RV: Right ventricle

RVAW: Right ventricular anterior wall

RVET: Right ventricular ejection time

RVOT: Right ventricular outflow tract

RVOTD: Right ventricular outflow tract diameter

S-I: Superior-inferior diameter

SMA: Superior mesentery artery

Splenic A: Splenic artery

Splenic V: Splenic vein

SUPA: Superior artery

SV: Stroke volume

TAD: Trans-Abdominal diameter

TAU: Transversal diameter after urination

TD: Thoracic diameter

TL: Tibial length

Trans: Transversal diameter

TV: Tricuspid valve

UI: Upper internal

UL: Upper lateral

UL: Ulnar length

Vol: Volume

Volume-A: Measure the volume with Area-length method

Volume-B: Measure the volume with Bi-plane method

Volume-E: Measure the volume with Ellipse method

Volume-S: Measure the volume with Simpson method

Appendix B Trackball Function Indication

Current mode	Trackball control object	Indication
B mode unfrozen	Focus depth	Focus
	Control window display item	WCont
B mode frozen	Scroll: display from frame to frame	Scroll
	Continuous: set start and end points of cine	Cine
B/M mode unfrozen	M line position	M Line
	Control window display item	WCont
B/M mode frozen	Scroll: display from frame to frame	Scroll
M mode unfrozen	Control window display item	WCont
M mode frozen	Scroll: display from frame to frame	Scroll
ZOOM mode	ZOOM frame position Pan	ZOOM
All menus	Select menu item	Menu
Text input	Text cursor position	Text
Annotation	Annotation position	Annot
Patient information input	Cursor position of input window items	PAT Data
Exam type setup	Cursor position of setup window items	Exam
Body mark	Arrow position of body mark	BDYMK
Calculation	Start and end points of calculation cursor	Calc
Measurement	Start and end points of measurement cursor	Meas
Distance measurement	Start and end points of distance measurement cursor	Dis
Area measurement	Start and end points of area measurement cursor	Area

Appendix C Description of Symbol

Number	Symbol	IEC publication	Implication
1		878-02-03	Type BF Applied Part
2		878-03-01	Caution, risk of electric shock
3		417-5019	Protective conductor terminal
4		417-5017	Earth (ground) terminal
5		417-5021	Equipotentiality
6		417-5032	Alternating current
7		417-5008	Off(supply)
8		417-5007	On(supply)
9		ISO 7010-M002	Caution: consult accompanying documents
10		ISO 7010-W001	General warning sign
11	IPX1	529	Protected against falling water
12	IPX4	529	Protected against splashing water
13	IPX7	529	Protected against water immersion

Appendix D Acoustic Output Parameter

Probe: C3L60B

M-mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-scan		Non-scan	
					$A_{aprt} \leqslant 1cm^2$	$A_{aprt} > 1cm^2$		
Global Maximum Index Value			0.924			0.060	0.202	0.091
Associated Acoustic Parameters	p_{ra} （MPa）		1.687					
	P （mW）						6.0	6.0
	Min. of [Pα(zs), Ita,α(zs)] （mW）							
	z_s （cm）							
	z_{bp} （cm）							
	z_b （cm）						2.90	
	z at max.. $I_{pi,\alpha}$ （cm）		2.95					
	d_{eq} （cm）						0.344	
	f_{awf} （MHz）		3.332			3.332	3.332	3.332
	Dim of A_{aprt}	X （cm）				1.92	1.92	
		Y （cm）				1.12	1.12	
Other Information	t_d （μs）		0.610					
	Prr （Hz）		512					
	p_r at max. I_{pi} （MPa）		2.340					
	d_{eq} at max. I_{pi} （cm）						0.339	
	$I_{pa\alpha}$ at max. MI (W/cm^2)		106.38					
Operating Control Conditions	Control 1: Power		100%			100%	100%	100%
	Control 2: Focal Depth		6.0cm			6.0cm	6.0cm	6.0cm
	Control 3: M Speed		1.25s			1.25s	1.25s	1.25s
	Control 4: Frequency （MHz）		3.5		3.5	3.5	3.5	3.5

Probe: C3L60B

B-mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					$A_{aprt} \leqslant 1cm^2$	$A_{aprt} > 1cm^2$		
Global Maximum Index Value			0.845	0.278				0.635
Associated Acoustic Parameters	p_{ra} （MPa）		1.523					
	P （mW）			42				42
	Min. of [Pα(zs), Ita,α(zs)] （mW）							
	z_s （cm）							
	z_{bp} （cm）							
	z_b （cm）							
	z at max.. Ipi,α （cm）		4.05					
	d_{eq} （cm）							
	f_{awf} （MHz）		3.244	3.244				3.244
	Dim of Aaprt	X （cm）		1.92				
		Y （cm）		1.12				
Other Information	t_d （μs）		0.602					
	Prr （Hz）		8000					
	pr at max. Ipi （MPa）		2.854					
	deq at max. Ipi （cm）							
	$Ipa,α$ at max. MI （W/cm^2）		247.76					
Operating Control Conditions	Control 1: Power		100%	100%				100%
	Control 2: Focal Depth		6.0cm	6.0cm				6.0cm
	Control 3: Scan Angle		70°	70°				70°
	Control 4: Frequency （MHz）		3.5	3.5				3.5

Probe:C5L20B

M-mode

Index Label		MI	TIS			TIB	TIC
				Non-Scan			
			Scan	$A_{aprt} \leqslant 1cm^2$	$A_{aprt} > 1cm^2$	Non-Scan	
Global Maximum Index Value		0.682			0.065	0.128	0.078
Associated Acoustic Parameters	p_{ra} （MPa）	1.489					
	P （mW）					4.0	4.0
	Min. of [Pα(zs), Ita,α(zs)] （mW）						
	z_s （cm）						
	z_{bp} （cm）						
	z_b （cm）					150	
	z at max.. Ipi,α （cm）	1.65					
	d_{eq} （cm）					0.433	
	f_{awf} （MHz）	4.712			4.712	4.442	4.712
	Dim of Aaprt X （cm）				1.20	1.20	
	Y （cm）				1.07	1.07	
Other Information	t_d （μs）	0.404					
	Prr （Hz）	512					
	pr at max. Ipi （MPa）	1.90					
	deq at max. Ipi （cm）					0.408	
	Ipα,α at max. MI （W/cm²）	82.83					
Operating Control Conditions	Control 1: Power	100%			100%	100%	100%
	Control 2: Focal Depth	4.0cm			4.0cm	4.0cm	4.0cm
	Control 3：M Speed	1.25s			1.25s	1.25s	1.25s
	Control 4: Frequency （MHz）	5.0			5.0	5.0	5.0

Probe: C5L20B

B-mode

Index Label		MI	TIS			TIB	TIC
			Scan	Non-Scan		Non-Scan	
				$A_{aprt}{\leq}1cm^2$	$A_{aprt}{>}1cm^2$		
Global Maximum Index Value		0.700	0.177				0.743
Associated Acoustic Parameters	p_{ra} (MPa)	1.507					
	P (mW)		38				38
	Min. of [Pα(zs), Ita,α(zs)] (mW)						
	z_s (cm)						
	z_{bp} (cm)						
	z_b (cm)						
	z at max.. Ipi,α (cm)	2.65					
	d_{eq} (cm)						
	f_{awf} (MHz)	4.635	4.635				4.635
	Dim of Aaprt X (cm)		1.20				
	Dim of Aaprt Y (cm)		1.07				
Other Information	t_d (μs)	0.466					
	Prr (Hz)	8000					
	pr at max. Ipi (MPa)	2.227					
	deq at max. Ipi (cm)						
	Ipa,α at max. MI (W/cm²)	72.644					
Operating Control Conditions	Control 1: Power	100%	100%				100%
	Control 2: Focal Depth	4.0cm	4.0cm				4.0cm
	Control 3: Scan Angle	110°	110°				110°
	Control 4: Frequency (MHz)	5.0	5.0				5.0

Probe: L7L38B

M-mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					$A_{\text{aprt}} \leqslant 1\text{cm}^2$	$A_{\text{aprt}} > 1\text{cm}^2$		
Global Maximum Index Value			0.527		0.127		0.186	0.153
Associated Acoustic Parameters	p_{ra} （MPa）		1.363					
	P （mW）				4.0		4.0	4.0
	Min. of [Pα(zs), Ita,α(zs)] （mW）							
	z_s （cm）							
	z_{bp} （cm）							
	z_b （cm）						1.44	
	z at max.. Ipi,α （cm）		1.60					
	d_{eq} （cm）						0.250	
	f_{awf} （MHz）		6.683		6.683		6.683	6.683
	Dim of Aaprt	X （cm）			0.84		0.84	
		Y （cm）			0.4		0.4	
Other Information	t_d （μs）		0.340					
	Prr （Hz）		512					
	pr at max. Ipi （MPa）		1.85					
	deq at max. Ipi （cm）						0.408	
	Ipa,α at max. MI （W/cm²）		242.88					
Operating Control Conditions	Control 1: Power		100%		100%		100%	100%
	Control 2: Focal Depth		2.1cm		2.1cm		2.1cm	2.1cm
	Control 3：M Speed		1.25s		1.25s		1.25s	1.25s
	Control 4: Frequency （MHz）		7.5		7.5		7.5	7.5

Probe: L7L38B

B-mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					$A_{aprt} \leqslant 1cm^2$	$A_{aprt} > 1cm^2$		
Global Maximum Index Value			0.865	0.308				0.764
Associated Acoustic Parameters	p_{ra} （MPa）		2.201					
	P （mW）			20				20
	Min. of [Pα(zs), Ita,α(zs)] （mW）							
	z_s （cm）							
	z_{bp} （cm）							
	z_b （cm）							
	z at max.. Ipi,α （cm）		2.32					
	d_{eq} （cm）							
	f_{awf} （MHz）		6.48	6.48				6.48
	Dim of Aaprt	X （cm）		0.84				
		Y （cm）		0.40				
Other Information	t_d （μs）		0.354					
	Prr （Hz）		8000					
	pr at max. Ipi （MPa）		3.821					
	deq at max. Ipi （cm）							
	Ipa,α at max. MI （W/cm²）		169.16					
Operating Control Conditions	Control 1: Power		100%	100%				100%
	Control 2: Focal Depth		2.1cm	2.1cm				2.1cm
	Control 3: Scan Angle		38mm	38mm				38mm
	Control 4: Frequency （MHz）		7.5	7.5				7.5

Probe: L10L25B

M-mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					$A_{\text{aprt}} \leqslant 1\text{cm}^2$	$A_{\text{aprt}} > 1\text{cm}^2$		
Global Maximum Index Value			0.901		0.175		0.213	0.216
Associated Acoustic Parameters	p_{ra}	（MPa）	2.733					
	P	（mW）			4.0		4.0	4.0
	Min. of [Pα(zs), Ita,α(zs)]	（mW）						
	z_{s}	（cm）						
	z_{bp}	（cm）						
	z_{b}	（cm）					0.50	
	z at max.. Ipi,α	（cm）	0.90					
	d_{eq}	（cm）					0.309	
	f_{awf}	（MHz）	9.196		9.196		9.196	9.196
	Dim of Aaprt	X （cm）			0.56		0.56	
		Y （cm）			0.30		0.30	
Other Information	t_{d}	（μs）	0.241					
	Prr	（Hz）	513					
	pr at max. Ipi	（MPa）	5.05					
	deq at max. Ipi	（cm）					0.264	
	Ipα,α at max. MI	(W/cm^2)	242.88					
Operating Control Conditions	Control 1: Power		100%		100%		100%	100%
	Control 2: Focal Depth		2.1cm		2.1cm		2.1cm	2.1cm
	Control 2：M Speed		1.25s		1.25s		1.25s	1.25s
	Control 4: Frequency （MHz）		10		10		10	10

Probe: L10L25B

B-mode

Index Label			MI	TIS			TIB	TIC
					Non-Scan			
				Scan	$A_{aprt} \leqslant 1cm^2$	$A_{aprt} > 1cm^2$	Non-Scan	
Global Maximum Index Value			0.693	0.272				0.649
Associated Acoustic Parameters	p_{ra} （MPa）		2.139					
	P （mW）			12				12
	Min. of [Pα(zs), Ita,α(zs)] （mW）							
	z_s （cm）							
	z_{bp} （cm）							
	z_b （cm）							
	z at max.. Ipi,α （cm）		2.65					
	d_{eq} （cm）							
	f_{awf} （MHz）		9.533	9.533				9.533
	Dim of Aaprt	X （cm）		0.56				
		Y （cm）		0.30				
Other Information	t_d （μs）		0.246					
	Prr （Hz）		7987					
	pr at max. Ipi （MPa）		5.119					
	deq at max. Ipi （cm）							
	Ipa,α at max. MI （W/cm²）		111.81					
Operating Control Conditions	Control 1: Power		100%	100%				100%
	Control 2: Focal Depth		2.1cm	2.1cm				2.1cm
	Control 3: Scan Angle		25mm	25mm				25mm
	Control 4: Frequency （MHz）		10	10				10

Probe: U5L50B

M-mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					$A_{\text{aprt}} \leqslant 1\text{cm}^2$	$A_{\text{aprt}} > 1\text{cm}^2$		
Global Maximum Index Value			0.911		0.097		0.141	0.106
Associated Acoustic Parameters	p_{ra} （MPa）		2.052					
	P （mW）				4.0		4.0	4.0
	Min. of [Pα(zs), Ita,α(zs)] （mW）							
	z_{s} （cm）							
	z_{bp} （cm）							
	z_{b} （cm）						1.0	
	z at max.. Ipi,α （cm）		2.80					
	d_{eq} （cm）						0.309	
	f_{awf} （MHz）		5.078		5.078		5.078	5.078
	Dim of Aaprt	X （cm）			1.17		1.17	
		Y （cm）			0.60		0.60	
Other Information	t_{d} （μs）		0.455					
	Prr （Hz）		515					
	pr at max. Ipi （MPa）		3.29					
	deq at max. Ipi （cm）						0.259	
	Ipα,α at max. MI （W/cm²）		242.88					
Operating Control Conditions	Control 1: Power		100%		100%		100%	100%
	Control 2: Focal Depth		4.0cm		4.0cm		4.0cm	4.0cm
	Control 3：M Speed		1.25s		1.25s		1.25s	1.25s
	Control 4: Frequency （MHz）		5.0		5.0		5.0	5.0

Probe:U5L50B

B-mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					$A_{aprt}{\leq}1cm^2$	$A_{aprt}{>}1cm^2$		
Global Maximum Index Value			0.641	0.242				0.688
Associated Acoustic Parameters	p_{ra} （MPa）		1.445					
	P （mW）			26				26
	Min. of [Pα(zs), Ita,α(zs)] （mW）							
	z_s （cm）							
	z_{bp} （cm）							
	z_b （cm）							
	z at max.. Ipi,α （cm）		5.0					
	d_{eq} （cm）							
	f_{awf} （MHz）		5.087	5.087				5.087
	Dim of Aaprt	X （cm）		1.17				
		Y （cm）		0.60				
Other Information	t_d （μs）		0.466					
	Prr （Hz）		8000					
	pr at max. Ipi （MPa）		3.479					
	deq at max. Ipi （cm）							
	Ipa,α at max. MI （W/cm^2）		61.670					
Operating Control Conditions	Control 1: Power		100%	100%				100%
	Control 2: Focal Depth		4.0cm	4.0cm				4.0cm
	Control 3: Scan Angle		50mm	50mm				50mm
	Control 4: Frequency （MHz）		5.0	5.0				5.0

Probe:V6L11B

M-mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					$A_{aprt} \leqslant 1cm^2$	$A_{aprt} > 1cm^2$		
Global Maximum Index Value			0.875		0.125		0.156	0.141
Associated Acoustic Parameters	p_{ra} （MPa）		2.239					
	P （mW）				4.0		4.0	4.0
	Min. of [Pα(zs), Ita,α(zs)] （mW）							
	z_s （cm）							
	z_{bp} （cm）							
	z_b （cm）						0.50	
	z at max.. Ipi,α （cm）		0.95					
	d_{eq} （cm）						0.462	
	f_{awf} （MHz）		6.541		6.541		6.541	6.541
	Dim of Aaprt	X （cm）			0.66		0.66	
		Y （cm）			0.60		0.60	
Other Information	t_d （μs）		0.251					
	Prr （Hz）		512					
	pr at max. Ipi （MPa）		2.750					
	deq at max. Ipi （cm）						0.382	
	Ipiα at max.MI （W/cm²）		242.88					
Operating Control Conditions	Control 1: Power		100%		100%		100%	100%
	Control 2: Focal Depth		2.1cm		2.1cm		2.1cm	2.1cm
	Control 3：M Speed		1.25s		1.25s		1.25s	1.25s
	Control 4: Frequency （MHz）		6.5		6.5		6.5	6.5

Probe:V6L11B

B-mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					$A_{aprt} \leqslant 1cm^2$	$A_{aprt} > 1cm^2$		
Global Maximum Index Value			0.744	0.295				0.422
Associated Acoustic Parameters	p_{ra} （MPa）		1.851					
	P （mW）			12				12
	Min. of [Pα(zs), Ita,α(zs)] （mW）							
	z_s （cm）							
	z_{bp} （cm）							
	z_b （cm）							
	z at max.. Ipi,α （cm）		1.85					
	d_{eq} （cm）							
	f_{awf} （MHz）		6.193	6.193				6.193
	Dim of Aaprt	X （cm）		0.66				
		Y （cm）		0.60				
Other Information	t_d （μs）		0.309					
	Prr （Hz）		8000					
	pr at max. Ipi （MPa）		2.750					
	deq at max. Ipi （cm）							
	Ipa,α at max.MI （W/cm²）		93.350					
Operating Control Conditions	Control 1: Power		100%	100%				100%
	Control 2: Focal Depth		2.1cm	2.1cm				2.1cm
	Control 3: Scan Angle		155°	155°				155°
	Control 4: Frequency （MHz）		6.5	6.5				6.5

Appendix E　　Range, Precision and Accuracy of Adjustment/Display Parameters

Adjustment/ Display Parameter	Range	Precision	Accuracy
Depth	1.6cm~24.4cm	0.8cm	≥95%
B_Gain	0~100	1	≥90%
B_PWR	0~100	2	≥90%
PTN	1~4	1	≥95%
Span	1~4	1	≥95%
B_PER	0~7	1	-
Smo/ Edg	-3 ~ +3	1	-
B_GSC	0~23	1	-
DYN	30~105: 2	2	≥85%
LD	High, Normal	-	-
Zoom	1.5, 2.0, 3.0, 4.0	1.5	≥90%
B_Chroma	0~7	-	-
SRT	None, Low, Medium, High	-	-
M_Gain	0~100	1	≥90%
M_GSC	0~23	1	-
MSP	1.25, 2.5, 5.0, 10.0	1.25	≥95%
M_Chroma	0~7	-	-