

Instructions for Use  
**SonidoSmart*Plus***



# SonidoSmart*Plus*

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Digital Ultrasound System

**OPERATING MANUAL**

**Valid as of: May 2019**

We reserve the right to amend this Manual without prior notice.

## CE mark



This product meets the basic requirements of the EU Medical Device Directive 93/42/EEC. Accessories without the CE mark are not guaranteed to comply with the basic requirements of the EU Medical Devices Directive.

This Operating Manual serves as a reference for the SonidoSmart*Plus* system.



1. This Manual may not be abridged, altered, copied or reprinted without the written consent of Zimmer MedizinSysteme GmbH.
2. The contents of this Manual are subject to change without prior notice and without legal obligation.
3. Before using the system, please read this Operating Manual carefully and completely. The Operating Manual constitutes an integral part of the appliance. Please keep the Operating Manual in an easily accessible place after reading in order to allow access to persons responsible for operating the appliance. If you have any questions or concerns, please contact Zimmer MedizinSysteme or your authorised service technician.

## Declaration

4. This Manual contains warnings and information concerning potential dangers. The user should pay particular attention to dangers that are mentioned in this Manual. Zimmer MedizinSysteme shall assume no liability for damage or loss caused due to negligence or disregard of the precautions specified in this Manual.
5. This system should be used only for medical evaluation and only by trained medical personnel.
6. Zimmer shall assume no liability for data loss due to operational mistakes or operation in abnormal conditions.
7. The user shall assume liability for the diagnostic process, for which Zimmer shall assume no liability.
8. After purchasing this system, the user shall bear full responsibility for the maintenance and management of the system.
9. Zimmer shall assume no liability for the safety, reliability and performance of the system in the event that one of the following occurs:
  - a. Loss or damage caused by failure to comply with the Manual or improper use of the system.
  - b. Loss or damage caused by force majeure such as fire, earthquake, flood or lightning.
  - c. Loss or damage resulting from an operating condition that does not conform to the requirements of the system, such as insufficient power supply, incorrect installation or environmental conditions that do not meet the requirements of the national standards for electrical installations.
  - d. Loss or damage caused by failure to use the system in the place for which it was intended.
  - e. System installation, removal, readjustment, enhancements, and maintenance are performed by technicians who are not authorised by Zimmer.
  - f. Damage or loss caused due to not purchasing the system from Zimmer or a Zimmer-  
authorised agent.
  - g. The company shall be responsible for accuracy and integrity of this Operating Manual.

## Maintenance instructions

1. Zimmer shall provide free maintenance during the warranty period if failure occurs during normal operation despite compliance with the Operating Manual.
2. No free maintenance will be provided if the following conditions apply.
  - a. Expiration of warranty period.
  - b. Malfunction due to improper use (such as abnormal mains voltage, fire, human error, accident and so on).
  - c. Disassembly and maintenance are not performed by Zimmer MedizinSysteme or by a Zimmer MedizinSysteme-authorized service partner.
  - d. If damage is caused to the system due to disassembly that has not been authorised by Zimmer, Zimmer shall have the right to refuse to perform maintenance.
3. Zimmer will invoice for maintenance following expiry of the system's warranty period.

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## Preliminary Remarks

For proper and safe operation of this system and to ensure a long service life, users should thoroughly familiarise themselves with the system's functions, operations, instructions and maintenance. Please read the information contained in this Manual carefully before using the system.

The Operating Manual consists of the two volumes listed below:

This system has been designed and manufactured so that it can be safely used by operators and patients. However, in order to ensure safety and reliability, the following instructions must be complied with:

1. This system belongs to **protection class I** in accordance with IEC 60601-1:2005. Please follow the safety requirements described in Chapter 1 when operating this system. The system contains **Type BF application parts**.
2. Do not try to alter the system. If necessary, contact our agent or request assistance from us directly.
3. If any abnormality occurs during operation, turn off the power supply immediately and contact our agent or request assistance from us directly.
4. Connect the unit power cable to a grounded power socket with a ground impedance of 0.1  $\Omega$  or less.
5. The system does not provide special protective functions or safeguards for use with high-frequency equipment. Users should proceed with caution in the event of such applications.
6. Additional equipment that is connected to the electrical medical system must comply with the relevant IEC or ISO standards(e.g. IEC 60950 for data processing systems). In addition, all configurations must comply with requirements for electrical medical equipment (cf. IEC 60601-1-1 or clause 16 of IEC 60601-1 3). Anyone who connects additional devices to electrical medical devices is configuring a medical system and is therefore responsible for ensuring that the system meets the requirements for electrical medical systems. Please note that local laws take priority over the aforementioned requirements. If in doubt, consult your local representative or the technical service department.
7. Pay special attention to **Warnings** or **Remarks** in the Operating Manual. Please read the Manual carefully and exercise caution when working.



**WARNING:** *This is an indication of possible hazards that may cause serious injury or death.*



**NOTE:** *This is an indication of possible hazards that may cause minor or moderate injury and damage to property.*

8. This Manual does not describe any clinical exam techniques. The user must therefore use proper exam techniques based on his/her professional knowledge, professional training and clinical experience.

9. This Operating Manual may slightly deviate from your equipment due to the system software version used, as well as the configuration of options and accessories. The actual system that you purchase shall prevail.
10. If the user of this system is changed, this Operating Manual should be passed on to the new user so that he/she can use the system correctly and in order to avoid damage or loss due to operational errors.

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# 1 Scope of Application and Safety Precautions

## 1.1 Intended use / indications

SonidoSmartPlus is a universally applicable ultrasonic diagnostic system for the generation of ultrasound images. This 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, Doppler or color Doppler, depending on the operating system specific software packages and compatible ultrasound transducers.

## Contraindications

- a) The device is not intended for diagnosis of gas-contained organs, such as: lung, stomach and intestines.
- b) The device is not intended for exams of a site with injury or acute inflammation, so as to avoid cross-infection.
- c) The endocavity transducer is not allowed for exams on patient with any of the following conditions: vaginal inflammation, such as trichomonas vaginitis, fungal vaginitis or sexually transmitted diseases, vaginal malformations, menstrual period, postmenopausal vaginal atrophy, vaginal ultrasonography difficulties, vaginal bleeding, placenta previa.

## 1.2 Operating conditions

- a) This system should be operated under the following ambient conditions in order to ensure safe and proper operation:
  - Ambient temperature: 0° to 40° C;
  - Relative humidity: 30 to 85%;
  - Atmospheric pressure: 700 hPa to 1060 hPa.



**NOTE:** *Correct ultrasound images cannot be guaranteed if operational conditions exceed the aforementioned ranges.*

- b) Strong sources of radiated emissions or electromagnetic waves, for example, radio and television emissions, may cause the system to malfunction or lead to image noise. The system must be kept away from such emission sources or electromagnetic waves.
- c) Do not operate this system while other devices with motors or silex switches are operating in the same power phase; otherwise, the power cables will cause interference to the system.

- d) Keep the system dry and avoid strong temperature fluctuations when adjusting the device; otherwise there is a risk of a short circuit due to condensation or drops of water.
- e) Use of the system in a confined space may result in a high internal temperature. Please therefore ensure that it is located in a well-ventilated room.

### 1.3 Power supply requirements

Never use the system when the power supply does not meet the requirements specified below, otherwise there is a risk of damage to the system.

- a) Main unit power voltage: internal battery 11.1 V, or external power supply 15 V DC;
- b) Mains voltage accessories: Power supply adapter 100-240 V ~, 50 Hz / 60 Hz;
- c) The detachable cable with power supply unit provided may be used only to supply power to the system. The connection of electrical devices which do not form part of the system can lead to potential dangers and is prohibited;
- d) Non-medical electrical devices that are connected to the SonidoSmartPlus via a cable connection may not be connected directly to the mains supply (socket). In such an event, an isolating transformer must be used.
- e) Do not attempt to change the power supply device (cable and power supply unit) supplied with the system or replace it with other accessories not approved by Zimmer MedizinSysteme;
- f) Only accessories and items of equipment approved by Zimmer MedizinSysteme for the product may be connected to the system, otherwise hazards may occur;
- g) Additional equipment connected to the system's analogue and digital interfaces must comply with the requirements of the IEC specifications (e.g. 60601-1:2005 for electro-medical devices). In addition, the power supply and special power supply equipment must comply with the requirements of the IEC 60601-1: 2005 standard. The electrical safety of the system ("system" refers only to the ultrasound and imaging system, and not to peripheral devices) must comply with the IEC 60601-1: 2005 standard. Should you have any queries, please consult your distributor or service personnel;
- h) Do not place the power supply unit on the ground, as this is can result in hazards;
- i) The maximum load-bearing capacity of the power supply unit may not be less than the total load of all devices that make up the system, otherwise hazards may occur.



**NOTE:** *In regions in which mains supply is not stable, it is recommended to use power supply from a stabiliser with output power of 220 VA so as to avoid damage to the system due to mains fluctuation.*



## 1.4 Essential features

- a) Material group: IIIb
- b) Pollution degree: 2
- c) Mains transient voltage - excess voltage category: Class II

## 1.5 Safety

This system was designed in compliance with international standard IEC 60601-1:2005. The system has undergone biological testing according to the relevant requirements of ISO 10993, which demonstrated that the system does not potentially cause cytotoxicity, skin allergies and stimulation.

To operate the system correctly and safely, please follow the instructions below:

- a) This system is not explosion-proof. Do not operate it in a flammable or easily explosive environment (e.g. in the presence of anaesthetics, gas, oxygen or hydrogen);
- b) This system is not waterproof. Never allow water or other liquids to drip on to the system;
- c) This unit requires a protective grounding device. The system's power cable must be connected to a grounded socket. Do not use the system in places where no grounding terminal is available;
- d) Ultrasound safety:
  - The ALARA (As Low As Reasonably Achievable) principle must be observed. In all cases, patients should be exposed to a transmission power level that is as low as practically feasible for as short a time as possible.
  - Stop the system or keep the probe away from the patient when no scan is in progress.
  - Do not examine the patient by holding the probe over a fixed position on the body for an extended period of time.
  - Insofar as clinical indications are required, the operator of the system must be fully acquainted with acoustic output or have access to the appropriate heat index. Please review the display of acoustic output power and MI when switching on the system, a new patient ID is entered, or when switching from a non-foetal to a foetal application.
  - If the probe is noticeably emitting heat when exposed to air, it should not be used for trans-vaginal exams. When examining an embryo or foetus, take special care to ensure that the acoustic output and exposure period are as low as possible.



**WARNING:** *To avoid the risk of electric shock, the device must only be connected to a mains supply with a protective conductor.*

## 1.6 Warning and remarks



### **WARNING:**

- a) Please follow the methods and procedures described in this Manual when commissioning the system.
- b) Users should be aware of latex-sensitivity issues and have at their disposal covers that are not made out of latex.
- c) 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.
- d) With the exception of the USB port, do not unplug the system or any other peripheral device (e.g. a printer) before the system has been turned off. Otherwise, the system may be damaged or an electric shock occur.
- e) The system is not intended for use with a defibrillator.
- f) The Application Part must come into direct contact with the heart of the patient.
- g) Multiple interconnected devices may result in cumulative leakage current and lead to hazards.
- h) Ensure that the power cable has been unplugged before cleaning the system. If any failure occurs in the system, the patient may be at risk of an electrical shock.
- i) Live components, such as signal input or output ports of the system or any other device, must under no circumstances come into direct contact with the patient. If any failure occurs in this system or other device, the patient may at risk of an electrical shock.
- j) The user must not open the system housing or panel themselves, as this may cause a short circuit or an electrical shock.



### **REMARK:**

- a) Always turn off the system when it is not in use.
- b) The system should be operated in a clean environment. Avoid operating the system in places where it is exposed to direct sunlight, major temperature fluctuations, large quantities of dust, or close to a heat source or high humidity. Do not place any objects on top of the main unit.
- c) Avoid exposure to strong vibrations, or damage may be caused to system components.
- d) Before connecting the probe(s), first ensure that the main unit is in standby mode. However, it is better to disconnect the main unit from the power supply.
- e) Always set the image to Freeze if no examination is being performed.
- f) In order to ensure safety, only ultrasound coupling gel that is compliant with the relevant standards may be applied.
- g) Turn off the system correctly, as otherwise there is a risk of system data loss or system failure.

- h) The system must not be turned off while printing, saving, and retrieving data, as otherwise, these procedures may not be performed normally and file information may be lost.
- i) Improper shut-down may result in the corruption of hard disk data or system failures.
- j) It is prohibited to expose the control panel to external force (such as physically leaning on it), otherwise damage may be caused to the system.
- k) Excessive bending or twisting of the system's cables may result in system failure or the system being unable to function continuously. Ensure that the system is not rolled on to the cable so as to avoid damage.
- l) Ensure that important data, such as clinical records and so on, are stored on an external storage medium so as to avoid accidental loss.
- m) When setting up the system, ensure that its power port (the connection point for the power supply cable) is accessible to allow the easy plugging-in of the cable. This means that the power supply can be cut off immediately in the event of an emergency.
- n) The mains plug or device terminal is intended to be used as an isolation device from the mains supply. Please ensure that mains plugs or device plugs are easily accessible.
- o) Ensure that only special components supplied by Zimmer are used for the repair or replacement of system components.

## 1.7 Classification

- a) Protection against electric shock  
System Protection Class I, Application Parts Type BF.
- b) Protection against ingress of water  
The system belongs to Class IPX0, the probe head to Class IPX7 and the probe cable to IPX4.
- c) EMC performance  
The system belongs to Group 1, Class A in accordance with CISPR 11.

## 1.8 ALARA

The guiding principle for the application of ultrasound diagnostics is "as low as reasonably achievable"(ALARA). In any case, users can minimise the biological effects of ultrasound if they keep the exposure time to ultrasound as brief as possible while obtaining diagnostic images.

Understanding the nature of the imaging mode being used allows the sonographer to apply the ALARA principle with informed judgement. Additionally, the probe frequency, system setup values, scanning techniques, and their own experience allow the sonographer to act in accordance with the ALARA principle.

There are several system controls that the operator can use to adjust the image quality and limit the acoustic intensity. These control elements are related to the techniques that an operator can use to implement ALARA. These controls can be divided into three categories: direct, indirect, and receiver controls.

### Direct controls

The choice of application and output intensity controls directly affect acoustic intensity. The choice of application relates to your choice of clinical option and the optimised pre-setting. Depending on your selection, there are different ranges of allowable intensity or output. Selection of the correct range of acoustic intensity for the application is one of the first things to occur in any exam. For example, intensity levels for peripheral blood vessels are not recommended for foetal exams. Some systems automatically select the appropriate range for a particular application, while others require manual selection. Ultimately, it is the user who bears responsibility for proper clinical use. The Zimmer system provides both automatic or standard and manual or user-selectable settings.

Output also has a direct impact on acoustic intensity. Once the application has been established, the output control can be used to increase or decrease the intensity. The output control allows you to select intensity levels that are lower than the set maximum value. Prudent use dictates that you select the lowest output intensity that is consistent with good image quality.

### Indirect controls

The indirect controls have an indirect effect on acoustic intensity. These controls affect the imaging mode, pulse repetition frequency, focus depth and probe selection.

The choice of imaging mode determines the properties of the ultrasonic beam. B mode is a scanning mode, and Doppler is a stationary or non-scanning mode. A stationary ultrasonic beam concentrates energy in a single location. A moving or scanning ultrasonic beam spreads the energy over an area and the beam is concentrated for a fraction of the time as in a non-scanning mode.

Pulse repetition frequency or pulse repetition rate refers to the number of ultrasonic bursts of energy over a specific period of time. The higher the pulse repetition frequency, the more pulses of energy in a time period. Several control elements affect the pulse repetition frequency: focal depth, depth, sample volume depth, colour sensitivity, number of focal zones and sector width.

The focus of the ultrasonic beam affects the image resolution. Maintaining or increasing the resolution at a different focus requires the variation of output over the focal zone. This variation of output is a function of system optimisation. Different exams require different focal depths. Setting the focus to the correct depth improves the resolution of the structure under examination.

Pulse length is the time period for which the ultrasonic burst is turned on. The longer the pulse, the greater the temporary average intensity value. The greater the temporary average intensity, the greater the likelihood of temperature increase and cavitation. The pulse length, recording duration or pulse duration is the output pulse duration of a pulse Doppler. Increasing the Doppler sample volume increases the pulse length.

The choice of frequency converter indirectly affects the intensity. Tissue attenuation changes with frequency. The higher the converter operating frequency, the greater the attenuation of the ultrasonic energy. Higher converter operating frequency requires more output intensity in order to sample at a deeper depth. To scan deeper at the same output intensity, a lower converter frequency is required. The use of increased gain and output power beyond a certain point, without corresponding increases in image quality, can mean that a lower frequency converter is required.

### **Receiver controls**

Receiver controls are used by the operator to improve image quality. These controls have no effect on acoustic output. Receiver controls affect only how the ultrasonic echo is received. These controls include GAIN, TGC, dynamic range and image processing. In relation to the output, it is important to remember that the receiver controls should be optimised before output is increased. For example, before increasing acoustic power output, optimise GAIN (amplification) to improve image quality.

### **An example of the application of ALARA**

An ultrasound scan of a patient's liver begins with selection of the appropriate sensor frequency. After selecting the frequency converter based on the anatomy of the patient, adjustments should be made to the output power to ensure that the lowest setting is used to capture an image. After the image is acquired, adjust the focus of the frequency converter, and then increase the receiver gain to produce a uniform representation of the tissue. If an adequate image can be obtained with the increased gain, then output should be decreased. Output should be increased to the next level only once these adjustments have been made.

Once the B display of the liver has been captured, colour can be used to localise the blood flow. As with the display of the B image, the gain of the image processing controls must be optimised before increasing output.

Once the blood flow has been localised, use the Doppler controls to position the sampling volume over the vessel. Before increasing output, adjust the velocity range or the scale and Doppler gain to capture an optimal Doppler record. Output should be increased only if maximum Doppler gain does not create an acceptable image.

In summary: Select the correct frequency of the frequency converter to perform the task. Start with a low output level. Optimise the image with focus, receiver gain and other image control units. If the image is unsuitable for diagnosis at this point, increase the output.

### **Control effects**

The acoustic output values may change due to the setting of various system controls. This becomes most apparent when the PWR setting is changed. However, other system controls also interfere with the output values on the screen. The following controls affect output:

- PWR
- ANGLE

- WIDTH
- PRF (and therefore the frame rate)
- FOCAL POINTS
- C-WIDTH (colour field width)
- C-SPAN (colour field range)
- SPECTRUM SCALE
- SVL (sample volume length)
- Zoom
- Depth
- Sample volume depth
- Frequency converter

## 2 Composition, principle and specifications

### 2.1 Set up and operating principle

#### 2.1.1 System set up

The system consists of a main unit (including a monitor), probes and peripheral devices. The main unit includes an operator interface board for probes, a digital signal processing board, a computer, a control panel and a power supply board. See Figure 1.

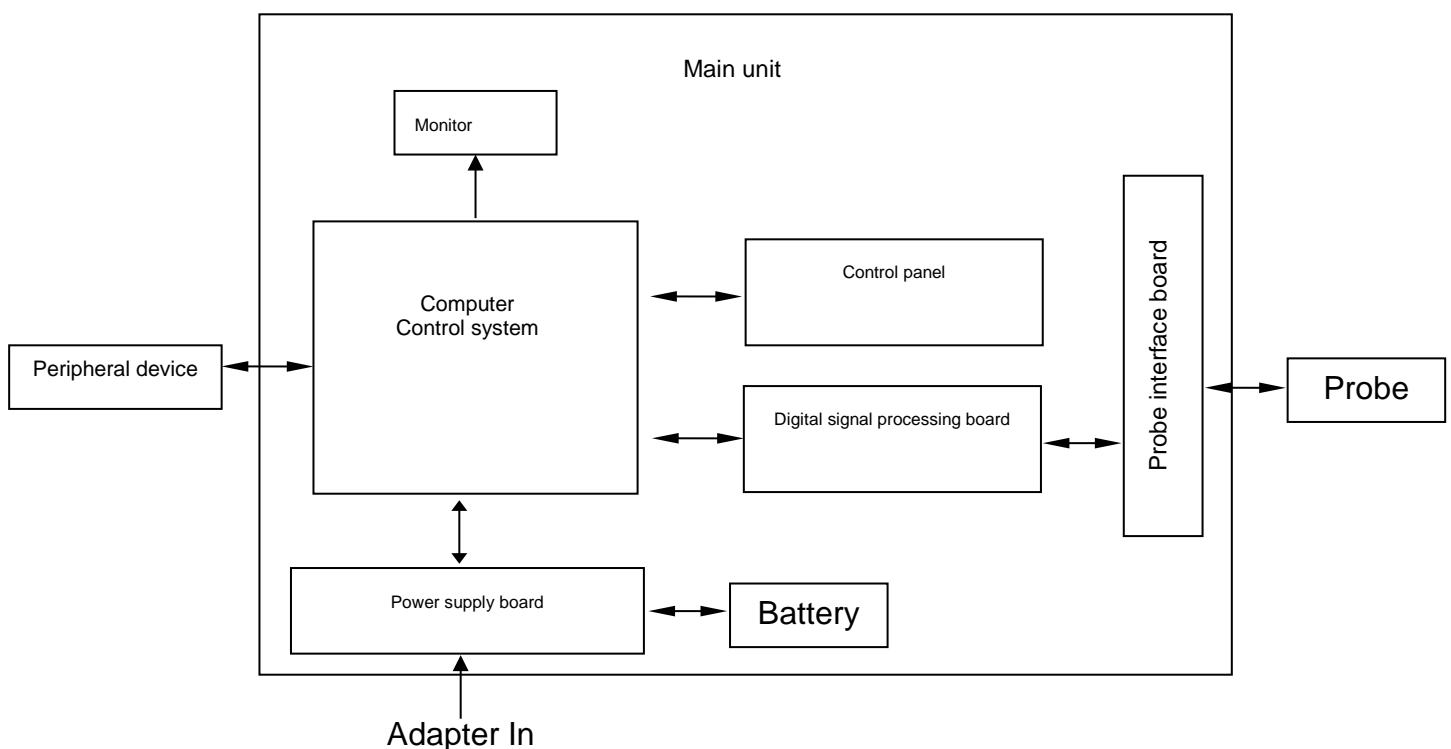


Figure 1: Block diagram - Set up of the main unit

#### 2.1.2 Operating principle

The basic operating principle of the main unit is as follows:

The digital signal processing board transmits, on the one hand, digital image signals to the control platform computer, and on the other, receives control information from the control platform and generates corresponding control data to achieve control of the front end.

The work process of the system is as follows:

Based on control activities on the control panel, the control platform generalises commands and parameter data automatically. The digital signal processing board receives commands and control parameters from the control platform and distributes them to each functional module.

The real-time controller on the digital signal processing board generates scanned control signals in real time and manages the transmission of the front-end T/R controller. Furthermore, the front-end T/R control manages the T/R ultrasound control in accordance with the requirements of the synchronised scanner control signals from the system.

The beam-shaping module on the digital signal processing board receives amplified echo signals from the probe interface board, implements digital beam shaping and sends beam data to the next processing module. As a key technique, digital signal processing plays an important role in ultrasound systems. This technology ensures that data is transmitted and converted with a high degree of accuracy. Further processing provides better images that supports correct diagnosis by the doctor. Data information such as image data processed by digital signals is sent through data channels on the interface board to the control platform for further processing and image display.

Every time that ultrasound is transmitted, the stimulation high-voltage from the T/R module generates and sends a set of excitation pulses to the currently active probe. A group of elements in the frequency converter is activated and ultrasound is transmitted. The sound wave spreads in the tissue, is reflected by it and the ultrasound that comes back to the probe returns to the same element group and is then sent to pre-amplification, depth/gain compensation and programmable gain expansion. For quantification and digital processing after this process.

The power required by the system is supplied through the power supply.

Based on the actions of the operator key, relevant information is sent to the control panel or the control platform. The platform automatically generates control commands and parameters, and sends them to the modules involved.

The computer control platform is the administrative centre of the whole system. It receives operational commands from the control panel and manages the whole system based on the current system status. The other functions performed by the control platform are measurement and calculation, screen display and video processing, and management of patient data and images, as well as control of storage, printing and communication.

## 2.2 Technical data

Hardware and software specifications for the system are listed below. Hardware and/or software that is marked with "Option" or \* are additional options and may not be available on your current system configuration.

REMARK: Subject to change.



### 2.2.1 Scope of delivery

<u>Item number</u>	<u>Designation</u>
8170	SonidoSmart <i>Plus</i>
54209048	Power supply with mains cable
54209049	Type DC-A007 battery
54209047	Probe holder
54208953	Control cable for video printer
54208954	BNC/RCA cable
54208957	S-video cable
54202500	Ultrasound gel
10103053	USB stick
10102691	Instructions for use

REMARK: Subject to change

### 2.2.2 Options

Various accessories, probes, licenses and peripherals can be offered as options for the SonidoSmartPlus system. Subject to modification and addition.

#### a) Accessories

<u>Item number</u>	<u>Designation</u>
54209050	Biopsy guide for convex and linear probes*
54209051	Biopsy guide for endocavitary probe*
54209052	BXX-02 bag*
54209053	JT-3 foot switch*
8173	CR-30A equipment trolley*

#### b) Probe

<u>Item number</u>	<u>Designation</u>
8171	Linear L8LN 38 mm probe, 5.0 – 12.0 MHz 879K*
8172	C3LN R60 convex probe, 2.0 – 5.0 MHz 771K*
8174	V6LN R11 probe, 4.0 – 9.0 MHz*
8175	P3FN phased array probe, 1.7 – 4.0 MHz*
8176	C5LN 4D probe 4.0 – 7.0 MHz*
8177	Linear L10LN 38 mm probe, 7.0 – 14.0 MHz

REMARK: Subject to availability

#### c) Licences

<u>Item number</u>	<u>Designation</u>
--------------------	--------------------

8170-01	Colour licence (CFM)*
8170-02	PW licence*
8170-03	Licence Panascope*
8170-04	Licence VS-Flow*
8170-05	Licence TDI*
8170-06	Licence Colour M mode*
8170-07	Licence CW*
8170-08	Licence DICOM 3.0*
8170-09	Licence Elastography*

REMARK: Subject to availability

#### d) Peripheral devices

<u>Item number</u>	<u>Designation</u>
	Printer*
54209053	Foot switch*
	Other peripheral devices with USB port*

### 2.2.3 Imaging modes

- a) B, 2B, 4B modes
- b) B/M mode, M mode\*
- c) B mode steering (linear probes) \*
- d) Tissue Harmonic Imaging (THI) \*
- e) Colour Flow Map (CFM) \*
- f) Colour Power Angio (CPA) \*
- g) Colour Management \*
- h) B-/colour split screen \*
- i) Directional power Doppler\*
- j) Pulsed wave Doppler (PWD) \*
- k) Trapezoidal/extended sector imaging \*
- l) Anatomical M mode \*
- m) Colour M mode\*\*
- n) Panoscope \*
- o) Macro-fidelity (MFI) \*
- p) ECG mode \*
- q) Tissue Doppler Imaging (TDI) \*
- r) Vector space flow (VS Flow) \*
- s) 3D Imaging
- t) 4D Lite Imaging \*
- u) 4D Pro Imaging \*
- v) Elastographic Imaging \*
- w) XBeam\*

### 2.2.4 Image parameter adjustment

- a) B mode: gain, TGC (time gain control), focal point number, focal span, smooth surface, dynamic range, persistence, acoustic power, B\_GSC, colour tone and saturation, automatic optimisation and zoom
- b) M mode: M velocity, M gain, M\_GSC, and colour tone and saturation
- c) Colour flow map (colour power angio) tissue Doppler imaging (CFM/CPA/TDI): colour gain, colour persistence, threshold, median filter, smooth surface, wall filter, PRF, map, colour field size
- d) Pulsed wave Doppler (PW): Doppler gain, Doppler frequency, wall filter, angle correction, PRF, scroll speed, baseline, colour tone and saturation, and smooth surface

### 2.2.5 Measurement, analysis and calculation functions

- a) General measurement:
  - 1. 2D: distance, area, circumference, volume and ellipse
  - 2. M mode: distance, time and inclination
  - 3. Doppler: acceleration, mean velocity, auto-trace
- b) Special calculation and measurement package:  
Analysis, calculation and reporting for abdomen, obstetrics, gynaecology, small parts, urology, orthopaedics, cardiology and peripheral blood vessels, etc.

### 2.2.6 Patient image file management

- a) Hard disk drive: images saved in JPG or DICOM format, and film clips saved in CIN format.
- b) Support for USB printer
- c) DICOM 3.0 archive ☐
- d) SonoAir\*

### 2.2.7 Power supply

- a) AC/DC adapter  
Power consumption: 100-240 V ~, 2.5 A, 50 Hz / 60 Hz  
Power output: 15 V $\square$ , maximum current 10 A
- b) Battery (rechargeable polymer/lithium/ion battery set)  
Rated voltage: 11,1 V  
Rated capacity: 7,500 mAh  
Rated output: 94 Wh  
Normal operating period: about 50 minutes



**NOTE:** *The battery's operating period depends on the system operating mode and the condition of the battery.*

### 2.2.8 Safe distance

The distances in the system are compliant with ISO 13852, and there is no special requirement for the exam zone for the operator, patient or other persons.

## 2.3 Dimensions and weight

- a) Dimensions (L × W × H): 390 mm × 420 mm × 171 mm
- b) Weight (incl. battery): approx. 8.5 kg

## 3 Presentation of system components

### 3.1 System configuration

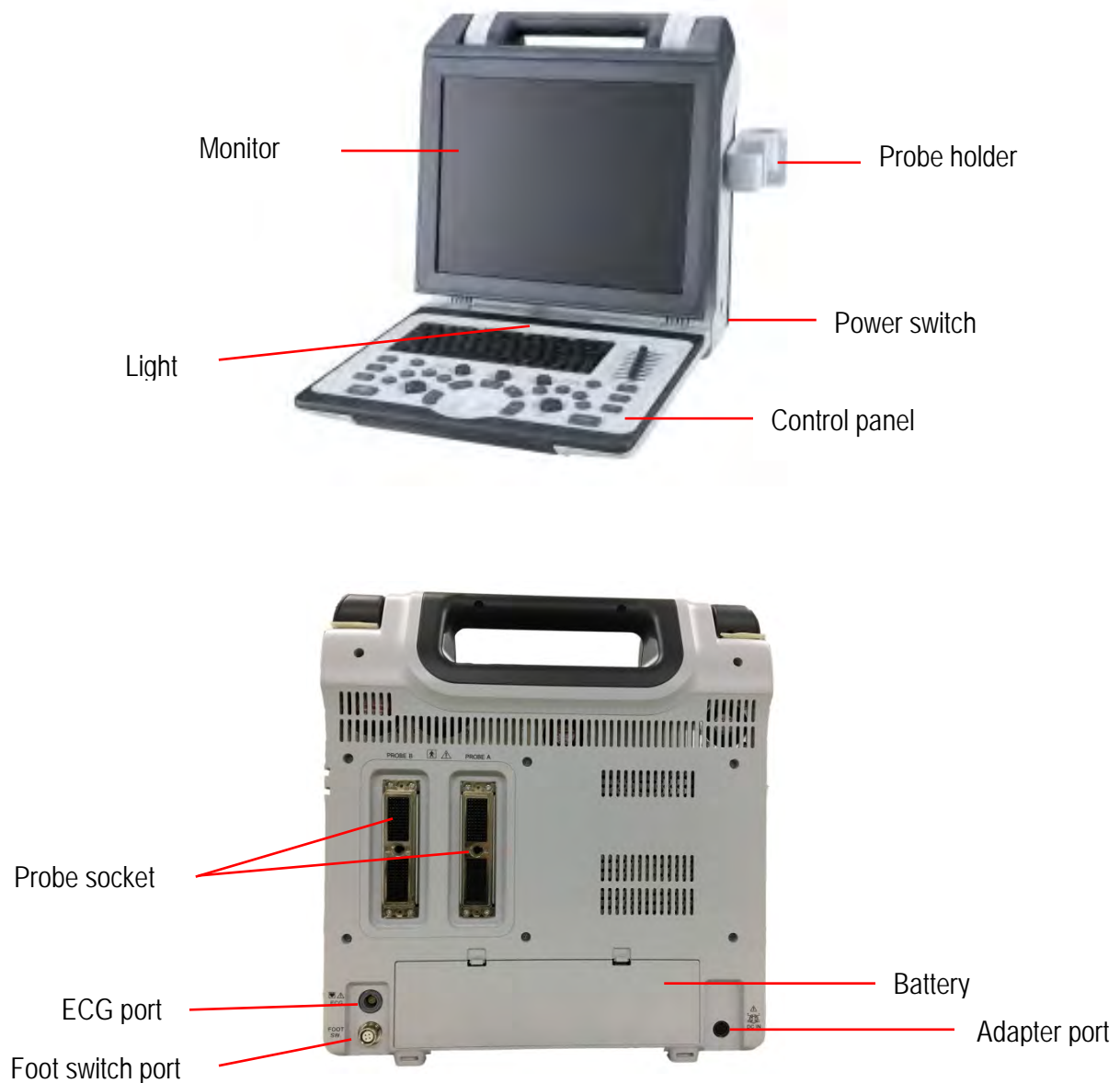


Figure 2: Drawing of the outer casing of the main unit

## 3.2 Presentation of system components

### 3.2.1 Probe (application parts)

#### 3.2.1.1 External structure of the probe

An indication point is located on the head of the probe housing. The immersion part is located beneath the indication point. If the indication point is orange, the medium frequency of the probe is 3.5 MHz, if it is green, 5.0 MHz, and purple, 8.0 MHz.

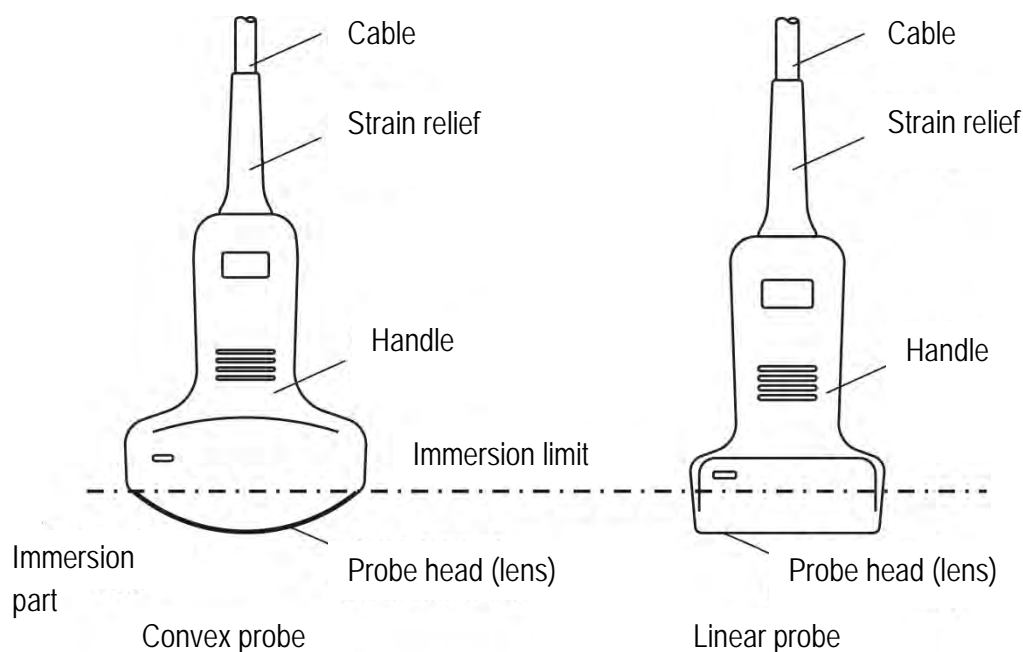


Figure 3: Probe structure

#### 3.2.1.2 Probe application

- The probe itself can be damaged by even a slight impact. Be careful when using to avoid shocks or impacts against hard objects.
- Ensure that the main unit is in standby mode while connecting or disconnecting the probe.
- Be very careful not to scratch the surface of the probe head (acoustic lens) during operation.
- Use a sponge or soft cloth soaked with water to clean the probe after exams. DO NOT use alcohol or cloths containing alcohol or an organic solvent such as thinner to clean the probe. For detailed information about the cleaning and disinfection of the probe, see *Section 4.4.11*.
- Any endocavity probes should be covered with a probe cover that is compliant with ISO4074:2002 when in use.



**BIOLOGICAL WARNING FOR SPECIAL PROTECTION:** Users should pay attention to latex sensitivity and provide protective covers that not consist of latex. Ensure that NO chemical

*substances (e.g. lubricants) come into contact with the silica keypad of the control panel so as to prevent the silica keypad from swelling.*

- f) When applying the endocavity probe, do not activate the probe (i.e. the main unit should not be in standby mode) when it is in-vitro of patients, otherwise it may cause harmful interference to other devices.
- g) The probe must not be immersed into water over the water immersion limit, as shown in Figure 3. The water-tightness category of the probe is IPX7. Accidental immersion of the probe in water over the immersion limit may cause failure or problems. Should such problems occur, please contact our service personnel immediately.
- h) The protection category for the probe cable is IPX4 (protected against splashing water). If the probe cable is exposed due to scratching or cracking of the coating, please contact our service personnel immediately to avoid electric shocks.
- i) It is prohibited to scan eyes with the probe.
- j) Do not use probes produced by other companies as they may cause damage to the system and the probe. In extreme cases, fire and other accidents can occur.

### 3.2.2 Monitor and display interface

#### 3.2.2.1 Monitor

The screen of the system can be raised up to a certain degree for a better viewing angle (see Figure 4).



Figure 4: Screen

#### 3.2.2.2 Display interface

The system's display interface chiefly consist of the: image display area, image preview area, and the control parameter area. See Figure 5.

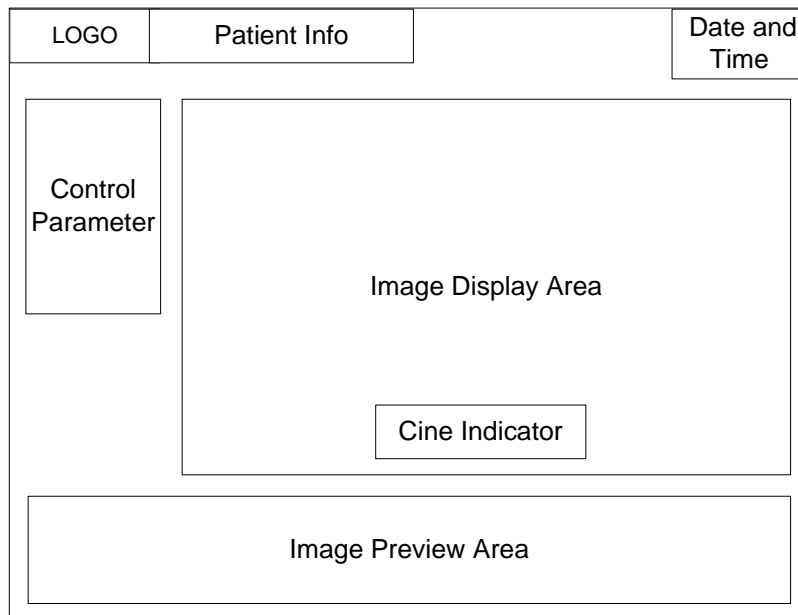


Figure 5: Display interface

### 3.2.3 Display

There are two indicators in the upper left corner of the monitor, as shown in Figure 6 .

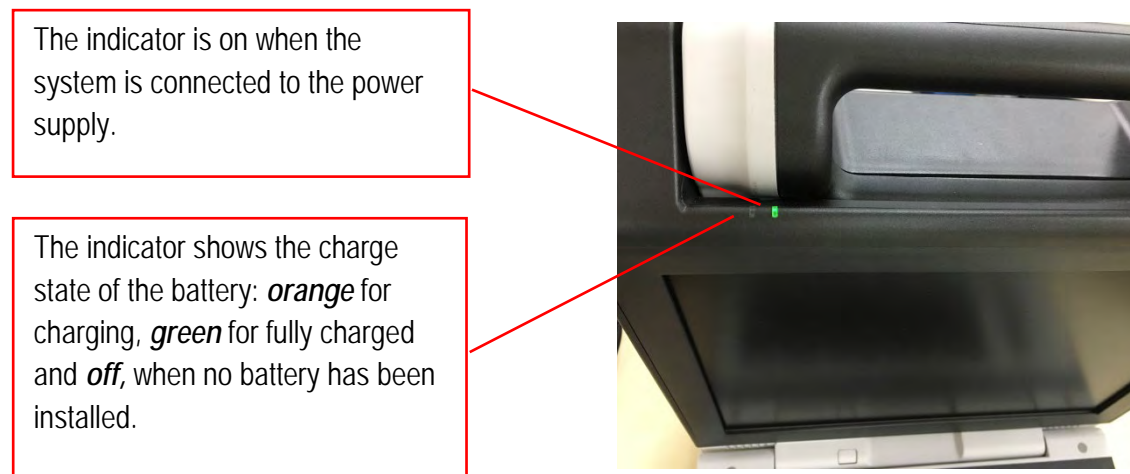


Figure 6: Display

### 3.2.4 Control panel

The control panel consists of a keyboard, a trackball, keys, buttons and controls, and controls various system functions, such as probe selection, change of imaging mode, TGC setting, depth and other parameters. See Figure 7 for the control panel layout and Table 1 for the functions of the control units.



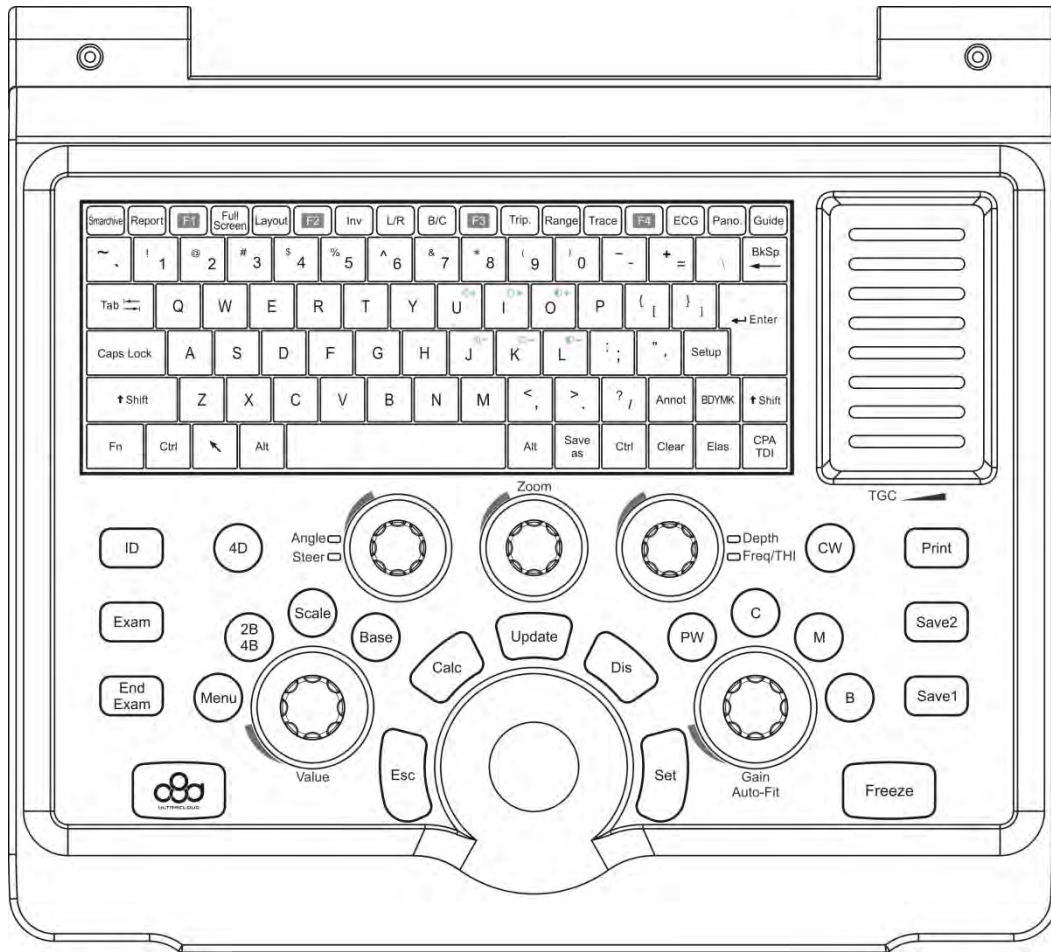


Figure 7: Control panel

**NOTE:** Press **Alt** (to the right of the space bar) + **Enter** (as shown in Figure 8 ) to turn the light at the bottom of the screen on or off.

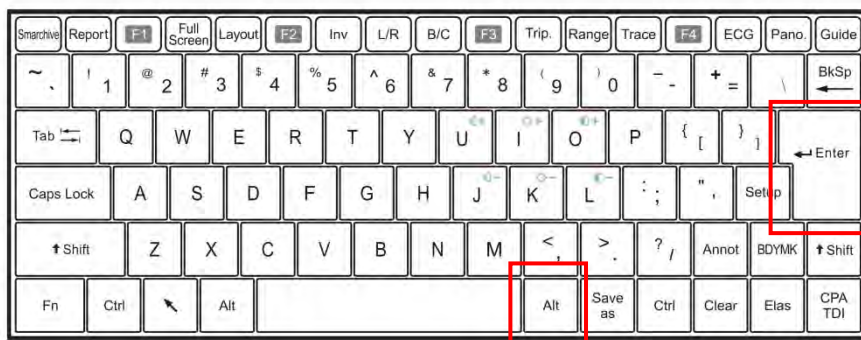















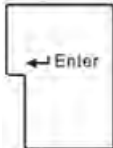
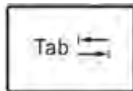









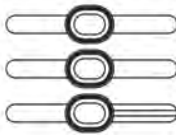
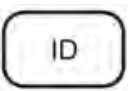
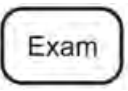
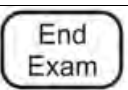



Figure 8: Keyboard

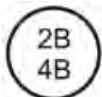
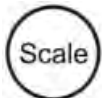

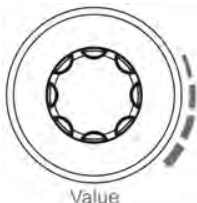
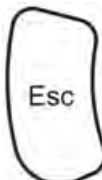
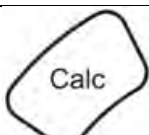
**NOTE:** When the keyboard backlight is on, the controllers, which control value and gain, change from white to orange during use so that the user can see the current mode or status. For example, if the parameter control window on the left-hand side of the screen is open, the menu key changes from white to orange. If you go to B/M mode , both change, as the B mode and M mode keys change from white to orange.




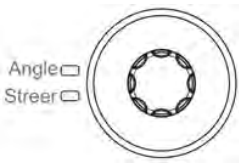
Table 1: Function list of control units

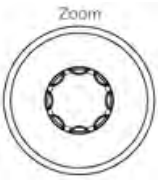
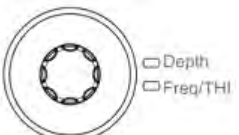




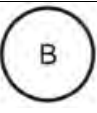
No.	Control unit	Type	Description of function
		Button	Smarchive (SmartArchiv): For the retrieval of the user interface for <i>Archive Management</i> and the review, export, printing or sending of patient data (including patient information, reports, media files etc.).
		Button	Report: To open a patient report.
		Button	F1~F4: Hotkey functions can be defined by the user for user-friendly operation. <i>Hotkey setup can be found under Setup-Function Setup.</i>
		Button	Full screen: Except in 4D mode, input and recording state, this key is used for full screen display.
		Button	Layout: To adjust image layout in B/M or B/PW mode.
		Button	Inv: To invert the B image, the direction of colour flow or the positive/negative display of the Doppler spectrum.
		Button	L/R: To reverse the image to the left/right.
		Button	B/C: To turn on live display of B and CFM modes simultaneously with CFM mode.
		Button	Ttrip.: To open the Triplex function if B, CFM and PW modes are all activated (i.e. all three modes are live).
		Button	Range: To open range trace measurement in PW mode
		Button	Trace: To open auto trace measurement in PW mode.
		Button	Key to select ECG mode. To open ECG mode.
		Button	Pano: Key to select panorama view. To enter or exit panorama view.
		Button	Guide: To turn on/off biopsy guideline display.




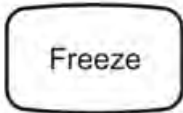
	Button	BkSp (Backspace): To delete one character in front of the deleting cursor before entering text so as to delete the trace point by point when performing trace measurement.
	Button	Enter: To add text to the image in annotation state.
	Button	Tab: Click on the New Patient Info screen and the screen for <i>Archive Management</i> . Click on Tab to move the cursor from one field to another.  If <i>Auto-Trace</i> is used, press Tab to switch among trace types.
	Button	Setup: To open the Setup main menu and perform system, function and measurement setup and system update etc.
	Button	Annot: Used to open the Annotation state and enter text with alphanumeric keys. Press Menu to open the dialogue box for the list of preset annotations.
	Button	BDYMK: To activate or close the pictogram display. For the selection of proper body marks by the user. Turn the Value control to rotate the probe mark when the pictograms are displayed.
	Button	Save as: To open the <i>Store Setup</i> window, which is To set up the storage space and format.
	Button	Clear (delete): To clear annotations, measurements and calculation results.
	Button	Elas To retrieve elastography imaging.

		Button	<p>CPA / TDI :</p> <p>When using a non-phased array probe, press the button to activate CPA mode.</p> <p>When using a phased array probe and TDI function is activated, press the button once to activate TDI mode, and twice to activate CPA mode.</p> <p>Press and hold this button to toggle between TDI and CPA mode.</p> <p><i>NOTE: TDI mode can only be entered when a phased array probe is being used.</i></p>
		Slide control	TGC: 8 slide controls on the upper right of the control panel for adjusting the gain at different display depths.
		Button	ID: To open the <i>New Patient Info</i> screen, then you create a new patient and input the patient data, create a new examination, or review and modify patient information.
		Button	Exam: To select the desired probe and examination type. The optional probe and exam type are displayed on the screen.
		Button	End Exam: To quickly end the current exam and create a new patient number.
		Button	ULTRACLOUD: To open or close the ULTRACLOUD operation button at the top left of the screen.
		Button	<p>4D: To display the 3D/4D ROI (exam area) field. After confirmation of the ROI, go to 3D, 4D Lite or 4D Pro mode.</p> <p><i>NOTE: 4D mode is only available when the volume probe is used.</i></p>
		Button	Menu: In non-annotation state, this is used to display or hide the parameter control window at the left-hand side of the screen; in annotation state, to open the dialogue box for the preset annotation list.

		Button	2B/4B: Press the button once to enter 2B mode, press it again to enter 4B mode. Use the Value or the Update control to switch between pictures in real time.
		Button	Scale: Press this button in CFM or PW mode then turn the Value control to set the pulse wave frequency of the colour Doppler or the pulse wave Doppler.
		Button	Base : Press this button in CFM or PW mode then turn the Value control to set the guide of the colour flow chart or the pulse wave Doppler trace.
		Button control +	<p>Parameter setting control (Value):</p> <p>If the parameter control window is displayed, turn the control to select one parameter in the control window, and the selected parameter is shown in it in blue. Press the centre of the button above a parameter and the parameter is shown in grey. Next, turn the control to change the parameter value. Press the key again and turn the control; now the function reverts to parameter selection.</p> <p>Move the cursor to any parameter on the left or at the bottom of the ultrasound screen. If the parameter is highlighted, turn the control to change the parameter value.</p>
		Button	Esc: To exit the current mode or operation state, e.g. to exit from CFM/spectral Doppler imaging/4D imaging to B mode, to exit a dialogue box, or to exit measurement and calculation. When a cursor is displayed, this button can be used to hide the cursor.
		Button	Calc: To open general and measurement software to match the chosen probe and exam type.

		Button	<p>Update: This key has several functions, depending on imaging state:</p> <p>to live toggle between the B image and Doppler trace in PW mode.</p> <p>to toggle the trackball control object if the ROI box is displayed.</p> <p>to switch the measurement cursor when performing calculations or measurement.</p>
		Button	Dis: To measure distance.
		Button	Set: To confirm the selected state; to enter formal modes (such as B/M, PW and 4D) from different preliminary modes; to display the trackball cursor in non-preliminary modes. The function is similar to the left mouse button.
		Button control	<p>Angle/Steer:</p> <p>Press this control continuously to toggle between <i>Angle</i> and <i>Steer</i>.</p> <p>If <i>Angle</i> is highlighted, turn the control to adjust the Angle/Width in B mode or the correction angle in PW mode.</p> <p>If <i>Steer</i> is highlighted, turn the control to set the steer angle or the colour of the ROI box when using a linear probe.</p> <p>In 4D mode, turn the control to change the image rotation angle along the X-axis.</p>

		Button control +	<p><b>Zoom:</b></p> <p>Turn the control to activate or the Full Zoom function and select magnification factors. When in Full Zoom state, press the control to toggle the trackball control object.</p> <p>When in non-Full Zoom state, press the control to activate the Zoom function, and the Zoom ROI box is displayed in the imaging area.</p> <p>When in 4D mode, turn the control to change the image rotation angle along the Y-axis.</p>
		Button control +	<p><b>Depth/Freq/THI:</b></p> <p>Press the control continuously to toggle between <i>Depth</i> and <i>Freq/THI</i>.</p> <p>If <i>Depth</i> is highlighted, turn the control to change the depth value.</p> <p>If <i>Freq/THI</i> is highlighted, turn the control to change the B mode frequency. Turn the control continuously to open Tissue Harmonic Imaging (THI) mode if an <i>H</i> is displayed in front of the frequency.</p> <p>When in 4D mode, turn the control to change the image rotation angle along the Z-axis.</p>
		Button	<p>CW: To open continuous Wave Doppler Mode when using the phased array probe.</p> <p><i>NOTE: This function is not supported by the system.</i></p>
		Button	PW: To activate Pulsed Wave Doppler Mode.
		Button	C mode: To activate the Colour Flow Map.
		Button	M mode: To activate B/M mode or M mode.
		Button	B mode: To activate single B mode.

		Button control +	<p>Gain/Auto:</p> <p>Turn the control to adjust the gain for the imaging mode, such as B, M, C and spectrum gain.</p> <p>Press the control to achieve smart optimisation that adjusts the image to its best state.</p>
		Button	Print: For printing images on a connected printer; this function can be set like other functions.
		Button	<p>Save1 or Save2: To save images or film files.</p> <p><i>NOTE: The storage location and format can be set in Store Setup .</i></p>
		Button	Freeze: To toggle between live and freeze state.
	Special function keys	Button	<p>Y: If the biopsy guideline is turned on, this button is used to toggle between single or dual biopsy lines.</p> <p>G: If the biopsy guideline is turned on, this button is used to toggle the display style of the biopsy guideline.</p> <p>Q /W: If the biopsy guideline is turned on, this button adjusts the position of the biopsy guideline.</p> <p>E/R: If the biopsy guideline is turned on, this button is used to set the angle of the biopsy guideline.</p> <p>L: To open or close the display of the positioning of the central line in B mode.</p>



	Trackball	/	<p>To select a specific object from the menu or window for steering.</p> <p>To change the focal position.</p> <p>To move the zoom-field within the image.</p> <p>When adjusting the ROI field, slide to change the size of the ROI field.</p> <p>To move the cursor in Annotation state.</p> <p>To select a specific image from a film that is playing.</p> <p>To move the measurement point in Measurement state.</p>
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### 3.2.5 System ports

The system ports are located on the left side of the system. The peripheral device ports are intended for the connection of peripheral devices to the system. As can be seen in Figure 9 .

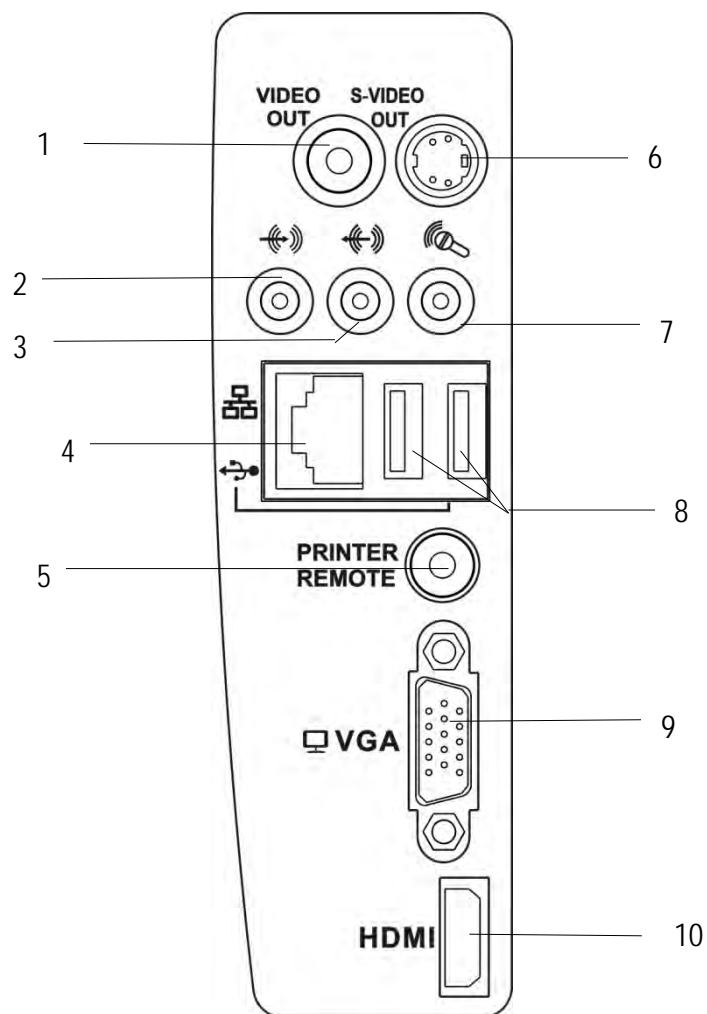


Figure 9: Connection field

- |                         |   |
|-------------------------|---|
| 1— Video output         | 2— Audio input                            |
| 3— Audio output         | 4— Network connection                     |
| 5— Printer control port | 6— S-Video output                         |
| 7— Microphone port      | 8— USB port                               |
| 9— VGA port             | 10— High-definition multi-media interface |

**NOTE:** *The OPERATOR must under no circumstances touch the relevant component and the PATIENT simultaneously.*

### 3.2.6 Peripheral devices and components

The System connectors attach the system to the peripheral devices and components listed in Table 2.

Table 2: Connected peripheral devices or component parts

1- Network connection: For connecting to a router or PC.	2- VGA port: For a monitor with VGA signal input.
3- S-Video port: For a monitor or video printer with S-Video signal input.	4- Video port: For a video or video printer with video signal input.
5- Printer remote port: For a video printer.	6- Foot switch port: For the foot switch.
7- USB port: For a USB disk or other device with a USB port.	

## 4 Getting Started

### 4.1 System installation

#### 4.1.1 Connecting components

In addition to the devices installed in the system, the ultrasound imaging system can support many peripheral devices, e. g. probes, printer, ISB devices and a foot switch. See Table 3 for the detailed list of system accessories.



**NOTE:** *Devices that have not been purchased from Zimmer or installed by Zimmer representatives are not covered by warranty. Zimmer MedizinSysteme will not provide a repair service for the aforementioned devices.*

Table 3: List of accessories, detachable parts, and materials

Accessories	Power cable, S-Video cable
-------------	----------------------------

#### 4.1.1.1 Installation of the battery and safety measures

##### 4.1.1.1.1 Installation of the battery

The system includes a battery, which is installed on the rear side. The battery can be replaced if necessary. Instructions for removal:

1. To remove the battery compartment cover, press with some force on the points on the battery compartment at which the lid is attached.



Figure 10: Battery compartment cover

2. Check the battery installation direction (the end with the electrode on the right-side points inwards), insert the left side of the battery first and then press the right side of the battery into the battery compartment.



figure 11: Position of the battery

3. First, install the lower end of the battery compartment cover, and then squeeze the two latch fasteners until you hear a "click"; this means that the cover is properly in place.



Figure 12: Closing the battery compartment

*NOTE: When removing the battery, you can use the tab under the battery to pull the it out of the device.*

#### 4.1.1.1.2 Charging the battery

The battery is recharged when the system is connected to the power supply through the adapter; it makes no difference whether the system is in the ON or OFF state. To shorten the recharge time, it is advisable to turn off the system when charging the battery.

*NOTE: The battery is consumed gradually. The charging capacity falls over time.*

#### 4.1.1.1.3 Notes on the battery

- a) Do not mix up the anode and cathode of the battery;
- b) Do not throw the battery into fire or heat it;
- c) Do not throw the battery into water or allow it to become wet;
- d) Do not use or store the battery in the vicinity of heat sources (e.g. fire or heaters);
- e) Do not connect the battery directly to a wall socket or car cigarette lighter;

- f) Do not short-circuit the battery with lead or metal-containing materials; do not transport or store the battery with necklaces, hair clips or other metal-containing materials;
- g) Do not attempt to dismantle the battery in any way;
- h) Do not hit, throw or shake the battery;
- i) Do not use a pin or other sharp object to pierce the battery cover; do not hammer or step on the battery;
- j) Do not charge the battery near fire sources or in extremely hot environments;
- k) Do not place the battery into microwave ovens or high-pressure containers;
- l) Do not use the battery with a primary battery (e.g. dry battery) or batteries of a different capacity, model or type;
- m) If the battery is leaking or gives off a peculiar smell, keep it away from open flames as leaked electrolyte may cause fire or explode;
- n) Do not use the battery if it is giving off a peculiar smell, is heating up, is deformed, it has changed colour, or if another abnormality occurs. If the faulty battery is charging or is working, discharge the battery through the system or a charger and do not use it anymore;
- o) In the event of accidental contact between the electrolytes and the eyes due to a battery leak, do not rub your eyes; instead, use water to rinse the fluid away immediately and contact a clinic immediately;
- p) If the battery is not used for an extended period of time, please take it out and store it in a cool place. Do not dispose of the battery in fire, otherwise it may cause an explosion.

#### 4.1.1.2 Connection/disconnection of a probe

- a) Connecting a probe: Insert the probe into the probe socket on the reverse side of the system (please ensure that the plug is inserted in the correct direction and that the probe cable points downwards). Ensure that the connection is secured and then turn the grip 90° clockwise to fix the connector in the socket.
- b) Disconnecting a probe: Turn the probe grip 90° anticlockwise, to loosen the fixing device, then pull out the probe connector as shown in Figure 13 .



Figure 13: Disconnecting the probe

#### 4.1.1.3 Connecting the adapter

Connect the adapter cable with the adapter connector on the reverse side of the system. The plug must be aligned to the positions of the socket. Insert the plug into the socket according to the arrow direction, as shown on Figure 14, otherwise the adapter port and the cable can be damaged.

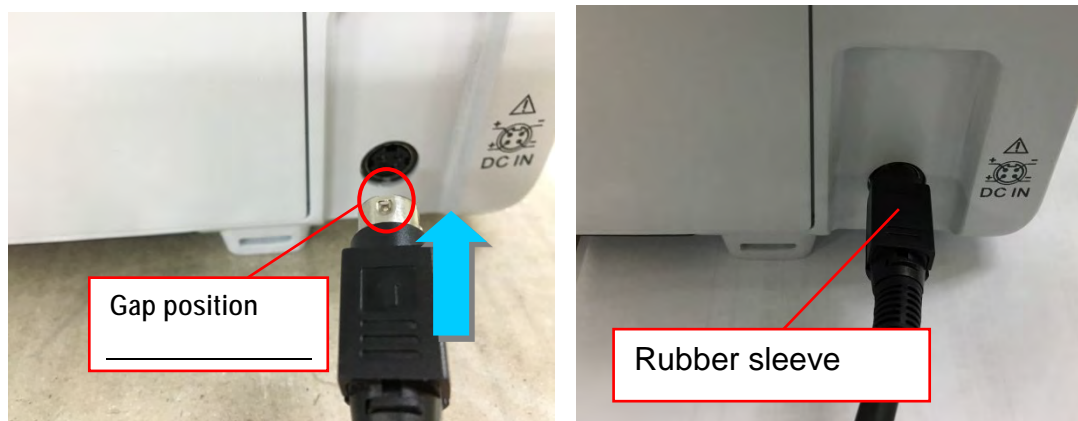


Figure 14: Connecting the adapter

Ensure that the power supply plug is no longer in the socket. If the rubber sleeve that connects the plug with the cable is pulled backwards, a little force needs to be applied to separate the cables.



**NOTE:** *Failure to follow the above procedure may result in damage to the adapter connector.*

Once you have connected the adapter cable to the system, connect the power supply unit to the adapter. If the indicator on the system is activated, this means the power supply is normal. Otherwise, check that the power supply is working.

#### 4.1.1.4 Network connection

Connect the network connector cable to the RJ-45 network port on the main unit to connect the main unit to other PC networks - for example, to a device such as e.g. a workstation or DICOM server.

The network interface is located on the left side of the system. See 3.2.5 for the interface position.

#### 4.1.1.5 Printer installation (optional)

- a) Video printer: Connect the BNC connector of the BNC/RCA cable to the Video input on the video printer and the RCA connector of the BNC/RCA cable to the Video output on the main unit (if the printer is a video device with an S-signal terminal, connect its S-Video input to the main unit through the S-Terminal cable); then connect the printer's REMOTE connector to the REMOTE connection for a printer with a cable for printer control by the main unit.
- b) USB port printer: Connect the USB printer to the USB port via a standard USB connection cable to the main unit. After the system has started, press on the **Setup** button on the control panel, select *Function Setup*) and then select *Printer Setup* to reach the setup screen for *printers and faxes*. Next, install the printer driver by following the printer operation manual. The printer is ready to use once installation has finished. See *Chapter 5* for detailed information on setup.



**NOTE:** Please connect the printer before turning on the system.

#### 4.1.1.6 Connecting the external wireless network adapter (optional)

To use the SonoAir function (**NOTE: This function is optional**), please install the external WLAN adapter (optional, as shown in Figure 15 ) on the USB port (the USB ports are located on the left-hand side of the system, see Figure 9 for information on the specific positions of the USB ports).

For wireless transmission, connect to an image end device, such as a workstation, iPad or iPhone, or connect to a DICOM server via a wireless network (Wi-Fi).

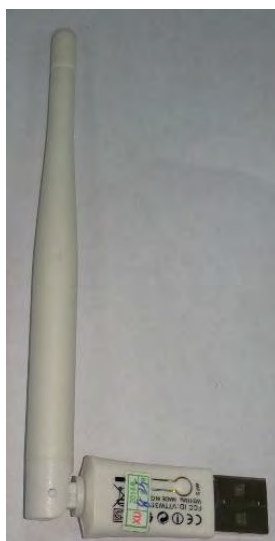


Figure 15: External W-LAN adapters

#### 4.1.2 Connection of electric cables

- a) The power supply source should be a tripod socket with grounded cable in order to ensure that the main unit is reliably grounded.
- b) Ensure that the power switch is turned off before connecting the power cable.

### 4.2 Location of the system

Once the assembly of the system has been completed, the system should be placed in a suitable position. Adjust the placement angle to avoid marking from above or from outside.

If moving the system with a trolley, unlock the wheel brakes and move the system. See 4.5 for precautionary measures for system movement. Lock the wheel brakes again to fix the system after moving it to the proper position.



**NOTE:** Keep the system at a distance of at least 30 cm or more above all thresholds in the vicinity, as otherwise defects may occur due to increased interior temperature.

## 4.3 Performance of an exam

Once system installation and inspection have been completed, the user can prepare for the first patient exam.

### 4.3.1 Preparation

- a) Ultrasound coupling gel: Used as a coupling agent between the probe and the body surface of the patient, through which the presence of air between the patient's skin and the probe must be avoided, as it could hinder the transmission of ultrasound.
- b) Tissues: To remove the ultrasound coupling gel from the patient and the probe.

### 4.3.2 Starting the system

To start the system, follow the steps below:

- a) Connect the adapter to the system, and then connect the AC power cable to the adapter.
- b) Insert the power supply unit into the wall socket.
- c) Press the button for the power switch on the control panel (see Chapter 3.1 for the specific position of the power switch) and start the system (the system requires about three minutes to boot up).
- d) Press the power switch button again to turn the system off.



**NOTE:** *If the system is not in its normal condition, press and hold the power button on the control panel for more than eight seconds to force a shutdown of the system.*

### 4.3.3 General exam steps

This section describes the general steps on how to operate the system for a patient exam. These steps include the inputting patient data, selection of probe and exam type, imaging, annotation and body marks (pictograms), printing, imaging review, image storage and calculation. Users can adjust the exam steps according to the purpose of the exam and operational preference.

General review steps:

- a) Inputting of patient data: Input patient data to the system before starting the exam. Press on ID on the control panel to open the New Patient Info page. Enter data in the data entry fields ID, NAME and DOB (date of birth) . For detailed information, see Chapter 8.1 Managing Patient Information.
- b) Select the probe and exam type: if you have to select a different type of exam during a patient exam, press the Exam button on the control panel, and use the trackball and the Set button to select the exam type . For detailed information , see Section 7.2 Selection of exam type.
- c) Imaging: All available image modes can be directly opened from the control panel. Image parameter adjustment can be controlled using the keys and controls on the control panel. For detailed information, see Chapter 7 Imaging.
- d) Annotations and pictograms:



- e) Press the Annot (annotation) button on the control panel. and the alphanumeric keys to add a comment to the image. Next, press Menu to open the annotation list, select the preset annotation and add it to the image. The preset annotations can be preset at Annot Setup Set up) (see 5.2.9 Annotation Setup).
- f) Pictograms can be opened using the BDYMK button. For detailed information, please see Chapter 7 Annotation of Image Information.
- g) Printing: Use the Print button to print images. For detailed information, see Section 4.1.1.5 Printer installation. For printer setup, see Section 5.2.2.2 Printer Setup.
- h) Image storage: Users can use the Save 1 or Save 2 buttons on the control panel to save captured images and/or film clips. The storage location and format can be set in Store Setup. For detailed information see Section 10.2 Storage Setup.
- i) Image analysis: During or after the exam, users can click on the Smarchive button on the control panel, the trackball, and the Set button and double-click on the desired patient information to evaluate the current exam image. For detailed information, see Section 10.4 Patient Archive.
- j) Measurement and calculation: Users click on the Calc button on the control panel to select the measurement and calculation tool and continue the measurement and calculation of still images. The system adopts measurement values to calculate and create patient reports.
- k) New Patient: When performing an exam, please press the ID button to open the New Patient Info page and on this page, click on New Pat (New Patient). Select Yes in the prompt window to end the current exam and create a new patient so that you can continue with the next exam.

#### 4.3.4 Diagnosticians should pay attention to the following:

If, during a longer-lasting exam, the diagnostician doesn't pay attention to the method, it may cause the patient discomfort and impair the efficiency of the exam. To make the diagnostician's overall task easier and more efficient, please refer to the following suggestions:

- a) Avoid overstraining the eyes. If possible, the screen should be positioned so that the image is clearly visible.
- b) Choose a chair that gives adequate support to the lower back and whose height can be adjusted to accommodate the height of the table.
- c) To avoid neck tension and perform complicated exams, it is recommended to remain standing until the end of the exam. Adjust the monitor to eye level or slightly below eye level.
- d) Keep the patient as close as possible to the diagnostician to ensure that the exam is comfortable.
- e) Place your elbows close to your body and relax your shoulders. To reduce arm fatigue, use a support cushion or pillow to support your arm, or rest your arm on the bed.
- f) Plan exams and have breaks between exams.
- g) Be sure to change the position of the head, neck, body, arms, and legs so as not to maintain the same posture over an extended period of time.



**WARNING:** Long-lasting exams can lead to uncomfortable feeling in the hands, fingers, arms, shoulders, eyes, back or other parts of the body. However, if you feel continuous or recurring discomfort, pain, numbness, burning sensation, or stiffness, please consult a qualified healthcare

*expert. These symptoms may be related to musculoskeletal disorder (MSD). The MSD can produce pain, and may lead to potential disabling injuries to the nerves, muscles, tendons, or other body parts.*

## 4.4 System inspection and maintenance

The user can proceed as follows to check the system: If an irregularity is found, please consult the Zimmer MedizinSysteme customer service. Our service staff provide detailed advice and take action to resolve any issues that arise.

### 4.4.1 Inspection with the power supply switched on

Check whether the power button indicator on the control panel is turned on.

### 4.4.2 Check controls and buttons

Check, with regard to **3.2.4 Control Panel**, every control and button for error-free normal function.

### 4.4.3 Inspection of image quality

See **Chapter 7 Imaging**: Adjust the image adjust buttons on the control panel and observe the image display to see whether it is functioning normally or not.

### 4.4.4 Inspection of measurement function

Check, with regard to **Chapter 9 Measurement, calculation and reports**, various measurement and calculation functions as to whether they are functioning normally or not.

### 4.4.5 Inspection of the ECG function

Inspect the ECG cable for shedding.

With reference to **Section 7.13 ECG Mode**; connect the three-lead ECG cable and adjust the ECG.

Adjust the buttons on the control panel and observe the ECG display to see whether the display is normal.

The ECG function is optional and only available if available.

**NOTE:** *ECG calibration is not required.*

### 4.4.6 Inspection of the probe and probe cable

Check the submersible part of the probe for cracks. Check the probe cable connector and the probe cable for shedding.

### 4.4.7 Inspection of the power cable

Check the power cable for damage such as cracks or detachment of the sheathing; examine it carefully to avoid unexpected hazards due to faults in the cable.

*NOTE: As the above Sections 4.4.6 and 4.4.7, among other things, concern safety, perform these inspections before every system start-up. Other components can be checked every 6 months.*

#### 4.4.8 Regular safety inspection

The user must check the system before each use to ensure that it is in a proper condition.

The system is listed in neither Appendix 1 nor Appendix 2 of the MP-BetriebV (German Medical Device Operator Ordinance).

In Germany, the DGUV Regulation 3 (Electrical Systems and Equipment) in its current version must also be observed.

*NOTE: This also applies to operation of the system in Germany. If required, comply with any divergent national regulations in your country.*

#### 4.4.9 Checking consumables

As the items listed below are consumables, it is advisable to check them regularly and replenish or replace them in time.

Table 4: List of consumables and instructions for replenishment or use

Object	When to replenish or replace
Ultrasonic coupling gel	If it is running out
Power supply cable and connection cable	Abnormal appearance
Probe	Abnormal appearance of plug or cable

*NOTE: The user must buy the required coupling gel that complies with the regulations of the country in which the system is installed. We recommend the use of coupling gel produced by Zimmer MedizinSysteme or a different coupling gel that is compliant with ISO 10993 requirements.*

#### 4.4.10 Essential performance characteristics

The definition of essential performance characteristics of the system is as follows:

- The fault may not produce interference on a waveform, artefacts, image distortion or errors in a displayed numerical value that may alter the diagnosis.
- The fault may not produce an error in the form of the display of incorrect numerical values associated with the diagnosis.
- The fault may not produce an error message in a notification related to safety.
- The fault may not produce unintended or excessive ultrasound output.
- The fault may not produce unintentional or excessive surface temperature of the frequency converter MODULE.

- f) The fault may not produce uncontrolled motion of the frequency converter MODULES that are intended for intra-corporeal use.

To ensure the essential performance characteristics, the system must be checked periodically or if required.

For the essential performance characteristics of definitions a), b) and c) above, the user can have the system certified and confirmed every 24 months by Zimmer service or a Zimmer MedizinSysteme-certified service partner as to the correctness of diagnoses and absence of misdiagnosis.

If the user has any queries about essential performance characteristics d), e) or f), he/she can request inspection and confirmation every 12 months by Zimmer service or a Zimmer MedizinSysteme-certified service partner.

The definition of ECG essential performance characteristics is as follows:

- a) Following electrostatic discharge, the System must resume normal operation in the previous operating mode within 10 seconds, without loss of any operator settings or stored data, and continue to perform its intended function and maintain essential performance characteristics.
- b) If exposed to fast electric transients and bursts the System must continue to perform its intended function as described in the accompanying documents.
- c) When exposed to conducted disturbances the System must continue to perform its intended function as described in the accompanying documents.
- d) If intended to be used in an electrosurgical environment the system must be protected against failures that may be triggered by electrosurgical devices.

If the user has any queries about essential performance characteristics a), b), c) or d), he/she can request inspection and confirmation every 12 months by Zimmer service or a Zimmer MedizinSysteme-certified service partner.

#### 4.4.11 Probe cleaning and disinfection

The probe must be cleaned and disinfected after every use.

Please meet the following requirements for cleaning and disinfecting the probe. Otherwise, the probe may be damaged.

- a) The probe must not be cleaned or disinfected with alcohol, cleaning agents that contain alcohol or other organic solvents (e.g. thinner).
- b) When immersed, the immersible part of the probe should not exceed the orientation mark on the inside of the probe housing;
- c) Do not expose the probe to high steam pressure or ethane oxide.
- d) Do not immerse the probe for longer than one hour.

##### 4.4.11.1 Cleaning

- a) Clean the probe surface with soft cloth soaked with water after use.

- b) If the probe is dirty, use a soft cloth soaked with cleanser (e.g. neutral soapsuds) to clean it, and then use a soft cloth soaked with water to remove the soapsuds.
- c) After cleaning, wipe the probe with a clean dry cloth.

#### 4.4.11.2 Disinfection

- a) The probe should be disinfected with a special fluid disinfectants. The use of glutaral or benzalkonium bromide solution is recommended. The disinfectant solution should be formulated and used according to the manufacturer's product instructions.  
It is recommended to use the disinfectant solutions listed below:  
Cidex solution by Johnson & Johnson
- b) After disinfection, thoroughly remove the disinfection solution with sterile water, then wipe the probe with soft dry cloth.



**WARNING:** *A special cover does not effectively protect the probe from contamination if the probe is used on a patient who is at risk of, or is suspected of having, Creutzfeldt-Jakob Disease (CJD). It is possible that the probe may have been severely contaminated. A probe that has been exposed to tissue of the central nervous system tissue of a patient at risk of or is suspected of having CJD or vCJD (a variant of Creutzfeldt-Jakob Disease) must be destroyed, as it will not be possible to thoroughly decontaminate the probe.*

#### 4.4.12 Cleaning of the control panel and the exterior housing of the system

Operating panel and the exterior housing of the system must be cleaned on a weekly basis. Information on cleaning is given below.

- a) No water must be present within the system. Water can damage the circuit.
- b) Wipe the system with a soft cloth moistened with water. If necessary, the cloth can be dipped in a small amount of neutral detergent. Once this has been done, use water to remove the detergent.
- c) After cleaning, wipe the system with clean, dry cloth.

#### 4.4.13 Cleaning of peripheral devices

Peripheral devices (such as a printers, foot switch sockets etc.) should be cleaned on a regular basis according to use. See the operating manuals for each device for information on cleaning methods.

## 4.5 Transport of the system

To transport the system safely, please observe the following instructions.

### 4.5.1 Transportation of the system (with trolley)

- a) Do not tilt the equipment more than 10 degrees.
- b) For a step higher than 2 cm, put an object under the rollers so that the step height is less than 2 cm.

- c) Secure the power cable and probe cable tightly so that they are not caught by the trolley casters.
- d) Make sure that the main unit is firmly fixed to the trolley.
- e) Move the system only if the wheel brakes are unlocked.
- f) Do not apply excessive force to push the system from the side, as the system could fall over.
- g) Pay attention to your feet when you move the system to ensure that none of the wheels rolls over or collides with them.
- h) It is prohibited to park the system on an incline.

#### 4.5.2 Transportation of the main unit

- a) Disconnect the cables at the rear of the main unit (except for the power cable and probe cable).
- b) Fix the probe(s) securely to the probe holder(s).
- c) Disconnect the main unit from the trolley and transport it with the power cable and probe cable(s) tied together.

# 5 System settings

## 5.1 System settings

System settings are used to set up the system and the environment for system start-up, operational states and the parameters of the various modes. Settings are stored in the system memory and retained in the system, even when it is turned off. This ensures that the system will run the same way every time it boots, according to settings previously made by the user.

The various system functions can be customised via the **SETUP** menu by the user. Press the **Setup** key on the control panel to reach the **SETUP** screen, as shown in Figure 16 . Roll the trackball to move the cursor over any item and press **Set** to enter the corresponding screen. Move the cursor over **Exit** and press **Set**, or press directly on **Esc**, to leave the **SET UP** screen.

The functions and operation of each setting are entered according to the numbers marked on the **SETUP** screen .

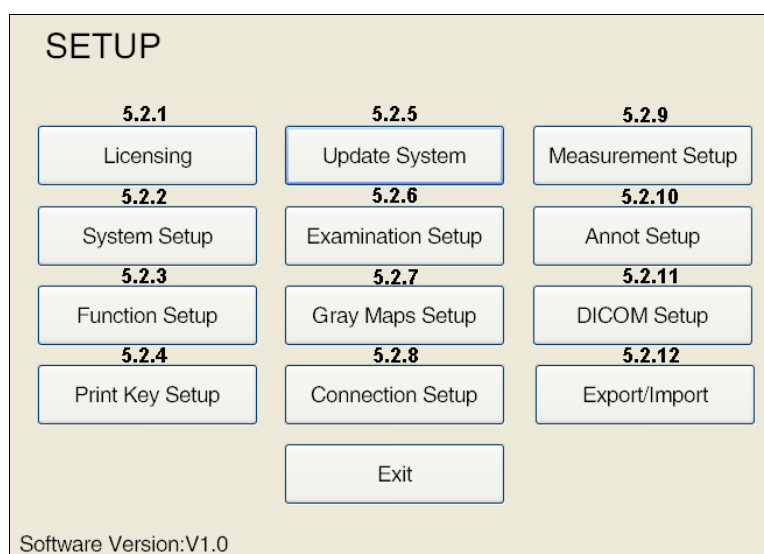


Figure 16: System settings

Software version "V X.X" is displayed in the lower left corner of the SETUP screen.

## 5.2 Setup instructions

### 5.2.1 Licencing

Within the software, the test functions have an expiration date. Activation status, activation date and the number of days of use can be retrieved in the Menu. Proceed according to Figure 17 to activate certain functions (including the basic system functions) on the **LICENCING** screen. Press **Set up** on the control panel to open the **SET UP** screen, then click on **Licencing** to open the **LICENSING SCREEN**.

**LICENSING**

Function	Activated Status	Activated Date	Used Days
System	Enabled	2013-08-07	9
Nanoview	Enabled	2013-08-07	9
DICOM	Not Available	N/A	
3D	Not Available	N/A	
4D Lite	Enabled	2013-08-07	9
PW	Enabled	2013-08-07	9
EI	Enabled	2013-08-07	9

CD Key

Export Activation File... Import LicenseKey File...

Active

Exit

Figure 17: licencing screen

- Export the activation file: Click on **Export Activation File ...**, to open the **Save file** dialogue box, in which you can select the device for the destination memory. Next, an **SN.txt** file is created automatically in the selected master data directory. Click on **Save** to save the **SN.txt** file on the target storage device and leave the dialogue box.
- Send the **SN.txt** to Zimmer and the **License.txt** file is returned to the user.
- Import LicenceKey File: Follow Step 1 to find the **licence.txt** file and click **Open**. The system then exits the dialogue box and creates a licence key. Click on **Active** on the **licencing** screen to complete activation.

**NOTE:** Users can change the licencing key in the **CD Key Edit** window and then click on **Active** click to complete the activation.

### 5.2.2 System settings

**SYSTEM SETUP** allows users to change facility name, system display properties, system date/time, and system language options. The screen for **SYSTEM SETUP** is shown on Figure 18. Press **Setup** on the control panel to reach the **SETUP** screen, then click on **System Setup** to reach the **SYSTEM-SETUP** screen.



Figure 18: System settings

- a) **Facility Name:** Use the alphanumeric keyboard to enter the name of the facility, e.g. Shantou Hospital.  
**NOTE:** When you have entered the text, press **Tab**, to switch to another language (e.g. Russian input).
- b) **Layout Setup:** This setup is not supported by the system.
- c) **Freq Unit:** Setup of frequency unit. There is a choice of two frequency units: **MHz** and **KHz**.
- d) **Auto Freeze, Screen Saver:** If no input is made in the system by the user, the system automatically switches to auto-still or the screen saver. Select **Off** to switch off the Auto Freeze and Screen Saver functions. To unfreeze the system and activate the probe/imaging, click on **Freeze** in the control panel.
- e) **Body Mark Show:** to set up the body mark display. Select **Current** to show only the body marks for the current exam; select **All** to show all preset body marks in the system.
- f) **TGC Graph:** There are three options for TGC graph display: **Always On**, **3 sec.** and **off**. Select **Always On** to permanently display the TGC diagram. Operate the 8 TGC sliders to set the TGC graph on the screen in real time; when selecting **3 sec.**, the TGC diagram is displayed during the adjustment procedure for the 8 TGC sliders. If the 8 TGC sliders are not used for a period of 3 seconds, the TGC graph automatically switches off. Select **Off** and the TGC chart is not displayed on the screen.
- g) **Main Interface Font:** To set up the font size of the main interface, such as information on image control parameters and the facility. Three options are available: **L**, **M** and **S**.
- h) **AC power unit:** Setup of AC power unit. Two AC power units are available: **%** and **dB**.
- i) **Foot Switch:** If a foot switch is connected, foot switch setup will be available. There are three options available: **Print**, **Freeze** and **Update**.
- j) **Language:** To set the system language. If only one language is available on the system, this item cannot be changed. If the system supports multiple languages, select one from the drop-

down menu, click **OK** and all texts on the user interface display are immediately replaced by the selected language.

- k) **Show Patient Information:** To set up the items displayed on the screen. Check the box before the item to display its information on the screen. If this box is not activated, the element is not displayed.
- l) **KeyBoardLamp:** Tick the box in front of **On** under **KeyBoardLamp** to turn on the keyboard backlight if you are working in a badly-lit room. Use the trackball and the **Set** key to click the slider below and change the brightness value of the keyboard lamp.
- m) **Date Time:** Set the current date and time in the system-defined format. Click on **Date Time** to open up the settings screen **for the date and time** (see Figure 19). Click **Change date and time...** to enter the settings screen.

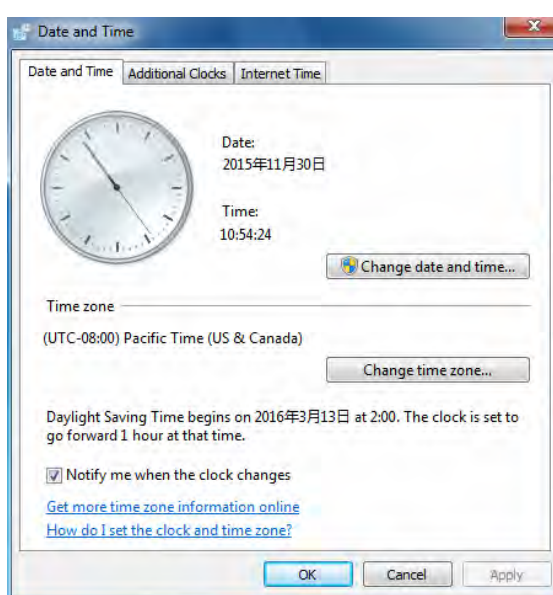


Figure 19: Date and time setting screen

**Date setting:** Click on the left and right arrow keys to skip to the previous or next month. Click on "X year X month" to select the month, and then click here once more to select the year. Click here once more and select the year box (same process as in the Windows system).

**Time setting:** Click on hours, minutes and seconds below the clock when the number is highlighted blue, and then use the number keys on the alphanumeric keyboard to adjust the time.

- n) **Regional and language options:** The formats for the date, the time and the display of the numbers of a certain country can be selected in the **regional** settings. Select the desired language in the **Languages** setting. Click on **Regional and Language Options** to open the screen, see Figure 20.

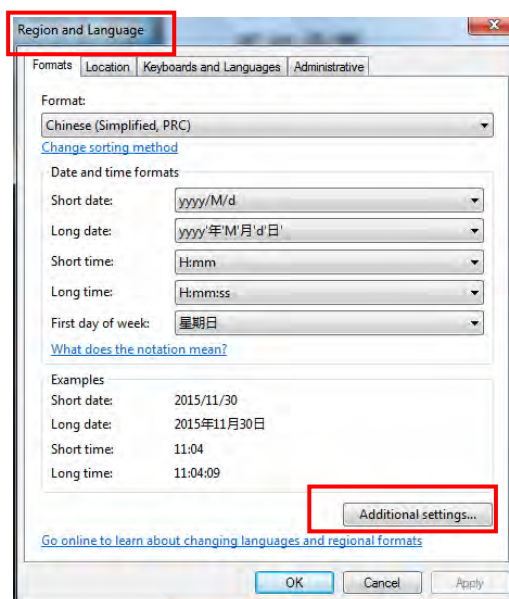


Figure 20: Regional and Language Options screen

**Set display format:** Select Figure 20 a format on the screen, for example *English (Great Britain)* and set the time and date format as required. Click on **Additional settings...** to set number, currency etc.

**Language setting:** Click on **Keyboards and Languages** to open the language settings screen.

### 5.2.3 Function setup

**FUNCTION SETUP** allow users to set certain system features, including setting up *hotkeys*, *SONOAIR*, *printer settings*, *video settings* and *4D devices*, as shown in Figure 21. Click on **Setup** on the control panel to open the **SETUP** screen, then click on **Function Setup** to open the **FUNCTION SETUP** screen.



Figure 21: Function setup

#### 5.2.3.1 Hotkey setup

The Hotkey Setup function allows users to define the functions of the keys **F1-F4** on the control panel. Each key can be defined for any action and configured for different modes. The **HOTKEY SETUP** is shown on Figure 22 .

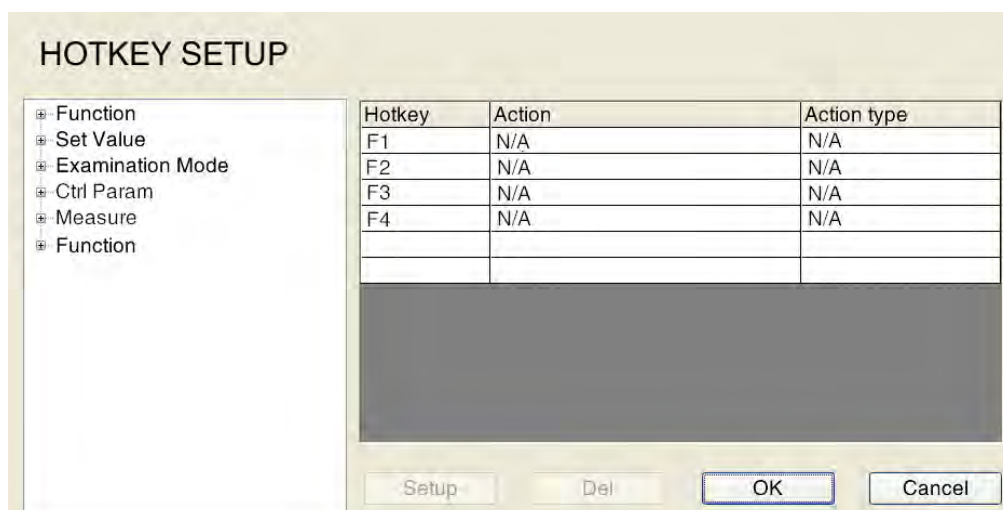


Figure 22: Hotkey setup

The hotkey setup process is as follows:

1. Select Hotkey: Move the cursor over the desired hotkey and click on **Set**. Four shortcuts are available: **F1~F4**.
2. Select the action type: Selection of various implementation actions for each hotkey. The following options are available: **Function**, **Set Value**, **Exam Mode**, **Ctrl Param**, **Measure** and **Function**. Move the cursor to an action type, double-click on **Set** or move the cursor to "+" before the function type, then click on **Set** to open the list of various functions.
3. Select action: Move the cursor to an action, then click on **Set** to select. Users can select a function according to their requirements.
4. Setup: After setting up the hotkeys, move the cursor over **Setup** on the **HOTKEY SETUP** screen, then click on **Set**. The selected action and action type for the key are automatically displayed in the hotkey table.  
**NOTE: To delete set hotkeys, click on the hotkey and click on Del to delete it. The action then shows N/V .**
5. Confirm setup: After setup, move the cursor over **OK** and click on **Set** to confirm the operation and return to the **FUNCTION SETUP** screen.  
**NOTE: Select Cancel to exit Hotkeys setup.**

**Example 1 :** Define F1 as System Setup (i.e. click on F1 to open the **System Setup** screen).

Setup: Select the F1 hotkey on the **HOTKEY SETUP** screen → double-click on **Function** select from → select from **System Configuration** from the Function submenu → click on **Setup**→ select **OK**.

**Example 2 :** Define F2 as the KeyBoardLamp hotkey (i.e. click on F2 to switch on the keyboard lamp).

Setup: F2 Hotkey on **HOTKEY SETUP** screen → double-click on **Set Value** → select **Keyboard Lamp** from the submenu → select **On**, → click on **Setup** → click on **OK** .

**NOTE: When the user resets the hotkeys, the default setting of the hotkeys is changed. In addition, the hotkeys are not changed with subsequent software updates.**

### 5.2.3.2 Printer setup

**Printer setup** allows users to set up printers and faxes that are connected to the system. Setup options include: **Add Printer**, **Set Printer Properties**, **Share Printer** and **View Printer Tasks**. The setup procedure is the same as that in the Windows screen. Click on **Printer Setup** in **Setup - Function Setup** to open the **Printers** screen, as shown in Figure 23.

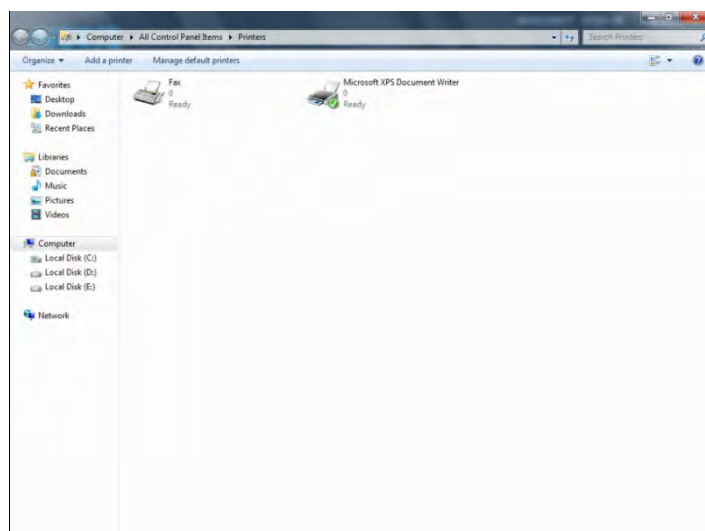


Figure 23: Printers

### 5.2.3.3 SonoAir

**SonoAir** enables users to send system video data (i.e. image data) to a work station set up by Zimmer via network connection, ensuring the receipt of high-quality, complete and undistorted video data at the work station.

See Figure 24 for the **SonoAir** screen.

*NOTE: SonoAir is an optional feature that is only activated on purchase. Until then, SonoAir remains greyed out and no settings are available.*



Figure 24: SonoAir

- a) **On**: To turn on the SonoAir network function, activate the **On** field.
- b) **Image Quality**: To set up image quality, three options are available under **Image Quality**: High, Medium and Low.
- c) **Listen Port**: The **Listen Port** field is read-only and serves as a port to the workstation supplied by Zimmer.
- d) **Screen Area**: To set up the area for transmitting images.

By selecting **Image Area**, only the ultrasound image area can be transferred.

**Custom Area** is used to customise any area as the image transfer area. The values of **Left** and **Top** are used to set the start of image transfer (i.e. the top left point in the transfer area); **Width** determines the width of the image transfer area and **Height** determines the height of the image transfer area.

The two setup methods:

1. Select **Custom Area** and enter the values for **Left**, **Top**, **Width**, **Height** (unit: pixel), or click the up/down arrow on the right of the item to change the value. The green rectangle on the right-hand preview area refers to the image transfer area.
2. Use the trackball to move the cursor to the right-hand preview area. Hold the **Set** button on the control panel at the start point of the area to be transferred and use the trackball to draw a green rectangle that contains the image transfer area. Now the setup boxes for **Left**, **Top**, **Width**, **Height** show the corresponding values.

#### 5.2.3.4 Video Setup

Select **Video Setup** in **Function Setup** to open the Video Setup screen, as shown in Figure 25.

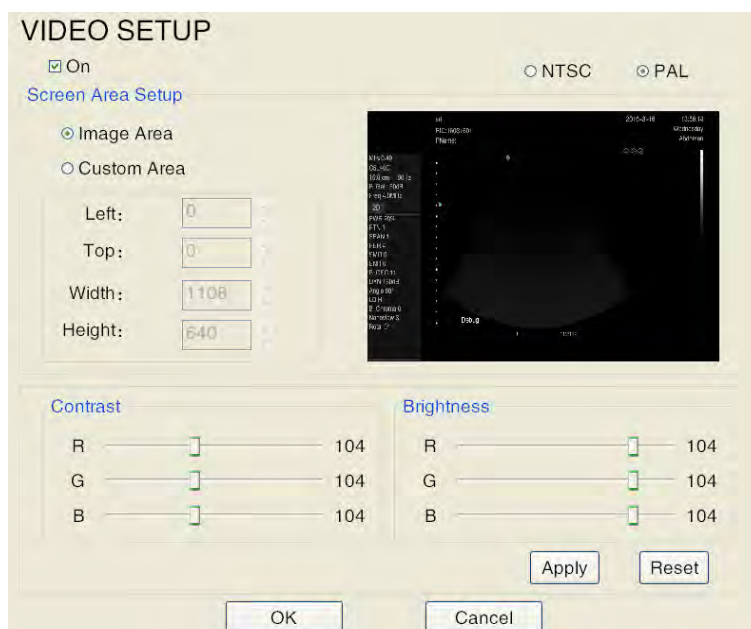


Figure 25: Video Setup

- a) **On** is used to turn the Video Transfer function on and off.
- b) Use the trackball and **Set** key to select the corresponding format (**NTSC** or **PAL**).



*NOTE: The setup of video out format takes effect only after restarting the operating system.*

- c) **Screen Area Setup** is for setting the area for object transfer.

By selecting **Image Area**, only the ultrasound image area can be transferred.

**Custom Area** is used to customise any area as the video transfer area. The values **Left** and **Top** are used to start the video transfer (i.e., the top left point in the transmission area); **Width** determines the width of the video transfer area and **Height** determines the height of the video transfer area.

The two setup methods:

1. Select **Custom Area** and enter the values for **Left**, **Top**, **Width**, **Height** (unit: pixel), or click the up/down arrow on the right of the item to change the value. The green rectangle on the right preview area refers to the video transfer area.
  2. Use the trackball to move the cursor to the right-hand preview area. Hold the **Set** button on the control panel at the start point of the area to be transferred and use the trackball to draw a green rectangle that contains the image transfer area. Now the setup boxes for **Left**, **Top**, **Width**, **Height** show the corresponding values.
- d) **Contrast/Brightness** is used to set the contrast and brightness of transfer object. Use the trackball and press **Set** to move the Contrast/Brightness slider and make settings. **Reset** is used to restore the default settings.

*NOTE: R means red; G means green; B means blue.*

#### 5.2.3.5 4D Setup

The 4D Setup screen is for the user to set the work mode of the **4D**-button.

*NOTE: This setting is only available when the 4D probe is available.*

**Abdomen** is the default 4D work mode, i.e. when using an abdominal 4D probe, pressing the **4D** button on the control panel will open 4D mode. Users can reset the work mode according to their requirements.

#### 5.2.4 Print Key Setup

**Print Key Setup** allows users to define the printer key. This option is not available for selection if this function has not been activated. See Figure 26 for the **PRINT KEY SETUP** screen. Click on **Setup on the control panel** to open the **SETUP** screen, then click on **Print Key Setup** to open the **PRINT KEY SETUP** screen.

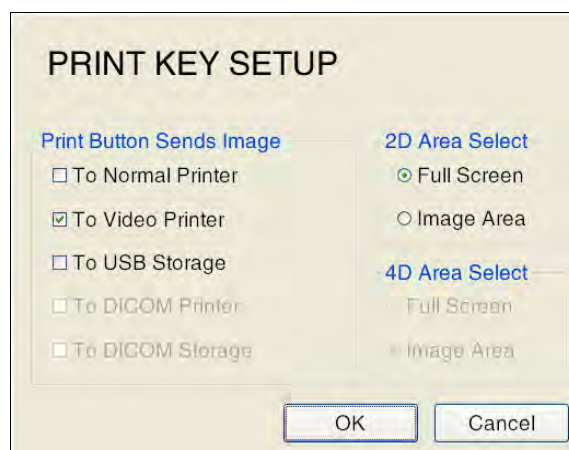


Figure 26: Print Key Setup

- a) **Print Button Sends Image:** There are five options to choose from: normal printer, video printer, USB memory, DICOM printer, and DICOM memory (the DICOM printer and DICOM memory functions are only available if the DICOM option has been purchased and DICOM has been set up). Select one of the items and press OK to exit the setup screen. Press Print again to send the current image to the printer, USB memory, DICOM printer or DICOM memory according to the device.
- b) **2D Area Select:** There are two choices for this setting: Full Screen and Image Area. Full Screen: In 2D mode, press Print to send the full screen; Image Area: In 2D mode, press Print to send only the image area.
- c) **4D Area Select:** There are two choices for this setting: Full Screen and Image Area. Full Screen: In live 3D imaging mode, press Print on the control panel to send the full screen; Image Area: in Live 3D Imaging mode, select Image Area and press Print on the control panel to send only the image area.

**NOTE:** The Full Screen and Picture Area settings are for PC printers only.

### 5.2.5 System Update

The System Update function is for the updating of system software and special requirements. If this function is required, please contact Zimmer.

After inserting the USB disk, click on **Setup** on the control panel to open the **SETUP** screen, then click on **Update System**. The system automatically searches for the **Colour.exe** update file in the USB disk's root directory. Once the file is found, the update information is assigned as shown in Figure 27.

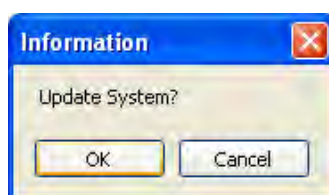


Figure 27: System Update

Select **OK** to update the system, or **Cancel** to cancel the update.



If *Colour.exe* is not found in the root directory of the USB, a checkbox for the update file appears. The user must locate the directory of the update file and select the update file *colour.exe* then click on **Open** (*open*), as shown in Figure 28.

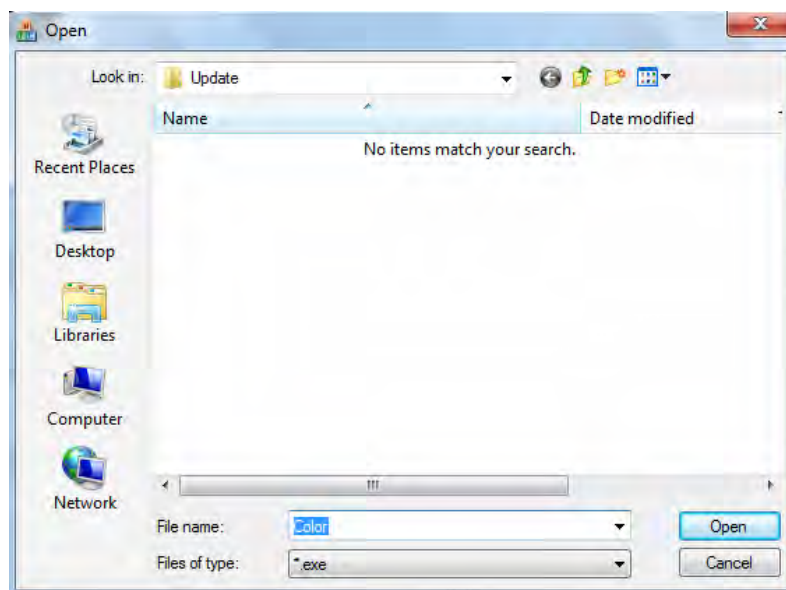


Figure 28: Checkbox for the update file

After selecting *colour.exe*, a confirmation field for the update appears again. Select **OK** to update the system or **Cancel** to cancel the update.

When the user opens an update software, four options are displayed on the software installation user interface; choose from these according to their needs, as shown in Figure 29.

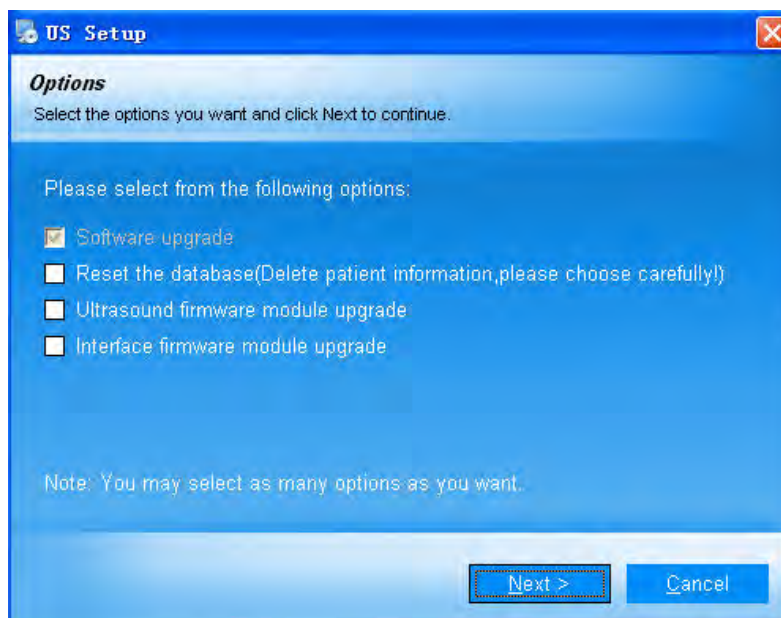


Figure 29: User interface for system installation

a) Software upgrade

This is a routine software upgrade with a standard check, and users cannot change this item.

## b) Reset the database

If, after the routine software upgrade, prompts for a database error still appear, it is recommended that the user select this item and reinstall that software.



**NOTE:** *Selecting this installation will delete patient information. Please backup information before installing this item.*

## c) Ultrasound firmware module upgrade

When this option is selected, the system will request a password during the installation process. If the password is correct, then the system will complete the installation and restart. While loading the ultrasound software the system automatically updates the ultrasound firmware module. The user should restart the system according to the on-screen prompts. If the password is incorrect, the user cannot continue this upgrade.

**NOTE:** *This function only works for some system modules.*



**NOTE:** *Updating the ultrasound firmware module deletes all user settings, including parameter settings and user-defined control modes. Therefore, please select this function with caution.*

## d) Interface firmware module upgrade

When this option is selected, the system will request a password during the installation process. If the password is correct, then the system will complete the installation and restart. When re-loading the ultrasound software, the system automatically updates the ultrasound firmware module. Subsequently, the user should perform a system restart according to the on-screen prompts. If the password is incorrect, the user cannot continue this upgrade.

**NOTE:** *This function only works for some system modules.*



**NOTE:** *Updating the ultrasound firmware module deletes all user settings, including parameter settings and user-defined control modes. Therefore, please select this function with caution.*

After selecting the item to be installed, press **Next** in the bottom right of the user interface to start the installation. Click on **Cancel** to cancel the installation. The system automatically restarts.

### 5.2.6 Examination Setup)

**Examination Setup** allows users to set up the imaging parameters of different exam types and to create new exam types. Click on **Setup** on the control panel to open the **SETUP** screen, then click on **Examination Setup** to open the **EXAM** screen, as shown in Figure 30. Models of the connected probes are displayed in the screen, with all exam types supported by them listed below the corresponding probes. There are two options for selection, **Operation**, **SaveParam** and **DefaultParam**.

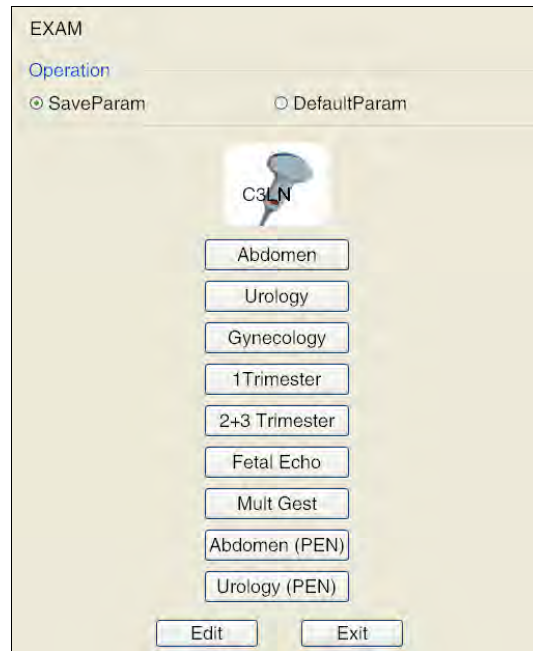


Figure 30: Examination settings

The procedure for **SaveParam (save parameters)** is as follows:

1. Adjust the imaging parameters to the ideal state in any mode.
2. Click on **Setup** on the control panel to open the **SETUP** screen, select **Examination Setup** to open the **EXAM** screen.
3. Move the cursor over **SaveParam** and click on **Set**.
4. Move the cursor to the button for the exam type for which you would like to save parameters. Press **Set**, and a prompt and dialogue box pop up. Click **Enter** to save the parameters for the exam type (when imaging for that exam type is accessed by the user, the saved imaging parameters are displayed); or click on **Cancel** to cancel the saving of parameters (when imaging for that exam type is accessed by the user, the imaging parameters must be reset).

To restore the default imaging parameter settings, select **Default Param on the EXAM screen** and follow the same procedure as for **SaveParam**.

The user can use the **Edit** button on the setup screen to create, rename, delete or adjust the exam type, or to export or import all parameters. The procedure is described here:

- a) Move the cursor to **Edit** and click on **Set** to open the setup screen, as shown in Figure 31 .
- b) New: Move the cursor to the Exam Name input box, click on **Set** and use the keyboard to enter the new exam type, then move the cursor to **New**. Click on **Set** and the new exam type is created and displayed in the list on the left.

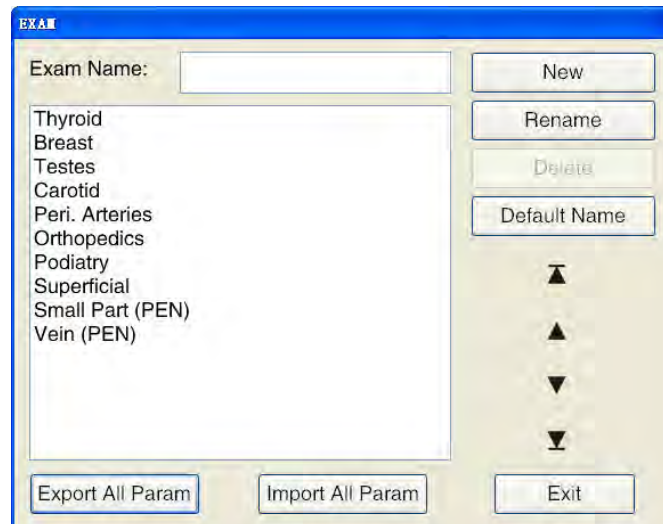






Figure 31: Examination settings

- c) **Rename:** Move the cursor to the list on the left, select the exam type that is to be renamed, and the name is displayed in the Exam Name input box. Move the cursor to the Exam Name input box. Press **Set** and make the change from the keyboard. Move the cursor to **Rename**. Click on **Set** to complete the change.
- d) **Delete:** Move the cursor to the list on the left, select the exam type that is to be deleted, and move the cursor to **Delete**. Click on **Set** and the system displays a prompt dialogue. Select **OK** to delete the exam type or **Cancel** to cancel the process.
- e) **Adjust position:** Move the cursor to the list on the left, select one exam type, and press any of the four arrow marks on the right to change the position of the exam type:  for top,  for upward,  for downward, and  for bottom.
- f) **Export All Parameters:** Export all Exam Type, Name and New Exam Type parameters to the specified location. Process method: Click on **Export All Param** to open the input field for saving the file, select the memory path and click on **Save**.
- g) **Import All Parameters:** Import all types of exams to the system with parameters and names. Process method: Click on **Import All Param** to open the input field for saving the file, select the file from this and click on **Open** to import the parameters.

**NOTE:** It is not possible to export or import parameters between systems with different modules.

### 5.2.7 Maps Configuration

Click on **Setup** on the control panel to open the **SETUP** screen and then click on **Grey Maps Setup** to open the **MAPS CONFIGURATION** screen, as shown in Figure 32 .

- The Maps Edit screen is located on the left-hand side of **MAPS CONFIGURATION**;
- In the middle is the currently defined grey scale;
- On the right-hand side is the effect diagram, on which there are five buttons: **Undo**, **Restore**, **Save**, **Apply** and **Exit**;
- **In** and **Out** at the top of the screen represent the coordinates of the cursor in the Maps Edit screen (i.e. **In X** corresponds to **Out X**);

- In **Map Select** there is a choice of eight maps;
- Map types refer to the maps applied to the grey curves. Three types are available: **B**, **M** and **D**. **B** for B mode images, **M** for M mode images, and **D** for Doppler images;
- Two types of maps are available to choose from: **curve** and **straight line**.

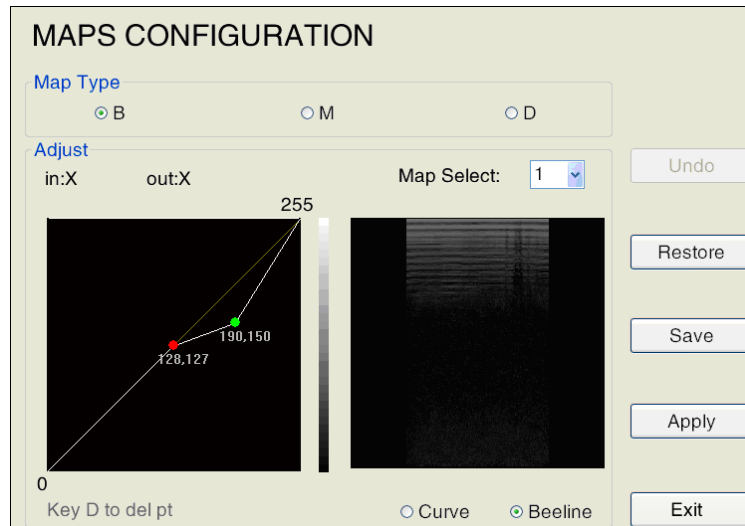


Figure 32: Maps Configuration screen

- a) Drawing the map: The standard graphic is a straight line on which the **In** value corresponds to the **Out** value (i.e. the X- and Y-coordinates are the same at each point of the straight line). Use the trackball, to move the + cursor, click on **Set** over the target position of the straight line in the left-hand edit box and the system marks a point (in green) at this position. Click and hold on **Set** ; at the same time, turn the trackball to drag the mark and draw the map according to the points that you have entered. Click on **Set** in the correct position again to confirm. The green marking changes to red. The right box shows the image after setup.
- b) Revise: Move the cursor to any point that you input in the edit box and click on the **Set** key to activate the point. Now move the trackball to adjust the position of the marked point.
- c) Delete: Move the cursor over one of the points that you have edited in the edit box - the points turn green. Next, click on **D** to delete the point.
- d) Undo: Move the cursor over the **Undo** button on the right side of the screen and click on **Set** to cancel the preceding process (including cancellation of input and deletion).
- e) Restore: Move the cursor over the **Restore** button on the right side of the screen and click on **Set**. The grey curve is reset to the standard straight line or curve, which means that the input corresponds to the output.
- f) Once the map edit is complete, move the cursor over **Save** on the right side of the screen and click on **Set** to save the custom greyscale map. However, this does not affect the current image.
- g) Once the map edit is finished, move the cursor over **Apply** on the right side of the screen and click on **Set** to apply the map to the current image. If you switch to the edit of another map before **Apply** has been highlighted, the settings will not be saved.
- h) Exit: Move the cursor over **Exit** on the right side of the screen. Click on **Set** or directly on **Esc** to return to the system menu.

### 5.2.8 Connection Setup

The network connection can be set up via **CONNECTION SETUP**.

Setup options include *automatic obtaining of an IP* address, *interface* and *gate*; **Advance** opens a connection window. The procedure is the same as that of the connection setup in the Windows system.

In addition, **Computer Name** can be used to change the computer name. However, the new name will not be applied until the computer restarts.

If the computer has multiple network adapters (e.g. an external wireless network adapter), use the setup to select the desired network adapter.

Click on **Setup** on the control panel to open the **SETUP** screen, then click on **Connection Setup** to open the **CONNECTION SETUP** screen, as shown in Figure 33.

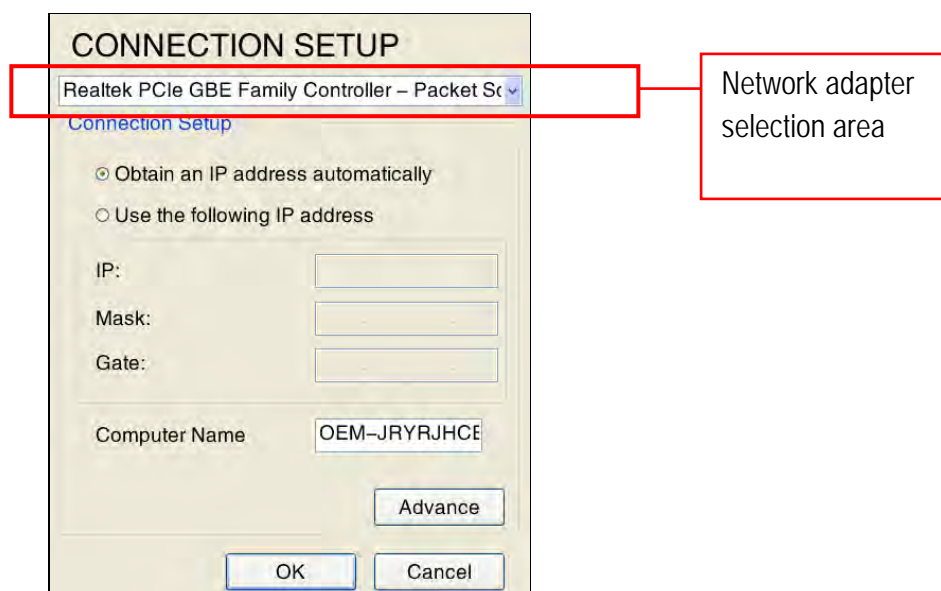


Figure 33: Connection Setup

### 5.2.9 Measurement Setup

Please read the separate Chapter 6 Measurement Setup

#### 5.2.10 Annotation Setup

**Annotation Setup** enables users to define annotations. Click on **Setup** on the control panel to open the **SETUP** screen, then click on **Annotation Setup** to open the **ANNOT SETUP** screen, as shown in Figure 34.



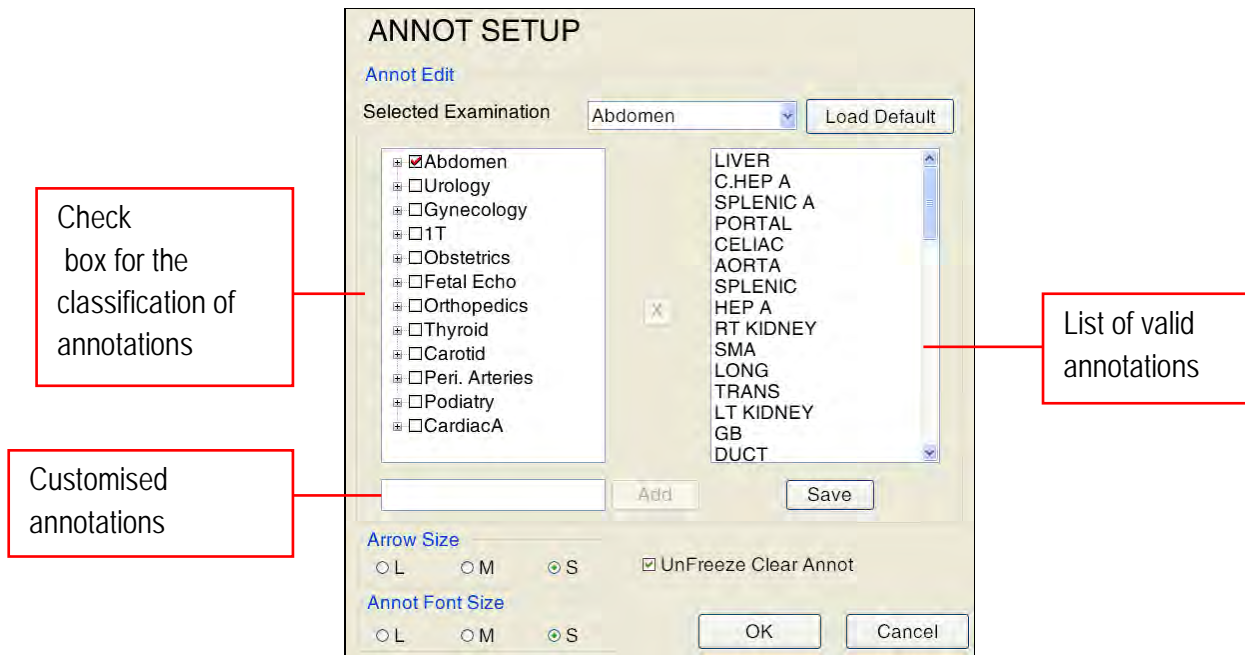



Figure 34: Annotation Setup screen

- a) Follow the steps below to add/delete predefined annotations:
1. Select Exam Type: select the desired exam type from the dropdown list **Selected Examination**;
  2. Add/delete annotations: Pre-defined annotations form part of every exam selected (i.e. all exams in the **Annotation Classification checkbox** have their own, corresponding, pre-defined annotations that can be added or deleted through activation and deactivation).
    - There are three methods for adding annotations:
      - (1) Select the desired exam type in the **Annotation Classification checkbox** by activating a "✓" in the front box, and all the preset annotations for this exam type appear in the **List of Valid Annotations** on the right.
      - (2) Click on "+" before the exam type in the **Annotation Classification checkbox** to open the preset annotations for that exam type. Click on one of the annotations and it appears in list of **valid annotations**.
      - (3) To add user-defined annotations, input new annotations manually via the keyboard in the **User-defined Annotations** box and click **Add**. The new annotation appears on the list of **valid annotations**.
    - To delete annotations, select the annotation that is to be deleted and click on "X" in the middle of the screen to remove it from the list of **Valid Annotations** and **deactivate it in the Annotation Classification checkbox**.
  3. Apply: After adding or deleting, select **Save** and click on **Set**, to save the settings. Next, select **OK** and click on **Set** to return to the main screen.

**NOTE:** The **Load Default** function resets the annotations to the default setting.

- b) **Set arrow size:** Use this setting to set the arrow size. After setting the arrow size, click on the  key on the control panel to display the corresponding arrow independently of the settings.

- c) **Set Annot Font size:** To set up the font size of annotations. After setting, the annotations, when added, are displayed in the corresponding size on the screen.
- d) **Unfreeze and clear annotation:** A check box can be found at the bottom of this interface. If this box is checked, the image is displayed as a live image and all annotations are removed at the same time. If this box is not checked, the image is displayed in Live mode and the annotations retained. This menu item is activated by default. Move the cursor to the check box and click on the **Set** key to disable this menu item.

### 5.2.11 DICOM Setup (optional)

DICOM setup is only available on the main setup screen when the DICOM function has been purchased and activated. Click on **Setup** on the control panel to open the **SETUP** screen, then use the trackball and the **Set** button to click on **DICOM Setup** and open the configuration screen for **DICOM**.

*NOTE: For information on using the DICOM function, see Attachment H for detailed Instructions.*

#### 5.2.11.1 Local network configuration

Go to **DICOM config**. The **local** screen is displayed as the default value, as shown in Figure 35 .

The screenshot shows the 'DICOM config' window. The 'Local' tab is selected. The configuration fields are as follows:

Field	Value
Computer	G41-VY46QSMI
AE	STORESCU
IP	192.168.0.178
Port	104

Below the fields are buttons: Ping, Echo, Save, New, Delete. Below these is a table with headers: Apply, Facility, AE, IP, Port. At the bottom of the window are buttons: Local (highlighted with a red box), Store, Worklist, Print, Exit.

Figure 35: Local screen

Local configuration includes AE and IP ports. Fill in the fields; use the trackball to move the cursor over **Save** and click on **Set** to save the configuration.

#### 5.2.11.2 DICOM Store Server Configuration

On the local screen, use the trackball to move the cursor over **Store** and click on **Set** to open the **Store** screen, as shown in Figure 36.



**DICOM SETUP**

**Store**  
 Facility: Zimmer AE: KPServer IP: 192.168.0.36 Port: 104

**Picture**  
 Compression Type: JPEG Lossy Image Quality Factor: 80

**Film**  
 Compression Type: JPEG Lossy Image Quality Factor: 40

Ping Echo Save New Delete Apply

Apply	Facility	AE	IP	Port
✓	Zimmer	KPServer	192.168.0.36	104

Echo 192.168.0.36:104 KPServer Done!

Local **Store** Worklist Print Exit

Figure 36: DICOM Store Server configuration screen

#### a) New server

Use the trackball and Set to open *New* and the contents of the Facility, AE, IP and Port fields are cleared automatically so that users can enter new information for the DICOM store server. Move the cursor to the input field and click on Set, then input using the alphanumeric keyboard.

- *Facility*: To distinguish between facilities across multiple servers that are connected at different times, especially when mobile devices work between different facilities, users can create multiple DICOM addresses, which can be identified through the Facility names in the list.

*NOTE: The facility must be entered, and names cannot be repeated.*

*NOTE: For the specific facilities of AE, IP and Port on the DICOM Store Server, please contact your network administrator.*

- *Compression Type and Image Quality Factor*: Compress DICOM images or films before transferring; the available file types are: *JPEG Lossless*, *JPEG Lossy* and *uncompressed*. If *JPEG Lossless* is selected, the higher value is for better image quality.

*NOTE: The compression type must match the setup (facility) of the DICOM store server, otherwise the transmission may fail.*

#### b) Connection to the server

When a new server is created, use the trackball and Set to click on *Echo* and test whether files can be sent between the local system and the chosen server.

The connection status is displayed below the "*Connection to XXXX Echo*", "*Echo successful*" or "*Echo failed*" list.

When connected successfully, click *Save*, and the server is displayed on the list.

#### c) Apply server

Select a server from the list, use the trackball, and click on Set in the upper-right corner of the list to apply the server, which causes a ✓ tick to appear on the application list.

**NOTE:** If the server has not been successfully connected, create the connection with the following Step b) to ensure that the connection is operating normally before use.

d) **Delete server**

Select the server to be deleted from the list, use the trackball and Set to click on *Delete* in the upper part of the list, and the server is deleted.

### 5.2.11.3 DICOM Worklist Server configuration

Enter the DICOM configuration, use the trackball and Set to open the **Worklist** and, as shown in Figure 37, to reach the **Worklist**.

On this screen, users can create, connect, apply or delete a DICOM worklist server. For the detailed procedure see **5.2.10.2 DICOM Store Server configuration**,

If the Worklist server supports the MPPS function, activate the **MPPS** option to realise MPPS service interaction with the Worklist server. If the Worklist server does not support the MPPS function, the system cannot use this function properly.

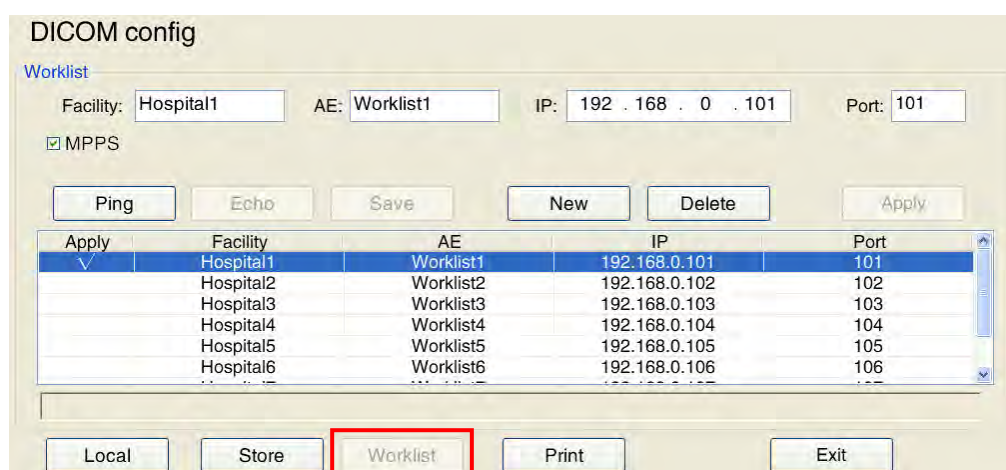


Figure 37: DICOM Worklist Server Configuration screen

### 5.2.11.4 DICOM Print Server Configuration

Open DICOM Config. Use the trackball and Set to click on **Print** and open the **PrintScreen** screen, as shown in Figure 38.

On this screen, users can create, connect, apply and delete a DICOM print server. For the detailed procedure see **5.2.10.2 DICOM Store Server Configuration**.

- **Print Copies** means the number of printed sheets on one page with good layout.
- **Colour Option:** Choose the print colour from the options **B/W** and **Colour**. If **Colour** is selected, you can also set up the **Orientation**; if **B/W** is selected, you can also set the **Destination**, **Medium Type**, **Orientation** and the **Film Size**.
- **Destination:** The destination of B/W printing, with **Processor** and **Cassette** options to choose from.
- **Medium Type:** Medium for B/W printing, with **Paper** and **Film** to choose from.

- **Orientation:** Print orientation, with **Portrait** and **Landscape** to choose from.
- Film Size for B/W printing, with multiple sizes to choose from.

**DICOM SETUP**

Print

Facility: Hospital1 AE: Print1 IP: 192.168.0.101 Port: 101

Print Copies: 1 Color option: B/W

Destination: Processor Medium Type: Paper

Orientation: Portrait Film Size: 8INX10IN

Ping Echo Save New Delete Apply

Apply	Facility	AE	IP	Port
✓	Hospital1	Print1	192.168.0.101	101
	Hospital2	Print2	192.168.0.102	102
	Hospital3	Print3	192.168.0.103	103
	Hospital4	Print4	192.168.0.104	104
	Hospital5	Print5	192.168.0.105	105
	Hospital6	Print6	192.168.0.106	106

Local Store Worklist **Print** Exit

Figure 38: Configuration screen for the DICOM print server

### 5.2.12 Export/Import

The Export Settings are used to export the user-defined setting in ".mdb" format and to import the setting to other, similar system series. It is convenient for users to apply the defined settings when changing systems without resetting them.

Click on **Setup** on the control panel to open the **SETUP** screen and use the trackball and the **Set** key to click on **Export/Import**. There are two options for selection: **Export Settings** and **Import Settings**. See Figure 39.

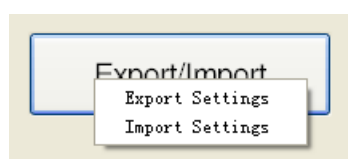


Figure 39: Export/Import

- Select **Export Settings** and the **Save as** window appears. Change the file name (if necessary), select the desired saving path, and click on **Save** to export the ".mdb" file to the desired path.
- Select **Import Settings** and the **Open** window appears. Select the desired ".mdb" file and click on **Open** to import the defined setting.

**NOTE:** The new setting only takes effect following a system restart.

## 6 Measurement setup (configuration)

### 6.1 Basic configuration of measurement

**Measurement Setup** allows users to set units of measurement and measurement equations. Click on **Setup** on the control panel to open the **SETUP** screen, then click on **Measurement Setup** to open the **MEASUREMENT SETUP** screen, as shown in Figure 40 .

Figure 40: Measurement Setup

- Volume Unit:** To select the relevant unit for volume measurement. There are five volume units available: *m<sup>3</sup>*, *mm<sup>3</sup>*, *ft<sup>3</sup>*, *in<sup>3</sup>* and *ml*.
- Distance Unit:** To select the relevant unit for distance (length) measurement. Four distance units are available: *cm*, *mm*, *ft* and *in*.
- Foetus Weight Unit:** To select the relevant unit of measurement for foetal weight. Four weight units are available: *g*, *oz*, *lb* and *kg*.
- Font Size of Measure Result:** To select the size of measurement result. Three sizes are available: *L*, *M* and *S*.
- Font Bright of Measure Result:** To select the brightness of the measurement result. Three sizes are available: *Dark*, *Mezzo* and *Bright*.
- Size of Measurement Cross Cursor:** To select the size of measurement cross cursor. Three sizes are available: *L*, *M* and *S*.
- Line Type:** For the selection of cursor line type. Three line types are available: *Dot*, *Solid* and *None*. If *None* is selected, no linear cursor is displayed in the measurement and calculation state.

- h) **Doppler Trace Type:** To select the trace type (automatic, manual or range trace). Select **All** to trace the whole spectrum, **Down** to trace the spectrum below the baseline or **Up** to trace the spectrum above the baseline.
- i) **Time Unit:** To select the unit for time measurement. Two time units are available: **s** (seconds) and **ms** (milliseconds).
- j) **BSA Function:** To select the equation for body surface area calculation. Two equations are available: **Stevenson** and **Grossman**.
- k) **PSAD Coefficient:** To define the PSAD coefficient.
- l) **Beat Cycle:** To measure heart beat in M mode or in the Doppler trace.

## 6.2 Advanced Calculation Presets

Use the trackball and the **Set** button to open *the Advanced Calculation Presets*, as shown in Figure 41.

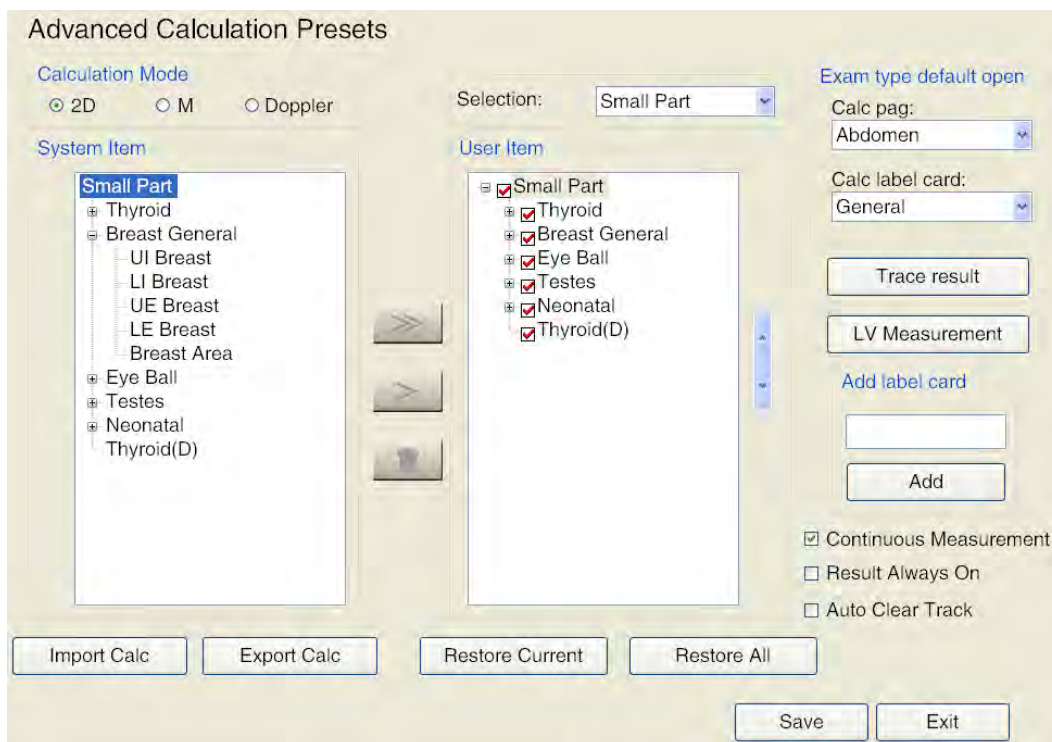


Figure 41: Advanced Calculation Presets

### 6.2.1 Function


The 2D, M, and Doppler modes are available in calculation mode. After selecting the **System** and **User Item**, the measurement element is displayed according to the mode.

Select the calculation software for selection from the drop-down list and the corresponding measurement element is displayed under **System Item** and **User Item**.

Users can set up the **User Item** according to their requirements, and can add/hide/delete or rearrange s or measurement elements, create the framework, calculate left-ventricular function item, etc.. Once





settings have been made, press the **Calc** button to open the calculation menu. The relevant measurement object is then displayed according to the user settings.

Each piece of calculation software can be divided into various measurement cards, and each measurement card contains various measurement objects. Correspondingly, Figure 41 the calculation software is used for small parts, the thyroid gland, breasts, eyeballs etc., and the measurement elements are UI Breast, LI Breast etc. Click on  in front of the measurement card to unfold it.

### 6.2.2 Add Measurement Element

Every measurement card and measurement object in **System Element** can be added to the **User item** at will.

Select a measurement card under **System Item** and the destination measurement card under **User Item**  and click on Add all Add for all measurement elements of the measurement card on the destination measurement card.

If you select a measurement object under **System Item** and the destination measurement card under **User Item**, click on the  key to add that measurement object to the destination measurement card.

If no object is selected, the keys remain grey.

### 6.2.3 Create new measurement card

Click on the calculation software (e.g. small parts) under **User Item** and enter, as required, a new designation for the measurement card under **Label map**. Click on **Add** to add it to the calculation software. Add the new **measurement elements** as shown in Figure 42, **to the new measurement card** according to the procedure for adding new measurement elements.

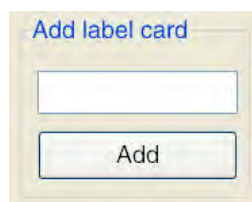


Figure 42: Add label card


**NOTE:** If you do not click on the calculation software with the cursor, the menu key remains grey.

### 6.2.4 Hide measurement card or measurement object

Move the cursor to activate the red "√" in front of a **User Unit** item and click on the **Set** button to remove this item; this means that that element will not be shown in the measurement menu. Click on the **Set** button to restore the item.



**NOTE:** Removing the "√" in front of the measurement card removes the entire measurement card and, if you remove the "√" in front of the measurement element, the measurement element is removed. Check this if problems occur when opening the calculation software.

### 6.2.5 Delete measurement card or measurement object

Only measurement elements or measurement cards that have been added by the user can be deleted. Standard measurement elements and measurement cards cannot be deleted. Select a new measurement card or new measurement object and click on the  symbol. The measurement card or object is deleted.

*NOTE: If it is not possible to delete the selected objects, the  symbol remains grey.*

### 6.2.6 Rearrange measurement card/measurement element

measurement cards/elements under the **User Unit** can be moved upwards or downwards as desired. Select a measurement card/object, move the cursor to the  button on right-hand side and click on the **Set** button to move the measurement card/object up one level. If you have to move the measurement object down, move the cursor over the  button and click on the **Set** button to move the measurement object down one level.

### 6.2.7 Exam type default open

To set up the calculation and measurement menu, open in in the current exam by clicking on the **Cal** button. For example: Configure the **"Abdomen"** measurement package and the **"General"** tab, as shown in Figure 43; this opens the measurement menu.

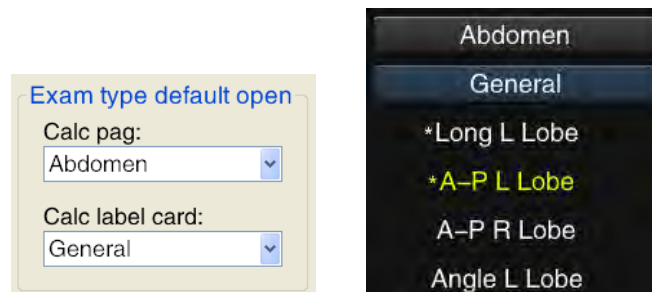


Figure 43: Fig. 1-1 Exam type default open

### 6.2.8 Trace Result

Choose **Trace Result from** and the prompt appears, as shown in Figure 44; here the user can delete the item that is not to be displayed. Move the cursor to the object that is to be deleted and click on the **Set** button to remove the "✓" and click on the **Set** button again to restore it. Click on **Save** and the object is not displayed when the trace measurement is finished, or click on **Cancel** to cancel the operation and return to the previous menu.

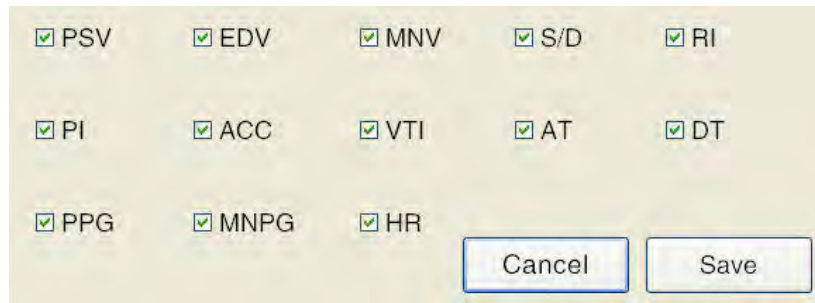


Figure 44: Trace Result screen

### 6.2.9 LV Measurement

Select **LV Measurement** to open the user interface from Figure 45 . Users can select unnecessary items in this interface. Move the cursor to the unnecessary item and click on the **Set** button to remove "✓" and click on **Set** again to restore it. Click on **Save** and the item is no longer displayed once the LV function measurement is completed, or click on **Cancel** to cancel the operation and return to the previous menu.



Figure 45: LV measurement screen

### 6.2.10 Measure Continuously and Result Shown Always

If **Measure Continuously** is selected, following the creation of a measurement object the system automatically accesses the next measurement object (except in the case of routine measurement software and some measurement elements with special functions in special measurement packages) until all measurements have been completed.

If **Result Shown Always** is selected, the measurement result is shown continuously in the lower-right corner of the screen and the image is not hidden if in Live mode.

If **Auto Clear Track** is selected, the on-screen measurement traces and data are automatically removed when the film starts to play. The measurement results are automatically imported to the report without being cleared.

### 6.2.11 Import/export of calculation software

When selecting **Import Calc** a prompt box appears. Select the required calculation software (document name with ".dat" extension) and click on **Open** to import the file into the system. Select **Export Calc** on the prompt box and search a destination folder to save the files in the prompt box. Change the name of the folder (if necessary) and click on **Save** to save the file in the folder.



**NOTE:** Only one piece of calculation software can be imported to this system from the same system series.

### 6.2.12 Restore calculation software

Move the cursor to **Restore Current** or **Restore All** and then click on **Set** to open the confirm window. Move the cursor to **OK** and then click on the **Set** key. All current calculation software or calculation software packages are reset to factory default settings. Click on **Cancel** to cancel the process and return to the previous process.

### 6.2.13 Save

Move the cursor to **Save** and click on **Set** to open the **Save Successfully** window. Now all user settings are saved in the system. Move the cursor to **OK** and click on the **Set** key; click on the **Exit** button to return to the previous menu without saving.

## 6.3 Growth Curves Edit

Use the trackball and the Set key to access Growth Curves Edit on the MEASUREMENT SETUP screen and the GROWTH CURVES EDIT screen, as shown in Figure 46 .

Select the desired sections and author in the dropdown list above the growth curve table; this way the content of the table corresponds with the selected growth curve.

To change a value, move the cursor with the trackball, click on the Set button and enter the new value using the alphanumeric keypad; to restore the default settings, highlight Load Default and click on Set. After making the settings, highlight Save and click on Set to save the change, or press Exit to cancel the change.

**GROWTH CURVE EDIT**

PARTS:  AUTHOR:

Age(w)	Length(mm)	1SD	10%	90%
12.0	58.9	6.0	51.3	66.6
13.0	70.8	6.4	62.6	79.1
14.0	82.7	6.9	73.8	91.5
15.0	94.4	7.4	85.0	103.8
16.0	106.1	7.8	96.1	116.1
17.0	117.7	8.3	107.1	128.3
18.0	129.3	8.7	118.1	140.4
19.0	140.7	9.2	129.0	152.5
20.0	152.1	9.6	139.7	164.4
21.0	163.3	10.1	150.4	176.3
22.0	174.5	10.6	161.0	188.0
23.0	185.5	11.0	171.4	199.7

Figure 46: Growth Curve Edit

## 6.4 Foetal Age Estimation Edit

Use the trackball and the Set button to open *Foetal Age Estimation Edit* on the *MEASUREMENT SETUP* screen. Two options are available: *Table* and *Equation*.

- Choose **Table** to open the screen Figure 47. The operation is the same as for the **Growth Curve Edit**. Data in the table can be edited by the user. Click on **Save** and the calculation results change accordingly. Select **Load Default** to restore the default system settings. Press **Esc** or **Exit** to return to the submenu for calculation settings.



**FETAL AGE EDIT**

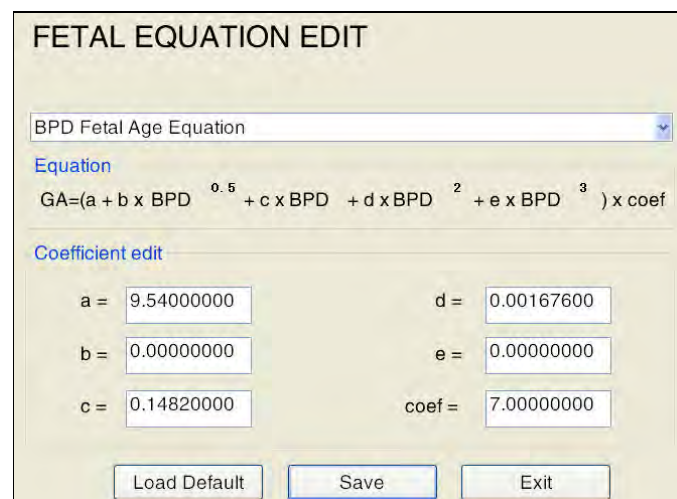
PARTS: AC AUTHOR: Hadlock

Length(mm)	Week	Days	Error(D)
100.0	16.0	0.0	6.0
105.0	16.0	3.0	6.0
110.0	16.0	6.0	6.0
115.0	17.0	1.0	6.0
120.0	17.0	4.0	6.0
125.0	18.0	0.0	6.0
130.0	18.0	3.0	6.0
135.0	18.0	6.0	7.0
140.0	19.0	2.0	7.0
145.0	19.0	5.0	7.0
150.0	20.0	1.0	7.0
155.0	20.0	4.0	7.0

Load Default Save Exit

Figure 47 Foetus Age Edit

- Choose **Equation** to open the screen from Figure 48. The standard equation is **BPD Foetal Age Equation**, but more options are available in the drop-down list. The values of **a~e** and **coef** can be changed by the user. If any coefficient value is changed, the corresponding equation values change accordingly. Next, select **Save** to **present** a new calculation result; select **Load Default** to restore the default system settings; click on **Esc** or **Exit** to return to the submenu for calculation setup.



**FETAL EQUATION EDIT**

BPD Fetal Age Equation

Equation

$$GA = (a + b \times BPD^{0.5} + c \times BPD + d \times BPD^2 + e \times BPD^3) \times coef$$

Coefficient edit

a = 9.54000000 d = 0.00167600

b = 0.00000000 e = 0.00000000

c = 0.14820000 coef = 7.00000000

Load Default Save Exit

Figure 48: Foetal Equation Edit

## 6.5 Foetal Age Estimating

Use the trackball and the Set button to click on Foetal Age Estimating on the MEASUREMENT SETUP screen and, as shown in Figure 49, to open the FOETAL AGE ESTIMATING screen.

Some foetal age estimates for varying parts of the exam are listed for selection. The Foetal Age Estimating Table is shown in Figure 49. When a table is selected, the calculation is performed based on the table. When an equation is selected, the calculation is based on the equation.

Figure 49: Foetal Age Estimating

Click on the arrow on the right-hand side of the individual items and click on the **Set** key to open the drop-down list; use the trackball to select and click on the **Set** key to confirm.

People from different regions have different body characteristics. The default foetal age estimates selected are different. Seven regions are defined: Southeast Asia, West Asia, Europe, North America, Latin America, North Africa and general. The user can choose the appropriate option depending on region. Move the cursor to the drop-down menu for the **region**; use the trackball to select an item and click on the **Set** key to confirm.

After completing the setting, move the cursor to **Save** at the bottom of the screen, click on the **set** key to save the setting, then move the cursor to **Exit**. Click on the **Set** key to return to the Measurement Setup screen. If the setting is not saved, it is invalid.

Click on **Load Default** and all settings are restored to the factory settings.

Table 5: Foetal Age Estimating table

Menu	Submenu
GS (gestational sac)	Hadlock Equation, Hadlock Table, Hansmann Table, Tokyo Table, South Hospital.
CRL (Crown-rump length)	Hadlock Equation, Hadlock Table, Hansmann Table, Osaka Table, Tokyo Table, Chitty Table, South Hospital.
HC (head circumference)	Hadlock Equation, Hadlock Table, Chitty Table, User-defined Table 1, User-defined Table 2, User-defined Table 3, South Hospital
AC (abdominal circumference)	Hadlock Equation, Hadlock Table, Hansmann Table, Tokyo Table, Chitty Table, User-defined Table 1, User-defined Table 2, User-defined Table 3, South Hospital
BPD (biparietal diameter)	Hadlock Equation, Hadlock Table, Hansmann Table, Osaka Table, Tokyo Table, Chitty Table, User-defined Table 1, User-defined Table 2, User-defined Table 3
FL (femur length)	Hadlock Equation, Hadlock Table, Hansmann Table, Osaka Table, Tokyo Table, Chitty Table, User-defined Table 1, User-defined Table 2, User-defined Table 3
OFD	Hadlock Equation, Hansmann Table, Asum Table, Nicolaides Table
CER	Hadlock Equation, Nicolaides Table, Hill Table
OOD	Hadlock Equation, Hansmann Table, Jeanty Table
TAD	Hadlock Equation, Hansmann Table
THD	Hadlock Equation, Hansmann Table
TTD	Hadlock Equation, Hansmann Table
FTA test	Hadlock Equation, Hansmann Table
HL	Hadlock Equation, Hansmann Table, Asum Table, Nicolaides Table
UL	Hadlock Equation, Jeanty Table, Merz Table
RL	Hadlock Equation, Jeanty Table, Merz Table
TL	Hadlock Equation, Jeanty Table
FIBL	Hadlock Equation, Merz Table
CLAV	Hadlock Equation, Yarkoni Table

EFW	AC+BPD(Shepard),AC+FL(Hadlock),AC+FL+HC(Hadlock),AC+FL+HC+BPD(Hadlock),AC+FL+BPD(Hadlock),AC(Campbell),BPD+TAD(Hansmann),Tokyo
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*NOTE: For a description of the abbreviations in the table, please see Appendix A.*

# 7 Imaging

## 7.1 Preparation

### 7.1.1 Instruments

- a) Ultrasound Coupling Gel: to be applied directly to parts of the patient's that are to be examined or to the acoustic lens on the probe surface.
- b) Paper tissues: must be used to remove ultrasound coupling gel from the patient's skin and from the probe following examination.
- c) Video recorder or printer: to record diagnostic images or files.

### 7.1.2 Operation

- a) Power On: Press the main unit power switch button, the indicator switches itself on and the system completes initialisation within about 3 minutes.

*If the system is in an abnormal state and cannot be shut off, press the power switch on the control panel for more than 8 seconds to shut the system off completely.*

- b) Gain Control preset: Set the **Gain** potentiometers to the correct positions for amplifiers and TGC (time gain compensation).

## 7.2 Selection of probe and Exam Type

Click on **Exam** on the control panel and all probes that are connected to the system and the exam types supported are displayed on the screen, as shown in Figure 50 . Use the trackball and the **Set** key to select the desired exam type, and the system switches automatically to the selected exam type. The selected probe and exam are displayed on the basic parameter display area.

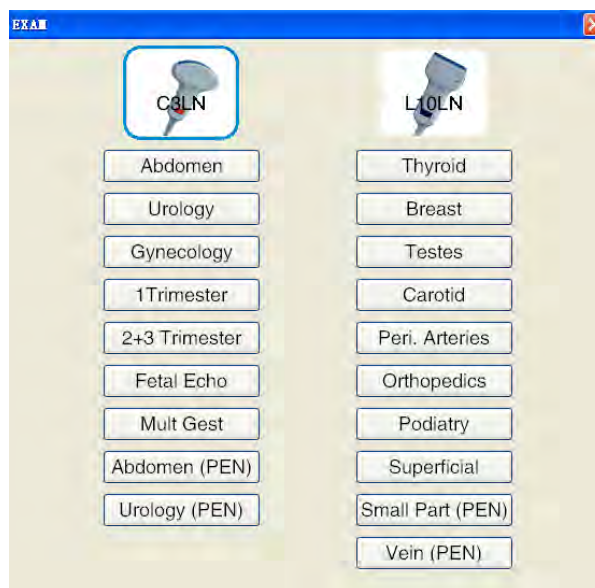


Figure 50: Selection screen for probe and examination type

The display of the exam type depends on the probe used. For each kind of probe in different exam types (including the application range and diagnostic position), the system performs initial settings of ultrasound control parameters based on the specific exam type, so that the system is best suited for that exam type. The user can also make set up control parameters for exam types.

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

table 6: Types of examination

Types of examination
1T, 2+3T, Foetus Echo, Mult Gest, Gynaecology
Abdomen, Abdomen PEN, Urology, Urology PEN
CardiacA, CardiacA_P, Paediatric
Thyroid, Small Part PEN, Breast, Testes
Peripheral arteries, Carotid, Peripheral Vein
MSK, Superficial,

## 7.3 Preliminary Imaging

### 7.3.1 Use of probe and ultrasound coupling gel

- Apply a sufficient amount of ultrasound coupling gel to the surface of the probe and the part's the patient's body that are to be examined.



**NOTE:** *If there is air between the patient's body and the probe, black dots will appear on the screen. In this case, apply the coupling gel once more.*

- b) An image appears on the monitor as soon as the probe is placed on the area under examination.

### 7.3.2 Selecting Imaging Mode

Imaging modes available in the system include 2D (B, 2B, 4B and B/M); \*colour Flow Map (CFM), \*colour Power Angio (CPA), \*Tissue Doppler Imaging (TDI), Pulsed Wave Doppler (PW), Trapezoidal/Extended Imaging, \*Continuous Wave Doppler (CW), \*Elastography Imaging, 3D Imaging, 4D Imaging and Lite \*4D Pro Imaging.

When in Live mode, users can click on **B mode**, **2B/4B**, **M mode**, **C mode**, **CPA/TDI**, **PW** or **CW**, **4D**, **Elas** on the control panel for mode selection and toggle.

**NOTE:** *The imaging mode with the \* symbol is optional.*

**NOTE:** *Hotkeys may be required for some imaging modes or functions. The hotkeys are all default settings, and can be changed according to user needs (see Section 5.2.3.1 for hotkey setup).*

### 7.3.3 MI/TI Display

MI and TI values shown on the imaging control parameter area are preset by the system according to probe type and imaging mode. MI and TI jointly reflect the relationship between ultrasound output parameters (e.g. frequency and acoustic power) and bioeffects.

**MI (Mechanical Index):** To give relevant indication on the likelihood of bioeffects due to the ultrasound beam (e.g. cavitation). The higher the MI is, the greater the likelihood of mechanical bioeffects.

**TI (Thermal Index):** Indicates the likelihood of a rise in tissue temperature. This is an estimation of the rise in temperature for body tissue with certain properties. TI consists of three indices: TIS (soft-tissue thermal index), TIB (bone thermal index) and TIC (cranial-bone thermal index).

The adjustment of acoustic power changes the MI or TI display. The higher the **PWR**, the greater the MI or TI value; in CFM or PW mode, the PRF is adjusted and the MI or TI value changed, too. The higher the PRF, the higher the MI or TI value will be.

### 7.3.4 Display of images as still images and live images

**Still images:** To display a live image as a still image, click on **Still image** or use the footswitch (if the footswitch has been set for the Still image function, please see *Section 5.2.2 System Setup* for details). The auto-still image time can be set by the system. This means that, if no operation is performed by the user within the setup period, the system will go to still-image mode and the image is automatically displayed as a still image.

**Display in Live mode:** when in still-image mode, click on **Still image** or use the footswitch (if the footswitch is set to the still image function, see *Section 5.2.2 System Setup* for details) to return to Live mode. When Still image mode is exited, the system refreshes the display.





**NOTE:** The footswitch is a pedal control device connected with a cable. The operational voltage is 5 V DC. Careless operation will not necessarily result in a hazard. Liquids must not be allowed to penetrate the footswitch.

### 7.3.5 Parameter Display

Click on the **Menu** button on the control panel to display the parameter control window, as can be seen below. Click again on **Menu** to close the window.

In single mode, the parameter of this mode is displayed on the left-hand side of the screen. When different modes are selected, the parameter of the current mode is displayed as a priority, and the parameters of other modes are hidden in the tabs. The user can click on 2D tab, C or PW to switch to and adjust a parameter for other modes.

The mode displays for 2D, CFM, and PW modes can be seen in Figure 51 .



Figure 51: Parameter display for 2D mode, CFM mode and PW mode

### 7.3.6 Full Screen Display

Click outside 4D, input and in the non-recording state, and without opening a screen and click on the **Full Screen** or **F** key on the control panel to activate full-screen display. The image is enlarged and displayed in full-screen mode, with its relevant parameter information hidden.

Click on the **Full Screen** or **F** key again to exit the full-screen display.



**NOTE:** *You cannot save or open media files in full-screen view; opening Archive Management or Store Setup automatically ends the full-screen display.*

## 7.4 B Mode Imaging

### 7.4.1 Entering B Mode

B mode is the default imaging mode on system start-up. To re-enter B mode from a different imaging mode, click on **B Mode** on the control panel. See Figure 52.

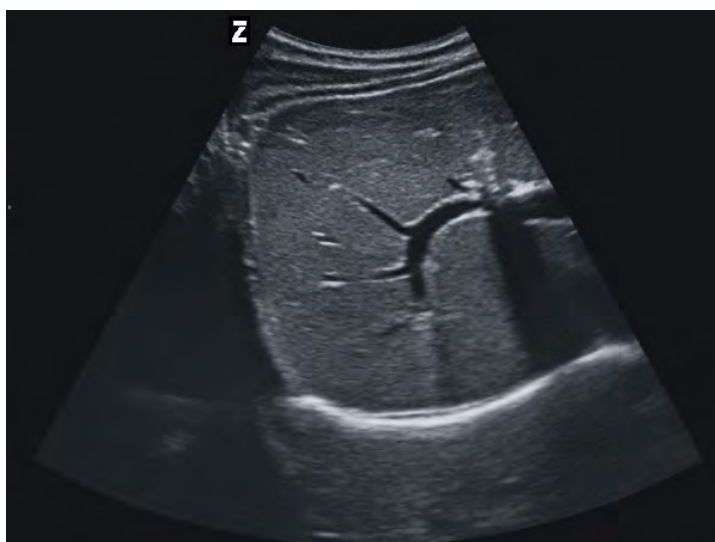


Figure 52: B mode

### 7.4.2 B Mode Imaging - Parameter Setup

B mode imaging parameters are displayed on the left-hand side of the ultrasound interface. The imaging parameter display changes according to the specific imaging mode and state.

There are two ways of changing the imaging parameters:

- (1) Control or adjustment via the buttons, controls, slider or trackball on the control panel (*The **control panel** is marked in the following introduction*).
- (2) Setup in the parameter control window (*The **parameter control window** is marked in the following introduction*).

B_Gain	<ul style="list-style-type: none"> <li>• <b>Control panel:</b> When in B mode Live state, turn the <b>Gain/Auto</b> control to adjust the gain in B mode image.</li> <li>• <b>Parameter control window:</b> In B mode Live state, click on <b>Set</b> to activate the cursor, use the trackball (or touchpad) to move the cursor to <b>B_Gain</b> in the left-hand side of the screen, and the parameter turns blue. Turn the <b>Value</b> control to set the gain for the B mode image.</li> </ul> <p><i>NOTE: Set the appropriate gain. For example, to display the liver, adjust the gain to produce an image with normal evenness and structures, with identification of the membrane reflector band closely near the rear of the liver. The portal vein and the hepatic vein are displayed as an echo-free tract structure in the cavity. Echoes are reflected off the portal vein wall, while echoes from the hepatic wall are weaker than those from the portal vein.</i></p> <p><i>NOTE: Wrong gain may result in incorrect diagnosis, or inability to diagnose. If the gain is too low, a solid tumour may appear cystic without a detectable echo inside. The echoes on the rear side, however, are amplified. If the gain is too high, the liquid structure can be similar to a solid tumour; or the normal amniotic fluid can be full of bright point echoes, and the picture shown is similar to cloudy amniotic fluid, which can lead to a misdiagnosis .</i></p> <p><i>NOTE: If overall gain is low, the overall sensitivity is low and the image appears dark, which is, however, advantageous for BPD measurement.</i></p> <p><i>NOTE: Apply more coupling gel on the part of the body to be examined or to the probe, if the picture is not clear when the gain is changed.</i></p>
TGC	<p>TGC (Time Gain Control) sliders (slide potentiometers) control the strength level of echo signals in the specific imaging area. In the Live state, slide the control to the right to amplify, and to the left to weaken the echo signals. When adjusting the TGC, the TGC graph is displayed to the right of the image on the screen.</p> <p><i>SUGGESTION: Adjust the values of the TGC control as follows: weak in the near field and strong in the far field.</i></p>
Frequency (freq)	<ul style="list-style-type: none"> <li>• <b>Control panel:</b> In B mode, click on Live state to turn on the <b>Freq/THI</b> display on the <b>Depth/Freq/THI</b> control, then turn the control to adjust the frequency of the picture in B mode.</li> <li>• <b>Parameter control window:</b> In B mode, press Live state to activate the cursor on <b>Set</b> when the parameter control window is displayed. Use the trackball to move the cursor to <b>Freq</b> on the left of the screen, and the parameter turns blue. Turn the <b>Value</b> control to adjust the frequency of the B mode image.</li> </ul>

Sound (PWR)	power	<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> In B mode, press Live state to activate the cursor on <b>Set</b> when the parameter control window is displayed. Then use the trackball (or the touch pad) to move the cursor in the parameter control window to <b>PWR</b>, and the parameter turns blue. Turn the <b>Value</b> control to adjust the power. Changing the PWR may affect the system parameters of acoustic output.</li> </ul> <p><i>NOTE: Provided the diagnosis can be made, use a power level that is as low as possible so as to avoid injury to the patient. To ensure ultrasound safety, it is also forbidden to fix the probe to a specific part of the patient's body and to scan it for an extended period of time.</i></p>
Focus Number (PTN) & Focus Span (SPAN)		<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> In B mode, press Live state to activate the cursor on <b>Set</b> when the parameter control window is displayed. Use the trackball to move the cursor in the parameter control window to <b>PTN</b> or <b>SPAN</b>, and the parameter turns blue. Turn the <b>Value</b> control to change the focus number of focus span.</li> </ul> <p><i>NOTE: If multiple focuses are in use, the frame rate is decreased, which affects the real-time playback of the image. When scanning a fast-moving organ, it is recommended using only one focus.</i></p>
Focus Position (Focus Pos)		<ul style="list-style-type: none"> <li>• <b>Control panel:</b> If the cursor is not activated in the Live state, move the focus position upwards or downwards with the trackball.</li> </ul>
Line Density (LD)		<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> In B mode, press Live state to activate the cursor on <b>Set</b> when the parameter control window is displayed. Use the trackball to move the cursor in the parameter control window to <b>LD</b>, and the parameter turns blue. Turn the <b>Value</b> control to the available line density in several steps.</li> </ul>
Dynamic (DYN)	Range	<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> In B mode, press Live state to activate the cursor on <b>Set</b> when the parameter control window is displayed. Use the trackball to move the cursor in the parameter control window to <b>DYN</b> and the parameter turns blue. Turn the <b>Value</b> control to increase or decrease the dynamic range, and so change image saturation.</li> </ul> <p><i>If the dynamic range is set too low, image information may be insufficient; while if the dynamic range is set too high, too much useless image information will be transferred.</i></p>

* B_Chroma	<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> In B mode, press Live state to activate the cursor on Set when the parameter control window is displayed. Use the trackball to move the cursor in the parameter control window to <b>B_Chroma</b> and the parameter turns blue. Turn the <b>Value</b> control to select; multiple steps of chroma are available.</li> </ul>
Speckle Reduction (Nanoview)	<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> In B mode, press Live state to activate the cursor on Set when the parameter control window is displayed. Use the trackball to move the cursor in the parameter control window to <b>Nanoview</b> and the parameter turns blue. Turn the <b>Value</b> control to select, where multiple steps are available.</li> </ul>
Enhancement (ENH)	<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> In B mode, press Live state to activate the cursor on Set when the parameter control window is displayed. Use the trackball to move the cursor in the parameter control window to <b>ENH</b> and the parameter turns blue. Turn the <b>Value</b> control to increase or reduce the enhancement. Adjusting the enhancement makes the image edge clearer.</li> </ul>
Persistence (PER)	<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> In B mode, press Live state to activate the cursor on Set when the parameter control window is displayed. Use the trackball to move the cursor in the parameter control window to <b>PER</b> and the parameter turns blue. Turn the <b>Value</b> control to adjust the persistence.</li> </ul>
Smoothness (SMO)	<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> In B mode, press Live state to activate the cursor on Set when the parameter control window is displayed. Use the trackball to move the cursor in the parameter control window to <b>SMO</b> and the parameter turns blue. Turn the <b>Value</b> control to adjust the smoothness value.</li> </ul> <p><i>NOTE: Surface Smoothing and Enhancement cannot be performed at the same time. If either item is changed, the other is automatically reset to 0.</i></p>
* B Blades of grass (B_GSC)	<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> In B mode, press Live state to activate the cursor on Set when the parameter control window is displayed. Use the trackball to move the cursor in the parameter control window to <b>B_GSC</b> and the parameter turns blue. Turn the <b>Value</b> control to select different greyscale curves.</li> </ul>

Depth Display	<ul style="list-style-type: none"> <li>• <b>Control panel:</b> To turn on the <b>Depth</b> display in B-mode Live state, click on <b>Depth/Freq/THI</b> and rotate the control to adjust the depth of the image display. The frame rate depends on the depth display. The lower the depth, the lower the frame rate and vice versa.</li> <li>• <b>Parameter control window:</b> In B mode Live state, use the trackball to move the cursor to the value <b>X.X cm</b> in the left parameter area, and the parameter turns blue. Turn the <b>Value</b> control to adjust.</li> </ul> <p><i>NOTE: The setting of the display depth depends on the probe.</i></p> <p><i>NOTE: In magnification, the depth setting is invalid.</i></p>
Angle/Width	<ul style="list-style-type: none"> <li>• <b>Control panel:</b> To turn on the <b>Angle</b> display in B mode Live state, click on the <b>Angle/Control</b> control and turn the control to adjust the angle/width.</li> <li>• <b>Parameter control window:</b> To activate the cursor in B-mode Live state, click on <b>Set</b> when the parameter control window is displayed. Use the trackball to move the cursor in the parameter control window to <b>Angle/Width</b> and the parameter turns blue. Turn the <b>Value</b> control to adjust.</li> </ul> <p><i>NOTE:</i></p> <ol style="list-style-type: none"> <li>1) <i>When using a convex probe, the display item is Angle; when using a linear probe, the display item is Width.</i></li> <li>2) <i>Use a convex probe and adjust Angle to its maximum value. The control parameter area now displays Angle Ext. (Angle ext.) on, this feature is for Extended Sector Imaging.</i></li> <li>3) <i>Use a linear probe to adjust Width to its maximum and the control parameter area displays Width Ext. This function is for Trapezoidal Imaging, which enlarges the field of view of the ultrasound section and the scan range so as to accommodate more diagnostic information, which is conducive to better observation.</i></li> </ol>
Negative/Positive Reverse	<p><b>Control panel:</b> Click on <b>N</b> to toggle between positive and negative in live or still image state. The default settings at system start-up is positive mode (white text on a black background).</p>

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| *L/R<br>(L/R) | Reversal | <ul style="list-style-type: none"><li>• <b>Control panel:</b> In B mode Live state, click on <b>L/R</b>, to reverse the image to the left/right. The mark ● represents the orientation for the start of the scan with the probe and can be moved from left to right, as shown in Figure 53 .</li></ul> |
|---------------|----------|--|

**NOTE:** *If the image is reversed, only the alignment mark ● is reversed, and not the pictographs, scale or markings for the active image.*

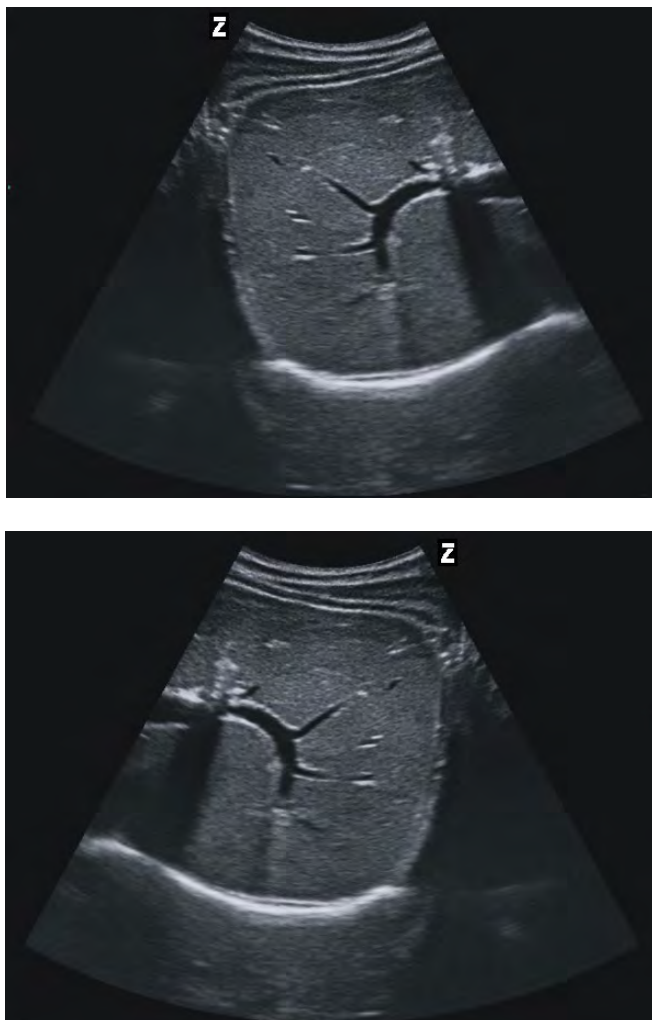


Figure 53: L/R Reversal

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- \* Up/Down Inversion (Inv) • **Control panel:** In B mode Live state, click on **Inv** to reverse the image upwards or downwards. The mark • represents the orientation for the start of the scan with the probe and can be moved up or down, as shown in Figure 54

**NOTE:** If the image is reversed, only the orientation mark • is reversed, and not the pictographs, scale or markings for the active image.

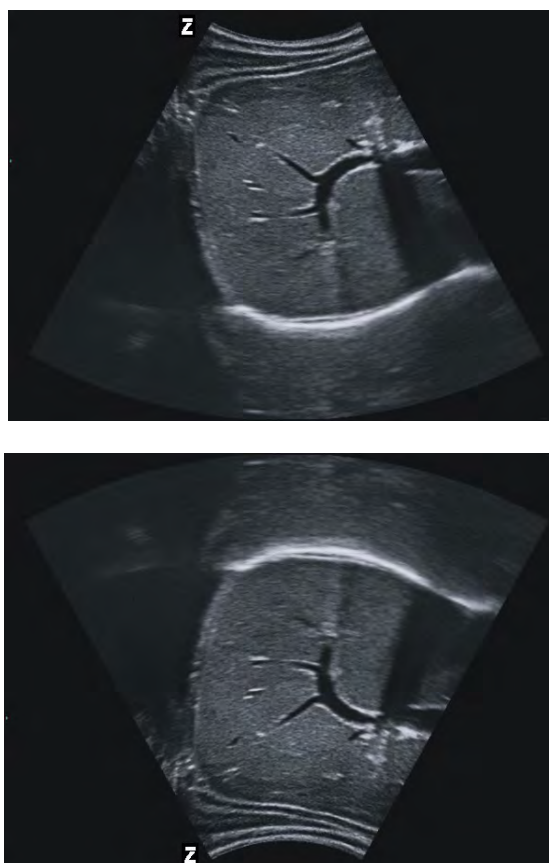


Figure 54: Up/Down Inversion

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**NOTE:**

- 1) In any mode or state, click on **Menu** to open the parameter control window, then turn the **Value** control to select a parameter in the control window; the selected parameter is shown in blue. Click on the **Value** control for a parameter and the parameter is displayed in grey. Turn the **Value** control to change the parameter value. Click on the **Value** control again to confirm the parameter.
- 2) The item marked with a \* means that the parameter process is also available in the film state.



### 7.4.3 Biopsy Guide Line

In Live state, click once on **Guide (Guide line)** on the control panel to display the biopsy guide lines, which are a pair of parallel, vertical dotted lines on the screen, spaced 1 cm apart, and the biopsy needle displayed in the middle between the two biopsy guide lines.

Press the **Y** key to switch to single biopsy guide line. Press **Y** repeatedly to toggle between single line and double lines.

*NOTE: For the biplane probe, only one biopsy line is available.*

Press **G** on the keyboard to toggle the display style of biopsy guide line. Two display styles of biopsy guideline are available, as shown in Figure 55.

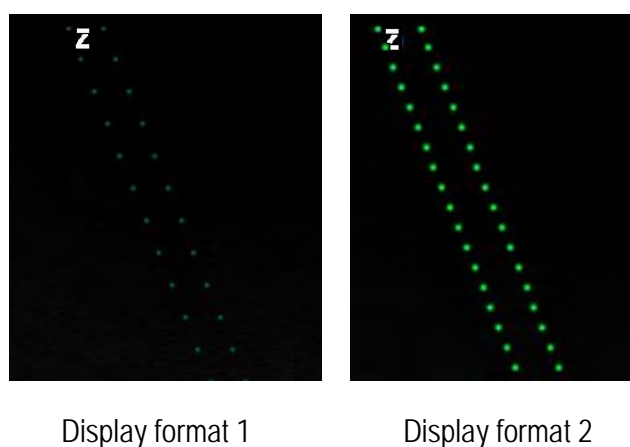


Figure 55: Biopsy Guide Line Display Format

The start point and angle of the biopsy guide line depend on the probe. The start point can be set using the **Q** and **W** keys, and the angle using the **E** and **R** keys. The position and angle values are displayed live on the screen.

Click on **Guide (Guide line)** on the control panel to turn off the biopsy guide line display.

*NOTE: If the probe supports different biopsy guide lines, click again on Guide to show a further biopsy guide line; hold Guide down until the biopsy guide line display turns off.*

*NOTE: Go to Biopsy Guide Line Setup in Setup - Exam Setup to save the parameters for the examination type before you switch off the biopsy guide line. See Section 5.2.5 for detailed instructions on setup.*

*NOTE: The Biopsy Guideline function depends on the probe model and is only available for B mode images.*



*NOTE: The biopsy should only be performed by persons qualified for this procedure, otherwise there is a risk of serious injury to the patient.*

### 7.4.4 Positioning of the Central Line

In the Live state, press **L**, and a positioning line is displayed in the centre of the image. Press **L** again to close the display of the central line for positioning. If the central positioning line is active, click on **Calc** to perform dynamic measurement.

*NOTE: The dynamic measurement function with the central positioning line is available for all probes, but for B mode images only.*

#### 7.4.5 Optimisation

In the Live state, click on Gain/Auto, **Auto-Fit**, to achieve one-touch optimisation, and all parameters are adjusted to the optimal state.

*NOTE: Adjusting B gain or TGC exits optimisation automatically.*

#### 7.4.6 Tissue Harmonic Imaging (THI)

In the Live state, click on the **Depth/Freq/THI** control to switch on the **Freq/THI** display and turn the control to set the B frequency to the highest level. Continue turning the control to enter THI (Tissue Harmonic Imaging) mode. The letter **H** is displayed on-screen in front of the frequency.

Once Tissue Harmonic Imaging has been turned on, turn the **Depth/Freq/THI** control continuously to adjust the harmonic frequency.

The THI images are displayed as shown in Figure 56 .



Figure 56: Tissue Harmonic Imaging

#### 7.4.7 XBeam

In the Live state, click on the hotkey assigned to XBeam (this must be set up by the user, see Section 5.2.3.1) to activate the function.

The “**XBeam**” parameter is displayed in the parameter control window. Next, use the trackball to move the cursor to **XBeam** and the parameter turns blue. Turn the **Value** control to adjust. There are three options: **High**, **Medium**, **Low**.

Press the assigned hotkey again to turn off XBeam.

## 7.5 Multiple B Mode Imaging

In the Live state, click once on the **2B/4B** button to open Imaging (see Figure 57); double-click on **2B/4B** to open 4B Imaging; click a third time on **2B/4B** to return to 2B Imaging. Press continuously on **2B/4B** to toggle between 2B and 4B Imaging.

When multiple B mode images are displayed, the image with a green focus marking is ► live. Turn the **Value** control or click on **Update** on the control panel to toggle between multiple B mode images.

*NOTE: To set multiple B mode imaging parameters, see 6.4.2.*

*If a biplane probe is purchased as an option, switching the display area in 2B mode will switch to another probe scan plane.*

1. Once the probe is properly connected, select one of the scan planes in B mode. Click on the **2B/4B** button on the control panel to open 2B mode. Now the left side displays the live B mode image of one scan plane.
2. Click on **Update**. The left-hand image is a still image and the system automatically switches to another scan plane. The live image is displayed on the right of the image area.
3. Click again on **Update**. The system reverts to the original scan plane, with the live image displayed on the left, and the still image on the right.
4. Hold down the **Update** button to cycle through and display the two scan planes of the probe. This function is helpful for the user to make direct observation and comparison of images in two scan planes.

*NOTE: The real-time display of double images can be achieved with biplane probes.*

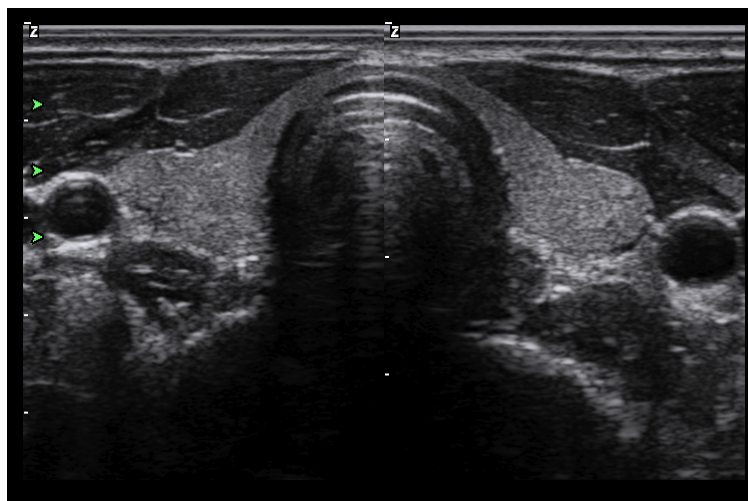


Figure 57: 2B mode image

## 7.6 B/M Mode Imaging

### 7.6.1 Entering B/M mode

When in the Live state, click on **M mode** on the control panel to enter B/M standby mode. A sampling line in M mode appears on the B-mode image. Move the trackball to control the position of the M-mode sampling line.

Click again on **M mode** to activate the sweep in M mode and go to B/M mode imaging (Figure 58), in which the B-mode image and the M-mode image are displayed up and down. When in live B/M mode imaging, use the trackball to control the position of the sampling line in M mode.

Click a third time on **M mode** to revert to B/M standby mode.

Click on **B mode** to revert to single B mode.

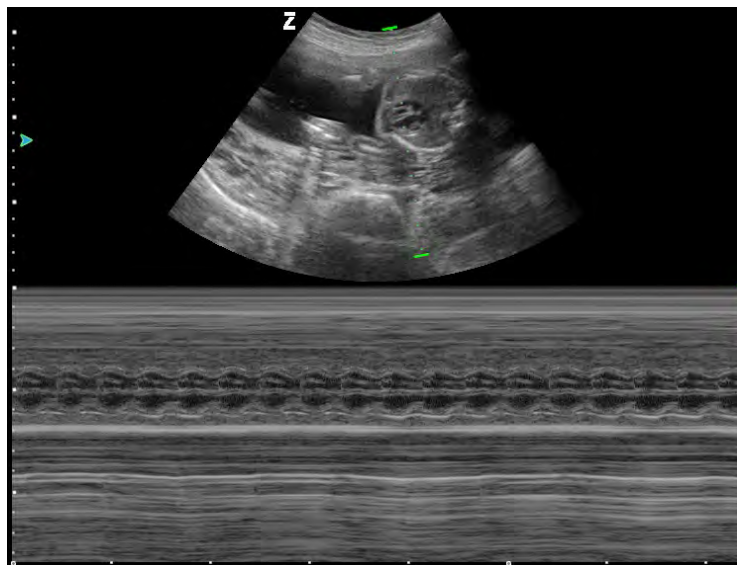


Figure 58: B/M mode

### 7.6.2 B/M mode imaging parameter adjustment

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M_Gain	<ul style="list-style-type: none"> <li>• <b>Control panel:</b> Turn the <b>Gain Auto</b> control in live M mode to adjust the gain in B-mode imaging.</li> <li>• <b>Parameter control window:</b> To activate the cursor in M mode Live state, click on <b>Set</b> when the parameter control window is displayed. Use the trackball to move the cursor to <b>M_Gain</b> on the left of the screen and the parameter turns blue. Turn the <b>Value</b> control to adjust the gain of the M-mode image.</li> </ul>
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| M velocity<br>(MSP) | <ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> To activate the cursor in M mode Live state, click on Set when the parameter control window is displayed. Use the trackball to move the cursor to <b>MSP</b> in the control window and the parameter turns blue. Turn the <b>Value</b> control to adjust.</li> </ul> |
|---------------------|--|

*Adjusting the MSP may affect the scroll speed and waveform display of imaging in M mode. Fewer, but larger, waves with higher velocity are displayed at higher velocity, and more, but smaller waves are displayed at lower velocity for the same section.*

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| Layout | <ul style="list-style-type: none"> <li>• <b>Control panel:</b> In live M mode Live state, click on <b>Layout</b> or the <b>V</b> button to toggle through the types of split imaging display in B/M mode: 9 layout options are available:</li> </ul> |
|--------|--|

B mode image/M mode trace up/down display, 8 options;

*NOTE: The last opportunity For up/down display is full-screen M mode.*

Display of B mode image/M mode trace left/right display, 1 option.

*NOTE: This function is only available with some models.*

*NOTE: For up/down layout, the image height in M mode is increased or reduced by 30 pixels at each step, and the image itself increased or reduced by 30 pixels.*

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*NOTE: See 6.4.2 for additional parameter settings in B/M mode.*

### 7.6.3 Anatomical M mode

In B/M or temporary M mode, click on the hotkey assigned to anatomical M mode (which must be set by the user); see Section 5.2.3 to activate this function. A sampling line is displayed on the B image, as shown in Figure 59. Rotate the trackball to adjust the position of the M sampling line.

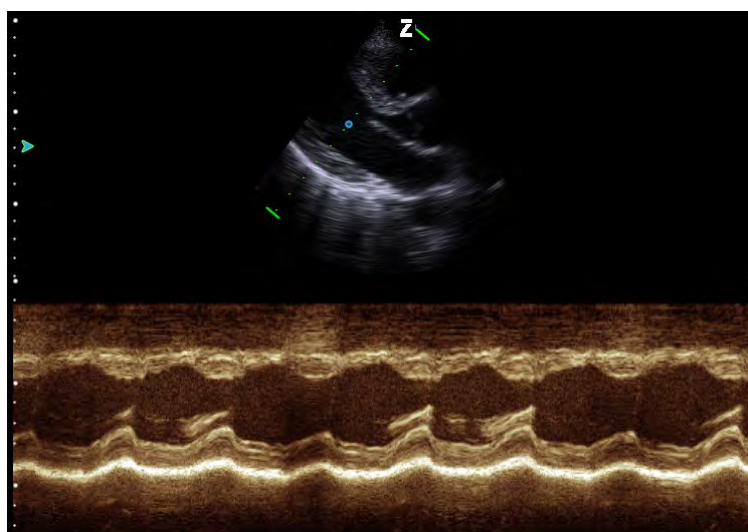


Figure 59: Imaging in anatomical M mode

Once anatomical M mode has been turned on, an **M\_Line** is displayed in the parameter control window. **M\_angle** and **AM\_velocity** are changed to adjustable with the following settings:

M_Line	<p><b>Parameter control window:</b></p> <p>The system supports three-line anatomical M mode, with the numbers 1, 2 and 3 used to identify the sampling lines. The user can set up the display of the number of M-mode sample lines.</p> <p>Click on Set to activate the cursor when the parameter control window is displayed. Use the trackball to move the cursor onto the <b>M_Line</b> control parameter and turn the Value control to make the setting.</p> <p>When multiple sample lines are displayed, click several times on Update to cycle through the controls for each sampling line. The sampling line under control is green.</p>
M_Angle	<p><b>Parameter control window:</b> When in Live state, click on <b>Set</b> to activate the cursor when the parameter control window is displayed. Use the trackball to move the cursor to <b>M_Angle</b> in the parameter control window and the parameter turns blue. Turn the <b>Value</b> control to change the angle of the M-mode sampling line under control, and rotate it against the number centre.</p>
Anatomical M Speed (AM_Speed)	<p><b>Parameter control window:</b> When in Live state, click on <b>Set</b> to activate the cursor when the parameter control window is displayed. Use the trackball to move the cursor to <b>AM_Speed</b> in the parameter control window and the parameter turns blue. Turn the <b>Value</b> control to adjust the speed in M mode.</p>

## 7.7 Colour Flow Map Imaging (CFM)

### 7.7.1 Entering the Colour Flow Map (CFM)

In Live state click on **C mode** to enter colour flow map mode (see Figure 60). Use the trackball to move the colour ROI box to the position that is to be scanned. Then click on **Update** to change the solid lines of the colour ROI box to dotted lines, move the trackball and adjust the size of the colour ROI box. Click on **Update** again to fix the size of the box, which restores the trackball function to change the position of colour ROI box.

When using a linear probe, click on the **Angle/Steer** control to switch on the **Control** display, then turn the control to set the control angle of the colour ROI.

Click on **C mode** again to return to single B mode.

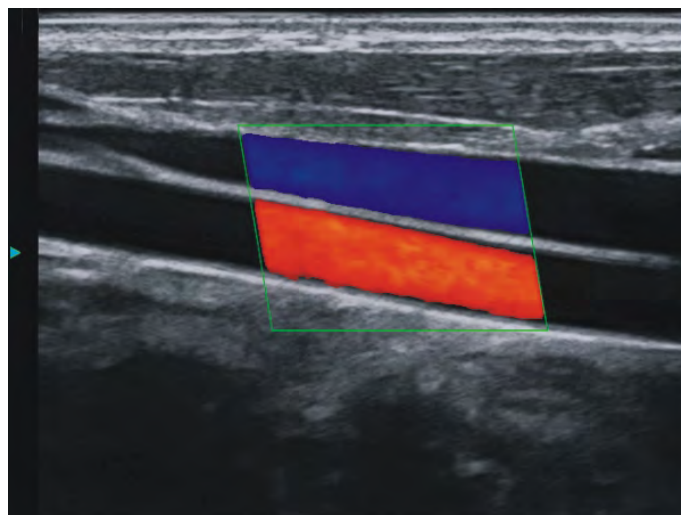


Figure 60: Colour Flow Map

## Colour Flow Map parameter setup

Colour (C_Gain)	Gain	<ul style="list-style-type: none"> <li>• <b>Control panel:</b> In CFM mode Live state, turn the <b>Gain/Auto</b> control to adjust the colour gain of the image. Turn the control clockwise to increase the flow signal level within the colour ROI box, or anticlockwise to decrease it.</li> <li>• <b>Parameter control window:</b> In CFM mode Live state, click on <b>Set</b> to activate the cursor when the parameter control window is displayed. Use the trackball to move the cursor to <b>C_Gain</b> on the left side of the screen and the parameter turns blue. Turn the <b>Value</b> control to adjust the gain of the image in CFM mode.</li> </ul> <p><i>NOTE: Greater colour gain increases the colour flow sensitivity. Too little colour gain can lead to poor signal saturation of the colour flow and to murky image colour. Excessive colour gain can lead to an obvious running out of the colours.</i></p>
Colour frequency (C_Freq)		<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> In CFM mode Live state, click on <b>Set</b> to activate the cursor when the parameter control window is displayed. Use the trackball to move the cursor to <b>C_Freq</b> in the parameter control window and the parameter turns blue. Turn the <b>Value</b> control to adjust it.</li> </ul> <p><i>NOTE: A higher colour frequency favours the detection of low blood circulation speed. However, excessively high colour frequency may cause defects.</i></p>
* C_Priority (Colour Priority) (C_Prior)		<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> In CFM mode Live state, click on <b>Set</b> to activate the cursor when the parameter control window is displayed. Use the trackball to move the cursor to <b>C_Prior</b> in the parameter control window and the parameter turns blue. Turn the <b>Value</b> control to adjust the 2D priority of the colour Doppler.</li> </ul>



* C_Map (Colour Map)	<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> In CFM mode Live state, click on <b>Set</b> to activate the cursor when the parameter control window is displayed. Use the trackball to move the cursor to <b>C_Map</b> in the parameter control window and the parameter turns blue. Turn the <b>Value</b> control to select the desired map according to the needs and preferences of the user.</li> <li>• When in Live or Freeze mode, click on <b>Inv</b> to invert the colour map, and the colour flow in the ROI box changes accordingly.</li> <li>• If <b>C_Map</b> is adjusted in the final step, the <b>B-flow</b> is opened.</li> </ul>
Median filter (M_Filter)	<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> In CFM mode Live state, click on <b>Set</b> to activate the cursor when the parameter control window is displayed. Use the trackball to move the cursor to <b>C_Filter</b> in the parameter control window and the parameter turns blue. Turn the <b>Value</b> control to adjust the colour Doppler median filter.</li> </ul> <p><i>NOTE: The median filter – without a negative value – is used for eliminating speckles and image noise.</i></p>
* Colour Threshold (Thred)	<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> In CFM mode Live state, click on <b>Set</b> to activate the cursor when the parameter control window is displayed. Use the trackball to move the cursor to <b>Thred</b> in the parameter control window and the parameter turns blue. Turn the <b>Value</b> control to adjust the colour Doppler threshold.</li> </ul> <p><i>NOTE: A high threshold value can reduce noise. However, if the threshold value is too high, flow information may be easily filtered out.</i></p>
Persistence (C_PER)	<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> In CFM mode Live state, click on <b>Set</b> to activate the cursor when the parameter control window is displayed. Use the trackball to move the cursor to <b>C_PER</b> in the parameter control window and the parameter turns blue. Turn the <b>Value</b> control to adjust the persistence level. The higher the persistence, the greater the S/N ratio and the better the image definition.</li> </ul> <p><i>NOTE: The higher the persistence, the better the image definition, while there is a significant deterioration in real-time display. When scanning fast-moving organs and structures, the image may wobble and blur.</i></p>



* C_Smoothness (C_SMO)	<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> In CFM mode Live state, click on <b>Set</b> to activate the cursor when the parameter control window is displayed. Use the trackball to move the cursor to <b>C_SMO</b> in the control window and the parameter turns blue. Turn the <b>Value</b> control to adjust the smoothness.</li> </ul> <p><i>NOTE: The minus value represents gain, while the plus value represents smoothness.</i></p>
Pulse Repetition Frequency (PRFc)	<ul style="list-style-type: none"> <li>• <b>Control Panel:</b> In CFM mode Live state, click on <b>Scale</b> on the control panel, then turn the <b>Value</b> control to adjust the pulsed wave frequency. The adjustment may increase or decrease the detection range of flow velocity.</li> <li>• <b>Parameter control window:</b> In CFM mode Live state, click on <b>Set</b> to activate the cursor when the parameter control window is displayed. Use the trackball to move the cursor to <b>PRFc</b> in the control window and the parameter turns blue. Turn the <b>Value</b> control to adjust it.</li> </ul> <p><i>NOTE: Higher PRF results in a more easily detectable flow rate, lower colour saturation, and higher frame rate. In contrast, a lower PRF results in a less easily detectable flow rate, higher colour saturation, and lower frame rate. It is better to adjust this value in such a way that no colour inversion occurs. If you detect that flow velocity is low, decrease the PRF value so as to increase the sensitivity of the colour flow signal. A low PRF can easily lead to colour aliasing and mosaic images.</i></p>
Wall Filter (WF)	<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> In CFM mode Live state, click on <b>Set</b> to activate the cursor when the parameter control window is displayed. Use the trackball to move the cursor to <b>WF</b> in the parameter control window and the parameter turns blue. Turn the <b>Value</b> control to adjust the wall filter. This is used to remove colour defects caused by vascular wall pulsation or valve activity.</li> </ul> <p><i>NOTE: This setting is relative to colour sensitivity.</i></p> <p>To detect high-velocity flow, increase the WF value to eliminate frequency shift defects due to low velocity and low wall activity. To detect low-velocity flow, decrease the WF value to avoid cutting off flow signals.</p>
Line density (C_LD)	<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> In CFM mode Live state, click on <b>Set</b> to activate the cursor when the parameter control window is displayed. Use the trackball to move the cursor to <b>C_LD</b> in the control window and the parameter turns blue. Turn the <b>Value</b> control to adjust line density. Several degrees of line density are available for selection.</li> </ul>

* Baseline	<ul style="list-style-type: none"> <li>• <b>Control panel:</b> In CFM mode Live state, click on <b>Base</b> on the control panel, then turn the <b>Value</b> control to move the baseline on the colour map up or down.</li> <li>• In CFM Live state, click on <b>Inv</b> to toggle the direction of the colour map against the baseline.</li> </ul>
colour Enhancement (C_ENH)	<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> In CFM mode Live state, click on <b>Set</b> to activate the cursor when the parameter control window is displayed. Use the trackball to move the cursor to <b>C_ENH</b> in the control window and the parameter turns blue. Turn the <b>Value</b> control to adjust it. Several steps are available for selection.</li> </ul> <p><i>NOTE: Increasing the colour gain parameters decreases the frame rate.</i></p>
B/C Division	<ul style="list-style-type: none"> <li>• <b>Control panel:</b> In CFM mode Live state, click on <b>B/C</b> to enable split-screen on both sides. The left-hand screen shows the live 2D CFM image, while the right-hand screen is a live 2D image in B mode. When in B/C split screen, click on <b>B mode</b> or <b>C mode</b> to return to B or CFM mode on the entire screen.</li> </ul>
* Colour On/Off	<ul style="list-style-type: none"> <li>• <b>Control panel:</b> In CFM mode Live state, click on the hotkey assigned to the Colour On/Off button to turn CFM on or off. If turned off, the colour ROI box becomes dim.</li> </ul>
Sample Volume (C_Gate)	<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> In CFM mode Live state, click on <b>Set</b> to activate the cursor when the parameter control window is displayed. Use the trackball to move the cursor to <b>C_Gate</b> in the control window and the parameter turns blue. Turn the <b>Value</b> control to adjust the size of sample volume.</li> </ul>

*NOTE: See Section 7.7 for instructions on other parameter settings in CFM mode.*

*NOTE: An asterisk \* above an item means that the parameter operation is also available in the film state.*

### 7.7.2 VS Flow (Vector Flow Mapping)

This feature was designed for low-velocity flow imaging.

In live CFM mode, click on the hotkey assigned to VS Flow to turn on the VS Flow function.

The “**VS**” parameter is displayed in the parameter control window. Use the trackball to move the cursor to **VS** and the parameter turns blue. Turn the **Value** control to adjust VS Flow sensitivity, with high and low steps available.

Click on the hotkey assigned to VS Flow function again to turn it off.

The VS flow images can be seen in the Figure below.

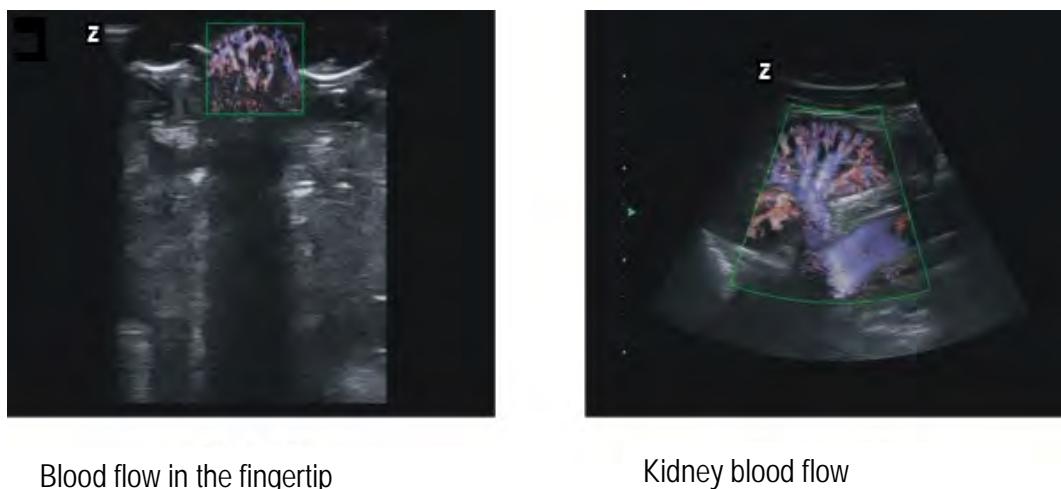


Figure 61: VS Flow imaging

## 7.8 colour M Mode (Option)

Similarly, to the display of echocardiography in M mode, colour M Mode imaging uses a coloured band to indicate the direction of cardiac motion, velocity and change in duration of different stages of the cardiac cycle. The direction of myocardial tissue movement can be determined from colour change. colour M Mode is clinically applied to: determination of myocardial phase velocity change and distribution, reflecting the speed of myocardial motion, and so on.

When in CFM Live state, adjust the size and position of the colour ROI box. When in **M mode**, click on the button on the control panel to open standby mode for the colour-M button. An M-mode sampling line appears on the colour Doppler flow image; you can move the trackball to control the sampling position of the sampling line in M mode.

Click on **M mode** to enter colour imaging in M mode. The CFM image and colour M-mode image are displayed from top to bottom, with the colour M-mode image live, and the CFM image is displayed as a still image, as shown in Figure 59 . Now use the trackball to control the sampling position of the sampling line of the M image.

Click on **Update** to activate the CFM image while the colour picture is displayed as a still image in M mode. Repeatedly press **Update** to cycle through the Live states in CFM and colour M mode.

Click on **Freeze** to stop scanning in colour M mode.

Click on the **C mode** control to leave colour M mode and return to M mode standby.

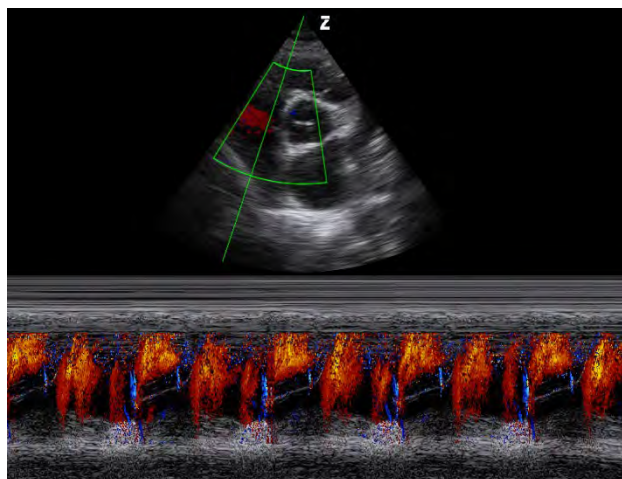


Figure 62: Coloured M-imaging

*NOTE: If CFM image is activated, you can set the CFM parameters. See 7.7.2 for parameter adjustment; If Colour M Image is activated, you can adjust the M mode parameters. See 7.6.2 for information on parameter setup.*

## 7.9 Colour Power Angio Imaging (CPA)

When using a non-phased array probe, in Live state, press **CPA/TDI** on the control panel to enter Colour Power Angio mode. See Figure 63.

*NOTE: When using a phased array probe and TDI function is activated, press the CPA/TDI button the first time to enter TDI mode, and press it again to enter CPA mode.*

Use the trackball to move the colour ROI box to the position that is to be scanned. Click on **Update** to change the solid lines of the colour box to dotted lines. Then use the trackball to adjust the size of the colour ROI box. Click on **Update** again to fix the size of the box.

When using a linear probe, click on the **Angle/Steer** control to switch on the **Control** display and turn the control to adjust the control angle of the colour ROI.

Click on **B mode** to leave CPA mode and return to single B mode.

*NOTE: See Section 7.7.2 for information on the setup of Colour Power Angio Imaging parameters.*

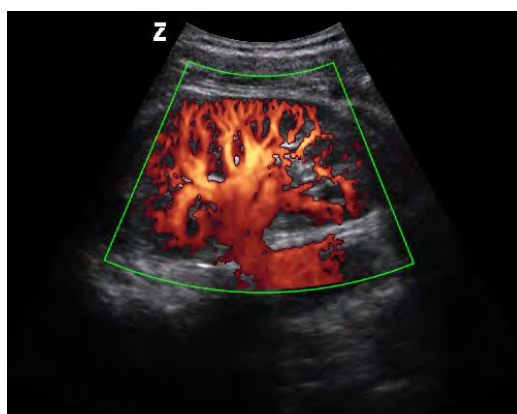


Figure 63: CPA Imaging

## 7.10 Pulsed Wave Doppler Imaging (PW)

### 7.10.1 Entering Pulsed Wave Doppler Mode

When in Live state, click on **PW** to open a PWD sampling line and volume on the image area and to enter PW standby mode, as shown in Figure 64 .

Click on the **Angle/Steer** control to switch on the angle indicator and turn the control to change the correction angle.

When using a linear probe, click on the **Angle/Steer** control to switch on the **>Control** display and turn the control to adjust the steer angle of the sampling line.

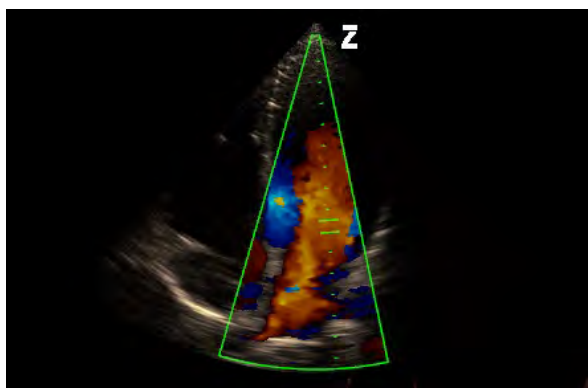


Figure 64: Sampling volume for the Pulse Wave Doppler

Click on **PW** or **Set** again to activate PW mode. When entering PW mode, the B and PW images are displayed from top to bottom, with the B-mode image shown as a still image, as shown in Figure 65 .

When first activating B mode, and to freeze PW mode, click on **Update**, and click again on **Update** to activate both images at the same time; click a third time on **Update** to activate PW mode and move B into still-image mode. Repeatedly pressing the button allows you to cycle through the procedures listed above.

Click a third time on **PW** to enter full-screen PW scan.

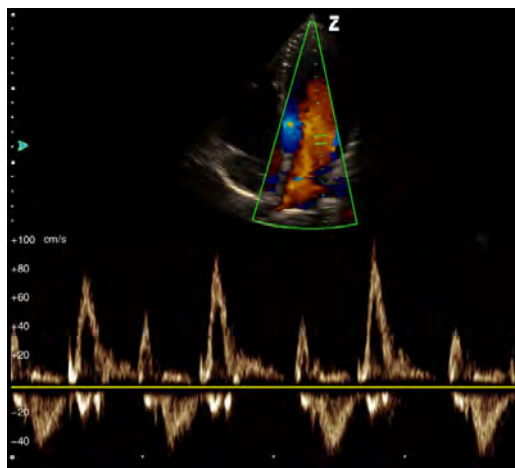


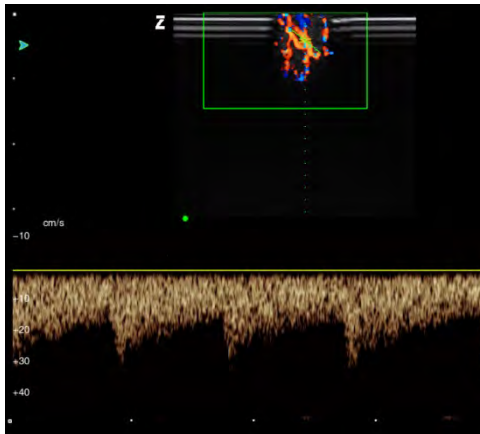
Figure 65: Imaging with Pulse Wave Doppler

### 7.10.2 Pulsed Wave Doppler Parameter Adjustment

D_Gain	<ul style="list-style-type: none"> <li>• <b>Control panel:</b> Turn the control in the Live state of PW mode for <b>Gain/Auto</b> to adjust the gain in B-mode image.</li> <li>• <b>Parameter control window:</b> In PW mode Live state, click on <b>Set</b> to activate the cursor if the parameter control window is displayed. Use the trackball to move the cursor to <b>D_Gain</b> in the left of the screen and the parameter turns blue. Turn the <b>Value</b> control to adjust the gain of the PW-mode image.</li> </ul> <p><i>NOTE: The spectrum displays noise if the gain is too high, or weak signals if the gain is too low.</i></p>
Correct Angle (Angle)	<ul style="list-style-type: none"> <li>• <b>Control panel:</b> When in PW standby mode, click on the <b>Angle/Steer</b> control to switch on the angle indicator, then turn the control to set the correct angle. This setting is used to calibrate the angle between the vector angle and the flow direction. The correction guideline and angle are displayed at the sample volume position.</li> <li>• <b>Parameter control window:</b> In PW mode Live state, click on <b>Set</b> to activate the cursor if the parameter control window is displayed. Use the trackball to move the cursor to <b>Angle</b> in the left-hand side of the screen and the parameter turns blue. Turn the <b>Value</b> control to adjust it.</li> </ul> <p><i>NOTE: When changing the angle, try to keep the correction guideline parallel to the blood vessel being scanned, and change the angle within the range of + 60° to -60° so that the flow velocity is close to the actual velocity.</i></p>
D Speed (DSP)	<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> When in PW mode Live state, press <b>Set</b> to activate the cursor when the parameter control window is displayed. Use the trackball to move the cursor to <b>DSP</b> in the control window and the parameter turns blue. Turn the <b>Value</b> control to adjust the flow speed in PW mode.</li> </ul>
D_Freq	<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> When in PW mode Live state, click on <b>Set</b> to activate the cursor when the parameter control window is displayed. Use the trackball to move the cursor to <b>D_Freq</b> in the control window and the parameter turns blue. Turn the <b>Value</b> control to adjust the frequency in PW mode.</li> </ul>

Sample volume (Gate)	<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> When in PW mode Live state, click on <b>Set</b> to activate the cursor when the parameter control window is displayed. Use the trackball to move the cursor to <b>Gate</b> on the left-hand side of the screen and the parameter turns blue. Turn the <b>Value</b> control to adjust the sample volume.</li> <li>• When the cursor is hidden, rotate the trackball to move the sample volume up or down.</li> </ul> <p><i>NOTE: The wider the gate, the higher the sensitivity.</i></p>
Audio Volume (Volume)	<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> When in PW mode Live state, press <b>Set</b> to activate the cursor when the parameter control window is displayed. Use the trackball to move the cursor to <b>Volume</b> in the parameter control window and the parameter turns blue. Turn the <b>Value</b> control to adjust the volume of the speaker.</li> </ul>
Smoothness D_SMO	<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> When in PW mode Live state, click on <b>Set</b> to activate the cursor when the parameter control window is displayed. Use the trackball to move the cursor to <b>D_SMO</b> in the control window and the parameter turns blue. Turn the <b>Value</b> control to adjust the smoothness of the spectrum.</li> </ul>
Pulse Repetition Frequency (PRFd)	<ul style="list-style-type: none"> <li>• <b>Control panel:</b> In PW mode Live state, click on <b>Scale</b> on the control panel, then turn the <b>Value</b> control to adjust the pulse wave frequency. Press the up arrow to increase, or the down arrow to decrease, the scan range of Doppler flow velocity.</li> <li>• <b>Parameter control window:</b> When in PW mode Live state, click on <b>Set</b> to activate the cursor when the parameter control window is displayed. Use the trackball to move the cursor to <b>PRFd</b> on the left-hand side of the screen and the parameter turns blue. Turn the <b>Value</b> control to adjust.</li> </ul> <p><i>NOTE: When capturing diagnostic image, the system enters High Pulse Repetition Frequency (HPRF) automatically, and the PRF value is changed simultaneously.</i></p> <p><i>NOTE: Higher-velocity flow can be detected if the PRF value is higher, and lower-velocity flow can be detected if the PRF value is lower. The value must be set according to the specific situation. Incorrect adjustment may lead to inability to detect the flow direction.</i></p>
Wall Filter (WF)	<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> When in PW mode Live state, click on <b>Set</b> to activate the cursor when the parameter control window is displayed. Use the trackball to move the cursor to <b>WF</b> in the parameter control window and the parameter turns blue. Turn the <b>Value</b> control to adjust the wall filter.</li> </ul> <p><i>NOTE: This adjustment can filter out low-frequency signal echoes on both sides of the baseline - not only useless low frequency signals, but also some useful signals. This may mean that flow signals cannot be displayed, especially when detecting low-velocity flow.</i></p>



Output Value	<ul style="list-style-type: none"> <li>• <b>Control panel:</b> When in PW mode Live state, click on <b>Base</b> on the control panel, then turn the <b>Value</b> control to move the Doppler baseline position up or down.</li> <li>• When in PW mode Live state, click on <b>Inv</b> to invert the Doppler trace display either positively or negatively against the output value.</li> </ul>
Layout	<ul style="list-style-type: none"> <li>• <b>Control panel:</b> In PW mode Live state, click on <b>Layout</b> or the <b>V</b> key on the control panel to cycle through Split Imaging display types for B/PW mode. There are 9 layout variants: Image in B/PW mode, up/down trace display, 8 options; <i>NOTE: The last opportunity for up/down display is full-screen PWD mode.</i> Image in B/PW mode, up/down trace display, 1 option. <i>NOTE: This function is only available with some models.</i> <i>NOTE: For up/down layout, the image height in PW mode is increased or reduced by 30 pixels at each step, and the image itself increased or reduced by 30 pixels.</i></li> </ul>
Triplex	<ul style="list-style-type: none"> <li>• <b>Control panel:</b> If all B/C/PW modes are switched on, click on <b>Trip</b> to activate B/C/PW Triplex and <b>Active B/C/PW</b> is displayed in the parameter control window (see Figure 66). Click repeatedly on <b>Update</b> to cycle through <b>Active PW</b>, <b>Active B/C</b> and <b>Active B/C/PW</b>. <i>NOTE: Click repeatedly on Layout or V to cycle through the 9 layouts in triplex mode.</i> <i>NOTE: Entering VS Flow when in Triplex mode returns you to the preliminary mode of the VS Flow spectrum.</i></li> </ul>
	
Figure 66: Triplex mode	
Auto Trace	<ul style="list-style-type: none"> <li>• <b>Control panel:</b> When in PW mode Live state, click on <b>Trace</b> to start Auto Trace; the corresponding measurement result is displayed to the right of the spectrum.</li> </ul>



## Range Trace

- **Control panel:** When in PW mode Live state, click on **Range** to start range trace measurement. A vertical line appears on the Doppler spectrum. Use the trackball to move the line to the start point of the desired trace region; click on **Set** to fix the line, and another line appears. Use the trackball to move the line to the endpoint and click on **Set** to fix it. The measurement result is displayed to the right of the spectrum.

*NOTE: See Section 7.4.2 for information on setting up other PWD parameters.*

## 7.11 Panoscope

Panoscope provides a function for creating and reviewing a static image in B mode that is wider than the given frequency converter field of view. This function can be used to review and measure an area larger than the structure of a single image. This function creates a panoramic image made up of single images while the probe is scanning the surface of the skin.

### 7.11.1 Activating Panoscope

When in B mode Live state, click on **Pano** on the control panel to enter the Panoscope function. The B-mode image is shifted to the left side of the image area and an ROI box appears on the image.

Use the trackball to move the ROI box. Click on **Update** and the ROI is changed from a solid to a dotted line. Use the trackball to change the size of the ROI. Click again on **Update** to confirm the ROI size; the trackball function is restored so that the position of the ROI can be changed.

### 7.11.2 Playback of panoramic image

Once the size of the ROI has been confirmed, move the ROI box onto the area being examined, click on **Set** and start recording images in the selected region.

A time progress bar is displayed above the image. The time counter goes down as recording progresses. It takes up to 60 seconds to capture images. The spliced panoramic view is displayed live on the right, as shown in Figure 67.

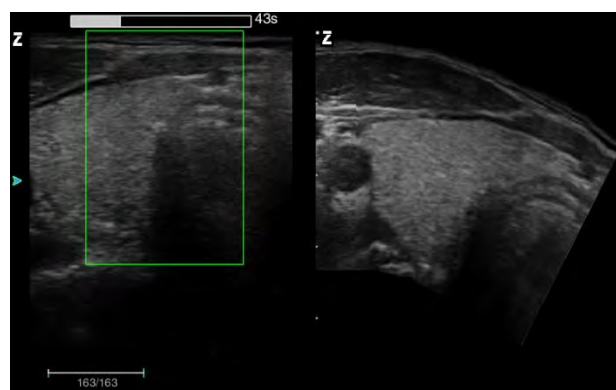


Figure 67: Recording of a panoramic image

*NOTE: Panoscope supports the Chroma function. Set Chroma in live B mode based on your personal preferences and open Panoscope for Chroma.*

Once the capture time reaches 60 seconds, the system stops the capture automatically and enters the panoramic view screen. To stop capture prematurely, click on **Set** to stop and enter the panoramic view screen.

*NOTE: When capturing an image, try to move the converter within a constant space. For a flat, straight body part, the moving speed of the converter can generally be maintained at 0.5 cm/s and increased appropriately; for body parts that curve at a large angle (e.g. shoulder joint), try to reduce the moving speed of the converter so as to maximise the imaging effect.*

### 7.11.3 Review and measurement

Click on the **Angle/Steer** control to switch on the **Angle** indicator, then turn the control to rotate the panoramic image. If the panoramic image is larger than the imaging area, move the image with the trackball to allow viewing beyond the image area.

Distance, circumference, volume and angle measurements can be taken on the panoramic image. The measurement objects and the method are the same as those for B mode.

Click on **Pano** to open the display of the B image (left) and the panorama image (right); both are displayed in Freeze mode, as shown in Figure 68.

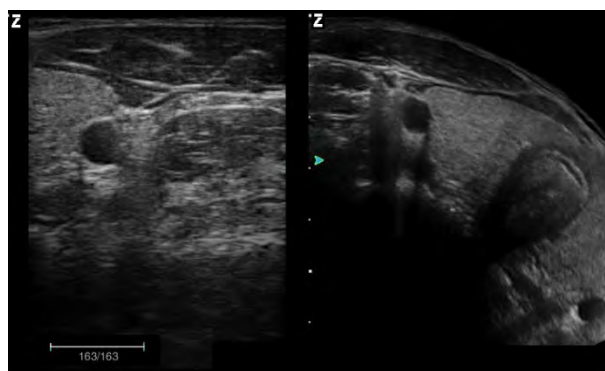


Figure 68: Display of both B image and Pano image

If the green focus ► is marked on the panoramic image, the image can be moved or rotated. Click on **Update** to switch the focus to the ► B image, which moves to the scroll film of B mode. Use the trackball to replay the B images. Click repeatedly on **Update** to toggle control between the two images.

If the green focus ► is marked on the panorama image, click again on **Pano** on the control panel to switch to the full-screen panorama view.

In the panoscope mode, click on **Freeze** to return to 2B mode. Click on **Pano** on the control panel and the ROI box reappears on the image. Follow the steps listed above to create a new panorama image.

### 7.11.4 Saving panoramic images

Once panoramic image capture is finished, click on the **Save 1** or **Save 2** button and save the image to a designated location. The user can set up the save format and save location in **Store Setup**. See **10.2 Store Setup** for further details.

### 7.11.5 Post-processing of panoramic images

The post-processing of panoramic images means the recapture of current or saved panorama images.

### 7.11.6 Post-processing of current panoramic images

On the screen on which both B and panoramic images are displayed, click on **Pano** to open the ROI box. The panorama image on the right disappears. Follow the description above to alter the size and position of the ROI box and click on **Set** to restart image capture.

#### 7.11.6.1 Post-processing of saved panoramic images

Procedure:

- 1) Click on **Save as** on the control panel to open the **Store Setup** screen.
- 2) Move the cursor to **Open** and click on **Set** to open a selection box.
- 3) Find the folder in which the images are saved, select the image, and then click on **Open**.
- 4) To perform post-processing, follow the process under **7.11.5.1**.

*NOTE: Post-processing is available for panoramic images in film format only.*

## 7.12 Tissue Doppler Imaging (TDI, option)

Tissue Doppler Imaging (TDI) is the generation of colour images according to the Doppler effect, with colour images that overlap with 2D images. TDI provides information on the direction and speed of tissue motion.

To open Tissue Doppler Imaging mode, click on the **CPA/TDI** button on the control panel, but only when a phased array probe is used in B mode Live state (*NOTE: Click again on CPA/TDI to change to CPA mode*).

A colour ROI box appears on the image. Use the trackball to move the colour ROI box. Click on **Update** and the four sides of the colour box change from solid to dotted lines. Next, use the trackball to change the size of the colour box. Click again on **Update** and the trackball function is restored so that the position of the colour box can be changed.

Click again on **B mode** to leave TDI mode and return to B mode.

When in TDI mode, press the **PW** control twice. The image is displayed in TDI mode and the PW image up and down. The TDI image appears as a still image. As seen on Figure 69.

*NOTE: Entering or exiting TDI mode in up/down spectrum mode will return to the provisional state.*

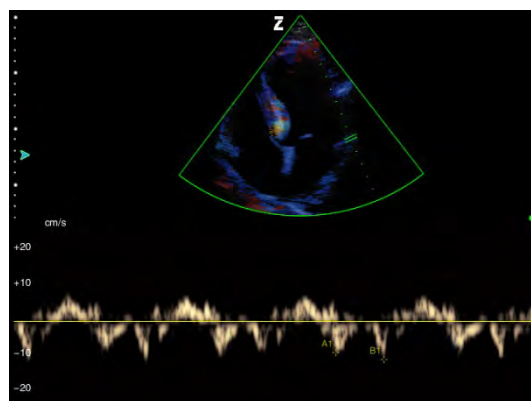


Figure 69: Imaging in tissue Doppler

*NOTE: TDI mode can only be entered when using a phased array probe.*

*NOTE: For parameter setup in TDI mode. See CFM Mode Parameter Setup for information on and a description of TDI parameter setup.*

*NOTE: The display of TDI velocity is the display of Doppler velocity of the myocardium in TDI mode if the spectral Doppler is enabled. See PW Mode Parameter Adjustment for TDI parameter adjustment and description.*

## 7.13 ECG mode (option)

### 7.13.1 Description of function

The ECG mode offers 3-channel ECG signals for cardiac exams.

R-wave trigger control is used for synchronised image capture for functions such as stress echo.

The ECG has three leads: **F** (left leg), **L** (left arm), **R** (right arm). **L** is a reference channel with signals from the ECG module, which as a rule provides a preload. The **F** and **R** signals come from the patient's body, which is connected to various output terminals on the ECG isolation amplifier.

*NOTE: The ECG mode is used solely for the detection and display of 3-lead ECG signals, and is not intended to replace an ECG machine.*

### 7.13.2 Opening the ECG

Connect one end of the ECG 3-lead cable to the ECG port on the system. Next, connect the three wires at the other end of the ECG 3-lead cable to the patient's left leg, left arm and right arm (please note the letters on the leads to ensure proper connection).

Once the connection has been completed and when Live state in B, M, CFM or PW mode, click on **ECG** on the control panel to enter ECG mode. Now a live ECG display appears at the bottom of the screen and the patient's heart rate is calculated.

Click on **ECG** again to exit ECG mode.

### 7.13.3 Imaging parameter setup in ECG mode

Gain	<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> When in the Live state, click on <b>Set</b> to activate the cursor when the parameter control window is displayed. Use the trackball to move the cursor to <b>Gain</b> and the parameter turns blue. Turn the <b>Value</b> control to adjust ECG gain , i.e. the sensitivity of ECG signals.</li> </ul>
Position	<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> When in the Live state, click on <b>Set</b> to activate the cursor when the parameter control window is displayed. Use the trackball to move the cursor to <b>Position</b> and the parameter turns blue. Turn the <b>Value</b> control to adjust the position of the ECG display. The larger the number, the higher the display position, with multiple positions available for selection.</li> </ul>
Interval	<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> When in the Live state, click on <b>Set</b> to activate the cursor when the parameter control window is displayed. Use the trackball to move the cursor to <b>Inv</b> and the parameter turns blue. Turn the <b>Value</b> control to turn the ECG curve upside down (inversion). The default setting is <b>Off</b>, i.e. no inversion.</li> </ul>
Scan Speed (ESP)	<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> When in the Live state, click on <b>Set</b> to activate the cursor when the parameter control window is displayed. Use the trackball to move the cursor to <b>ES</b> and the parameter turns blue. Turn the <b>Value</b> control to adjust the ECG scan speed. The larger the number, the higher the speed, with multiple levels available.</li> </ul>
Colour	<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> When in Live state, click on <b>Set</b> to activate the cursor when the parameter control window is displayed. Use the trackball to move the cursor to <b>Colour</b> and the parameter turns blue. Turn the <b>Value</b> control to adjust the ECG display colour, with multiple levels available.</li> </ul>
Hide	<ul style="list-style-type: none"> <li>• <b>Parameter control window:</b> When in the Live state, click on <b>Set</b> to activate the cursor when the parameter control window is displayed. Use the trackball to move the cursor to <b>Hide</b> and the parameter turns blue. Turn the <b>Value</b> control to turn the Hide function on or off. Set the control to <b>On</b> to hide the ECG, or <b>Off</b> to display it.</li> </ul>

### 7.13.4 ECG Save Setup

Set the number of cardiac cycles under **Store Setup - Real-Time Film Setup** and assign the **Save 1** button or the **Save 2** button to the **Film Save** (for further information about configuration, see **10.2** in this

Manual). In live image capture, click on **Save 1** or **Save 2** and the system saves the ECG for the set cardiac cycle and 2D images before the key is pressed.

## 7.14 Zoom

### 7.14.1 Introduction

The zoom function activates the ROI field. Use this field to set the magnification area within the sound image and display the zoom factor.

The following modes support the Zoom function: Live B mode, Live CFM mode, CFM mode, CFM mode activated in Live B Zoom mode, or PW/CW enabled in Live CFM or B Zoom mode.

### 7.14.2 Magnification in Live state of B-mode

- 1) When in Live B mode, click on the **Zoom** control to activate the Zoom ROI box.
- 2) Click on the **Update** key and the four sides of the ROI box change to dotted lines, then use the trackball to adjust the size of the ROI box. Click again on **Update** - the four sides of the ROI box revert to solid lines; the trackball function is restored, allowing the movement of the ROI box.
- 3) Once the ROI box has been adjusted, click on **Set**, and the image in the ROI is magnified in the display area.
- 4) A thumbnail of the image before magnification appears in the lower left of the image display area and the PIP image on which the current ROI box located is shown as guidance for users to move the ROI box.
- 5) The image zoom rate depends on the size of the ROI box, which is displayed in the "PIP image". The larger the ROI, the smaller the zoom rate; or, the smaller the ROI, the greater the zoom rate.
- 6) Now you can use the trackball to move the location of the ROI box, and the PIP image is also updated with the ROI location in real time.
- 7) Click again on the **Zoom** control on the control panel or click on the **Esc** key to leave Zoom mode.

**NOTE:** When in Zoom or Full Zoom state, click on the **K** key on the control panel to display/hide the "PIP image".

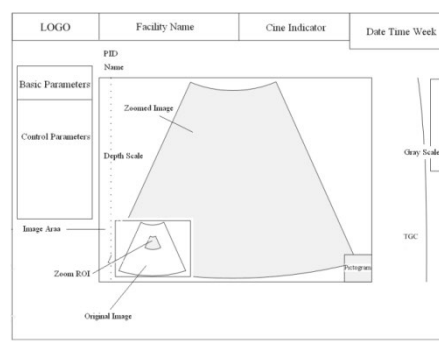


Figure 70: Zoom state

### 7.14.3 Zoom in the Live state of CFM mode

- 1) In live CFM mode, press the **Zoom** control on the control panel and the system zooms in on the image at a certain percentage according to the size of the coloured ROI box (as a rule, the system sets the sample ROI up for zoom based on an area slightly larger than the colour ROI box); the zoomed image is displayed in the image display area and the "PIP" image, in which the zoom rate is displayed, appears in the bottom left.
- 2) If the coloured ROI box is smaller than the zoomed 2D image area and has been shifted within its range, the zoom ROI of the PIP does not move; if the coloured ROI box is shifted to the edge of the 2D image area, the Zoom ROI is shifted as well, and the location of the Zoom ROI in the PIP is refreshed.
- 3) Now you can close CFM mode, and the image remains in the current zoomed B-mode, or you can activate it again after closing CFM mode.
- 4) Click again on the **Zoom** control on the control panel or click on the **Esc** button to leave Zoom mode, while staying in the current image mode.

### 7.14.4 Activation of CFM mode in Live Zoom

After zooming the B mode image, follow the process above, click on the **C mode** button to activate CFM mode; the original image zoom rate is retained. Click on **Update** and the four sides of the coloured ROI box change to dotted lines for the adjustment of the size of the coloured ROI box.

### 7.14.5 PW/CW sampling in Live state of B or CFM Zoom

- 1) After zooming the image in B or CFM mode, follow the above process, click on the middle button of the **PW** or **CW** control to enter PW or CW Standby mode for scanning and perform a more precise scan on the zoomed image.
- 2) When using the trackball to shift the PW/CW sampling line to the edge of the 2D image display area, the zoomed ROI moves accordingly; the zoomed ROI position in the PIP is refreshed.

## 7.15 Full Zoom

### 7.15.1 Introduction

Full Zoom is used to zoom in entire image display area in Live or Freeze mode. Support modes include: Live/Freeze state in B mode, Live/Freeze state in CFM mode, CFM enabled in Live Full B Zoom, B or DFM Full Zoom in Live state with activated PW/CW Scan and B Full Zoom in Live state with M Scan activated.

### 7.15.2 Full Zoom in Live/Freeze B mode

- 1) When in B Freeze or Live mode, turn the **Zoom** control clockwise to achieve Full Zoom of the image area; several steps are available for this. "PIP image" is shown in the lower left of the image display area, with the full image shown in thumbnail and the Full Zoom box (identifying the current location of the 2D image), as well as the zoom rate.
- 2) If the zoomed image is larger than the image display area, move the trackball to view image areas beyond the image display area, and the Full Zoom box in the "PIP image" is shifted accordingly.
- 3) When in Live state, click on **Value** to move the position of the B image focus with the trackball. Press **Value** repeatedly to cycle through the trackball control of focus or the Full Zoom box. When in Freeze mode, press **Value** repeatedly to cycle through the trackball control of the film schedule or the Full Zoom box.
- 4) Turn the **Zoom** control **anticlockwise** to Zoom Rate 1 or click on **Esc** to exit Full Zoom.

### 7.15.3 CFM activation in the Live state of B Full Zoom

Following the method above, after the Full Zoom process for the B-mode image, click on the **C mode** button to activate CFM; the image maintains the original zoom rate. Click on the **Update** button and the four sides of the coloured ROI box change to dotted lines for setting the size of the coloured ROI box.

Click on **Value** then use the trackball to move the coloured ROI box. Click repeatedly on **Value** to cycle through the trackball control of Full Zoom box or coloured ROI box.

### 7.15.4 PW/CW scan in Live state of B or CFM Full Zoom

- 1) After the Full Zoom process for the B or CFM image, follow the above process and click on the middle button of the **PW** control or the **CW** button to open PW or CW Standby mode for scanning and perform a more precise scan based on the zoomed image.
- 2) If the zoomed image is larger than the image display area, move the trackball to view image areas beyond the image display area, and the Full Zoom box in the "PIP image" is shifted accordingly.
- 3) Click on **Value** and use the trackball to move the PW/CW scan line. Click on **Value** repeatedly to cycle through the trackball control of the Full Zoom box or the PW/CW scan line.
- 4) Turn the **Zoom** control **anticlockwise** to Zoom Rate 1 or click on **Esc** to exit Full Zoom.

### 7.15.5 M scanning in the Live state of B Full Zoom

After following the process above and the opening of Full Zoom, click on the **M mode** button to open M Scanning in Standby mode and perform a more precise scan based on the zoomed image.



Other procedures are the same as *PW/CW scanning and activation in Live state within Full Zoom in B or CFM mode*.

#### 7.15.6 Full Zoom after simple Zoom

Follow the above process in Live or Freeze mode to zoom the image, then turn the **Zoom control** clockwise to open Full Zoom of an image that has been zoomed at a certain zoom rate. Now, the thumbnail in the PIP image becomes the thumbnail of the fully zoomed image; the zoom rate is the "zoom rate x full zoom rate".

## 8 Notes on image information

### 8.1 Management of patient information

Click on the **ID** button to access the editing screen for patient information (New Patient Info), as shown in Figure 71. Information such as **ID**, **name**, **age**, **gender**, **DOB (date of birth)**, **height**, **weight**, **Examination**, **referring physician**, **diagnostician** and **operator** can be entered and stored in the database via this screen. The entry of **ID** is mandatory.

There are four different user interfaces according to the different types of examination, including General Mode Figure 71, Gynaecology and Obstetrics mode Figure 72, Urology mode Figure 73 and Cardiology mode Figure 74.

The screenshot shows the 'New Patient Info' form in General mode. The form is titled 'New Patient Info' and has a checkbox 'Automatically create the ID' which is checked. The ID field is filled with '15102901'. The AccessNum field is filled with '20151029150030'. The Last Name, First Name, and M.I. fields are empty. The Sex field is a dropdown menu with 'Unknown' selected. The DOB field is a dropdown menu with a date format '( dd/MM/yyyy )'. The Age field is a dropdown menu with 'Y' selected. The Height field is a dropdown menu with 'cm' selected. The Weight field is a dropdown menu with 'Kg' selected. The Exam field is a dropdown menu with 'Abdomen' selected. The Ref.M.D., Diagnostician, and Operator fields are dropdown menus with 'X' next to them. The Cloud ID field is filled with 'UnLogin' and has an 'X' next to it. The Study Description field is empty. The Comments field is a text area. At the bottom, there are buttons for 'Import', 'Worklist', 'New Pat', 'New Exam', 'End Exam', 'Clear', 'Save', and 'Exit'.

Figure 71: General mode

**NOTE:** The *AccessNum* and *Worklist* buttons are available only when *DICOM* is activated.

New Patient Info

☒ Automatically create the ID

ID: 15102901

AccessNum: 20151029150030

Last Name:

First Name:

M.I.:

Exam: OB(General)

Ref.M.D:

Diagnostician:

Operator:

Cloud ID: UnLogin

Sex: Female

DOB: (dd/MM/yyyy)

Age: Y

Height: cm

Weight: Kg

Study Description:

Comments:

LMP: (dd/MM/yyyy)

GA:

EDD:

Import Worklist

New Pat New Exam End Exam Clear Save Exit

Figure 72: Gynaecology and Obstetrics mode

*NOTE: If an examination type such as Gynaecology or Obstetrics (OB) is selected, the gender is automatically displayed as female. At the same time, LMP (Last Menstrual Period), Gestation Age (GA) and the Estimated Date of Delivery (EDD) are also displayed on the basis of General mode.*

New Patient Info

☒ Automatically create the ID

ID: 15102901

AccessNum: 20151029150030

Last Name:

First Name:

M.I.:

Exam: Urology

Ref.M.D:

Diagnostician:

Operator:

Cloud ID: UnLogin

Sex: Unknown

DOB: (dd/MM/yyyy)

Age: Y

Height: cm

Weight: Kg

Study Description:

Comments:

PSA: ng/ml

Import Worklist

New Pat New Exam End Exam Clear Save Exit

Figure 73: Urology mode

*NOTE: PSA is added to the input in Urology mode on the basis of General mode.*

The screenshot shows the 'New Patient Info' window. At the top, there is a checkbox 'Automatically create the ID' which is checked. Below it, the 'ID' field contains '15102901'. The 'AccessNum' field contains '20151029150030'. The 'Last Name', 'First Name', and 'M.I.' fields are empty. The 'Exam' dropdown is set to 'Cardiology'. The 'Ref.M.D.', 'Diagnostician', and 'Operator' fields are empty and each has a small 'X' icon to its right. The 'Cloud ID' field contains 'UnLogin' and also has an 'X' icon. On the right side, the 'Sex' dropdown is set to 'Female'. The 'DOB' field is empty with a date format hint '( dd/MM/yyyy )'. The 'Age' field is empty with a unit 'Y' dropdown. The 'Height' field is empty with a unit 'cm' dropdown. The 'Weight' field is empty with a unit 'Kg' dropdown. The 'Study Description' field is empty. The 'Comments' field is a large text area. Below the 'Comments' field, the 'BSA' field is labeled 'm²'. At the bottom, there are buttons: 'Import', 'Worklist', 'New Pat', 'New Exam', 'End Exam', 'Clear', 'Save', and 'Exit'.

Figure 74: Cardiology mode

**NOTE:** BSA (Body Surface Area) is added to Cardiology mode on the basis of General mode. The system automatically calculates BSA once the height and weight have been entered.

- a) **New automatic ID:** At the top of the interface to the patient system (New Patient Info) you can find the *automatically create the ID option*. If this option is selected, a new patient ID is created automatically based on the current date on which the new patient is created; if this option is not selected, the new patient ID remains empty and must be entered manually by the user.

**NOTE:** The patient ID is generated automatically based on the date (the date corresponds to the format year/month/day, YYMMDD) plus one check number (two characters) of the same day. For example, 15060801 is the first patient on 8 June 2015.

- b) **New patient:** Creation of new patient information after concluding the examination of the previous patient.
- Quickly creation of new patient information: Click on **End Exam** on the control panel; this displays the **End Exam** prompt on the screen (see Figure 75). Use the trackball to move the cursor to **Yes** and click on the **Set** button to confirm the conclusion of the current examination and create new patient data.

The system automatically generates a new patient ID based on the current date and saves it to the database. Select **No** to end the current examination without creating new patient information, and select **Cancel** to cancel the operation.

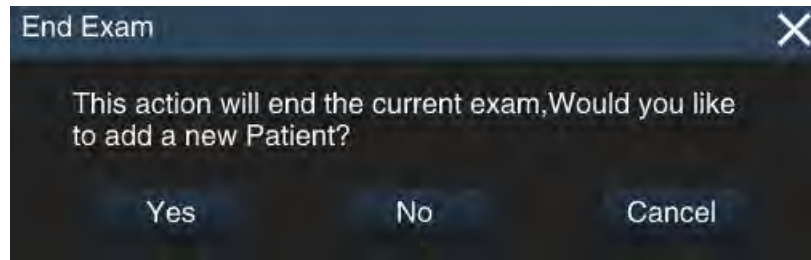


Figure 75: End Exam

- Create new patient data: Click on the **ID** button on the control panel to open the **New Patient Info** screen. Use the trackball to move the cursor to **New Pat**, click on the **Set** button and a dialogue box appears on the screen (see Figure 76).

Use the trackball to move the cursor to **Yes** and click on the **Set** button to confirm the end of the current examination and create new patient data. The system automatically deletes the original information and generates a new patient ID, and the user can input new patient data. Select **No** to end the current examination without creating new patient data.

If the DICOM feature is activated, an access number is generated at the same time as the number. If the medical record is obtained from the worklist server, the access number is generated by the worklist server. If the patient record is registered locally, the access number is generated automatically.

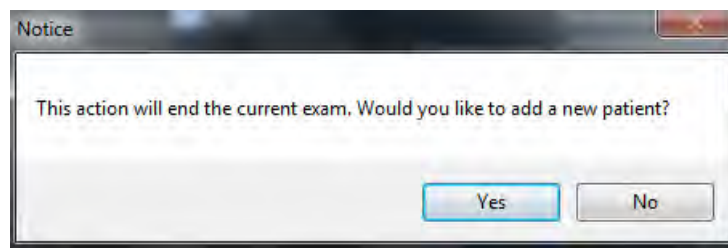


Figure 76: End Exam and Create New Patient Information prompt.

- c) **Edit:** On the **New Patient Info** screen, use the trackball to move the cursor to the information input box, click on **Set** on the control panel to activate the cursor, and use the keyboard to enter patient information. After editing, move the cursor to **Save** and click on **Set** on the control panel; the system automatically saves the patient information and exits the editing interface.

*NOTE: When you have entered the text, press Tab to change the language (e.g. Russian) (if the language is supported by the system).*



*NOTE: Click [calendar icon] in the DOB (date of birth) box to open the date selection control. Click on the left and right arrow to skip to the last or next month. Click on "X year X month" to choose the month, and click again to select the year, as shown in Figure 77. The patient's age is automatically generated if the date of birth is entered properly.*

*You can also follow the prompt to input the date of birth manually. Once input is finished, click on any other input field, and the patient's age is automatically generated.*

When the patient age is first entered, the system automatically calculates the date of birth based on the current date; the user can then change the appropriate numbers.

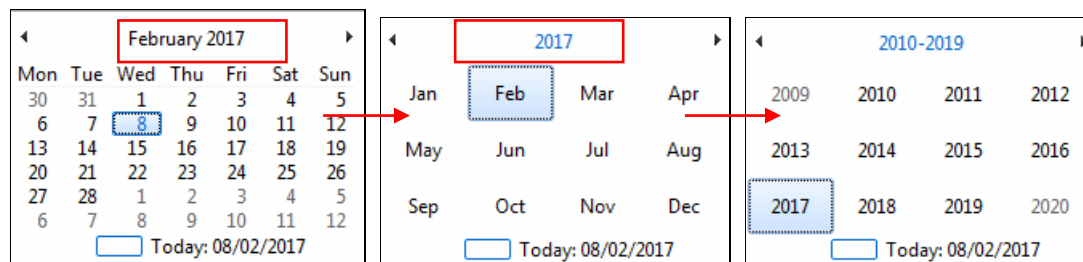



Figure 77: Date selection control

**NOTE:** Select the name of the "referring physician, diagnostician or operator" that is to be deleted from the drop-down list. Move the cursor to  and click on Set, then move the cursor to Save on the screen and click on Set to delete the stored name of the doctor. If is not saved, the name of the doctor is displayed as soon as the New Patient Info edit screen is next opened .

**NOTE:** Further entries contain data, such as LMP and relate to the Date of birth under Note 2. The date format should be consistent with the format displayed on the screen. See Section 5.2.2 to change the format.

**NOTE:** Edit the size. If you select the units in feet (ft), the system automatically displays "inches" in the input field , see Figure 79.

Figure 78: Input of body size

- d) **New exam:** Creation of a new exam under the same patient ID. There are several situations under the same patient ID.
- Continuous exam in the same period (for example: if the patient undergoes an abdominal exam and a cardiac exam at the same time, the doctor can create different types of exam under the same ID without creating multiple IDs for the same patient).

- Multiple exams in different periods (for example: if the patient has different exams on different days, the doctor can create a new exam type under the same patient ID without creating a new type).
- Importing of the ID of cases that were generated by another system of the same series are to be used for a new examination on this system.

Process: Go to **New Patient Info** on the screen, click on the **New Exam** button and a notice box appears on the screen (Figure 79). Use the trackball to move the cursor over **Yes** and click on **Set** to confirm the completion of the current examination. Next, select a new examination type under the same patient data.

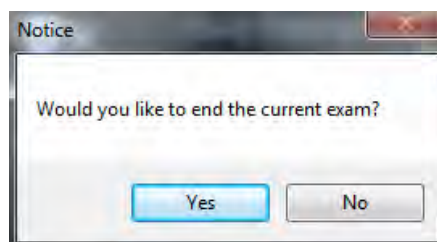


Figure 79: Window for New Exam

- e) **End Exam:** To end the current exam. Use the trackball to move the cursor to **End Exam** and then click on **Set** and a dialogue box appears on the screen (Figure 80). Use the trackball to move the cursor to **Yes** and click on **Set** to confirm the ending of the current examination or select **No** to not end the current examination. If End Exam is selected, the system displays a prompt to add a new patient (Figure 81). Depending on the situation, the user can choose **Yes** or **No**.

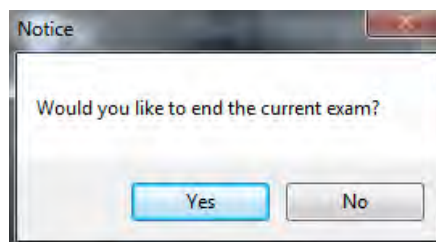


Figure 80: End Exam notice

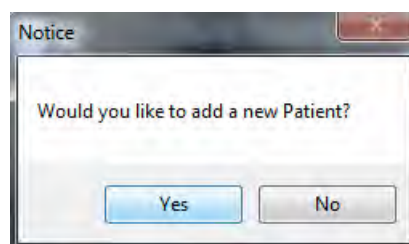


Figure 81: New ID notice

- f) **Clear:** On the **New Patient Info** screen, move the cursor to Clear to **remove** and click on **Set** to



remove patient data that has been entered, such as name, date of birth and so on.

- g) **Save:** After entering the patient data, use the trackball to move the cursor to save and click on **Set** to save the patient data and exit the screen.
- h) **Exit:** On the **New Patient Info** editing screen, use the trackball to move the cursor to **Exit** and click on **Set** to end the editing of patient information and exit.
- i) **Import:** To import previously saved patient data. The current exam is ended after import.

**Import Method:** On the **New Patient Info** editing screen, use the trackball to move the cursor to **Import** and click on **Set** to switch to the **Archive Management** screen. Next, move the cursor to the desired patient record from the patient list and double-click on **Set** to return to the **New Patient Info** editing screen, where the selected patient data is displayed.

*NOTE: Patient ID that has been generated by another system of the same series can be imported into this system for a new exam or file search.*

- j) **Worklist:** Importing of patient information stored on the server via DICOM transmission. After import, the current examination is ended.

On the **New Patient Info** screen, use the trackball to move the cursor to **Worklist**, then click on **Set** to open the Worklist screen, as shown in Figure 82.

*NOTE: Make sure that the DICOM function has been activated before the patient data is loaded using this process; the system should be correctly connected to the server (see 5.2.11 for DICOM setup and connection).*

Figure 82: Worklist screen

The patient list stored on the server is displayed on the screen. Move the cursor to the patient record that is to be imported. Double-click on **Set** or use the trackball and **Set** to click on **PATINFO**. The **New Patient Info** screen is displayed, as shown in Figure 83. The patient data is displayed on the screen.



Confirm that the data is correct and click on **Save**; the patient information is then saved in the archive and the display returns to the main screen. Select the exam type and start the exam. If the information is incorrect, click on **Exit** to return to the patient list and re-select.

**New Patient Info**

☒ Automatically create the ID

ID: 15102901

AccessNum: 20150122113132

Last Name: king

First Name: lili

Middle Name:

Exam: Abdomen

Ref.M.D.: GG

Diagnostician: VV

Operator: HH

Sex: Female

DOB: 1/22/1995 (MM/yyyy)

Age: 20 Y

Height: 160 cm

Weight: 45 kg

Study Description:

Comments:

Save Exit

Figure 83: Patient data

- Choose from multiple servers via **Select server** in the lower right corner of the Worklist screen, select a server and click on **Echo** to connect to the server with the updated patient list.
- If there are too many patient records, you can use the **Search** button on the right side of the Worklist screen. Move the cursor to the small box of the items to be searched and click on **Set** to check the box. Enter the keyword and move the cursor to the **Search button**; click on **Set** and the system searches the patient database of the current server. The search result is displayed in the patient list.

**NOTE:** *The more key words are inputted, the more accurate the result is.*

- Click on **Refresh** in the lower-left corner of the **Worklist** screen to update the patient list. If the selected patient record does not exist (the examination may have been terminated by other ultrasound terminal), you can refresh the list to acquire the updated list data.
- Click on **Return** on the lower right of the **Worklist** screen to return to the editing screen for **New Patient Info**.
- If **End Exam** or **New Pat** is selected, the information is sent to the server once the examination is finished. Refresh the worklist, and the patient data is removed.

## 8.2 Adding Annotations

### 8.2.1 Description of function

Add selected annotations to the image. The text function allows users to enter letters and numbers. The annotation function allows you to add pre-set and user-customised annotations to images (see *Section 5.2.9 Annotation Setup*).

### 8.2.2 Procedure

Table 7: Functional description, list of relevant control units

Control unit	Description of function
<b>Annotation</b>	Open and leave annotations.
<b>Set</b>	To go to a new line in Annotation state. To add the selected annotations to the image.
<b>Reset</b>	To clear measurement data on the screen.
<b>BkSp</b> (Backspace)	To delete one character or a text arrow in the Annotation state.
<b>Trackball</b>	To move the cursor and select the location for the annotation.

- a) **Add text annotations:** When in Live or Freeze mode, click on **Annot** on the control panel to enter Annotation state; a cursor is shown in the image area. Move the cursor over the target position and an input field is displayed at the bottom left of the image area. Use the alphanumeric keyboard to enter text annotations in the input box, then press **Enter** or **Set** to add the text to the target position.
- b) **Add preset annotations:** When in Live or Freeze mode, click on **Annot** and then on **Menu** to open the list of preset annotations in the selection window. The preset annotations are displayed on the screen. See Figure 84. Press **Set** to activate the cursor, then use the trackball to move the cursor to the desired annotation (if the desired annotation is not available, follow the instructions in *Section 5.2.9 Annotation Setup*). To select, click on **Set**. Move the cursor with the selected annotation to the desired position and click on **Set** to attach the annotation.

**NOTE:** On the control panel, click on **Esc** or **Annot** to exit the text annotation state.

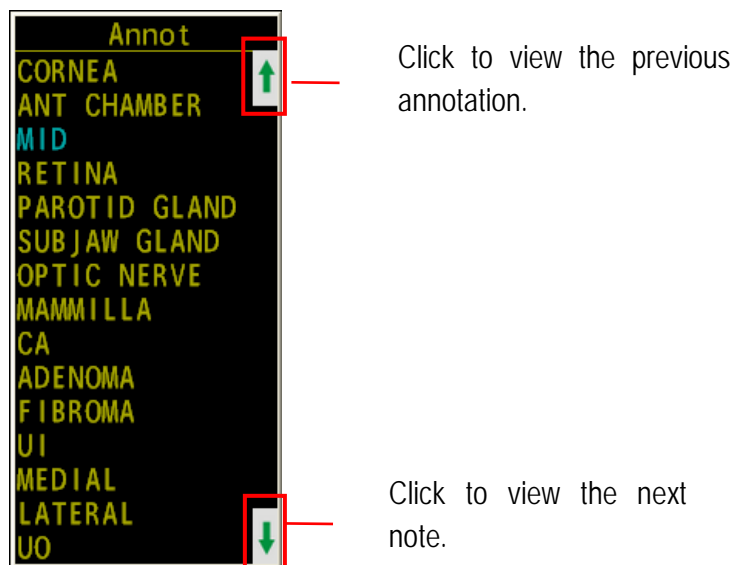


Figure 84: Annotation selection window

### 8.2.3 Preset Annotations

The preset annotations in the system are shown in Tables 8 to 19. In addition, users are allowed to customise annotations for every type of examination (See *section 5.2.9 Annotation Setup*).

Table 8: Preset annotations for abdomen examination

Abdomen			
LIVER	LONG	HEAD	WD
C.HEP A	TRANS	NECK	IMA
SPLEEN	LT KIDNEY	BODY	GDA
SPLENIC A	GB	PANCREAS	CY
PORTAL	DUCT	CYST	STONE
CELIAC	IVC	STOMACH	SD
HEP V	PANCREAS HEP V	MASS	CHA
PANCREAS AORTA	AORTA	TAIL	TUMOR
HEP A	LEFT	CBD	VL
RT KIDNEY	CD	PV	GBF
SMA	LTH	AO	PD
HD	CHD	CAUDATE LOBE	BD
EHBD	HEPATIC DUCT	QUADRATE LOBE	ROUND

			LIGMENT
LFH	POLYP		

Table 9: Preset annotations for examinations in the 1st trimester

1 <sup>st</sup> trimester		
BABY 1	LONG	YS
RIGHT	UTERUS	EMBRYO
LEFT	HEART	DECIDUA
BLADDER	CORD	FM
TRANS	GS	CRL
OVARY	ADNEXA	

Table 10: Preset annotations for gynaecological examinations

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

CERVIX	UTO	TUMOR
OVARY	UTERUS CANAL	EN

Table 11: Preset annotations for urological examinations

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

Table 12: Preset annotations for birth preparation examinations

Obstetrics		
RIGHT	AM	HC
LEFT	AM C	AC
TRANS	Chorionic villi	BPD

UMB CORD	CHORION	THC
HEART	FOETUS	OFD
LONG	FOETAL HEART	EYE
BLADDER	FM	QD
STOMACH	FH	TTD
KIDNEY	F SP	FW
BODY	F THX	UA
PLACENTA	FL	UV
CERV OS	HL	PL
FUNDUS	UC	

Table 13: Preset annotations for foetal echo examinations

Foetal Echo		
RIGHT	LONG	PLACENTA
LEFT	BLADDER	CERV OS
TRANS	STOMACH	FUNDUS
UMB CORD	KIDNEY	HEAD
HEART	BODY	

Table 14: Preset annotations for orthopaedic examinations

Orthopaedics		
THIGHBONE HEAD	HIPBONE	ACETABULUM

Table 15: Preset annotations for cardiological examinations

Cardiology		
AORTIC	REGURG	SEPTUM
LV	AV	RV

TCHZ	RVAW	4 CH
AO ROOT	PULMONIC	LEFT VENT
MITRAL	OUTFLW	AO ARCH
MV	LA	TV
PEAK	DIAS	VSD
R ATRIUM	TRICUSPID	RIGHT VENT
ASC AO	INFLOW	DESCENDING AO
AO	PV	TVI
LVOT	SYST	ASD
L ATRIUM	ATRIAL SEP	

Table 16: Preset annotations for carotid artery examinations

Carotid artery		
BULB	ECA	JUGULAR
DISTAL	CCA	IA
MID	RIGHT	SCA
PROX	VERTEBRAL	IJV
LEFT	ICA	EJV
SUBCLAVIAN	BIF	

Table 17: Preset annotations for podiatric examinations

Podiatry		
Left	Plantar	Tendon
Right	Fascia	Neuroma
LONG	Achilles Tendon	Calcaneus
TRV	PT Tendon	Injection

Table 18: Preset annotations for peripheral blood vessel examinations

Peripheral blood vessels		
RIGHT	PROXIMAL	GASTRO
PERONEAL A	M SFA	DFV
ILIAC	D SFA	LSV
CFA	P SFA	D GSV
EXT IL	RADIUS A	M GSV
POST TIBIAL A	M PTA	P SFV
P PTA	SCA	D SFV
ATA	EJV	D PTA
INT IL	CFV	DR PED
ANT TIBIAL A	P GSV	ARTERY
PERON	M SFV	DISTAL
POP	POP	VEIN
LT CIR	P PTV	LEFT
BRACHIAL A	M PTV	ULNAR A
ARTERY	D PTV	IA
MID	ATV	IJV
PROFUN		

Table 19: Preset annotations for examinations of minor organs

Small Parts		
RIGHT	ADENOMA	PCA
LEFT	FIBROMA	LGA
OCULUS	UI	STA
SUPERIOR	MEDIAL	OV
TRANS	LATERAL	SOV



LONG	UO	STV
THYROID	TAIL	CRV
ISTHMUS	AXILLA	VV
RT LOBE	LI	LIVER
LENS	LO RIGHT	SAGITTAL
INFERIOR	VARICOCELE	3RD VENT
THROAT	EPIDIDYMUS	L KID
LT LOBE	TESTICLE	CORONAL
PARA	HYDROCELE	4TH VENT
CCA	EYEBALL	R KID
CORNEA	IRLS	SPLEEN
ANT CHAMBER	SCLERA	LAT VENT
MID	ANTER CH	CAVUM
RETINA	VITREOUS BODY	CHOROID
AROTID GLAND	OPTIC DISK	THALAMUS
SUBJAW GLAND	MASS	CEREBELLUM
OPTIC NERVE	SOA	PL
MAMMILLA	OA	HEMORRHAGE
CA	CRA	

## 8.3 Pictograms

### 8.3.1 Description of function

Pictograms are a group of pictorial diagrams of human organs preset by the system. They are used to mark an ongoing organ examination. A movable, rotatable green symbol • | (referred to as “probe indicator”) is used to indicate the position and direction of the probe.

### 8.3.2 Procedure

- 1) Click on **BDYMK (Body Mark)**, on the control panel to display pictograms supported by the current

exam type. Click on the button (e.g. urology, gynaecology) at the top of the screen to see more pictograms.

See Figure 85.

*NOTE: Only body marks supported for the current examination, or all marks preset in the system, are displayed; these can be selected under Setup-System-Setup.*

- 2) Move the cursor to the pictogram and click on **Set** to select it, then click on **OK** at the bottom of the screen to exit. Or move the cursor onto the pictogram and click twice on **Set** to select it and close the screen at the same time. The selected pictogram and a "probe indicator" are displayed at the bottom right of the image area.
- 3) Roll the trackball to move the probe indicator. Turn the **Value** control to adjust the arrow angle.
- 4) To delete the pictograms on the screen, click on **BDYMK (Body Mark)** and move the cursor over **Clear**. Then click on **Set** to confirm.

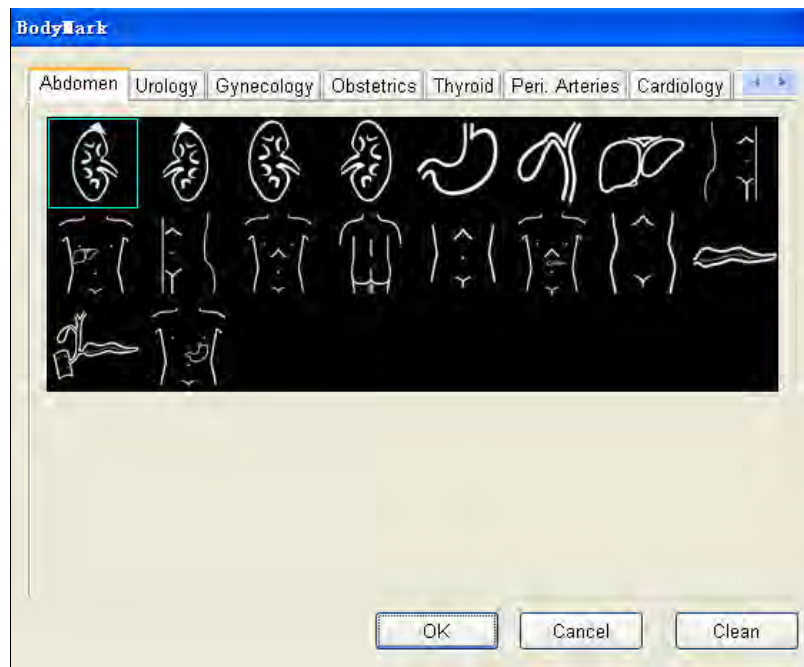


Figure 85: Body/characteristic

### 8.3.3 Format

Only one pictogram can be displayed on one image element and on every B/B or 4B image element.

### 8.3.4 Displayed position:

There are four displayed positions for selection by the user: the bottom left, bottom right, top right and top left corners. When the status is set to the positioning of the chart, the displayed position of the pictogram can only be selected by clicking on the **Pkey**.

### 8.3.5 Application

The type of pictograms specified by the system changes according to the different applications. Specified pictorial diagrams are shown as below:

#### a) Abdomen pictograms

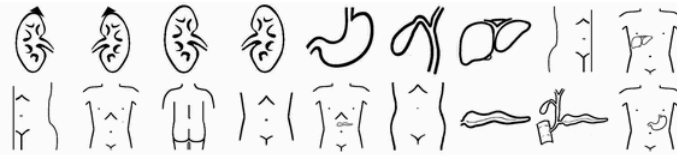


Figure 86: Abdomen pictograms

#### b) Cardiology pictograms



Figure 87: Cardiology pictograms

#### c) Gynaecology pictograms



Figure 88: Gynaecology pictograms

#### d) Obstetrics pictograms (including 1st, 2nd and 3rd trimester and foetal ultrasound)



Figure 89: Obstetrics pictograms

#### e) Pictograms of peripheral blood vessels

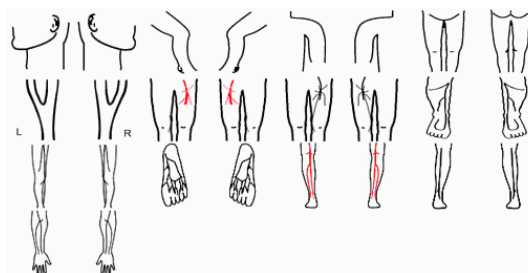


Figure 90: Pictograms of peripheral blood vessels

#### f) Urology pictograms



Figure 91: Urology pictograms

## g) Marks for small parts

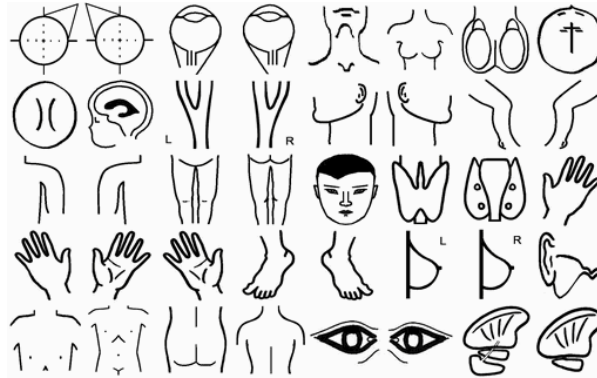




Figure 92: Marks for minor organs

## 8.4 Adding an arrow

Click on the  button on the control panel. An arrow appears in the centre of the image area.

- a) The trackball is used to adjust the angle.
- b) Fix: The arrow can only be fixed by clicking on **Set** (the arrows turn yellow). Otherwise, the arrow is cleared when entering another state.

*NOTE: The fixed arrow is automatically cleared when toggling to another imaging mode.*

- c) Exit: Click on **Esc** or the  button the exit the process before fixing the arrow.
- d) Enter multiple arrows: After the first arrow has been fixed, the second movable arrow appears automatically.
- e) Delete: When in Live or Freeze mode, click on **Clear** to delete all the arrows. In the arrow annotation state (current arrows are green), arrows can be cleared individually with the **BkSp** (**Backspace**) key on the keyboard.

# 9 Measurements, calculations and reports

## 9.1 Introduction to measurements and calculations

The measurement and calculation functions allow the user to perform clinical ultrasound analysis, including measurements on ultrasound images and various calculation results, using a variety of calculation methods. These results are automatically and simultaneously entered into reports for the processing of user diagnostic reports.

Measurement and calculation functions consist of general measurements and calculation software.


### 9.1.1 Function keys for measurement and calculation

The function keys used for measurements and calculations (Meas/Calc) and their functions are listed in Table 20.

Table 20: Function list for the control unit

Control unit	Function
Calc	To activate the Measurement & Calculation function and open the general measurement menu or the <b>special calculation menu</b> .
Reset to default	To clear measurement data on the screen. <i>NOTE: This button is not used to delete measurement data in reports.</i>
Set	To select, set up and activate the cursor and confirm the measurement.
Updates	To toggle between cursors before confirming measurement.
BkSp	To correct operating errors during trace measurement or to delete certain measurements.
P	Hold this button down to scroll through the display positions of the measurement result. Four positions are available: "bottom right image", "top right image", "top left image" and "bottom left image". <i>NOTE: This key is only available when no pictogram is displayed or the pictogram is inactive (the probe identifiers are fixed).</i>

### 9.1.2 CALC Menu

Click on **Calc**, and the Calc menu is shown on the left of the screen. This displays the calculation software for the current examination type. Calculation software may contain various measurement cards (blue shading), and one measurement card has multiple measurement objects. If there are too many items, the display is paged. Move the cursor to the  bottom right, click on **Set** to turn the page Figure 93 accordingly.

Use the trackball to move the cursor to calculation software, such as **Abdomen**, click on **Set** to open the drop-down menu for the software and display all the calculation software packages accordingly Figure 94 .

Use the trackball to move the cursor to the measurement card, such as **General**; click on **Set** to collapse the drop-down menu for that measurement card and display all measurement cards of that calculation software package accordingly Figure 95.

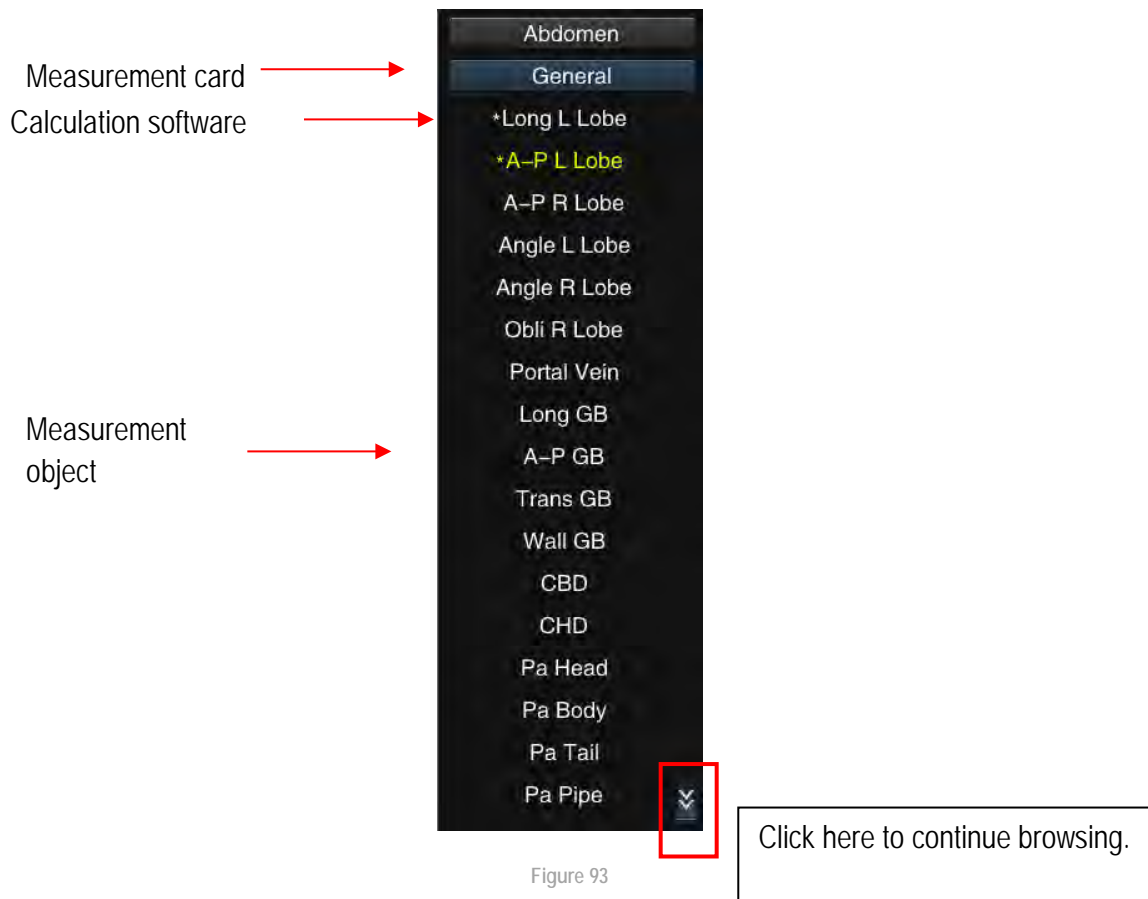


Figure 93

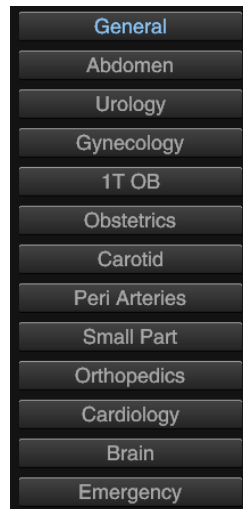


Figure 94

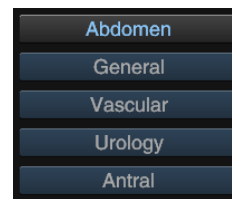


Figure 95

The cursor turns blue when moved over a measurement object. Press **Set** to select it. The item currently being measured is shown in yellow and a \*symbol is shown before the object that is to be measured (see Figure 93).

## 9.2 General Measurements

### 9.2.1 B mode - general measurement menu

When in B-imaging mode, click on **Calc** to open the menu. Move the cursor over the calculation software and click on **Set**. Next, move the cursor to **General** and click on **Set** to enter B mode for the general measurement menu.

Table 21: B mode – General measurements

Measurement object	Description of function
Distance	Distance measurement between two points.
Depth	Measure the depth of the target object.
Trace length	Measure the length of the target object.
Ellipse	Measurement of the area and circumference of an enclosed area with the variable ellipse method.
Trace	Measurement of the area and circumference of an enclosed area using the trace method.
Angle (general) Angle (cross)	Measurement of the angle between two intersecting planes.

Measurement object	Description of function
Blood vessel diameter	Measurement of the distance between two points of the vessel.
Variable ellipse	Measurement of the area and a circumference of an enclosed area using the variable ellipse method.
IMT	Measuring the maximum, minimum, mean and standard deviation of the IMT (intima-media thickness), as well as the intima-media length.
Histogram	Greyscale distribution of ultrasonic echo signals within an enclosed area.
Volume – 3 axes	Volume measurement using the three-line method.
Biplane vol.	Volume measurement using the biplane method.
Ellipse vol.	Volume measurement using the ellipse method.
Simpson vol.	Volume measurement using the Simpson method.
Sphere volume	Volume measurement using the sphere method.
Area ratio (t)	Area ratio using the trace method.
Area ratio (e)	Area ratio using the ellipse method.
%area redu(t)	Area reduction percentage with the trace method.
%area redu(e)	Area reduction percentage using the ellipse method.
% diam. Reduction	Length reduction in percentage points.

#### 9.2.1.1

#### 9.2.1.2 Distance

Measurement:

1. When in B mode imaging state, click on **Calc** to open the menu. Move the cursor over the calculation software and click on and click on **Set**. Move the cursor over **General** and click again on **set**. Select **Distance** to open the Distance Measurement state. The cross cursor + is then displayed in the image area.
2. Use the trackball to move the cursor over the start point for measurement, click on **Set** to fix the



start point and activate another cross cursor + .

3. The second cursor, which is connected to the start point cursor by a dotted line, can be moved using the trackball. The result of measurement is displayed in the measurement result window. Click on **Update** to toggle between the two cursors and position one or the other.
4. Use the trackball to move the second cursor to the measurement endpoint. Click on **Set** to fix the measurement endpoint and finalise the measurement result.
5. Repeat the process in steps 2) to 4) to continue with another distance measurement. Press **Esc** to exit the measurement procedure.

*NOTE: Click on DIS on the control panel to go straight to Distance Measurement.*



Figure 96: Distance measurements

### 9.2.1.3 Depth

Measurement:

1. When in B-imaging mode, click on **Calc** to open the menu. Move the cursor to the calculation software and click on **Set**. Then move the cursor to **General** and click on **Set**. Select **Depth** to display the + cursor and enter Depth Measurement.
2. Use the trackball to move the cursor to the target object and click on **Set** to measure the depth of the target object. The measurement result is displayed in the bottom right corner of the screen, and the measurement procedure is completed.
3. Move the cursor to **Depth** in the menu and click on **Set**. Repeat the second step to start the next depth measurement.

*NOTE: Depth measurement and depth scale is consistent if the measurement is negative with a movement of 0 cm from the top of the scale.*

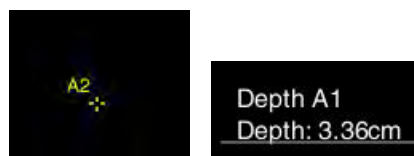


Figure 97: Depth measurement

### 9.2.1.4 Trace length

Measurement:

1. When in B-imaging mode, click on **Calc** to open the menu, move the cursor over the calculation

software and click on **Set**. Move the cursor over **General** again and click on **Set**. Then select **Trace Length** to enter the trace measurement state, where a cross cursor  $+$  is displayed in the image area.

2. Move the cursor over a certain point and click on **Set** to fix the start point of the measurement.
3. Use the trackball to draw the trace along the edge of the target area.
4. Click on **Set** at the measurement endpoint to finish the measurement. The length of the measured object is displayed in the measurement result window.
5. Move the cursor to **Trace Length** and press **Set**. Repeat steps 2) to 4) and you can continue with another trace length measurement.

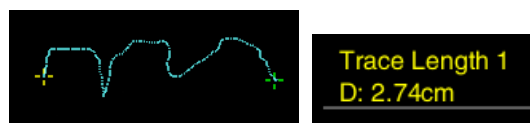


Figure 98: Trace length measurement

#### 9.2.1.5 Ellipse

Measurement:

1. When in B-imaging mode, click on **Calc** to open the menu, then move the cursor over the calculation software and click on **Set**. Move the cursor over **General** again and click on **Set**. Next, select **Ellipse** to open ellipse measurement; a cross cursor  $+$  is shown in the image area.
2. Move the cursor over a specific point in the measurement area. Click on **Set** to fix the axis of the start point.
3. Move the cursor to select the desired axis endpoint and press **Set** to fix it. Click on **Update** to toggle between the two cursors and position either or both.
4. Move the cursor to change the ellipse shape, using the fixed axis as a base. To adapt the ellipse to the measurement area, click on **Set** to fix the measurement area for the ellipse and complete the measurement. The measurement results of the ellipse circumference and area are displayed in the measurement result window.
5. Move the cursor to **Ellipse** and click on **Set**. Repeat the operation in steps 2) to 4) to continue with another ellipse measurement.



Figure 99: Ellipse measurement

### 9.2.1.6 Trace

Measurement:

1. In B-imaging mode, press **Calc**, move the cursor over the calculation software to open the menu, and click on **Set**; move the cursor over **General** again and click on **Set**. Next, select **Trace** to open the trace measurement state; a cross cursor  $\oplus$  is displayed in the image area.
2. Move the cursor over a certain point and click on **Set** to fix the start point of the measurement.
3. Use the trackball to draw the trace along the edge of the target area. To delete the trace dot by dot, click on **BkSp**.
4. At the endpoint of the measurement, click on **Set** to complete the measurement. If the area is not enclosed, the system automatically connects the start point with the endpoint with a line. The measurement result is displayed in the measurement result window.
5. Move the cursor to **Trace** and click on **Set**. Repeat the operation in steps 2) to 4) to continue with another trace measurement.



Figure 100: Trace measurement

### 9.2.1.7 Angle (general)

Measurement:

1. When in B-imaging mode, click on **Calc** to open the menu, move the cursor over the calculation software and click on **Set**. Move the cursor over **General** again and click on **Set**. Next, select **Angle (general)** to open Angle Measurement, for which a cross cursor  $\oplus$  is displayed in the image area.
2. Fix a line section with the distance measurement method, and the end of the section is the start of the second section. Use the trackball to change the inclination between the two sections. Press **Update** to toggle control between the three cursors. The angle is adjustable, and the angle values are displayed in the measurement result window. Click on **Set** at the proper position to fix the angle and finish the measurement.
3. Move the cursor to **Angle(general)** and click on **Set**. Repeat the operation in step 2) to continue with another angle measurement.



Figure 101: Angle (general) measurement

#### 9.2.1.8 Angle (cross)

Measurement:

1. Select **Angle (cross)** in the **General** menu. Fix the two sections using the distance measurement method. The displayed angle is the inclination between the two straight lines along the direction of the marking.
2. Repeat the procedure to perform another angle measurement.

*NOTE: If the angle of the two fixed sections needs to be changed, click on Esc to exit the measurement state. Click on Set again to bring up the cursor. Move the cursor to the endpoints of the section that needs to be changed. Press Set again to adjust the section. Press the BkSp button on the keyboard to delete the two sections and start another measurement.*

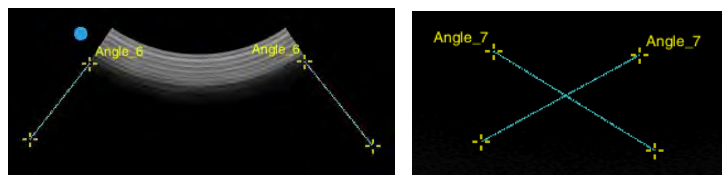


Figure 102: Angle (cross) measurement

#### 9.2.1.9 Vascular diameter

Measurement :

1. When in B-imaging mode, click on **Calc** to open the menu; move the cursor over the calculation software and click on **Set**. Next, move the cursor to **General** and click on **Set**. Select **Vascular Diameter** to display the cross cursor + and enter the vascular diameter measurement state.
2. Move the cursor to a point in the measuring area and press **Set** to fix the point and show a second + cursor.
3. The second cursor, which is connected to the start point cursor by a dotted line, can be moved using the trackball. The result of measurement is displayed in the measurement result window. Click on **Update** to toggle between the two cursors and position one or both.
4. Use the trackball to move the second cursor to the measurement endpoint and press **Set** to fix the measurement endpoint and finalise the measurement result. The system automatically calculates the vascular area according to the measurement result. The result is displayed in the

measurement result area.

- Repeat the operation in steps 2) to 4) to continue with another vascular diameter measurement.  
Press **Esc** to exit the measurement procedure.

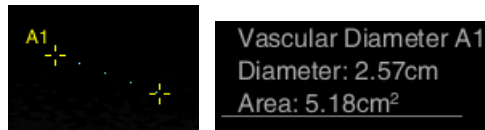


Figure 103: Measurement of vascular diameter

#### 9.2.1.10 Variable ellipse

Measurement :

- When in B-imaging mode, click on **Calc** to open the menu, move the cursor over the calculation software and click on **Set**. Next, move the cursor to **General** and click on **Set**. Select **Variable Ellipse** to display the **+** cursor and enter the Variable Ellipse measurement state.
- Draw an ellipse according to **Ellipse Measurement** (see Section 9.2.1.4). There are many control points in the ellipse, as shown in Figure 95.
- Move the cursor to one control point and click on **Set** to activate it. At this point the control point turns yellow. Next, use the trackball to move the control point (then click on **Update** to toggle between the control points) and adjust the graphics so as to be as close as possible to the measurement target, as shown in Figure 104. The results of measurement of the circumference and area are displayed in the lower right corner of the screen.
- Move the cursor to **Variable Ellipse** in the measurement menu and click on **Set**. Repeat steps 2) to 3) to start the next variable ellipse measurement.

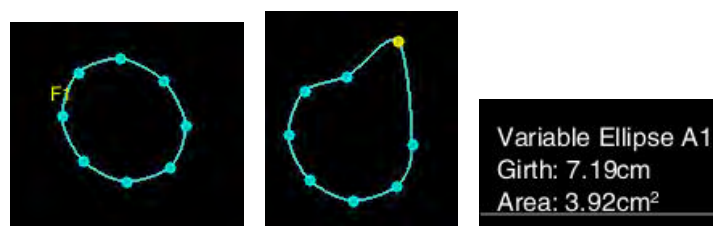


Figure 104: Measurement of the variable ellipse

#### 9.2.1.11 Intima-media (IMT)

Measurement:

- When in B-imaging mode, click on the **Calc** button to open the measurement menu. Move the cursor to the calculation software, click on **Set**, then move the cursor to **General** and click on **Set**. Select **IMT** and an ROI box appears in the image area, meaning that it is now in the intima-media measurement area.

2. Use the trackball to move the ROI box. Click on **Update** and the solid lines are changed to dotted in the ROI box. Next, change the size of the box using the trackball. Click again on **Update** to confirm the size of the ROI; the trackball function is restored to allow the changing of the ROI position.
3. Once the size and position of the ROI box has been adjusted, click on **Set** and the system automatically calculates the maximum, minimum, average, and standard deviation of IMT (intima-media thickness), as well as the intima-media length. The positions with two arrow marks indicate the position of the largest IMT, as shown in the Figure below. The system displays the index description for user reference according to the measurement result, i.e. *Normal, Abnormal, High Risk*.

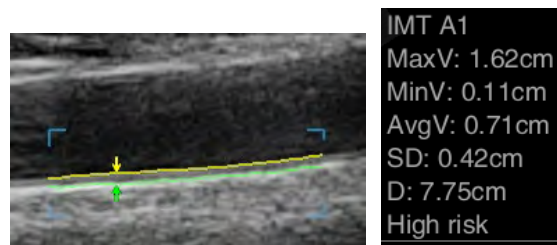


Figure 105: IMT measurement

#### 9.2.1.12 Histogram

The map with the probability density distribution based on experimental data and the statistical method is known as a histogram. The probability distribution histogram in B mode refers to the greyscale distribution map.

When in the B-mode screen, press the **Calc** button to open the menu, move the mouse over the calculation software and click on **Set**. Next, move the cursor over **General** and click on **Set to select Histogram**. A transparent rectangular box is shown in the centre of the image, with the measurement result shown at the bottom left of the image area, in which the x-axis represents a greyscale within the range of 0-255, and the y-axis represents a probability percentage with which each greyscale appears, as shown in Figure 106.

Use the trackball to move the position of the ROI within the image; use **Update** and the trackball to change the size of the ROI box.



Figure 106: Histogram

### 9.2.1.13 Volume – 3 axes

Click on **2B/4B** on the control panel to enter 2B mode. Record the area with the maximum longitudinal diameter and click on **Update** to activate another image window and display the surface with the maximum longitudinal diameter as a still image. Capture the image of the area with the maximum transverse diameter perpendicularly to the area with the longitudinal diameter. Next, click on **Freeze** to freeze the image.

The measurement procedure is as follows:

1. Click on **Calc** and move the cursor to the calculation software, click on **Set** and then move the cursor to **General**, click on **set** and select **Volume 3 Axes** to enter the volume measurement screen.
2. Use the trackball to place the **+** cursor over the maximum longitudinal diameter of the image. Follow the procedure for distance measurement (see **9.2.1.1** for instructions) to obtain the values for **D1** and **D2**, i.e. the diameter and the anteroposterior diameter of the object.
3. Move the cursor to the maximum transverse diameter of the image and follow the instructions for distance measurement (see **9.2.1.1** for instructions) to obtain the value for **D3** and conclude the measurement. The volume value and values for D1, D2 and D3 are now displayed in the results window.



Figure 107: Volume measurement - three axes.

## 9.2.1.14 Biplane volumes

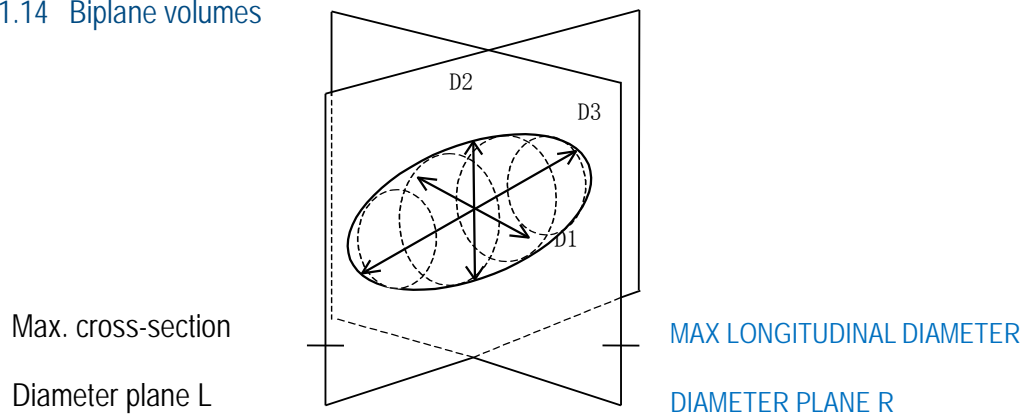


Figure 108: Diagram of biplane volume measurement

Click on **2B/4B** on the control panel to enter 2B mode. Record the level of the max. longitudinal diameter (level **R** on Figure 109); click on **Update** to activate another image window and display a still image of the max. longitudinal diameter level; capture an image of the max. transverse diameter plane (plane **L** on Figure 109) at right angles to plane **R** on. Then click on **Freeze** to open the still image.

The measurement procedure is as follows:

1. Click on **Calc** and move the cursor to the calculation software, click on **Set** and then move the cursor to **General** and click on **Set**, select **Biplane-vol.** to access the Biplane Volume (volume on two levels) measurement screen.
2. Use the trackball to place the + cursor at the start point of the longitudinal axis of the max. longitudinal diameter image (R level). Follow the procedure for **Ellipse** distance measurement (see 9.2.1.4 for instructions to obtain the values for **D1** and **D2**, i.e. the longitudinal and anteroposterior diameter of the object. To confirm, then press on **Set**.
3. Follow the procedure for distance measurement (see 9.2.1.1 for instructions) to obtain the value of **D3** above the max. transverse diameter plane (plane L) and finish the measurement. The volume value and values for D1, D2 and D3 are now displayed in the results window.

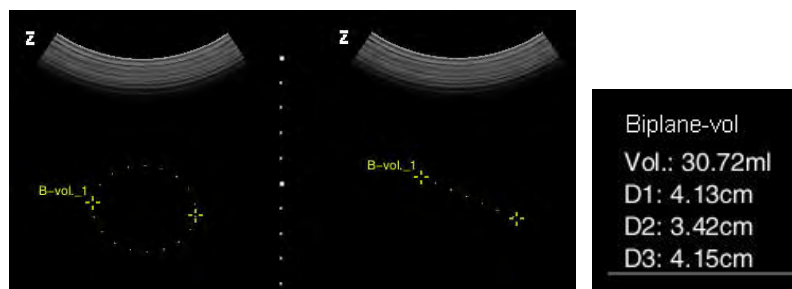


Figure 109: Biplane-Vol. Measurement



### 9.2.1.15 Sphere volume

The measuring process is similar to the measuring process for the ellipse area. Please follow the procedure under Ellipse Measurement (see **9.2.1.4**).

### 9.2.1.16 Simpson volume

In Simpson volume measurement, the enclosed area captured through the trace measurement method is divided into several equal parts (here they are five pixels apart) along the long axis. Each part is regarded approximately as a cylinder for calculating the volume. The accumulated cylinder volume of all parts corresponds to the approximate volume of the entire surface.

Measurement:

1. When in B-imaging mode, click on **Calc** to open the menu, move the cursor over the calculation software and click on **Set**. Move the cursor over **General** again and click on **Set**. Next, select **Simpson-Vol.** to enter Simpson volume measurement, and a cross cursor appears in the image area + shown.
2. Follow the procedure for the trace measurement range (see **9.2.1.5** for instructions) to obtain an enclosed area.
3. A dotted line is displayed as a long axis between the two most widely separated points in the area. The user can adjust the position of the long axis using the trackball. The two ends of the dotted line are kept on the border of the area during adjustment. The result of measurement changes with the adjustment of the position of the long axis.
4. Click on **Set** to fix the long axis and finish the measurement. The measurement result is displayed in the measurement result window.



Figure 110: Volume of Simpson measurement

### 9.2.1.17 Sphere volume

The sphere volume is used in obstetrics for measuring the volume of ovarian follicles. The measurement procedure is similar to the method for measuring the ellipse area (see **9.2.1.4** for instructions); however, the length of the longitudinal and transverse axes must be the same.

### 9.2.1.18 Area ratio (t)

Measurement:

1. When in B-imaging mode, click on **Calc** to open the menu, move the cursor over the calculation software and click on **Set**. Move the cursor over **General** again and click on **Set**. Next, select **Area Ratio** to enter area ratio measurement, in which a cross cursor  $+$  is displayed in the image area.
2. Follow the procedure for trace measurement to obtain a measurement for a trace area (see **9.2.1.5** for instructions);
3. Follow the procedure for trace measurement to obtain a further measurement of a trace area (see **9.2.1.5** for instructions).
4. The area ratio is calculated automatically, and the two area results and the area ratio in the trace method are displayed in the result window.



Figure 111: Area ratio(t) measurement

### 9.2.1.19 Area ratio (e)

Please refer to the Area Ratio(t) measurement procedure, where the measurement method for the first area is ellipse instead of trace.

**NOTE:** Measure normal blood vessels using the elliptical measurement method, and deformed blood vessels using the trace measurement method.

### 9.2.1.20 Range reduction (t) in percent

Measurement:

1. When in B-imaging mode, click on **Calc** to open the menu, move the cursor over the calculation software and click on **Set**. Move the cursor over **General** again and click on **Set**. Then select **Range reduction (t) in percent** in order to obtain the measurement for the area reduction (t) in percent using a cross cursor  $+$  that is displayed in the image area.
2. Follow the procedure for trace measurement (see **9.2.1.5** for instructions) to perform an exterior measurement of the trace area.
3. Follow the trace measurement procedure (see **9.2.1.5** for instructions) to perform an interior measurement of another trace area.
4. The area reduction ratio is calculated automatically, and the two area results and the area reduction

ratio in trace method are displayed in the result window.

#### 9.2.1.21 Range reduction (e) in percent

Area reduction process (e) is similar to area reduction process (t). Please refer to the for area reduction (t) measuring process, whose measuring process for the first area is ellipse instead of trace.

*NOTE: Measure normal blood vessels using the ellipse measurement method, and deformed blood vessels using the trace method.*

#### 9.2.1.22 Diameter reduction in percent

Measurement:

1. When in B-imaging mode, click on **Calc** to open the menu, move the cursor over the calculation software and click on **Set**. Move the cursor over **General** again and click on **Set**. Then select **% Reduce diameter** to open the measurement of length reduction in percent, in which a cross cursor + is displayed in the image area.
2. Follow the procedure for distance measurement (see **9.2.1.1** for instructions) to perform distance measurement for both line segments, **a** and **b**.
3. After the measurement has been taken, the measurement results for the distances and ratio are displayed in the result window.



Figure 112: Measurement of the reduction diameter

#### 9.2.2 M mode – General measurement

In B/M and M modes, the **General** calculation software includes **General** and **M General** measuring cards. The **General** measurement card contains many measurement objects, such as Distance, Depth, Trace length, Ellipse, Trace, etc. The measurement procedures are the same as in B mode. In **M General** the measurements are as follows:

Table 22

Measurement	Function
Time	Time interval between any two points
Gradient	The average velocity (gradient) based on measurement of the distance and time between two points.
Heart rate	The number of heart beats per minute based on measurement of the time interval between $n$ heart beat cycles. The number of beat cycles can be preset.
Multi-distance	The vertical distance between two points of multiple segments.

### 9.2.2.1 Time

Measurement:

1. When in B/M or M mode, click on **Calc** on the control panel to open the menu. Move the cursor over the calculation software and click on **Set**. Next, select **General** and then **M General**. Select **Time** again to open a **+** cursor and a vertical line in the image area and time measurement state is entered.
2. Move the trackball cursor to the measurement start point; click on **Set** to fix the measurement start point. Next, move the trackball to show the second **+** cursor and a vertical line.
3. Use the trackball to move the cursor. The result of measurement is displayed in the results display window. Click on **Update** to toggle between the two cursors and fix one or both.
4. Use the trackball to move the second cursor to the measurement endpoint. Click on **Set** to fix the measurement endpoint, with the final result displayed in the result display area. The measurement is completed, as shown in the Figure below.

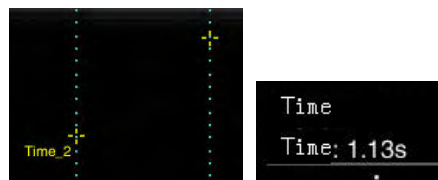


Figure 113: Time measurement

### 9.2.2.2 Gradient

Measurement:

1. When in B/M or M-imaging mode, click on **Calc** on the control panel to open the menu. Move the cursor over the calculation software and click on **Set**. Next, select **General** and then **M**

**General.** Select **Slope** again to open a + cursor and a vertical line and the slope measurement state is opened.

2. Use the trackball to move the cursor over the measurement start point and click on **Set** to fix it. Next, use the trackball to move the cursor to bring up the second + cursor and a vertical line is displayed.
3. Use the trackball to move the cursor, and the measurement is displayed in the results window. Click on **Update** to toggle between the two cursors and fix one or both.
4. Use the trackball to move the second cursor to the measurement endpoint. Click on **Set** to fix the measurement endpoint and confirm the measurement result. The result of the measurement is displayed in the measurement result area. The measurement is completed, as shown in the Figure below.

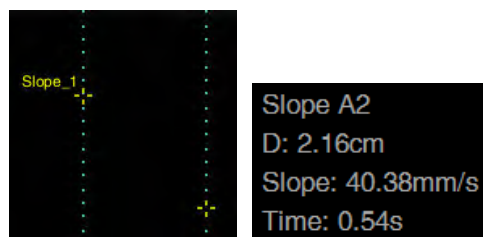


Figure 114: Measurement of the slope

### 9.2.2.3 Heart rate

Measurement:

1. When in B/M- or M-imaging mode, click on **Calc** to open the calculation menu. Move the cursor over the calculation software and click on **Set**. Next, select **General** and then **M General**. Select **Heart Rate** again to display a + cursor and a vertical dotted line in the image area and enter the Heart Rate Measurement state.
2. The measurement is the same as for **Time** in M mode.
3. Once the measurement has been taken, the result is displayed in the result area. The heart beat cycle can be preset under **Setup – Measurement Setup**. The setup procedure is explained in Section 5.2.8.



Figure 115: Heart rate measurement

#### 9.2.2.4 Multi-distance

Measurement:

1. When in B/M- or M-imaging mode, click on **Calc** to open the menu. Move the cursor over the calculation software and click on **Set**. Next, select **General** and then **M General**. Again select **Mult distance** to display a + cursor and its extended dotted line in the image area, and it enters the Multi-distance Measurement state.
2. Use the trackball to move the cursor to the measurement start point for the first distance. Click on **Set** to fix the start point and roll the trackball to display the second + cursor.
3. Move the trackball. The second cursor can only be moved vertically; the result of the measurement is displayed in the results window.
4. Use the trackball to move the second cursor to the measurement endpoint. Click on **Set** to fix the measurement endpoint. Measurement of the first distance is finished.
5. Repeat steps 2) to 4) to finalise the distance measurement of the 2nd, 3rd, 4th, 5th or 6th segment. Prior to confirming the last measurement point, click on **Update** to toggle between the controls for each measurement point and re-adjust the position of any point.
6. The measurement result area displays six distances, as shown in the following Figure:

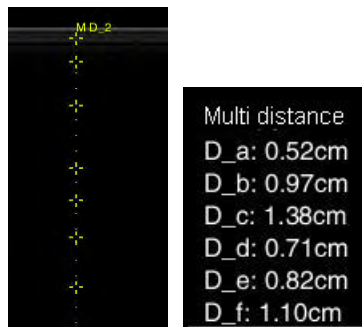


Figure 116: Measurement of several distances

**NOTE:** After measurement, re-adjust the position of the measuring point. Move the cursor to a measurement point, press **Set** to activate the measurement point, and move the trackball to adjust. When the adjustment is finished, press **Set** again to skip to the next measurement point, or press **Esc** to exit the measurement state.

### 9.2.3 General measurement in C mode

Measurement elements in CFM and CPA modes are shown in the table below:

Table 23

Measurement	Function
Flow Distribution	To measure the probability distribution of flow velocity within an enclosed area.
Circulation speed	To measure average and maximum velocity and calculate flow volume.

*NOTE: Measurement elements in CFM mode are the same as in B mode.*

#### 9.2.3.1 Flow Distribution

Flow distribution measurement in CFM is similar to that of the histogram in B mode, whose probability distribution refers to the probability distribution for flow velocity.

When in CFM or CPA image mode, click on **Calc** to open the menu and move the cursor over the calculation software and click on **Set**. Move the cursor over **General** and click on **Set**. Select **Flow distribution**. Subsequently, a transparent rectangular box is displayed at the centre of the image and the measurement result at the bottom left of the image area, in which x-axis represents flow velocity with a settable range, and the y-axis represents frequency percentage with which each individual velocity appears, as shown in Figure 117.

Use the trackball to move the box within the image area. Click on **Update** and change the size of the box with the trackball. Click on **Update** again and the trackball function is restored to change the position of the box.

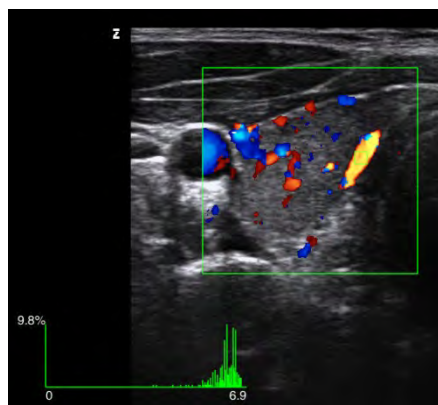


Figure 117: Measurement of flow distribution

### 9.2.3.2 Circulation speed

Measurement:

1. When in the CFM-imaging mode image, click on **Calc** to open the menu. Move the cursor over the calculation software and click on **Set**. Move the cursor over **General** again and click on **Set**. Next, select **Circulation** to bring up a + cursor and the Circulation Measurement state is displayed.
2. Move the cursor to the vessel and use **Distance measurement** to obtain the diameter of the vessel.
3. A dotted line appears as soon as the diameter has been determined. The default angle between the dotted line and the diameter is 60°. Move the trackball to rotate the dotted line against the red dot in the middle of the vessel diameter. If it is parallel to the vessel, click on **Set** to confirm and stop the measurement.
4. The system automatically calculates the flow angle, average flow velocity, maximum value and flow volume, and displays the measurements in the result area.

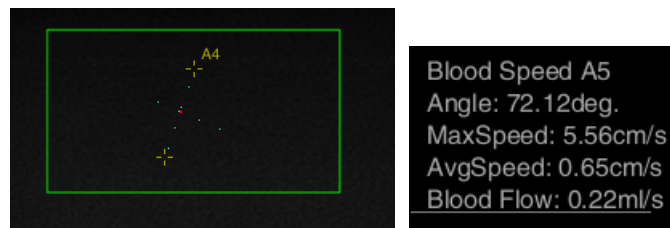


Figure 118: Circulation velocity

### 9.2.4 General measurement in PW mode

In PW mode, the calculation software incorporates **General** and the **General** and **Doppler General** measurement cards. The **General** measurement card contains five measurement objects, such as Distance, Depth, Trace Length, Ellipse, Trace, etc. The measurement procedures are the same as in B mode. The measurement elements in **Doppler General** are as follows:

Table 24

Measurement	Function
Velocity	To measure the velocity and pressure gradient of certain point in the Doppler spectrum waveform.
Instantaneous Velocity	To measure the velocity and pressure gradient of certain point in the Doppler spectrum waveform.
ACC	To measure the velocity and time interval between two points and obtain the speed difference within a certain time period.



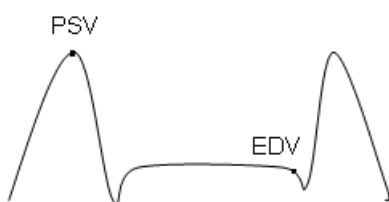
Manual Trace	To manually trace one or more Doppler waveforms so as to obtain clinical indices such as velocity, acceleration and heart rate.
Auto Trace	To automatically trace one or more Doppler waveforms according to the waveform scan system so as to obtain clinical indices such as velocity, acceleration and heart rate.
Range Trace	Clinical indices such as velocity, acceleration and heart rate can be obtained by setting the start and end lines of the region to be traced on the Doppler spectrum.
Velocity Ratio (A:B)	To measure the speed ratio between two points.
Blood circulation	To measure the flow volume in an enclosed area within a certain time period.

*NOTE: Other measurement objects in PW mode are the same as those in M mode.*

#### 9.2.4.1 Velocity

Measurement:

1. In PW image mode, click on **Calc** on the control panel to open the menu. Move the cursor over the calculation software and click on **Set**. Then select **General** and then **Doppler General**. Select **Velocity** again to display the + cursor (PSV) and its two intersecting dotted lines, and the system enters the Velocity Measurement state.
2. Use the trackball to move the cursor over the peak systolic spectrum and click on **Set**. The + cursor (PSV) is fixed and the PSV value is confirmed too. Move the trackball to display the second + cursor (EDV) and its two intersecting dotted lines.
3. Use the trackball to move the cursor, and the measurement is displayed in the results window. Click on **Update** to toggle between the two cursors and fix one or both.
4. Use the trackball to move the cursor over the peak systolic spectrum and press **Set** to fix the + cursor (EDV). The EDV, S/D and RI values are also confirmed. The measurement has now been successfully completed.
5. The measurement result is displayed in the result area, as shown below:



Velocity

PSV : x.xx cm/s

EDV : x.xx cm/s

S/D: x.xx ; xx

RI: x.xx

PPG: x.xx mm Hg

#### 9.2.4.2 Instant Velocity

Measurement :

1. In PW image mode, click on **Calc** on the control panel to open the menu, move the cursor to the calculation software and press **Set**. Next, select **General - Doppler General** and again **Instant Velocity** to display the + cursor and its two intersecting dotted lines; the system then enters the Instant Velocity measurement state.
2. Move the cursor to the point position needed to measure the velocity, click on **Set** to confirm and fix the point position to finish the velocity measurement. The system automatically calculates the pressure gradient (PG) value. The measurement and calculated result are shown as follows.

Instant Velocity

V : ×.×× cm/s

PG : ×.×× mm Hg

#### 9.2.4.3 Acceleration

Measurement:

1. When in PW image mode, click on **Calc** on the control panel to open the menu. Move the cursor over the calculation software and click on **Set**. Next, select **General** and then **Doppler General**, select **ACC** again to display the + cursor and its two intersecting dotted lines in the image area, and the system enters the Acceleration Measurement state.
2. Move the cursor over the position of a desired measurement point. Then press **Set** to confirm and fix the point. The velocity measurement of the first point is now finished.
3. Use the trackball to move the cursor, and the measurement is then displayed in the results window. Click on **Update** to toggle between the two cursors and fix one or both.
4. Move the trackball to fix the position of the second point in the same way. The current measurement is finished after the velocity measurement of the second point.
5. The results area is displayed as follows:

ACC

ACC: ×.×× cm/s<sup>2</sup>

#### 9.2.4.4 Manual Trace

Measurement:

- 1) When in PW image mode, click on **Calc** to open the menu. Move the cursor over the calculation software and click on **Set**. Next, select **General** and then **Doppler General**, select **Manual Trace** to display the + cursor and open the Manual Trace state.
- 2) Move the measurement cursor over the desired start point of the Doppler spectrum and click on **Set** to confirm the position of the start point.
- 3) Use the trackball to move the cursor along the Doppler spectrum scan target edge and make the scan coincide with the Doppler spectrum as much as possible. To revise the scan trace, move the trackball to the left to delete the previously scanned trace.
- 4) Follow the desired Doppler spectrum endpoint and click on **Set** again to confirm the Doppler scan trace and end the measurement. The result of the measurement result is displayed in the measurement result area, as shown below:

Manual Trace

PSV: x.xx cm/s ;

EDV: x.xx cm/s ;

MNV: x.xx cm/s;

S/D: x.xx ; xx;

RI: x.xx;

PI: x.xx;

MNV: x.xx cm/s ;

VTI: x.xx cm ;

AT: x.xx s ;

DT: x.xx s ;

PPG: x.xx mm Hg ;

MNPG: x.xx mm Hg ;

HR: x.xx bpm.

#### 9.2.4.5 Auto Trace

Measurement:

1. When in PW imaging mode, click on **Calc** on the control panel to open the menu. Move the cursor over the calculation software and click on **Set**. Next, select **General** and then **Doppler General**, and select **Auto Trace** again to enter the Auto Trace Measurement state.

- Click on **Freeze** to display the start line and end line of a cardiac cycle. You can now move two lines with the trackball. Click on **Set** to activate the start line and roll the trackball to move the start line. Click on **Set** again to activate, and roll the trackball to move the end line.
- The result of the measurement is displayed in the measurement result area, as shown below:

## Auto Trace

MN\_PG: x.xx mm Hg ;

PSV: x.xx cm/s ;

EDV: x.xx cm/s ;

MN: x.xx cm/s ;

MNV: x.xx cm/s ;

S/D: x.xx ; xx;

RI: x.xx;

PI: x.xx;

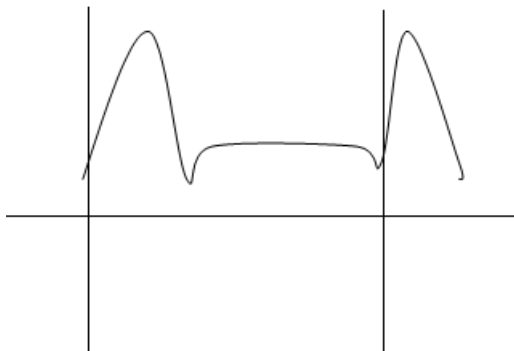
HR: x.xx bpm.

*NOTE: If Auto Trace is used, click on the Tab button to change the trace type. An upper scan trace, lower scan trace and full scan trace are available for selection.*

*NOTE: Set up the first trace type for manual trace, auto-trace, or range trace in Measurement Setup.*

## 9.2.4.6 Range Trace

- When in PW imaging mode, click on **Calc** on the control panel to open the menu. Move the cursor over the calculation software and click on **Set**. Next, select **General** and then **Doppler General**, select **Range Trace** again to open the Range Trace state.
- A vertical line appears on the Doppler spectrum. Use the trackball to move the line to the start point of the desired trace region, press **Set** to fix the line, and another line appears. Next, use the trackball to move the line to the endpoint and press **Set** to complete the measurement. The result of the measurement result is displayed in the measurement result area, as shown below:



## Range Trace

PSV: x.xx cm/s ;

EDV: x.xx cm/s ;

MN: x.xx cm/s ;

S/D: x.xx ; xx;

RI: x.xx;

PI: x.xx;

MNV: x.xx cm/s ;

VTI: x.xx cm ;

AT: x.xx s ;

DT: x.xx s ;

PPG: x.xx mm Hg ;

MNPG: x.xx mm Hg ;

HR: x.xx bpm.

*NOTE: To display the calculation elements of Auto Trace and Range Trace, you can use Measurement Setup - - Advanced Settings - Trace Result, as shown in Figure 119. For a description of the setup process, see Section 6.2.8.*

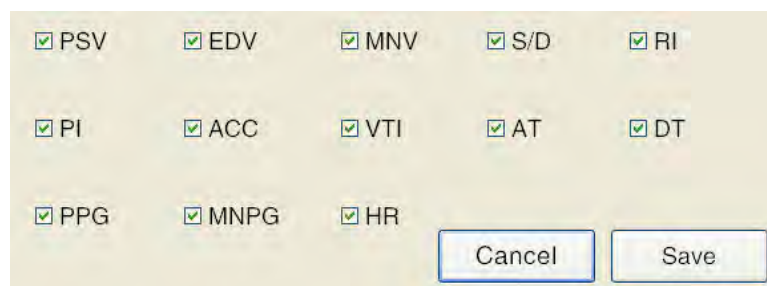


Figure 119: Trace result

#### 9.2.4.7 Velocity Ratio (A:B)

Measurement:

1. When in PW image mode, click on **Calc** on the control panel to open the menu. Move the cursor over the calculation software and click on **Set**. Next, select **General** and then **Doppler General**, and select **Velocity Ratio (A: B)** again to display the + cursor and its two intersecting dashed lines in the image area, and the measurement state for the Velocity Ratio is displayed.
2. Move the measurement cursor to the desired two velocity points, and click on **Set** to fix the two positions. The system automatically calculates the velocity value between the two points, and displays the results as below:

Velocity Ratio (A:B)

A: x.xx cm/s ;

B: x.xx cm/s ;

A:B: x.xx

#### 9.2.4.8 Blood circulation

Measurement:

1. Move the cursor in the upwards and downwards distributed state for B and PW images onto the calculation software and click on **Set**. Next, select **General** and then **General** and select **Vascular Diameter** to display + in the image area.
2. Move the cursor with the measurement procedure for the **Vascular Diameter to the B-image** (see Section 9.2.1.8) to measure the cross-sectional area of the target object.
3. Move the cursor over the measurement card **General and click on Set**, then move the cursor to **Doppler General** and click on **Set**, select **Blood Flow** again to display a + in the image area and to enter the Blood Flow measurement state.
4. Move the cursor to the starting position of the measurement area in the Doppler spectrum and click on **Set** to fix the start point.
5. Use the trackball to move the measurement cursor along the edge of the target area of the Doppler spectrum trace. Move the trackball to the left to delete the curve displayed previously. Click on **Set** to fix the endpoint that measures the mean circulation velocity (MNV) at the end position.
6. The system combines the value of the flow velocity and blood flow area to automatically calculate the blood flow (BF). The measurement results are shown as below:

Vascular diameter

Diameter: x.xx cm

Area: x.xx cm<sup>2</sup>

Blood Flow

MNV: x.xx cm/s

BF: x.xx ml/s

### 9.3 Calculation software


#### 9.3.1 Introduction to calculation software

The system provides calculation software for obstetrics, the abdomen, small parts, urology, gynaecology, the carotid artery, peripheral blood vessels, cardiology, orthopaedics, the brain and emergencies. Users can apply different software packages based on their diagnostic needs.

*NOTE: Press Calc to bring up the calculation menu for the current exam type. If a different default calculation menu is required, click on Setup to access the Measurement Setup - Advanced Setup and*

set the default calculation menu to "Open Scan Type" (see Section 6.2.7 for detailed instructions). Then, the next time the same exam type is selected, the preset calculation menu is the default.

- Marking of paired organs and/or vessels with large diameters

The option box  is placed above the measurement menu and is used to select parts of paired organs and/or measurement of longer vessels. The selected mark key is displayed in yellow.

If the current displayed measurement menu includes part of a paired organ, the **R (right)** and **L (left)** mark keys are optional. If it includes a large-diameter blood vessel, the **P (proximal)**, **M (medium)** and **D (distant)** mark keys are optional. To begin measurement, the user simply clicks on the desired item for measurement with the mark key.

If the measuring item is a not paired organ, the **R** and **L** mark keys are optional, but inactive. Similarly, if the measurement element is not a large-diameter blood vessel, the **P**, **M** and **D** mark keys are invalid.

**Example:** AO is a large-diameter blood vessel. The user clicks on **P** and then on **Abdominal Vascular AO** to open the AO Measurement state. Figure 120 It shows a measurement of the proximal abdominal aorta. The **R** and **L** mark keys become invalid at this point.

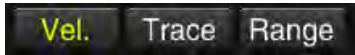
**Example 2:** SMA are paired organs. The user can click on **L** and then **Abdomen Vascular SMA** to enter the SMA Measurement state. The **P**, **M** and **D** mark keys become invalid at this point.



Figure 120

**NOTE:** A \* mark in front of the AO measurement object means that the proximal AO was measured, but not all components of the AO.

- PW specialist measurement options

To use a specialist measurement object in PW mode, an option box , which is used to select the measurement process, can be found above the measurement menu. The selected marking is displayed in yellow.

If the currently displayed measurement menu includes measured items that use velocity, trace and range as measuring processes, the three mark keys are optional. If none of the three measuring methods are used, the three marking keys are not optional.

The system uses the **Velocity process** as a standard measurement. If the user needs to change the measurement method, click on the corresponding icon to change it. **Trace** is the same process as **Manual Trace** and **Range** is the same process as the **Range Trace** process. Specific measurement processes are described in **9.2.4 General measurement in PW mode**.

- **Continuous Measurement**

If, in **Setup – Measurement Setup – Advanced Settings**, **Measure Continuously** is selected, the system continuously measures the calculation menu item that is to be measured. When previous item is finished, simply click on **Set** to automatically enter the next element to be measured without having to select a measurement element. Also, after the approval (selection of another section) and retrieval of the measurement, the system remembers the previously measured item and automatically performs the next measurement.

If the user needs to repeat the measurement of the previous measurement object or measure the subsequent measurement object out of order, the cursor must be moved to the measurement menu and the corresponding measurement object clicked on. To exit the Measurement state, click on **Esc**.

**Example:** To measure the amount of residual urine, the user only has to go to the relevant sections. After selecting **Trans AU Blad (transverse diameter of the urinary bladder after urination)**, the remaining two diameter measurements are completed directly and continuously. The measuring procedure is shown in Figure 121.

#### Calc Menu

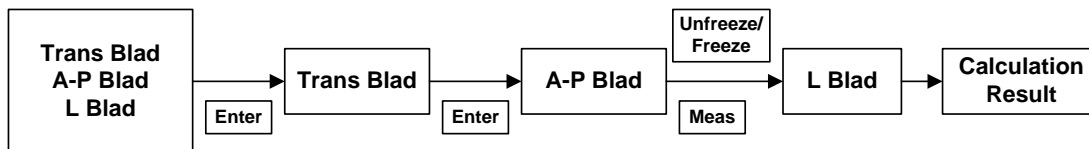


Figure 121: Scheme for the ongoing measurement process

**NOTE:** For items that need to be measured multiple times, it is recommended to use continuous measurement to simplify the process.

**NOTE:** The following procedure uses **Measure Continuously** by default.

### 9.3.2 Obstetrics

#### 9.3.2.1 Introduction to calculation software for obstetrics

The calculation software for obstetrics is used to calculate the age of the foetus and anticipated delivery date, measure various indications of foetal growth, such as the weight of the foetus, and to determine foetal growth based on the growth charts and biophysical profile of the foetus.

#### 9.3.2.2 Preparation before obstetrics measurement

Please make sure that the preparations described below have been made before performing the obstetrics measurement.



1. Ensure that the chosen probe is suitable for the obstetrics examination.

Ensure that the current date is correct.

*(NOTE: If the current date is incorrect, the age of the foetus and the expected date of birth will be calculated incorrectly.)*

2. If new patient information has not been created, click on **ID** to open the **New Patient Info** screen to enter and save the information. Please refer to **Chapter 8** for detailed instructions.
3. Switch to the correct obstetrics exam type.

### 9.3.2.3 Obstetrics measurement menu

When in B mode, click on **Calc** to open the measurement menu. The system shows **Obstetrics Foetal General** measurement elements by default, as shown in Figure 122.

The calculation software for **Obstetrics** is divided into several measurement cards based on the various measurement objects to make it fast and easy for the user to find measurement objects. Click on the **Foetal General** measurement card to display all measurement cards, as shown in Figure 122.



Figure 122: Measurement objects for obstetrics

The system performs calculations of foetal age, foetal weight, amniotic fluid index and the estimated date of delivery based on obstetrics measurement results (the user is allowed to preset the default formula before obstetrics measurement. See **Chapter 6** for the specific measurement setup procedure). The analysis of foetal growth for the final obstetrics report is performed on the basis of the calculation results.

### 9.3.2.4 Obstetrics measurement process

The measurement process for obstetrics is the same as the general measurement process. See **Chapter 9.2** for a detailed description of the process.

Table 25

Type	Measurement object	Measurement process
Length measurement	For example: GS, CRL, BPD etc.	See <i>Distance Measurement</i> in B mode.
Circumference measurement	For example: HC, AC etc.	See <i>Ellipse measurement</i> or <i>Trace measurement</i> in B mode.
Heart rate measurement	For example: Foetal HF etc.	See <i>Heart rate measurement</i> in M mode.
Doppler measurement	For example: umbilical artery, venous catheter etc.	See <i>Velocity measurement</i> or <i>Manual trace measurement</i> or <i>Range trace measurement</i> in PW mode.

- Using **GS** as an example, the steps for distance measurement are briefly described below:
  - When in B-imaging mode, click on **Calc** to open the menu. The Obstetrics Measurement menu is displayed and you can select **GS** directly.
  - A cross cursor **+** is displayed on the screen. Use the trackball to move the cursor over the measurement start point and click on **Set** to fix the start point and bring up another cross cursor **+**.
  - Use the trackball to move the second cursor to the measurement endpoint and press **Set** to fix the measurement endpoint and finalise the measurement result. According to the measurement result, the system automatically calculates GA (gestation age) and EDD (expected delivery date). The result of measurement is displayed in the measurement result area, as shown below:

GS

D: .x.xx cm

GA: xx

Expected delivery date: YY/MM/DD

- Using **HC** as an example, the steps for distance measurement are briefly explained below:
  - When in B-imaging mode, click on **Calc** to open the menu. The Obstetrics Measurement menu is displayed. You can now select **HC** directly and enter the measurement state. A cross cursor appears on the screen.
  - Use the trackball and the **Set** key to confirm the start and endpoints for the fixed axis of the ellipse.
  - Move the cursor to change the ellipse shape, using the fixed axis as a base. To adapt the ellipse to the measurement area, click on **Set** to fix the measurement area for the ellipse and

complete the measurement. According to the measurement result, the system automatically calculates GA (gestation age) and EDD (expected delivery date). The result of measurement is displayed in the measurement result area, as shown below:

HC

E\_C: x.xx cm

GA: xx

Expected delivery date: YY/MM/DD

*NOTE: After completing the measurement of the basic element, the system automatically calculates the ratio of various elements such as HC/AC, FL/BPD, FL/AC, CER/AC, LVW/HW. etc. The calculated result is imported into the report.*

*NOTE: For a description of the abbreviations in the table, please see Appendix A.*

- Using **Foetal HR** as an example, the steps for heart rate measurement are briefly explained below:
  1. When in M-imaging mode, click on **Calc** to open the measurement menu. The obstetrics measurement menu is displayed. Select **Foetal HR** directly to go straight to the measurement state.
  2. Follow the procedure for measuring the **heart rate** in M mode (see Section 9.2.2.3 for detailed instructions).
  3. The result of measurement is displayed in the measurement result area, as shown below:

Foetal HR

HR: x.xx bpm

Beat cycle: x

*NOTE: The measurement steps for foetal heart rate are the same in PW mode.*

- Using **Umb A (umbilical artery)** as an example, the steps for Doppler measurement steps are briefly explained below:
  1. When in PW mode, click on **Calc** on the control panel to open the Measurement menu. The obstetric measurement menu is now displayed. Select **Umb A** to enter the measurement state directly.
  2. The system uses the **Velocity** process as its default method. If the user needs to adjust the measurement process, the user clicks on the **Trace** or **Range** options on the measurement menu to toggle before **Umb A** is selected.
  3. To select from **Vel. (velocity)** See section 9.2.4.1 and to choose from **Trace**, see Section 9.2.4.4, to choose from **Range** see Section 9.2.4.6.
  4. The result of measurement is displayed in the measurement result area, as shown below:

Umb A

PSV: x.xx cm/s ;

EDV: x.xx cm/s ;

S/D: x.xx ; xx;

RI: x.xx;

PI: x.xx;

MNV: x.xx cm/s ;

VTI: x.xx cm ;

AT: x.xx s ;

DT: x.xx s ;

PPG: x.xx mm Hg ;

MNPG: x.xx mm Hg ;

HR: x.xx bpm.

*NOTE: When in PW mode, the measurement process for other elements to be measured can take place according to the measuring process for the umbilical artery.*

#### 9.3.2.5 Amniotic fluid index (AFI)

The amniotic fluid index is obtained by measuring the depth of the amniotic fluid in four regions, and the calculation formula is as follows:

$$\text{AFI} = \text{AFI Q1} + \text{AFI Q2} + \text{AFI Q3} + \text{AFI Q4}$$

Measurement:

1. When the obstetrics calculation software is in B mode, click on the **AFI** measuring card and select **AFI Q1**. Use the **distance** measurement (see Section 2.2.1.1) to measure the first index.
2. Use the same method to measure Q2, Q3 and Q4.
3. Once you have obtained the four indices, the system automatically calculates the AFI value and the mean value. The average value is not displayed on the screen but can be checked in the report.

#### 9.3.2.6 Foetal Weight

Foetal weight is a calculation and estimation made on the basis of a number of foetal parameter measurements. There are various formulae for calculating foetal weight. Objects to be measured and

the order of measurement vary with different formulae. The results of foetal weight calculations are obtained by the substitution of the arithmetical mean values in the selected formula.

The items to be measured and the results of calculation using the empirical formulae supported by the system are listed below:

Table 26

Formula	Measurement	Calculation result
EFW Shepard	AC, BPD	Weight, GA
EFW Hadlock1	AC, FL	Weight, GA, EDD
EFW Hadlock2	AC, FL, HC	Weight, GA, EDD
EFW Hadlock3	AC, FL, HC, BPD	Weight, GA, EDD
EFW Hadlock4	AC, FL, BPD	Weight, GA, EDD
EFW Campbell	AC	Weight, GA, EDD
EFW Hansmann	BPD, TAD	Weight, GA, EDD
EFW Tokyo	BPD, APD, TAD, FL	Weight, GA, EDD

**NOTE:** For a description of the abbreviations in the table, please see Appendix A.


Taking the example of EFW Shepard, the measurement process is as follows:

1. Set the foetal weight calculation formula in **Setup - Measurement Setup - Foetal Age Estimating** and select **AC + BPD (Shepard)**. Take into account the specific setup method in Section 6.5.
2. In B-imaging mode, click on **Calc** to open the menu. The obstetric measurement menu is displayed and you can directly select **AC** and enter the measurement state from there. Follow the measuring process for general circumference measurement.
3. Select **BPD** and follow the procedure for general distance measurement.
4. Once the measurement has been performed, the system will automatically calculate the foetal weight, and the results of the calculation are imported into the report.

**NOTE:** The unit of foetal weight can be reset under **Setup - Measurement Setup**. The options are *g, oz, lb, kg*.

### 9.3.2.7 Worksheet - Report on obstetrics report

When using the measurement & calculation function in the Calc software, the measurement result is automatically imported into the report. During or after measurement and calculation, click on the **Report** key on the operating panel to open the report worksheet (as shown in Figure 123 ) and check the result of the calculation.

Click  in the upper right-hand corner of the screen or click on **Report** again to exit the report worksheet screen.

**Report Worksheet** 1/1P 22/2/2013 Friday

ID: 20130130-0956-001 Sex: Female Physician: gfg Height: 160 cm  
 Name: wx Age: 28 Y Sonographer: fd Weight: 50 kg  
 LMP: 25/10/2012 DOB: Exam: Obstetrics(Gen)

From LMP: GA 17W1D EDD 1/8/2013 EFW Measure: AC+BPD(Shepard) HR 392.54 bpm  
 From AUA: GA 12W0D EDD 6/9/2013 EFW 150.44g

2D	1	2	3	Method	Value	GA	Formula	EDD	SD
GS	1.04			Last	1.04 cm	5W4D	Hadlock Table	21/10/2013	±2D
BPD	2.43	2.58	2.43	Last	2.43 cm	14W0D	Hadlock Table	23/8/2013	±5D
HC	7.16	6.24	6.75	Last	6.75 cm		Hadlock Table		
AC	13.23			Last	13.23 cm	18W4D	Hadlock Table	22/7/2013	±6D
Max AF	4.03			Last	4.03 cm				
AFI Q1	1.14			Last	1.14 cm				
AFI Q2	1.57			Last	1.57 cm				
AFI Q3	2.83			Last	2.83 cm				
AFI Q4	2.71			Avg	2.71 cm	INDX: 8.24 cm		Avg: 2.06 cm	
RV	2.09			Min	2.09 cm				
RA	3.86			Max	3.86 cm				
Ratio	HC/AC 0.51			Last					

M	1	2	3	Method	Value
Fetal HR	315.79	417.39	444.44	Avg	392.54 bpm


PW	PSV	EDV	MNV	S/D	RI	PI	ACC	VTI	AT	DT	PPG	MINPG	HR
Umb A	27.00	22.25		1.21	0.18						mmHg		

Comments

Data Analysis Chart Picture Print Preview PrintScreen Pg Up Pg Dn

Figure 123: Worksheet for obstetrics report

- Header

Patient-related information is displayed in the header. If the patient data has not been entered in the *New Patient Info* screen, it can still be entered in the header. After entering the patient data, click on the  button on the right side of the header and the entered data is saved, otherwise the supplemented data will be lost when leaving the report worksheet screen.

**NOTE:** The "name" in the report cannot be edited.

- Calculation result

The result obtained from the calculation is displayed in the calculation area, including the gestational age (GA), the expected date of delivery (EDD) and foetal weight (EFW) as determined using the LMP or the calculation.

The *EFW Measure* is the preset formula for the measuring of foetal weight, which is displayed by default and can be changed here. Click the arrow on the right to open the drop-down menu and choose a different calculation formula. The result of the calculation of foetal weight changes.

**NOTE:** If you select the foetal weight calculation formula in the report worksheet again, the calculation result will not be saved. If you exit and then re-enter the worksheet, the result displayed is taken from the default calculation formula.

- Measurement objects and calculation results

This area displays the measurement results of all measurement objects and results taken from calculation results and can be edited.

Three measurement values can be recorded for each measurement object in 2D mode. To delete any of the measurement results, move the cursor to the value and click on **Set** to cross it out, as shown in Figure 123.

In connection to the three measurement values, a drop-down list offering the options Avg (average of all effective measurement values), Min (minimum value), Max (maximum value) or Last (last measured value) is available. Based on the user's selection, the system provides the final value and calculates the GA and expected date of birth.

The formula for each measuring item can be preset in **Setup - Measurement Setup - Foetal Age Estimating**. The system calculates the corresponding gestational age and expected date of birth based on the selected formula. The user can also change the formula in the report worksheet and the calculation results are changed accordingly. However, this change only applies to the current patient.

After each measurement of an object that can be used for calculation of the GA calculation, a ☒ check box is displayed. The checked items are used for a comprehensive calculation of the GA. Click on **Set** to activate or deactivate it. The final calculated GA is displayed above the check box, as shown in Figure 123.

In PW mode, the measurement results of measurement objects are listed on the report worksheet, as shown below:

PW	PSV	EDV	MNV	S/D	RI	PI	ACC	VTI	AT	DT	PPG	MNPG	HR
Umb A	cm/s 27.00	cm/s 22.25		1.21	0.18						mmHg 0.29		

Figure 124: Measurement results in PW mode

- **Comments**

The user can enter the relevant diagnostic information in the **Comments** area. Move the cursor to the comments area and click on **Set** to enter information.

- **Menu bar**

Click on the relevant object on the menu bar to open the corresponding screen.

**Data:** If another screen is currently displayed in front of you, click to return to the screen with the report worksheet.

**Analysis:** Enter the foetal biophysical analysis and profile screen (see Section 9.3.2.8).

**Diagram:** Access to the growth curve editing screen (see Section 9.3.2.9).

**Image:** Access to the report editing screen (see Section 9.3.2.10).

**Print Preview:** Access to the Print Preview screen (see Section 9.3.2.11).

**Print Screen:** Click to save the current page to the specified directory in BMP format.

**Pg Up, Pg Dn:** Change page when there are multiple pages.

### 9.3.2.8 Biophysical analysis and profile of the foetus

In the report worksheet, use the trackball and the **Set** key to click on **Analysis** and open the **Foetus Analysis** screen (see Figure 125). In this screen, the user can record the results of the observation and enter a biophysical score.

A biophysical foetal profile (BPP) is a prenatal ultrasound examination (in the 2nd and 3rd trimester) of foetal wellbeing. It uses ultrasound to measure foetal movement, foetal breathing, amniotic fluid volume and placental maturity.

The screenshot displays the 'Foetus analysis' screen with a dark background and white text. The interface is organized into several sections, each with a category label in green text:

- Main Description:** Includes dropdowns for Fetal Position, Umbilical (Cephalic, Breech, Lt Trans, Rt Trans), Stomach, PL Position (LOA, ROA, LOP, ROP), Limb (Upper Limb, Lt Foot), Brain (LVW), Heart (4 Chamber, Ductal Arch), and Fetus Score (FM, FBM, FHR, FT, AF).
- Other Parameters:** Includes Fetal Head, Lungs, Rt Kidney, PL Maturity, Face, Diaphragm, Lt Kidney, Genitals, Nose Lips, Liver, Bladder, AF, Multiple, NB, Gall Bladder, Bowel, Spine, Rt Palm, Rt Foot, Lower Limb, and Lt Palm.
- Brain:** Includes LVW, Cist Magna, and Cerebellum.
- Heart:** Includes 4 Chamber, LVOT, RVOT, 3 Vessel, and Aortic Arch.
- Fetus Score:** Includes FM, FBM, FHR, FT, and AF.

Each dropdown menu is represented by a white box with a blue arrow on the right. The 'Total Score' is indicated at the bottom left.

Figure 125: Foetus analysis screen

### 9.3.2.9 Growth charts

Foetal growth charts serve as a comparison tool for foetal measuring data with the normal growth curve to determine whether foetal development is proceeding normally. Click on **Chart** on the menu bar of the report worksheet to open the foetal growth chart screen (see Figure 126).



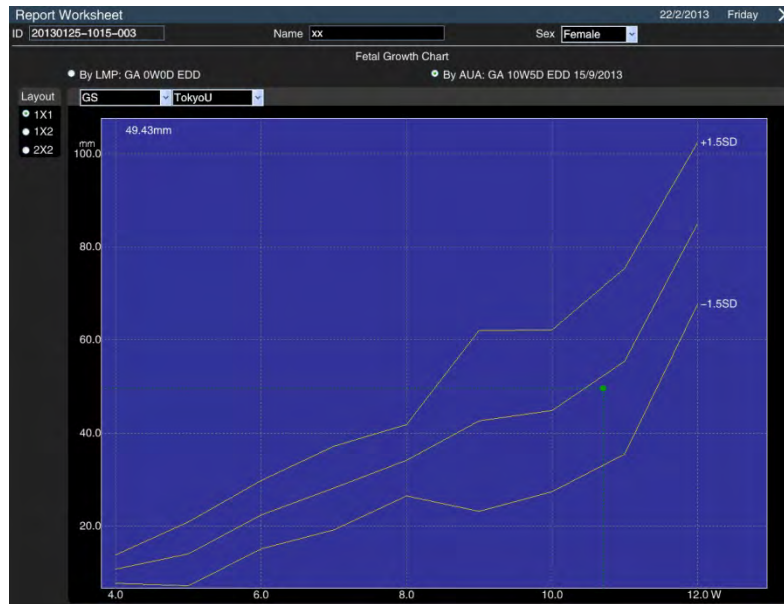


Figure 126: Growth charts (a picture)

*The layout* on the left side of the screen is used to choose the growth curves and position to make comparative analysis easier.  $1 \times 2$  is for two images which are displayed side-by-side.  $2 \times 2$  is for four pictures that are displayed in two lines, as shown in Figure 127.

Multiple measurement objects and measuring formulae are available to choose from on the upper left side of the growth curve chart.

Growth curves display percentile or variance based on various types of statistics.

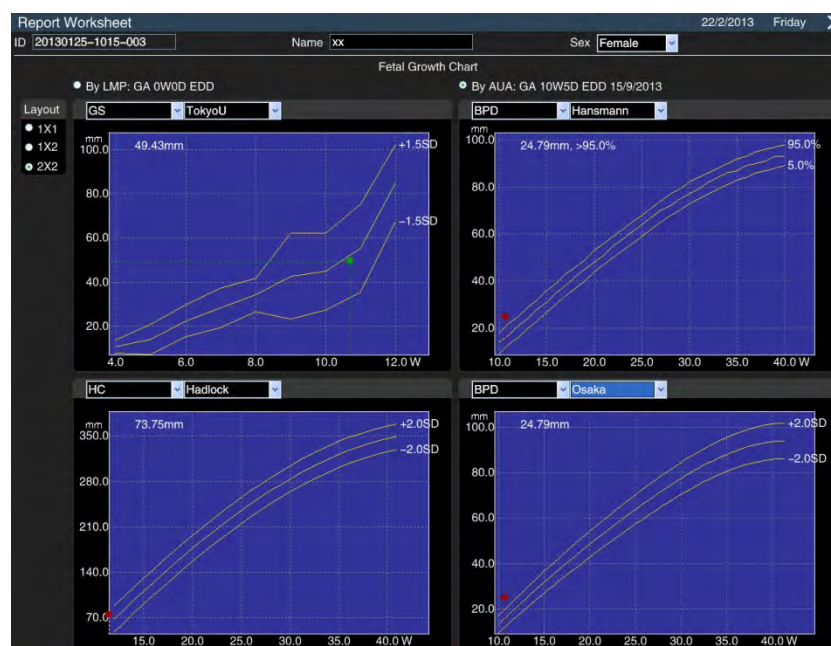


Figure 127: Growth charts (four images)

The measurement procedure is as follows:

1. Input LMP on the **New Patient info** screen. Save and exit.
2. Selection of **BPD. HC. AC. FL** etc. in the calculation software for measurements in obstetrics.
3. After opening the report worksheet, click on **Chart** to enter the Growth Charts screen. Select any growth curve from the left corner of the screen, e. g. **BPD [Hadlock]**. Two gestational ages and the estimated date of delivery are displayed for user reference: one is calculated from the LMP, the other from the BPD. In the growth diagram there are three curves: the middle one is the age curve of the foetus. The other two curves refer to errors in the age of the foetus. The actual measurement result is marked with ● in the growth chart. The y-coordinate of the result marked with ● is taken from the measurement, while the x-coordinate (i.e. the GA) is acquired by selecting either **GA(via AUA)** or **GA(via LMP)**. If the “●” mark is green, this means that the measurement object is within the normal range. If the “●” mark is red, this means that the measurement object is outside the normal range.

### 9.3.2.10 Image

Images saved during the examination procedure can be previewed in the Report Worksheet. Additionally, these images can be typeset and sorted according to user preferences and become an integral part of the report content together with a text message.

After entering the report worksheet, click on **Picture** to open the picture editing screen, as shown in Figure 128.

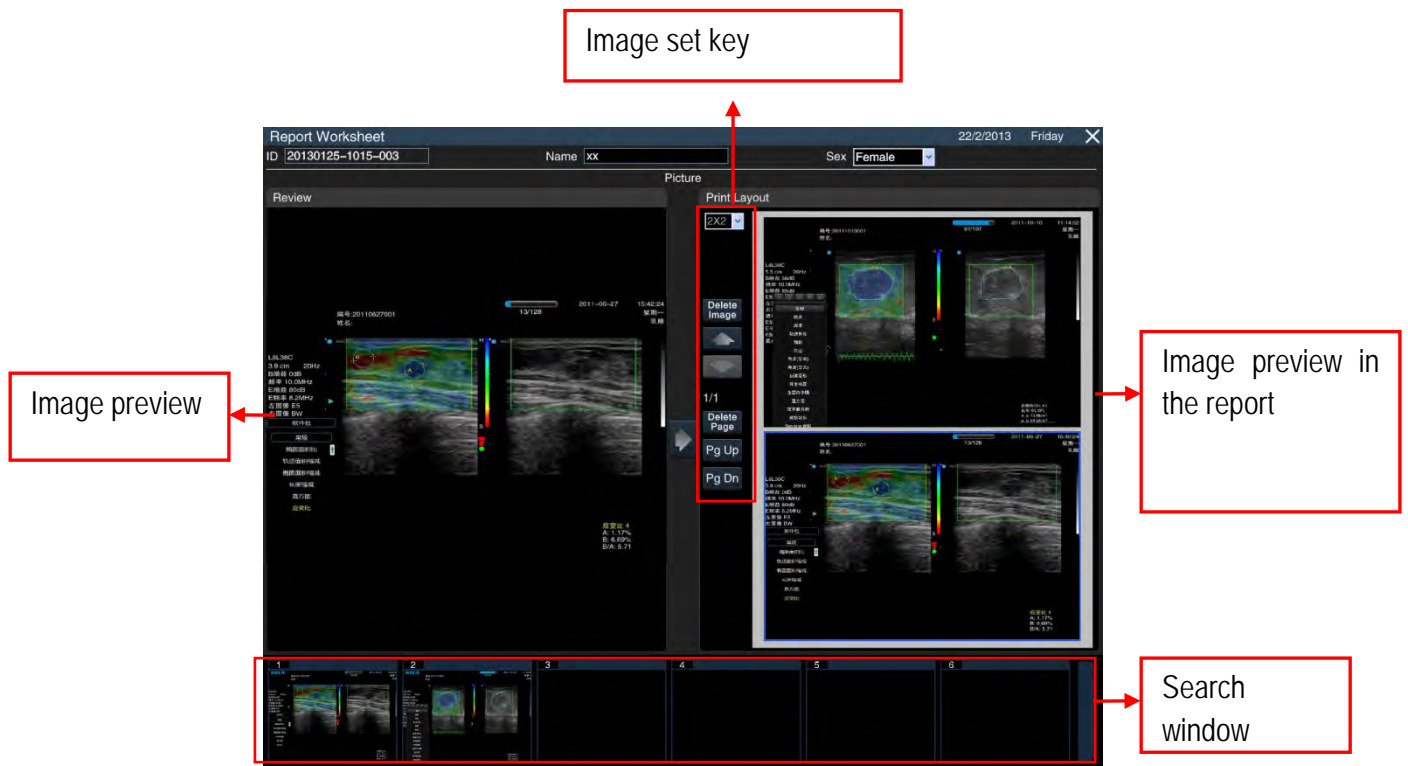



Figure 128: Screen in Picture mode

Edit:

a) **Browse Images:** Images saved during the exam process are displayed in the search window in the lower part of the screen so that the user can browse and select the image for the report in advance.



*NOTE: In the browse window, film format can only be inserted in the report as the final frame. If it is necessary to find a video image to put in the report, exit the report and use film loop to find the frame and save the image.*

b) **Preview Image:** Click on **Set** to activate the cursor. Move the cursor to select the image and click on **Set** again. This image is highlighted in the search area on the left side of the screen for review by the user.



c) **Import Image:** If you are sure that you would like to place an image in the report, click on  in the centre of the screen to import the image to the preview area on the right side of the screen.

*NOTE: The default layout of the display on the right-hand side is 1×1, which means that only one image can be imported. If you want to import more than one image, you can change the format or click on Pg Dn to add a page.*

d) **Picture Layout:** The imported image can be deleted, sorted and typeset.

- **Delete:** If you wish to delete an image, move the cursor over it and click on **Set** to select it (the selected image is marked in a blue box and click on **Delete Image** to remove the image from the report. If you click on **Delete Page**, all images on the current page are deleted.
- **Sort:** Move the cursor to the image that is to be sorted and click on **Set** to select it. Click on  or  to move the image up or down.
- **Typesetting:** The user can select the layout for the image in **Print Layout**. There are several types of layout to choose from, namely single image as large page display and multiple images in single page display (for example, 3 x 3 means that three lines are displayed, with three images in each row). Multiple pages and multiple layout are supported.

#### 9.3.2.11 Print Preview

Enter the report and click on < **Print Preview** to open the overall view of the report on the Print Preview screen, as shown in Figure 129. The image is attached at the end of the report. Click on **Pg Up** and **Pg Dn** to view a different page. Click on   to shrink or enlarge the page, and click on **Print** to print the report.

*NOTE: The printer should be installed before printing the report. The structure of the printer is described in Chapter 4.1.1.5.*

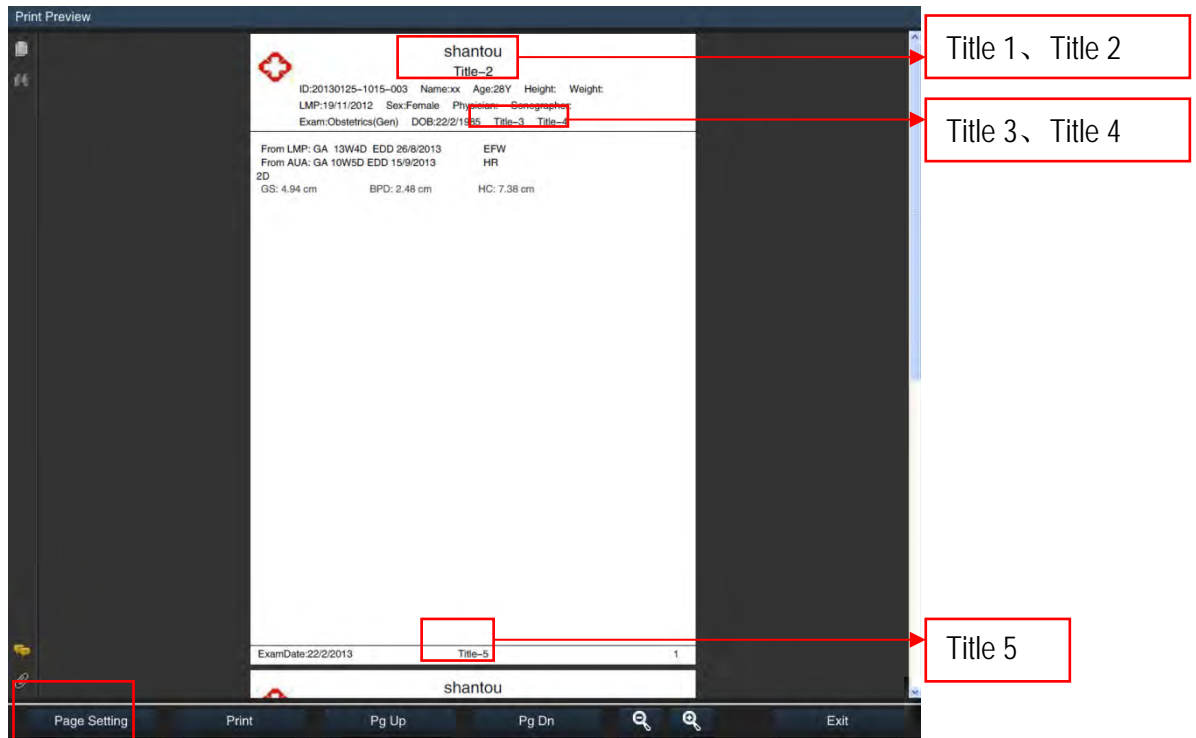


Figure 129: Print Preview

- **Page Settings**

Click on **Page Setup** in the lower left corner and go to the Settings screen as shown in Figure 130. Up to five titles can be set up here. Move the cursor to the corresponding input field and click on **Set** to enter the title via the keyboard.



Figure 130: Page Setting screen.

Move the cursor to the box on the right side of the image and click on **Set** to review it, i.e.: to display the symbol on the left side of the screen, click on **Set** again to deactivate it, and no symbol is shown.

Click on **Browse** to open the file's selection box; as shown in Figure 131, other symbol files can be selected. (The recommended icon size is 64 \* 64).

After making the settings, click on **Save** on the bottom right to save the settings and exit.

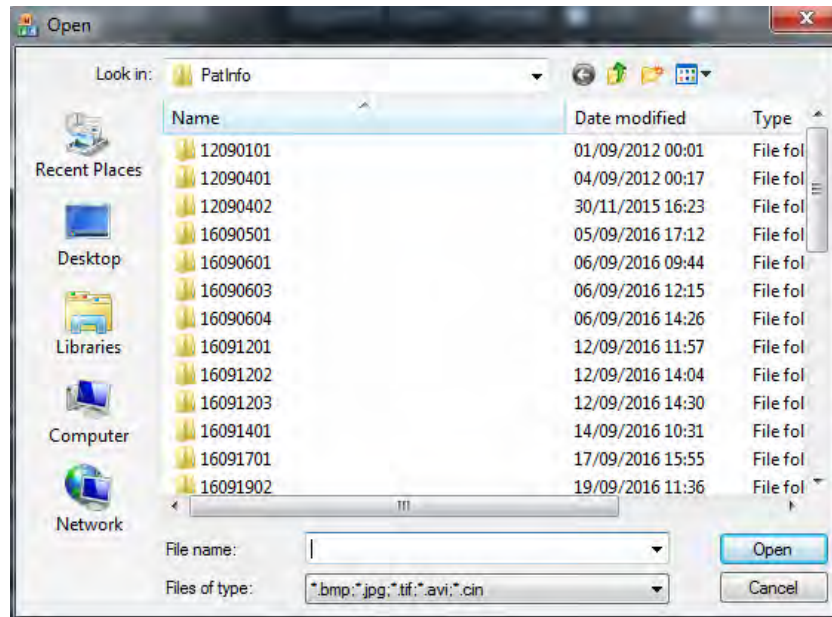


Figure 131: File selection box

### 9.3.3 Abdomen

#### 9.3.3.1 Function

The abdominal calculation software is used for the detection of abdominal organs such as the liver, gall bladder, pancreas, spleen and so on. You can use the measured and calculated results to analyse whether the abdominal organs are affected or not.

#### 9.3.3.2 Preparation before abdominal measurement

Please make sure that the preparations described below have been made before performing the abdominal measurement.

1. Ensure that the current selected probe is suitable for abdominal examinations.
2. If the new patient information has not been created, click on **ID** to open the *New Patient Info* screen to enter and save the information. See also **Chapter 8**.
3. Switch to the correct exam type for abdomen.

#### 9.3.3.3 Measurement in B mode

When in B mode, click on **Calc** to open the measurement menu. The default system display for measurement elements is **Abdomen - General**, as shown in Figure 93 above. Click on the **General** measurement card to display all measurement cards (including General, Vascular, Urological System, etc.), as shown in Figure 94 above.

The abdominal computation software describes B-mode measurement in the following table.

Table 27

Type	Measurement object	Measurement process
Length measurement	For example: Long L lobe, AP L Lobe, Long GB, Pa Head, PV, AO, etc.	See <i>Distance Measurement</i> in B mode.
Angle measurement system	For example: Angle L Lobe , Angle R Lobe etc.	See <i>Angle (Cross) Measurement</i> in B mode.
Area Reduction Measurement	For example: %Aorta redu (t) etc.	Refer to <i>% Area Redu (t) Measurement</i> in B mode.

*NOTE: For a description of the abbreviations in the table, please see Appendix A.*

- Take the **longitudinal lobe** as an example. The steps for longitudinal measurement are briefly described below:
  - Take a section of the long L lobe and freeze the image.
  - Follow the steps above to display the **Abdomen - General** measurement cards, select **Long L Lobe** to enter measurement state, with a cross cursor + displayed in the image area.
  - Use the trackball to move the cursor to the measurement start point, click on **Set** to fix the measurement start point, and the second + cursor appears.
  - The second cursor, which is connected to the start point cursor by a dotted line, can be moved using the trackball. The result of the measurement is displayed in the measurement result window. Click on **Update** to toggle between the two cursors and position one or both.
  - Use the trackball to move the second cursor to the measurement endpoint. Click on **Set** to fix the measurement endpoint and finalise the measurement result.

*NOTE: Vascular measurement elements, such as AO, are located in the vascular card. Users can choose from the P (proximal), M (medium) and D (distant) positions to measure a wide-diameter vessel.*

- Take the **angle of the L flap** as an example. The steps for angle measurement are briefly described below:
  - Take a section of the angle L lobe and click on **Freeze** to display the image as a still image.
  - Follow the steps above to display the **Abdomen - General** measurement cards, select **Angle L Lobe** to enter the measurement state, with a cross cursor + displayed in the image area.
  - Fix one side of the L-lobe angle with the **Distance Measurement**. The steps are as follows:



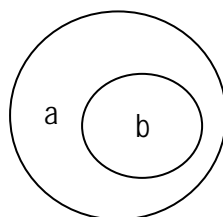
Move the cursor to the top of a page, click on **Set** to fix a point, then move the cursor to the end. Click on **Set** to fix the endpoint. Before the endpoint is fixed, click on **Update** to toggle control between the two cursors and readjust properly.

4. Follow step 3) to fix the other side of the angle of the L lobe, and the angle value is displayed in the measurement result area. The displayed value is the angle between the two lines in the marked direction.

*Move the cursor to the endpoints of the section that needs to be changed. Press Set again to adjust the section. Press the BkSp button on the keyboard to delete the two sections and start another measurement.*

- Taking **(Stenosis AO) Aorta redu (t) in percent** as an example, the measurement steps for area reduction are briefly described below. The blocking situation of the aorta can be judged by calculating the proportion of area reduction.
  1. Make the aortic cross-section for the area reduction and display the image as a still image.
  2. Follow the above steps to display the **Abdomen – Vascular** measurement cards and select **(Stenosis AO) Aorta Area redu(t) in percent** to open the Measurement state, and a cross cursor + is displayed in the image area.
  3. Move the cursor over the edge of the original aortic cross-section and click on **Set** to fix the measurement start point.
  4. Draw the trace along the rim of the cross-section with the trackball. To delete the trace dot by dot, click on **BkSp**.
  5. At the measurement endpoint, click on **Set** to measure **Area A** of the original aortic cross-section. The result of the measurement is displayed in the measurement result window.
  6. Follow steps 3) to 5) to measure the reduced aortic cross-section **Area B**. The measured value is displayed in the measurement result area, and the percentage reduction of the area is automatically calculated. The calculation formula is as follows:

$$\text{Reduce\%} = (a-b)/a \times 100\%$$



a: Original Aortic

b: Area-Reduced Aortic

Figure 132: Sketch map for the measurement of % Aortic Area Redu(t)



#### 9.3.3.4 Measurement in PW mode

When in PW mode, click on **Calc** on the control panel to open the Measurement menu. By default, the system displays measurement elements for the **Abdomen-Artery**, as shown in Figure 133 . Click on the **Artery** measurement card to display all measurement cards.



Figure 133: Abdomen measurement elements in PW mode

Measurement in PW mode is described as follows in the abdominal calculation software.

Table 28

Type	Measurement object	Measurement process
Artery Measurement	For example: AO, SMA, CHA, Main Renal A etc.	The flow data is obtained from the Doppler spectrum of vascular flow measurement (e.g. PSV, EDV and S/D). Use <b>Velocity Measurement</b> , <b>Trace Measurement</b> or <b>Range Measurement</b> in PW mode for measurement.
Venal Measurement	For example: IVC, PV, Hepatic Vein, Splenic V, Renal Vein etc.	The flow data is acquired from measuring vessel flow with the Doppler spectrum (e.g. velocity, differential pressure, etc.). Use the <b>Instant Velocity</b> in PW mode for measurement.

**NOTE:** For a description of the abbreviations in the table, please see Appendix A.

- Take **AO** as an example. The steps for measuring the arteries are briefly explained below:
- When in PW mode, create the Doppler spectrum of the AO and use the Freeze button to display

the image as a still image.

2. Follow the steps above to display the **Abdomen – Artery** measurement cards. Select the AO position that is to be measured, with a choice of **P (proximal)**, **M (medium)** and **D (distant)**. Then select the measurement procedure, with a choice of **Velocity Measurement**, **Trace Measurement** or **Range Measurement**. Click the option to make a selection. Next, select **AO** to open the Measurement state, and a cross cursor + is displayed in the image area.
3. The three measuring methods slightly differ from one another:
  - **Vel. (velocity)**: Use the trackball and **Set** key to fix the PSV and EDV points at the peak of the systolic spectrum and valley of the diastolic spectrum to obtain the calculation results for items such as PSV, EDV, S/D and PPG. See **9.2.4.1 Velocity** for details.
  - **Trace**: Use the trackball and the **Set** key to follow the target area on the spectrum and to obtain the calculation results for elements such as PSV, EDV, MNV, S/D, ACC, VTI, AT, DT, PPG, MNPG and HR. See **9.2.4.4 Manual Trace** for further details.
  - **Offer**: Use the trackball and **Set** key to confirm the start and target lines of the wrapped region for the spectrum and to obtain the calculation results for elements such as PSV, EDP, MNV, S/D, ACC, VTI, AT, DT, PPG, MNPG and HR. See **2.2.40.6 Offer Trace** for further details.
4. The measurement result is displayed in the measurement result window on the right-hand side of the screen.


**NOTE:** *Kidney measurement elements such as Main Renal A are found on the kidney measurement card.*

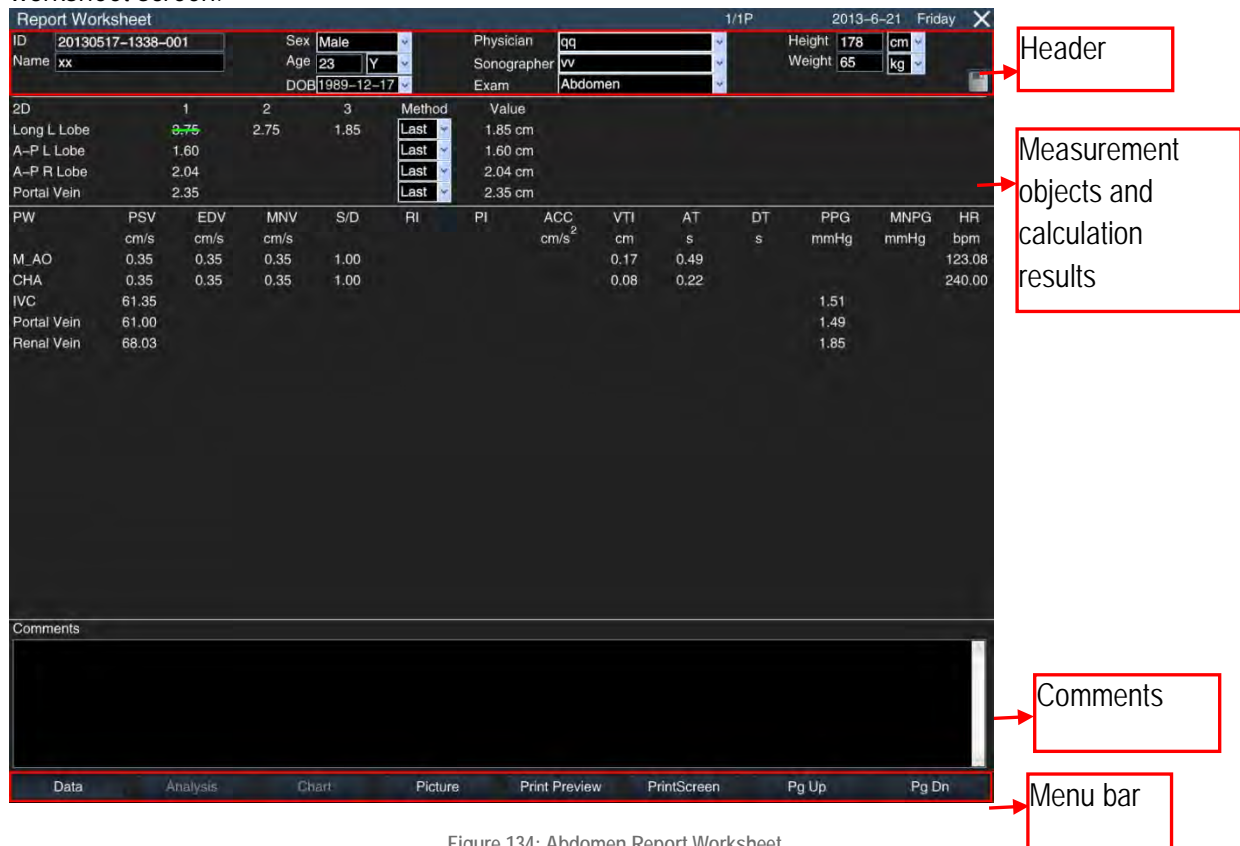
- Take **IVC** as an example. The steps for venal measurement are briefly explained below:
  1. Create a Doppler spectrum for IVC and display the image as a still image.
  2. Follow the steps above to display **Abdomen–Vein**. Select IVC to display the + cursor and its two intersecting dotted lines. The measurement state is called.
  3. Move the cursor to the required position for measuring velocity and click on **Set** to obtain the V and PG values. Please see **Instant Velocity** (see **9.2.4.2** as an introduction).
  4. The measurement result is displayed in the measurement result window on the right-hand side of the screen.

**NOTE:** *Kidney measurement elements such as Renal Vein are found on the kidney measurement card.*

### 9.3.3.5 Abdomen Report Worksheet

When using the measurement & calculation function in the Calc software, the measurement result is automatically imported into the report. During or after measurement and calculation, click on the **Report** key on the control panel to open the Report Worksheet (as shown in Figure 134 ) and check the result of the calculation.

Click  in the upper right-hand corner of the screen or click on **Report** again to exit the report worksheet screen.



The screenshot shows the 'Report Worksheet' window for an Abdomen report. The window is divided into several sections: a header bar at the top, a main area for measurement objects and calculation results, a comments section at the bottom, and a menu bar at the very bottom. Red boxes and arrows highlight these sections: 'Header' points to the top bar containing patient and exam information; 'Measurement objects and calculation results' points to the central table of measurements; 'Comments' points to the large text area below the table; and 'Menu bar' points to the bottom bar with options like Data, Analysis, Chart, etc.


2D	1	2	3	Method	Value
Long L Lobe	0.75	2.75	1.85	Last	1.85 cm
A-P L Lobe	1.60			Last	1.60 cm
A-P R Lobe	2.04			Last	2.04 cm
Portal Vein	2.35			Last	2.35 cm

PW	PSV	EDV	MNV	S/D	RI	PI	ACC	VTI	AT	DT	PPG	MNPG	HR
	cm/s	cm/s	cm/s				cm/s <sup>2</sup>	cm	s	s	mmHg	mmHg	bpm
M_AO	0.35	0.35	0.35	1.00				0.17	0.49				123.08
CHA	0.35	0.35	0.35	1.00				0.08	0.22				240.00
IVC	61.35										1.51		
Portal Vein	61.00										1.49		
Renal Vein	68.03										1.85		

Figure 134: Abdomen Report Worksheet

- **Header**

Patient-related information is displayed in the header. If the patient data has not been entered in the **New Patient Info** screen, it can still be entered in the header. After entering the patient data, click on the **Save**  button on the right-hand side of the header bar and the entered data is saved; otherwise you exit the Report Worksheet screen and all data is lost.

**NOTE: The "name" in the report cannot be edited.**

- **Measurement objects and calculation results**

This area displays the measurement results of all measurement objects and results taken from calculation results and can be edited.

Three measurement values can be recorded for each measurement object in 2D mode. To delete any of the measurement results, move the cursor to the value, and click on **Set** to cross it out.

In connection to the three measurement values, a drop-down list offering the options Avg (average of all effective measurement values), Min (minimum value), Max (maximum value) or Last (last measured value) is available.

The measurement results for the measurement objects in PW mode are listed in the report worksheet shown above.

- **Comments**

The user can enter relevant diagnostic information in the **Comments** area. Move the cursor into the Comments area and click on **Set** to enter information.

- **Menu bar**

Click on the relevant object on the menu bar to open the corresponding screen.

**Data:** If another screen is currently displayed in front of you, click backwards to return to the screen with the report worksheet.

**Picture:** Enter the image of the report editing screen for the report. The process is the same as for the *worksheet for the obstetrics report* (see Section 9.3.2.7).

**Print Preview:** Enter the Report Preview screen. The process is the same as for the *Obstetrics Report Worksheet* (see section 9.3.2.7).

**Print Screen:** Click to save the current page to the specified directory in BMP format.

**Pg Up, Pg Dn:** To turn the page when there are multiple pages.

**NOTE:** *Analyses and charts that are not intended for the abdomen worksheet are invalid.*

### 9.3.4 Small Parts

#### 9.3.4.1 Function

The small parts calculation package is used for the examination of the minor organs such as the thyroid, breast, testicle, neonate and so on. You can use the measured and calculated results to analyse whether the abdominal organs are affected or not.

#### 9.3.4.2 Preparation before the measurement of small parts

Before taking the measurements of small parts, please ensure that the following preparations have been made.

1. Make sure that the current selected probe is suitable for examinations of small parts.
2. If the new patient information has not been created, click on **ID** to open the *New Patient Info* screen to enter and save the information. See also **Chapter 8**.
3. Switch to the correct exam type for small parts.

#### 9.3.4.3 Measurement in B mode

When in B mode, click on **Calc** on the control panel to open the Measurement menu. The default system display are the measurement elements for *Small Part - Thyroid*, as shown in Figure 135. Click on the *Thyroid* measurement card to display all measurement cards, including the general cards for breast, testicle and neonate.

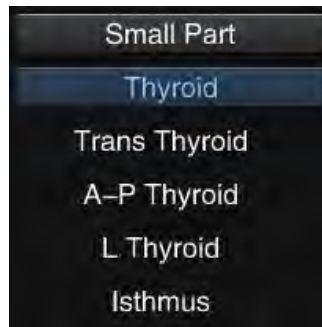


Figure 135: Thyroid measurement

Measurement in B mode for the Small Parts calculation software is shown in the following table.

Table 29

Type	Measurement object	Measurement process
Volume measurement	For example: Thyroid Volume, Testicle Volume etc.	Please see <i>Volume-3 Axes-Measurement</i> , through the Transverse distance, thickness and length from the target object.
Length measurement	For example: UI Breast, LI Breast, UE Breast, LE Breast, L Testicle, A-P Testicle, Trans Testicle, L Epididymis, A-P Epididymis, LVW, Third Ventricle, HW etc.	Please see <i>Distance Measurement</i> in B mode.
Area Measurement	For example: Breast Area etc.	Please see <i>Variable ellipse</i> in B mode.

**NOTE:** For a description of the abbreviations in the table, please see [Appendix A](#).

Take the **thyroid** as an example. The steps for measurement are briefly presented below:

1. Create a cross-sectional diameter for the thyroid gland. Retrieve the image as a still image.
2. Open the Measurement menu. Use the trackball to move the cursor to **Trans-Thyroid** and click on **Set** to enter the Measurement state.
3. Use **Distance Measurement** to continuously measure the length of the transverse diameter (**L Thyroid**) and thickness (**A-P Thyroid**).
4. Click on **Freeze** to display the image in Live state and create the sections for measuring diameter of the thyroid (measurement is saved when calling Live state, then call the still-image state again).
5. Use **Distance Measurement** to measure the diameter. The system then automatically

calculates the volume of the thyroid gland.

*NOTE: The detailed measurement can be retrieved in Section 9.2.1.12 Volume.*

*NOTE: The user can perform multiple measurements. The system saves the last three measurements for display and editing in the report.*

Data measurements can be used to judge whether the organ has lesions. For example: In a normal thyroid, the anteroposterior diameter in the transverse direction should not exceed 2 cm. The diameter from left to right should not exceed 2 cm and the anteroposterior diameter of the isthmus should not exceed 0.5 cm. The length of the diameter from top to bottom (longitudinal diameter) should be 4 to 5 cm below the longitudinal section (the above data is for reference only). If the measurement result is abnormal, the organ may have lesions.

Taking **"UI Breast"** as an example, the steps for longitudinal measurement are briefly explained below:

1. Take a section of UI Breast and display the image as a still image.
2. Follow the above steps to open the measurement cards for **Small Part - Breast General**, select the measurement target (left or right breast) by clicking on **L** or **R** on the Measurement menu, then select **UI Breast** to enter the Measurement state, and a + cursor is displayed in the image area.
3. Use the trackball to move the cursor to the measurement start point, click on **Set** to fix the measurement start point, and the second + cursor appears.
4. Use the trackball to move the second cursor to the measurement endpoint. Click on **Set** to fix the measurement endpoint and finalise the measurement result.

*NOTE: Testicle measurement elements such as L testicles can be found in the Testicle measurement card. Neonate measurement elements such as LVW are found in the Neonate measurement card. Users can select the R (right) and L (left) positions to measure paired organs.*

Taking **Breast Area** as an example, the steps for area measurement are briefly introduced below:

1. Take a section of the breast and display the image as a still image.
2. Follow the steps above to display the measurement cards for the **Small Part - Breast Area**, select the measurement target (left breast or right breast) by hovering over the measurement menu and clicking on **L** or **R**. Next, select **Breast Area** to retrieve the state for the measurement, and a cross cursor + is displayed in the image area.
3. Draw an ellipse according to the steps for **Ellipse Measurement**. There are many control points in the ellipse. Move the cursor to a control point and click on **Set** to activate it. Move the control point using the trackball. Adjust the graphics as well as possible to the measurement target to calculate the measurement results for the perimeter and the area.

*NOTE: The detailed measurement can refer to section 9.2.1.9 Variable Ellipse.*

#### 9.3.4.4 Measurement in PW mode

When in PW mode, click on **Calc** on the control panel to open the Measurement menu, and the system displays the **Small Parts** measurement software, as shown in Figure 136.




Figure 136: Measurement of small parts

The user can initially select the measurement procedure for **Vel. (velocity)**, **Trace** or **Range** to measure the thyroid artery and then the measurement element. Then, for paired organs, the user can select the **L (left)** or **R (right)** positions for measurement.

- **Vel. (velocity)**: Use the trackball and **Set** key to fix the PSV and EDV points at the peak of the systolic spectrum and valley of the diastolic spectrum to obtain the calculation results for items such as PSV, EDV, S/D and PPG. See **9.2.4.1 Velocity** for details.
- **Trace**: Use the trackball and the **Set** key to follow the target area on the spectrum and obtain calculation results for elements such as PSV, EDV, MNV, S/D, ACC, VTI, AT, DT, PPG, MNPG and HR. See **9.2.4.4 Manual Trace** for details.
- **Range**: Use the trackball and **Set** key to confirm the start and target lines of the wrapped region for the spectrum and to obtain the calculation results for elements such as PSV, EDV, MNV, S/D, ACC, VTI, AT, DT, PPG, MNPG and HR. See **9.2.4.6 Range Trace** for details.

#### 9.3.4.5 Report Worksheet - Small Parts

When using the measurement & calculation function in the Calc software, the measurement result is automatically imported into the report. During or after measurement and calculation, press the **Report** button on the control panel to enter the Report Worksheet screen and check the exam result.

Click  in the upper right-hand corner of the screen, or click on **Report** again to exit the report worksheet screen.

The display screen of the Small Parts Report Worksheet is the same as for the Abdomen Report Worksheet. See Section **9.3.3.5 Abdomen Report Worksheet** for a reference measurement.

### 9.3.5 Urology

#### 9.3.5.1 Function

The urology calculation software is used for detecting the kidney, bladder, prostate and so on. The results can be used to calculate bladder volume, bladder residual urine, prostate volume and prostate

specific antigen density. The results of measurement can be used to analyse whether these organs are affected or not.

#### 9.3.5.2 Preparation before urology measurement

Before taking a urological measurement, please ensure that the preparations below have been made.

1. Ensure that the current selected probe is suitable for the urological examination.
2. If the new patient information has not been created, click on **ID** to open the *New Patient Info* screen to enter and save the information. See also **Chapter 8**.
3. Switch to the correct urology exam type.

#### 9.3.5.3 Measurement in B mode

When in B mode, click on **Calc** on the control panel to open the Measurement menu. The system displays as default the *Urology - General* measurement elements, as shown in Figure 137. Click on the *General* measurement card to display all measurement cards.

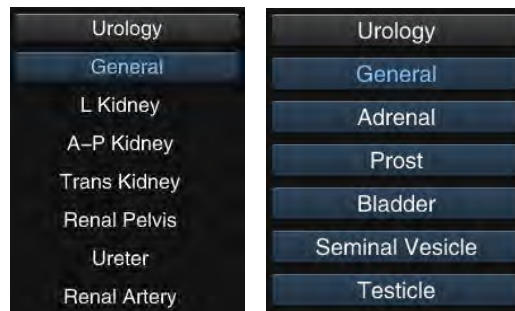


Figure 137: Urology measurement in B mode



Measurement in B mode for the Urology calculation software is shown in the following table.

Table 30

Type	Measurement object	Measurement process
Length measurement	For example: L Kidney, Renal Pelvis, Ureter, Renal Artery, L Adrenal, Trans Prost, Trans BU Blad, L Seminal Vesicle, L Testicle, etc.	See <i>Distance Measurement</i> in B mode.
Volume measurement	For example: bladder volume, kidney volume, adrenal volume, seminal vesicle volume, testicle volume, etc.	Please see <i>Volume-3 Axes Measurement</i> in B mode.

**NOTE:** For a description of the abbreviations in the table, please see Appendix A.

Take **L Kidney** as an example. The steps for longitudinal measurement are briefly described below:

1. Take a section of the L kidney and display the image as a still image.
2. Follow the steps above to display the measurement card, select the measurement target (left kidney or right kidney) by clicking on **L** or **R** on the measurement menu, then select **L Kidney** to enter Measurement state, and a + cursor is displayed in the image area.
3. Use the trackball to move the cursor to the measurement start point, click on **Set** to fix the measurement start point, and the second "+" cursor appears. The measurement value is displayed in the measurement result window.
4. Use the trackball to move the second cursor to the measurement endpoint. Click on **Set** to fix the measurement endpoint and the length of the kidney is calculated and displayed in the measurement result window (calculate the volume *V* after measuring the renal transverse distance and renal thickness distance).

**NOTE:** Adrenal measurement elements such as **L Adrenal** are found in the *Adrenals measurement card*. Prostate measurement elements such as **Trans Prost** can be found on the *Prostate measurement card*. Bladder measurement elements such as **Trans BU Blad** can be found in the *Bladder measurement card*. Seminal Vesicle measurement elements such as **L Seminal Vesicle** can be found in the *Seminal Vesicle measurement card*. Testicle measuring elements such as **L-Testicle** can be found on the *Testicle measurement card*.

*NOTE: Users can choose between the R (right) and L (left) positions to measure paired organs, and between the P (proximal), M (medium), and D (distant) positions for large-span vessels.*

Urine output can be calculated by measuring the volume of the bladder before and after urination. The measurement of urine output in 2B mode is shown below. Other volume measurements can make a reference to this.

1. When in 2B mode, create two image sections of the bladder, placed vertically to one another, before urination, and then display the image as a still image.
2. Follow the steps above to open the **Urology - Bladder** measurement card. Use the trackball to move the cursor to **Trans BU Blad** and click on **Set** to enter the Measurement state.
3. Use **Distance Measurement** (see Section 9.2.1.1 Distance) to continuously display the transverse diameter and thickness diameter of the bladder before urination in the maximum diameter section image and move the cursor to another section image to measure the longitudinal diameter. The system automatically calculates the bladder volume before urination and imports the result into the report worksheet.
4. After urination, create two image sections of the bladder, placed vertically to one another, in 2B mode. Set the image as a still image and open the **Bladder** measurement card. Use the trackball to move the cursor to **Trans BU Blad** and click on **Set** to enter the Measurement state.
5. Use **Distance Measurement** (see Section 9.2.1.1 Distance) to continuously display the transverse diameter and thickness diameter of the bladder before urination in the maximum diameter section image and move the cursor to another section image to measure the longitudinal diameter. The system automatically calculates the bladder volume before urination and imports the result into the report worksheet.

*NOTE: This measurement can be performed in single B mode. For the measurement of the cross-section, it is necessary to display the image in the Live state.*

#### 9.3.5.4 Prostate-specific antigen density

Measurement:

1. Ensure that the patient's PSA value has been entered. Input method: Click on **ID** to open the **New Patient Info** window. Select **Urology** from the **Exam** drop-down menu and the **PSA** editing field is displayed. Move the cursor over the editing box. Click on the **Set** key and use the keyboard to enter information. Then click on **Save** to end the process.

*NOTE: If "Female" is selected, the PSA edit box is not displayed.*

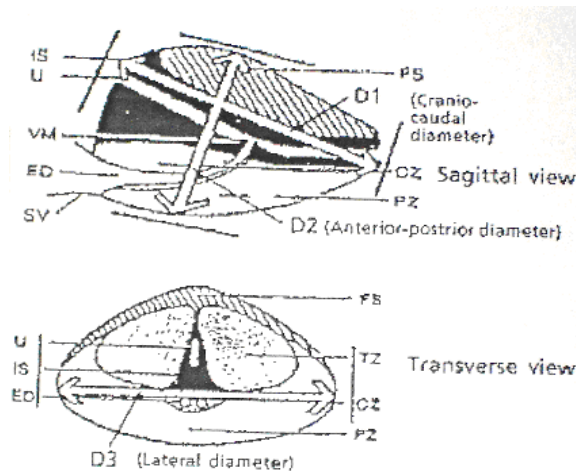
2. Create two section images of the prostate, placed vertically to one another, in 2B mode. Display the image as a still image and open the **Prostate** measurement card. Use the trackball to move

the cursor to **Trans Prost** and click on **Set** to enter the Measurement state.

3. Use **Distance Measurement** (see section 9.2.1.1) to continuously measure the transverse and thickness diameters of the prostate in the maximum diameter image section, and then move the cursor to another section to measure the longitudinal diameter. The system automatically calculates the prostate volume and the PSAD value and imports the result into the report worksheet.

**NOTE:** The PSAD coefficient affects the PSAD value. The user can modify the PSAD coefficient in **Setup – Measurement Setup**.

**NOTE:** This measurement can be performed in single B mode. The user should determine the Transverse diameter of the section that is to be measured, unfreeze the image and determine the longitudinal diameter section of the section that is to be measured.



$$WGVOL = \frac{\pi}{6} * D1 * D2 * D3$$

Figure 138: Measurement of prostate volume

#### 9.3.5.5 Measurement in PW mode

When in PW mode, click on **Calc** on the control panel to open the Measurement menu. The system displays the **Urology** measurement software, as shown in Figure 139.

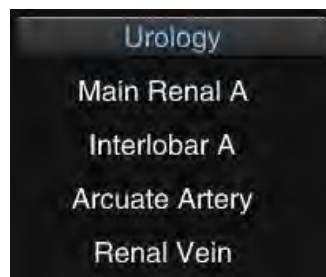


Figure 139: Urology measurement


- The user can initially select the measurement procedure for **Vel. (velocity)**, **Trace** or **Range** to measure the urological artery, then select the measurement element. Meanwhile, you can select the

**R (right)** and **L (left)** positions for measurement.

- **Vel. (velocity)**: Use the trackball and **Set** key to fix the PSV and EDV points at the peak of the systolic spectrum and valley of the diastolic spectrum to obtain the calculation results for items such as PSV, EDV, S/D and PPG. See **9.2.4.1 Velocity** for details.
- **Trace**: Use the trackball and the **Set** key to follow the target area on the spectrum and obtain the measurement results for elements such as PSV, EDV, MNV, S/D, ACC, VTI, AT, DT, PPG, MNPG and HR. See **9.2.4.4 Manual Trace** for details.
- **Offer**: Use the trackball and **Set** key to confirm the start and target lines of the wrapped region for the spectrum and to obtain the calculation results for elements such as PSV, EDP, MNV, S/D, ACC, VTI, AT, DT, PPG, MNPG and HR. See **9.2.4.6 Range Trace** for details.
- Measurement of urological vein: Select the measurement element (e.g. **Renal Vein**). Use the trackball to move the trackball to the point position required to measure the velocity and click on **Set** to obtain the V and PG values. Please see **Instant Velocity** (see **9.2.4.2** as an introduction).

#### 9.3.5.6 Urology Report Worksheet

When using the measurement & calculation function in the Calc software, the measurement result is automatically imported into the report. During or after measurement and calculation, press the **Report** button on the control panel to enter the Report Worksheet screen and check the exam result.

Click  in the upper right-hand corner of the screen or click on **Report** again to exit the report worksheet screen.

The screen for the Urology Report Worksheet is the same as for the Abdomen Report Worksheet, but a **"PSA"** value is in the header - see Section **9.3.3.5 Abdomen Report Worksheet** for a reference method.

### 9.3.6 Gynaecology

#### 9.3.6.1 Function

The gynaecology calculation software is used for the examination of the uterus, the follicle and so on. The measurement result can be used to determine whether the uterus is affected or not and whether the follicle is mature or not.

#### 9.3.6.2 Preparation for gynaecology measurement

Before taking a urological measurement, please ensure that the preparations below have been made.

1. Ensure that the current selected probe is suitable for the urological examination.
2. Ensure that the current date is correct.
3. If the new patient information has not been created, click on **ID** to open the **New Patient Info** screen and enter and save the information. See also **Chapter 8**.

4. Switch to the correct gynaecology exam type.

#### 9.3.6.3 Measurement in B mode

When in B mode, click on **Calc** on the control panel to open the Measurement menu. The system shows as default **Gynaecology - Uterus** measurement elements, as shown in Figure 140. Click on the **Uterus** measurement card to display all measurement cards.



Figure 140: Gynaecology measurement

##### a) Measurement of the uterus

Distance measurement can be used for the longitudinal measurement of the uterus, the transverse measurement of the uterus and the longitudinal measurement of the cervix. If the uterus is normal, the longitudinal diameter of the uterus in the longitudinal section should be 5.5 to 7.5 cm, and the anteroposterior diameter 3.0 to 4.0 cm (the above data is for reference only).

##### b) Ovary measurement

Calculate the volume of the ovaries by measuring their length, their transverse diameter and thickness. See **9.3.4.3 Thyroid measurement** for the measurement procedure and steps.

##### c) Follicle measurement:

Determine the maturity degree of the follicle by measuring its volume. There are two methods for measuring follicle volume.

- **First method:** If the follicle is regarded as an ellipse, measure it with the aid of **ellipse measurement**. The measurement steps are as follows:
  - 1) In the B-mode still-image mode, open the measurement card for **Follicle**.
  - 2) Click on **L** or **R** above the Measurement menu to select the measurement target (left or right follicle), then use the trackball to move the cursor to **Follicle X Vol** and press **Set**.

- 3) The "+" cursor appears in the image area. Use the trackball and the **Set** key to fix two points and the ellipse axis. Fix the ellipse axis. Move the cursor, and the ellipse changes its shape with the movement of the cursor. Based on the fixed ellipse axis, move the cursor to bring the ellipse as close to the measured area as possible. Click on **Set** to fix the measured area and finish the measurement.
  - 4) Follicular volume and the values for L (long axis) and S (short axis) are displayed in the bottom right of the screen.
- **Second method:** Use *the Volume-3Axes Measurement* to calculate the volume of the follicle through measurement of the follicle length and transverse diameter and thickness. The measurement steps are as follows:
    - 1) Create two image sections of the follicle, placed vertically to one another, in 2B mode. Display the image as a still image.
    - 2) Click on **Calc** to open the measurement menu and search for the **Follicle** measurement card.
    - 3) Click on **L** or **R** above the Measurement menu to select the measurement target (left or right follicle), then use the trackball to move the cursor to **Follicle X Vol** and press **Set**.
    - 4) Use **Distance Measurement** (see Section 9.2.1.1) to measure the longitudinal diameter of the follicle in the image section with the maximum diameter, then move the cursor to another image section to measure the transverse diameter and thickness. The system automatically calculates the follicle volume and displays it on the right side of the screen.

#### 9.3.6.4 Measurement in PW mode

When in PW mode, click on **Calc** on the control panel to open the Measurement menu. The system displays the **Gynaecology** measurement software, as shown in Figure 141.

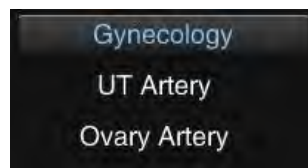


Figure 141: Gynaecology measurement


All measurement objects are arteries. User can initially select the measurement method for **Vel.** (*velocity*), **Trace** or **Range**, then select the measurement element. Meanwhile, you can select the **R** (*right*) and **L** (*left*) positions for measurement.

- **Vel. (velocity):** Use the trackball and **Set** key to fix the PSV and EDV points at the peak of the systolic spectrum and valley of the diastolic spectrum to obtain the calculation results for items such as PSV, EDV, S/D and PPG. See 9.2.4.1 *Velocity* for details.

- **Trace:** Use the trackball and the **Set** key to follow the target area on the spectrum and obtain the measurement results for elements such as PSV, EDV, MNV, S/D, ACC, VTI, AT, DT, PPG, MNPG and HR. See **9.2.4.4 Manual Trace** for details.
- **Offer:** Use the trackball and **Set** key to confirm the start and target lines of the wrapped region for the spectrum and to obtain the calculation results for elements such as PSV, EDP, MNV, S/D, ACC, VTI, AT, DT, PPG, MNPG and HR. See **9.2.4.6 Range Trace** for details.

#### 9.3.6.5 Gynaecology Report Worksheet

When using the measurement & calculation function in the Calc software, the measurement result is automatically imported into the report. During or after measurement and calculation, press the **Report** button on the control panel to enter the Report Worksheet screen and check the exam result.

Click  in the upper right-hand corner of the screen or click on **Report** again to exit the report worksheet screen.

The display screen for the Gynaecology Report Worksheet is the same as for the Abdomen Report Worksheet, but with an "**LMP**" value in the header bar. See Section **9.3.3.5 Abdomen Report Worksheet** for a reference method.

#### 9.3.7 Carotid artery

The calculation software for the carotid artery is used to measure CCA, CCA Stenosis, B. Stenosis, VA, SCA etc.

##### 9.3.7.1 Preparation before carotid artery measurement

Before taking the carotid measurement, please ensure that the following preparations have been made.

1. Make sure that the current selected probe is suitable for the carotid examination.
2. If the new patient information has not been created, click on **ID** to open the **New Patient Info** screen and enter and save the information. See also **Chapter 8**.
3. Switch to the correct carotid exam type.

##### 9.3.7.2 Measurement in B mode

When in B mode, click on **Calc** on the control panel to open the Measurement menu. The system shows the measurement elements for the carotid artery by default, as shown in Figure 142.

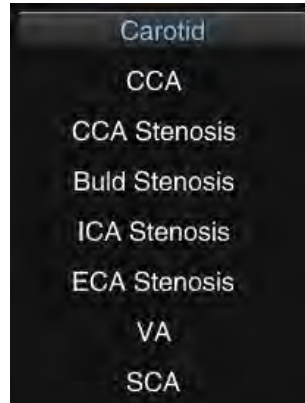


Figure 142: Carotid artery measurement

Measurement in B mode is shown in the following table in the carotid artery calculation software.

Table 31

Type	Measurement object	Measurement process
Length measurement	For example: CCA, CCA Stenosis etc.	See <i>Distance Measurement</i> in B mode.
Area Reduction Measurement	For example: %A Redu CCA etc.	Please see <i>%area Red (t) measurement</i> and <i>%area Red (e) measurement</i> in B mode.
IMT measurement	For example: CCA IMT etc.	Please see <i>IMT Measurement</i> in B mode.

**NOTE:** For a description of the abbreviations in the table, please see Appendix A.

Taking **CCA (Common Carotid Artery)** as an example, the steps for length measurement are introduced briefly below:

1. Create a section of the carotid artery and call up the still image.
2. Follow the steps above to display the measurement software for the **carotid artery**. Before selecting the **CCA** measurement element, the user can select the specific measurement targets (choice between the **R (right)** or **L (left)** position for paired organs). For the measurement of large-span vessels, the user can select **P (proximal)**, **M (medium)** or **D (distant)**. As the carotid artery



(*CCA*) is a paired organ and a large-span vessel, *R (right)*, *L (left)* *P (proximal)*, *M (medium)* and *D (distant)* are available for selection. *R (right)* and *P (proximal)* are selected by default. Next, select *CCA* to open the Measurement state, and a cross cursor + is displayed on the screen.

3. Use the trackball to move the cursor to the measurement start point, click on **Set** to fix the measurement start point, and the second + cursor appears.
4. Use the trackball to move the second cursor to the measurement endpoint. Press **Set** to fix the measurement endpoint. The length of the *R (right) P (proximal) CCA* is measured as the default setting.

Taking *%A Redu CCA* as an example, the steps for measurement of the area reduction ratio are briefly introduced below:

1. Create a section of the carotid artery and click on **Freeze** to call the still image.
2. Follow the steps above to display the measurement software for the *carotid artery*. Select *%A Redu CCA* to open the Measurement state, and a cross cursor + is displayed on the screen.
3. Use the *Ellipse measurement* to measure the original aortic cross-section area. The method is performed as follows: Move the cursor over a certain point in the measured area and click on **Set** to fix the axis start point. Next, move the cursor to select the desired axis endpoint and click on **Set** to fix it. Move the cursor to change the ellipse shape, using the fixed axis as a base. To adapt the ellipse to the measurement area, click on **Set** to fix the ellipse measurement area.
4. Next, a cross cursor + is displayed in the image area. Use *Trace Measurement* to measure the aortic cross-section area after reduction. The method is performed as below: Move the cursor over the measurement start point and click on **Set** to fix it. Draw the trace along the rim of the cross-section with the trackball. Click on **Set** at the measurement endpoint to finalise the measurement result.
5. The area values and reduction ratio before and after CCA reduction are displayed in the measurement result area.

Taking *CCA IMT* as an example, the steps for IMT measurement are introduced briefly below:

1. Create a section of the carotid artery vessel and click on **Freeze** to call up the still the image.
2. Follow the steps above to display the *Carotid* measurement software and select *CCA IMT*. An ROI box appears on the image. Click on **Update**, and the four sides of the coloured box are changed from solid lines to dotted lines. Next, use the trackball to change the size of the coloured box and click on **Update** to confirm.

3. Move the ROI box to the desired vascular wall and click on **Set**. The system automatically calculates the maximum, minimum and average standard deviation of IMT (intima-media thickness), as well as the length of intima-media. The measurement result is displayed on the right side of the screen. The positions with two arrow marks indicate where the largest IMT is located. The system displays guidelines for user reference according to the measurement result, for example: *Normal, Abnormal, High Risk*.

### 9.3.7.3 Measurement in PW mode

When in PW mode, click on **Calc** on the control panel to open the Measurement menu. The system shows the *Carotid* measurement software, as shown in Figure 143.

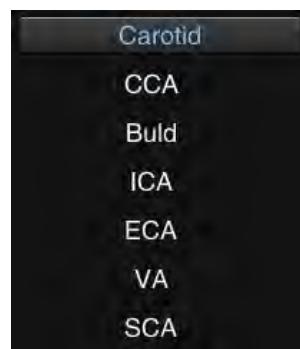



Figure 143: Carotid artery measurement

All measurement objects are arteries. User can initially select the measurement method for *Vel. (velocity)*, *Trace* or *Range*, then select the measurement element. Otherwise, for paired organs, the user can select *R (right)* or *L (left)* positions for measurement. When measuring large-span vessels, the user can select *P (proximal)*, *M (medium)* or *D (distant)* positions.

- **Vel. (velocity):** Use the trackball and **Set** key to fix the PSV and EDV points at the peak of the systolic spectrum and valley of the diastolic spectrum to obtain the calculation results for items such as PSV, EDV, S/D and PPG. See **9.2.4.1 Velocity** for details.
- **Trace:** Use the trackball and the **Set** key to follow the target area on the spectrum and obtain the measurement results for elements such as PSV, EDV, MNV, S/D, ACC, VTI, AT, DT, PPG, MNPG and HR. See **9.2.4.4 Manual Trace** for details.
- **Offer:** Use the trackball and the **Set** key to confirm the start and target lines of the enclosed region for the spectrum and to obtain the calculation results for elements such as PSV, EDV, MNV, S/D, ACC, VTI, AT, DT, PPG, MNPG and HR. See **9.2.4.6 Range Trace** for details.

### 9.3.7.4 Carotid Report Worksheet

When using the measurement & calculation function in the Calc software, the measurement result is automatically imported into the report. During or after measurement and calculation, press the **Report** button on the control panel to enter the Report Worksheet screen and check the exam result.

Click  in the upper right-hand corner of the screen or click on **Report** again to exit the report worksheet screen.

The display screen for the Carotid Report Worksheet is the same as for the Abdomen Report Worksheet. See Section **9.3.3.5 Abdomen Report Worksheet** for a reference method.

### 9.3.8 Peripheral blood vessels

The calculation software for peripheral blood vessels is used to determine *arteries in the upper limbs, veins in the upper limbs, arteries in the lower limbs and veins in the lower limbs*. By measuring the longitudinal diameter, intima thickness etc., the user can analyse whether the peripheral blood vessels are affected or not.

#### 9.3.8.1 Preparation before peripheral blood vessel measurement

Before measuring peripheral blood vessels, please ensure that the preparations below have been made.

1. Make sure that the current selected probe is suitable for the examination of peripheral blood vessels.
2. If the new patient information has not been created, click on **ID** to open the *New Patient Info* screen and enter and save the information. For further information, see Chapter 8.
3. Switch to the correct exam type for peripheral blood vessels.

#### 9.3.8.2 Measurement in B mode

When in B mode, click on **Calc** on the control panel to open the Measurement menu. The system displays the *Peri Arteries - Upper limb A* measurement elements by default, as shown in Figure 144. Click on the *Upper limb A* measurement card and all measurement cards are displayed.



Figure 144: Measurement of peripheral blood vessels

All measurement elements in the calculation software and length measurements. Users can refer to *Distance Measurement* (see **9.2.1.1** for information on application).

Take **SCA** as an example. The steps for longitudinal measurement are briefly described below:

1. Take a section of the SCA and call up the still image.
2. Follow the steps above to display the **Peri Arteries – Upper limb A** measurement cards, select the measurement target (left clavicle or right clavicle) by clicking on **L** or **R** above the measurement menu, then select **SCA** to enter the Measurement state, and a cross cursor + is displayed in the image area.
3. Use the trackball to move the cursor to the measurement start point, click on **Set** to fix the measurement start point, and the second "+" cursor appears. The measurement value is displayed in the measurement result window.
4. Use the trackball to move the second cursor to the measurement endpoint. Click on **Set** to fix the measurement endpoint and the length of the SCA is calculated and displayed in the measurement result window.

*NOTE: Measurement elements such as Upper limb V and SCV (Inferior Subclavian Vein) can be found on the Upper limb V measurement card. Measurement elements such as Lower limb A and CIA(Common Ilium Artery) can be found in the measurement card for Lower limb A. Measuring elements such as Lower limb V and CIV (Common Ilium Vein) can be found on the Lower limb V measurement card.*

*NOTE: Users can choose between the R (right) and L (left) positions to measure paired organs, and between the P (proximal), M (middle), and D (distant) positions for large-span vessels.*

### 9.3.8.3 Measurement in PW mode

When in PW mode, click on **Calc** on the control panel to open the Measurement menu. The system displays **Peri Arteries - Upper limb A**, as shown in Figure 145. Click on the **Upper Limb A** measurement card to display all measurement cards.

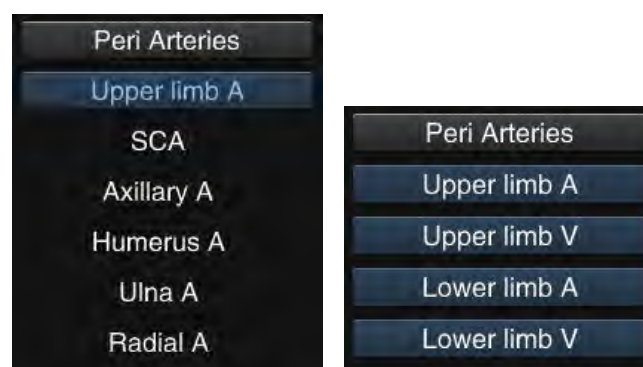


Figure 145: Peripheral blood vessel measurement in PW mode


- Measurement of **Upper limb A** and **Lower limb A**: For measurement, first select the measurement process for **Vel. (velocity)**, **Trace** or **Range**. Next select the measurement element, while the positions **R (right)** or **L (left)** are selected for measurement.
  - **Vel. (velocity)**: Use the trackball and **Set** key to fix the PSV and EDV points at the peak of

the systolic spectrum and valley of the diastolic spectrum to obtain the calculation results for items such as PSV, EDV, S/D and PPG. See **9.2.4.1 Velocity** for details.

- **Trace:** Use the trackball and the **Set** key to follow the target area on the spectrum and obtain the measurement results for elements such as PSV, EDV, MNV, S/D, ACC, VTI, AT, DT, PPG, MNPG and HR. See **9.2.4.4 Manual Trace** for details.
- **Offer:** Use the trackball and **Set** key to confirm the start and target lines of the wrapped region for the spectrum and to obtain the calculation results for elements such as PSV, EDP, MNV, S/D, ACC, VTI, AT, DT, PPG, MNPG and HR. See **9.2.4.6 Offer Trace** for details.
- Measurement of **Upper limb V** and **Lower limb V**: Select the measurement element (e.g. **SCV**). Use the trackball to move the cursor to the point position needed to measure the velocity and click on **Set** to obtain the V and PG values. See **9.2.4.2 Instant Velocity** for details.

#### 9.3.8.4 Peripheral Blood Vessel Report Worksheet

When using the measurement & calculation function in the Calc software, the measurement result is automatically imported into the report. During or after measurement and calculation, press the **Report** button on the control panel to enter the Report Worksheet screen and check the exam result.

Click  in the upper right-hand corner of the screen or click on **Report** again to exit the report worksheet screen.

The display screen of the Peripheral Blood Vessel Report Worksheet is the same as that of the Abdomen Report Worksheet. See Section **9.3.3.5 Abdomen Report Worksheet** for a reference method.

#### 9.3.9 Cardiology measurement

##### 9.3.9.1 Function

The cardiac calculation software is used for examinations of the aorta, mitral valve, tricuspid valve, left ventricle, left ventricular function and so on. The system provides many cardiac measurements such as PISA, Teichholz, Cubed, Gibson, Simpson etc. The user can choose the appropriate measurement method, and data on the left ventricular function can be processed using the measurement results to analyse the health state of the heart.

##### 9.3.9.2 Preparation before cardiology measurement

Before taking cardiological measurements, please ensure that the following preparations have been made.

1. Make sure that the currently selected probe is suitable for cardiological examinations.
2. If the new patient information has not been created, click on **ID** to open the **New Patient Info** screen and enter and save the information. For further information, see Chapter 8.

3. Switch to the correct cardiology exam type.

### 9.3.9.3 Cardiology measurement menu

When in 2D mode, click on **Calc** on the control panel to open the Measurement menu. The system displays the Cardiology-General measurement elements by default, as shown in Figure 146. Click on the **General** measurement card to display all measurement cards.

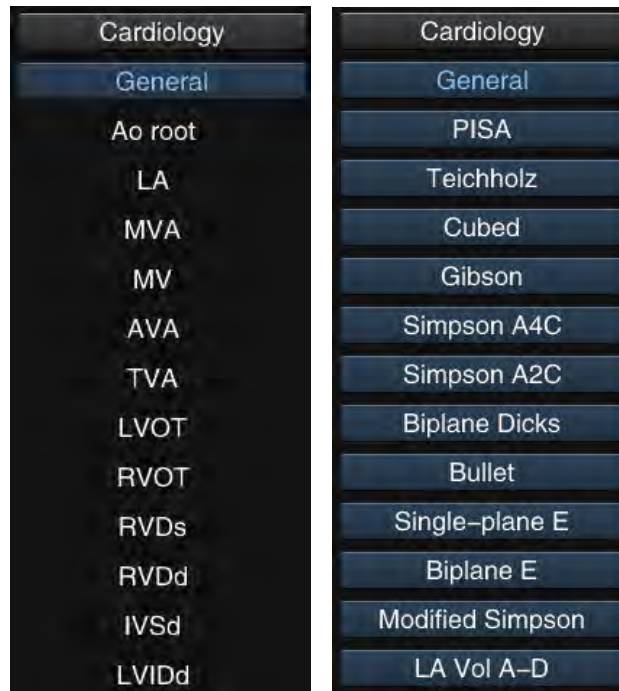


Figure 146: Cardiological measurement in 2D mode

When in 2D mode, click on **Calc** on the control panel to open the Measurement menu. The system displays the **Cardiology – HR** measurement elements by default, as shown in Figure 147. Click on the **HR** measurement card to display all measurement cards.

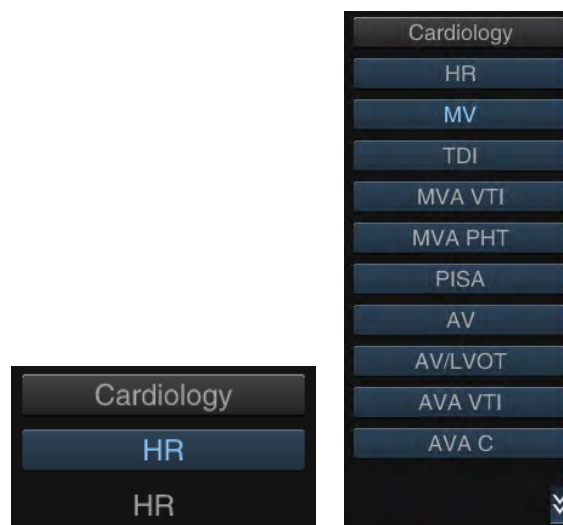


Figure 147: Cardiology measurement in PW mode

#### 9.3.9.4 General cardiological measurement in B mode

Measurement in B mode is shown in the following table in the cardiac calculation software.

Table 32

Type	Measurement object	Measurement process
Length measurement	For example: LA, MV, RVDs, RVDd , etc.	See <i>Distance Measurement</i> in B mode.
Area Measurement	For example: MVA, AVA, TVA, etc.	Please see <i>Trace measurement</i> in B mode.

*NOTE: For a description of the abbreviations in the table, please see Appendix A.*

Take **MV** as an example. The steps for longitudinal measurement are briefly described below:

1. When in B mode , take a section of MV and call up the still image.
2. Follow the steps above to display the *Cardiology –General* measurement cards, select **MV** to enter the Measurement state, and a cross cursor + is displayed in the image area.
3. Use the trackball to move the cursor to the measurement start point, click on **Set** to fix the measurement start point, and the second "+" cursor appears. The measurement value is displayed in the measurement result window.
4. Use the trackball to move the second cursor to the measurement endpoint. Press **Set** to fix the measurement endpoint. The length of the MV is calculated and automatically imported into the report worksheet.

*NOTE: Measurement elements marked with (s), such as RVD(s), are the right ventricular diameters in systole. Measurement elements marked with (d) mark, such as RVD(d), are the right ventricular diameters in diastole.*

*NOTE: After measuring the length of LA, the system automatically calculates the ratio of LA/AO and AO/LA, then imports the result into the report worksheet.*

Taking **MVA** as an example, the steps for area measurement are briefly introduced below:

1. When in B mode , take a section of MVA, and call up the still image.
2. Follow the steps above to display the *Cardiology -General* measurement cards and select **MVA** to open the Measurement state, and a cross cursor + is displayed on the screen.
3. Use the trackball to move the cursor to the measurement start point and click on **Set** to fix the start point.
4. Draw the trace along the rim of the cross-section with the trackball. To delete the trace dot by dot, click on **BkSp**.

- Click on **Set** at the measurement endpoint to finalise the measurement result. If the area is not enclosed, the system automatically connects the start point with the endpoint with a line. The result of the measurement is displayed in the measurement result window.

#### 9.3.9.5 Teichholz

In this measurement method, left ventricular function is calculated by measuring the interventricular septal thickness, left ventricular inner diameter and left ventricular posterior wall thickness in diastole and systole. Teichholz measurement elements are shown in Figure 148 .

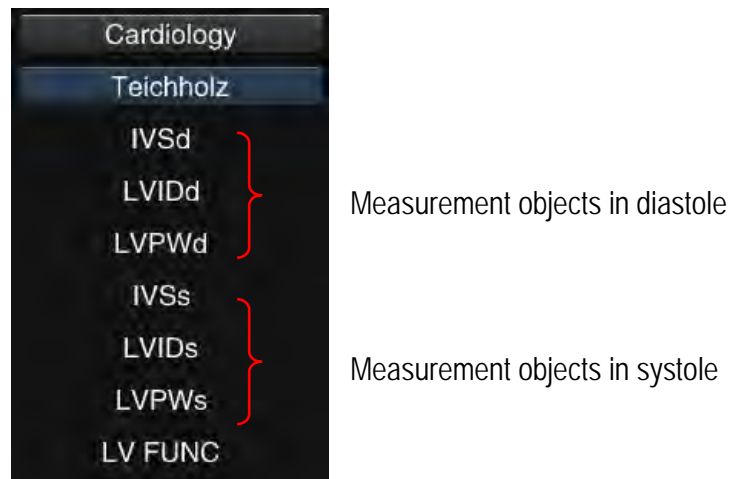


Figure 148: Measurement objects for Teichholz

**NOTE:** For a description of the abbreviations in the table, please see Appendix A.

Measurement:

- In B mode, create sections of the left ventricle in diastole and systole, and display the image as a still image.
- Search for the **Teichholz** measurement card and click to open the measurement menu.
- Use the trackball to move the cursor to **IVSd** and click on **Set** to enter the Measurement state.
- Move the cursor to the measurement start point of the diastolic intraventricular septum in diastole section and click on **Set** to fix the measurement start point, and a second + cursor appears.
- Move the second cursor to the measurement endpoint and click on **Set** to measure IVSd. The end of the measurement is the start point of the second **IVIDd measurement object**.
- Move the cursor to the end of the left ventricular internal diameter and click on **Set** to measure the left ventricular internal diameter (d). The measurement endpoint is the start point for the third **IVPWD measurement object**.
- Move the cursor to the end of the left ventricular posterior wall and click on **Set** to complete measurement of this section.
- Use the trackball to move the cursor to **IVSs** and click on **Set**. Follow the steps described above for systole to measure the three values.



9. Once the six measurements have been completed, the system automatically calculates the data for the left ventricular function. The measurement and calculation results are displayed in the bottom right of the screen. The calculation objects and formulae are as follows:

Table 33

Calculation object	Layout	Calculation formula
EDV	End-diastolic volume (ml)	$\text{EDV (Teichholz)} = \frac{7 \times (LVIDd)^3}{2.4 + LVIDd}$ $\text{EDV (Cubed)} = (LVIDd)^3$ $\text{EDV (Gibson)} = \frac{\pi}{6} \times (LVIDd)^2 \times (0.98 \times LVIDd + 5.90)$
ESV	End-systolic volume (ml)	$\text{ESV (Teichholz)} = \frac{7 \times (LVIDs)^3}{2.4 + LVIDs}$ $\text{ESV (Cubed)} = (LVIDs)^3$ $\text{ESV (Gibson)} = \frac{\pi}{6} \times (LVIDs)^2 \times (0.98 \times LVIDs + 5.90)$
SV	Stroke volume (ml)	$SV = EDV - ESV$
EF	Ejection fraction (%)	$EF = \frac{EDV - ESV}{EDV} \times 100$
FS	Reduction of left ventricular ejection fraction (%)	$FS = \frac{LVIDd - LVIDs}{LVIDd} \times 100$
CO	Cardiac output (L/min)	$CO = SV \times HR \div 1000$
dTIVS	Fraction shortening of interventricular septum (%)	$dTIVS = \frac{IVSd - IVSs}{IVSd} \times 100$
dTPW	Fraction shortening of posterior wall (%)	$dTPW = \frac{LVPWd - LVPWs}{LVPWd} \times 100$
SI	The cardiac index is the ration of stroke volume to body surface area.	$SI = SV \div BSA$

Calculation object	Layout	Calculation formula
CI	The cardiac output index is the ratio of cardiac output to body surface area.	$CI = CO \div BSA$
LV Mass	Left ventricular mass (g)	$LV\ Mass = 1.055 [(LVIDd + IVSd + LVPWd)^3 - LVIDd^3] - 14$
LV MI	Left ventricular muscle mass index (g/cm <sup>2</sup> )	$LV\ MI = LV\ Mass / BSA$

*NOTE: When measuring cardiac output per minute (CO), the HR value must be measured in M or PW mode. The measurement object can be found in the General calculation software.*

*NOTE: The BSA (Body Surface Area) value is required for some measurement objects. The value is calculated using the patient's height and weight. Make sure that the patient's height and weight are entered under New Patient Info.*

*NOTE: The Cubed and Gibson measurement method can apply to Teichholz. In B/M or M mode, the measurement method for Cubed, Gibson, and Teichholz can apply to B mode.*

*NOTE: The table above shows all calculation elements. If it is not necessary to display all the calculation elements, you can select the required calculation elements under Settings-Measurement Settings-Advanced Settings-LV Measurement (as shown in Figure 149).*

The screenshot shows a settings window for LV measurement. It contains a grid of checkboxes for the following items: EDV, ESV, EF, FS, SV, CO, dTIVS, dTPW, SI, CI, LV Mass, and LV MI. All checkboxes are checked. At the bottom right, there are two buttons: 'Cancel' and 'Save'.

Figure 149: LV measurement screen

#### 9.3.9.6 Biplane Dicks

This measurement is the combination of Simpson A4C and Simpson A2C through measurement of the endocardium in diastole and systole of a section with four ventricles and in diastole and systole of a section with four ventricles to calculate the left ventricular function. The measurement objects for Biplane Dicks are shown in Figure 150.

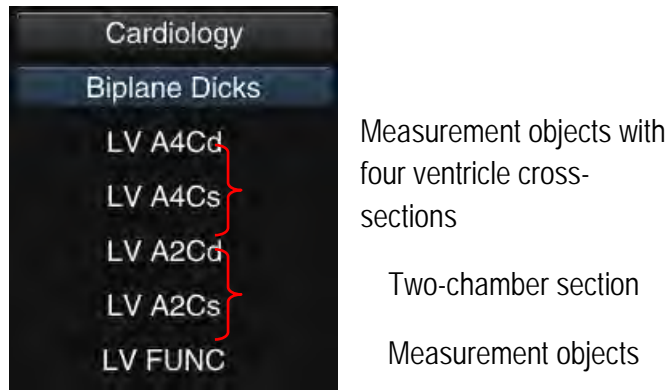


Figure 150: Biplane Dicks measurement objects

Table 34

Measurement object	Layout
LV A4Cd	Endocardial length and volume of a cross-section of all four ventricles during diastole.
LV A4Cs	Endocardial length and volume of a cross-section of all four ventricles during systole.
LV A2Cd	Endocardial length and volume of a cross-section with two ventricles during diastole.
LV A2Cs	Endocardial length and volume of a cross-section of two ventricles during systole.

## Measurement :

1. When in 2B mode, create a cross-section of all four ventricles during diastole and call up the image as a still image.
2. Look for the **Biplane Dicks** measurement card according to Section 2.3.9.3 and click to open the measurement menu.
3. Use the trackball to move the cursor to **LV A4Cd** and click on **Set**, to enter the Measurement state.
4. Use the trackball to move the cursor to the four-chamber diastolic section, fix two points on the mitral annulus and the third point on the apex, as shown in Figure 151. Once the third point has been fixed, the system automatically sketches the outline of the heart, as shown in Figure 152.



Figure 151: Confirm the three points in the four-chamber diastole section

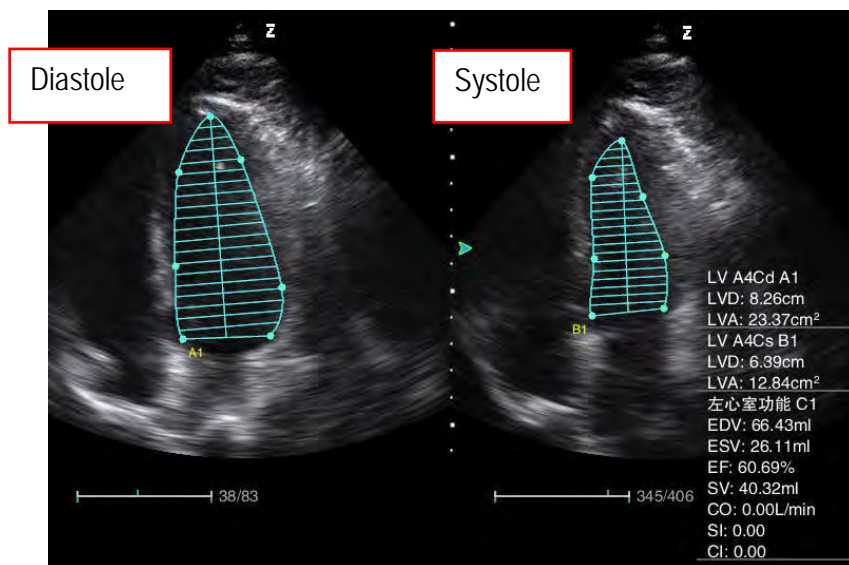


Figure 152: Simpson A4C

5. If the outline cannot cover the target area, you can move the cursor to any point on the edge of the outline and click on **Set** to activate the point. Use the trackball to make the appropriate setting and click on **Update** to switch to the next control point and make a setting. After making the adjustment, click on **Set** to confirm.
6. At this point the endocardial length value in diastole and area value of left ventricular are displayed in the bottom right of the screen.
7. Use the trackball to move the cursor to **LV A4Cs** and click on **Set** to open the Measurement state for another section.
8. Use the method described above to measure the endocardial length value in systole and the area value of the left ventricle for the four-chamber heart section in the systolic phase, and the measurement result is displayed in the bottom right of the screen.
9. Unfreeze the image, make diastolic and systolic sections of the two-chamber section in 2B mode, then call up the image as a still image.

10. Measure **LV A2Cd** and **LV A2Cs** according to the measurement of four-chamber section to obtain the endocardial length in diastole and systole of the two-chamber section and left ventricular area value, and the measurement result is shown in the bottom right of the screen.
11. Use the trackball to move the cursor to **LV FUNC** and click on **Set**. The system calculates the relevant data based on the results of the above measurements, which are displayed in the bottom right of the screen. Calculation items and calculation formulae are as follows.

Table 35

Calculation objects	Layout	Calculation formulae
EDV	End-diastolic volume (ml)	EDV (Biplane Dicks) = $\frac{\pi}{4} \sum_{i=1}^{20} a_i b_i \times \frac{LVLd(A4C) + LVLd(A2C)}{20} \times \frac{1}{2}$ a, b for the diameter of each slice of 20 equal parts of the diastole A4C, A2C section.
ESV	End-systolic volume (ml)	EDV (Biplane Dicks) = $\frac{\pi}{4} \sum_{i=1}^{20} a_i b_i \times \frac{LVLs(A4C) + LVLs(A2C)}{20} \times \frac{1}{2}$ a, b for the diameter of each slice of 20 equal parts of systole A4C, A2C section.
SV	Stroke volume (ml)	SV = EDV-ESV
EF	Ejection fraction (%)	$EF = \frac{EDV - ESV}{EDV} \times 100\%$
CO	Cardiac output (L/min)	CO = SV×HR/1000
SI	The cardiac index is the ration of stroke volume to body surface area.	SI=SV/BSA
CI	The cardiac output index is the ratio of cardiac output to body surface area.	CI=CO/BSA

*NOTE: When measuring cardiac output per minute (CO), the HR value must be measured in M or PW mode. The measurement object can be found in the General calculation software.*

*NOTE: The BSA (Body Surface Area) value is required for some measurement objects. The value is calculated using the patient's height and weight. Make sure that the patient's height and weight are entered under New Patient Info.*

*NOTE: The EF value is normal when it reaches 50 % to 80 %.*

### 9.3.9.7 Simpson A4C

This measurement is used to calculate the left ventricular function by measuring the endocardium in diastole and endocardium in systole of the four-chamber section. The Simpson A4C measurement objects are shown in Figure 153.

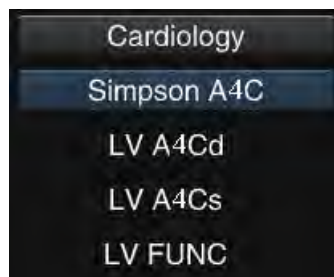


Figure 153: Simpson A4C measurement objects

Table 36

Measurement object	Layout
LV A4Cd	Endocardial length and volume of a cross-section of all four ventricles during diastole.
LV A4Cs	Endocardial length and volume of a cross-section of all four ventricles during systole.

Measurement method for **Simpson A4C** see Section **9.3.9.6 Biplane Dicks, steps 1) to 8)** for measurement of the endocardium length and volume with four ventricles. Next, select **LV Measurement**, and the system automatically calculates the data for the left ventricular function. Calculation items and calculation formulae are as follows.

Table 37

Calculation objects	Layout	Calculation formulae
EDV	End-diastolic volume (ml)	$EDV \text{ (Simp A4C)} = \frac{\pi}{4} \sum_{i=1}^{20} a_1^2 \times \frac{LVLd}{20}$ <p>a for the diameter of each slice of 20 equal parts of the diastole A4C section.</p>
ESV	End-systolic volume (ml)	$EDV \text{ (Simp A4C)} = \frac{\pi}{4} \sum_{i=1}^{20} a_1^2 \times \frac{LVLs}{20}$ <p>a for the diameter of each slice 20 of equal parts of systole A4C section.</p>
SV	Stroke volume (ml)	$SV = EDV - ESV$
EF	Ejection fraction (%)	$EF = \frac{EDV - ESV}{EDV} \times 100\%$
CO	Cardiac output (L/min)	$CO = SV \times HR / 1000$
SI	The cardiac index is the ration of stroke volume to body surface area.	$SI = SV / BSA$
CI	The cardiac output index is the ratio of cardiac output to body surface area.	$CI = CO / BSA$

*NOTE: When measuring cardiac output per minute (CO), the HR value must be measured in M or PW mode. The measurement object can be found in the General calculation software.*

*NOTE: The BSA (Body Surface Area) value is required for some measurement objects. The value is calculated using the patient's height and weight. Make sure that the patient's height and weight is entered in New Patient info.*

#### 9.3.9.8 Simpson A2C

This measurement is used to calculate the left ventricular function by measuring the endocardium in diastole and endocardium in systole of the two-chamber section. The Simpson A4C measurement objects are shown in Figure 154.

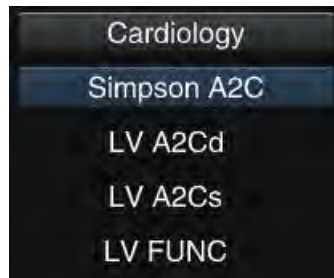


Figure 154: Simpson A2C measurement objects

Table 38

Measurement object	Layout
LV A2Cd	Endocardial length and volume of a cross-section with two ventricles during diastole.
LV A2Cs	Endocardial length and volume of a cross-section of two ventricles during systole.

To use **Simpson A2C** for measurement, first create a two-chamber section in diastole and systole and go to **Simpson A4C** for the measurement. See Section 9.3.9.6 **Biplane Dicks, steps 1) to 8)** for details. Calculation items and calculation formulae are as follows.

Table 39

Calculation objects	Layout	Calculation formulae
EDV	End-diastolic volume (ml)	$EDV (Simp A2C) = \frac{\pi}{4} \sum_{i=1}^{20} b_1^2 \times \frac{LVLd}{20}$ <p>b for the diameter of each slice of 20 equal parts of the diastole A2C section.</p>
ESV	End-systolic volume (ml)	$EDV (Simp A2C) = \frac{\pi}{4} \sum_{i=1}^{20} b_1^2 \times \frac{LVLs}{20}$ <p>b for the diameter of each slice of 20 equal parts of the diastole A2C section.</p>
SV	Stroke volume (ml)	$SV = EDV - ESV$
EF	Ejection fraction (%)	$EF = \frac{EDV - ESV}{EDV} \times 100\%$
CO	Cardiac output (L/min)	$CO = SV \times HR / 1000$



Calculation objects	Layout	Calculation formulae
SI	The cardiac index is the ration of stroke volume to body surface area.	$SI = SV / BSA$
CI	The cardiac output index is the ratio of cardiac output to body surface area.	$CI = CO / BSA$

*NOTE: When measuring cardiac output per minute (CO), the HR value must be measured in M or PW mode. The measurement object can be found in the General calculation software.*

*NOTE: The BSA (Body Surface Area) value is required for some measurement objects. The value is calculated using the patient's height and weight. Make sure that the patient's height and weight is entered in New Patient info.*

#### 9.3.9.9 Bullet

This measurement is used to calculate the left ventricular function through measurement of the longitudinal diameter of the left ventricle with four chambers in diastole and systole and the left ventricular area in diastole and systole (mitral valve plane). The bullet measurement objects are shown in Figure 155.

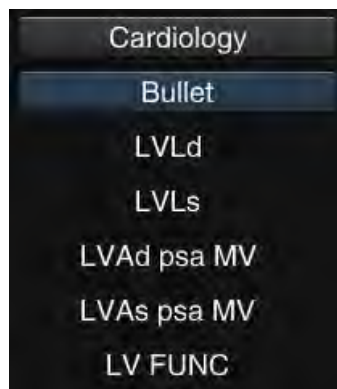


Figure 155: Bullet measurement objects

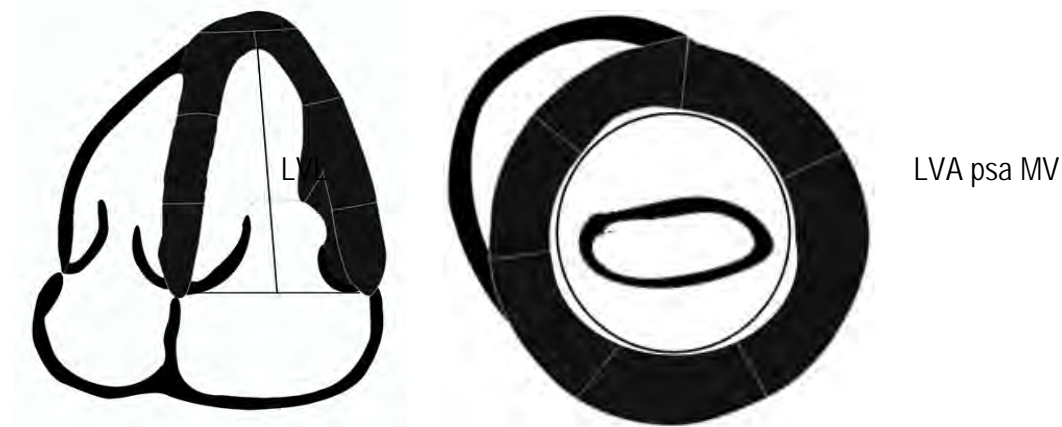


Figure 156: Bullet map sketch

Table 40

Measurement object	Layout
LVLd	Four-chamber Left Ventricle Long diameter in diastole
LVLs	Four-chamber Left Ventricle Long diameter in systole
LVA d psa MV	Left ventricular area in diastole (mitral valve plane)
LVA s psa MV	Left ventricular area in systole (mitral valve plane)

Measurement:

1. When in 2B mode, create a cross-section drawing of a four-chamber section in diastole or systole and call up the image as a still image.
2. Look for the **Bullet** measurement card according to Section 9.3.9.3 and click to open the Measurement menu.
3. Use the trackball to move the cursor to **LVLd** and click on **Set** to enter the Measurement state.
4. Use the trackball to move the cursor to the four-chamber diastolic section and the start point of the longitudinal diameter of the left ventricle and click on **Set** to fix the start point. Next, move the cursor to the endpoint of the longitudinal diameter of the left ventricle and click on **Set** to fix the point. Use **Distance Measurement** to measure the LVLd (longitudinal diameter of the left ventricle in diastole).
5. Next, use the trackball to move the cursor to the four-chambered systolic section and the start point of the Left Ventricle Long diameter, click on **Set** to fix the start point, then move the cursor to the endpoint of the Left Ventricle Long diameter and click on **Set** to fix the point. The LVLs (Left Ventricle Long diameter in systole) value is calculated.
6. Click on **Freeze** to unfreeze the image, then create one section each in diastole and systole of the

mitral valve plane of the left ventricle.

7. When the image is frozen, click on **Calc** to open the Measurement menu, then go to the Measurement state to measure the ***LVAd psa MV directly***.
8. Use the trackball to move the cursor to the mitral valve plane of the left ventricle in the diastolic period and click on **Set** on the edge of the left ventricle to fix the start point. Move the trackball to draw the trace along the edge of the left ventricle. To delete the trace dot by dot, press **BkSp**. Then click on **Set** to fix the endpoint. Use **Trace Measurement** to measure ***the LVAd psa MV*** value (left ventricular area in diastole) mitral valve plane)).
9. Use the trackball to move the cursor to the mitral valve plane of the left ventricle in the systolic period. Go back to the last step to measure the ***LVAAs psa MV*** value (left ventricular area in systole (mitral valve plane)).
10. After the completion of the four measurements, the system automatically calculates the data for the left ventricular function. Calculation items and calculation formulae are as follows.

Table 41

Calculation objects	Layout	Calculation formulae
EDV	End-diastolic volume (ml)	$EDV(\text{Bullet}) = [5 \times (LVAd \text{ psa MV}) \times LVLd] / 6$
ESV	End-systolic volume (ml)	$EDV(\text{Bullet}) = [5 \times (LVAAs \text{ psa MV}) \times LVLd] / 6$
SV	Stroke volume (ml)	$SV = EDV - ESV$
EF	Ejection fraction (%)	$EF = \frac{EDV - ESV}{EDV} \times 100\%$
CO	Cardiac output (L/min)	$CO = SV \times HR / 1000$
SI	The cardiac index is the ration of stroke volume to body surface area.	$SI = SV / BSA$
CI	The cardiac output index is the ratio of cardiac output to body surface area.	$CI = CO / BSA$

*NOTE: When measuring cardiac output per minute (CO), the HR value must be measured in M or PW mode. The measurement object can be found in the General calculation software.*

*NOTE: The BSA (Body Surface Area) value is required for some measurement objects. The value is calculated using the patient's height and weight. Make sure that the patient's height and weight is entered in New Patient info.*

#### 9.3.9.10 Single-plane ellipse

This measurement is used to calculate the left ventricular function by measuring the Left Ventricle Long diameter in diastole and systole and the endocardial volume of the four-chamber section in diastole and systole. The E measurement objects on one plane are shown in Figure 157 .

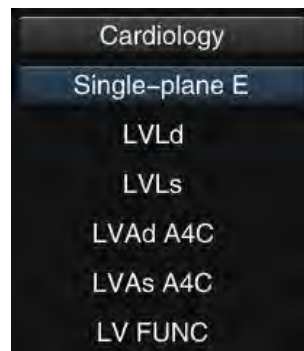


Figure 157: Measurement objects of single level E

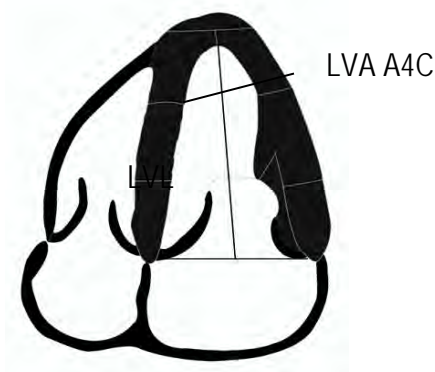


Figure 158: Map sketch of single level E

Table 42

Measurement object	Layout
LVLd	Four-chamber Left Ventricle Long diameter in diastole
LVLs	Four-chamber Left Ventricle Long diameter in systole
LVAd A4C	Left Ventricle Area in diastole (four-chamber)
LVAs A4C	Left Ventricle Area in systole (four-chamber)

## Measurement:

1. When in 2B mode, create one four-chamber section each in the diastolic and systolic periods and use **Distance Measurement** to measure the Left Ventricle Long diameter in the diastolic and systolic periods.
2. Next, use **Trace Measurement** to measure the Left Ventricle Area in diastole and systole.
3. See Section **9.3.9.9 Bullet** for detailed measurement steps.
4. After the completion of the four measurements, the system automatically calculates the data for the left ventricular function. Calculation items and calculation formulae are as follows.

Table 43

Calculation objects	Layout	Calculation formulae
EDV	End-diastolic volume (ml)	EDV (single-plane ellipsoid) = $\frac{8}{3} \times \frac{LVAd(A4C)^2}{\pi \times LVLd}$
ESV	End-systolic volume (ml)	EDV (single-plane ellipsoid) = $\frac{8}{3} \times \frac{LVAs(A4C)^2}{\pi \times LVLs}$
SV	Stroke volume (ml)	SV = EDV-ESV
EF	Ejection fraction (%)	EF = $\frac{EDV - ESV}{EDV} \times 100\%$
CO	Cardiac output (L/min)	CO = SV×HR/1000
SI	The cardiac index is the ration of stroke volume to body surface area.	SI=SV/BSA
CI	The cardiac output index is the ratio of cardiac output to body surface area.	CI=CO/BSA

**NOTE:** When measuring cardiac output per minute (CO), the HR value must be measured in M or PW mode. The measurement object can be found in the General calculation software.

**NOTE:** The BSA (Body Surface Area) value is required for some measurement objects. The value is calculated using the patient's height and weight. Make sure that the patient's height and weight is entered in New Patient info.

### 9.3.9.11 Biplane Ellipsoid

This measurement is used to calculate the left ventricular function by measuring the left ventricular medial-lateral dimension in diastole and systole (four-chamber), the left ventricle area in diastole and systole (mitral valve plane), and the endocardial volume of the four-chambered section in diastole and systole. The biplane E-measurement objects are shown in Figure 159 .

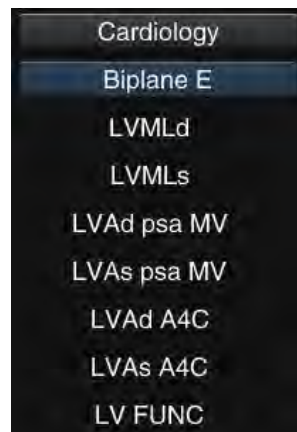


Figure 159: Biplane E-measurement objects

Table 44

Measurement object	Layout
LVMLd	Left ventricular medial-lateral measurement in diastole (four-chamber)
LVMLs	Left ventricular medial-lateral measurement in systole (four-chamber)
LVAd psa MV	Left ventricular area in diastole (mitral valve plane)
LVAs psa MV	Left ventricular area in systole (mitral valve plane)
LVAd A4C	Left Ventricle Area in diastole (four-chamber)
LVAs A4C	Left Ventricle Area in systole (four-chamber)

Measurement:

1. When in 2B mode, create sections of the left ventricular mitral valve plane in diastole or systole. Use **Trace Measurement** to measure the left ventricle area of the mitral valve plane in diastole and systole.
2. Next, create a four-chamber section in the diastole and systole and use **Distance**

**Measurement** to measure the left ventricular mediolateral dimension in diastole and systole.

Use **Trace Measurement** to measure the left ventricle area in diastole and systole.

- See Section **9.3.9.9 Bullet** for detailed measurement steps.
- Once the six measurements have been completed, the system automatically calculates the data for the left ventricular function. Calculation items and calculation formulae are as follows.

Table 45

Calculation objects	Layout	Calculation formulae
EDV	End-diastolic volume (ml)	EDV (Biplane Ellipsoid) = $\frac{8}{3} \times \frac{LVAd(psaMV) \times LVAd(A4C)}{\pi \times LVMLd}$
ESV	End-systolic volume (ml)	EDV (Biplane Ellipsoid) = $\frac{8}{3} \times \frac{LVAs(psaMV) \times LVAs(A4C)}{\pi \times LVMLs}$
SV	Stroke volume (ml)	SV = EDV-ESV
EF	Ejection fraction (%)	EF = $\frac{EDV - ESV}{EDV} \times 100\%$
CO	Cardiac output (L/min)	CO = SV×HR/1000
SI	The cardiac index is the ration of stroke volume to body surface area.	SI=SV/BSA
CI	The cardiac output index is the ratio of cardiac output to body surface area.	CI=CO/BSA

**NOTE:** When measuring cardiac output per minute (CO), the HR value must be measured in M or PW mode. The measurement object can be found in the General calculation software.

**NOTE:** The BSA (Body Surface Area) value is required for some measurement objects. The value is calculated using the patient's height and weight. Make sure that the patient's height and weight is entered in New Patient info.

### 9.3.9.12 Modified Simpson

This measurement is used to calculate the left ventricular function by measuring the Left ventricle Long diameter with four chambers in diastole and systole, the area of the left ventricle in diastole and systole (mitral valve plane), and the area of the left ventricle in diastole (papillary muscle plane). The modified Simpson measurement objects are shown in Figure 160.

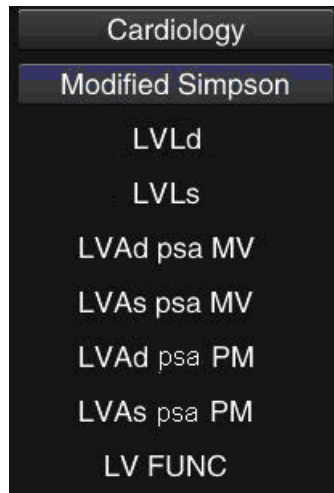


Figure 160: Modified Simpson measurement objects

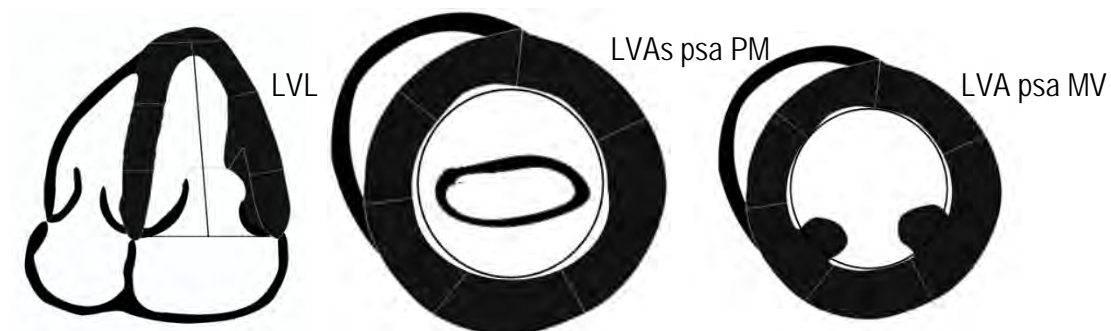


Figure 161: Modified Simpson map sketch

Table 46

Measurement object	Layout
LVLd	Four-chamber Left Ventricle Long diameter in diastole
LVLs	Four-chamber Left Ventricle Long diameter in systole
LVAd psa MV	Left ventricular area in diastole (mitral valve plane)
LVAs psa MV	Left ventricular area in systole (mitral valve plane)
LVAd psa PM	Left Ventricle Area in diastole (Papillary Muscle plane)
LVAs psa PM	Left Ventricle Area in systole (Papillary Muscle plane)



## Measurement:

1. When in 2B mode, create one section each in the diastole and systole of the left ventricle of the mitral valve plane. Use **Trace Measurement** to measure the left ventricular area of the mitral valve plane in diastole and systole.
2. Create a section in the diastole and systole of the left ventricle of the papillary muscle plane. Use **Trace Measurement** to measure the left ventricular area at the papillary muscle level of diastole and systole.
3. Next, create in the diastole and systole, and in four chambers and using **Distance Measurement**, a measurement of the Left Ventricle Long diameter in diastole and systole.
4. See Section **9.3.9.9 Bullet** for detailed measurement steps.
5. Once the six measurements have been completed, the system automatically calculates the data for the left ventricular function. Calculation items and calculation formulae are as follows.

Table 47

Calculation objects	Layout	Calculation formulae
EDV	End-diastolic volume (ml)	$\text{EDV (Modified Simpson)} = \frac{LVLd}{3} \times \left\{ LVAd(psaMV) + \frac{LVAd(psaMV) + LVAd(psaPM)}{2} + \frac{LVAd(psaPM)}{3} \right\}$
ESV	End-systolic volume (ml)	$\text{EDV (Modified Simpson)} = \frac{LVLS}{3} \times \left\{ LVAs(psaMV) + \frac{LVAs(psaMV) + LVAs(psaPM)}{2} + \frac{LVAs(psaPM)}{3} \right\}$
SV	Stroke volume (ml)	$SV = EDV - ESV$
EF	Ejection fraction (%)	$EF = \frac{EDV - ESV}{EDV} \times 100\%$
CO	Cardiac output (L/min)	$CO = SV \times HR / 1000$
SI	The cardiac index is the ration of stroke volume to body surface area.	$SI = SV / BSA$

Calculation objects	Layout	Calculation formulae
CI	The cardiac output index is the ratio of cardiac output to body surface area.	$CI = CO / BSA$

*NOTE: When measuring cardiac output per minute (CO), the HR value must be measured in M or PW mode. The measurement object can be found in the General calculation software.*

*NOTE: The BSA (Body Surface Area) value is required for some measurement objects. The value is calculated using the patient's height and weight. Make sure that the patient's height and weight is entered in New Patient info.*

#### 9.3.9.13 LA Vol A-L

This measurement is used to calculate the left atrial volume by measuring the Left Atrial Long diameter of the left atrium (four chambers) and the Left Atrium Area (two chambers). The LA Vol (A-L) measurement objects are introduced below.

Table 48

Measurement object	Layout
LAL	Left Atrial Long
LAA (A4C)	Left Atrium Area (four-chamber)
LAA (A2C)	Left Atrium Area (two-chamber)
LA Vol (A-L)	Left Atrium Volume

Measurement:

1. When in B mode, make a section of the Left Atrial Long diameter using Distance Measurement (*see* Section 9.2.1.1) to measure the length of the long diameter of the left atrium.
2. Create a four-chamber section and use *Trace Measurement* (*see* Section 9.2.1.5) to measure the left atrium area.
3. Next, create a two-chamber section and use *Trace Measurement* (*see* Section 9.2.1.5) to measure the left atrium area again.
4. After the completion of the three measurements, the system automatically calculates the volume of the left atrium.

#### 9.3.9.14 Mitral valve (MV)

When in PW mode, and with the current examination type for cardiology (for example Cardiology A), click on the control panel on **Calc** to open the Measurement menu. The system displays **Cardiology – HR** measurement objects by default. Click on the **HR** measurement card to display all measurement cards. Click on **MV** to open the MV measurement menu. The mitral valve (MV) measurement objects and measurement method are described below.

Table 49

Measurement object	Layout	Measurement process
MV E Vel	Maximum E-wave velocity of the mitral valve	<b>Instant Velocity Measurement:</b> After selecting the measurement object, move the cursor to the E-wave or A-wave spectrogram and click on <b>Set</b> to calculate the velocity. See Section 9.2.4.2 <b>Instant Velocity Measurement</b> for instructions.
MV A Vel	Maximum velocity of mitral valve A-wave	

Table 50

Measurement object	Layout	Measurement process
MV DT	Deceleration time of mitral valve	<b>Time Measurement:</b> After selecting the measurement object, move the cursor to the spectrogram. Click on <b>Set</b> at the starting position of the target measurement to fix the start point. Then move the cursor to the end position and click on <b>Set</b> . See Section 9.2.2.1 <b>Time Measurement for information</b> on application.
MV AT	Acceleration time of mitral valve	
MV E Dur	Duration of mitral valve E-wave	
MV A Dur	Duration of mitral valve A-wave	
IVRT	isoVelocity Relaxation Time	

**NOTE:** After measuring MV E Vel and MV A Vel. the system automatically calculates the ratio and displays it in the results window, then imports the result into the report worksheet.

### 9.3.9.15 Mitral valve area (MVA)

The mitral valve area can be measured in two ways: by VTI and by PHT:

#### First method:

Measurement:

1. When in B-mode, use **Distance Measurement** (see Section 9.2.1.1 for information on application) to measure the length value of **LVOT**.

**NOTE:** The **LVOT measurement object** is located on the **Cardiology General measurement card**.

2. Enter PW mode and click on **Calc** on the control panel to open the Measurement menu. The system displays **Cardiology – HR** measurement objects by default. Click on the **HR** measurement card to view all measurement cards. Click on **MVA VTI** on the measurement card to open the Measurement menu.
3. Use the trackball to move the cursor to **LVOT VTI** and click on **Set** to enter the measurement state. Use the **Manual Trace** method (see 9.2.4.4 for instructions) to measure the **LVOT VTI** (Velocity Time Integral of Left Ventricular Outflow Tract and **MV VTI** (Velocity time Integral of Mitral Valve Velocity) values continuously in the spectrogram.
4. The system automatically calculates the mitral valve area based on the VTI value, which is displayed in the bottom right of the screen. The calculation formula is written as follows:

$$MVA = \pi (LVOT/2)^2 \times VTI(LVOT)/VTI(MV)$$

#### Second method:

1. When in PW mode, click on **Calc** on the control panel to open the Measurement menu. The system displays **Cardiology – HR** measurement objects by default. Click on the **HR** measurement card to view all measurement cards. Click on the **MVA PHT** measurement card to open the Measurement menu.
2. Use the trackball to move the cursor to **MVA PHT** and click on **Set** to open the Measurement state. See **Time Measurement** (see 9.2.2.1 for information on application) to measure the **MV PHT** (Mitral Valve Differential Pressure Half-Time) in the spectrogram.
3. The system automatically calculates the mitral valve area based on the PHT value, which is displayed in the bottom right of the screen. The calculation formula is written as follows:

$$MVA = 220/PHT$$

**NOTE:** The measurement methods for other measurement objects on the measurement card in the **MVA PHT** are listed below:

Table 51

Measurement object	Layout	Measurement process
MV MPG	Mitral Valve Mean Pressure Gradient	Use <i>Manual Trace Measurement</i> (see Section 9.2.4.4 for instructions).

### 9.3.9.16 Pulmonary Circulation and Systemic Circulation Ratio (Qp: Qs)

Measurement:

1. When in B-mode, create a section of the right ventricular outflow tract. Use *Distance Measurement* (see Section 9.2.1.1) to measure the length of the right ventricular outflow tract (note: the *RVOT* is located on the *Cardiology General measurement card*).
2. Enter PW mode and create the baseline at the top.
3. Click on **Calc** on the control panel to open the Measurement menu. The system shows *Cardiology-HR* measurement objects by default. Click on the *HR* measurement card to view all measurement cards. Click on the *Qp:Qs* measurement card to open the Measurement menu.
4. Use the trackball to move the cursor to *RVOT VTI* and click on the **Set** key to enter the Measurement state. See *Manual Trace Measurement* (see 9.2.4.4 for information on application). Measure the RVOT VTI value in the spectrogram continuously.

Return to B mode and create the left ventricular outflow tract section. Measure the length of the left ventricular outflow tract using *Distance Measurement* (see Section 9.2.1.1 for information on application)

*(NOTE: The LVOT measurement object is located on the Cardiology-General measurement card.)*

5. Re-enter PW mode, open the *Qp:Qs* measurement card and click on the *LVOT VTI* measurement object. See *Manual Trace Measurement* (see Section 9.2.4.4 for information on application) to measure the LVOT VTI value on the spectrogram.
6. The system automatically calculates the *Qp:Qs* value (pulmonary circulation: systemic circulation). The calculation is shown as follows:

$$Qp:Qs = (RVOT^2 \times RVOT \text{ VTI}) / (LVOT^2 \times LVOT \text{ VTI})$$

### 9.3.9.17 TEI

The TEI index is calculated using the isovolumic contraction time (IVCT) and isovolumic relaxation time (IVRT) and ejection time (ET).

Measurement:

1. When in PW mode, click on **Calc** on the control panel to open the Measurement menu. The system shows **Cardiology-HR** measurement objects by default. Click on the **HR** measurement card to view all measurement cards. Click on the **TEI** measurement card to open the Measurement menu.
2. Use the trackball to move the cursor to **IVCT** and click on **Set** to enter the Measurement state. See **Time Measurement** (see Section 9.2.2.1 for instructions on use) to continuously measure the IVCT, IVRT and ET values in the spectrogram, as shown in Figure 162.
3. After completing the three measurements, the system automatically calculates the TEI index. The calculation formula is as follows:

$$TEI = (IVCT + IVRT) / ET$$

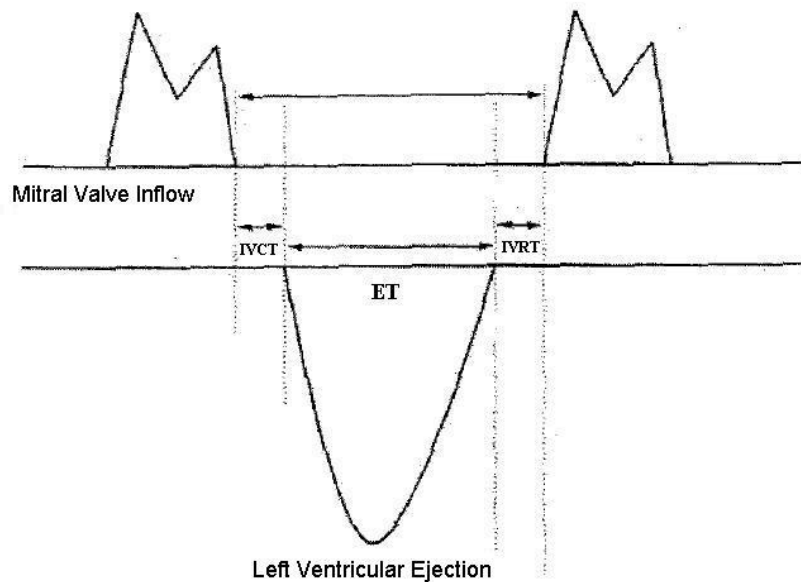


Figure 162: TEI map sketch

### 9.3.9.18 Aortic Valve

When in PW mode, and with the current examination type for cardiology (for example Cardiology A), click on the control panel on **Calc** to open the Measurement menu. The system displays **Cardiology – HR** measurement objects by default. Click on the **HR** measurement card to display all measurement cards. Click on **AV** to open the AV measurement menu. The aortic valve (AV) measurement objects and measurement methods are described below.

Table 52

Measurement object	Layout	Measurement process
AV Vel	Aortic Valve Velocity	<b>Instant Velocity measurement:</b> After selecting the measurement object, move the cursor to the desired measurement point in the spectrogram. Click on <b>Set</b> to calculate the values for the velocity and the differential pressure (V, PG). See Section <b>9.2.4.2 Instant Velocity Measurement</b> for information on application.
DAo Vel	Velocity of Descending Aorta	
AV AT	Aortic Valve Acceleration Time	<b>Time Measurement:</b> After selecting the measurement object, move the cursor to the spectrogram. Click on <b>Set</b> at the starting position of the target measurement to fix the start point. Then move the cursor to the end position and click on <b>Set</b> . See Section <b>9.2.2.1 Time Measurement</b> for information on application.
AV DT	Aortic Valve Deceleration Time	

### 9.3.9.19 Aortic Valve/Left Ventricular Outflow Tract (AV/LVOT)

When in PW mode, and with the current examination type for cardiology (for example Cardiology A), click on the control panel on **Calc** to open the Measurement menu. The system displays **Cardiology – HR** measurement objects by default. Click on the **HR** measurement card to display all measurement cards. Click on **AV/LVOT** to open the AV/LOT measurement menu. The measurement objects and measurement methods are shown below.

Table 53

Measurement object	Layout	Measurement process
LVOT	Left Ventricular Outflow Tract	<b>Instant Velocity measurement:</b> After selecting the measurement object, move the cursor to the desired measurement point in the spectrogram. Click on <b>Set</b> to calculate the values for the velocity and differential pressure (V, PG). See Section <b>9.2.4.2 Instant Velocity Measurement</b> for instructions.
AV Vel	Aortic Valve Velocity	
LVOT AT	Left Ventricular Outflow Tract Acceleration Time	<b>Time Measurement:</b> After selecting the measurement object, move the cursor to the spectrogram. Click on <b>Set</b> at the starting position of the target measurement to fix the start point. Then move the cursor to the end position and click on <b>Set</b> . See Section <b>9.2.2.1 Time Measurement for information</b> on application.
LV ET	Left Ventricular Ejection Time	

### 9.3.9.20 Aortic Valve Area (AVA)

The Aortic Valve Area can be measured using VTI.

Measurement:

1. When in B mode, use **Distance Measurement** (see Section **9.2.1.1** for information on application) to measure the length value of **LVOT**.

**NOTE:** The **LVOT** measurement object is located on the **Cardiology General measurement card**.

2. Enter PW mode and click on **Calc** on the control panel to open the Measurement menu. The system displays **Cardiology – HR** measurement objects by default. Click on the **HR** measurement card to view all measurement cards. Click on the **AVA VTI** measurement card to open the Measurement menu.
3. Use the trackball to move the cursor to **LVOT VTI** and click on **Set** to enter the measurement state. Please see the **Manual Trace** method (see **9.2.4.4** for information on application) to continuously measure the values for the **LVOT VTI** (Velocity Time Integral of Left Ventricular Outflow Tract) and **AV VTI** (Velocity Time Integral of Aortic Valve Velocity) in the spectrogram.
4. The system automatically calculates the aortic valve area based on the **VTI value**, which will be displayed in the bottom right of the screen. The calculation formula is written as follows:

$$AVA = \pi (LVOT/2)^2 \times VTI(LVOT) / VTI(AV)$$



### 9.3.9.21 Tricuspid Valve (TV)

When in PW mode, and with the current examination type for cardiology (for example Cardiology A), click on the control panel on **Calc** to open the Measurement menu. The system displays **Cardiology – HR** measurement objects by default. Click on the **HR** measurement card to display all measurement cards. Click on **TV** to open the Measurement menu for the tricuspid valve. The tricuspid valve (TV) measurement elements and measurement methods are shown below.

Table 54

Measurement object	Layout	Measurement process
TVE Vel	Maximum Velocity of Tricuspid Valve E-wave	<b>Instant Velocity Measurement:</b> After selecting the measurement object, move the cursor to the E-wave or A-wave spectrogram and click on <b>Set</b> to calculate the velocity. See Section <b>9.2.4.2 Instant Velocity Measurement</b> for instructions.
TV A Vel	Maximum Velocity of Tricuspid Valve A-wave	
TV VTI	Velocity Time Integral of Tricuspid Valve	<b>Manual Trace :</b> After selecting the measurement object, use the trackball and <b>Set</b> key to trace the target region on the spectrum and calculate the VTI value. See Section <b>9.2.4.4 Manual Trace Measurement</b> for instructions on application.
TV DT	Deceleration Time of Tricuspid Valve	<b>Time Measurement:</b> After selecting the measurement object, move the cursor to the spectrogram. Click on <b>Set</b> at the starting position of the target measurement to fix the start point. Then move the cursor to the end position and click on <b>Set</b> . See Section <b>9.2.2.1 Time Measurement</b> for information on application.
TV AT	Acceleration Time of Tricuspid Valve	
TV E Dur	Tricuspid Valve E-wave Duration	
TV A Dur	Tricuspid Valve A-wave Duration	

**NOTE:** After measuring the TV E Vel and TV A Vel., the system automatically calculates the ratio and displays it in the results window, then imports the result into the report worksheet.

### 9.3.9.22 Tricuspid Valve Area (TVA)

1. When in PW mode, click on **Calc** on the control panel to open the Measurement menu. The system displays **Cardiology – HR** measurement objects by default. Click on the **HR**

measurement card to display all measurement cards. Click on **TVA** to open the Measurement menu for the tricuspid valve.

2. Use the trackball to move the cursor to **TVA PHT** and click on **Set** to enter the Measurement state. See **Time Measurement** (see 9.2.2.1 for information on application) to measure the **TV PHT** (Tricuspid Valve Differential Pressure Half-Time) in the spectrogram.
3. The system automatically calculates the Tricuspid Valve Area based on the PHT value, which is displayed in the bottom right of the screen. The calculation formula is written as follows:

$TVA = 220 / PHT$
-------------------

**NOTE:** The measurement methods for other measurement objects on the measurement card in the **TVA PHT** are listed below:

Table 55

Measurement object	Layout	Measurement process
TV MPG	Tricuspid Valve Mean Pressure Gradient	Use <b>Manual Trace Measurement</b> (see Section 9.2.4.4).

### 9.3.9.23 Pulmonary Valve (PV)

When in PW mode, and with the current examination type for cardiology (for example Cardiology A), click on the control panel on **Calc** to open the Measurement menu. The system displays **Cardiology – HR** measurement objects by default. Click on the **HR** measurement card to display all measurement cards. Click on **PV** to open the Measurement menu for the pulmonary valve. The Pulmonary Valve (PV) measurement objects and measurement methods are shown below.

Table 56

Measurement object	Layout	Measurement process
PV Max Vel	Maximum Velocity of Pulmonary Valve	<b>Instant Velocity Measurement:</b> After selecting the measurement object, move the cursor to the maximum velocity point and click on <b>Set</b> to calculate the velocity value (V). See Section 9.2.4.2 <b>Instant Velocity Measurement</b> for information on application.

Measurement object	Layout	Measurement process
PV VTI	Velocity Time Integral of Pulmonary Artery	<b>Manual Trace</b> : After selecting the measurement object, use the trackball and <b>Set</b> key to trace the target region on the spectrum and calculate the VTI value. See Section <b>9.2.4.4 Manual Trace Measurement</b> for instructions on application.
PV AT	Pulmonary Valve Acceleration Time	<b>Time Measurement</b> : After selecting the measurement object, move the cursor to the spectrogram. Click on <b>Set</b> at the starting position of the target measurement to fix the start point. Then move the cursor to the end position and click on <b>Set</b> . See Section <b>9.2.2.1 Time Measurement for information</b> on application.
PV DT	Pulmonary Valve Deceleration Time	

#### 9.3.9.24 Pulmonary Flow (Pul Flow)

When in PW mode, and with the current examination type for cardiology (for example Cardiology A), click on the control panel on **Calc** to open the Measurement menu. The system displays **Cardiology – HR** measurement objects by default. Click on the **HR** measurement card to display all measurement cards. Click on **Pul Flow** to open the Measurement menu for the pulmonary flow. The Pulmonary Flow (Pul Flow) measurement objects and measurement methods are shown below.

Table 57

Measurement object	Layout	Measurement process
Pul S Vel	Pulmonary Vein S-wave Velocity	<b>Instant Velocity Measurement</b> : After selecting the measurement object, move the cursor to the maximum speed point of the S wave. D-wave and A-wave, in the Spectrogram and, click on <b>Set</b> to calculate the velocity value (V). See Section <b>2.2.4.2 Instant Velocity Measurement</b> for information on application.
Pul D Vel	Pulmonary Vein D-wave Velocity	
Pul A Vel	Pulmonary Vein A-wave Velocity	
Pul A Dur	Pulmonary Vein A-wave Duration	<b>Time Measurement</b> : After selecting the measurement object, move the cursor to the spectrogram. Click on <b>Set</b> at the starting position of the target measurement to fix the start point. Then move the cursor to the end position and click on <b>Set</b> . See Section <b>2.2.2.1 Time Measurement for</b>

Measurement object	Layout	Measurement process
		<i>information</i> on application.

*NOTE: After measuring Pul S Vel and Pul D Vel., the system automatically calculates the S/D value and displays the value in the result window, then imports the result into the report worksheet.*

#### 9.3.9.25 Tissue Doppler Imaging (TDI)

If the TDI and PW images are displayed in the upper and lower layout and the exam type is cardiology (e.g. Cardiology A), click on **Calc** on the control panel to open the Measurement and Calculation menu. The system displays **Cardiology – HR** measurement objects by default. Click on the **HR** measurement card to show all measurement cards. Then click on **TDI** to open the TDI measurement menu. The TDI measurement objects and measurement methods are shown below.

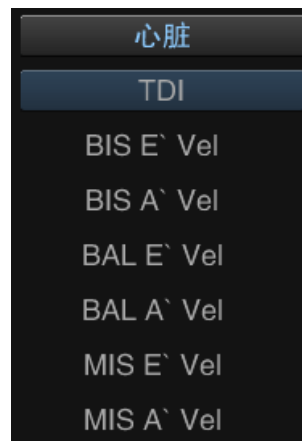


Figure 163: TDI measurement objects


Table 58

Measurement object	Layout	Measurement process
BIS E' Vel	Basal inferoseptum E velocity	<b>Instant Velocity measurement</b> : Select a measurement point. Move the cursor to the E peak or A peak on the spectrum and click on <b>Set</b> to obtain the velocity (V). See <b>9.2.4.2</b> for further information.  <i>NOTE: When BIS E' Vel and BIS A' Vel are measured, the system automatically calculates their ratio (BIS E'/A'); when BAL E' Vel and BAL A' Vel are measured, the system automatically calculates their ratio (BAL E'/A').</i>
BIS A' Vel	Basal inferoseptum A' velocity	

Measurement object	Layout	Measurement process
BAL E' Vel	Basal anterolateral E' velocity	<i>NOTE: When MV E Vel and MV A Vel are measured, the system automatically calculates MV E/BIS E', MV A/BIS A', MV E/BAL E' and MV A/BAL A' to further evaluate the diastole function.</i>
BAL A' Vel	Basal anterolateral A' Velocity	
MIS E' Vel	Mid inferoseptum E' Velocity	<b>Instant Velocity measurement</b> : Select a measurement point. Move the cursor to the E peak or A peak on the spectrum and click on <b>Set</b> to obtain the velocity. See 9.2.4.2 for further information.  <i>NOTE: When MIS E' Vel and MIS A' Vel are measured, the system automatically calculates their ratio (MIS E'/A').</i>
MIS A' Vel	Mid inferoseptum A' velocity	

### 9.3.9.26 Cardiology Report Worksheet

The result of cardiac measurement is automatically imported into the report. During the measurement process or after completion of the measurement, click on **Report** to open the Report Worksheet screen (as shown in Figure 164) and check the measurement result.

Click  in the upper right-hand corner of the screen or click on **Report** again to exit the report worksheet screen.

Report Worksheet

ID: 20130525-1033-001, Name: Lucy, Sex: Female, Age: 36, Physician: QI, Sonographer: LV, Exam: Cardiology, Height: 156 cm, Weight: 50 kg, BSA: 1.47 m²

2D	1	2	3	Method	Value	Formula
Ao root	1.48	1.09	1.42	Last	1.42 cm	
LA	0.87	1.02	0.59	Avg	0.80 cm	LA/AO:0.57
MVA	2.58	1.39	8.97	Min	1.39 cm²	AO/LA:1.76
MV	1.19			Max	1.19 cm	
LVOT	1.13	1.65	2.84	Last	2.84 cm	
RVDs	1.40			Last	1.40 cm	
IVSd	1.42			Last	1.42 cm	
LVIDd	1.04			Last	1.04 cm	
LVPWd	1.33			Last	1.33 cm	
IVSs	0.77			Last	0.77 cm	
LVIDs	1.07			Last	1.07 cm	
LVPWs	1.24			Last	1.24 cm	
LV FUNC						
EDV						
SV						
SI						
RA Area	0.47					
LPA	1.08					
RA	1.10					
VSD	1.21					
PEd	0.81					
LV A4Cd	5.82					
LV A4Cs	4.34					
LV FUNC						
EDV:0.09 ml						
CO						
ESV:0.04 ml						
SI:31.31						
EF:50.78 %						
CI						
FS						
dTPW						
LV MI						
LVA:22.18 cm²						
LVA:13.53 cm²						

Menu bar: Data, Analysis, Chart, Picture, Print Preview, PrintScreen, Pg Up, Pg Dn

Figure 164: Cardiology Report Worksheet

- Header**

Patient-related information is displayed in the header. If the patient data has not been entered in the **New Patient Info** screen, it can still be entered in the header. After entering the patient data, click on the **Save** button on the right-hand side of the header bar and the entered data is saved; otherwise you exit the Report Worksheet screen and all data is lost.

The system automatically calculates the BSA value when **height** and **body weight** are entered.

**NOTE:** The "name" in the report cannot be edited.

- Measurement objects and calculation results**

This area displays the measurement results of all measurement objects and results taken from calculation results and can be edited.

Three measurement values can be recorded for each measurement object in 2D mode. To delete any of the measurement results, move the cursor to the value and click on **Set** to cross it out, as shown above. In connection to the three measurement values, a drop-down list offering the options Avg (average of all effective measurement values), Min (minimum value), Max (maximum value) or Last (last measured value) is available.

Several formulae are available for left ventricular function calculation, for example Teichholz, Cubed, or Gibson. The result of the calculation changes depending on the selection of the formula.

- Comments**

The user can enter relevant diagnostic information in the **Comments** area. Move the cursor into the Comments area and click on **Set** to enter information.

- Menu bar**

Click on the relevant object on the menu bar to open the corresponding screen.

**Data:** If another screen is currently displayed in front of you, click to return to the screen with the report worksheet.

**Picture:** Enter the image of the report editing screen for the report. The method is the same as for *Obstetrics Report Worksheet* (see Section 9.3.2.10).

**Print Preview:** Enter the Report Preview screen. The operation is the same as on the *Obstetrics Report Worksheet* (see Section 9.3.2.11).

**Print Screen:** Click to save the current page to the specified directory in BMP format.

**Pg Up, Pg Dn:** Change page when there are multiple pages.

**NOTE:** Analyses and charts that are not intended for the Cardiology Worksheet are invalid.

### 9.3.10 Orthopaedics

#### 9.3.10.1 Function

The orthopaedics calculation software can be used for the examination of the hip joint. Three lines must be correctly placed on the ultrasound image: BL, alpha and beta. The system automatically calculates the value of the two angles (alpha angle and beta angle), as shown in Figure 165. Analyse the data from these two angles to check whether the joints have deformities or dislocation.

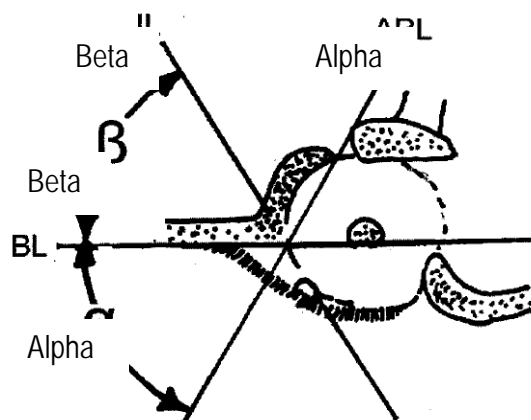


Figure 165: Hip joint measurement

### 9.3.10.2 Procedure

Measurement:

1. When in B mode, click on **Calc** on the control panel to open the Measurement menu. If the current examination type is one for orthopaedics, the system displays the **Hip joint** measurement object. Use the trackball to move the cursor to the measurement point and click on **Set** to open the Measurement state.
2. A + cursor appears in the centre of the image. Click on **Set** to fix point **A**. Next, move the trackball and click on **Set** to fix point **B**. The first line **BL** (baseline) is displayed.
3. Move the trackball to display the **alpha** line (limbus acetabuli line). Rotate it to the appropriate angle. Now click on **Update** and use the trackball to move the **Alpha** lines to the corresponding position. Click on **Update** again and the trackball function is restored so that the angle of the **alpha line** can be changed. Click repeatedly on **Update** to toggle between the trackball steering of the angle or the position of the line.
4. Once the angle and the position have been confirmed, click on **Set** to fix the **alpha line**.
5. Move the trackball again to display the **beta line** (slope line), set the angle and position of the **beta line** according to **Step 3)** above and click on **Set** to fix it.
6. After you have drawn the three lines, click on **Set** at the start/endpoint of the line to activate and modify it.
7. The display result is:

Angle **alpha**: The inclination between the B line and the **alpha line**.

Beta **angle**: The inclination between the B line and the **beta line**.

### 9.3.11 Brain

The brain software package is used primarily for neonatal examinations. Measurements such as cranial cortical width and cerebellar circumference can be used to perform analyses to determine whether neonatal brain growth is normal.

When in B mode, click on **Calc** on the control panel to open the Measurement menu. Use the trackball and **Set**, and click on the current calculation software package to display all calculation software, then click on the calculation software for the **brain** to display all measurement objects, as shown in Figure 166.





Figure 166: Brain measurement

In the brain calculation software, measurement in B mode is shown in the label below.

Table 59

Type	Measurement object	Measurement process
Length measurement	For example: CCW, SCW, IHW etc.	See <i>Distance Measurement</i> in B mode.
Circumference/area measurement	For example: CVC, CVA etc.	Please see <i>Trace measurement</i> in B mode.

### 9.3.12 Emergency

*The emergency* calculation package includes general physiological calculation elements (e.g. abdomen, vascular, urology and cardiology, etc. ), as shown in Figure 167. This makes it convenient for operator to quickly find the required measurement element in an emergency and perform a quick measurement and diagnosis.

The measurement methods of each measurement object are the same as those mentioned above; please refer to the above paragraphs for an introduction.

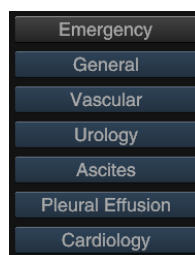


Figure 167: Emergency measurement

# 10 Film and file management

## 10.1 Film

### 10.1.1 Description of function

Images are stored continuously in real time; when the memory is full, new images replace previous images on a continual basis. After freezing the image, the images stored in the memory before this still image can be played back.

*NOTE: The frame frequency depends on the relevant mode.*

*When the mode is changed, all temporarily stored film images are deleted; when the system is active or the power is turned off, all stored images are deleted.*

### 10.1.2 Operational methods

#### 10.1.2.1 Manual film

Click on **Freeze** to open the image as a still image and open the Film state. A film display appears at the bottom of the screen. Move the trackball or turn the **Gain/Auto** knob for frame-by-frame playback of images saved in the memory.

#### 10.1.2.2 Continuous film

When in still-image mode, move the trackball to open Continuous film state.

#### 10.1.2.3 Segment Film

To play a section of film in still-image mode, you must set up the first frame and the end frame of the film. Method for playing a section of film:

When in still-image mode, move the trackball to play the film manually on an image, then click on the **D** key to confirm the start point. Next, turn the **Values** control to move the start point to the left or right. Move the trackball again to play the film on another image, then click on the **D** key to confirm the endpoint. Now turn the **Values** knob, which can also be used to move the endpoint to the left or right. Click on the **D** key again to cancel the start and endpoints and perform setup again. Once the setup is finished, turn the trackball or the **Gain/Auto** knob to start that section of film.

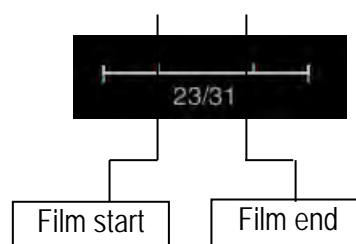


Fig. 9-1

Segment Film

## 10.2 Save setup

Click on **Save as** on the control panel to open the screen, as shown in Figure 168:

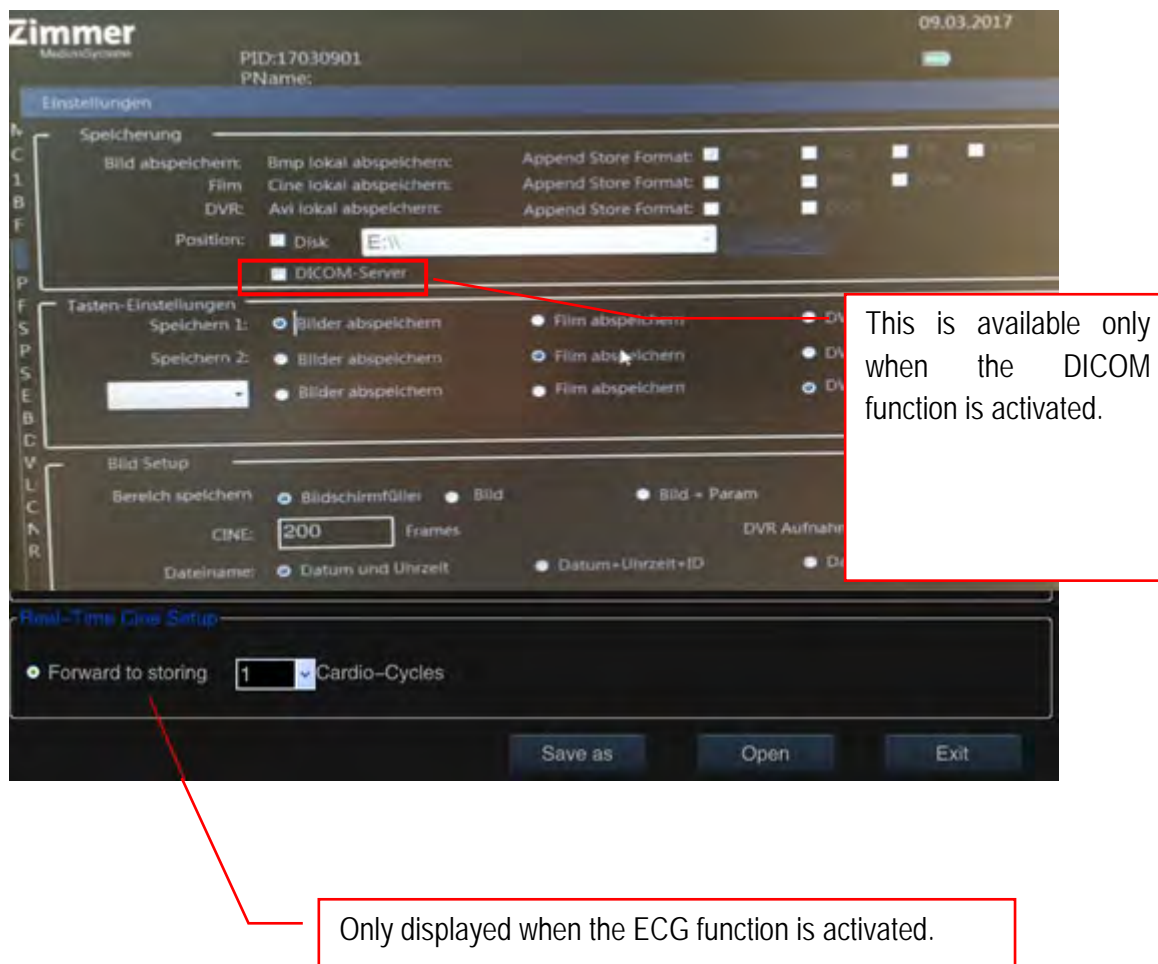


Figure 168: Save function setup

### 10.2.1 Key configuration

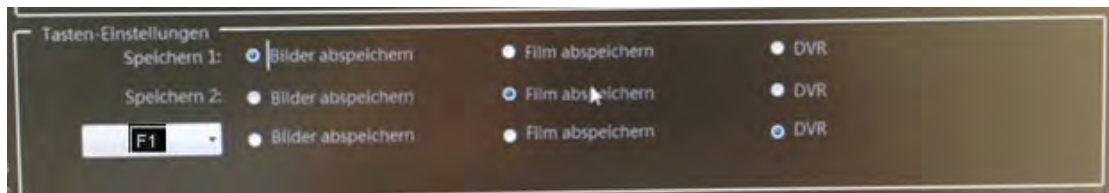


Figure 169: Keys setup

- **Save 1:** Three options are available for selecting the file type and save option: *Image*, *Film* and *DVR*. When setup is complete, click on
- **Save 1** to save the file under this type.
- **Save 2:** Three options are available for selecting the file type and save option: *Image*, *Film* and *DVR*. When setup is finished, click on **Save 2** to save the file under that type.
- **Hotkey F1~F4:** Select a hotkey from the drop-down menu and define it as a **Save** key ( **【Note】** : If the hotkey has already been defined, its previous function is cancelled.).

Next, select the file type for the file storage. When setup is finished, press the **hotkey** to save the file under this type.

*NOTE: The storage format for images and film when not in 4D mode is DVR bmp, cin or avi; in 4D mode, the storage format is DVR vol, vols or avi. The cin, vol and vols formats cannot be opened directly on a PC. To view on a PC, attach the file in a different PC format (see Add storage below) or convert the file into a PC format (see Section 10.4.5 for more information).*

### 10.2.2 Add storage



Figure 170: Add storage

Select the destination for the attached store files; two options are available for this purpose: **hard disk** and **DICOM server**. The **DICOM server** is only available with the DICOM function activated. Select the option, click on **Save 1**, **Save 2** or one of the **F1 ~ F4** hotkeys to save the image to the local hard disk, while a DICOM single-frame image is sent to the DICOM server.

**Attach storage format** is available for selection only when **Disk** is selected.

As a rule, the following **image** formats can be attached: **bmp**, **jpg** und **tif**; the available **film** formats are: **cin** and **avi**; the available **DVR** format is **avi**. If the DOCM function is activated, one further **DCM** format is available.

To select the **hard disk**, click on **Browse** on the right-hand side and the **Browse For Folder** window appears (see Figure 171). You can select a specific folder for storage or select a folder from the drop-down menu.

*NOTE: Prior to the first file save the drop-down menu is empty. If a file has already been stored, the system saves the storage path automatically.*

Once setup has been completed, click on **Save 1**, **Save 2** or the **F1 ~ F4** to save the file in two formats simultaneously (system default and attachment formats). The file is saved in the default system folder in the default system format (usually in E:\PatInfo folder), and the attached file is saved in the user-defined folder.

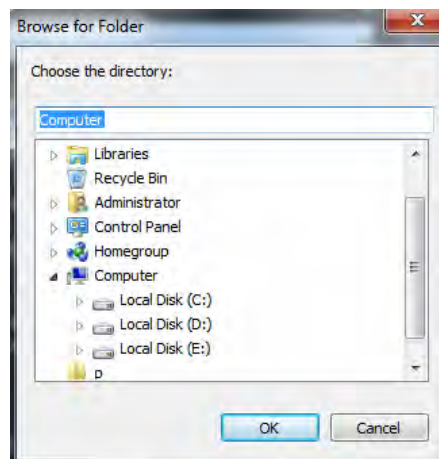


Figure 171: Browse For Folder

### 10.2.3 Image Adjustment

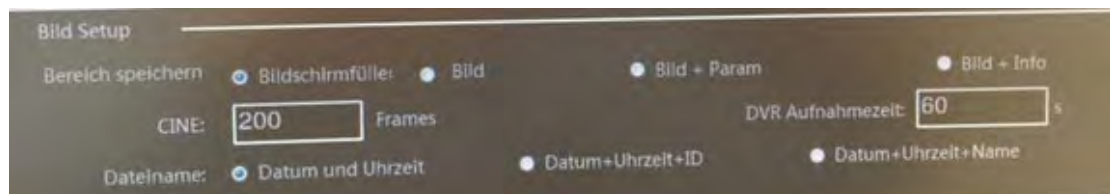


Figure 162a: Image adjustment

- **Storage area:** Four types are available for setting the image memory area:  
**Full screen:** To save the full-screen image, including the image and parameter area.  
**Image area:** To save the image area only.  
**Image Area + Param:** Only the image area and the parameters in the left-hand screen are saved.  
**Image Area + Info:** Only the image area and the patient information on the screen are saved.
- **Film length:** To set up the maximum number of images saved for the film. Move the cursor to the input box, click on **Set** and use the keyboard to enter the number.
- **DVR record time:** To set up the duration for saving DVR files. If the recording is not stopped manually upon reaching the set time, it is stopped automatically and saved as a video by the system. The setup process is the same as for **Film Length**.
- **File Name:** To select the name format of the file that is to be saved.

## 10.2.4 Real-time film setup

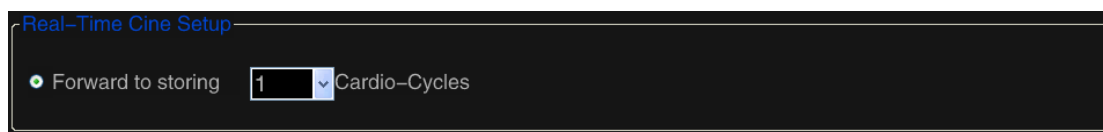


Figure 172: Real-time film setup

**NOTE:** This setting is available only when the ECG function is activated on the system.

This setting allows the user to set up the cardiac cycle number for the film that is to be saved. When the setup is finished and the ECG function in operation, press the **Save 1**, **Save 2** or **F1 ~ F4** keys to save the film, and the system saves the ECG for the set cardiac cycles and 2D images before the key is pressed.

Setup: Use the trackball and the **Set** key to click on the right-hand arrow (as shown in Figure 172) and select the number from the drop-down menu.

## 10.2.5 Save as

Use **Save as** to save the current image or recording to a specified location in the designated format.

Freeze the image and click on **Save as** on the control panel to open the **Store Setup** screen. Use the trackball and the **Set** key to click on the **Save as** button and the **Save as** dialogue box appears (see Figure 173).

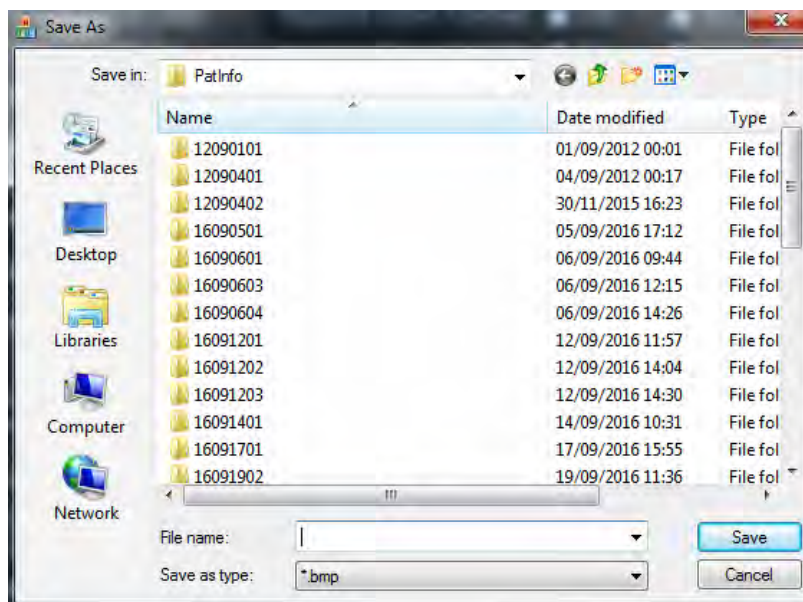


Figure 173: "Save as" dialogue box

Select the save location, enter the file name in the **File name** box, select the storage type from the **Save as** drop-down menu (formats **bmp**, **jpg** and **cin** are available), and click on **Save**.

## 10.2.6 Open

Use **Open** to open any image or film saved in the local system.



Click on **Open** on the **Store Setup** screen to open the **Open** dialogue box (see Figure 174). Find the target folder and click on **Open** to open it.

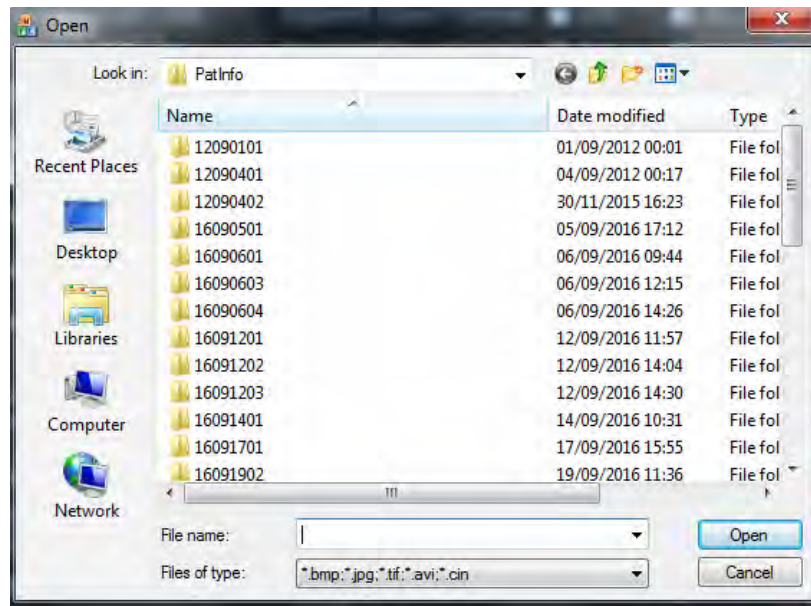


Figure 174: Open dialogue box

## 10.3 Quickly write, read and delete images

### 10.3.1 Fast Image Save

In different modes, click on the (**Save 1**, **Save 2** or **F1 ~ F4**) buttons to save an image or film to store the still image or film (if it is not in still-image mode, the image is converted to a still first and then saved) to the system default folder (usually in E:\PatInfo folder).

The saved image is displayed in the image preview area so that it is convenient for users to check.

Before saving, first go to the Film state, then move the trackball to select and save the desired images.

### 10.3.2 Fast AVI Save

AVI files can be saved in Live state or the still-image mode.

When in the Live state, click on the button to activate DVR (which can be activated via **Store Setup**, see Section 10.2.1 for further information). The flashing red mark at the bottom right of the screen, which is displayed above the recording time (played and remaining time), means 'recording'. See Figure 175.

Click on the **Still image** button or the button to activate the DVR recording to stop recording early. If the recording is not stopped manually as soon as the set time has been reached (*the DVR recording time* can be set via **Store Setup**, see 10.2.3 for further information, the recording is stopped automatically and saved as a video by the system.

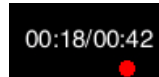


Figure 175: DVR recording time

When in Still image mode, press the button to activate and start the DVR recording. Not every process in the recording process is available before the recording ends automatically.

The recorded AVI file is displayed in the image preview area at the right side of the screen.

*NOTE: AVI files recorded in real time have no sound, while spectral AVI files recorded after the still image or transcoding has been opened, do have sound. No sound is available during playback on the ultrasound system, although it is on the computer.*

### 10.3.3 Fast Image Read

Click on **Set** to activate the cursor, then use the trackball to move the cursor to the image to be viewed in the preview area. Now click on **Set** to open and display the image.

Use the trackball to move the cursor to the **CIN** format file in the preview area and double-click on **Set** to display the film loop automatically.

Alternatively, you can click on **Open** in the **Store Setup** screen and select the file that you wish to read from the file list (see Section 10.2.6 for detailed instructions).

The operational mode cannot be changed during the image-reading process. Measurement, calculation and annotation functions can be performed but not saved (i.e. all corresponding data is cleared after the above process is finished).

### 10.3.4 Immediate deletion of images


Click on **Set** to activate the cursor, then use the trackball to move the cursor to the image to be deleted in the preview area, and the file format appears above the file, with a  (deletion mark) at the upper right, as shown in Figure 176. Move the cursor to the mark and click on **Set** - the screen with instructions for deletion appears. Click on **Yes** to delete the file immediately.



Figure 176: File selection



## 10.4 Patient Archive

Click on **Smarchive** on the control panel to open Figure **Archive Management**. Features such as the patient list, patient retrieval, patient reports, information browsing, transmission of patient data and so on are integrated into the function.

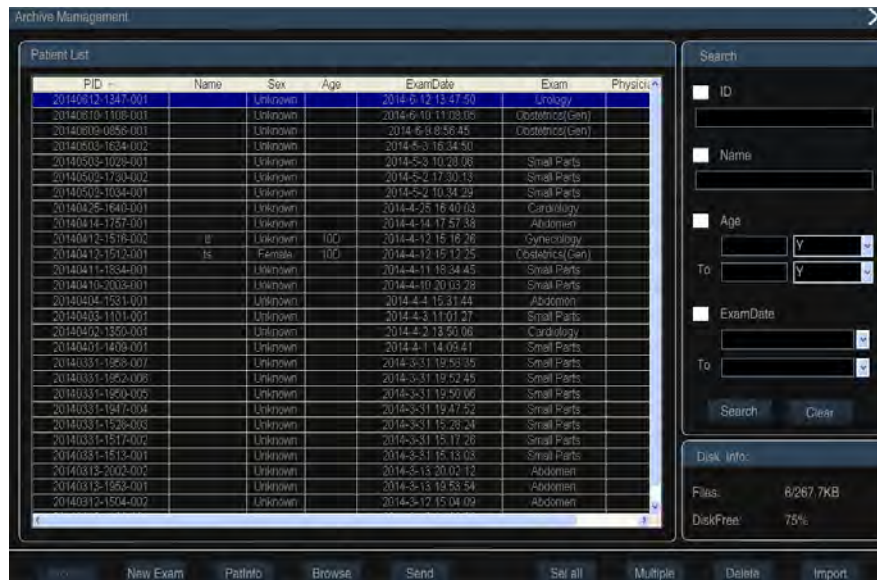


Figure 177: Archive management

**NOTE:** Click on a patient to make either a single selection, or you can change the selection. If you want to select multiple patients, first you must click on the **Multiple** key, and then on multiple patients.

### 10.4.1 Retrieval :

Two methods:

- The user can find the required patient records in the patient list. The system arranges the patient information according to PID, Name, Sex, Age, Exam Date and Exam (exam type). Move the cursor to PID, Name, Sex, Exam Date or Exam and press **Set** for a fuzzy search. For example: select PID and the list of patient data is arranged in ascending or descending order. Select Sex and the list is divided into female and male. If you select Age, the list is arranged from young to old or from old to young.

**NOTE:** The default list of patient information is arranged from near to far.

- The user can use the retrieval bar on the right side of **Archive Management**. Retrieval items include patient ID, name, age group and examination time. Individual or common retrieval can be used with multiple items (more keywords and a smaller range can help to find the target more quickly). Move the cursor to the small box before the item that is to be retrieved and click on **Set** to mark "√" in the field. Next, enter the relevant information, move the cursor to **Search** and click on **Set** to search the patient database. The aforementioned fuzzy search helps users to quickly find matching patients or narrow the range of matching patients, as shown in Figure 178.

Patient List						Search
PID	Name	Sex	Age	ExamDate	Exam	
20130128-1611-002	wx	Female	26Y	28/1/2013 PM 4:11:08	Cardiology	<input checked="" type="checkbox"/> ID
20130128-1400-001		Unknown		28/1/2013 PM 2:00:48	Abdomen	<input type="text" value="128"/>

Figure 178: Retrieval of patient information

#### 10.4.2 Hard Disk Information

Hard disk information, including file information and free memory space on the hard disk, is displayed in the lower right corner of the screen.

#### 10.4.3 Patient Data

Once the exact patient information has been found, move the cursor to the information and press **Set** to select. Move the cursor to **PATINFO** on the lower edge of the screen and click on **Set** to open **New Patient Info**, as shown in Figure 179.

New Patient Info

☒ Automatically create the ID

ID: 15102901

AccessNum: 20150122113132

Last Name: king

First Name: lili

Middle Name:

Exam: Abdomen

Ref.M.D: GG

Diagnostician: VV

Operator: HH

Sex: Female

DOB: 1/22/1995 ( M/yyyy )

Age: 20 Y

Height: 160 cm

Weight: 45 kg

Study Description:

Comments:

Figure 179: Basic patient information

**NOTE:** The user interface is for browsing only and cannot be edited. See Section 8.1 to change patient information.

#### 10.4.4 Browse

Once the exact patient information has been found, move the cursor to the information and press **Set** to select. Move the cursor to **Browse** on the bottom of the screen, then press **Set** or double-click on this patient information to open the Browse Media window, as shown in Figure 180.

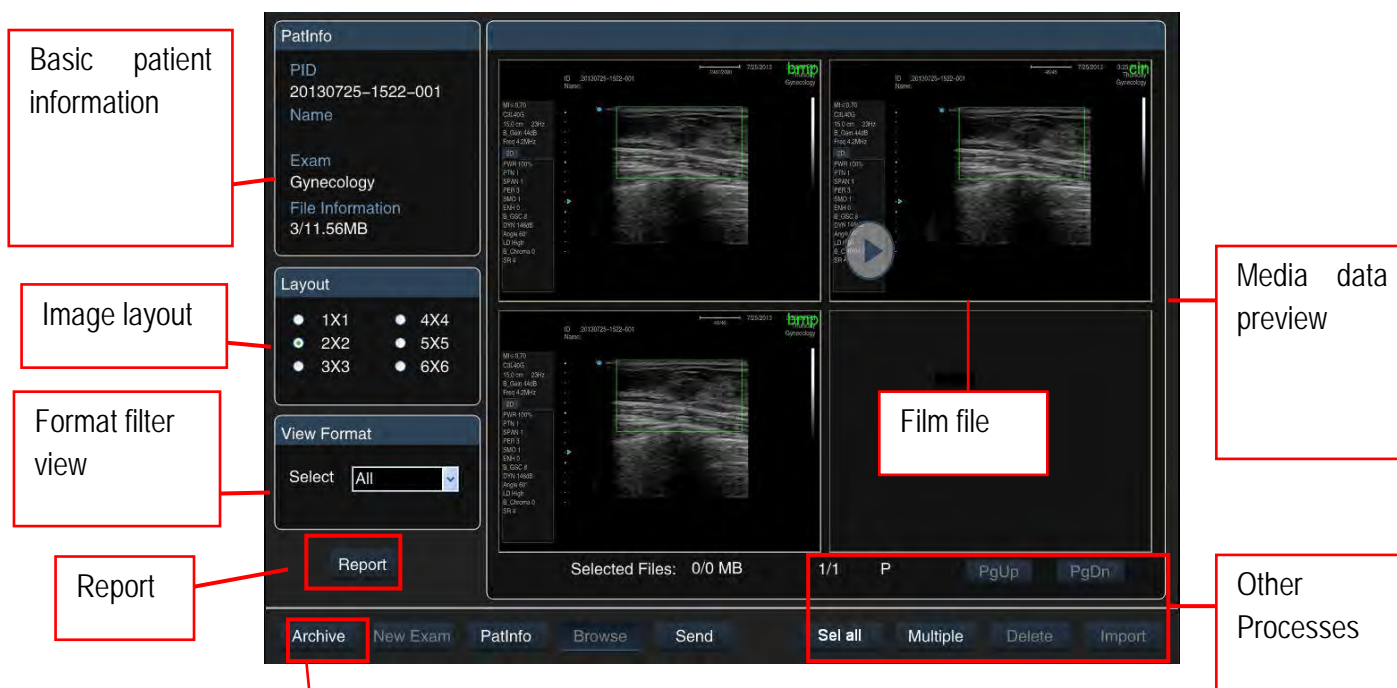




Figure 180: Browse Patient Information

Click on **Archive** and return to **Archive Management**, as shown in Figure 177.

- Basic Information:** selected patient basic information is displayed in the upper left corner; make sure that the wrong patient is not selected. Basic information includes: PID, name, exam type and stored media data quantity and size.
- Image layout:** Selection of media data display layout in the preview user interface. Six layouts are available for selection, and the required page is displayed based on the chosen layout and media data quantity. Use the trackball to move the cursor to the (previous) option and click on **Set** to select it.
- Display format:** To filter out files in the desired format. Use the trackball to move the cursor to  click on **Set** to open the drop-down menu, select one file format (e.g. jpg), and all the files in that format are displayed in the right preview area.
- Media Preview:** Preview of all media information on the current patient, including images and films, JPG, Cin, etc. formats (the file format is displayed at the upper right, and film files are also marked  on the upper left, as shown in Figure 180).

**NOTE:** Double-click on a media file - the system goes to the ultrasound screen and plays all media files. If this takes place during an examination procedure, the prompt "This action will end the current examination; would you like to continue?" appears on the screen. Choose **No** if you do not want to continue and choose **Yes** to end the current examination. Import the selected patient data, whereby the media data is listed in the browser window. At the same time, the media data that you have double-clicked on is opened (see Section 10.1.2 for a description of films). Press **Smarchive** on the control panel to return to the current Archive Management screen.

- Report:** Open **Browse**, move the cursor to **Report** on the lower left and click on **Set** to open the **Report Worksheet** screen to view the patient report. See Section 9.3.2.7 for detailed information on the report.

- b) Other operations: Turn Page, Select All, Multi Select and Delete Preview Image.

*NOTE: If you want to open an image several times, you must first click on the Multiple key and then the Multiple image.*

#### 10.4.5 Data Transmission

If you want to send all of the patient's data (including basic information, reports, media files, etc.), you must select the desired patient record from the list of files and move the cursor to **Send**. Then click on **Set** to open the transfer screen. See Figure 181.

*NOTE: You can select individual patient data or use Sel All (select all) and Multiple to select multiple patients. The process is the same as above.*

*NOTE: DICOM is an optional feature that is inactive when not purchased and the Send screen does not show any STORESCU and PRINTSCU elements.*



The 'Send' dialog box is shown with the following sections and options:

- Destination:**
  - ☒ Disk (with a text input field and a 'Browse' button)
  - ☐ Burn (with a text input field and a 'Browse' button)
  - ☐ Digital Print (with a text input field and a 'Printout' button)
  - ☐ STORESCU (with a text input field and a 'Printout' button)
  - ☐ PRINTSCU (with a text input field and a 'Printout' button)
- Output Media Files:**
  - ☒ Output Media Files
  - Image: ☐ Bmp ☐ Jpg ☐ Tif ☒ DCM
  - Cine: ☐ Avi ☒ DCM Org\_Format: ☐
  - Image Size: ☒ Org\_Slab; ☐ Image;
  - ☐ Image + Param ☐ Image + Info
- Other:**
  - Complete: ☒ Keep Files ☐ Delete Files
- Status:**
  - ☒ Report

Buttons at the bottom: Send, Cancel

Figure 181: Data transmission

### 10.4.5.1 Send data

The steps for sending patient information to the hard disk are as follows:

1. Select the target path

Activate **Disk** and select the subfolder from the drop-down menu. Use the drop-down button to select the subfolder (*NOTE: The drop-down menu is blank when the initial transmission is performed. If the transmission has already been made, on the next transmission the system stores the transmission path in the drop-down menu for immediate selection.*).

If the drop-down menu is empty, click on the **Browse** button to the right of **Disk** to open the **Browse For Folder** window (see Figure 182), from which the user selects a specific path on the hard disk. The user can create a new folder named "aa" (as shown below) and the file is displayed as **Transmission date\_time** and send to the new folder.



Figure 182: Folder search when transmitting data

2. Confirm transmission content

The transmission content includes the media file (image or film) and the report.

- To view patient data only, uncheck **Output Media Files** and the **Report**.
- To send the patient information and media file only, uncheck **Report**.
- To send the patient data, media file and report, check **Output Media Files** and **Report**.

3. Select and set up media files.

Check the **Output Media Files** element and all saved media files are sent by default.

If you want to select several images for transmission, first open the **Browse** screen. Using the cursor placed on the image that is to be sent, click on **Set** (to select several files, click on **Multiple** before selection), then move the cursor to **Send** on the lower edge of the screen and click on **Set** to open the **Send** screen, as shown in Figure 181. If no media file is selected, click on **Send** and the following is displayed: **"No images selected. Do you wish to continue?"**. Select **Yes** to send the patient information without the media file, or select **No** to stop transmission.

Media files can be converted to a PC-friendly format during transmission for direct view on the PC, and the transmission area can be set up. The detailed process is as follows: On the **Send** screen, first check **Output Media Files** and then choose the format (images can be converted to the **bmp**,

*jpg* or *tiff* formats, or to the *DCM* format) when the DICOM function is activated. Films can be converted to the *AVI* or *DCM* formats when the DICOM function is activated. To send in the default format, check *Org\_format*).

*NOTE: The image size can only be selected if the files are sent in Cin format (with four send options: Org\_size, Image, Image+Param, Image+Info).*

#### 4. Other

*Other* can be selected only when *Output Media Files* , *Report* and Send all media files are checked.

There are two options: *Keep Files* (when the transmission is finished, the patient file is still kept in the local system) and *Delete Files* (when the transmission is finished, the patient file is deleted and the user can no longer find the data in the local system).

#### 5. Send

After finishing the steps above, use the trackball and **Set** key to click on the **OK** button at the bottom right of the screen to start sending.

The transmission is finished when the current status shows **Sent Successfully!**

### 10.4.5.2 Data Burning

To burn the data onto a CD, connect the burner first and then follow the steps below:

- 1) Select the destination path: Check **Burn** and select the burner model using the drop-down button.

*NOTE: The drop-down menu is empty if no burner is connected.*

- 2) Confirm the content of the transmission.
- 3) Select and set up the media file.
- 4) Other processes.
- 5) Send.

*NOTE: The procedure in steps 2) to 5) is the same as that in 10.4.5.1, Sending data to disk.*

### 10.4.5.3 Printing using a digital printer

To print data using a digital printer, connect a digital printer and follow the steps below:

- 1) Select the destination path: **Digital Print** and select the digital printer model from the drop-down menu.

*NOTE: The drop-down menu is empty if no digital printer is connected.*

- 2) Confirm the transmission content using the same procedure as in 9.4.5.1 Sending data to disk.
- 3) Media file selection and layout

If you want to select some images for transmission, enter the **Browse** screen first. Move the cursor to the desired media file and click on **Set** (to select multiple files, click **Multiple** before selection),



then move the cursor to **Send** on the bottom of the screen and click on **Set** to open the Send screen, as shown in Figure 183.

If the selected file is a film format, only the final image can be printed. To select a better frame from the film, exit the Patient Management System, play back the film file, find the correct frame and save it as an image.

Next, use the trackball and the **Set** key to click on the **Layout** button to the right of Digital Print and open the **Print Typeset** screen (see Figure 183). The selected image is displayed in thumbnail at the bottom of the screen. The file is printed when typesetting is complete.

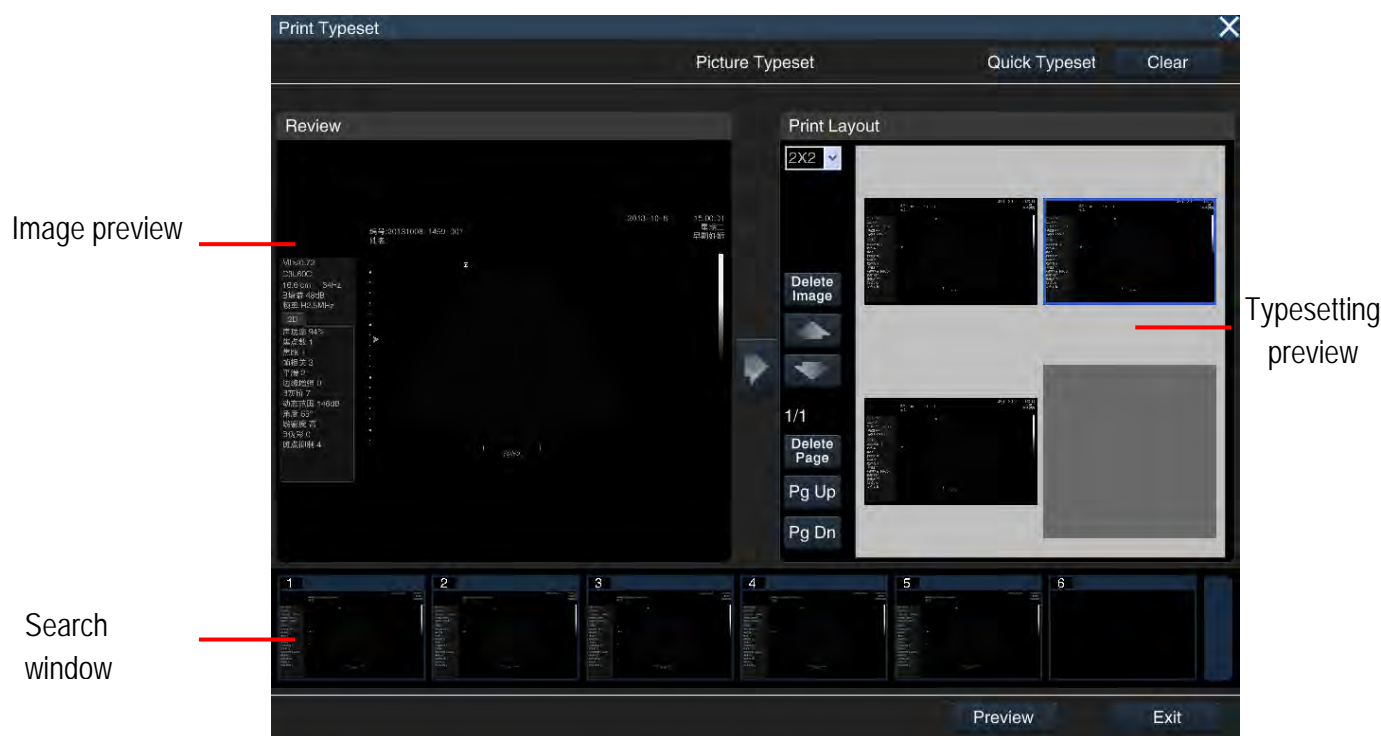





Figure 183: Layout screen

The layout:

- a) Use the trackball and the **Set** key to click on **Quick Typeset** on the upper right of the screen; the selected images are arranged in the typeset and displayed in the Typeset Preview area on the right side of the screen.
- b) **Manual Typeset**
  - View: Click on **Set** to activate the cursor. Move the cursor to an image in the browser window and then click on the **Set** key. The image is resized and displayed in the preview area on the left side of the screen for review by the user.
  - Load: Click on  the centre of the screen and load images from the Image Preview area on the left to the Typeset Preview area on the right.

- Change Typeset: Use the trackball and the **Set** key to make a selection in the **Print Layout** drop-down list. For example, the 3×3 layout means that there are 3 rows, and 3 pictures in each row.
  - Change Image Position: Click on  or  to move the image up or down.
  - Turn Page: If the images cannot be displayed on the same page, click on **Pg Up** or **Pg Dn** to turn the page and see other images.
  - Delete Image: Move the cursor to the image you want to delete. Click on **Set** to select it (the selected image is displayed in a blue box), then click on **Delete Image** to remove the image from the Typeset Preview area.
  - Delete Page: Click on **Delete Page**, and all images displayed on the current page are deleted.
  - Clear Images: Click on the **Clear** button at the top right of the screen, and all images in the Typeset Preview area are deleted for fresh typesetting.
  - Preview: Click on **Preview** to enter the Print Preview screen.
  - Exit: When the typeset process is finished, click on **Exit** at the lower right of the screen to return to the **Send** screen.
- 4) Print: When the above steps are finished, use the trackball and **Set** key to click on the **OK** button at the bottom of the **Send** screen and start printing.

#### 10.4.5.4 Send data to the DICOM Server

To send data to the DICOM server, ensure that the system is properly connected to the DICOM server (see Section 5.2.11 for a detailed description of the connection process), and the DICOM server is activated. Then follow the steps below:

- 1) Select the destination path: Check **STORESCU**. Select the target server from the drop-down menu.
- 2) Confirm the transmission content using the same process as in Section 10.4.5.1 *Sending data to disk*.

*NOTE: When exiting the report, a structured DICOM report file is automatically generated in the patient's media file directory. If the "Report" element is checked, the report is sent to the DICOM server.*

- 3) Select and set up media files.

If you want to select some images for transmission, enter the **Browse** screen first. Move the cursor to the desired media file and click on **Set** (to select multiple files, click **Multiple** before selection); move the cursor to **Send** on the bottom of the screen and click on **Set** to open the **Send** screen, as shown in Figure 181.



If the file to be sent is in Cin format, you can set the **Image Size** before transmission. All files are converted to DCM format during transmission.

#### 4) Send

After finishing the steps above, use the trackball and **Set** key to click on the **OK** button at the bottom right of the screen to start sending.

When the transfer is complete, the current status indicates the number of files sent, irrespective of whether the transfer was successful or not.

#### 10.4.5.5 Print files with the DICOM printer

To send data to the DICOM printer, make sure that the system has been correctly connected (see Section 5.2.11 for a detailed description of the connection process) and that the DICOM function has been activated. Then follow the steps below:

- 1) Select the target path: Activate **PRINTSCU** and select the target server from the drop-down menu.
- 2) Setting of transmission content: to only print media files, activate **Output Media Files**. The printing of reports is not supported, i.e. **Report** cannot be activated.
- 3) Select and adjust the media files.

To select a media file for printing, open the **Browse** screen and return to the **Send** screen. Click on **Layout** to the right of **PRINTSCU** to open the Print typeset screen. Detailed instructions on this process can be found in 10.4.5.3 *Printing with a digital printer*.

**NOTE:** *PRINTSCU is used for printing images only, and not films.*

#### 4) Print

After completing the above steps, use the trackball and the **Set** key to click on the **OK** button on the lower right of the screen and send your print request to the DICOM server.

#### 10.4.6 Data import

Data import allows the import of patient data that is transmitted from this system or another system in the same series for review and new examinations.

Go to **Archive Management** and click on **Import** on the lower right of the screen to open the **Browse for Folder** window (as shown in Figure 184) and browse for the saved patient data folder. Click on **OK** to import data to the system. If the same data is present in the system, a box appears, asking if the data should be overwritten. Depending on requirements, the user can select **Yes** or **No**.

**NOTE:** *Instead of creating new folder, the user should select a folder for saving data, as shown in Figure 184 below.*

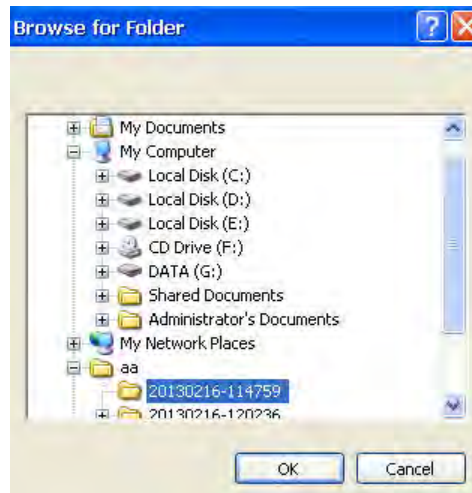


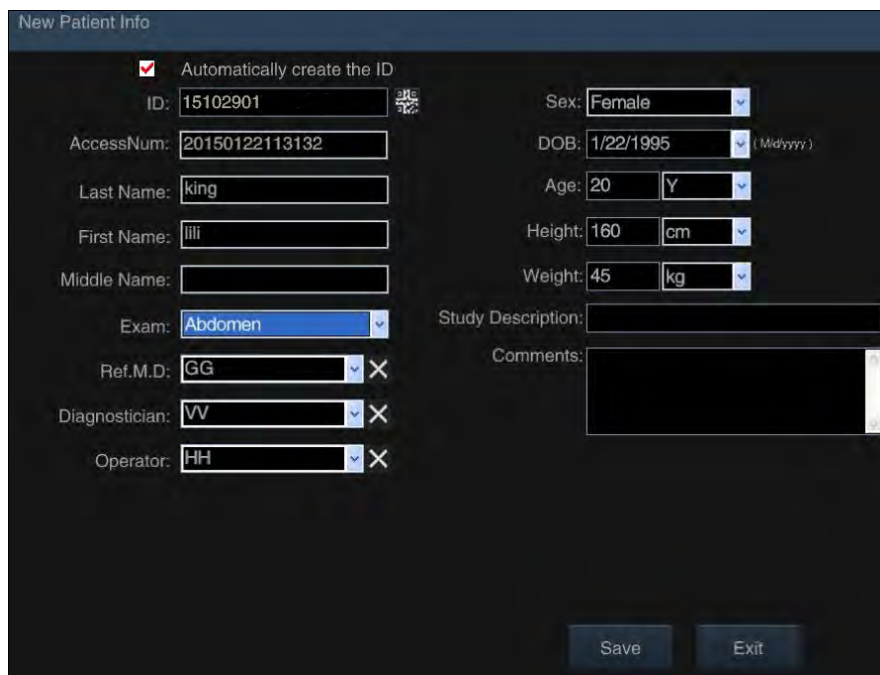
Figure 184: Browse for Folder in Data Import

#### 10.4.7 New Examination

This feature helps the user to create a new exam type for the patient under the same ID. After the examination, the new examination for the same patient is displayed in the patient list according to the different exam time, different (or the same) organs examined, doctor, etc. All you need to do is retrieve the ID, and the different exam times and organs examined are listed.

Methods:

- 1) See the retrieval method in Section **10.4.1** to retrieve the patient data for a new examination.
- 2) Move the cursor to the patient information area and click on **Set**.
- 3) Then move the cursor to **New Exam** at the bottom of the screen and click on **Set**. The screen shows a message asking for confirmation of the end of the current examination and to open the **New Patient Info** screen following confirmation (see Figure 185).
- 4) After a new examination has been created, move the cursor to **Save** and click on **Set** - the system switches to the ultrasound screen. Users can start the examination immediately or move the cursor to **Exit** and click on **Set** to end the process.



The image shows a software window titled "New Patient Info". It contains various input fields for patient data. At the top left, there is a checked checkbox labeled "Automatically create the ID". Below this, the "ID" field contains "15102901" and has a small icon to its right. The "AccessNum" field contains "20150122113132". The "Last Name" field contains "king", "First Name" contains "lili", and "Middle Name" is empty. The "Exam" dropdown menu is set to "Abdomen". Below that, "Ref.M.D." contains "GG", "Diagnostician" contains "VV", and "Operator" contains "HH", each with a small 'X' icon to its right. On the right side, the "Sex" dropdown is set to "Female", "DOB" is "1/22/1995" with a "(MM/yyyy)" hint, "Age" is "20" with a "Y" dropdown, "Height" is "160" with a "cm" dropdown, and "Weight" is "45" with a "kg" dropdown. Below these are "Study Description" and "Comments" text areas. At the bottom right are "Save" and "Exit" buttons.

Field	Value
Automatically create the ID	<input checked="" type="checkbox"/>
ID	15102901
AccessNum	20150122113132
Last Name	king
First Name	lili
Middle Name	
Exam	Abdomen
Ref.M.D.	GG
Diagnostician	VV
Operator	HH
Sex	Female
DOB	1/22/1995 (MM/yyyy)
Age	20 Y
Height	160 cm
Weight	45 kg
Study Description	
Comments	

Figure 185: New examination

## 10.5 Print Image

Click on **Print** on the control panel and the still image can be printed on a system or DICOM printer (see Section 4.1.1.5 *Printer Installation* for information on printer connection and Section 5.2.3.2 *Printer Setup* for information on printer setup).

# 11 Maintenance, Inspection, Transportation and Storage

## 11.1 System Maintenance

Every time the system is started up, the user should carefully inspect the probe cable connector, the probe cable, the equipotential bonding conductor and the power cord to check for any detached sheathing, shedding or other signs of damage. Verify if the equipotential bonding conductor is correctly and safely grounded. Special attention should be paid to these daily inspections to avoid unexpected risks and to ensure that the system is used safely.

Upon each system power-up, check whether the power indicator and the fan are operating normally. Buttons and knobs should be thoroughly inspected once every half-year. For detailed information, see *Section 4.4 System Inspection and Maintenance*.

## 11.2 Troubleshooting

The following table lists some common malfunctions, possible causes and solutions (see Table 60). The user can refer to these solutions to perform troubleshooting. If the causes of malfunction cannot be identified or the problems cannot be solved even though the provided solutions have been applied, please contact our Customer Service. UNDER NO CIRCUMSTANCES should you dismantle the system without supervision by one of our service technicians; otherwise, operating errors may lead to system damage, or even risks to personal safety.

Table 60: Troubleshooting list

Malfunctions	Causes and Solutions
No power supply	Make sure that if the power cord at the rear panel of the system is properly plugged in.
No ultrasound image display on the screen in any scanning mode, but characters and the greyscale bar are displayed normally	Check that the probe is correctly connected to the main unit.
The printer is not working	Check whether the printer is properly connected to the main unit and that the power is on.  If there is no response when pressing the print button, but the print key on the printer responds when pressed, then the possible reason is that the remote printer cable is not connected properly.

Incorrect date display	Follow the procedure in <i>Section 5.2.2.</i> to reset the date.
------------------------	--

If any abnormality occurs, turn off the power supply immediately and inform our Customer Service about the abnormality, giving as many details as possible.

Please contact our Customer Service if the system needs repair or readjustment. We are not responsible for failures caused by repairs made to the system by unauthorised service personnel.



**NOTE:** *If an abnormality occurs on the system, contact Zimmer MedizinSysteme or a Zimmer certified service technician immediately. Try to describe the malfunction in as much detail as possible and send the description to Zimmer MedizinSysteme or the appropriate service technician.*



**WARNING:** *It is not permitted to make alterations to these devices.*

## 11.3 Transport and storage requirements

### 11.3.1 General requirements

- a) Ambient temperature range: -20° ~ 60°C
- b) Relative humidity range: 15 ~ 93%
- c) Air pressure range: 500 hPa ~ 1060 hPa

### 11.3.2 Requirements for the air transport of the lithium battery

- a) When transporting the system by air, the battery should be removed from the system and carried in hand luggage. For shipping, the battery terminals must be isolated and the battery inserted into the system. (Even if there is a switch in the system to prevent inadvertent activation);
- b) When transporting the battery by air, be sure to insulate the battery terminals (e.g. by placing each single battery in a separate plastic bag or protective case to prevent short circuits) and transport the battery in hand luggage.

Shipping must be performed in accordance with the terms of the purchase agreement. Avoid drenching by rain or snow, or mechanical collisions during shipment.

## 11.4 Disposal

The service life of the system is ten years from the date of manufacture (see the label on the main unit).

The system, as well as its accessories and waste materials, must be disposed of or recycled properly at the end of their useful life in accordance with relevant national safety and environmental standards and regulations so as to minimise the associated risks as much as possible.

Disposal in Germany is carried out by Zimmer MedizinSysteme GmbH.

# Appendix A: Abbreviations

3.: Third ventricle

%A Redu: percentage of area reduction

% D Redu: Percentage of diameter reduction

## A

AA: Abdominal area

AAO: Ascending aorta

AAo Vmax: Maximum velocity of ascending aortic valve

AC: Abdominal circumference

AC: Anterior chamber

A-C: Time from point A to point C

AC A: Anterior cerebral artery

ACS: Aortic valve cusp circumference

Aepi: Apical cap

AFI: Amniotic Fluid Index

Alias Vel: Aliasing velocity

AO: Aorta

AOAMP: Aortic posterior wall amplitude

AO Arch: Aortic arch diameter

AO Asc: Ascending aortic diameter

AOD: Aortic diameter

AO Desc: Descending aortic diameter

AO isthmus: Aortic isthmus

AO sinus: Diameter of aortic sinus

AO st junct: Aorta ST junction

A-P: Anteroposterior diameter

APAD: Anteroposterior diameter of abdomen

A-P adrenal: Anteroposterior diameter of the adrenal glands

A-PAU: Anteroposterior diameter after urination

A-P AU Blad: Anteroposterior diameter of bladder after urination

A-P BU Blad: Anteroposterior diameter of bladder before urination

A-P CX: Anteroposterior diameter of cervix

A-P epididymis: Anteroposterior diameter of epididymis

A-P follicle: Anteroposterior diameter of follicle

A-P GB: Anteroposterior diameter of gallbladder

A-P L lobe: Anteroposterior diameter of left lobe

A-P kidney: Anteroposterior diameter of kidney

A-P ovary: Anteroposterior diameter of ovary

A-P prost: Anteroposterior diameter of prostate

AP seminal vesicle: Anteroposterior diameter of seminal vesicle

A-P spleen: Anteroposterior diameter of spleen

APTD: Anteroposterior trunk diameter

A-P testicle: Anteroposterior diameter of testicle

A-P thyroid: Anteroposterior diameter of the thyroid

A-P UT: Anteroposterior diameter of uterus

AR: Aortic regurgitation

Area-E: Measurement of the area using the ellipse method

Area-T: Measurement of the area using the trace method

ASD: Atrial septal defect

ASD Vmax: Maximum velocity of atrial septal defect

AS Vmax/AS Max Vel: Maximum velocity of aortic stenosis

A tibial A / ATA: Anterior tibial artery

A tibial V: Anterior tibial vein

AU Blad Vol: Bladder volume after urination

AV: Aortic valve

AVA: Aortic valve area

AVAO CUSP: Aortic valve aortic cusp separation

AV AT: Aortic valve acceleration time

AVD: Aortic valve open distance

AV DT: Aortic valve deceleration time

AVR AT: Aortic valve regurgitation acceleration time

AVR DT: Aortic valve regurgitation deceleration time

AVR Vmax: Maximum velocity of aortic valve regurgitation

AVR VTI: Time integral of aortic valve regurgitation

AV Vel: Aortic valve velocity

AV Vmax: Maximum velocity of aortic valve

AV VTI: Time integral of aortic valve velocity

A-wave V: A-wave velocity

Axillary A: Axillary artery

Axillary V: Axillary vein

## B

BAL E' Vel: Basal anterolateral E' velocity

BAL A' Vel: Basal anterolateral A' velocity

Basilic V: Basilic vein

BIF: Bifurcation

Blad: Bladder

BIS E' Vel: Basal inferoseptum E' velocity

BIS A' Vel: Basal inferoseptum A' velocity

BPD: Biparietal diameter

BSA: Body surface area

Bladder Vol: Bladder volume

BU Blad Vol: Bladder volume before urination

Bulb stenosis: Bulb stenosis diameter



**C**

CBD: Common bile duct  
CC: Cerebellar circumference  
CCA: Common carotid artery  
CCA stenosis: Common carotid artery stenosis diameter  
CCW: Cranial cortical width  
CD: Cardiac diameter  
CeA: Celiac axis  
CELIA: Celiac artery  
Cephalic V: Cephalic vein  
CER: Transverse cerebellar diameter  
CFA: Common femoral artery  
CFV: Common femoral vein  
CHA: Common hepatic artery  
CHD: Common hepatic duct  
CI: Cardiac index  
CIA / ILIAC: Common ilium artery  
CIV: Common ilium vein  
Cist Magna: Cisterna magna  
CLAV: Clavicle length  
CO: Cardiac output  
Coarc Post-Duct: Coarctation of the post-ductus  
Coarc Pre-Duct: Coarctation of pre-ductus  
CRL: Crown rump length  
CVA: Cerebellar vermis Area

**D**

DAo isthmus: Descending aortic isthmus

DAo Vmax: Maximum velocity of descending aorta

D-E: Height from point D to point E

DFA: Deep femoral artery

DFV: Deep femoral vein

Diam: Diameter

DPA / DR PED: Dorsal artery

dP/dt: Rate of pressure change

Duct Art: Ductus arteriosus

## E

Ear: Ear length

ECA: External carotid artery

ECA stenosis: External carotid artery stenosis diameter

EDD: Expected date of delivery

EDV: End-diastolic volume

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

EF: Ejection fraction

EFSLP: EF speed

EFW: Estimated foetal weight

EIA/EXT IL: External ilium artery

EIV: External ilium vein

EN / EN-T: Endometrial thickness

EPSS: E-point septal separation

EROA: Effective reflux opening area

ESV: End-systolic volume

ET: Ejection time

E-wave V: E-wave velocity

Eye AC: Eye anterior chamber

Eye OA: Eye optic axis

Eye ON: Eye optic nerve

## **F**

Foetal AO: Foetal Aorta

Foetal DAO: Foetal descending aorta

Foetal HR: Foetal heart rate

Foetal Kidney: Foetal kidney length

FIBL: Fibular length

FL: Femur length

Follicle Vol: Follicle volume

FS: Left ventricular diameter of ejection fraction

FTA: Foetal trunk cross-sectional area

## **G**

GB Vol: Gallbladder volume

Grow Chart: Growth chart

GS: Gestational sac

GSV : Great saphenous vein

## **H**

HA: Head area

HC: Head circumference

Heart C: Heart circumference

Hepatica A: Hepatic artery

HIP: Hip joint

HL/Humerus: Humeral length

HR: Heart rate

Humerus A: Humerus artery

HAT: Hemisphere area of surface

HW: Hemisphere width

## I

ICA: Internal carotid artery

ICA stenosis: Internal carotid artery stenosis diameter

IG: Internal gland

IHW: Inter-hemispheric width

IIA/ INT IL: Internal ilium artery

IIV: Internal ilium vein

INFA: Inferior artery

IOD: Internal orbit diameter

IVC: Inferior vena cava

IVCT : ISO velocity compression time

IVC Vel: Velocity of inferior vena cava

IVRT: ISO velocity relaxation time

IVS: Inter-ventricular septum

IVSD: Interventricular septal diameter at end diastole

IVSS: Interventricular septal diameter at end systole

## K

Kidney: Kidney length

Kidney Vol: Kidney volume

## L

LA: Left atrium

LAA (A2C): Left atrium area (two chambers)

LAA (A4C): Left atrium area (four chambers)

LA Area: Left atrium area

LAD: Left atrial diameter

L Adrenal: Long diameter of adrenal gland

L-AG: Left adrenal gland

LAL: Longitudinal diameter of left atrium

LAU: Longitudinal diameter after urination

L AU Blad: Longitudinal diameter of bladder after urination

LA Vol (A-L): Measurement of left atrium volume with area and long diameter

L AXIA: Left axillary artery

L BU Blad: Longitudinal diameter of bladder before urination

L BRAA: Left brachial artery

L Breast: Left breast

LCA : Left coronary artery

LCCA: Left common carotid artery

L CX: Longitudinal diameter of cervix

L DORA: Left dorsal artery

L ECA: Left external carotid artery

L Epididymis: Longitudinal diameter of epididymis

L Eye: Left eyeball

L FEMA: Left femoral artery

L Follicle: Longitudinal diameter of follicle

LHD: Left hepatic duct

LI: Lower internal

L ICA: Left internal carotid artery

L-Inf Parathyroid: Left inferior parathyroid

L Kidney: Left kidney

LL: Lower Lateral

L Lobe: Left lobe

L LV: Left lateral ventricle

Long: Longitudinal diameter

Long GB: Longitudinal diameter of gallbladder

Long L Lobe: Longitudinal diameter of left lobe

L Ovary: Left ovary

LPA: Diameter of left pulmonary artery diameter

LPA Vmax: Maximum velocity of left pulmonary artery

L POPA: Left popliteal artery

L Prost: Longitudinal diameter of prostate

LRA: Left renal artery

L RADA: Left radial artery

L-Renal Cortex: Thickness of left renal cortex

L Seminal Vesicle: Longitudinal diameter of seminal vesicle

L Spleen: Longitudinal diameter of spleen

LSV: Lesser saphenous vein

L-SV: Left seminal vesicle

L-Sup Parathyroid: Left superior parathyroid

L- Testicle: Longitudinal diameter of testicle

L Testis / L-Ts: Left testis

L- Thyroid: Long diameter of thyroid gland

Lt OV H: Height of left ovary

Lt OV L: Length of left ovary

Lt OV W: Width of left ovary

Lt Uterin A: Left uterine artery

L ULNA : : Left ulnar artery

L Ureter: Left ureter

L UT: Longitudinal diameter of uterus

LV: Left ventricle

LVAd A4C: Left ventricle area in diastolic phase (four-chamber)

LVAd psa MV: Left ventricle area in diastolic phase (mitral valve plane - short axes)

LVAd psa PM: Left ventricle area in diastolic phase (papillary muscle plane - short axes)

LVAs A4C: Left ventricle area in systolic period (four-chamber)

LVA<sub>s</sub> ps<sub>a</sub> MV: Left ventricle area in systolic period (mitral valve plane - short axes)

LVA<sub>s</sub> ps<sub>a</sub> PM: Left ventricle area in systolic period (papillary muscle plane - short axes)

LV Area (d): Left ventricle area in diastolic phase

LV Area (s): Left ventricle area in systolic phase

LVET: Left ventricular ejection time

LVLD : Left Ventricle Long diameter in the diastolic phase

LVLS : Left Ventricle Long diameter in the systolic period

LV Mass : Left ventricle cardiac muscle mass

LV MI : Left ventricle cardiac muscle index

LVMLd: Left ventricular medial-lateral dimension in the diastolic phase (four-chamber)

LVMLS: Left ventricular medial-lateral dimension in the systolic phase (four-chamber)

LVW : Lateral Ventricle

LV Func: Functions of the left ventricle

LVIDd : Left ventricular internal diameter in diastolic phase

LVIDs: Left ventricular internal diameter in systolic phase

LVOT: Left ventricular outflow tract

LVOT AccT: Acceleration time of left ventricular outflow tract

LVOT Vel: Velocity of left ventricular outflow tract

LVOT Vmax: Maximum velocity of left ventricular outflow tract

LVOT VTi: Time integral for the velocity of the left ventricular outflow tract

LV outflow Diam: Left ventricular outflow diameter

LVPEP: Left ventricular pre-ejection period

LVPWD: Left ventricular posterior wall thickness in diastolic phase

LVPWS: Left ventricular posterior wall thickness in systolic phase

LVDS: Left ventricular diameter in systolic phase

## M

Main PV: Main portal vein

Main Renal A: Main renal artery

Major Pa Duct: Major pancreatic duct

Max AF: Maximum depth of amniotic fluid

MC A: Middle cerebral artery

MCS: Mitral valve cusp separation

Meas avera: Average measurement

MIS E' Vel: Mid-inferoseptum E' velocity

MIS A' Vel: Mid-inferoseptum A' velocity

MNPG: Mean pressure gradient

MPA: Main pulmonary artery

MPA Vmax: Maximum velocity of main pulmonary artery

MPD: Main pancreatic duct

MS Vmax: Maximum velocity of mitral valve stenosis

Mult Dist: Measurement of multiple distances

MR Max Vel: Maximum velocity of mitral valve regurgitation

MR VTI: Time integral of velocity of mitral valve regurgitation

MR Vol: Mitral valve regurgitation volume

MV: Mitral valve

MVA: Mitral valve area

MV A: Mitral valve A-wave

MV A Dur: Mitral valve A-wave duration

MV AT: Mitral valve acceleration time

MV A Vel: Maximum velocity of mitral valve A-wave

MV A VTI: Time integral of velocity of mitral valve A-wave

MVA(VTI): Calculation of the mitral valve area using the velocity time integral

MVCF: Mean velocity of circumferential reduction

MV DT: Mitral valve deceleration time

MV E: Mitral valve E-wave velocity

MV E/A: Mitral valve E/A value

MV E Dur: Mitral valve E-wave duration



MV E-F Slope: Mitral valve E-F slope

MV E Vel: Maximum velocity of mitral valve E-wave

MV E VTI: Velocity time integral of mitral valve E-wave

MV D-E: D-E amplitude of mitral valve

MV D-E Slope: D-E slope of mitral valve

MV PHT: Mitral valve pressure half time

MVR AT: Mitral valve regurgitation acceleration time

MVR DT: Mitral valve regurgitation deceleration time

MVR Vmax: Maximum velocity of mitral valve regurgitation

MVR VTI: Time integral for mitral valve regurgitation velocity

MV Vmax: Maximum velocity of mitral valve

MV VTI: Time integral of mitral valve velocity

## **N**

NB: Nose bone

NT : Neck transparency

## **O**

OA: Ocular axis

OB: Obstetrics

Obli R Lobe: Maximum oblique diameter of the right lobe

OFD: Occipito-frontal diameter

OOD: Outer orbital diameter

ON: Optic nerve

Ovary Vol: Ovary volume

## **P**

PA: Pulmonary artery

Pa Head: Pancreatic head

Pa Body: Pancreatic body  
PAP: Pulmonary artery pressure  
Pa Tail: Pancreatic tail  
PC A: Posterior cerebral artery  
PDA: Persistent ductus arteriosus  
PDA Vel (d): Velocity of open ductus arteriosus in diastole  
PDA Vel(s): Velocity of open ductus arteriosus in systole  
PEd: Pericardial effusion in diastole  
PEs: Pericardial effusion in systole  
Peroneal A / PERON: Peroneal artery  
Peroneal V: Peroneal vein  
PFO : Passable foramen ovale  
P Grade: Inclination of the placenta  
PHT : Pressure half time  
Placenta A: Placenta artery  
PL Thickness: Placenta thickness  
Popliteal A / POP: Popliteal artery  
Popliteal V: Popliteal vein  
PR: Pulmonary regurgitation  
Prost: Prostate  
Prost Vol: Prostate volume  
P tibial A / PTA: Posterior tibial artery  
P tibial V: Posterior tibial vein  
Pul A Vel: Pulmonary vein A-wave velocity  
Pul D Vel: Pulmonary vein D-wave velocity  
Pul S Vel: Pulmonary vein S-wave velocity  
PUL. Valve Diam: Pulmonary valve diameter  
PV: Portal vein  
PV/PUL. Valve: Pulmonary valve

PV A: Pulmonary valve A-wave depth

PV AT: Pulmonary valve acceleration time

PV DT: Pulmonary valve deceleration time

PV Max Vel: Maximum velocity of pulmonary valve

PV VTI: Time integral for the velocity of the pulmonary artery

Pul A Dur: Pulmonary vein A-wave duration

Pul DT: Pulmonary vein deceleration time

Pul D VTI: Time integral for the velocity of the pulmonary vein D-wave

Pul S VTI: Time integral of velocity of pulmonary vein S-wave

PVR AT: Acceleration time of pulmonary valve regurgitation

PVR DT: Delay time of pulmonary valve reflux

PVR VTI: Time integral of velocity of pulmonary artery reflux

PVR Vmax: Maximum velocity of pulmonary artery reflux

PV VTI: Time integral for velocity of the pulmonary artery

## R

RA: Right atrium

RA Area: Right atrium area

Radial A: Radial artery

Radial V: Radial vein

R-AG: Right adrenal gland

RAP: Right atrium pressure

R AXIA: Right axillary artery

R BRAA: Right brachial artery

R Breast: Right breast

RCA: Right coronary artery

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  
Ribs Dn Spleen: Ribs underneath spleen  
R-Inf Parathyroid: Right inferior parathyroid  
R Kidney: Right kidney  
RL/Radius: Radial length  
R Lobe: Right lobe  
R LV: Right lateral ventricle  
R Ovary: Right ovary  
RPA: Diameter of right pulmonary artery  
RPA Vmax: Maximum velocity of right pulmonary artery  
R POPA: Right popliteal artery  
RRA: Right renal artery  
R RADA: Right radial artery  
R-Renal Cortex: Thickness of right renal cortex  
PSAD: Prostate-specific antigen density  
R-SV: Right seminal vesicle  
R-Sup Parathyroid: Right superior parathyroid  
R Testis/R-Ts: Right testis  
Rt OV H: Height of right ovary  
Rt OV L: Length of right ovary  
Rt OV W: Width of right ovary  
Rt Uterin A: Right uterus artery  
R ULNA: Right iliac artery  
R Ureter: Right ureter  
RV: Right ventricle  
RV Area (d): Right ventricular area in diastole

RV Area (e): Right ventricular area in the systole

RVAW: Right ventricular anterior wall

RVAWd: Right ventricular anterior wall thickness in diastole

RVAWs : Right ventricular anterior wall thickness in systole

RVDd: Right ventricular diameter in diastole

RVDs: Right ventricular diameter in systole

RVET: Right ventricular ejection time

RVOT: right ventricular outflow tract

RVOTD: Diameter of right ventricular outflow tract

RVOT Vmax: Maximum velocity of right ventricular outflow tract

RVOT VTI: Time integral of velocity of right ventricular outflow tract

RVPEP: Right ventricular pre-ejection period

RVSP: Right ventricular pressure

## S

SCA : Inferior subclavian artery

SCV: Inferior subclavian vein

SCW: Sinus cortical width

SFA: Superficial femoral artery

SFV: Superficial femoral vein

S-I: Superior/inferior diameter

SMA: Superior mesenteric artery

SMV: Superior mesenteric vein

Splenic A: Splenic artery

Splenic V: Splenic vein

SUPA: Superior artery

SV: Stroke volume

SVC: Superior vena cava

SVC Vel: Velocity of superior vena cava

**T**

TAD: Trans-abdominal diameter

TAU: Transverse diameter after urination

TC: Thoracic circumference

TD/THD : Thoracic diameter

Testicle Vol: Testicular volume

Thy Lower A: Lower thyroid artery

Thy Mid A: Middle thyroid artery

Thy Upper A: Upper thyroid artery

TL/Tibia: Length of tibia

TP Trunk V: Tibial peroneal trunk vein

TR: Tricuspid regurgitation

Trans: Transverse diameter

Trans Adrenal: Transverse diameter of the adrenal glands

Trans AU Blad: Transverse diameter of the bladder after urination

Trans BU Blad: Transverse diameter of the bladder before urination

Trans CX: Transverse diameter of the cervix

Trans Follicle: Transverse diameter of the follicle

Trans GB: Transverse diameter of the gallbladder

Trans Kidney: Transverse diameter of the kidney

Trans Ovary: Transverse diameter of the ovary

Trans Prost: Transverse diameter of the prostate

Trans Seminal Vesicle: Transverse diameter of the seminal vesicle

Trans Testicle: Transverse diameter of the testicle

Trans-Thyroid: Transverse diameter of the thyroid

Trans UT: Transverse diameter of the uterus

TrZoneProst Vol: Transfer zone of the prostate volume

TTD: Transverse diameter of the torso

TV: Tricuspid valve

TVA: Tricuspid valve area

TV A Dur: Tricuspid valve A-wave duration

TVA(PHT): Calculation of the tricuspid valve area using PHT

TV AT: Tricuspid valve acceleration time

TV A Vel: Maximum velocity of tricuspid valve A-wave

TV DecT: Tricuspid valve deceleration time

TV E/A: Tricuspid valve E-Vel/A-Vel

TV E Vel: Maximum velocity of tricuspid valve E-wave

TV MPG: Tricuspid valve - mean pressure gradient

TVR AT: Acceleration time of tricuspid valve regurgitation

TVR DT: Deceleration time of tricuspid valve regurgitation

TVR Vmax: Maximum velocity of tricuspid valve regurgitation

TVR VTI: Time integral for velocity of tricuspid valve regurgitation

TV Vmax: Maximum velocity of tricuspid valve

TV VTI: Time integral for velocity of tricuspid valve

## U

UI: Upper internal

UL: Upper lateral

UL / Ulna: Ulnar length

Ulna A: Ulnar artery

Ulna V: Ulna vein

Umb A: Umbilical artery

Umb VD: Diameter of umbilical artery

Ureter: Diameter of ureter

UT Artery: Uterus artery

UT Body Diam: Diameter of uterus body

UT H: Height of uterus

UT L: Length of uterus

UT Vol: Volume of uterus

UT W: Width of uterus

## **V**

VA: Diameter of verbal artery

Vm: Mean velocity

Vol: Volume

Volume-A: Volume measurement using the Area method

Volume-B: Volume measurement using the Bi-plane method

Volume-E: Volume measurement using the Ellipse method

Volume-S: Volume measurement using the Simpson method

VSD: Ventricular septal defect

VSD Vmax: Maximum velocity of ventricular septal defect

## **W**

Wall GB: Thickness of gallbladder wall














WholeProst Vol: Whole prostate volume














## **Y**

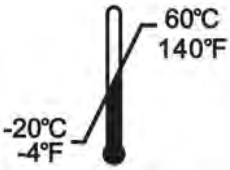
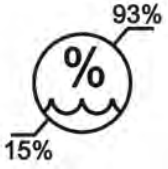
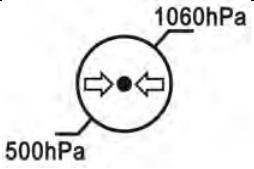
YS: Yolk sac



## Appendix B: Description of symbols

Number	Symbol	IEC publication	Description
1		IEC 60878-5333	Type BF Applied Part
2		IEC 60878-5335	Type CF Applied Part
3		IEC 60878-5036	Hazardous voltage
4		IEC 60878-5019	Protective conductor (ground)
5		IEC 60878-5017	Earthing (ground)
6		IEC 60878-5021	Equipotentiality
7		IEC 60878-5032	Alternating current
8		IEC 60878-5008	Off (power supply)
9		IEC 60878-5007	On (power supply)
10		IEC 60878-5009	Standby
11		ISO 15223-1	Manufacture date
12		ISO 7010-M002	See operating manual/booklet.
13		ISO 7010-W001	General warning sign
14	IPX1	IEC 60529	Protection against vertically falling water drops
15	IPX4	IEC 60529	Protection against splashing water

16	IPX7	IEC 60529	Protection against the effects of temporary immersion in water
17		ISO 7000-0623	This way up
18		ISO 7000-0621	Fragile; handle with care
19		ISO 7000-0626	Keep away from rain
20		---	USB interface
21		---	Ethernet interface
22		---	Wireless interface
23		---	Input (audio interface)
24		---	Output (audio interface)
25		---	Microphone interface
26		ISO 7010-M002	Injury to the hands
27		ISO 15223-1	Manufacturer
28		ISO 15223-1	Serial number
29		Directive 2012/19/EU	<u>Disposal of electrical and electronic equipment. It is not permitted to dispose of products with this symbol in the household waste.</u>

30		ISO 7000-0632	Upper and lower temperature limit
31		ISO 7000-2620	Upper and lower humidity limit
32		ISO 7000-2621	Upper and lower air pressure limit

# Appendix C: Acoustic output parameters

Acoustic output parameter uncertainty factor: 21.2 %

Operating mode: B mode

Probe: C3LN

Index labelling			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value			0.72	0.87				
Associated acoustic parameters	Pra		(Mpa)	1.26				
	P		(mW)		82.2			
	Min. of [Pa(zs), Ita, a(zs)]		(mW)					
	Zs		(cm)					
	Zbp		(cm)					
	Zb		(cm)					
	z at max .. I <sub>pi,a</sub>		(cm)	5.48				
	deq		(cm)					
	fawf		(MHz)	3.13	3.13			
	Dim. from A <sub>aprt</sub>	X	(cm)		1.42			
J		(cm)		1.58				
Other information	td		(μsec)	0.317				
	Prr		(Hz)	8333				
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	2.28				
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)					
	I <sub>pi,a</sub> at max. MI		(W/cm²)	97.09				
Operational control conditions	Frequency		(MHz)	3.5	3.5			
	Output		(dB)	0	0			
	Focus number			1	1			
	Focus position		(mm)	55	55			
	Focus depth		(cm)	6.3	6.3			

Operating mode: BM mode      Probe: C3LN

Index labelling			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value			0.71	0.71		0.14	0.39	
Associated acoustic parameters	Pra		(Mpa)	1.26				
	P		(mW)		66.4			17.2
	Min. of [Pa(zs), Ita, α(zs)]		(mW)				9.22	
	Zs		(cm)				3.07	
	Zbp		(cm)				2.53	
	Zb		(cm)					4.95
	z at max .. Ipi,α		(cm)	5.48				
	deq		(cm)					0.35
	fawf		(MHz)	3.14	3.14		3.13	3.13
	Dim. from Aaprt	X	(cm)		1.42		1.42	1.42
		J	(cm)		1.56		1.57	1.57
Other information	td		(μsec)	0.317				
	Prr		(Hz)	8,000				
	pr at max. Ipi		(Mpa)	2.28				
	deq at max. Ipi		(cm)					0.34
	Ipi,α at max. MI		(W/cm²)	98.03				
Operational control conditions	Frequency		(MHz)	3.5	3.5		3.5	3.5
	Output		(dB)	0	0		0	0
	Focus number			1	1		1	1
	Focus position		(mm)	55	55		55	55
	Focus depth		(cm)	6.3	6.3		6.3	6.3

Operating mode: BM (anatomical) mode

Probe: C3LN

Index labelling			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value			0.71	0.71		0.14	0.39	
Associated acoustic parameters	Pra		(Mpa)	1.26				
	P		(mW)		66.4		17.2	
	Min. of [Pa(zs), Ita, α(zs)]		(mW)			9.22		
	Zs		(cm)			3.07		
	Zbp		(cm)			2.53		
	Zb		(cm)				4.95	
	z at max .. I <sub>pi,α</sub>		(cm)	5.48				
	deq		(cm)				0.35	
	fawf		(MHz)	3.14	3.14	3.13	3.13	
	Dim. from A <sub>aprt</sub>	X	(cm)		1.42	1.42	1.42	
		J	(cm)		1.56	1.57	1.57	
Other information	td		(μsec)	0.317				
	Prr		(Hz)	8,000				
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	2.28				
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)				0.34	
	I <sub>pi,α</sub> at max. MI		(W/cm²)	98.03				
Operational control conditions	Frequency		(MHz)	3.5	3.5	3.5	3.5	
	Output		(dB)	0	0	0	0	
	Focus number			1	1	1	1	
	Focus position		(mm)	55	55	55	55	
	Focus depth		(cm)	6.3	6.3	6.3	6.3	

Operating mode: M mode

Probe: C3LN

Index labelling			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value			0.90			0.10		0.07
Associated acoustic parameters	Pra		(Mpa)	1.64				
	P		(mW)					6
	Min. of [Pa(zs), Ita, α(zs)]		(mW)			9.22		
	Zs		(cm)			3.07		
	Zbp		(cm)			2.53		
	Zb		(cm)					
	z at max .. I <sub>pi,α</sub>		(cm)	2.13				
	deq		(cm)					
	fawf		(MHz)	3.33		3.13		3.33
	Dim. from A <sub>aprt</sub>	X	(cm)			1.42		1.00
		J	(cm)			1.57		3.20
Other information	td		(μsec)	0.59				
	Prr		(Hz)	287				
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	2.09				
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)					
	I <sub>pi,α</sub> at max. MI		(W/cm²)	116				
Operational control conditions	Frequency		(MHz)	3.5		3.5		3.5
	Output		(dB)	0		0		0
	Focus number			1		1		1
	Focus position		(mm)	55		55		55
	Focus depth		(cm)	6.3		6.3		6.3

Operating mode: B+colour mode

Probe: C3LN

Index labelling			MI	TIS			TIB	TIC	
				Scan	Non-Scan		Non-Scan		
					Aaprt≤1 cm²	Aaprt>1 cm²			
Global maximum index value			0.78	0.03				0.14	
Associated acoustic parameters	Pra		(Mpa)	1.23					
	P		(mW)		2			2	
	Min. of [Pa(zs), Ita, α(zs)]		(mW)						
	Zs		(cm)						
	Zbp		(cm)						
	Zb		(cm)						
	z at max .. I <sub>pi,α</sub>		(cm)	3.67					
	deq		(cm)						
	fawf		(MHz)	2.50	2.50			2.50	
	Dim. from A <sub>aprt</sub>	X	cm		1.00				1.00
		J	cm		1.00				1.00
Other information	td		(μsec)	1.42					
	Prr		(Hz)	90					
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	1.69					
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)						
	I <sub>pi,α</sub> at max. MI		(W/cm²)	55					
Operational control conditions	Frequency		(MHz)	3.5	3.5			3.5	
	Output		(dB)	0	0			0	
	Focus number			1	1			1	
	Focus position		(mm)	55	55			55	
	Pulse Repetition Frequency		(KHz)	6	6			6	
	Focus depth		(cm)	6.3	6.3			6.3	



Operating mode: B+CPA mode Probe: C3LN

Index labelling				MI	TIS			TIB	TIC
					Scan	Non-Scan		Non-Scan	
						Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value				0.78	0.03				0.14
Associated acoustic parameters	Pra		(Mpa)	1.23					
	P		(mW)		2				2
	Min. of [Pa(zs), Ita, α(zs)]		(mW)						
	Zs		(cm)						
	Zbp		(cm)						
	Zb		(cm)						
	z at max .. I <sub>pi,α</sub>		(cm)	3.67					
	deq		(cm)						
	fawf		(MHz)	2.50	2.50				2.50
	Dim. from A <sub>aprt</sub>	X	(cm)		1.00				1.00
		J	(cm)		1.00				1.00
Other information	td		(μsec)	1.42					
	Prr		(Hz)	90					
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	1.69					
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)						
	I <sub>pi,α</sub> at max. MI		(W/cm²)	55					
Operational control conditions	Frequency		(MHz)	3.5	3.5				3.5
	Output		(dB)	0	0				0
	Focus number			1	1				1
	Focus position		(mm)	55	55				55
	Pulse Repetition Frequency		(KHz)	6	6				6
	Focus depth		(cm)	6.3	6.3				6.3

Operating mode: PW mode      Probe: C3LN

Index labelling			MI	TIS			TIB	TIC	
				Scan	Non-Scan		Non-Scan		
					Aaprt≤1 cm²	Aaprt>1 cm²			
Global maximum index value			0.44			2.79	1.19	2.33	
Associated acoustic parameters	Pra		(Mpa)	0.82					
	P		(mW)				167	157	159
	Min. of [Pa(zs), Ita, α(zs)]		(mW)						
	Zs		(cm)						
	Zbp		(cm)						
	Zb		(cm)						
	z at max .. I <sub>pi,α</sub>		(cm)	3.67					
	deq		(cm)						
	fawf		(MHz)	3.50			3.50	3.50	3.50
	Dim. from A <sub>aprt</sub>	X	(cm)				1.00	1.00	1.00
J		(cm)				1.00	1.00	1.00	
Other information	td		(μsec)	2.28					
	Prr		(Hz)	1,250					
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	1.27					
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)						
	I <sub>pi,α</sub> at max. MI		(W/cm²)	23					
Operational control conditions	Frequency		(MHz)	3.45			3.45	3.45	3.45
	Output		(dB)	0			0	0	0
	Focus number			1			1	1	1
	Focus position		(mm)	25			25	25	25
	Pulse Repetition Frequency		(KHz)	12.5			12.5	12.5	12.5
	Focus depth		(cm)	3.2			3.2	3.2	3.2

Operating mode: B+PW mode Probe: C3LN

Index labelling				MI	TIS			TIB	TIC
					Scan	Non-Scan		Non-Scan	
						Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value				0.69	0.69		0.14	0.35	
Associated acoustic parameters	Pra		(Mpa)	1.30					
	P		(mW)		64.4			16.2	
	Min. of [Pa(zs), Ita, a(zs)]		(mW)				9.01		
	Zs		(cm)				3.05		
	Zbp		(cm)				2.04		
	Zb		(cm)					4.75	
	z at max .. I <sub>pi,α</sub>		(cm)	5.42					
	deq		(cm)					0.32	
	fawf		(MHz)	3.5	3.5		3.5	3.5	
	Dim. from A <sub>aprt</sub>	X	(cm)		1.50		1.50	1.50	
		J	(cm)		1.54		1.56	1.56	
Other information	td		(μsec)	0.322					
	Prr		(Hz)	8,000					
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	2.28					
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)					0.34	
	I <sub>pi,α</sub> at max. MI		(W/cm²)	97.03					
Operational control conditions	Frequency		(MHz)	3.45	3.45		3.45	3.45	
	Output		(dB)	0	0		0	0	
	Focus number			1	1		1	1	
	Focus position		(mm)	25	25		25	25	
	Pulse Repetition Frequency		(KHz)	12.5	12.5		12.5	12.5	
	Focus depth		(cm)	3.2	3.2		3.2	3.2	

Operating mode: B+CFM+PW mode    Probe: C3LN

Index labelling			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value			0.62	0.61		0.24	0.25	
Associated acoustic parameters	Pra		(Mpa)	1.21				
	P		(mW)		58			118.2
	Min. of [Pa(zs), Ita, α(zs)]		(mW)				9.56	
	Zs		(cm)				3.14	
	Zbp		(cm)				2.03	
	Zb		(cm)					4.75
	z at max .. I <sub>pi,α</sub>		(cm)	5.40				
	deq		(cm)					0.32
	fawf		(MHz)	3.74	3.74		3.74	3.74
	Dim. from A <sub>aprt</sub>	X	(cm)		1.55		1.55	1.55
J		(cm)		1.60		1.60	1.60	
Other information	td		(μsec)	0.322				
	Prr		(Hz)	8,480				
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	2.38				
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)					0.34
	I <sub>pi,α</sub> at max. MI		(W/cm²)	96.03				
Operational control conditions	Frequency		(MHz)	3.45	3.45		3.5	3.5
	Output		(dB)	0	0		0	0
	Focus number			1	1		1	1
	Focus position		(mm)	25	25		25	25
	Pulse Repetition Frequency		(KHz)	12.5	12.5		12.5	12.5
	Focus depth		(cm)	3.2	3.2		3.2	3.2

Operating mode: B+CPA+PW mode    Probe: C3LN

Index labelling			MI	TIS			TIB	TIC	
				Scan	Non-Scan		Non-Scan		
					Aaprt≤1 cm²	Aaprt>1 cm²			
Global maximum index value			0.62	0.61		0.24	0.25		
Associated acoustic parameters	Pra		(Mpa)	1.21					
	P		(mW)		58		118.2		
	Min. of [Pa(zs), Ita, α(zs)]		(mW)			9.56			
	Zs		(cm)			3.14			
	Zbp		(cm)			2.03			
	Zb		(cm)				4.75		
	z at max .. I <sub>pi,α</sub>		(cm)	5.40					
	deq		(cm)				0.32		
	fawf		(MHz)	3.74	3.74		3.74	3.74	
		Dim. from A <sub>aprt</sub>	X	(cm)		1.55		1.55	1.55
J			(cm)		1.60		1.60	1.60	
Other information	td		(μsec)	0.322					
	Prr		(Hz)	8,480					
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	2.38					
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)				0.34		
	I <sub>pi,α</sub> at max. MI		(W/cm²)	96.03					
Operational control conditions	Frequency		(MHz)	3.45	3.45		3.5	3.5	
	Output		(dB)	0	0		0	0	
	Focus number			1	1		1	1	
	Focus position		(mm)	25	25		25	25	
	Pulse Repetition Frequency		(KHz)	12.5	12.5		12.5	12.5	
	Focus depth		(cm)	3.2	3.2		3.2	3.2	

Operating mode: B mode

Probe: L8LN

Index labelling				MI	TIS			TIB	TIC
					Scan	Non-Scan		Non-Scan	
						Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value				0.88	0.51				
Associated acoustic parameters	Pra		(Mpa)	1.99					
	P		(mW)		20.6				
	Min. of [Pa(zs), Ita, α(zs)]		(mW)						
	Zs		(cm)						
	Zbp		(cm)						
	Zb		(cm)						
	z at max .. Ipi,α		(cm)	1.81					
	deq		(cm)						
	fawf		(MHz)	5.16	5.16				
	Dim. from Aaprt	X	(cm)		1.02				
J		(cm)		0.91					
Other information	td		(µsec)	0.266					
	Prr		(Hz)	16,667					
	pr at max. Ipi		(Mpa)	2.76					
	deq at max. Ipi		(cm)						
	Ipi,α at max. MI		(W/cm²)	119.5					
Operational control conditions	Frequency		(MHz)	10.0	10.0				
	Output		(dB)	0	0				
	Focus number			1	1				
	Focus position		(mm)	23	23				
	Focus depth		(cm)	2.4	2.4				

Operating mode: BM mode      Probe: L8LN

Index labelling			MI	TIS			TIB	TIC	
				Scan	Non-Scan		Non-Scan		
					Aaprt≤1 cm²	Aaprt>1 cm²			
Global maximum index value			0.87	0.46	0.052		0.12		
Associated acoustic parameters	Pra		(Mpa)	1.99					
	P		(mW)		18.2	2.1		2.1	
	Min. of [P & agr; (ZS), lta, α (zs)] (mW)								
	Zs		(cm)						
	Zbp		(cm)						
	Zb		(cm)				1.74		
	z at max .. l <sub>pi,α</sub>		(cm)	1.81					
	deq		(cm)				0.23		
	fawf		(MHz)	5.22	5.22	5.19		5.19	
	Dim. from A <sub>aprt</sub>	X	(cm)		1.00	1.02		1.02	
		J	(cm)		0.92	0.93		0.93	
Other information	td		(μsec)	0.278					
	Prr		(Hz)	15,924					
	p <sub>r</sub> at max. l <sub>pi</sub>		(Mpa)	2.76					
	d <sub>eq</sub> at max. l <sub>pi</sub>		(cm)				0.23		
	l <sub>pi,α</sub> at max. MI		(W/cm²)	115.5					
Operational control conditions	Frequency		(MHz)	10.0	10.0	10.0		10.0	
	Output		(dB)	0	0	0		0	
	Focus number			1	1	1		1	
	Focus position		(mm)	23	23	23		23	
	Focus depth		(cm)	2.4	2.4	2.4		2.4	

Operating mode: BM (anatomical) mode

Probe: L8LN

Index labelling			MI	TIS			TIB	TIC	
				Scan	Non-Scan		Non-Scan		
					Aaprt≤1 cm²	Aaprt>1 cm²			
Global maximum index value			0.87	0.46	0.052		0.12		
Associated acoustic parameters	Pra		(Mpa)	1.99					
	P		(mW)		18.2	2.1		2.1	
	Min. of [Pa(zs), Ita, α(zs)]		(mW)						
	Zs		(cm)						
	Zbp		(cm)						
	Zb		(cm)					1.74	
	z at max .. l <sub>pi,α</sub>		(cm)	1.81					
	deq		(cm)					0.23	
	fawf		(MHz)	5.22	5.22	5.19		5.19	
	Dim. from A <sub>aprt</sub>	X	(cm)		1.00	1.02		1.02	
		J	(cm)		0.92	0.93		0.93	
Other information	td		(μsec)	0.278					
	Prr		(Hz)	15,924					
	p <sub>r</sub> at max. l <sub>pi</sub>		(Mpa)	2.76					
	d <sub>eq</sub> at max. l <sub>pi</sub>		(cm)					0.23	
	l <sub>pi,α</sub> at max. MI		(W/cm²)	115.5					
Operational control conditions	Frequency		(MHz)	10.0	10.0	10.0		10.0	
	Output		(dB)	0	0	0		0	
	Focus number			1	1	1		1	
	Focus position		(mm)	23	23	23		23	
	Focus depth		(cm)	2.4	2.4	2.4		2.4	



Operating mode: M mode

Probe: L8LN

Index labelling			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value			0.65		0.07			0.05
Associated acoustic parameters	Pra		(Mpa)	0.66				
	P		(mW)			2		2
	Min. of [Pa(zs), Ita, α(zs)]		(mW)					
	Zs		(cm)					
	Zbp		(cm)					
	Zb		(cm)					
	z at max .. I <sub>pi,α</sub>		(cm)	1.59				
	deq		(cm)					
	fawf		(MHz)	6.67		6.67		6.67
	Dim. from A <sub>aprt</sub>	X	(cm)			0.70		0.70
J		(cm)			1.50		1.50	
Other information	td		(μsec)	0.47				
	Prr		(Hz)	335				
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	0.95				
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)					
	I <sub>pi,α</sub> at max. MI		(W/cm²)	14				
Operational control conditions	Frequency		(MHz)	10.0		10.0		10.0
	Output		(dB)	0		0		0
	Focus number			1		1		1
	Focus position		(mm)	23		23		23
	Focus depth		(cm)	2.4		2.4		2.4

Operating mode: B+colour mode

Probe: L8LN

Index labelling			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value			0.45	0.10				1.87
Associated acoustic parameters	Pra		(Mpa)	1.15				
	P		(mW)		3			4
	Min. of [Pa(zs), Ita, α(zs)]		(mW)					
	Zs		(cm)					
	Zbp		(cm)					
	Zb		(cm)					
	z at max .. I <sub>pi,α</sub>		(cm)	1.06				
	deq		(cm)					
	fawf		(MHz)	6.66	6.66			6.66
	Dim. from A <sub>aprt</sub>	X	(cm)		0.70			
J		(cm)		0.60				0.60
Other information	td		(μsec)	0.58				
	Prr		(Hz)	162				
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	1.47				
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)					
	I <sub>pi,α</sub> at max. MI		(W/cm²)	70				
Operational control conditions	Frequency		(MHz)	8.2	8.2			8.2
	Output		(dB)	0	0			0
	Focus number			1	1			1
	Focus position		(mm)	23	23			23
	Pulse Repetition Frequency		(KHz)	3	3			3
	Focus depth		(cm)	2.4	2.4			2.4

Operating mode: B+CPA mode Probe: L8LN

Index labelling			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value			0.45	0.10				1.87
Associated acoustic parameters	Pra		(Mpa)	1.15				
	P		(mW)		3			4
	Min. of [Pa(zs), Ita, α(zs)]		(mW)					
	Zs		(cm)					
	Zbp		(cm)					
	Zb		(cm)					
	z at max .. I <sub>pi,α</sub>		(cm)	1.06				
	deq		(cm)					
	fawf		(MHz)	6.66	6.66			6.66
		Dim. from A <sub>aprt</sub>	X	(cm)		0.70		
J			(cm)		0.60			0.60
Other information	td		(µsec)	0.58				
	Prr		(Hz)	162				
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	1.47				
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)					
	I <sub>pi,α</sub> at max. MI		(W/cm²)	70				
Operational control conditions	Frequency		(MHz)	8.2	8.2			8.2
	Output		(dB)	0	0			0
	Focus number			1	1			1
	Focus position		(mm)	23	23			23
	Pulse Repetition Frequency		(KHz)	3	3			3
	Focus depth		(cm)	2.4	2.4			2.4

Operating mode: PW mode      Probe: L8LN

Index labelling			MI	TIS			TIB	TIC	
				Scan	Non-Scan		Non-Scan		
					Aaprt≤1 cm²	Aaprt>1 cm²			
Global maximum index value			0.25		0.26		0.72	1.55	
Associated acoustic parameters	Pra		(Mpa)	0.50					
	P		(mW)			14		51	45
	Min. of [Pa(zs), Ita, α(zs)]		(mW)						
	Zs		(cm)						
	Zbp		(cm)						
	Zb		(cm)						
	z at max .. I <sub>pi,α</sub>		(cm)	1.62					
	deq		(cm)						
	fawf		(MHz)	4.00		4.00		4.00	4.00
		Dim. from A <sub>aprt</sub>	X	(cm)			0.70		0.70
J			(cm)			0.60		0.60	0.60
Other information	td		(μsec)	2.40					
	Prr		(Hz)	1,250					
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	0.62					
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)						
	I <sub>pi,α</sub> at max. MI		(W/cm²)	11					
Operational control conditions	Frequency		(MHz)	7.1		7.1		7.1	7.1
	Output		(dB)	0		0		0	0
	Focus number			1		1		1	1
	Focus position		(mm)	18		18		18	18
	Pulse Repetition Frequency		(KHz)	6		6		6	6
	Focus depth		(cm)	2.4		2.4		2.4	2.4

Operating mode: B+PW mode Probe: L8LN

Index labelling				MI	TIS			TIB	TIC
					Scan	Non-Scan		Non-Scan	
						Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value				0.77	0.65	0.09		0.23	
Associated acoustic parameters	Pra		(Mpa)	1.78					
	P		(mW)		22.3	3.2		4.1	
	Min. of [Pa(zs), Ita, α(zs)]		(mW)						
	Zs		(cm)						
	Zbp		(cm)						
	Zb		(cm)					1.64	
	z at max .. I <sub>pi,α</sub>		(cm)	1.75					
	deq		(cm)					0.24	
	fawf		(MHz)	5.3	5.3	5.29		5.29	
		Dim. from A <sub>aprt</sub>	X	(cm)		1.00	1.02		1.02
J			(cm)		0.92	0.93		0.93	
Other information	td		(μsec)	0.264					
	Prr		(Hz)	5,924					
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	2.76					
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)					0.23	
	I <sub>pi,α</sub> at max. MI		(W/cm²)	121.4					
Operational control conditions	Frequency		(MHz)	7.1	7.1	7.1		7.1	
	Output		(dB)	0	0	0		0	
	Focus number			1	1	1		1	
	Focus position		(mm)	18	18	18		18	
	Pulse Repetition Frequency		(KHz)	6	6	6		6	
	Focus depth		(cm)	2.4	2.4	2.4		2.4	

Operating mode: B+CFM+PW mode    Probe: L8LN

Index labelling			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value			0.77	0.74	0.11		0.30	
Associated acoustic parameters	Pra		(Mpa)	1.92				
	P		(mW)		24.0	4.2		4.9
	Min. of [Pa(zs), Ita, α(zs)]		(mW)					
	Zs		(cm)					
	Zbp		(cm)					
	Zb		(cm)				1.54	
	z at max .. I <sub>pi,α</sub>		(cm)	1.87				
	deq		(cm)				0.24	
	fawf		(MHz)	5.2	5.2	5.21		5.21
		Dim. from A <sub>aprt</sub>	X	(cm)		1.00	1.02	
J			(cm)		0.92	0.93		0.93
Other information	td		(μsec)	0.271				
	Prr		(Hz)	5,120				
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	2.76				
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)				0.23	
	I <sub>pi,α</sub> at max. MI		(W/cm²)	121.4				
Operational control conditions	Frequency		(MHz)	7.1	7.1	7.1		7.1
	Output		(dB)	0	0	0		0
	Focus number			1	1	1		1
	Focus position		(mm)	18	18	18		18
	Pulse Repetition Frequency		(KHz)	6	6	6		6
	Focus depth		(cm)	2.4	2.4	2.4		2.4

Operating mode: B+CPA+PW mode    Probe: L8LN

Index labelling				MI	TIS			TIB	TIC
					Scan	Non-Scan		Non-Scan	
						Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value				0.77	0.74	0.11		0.30	
Associated acoustic parameters	Pra		(Mpa)	1.92					
	P		(mW)		24.0	4.2		4.9	
	Min. of [Pa(zs), Ita, a(zs)]		(mW)						
	Zs		(cm)						
	Zbp		(cm)						
	Zb		(cm)					1.54	
	z at max .. I <sub>pi,α</sub>		(cm)	1.87					
	deq		(cm)					0.24	
	fawf		(MHz)	5.2	5.2	5.21		5.21	
		Dim. from A <sub>aprt</sub>	X	(cm)		1.00	1.02		1.02
J			(cm)		0.92	0.93		0.93	
Other information	td		(μsec)	0.271					
	Prr		(Hz)	5,120					
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	2.76					
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)					0.23	
	I <sub>pi,α</sub> at max. MI		(W/cm²)	121.4					
Operational control conditions	Frequency		(MHz)	7.1	7.1	7.1		7.1	
	Output		(dB)	0	0	0		0	
	Focus number			1	1	1		1	
	Focus position		(mm)	18	18	18		18	
	Pulse Repetition Frequency		(KHz)	6	6	6		6	
	Focus depth		(cm)	2.4	2.4	2.4		2.4	

Operating mode: B mode

Probe: P3FN

Index labelling			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					A <sub>aprt</sub> ≤1 cm <sup>2</sup>	A <sub>aprt</sub> >1 cm <sup>2</sup>		
Global maximum index value			0.70	0.46				
Associated acoustic parameters	Pra		(Mpa)	1.22				
	P		(mW)		56.4			
	Min. of [P <sub>a</sub> (z <sub>s</sub> ), I <sub>ta</sub> , α(z <sub>s</sub> )]		(mW)					
	Z <sub>s</sub>		(cm)					
	Z <sub>bp</sub>		(cm)					
	Z <sub>b</sub>		(cm)					
	z at max .. I <sub>pi,α</sub>		(cm)	5.43				
	deq		(cm)					
	fawf		(MHz)	3.08	3.08			
		Dim. from A <sub>aprt</sub>	X	(cm)		1.80		
J			(cm)		1.62			
Other information	td		(μsec)	0.441				
	P <sub>rr</sub>		(Hz)	8333				
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	2.17				
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)					
	I <sub>pi,α</sub> at max. MI		(W/cm²)	128.5				
Operational control conditions	Frequency		(MHz)	3.0	3.0			
	Output		(dB)	0	0			
	Focus number			1	1			
	Focus position		(mm)	60	60			
	Focus depth		(cm)	7.1	7.1			



Operating mode: BM mode      Probe: P3FN

Index labelling			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value			0.70	0.80	0.18		0.49	
Associated acoustic parameters	Pra		(Mpa)	1.22				
	P		(mW)		54.2	12.2		12.2
	Min. of [Pa(zs), Ita, α(zs)]		(mW)					
	Zs		(cm)					
	Zbp		(cm)					
	Zb		(cm)				4.90	
	z at max .. I <sub>pi,α</sub>		(cm)	5.43				
	deq		(cm)				0.21	
	fawf		(MHz)	3.08	3.08	3.07		3.07
		Dim. from A <sub>aprt</sub>	X	(cm)		1.80	1.78	
J			(cm)		1.60	1.54		1.54
Other information	td		(μsec)	0.440				
	Prr		(Hz)	8,000				
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	2.17				
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)				0.21	
	I <sub>pi,α</sub> at max. MI		(W/cm²)	128.1				
Operational control conditions	Frequency		(MHz)	3.0	3.0	3.0		3.0
	Output		(dB)	0	0	0		0
	Focus number			1	1	1		1
	Focus position		(mm)	60	60	60		60
	Focus depth		(cm)	7.1	7.1	7.1		7.1

Operating mode: BM (anatomical) mode

Probe: P3FN

Index labelling			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value			0.70	0.80	0.18		0.49	
Associated acoustic parameters	Pra		(Mpa)	1.22				
	P		(mW)		54.2	12.2		12.2
	Min. of [Pa(zs), Ita, α(zs)]		(mW)					
	Zs		(cm)					
	Zbp		(cm)					
	Zb		(cm)				4.90	
	z at max .. I <sub>pi,α</sub>		(cm)	5.43				
	deq		(cm)				0.21	
	fawf		(MHz)	3.08	3.08	3.07		3.07
	Dim. from A <sub>aprt</sub>	X	(cm)		1.80	1.78		1.78
		J	(cm)		1.60	1.54		1.54
Other information	td		(μsec)	0.440				
	Prr		(Hz)	8,000				
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	2.17				
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)				0.21	
	I <sub>pi,α</sub> at max. MI		(W/cm²)	128.1				
Operational control conditions	Frequency		(MHz)	3.0	3.0	3.0		3.0
	Output		(dB)	0	0	0		0
	Focus number			1	1	1		1
	Focus position		(mm)	60	60	60		60
	Focus depth		(cm)	7.1	7.1	7.1		7.1

Operating mode: M mode

Probe: P3FN

Index labelling			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value			0.59		0.11			0.12
Associated acoustic parameters	Pra		(Mpa)	1.08				
	P		(mW)			7		6
	Min. of [Pa(zs), Ita, α(zs)]		(mW)					
	Zs		(cm)					
	Zbp		(cm)					
	Zb		(cm)					
	z at max .. I <sub>pi,α</sub>		(cm)	4.71				
	deq		(cm)					
	fawf		(MHz)	3.33		3.33		3.33
	Dim. from A <sub>aprt</sub>	X	(cm)			0.70		0.70
		J	(cm)			1.63		1.63
Other information	td		(μsec)	0.69				
	Prr		(Hz)	3.03				
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	1.86				
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)					
	I <sub>pi,α</sub> at max. MI		(W/cm²)	40				
Operational control conditions	Frequency		(MHz)	3.0		3.0		3.0
	Output		(dB)	0		0		0
	Focus number			1		1		1
	Focus position		(mm)	60		60		60
	Focus depth		(cm)	7.1		7.1		7.1

Operating mode: B+colour mode

Probe: P3FN

Index labelling			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value			1.22	0.08				4.13
Associated acoustic parameters	Pra		(Mpa)	1.73				
	P		(mW)		8			6
	Min. of [Pa(zs), Ita, a(zs)]		(mW)					
	Zs		(cm)					
	Zbp		(cm)					
	Zb		(cm)					
	z at max .. I <sub>pi,α</sub>		(cm)	4.34				
	deq		(cm)					
	fawf		(MHz)	2.00	2.00			2.00
	Dim. from A <sub>aprt</sub>	X	(cm)		0.70			
J		(cm)		0.51				0.51
Other information	td		(μsec)	0.74				
	Prr		(Hz)	180				
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	2.34				
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)					
	I <sub>pi,α</sub> at max. MI		(W/cm²)	131				
Operational control conditions	Frequency		(MHz)	3.0	3.0			3.0
	Output		(dB)	0	0			0
	Focus number			1	1			1
	Focus position		(mm)	60	60			60
	Pulse Repetition Frequency		(KHz)	6	6			6
	Focus depth		(cm)	7.1	7.1			7.1

Operating mode: B+CPA mode Probe: P3FN

Index labelling				MI	TIS			TIB	TIC
					Scan	Non-Scan		Non-Scan	
						Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value				1.22	0.08				4.13
Associated acoustic parameters	Pra		(Mpa)	1.73					
	P		(mW)		8				6
	Min. of [Pα(zs), Ita, α(zs)]		(mW)						
	Zs		(cm)						
	Zbp		(cm)						
	Zb		(cm)						
	z at max .. I <sub>pi,α</sub>		(cm)	4.34					
	deq		(cm)						
	fawf		(MHz)	2.00	2.00				2.00
	Dim. from A <sub>aprt</sub>	X	(cm)		0.70				0.70
J		(cm)		0.51				0.51	
Other information	td		(μsec)	0.74					
	Prr		(Hz)	180					
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	2.34					
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)						
	I <sub>pi,α</sub> at max. MI		(W/cm²)	131					
Operational control conditions	Frequency		(MHz)	3.0	3.0				3.0
	Output		(dB)	0	0				0
	Focus number			1	1				1
	Focus position		(mm)	60	60				60
	Pulse Repetition Frequency		(KHz)	6	6				6
	Focus depth		(cm)	7.1	7.1				7.1

Operating mode: PW mode      Probe: P3FN

Index labelling				MI	TIS		TIB	TIC	
					Scan	Non-Scan			Non-Scan
						Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value				0.03		0.09		0.09	4.02
Associated acoustic parameters	Pra		(Mpa)	0.06					
	P		(mW)			3		3	
	Min. of [Pα(zs), Ita, α(zs)]		(mW)						
	Zs		(cm)						
	Zbp		(cm)						
	Zb		(cm)						
	z at max .. Ipi,α		(cm)	1.23				1.23	
	deq		(cm)					0.29	
	fawf		(MHz)	6.00		6.00		6.00	6.00
	Dim. from Aaprt	X	(cm)			0.70		0.70	0.70
J		(cm)			0.41		0.41	0.41	
Other information	td		(μsec)	2.28					
	Prr		(Hz)	1,250					
	pr at max. Ipi		(Mpa)	0.08					
	deq at max. Ipi		(cm)						
	Ipi,α at max. MI		(W/cm²)						
Operational control conditions	Frequency		(MHz)	3.0		3.0		3.0	3.0
	Output		(dB)	0		0		0	0
	Focus number			1		1		1	1
	Focus position		(mm)	30		30		30	30
	Pulse Repetition Frequency		(KHz)	12.5		12.5		12.5	12.5
	Focus depth		(cm)	7.1		7.1		7.1	7.1

Operating mode: B+PW mode Probe: P3FN

Index labelling			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value			0.76	0.80	0.21		0.45	
Associated acoustic parameters	Pra		(Mpa)	1.31				
	P		(mW)		54.2	14.2		11.2
	Min. of [Pa(zs), Ita, α(zs)]		(mW)					
	Zs		(cm)					
	Zbp		(cm)					
	Zb		(cm)				4.80	
	z at max .. I <sub>pi,α</sub>		(cm)	5.43				
	deq		(cm)				0.21	
	fawf		(MHz)	3.00	3.00	3.00		3.00
		Dim. from A <sub>aprt</sub>	X	(cm)		1.80	1.78	
J			(cm)		1.60	1.54		1.54
Other information	td		(μsec)	0.410				
	Prr		(Hz)	8,000				
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	2.34				
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)				0.21	
	I <sub>pi,α</sub> at max. MI		(W/cm²)	138.1				
Operational control conditions	Frequency		(MHz)	3.0	3.0	3.0		3.0
	Output		(dB)	0	0	0		0
	Focus number			1	1	1		1
	Focus position		(mm)	30	30	30		30
	Pulse Repetition Frequency		(KHz)	12.5	12.5	12.5		12.5
	Focus depth		(cm)	7.1	7.1	7.1		7.1

Operating mode: B+CFM+PW mode    Probe: P3FN

Index labelling			MI	TIS			TIB	TIC	
				Scan	Non-Scan		Non-Scan		
					Aaprt≤1 cm²	Aaprt>1 cm²			
Global maximum index value			0.86	0.80	0.20		0.42		
Associated acoustic parameters	Pra		(Mpa)	1.52					
	P		(mW)		54.2	13.2		12.2	
	Min. of [Pa(zs), Ita, α(zs)]		(mW)						
	Zs		(cm)						
	Zbp		(cm)						
	Zb		(cm)				4.80		
	z at max .. I <sub>pi,α</sub>		(cm)	5.53					
	deq		(cm)				0.21		
	fawf		(MHz)	3.1	3.1	3.1		3.10	
	Dim. from A <sub>aprt</sub>	X	(cm)		1.80	1.78		1.78	
		J	(cm)		1.60	1.54		1.54	
Other information	td		(μsec)	0.420					
	Prr		(Hz)	8,000					
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	2.42					
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)				0.21		
	I <sub>pi,α</sub> at max. MI		(W/cm²)	127.0					
Operational control conditions	Frequency		(MHz)	3.0	3.0	3.0		3.0	
	Output		(dB)	0	0	0		0	
	Focus number			1	1	1		1	
	Focus position		(mm)	30	30	30		30	
	Pulse Repetition Frequency		(KHz)	6	6	6		6	
	Focus depth		(cm)	7.1	7.1	7.1		7.1	



Operating mode: B+CPA+PW mode      Probe: P3FN

Index labelling			MI	TIS			TIB	TIC	
				Scan	Non-Scan		Non-Scan		
					Aaprt≤1 cm²	Aaprt>1 cm²			
Global maximum index value			0.86	0.80	0.20		0.42		
Associated acoustic parameters	Pra		(Mpa)	1.52					
	P		(mW)		54.2	13.2		12.2	
	Min. of [Pa(zs), Ita, α(zs)]		(mW)						
	Zs		(cm)						
	Zbp		(cm)						
	Zb		(cm)					4.80	
	z at max .. I <sub>pi,α</sub>		(cm)	5.53					
	deq		(cm)					0.21	
	fawf		(MHz)	3.1	3.1	3.1		3.10	
		Dim. from A <sub>aprt</sub>	X	(cm)		1.80	1.78		1.78
J			(cm)		1.60	1.54		1.54	
Other information	td		(μsec)	0.420					
	Prr		(Hz)	8,000					
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	2.42					
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)					0.21	
	I <sub>pi,α</sub> at max. MI		(W/cm²)	127.0					
Operational control conditions	Frequency		(MHz)	3.0	3.0	3.0		3.0	
	Output		(dB)	0	0	0		0	
	Focus number			1	1	1		1	
	Focus position		(mm)	30	30	30		30	
	Pulse Repetition Frequency		(KHz)	6	6	6		6	
	Focus depth		(cm)	7.1	7.1	7.1		7.1	

Operating mode: B mode

Probe: V6LN

Index labelling			MI	TIS			TIB	TIC	
				Scan	Non-Scan		Non-Scan		
					Aaprt≤1 cm²	Aaprt>1 cm²			
Global maximum index value			0.70	0.46					
Associated acoustic parameters	Pra		(Mpa)	1.22					
	P		(mW)		56.4				
	Min. of [Pa(zs), Ita, α(zs)]		(mW)						
	Zs		(cm)						
	Zbp		(cm)						
	Zb		(cm)						
	z at max .. I <sub>pi,α</sub>		(cm)	5.43					
	deq		(cm)						
	fawf		(MHz)	3.08	3.08				
	Dim. from A <sub>aprt</sub>	X	(cm)		1.80				
		J	(cm)		1.62				
Other information	td		(μsec)	0.441					
	Prr		(Hz)	8333					
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	2.17					
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)						
	I <sub>pi,α</sub> at max. MI		(W/cm²)	128.5					
Operational control conditions	Frequency		(MHz)	6.0	6.0				
	Output		(dB)	0	0				
	Focus number			1	1				
	Focus position		(mm)	65	65				
	Focus depth		(cm)	7.1	7.1				

Operating mode: BM mode      Probe: V6LN

Index labelling			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value			0.85	0.65	0.11		0.26	
Associated acoustic parameters	Pra		(Mpa)	2.40				
	P		(mW)		25.4	4.3		4.3
	Min. of [Pa(zs), Ita, α(zs)]		(mW)					
	Zs		(cm)					
	Zbp		(cm)					
	Zb		(cm)				2.09	
	z at max .. Ipi,α		(cm)	2.09				
	deq		(cm)				0.18	
	fawf		(MHz)	5.36	5.36	5.35		5.35
	Dim. from Aaprt	X	(cm)		0.49	0.47		0.47
		J	(cm)		0.96	0.98		0.98
Other information	td		(µsec)	0.346				
	Prr		(Hz)	9,960				
	pr at max. Ipi		(Mpa)	3.53				
	deq at max. Ipi		(cm)				0.18	
	Ipi,α at max. MI		(W/cm²)	250.3				
Operational control conditions	Frequency		(MHz)	6.0	6.0	6.0		6.0
	Output		(dB)	0	0	0		0
	Focus number			1	1	1		1
	Focus position		(mm)	65	65	65		65
	Focus depth		(cm)	7.1	7.1	7.1		7.1

Operating mode: M mode

Probe: V6LN

Index labelling			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value			0.62	0.02				0.01
Associated acoustic parameters	Pra		(Mpa)	0.58				
	P		(mW)		1			1
	Min. of [Pa(zs), Ita, α(zs)]		(mW)					
	Zs		(cm)					
	Zbp		(cm)					
	Zb		(cm)					
	z at max .. I <sub>pi,α</sub>		(cm)	1.56				
	deq		(cm)					
	fawf		(MHz)	6.00	6.00			6.00
		Dim. from A <sub>aprt</sub>	X	(cm)		0.70		
J			(cm)		0.90			0.90
Other information	td		(μsec)	0.37				
	Prr		(Hz)	378				
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	0.80				
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)					
	I <sub>pi,α</sub> at max. MI		(W/cm²)	10				
Operational control conditions	Frequency		(MHz)	6.0	6.0			6.0
	Output		(dB)	0	0			0
	Focus number			1	1			1
	Focus position		(mm)	65	65			65
	Focus depth		(cm)	7.1	7.1			7.1

Operating mode: B+colour mode

Probe: V6LN

Index labelling			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value			0.15					2.61
Associated acoustic parameters	Pra		(Mpa)	0.34				
	P		(mW)					
	Min. of [Pa(zs), Ita, α(zs)]		(mW)					
	Zs		(cm)					
	Zbp		(cm)					
	Zb		(cm)					
	z at max .. I <sub>pi,α</sub>		(cm)	1.52				
	deq		(cm)					
	fawf		(MHz)	5.00	5.00			5.00
	Dim. from A <sub>aprt</sub>	X	(cm)		0.70			
J		(cm)		0.41				0.41
Other information	td		(μsec)	0.89				
	Prr		(Hz)	162				
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	0.44				
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)					
	I <sub>pi,α</sub> at max. MI		(W/cm²)	4				
Operational control conditions	Frequency		(MHz)	5.7	5.7			5.7
	Output		(dB)	0	0			0
	Focus number			1	1			1
	Focus position		(mm)	60	60			60
	Pulse Repetition Frequency		(KHz)	6	6			6
	Focus depth		(cm)	7.1	7.1			7.1

Operating mode: B+CPA mode Probe: V6LN

Index labelling				MI	TIS			TIB	TIC
					Scan	Non-Scan		Non-Scan	
						Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value				0.15					2.61
Associated acoustic parameters	Pra		(Mpa)	0.34					
	P		(mW)						
	Min. of [Pa(zs), Ita, α(zs)]		(mW)						
	Zs		(cm)						
	Zbp		(cm)						
	Zb		(cm)						
	z at max .. I <sub>pi,α</sub>		(cm)	1.52					
	deq		(cm)						
	fawf		(MHz)	5.00	5.00				5.00
	Dim. from A <sub>aprt</sub>	X	(cm)		0.70				
J		(cm)		0.41					0.41
Other information	td		(μsec)	0.89					
	Prr		(Hz)	162					
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	0.44					
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)						
	I <sub>pi,α</sub> at max. MI		(W/cm²)	4					
Operational control conditions	Frequency		(MHz)	5.7	5.7				5.7
	Output		(dB)	0	0				0
	Focus number			1	1				1
	Focus position		(mm)	60	60				60
	Pulse Repetition Frequency		(KHz)	6	6				6
	Focus depth		(cm)	7.1	7.1				7.1

Operating mode: PW mode      Probe: V6LN

Index labelling			MI	TIS			TIB	TIC	
				Scan	Non-Scan		Non-Scan		
					Aaprt≤1 cm²	Aaprt>1 cm²			
Global maximum index value			0.29		1.88		1.18	3.66	
Associated acoustic parameters	Pra		(Mpa)	0.46					
	P		(mW)			158		155	152
	Min. of [Pa(zs), Ita, α(zs)]		(mW)						
	Zs		(cm)						
	Zbp		(cm)						
	Zb		(cm)						
	z at max .. I <sub>pi,α</sub>		(cm)	4.71					
	deq		(cm)						
	fawf		(MHz)	2.50		2.50		2.50	2.50
	Dim. from A <sub>aprt</sub>	X	(cm)			0.70		0.70	0.70
J		(cm)			0.51		0.51	0.51	
Other information	td		(μsec)	2.42					
	Prr		(Hz)	1,250					
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	0.68					
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)						
	I <sub>pi,α</sub> at max. MI		(W/cm²)	10					
Operational control conditions	Frequency (MHz)			6.25		6.25		6.25	6.25
	Output		(dB)	0		0		0	0
	Focus number			1		1		1	1
	Focus position		(mm)	30		30		30	30
	Pulse Repetition Frequency		(KHz)	12.5		12.5		12.5	12.5
	Focus depth		(cm)	7.1		7.1		7.1	7.1

Operating mode: B+PW mode Probe: V6LN

Index labelling			MI	TIS			TIB	TIC	
				Scan	Non-Scan		Non-Scan		
					Aaprt≤1 cm²	Aaprt>1 cm²			
Global maximum index value			0.73	0.61	0.13		0.24		
Associated acoustic parameters	Pra		(Mpa)	2.45					
	P		(mW)		26.8	4.1		4.1	
	Min. of [Pa(zs), Ita, α(zs)]		(mW)						
	Zs		(cm)						
	Zbp		(cm)						
	Zb		(cm)					2.09	
	z at max .. I <sub>pi,α</sub>		(cm)	2.15					
	deq		(cm)					0.18	
	fawf		(MHz)	5.24	5.24	5.24		5.24	
		Dim. from A <sub>aprt</sub>	X	(cm)		0.49	0.47		0.47
J			(cm)		0.96	0.98		0.98	
Other information	td		(μsec)	0.354					
	Prr		(Hz)	9,960					
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	3.41					
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)					0.18	
	I <sub>pi,α</sub> at max. MI		(W/cm²)	248					
Operational control conditions	Frequency		(MHz)	6.25	6.25	6.25		6.25	
	Output		(dB)	0	0	0		0	
	Focus number			1	1	1		1	
	Focus position		(mm)	30	30	30		30	
	Pulse Repetition Frequency		(KHz)	12.5	12.5	12.5		12.5	
	Focus depth		(cm)	7.1	7.1	7.1		7.1	



Operating mode: B+CFM+PW mode    Probe: V6LN

Index labelling			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value			0.90	0.63	0.23		0.19	
Associated acoustic parameters	Pra		(Mpa)	2.21				
	P		(mW)		24.8	4.9		3.1
	Min. of [Pa(zs), Ita, α(zs)]		(mW)					
	Zs		(cm)					
	Zbp		(cm)					
	Zb		(cm)					2.09
	z at max .. I <sub>pi,α</sub>		(cm)	2.25				
	deq		(cm)					0.18
	fawf		(MHz)	5.3	5.3	5.3		5.3
	Dim. from A <sub>aprt</sub>	X	(cm)		0.49	0.47		0.47
		J	(cm)		0.96	0.98		0.98
Other information	td		(μsec)	0.361				
	Prr		(Hz)	9,960				
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	3.18				
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)					0.18
	I <sub>pi,α</sub> at max. MI		(W/cm²)	244				
Operational control conditions	Frequency (MHz)			6.25	6.25	6.25		6.25
	Output		(dB)	0	0	0		0
	Focus number			1	1	1		1
	Focus position		(mm)	30	30	30		30
	Pulse Repetition Frequency		(KHz))	6.0	6.0	6.0		6.0
	Focus depth		(cm)	7.1	7.1	7.1		7.1

Operating mode: B+CPA+PW mode      Probe: V6LN

Index labelling				MI	TIS			TIB	TIC
					Scan	Non-Scan		Non-Scan	
						Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value				0.96	0.63	0.23		0.19	
Associated acoustic parameters	Pra		(Mpa)	2.21					
	P		(mW)		24.8	4.9		3.1	
	Min. of [Pa(zs), Ita, α(zs)]		(mW)						
	Zs		(cm)						
	Zbp		(cm)						
	Zb		(cm)					2.09	
	z at max .. I <sub>pi,α</sub>		(cm)	2.25					
	deq		(cm)					0.18	
	fawf		(MHz)	5.3	5.3	5.3		5.3	
	Dim. from A <sub>aprt</sub>	X	(cm)		0.49	0.47		0.47	
		J	(cm)		0.96	0.98		0.98	
Other information	td		(μsec)	0.361					
	Prr		(Hz)	9,960					
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	3.18					
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)					0.18	
	I <sub>pi,α</sub> at max. MI		(W/cm²)	244					
Operational control conditions	Frequency		(MHz)	6.25	6.25	6.25		6.25	
	Output		(dB)	0	0	0		0	
	Focus number			1	1	1		1	
	Focus position		(mm)	30	30	30		30	
	Pulse Repetition Frequency		(KHz)	6.0	6.0	6.0		6.0	
	Focus depth		(cm)	7.1	7.1	7.1		7.1	

Operating mode: B mode

Probe: C5LN

Index labelling			MI	TIS			TIB	TIC	
				Scan	Non-Scan		Non-Scan		
					Aaprt≤1 cm²	Aaprt>1 cm²			
Global maximum index value			0.49	0.82					
Associated acoustic parameters	Pra		(Mpa)	1.03					
	P		(mW)		79.3				
	Min. of [Pa(zs), Ita, a(zs)]		(mW)						
	Zs		(cm)						
	Zbp		(cm)						
	Zb		(cm)						
	z at max .. l <sub>pi,α</sub>		(cm)	2.30					
	deq		(cm)						
	fawf		(MHz)	4.47.	4.47				
	Dim. from A <sub>aprt</sub>	X	(cm)		1.20				
		J	(cm)		1.42				
Other information	td		(μsec)	0.476					
	Prr		(Hz)	4,730					
	p <sub>r</sub> at max. l <sub>pi</sub>		(Mpa)	1.83					
	d <sub>eq</sub> at max. l <sub>pi</sub>		(cm)						
	l <sub>pi,α</sub> at max. MI		(W/cm²)	47.9					
Operational control conditions	Frequency		(MHz)	4.5	4.5				
	Output		(dB)	0	0				
	Focus number			1	1				
	Focus position		(mm)	55	55				
	Focus depth		(cm)	6.3	6.3				

Operating mode: BM mode      Probe: C5LN

Index labelling			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value			0.50	0.68		0.10	0.29	
Associated acoustic parameters	Pra		(Mpa)	1.03				
	P		(mW)		65.8		13.6	
	Min. of [Pa(zs), Ita, α(zs)]		(mW)			8.31		
	Zs		(cm)			3.23		
	Zbp		(cm)			2.53		
	Zb		(cm)				4.62	
	z at max .. I <sub>pi,α</sub>		(cm)	2.30				
	deq		(cm)				0.32	
	fawf		(MHz)	4.47	4.47	4.47	4.47	
	Dim. from A <sub>aprt</sub>	X	(cm)		1.20	1.20	1.20	
		J	(cm)		1.42	1.42	1.42	
Other information	td		(μsec)	0.476				
	Prr		(Hz)	5,200				
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	1.83				
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)				0.35	
	I <sub>pi,α</sub> at max. MI		(W/cm²)	50				
Operational control conditions	Frequency		(MHz)	4.5	4.5	4.5	4.5	
	Output		(dB)	0	0	0	0	
	Focus number			1	1	1	1	
	Focus position		(mm)	55	55	55	55	
	Focus depth		(cm)	6.3	6.3	6.3	6.3	

Operating mode: BM (anatomical) mode

Probe: C5LN

Index labelling			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value			0.50	0.68		0.10	0.29	
Associated acoustic parameters	Pra		(Mpa)	1.03				
	P		(mW)		65.8			13.6
	Min. of [Pa(zs), Ita, α(zs)]		(mW)				8.31	
	Zs		(cm)				3.23	
	Zbp		(cm)				2.53	
	Zb		(cm)					4.62
	z at max .. I <sub>pi,α</sub>		(cm)	2.30				
	deq		(cm)					0.32
	fawf		(MHz)	4.47	4.47		4.47	4.47
		Dim. from A <sub>aprt</sub>	X	(cm)		1.20		1.20
J			(cm)		1.42		1.42	1.42
Other information	td		(μsec)	0.476				
	Prr		(Hz)	5,200				
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	1.83				
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)					0.35
	I <sub>pi,α</sub> at max. MI		(W/cm²)	50				
Operational control conditions	Frequency		(MHz)	4.5	4.5		4.5	4.5
	Output		(dB)	0	0		0	0
	Focus number			1	1		1	1
	Focus position		(mm)	55	55		55	55
	Focus depth		(cm)	6.3	6.3		6.3	6.3

Operating mode: M mode

Probe: C35LN

Index labelling			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value			0.501			0.11		0.07
Associated acoustic parameters	Pra		(Mpa)	1.05				
	P		(mW)			6		6
	Min. of [Pa(zs), Ita, α(zs)]		(mW)					
	Zs		(cm)					
	Zbp		(cm)					
	Zb		(cm)					
	z at max .. I <sub>pi,α</sub>		(cm)	2.420				
	deq		(cm)					
	fawf		(MHz)	4.43		4.43		4.43
		Dim. from A <sub>aprt</sub>	X	(cm)			0.67	
J			(cm)			1.20		3.18
Other information	td		(μsec)	0.460				
	Prr		(Hz)	409				
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	1.74				
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)					
	I <sub>pi,α</sub> at max. MI		(W/cm²)	47				
Operational control conditions	Frequency		(MHz)	4.5		4.5	4.5	
	Output		(dB)	0		0	0	
	Focus number			1		1	1	
	Focus position		(mm)	55		55	55	
	Focus depth		(cm)	6.3		6.3	6.3	

Operating mode: B+colour mode

Probe: C5LN

Index labelling			MI	TIS			TIB	TIC	
				Scan	Non-Scan		Non-Scan		
					Aaprt≤1 cm²	Aaprt>1 cm²			
Global maximum index value			0.51	0.04				0.10	
Associated acoustic parameters	Pra		(Mpa)	1.10					
	P		(mW)		3			3	
	Min. of [Pa(zs), Ita, a(zs)]		(mW)						
	Zs		(cm)						
	Zbp		(cm)						
	Zb		(cm)						
	z at max .. I <sub>pi,α</sub>		(cm)	4.57					
	deq		(cm)						
	fawf		(MHz)	4.68	4.68			4.68	
	Dim. from A <sub>aprt</sub>	X	(cm)		1.22				1.22
		J	(cm)		1.23				1.23
Other information	td		(μsec)	1.32					
	Prr		(Hz)	90					
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	1.53					
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)						
	I <sub>pi,α</sub> at max. MI		(W/cm²)	54					
Operational control conditions	Frequency		(MHz)	4.5	4.5			4.5	
	Output		(dB)	0	0			0	
	Focus number			1	1			1	
	Focus position		(mm)	55	55			55	
	Pulse Repetition Frequency		(KHz)	6	6			6	
	Focus depth		(cm)	6.3	6.3			6.3	

Operating mode: B+CPA mode Probe: C5LN

Index labelling				MI	TIS			TIB	TIC
					Scan	Non-Scan		Non-Scan	
						Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value				0.51	0.04				0.10
Associated acoustic parameters	Pra		(Mpa)	1.10					
	P		(mW)		3				3
	Min. of [Pa(zs), Ita, α(zs)]		(mW)						
	Zs		(cm)						
	Zbp		(cm)						
	Zb		(cm)						
	z at max .. I <sub>pi,α</sub>		(cm)	4.57					
	deq		(cm)						
	fawf		(MHz)	4.68	4.68				4.68
	Dim. from A <sub>aprt</sub>	X	(cm)		1.22				1.22
		J	(cm)		1.23				1.23
Other information	td		(μsec)	1.32					
	Prr		(Hz)	90					
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	1.53					
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)						
	I <sub>pi,α</sub> at max. MI		(W/cm²)	54					
Operational control conditions	Frequency		(MHz)	4.5	4.5				4.5
	Output		(dB)	0	0				0
	Focus number			1	1				1
	Focus position		(mm)	55	55				55
	Pulse Repetition Frequency		(KHz)	6	6				6
	Focus depth		(cm)	6.3	6.3				6.3



Operating mode: PW mode      Probe: C5LN

Index labelling				MI	TIS			TIB	TIC
					Scan	Non-Scan		Non-Scan	
						Aaprt≤1 cm²			
Global maximum index value				0.61		2.62		1.01	3.31
Associated acoustic parameters	Pra		(Mpa)	1.08					
	P		(mW)			145		151	147
	Min. of [Pa(zs), Ita, α(zs)]		(mW)						
	Zs		(cm)						
	Zbp		(cm)						
	Zb		(cm)						
	z at max .. I <sub>pi,α</sub>		(cm)	3.55					
	deq		(cm)						
	fawf		(MHz)	3.80		3.80		3.80	3.80
	Dim. from A <sub>aprt</sub>	X	(cm)			0.90		0.90	0.90
		J	(cm)			1.00		1.00	1.00
Other information	td		(μsec)	2.12					
	Prr		(Hz)	1,230					
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	1.30					
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)						
	I <sub>pi,α</sub> at max. MI		(W/cm²)	21					
Operational control conditions	Frequency		(MHz)	5.0		5.0		5.0	5.0
	Output		(dB)	0		0		0	0
	Focus number			1		1		1	1
	Focus position		(mm)	35		35		35	35
	Pulse Repetition Frequency		(KHz)	12.5		12.5		12.5	12.5
	Focus depth		(cm)	6.3		6.3		6.3	6.3

Operating mode: B+PW mode Probe: C5LN

Index labelling				MI	TIS			TIB	TIC
					Scan	Non-Scan		Non-Scan	
						Aaprt≤1 cm²	Aaprt>1 cm²		
Global maximum index value				0.57	0.63		0.20	0.28	
Associated acoustic parameters	Pra		(Mpa)	1.2					
	P		(mW)		60.1			14.9	
	Min. of [Pa(zs), Ita, α(zs)]		(mW)				9.45		
	Zs		(cm)				3.13		
	Zbp		(cm)				2.21		
	Zb		(cm)					4.45	
	z at max .. I <sub>pi,α</sub>		(cm)	2.38					
	deq		(cm)					0.31	
	fawf		(MHz)	4.42	4.42		4.42	4.42	
	Dim. from A <sub>aprt</sub>	X	(cm)		1.20		1.20	1.20	
		J	(cm)		1.42		1.42	1.42	
Other information	td		(μsec)	0.465					
	Prr		(Hz)	5,200					
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	1.73					
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)					0.35	
	I <sub>pi,α</sub> at max. MI		(W/cm²)	55					
Operational control conditions	Frequency		(MHz)	5.0	5.0		5.0	5.0	
	Output		(dB)	0	0		0	0	
	Focus number			1	1		1	1	
	Focus position		(mm)	35	35		35	35	
	Pulse Repetition Frequency		(KHz)	12.5	12.5		12.5	12.5	
	Focus depth		(cm)	6.3	6.3		6.3	6.3	

Operating mode: B+CFM+PW mode    Probe: C5LN

Index labelling			MI	TIS			TIB	TIC	
				Scan	Non-Scan		Non-Scan		
					Aaprt≤1 cm²	Aaprt>1 cm²			
Global maximum index value			0.68	0.58		0.21	0.23		
Associated acoustic parameters	Pra		(Mpa)	1.42					
	P		(mW)		5.9		15.8		
	Min. of [Pa(zs), Ita, α(zs)]		(mW)			9.33			
	Zs		(cm)			3.24			
	Zbp		(cm)			2.34			
	Zb		(cm)				4.43		
	z at max .. I <sub>pi,α</sub>		(cm)	2.26					
	deq		(cm)				0.31		
	fawf		(MHz)	4.32	4.32		4.32	4.32	
		Dim. from A <sub>aprt</sub>	X	(cm)		1.20		1.20	1.20
J			(cm)		1.42		1.42	1.42	
Other information	td		(μsec)	0.455					
	Prr		(Hz)	5,200					
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	1.69					
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)				0.35		
	I <sub>pi,α</sub> at max. MI		(W/cm²)	55					
Operational control conditions	Frequency		(MHz)	5.0	5.0		5.0	5.0	
	Output		(dB)	0	0		0	0	
	Focus number			1	1		1	1	
	Focus position		(mm)	35	35		35	35	
	Pulse Repetition Frequency		(KHz)	12.5	12.5		12.5	12.5	
	Focus depth		(cm)	6.3	6.3		6.3	6.3	

Operating mode: B+CPA+PW mode    Probe: C5LN

Index labelling			MI	TIS			TIB	TIC	
				Scan	Non-Scan		Non-Scan		
					Aaprt≤1 cm²	Aaprt>1 cm²			
Global maximum index value			0.68	0.58		0.21	0.23		
Associated acoustic parameters	Pra		(Mpa)	1.42					
	P		(mW)		5.9		15.8		
	Min. of [Pa(zs), Ita, a(zs)]		(mW)			9.33			
	Zs		(cm)			3.24			
	Zbp		(cm)			2.34			
	Zb		(cm)				4.43		
	z at max .. I <sub>pi,α</sub>		(cm)	2.26					
	deq		(cm)				0.31		
	fawf		(MHz)	4.32	4.32		4.32	4.32	
	Dim. from A <sub>aprt</sub>	X	(cm)		1.20		1.20	1.20	
J		(cm)		1.42		1.42	1.42		
Other information	td		(μsec)	0.455					
	Prr		(Hz)	5,200					
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	1.69					
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)				0.35		
	I <sub>pi,α</sub> at max. MI		(W/cm²)	55					
Operational control conditions	Frequency		(MHz)	5.0	5.0		5.0		
	Output		(dB)	0	0		0		
	Focus number			1	1		1		
	Focus position		(mm)	35	35		35		
	Pulse Repetition Frequency		(KHz)	12.5	12.5		12.5		
	Focus depth		(cm)	6.3	6.3		6.3		

Operating Mode: BMode

Probe: L10LN

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					Aaprt≤1cm²	Aaprt > 1cm²		
Global Maximum Index Value			0.80	0.48				
Associated Acoustic Parameters	Pra		(Mpa)	1.91				
	P		(mW)		17.5			
	Min. of [Pa(zs), Ita,α(zs)]		(mW)					
	Zs		(cm)					
	Zbp		(cm)					
	Zb		(cm)					
	zat max.. I <sub>pi</sub>		(cm)	1.61				
	deq		(cm)					
	fawf		(MHz)	7.16	7.16			
	Dim of A <sub>aprt</sub>	X	(cm)		1.02			
Y		(cm)		0.91				
Other Information	td		(μsec)	0.243				
	Prr		(Hz)	14671				
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	2.58				
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)					
	I <sub>pia</sub> at max. MI		(W/cm²)	107.2				
Operating Control Conditions	Frequency		(MHz)	7.0	7.0			
	Power		(dB)	0	0			
	Focus Number			1	1			
	Focus Position		(mm)	23	23			
	Focal Depth		(cm)	2.4	2.4			

Operating Mode: BM Mode      Probe: L10LN

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					Aaprt≤1cm²	Aaprt> 1cm²		
Global Maximum Index Value			0.80	0.46	0.04		0.1	
Associated Acoustic Parameters	Pra		(Mpa)	1.91				
	P		(mW)		18.2	1.7		1.7
	Min. of [Pa(zs), I <sub>ta,α</sub> (zs)] (mW)							
	Zs		(cm)					
	Zbp		(cm)					
	Zb		(cm)				1.6	
	zat max.. I <sub>pi</sub>		(cm)	1.61				
	deq		(cm)				0.22	
	fawf		(MHz)	7.22	7.22	7.19		7.19
	Dim of A <sub>aprt</sub>	X	(cm)		1.00	1.00		1.00
		Y	(cm)		0.92	0.92		0.92
Other Information	td		(μsec)	0.243				
	Prr		(Hz)	15071				
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	2.58				
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)				0.22	
	I <sub>pia</sub> at max. M		(W/cm²)	107.2				
Operating Control Conditions	Frequency		(MHz)	7.0	7.0	7.0		7.0
	Power		(dB)	0	0	0		0
	Focus Number			1	1	1		1
	Focus Position		(mm)	23	23	23		23
	Focal Depth		(cm)	2.4	2.4	2.4		2.4

Operating Mode: BM (Anatomical) Mode      Probe: L10LN

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					Aaprt≤1cm²	Aaprt>1cm²		
Global Maximum Index Value			0.80	0.46	0.04		0.1	
Associated Acoustic Parameters	Pra		(Mpa)	1.91				
	P		(mW)		18.2	1.7		1.7
	Min. of [Pa(zs), I <sub>ta,α(zs)</sub> ] (mW)							
	Zs		(cm)					
	Zbp		(cm)					
	Zb		(cm)				1.6	
	z <sub>at</sub> max. <i>I<sub>pi</sub></i>		(cm)	1.61				
	d <sub>eq</sub>		(cm)				0.22	
	fawf		(MHz)	7.22	7.22	7.19		7.19
	Dim of <i>A<sub>aprt</sub></i>	X	(cm)		1.00	1.00		1.00
		Y	(cm)		0.92	0.92		0.92
Other Information	td		(μsec)	0.243				
	Prr		(Hz)	15071				
	<i>p<sub>r</sub></i> at max. <i>I<sub>pi</sub></i>		(Mpa)	2.58				
	<i>d<sub>eq</sub></i> at max. <i>I<sub>pi</sub></i>		(cm)				0.22	
	<i>I<sub>piα</sub></i> at max. <i>MI</i>		(W/cm²)	107.2				
Operating Control Conditions	Frequency		(MHz)	7.0	7.0	7.0		7.0
	Power		(dB)	0	0	0		0
	Focus Number			1	1	1		1
	Focus Position		(mm)	23	23	23		23
	Focal Depth		(cm)	2.4	2.4	2.4		2.4

Operating Mode: M Mode

Probe: L10LN

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					Aaprt≤1cm²	Aaprt>1cm²		
Global Maximum Index Value			0.80		0.04		0.1	
Associated Acoustic Parameters	Pra		(Mpa)	1.91				
	P		(mW)			1.7		1.7
	Min. of [Pa(zs), I <sub>ta,α</sub> (zs)] (mW)							
	Zs		(cm)					
	Zbp		(cm)					
	Zb		(cm)				1.6	
	zat max.. I <sub>pa</sub>		(cm)	1.61				
	deq		(cm)				0.22	
	fawf		(MHz)	7.22		7.19		7.19
	Dim of A <sub>aprt</sub>	X	(cm)			1.00		1.00
Y		(cm)			0.92		0.92	
Other Information	td		(μsec)	0.243				
	Prr		(Hz)	400				
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	2.58				
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)				0.22	
	I <sub>pia</sub> at max. MI		(W/cm²)	17.2				
Operating Control Conditions	Frequency		(MHz)	7.0		7.0		7.0
	Power		(dB)	0		0		0
	Focus Number			1		1		1
	Focus Position		(mm)	23		23		23
	Focal Depth		(cm)	2.4		2.4		2.4



Operating Mode: B+ColorMode

Probe: L10LN

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					Aaprt≤1cm²	Aaprt > 1cm²		
Global Maximum Index Value			0.40	0.67				1.80
Associated Acoustic Parameters	Pra		(Mpa)	1.11				
	P		(mW)		29			29
	Min. of [Pa(zs), I <sub>ta</sub> ,α(zs)]		(mW)					
	Zs		(cm)					
	Zbp		(cm)					
	Zb		(cm)					
	z <sub>at</sub> max.. I <sub>pi</sub>		(cm)	1.05				
	deq		(cm)					
	fawf		(MHz)	6.66	6.66			6.66
	Dim of A <sub>aprt</sub>	X	(cm)		0.76			0.76
		Y	(cm)		0.60			0.60
Other Information	td		(μsec)	0.58				
	Prr		(Hz)	3000				
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	1.47				
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)					
	I <sub>pia</sub> at max. MI		(W/cm²)	106.2				
Operating Control Conditions	Frequency		(MHz)	5.8	5.8			5.8
	Power		(dB)	0	0			0
	Focus Number			1	1			1
	Focus Position		(mm)	23	23			23
	Pulse Repetition Frequency		(KHz)	3	3			3
	Focal Depth		(cm)	2.4	2.4			2.4

Operating Mode: B+CPAMode Probe: L10LN

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					Aaprt≤1cm²	Aaprt > 1cm²		
Global Maximum Index Value			0.40	0.67				1.80
Associated Acoustic Parameters	Pra		(Mpa)	1.11				
	P		(mW)		29			29
	Min. of [Pa(zs), I <sub>ta</sub> ,α(zs)]		(mW)					
	Zs		(cm)					
	Zbp		(cm)					
	Zb		(cm)					
	zat max.. I <sub>pi</sub>		(cm)	1.05				
	deq		(cm)					
	fawf		(MHz)	6.66	6.66			6.66
	Dim of A <sub>aprt</sub>	X	(cm)		0.76			
Y		(cm)		0.60				0.60
Other Information	td		(μsec)	0.58				
	Prr		(Hz)	3000				
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	1.47				
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)					
	I <sub>pia</sub> at max. M		(W/cm²)	106.2				
Operating Control Conditions	Frequency		(MHz)	5.8	5.8			5.8
	Power		(dB)	0	0			0
	Focus Number			1	1			1
	Focus Position		(mm)	23	23			23
	Pulse Repetition Frequency		(KHz)	3	3			3
	Focal Depth		(cm)	2.4	2.4			2.4

Operating Mode: PW Mode      Probe:L10LN

Index Label			MI	TIS			TIB	TIC	
				Scan	Non-Scan		Non-Scan		
					Aaprt≤1cm²	Aaprt > 1cm²			
Global Maximum Index Value			0.36		0.42		0.98	1.87	
Associated Acoustic Parameters	Pra		(Mpa)	0.75					
	P		(mW)			17		17	
	Min. of [Pa(zs), Ita,α(zs)]		(mW)						
	Zs		(cm)						
	Zbp		(cm)						
	Zb		(cm)						
	zat max.. I <sub>pi</sub>		(cm)	1.60					
	deq		(cm)						
	fawf		(MHz)	5.10		5.10		5.10	5.10
	Dim of A <sub>aprt</sub>	X	(cm)			0.76		0.76	0.76
		Y	(cm)			0.60		0.60	0.60
Other Information	td		(μsec)	2.35					
	Prr		(Hz)	3000					
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	0.98					
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)						
	I <sub>pia</sub> at max. MI		(W/cm²)	125					
Operating Control Conditions	Frequency		(MHz)	5.8		5.8		5.8	5.8
	Power		(dB)	0		0		0	0
	Focus Number			1		1		1	1
	Focus Position		(mm)	18		18		18	18
	Pulse Repetition Frequency		(KHz)	6		6		6	6
	Focal Depth		(cm)	2.4		2.4		2.4	2.4

Operating Mode: B+PWMode Probe: L10LN

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					Aaprt≤1cm²	Aaprt > 1cm²		
Global Maximum Index Value			0.80	0.45	0.56		0.95	
Associated Acoustic Parameters	Pra		(Mpa)	1.91				
	P		(mW)		15.6	16		16
	Min. of [Pa(zs), I <sub>ta</sub> ,a(zs)]		(mW)					
	Zs		(cm)					
	Zbp		(cm)					
	Zb		(cm)				1.6	
	z at max. I <sub>pa</sub>		(cm)	1.61				
	deq		(cm)					
	fawf		(MHz)	5.16	5.16	5.16		5.16
	Dim of A <sub>aprt</sub>	X	(cm)		1.02	1.02		1.02
		Y	(cm)		0.60	0.60		0.60
Other Information	td		(μsec)	0.241				
	Prr		(Hz)	6000				
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	2.58				
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)					
	I <sub>pi</sub> at max. MI		(W/cm²)	106.2				
Operating Control Conditions	Frequency		(MHz)	5.8	5.8	5.8		5.8
	Power		(dB)	0	0	0		0
	Focus Number			1	1	1		1
	Focus Position		(mm)	18	18	18		18
	Pulse Repetition Frequency		(KHz)	6	6	6		6
	Focal Depth		(cm)	2.4	2.4	2.4		2.4

Operating Mode: B+CFM+PWMode

Probe: L10LN

Index Label			MI	TIS			TIB	TIC	
				Scan	Non-Scan		Non-Scan		
					Aaprt≤1cm²	Aaprt > 1cm²			
Global Maximum Index Value			0.76	0.70	0.13		0.42		
Associated Acoustic Parameters	Pra		(Mpa)	1.92					
	P		(mW)		28.0	5.2		5.9	
	Min. of [Pa(zs), Ita,α(zs)]		(mW)						
	Zs		(cm)						
	Zbp		(cm)						
	Zb		(cm)					1.56	
	zat max.. I <sub>pi</sub>		(cm)	1.80					
	deq		(cm)					0.24	
	fawf		(MHz)	5.2	5.2	5.21		5.21	
	Dim of A <sub>aprt</sub>	X	(cm)		1.00	1.02		1.02	
		Y	(cm)		0.60	0.60		0.60	
Other Information	td		(μsec)	0.273					
	Prr		(Hz)	6200					
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	2.84					
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)					0.25	
	I <sub>pi</sub> at max. MI		(W/cm²)	132.1					
Operating Control Conditions	Frequency		(MHz)	5.8	5.8	5.8		5.8	
	Power		(dB)	0	0	0		0	
	Focus Number			1	1	1		1	
	Focus Position		(mm)	18	18	18		18	
	Pulse Repetition Frequency		(KHz)	6	6	6		6	
	Focal Depth		(cm)	2.4	2.4	2.4		2.4	

Operating Mode: B+CPA+PWMode

Probe: L10LN

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-Scan	
					Aaprt≤1cm²	Aaprt > 1cm²		
Global Maximum Index Value			0.76	0.70	0.13		0.42	
Associated Acoustic Parameters	Pra		(Mpa)	1.92				
	P		(mW)		28.0	5.2		5.9
	Min. of [Pa(zs), Ita,α(zs)]		(mW)					
	Zs		(cm)					
	Zbp		(cm)					
	Zb		(cm)				1.56	
	zat max.. I <sub>pa</sub>		(cm)	1.80				
	deq		(cm)				0.24	
	fawf		(MHz)	5.2	5.2	5.21		5.21
	Dim of A <sub>aprt</sub>	X	(cm)		1.00	1.02		1.02
Y		(cm)		0.60	0.60		0.60	
Other Information	td		(μsec)	0.273				
	Prr		(Hz)	6200				
	p <sub>r</sub> at max. I <sub>pi</sub>		(Mpa)	2.84				
	d <sub>eq</sub> at max. I <sub>pi</sub>		(cm)				0.25	
	I <sub>pa</sub> at max. MI		(W/cm²)	132.1				
Operating Control Conditions	Frequency		(MHz)	5.8	5.8	5.8		5.8
	Power		(dB)	0	0	0		0
	Focus Number			1	1	1		1
	Focus Position		(mm)	18	18	18		18
	Pulse Repetition Frequency		(KHz)	6	6	6		6
	Focal Depth		(cm)	2.4	2.4	2.4		2.4

## Appendix D:

### Range, precision, and accuracy of setting/display parameters

Adjustment/ display parameters	Range	Precision	Accuracy
Depth	1.6 cm~30, 8 cm	0.8 cm	≥95 %
B_Gain	0~100	1	≥90 %
B_PWR	0~100	2	≥90 %
PTN	1~8	1	≥95 %
Span	1~6	1	≥95 %
B_PER	0~7	1	-
Smo	0~3	1	-
ENH	0~3	1	-
B_GSC	0~23	1	-
DYN	30~180	4	≥85%
LD	High, low	-	-
B_Chroma	0~8	-	-
SRT	0~6	1	-
M_Gain	0~100	2	≥90 %
M_GSC	0~23	1	-
MSP	Low, mid, high, most	-	≥95 %
M_Chroma	0~8	-	-
D_Gain	0~100	2	≥90 %
D_Smo	0~3	1	-

DSP	1-6	2.5	≥85%
D_PRF	0.25-25 kHz	1 k	≥95 %
D_Angle	-80~+80 degrees	2 degrees	≥90 %
D_Control	-20, 0, +20 degrees	10	≥90 %
D_WF	12.5 kHz, Max	10	≥95 %
D_Chroma	0~7	-	-
C_PER	0~7	1	-
C_Smo	-3~+3	1	-
C_Map	0~10	1	-
C_PRF	0.25~6.0 kHz	0.25	≥95 %
C_WF	3 kHz, Max	20	≥95 %
C_Control	-20, 0, +20 degrees	10	≥90 %
C_Gain	0~100	2	≥90 %
C_Thred	0~10	1	≥90 %
4D_Smo	0~3	1	-
4D_Colour	0~4	1	-
4D_Thred	0~100	1	≥95 %
4D_Map	-15~15	1	-
4D_Bright	0~10	1	-
4D_Rotal	0~270	90 degrees	≥95 %



# Appendix E:

## 3D imaging guide

### E.1 3D imaging method

If no volume probe is being used, click on the **4D** key on the control panel while in Freeze mode - the system is now in 3D imaging mode (press the **Esc** key to leave 3D imaging mode). A "+" cursor is subsequently displayed on the ultrasound image. The "Select ROI area" prompt box appears in the lower half of the screen (ROI is the imaging area. Only one image in this area can be rendered as a 3D image). See Figure 186.



Figure 186: 3D imaging mode

Move the trackball to shift the position of the "+" cursor to the beginning of the ROI. Click on **Set** to fix its position. Then move the trackball to select a rectangular area. See Figure 187.

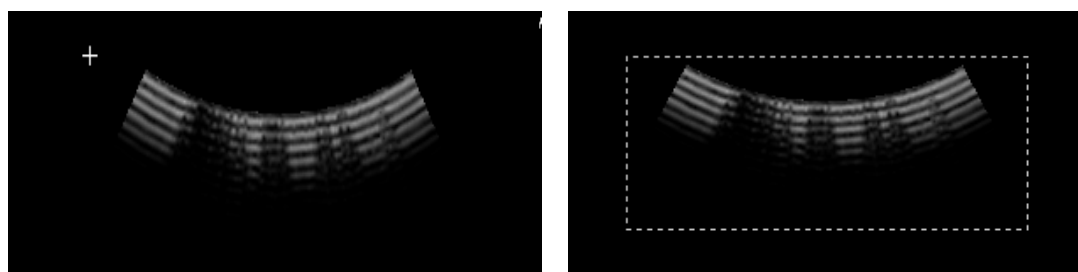


Figure 187: Selection of the imaging area

Click on the **Set** key again. You can now render a 3D image based on the ultrasound image in the selected area. The on-screen display is shown in Figure 188. Click on the **Set** key to complete the 3D rendering. To exit the rendering operation, press **Esc**. A 3D image is now rendered. Now you can set the imaging parameters.

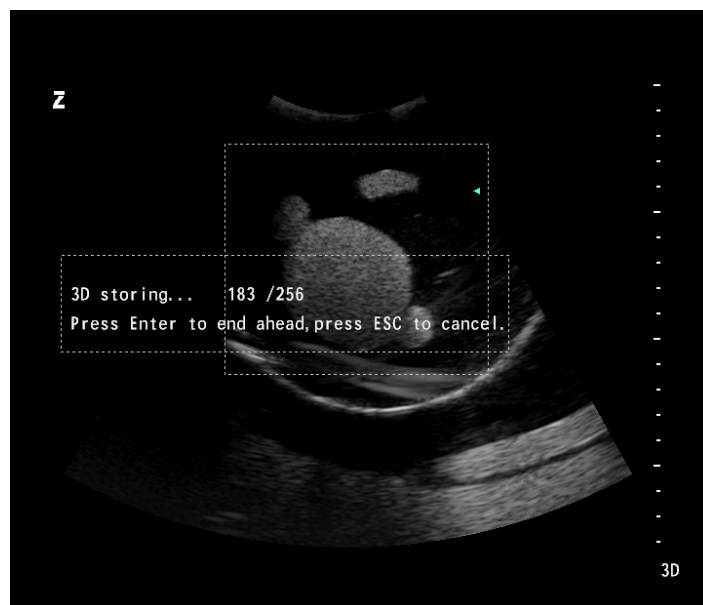


Figure 188: Recording of images in ROI

## E.2 Image processing

### E.2.1 Scale facilities

After entering 3D imaging mode, set the values of *X*, *Y* and *Z*, which correspond to the physical distances of every pixel on the 3D image in the direction of the length, width and height. Only the *Z* value is adjustable; the *X* and *Y* values are automatically adopted by the 2D ultrasound software. See Figure 189.

Use the trackball and **Set to adjust**. Now click on **OK** and a 3D image is shown.

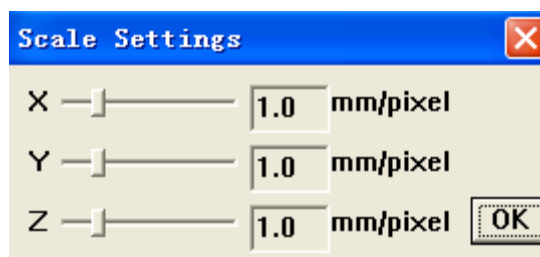


Figure 189: Scale facilities

See Figure 190 for the 3D user interface.

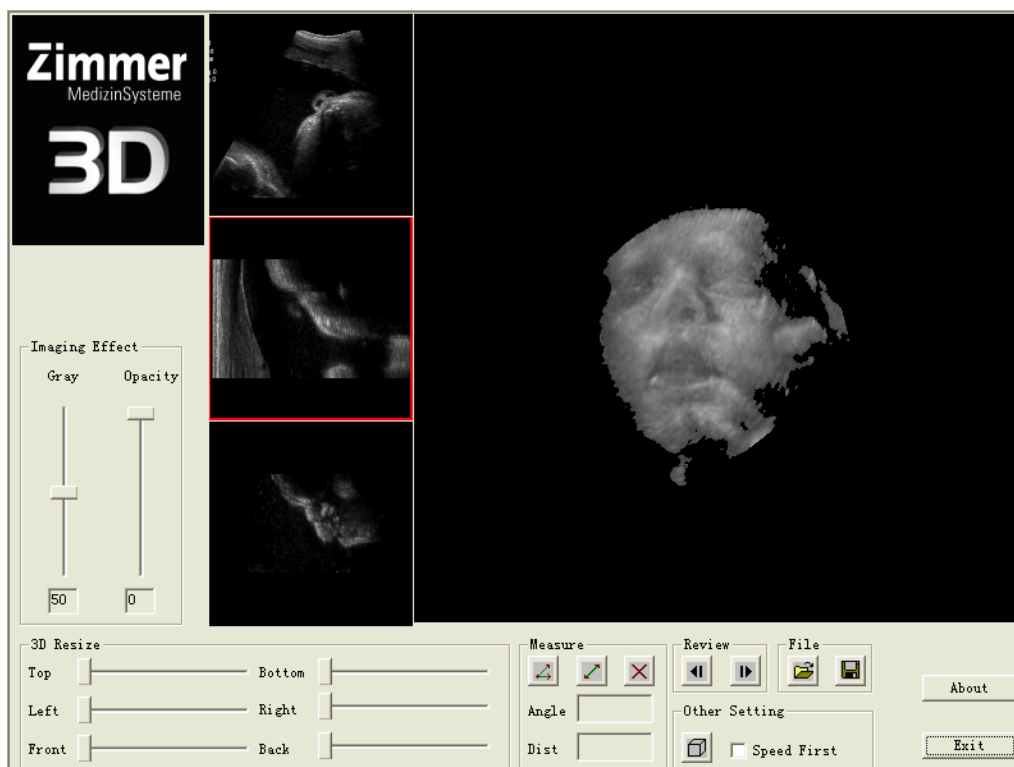


Figure 190: 3D imaging surface

The largest window on the right-hand screen displays a 3D image from the ROI area. On the left, three small windows display 2D images from different viewing angles. If the 3D image does not appear, double-click **Set** in the 3D imaging area to accelerate the rendering of the 3D image.

### E.2.2 Imaging effect

The imaging effect is adjusted using **Grey** and **Opacity**. Use Grey to change the brightness. Use Opacity to filter pixels in different ranges of greyscale.

Use the trackball and **Set to adjust**. Opacity is set to 30 by default. See Figure 191 and Figure 192.

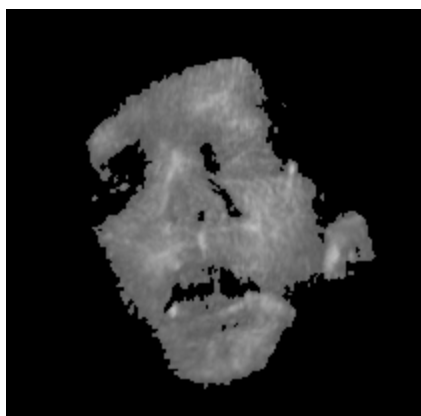


Figure 191: Opacity at 45

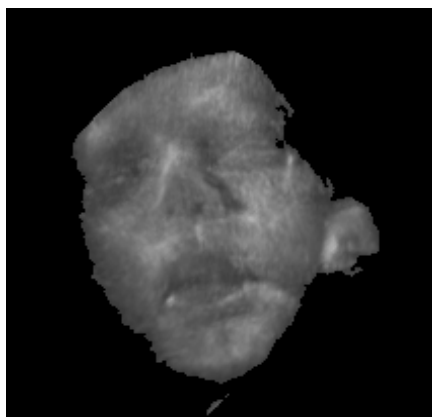


Figure 192: Opacity at 30

### E.2.3 3D resizing

Set the values for *Top*, *Bottom*, *Left*, *Right*, *Front* and *Back* to cut the surrounding areas. Use the trackball and **Set** to adjust. See Figure 193 and Figure 194.

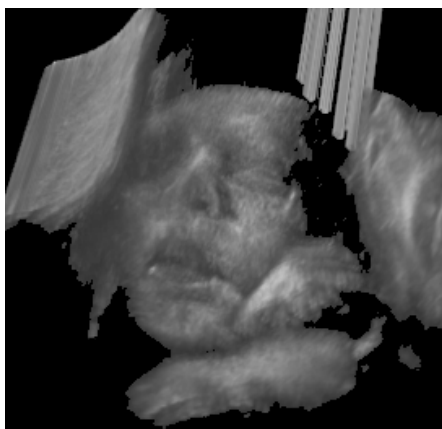


Figure 193: Before cutting

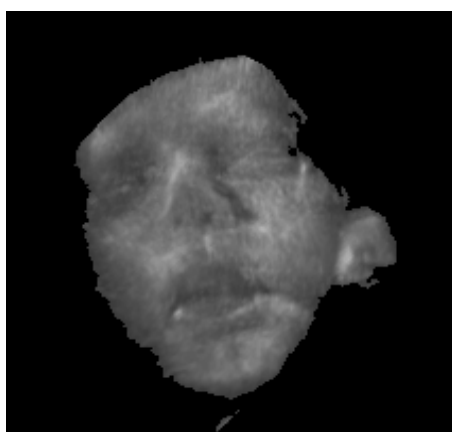




Figure 194: After cutting

### E.2.4 Image control

Hold the **Set** key down and rotate the 3D image using the trackball.

### E.2.5 Measurement

Use the trackball and **Set** to click on the  key for the measurement angle. Click on  for the distance measurement. The measurement tool appears on the image when either of the above buttons is clicked. See Figure 195.



Use the trackball and **Set** to click on the arrow or the start point in the measurement tool and change the angle or distance. The measurement results are displayed in the Angle and Dist box in real time.

Use the trackball and **Set** to click on  and delete the measurement result .





Figure 195: Image measurement


### E.2.6 Review

In the Review area, use the trackball and **Set** to click on  and play back 2D images as single images or click on  to play 2D images forwards as single images.

### E.2.7 File

Use  or  to open or save 3D image files as \*.im0.

### E.2.8 Further settings

Use  to open the **Scale Settings** screen and change the proportions of the 3D images again, as shown in Figure 189.

Check ***Speed First*** to increase the speed of imaging processing with reduced image resolution. Uncheck ***Speed First*** to return to high resolution.

#### E.2.9 Notes

- Check ***Speed First*** when adjusting Grey and Opacity or performing 3D Resize. If the resolution of the image is reduced, the processing speed increases. When the above processing is completed, uncheck ***Speed First*** and you get the image in high resolution.
- The 3D image becomes clearer when it stays still for a few seconds.
- The image can be temporarily hidden to increase the speed after some operations (e.g. File). Click on the **Set** key on the imaging area to make the image reappear.

# Appendix F:

## Instructions for 4D Lite Imaging (optional)

*NOTE: These function should be used only when the volume probe is connected.*

### F.1 Activate 4D Lite option

#### F.1.1 4D Lite function

After connecting the Volume probe, click on **4D** and an ROI (Region of Interest) box appears.

Click on **Update** to toggle between the ROI field status. If the ROI box is surrounded by a solid line, it can be moved with the trackball, as shown in Figure 196 on the left; if the ROI box is surrounded by a dashed line, the size of the box can be increased and decreased, as shown in Figure 196 on the right.

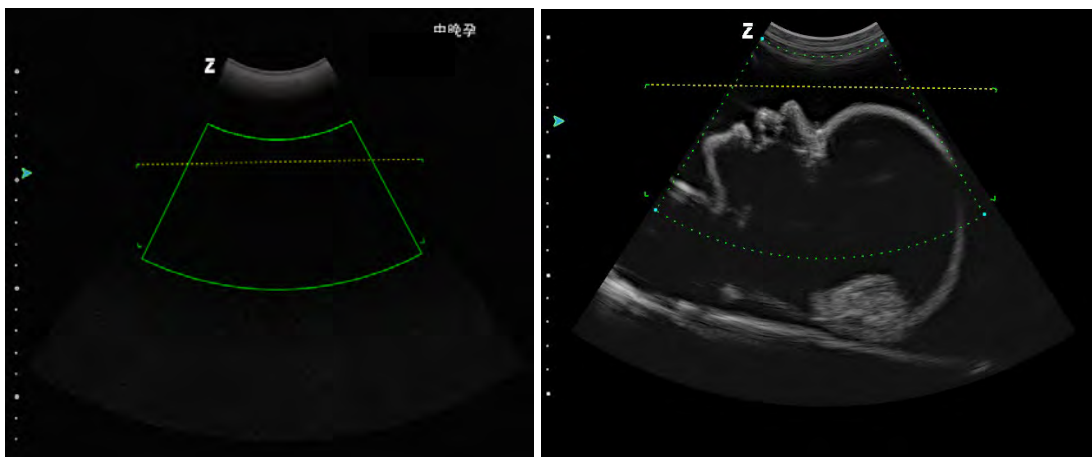


Figure 196: Lite ROI

Section box: ROI for Plane B in ultrasound image 4D Lite rendering. See Figure 197.

Horizontal line: The section area below the line is the 4D Lite imaging area.

*NOTE: If the examination area on the image is scanned, please ensure that the imaging area is within the range (see Figure 197). There are four corners on both sides of the horizontal line and the far side of the sector. The rectangular area enclosed by the four corners is the layer box area of the volume image. See the layer box of the foetus' head on the right-hand side of Figure 198.*

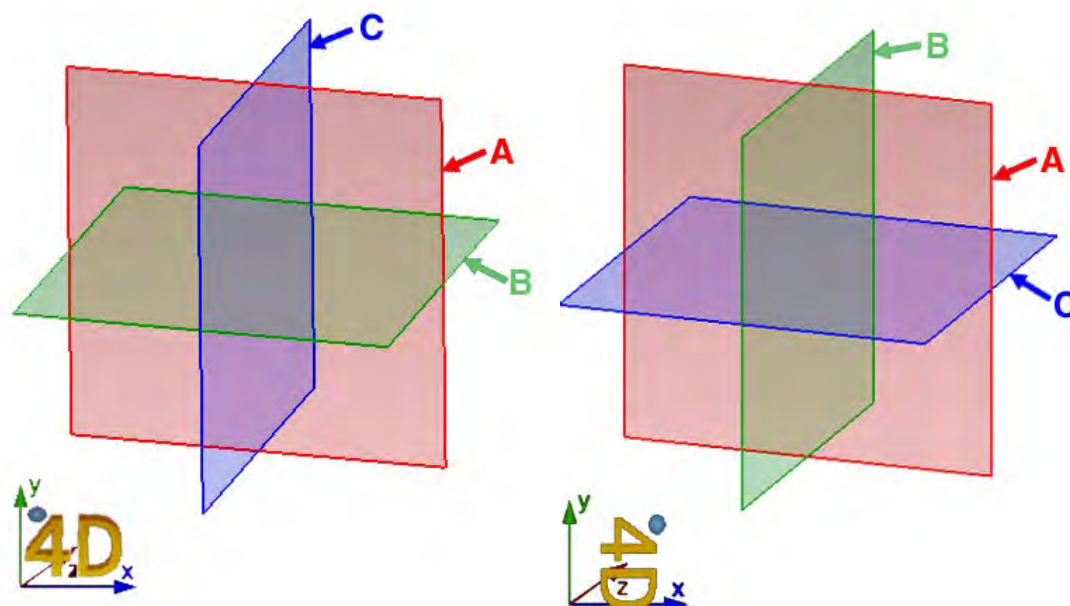


Figure 197: Diagram of the planes

- (1) If the rotation is  $0^\circ$  or  $180^\circ$ , the A/B/C planes are displayed, as shown in Figure 197 on the left.
  - (2) If the rotation is  $90^\circ$  or  $270^\circ$ , the A/B/C planes are displayed, as shown in Figure 197 on the right.
- Once the position of the ROI box has been confirmed, click on **Set**; this takes you to the 4D Lite imaging screen.

After entering the 4D Lite state, a layer field appears on the 2D plane B. Turn the **Value** control to adjust the cutting angle of the cutting line. Click on **Update** to toggle the status of the layer field. This process is the same as for the ROI box.

**3D** or **4D** characters and coordinates with pointers are available on the lower left of the Volume image for guiding image rotation. A small ball symbol on the top left of the "3D" or "4D" Volume sign is used to show the direction of the probe. The direction indicated by this icon is the same as that of the probe.

4D-Lite imaging interface as shown in Figure 198.



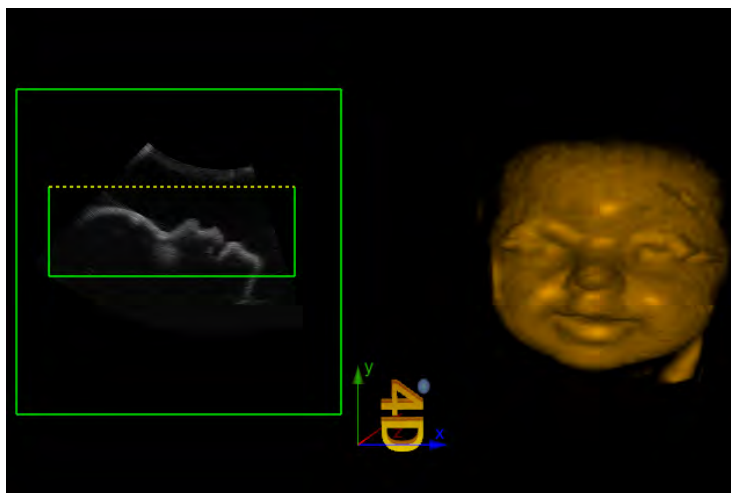


Figure 198: Lite imaging interface

### F.1.2 Auto 3D

Click on **4D** and an ROI box appears that has the same function as the 4D ROI. After selecting the ROI, click on the hotkey assigned to Auto 3D (which must be set up under **Setup - Function Setup - Hotkey Setup**, see Section 5.2.3.1) and the 4D probe automatically scans the image; go to the Auto 3D Imaging interface and create a 3D image.

*NOTE: When in 3D Freeze mode, click on Freeze to return to B mode.*

## F.2 Composition of the 4D Lite display screen

The 4D Lite display screen mainly consists of the image display area, menu and parameters. The menu settings include three menu pages, display, playback and user, and a control window, as shown in Figure 199.

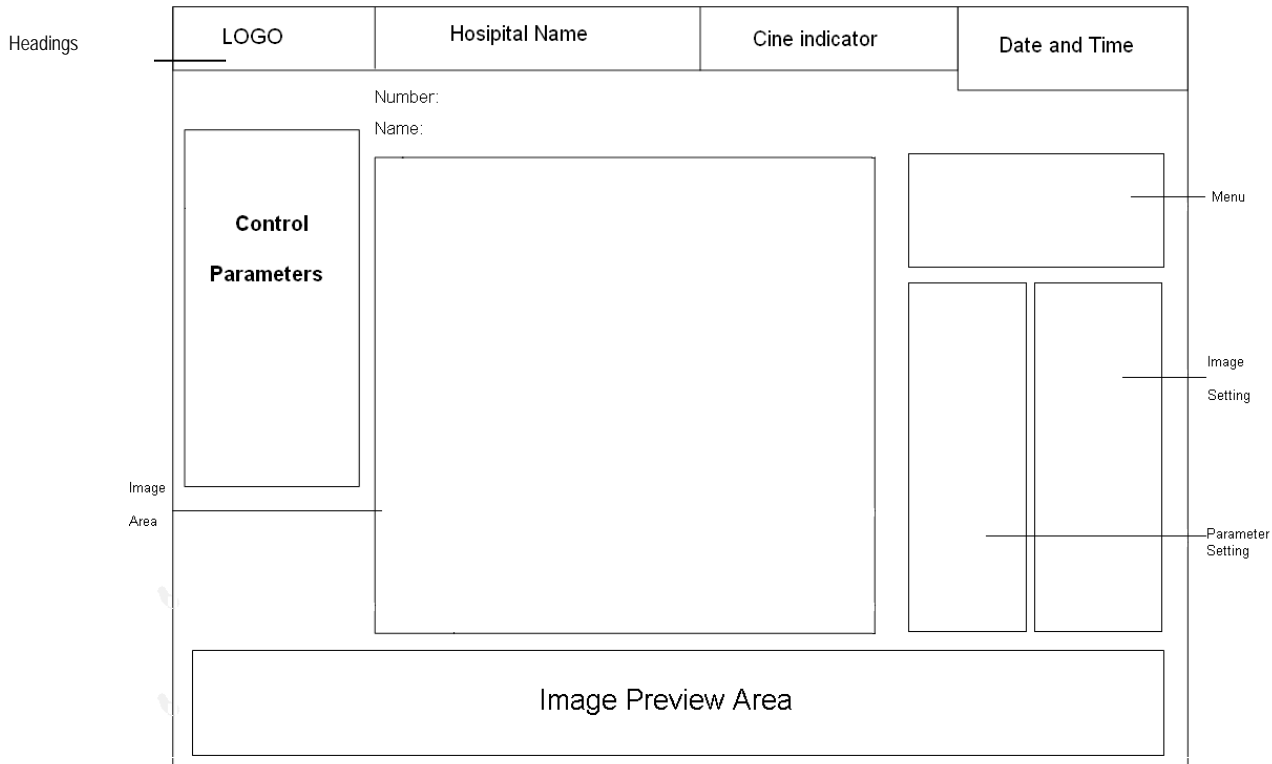


Figure 199: Diagram of the 4D Lite screen

*NOTE: Press 4D to switch to Full Screen mode. Headers and control parameters are hidden when in Full Screen mode. To exit, click on 4D again.*

F.3 Switching the image display mode

The display can be set in nine image display modes, as shown in Figure 200.

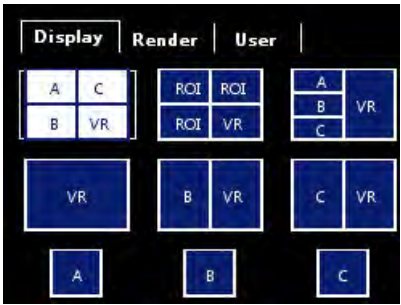


Figure 200: Display setup

The display modes include:

- A/B/C/ VR mode (as shown in Figure 201)

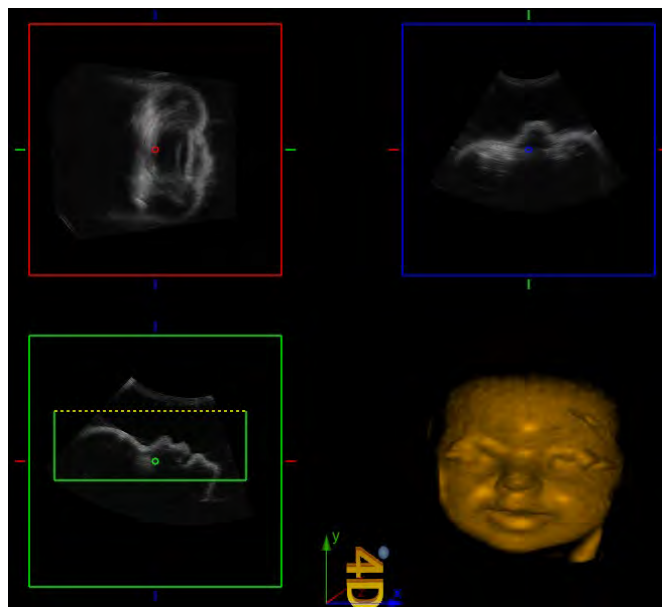


Figure 201: A/B/C/VR mode

A/B/C/VR mode consists of four areas: three slice images of the A/B/C layers, and a volume image.

In this mode, the 2D images of all planes of the 3D volume can be seen. Activate any view of A/B/C to move the cursor to the round point in the middle of the view and a "⊕" cursor appears. Click on **Set** to move the round dot, and the other two 2D images display the cross-section images according to the location of the round dot, as shown in Figure 202.

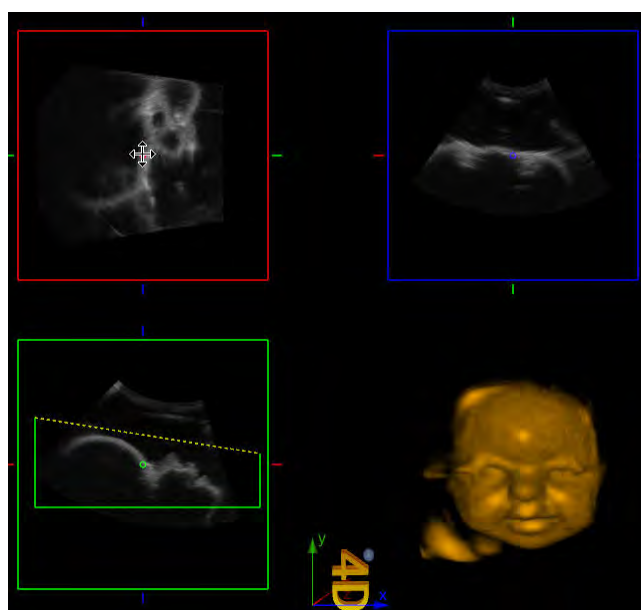


Figure 202: Cursor display

Press and hold the **Set** button on the Volume image while simultaneously moving the trackball to rotate the Volume image, as shown in Figure 203 .

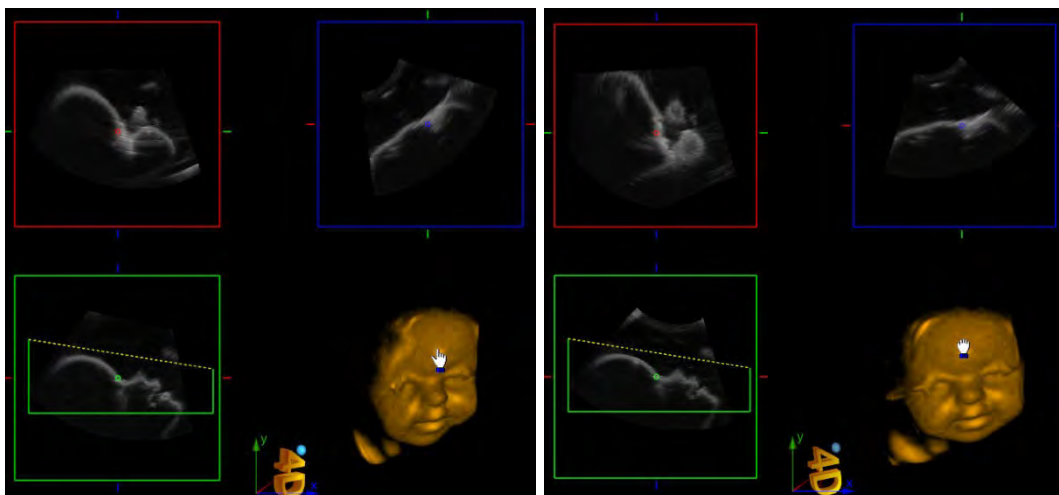


Figure 203: Rotation

- ROI/ROI/ROI/VR mode

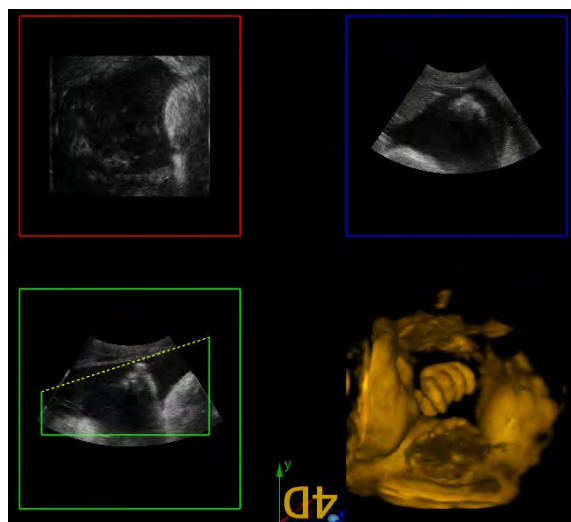


Figure 204: ROI/ROI/ROI/VR mode

ROI/ROI/ROI/VR mode consists of four areas, i.e. three cross-sections of the three A/B/C planes and a volume image.

- B/VR mode

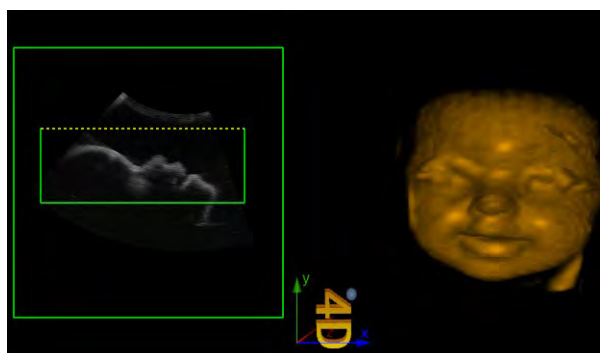


Figure 205: B/VR mode

B/VR mode consists of two areas, the slice image of plane B and a volume image.  
The cross-section of plane B is the plane for conventional B-mode scanning.

- C/VR mode

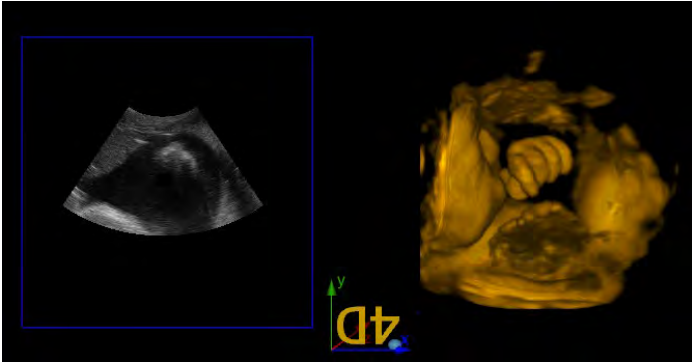


Figure 206: B/VR mode

C-/VR mode consists of two areas, i.e. the cross-section of slice B and a volume image.

- A mode

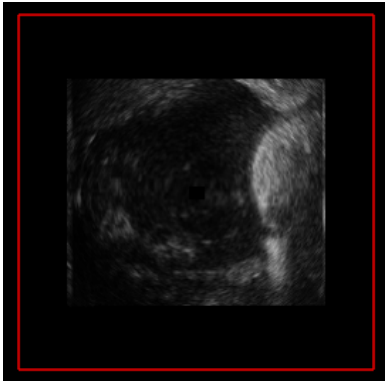


Figure 207: A mode

Slice image A

- B mode

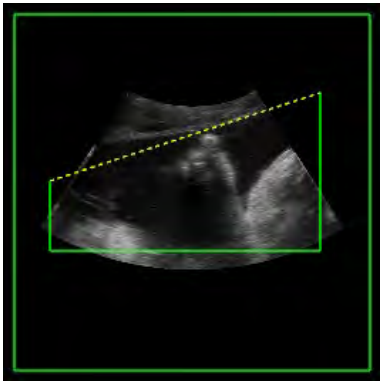


Figure 208: B mode

Slice image B

- C mode

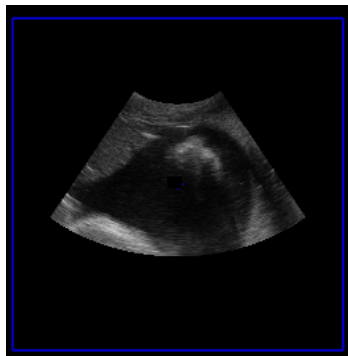


Figure 209: C mode

Slice image C

- VR mode



Figure 210: B/VR mode

Volume image.

## F.4 Render menu - switching

The Render menu contains four settings: Surface, Max, X-Ray, and Negative, as shown in Figure 211.

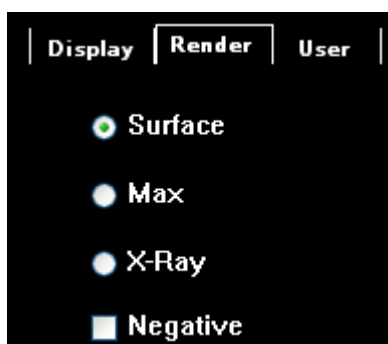


Figure 211: Render settings

## F.5 User

In the User menu, the user must define the six groups of system default parameter settings for different examination objects, import the corresponding parameters and re-save the user-defined settings. The saveable settings also include all settings in the control window, as shown in Figure 212.

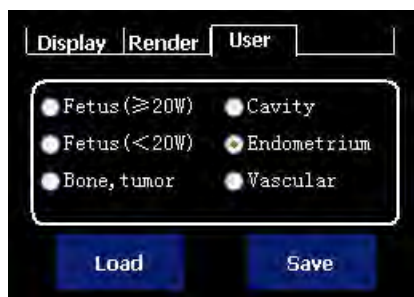


Figure 212: User settings

(1) **Save:** Set the current changed parameters to a specific option that may be used for additional parameter defaults. Let's take **Vascular** as an example.

Procedure:

- 1) Adjust the parameters properly to adapt to a vascular exam.
- 2) Use the trackball and the **Set** key to click on an item, e.g. **Vascular**.
- 3) Use the trackball and the **Set** key to click on **Save**.

(2) **Load:** Load the saved parameter values to the current state and modify the parameters that are in use for the current image.

Procedure:

- 1) Freeze the current image.
- 2) Use the trackball and the **Set** key to click on an element with preset parameters, for example **Vascular**.
- 3) Use the trackball and the **Set** key to click on **Load**.

## F.6 Display options

### F.6.1 Image Setting

The Image Setting menu contains many Parameters that can be set, including, amongst others, Colour, Smoothness, Brightness, Thred, Map, Opacity and so on, as shown in Figure 213.

- Colour

Use the trackball and click on **Set** to adjust



A large number of colours are available for selection.

- Smoothness

Use the trackball and click on **Set** to adjust



. A large number of gradations are available for selection.

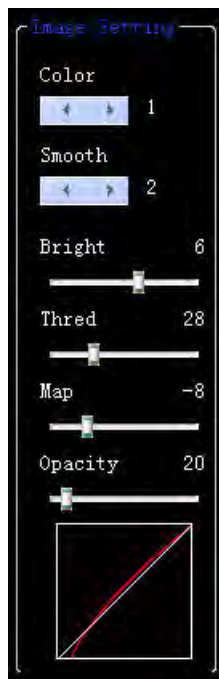


Figure 213: Image Setting

- Brightness

Use the trackball and click on **Set** to change the control and adjust

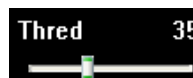


. A large number of gradations are available for selection.

- Thred

The Thred setting is used to filter out image data below certain grey levels.

Use the trackball and **Set** to change the control and adjust



. A large number of gradations are available for selection.

- Card

Use the trackball and click on **Set** to change the control and adjust



.

- Opacity

Use the trackball and click on **Set** to change the control and adjust




.

### F.6.2 Rotal (rotation)

You can choose an angle between 0°~270°. Rotation is by 90° each time.



Use the trackball and click on **Set** to adjust  .

### F.6.3 Render rate

Use the trackball and click on **Set** to adjust  . There are three options: *L*, *M* and *H*.

### F.6.4 Scan rate


Use the trackball and click on **Set** to adjust  . There are three options: *L*, *M* and *H*.

### F.6.5. Angle


The angle is adjusted with the wobble angle of the probe.

Use the trackball and click on **Set** to adjust  . Several steps are available for selection.


### F.6.6 Enhance current

When in still-image mode, move the trackball and click on **Set** over the  or click on **Gain/Auto** on the control panel and the current 3D volume is enhanced.


### F.6.7 Enhance all

When in still-image mode, move the trackball and click on **Set** over the  button and the 3D volume of the entire film is enhanced.

### F.6.8 Probe Reset

If the 4D probe wobble is obviously inclined to one side, use  to correct the probe wobble range.

### F.6.9 Reset

Use the trackball and click on **Set** to adjust  .

## F.7 Rotation control

When in Auto 3D or 4D, rotate the **Angle/Steer, Zoom and Depth/Freq/THI control** to alter the image rotation angle in directions X, Y and Z. When rotation stops, the coordinates axes are automatically hidden, as shown in Figure 214.

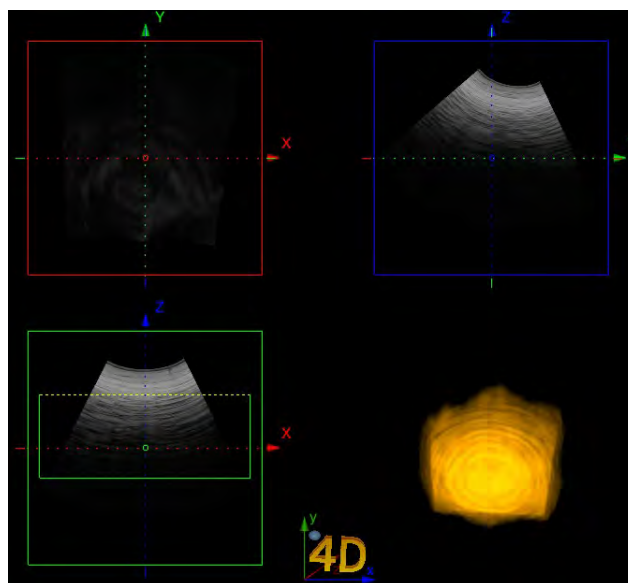


Figure 214: Rotation control

## F.8 Saving and retrieval of images

### F.8.1 Saving images

Click on **Save1** or **Save2** on the control panel to save the current image.

*NOTE: Click on Save below on the control panel to access the memory configuration screen and select Save1 or Save2 as Save film, then the system automatically saves the images in Vols format. You can change relevant parameters when opening images in Vols format.*

### F.8.2 Image retrieval

You can click on the **Set** key to activate the cursor, and move the cursor to the image preview area, then click on **Set** to select and review the desired image. Roll the trackball or turn the **Gain/Auto** control for the frame-by-frame playback of saved images.

## F.9 Exit

Move the cursor over **Exit** on the screen and select it or click on **B mode** on the control panel to exit the 4D Lite screen. Furthermore, an ROI box is displayed on the screen. Press **4D** or **Esc** again to exit 4D Lite mode and return to B mode.

# Appendix G:

## Instructions for elastography imaging (optional)

### G.1 Starting Elastography Imaging

#### G.1.1 Function - Elastography imaging

When in Freeze mode, click on the **Elas** key to switch on elastography imaging, as shown in Figure 215.

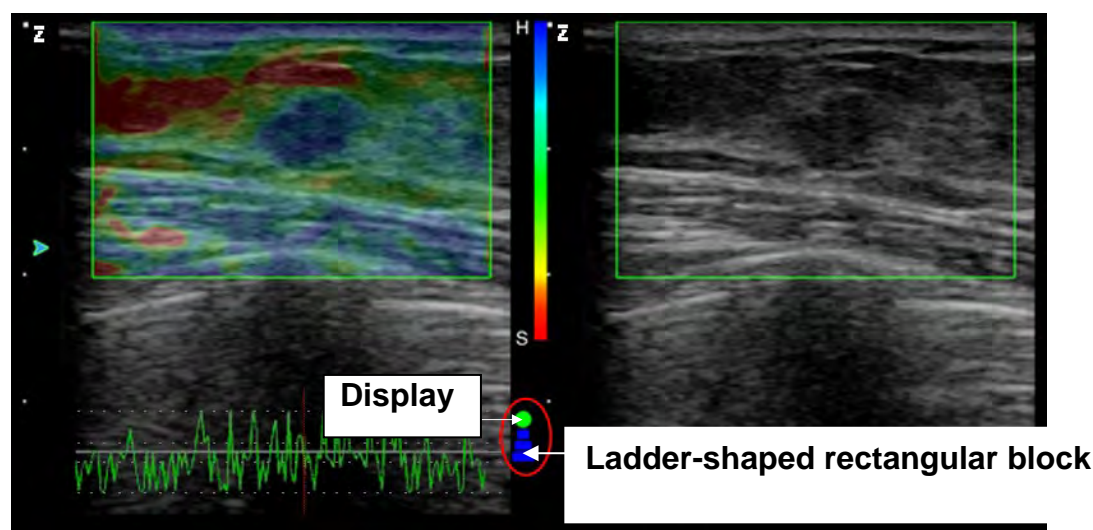


Figure 215: Elastography imaging

##### G.1.1.1 ROI box

After entering elastography imaging mode, an ROI box is displayed on the screen. Move the trackball to change the position or size of the ROI box. Click on **Update** to switch to the trackball status that controls the ROI box, i.e. to confirm that the trackball is to control the adjustment of the size and position of the ROI box.

##### G.1.1.2 Display and ladder-shaped rectangular block

An indicator and a ladder-shape rectangular block, which indicate the specific state of the current image, are displayed in the image area.

##### G.1.1.2.1 Display

If the indicator is green, the elastography imaging is authentic, as shown in Figure 215 .

If the indicator is red, the elastography imaging is inauthentic, as shown in Figure 216.

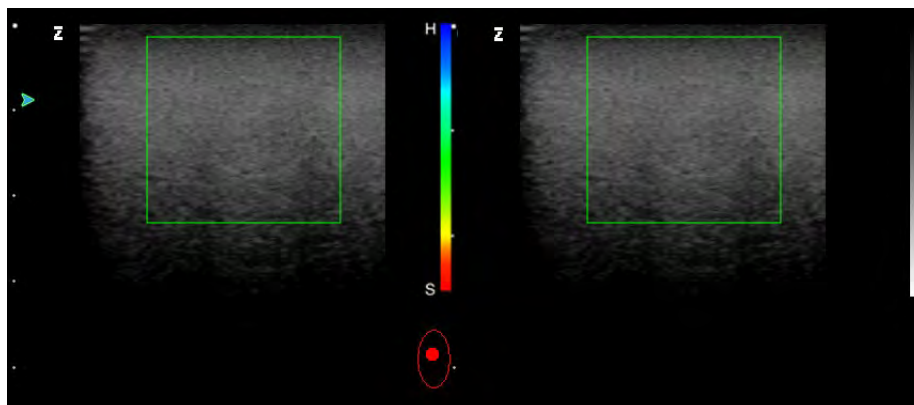


Figure 216: Inauthentic image

#### G.1.1.2.2 Ladder-shaped rectangular block

The ladder-shaped rectangular block indicates the pressure: when pressure is exerted on the probe on or in the vicinity of the body tissue, the rectangular block is blue, as shown in Figure 215 above.

If the rectangular block is on top of the indicator and shows red, it means that the probe is moving away from the human body, i.e. the “release” action after pressing, as shown in Figure 217.

If the display has no pressure indication (i.e. the ladder-shape rectangular block does not appear), this means that the probe is placed relatively still in a vertical direction to the tissue, as shown in Figure 216.

*NOTE: The pressure gauge is used to indicate the contact state between the current probe and the tissue, allowing better performance of the procedure by the user. If the probe is lying relatively still on the body part to be examined, the pressure is too great or the probe is too far away, and you cannot obtain a quality image.*

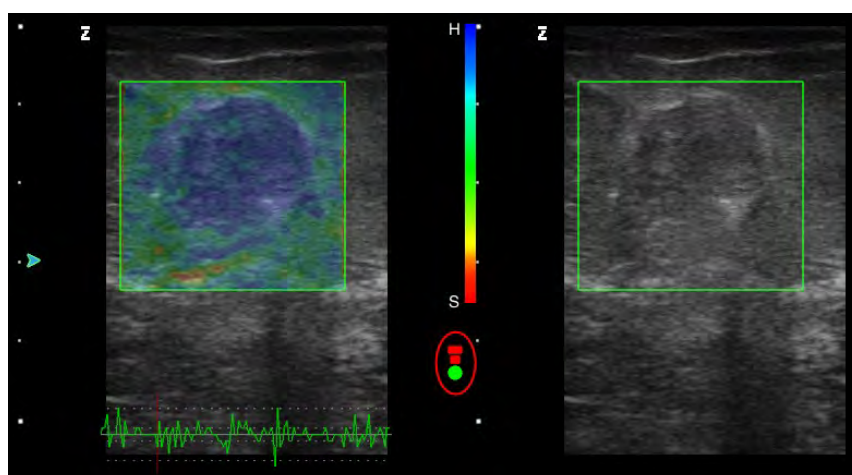


Figure 217: Authentic image

#### G.1.1.3 Screen layout of elastography imaging

The elastography imaging screen chiefly consists of two parts: the imaging area and control parameter adjust area, as shown in Figure 218.

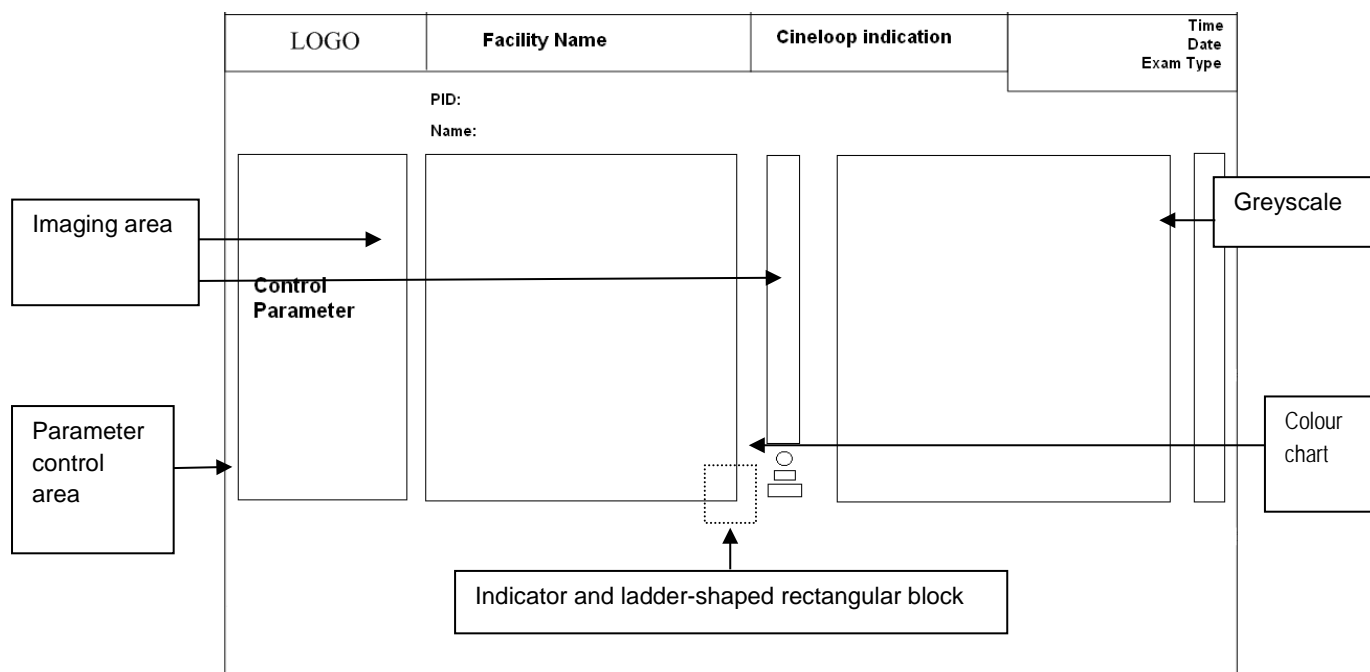


Figure 218: Elastography Imaging screen layout

## G.2 Parameter setup for elastography imaging

### G.2.1 E\_Gain

E\_Gain is used to change the gain of the signal source for elastographic images.

When in Live or Still-image mode, click on **Set** to activate the cursor when the parameter control window is displayed. Then use the trackball to move the cursor over the **E\_Gain** control parameter, which changes to blue. Then turn **Value** control to adjust the gain for elastographic images.

*NOTE: To set the parameters described below, see the procedure for E\_Gain in this section.*

### G.2.2 E\_Freq

**E-Freq** is used to change the transmission frequency for elastographic imaging.

### G.2.3 Map\_L and Map\_R

**Map\_L** and **Map\_R** are used to adjust the image mode and the map, and are shown on the left- and right-hand images.

Example 1: **Map\_R BW** means that the image displayed on the right is a black and white image.

Example 2: **Map\_L E5** means that the picture displayed on the left is an elastographic image with colour map 5.

### G.2.4 Alpha

Alpha denotes the mixed plane of the elastographic image and the B image. If Alpha is at a step between **0 and 2** and the image in elastography imaging is considered unauthentic by the system (i.e.

the indicator is red), the system recognises this automatically and hides the image, with only a black and white image displayed in the image area. For many unauthentic images, the picture flickers.

When Alpha is at any step between **3 and 5**, the unauthentic images, which occur as a result of improper operation or limited patient condition (i.e. the indicator is red), are displayed continuously together with the correct, authentic elastographic images (i.e. the indicator is green). That is, the system cannot detect whether the image is correct and hides it, and the images do not flicker.

### G.2.5 E\_DYN

Choose the appropriate value depending on the circumstances. If the image contrast is not sufficient, increase the value appropriately so as to achieve better differentiation between soft and hard tissues.

### G.2.6 E\_SMO

This is used to ensure smooth operation on elastographic images. If you increase the value, the image looks smooth and soft, but the contours of the image colour become blurrier.

### G.2.7 E\_PER

This is used to edit persistency on elastographic images. The higher the persistence, the smoother the transition between the individual images, and there is also less image noise. However, the resolution of the elastographic images is impaired. Be careful when adjusting the parameters.

## G.3 Calculation and measurement

### G.3.1 Stretch ratio

Strain ratio, also known as the strain rate ratio, refers to the ratio of the strain rate of the normal tissue and the strain rate of lesions.

Measurement:

1. When in elastography mode, click on the **Calc** key to open the Measurement menu.
2. Use the trackball to move the cursor to **Strain ratio** and click on the **Set** key. The "+" cursor appears in the image area. Now go to the Measurement state.
3. Move the cursor to one point of the focal area in the image, and then click on the **Set** key to fix a point.
4. Roll the trackball to draw a circle and ensure that the circle covers the measurement area as closely as possible. Click on the **Update** key to toggle between the two cursors and create new settings. Click on the **Set** key to confirm a circular area. Another "+" cursor appears at the same time.
5. Move the cursor onto the normal tissue around the injured area and draw a circle of the same size circle using the method described above. If the circles are not the same size, they are displayed with dashed lines. If the circles are the same size, they are displayed with solid lines. Click on the **set** key to complete the measurement, as shown in Figure 219. The system then automatically calculates the ratio, and the measurement and calculation results are displayed in the bottom-right corner of the screen.

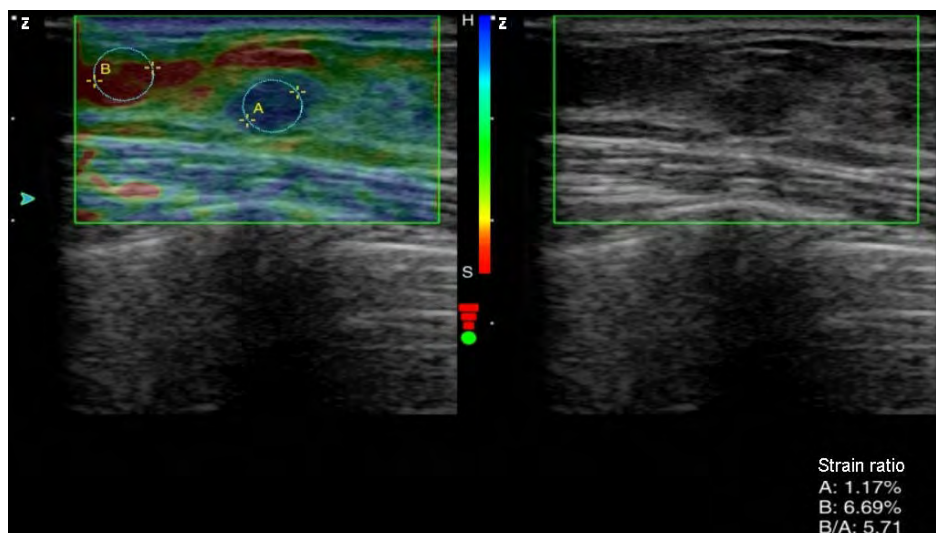


Figure 219: Measurement of the strain ratio

### G.3.2 Area ratio

Area ratio refers to the ratio between the lesion area of the image in elastography mode and the lesion area of the image in B mode.

Measurement:

1. When in elastography mode, click on the **Calc** key to open the Measurement menu.
2. Use the trackball to move the cursor to **Area ratio (t)** and click on the **Set** key. The "+" cursor appears in the image area and goes to the Measurement state.
3. Move the cursor to the lesion area of the image and click on the **Set** key to fix the measurement start point.
4. Roll the trackball to move the cursor along the edge of the target area to draw a trajectory. If you want to modify the trajectory, click on the **BkSp** key on the keyboard and delete the trajectory dot by dot or section by section.
5. To end the measurement, click on the **Set** button to complete the area measurement of the image (if a non-enclosed area is drawn, the system automatically connects the start and endpoints with a line). Another "+" cursor appears at the same time.
6. Move the cursor to the injured area in the B-mode image and record the injured area according to the above procedure, as shown in Figure 220.
7. The system automatically calculates the two area ratios, while the measurement and calculation results are shown in the bottom-right corner of the screen.



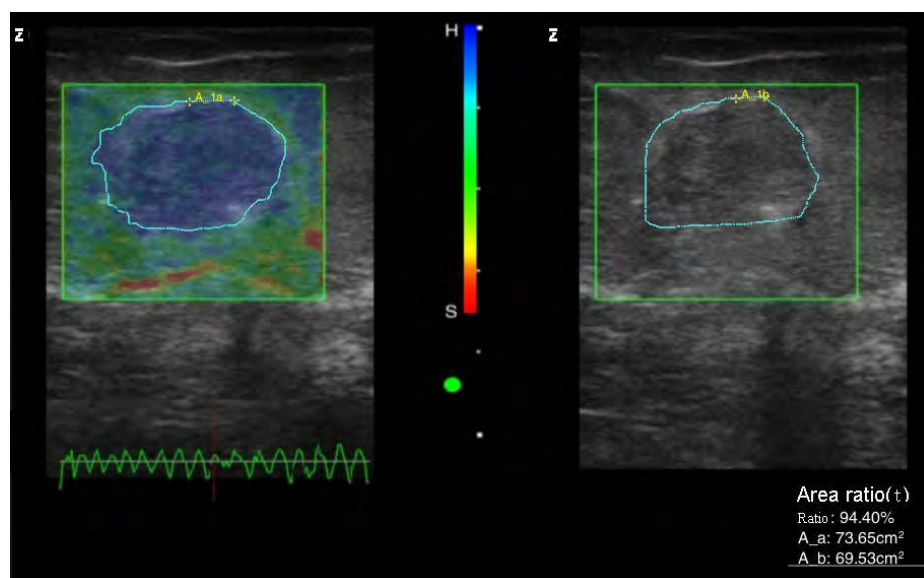


Figure 220: Elastography area ratio measurement

## G.4 Exit

Click on **Esc** or **B mode** on the control panel to exit Elastography Imaging.



# Appendix H:

## DICOM function guide (optional)

### H.1 Network connection and setup

#### H.1.1 Network connection

Before using the DICOM function, make sure the network connection between the ultrasound system and the DICOM server is working.

To use a wired network connection between the ultrasound system and the DICOM server, connect both ends of the net cable to the network ports of the ultrasound system and the DICOM server respectively (the network port of the ultrasound system is located on the interface panel. See **Chapter 3** of the operating instructions for the exact location).

To use a wireless LAN connection between the ultrasound system and the DICOM server, plug the external wireless LAN adaptor (optional, see Figure 221) into the USB port of the ultrasound system. The DICOM server must have a WLAN connection.



Figure 221: External WiFi adaptor (optional)

#### H.1.2 Network setup of the ultrasound system

Here are the steps for setting up the network:

1. Click on **Setup** on the control panel to open the main **SETUP** screen, as shown in Figure 212.
2. Select **Connection Setup** to open the **CONNECTION SETUP** screen, as shown in Figure 222.

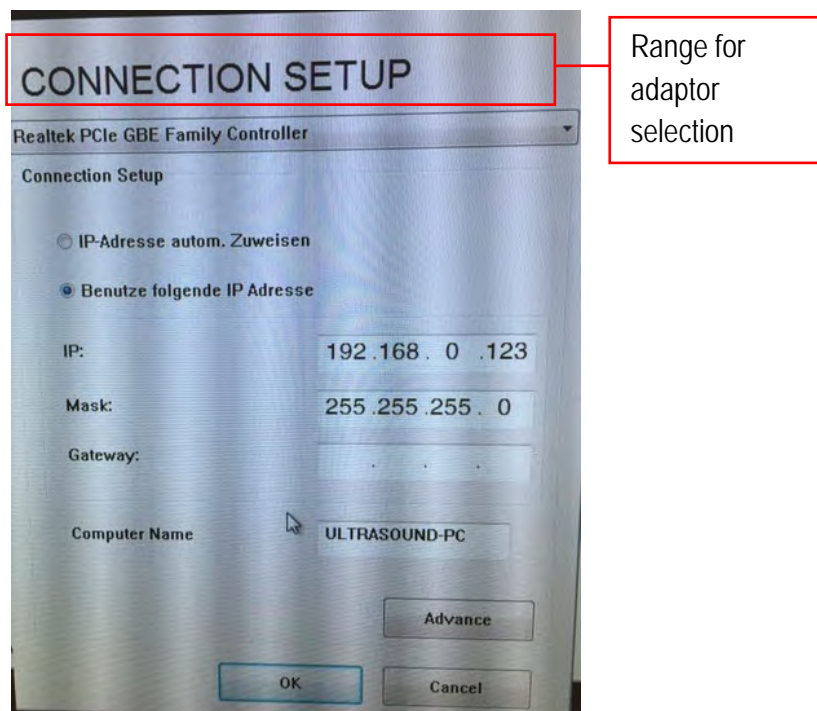


Figure 222: Connection Setup screen

3. Select the desired adaptor from the drop-down menu at the top of the screen. Some ultrasound system models may have both wireless and LAN adaptors.
4. Select **Use IP address below** and enter the IP address and interface. The IP addresses of wireless and LAN adaptors must be entered in different fields so as to avoid conflicts. To determine whether specific IP addresses are available, please contact your network administrator. After making the settings, click on **OK** to save them.

*Many network environments use IP addresses that are automatically managed and allocated by the router DHCP. If this is the case with your network environment, please select Find IP address automatically.*

### H.1.3 Network setup of the DICOM server

Interfaces are generally set to 255.255.255.0, and the IP address of the network adaptor for the connection between the DICOM server and the ultrasound system should be allocated to the same field, that is, the first three segments should be the same.

**For example:** The IP address of the ultrasound system is set to: 192.168.0.123 (LAN adaptor) and 192.168.123.1 (wireless adaptor), therefore the IP address of the DICOM server should be set to 192.168.0.XXX (LAN adaptor) and 192.168.123.XXX (wireless adaptor). The final segment can be set to any number between 1 and 255, but should not overlap with the IP address of the ultrasound system.

*NOTE: : If several DICOM servers are connected to the same ultrasound system, the final segments of the server IP addresses should not be identical. Contact your network administrator to find out the available IP addresses.*

*NOTE: The DICOM server firewall should be disabled.*

## H.2 DICOM licensing

For DICOM transmission, the DICOM function of the ultrasound system should be activated.

1. Click on **Setup** on the control panel to open the main **SETUP** screen, as shown in Figure 223.

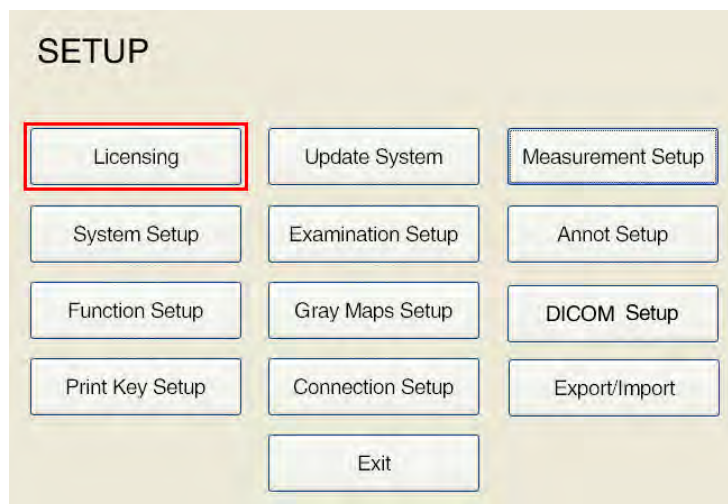


Figure 223: Main SETUP screen

2. Select **Licensing** and then **Import LicenceKey file...** to activate the DICOM licence obtained from Zimmer together with the licence key file (for detailed instructions on activating the DICOM function, see Section 5.2.1 in the Operating Manual). The licensing screen is shown in Figure 224.

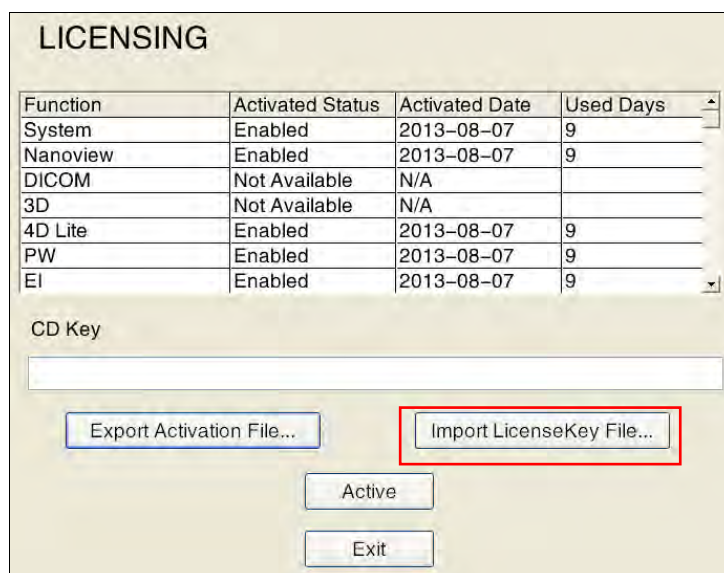


Figure 224: licensing screen

### H.3 DICOM memory configuration

1. Click on **Setup** on the ultrasound system control panel to open the main **SETUP** screen, as shown in Figure 225.



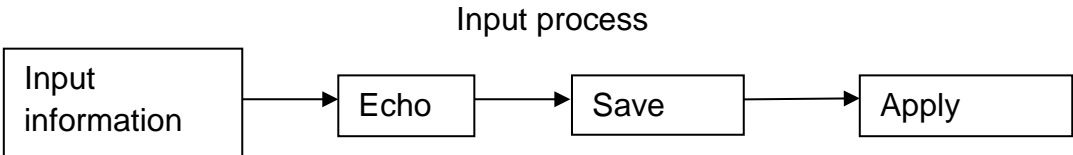
Figure 225: Main SETUP screen

2. Click on **DICOM Setup** to open the DICOM configuration screen. The default display is **Local**, as shown in Figure 226.



Figure 226: DICOM Local config screen

3. Click on the **Store** key to open the "DICOM Store Setup" screen, as shown in Figure 227. Enter the **Facility**, **AE**, **IP** and the **Port** of the DICOM server and click on **Echo**. If it works, click on **Save**. Server-related information is shown in the table below. Select the information and click on **Apply** to start transmission. For other specific operations, see the description in 5.2.11.2 *DICOM Store Server Setup* in this operating manual.



*NOTE: Please follow the description above to set up the DICOM IP address properly, otherwise the connection may fail. For details on the facility, AE, IP and port, please contact your network administrator.*

*NOTE: The compression type should match the DICOM SETUP. Otherwise, transmission is not possible.*

**DICOM SETUP**

**Store**

Facility: SIUI AE: KPSEServer IP: 192 . 168 . 0 . 36 Port: 104

**Picture**

Compression Type: JPEG Lossy Image Quality Factor: 80

**Film**

Compression Type: JPEG Lossy Image Quality Factor: 40

Ping Echo Save New Delete Apply

Apply	Facility	AE	IP	Port
✓	SIUI	KPSEServer	192.168.0.36	104

Echo 192.168.0.36:104 KPSEServer Done!

Local Store Worklist Print Exit

Figure 227: DICOM Store Setup screen

## H.4 How to use DICOM

Once the ultrasound system and DICOM server have been successfully connected, follow any of the three methods below to send files.

### H.4.1 Method 1: Send via "Archive Management - Send"

1. Click on **Smarchive** on the ultrasound system control panel to open the **Archive Management** screen, as shown in Figure 228.



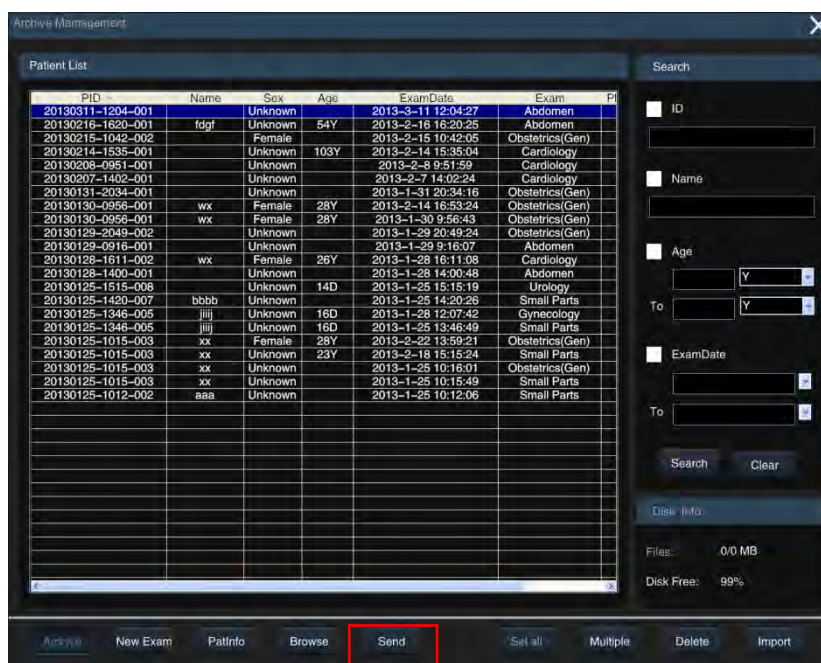


Figure 228: Archive Management screen

2. Select the patient record to be sent from the patient list, click on **Send** at the bottom of the screen to open the **Send** screen, as shown in Figure 229.
3. Check **STORESCU** and select the target server from the drop-down menu. Now determine the content and scope of the transmission. Finally, click on **Send** and all files are converted to DCM format for transmission. For the exact procedure, see Section 10.4.5.4 in this Operating Manual.

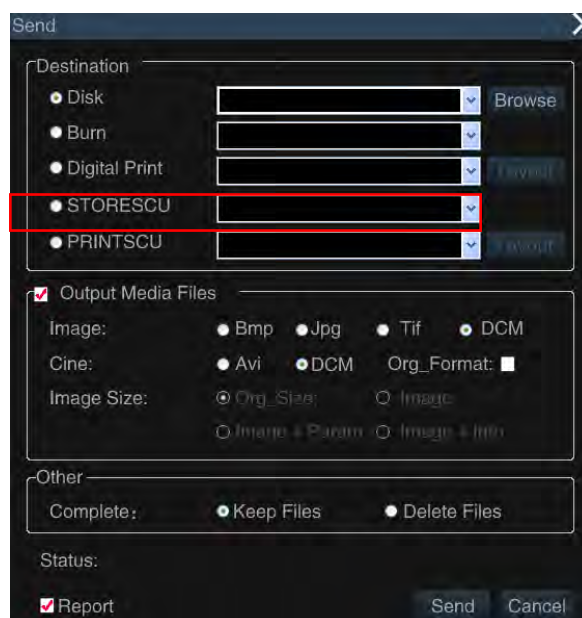


Figure 229: Archive Management - Send screen

#### H.4.2 Method 2: Send using the Print key

1. Click on **Setup** on the ultrasound system control panel to open the main **SETUP** screen, as shown in Figure 230.

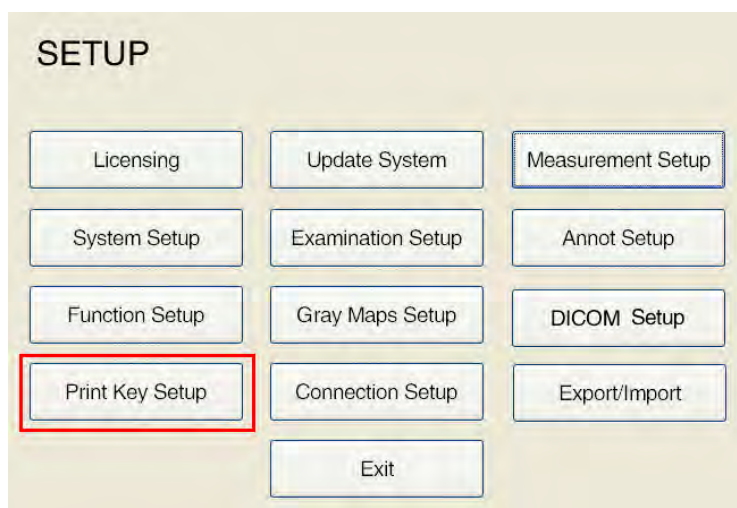


Figure 230: Main SETUP screen

- Click Print Key Setup to display the Print Key Setup screen, as shown in Figure 231.



Figure 231: Print Key Setup screen

- Select **To DICOM Storage** and click on **OK** to save the settings. If you click on the **Print** key on the operating panel after making the settings, the current image is sent to the DICOM server in DCM format.

**NOTE:** This method is used to send images only and cannot be used to send films.

#### H.4.3 Method 3: Send using the Save key

- Click on **Save as** on the ultrasound system control panel to open the **Store Setup** screen.
- Select the **DICOM server**, as shown in Figure 232. If, after creating the settings, you click on the Image save button, the image is saved on the local hard disk, while a DICOM single frame is sent to the DICOM server.

**NOTE:** This method is used to send images only, and cannot be used to send films.

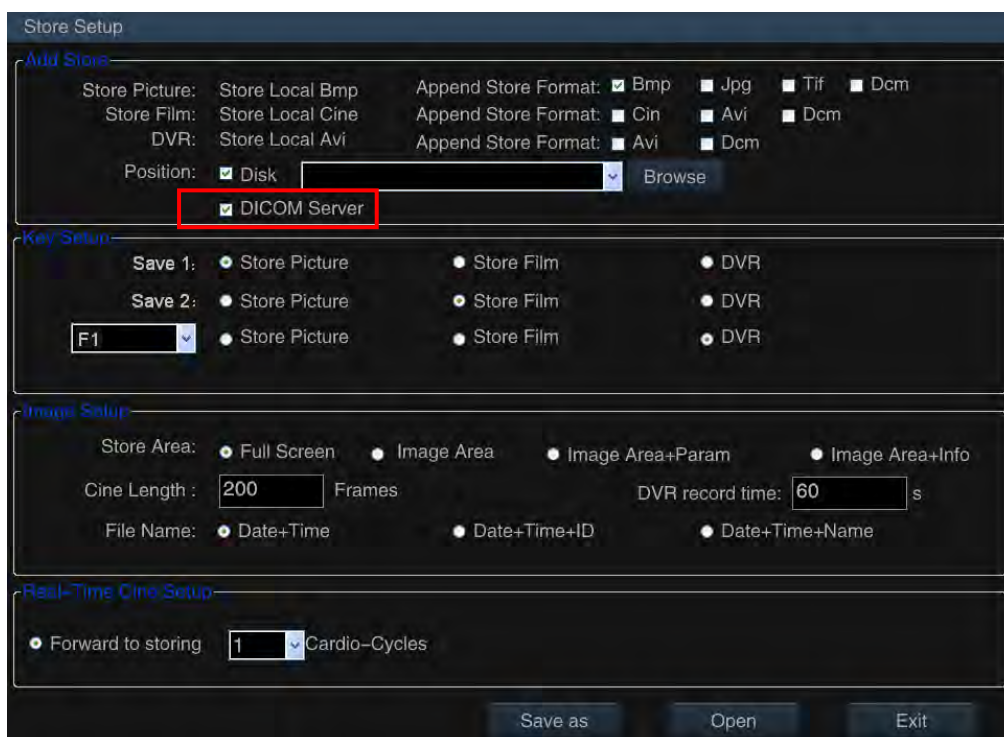


Figure 232: Store Setup screen

## H.5 DICOM Worklist settings

As described above, go to the **"Setup - DICOM Setup"** screen and click on the **Worklist** key to display the "DICOM Worklist Setup" screen, as shown in Figure 233.

You can connect and apply the connection to the DICOM worklist server on this screen. For the specific operation, see Section 5.2.11.3 DICOM Worklist Server Configuration.

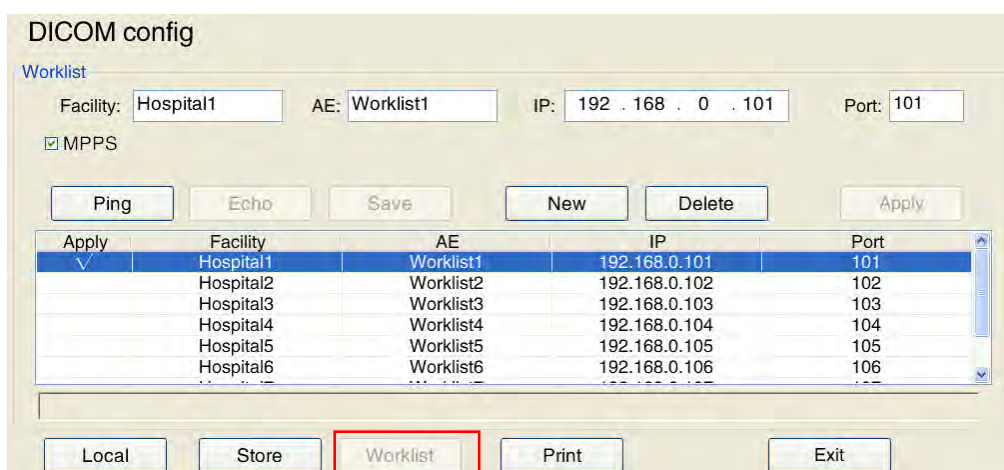


Figure 233: DICOM Worklist Setup screen

## H.6 Application of the DICOM Worklist Service

Once you have a successful connection between the ultrasound system and the DICOM server, follow the method below for the worklist service:



1. Click on **ID** on the ultrasound system control panel to open the **New Patient Info** screen, as shown in Figure 234.

Figure 234: New Patient Info screen

2. Click on **Worklist** to open the **Worklist** screen, as shown in Figure 235. This screen displays the patient list stored on the Worklist server. The user can retrieve the patient data and save it to the local archive for a new examination. For the specific procedure, see Section 7.1.

Figure 235: Worklist screen

# Appendix I:

## Instructions for 4D Pro Imaging (optional)

*NOTE: These function can only be used with a connected volume probe.*

### I.1 Activation of the 4D Pro option

#### I.1.1 4D Pro function

After connecting the volume probe, click on **4D**, and an ROI (Region of Interest) box appears.

Click on **Update** to toggle between the ROI field status. If the ROI box is surrounded by a solid line, it can be moved with the trackball, as shown in Figure 236 on the left. If the ROI field is surrounded by a dashed line its size can be adjusted according to Figure 236 on the right.

Once the position of the ROI box has been confirmed, click on **Set** to enter the 4D Pro screen and start imaging.

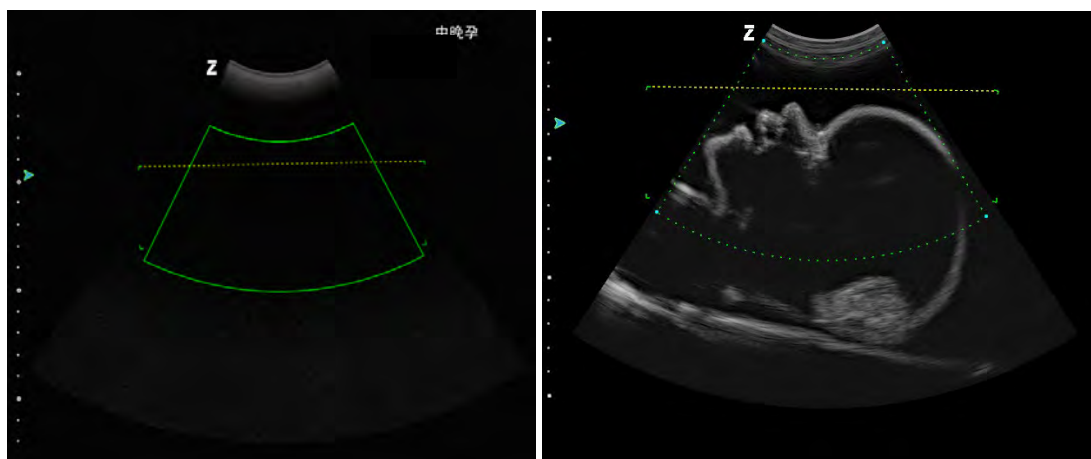


Figure 236: 4D ROI

Sector box: ROI for an ultrasound image 4D Pro image rendering in Slice B. See Figure 237.

Horizontal line: The sector area below the cut line is the 4D Pro imaging area.

*NOTE: When the examination area is scanned on the image, please note that the imaging area is located within the range, as shown in Figure 236 on the right. There are four corners on both sides of the horizontal line and the far side of the sector. The rectangular surface enclosed by the four corners is the Layer field area of the volume image.*

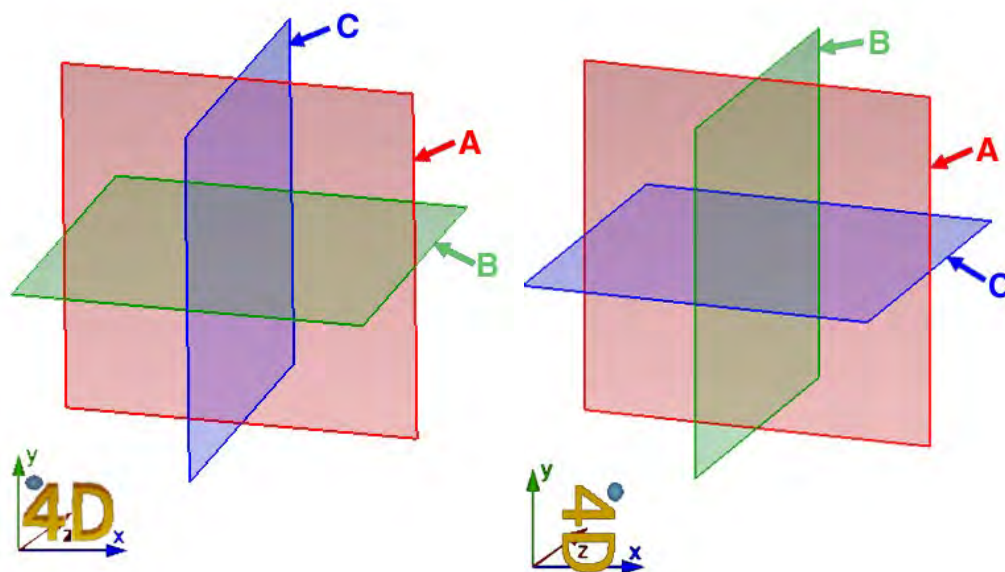


Figure 237: Diagram of layers

- (3) If the degree of rotation is  $0^\circ$  or  $180^\circ$ , the A/B/C levels correspond to Figure 237 on the left.
- (4) If the degree of rotation is  $90^\circ$  or  $270^\circ$ , the A/B/C levels correspond to the Figure 237 on the right.
- At the bottom left of the volume image is a "4D" character and coordinates with directional signs for guiding the image rotation. A small ball symbol in the upper left corner of the "4D" volume symbol indicates the direction of the probe. The direction indicated by this icon is the same as that of the probe.

### I.1.2 Auto 3D

Click on **4D** and an ROI box appears that has the same function as the 4D ROI. After selecting the ROI, click on the Auto 3D hotkey (this must be set up through **Setup - Function Setup - Hotkey Setup**, see Section 5.2.3.1). The 4D probe then automatically scans the image, enters the Auto 3D imaging interface, and creates a 3D image.

*NOTE: When in 3D still image mode, click on Freeze to return to B mode.*

## I.2 Rotation control

### I.2.1 Slice image rotation

When in 3D or 4D mode, click on **Set** to activate the cursor. Move the cursor to any level of A/B/C and click on **Set** to activate the image at this level. Turn the **Angle/Control**, **Zoom** or **Depth/Freq/THI** controls to swivel the image rotation angles in directions X, Y and Z; the images on the other levels change accordingly.

To adjust the images of another layer, follow the procedure described above; activate the picture and rotate it.

*NOTE: The lower left coordinates apply to the activated image.*

### I.2.2 Rotation of the volume image

Click and hold the **Set** key on the Volume image while moving the trackball to rotate the Volume image, as shown in Figure 238. The volumetric “4D” characters at the lower left of the image indicate the direction of image rotation.

The Volume image rotates individually, without affecting other slices.

To revert to the state before rotation, click on the **RST VR** menu on the right.

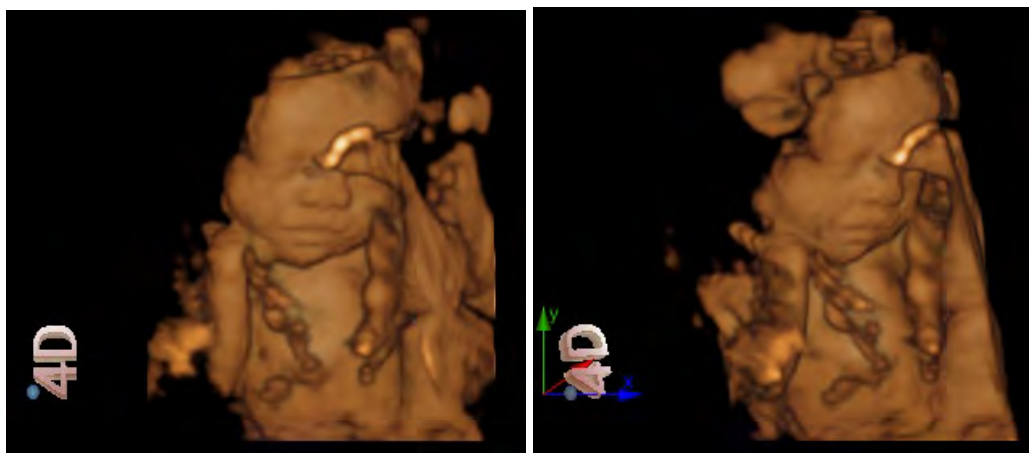


Figure 238: Rotational diagram of the Volume image

Before rotation

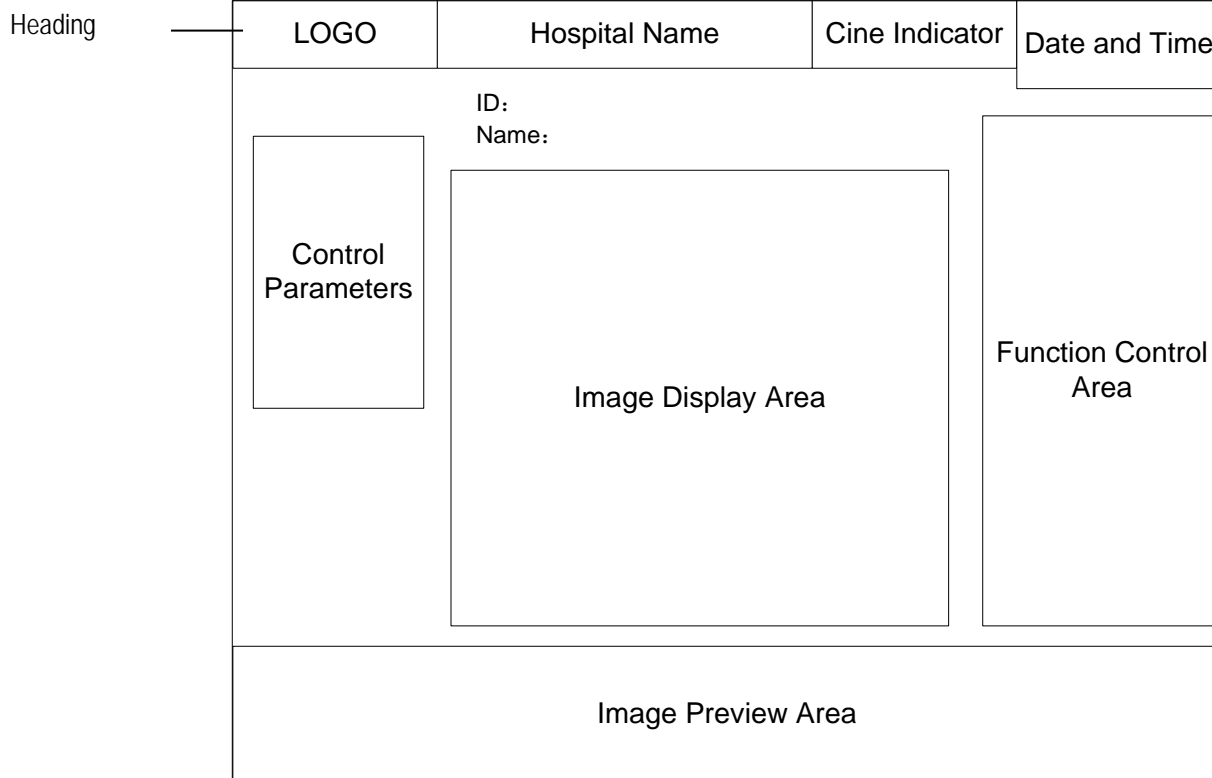
After rotation

### I.3 Layout of the 4D Pro display screen

The 4D Pro display screen consists chiefly of an image display area, an image preview area and a control parameters area. The Function Control area consists of six menu pages: **Render**, **Img Setup**, **Img Mode**, **Any Cut**, **nSlice** and **User Setup**, as shown in Figure 239.

The Function Control menu is displayed on the right of the screen. When in Live or Still-image mode, click on the **Set** button to activate the cursor, then move the cursor to a menu item, for example **Render**, and click on the **Set** key. The menu turns blue, while the corresponding content for menu setup is displayed on the left.

Figure 239: Diagram of the 4D Pro screen



*NOTE: Click on 4D to switch to Full Screen mode. The Header, the Control Parameters and the Function Control area are hidden. Click on 4D again to exit Full Screen mode.*

## I.4 Render

Toggle image display mode in the setup menu of **Render**. When in image display mode, the user can adjust the cross-section and set the image rotation angle, zoom factor, colour, smooth and "thred" in the setup menu, as shown in Figure 240.

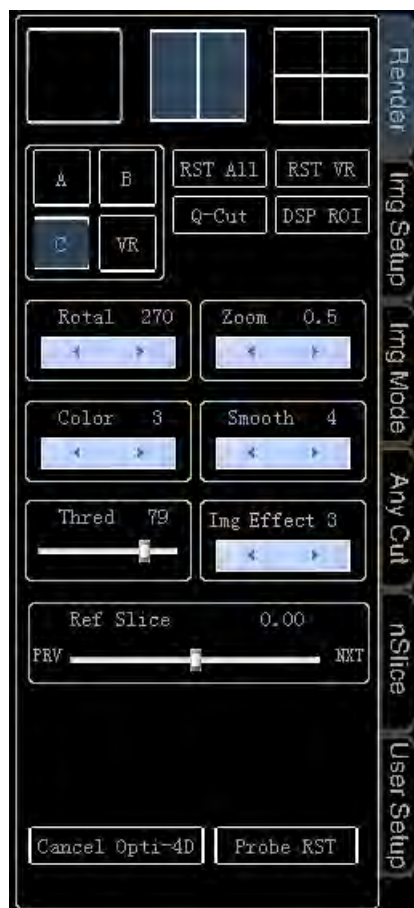


Figure 240: Render

#### I.4.1 Toggle image display mode

Three image display modes are available: single window, dual window and multi-window. Move the cursor over the image icon, as shown in Figure 241, and click on **Set** to switch to that display mode. (a) single window mode; (b) dual window mode; (c) multi-window mode.



Figure 241: Image display mode

(a) (b) (c)

When the display mode is confirmed, move the cursor to any symbol, as shown in Figure 242 and click on **Set** over A, B, C or VR to select or activate the desired level. A applies to level A, B for level B, C for level C and VR for volume image.



Figure 242: Display layers

The display modes include:

a) A/B/C/VR mode (as shown in Figure 243) with quadruple window display.

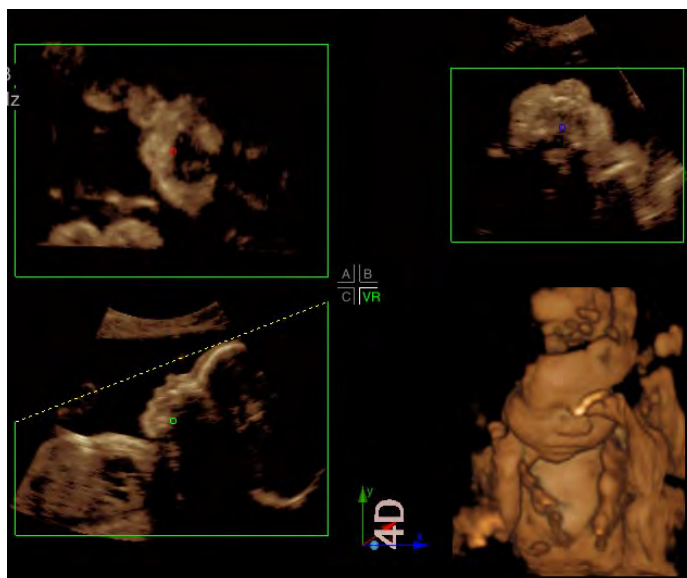


Figure 243: A/B/C/VR mode

A/B/C/VR mode consists of four areas: three plane images of levels A/B/C and one volume image.

The 

A	B
C	VR

 in the middle of the screen indicates that four images - A, B, C, VR - are being displayed, and the colour green indicates that VR is the current activated image.

In this mode you can see 2D images for each slice of the 3D volume. Click on **set** on any view from A/B/C or click on the Figure 242 icon to activate a plane image from A/B/C. Move the cursor to the centre of the image and a "+" cursor appears. Click on **Set**, move the dot with the trackball, and the other two 2D images display plane images according to the location of the dot.

b) A/VR mode is a dual-display mode.

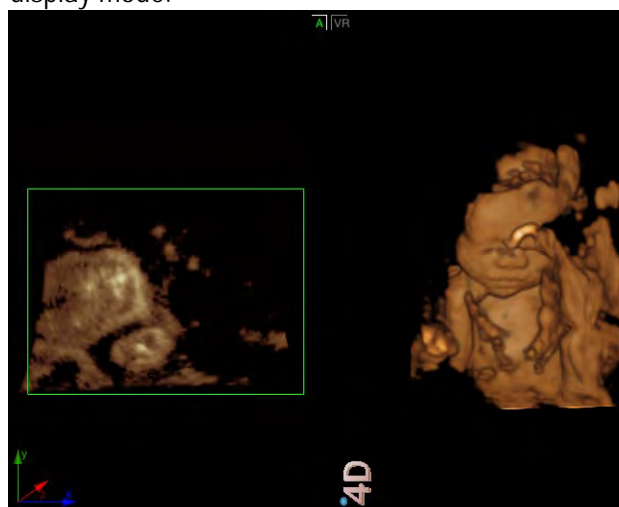


Figure 244: A/VR mode

A/VR mode consists of a section of the image in direction A and a volume image.



The **A|VR** at the top of the screen indicates that two A and VR images are displayed, and the colour green indicates that A is the current active layer.

The slice image in direction A is plane B in the same direction.

c) B/VR mode is a dual-display mode.

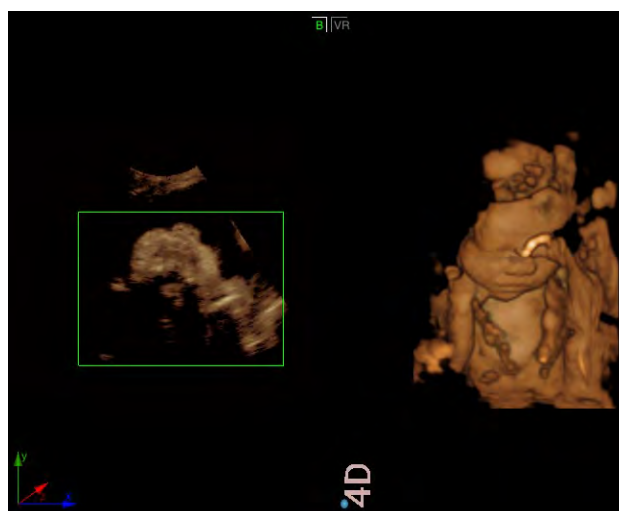


Figure 245: B/VR mode

B/VR mode consists of a section of image in direction B and a volume image.

The **B|VR** at the top of the screen indicates that two B and VR images are displayed, and the colour green indicates that B is the current active layer.

The slice image in direction B is plane B in the same direction.

d) C/VR mode is a dual-display mode.

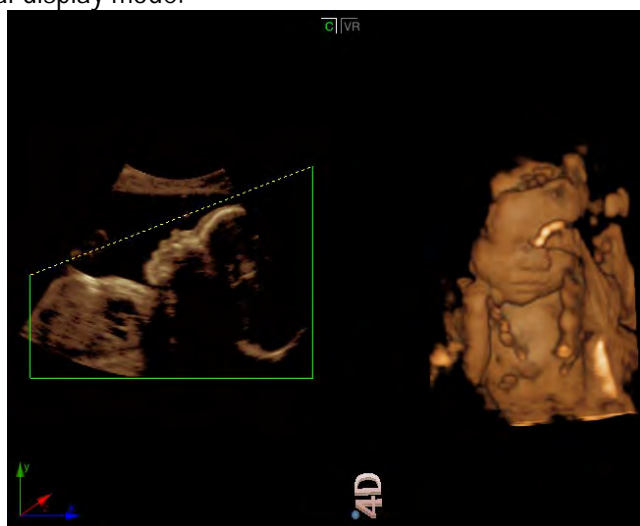



Figure 246: C/VR mode

C/VR mode consists of a section of image in direction C and a volume image.



The  at the top of the screen indicates that two C and VR images are displayed, and the colour green indicates that VR is the current active layer.

The slice image in direction C is plane B in the same direction.

e) Single-window display mode: Slice A, B, C or VR (volume image)

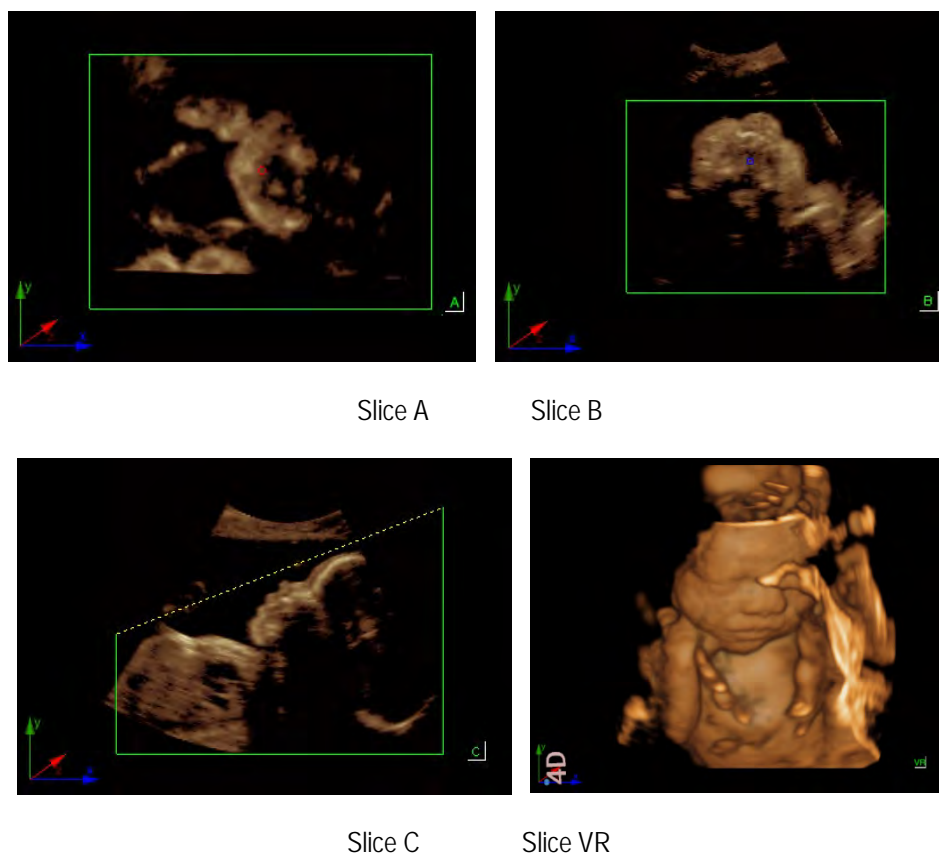


Figure 247: Single window display mode

### I.4.2 Line Cut and Q-Cut

There are two ways to adjust the box: **Line Cut** and **Q-Cut**(Curve Cut).

#### I.4.2.1 Line Cut

Enter 4D Pro imaging; a field appears on 2D slice B. The standard mode is Line Cut (*NOTE: If this is in Q-Cut mode, move the cursor to Line Cut in the Render Setup menu (press the set button to switch from Q-Cut to Line Cut)*) then turn the **control for the Value** to change the angle of the cut line.

Click on **Update** to toggle the status of the Cut field. If the cut box is surrounded by a solid line, the trackball is used to alter its position, as shown in Figure 248 on the left. If the cut box is surrounded by a dotted line, the trackball is used to alter its size, as shown in Figure 248 on the right.

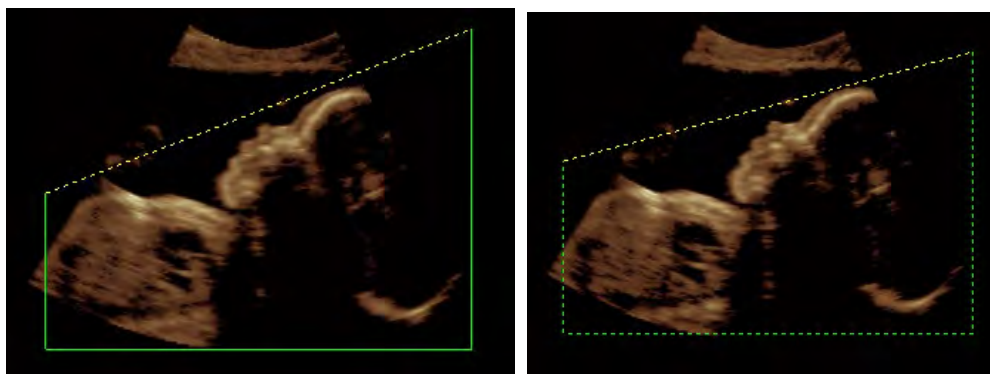


Figure 248: Line Cut

#### I.4.2.2 Q-Cut

Go into 4D Pro imaging; the standard cutting method is **Line Cut**. Move the cursor to **Q-Cut** in the **render** setup menu, click on **Set** and it toggles from **Line Cut** to **Q-Cut**. Now a yellow dot appears on the section. This is the curve control point, as shown in Figure 249.

Click on **Set** to release the cursor and use the trackball to move the cursor to the curve control point. Press and hold **Set** and move the trackball to change the curvature of the cut line, as shown in Figure 249. Press **Set** or **Esc** to exit the adjust state.

**NOTE:** When in Q-Cut mode, Q-Cut is changed to Line Cut in the Setup menu. If this is selected, the system is switched to Line Cut mode.

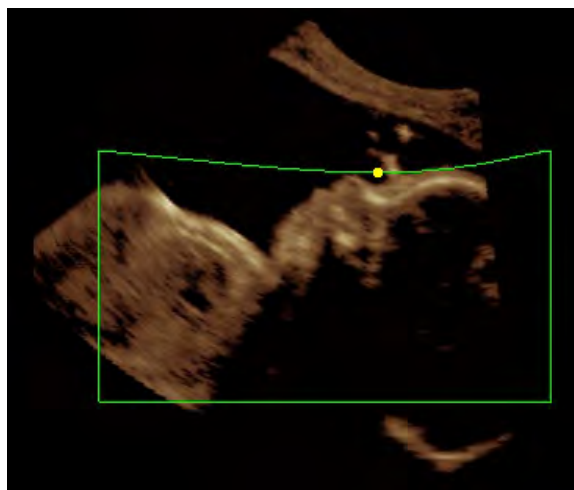


Figure 249: Q-Cut

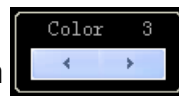
#### I.4.3 Parameter setup

- **Rotal**

Use the trackball in Live or Freeze mode and click on **Set** to select the arrow on  in the range of 0°~270°, each rotation is by 90°.


**NOTE:** This parameter setting is only available for the VR image and has no effect on the A/B/C plane.

- **Colour**

Use the trackball in Live or Still-image mode and click on **Set** to select the arrow on  and make the adjustment. A large number of colours are available for selection.

*NOTE: This parameter setting is only available for the VR image and has no effect on the A/B/C level.*

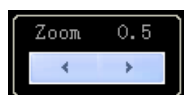
- **Smoothness**

When in Live or Freeze mode, use the trackball and click on **Set** to select the arrow on  and make the adjustment. A large number of gradations are available for selection.

*NOTE: This parameter setting is only available for the VR image and has no effect on the A/B/C level.*

- **Zoom**

When in Live or Still-image mode, use the trackball and click on **Set** to select the arrow on




and zoom the image by steps.

Set the parameter when the A/B/C view is activated. The cut section remains unchanged, but all images are enlarged proportionally. Certain changes can now be made to the captured image.

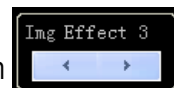
If the VR image is activated, adjust the parameter, and the cut section and VR image are magnified proportionally. Now the captured VR image remains unchanged.

- **Thred**

The Thred setting is used to filter out image data below certain grey levels. When in Live or Still-image mode, move the cursor to the slider on , press and hold **Set** and use the trackball to move the slider in steps to make the setting.

- **Image Effect**

The foetus may show various states at different stages of development, resulting in varied imaging results. If the imaging is poor, set the **"Image Effect"** properly to obtain a better image.

When in Live or Freeze mode, use the trackball and click on **Set** to select the arrow on  and make the adjustment. A large number of gradations are available for selection.

- **Ref Slice**

When level A, B or C is activated, an element, **Ref Slice**, appears in the Setup menu. Use this element to check multiple 2D slices parallel to the section.

When in Live or Still-image mode, move the cursor to the slider




down **Set** and use the trackball to move the slider in Setup.



#### I.4.4 Reset All

Use the trackball and press to click with **Set** on  to reset all images to their original state.

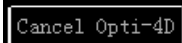
#### I.4.5 Reset VR

Use the trackball and click with **Set** on  to reset only the volume image to its original state, while leaving other images unchanged.

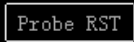
#### I.4.6 Hide ROI

Use the trackball and click on **Set** on  to hide all ROIs. The icon changes to ; click on it to display ROI.

#### I.4.7 Cancel Opti-4D

Use the trackball in Still-image mode and click with **Set** on  to cancel the optimisation of the 3D volume. The button changes to **Opti-4D**; click on it to optimise the 3D volume.

#### I.4.8 Probe Reset

Click on  if the wobble of the 4D probe is clearly tilted to one side so as to correct the range of the wobble.

### I.5 Image Setup

Use the trackball and click with **Set** on the *Img Setup menu*; the menu with the setup elements, such as Colour, Smooth, Bright, Thred and Blend, appears, as shown in Figure 250.

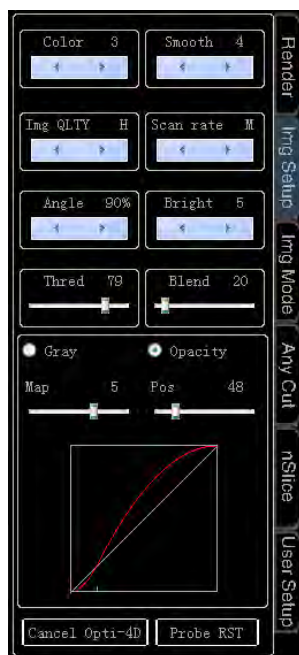


Figure 250: Image Setup menu

- Image Quality

Use the trackball in Live or Still-image mode and click with **Set** on the arrow



Choose from *L*, *M* and *H*.

- Scan Rate

**Scan rate** is used to adjust the scan rate of 4D images. Increasing the scan rate increase the displayed frame rate as the image quality decreases. Therefore, the lower the scan rate, the higher the image quality. The default scan rate is *M*.



When in Live mode, use the trackball and click with **Set** on the arrow; choose from *L*, *M* and *H*.

- Angle

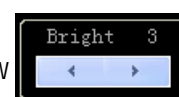
Angle adjustment is used to change the wobble angle of the probe.

Use the trackball in Live mode and click with **Set** on the arrow



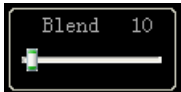
- Brightness

When in Live or Still-image mode, use the trackball and click with **Set** on the arrow



- Blend

Blend is used to adjust the degree of image blend so as to be able to discern different tissues.

When in Live or Still-image mode, move the cursor to the slider on , click and hold **Set** and use the trackball to move the slider in steps to make the setting.

- **Grey and Opacity**

Use the trackball and click on **Set** to click on **Grey** and set **Pos** (Breakpoint position); then set the **map** to change the greyscale curve to adjust the greyscale arrangement in the image.

Use the trackball and click on **Set** to click on **Opacity** and set the **Pos** (Breakpoint position); then set the **map** to change the curve and adjust the opacity arrangement in the 4D image.

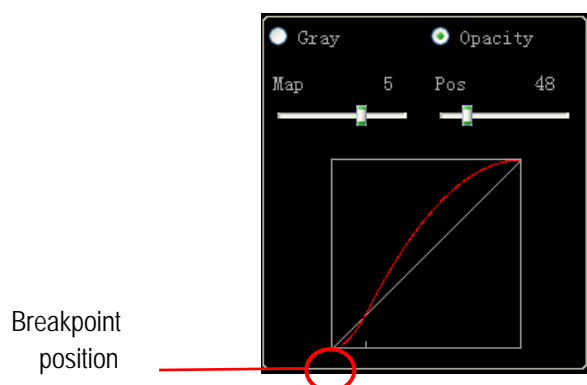


Figure 251: Greyscale and transparency adjustment

*NOTE: See Figure 239 for the setup of additional parameters in **Img Setup**.*

## I.6 Image mode

Use the trackball and click on **Set** to click on the **Img Mode** menu; now the setup items are displayed, these being: **Surface**, **Max**, **X-Ray** and **Negative**. There are four options available, as shown in Figure 252.

Different recording modes are available for the body parts to be examined. For example, select **Max** for a bone examination or select **Negative** + **Surface** for a liver, vascular or cyst examination.

*NOTE: When in Surface image recording mode, Opti 4D is opened by default. When in Max imaging mode, Opti 4D is closed by default.*

To select, use the trackball and click on **Set**.



Figure 252: Image Mode setup menu

## I.7 Any Cut

Use the trackball and click on **Set** to open the *Any Cut* menu and display all setup elements, as shown in Figure 253.

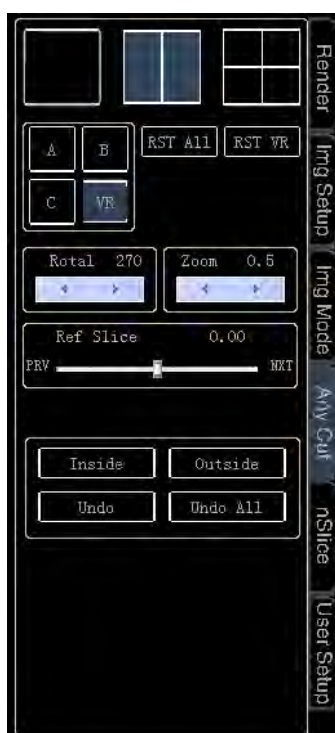


Figure 253: Any Cut menu

**NOTE:** See G.4 to change the RST, All and RST VR display modes and the Parameter Setup.

The Any Cut function includes four options: **Inside**, **Outside**, **Undo** and **Undo All**.

- a) **Inside:** To cut the inside of the selected area, click on **Set** to release the cursor; use the trackball to move the cursor over **Inside** and click on **Set** to select it. Now move the cursor to the 4D image and drag the area to be cut according to the trace measurement, as shown in Figure 254 on the left. Click on **Set** and the selected area is cut out, as shown in Figure 254 on the right.

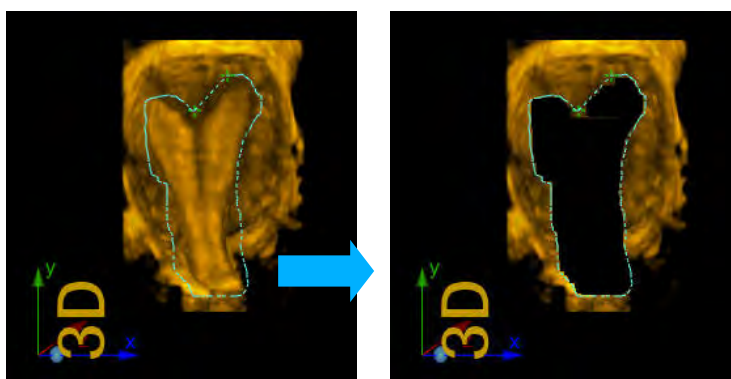


Figure 254: Cut Inside

- b) **Outside:** To retain the selected area and cut out the outside. Click on **Set** to release the cursor, use the trackball to move the cursor over **Outside** and click on **Set** to select it; move the cursor to the 4D image and drag the area to retain the **Trace** measurement, as shown in Figure 255 on the left. Click on **Set**; the outside area is cut out and the selected area is displayed on the screen, as shown in Figure 255 on the right.

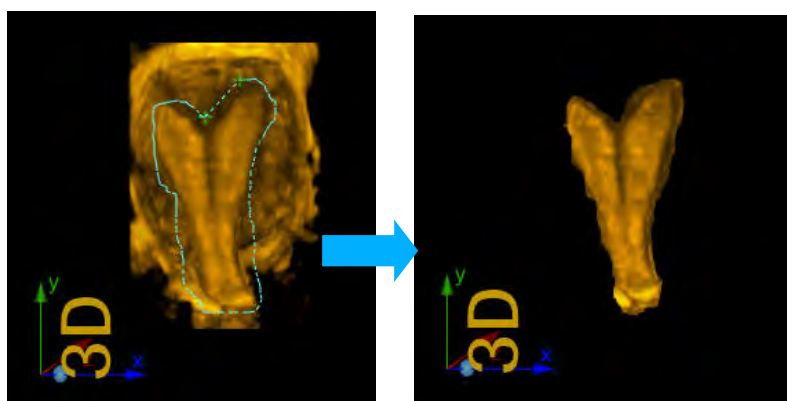


Figure 255: Outside cut

- c) **Undo:** To cancel the last step of the cutting operation. Click on **Set** to release the cursor, move the cursor to **Undo** and then click on **Set**.
- d) **Undo All:** To reverse all cutting operations. Click on **Set** to release the cursor, then move it over **Undo All** and click on **Set**.



## I.8 nSlice

The nSlice function allows the user to perform any cut on any slice image from A/B/C, zoom, and display the cut slice for diagnosis and analysis. Use the trackball and click on **Set** to open the *nSlice* menu and open nSlice mode, as shown in Figure 256.

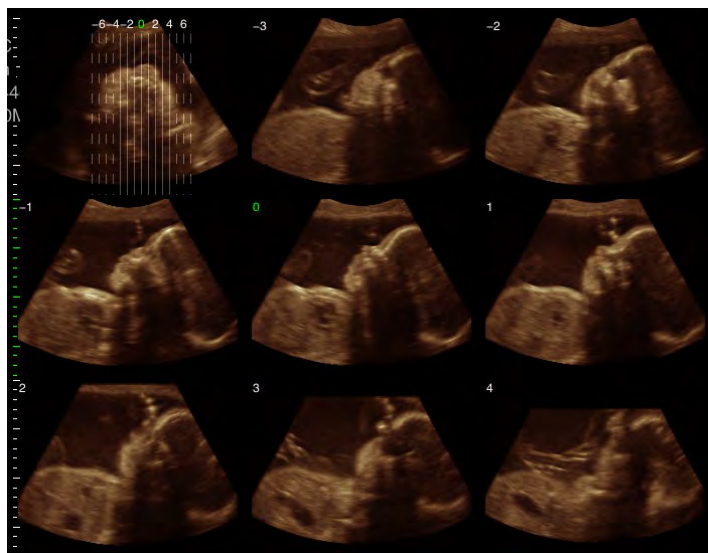


Figure 256: nSlice screen

Use the trackball and click on **Set** to open "A/B/C" on the Setup menu to confirm the cut that is to be made. The cutting of planes A and C is conducted from level B, and the cutting of plane B is conducted by plane C, with the guide image being displayed in the upper left corner of the screen.

- Planes and distance

Use the trackball and use **Set** to click on



and



. *Slices* are the number of slices, as shown in Figure 256, and the slice number is seven; *the Distance* is the distance between the slices, as shown in Figure 257. The distance in the first Figure is greater than in the second one.

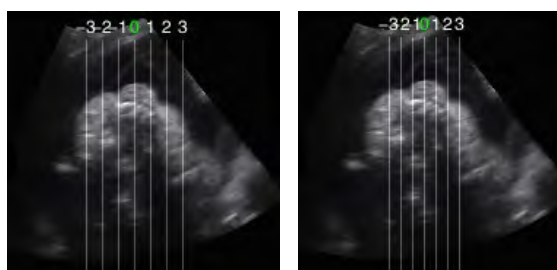
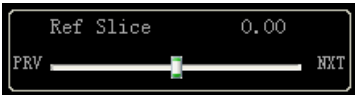


Figure 257: nSlice screen

Based on the settings, cuts are made from left to right in an outwards direction, in equal, symmetrical sections starting from the middle of the 0-line; the number of the slice is marked on the slice lines. Subsequently, the slices of the layers are displayed as shown in Figure 258 and the number is displayed in the upper-left corner of the plane.

- Ref Slice

Use the trackball and **Set** to click on , all slice lines are shifted horizontally to the right or left as shown in Figure 258, and each slice changes accordingly.

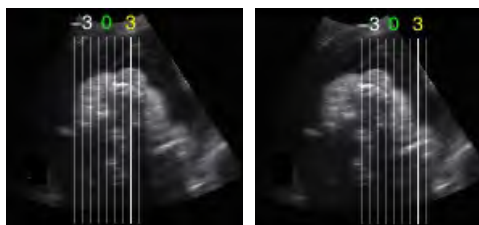




Figure 258: Ref Slice

- Full-screen display of slices

Click on **Set** to activate the cursor. Move the cursor to a plane, which is then marked with dashed lines. The slice lines are brighter when displayed, as shown in Figure 259. Click on **Set** again and the slice is displayed in full screen.

When the slice is displayed in full screen, use the trackball and click on **Set** to click on the dual window mark  in the Setup menu and enter dual display mode; the guidance image and plane are shown in parallel. Use the trackball and click on **set** to click on the multi-window marker  in the menu and return to the nSlice screen. The current displayed layout is the same as the one before opening the full screen.

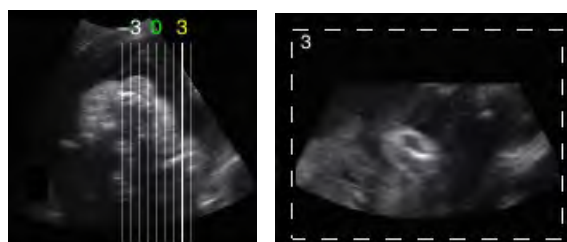




Figure 259: Select a plane

- Layout


Select the drop-down box  in the menu to set up the display layout; several layouts are available here. For example, 3×3 means display in three rows, with three images in each row.

If there are too many planes, use the trackball and press **Set** to click on the arrow on  and flip the pages and view other planes. The solid line on the guide image means that the plane image is displayed on the current screen, while this is not the case if the line is dashed.


- Image rotation

When in nSlice mode, turn the **Angle/Steer, Zoom, Depth/Freq/THI** control to change the rotation angle of the layer image in directions X, Y and Z. To restore the original angle, click on **RST All** on the Setup menu.

- Zoom

When in nSlice mode, use the trackball and **Set** to click on the  arrow, which enlarges all the images; more steps are available.

- Chroma

Use the trackball in nSlice mode and **Set** to click on , several colours are available for this purpose. This setting changes all 2D layer images.

- Opti-4D

Use the trackball in nSlice mode and **Set** to go to the **Opti-4D** menu to click and optimise all 2D layers. The button changes to **Cancel Opti-4D**. Click to cancel layer optimisation.

- Measurement

When in nSlice mode, click on **DIS** mode to switch on distance measurement or on **Calc** to open the Measurement and Calculation menu then select the desired element for measurement.

Measurement should be performed in Full Screen mode.

## I.9 User Setup

All the parameter settings described above are saved automatically and loaded when 4D mode is next entered. The user does not need to make any new settings. To restore the original setup or save the new settings, go to the **user setup**.

The system presets six groups of parameter settings for different examination objects, including: Foetus(>20W), Foetus(≤20W), Bone&Tumour, Cavity, Endometrium, Vascular.

The user can load the parameters as required or save the user-defined settings. These settings, which can be saved, include all the current parameters.

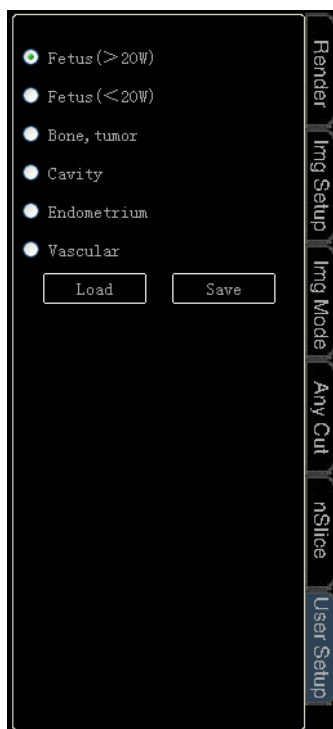


Figure 260: User Setup

(1) **Save:** To save a parameter that has been modified for a particular option and might be used for additional parameter resets. Let's take **Vascular** as an example.

Procedure:

- 1) Adjust the parameters properly to adapt to a vascular exam.
- 2) Use the trackball and **Set** to click on an element, e.g. **Vascular**.
- 3) Use the trackball and the **Set** key to click on **Save**.

(2) **Load:** To load the saved parameter values for the current state and change the parameters used for the current image.

Procedure:

- 1) Freeze the current image.
- 2) Use the trackball and **Set** to click on an element with preset parameters, e.g. **Vascular**.
- 3) Use the trackball and the **Set** key to click on **Load**.

## I.10 Save and Retrieve Images

### I.10.1 Save Images

Click on **Save1** or **Save2** on the control panel to save the current image.

*NOTE: Click on "Save as" on the control panel to enter the Save Settings screen and select Save1 or Save2 as film, then the system automatically saves the images in Vols format. You can change relevant parameters when opening images in Vols format.*

### I.10.2 Retrieval of images

You can click on **Set** to activate the cursor and move the cursor over the Image Preview area, then click on **Set** to select and review the desired image. Roll the trackball or turn the **Gain/Auto** control for the frame-by-frame playback of saved images.

## I.11 Exit

Click on **B mode** on the control panel to exit the 4D-Pro screen. Furthermore, an ROI box is displayed on the screen. Now click on **4D** or **Esc** again to exit 4D Pro mode and revert to B mode.

# SonidoSmart*Plus*

## Instructions for Use

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