S2/S2BW
Digital Color Doppler Ultrasound System
Basic Operator's Manual

SonoScape

SonoScape Co., Ltd.

P/N: 4710.00149A01

Regulatory Requirement

This product complies with regulatory requirements of the following European directive 93/42/EEC as amended by 2007/47/EC concerning medical devices.

CE 0434

NOTE:

Some options are not available on some models!

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

Revision History

Revision	Date	Description
1.0	June 2012	First edition.

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Contents

Chapter 1

Introduction

S2/S2BW is a full digital color Doppler ultrasound system for general application.
The high performances of the SonoScape S2 series stem from the advanced ultrasound doppler imaging technologies that include full digital beam-former, wide dynamic range, multi-beam processing, etc. The ergonomic user-friendly design enables user to customize the system according to the specific application, and the graphic exam icon assure you familiar with the system in few minutes.

Applications:

This general-purpose ultrasonic imaging instrument is intended for use by a qualified physician for evaluation of Fetal, Abdominal, Pediatric, Small Organ(breast, testes, thyroid), Trans-rectal, Trans-vaginal, Peripheral Vascular, Musculoskeletal (Conventional and Superficial), Cardiac(neonatal and adult), OB/Gyn and Urology.

Contraindication:

Can not be used for eye examinations or any other exam which may cause the acoustic beam pass through eye.

Chapter 2

System Safety and Maintenance

2.1 Safety Overview

This section discusses measures to ensure the safety of both the operator and patient.
To ensure the safety of both operator and patient, please read the relevant details in this chapter carefully before operating this system. Disregarding the WARNINGS or violation of relevant rules may result in personal injury or even loss of life for operator or patient.
Users should observe the following PRECAUTIONS:

- This system complies with Type BF general equipment, and the EN60601-1 standard.
- Do not modify this system in any way. Necessary modifications must be made only by the manufacturer or its designated agents.
- This system has been fully adjusted at the factory. Do not adjust any fixed adjustable parts.
- In the event of a malfunction, turn off the system immediately and inform the manufacturer or its designated agents.
- The power cable of the system should only be connected to a grounded power socket. Do not remove the ground cable for any reason.
- Only connect this system, either electronically or mechanically, with devices that comply with the EN60601-1 standard. Recheck the leakage current and other safety performance indices of the entire system to avoid potential system damage caused by leakage from a current superposition.
- The system does not incorporate any specialized protective measures in the event it is configured with high-frequency operation devices. The operator should use CAUTION in these types of applications.
- The system should be installed only by personnel authorized by the manufacturer. Do not attempt to install the system yourself.
- Only an authorized service engineer may perform maintenance.
- Only a qualified operator, or someone under qualified supervision, should use the system.
- Do not use this system in the presence of flammable substances or an explosion may occur.
- Do not continuously scan the same part of a patient or expose the patient to prolonged scanning. Doing so may harm the patient.
- When using the system for ultrasound testing, use only qualified ultrasound gel that complies with system standards.

- Do not use the switch at the back of the unit for normal shut down. Always use the power-on button in the keyboard area
- Do not unplug probe when the system is in active operation. Doing so may damage the probe. Always go to EXAM screen when need to remove the probe.
- To prevent from arm or neck injury, the operator should not stay at the same position for too long during patient scanning without taking break.
- Do not put liquid on top of the main unit.
- For proper disposal of this product, please contact our service department.

2.2 Symbol Used

Refer to **Appendix A**.

2.3 Biological Safety

This product, as with all diagnostic ultrasound equipment, should be used only for valid reasons and should be used both for the shortest period of time and at the lowest power settings necessary (**ALARA** - As Low As Reasonably Achievable) to produce diagnostically acceptable images.
The AIUM offers the following guidelines:

Clinical Safety Quoted from AIUM
Approved March 26, 1997

Diagnostic ultrasound has been in use since the late 1950s. Given its known benefits and recognized efficacy for medical diagnosis, including use during human pregnancy, the American Institute of Ultrasound in Medicine herein addresses the clinical safety of such use:

There are no confirmed biological effects on patients or instrument operators caused by exposures from present diagnostic ultrasound instruments. Although the possibility exists that such biological effects may be identified in the future, current data indicate that the benefits to patients of the prudent use of diagnostic ultrasound outweigh the risks, if any that may be present.

Heating:

Elevating tissue temperature during obstetrical examinations creates medical concerns. At the embryo development stage, the rise in temperature and the length of time exposed to heat combine to determine potential detrimental effects. Exercise CAUTION particularly during Doppler/Color exams.
The Thermal Index (TI) provides a statistical estimate of the potential temperature elevation (in centigrade) of tissue temperature. Three forms of TI are available: TIS, for soft tissue exposures; TIB, for instances when bone lies near the beam focus; and TIC, for the heating of bone situated close to the transducer.

Cavitation:

Cavitation may occur when sound passes through an area that contains a cavity, such as a gas bubble or air pocket (in the lung or intestine, for example). During the process of cavitation, the sound wave may cause the bubble to contract or resonate. This oscillation may cause the bubbles to explode and damage the tissue. The Mechanical Index (MI) has been created to help users accurately evaluate the likelihood of cavitation and the related adverse effects.

2.4 Adverse Effects and Precautions

This ultrasound system, same as all other diagnostic ultrasound system in the market, should be used only for clinically appropriate reasons, for the shorteds period of time and at power settings as low as reasonably achievable (ALARA).
The American Institute of Ultrasound in Medicine (AIUM) principle of As Low As Reasonably Achievable (ALARA) is recommended during selection of the output of ultrasound power. Try not to aim probe at the smae spot in tissue for a long period of time unless it is necessary for diagnostic purpose.
This system, as a basic imaging system with the Doppler and Color Doppler feature generates acoustic power that is below pre-enactment levels, which are generally considered to be safe for the respective applications.

2.5 Scanning Patients and Education

The Track-3 or IEC60601-2-37 output display standard allows users to share the responsibility for the safe use of this ultrasound system. Follow these usage guidelines for safe operation:

- In order to maintain proper cleanliness of the transducers, always clean them between patients.
- Always use a new disinfected sheath on all EV/ER probes during every exam.
- Continuously move the probe, rather than staying in a single spot, to avoid elevated temperatures in one part of the patient's body.
- Move probe away from the patient when not actively scanning.
- Understand the meaning of the TI, TIS, TIB, TIC, and MI output display, as well as the relationship between these parameters and the thermal/cavitation bioeffect to the tissue.
- Expose the patient to only the very lowest practical transmit power levels for the shortest possible time to achieve a satisfactory diagnosis (ALARA - As Low As Reasonably Achievable).

2.5.1 Safe Scanning Guideline

1. Ultrasound should only be used for medical diagnosis and only by trained medical personnel.
2. Diagnostic ultrasound procedures should be done only by personnel fully trained in the use of the equipment, in the interpretation of the results and images, and in the safe use of ultrasound (including education as to potential hazards).
3. Operators should understand the likely influence of the machine controls, the operating mode (e.g. B-mode, color Doppler imaging or spectral Doppler) and probe frequency on thermal and cavitation hazards.
4. Select a low setting for each new patient. Output should only be increased during the examination if penetration is still required to achieve a satisfactory result, and after the Gain control has been moved to its maximum value.
5. Maintain the shortest examination time necessary to produce a useful diagnostic result.
6. Do not hold the probe in a fixed position for any longer than is necessary. It should be removed from the patient whenever there is no need for real-time imaging or spectral Doppler acquisition. The freeze frame and Cine loop capabilities allow images to be reviewed and discussed without exposing the patient to continuous scanning.

7. Do not use endo-cavity probes if there is noticeable self heating of the probe when operating in the air. Although applicable to any probe, take particular care during trans-vaginal exams during the first eight weeks of gestation.

8. Take particular care to reduce output and minimize exposure time of an embryo or fetus when the temperature of the mother is already elevated.

9. Take particular care to reduce the risk of thermal hazard during diagnostic ultrasound when exposing: an embryo less than eight weeks after gestation; or the head, brain or spine of any fetus or neonate.

10. Operators should continually monitor the on-screen thermal index (TI) and mechanical index (MI) values and use control settings that keep these settings as low as possible while still achieving diagnostically useful results.
    In obstetric examinations, TIS (soft tissue thermal index) should be monitored during scans carried out in the first eight weeks after gestation, and TIB (bone thermal index) thereafter. In applications where the probe is very close to bone (e.g. trans-cranial applications), TIC (cranial thermal index) should be monitored.

MI> 0.3	There is a possibility of minor damage to neonatal lung or intestine. If such exposure is necessary, reduce the exposure time as much as possible.
MI> 0.7	There is a risk of cavitation if an ultrasound contrast agent containing gas micro-spheres is being used. There is a theoretical risk of cavitation without the presence of ultrasound contrast agents. The risk increases with MI values above this threshold.
TI> 0.7	The overall exposure time of an embryo or fetus should be restricted in accordance with Table 2.1 below as a reference.

TI	Maximum exposure time (minutes)
0.7	60
1.0	30
1.5	15
2.0	4
2.5	1

Table 2.1: Maximum recommended exposure times for an embryo or fetus

11. Non-diagnostic use of ultrasound equipment is not generally recommended. Examples of non-diagnostic uses of ultrasound equipment include repeated scans for operator training, equipment demonstration using normal subjects, and the production of souvenir pictures or videos of a fetus.
    For equipment of which the safety indices are displayed over their full range of values, the TI should always be less than 0.5 and the MI should always be less than 0.3. Avoid frequent repeated exposure of any subject.
    Scans in the first trimester of pregnancy should not be carried out for the sole purpose of producing souvenir videos or photographs, nor should their production involve increasing the exposure levels or extending the scan times beyond those needed for clinical purposes.

12. Diagnostic ultrasound has the potential for both false positive and false negative results. Misdiagnosis is far more dangerous than any effect that might result from the ultrasound exposure. Therefore, diagnostic ultrasound should be performed only by those with sufficient training and education.

2.5.1.1 Temperature Display for Transducers Intended for Internal Use

For transducers intended for internal applications, e.g. the intracavitary transducers, the transducer tip temperature is displayed on the screen.To protect the patient against the harm of excessive temperature, the system automatically turns off the transducer when the temperature of the transducer reaches a threshold temperature.

2.5.2 Understanding the MI/TI Display

Track-3 follows the Output Display Standard for systems which include fetal Doppler applications. The acoustic output will not be evaluated on an application-specific basis, but the global maximum de-rated Ispta must be $\leq$ 720 mW/cm2 and either the global maximum MI must be $\leq$ 1.9 or the global maximum de-rated Isppa must be $\leq$ 190 W/cm2. An exception is for ophthalmic use, in which case the TI=max (TIS_as, TIC) is not to exceed 1.0; Ispta.3 $\leq$50mW/cm2, and MI $\leq$ 0.23. Track-3 gives the user the freedom to increase the output acoustic power for a specific exam, and still limit output acoustic power within the global maximum de-rated Ispta $\leq$ 720 mW/cm2 under an Output Display Standard.
For any diagnostic ultrasonic systems, Track-3 provides an Output Indices Display Standard. The diagnostic ultrasound systems and its operator's manual contain the information regarding an ALARA (As Low As Reasonably Achievable) education program for the clinical end-user and the acoustic output indices, MI and TI.
The MI describes the likelihood of cavitation, and the TI offers the predicted maximum temperature rise in tissue as a result of the diagnostic examination.
In general, a temperature increase of 2.5oC must be present consistently at one spot for 2 hours to cause fetal abnormalities. Avoiding a local temperature rise above 1oC should ensure that no thermally induced biologic effect occurs.
When referring to the TI for potential thermal effect, a TI equal to 1 does not mean the temperature will rise 1 degree C. It only means an increased potential for thermal effects can be expected as the TI increases. A high index does not mean that bioeffects are occurring, but only that the potential exists and there is no consideration in the TI for the scan duration, so minimizing the overall scan time will reduce the potential for effects. These operator control and display features shift the safety responsibility from the manufacturer to the user. So it is very important to have the Ultrasound systems display the acoustic output indices correctly and the education of the user to interpret the value appropriately.

R_F: De-rating factor

In Situ intensity and pressure cannot currently be measured. Therefore, the acoustic power measurement is normally done in the water tank, and when soft tissue replaces water along the ultrasound path, a decrease in intensity is expected. The fractional reduction in intensity caused by attenuation is DENOTED by the de-rating factor R_F,

$$R_F = 10^{(-0.1a \cdot f \cdot z)}$$

Where a is the attenuation coefficient in dB cm-1 MHz-1, f is the transducer center frequency, and z is the distance along the beam axis between the source and the point of interest.

De-rating factor RF for the various distances and frequencies with attenuation coefficient 0.3dB cm-1 MHz-1 in homogeneous soft tissue is listed in the following table. An example is if the user uses 7.5MHz frequency, the power will be attenuated by .0750 at 5cm, or 0.3x7.5x5=-11.25dB. The De-rated Intensity is also referred to as '.3' at the end (e.g. Ispta.3).

Distance (cm)	Frequency (MHz) 1	3	5	7,5
1	0,9332	0,8128	0,7080	0,5957
2	0,8710	0,6607	0,5012	0,3548
3	0,8128	0,5370	0,3548	0,2113
4	0,7586	0,4365	0,2512	0,1259
5	0,7080	0,3548	0,1778	0,0750
6	0,6607	0,2884	0,1259	0,0447
7	0,6166	0,2344	0,0891	0,0266
8	0,5754	0,1903	0,0631	0,0158

I'=I*RF Where I' is the intensity in soft tissue, I is the time-averaged intensity measured in water.

Tissue Model

Tissue temperature elevation depends on power, tissue type, beam width, and scanning mode. Six models are developed to mimic possible clinical situations.

Thermal Models	Composition	Mode	Specification	Typ. app
1TIS	Soft tissue	Unscanned	Large aperture (>1cm^2)	Liver PW
2TIS	Soft tissue	Unscanned	Small aperture (<1cm^2)	Pencil probe
3TIS	Soft tissue	Scanned	Evaluated at surface	Breast color
4TIB	Soft tissue and bone	Scanned	Soft tissue at surface	Muscle color
5TIB	Soft tissue and bone	Unscanned	Bone at focus	Fetus head PW
6TIC	Soft tissue and bone	Unscanned / Scanned	Bone at surface	Trans cranial

Soft tissue

Describes low fat content tissue that does not contain calcifications or large gas-filled spaces.

Scanned: (auto-scan)

Refers to the steering of successive burst through the field of view, e.g. B and color mode.

UnScanned

Emission of ultrasonic pulses occurs along a single line of sight and is unchanged until the transducer is moved to a new position. For instance, the PW, CW and M mode.

TI

TI is defined as the ratio of the In Situ acoustic power (W.3) to the acoustic power required to raise tissue temperature by 1oC (Wdeg),

$$TI = W.3/Wdeg$$

Three TIs corresponding to soft tissue (TIS) for abdominal; bone (TIB) for fetal and neonatal cephalic; and cranial bone (TIC) for pediatric and adult cephalic, have been developed for applications in different exams. An estimate of the acoustic power in milliwatts necessary to produce a 1℃temperature elevation in soft tissue is:

$$Wdeg = 210/fc$$

for model 1 to 4, where fc is the center frequency in MHz.

$$Wdeg = 40 \cdot K \cdot D$$

for model 5 and 6, where K (beam shape factor) is 1.0, D is the aperture diameter in cm at the depth of interest

MI

Cavitation is more likely to occur at high pressures and low frequencies in pulse ultrasound wave in the tissue, which contains the bubble or air pocket (for instance, the lung, intestine, or scan with gas contrast agents).

The threshold under optimum conditions of pulsed ultrasound is predicted by the ratio of the peak pressure to the square root of the frequency.

$$MI = Pr'/\sqrt{fc}$$

Pr' is the de-rated (0.3) peak rare-fractional pressure in Mpa at the point where PII is the maximum, and fc is the center frequency in MHz. PII is the Pulse Intensity Integral that the total energy per unit area carried by the wave during the time duration of the pulse.
The peak rare-fractional pressure is measured in hydrophone maximum negative voltage normalized by the hydrophone calibration parameter.

Display Guideline

For different operation modes, different indices must be displayed. However, only one index needs to be shown at a time. Display is not required if maximum MI is less than 1.0 for any setting of the operating mode, or if maximum TI is less than 1.0 for any setting of the operating mode. For TI, if the TIS and TIC are both greater than 1.0, the scanners need not be capable of displaying both indices simultaneously. If the index falls below 0.4, no display is needed. The display increments are no greater than 0.2 for index value less than one and no greater than 1.0 for index values greater than one (e.g. 0.4, 0.6, 0.8, 1, 2, 3).

Display and Report in Different Mode

For B-Scan Mode

Only display and report MI, and start from 0.4 if maximum MI > 1.0

For Color Mode

Only display and report TIS or TIB and start from 0.4 if maximum TI > 1.0

For Doppler Mode

Only display and report TIS or TIB and start from 0.4 if maximum TI > 1.0

Below is a simple guideline for the user when TI exceeds one limit exposure time to 4(6-TI) minutes based on the *National Council on Radiation Protection. Exposure Criteria for Medical Diagnostic Ultrasound: I. Criteria Based on Thermal Mechanisms. Report No.113 1992*:

Operator Control Features

The user should be aware that certain operator controls may affect the acoustic output. It is recommended to use the default (or lowest) output power setting and compensate using Gain control to acquire an image. Other than the output power setting in the soft-menu, which has the most direct impact on the power; the PRF, image sector size, frame rate, depth, and focal position also slightly affect the output power. The default setting is normally around 70% of the allowable power depending on the exam icon.

2.6 Environmental Requirements

The environmental requirements for using the ultrasound system are listed below.

Operation	
Temperature:	10℃ ~ 40℃
Relative Humidity:	30%~75%, no condensation
Atmospheric Pressure:	700~1060hPa

Transport & Storage	
Temperature:	-20℃ ~ 55℃
Relative Humidity:	20% ~90 %, no condensation
Atmospheric Pressure:	700~1060hPa

Strong radiation sources or powerful electromagnetic waves (e.g. electromagnetic waves from radio broadcasting) may result in image ghosting or noise. The system should be isolated from such radiation sources or

electromagnetic waves.

2.7 Electrical Requirements

110~240 V AC, 2.7-1.2A, 50/60Hz

Main unit voltage

Maintain a fluctuation range of less than ±10% or the system may be damaged.

Grounding

Before connecting the power cable, connect the accompanying earth protection cable to a specialized grounding device.

Note:

- Please ensure that the power requirements are satisfied. Only use power lines that meet the system guidelines—failure to follow these procedures may result in system damage.

Caution for using AC adapter:

- Use the AC adapter approved by SonoScape only.
- AC adapter can get very hot if being used in poorly ventilated area. Maintain good ventilation for heat dissipation. Do not put any items on the AC adapter or the power cable.
- Make sure that the power cable is not entangled and avoid step on the cable.
- Do not the adapter in its carrying case.
- To ensure proper grounding, connect the AC adapter to a receptacle/outlet marked with "hospital grade".

Caution for using battery:

- To assure the best performance of the system, we recommend to replace the battery pack every three years.
- This battery is designed to be an integral part of the ultrasound system. Attempting do-it-yourself removal of the battery not only voids the warranty but also violates the regulations, and is discouraged by IEC 60601-1.
- Do not short the conductive parts of the battery.
- The temperature of the battery can be high right after discharging completes. To protect it from overheat damage, it will not be charged immediately after being connected to an AC supply.
- During long time storage of the battery, a discharge-charge cycle should be performed in every 3 to 6 months.
- Do not discard the battery in fire.
- Do not remove the battery pack from the system.
- Do not put foreign metal or other conductive parts inside the system to avoid electrical short.
- Protect the battery from rain and do not immerse the battery in water.
- Do not place the system at unstable position and use the system.
- Do not heat or burn the battery.
- Do not use the system near any source which produces significant amount of heat, such as fire and heater.
- Do not charge or discharge the battery in direct sunlight.
- Do not destroy or disassemble the battery; Do not solder the battery.
- This battery pack should only be used with the ultrasound system which it has been designed for.
- Do not use the battery in strong electric field.

For more information about the AC adapter and the battery, read Section 4.2.

2.8 Electrical Safety

Only trained health professionals should operate this system. This equipment complies with the following standards:

- The equipment conforms with the following regulations for electrical safety,
  - IEC 60601-1, Medical electrical equipment Part 1: General requirements for basic safety and essential performance, Class I, BF, continuous operation
  - IEC 60601-2-37, Medical Electrical Equipment Part 2-37: Particular Requirements for the Basic Safety and Essential Performance of Ultrasonic Medical Diagnostic and Monitoring Equipment
- The equipment conforms with the following EMC/EMI standards: IEC60601-1-2, Class A (CE)
- Degrees of protection against harmful liquid:

For the main system:	IPX0
For the transducer:	IPX7, from the acoustic window to the junction line (**Figure 13.1**); and IPX1 for other parts that may contact with the patient, excluding the transducer connector.

For maximum safety, adhere to these guidelines:

- Proper grounding of the system is critical to avoid electrical shock. For protection, ground the system with a three-conductor cable, and plug the system into a hospital-grade receptacle or outlet.
- Do not remove or entangle the grounding wire.
- Do not remove the protective covers of the system. These covers protect users from hazardous voltages. Only authorized service technicians can make replacements of the parts inside the system.
- Never use this system while inflammable gas is present!
- Devices must be powered from a receptacle marked "hospital grade" before being connected to the system directly. In case "hospital grade" receptacles are not available, use isolation transformers instead.

Use of foot switch:

The foot switch paddle must not be used in the operating room.

Take the following precautions when an optional printer is connected to your ultrasound system:

1. When the ultrasound system and the optional printer are connected to the mains outlets, the outlets must have the protective grounding conductor.
2. The accessories provided with the ultrasound system are safe to operate in patient environment. Other accessories or devices not listed in the supported accessories' list (Contact the manufacturer for the updated and complete list of accessories.) must not be used.
3. Installation of the system must be performed by the service engineer authorized by SonoScape.

2.9 Transducer Maintenance

The transducers/probes provided with the system are durable and have reliable performance. These precision instruments should be inspected daily and handled with care. Please observe the following PRECAUTIONS:

- Do not drop the transducer on the hard surface. This can damage the transducer elements and compromise the electrical safety of the transducer.
- Avoid kinking or pinching the transducer cable.
- Use only approved ultrasound coupling gels.
- Follow the instructions for cleaning and disinfecting the probes.

Disinfecting Surface Transducers

- Disconnect the transducer from the system.
- Wipe all surfaces with isopropyl alcohol solution and air dry.
- Clean all surfaces of the probe and cable with soft cloth.
- Allow the transducer to air dry prior to storage or further use.

The following statement from AIUM outlines instructions for cleaning the intracavitary transducer:

Guidelines for Cleaning and Preparing Endocavitary Ultrasound Transducers between Patients from AIUM
Approved June 4, 2003

The purpose of this document is to provide guidance regarding the cleaning and disinfection of transvaginal and transrectal ultrasound probes.

All sterilization/disinfection represents a statistical reduction in the number of microbes present on a surface. Meticulous cleaning of the instrument is the essential key to an initial reduction of the microbial/organic load by at least 99%. This cleaning is followed by a disinfecting procedure to ensure a high degree of protection from infectious disease transmission, even if a disposable barrier covers the instrument during use.

Medical instruments fall into different categories with respect to potential for infection transmission. The most critical level of instruments are those that are intended to penetrate skin or mucous membranes. These require sterilization. Less critical instruments (often called “semi-critical” instruments) that simply come into contact with mucous membranes such as fiber optic endoscopes require high-level disinfection rather than sterilization.

Although endocavitary ultrasound probes might be considered even less critical instruments because they are routinely protected by single use disposable probe covers, leakage rates of 0.9% - 2% for condoms and 8%-81% for commercial probe covers have been observed in recent studies. For maximum safety, one should therefore perform high-level disinfection of the probe between each use and use a probe cover or condom as an aid in keeping the probe clean.

There are four generally recognized categories of disinfection and sterilization.

Sterilization is the complete elimination of all forms or microbial life including spores and viruses.

Disinfection, the selective removal of microbial life, is divided into three classes:

- High-Level Disinfection -Destruction/removal of all microorganisms except bacterial spores.
- Mid-Level Disinfection - Inactivation of Mycobacterium Tuberculosis, bacteria, most viruses, fungi, and some bacterial spores.
- Low-Level Disinfection - Destruction of most bacteria, some viruses and some fungi. Low-level disinfection will not necessarily inactivate Mycobacterium Tuberculosis or bacterial spores.

The following specific recommendations are made for the use of intracavitary ultrasound transducers. Users should also review the Centers for Disease Control and Prevention document on sterilization and disinfection of medical devices to be certain that their procedures conform to the CDC principles for disinfection of patient care equipment.

1. CLEANING

- After removing the probe cover, use flowing water to remove any residual from the probe.
- Use a damp gauze pad or other soft cloth and a small amount of mild non-abrasive soap water to thoroughly clean the transducer.
- Use a soft bristle brush for cleaning if the residue has dried onto the probe surface. Rinse the transducer thoroughly with running water, and allow to air dry or dry with a soft cloth.

2. DISINFECTION

1) Use liquid chemical germicide for disinfection. In order for the germicide to be effective, clean the probe thoroughly to remove all visible residues.
2) Using high level liquid disinfectant will ensure further statistical reduction in microbial load. Because of the potential invisible breakage of the probe sheath, additional high level disinfection with chemical germicide is necessary.

Examples of such high level disinfectants include but are not limited to:

- 2.4-3.2% glutaraldehyde products (a variety of commercially available products including “Cidex,” “Metricide,” or “Procide”).
- Non-glutaraldehyde agents including Cidex OPA (o-phthalaldehyde), Cidex PA (hydrogen peroxide & peroxyacetic acid).- 7.5% Hydrogen Peroxide solution.
- Common household bleach (5.25% sodium hypochlorite) diluted to yield 500 parts per million chlorine (10 cc in one liter of tap water). This agent is effective, but generally not recommended by probe manufacturers because it can damage metal and plastic parts.
- Other agents such as quaternary ammonium compounds are not considered high level disinfectants and should not be used. Isopropanol is not a high level disinfectant when used as a wipe and probe manufacturers generally do not recommend soaking probes in the liquid.
- The FDA has published a list of approved sterilant and high level disinfectants for use in processing reusable medical and dental devices. That list can be consulted to find agents that may be useful for probe disinfection.

3) You should consult the manufacturer’s instructions to prepare, store and use the disinfectant.
   Consult SonoScape if you are not sure about the compatibility of these agents with the probes. Many of the chemical disinfectants are potentially toxic and many require adequate precautions, such as proper ventilation, personal protective devices (gloves, face/eye protection, etc.) and rinsing before reusing the probe.

3. PROTECTIVE SHEATHS

1) The transducer should be protected with a probe sheath. If condoms are used, they should be non-lubricated and non-medicated.
2) Practitioners should be aware that condoms have been shown to be less prone to leakage than commercial probe covers, and have a six-fold enhanced AQL (acceptable quality level) when compared to standard examination gloves. They have an AQL equal to that of surgical gloves.

3) Users should be aware of latex-sensitivity issues and have available nonlatex-containing barriers.

4. ASEPTIC TECHNIQUE

1. For the protection of the patient and the health care worker, all endocavitary examinations should be performed by the operator wearing gloves properly throughout the ultrasound diagnostic process.
2. Gloves should be used to remove the condom or other barrier from the transducer and to wash the transducer as mentioned above.
3. As the probe sheath is removed, care should be taken not to contaminate the probe with secretions from the patient. At the completion of the procedure, hands should be thoroughly washed with soap and water.

✍ Note:

- Obvious rupture in condom integrity does NOT require modification of this protocol.
- These guidelines take into account possible probe contamination due to ruptures in the barrier sheath.
- In summary, high level disinfection of the endocavity probes should be carried out routinely. Protective barrier is required for every examination to avoid potential disease transmission.
- For all chemical disinfectants, PRECAUTIONS must be taken to protect workers and patients from the toxicity of the disinfectant.

Reference:

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⚠ Attention!

- These transducers are not designed to withstand thermal disinfection. Exposure to temperatures higher than 66°C (150°F) will cause permanent damage.
- Do not immerse the probe beyond its binding line.
- To clean the transducer, refer to the relevant instructions in the probe's manual.

2.10 System Transportation

2.10.1 Moving the System

When moving or transporting the system, take the PRECAUTIONS listed below.
Before moving the system:

1. Completely power off the system.
2. Unplug the power cord.
3. Disconnect all cables attached to the system.
4. To prevent damaging the power cord, do not pull, stretch or bend it excessively.
5. Store the probes in their carrying cases or wrap them in soft cloth or foam to prevent damage.
6. Store gel and other essential accessories in the appropriate storage cases.

2.10.2 Transporting the System

Use extra care when transporting the system in a vehicle. After preparing the system as described above, take the following additional PRECAUTIONS:

- Before transporting, prepare and pack the system in the original package.
- Secure the system firmly with straps (or as directed otherwise) within the vehicle to prevent excessive vibrations during transport.
- Drive carefully to prevent vibration damage. Avoid unpaved roads, excessive speeds.

After being transported, the system requires some time to reach thermal equilibrium with the environment. Decrease or increase this time period (4 to 5 hours for 10°C difference) according to the initial temperature difference of the system and the environment.

Chapter 3

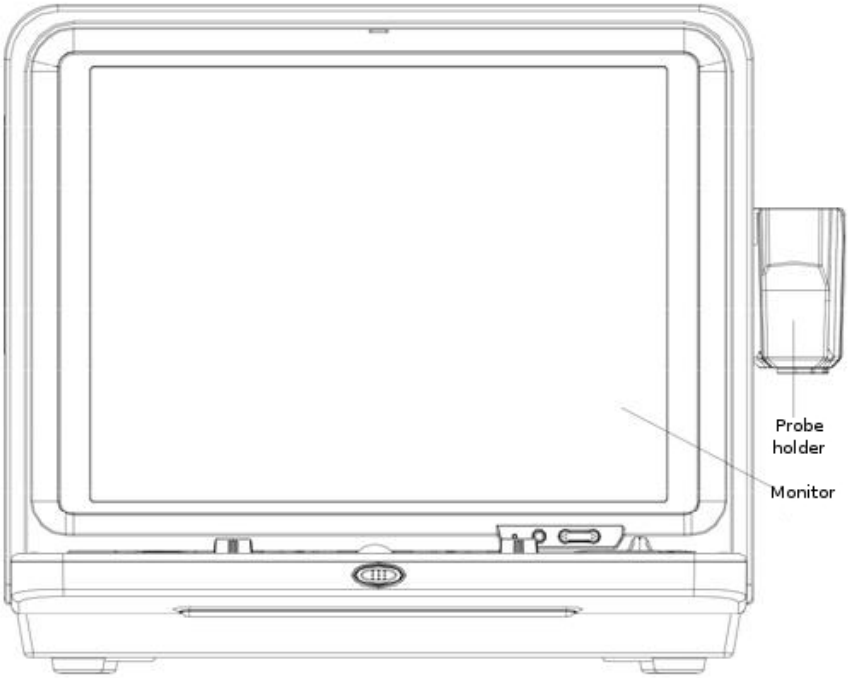
System Specifications

3.1 Product introduction

S2/S2BW is a full digital color Doppler ultrasound system for general application.
Thanks to the unique full digital construction, VLSI and computer platform based on Linux system, S2/S2BW can maximize the use of its transducers and enhance the diagnosis effect; besides high performance, it is also flexible and lightweight.
Users can use the default mode to have quick diagnosis instead of adjusting large number of complex and professional parameters. For advanced users, the system also opened the bottom of the adjustable menu allows professional users to change various image settings and different parameters according to their needs.
The system equips high performance large screen medical professional LCD display, it has clear definition resolution which other system do not have.
Because the system is based on PC platform, system software can easily optimize the preset parameters in variety inspection mode; meanwhile it has many optional software upgrade choices in order to enhance the cost-effective of the system and maintain competitive in technology at the same time.

3.2 Base System

3.2.1 Front View



3.2.2 Side View

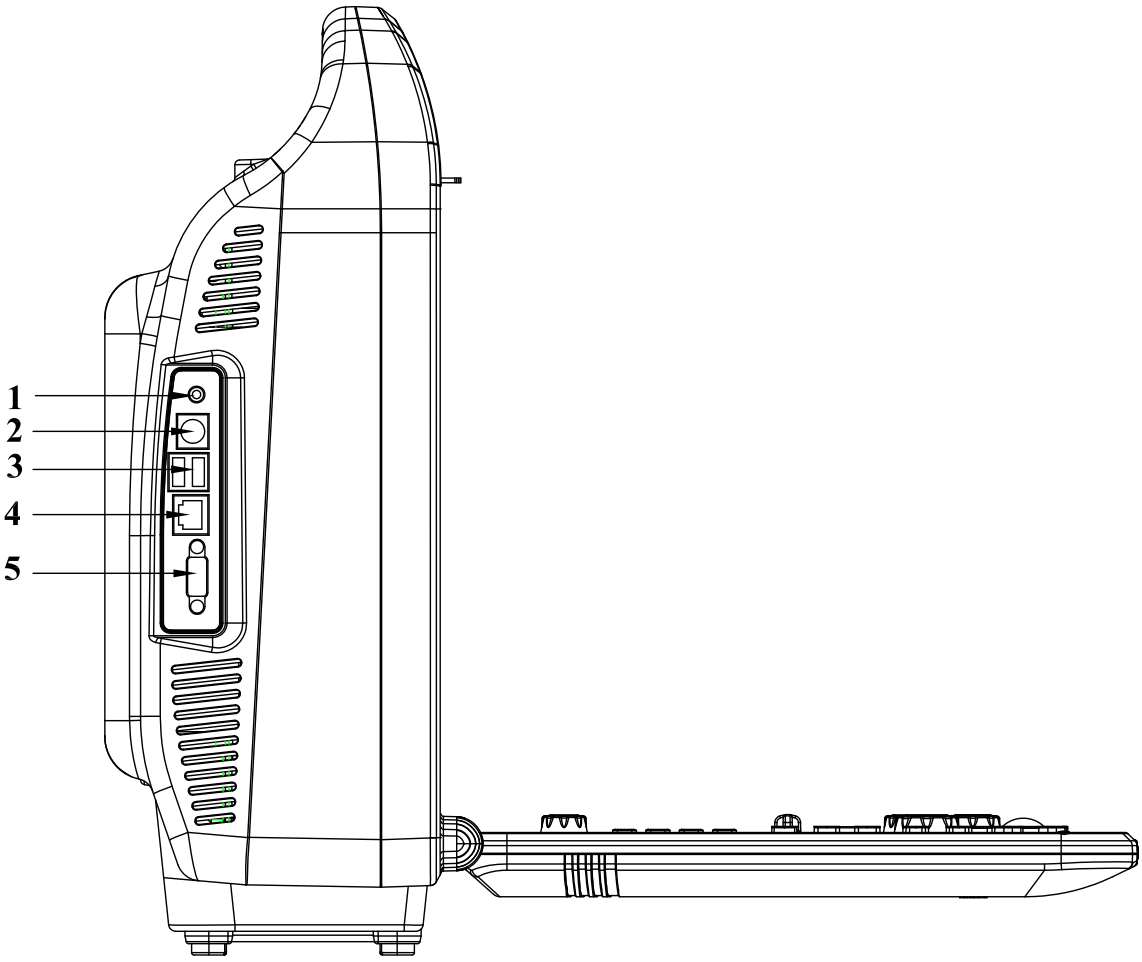


Figure 3.1: Side view

1 Audio port
2 Video port
3 USB port
4 DICOM port
5 VGA port

3.2.3 Rear View

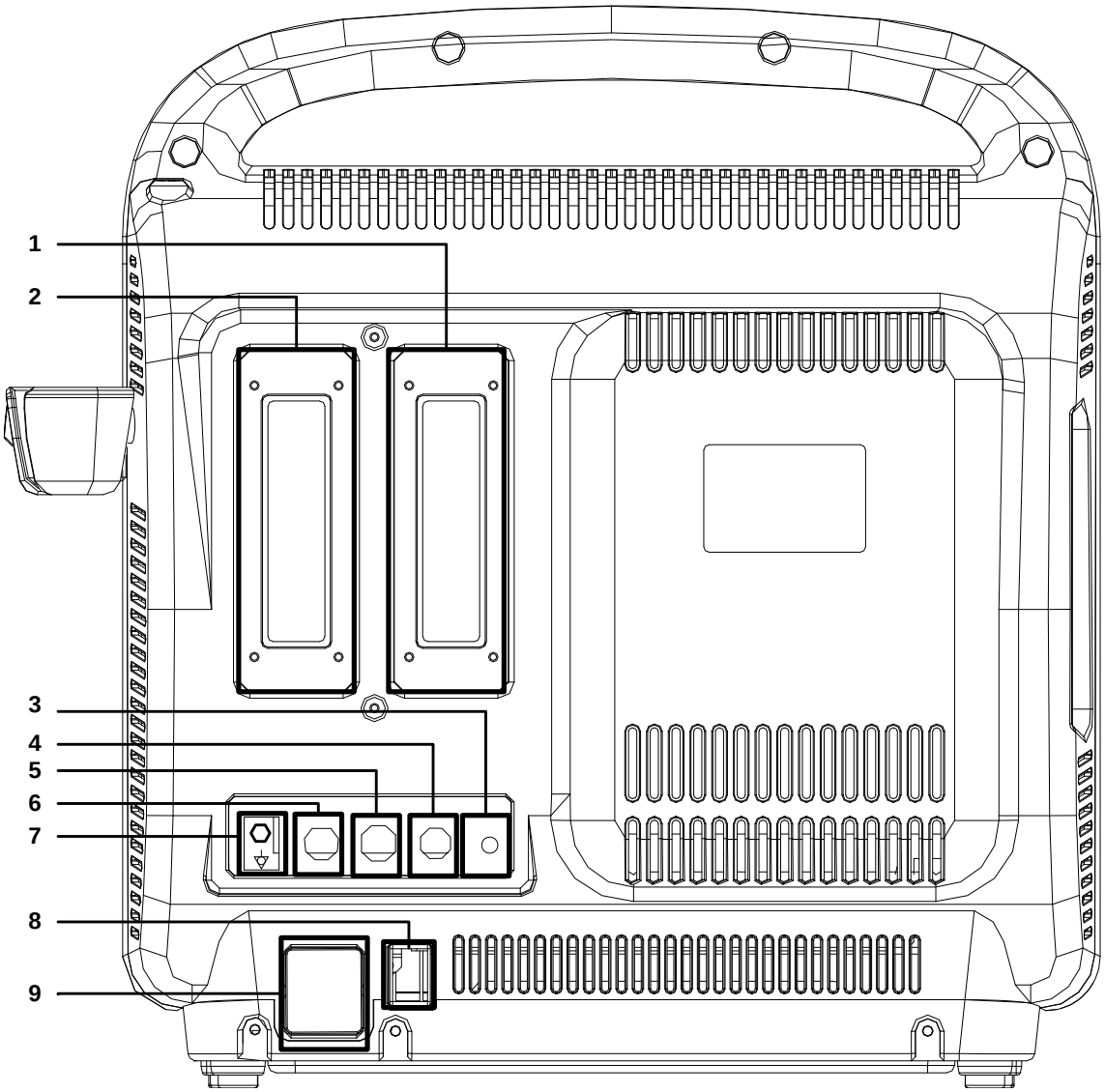


Figure 3.2: Rear view

1	Transducer socket port 1	5	Video port
2	Transducer socket port 2	6	ECG port
3	Printer port	7	Equipotential point(earth)
4	Foot switch	8	Power interface

3.2.4 Keyboard Layout

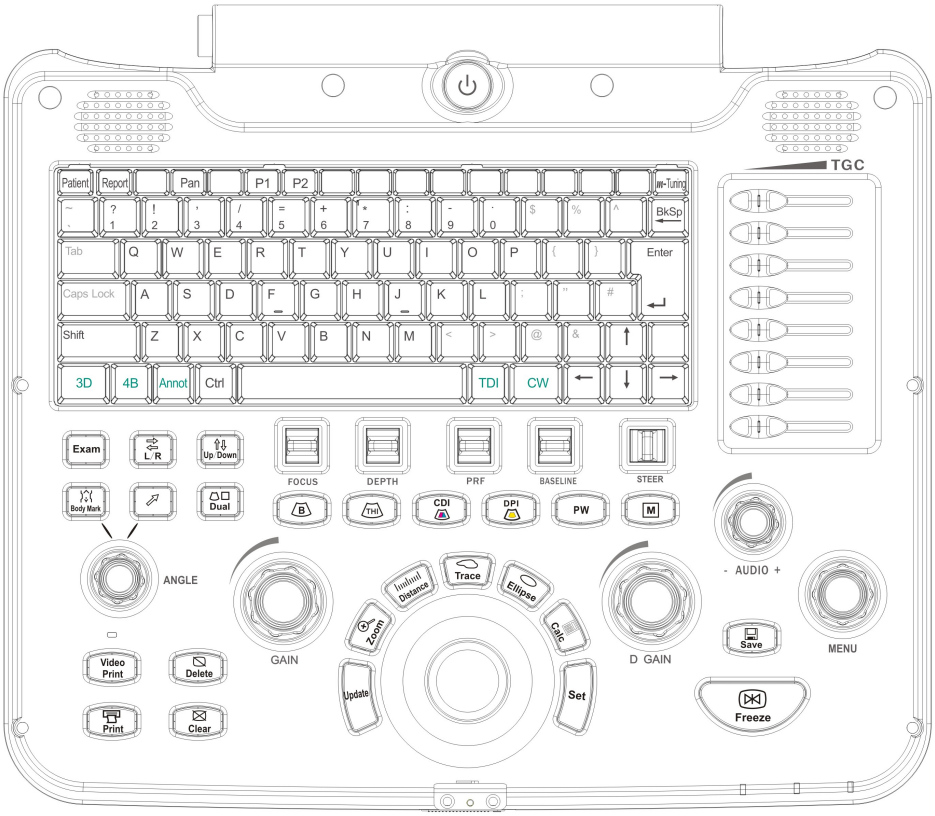


Figure 3.3: Keyboard Layout

3.2.5 Keyboard Description

Key	Description
Exam	EXAM return the system to the preparation mode (EXAM screen).
Patient	Patient access the Patient Information interface.
Dual	Dual activate the dual display format.
L/R	L/R flip the ultrasound image left/right.
Up/Down	U/D flip the ultrasound image upward/downward.

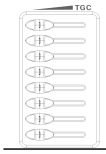
continued on next page . . .

Key	Description of the Usage
Annot	Annotation insert texts or predefined annotation items.
Body Mark	Bodymark insert Bodymarks.
	Arrow insert an arrow symbol on the ultrasound image
3D	3D/4D start volume mode (3D or real time 4D mode).
m-Tuning	***m***-Tuning press this key during scanning to let the system automatically adjust various parameters to obtain high quality image.
Save	SAVE press this key during real time scan to save the current application mode as a new customized application mode. press this key while the ultrasound image is frozen to save a single frame or a cine clip.
Report	REPORT write report for current diagnosis.
Video Print	VideoPrint Press to print the screen using a video printer.
Print	PRINT trigger the network printers.
Delete	DELETE remove the most recently inserted annotations or Bodymarks. or redefine the route of trace.
Clear	CLEAR clear the all measurements and calculations.
- AUDIO +	AUDIO adjust the Doppler sound volume.
MENU	MENU open the context menu.
D GAIN	D GAIN rotate this key to adjust the Doppler gain.
GAIN	GAIN rotate this key to adjust the 2D gain.
ANGLE	ANGLE Adjust the angle degree.
B	B Mode press this key during the real time scan to start B mode imaging and remove additional modes.

continued on next page . . .

Key	Description of the Usage
	THI activate the Tissue Harmonic Imaging.
	CDI turn on/off Color Doppler Imaging.
	DPI turn on/off Doppler Power Imaging.
	PW Turn on/off Power Doppler imaging.
	CW Turn on/off Continuous Doppler imaging.
	M Mode turn on/off M mode imaging.
	4B Switch to 4B display format.
	FREEZE unfreeze/freeze the ultrasound image.
	FOCUS flip the switch up/down to change the depth position(s) of the focal zone(s).
	DEPTH increase or decrease the maximum scanning depth.
	STEER adjust the angle of deflection of sample line.
	PRF flip this switch to change the Velocity Range represented as PRF (Pulse Repetition Frequency).
	BASELINE flip this switch to shift the baseline, which enlarges the Velocity Range in one direction.
	Trackball use the trackball to move the cursor position.
	UPDATE in spectral Doppler mode or M mode, press this key to start/stop PW/CW and M traces. in 3D mode press this key to toggle the selection between 2D and 3D images.

continued on next page . . .

Key	Description of the Usage
	SET this key serves as the confirmation key. to set, fixate markers and activate buttons/items marked by the cursor.
	ZOOM zoom ultrasound image.
	DISTANCE measure the distance between two points.
	TRACE press this key and move the trackball to draw a trace on the ultrasound image; press SET to close the trace.
	ELLIPSE press this key and move the trackball to draw an ellipse on the ultrasound image.
	CALC press this key to activate the measurement menu.
	TGC slide the TGC control to change the gain in the corresponding 2D depth.

3.3 Probes and Accessories

Supported Transducers: see **Table 13.1**.
Supported Peripherals and Accessories

- Video printers
- Network printers
- PC/workstation for accessing/reviewing ultrasound images
- USB2.0 removable disk drives
- Foot switch
- ECG electrodes and ECG cable
- Ultrasound coupling gel

3.4 Physical Specifications

Weight: approximately 13kg
Dimensions: 400mm X 350mm X 230mm

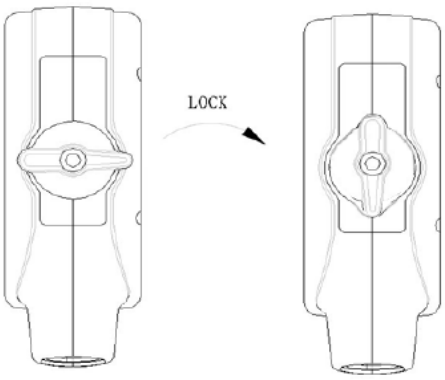
Chapter 4

Starting the System

4.1 Probe Connection

Attention!

- Prior to connecting or disconnecting a probe freeze the image or back to EXAM screen.
- It is unnecessary to switch the unit off.



Instructions:

- Plug the probe into the probe socket.
- Switch the lock clockwise to vertical direction to lock the probe.
- If the cable is too long, you may hang it on the cable hook at the right side panel.

4.2 Power On and Off

Warning!

Review **Section 2.7** and **Section 2.8** for the detailed electrical requirements and for the electrical safety.

Important! Read messages below and carefully before starting up your system. In order to avoid unnecessary electric hazards, it's recommended to connect the equipotential point to earth even when operating with the battery.

4.2.1 Using AC Supply

The ultrasound system can be powered by means of two different power sources:

- the AC power through the AC adapter, and

- the battery.

Turn on and off the system:

1. Press the power button of system to turn on the system, the backlight of the keyboard will be on and it takes about 1 minute for the system to enter the preparation mode (EXAM screen).
2. To turn off the system, press the power button .

Information for power supply status can be found in **Section 4.2.3**.
Use the battery only during emergency or when no reliable AC power supply is available. With the external AC power supply available, it is always recommended to use the AC supply instead of the battery.

Warning!

- The AC adapter is specifically designed for the SonoScape S2 ultrasound system, do not use it with other equipments. To avoid electric hazard and system damage, use only the AC adapter approved by SonoScape with the S2 ultrasound system.
- AC adapter can get very hot if being used in poorly ventilated area. Maintain good ventilation for heat dissipation. Do not cover the AC adapter or the power cable with any other items.
- Make sure that the power cable is not entangled.

1. Connect the equipotential point at the rear panel to safety ground (earth).
2. Attach the connector of the power cable to the AC adapter firmly.
3. Ensure that the mains voltage level is within the required range.
4. Connect the mains power plug into a wall outlet. To achieve the reliable grounding, ensure to use a power outlet marked with “hospital grade” or the equivalent. **Warning: To avoid risk of electric shock, this equipment must only be connected to a supply mains with protective earth.**
5. Secure the DC output plug into the power supply socket on the ultrasound system. The LED **POR** will be illuminated. Refer to the illustration in **Figure 4.1** for proper connection.
6. Ensure that all the connections are appropriate and press the power button to turn the system on.

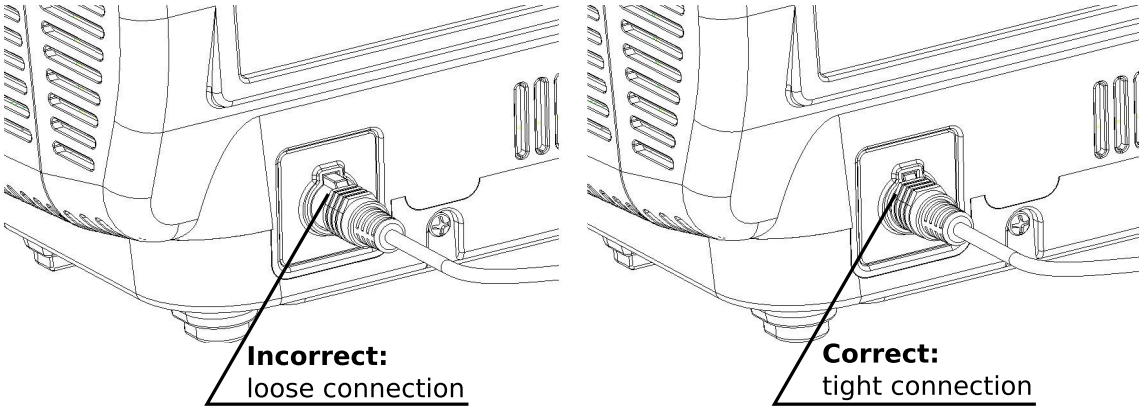


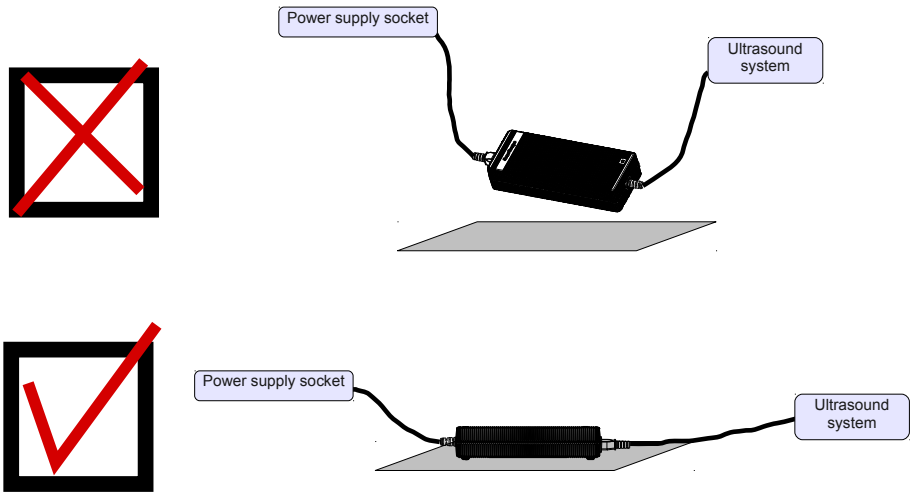
Figure 4.1: Connecting the DC output plug

Note

If battery is in use, to switch the power supply to AC source, follow **Section 4.2.2**.

⚠ Warning!

Do not allow the adaptor to hang in the air. Place it on the ground or other well ventilated platform instead.



4.2.2 Using Battery

The battery serves as a power source when no AC power supply is available. A fully charged battery can provide power for the system for up to 1.5 hours. To start operating the system using only the battery, you need to **long-press** the power button (press and hold down the power button for at least 2 seconds).

Battery charging time (from depletion to full):

When the system is off:
approximately 2.5 hours.

When the system is on:
approximately 12 hours.

⚠ Warning!

- This battery is designed to be an integral part of the ultrasound system. Attempting do-it-yourself removal of the battery not only voids the warranty but also violates the regulations, and is discouraged by IEC 60601-1.
- Do not short the metal pins on the connectors using metal objects.

✍ Information for disposing the battery:

To dispose and recycle the ultrasound system and the battery properly, contact SonoScape representative for instructions.

Turn on the system without connecting the AC adapter to use the battery as the source.
Disconnect the output plug of the AC adapter from the system while it is on, and the system uses battery as the source automatically.
You may charge the battery while the system is off by connecting the AC adapter to the system.
You may also charge the battery without turning off the system.
Instructions for charging battery with system on:

1. Connect the equipotential point at the rear panel to safety ground (earth).

2. Attach the connector of the power cable to the AC adapter firmly.
3. Connect the power plug of the AC adapter to the outlet marked with “hospital grade”.
4. Connect the DC output plug into the power supply socket on the ultrasound system. The system automatically charges the battery and takes the AC supply as source.

Attention!

- Make sure to follow the above steps. Connecting the DC output plug of the AC adapter, which has no AC input, into the system can trigger protection mechanism which automatically shuts down the system.
- If auto-shutdown due to misoperation occurs, connect to the AC source and restart the system.
- Charge the battery only when the ambient temperature is between 0℃ and 45℃.
- When you hear the beep sound and the LED **BAT** is blinking, it means that the battery power is almost depleted. You should save your data and turn off the system or connect the system to an AC power source immediately.

Note

Once the system is turned on, the control panel will be illuminated. It takes about 1 minute for the system to enter the preparation mode (EXAM screen).

Attention!

DO NOT plug in any external USB drive before the system startup completes, otherwise the μSCAN function might be interrupted.

4.2.3 LED Indicators

The three Light-Emitting Diodes (LEDs), shown in **Figure 4.2**, indicate the power supply status and the battery status. Their indications are listed in **Table 4.1** and **Table 4.2**.

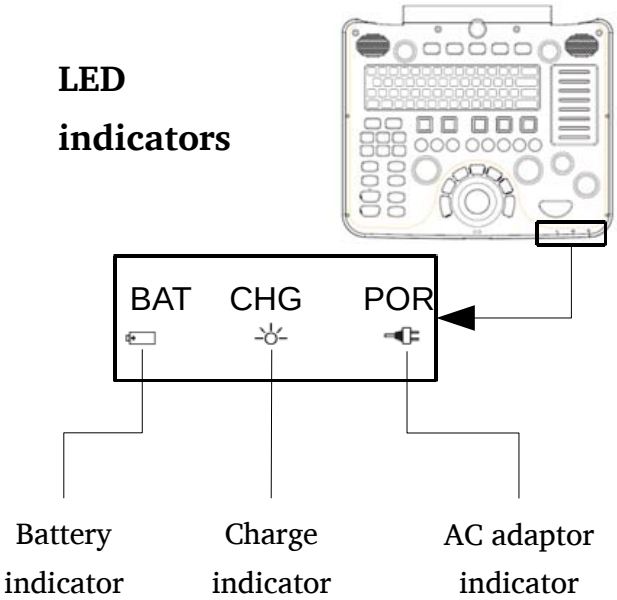


Figure 4.2: LED Indicators

Using AC power supply. System can be on or off.

Indications			
Battery full	Off	Green	Green
Battery not full and being charged.	Off	Yellow	Green

Table 4.1: Status of the power supply - using AC source

Using battery.

Indications			
System off	Off	Off	Off
System on, battery power high and discharging.	Green	Off	Off
System on, battery power medium and discharging.	Yellow	Off	Off
System on, battery power critically low. You should prepare to turn off the system or recharge the battery.	Yellow, Blinking	Off	Off

Table 4.2: Status of the power supply - using battery

4.3 Patient Information

Information of the patient can be entered using the data forms. These information will be used in calculations, patient information display, DICOM setting and display the icon of application mode.
All information entered will be saved in the internal database.
Press Patient to open the Patient Review or Exam Review window.
If an examination is already activated, the Exam Review screen will be displayed as follow.

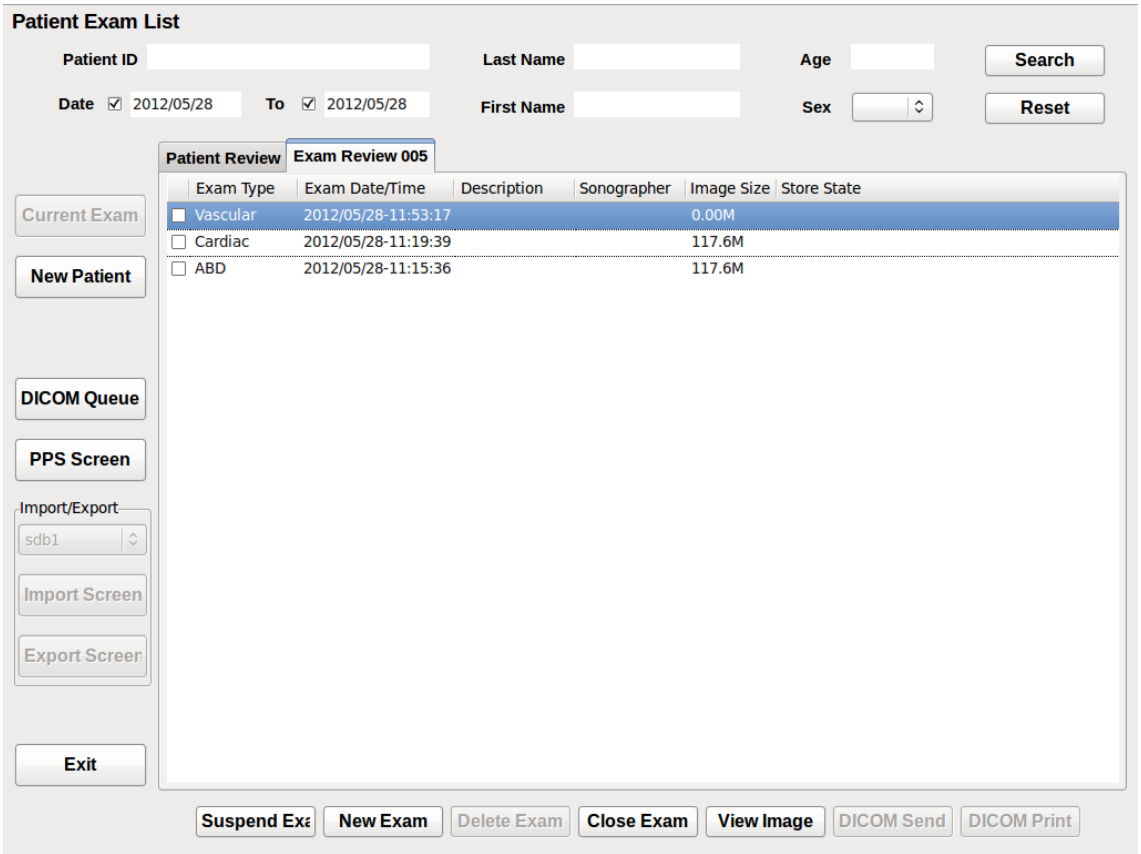


Figure 4.3: Exam Review window

If no examination is active, the Patient Review screen will be displayed.

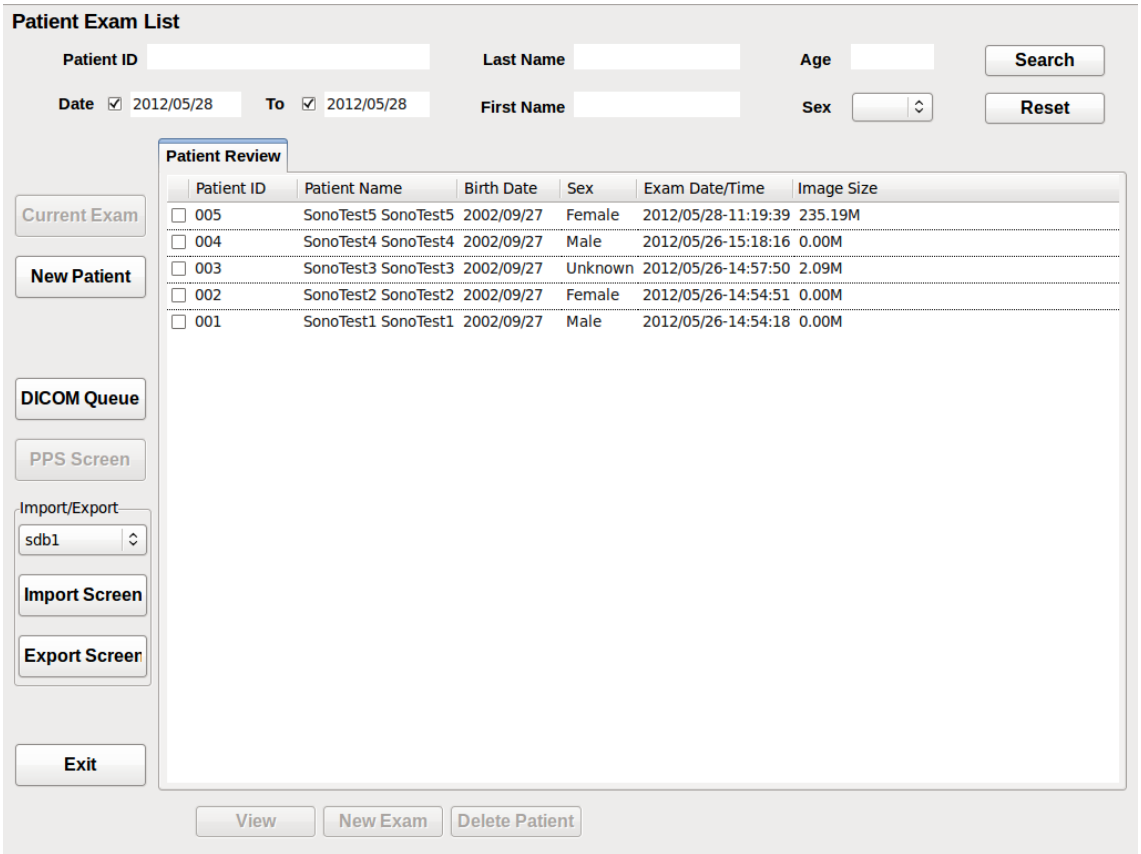


Figure 4.4: Patient Review window

✍ Note

When this ultrasound system is connected to a worklist server (e.g., HIS/RIS), you may select a patient from a list of patients.

For detailed instructions, refer to “Acquire Patient Information from Worklist Server”.

4.3.1 Create New Patient

Move the cursor over **New Patient** and press Set to open the *New Patient* window.

1.Patient Basic Information

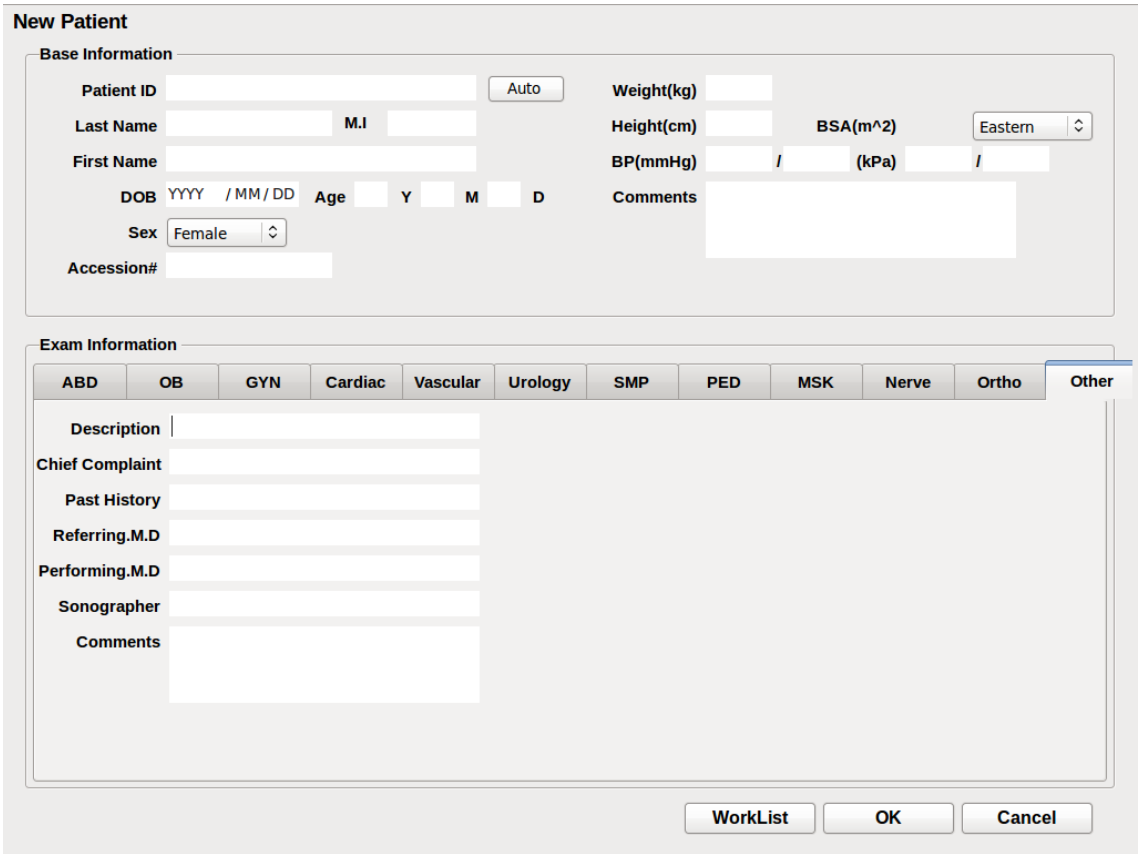


Figure 4.5: New Patient window

Patient ID
This item is required, however, can be generated automatically by the sytem. Maximum of 64 characters allowed.
Last Name
Enter the last name of the patient.
First Name
Enter the first name of the patient.
DOB
Enter the date of birth of the patient. Only numerical value is allowed. The age of the patient will be calculated automatically.
Sex
Enter the gender of the patient.
Accession#
Maximum of 64 characters allowed.
Weight(kg)
Enter the weight of the patient in kilograms. Only numerical value is allowed.
Height(cm)
Enter the height of patient in centimeters. Only numerical value is allowed.
BSA(m^2)
Select `Eastern` or `Western` for automatic calculation of body surface area.
BP(mmHg)
Enter the blood pressure of the patient in `mmHg` or `kPa`. Only numerical value is allowed.
Comments
Enter other information as comments. You can enter no more than 512 characters.

✍ Note

- Click **OK** to save the patient information. The patient ID will no longer be modifiable. After saving images or cine clips for this patient, the name of the patient will also become unmodifiable.
- If the ultrasound system is connected to a worklist server, you may select a patient from a worklist. Click the **Worklist** button to retrieve a list of patients from the server.
- After entering height and weight of the patient, the system automatically calculates the body surface area (BSA) using the following formulas, (Weight and height are expressed in kilograms and centimeters respectively.

2.Acquire Patient Information from Worklist

In the *New Patient* window, click the **Worklist** button to open the *Worklist* window.

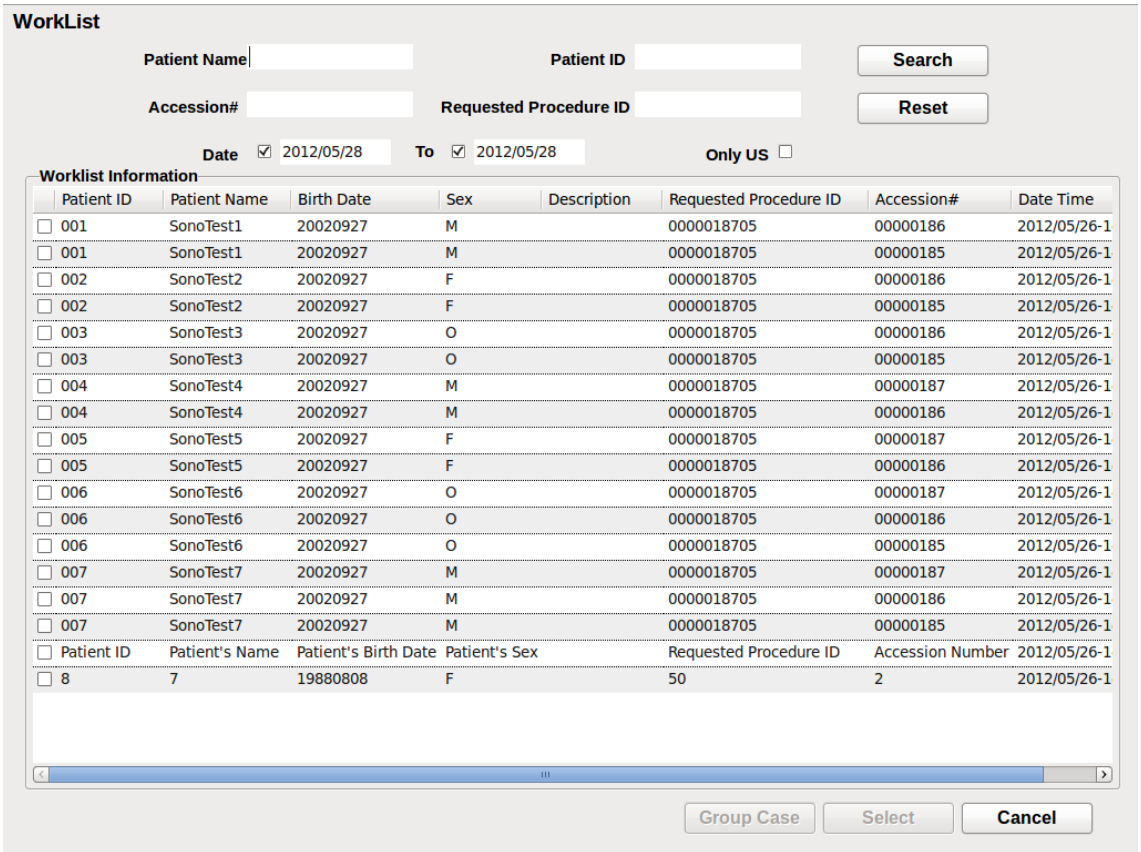


Figure 4.6: Worklist information window

1. To list all patients saved on the server, click **Search** without entering any other search criteria.
2. Enter **Patient Name**, **Patient ID**, **Accession#** or **Requested Procedure ID** as search criteria to search for patients which contains these provided information. You can limit the search to patients whose examinations are performed within a period of time by selecting the starting date and end date.
3. Click **Reset** to clear all search criteria.
4. Double click a patient information to select the patient and load this patient information as a new patient on the local system.

5. When multiple exam cases have been performed for a patient, you can select multiple exam cases and click **Group Case** to load all exam cases to the local system.

Note

Patients list can be loaded only when valid DICOM worklist server addresses have been correctly provided. Please see DICOM worklist.

3.Select Exam Type

Abdominal (ABD)
Obstetrical (OB)
Gynecology (GYN)
Cardiac
Vascular
Urology
Small Parts (SMP)
Pediatrics (PED)
Musculoskeletal (MSK)
Nerve
Orthopaedic (Ortho)
Other

4.Information Required for Specific Exam

Other Information

Description
Maximal 64 characters allowed.
Chief Complaint
Maximal 64 characters allowed.
Past History
Maximal 64 characters allowed.
Referring M.D.
Maximal 64 characters allowed.
Performing M.D.
Maximal 64 characters allowed.
Sonographer
Maximal 64 characters allowed.
Comments Maximal 512 characters allowed.

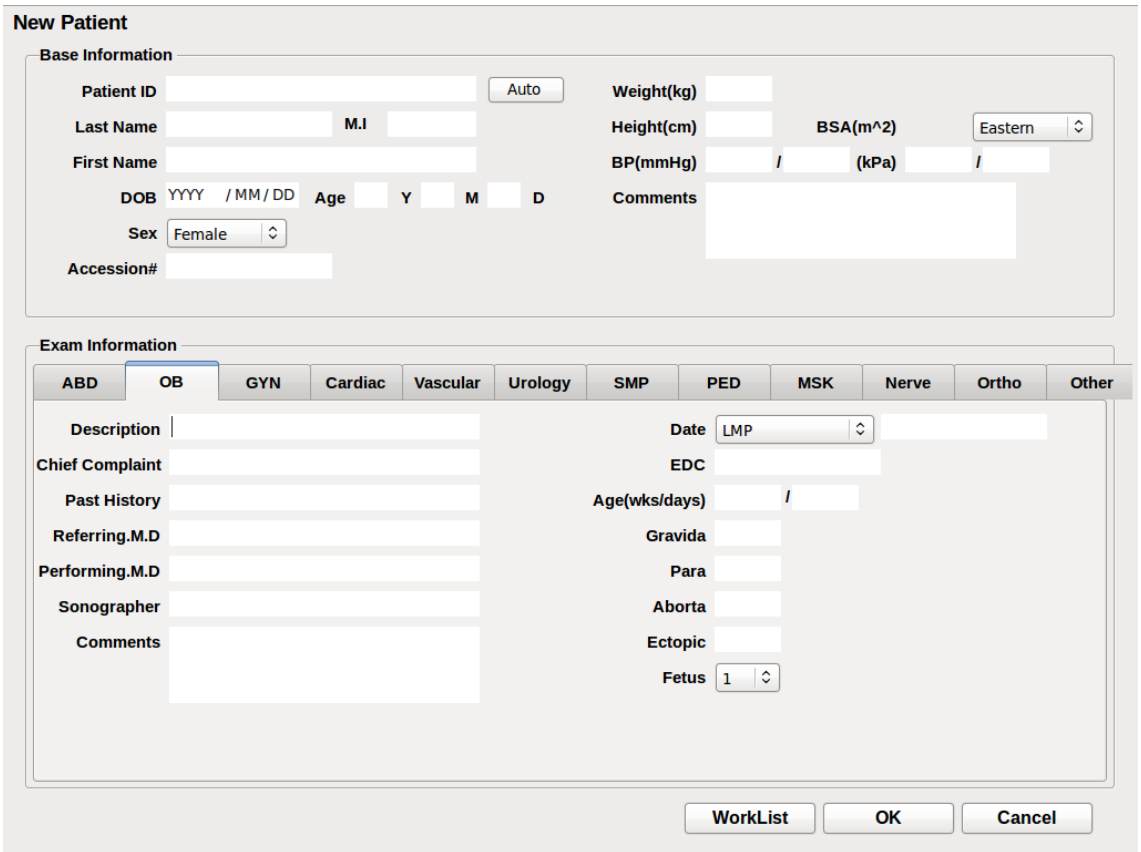
5.Save Patient Information

Click **OK** to save the patient information and exit the *New Patient* window.

4.3.1.1 Exam Type – Abdominal

No information specific to abdominal exam required.

4.3.1.2 Exam Type – Obstetrical (OB)



Obstetrical Exam Information

Date
Select LMP or IVF and enter the corresponding date.
EDC
Click to select the estimated date of confinement.
Age(wks/days)
Gestational age should be less than 44 weeks and 6 days.
Gravida
Number of pregnancy times. Only numerical value is allowed.
Para
Number of deliveries. Only numerical value is allowed.
Aborta
Number of abortions. Only numerical value is allowed.
Ectopic
Number of ectopic pregnancies. Only numerical value is allowed.

✍ Note

Date of LMP/IVF, EDC and gestational age can be calculated from each other. Enter one of them and the other two would be calculated automatically.

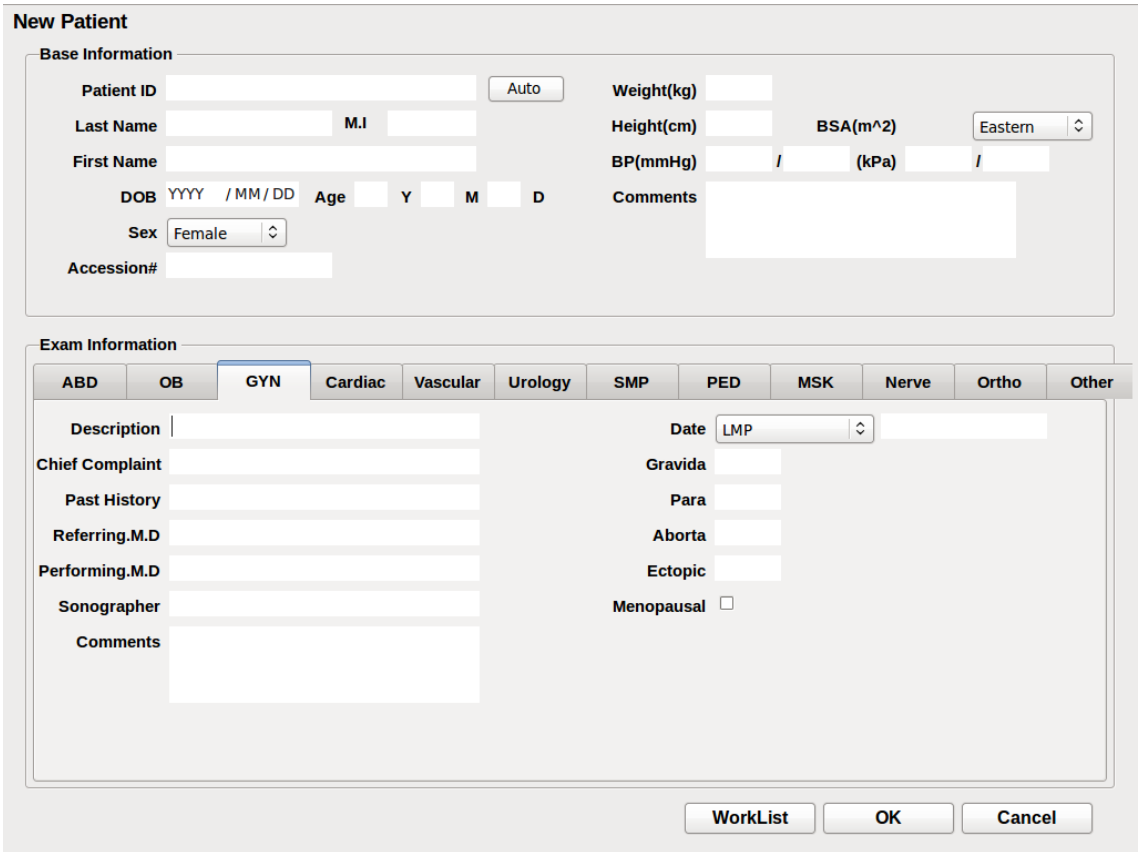
When LMP is selected,

- $EDC = LMP + 280$ days
- $AGE =$Current date$-LMP + 14$ days
- $LMP = EDC - 280$ days

When IVF is selected,

- $EDC = IVF + 266$ days.
- $AGE =$ Current date $-LMP$ days
- $LMP = EDC - 266$ days

4.3.1.3 Exam Type – Gynecology



Gynecology Exam Information

Date
Select LMP or IVF and enter the corresponding date.

Gravida
Number of pregnancy times. Only numerical value is allowed.

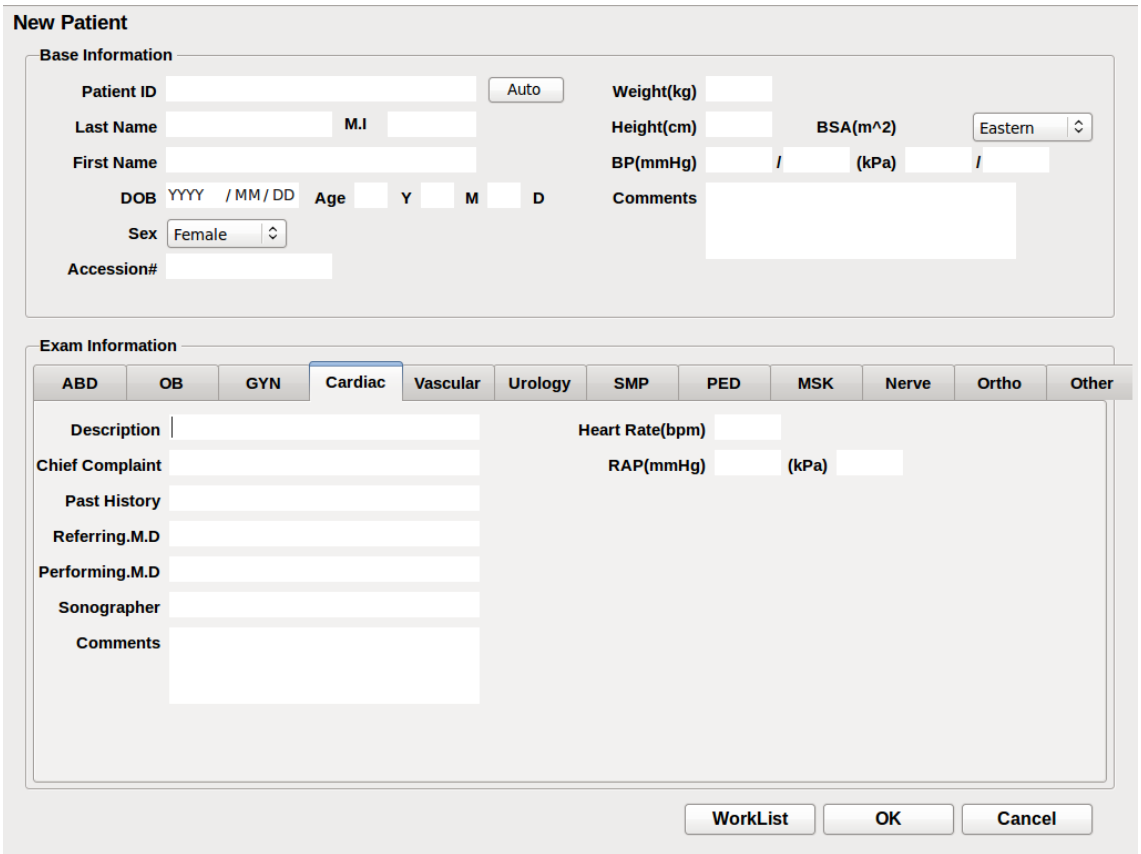
Para
Number of delivery times. Only numerical value is allowed.

Aborta
Number of abortion times. Only numerical value is allowed.

Ectopic
Number of ectopic pregnancy times. Only numerical value is allowed.

Menopausal
Check the box for menopausal patient.

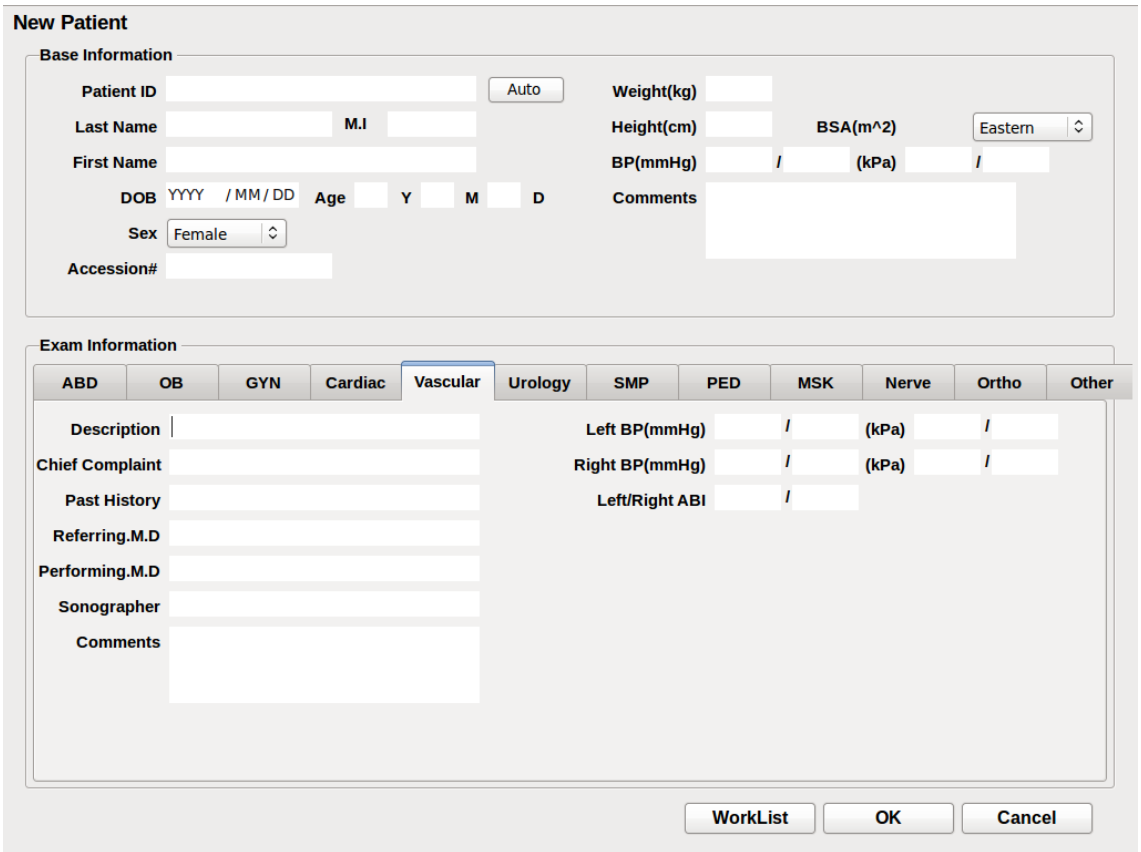
4.3.1.4 Exam Type – Cardiac



Cardiology Exam Information

Heart Rate(bpm)
Heart rate in beats per minute. Only numerical value is allowed.
RAP
Right atrium pressure in `mmHg` or `kPa`. Only numerical value is allowed.

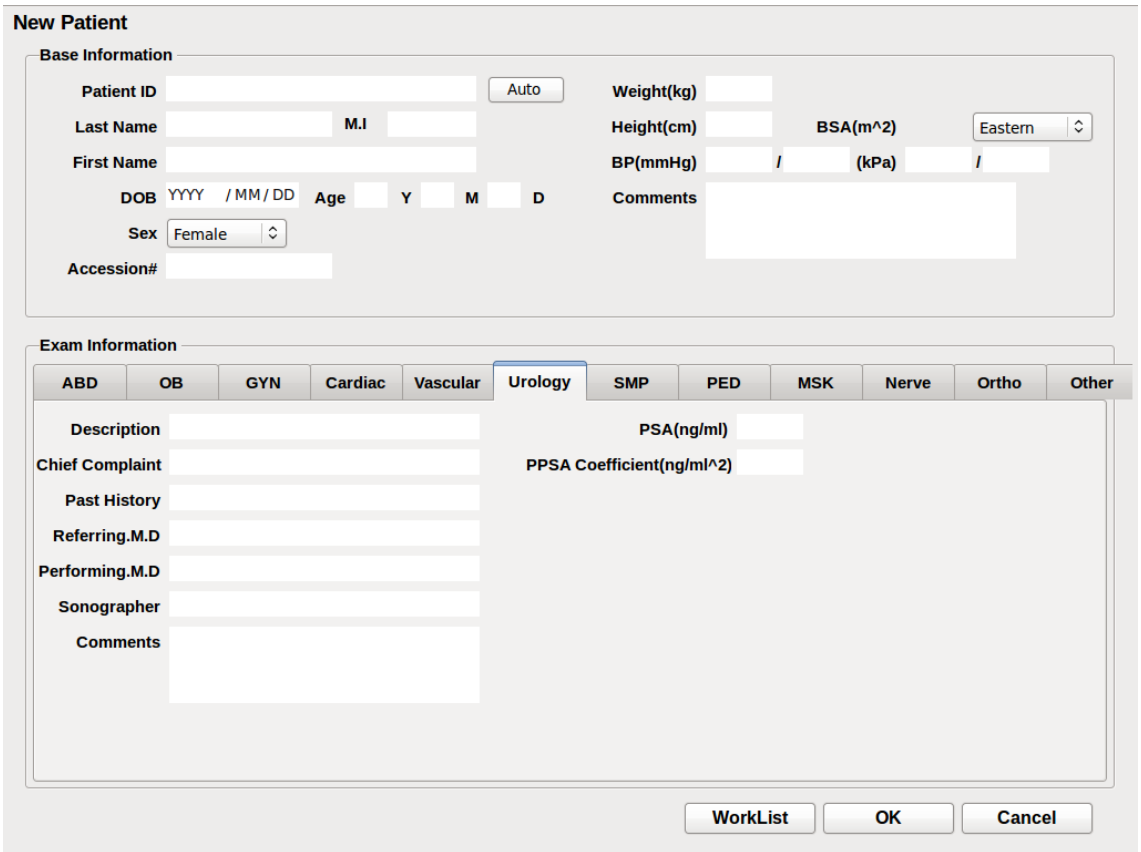
4.3.1.5 Exam Type – Vascular



Vascular Exam Information

Left BP
Blood pressure in `mmHg` or `kPa`. Only numerical value is allowed.
Right BP
Blood pressure in `mmHg` or `kPa`. Only numerical value is allowed.
Left/Right ABI
Ankle brachial index. Only numerical value is allowed.

4.3.1.6 Exam Type – Urology



Urology Exam Information

PSA
Prostate-specific antigen: maximum four digits allowed.
PPSA Coefficient
Maximum four digits allowed.

✍ Note

PPSA has a unit of ng/ml^2, it is used for estimate the PSA level for a prostate with a specified volume.
Estimated PSA = Prostate Volume $\times$ 0.15 ng/ml^2

4.3.1.7 Exam Type – Small Parts (SMP)

No information specific to this exam required.

4.3.1.8 Exam Type – Pediatrics (PED)

No information specific to this exam required.

4.3.1.9 Exam Type – Musculoskeletal (MSK)

No information specific to this exam required.

4.3.1.10 Exam Type – Nerve

No information specific to this exam required.

4.3.1.11 Exam Type – Orthopaedic (Ortho)

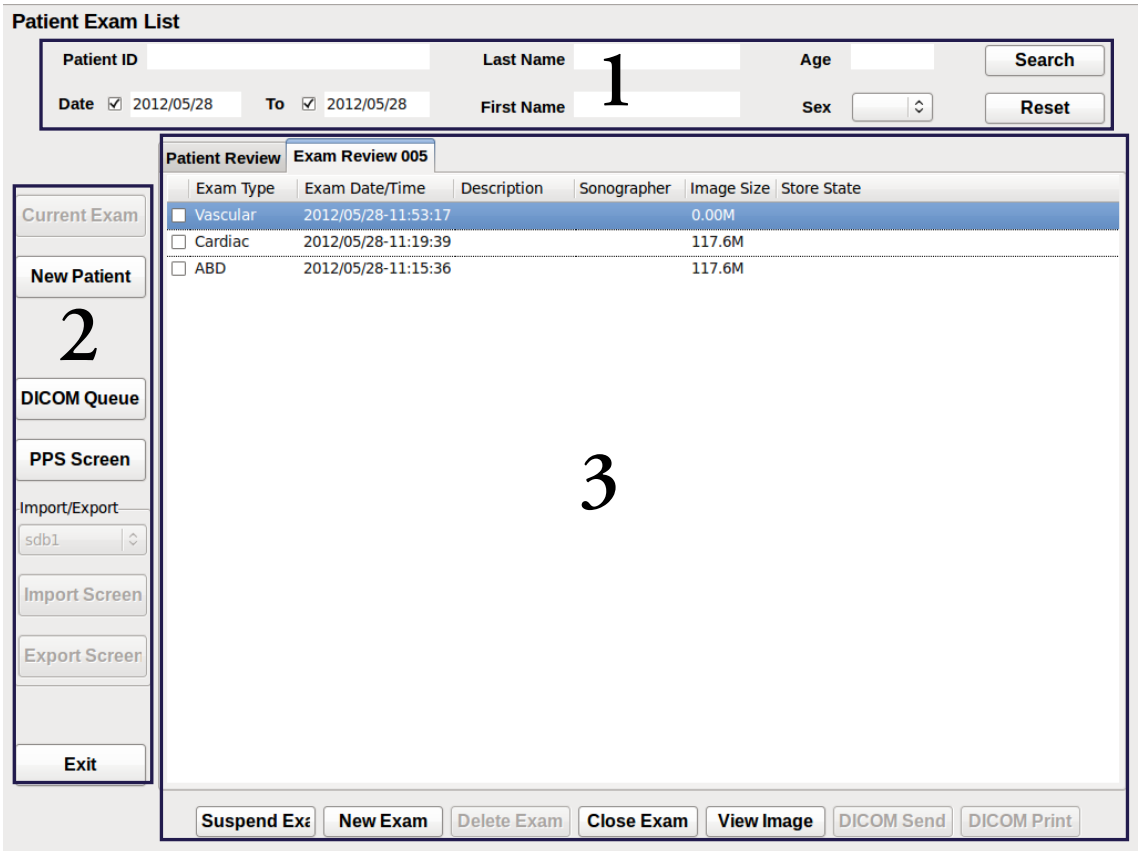
No information specific to this exam required.

4.3.1.12 Exam Type – Other

No information specific to this exam required.

4.3.2 Patient Exam List

After entering patient information following **Section 4.3**, press Patient to open the *Patient Exam List* window.



The *Patient Exam Review* window includes three sections for the following functions,

1. Search
2. Patient operations
3. Functions

Search

1. To list all patients saved on the server, click **Search** without entering any other search criteria.

2. Enter **Patient Name**, **Patient ID**, **Accession#** or **Requested Procedure ID** as search criteria to search for patients which contains these provided information. You can limit the search to patients whose examinations are performed within a period of time by selecting the starting date and end date.
3. Click **Search** to start search using the above defined search criteria.
4. Click **Reset** to clear all search criteria.
5. Double click a patient information to select the patient and load this patient information as a new patient on the local system.

1.Patient operations

Two user interfaces are provided for patient operations: *Patient Review* and *Exam Review*.

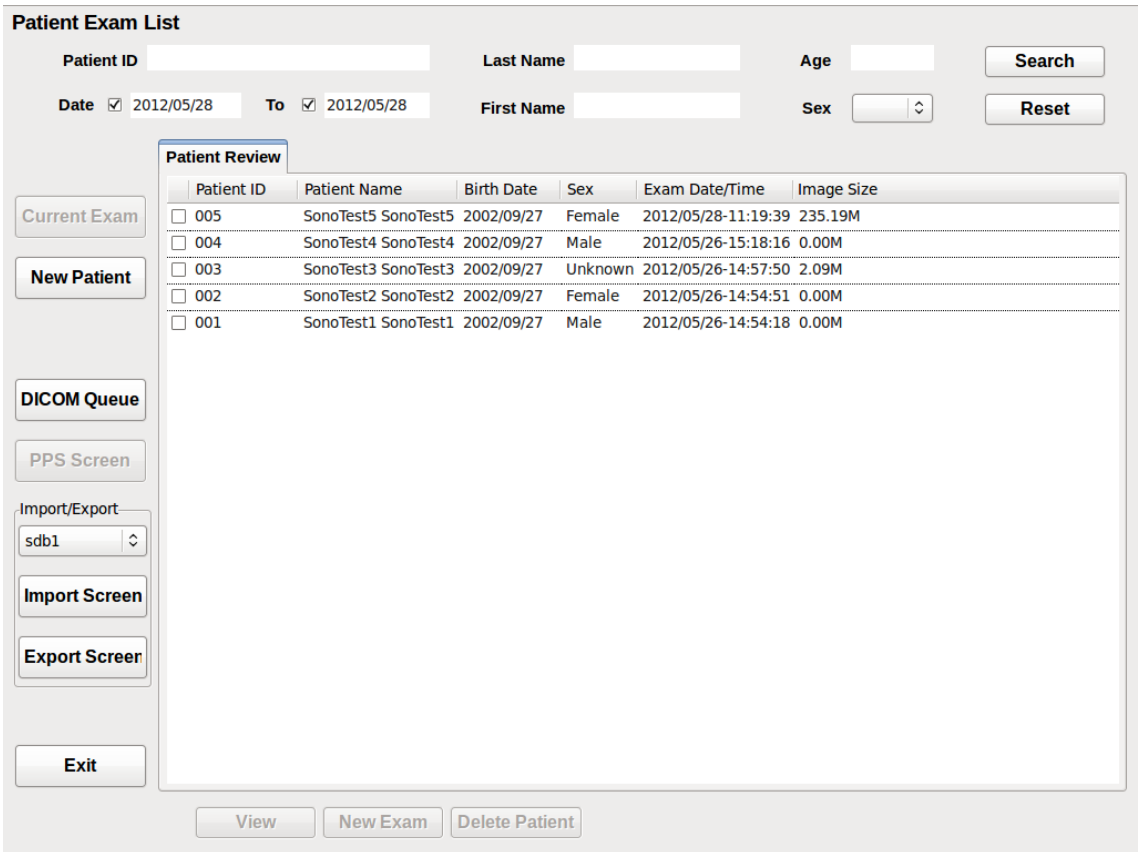


Figure 4.7: Patient Review window

View
Review all exams performed for the selected patient.
New Exam
Start a new exam for the selected patient.
Delete Patient
Remove the selected patient.

2.Exam operations

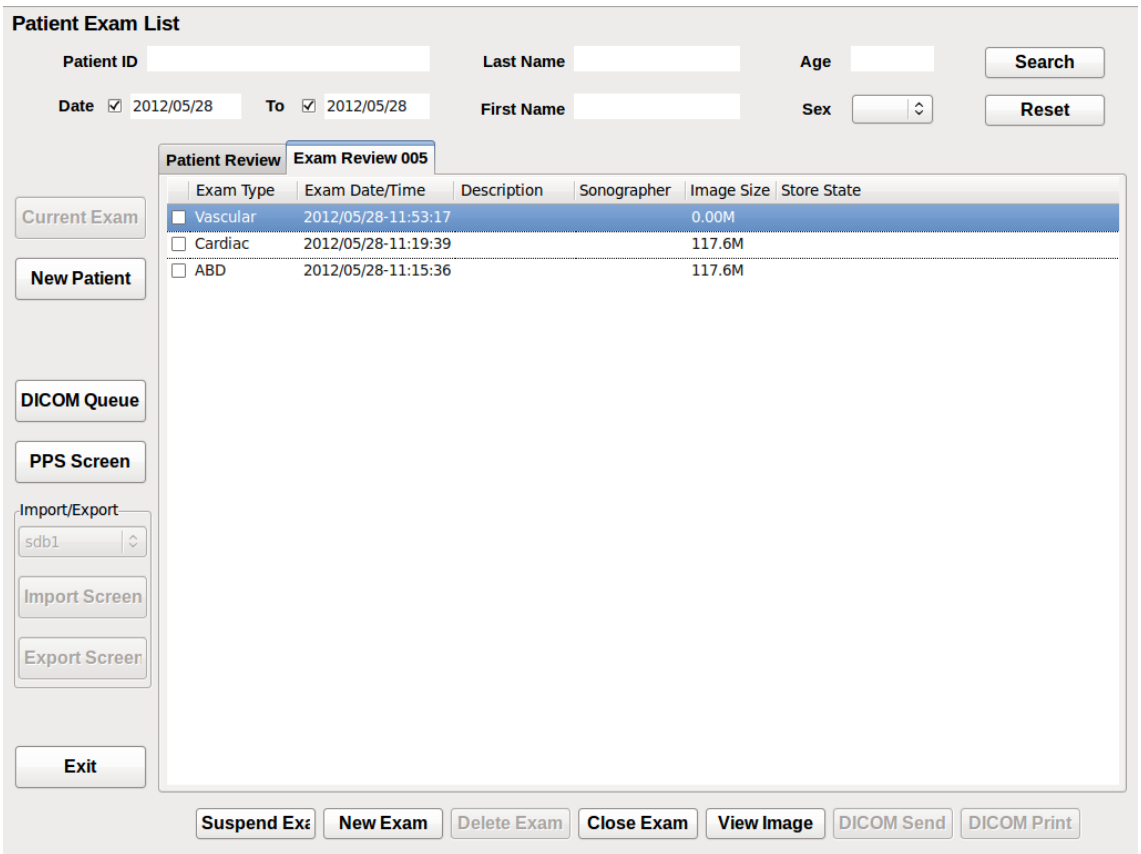


Figure 4.8: Exam Review window

Resume Exam
Resume the currently active exam.
New Exam
Create a new exam for the current patient.
Delete Exam
Delete the selected exam. An active exam can be deleted only after closed.
Close Exam
Click this button and select `Yes`. Provide information in the *PPS* window to close the exam. See **Figure 4.9**.
View Image
Review the images or cine clips of the selected examination. See **Figure 4.10**.
DICOM Send
Send the images or cine clips of the selected examination to DICOM server.
DICOM Print
Print all images or cine clips of the selected examination through DICOM.

In the PPS window (**Figure 4.9**), provide reason for the discontinued exam and click **Discontinued** or click **Completed** to terminate an exam. See **Figure 4.9**.

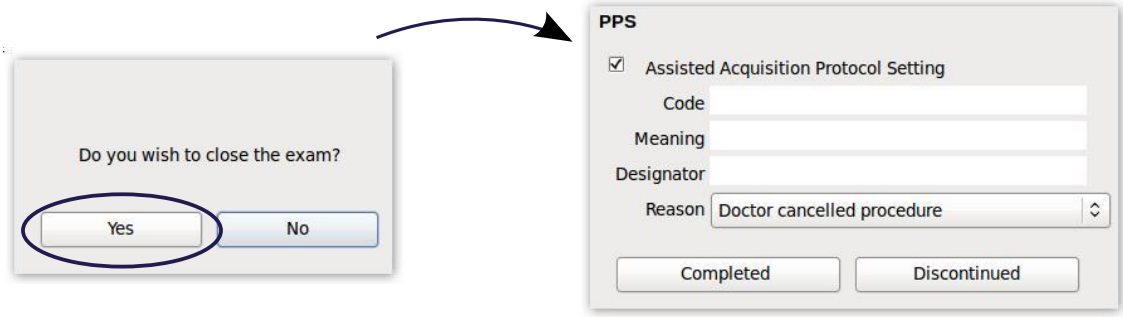


Figure 4.9: PPS window

In the image review window**Figure 4.10**, press Set to select an image. The selected images will be highlighted with a yellow frame. Greyed-out buttons on left side will become active and the respective user operations are allowed.

3.View Image

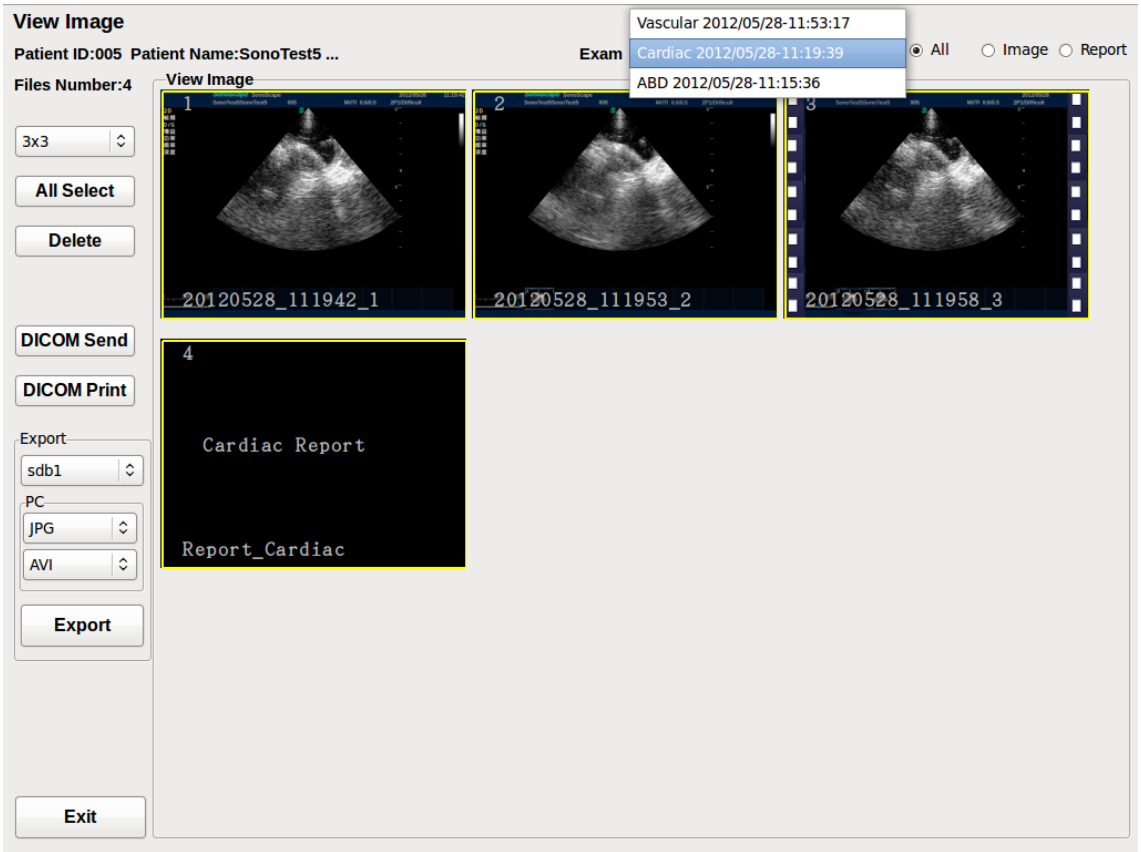


Figure 4.10: View image

Exam
Click on this drop-down box to select other exams performed for the same patient.
All
List both images and reports for this exam.
Image
List only images for this exam.
Report

List only reports for this exam.

Layout

Change the layout of the displayed images: 1×1, 2×2, 3×3, 4×4.

Select All

Select all images in the preview window.

Delete

Delete the selected images.

DICOM Send

Send the selected images to a DICOM server.

DICOM Print

Print the selected images through DICOM.

Export

If multiple USB storage devices have been connected, use this drop-down box to select a USB device as the export target. **PC**

Select the format for exported images or cine clips.

- For images: JPEG, BMP, TIFF
- For cine clips: AVI, WMV

Exit

Click this button to close the image review window.

4.3.3 DICOM Queue

The *DICOM Queue* interface records all detailed log for the DICOM services of the following four categories: image storage, committed storage, MPPS, DICOM storage. The log includes the initiation time, image size, result and service status the returned messages for each service call.

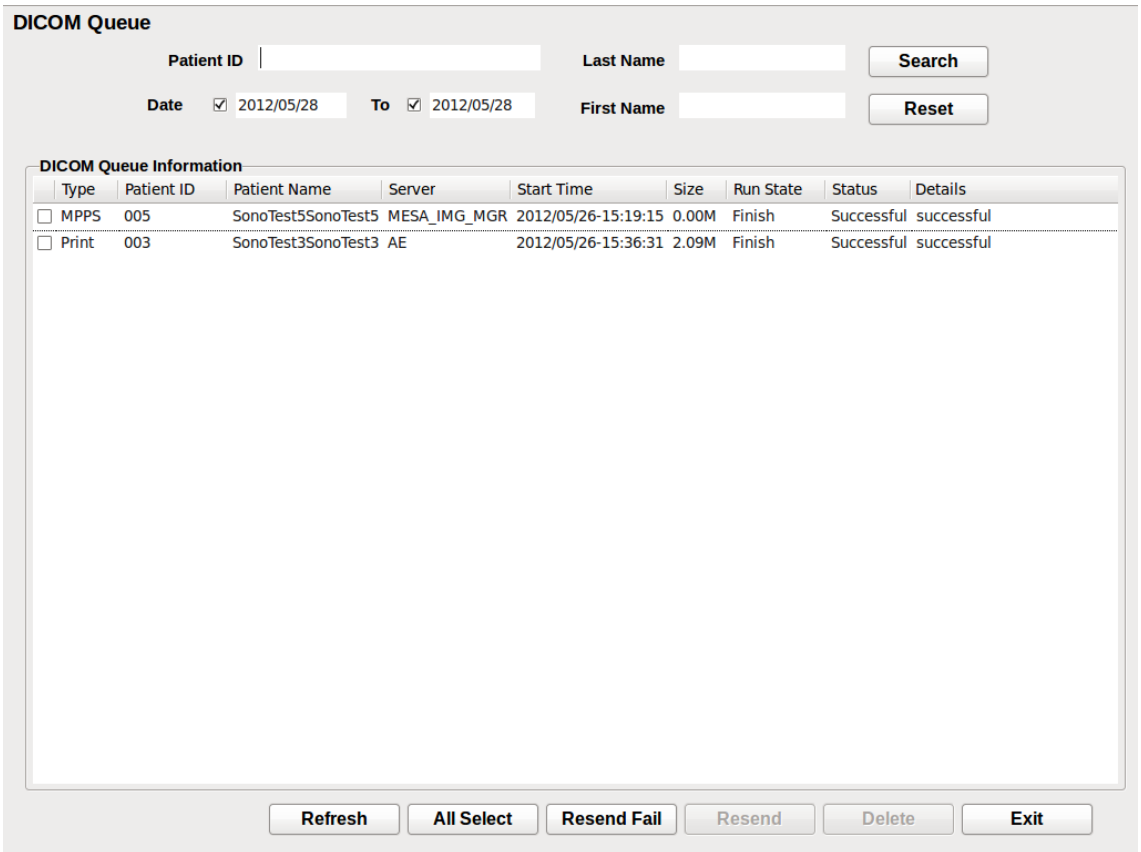


Figure 4.11: DICOM Queue window

Refresh
Refresh the log of the DICOM queue.
All Select
Select all logs.
Resend
Resend the selected DICOM queue.
Delete
Delete the selected logs.
Exit
Close and exit the *DICOM Queue* window.

4.3.4 PPS Screen

Only when the current exam is active and highlighted can the *PPS Screen* be opened.
The *PPS Screen* includes the detailed examination information and the scheduled procedure step information.

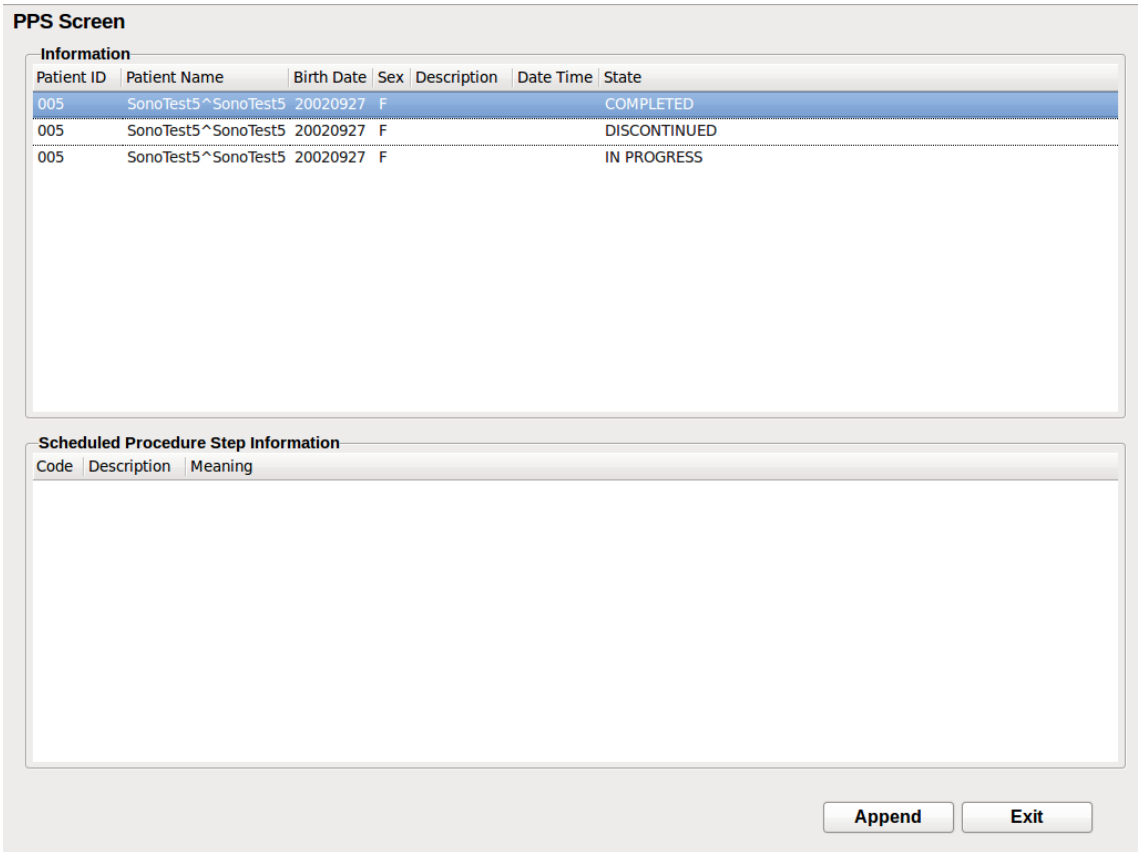


Figure 4.12: PPS Screen

Click **Append** to add MPPS status for the current exam.
MPPS records the procedures for executing tasks. The system sends MPPS messages to the DICOM server when an examination starts, completed or terminated.

4.3.5 Patient Exam Import/Export

The system assumes images will be added into the patient exams database when an exam is active. So only when the current exam is closed can import/export function be performed.

Patient Information Export

Connect an USB storage drive or USB CD/DVD writer. When the system detects the USB storage device, click the **Export** button in the *Patient Exam List* window to open the *Export Screen*.

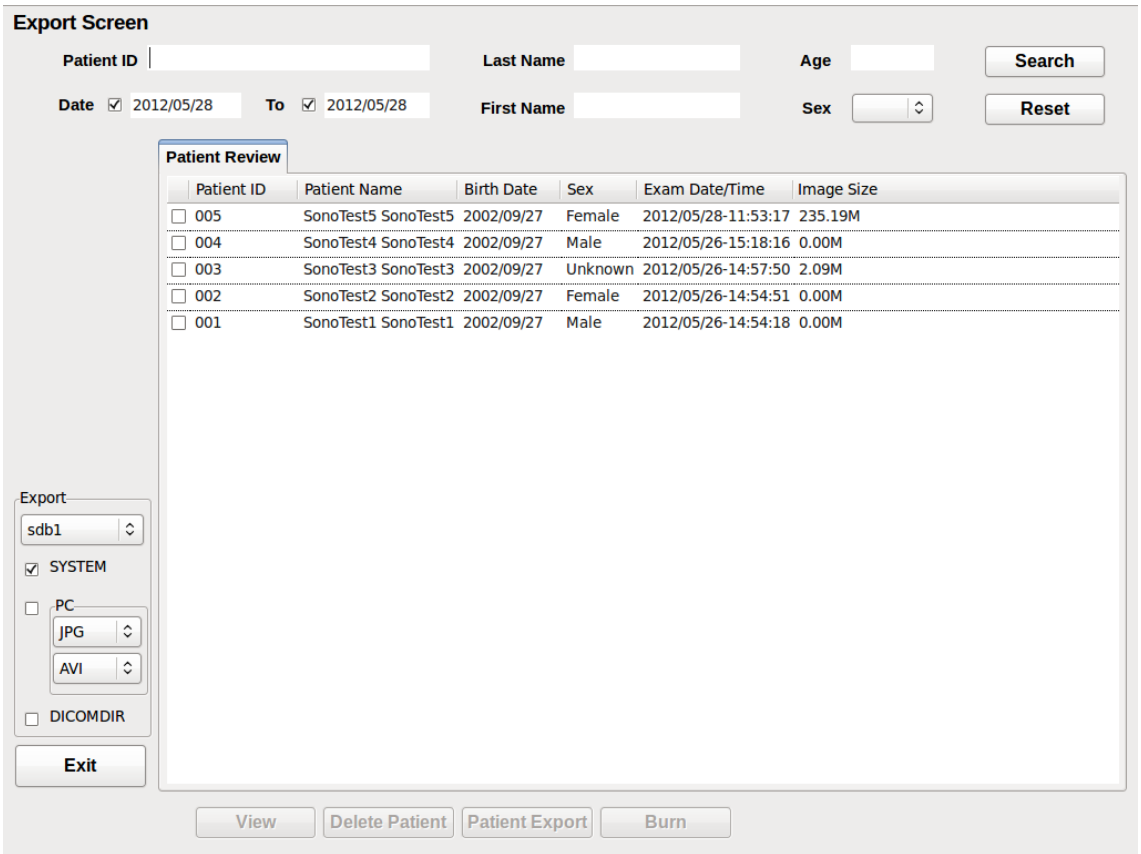


Figure 4.13: Export Screen

View
View all the exams for the selected patient. The user has the option to export only some of the exams of the patient.
Delete Patient
Delete the selected patient information.
Patient Export
Export the selected patient information to USB drive.
Burn
Burn the selected patient information to a CD/DVD.

1. Select patient information by checking the check-box at the front of the patient list. Multiple patients can be selected.
2. In the drop-down box, select a device as the target device.
3. Select the export format: `SYSTEM`, `PC`, `DICOMDIR`. (When `PC` format is selected, you may further select image format (JPEG, BMP, TIFF) and cine format (AVI, WMV).
4. Click **Patient Export** to export the selected patient information to the USB drive. (For USB CD/DVD drive, click **Burn** to burn the selected patient information to the CD/DVD disk.)

5. Export progress status bar is displayed at the bottom of the window. A notification message will appear when export completes.

6. Depending on the export format selected in step 3 above, the `sonoscape`, `DICOM`, or `DICOMDIR` folders will be generated on the USB drive or CD/DVD disk.

Patient Information Import

Because the management of patient information on S2/S2BW is based on data base, so when export, only in systemąś format can be transferred to other S2/S2BW units. Insert USB driver when in Patient Information List, when USB driver is detected, select Import Screen to open the interface.

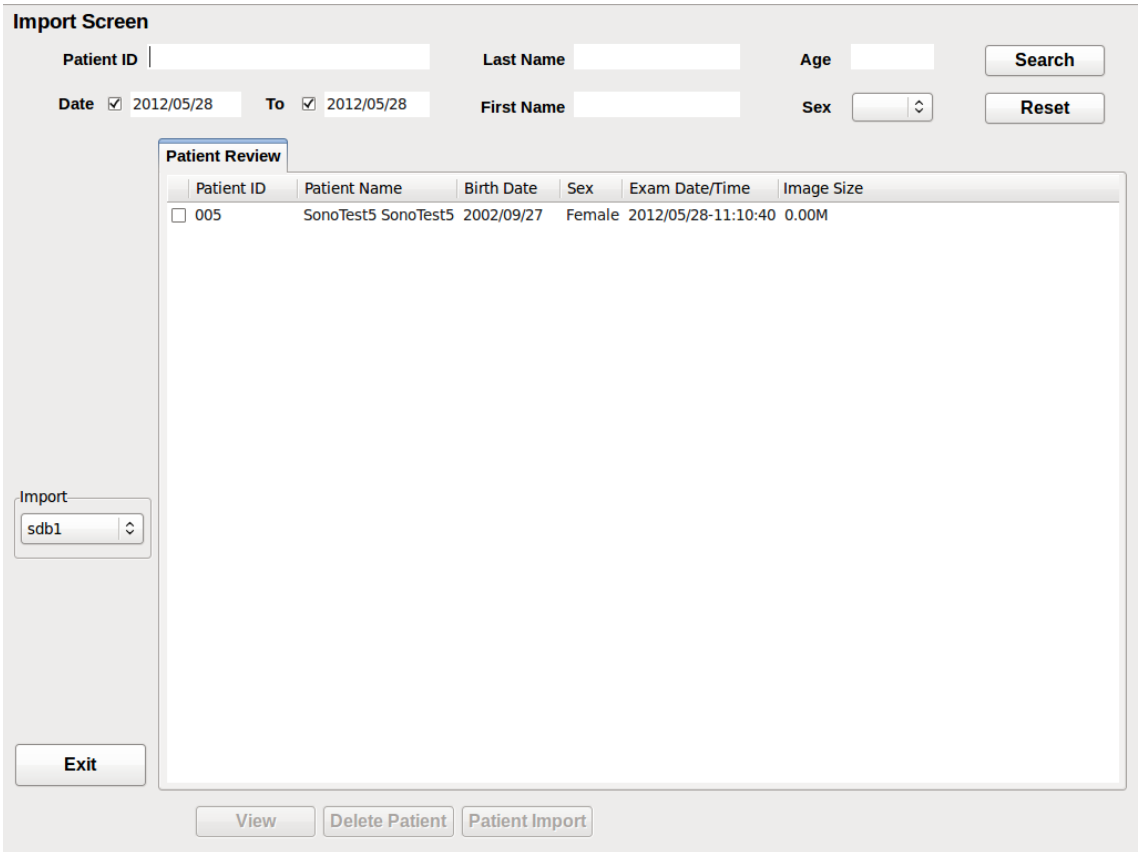


Figure 4.14: Import Screen

Open Import screen interface, patient information of the previous diagnosis can be found in Patient Review

View
View all the exams for the selected patient. The user has the option to export only some of the exams of the patient.
Delete Patient
Delete the selected patient information.
Patient Import
Imported the selected patient information into the system.

1. Select patient information by checking the check-box at the front of the patient list. Multiple patients can be selected.

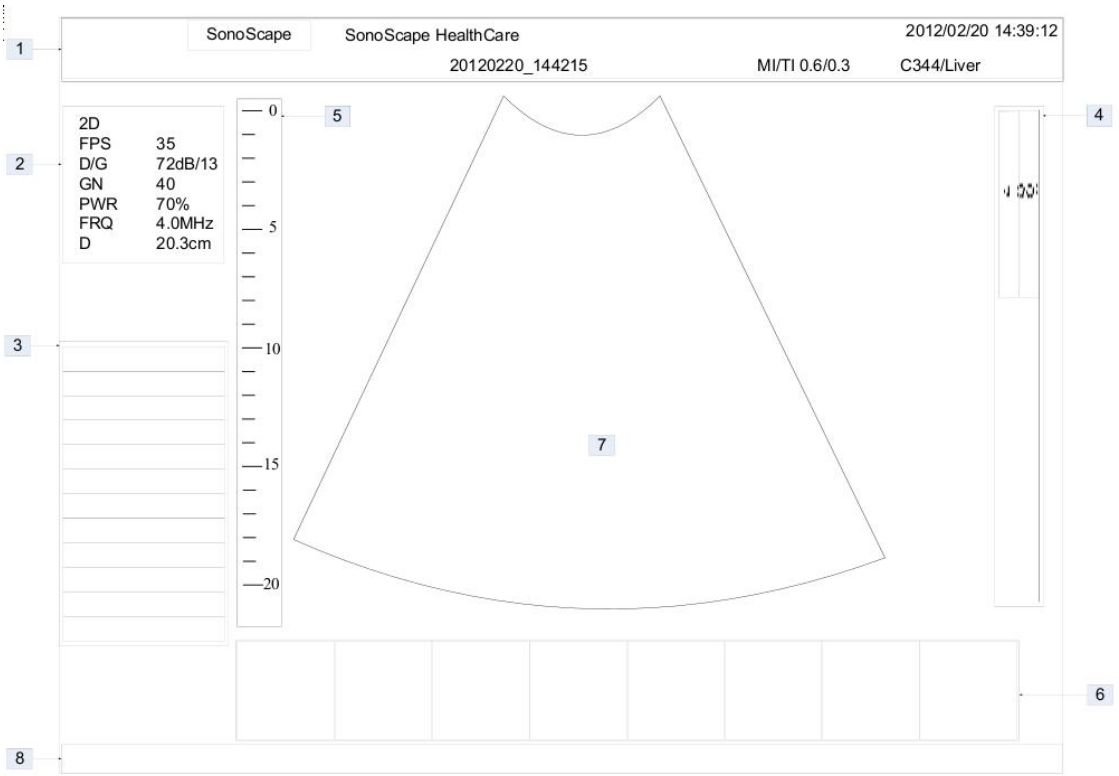
2. In the drop-down box, select a device as the target device.

3. Click **Patient Import** to import the selected patient information to the system.
4. Import progress status bar is displayed at the bottom of the window. A notification message will appear when import completes.
5. Click **Exit** to return the *Patient Exam List* window. The imported patients will be listed in the *Patient Review* window.

4.4 Select Probes and Exam mode

Press Exam to return the EXAM screen. The connected probes and the application modes are displayed on the screen. Move the cursor on an application mode icon and press Set to start a real time scan.

4.5 Main User Interface



The main user interface contains the information of the following categories:

1. System information: including manufacturer logo, hospital name, system time, patient information, application mode and etc.
2. Image parameters: including current imaging mode, frame rate, acoustic power, scan depth and etc.
3. Menu for imaging adjustment
4. TGCąćGray ScaleąćColor Doppler image
5. Depth scale
6. Clipboard (visible when activated)
7. Ultrasound image
8. Status indication

Attention!

If no user activity is performed in a real time scan for more than 30 minutes, the system automatically exits the scan and returns the EXAM screen. This prevents unintended probe operation.

Chapter 5

System Setup

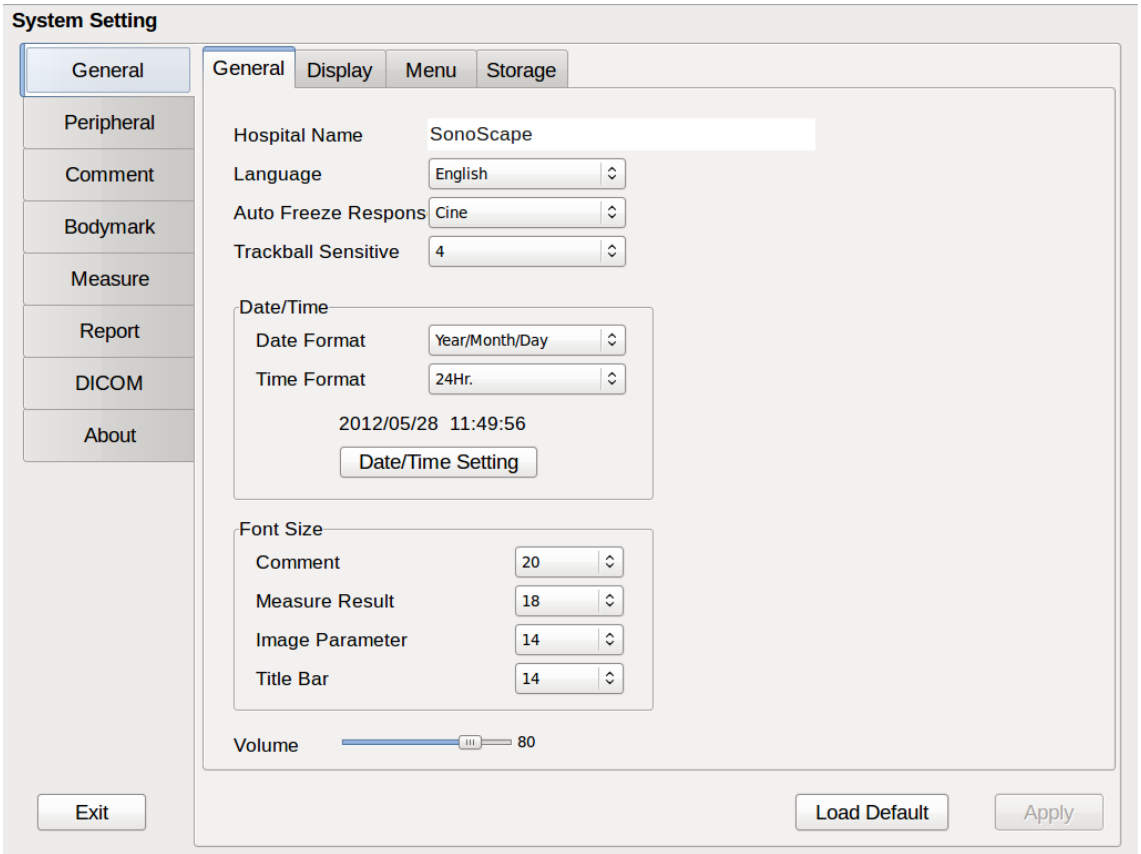
In the EXAM screen, press 

to open the *System Setting* window. The general setting and configurations for peripherals, comments (annotations) bodymark symbols, measurements, report, DICOM can be adjusted in the *System Setting* window. System information can also be found here.

5.1 General Setting

Click the **General** tab on top left to open the general setting page. It includes the following four sections: **General**, **Display**, **Menu** and **Storage**.

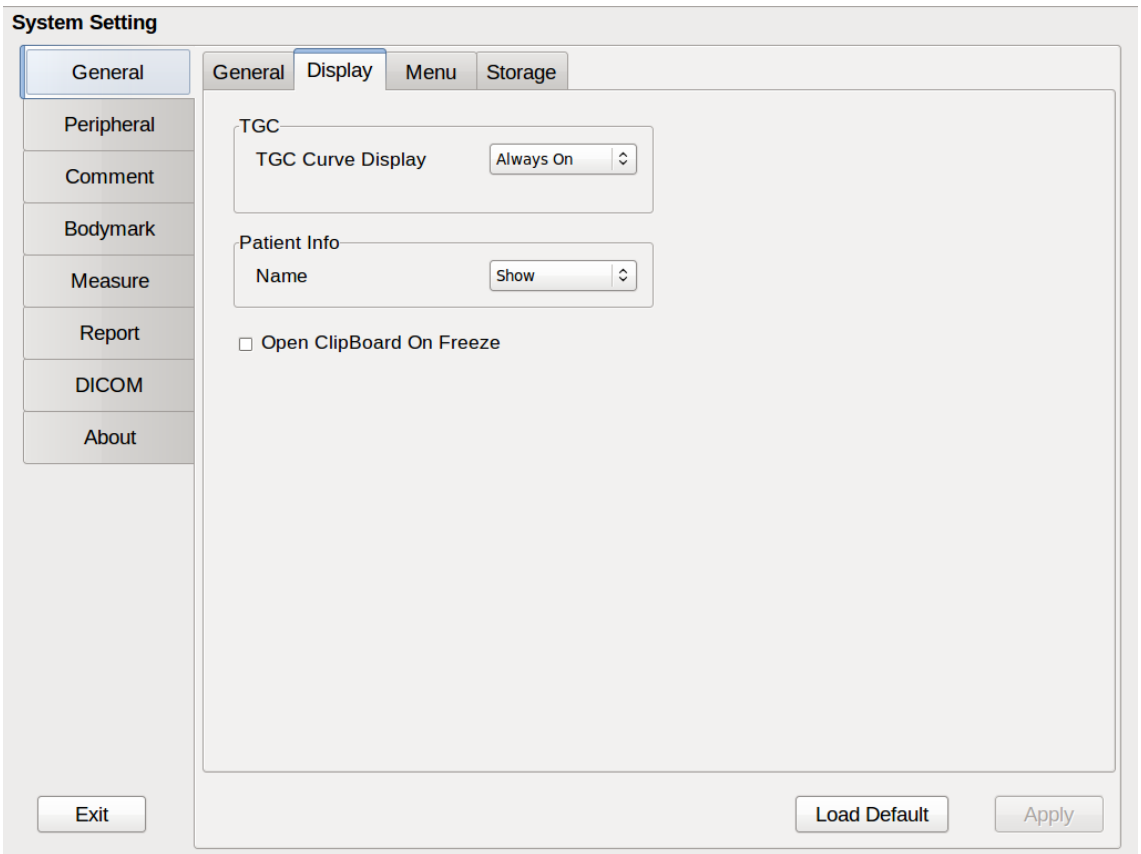
5.1.1 General



General configurations:

Hospital Name
Enter the hospital name. Maximum of 30 characters allowed.
Language
Click the drop-down box and select the language of the user interface. Click **Apply** to change the display language immediately.
Auto Freeze Response
Select the function to be activated once the Freeze key is pressed in a real time scan. `Cine` play back, `Measurement`, `Bodymark` selection, `Comment` or `Arrow` placement is allowed.
Trackball Sensitivity
Adjust the trackball sensitivity. Five levels available and the larger the number the higher the sensitivity.
Date Format
Adjust the date format.
Time Format
Adjust the time format.
Date/Time Setting
Click this button to adjust the system date and time.
Font Size
Adjust the font size for the comment, measurement results, imaging mode parameters and title bar.
Volume
Adjust volume with Audio key, alternatively, press Set key and move trackball left and right to adjust the volume.
Apply
Changing of any settings will activated this button. Click it to save any modifications.
Load Default
Click this button and select `Yes` to discard all modifications and load the system default setting.

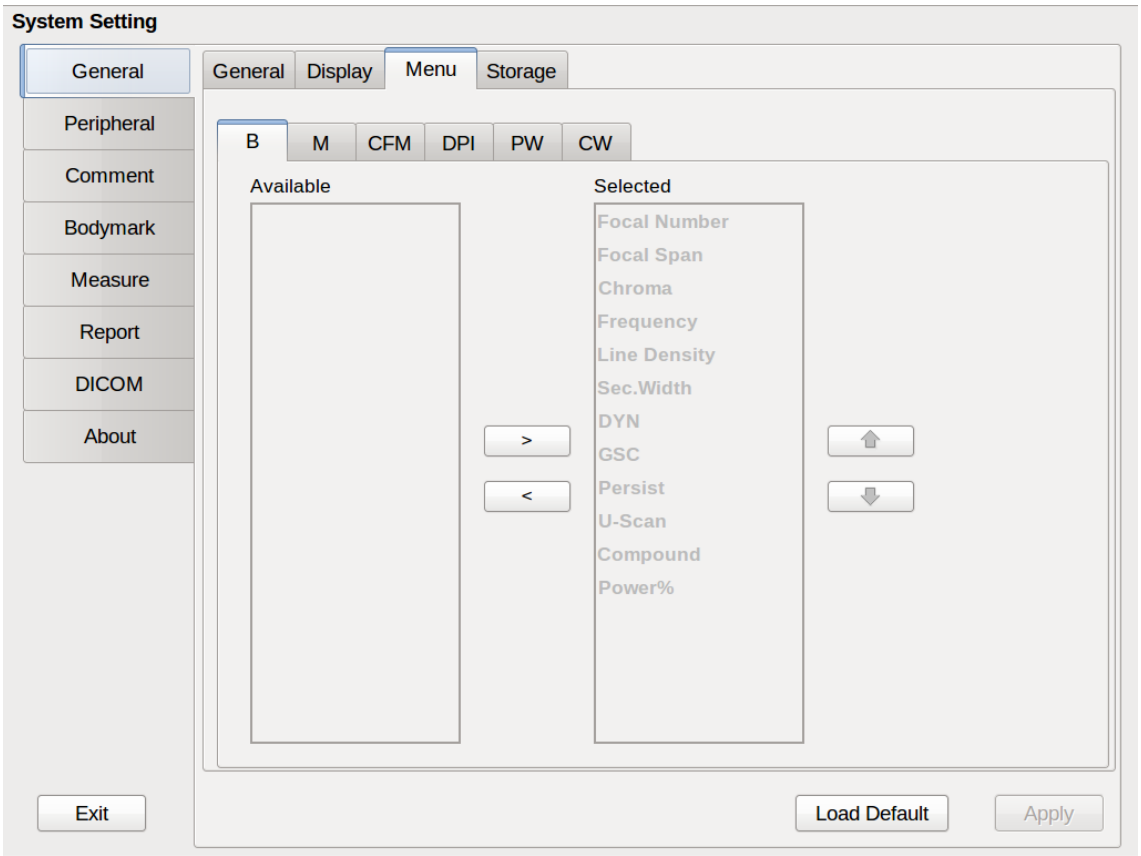
5.1.2 Display



Display configurations:

TGC Curve Display
TGC curve can be set to be displayed always or auto hide after a defined time period or never displayed.
Patient Name **Display**
Select whether to display the patient name on screen.
Open Clipboard on Freeze
Select this option to open clipboard automatically after pressing  in a real time scan.
Apply
Changing of any settings will activated this button. Click it to save any modifications.
Load Default
Click this button and select `Yes` to discard all modifications and load the system default setting.

5.1.3 Menu



Menu configuration item:


Add selected item(s) from the menu.


Remove selected item(s) from the menu.


Move the selected item up in the menu.


Move the selected item down in the menu.

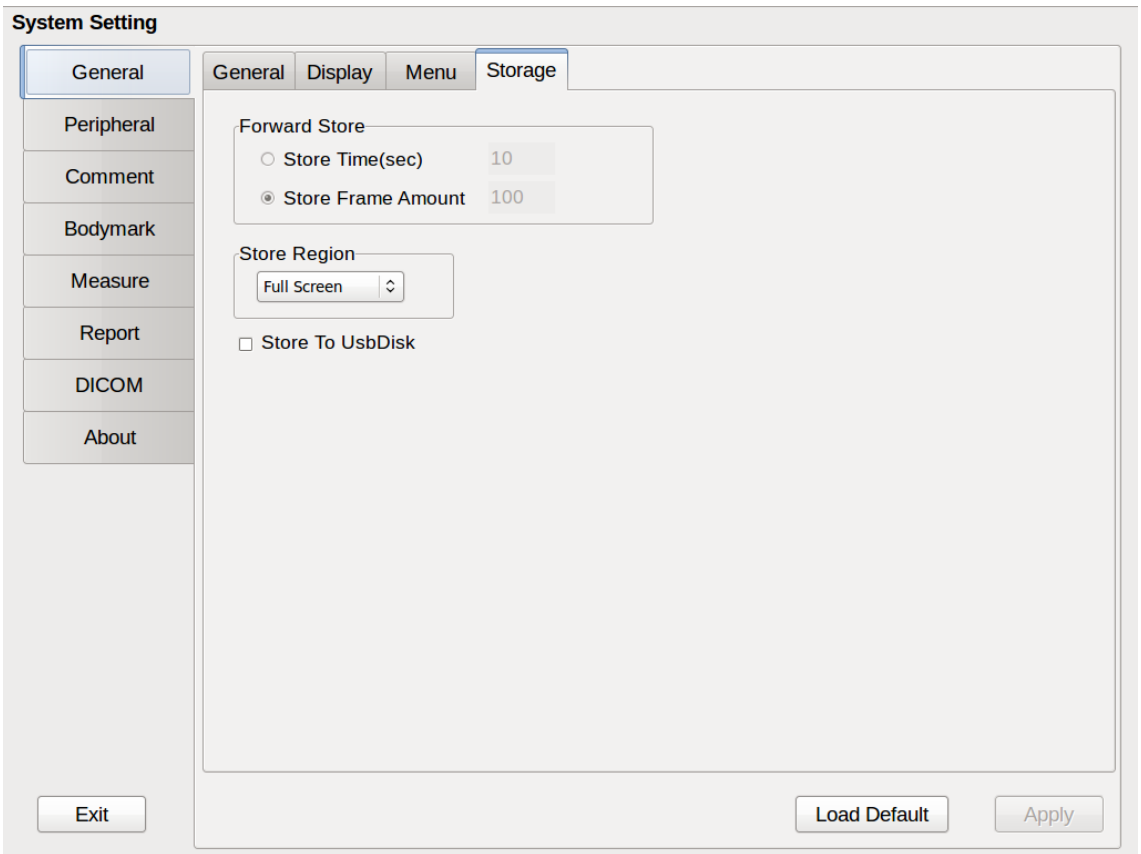
Apply

Changing of any settings will activated this button. Click it to save any modifications.

Load Default

Click this button and select `Yes` to discard all modifications and load the system default setting.

5.1.4 Storage



Storage configuration item:

Store Time

The time length for storing cine clips. Maximum 2 digits allowed.

Store Frame Amount

The number of frames to be saved in cine clips. Maximum 3 digits allowed.

Store Region

Use the drop-down box to select the region of the screen to be stored: `Full Screen`, `US Image` or `Right Top`.

Store to USB Disk

Use this option to choose whether to save image/cine directly to external USB drives when pressing 

.

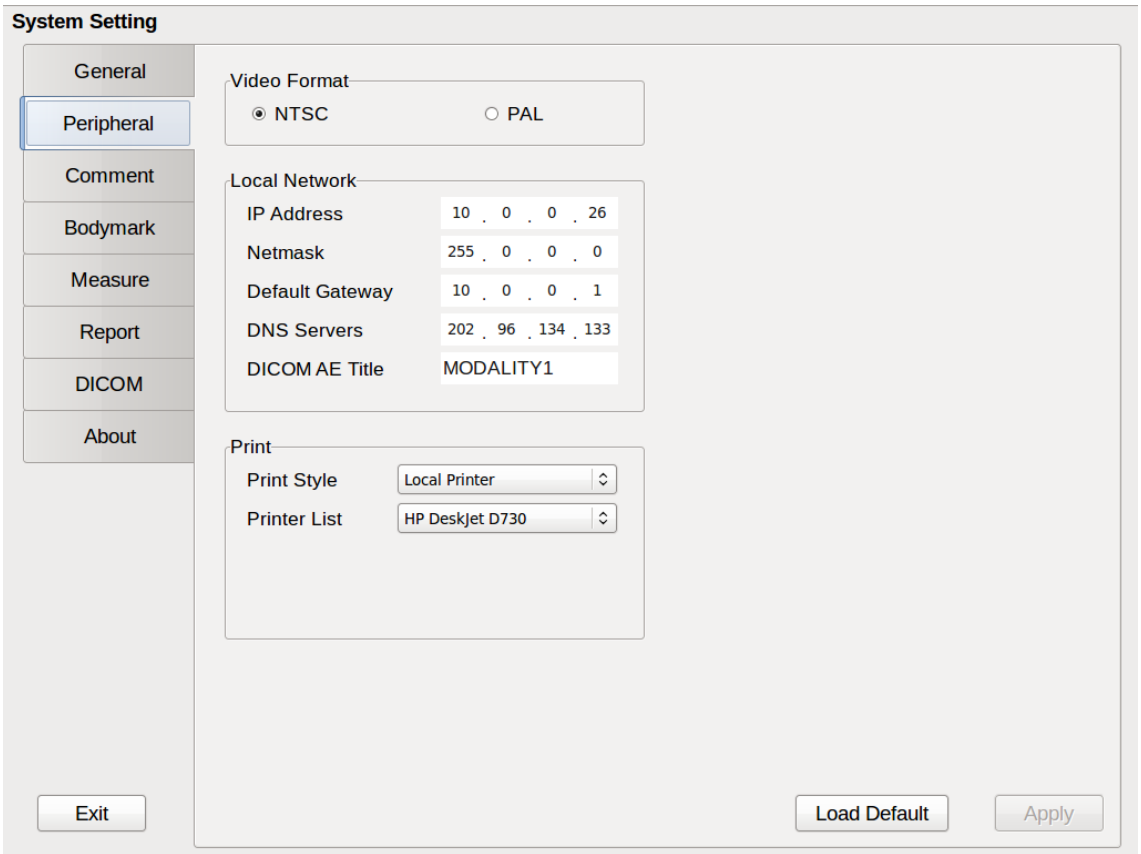
Apply

Changing of any settings will activated this button. Click it to save any modifications.

Load Default

Click this button and select `Yes` to discard all modifications and load the system default setting.

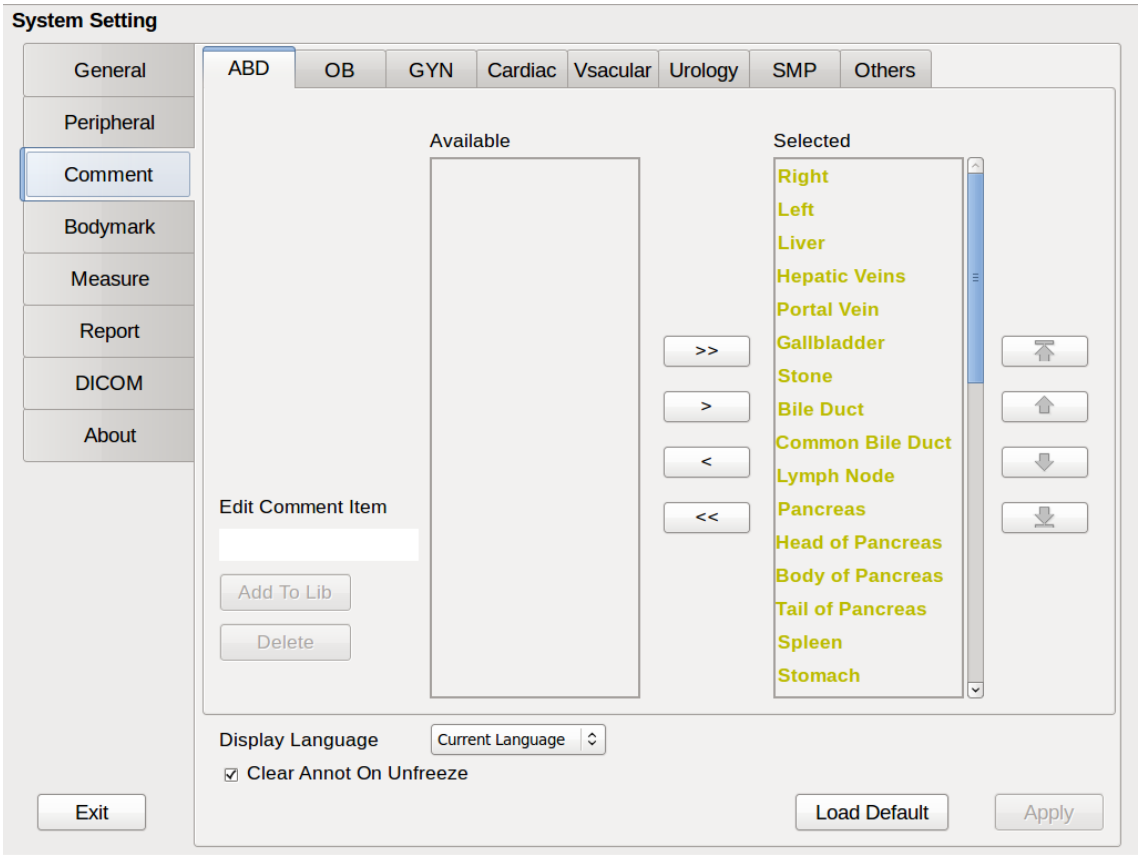
5.2 Peripheral



Peripheral configuration item:

Video Format
Select output video format: `NTSC` or `PAL`.
IP Address
Only numerical values of $0 \sim 255$ are allowed.
Netmask
Only numerical values of $0 \sim 255$ are allowed.
Default Gateway
Only numerical values of $0 \sim 255$ are allowed.
DNS Server
Only numerical values of $0 \sim 255$ are allowed.
DICOM AE Title
Maximum 16 characters allowed.
Print Style
Select the where to print: locally or using remote DICOM printer.
Printer List
Select a printer model.
Apply
Changing of any settings will activated this button. Click it to save any modifications.
Load Default
Click this button and select `Yes` to discard all modifications and load the system default setting.

5.3 Comment



Comment configuration item:

Add to Lib

Enter a string in the text box above and press this button to add this string into comment library.

Delete

Select a string in the *Available* region and press this button to delete the comment.

Display Language

Change the language of comment to the current system language or the default English.

Add all available items into active comment menu.

Add selected available items into active comment menu.

Remove selected items from active comment menu.

Remove all items from active comment menu.

Choose comment in the Selected region. Use the above four buttons to move the selected comments up or down to adjust their display order.

Clear Annot on Unfreeze

If this box is checked, all comments will be removed when  is pressed in a frozen mode.

Use the above buttons to move an selected item up or down the comment menu.

Store to USB Disk

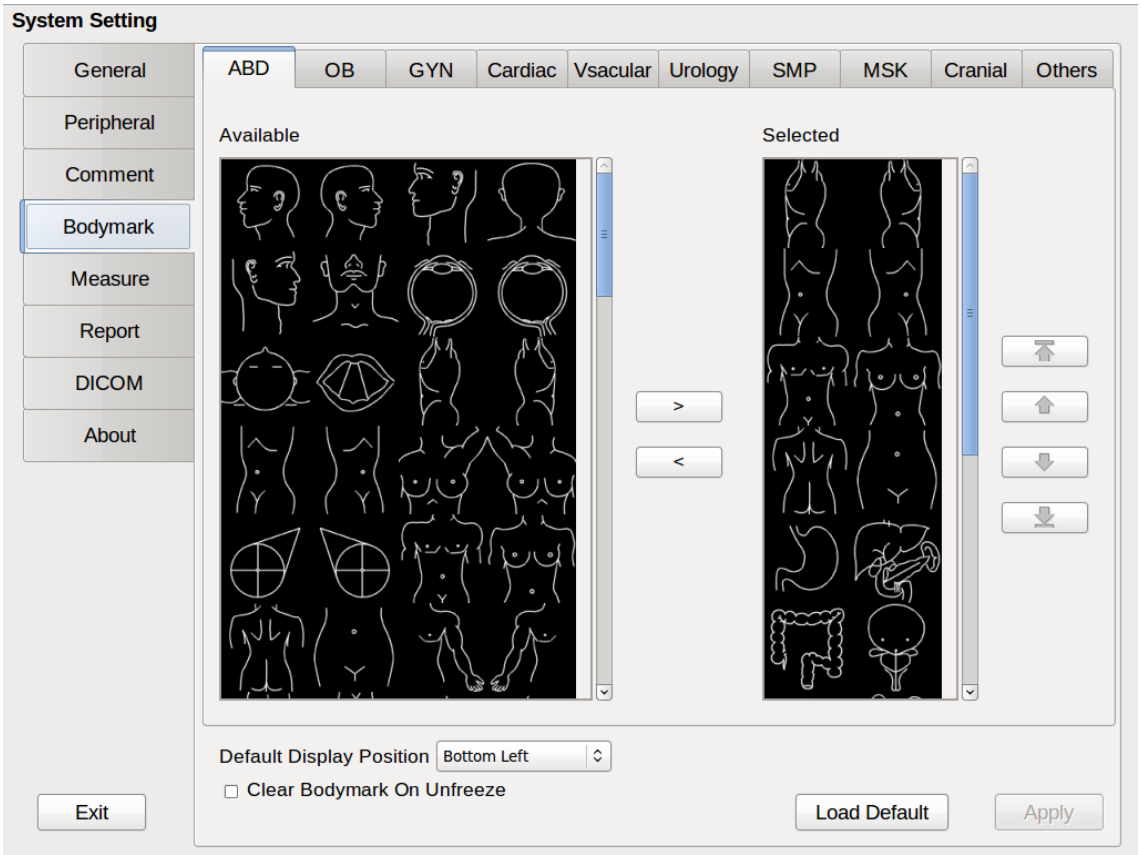
Check this box for saving images/cine clips directly to external USB drives when pressing  .

Apply

Changing of any settings will activated this button. Click it to save any modifications.

Load Default
Click this button and select `Yes` to discard all modifications and load the system default setting.

5.4 Bodymark



Bodymark configuration item:


Add selected available items into active bodymark screen.


Remove selected items from active bodymark screen.


Choose bodymark in the Selected region. Use the above buttons to move the selected bodymark up or down to adjust their display order.

Default Display Position
Select the default location for bodymark placement.

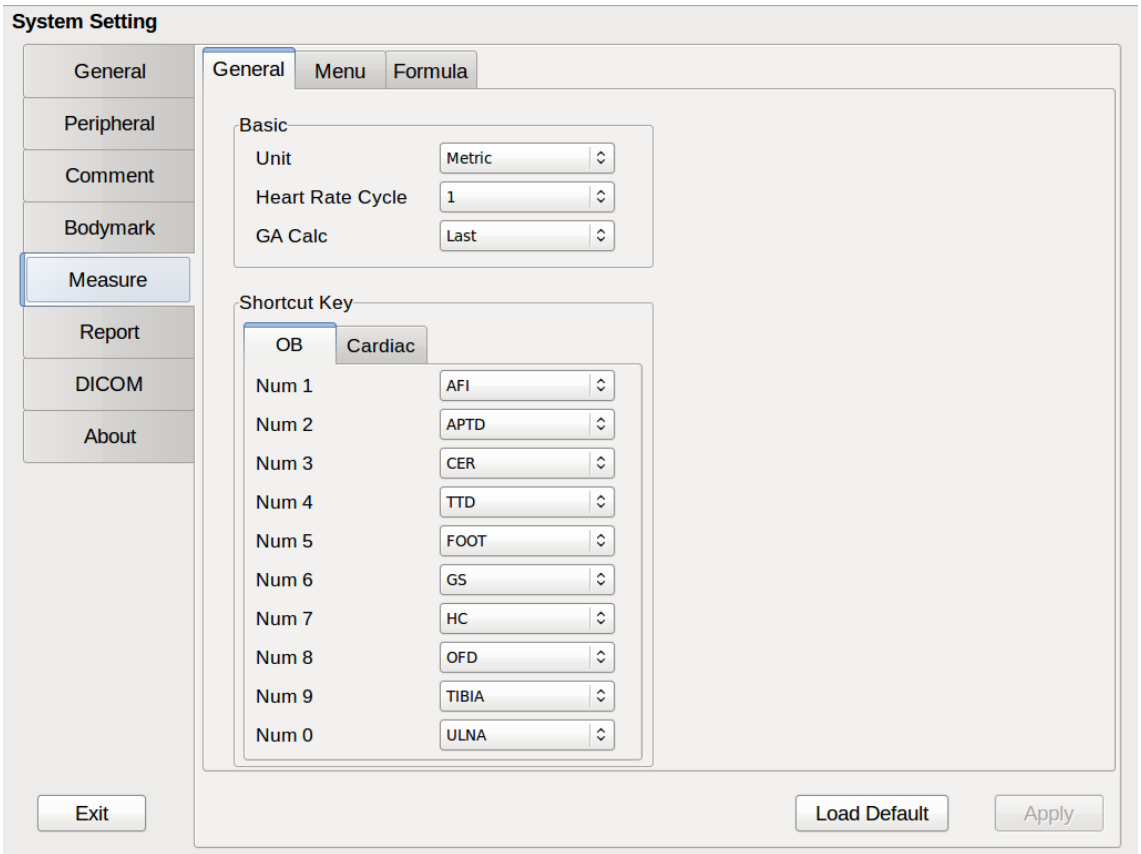
Clear Bodymark on Unfreeze
If this box is checked, all bodymark will be removed when  is pressed in a frozen mode.

Apply
Changing of any settings will activated this button. Click it to save any modifications.

Load Default
Click this button and select `Yes` to discard all modifications and load the system default setting.

5.5 Measure

5.5.1 General



Measurement configuration item:

Basic

Unit

Select the measurement units to be used from `Metric` or `US`.

Heart Rate Cycle

Select from $1 \sim 6$.

GA Calc

Select the method for GA calculation.

Shortcut Key

The ten number keys on the keyboard can be set as shortcuts in OB or Cardiac calculations.

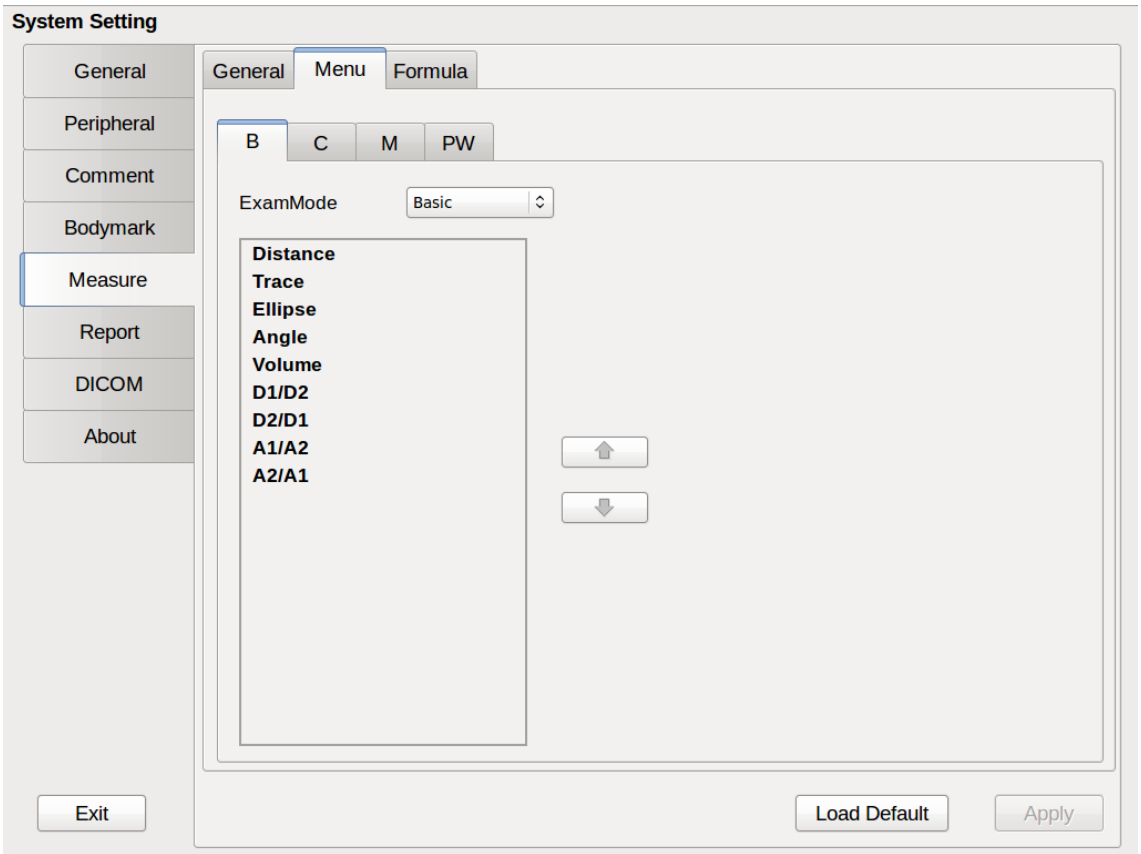
Apply

Changing of any settings will activated this button. Click it to save any modifications.

Load Default

Click this button and select `Yes` to discard all modifications and load the system default setting.

5.5.2 Menu



Click the imaging mode tab and change the displayed menu following instructions below.

Exam Mode

Select the application mode: `Basic`, `Vascular`, and etc.

Use the above buttons to move an selected measurement item up or down in the measurement menu.

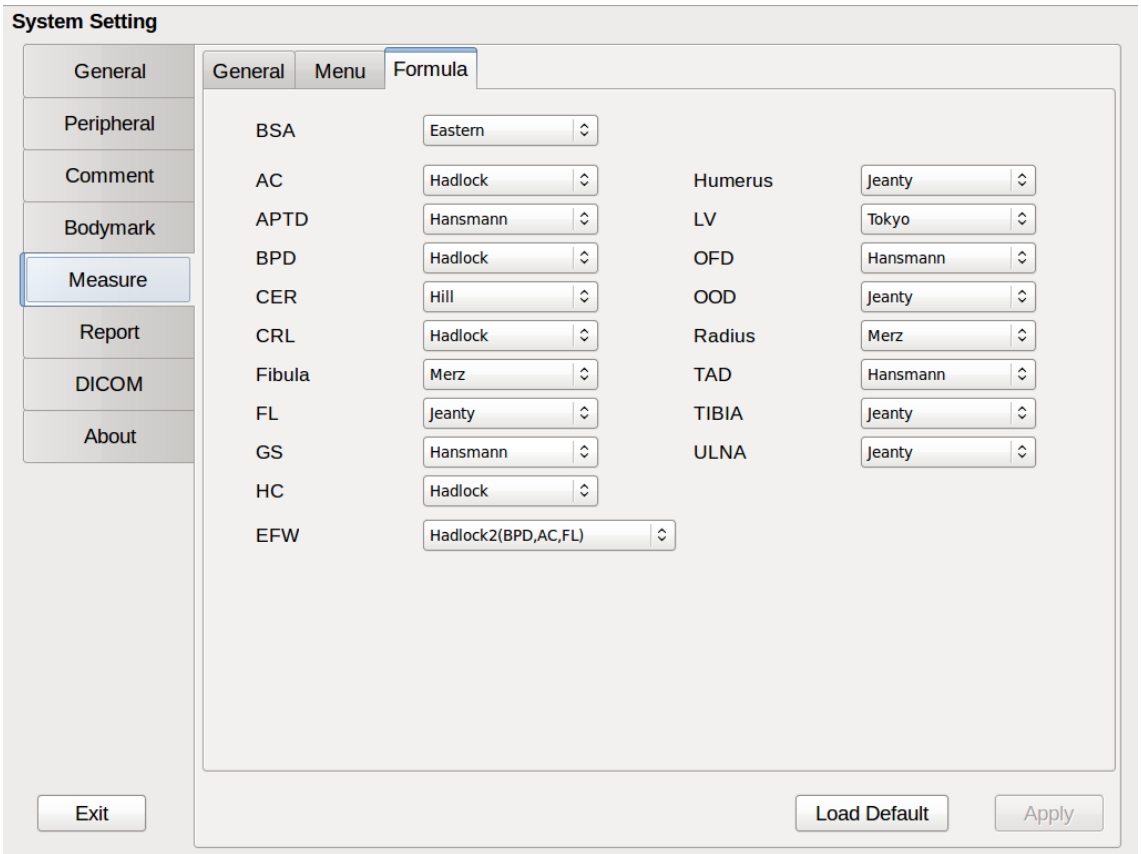
Apply

Changing of any settings will activated this button. Click it to save any modifications.

Load Default

Click this button and select `Yes` to discard all modifications and load the system default setting.

5.5.3 Formula

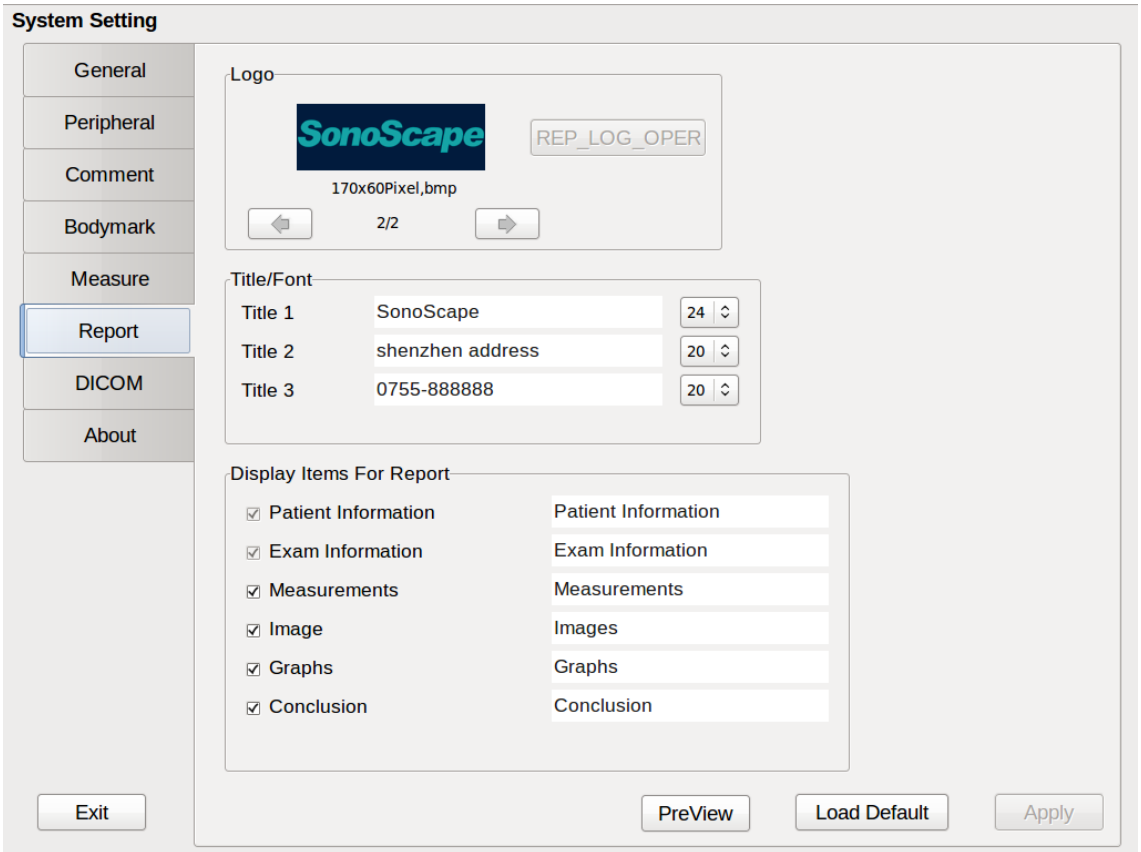


Use drop-down box to choose different formula in each measurement.

BSA
Body surface area calculation formula.
AC
Abdomen circumference calculation formula.
APTD
Anterior-Posterior Thigh Diameter calculation formula.
BPD
Biparietal diameter calculation formula.
CER
Cerebellum Diameter calculation formula.
CRL
Cerebellum Diameter calculation formula.
Fibula
Fibula length calculation formula.
FL
Femur length calculation formula.
GS
Gestational sac calculation formula.
HC
Head circumference calculation formula.
EFW
Estimated fetal weight calculation formula.
Humerus
Humerus length calculation formula.

LV
Lateral ventricle calculation formula.
OFD
Occipito-frontal diameter calculation formula.
OOD
Outer Ocular Diameter calculation formula.
Radius
Radius length calculation formula.
TAD
Trans-Abdominal Diameter calculation formula.
Tibia
Tibia length calculation formula.
Ulna
Ulna length calculation formula.
Apply
Changing of any settings will activated this button. Click it to save any modifications.
Load Default
Click this button and select `Yes` to discard all modifications and load the system default setting.

5.6 Report



Report configuration item:

Logo

Use  to choose different logo displayed on screen.

Title/Font

Enter the title text of the report and change the font size for each title with the drop-down box.

Display item for report

Choose items for display in report by checking the box in front of each item. Items including: `Patient Information`, `Exam Information`, `Measurements`, `Image`, `Graphs`, `Conclusion`

Preview

Preview the report using the current configuration.

Apply

Changing of any settings will activated this button. Click it to save any modifications.

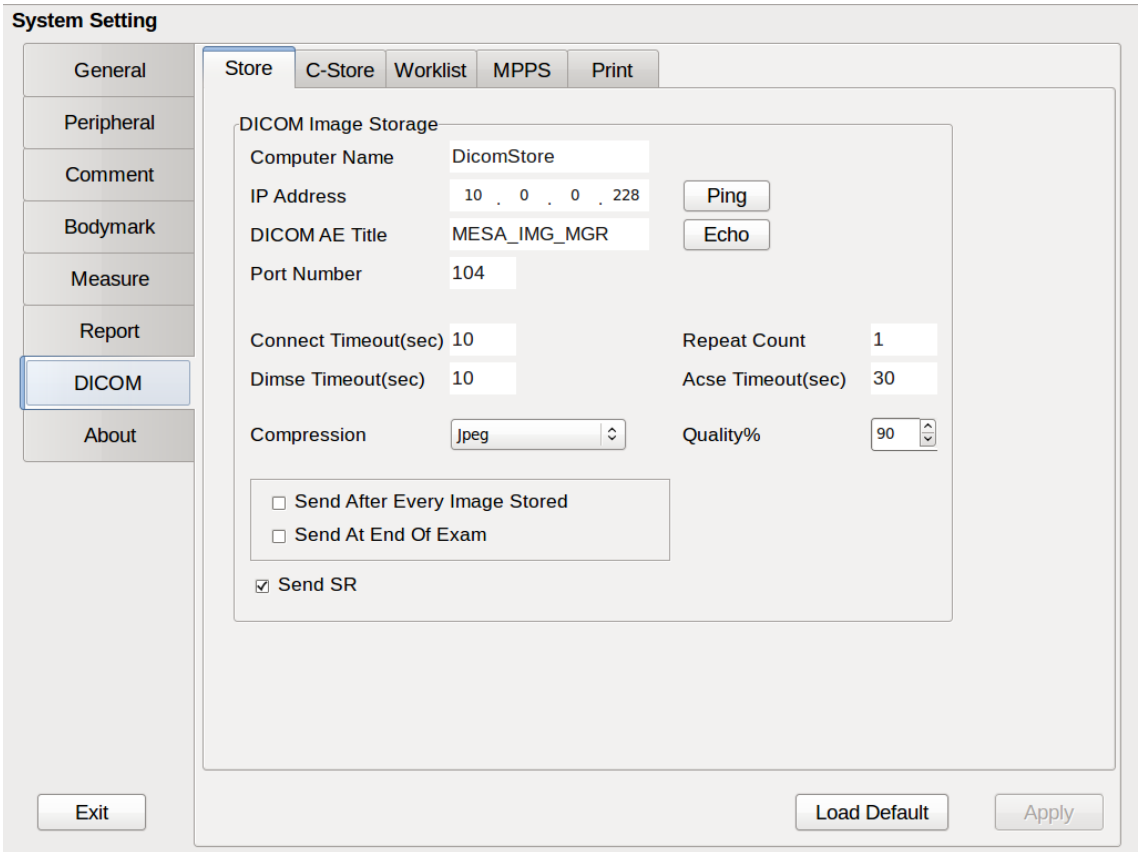
Load Default

Click this button and select `Yes` to discard all modifications and load the system default setting.

5.7 DICOM

This device complies with the Digital Imaging and Communications in Medicine (DICOM) standard which is widely accepted as the standard for data storage and communication among hospitals and organizations. DICOM configurations can be divided into the following categories: **Image Storage**, **Storage Commitment**, **worklist**, **MPPS** and **printing**.

5.7.1 DICOM Image Storage



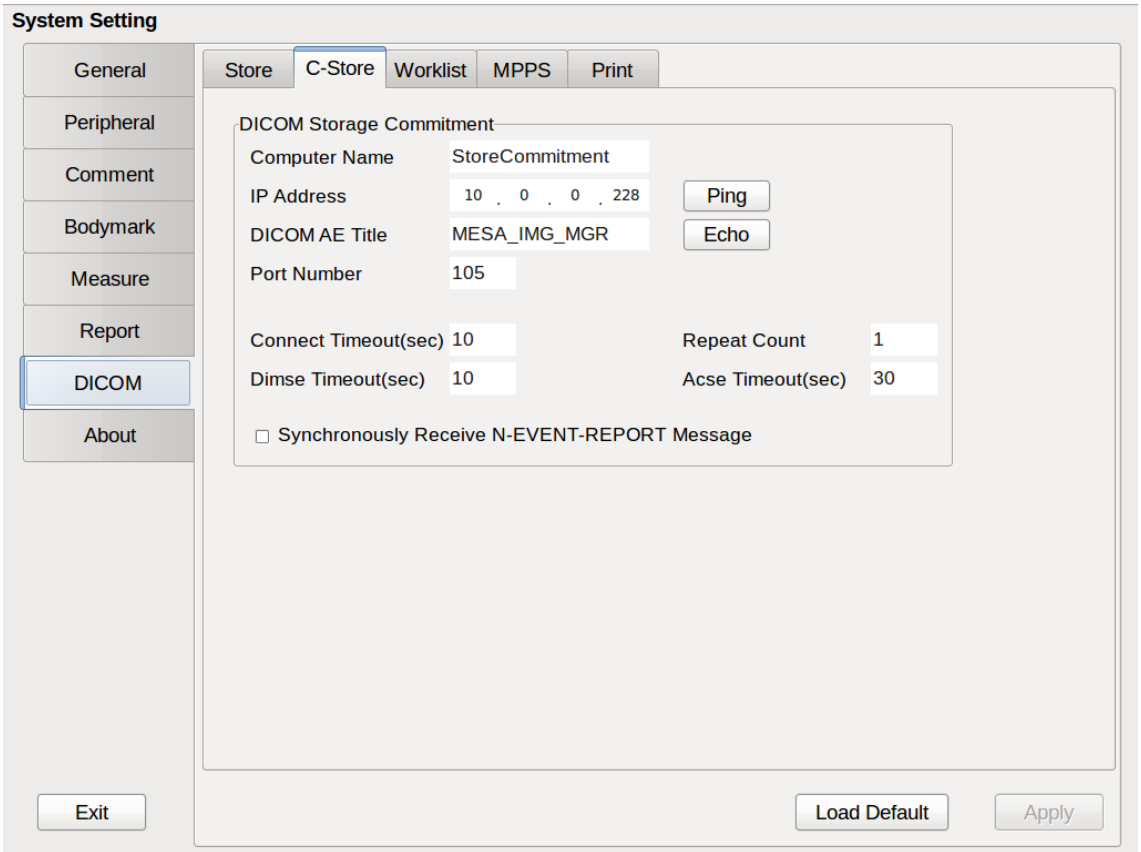
Computer Name
Maximum 16 characters allowed.
IP Address
Only values of $0 \sim 255$ allowed.
DICOM AE Title
Maximum 16 characters allowed.
Port Number
Numerical value of maximum 5 digits allowed.
Connect Timeout
Numerical value of maximum 2 digits allowed.
Repeat Count
Numerical value of maximum 2 digits allowed.
Dimse Time
Numerical value of maximum 2 digits allowed.
Acse Timeout
Numerical value of maximum 2 digits allowed.
Compression and Quality%
Select compressed image type and the compression level.
Apply

Changing of any settings will activated this button. Click it to save any modifications.

Load Default

Click this button and select `Yes` to discard all modifications and load the system default setting.

5.7.2 DICOM Storage Commitment



Storage Commitment configuration item:

Computer Name

Maximum 16 characters allowed.

IP Address

Only values of $0 \sim 255$ allowed.

DICOM AE Title

Maximum 16 characters allowed.

Port Number

Numerical value of maximum 5 digits allowed.

Connect Timeout

Numerical value of maximum 2 digits allowed.

Repeat Count

Numerical value of maximum 2 digits allowed.

Dimse Time

Numerical value of maximum 2 digits allowed.

Acse Timeout

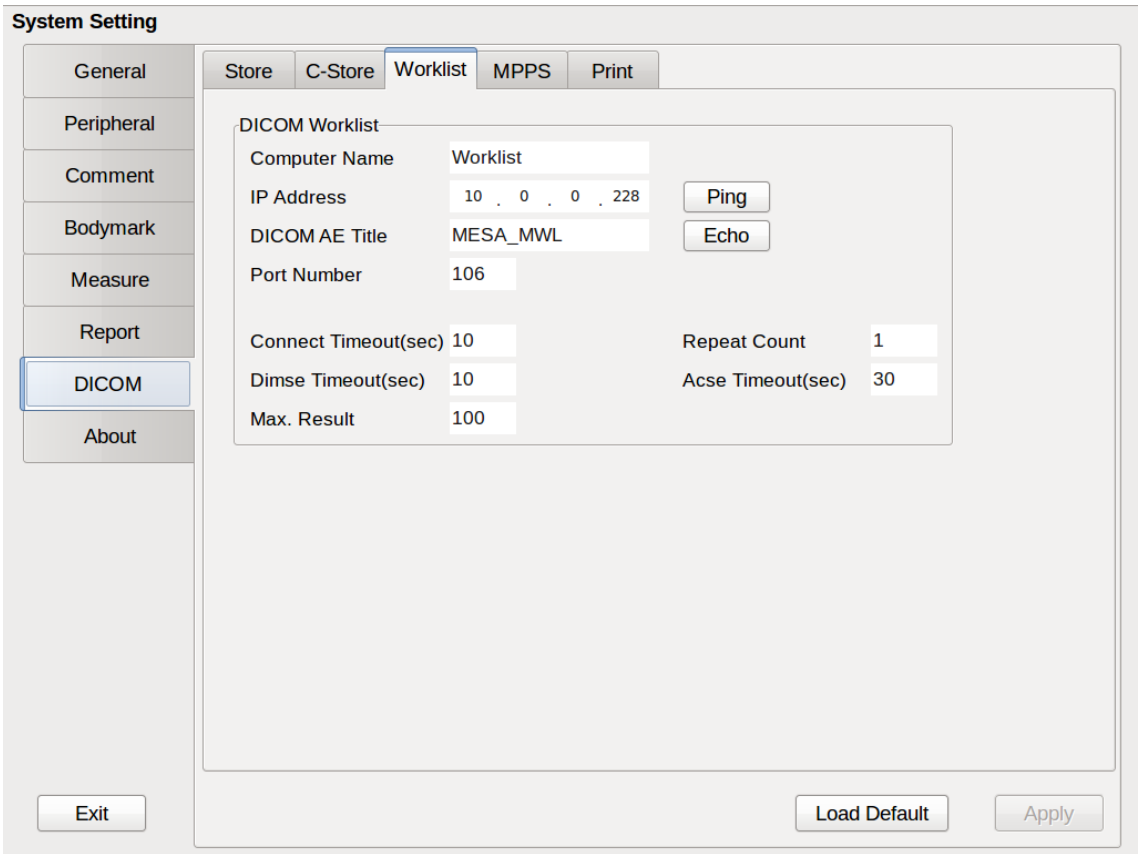
Numerical value of maximum 2 digits allowed.

Apply

Changing of any settings will activated this button. Click it to save any modifications.

Load Default
Click this button and select `Yes` to discard all modifications and load the system default setting.

5.7.3 DICOM Worklist

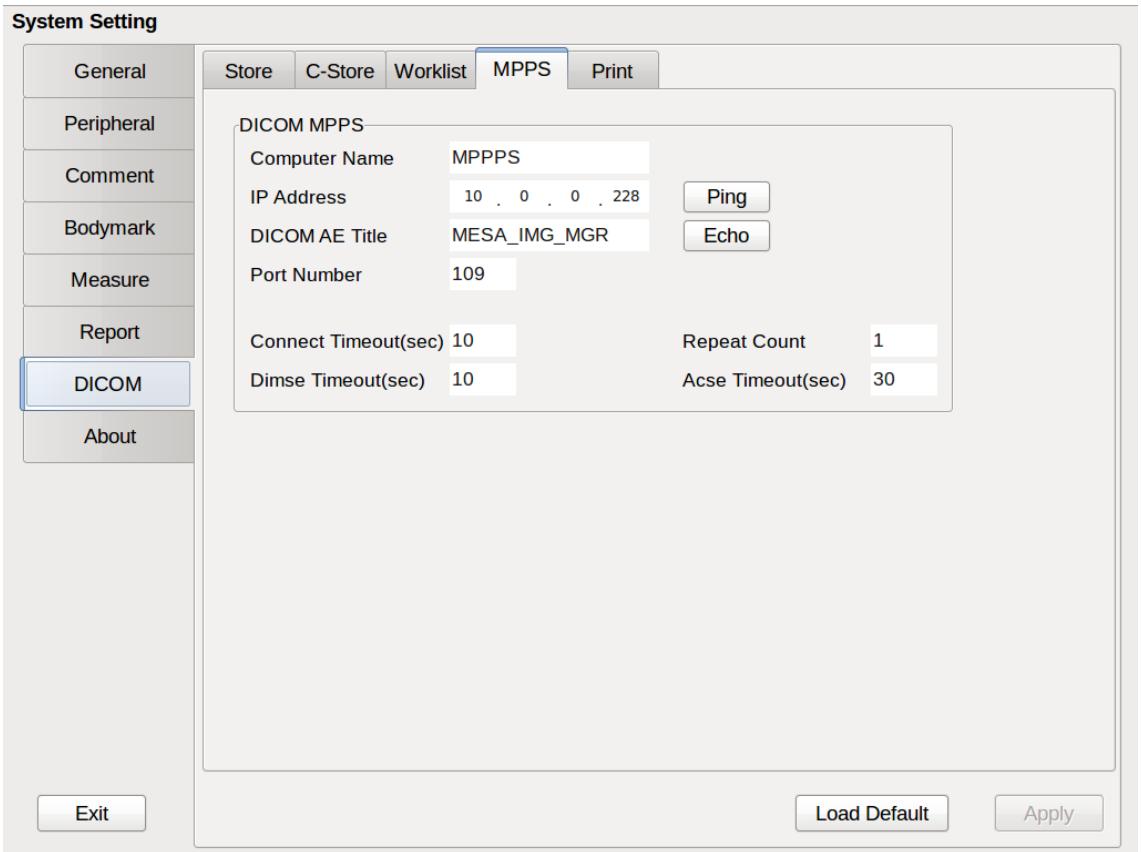


Worklist configuration item:

Computer Name
Maximum 16 characters allowed.
IP Address
Only values of $0 \sim 255$ allowed.
DICOM AE Title
Maximum 16 characters allowed.
Port Number
Numerical value of maximum 5 digits allowed.
Connect Timeout
Numerical value of maximum 2 digits allowed.
Repeat Count
Numerical value of maximum 2 digits allowed.
Dimse Time
Numerical value of maximum 2 digits allowed.
Acse Timeout
Numerical value of maximum 2 digits allowed.
Max. Result
Numerical value of maximum 4 digits allowed.
Apply
Changing of any settings will activated this button. Click it to save any modifications.
Load Default

Click this button and select Yes to discard all modifications and load the system default setting.

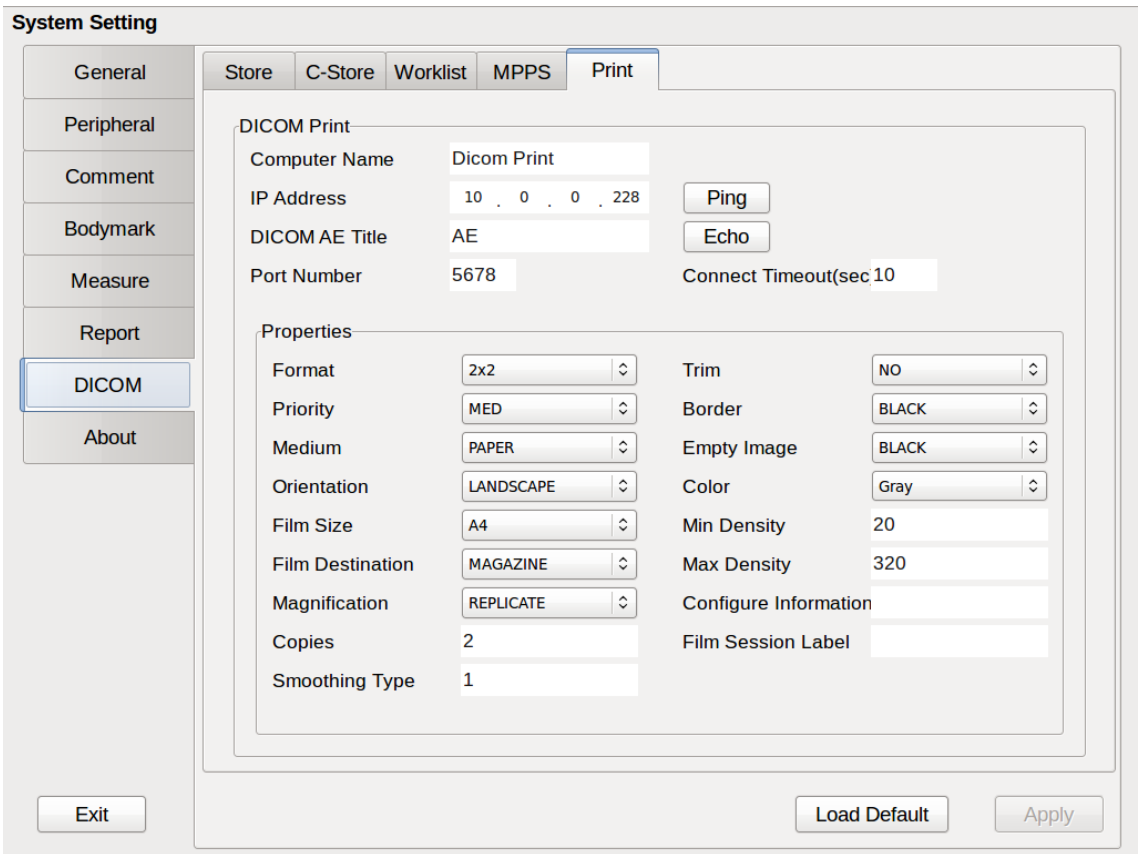
5.7.4 DICOM MPPS



MPPS configuration item:

Computer Name
Maximum 16 characters allowed.
IP Address
Only values of $0 \sim 255$ allowed.
DICOM AE Title
Maximum 16 characters allowed.
Port Number
Numerical value of maximum 5 digits allowed.
Connect Timeout
Numerical value of maximum 2 digits allowed.
Repeat Count
Numerical value of maximum 2 digits allowed.
Dimse Time
Numerical value of maximum 2 digits allowed.
Acse Timeout
Numerical value of maximum 2 digits allowed.
Apply
Changing of any settings will activated this button. Click it to save any modifications.
Load Default
Click this button and select Yes to discard all modifications and load the system default setting.

5.7.5 DICOM Print



Print configuration item:

Computer Name
Maximum 16 characters allowed.
IP Address
Only values of $0 \sim 255$ allowed.
DICOM AE Title
Maximum 16 characters allowed.
Port Number
Numerical value of maximum 5 digits allowed.
Connect Timeout
Numerical value of maximum 2 digits allowed.
Format
Print layout: $1 \times 1 \sim 5 \times 6$.
Priority
Set the printing job priority to be `low`, `medium` or `high`.
Medium
Select print target medium: `BLUE FILM`, `CLEAR FILM`, `PAPER`.
Copies
Input the number of copies to print. Numerical value of maximum 3 digits allowed.
Orientation
Choose whether to print the image `Landscape` or `Portrait`.
Film Size
Specifies the dimension of the film size.
Film Destination
Specifies the film destination: `Magazine`—for storing in a film magazine; `Processor`—for processing in a film processor.

Magnification

Specifies the method used for magnifying images at the printing process. The value can be set from `Replicate`, `Bilinear`, `Cubic` or `None`.

Smoothing Type

Input the value of magnification interpolation for the printer.

Trim

Choose whether a trim box should be printed around each image.

Min. Density

Input density level of the film. Numerical value of maximum 2 digits allowed.

Max. Density

Input the maximum density level of the film. Numerical value of maximum 3 digits allowed.

Border

Choose the color of the border(`Black` or `White`) which fills the gap between the images.

Empty Image

Choose whether to print `Black` or `White` empty images.

Color

Choose whether to print the images in color or grayscale.

Film Label

Input a name to be applied to a group of the film labels. Maximum 16 characters allowed.

Configure Information

Specifies special image quality settings.

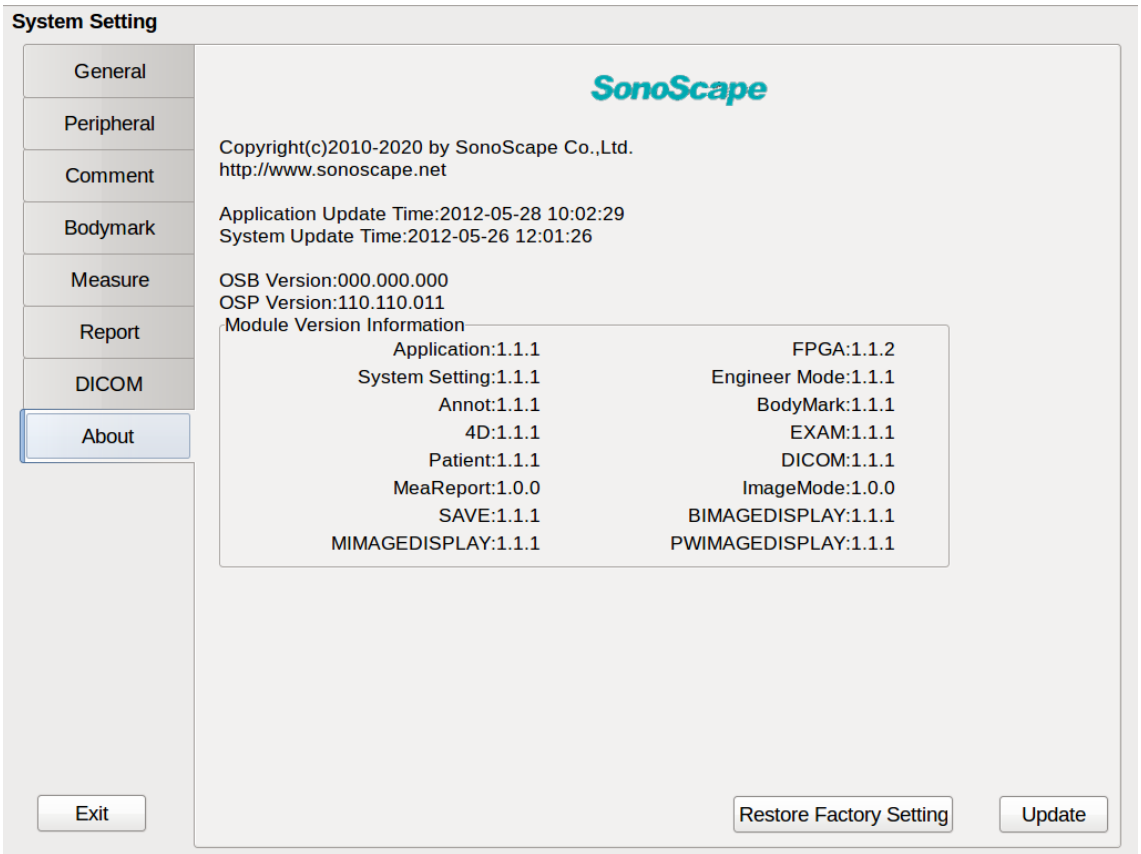
Apply

Changing of any settings will activated this button. Click it to save any modifications.

Load Default

Click this button and select `Yes` to discard all modifications and load the system default setting.

5.8 System Information



System information configuration:

Restore Factory Setting
Restore the system to factory setting.
Update
Click this button to update the system software.
Network Update
Select this option to start network update. The system automatically determines the connectivity to the update server. Press **Confirm** to start updating.
USB Update
Select this option to update using USB drive.

Chapter 6

B Mode

The ultrasound image of B mode originates from the tissue echo received by transducer. A series of process like amplification, D/A transformation, beam-forming will be carried out by the system to form the gray-scale image to reflect the echo intensity. The gray-scale image appears lighter when the echo signal is stronger.

6.1 Entering B Mode

Select an exam mode in the selection interface with your cursor, and press SET to enter into the scanning mode, which is a B real-time mode as default.

When in other modes (e.g. CFM, M mode), you can also press the key to switch into B real-time mode from other mode.

A B-mode image displays in **Figure 6.1**.

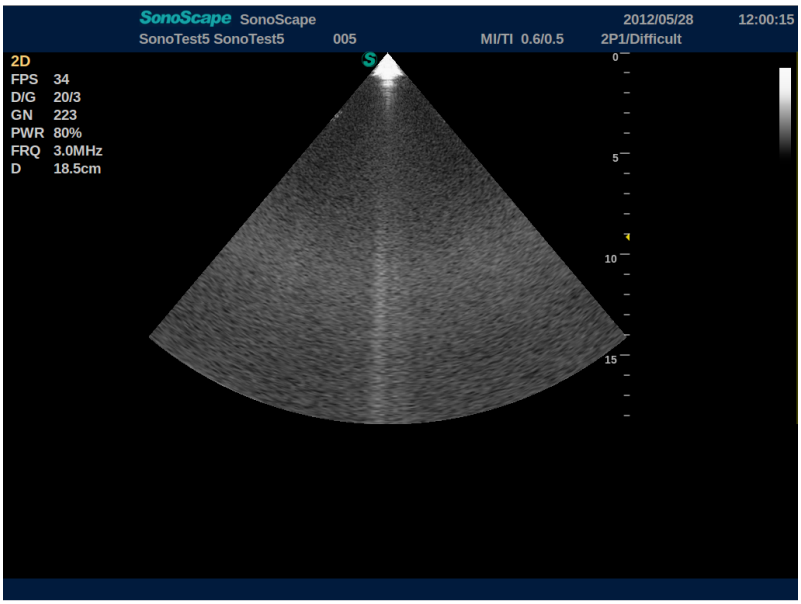
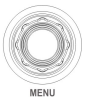


Figure 6.1: B mode

6.2 Parameter Adjustment



Enter B-Mode, and press MENU in the real-time scanning mode to start up the following menu.

Real time B mode menu	
Focal Number	1
Focal Span	1
Chroma	0
Frequency	4.0MHz
Line Density	High
Sec. Width	70.9
Dynamic Range	72dB
Gay Scale Curve	13
Persist	4
μScan	
Compound	0
Power%	60%

Press Freeze to freeze the image in real-time scanning mode, and then press MENU, you will see the following menu:

Frozen B mode menu	
Chroma	
GSC	
μScan	13

Note:

- Press MENU for mode menu, use AUDIO knob to select the menu items, and use MENU knob to adjust the parameter value.

6.2.1 Focal Number

Focus refers to the focal zone for emitting and receiving ultrasound pulse waves. Focal number is related to “image resolution” and “frame rate”; the image is better with more focal numbers, but the image frame rate becomes lower. You can only adjust this parameter in active B-mode.

Operation:

Focal Number

- Press 

for B-mode menu, use 

knob to select the item of focal number;.
- Twist 

knob clockwisely to add more focal number, and counterclockwisely to reduce the focal number.

6.2.2 Focal Span

Ultrasound focal zone has a specific effective range in depth. When the two or more than two focuses are displayed, focal span can be adjusted to change the effective range between neighboring focal zones. You can only use this adjustment in the real-time B-mode.

Operation:

Focal Span

- Press 

for mode menu, use 

to select the item of focal span;.
- Twist 

knob clockwisely to extend the focal span, and counterclockwisely to reduce the focal span.

6.2.3 Chroma

For the gray scale ultrasound image on the screen, the user can select the other colors except black and white to dispay the image. User can select the color from colors of pink, light-blue, heavy-blue and amber, etc. Chroma can be adjusted in freeze mode.

Operation:

CHROMA

- Press 

for B-mode menu, use 

to select Chroma;.
- Twist 

knob for Chroma value,to adjust the color of Chroma.

6.2.4 Frequency (Freq)

Adjust the frequency of pulse wave in real-time B mode to change the acoustic power and scanning depth of transducer and image resolution.

Operation:

FREQUENCY

- Press 

for B-mode menu, use 

to select Frequency;.
- Twist 

knob clockwisely to increase the frequency, and counterclockwisely to reduce the frequency .

6.2.5 Line Density

Line density refers to the density of scanning lines within the specific width and area of image.Higher line density can improve lateral resolution of image, but also decrease the image frame rate. Users have to make a balance between the frame frequency and image quality when adjusting the parameter.

Operation:

Line Density

- Press for B-mode menu, use to select Line Density;.
- Twist knob to set the line density value .

6.2.6 SEC/Width

When the image covers the wanted tissue, the user can reduce the width (for linear probe) or angle (for convex probe) in B-mode to have a high frame rate, or increase the sec/width for a wide scanning area but lower frame rate.

Operation:

Sec. Width

- Press for B-mode menu, use to select SEC/Width;.
- Twist knob clockwisely to increase the SEC/Width, and counterclockwisely to reduce the SEC/Width .

6.2.7 Dynamic Range (DYN)

Adjust the dynamic range of image to enhance the the gray scale by chaging the levels of the internal gray scale, to display the pathological structure.

Operation:

DYN

- Press for B-mode menu, use to select DYN;.
- Twist knob clockwisely to increase the dynamic range, and counterclockwisely to reduce the dynamic range .

6.2.8 Gray Scale Curve (GSC)

Different anatomical structure of organs in human body can cause great difference in the gray scale displayed in B-mode image. Therefore different gray scales can be selected to improve tissue profile and help to recognize the different tissue structure. There are 16 available kinds of gray scale curve.The gray scale profile can determine the display lightness according to the strongness of echo and different gray scale curves have different imaging modes. Gray scale curves can be adjusted in the freeze mode.

Operation:

GSC

- Press 

for B-mode menu, use 

to select GSC;.
- Twist 

knob to select differenct GSC .

6.2.9 Persist

Persist is an image processing method, it averages each frame to reduce irrelevant noises. Set a lower Persist value, you can have better real-timeness of image, but also may cause more noise. A higher Persist value reduces the noise, improve the smoothnss of image but also reduces real-timeness of the image.

Operation:

Persist

- Press 

for B-mode menu, use 

to select Persist;.
- Twist 

knob clockwisely to increase the value of Persist, and counterclockwisely to reduce the value of Persist.

6.2.10 μ-Scan

μScančňis the function to optimize the ultrasound image. It can reduce speckle noise, enhance contrast resolution and enhance the display of tissue boundaries.

Operation:

μScan

- Press 

for B-mode menu, use 

to select μScan;.
- Twist 

knob to adjust μScan.

6.2.11 Compound Imaging

In B-mode scanning, sometimes the beam is not vertical to the surface of transducer but has a certain angle. The final mage is formed by many images of different scanning angles and through image process. The advantage is to have a better tissue differentiation and enhance the contrast resolution to have a clear edge of orgain. For a better recognition, the wall of vascular and tissue phrase will be marked specifically.Compound Imaging can suppress the ultrasound side lobe to enhance the spatial resolution of system and signal-to-noise ratio to have a better image.

Operation:

Compound

- Press 

for B-mode menu, use 

to select Compound Imaging;.
- Twist 

knob clockwisely to increase the compound imaging scale of contrast resolution, and counterclockwisely to reduce the compound imaging scale of contast resolution.

6.2.12 Power

Power of transducer shall be adjusted in a reasonable level to meet the imaging requirement and lower the magnitude of ultrasound enegy received by body at most, to reduce unexpected effect.To remain the power and exposure time at the lowest level to provide a smallest value of evaluable information. The adjustment range of power is 0~100%.The actual power value will be displayed in the image information zone of the screen.

Operation:

Power

- Press 

for B-mode menu, use 

to select Power.
- Twist 

knob clockwisely to increase the value of Power, and counterclockwisely to reduce the value of Power.

6.2.13 Gain

Use Gain knob to adjust the over-all brightness of B-mode image. The adjustment of Gain determines the enlarging value of the received echo; the whole received echo can be enlarged with the same value regardless of the depth.

Operation:

Turn the Gain knob clockwisely to lighten the image.
Turn the Gain knob counterclockwisely to darken the image.

✍ Note:

- The gain value will be displayed on the screen.
- B- Gain can only be adjusted in real-time B mode.

6.2.14 Focus Position

Use Focus Pos. to select the actual focus position.The focus position is marked with yellow triangle in the depth of ultrasound image

Operation:

Tap to the Focus Pos. key up to move the focus to the shallow part;
Tap to the Focus Pos. key down to move the focus to the deep part.

6.2.15 Depth

Adjusting the parameter to change the display depth of image.The display proportion can be adjusted accordingly. The depth range of the interest zone of ultrasound image can be adjusted with the function, and the number and frame frequency of the image scanning lines can be adjusted auotomatically. The depth can only be changed in the real-time mode.

Operation:

Tap the Depth key up to reduce the depth range of B-mode image and enlarge the display size of image;
Tap the Depth down to increase the depth range of B-mode image and reduce the display size of image to have the entire view of depth range.

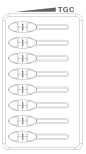
✍ Note:

- The maximum and minimum depth available depend on the selected transducer.
- The value is displayed on the left side of screen with the unit of cm.

6.2.16 Time Gain Compensation (TGC)

The attenuation of ultrasound echo in human body is increased by the depth. Gain compensation of different depth is needed for the far-field image, to maintain the conformity of brightness from near-field to the far-field. Use the slide control of TGC to increase the gain of specific depth.

Operation:



TGC slide control is used to adjust the lightness of specific depth.
Slide TGC left to reduce the brightness of correspondent B-mode depth.;
Slide TGC to the right to increase the brightness of correspondent B-mode depth.

✍ Note:

- The starting position of slide control should be placed in the middle, with the preset time of gain compensation of different transducers.
- With the difference in the position of slide control, the setting position of slide control is not saved in the user pre-set.TGC curve is displayed in the right side of imaging zone when adjusting TGC control.

6.3 Other B Mode Operations

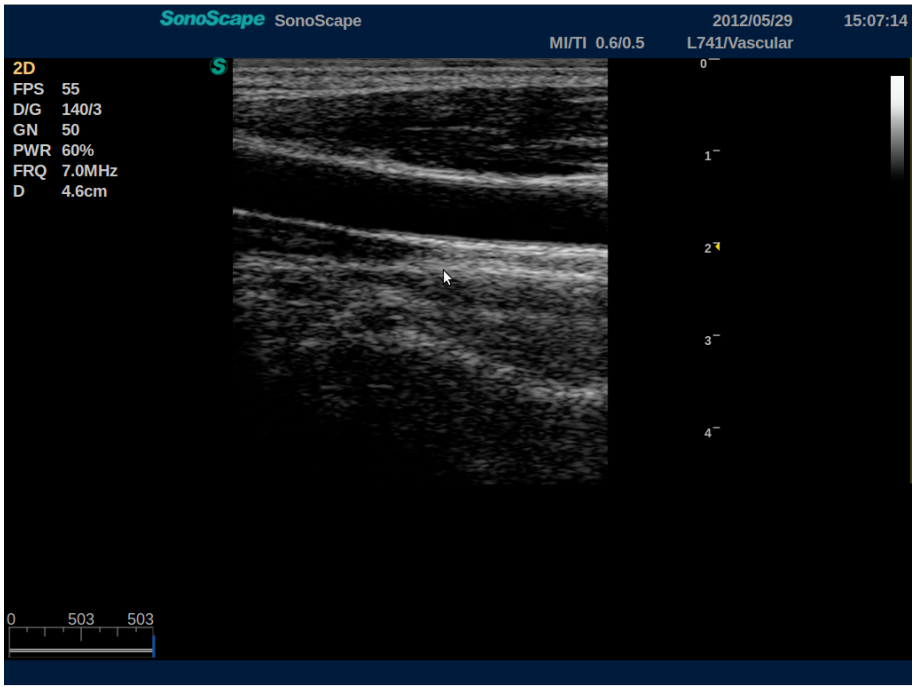
6.3.1 Freeze

Use Freeze to switch between real-time mode and freeze mode.

Operation:

- Press Freeze Key in real-time scanning mode to freeze the image and stop scanning;;.
- Press Freeze Key in freeze mode to activate scanning.

Freeze B-mode displays as follow

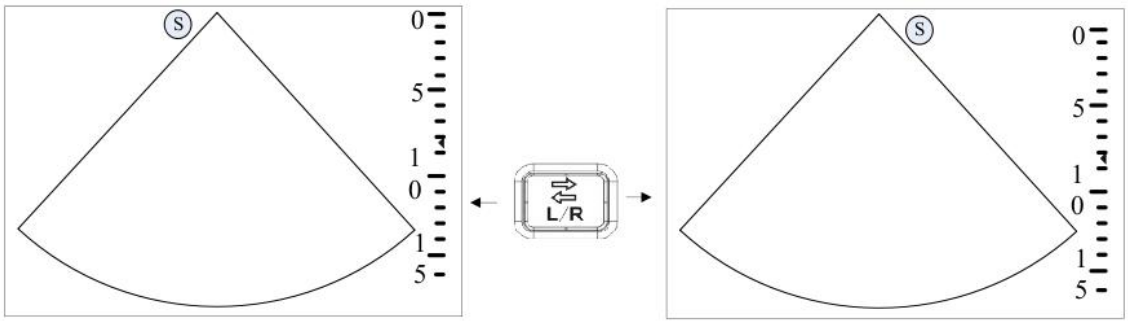


6.3.2 Image Orientation (Left/Right)

The key is used to flip the image on screen left/right rapidly without changing the direction of tranducer, and switch the image of left and right side in Dual-B mode.The horizontal display direction of ultraosound image is the position of ultrasound image where the first element of transducer places. The direction mark reflects the actual direction.

Operation:

Press L-R Key to flip the image left or right once

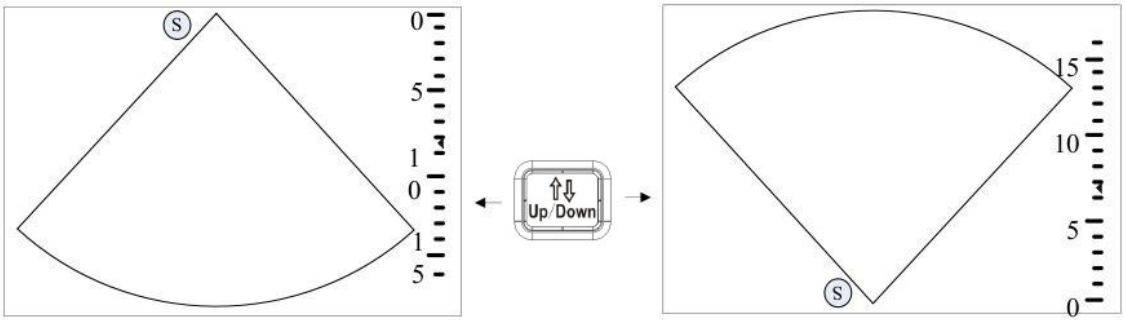


6.3.3 Image Orientation (Up/Down)

The key is used for up/down flip of image and mainly for entracavity imaging. The function helps to switch the up or down direction of image.

Operation:

Press **Up-Down** Key to flip the image left or right once



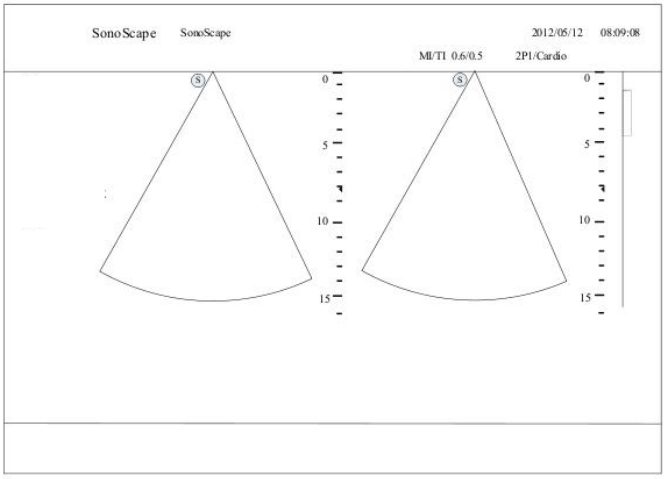
6.3.4 Dual- B Dispaly

Dual- B Display can have the comparison of the images in different time conveniently.

Operation:

1. In real-time B mode, press **Dual** key to activate dual image display. The screen is split into two parts for real-time B mode images.
2. Press **L/R** key to freeze the B-mode image in the left side and activate the B-mode image on the right side.
3. Press again **L/R** key to activate the left and right image, and the transducer direction of current activating image is marked as green.
4. Press again **Dual** to quit the dual-B display mode.

Dual-B mode displays as follow:



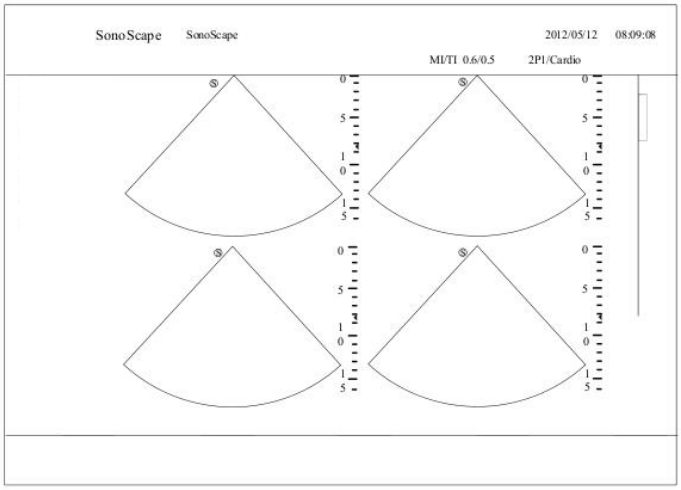
6.3.5 Quad (4B) Display

Dual- B Display can have the comparison of the images in different time conveniently.

Operation:

1. In real-time B mode, press 4B to activate the 4B display mode. The original image reduces to 1/4 of the size to leave out space for the other three images.
2. Press L/R to activate upper-left, upper-right, bottom-left, bottom-right image cyclically. The transducer direction of current activating image is marked as color.
3. Press 4B again to quit the 4B display mode.

4B mode displays as follow:



6.3.6 Tissue Harmonic Imaging (THI)

Ultrasound has various motions like transmission, reflection, refringence, attenuation, frequency shift when travelling in the human-body tisse. The frequency of its echo is a broadband signal including harmonic waves.

The Tissue Harmonic Imaging (THI) refers to the process that system displays image by receiving its higher harmonic echoes.

THI can acquire the nonlinear feature information of tissue, reduce artifacts and enhance the outline of tissues, which is helpful for specific organs and tissue, like heart.THI makes use of the harmonic frequency produced by the tissue. The original emission frequency can produce the harmonic frequency echo. Frequency doubling of base emission frequency is the harmonic frequency received by tissue. The harmonic frequency received by ultrasound systems has no original frequency or artifact,to reduce noise and increase the contrast resolution and enhance the edge of image. THI is helpful for the difficult patients.

When in the working B-mode/Color-mode/Doppler real-time mode,press THI to enter Tissue Harmonic imaging mode, and press the key again to quit the mode.

When entering THI mode, the THI mark displays on the upper-right of screen to demonstrate the working condition. The parameter adjustment of B-mode imaging works in the THI mode as well.

When in THI mode, press THI to quit the imaging mode, and the mark disappears.

✍ Note

- Tissue harmonic image, compared to B-mode image, has a higher signal-to-noise ratio, but with a lower image gain and testing depth. User can select suitable imaging mode according to different need.
- THI is mainly used in imaging of phase array. Not all the transducer can be applicable.

Chapter 7

CFM Mode

7.1 Enter CFM Mode

CFM(color flow mapping) uses Doppler principle to display the motion of blood flow, and other information including the blood velocity, direction and spectrum.

7.1.1 How to enter CFM

When in B mode, press CFM key to enter CFM mode.
The color image and the color scale gives information about the flow velocity, direction and time.

CFM mode interface is the following format

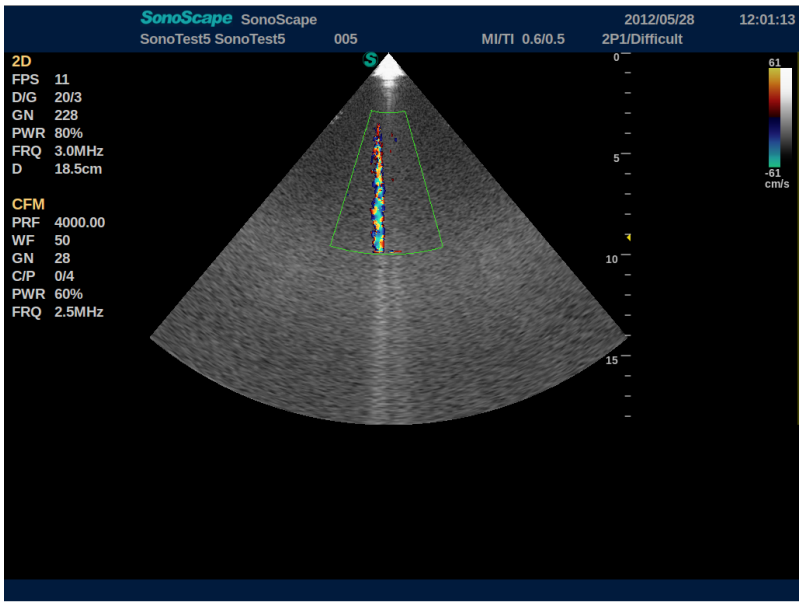
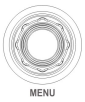


Figure 7.1: CFM mode

7.2 Parameter Adjustment



When in CFM mode, press MENU key before freeze, you will see this menu:

Real time CFM mode menu	
Frequency	2.5MHz
Line Density	High
Wall Filter	600
B Reject	26
Persis	3
C. Map	4
Power%	60%

In CFM mode, when you press Freeze key, then press MENU, you will see a different menu as follow:

Frozen CFM mode menu	
C. Map	4
B Reject	26

Note

- Press the MENU key to pop up the adjustment menu;
- Turn the AUDIO knob to switch from one item to another;
- Turn the MENU key to adjust each parameter;

7.2.1 FREQUENCY

This parameter controls the working frequency of the transducer.

Operate:

FREQUENCY

- Press MENU to pop up the menu, turn AUDIO knob to switich andhigh-llight the “Frequency” Item;
- Turn the MENU key clock-wise to increase frequency, counter-clockwise to decrease freqeuncy.

7.2.2 Line Density

Line desnity is the density of scanning lines in a set scanning width or scanning area. The Line Density parameter is related to “Lateral Resolution” and “Frame Rate”. The higher Line Density, the better resolution, but the frame rate will decrease. You can only adjust Line Density in active mode (not frozen).

Operate:

Line Density

- Turn AUDIO, to high-light the “Line Density” item;
- Turn MENU key, to adjust Line Density.

7.2.3 Wall Filter (WF)

This parameter controls the working frequency of the transducer.

Operate:

WF

- Turn AUDIO, high-light “Wall Filter” item;
- TurnMENU key, to adjust Wall Filter.

Operate:

The Wall Filter range is:

If you change the PRF value, Wall Filter value will change accordingly. The higher WF, the less noise you have in the color image, but, you might eliminate some low-velocity and cause inaccuracy. The lower the W, the more noise on the color image.

7.2.4 B Reject

B reject, this parameter rejects B mode signal to improve color signal display.

Operate:

B Reject

- Turn AUDIO, high-light “B reject” item.
- Turn MENU key, to adjust B-reject Value.

7.2.5 Color Map (C Map)

Color Map is the color scale for displaying blood flow signal in color mode, adjust C Map to display the detail of different types of blood flow. You can adjust this parameter both before and after freezing the image.

Operate:

C Map

- Turn AUDIO, high-light “C Map” item;
- Turn MENU key, to adjust C Map.

Note

- If you change C Map the displayed color will change, the color scale is shown in the color bar on the top right.

7.2.6 PERSIST

Low Presist value can improve the time-sensitivity of blood flow; but high Persist can increase the continuity of blood flow. There are 7 levels of Persist you can adjust.

Operate:

PERSIST

- Turn AUDIO, high-light “Persist”item.
- Turn MENU key, to adjust Wall Filter.

7.2.7 POWER

Power is the acoustic power of transducer.

Operate:

POWER

- Turn AUDIO, high-light “Power” item.
- Turn MENU key, to adjust Power level.

7.2.8 D GAIN

D Gain controls the sensitivity of color image, control the display of over all blood signals and noises.

Operate:

Turn D Gain to adjust the Gain of color image.
Higher Gain will improve blood signal while increasing noise.
Lower Gain will decrease blood signal and noise.

Note

- Gain value is displayed on the screen.

7.2.9 PRF

PRF controls the highest blood velocity the system can recognize. The higher PRF is, the higher speed the system can display. The PRF range of S2 is 1.0 kHz to 24.0 kHz. But different exam modes and different transducers have different PRF range.

Operate:

Turn switch up to increase PRF value.
Turn switch down to decrease PRF value.

Note

- When scanning different organs, you should choose approporiate PRF according to the flow speed in this organ.
- Low PRF may cause aliasing, e.g. the top part of the spectrum will be displayed in the bottom; too high PRF will reduce the peaks of the spectrum, and make it hard to discern.

7.2.10 STEER

For linear transducers, you can steer the scanning beam when in active scanning, to adjust the angle between blood flow and ultrasound beam, to increase the accuracy of blood display. You can have -20° , -12° , -6° , 0° , $+6^\circ$, $+12^\circ$, $+20^\circ$, 7 different angles.

Operate:

Turn the switch lef to steer beam to the left;
Turn the switch right to steer beam to the right.

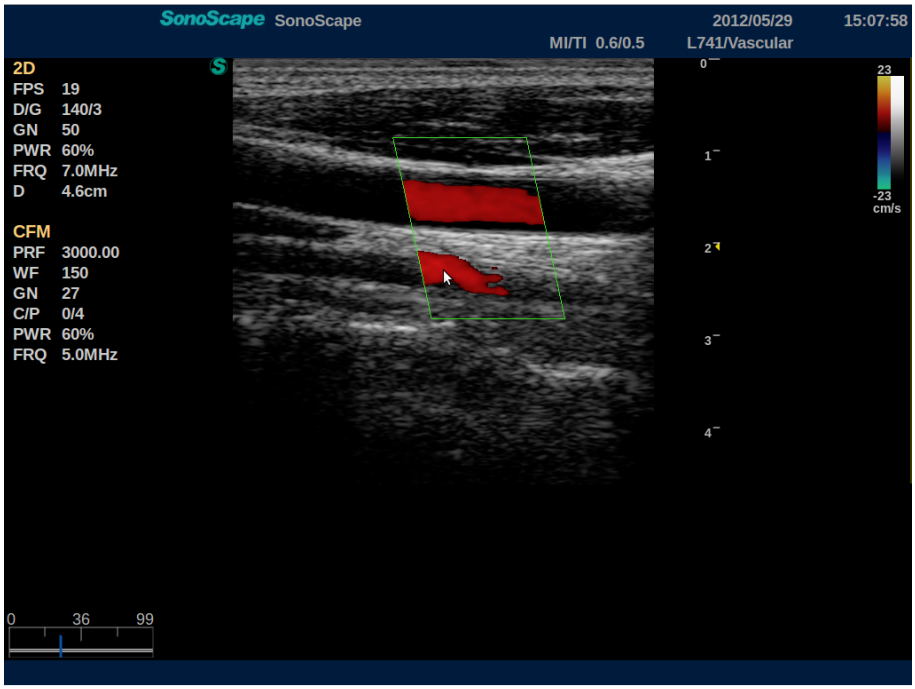
7.3 Other Operations

7.3.1 Freeze

Press **Freeze** key to activate or freeze a image.

While scanning, press **Freeze** to freeze the image and stop the transducer from working;
After frozen, press **Freeze** to activate the image , and start the transducer

A frozen CFM image is in this format:



7.3.2 Single Image

When in B-mode, Press **CFM** to enter CFM active display. Press **CFM** again to quit CFM and return to B mode. When in DPI mode, you can also press **CFM** to enter CFM mode.
Enter: When in B-mode, Press **CFM** to enter CFM active display Quit: When in CFM already, Press **CFM** again to quit CFM and return to B mode.
Switch: When in DPI mode, you can also press **CFM** to enter CFM mode.

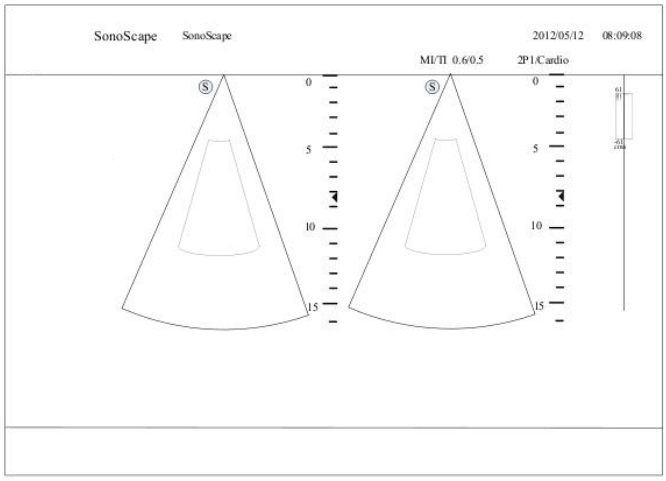
7.3.3 Dual Display

Dual Display allows you to compare related images taken at different time on the same screen;

Operate:

1. When in live B-mode, press **Dual** key to start dual display, now the screen shows two images, on the left is a B-mode live image.

2. Press L/R key, to freeze the B-mode image on the left and switch to a active B-mode image on the right;
3. Press L/R again, to switch between the left image andthe right image, when the current image is active, the transducer marker is displayed in green;
4. Press Dual again to quit Dual display.



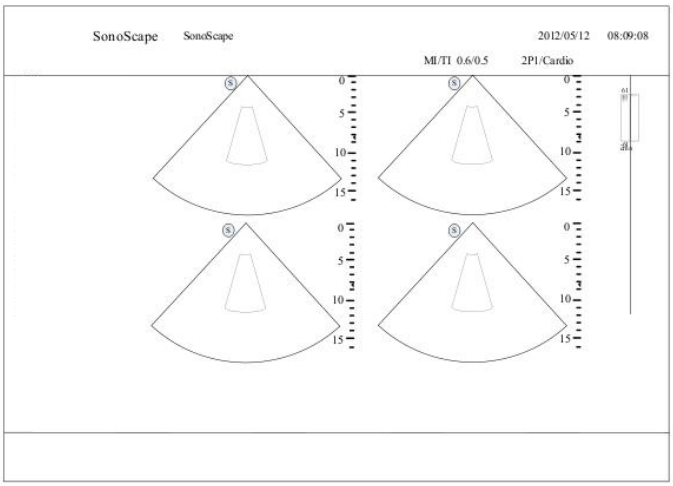
7.3.4 Quad Display

Use quad display to compare 4 images taken at different time on the same screen.

Operate:

1. When in B mode, press 4B key to activate quad display mode, now the image is reduced to 1/4 of itąŕs original size, and give space to other 3 images;
2. Now press L/R key, to activate the top-left, top-right, down-left, down-right image, the transducer of the activated image will displayed in color.
3. Press 4B key again to quit quad display.

Quad Display is in this format:



7.3.5 B+CFM Dual Dynamic

B+CFM mode dual dynamic means: on the left is a live B-mode image, on the right is a live CFM image. When in CFM, Press 

twice to enter B+CFM dual dynamic. When in Dual Dynamic, press 

key again to return to CFM.

Chapter 8

DPI Mode (Doppler Power Imaging)

DPI mode (Power Doppler) has no blood flow direction, comparing to CFM mode, the rest are all similar to CFM mode. So the parameter adjustment operation is also similar.

8.1 Entering DPI Mode

The DPI color image and the color scale gives information about the flow velocity, direction and time.

when in B mode, press DPI key to enter DPI mode.

DPI mode is displayed as the following format:

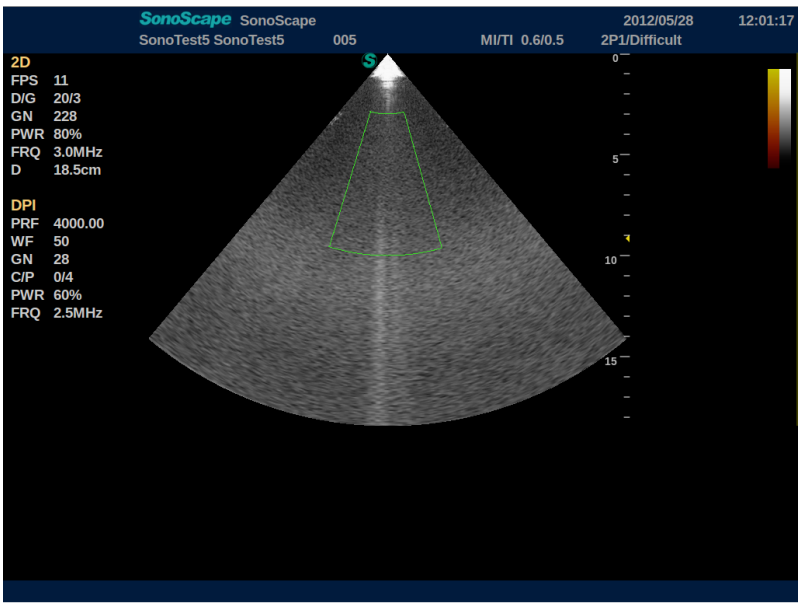
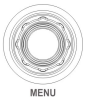


Figure 8.1: DPI mode

8.2 Parameter Adjustment



When in DPI mode, press MENU key before freeze, you will see this menu:

Real time DPI mode menu	
Frequency	2.5MHz
Line Density	High
Wall Filter	600
B Reject	26
Persis	3
C. Map	4
Power%	60%

When in DPI mode, press Freeze to stop the image then press MENU, you will see this menu:

Frozen DPI mode menu	
C. Map	3
B Reject	26

Note

- Press the MENU key to pop up the adjustment menu;
- Turn the AUDIO knob to switch from one item to another;
- Turn the MENU key to adjust each parameter.

8.2.1 FREQUENCY

See **Section 7.2.1**.

8.2.2 Line Density

See **Section 7.2.2**.

8.2.3 Wall Filter

See **Section 7.2.3**.

8.2.4 B Reject

See **Section 7.2.4**.

8.2.5 C Map/DIRECT.D

See **Section 7.2.5**.

8.2.6 PERSIST

See **Section 7.2.6**.

8.2.7 POWER

See **Section 7.2.7**.

8.2.8 D GAIN

See **Section 7.2.8**.

8.3 Other Operations

See **Section 7.3**.

Chapter 9

M Mode

M mode shows graph image about the tissue motion in a time sequence, the tissue motion information comes from ultrasound beam echoes. M mode is mostly used in cardiology.

9.1 Starting M Mode

9.1.1 Pre-active Mode

When in B PW or CW mode, you press M, the image will divide into two parts, the upper one is the B mode, the lower part of the screen is reserved for M mode graphs as the picture bellow shows. In this picture the M mode is not really activiated, this is the “pre-active” mode:

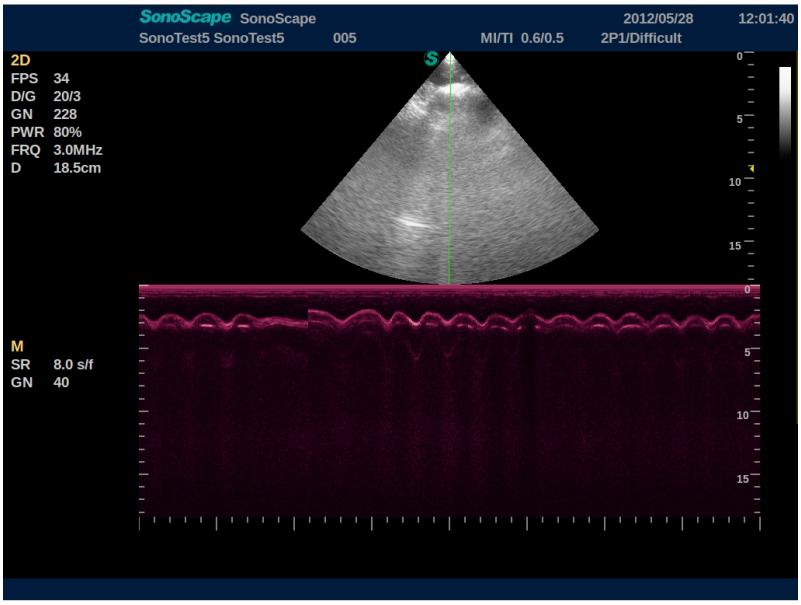
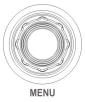


Figure 9.1: M Mode Image

9.1.2 Active Mode

In the pre-active M mode, press UPDATE key to activate M mode. The M mode scanning graph will show, now the upper part remains the B-mode image, and the lower part of the screen display M mode spectrum.

9.2 Parameter Adjustment



When in Pre-active M mode, press MENU key, you will see this menu

Frozen M mode menu	
M trace active	
Display Format	V1/1
Chroma	4.0s/f

When in active M mode, press MENU key to vie the following menu:

Real time M mode menu	
M trace active	
Display Format	V1/1
Sweep Speed	4.0s/f
Chroma	0
Smooth	1

When in Pre-active M mode, press Freeze key, you will see this menu

Frozen M mode menu	
M trace active	
Chroma	0
Display Format	V1/1

9.2.1 Sweep Speed

Operate:

Sweep Speed

1. Press MENU key to display the parameter Menu, turn the AUDIO to high-light the “SWEEP SPEED” item;
2. Turn the MENU key to adjust the Sweep Speed level.

9.2.2 Display Format

There are five different display formats to choose:

Operate:

Display Format

1. Press MENU key to display the parameter Menu, Turn AUDIO to high-light “Display” item;
2. Turn MENU key, to adjust “Display”.

9.2.3 Chroma

Beside the gray scale B-mode image, user can choose other color to colorize the B mode image. Users can choose among Pink, Amber, Light Blue and Dark Blue and other colors, in totoal 8 different types. You can use Chroma function after freezing the image.

Operate:

Chroma

1. Press MENU key to display the parameter Menu, Turn AUDIO to high-light “Chroma” item;
2. Turn MENU key, to adjust “Chroma” type.

9.2.4 Smooth(SMO)

The Smooth parameter can improve the time-correlation of M mode image, and display better continuity in M mode image details. Smooth parameter is correlated with “Presistence” and “Time Sensitivity” of the M mode image. The higher the smoothness, the better the continuity, but also the image appears slower. On the opposite, with lower smoothness, the image shows less continuity but appears faster. You can only adjust Smooth in live M mode.

Operate:

Smooth(SMO)

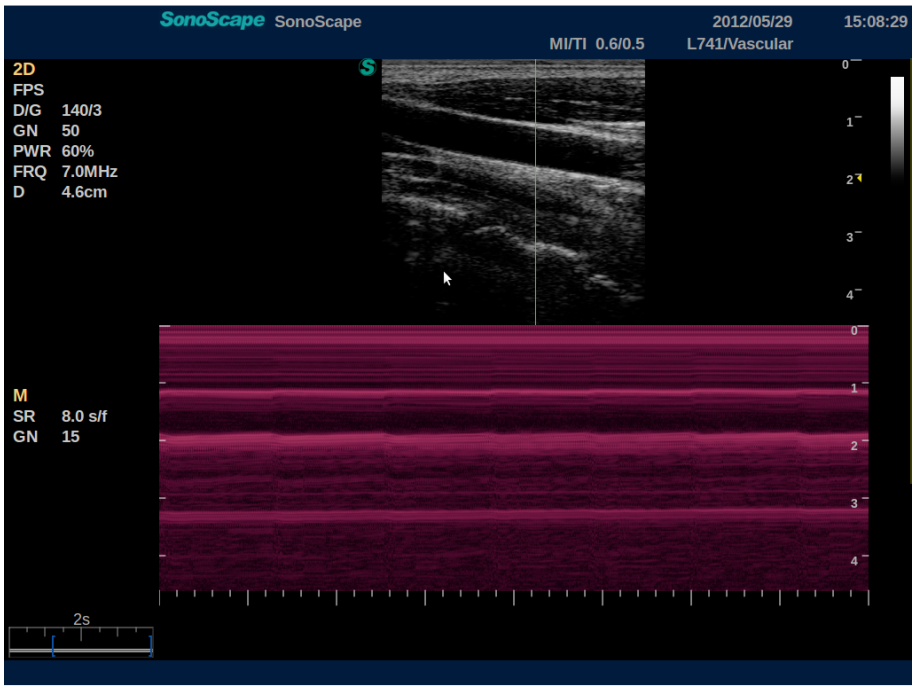
1. Press MENU key to display the parameter Menu, Turn AUDIOto high-light “SMO” item;
2. Turn MENU key, to adjust “SMO”.

9.3 Other Operations

9.3.1 Freeze

While scanning, press Freeze to freeze the image and stop the transducer from working;
After frozen, pressAfter frozen, pressAfter frozen, press Freeze to activate the image , and start the transducer. to activate the image , and start the transducer. to activate the image , and start the transducer.

A frozen M-mode image is displayed in the following format:



9.3.2 Adjust M Mode Sampling Line

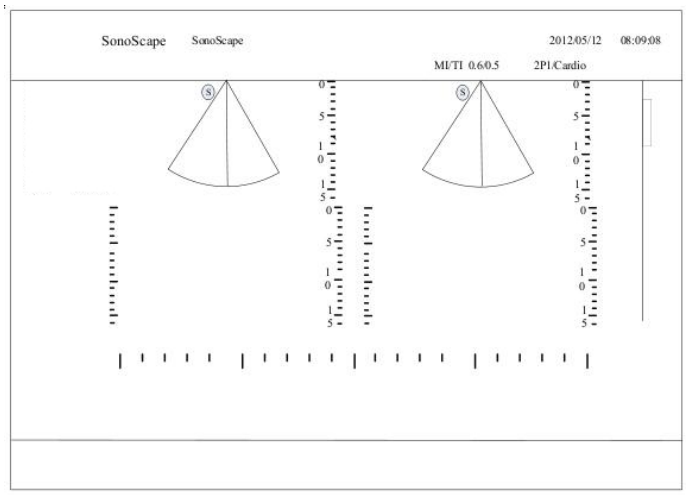
In the pre-active M mode, or Live M mode, the sampling line is in the center of the B-mode scanning area. You can use TrackBall to move the sampling line left or right to you desired position.

9.3.3 Dual Display

Dual Display allows you to compare related images taken at different time on the same screen;

1. When in live M-mode, press Dual key to start dual display, now the screen shows two images, on the left is a M-mode live image.
2. Press L/R key, to freeze the M-mode image on the left and switch to a active M-mode image on the right;
3. Press L/R again, to switch between the left image andthe right image, when the current image is active, the transducer marker is displayed in green;
4. Press Dual again to quit Dual display.

M-mode Dual Display is shown in the following format:



Chapter 10

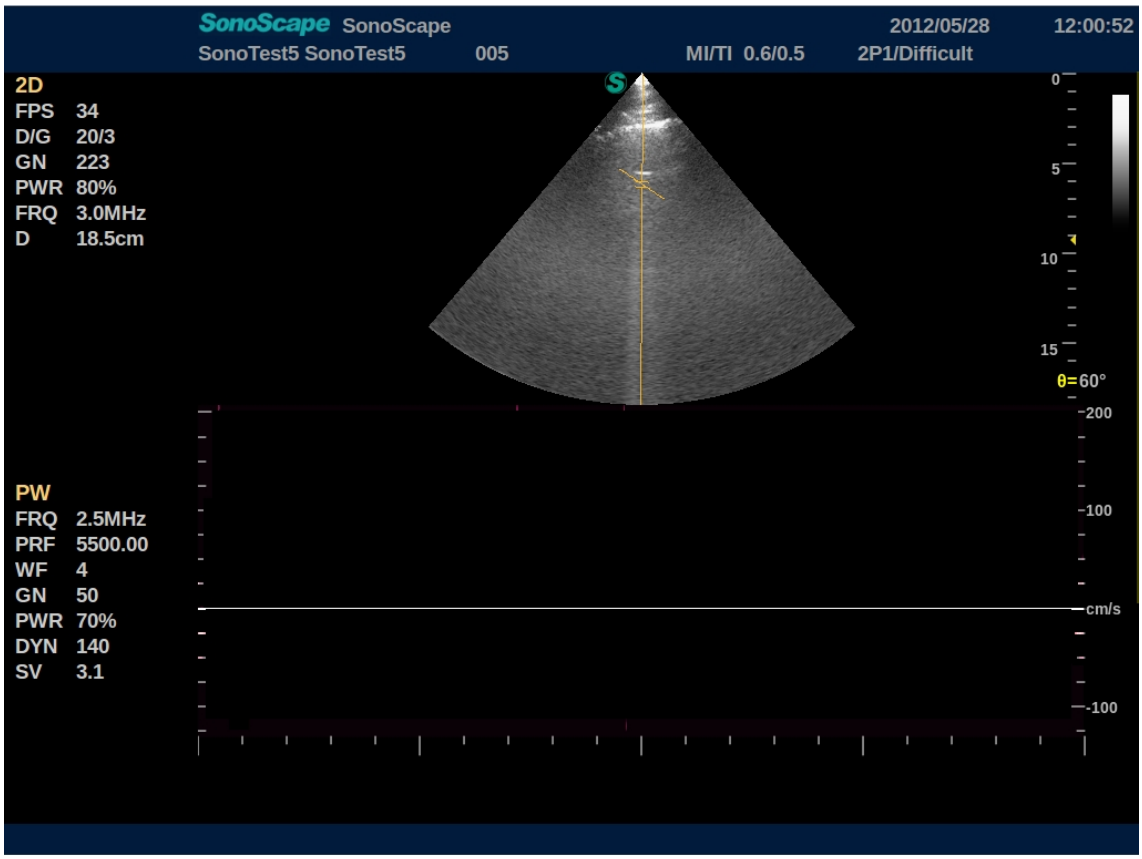
PW Mode

10.1 Entering PW Mode

10.1.1 Pre-Active Mode

When in B or M or CW mode, press PW key you will enter the pre-active mode, the screen will divide into two parts. On this screen the PW mode is not really activiated, only a sampling line is shown on the B-mode image, on the lower half of the screen there is a blank area reserved for the PW graph.

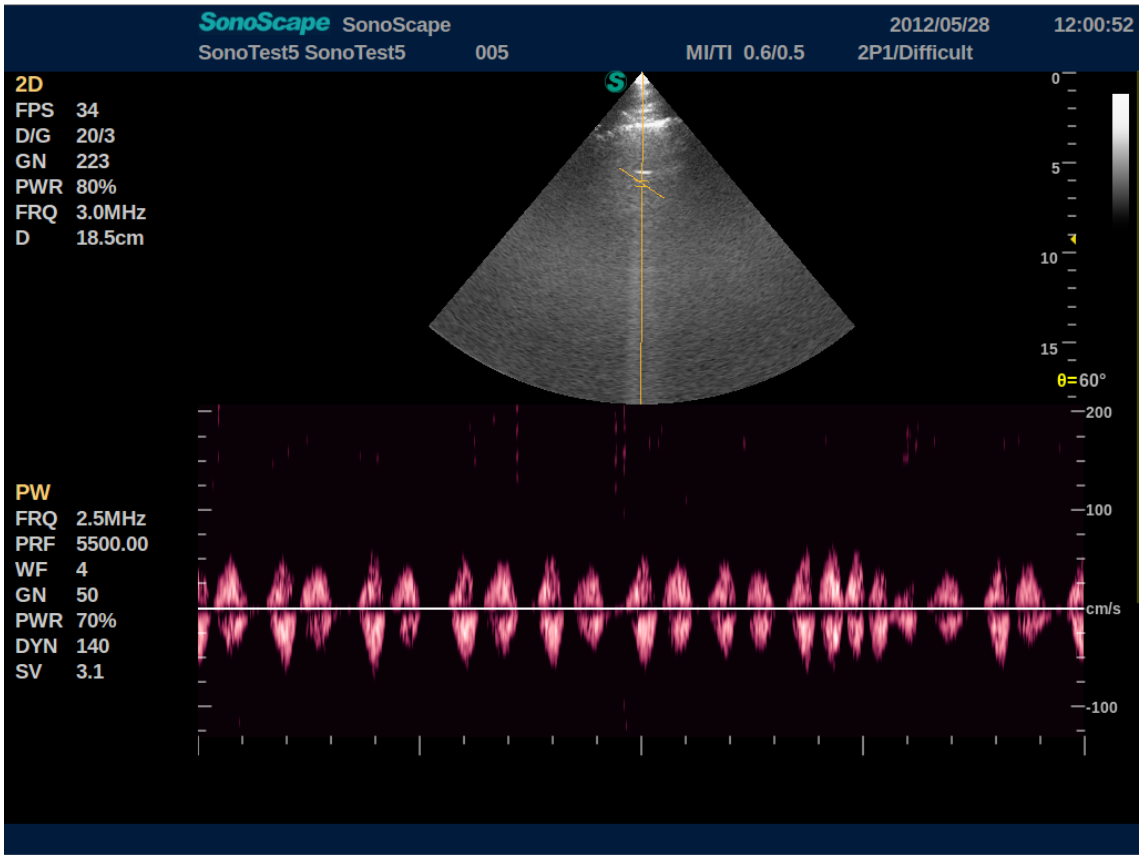
Pre-active mode of PW is shown in this format:



10.1.2 Active Mode

When you have set the sampling volume of PW, press UPADATE to activate the PW scan. Now the B-mode image is shown on the upper half of the screen, the lower half displays the active PW spectrum.

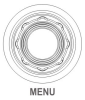
An active PW image is displayed in the following format:



✍ Note

- By pressing UPDATE key, you can switch between pre-active and active PW mode.

10.2 Parameter Adjustment



In Pre-Active PW mode, press MENU key, you will see the following Menu:
In Active PW mode, press MENU key to display the following Menu:

Display Format	V1/1
Sweep Speed	4.0s/f
Frequency	2.5MHZ
Velocity	4.0s/f
Dynamic Range	140
Wall Filter	4
Chroma	0
DisplayFormat	V1/1
Power	70%

When in PW mode, press **Freeze** to stop the image, then press **Menu** you will see the following Menu:

Chroma	0
DisplayFormat	V1/1

10.2.1 PW FREQUENCY

1. When in Active PW mode, press **MENU** to display the parameter Menu, then turn **Audio** key to high-light the “Frequency” item.
2. Turn the **MENU** key to increase or decrease frequency.

10.2.2 Sweep Speed

See **Section 9.2.1**.

10.2.3 Dynamic Range(DYN)

See **Section 6.2.7**.

10.2.4 Wall Filter(WF)

See **Section 7.2.3**.

10.2.5 CHROMA

See **Section 9.2.3**.

10.2.6 DISPLAY FORMAT

See **Section 9.2.2**.

10.2.7 POWER

See **Section 7.2.7**.

10.2.8 Baseline

Adjust the baseline position, you can turn it upper or lower according to the height of the graph you want to display. You can adjust Baseline position both before and after freezing the image.

Operate:

1. Turn the switch up to move Basline Up
2. Turn the switch down to move Basline Down

Note

- If the baseline is not properly positioned (too high or too low), the spectrum graph may displayed wrong or looked like aliasing image.

10.3 B + PW Other Operations

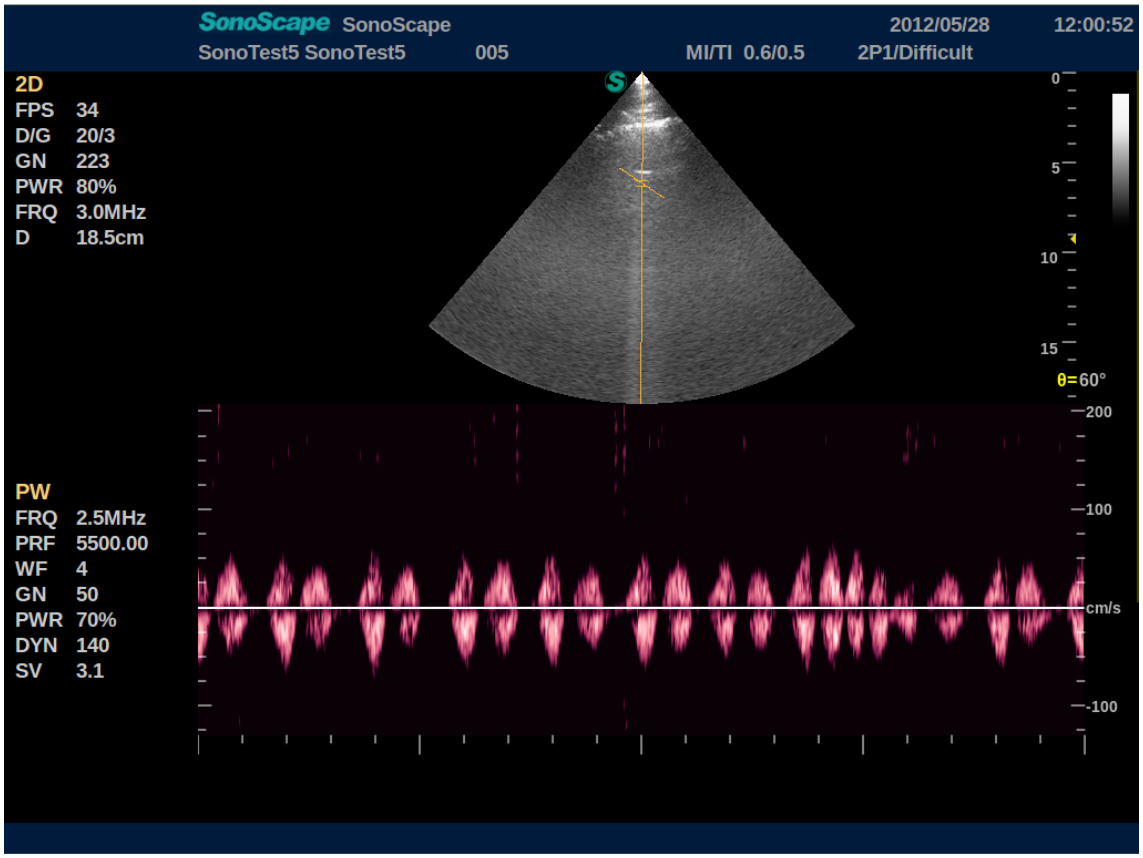
10.3.1 Freeze

Press **Freeze** key to activate or freeze a image.

Operate:

1. While scanning, press **Freeze** to freeze the image and stop the transducer from working;
2. After frozen, press **Freeze** to activate the image , and start the transducer.

A frozen PW-mode image is displayed in the following format:



10.3.2 Adjust PW Sampling Line

When in PW pre-active mode or active mode, you can move the **TrackBall** left and right to adjust the position of sampling line.

10.3.3 Adjust PW Sample Volume

When in pre-active or Active PW mode, move the TrackBall up and down to adjust the depth of Sample Volume;
Press SET then drag the TrackBall to adjust the size of the sample volume; then press SET again to confirm your desired size

10.3.4 Adjust PW Sample Angle

When in pre-active or active PW mode, turn the ANGLE key to adjust the correction angle of the sample volume.

10.3.5 Adjust Baseline

When in pre-active or active PW mode, or after frozen image, turn the BaseLine swtich to adjust Baseline position; turn the switch up to move up baseline, turn down the switch to move down baseline; notice when baseline is not properly placed, the spectrum graph might look like aliasing.

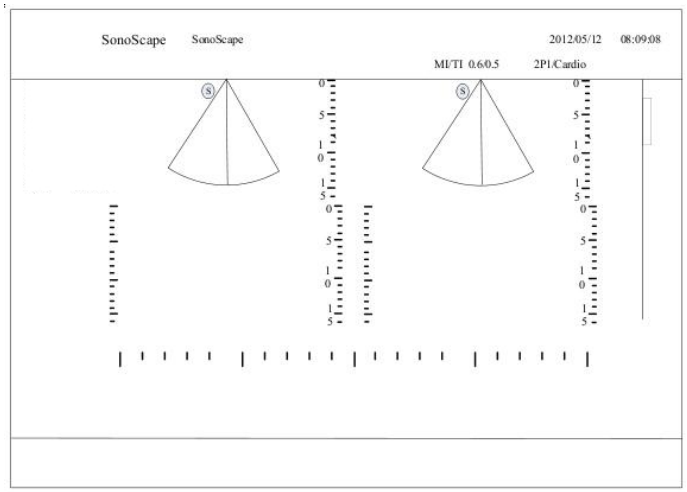
10.3.6 Dual Display

Dual Display in PW mode allows you to compare different images taken at different time.

Operate:

1. When in live PW-mode, press Dual key to start dual display, now the screen shows two images, on the left is a PW-mode live image;
2. Press L/R key, to freeze the PW-mode image on the left and switch to a active PW-mode image on the right;
3. Press L/R again, to switch between the left image andthe right image, when the current image is active, the transducer marker is displayed in green;
4. When finished, press Dual agai to quit Dual Display.

A dual display image is in the following format:



Chapter 11

CW Mode

For basic CW operation guides, please refer to Chapter 10: PW Mode.
The CW mode operation procedures are quite similar to the PW operation,Except the CW sample volume is not adjustable. (which means 10.3.4 is not applicable to CW mode)

✍ Note

- CW mode is only available on Phased Array transducers, please donot attempt to activate CW mode on other transducers (Linear or Convex or Endocavity transducers)

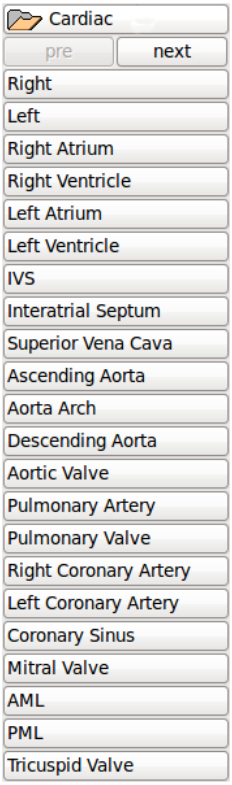
Chapter 12

Miscellaneous Functions

12.1 Annotation

The annotation function allows the user to add textual comments or arrows on the ultrasound image using the keyboard.

12.1.1 Textual Annotation



Annotation is used for doctor to mark on the ultrasound image. The functions consist of: Comment, Edit, Modify, Move, Insert, Arrow, Delete and Clear.
When multiple comments are on screen, different colors are used to differentiate the comments. Multiple languages for comments are supported and can be configured in system setting.
During a ultrasound scan, press Annot key to enter annotation state. The cursor is changed to |, and the user can enter texts directly using the keyboard or select an annotation string from the annotation library.

Modify Annotation

To edit an annotation item already added on screen, press Annot to start the annotation mode, the cursor is changed to |. Move the trackball to highlight the annotation item to be modified, edit the item directly using the alphanumeric keyboard.

Move Annotation

To move an annotation item already added on screen, press Annot to start the annotation mode, the cursor is changed to |. Move the trackball to highlight the annotation item to be moved, drag the item directly to the new location.

Insert Another Annotation

Press Annot to start the annotation mode, the cursor is changed to |. Move the trackball to a location where the new annotation will be added and type using the alphanumeric keyboard to add the new annotation.

Deletion

To delete an annotation item already added on screen, press Annot to start the annotation mode, the cursor is changed to |. Move the trackball to over the annotation item to be deleted and press Delete key to delete the annotation item after cursor |.

Clear

To clear all annotation items already added on screen, press Annot to start the annotation mode, the cursor is changed to |. Press Clear to remove all annotation items added on screen.

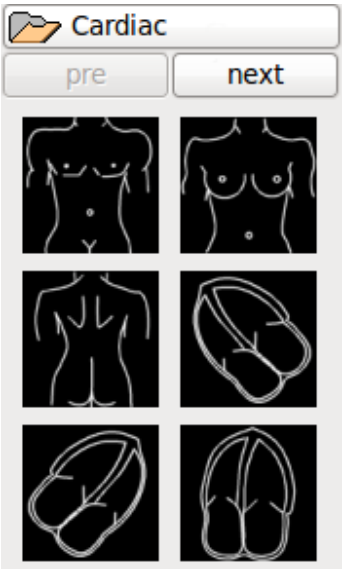
12.1.2 Arrow

To add arrow on screen

In a ultrasound scan, press ⇗ and an arrow will appear on screen. Move the cursor to a desired location and rotate ANGLE to change the direction of arrow tip. Press the up or down keys on the alphanumeric keyboard to change the size of the arrow. Press Set to place the arrow.
To remove the arrow added on screen, first enter annotation mode, move the trackball to select the arrow and press Delete to delete.

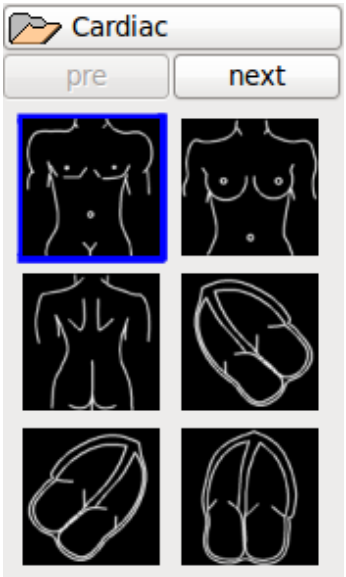
12.2 Bodymark

Bodymark symbol can be added on the ultrasound image to indicate the scan location.
In any scan mode, press Body Mark, the bodymark symbol library of the corresponding application mode will appear on screen. For abdominal application, the following symbols will be displayed.



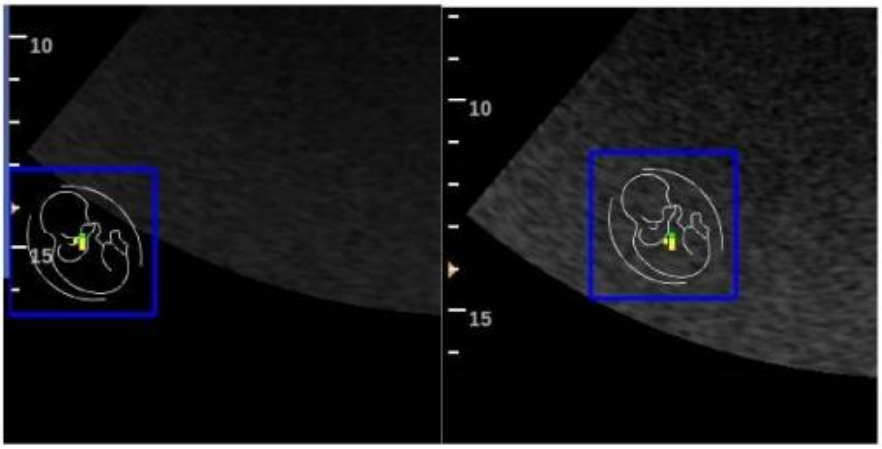
Choose Bodymark

Move the cursor to select a symbol, the selected one will be highlighted with a blue frame. Press Set key to add the chose bodymark to ultrasound image area.



Move Bodymark

To move a bodymark symbol added on screen, move the cursor on the symbol and press Set to highlight. Move to new location and press Set again to confirm movement, exit the bodymark state at the same time.



Rotate Probe Marker

To rotate the probe marker on the bodymark symbol, rotate Angle

Modify Bodymark

To adjust bodymark symbol already added on screen, press BodyMark key, move the cursor to highlight the bodymark. Then you can drag the symbol or change probe marker orientation.

Auto-Adjustment of Bodymark

When the system changed display formats, such as from 2B to B mode, 4B to B mode, 2B to 4B mode and 4B to 2B mode. The bodymark will be deleted, but the relative location will be kept. And the bodymark symbol will change its size accordingly.

Delete Bodymark

When there is only one bodymark symbol on screen, press Delete or Clear to remove the bodymark.
When there is only one bodymark symbol on screen, press Delete or Clear to remove the bodymark.
Note: Deletion of bodymark is possible only when the bodymark symbol library is opened.

12.3 Save and Review

The system can save multi-frame cine clips or single frame image to local hard drive. The single frame and multi-frame document can be saved as file. There are two types of files, one is system data, and the other is DICOM.

Save Image

Start the system and enter Exam page. In any real time scan mode, press Freeze to freeze the image. Press Save to save single frame image. The clipboard will appear showing a small preview of the image just saved.

Save All Frames as Cine Clip

Start the system and enter Exam page. In any real time scan mode, press Freeze to freeze the image. Hold down Save key to save multi-frame cine clip. The clipboard will appear showing a small preview of the cine just saved.

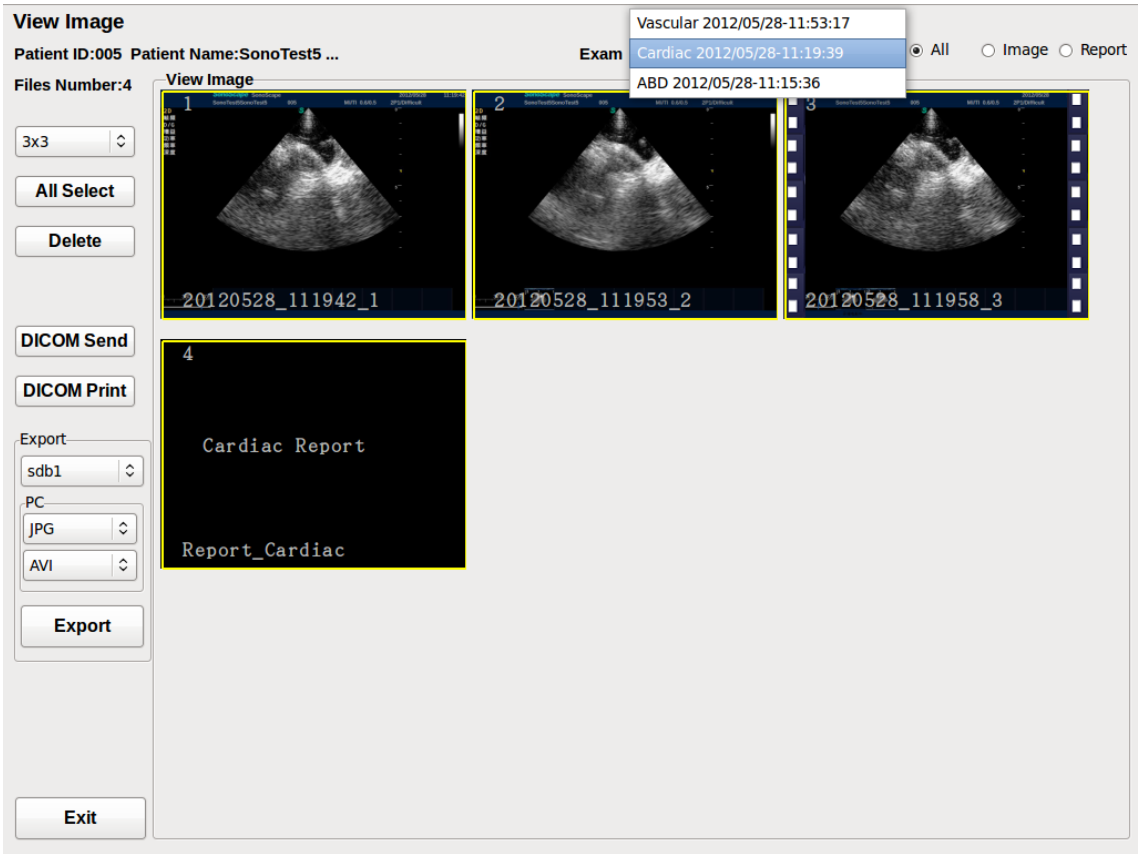
Save Selected Frames as Cine Clip

Start the system and enter Exam page. In any real time scan mode, press Freeze to freeze the image. Use the trackball to select the frames need to be saved. Press Save to confirm and Long-press Save to save multi-frame cine clip. The clipboard will appear showing a small preview of the cine just saved.

Review Images or Cine

Exam Review

Start the system and enter Exam page. Press Patient to open patient exam list. Click and choose any patient to open exam view. To open any image or cine clip of current chose patient, move the cursor over the image or cine clip and press Set twice.



Current Exam Review

In any real time scan mode, freeze the image and press the space bar to open the clipboard window. Rotate to select an image or a cine clip, press Set to review the image or cine clip. Press Freeze to stop review.

Patient Review

In any real time scan or freeze mode, press Patient to open the Patient Exam List window. Double click a patient name to review the exam images of the patient. Click and choose any patient to open exam view. To open any image or cine clip of current chose patient, move the cursor over the image or cine clip and press Set twice.

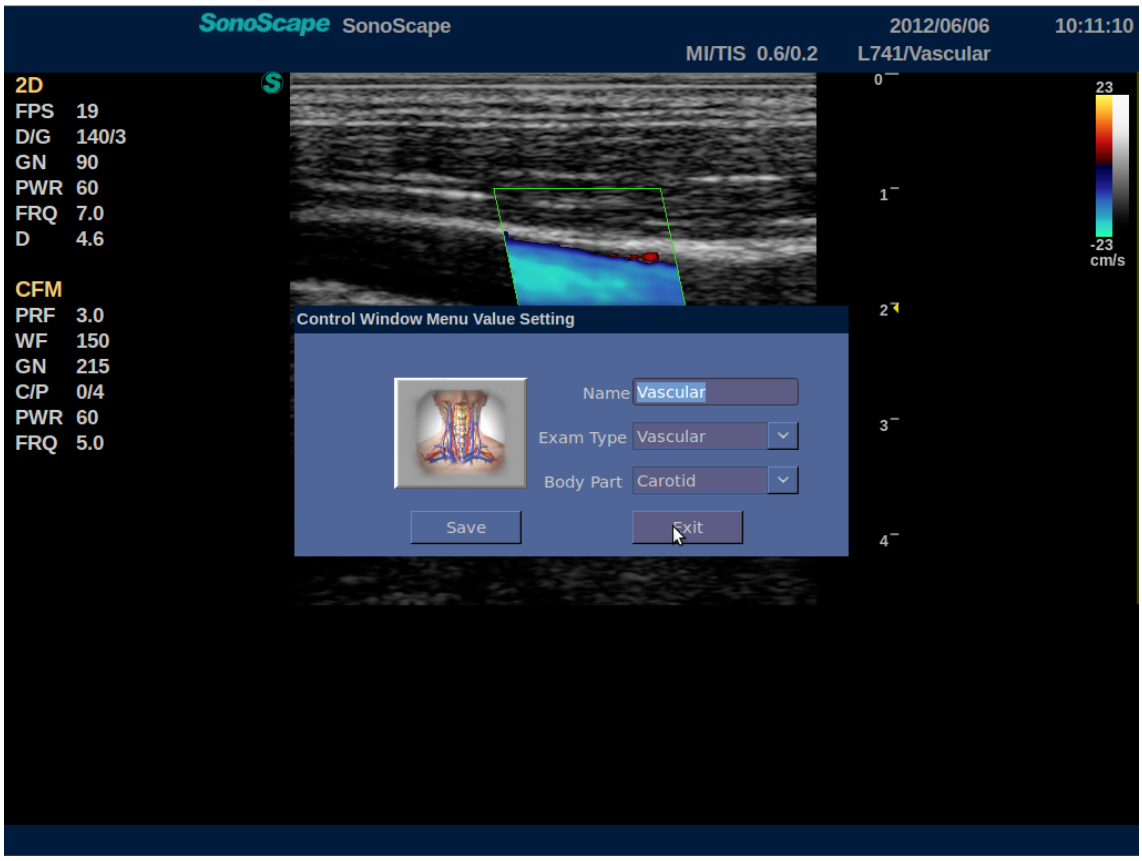
12.4 Customize Exam Mode

The user can customize application/exam modes according to his/her habit, so that the system can become more personalized. The user customized modes can be deleted, while the system predefined modes canąt be removed.

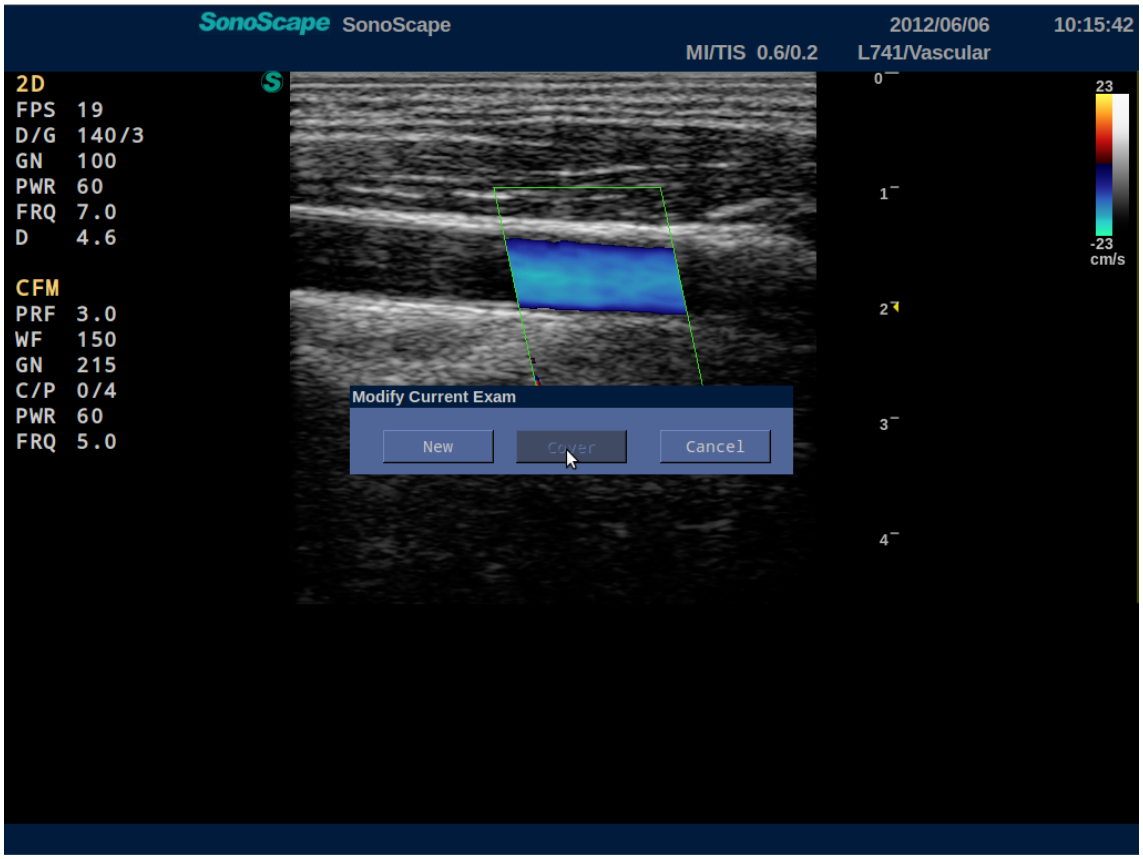
12.4.1 Create New Exam Mode

Operations:

1. Select a transducer and an EXAM mode from the EXAM screen and press to start a real time scan.
2. In the real time scan mode, adjust various imaging parameters to make the best effect.
3. Keep the system in real time scan mode and press S on the keyboard.



4. Enter Name, choose Exam type Type and Body Part for the new exam mode and click on the Save button
5. Click on New to create a new exam mode.

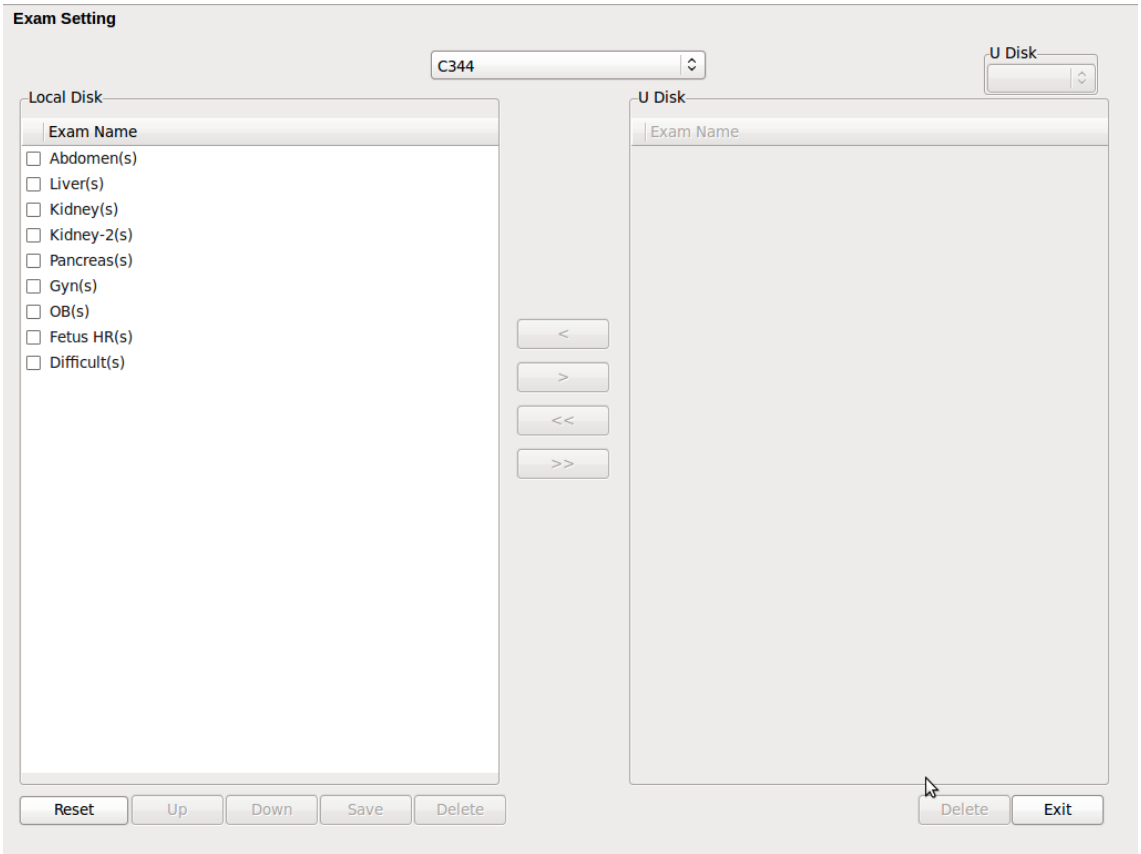


12.4.2 Exam Mode Management

The user can do management for all the exam modes, such as sort and delete.

Operations:

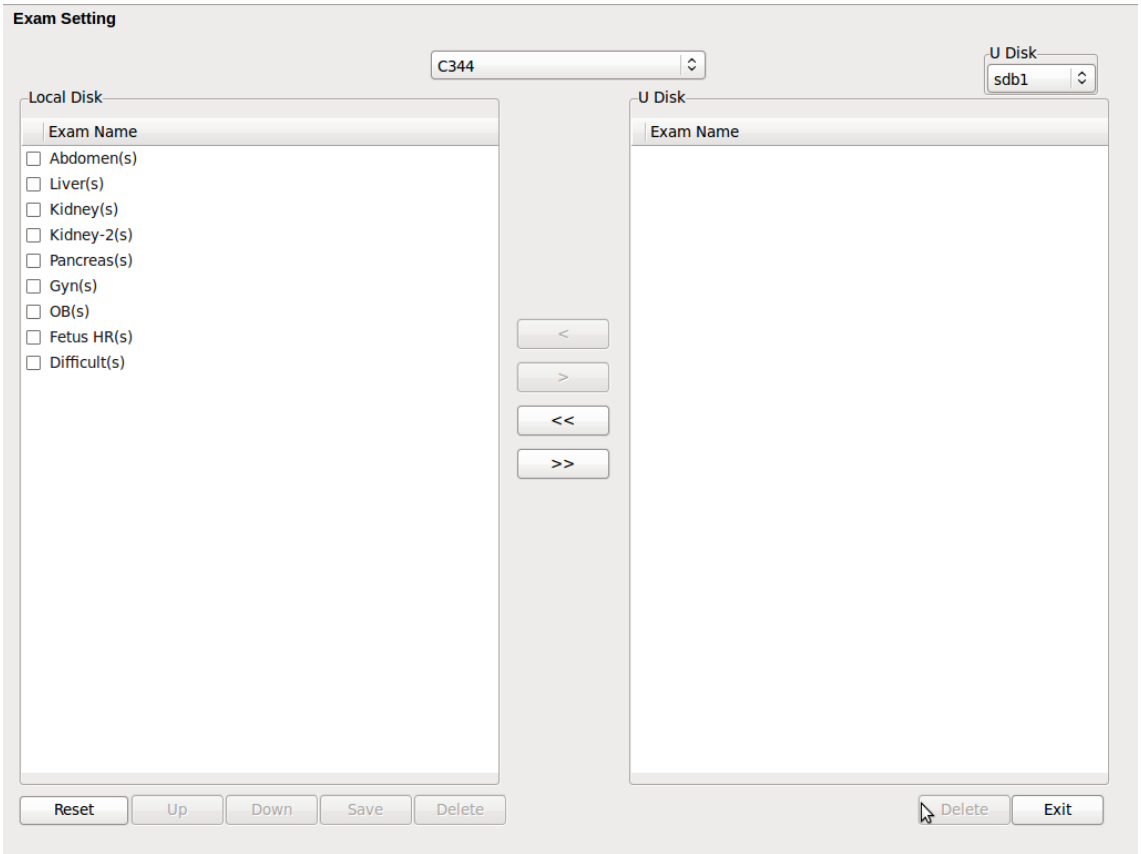
1. In the EXAM page, press ąőEąŕ on the keyboard to open the window below.
2. Select an exam mode on the local disk.
3. Click “up” or “down” to change the exam modes sequence.
4. Click “Delete” to remove this exam mode.
5. Click “Save” to finish the sorting.
6. Click “Reset” to restore all default settings.
7. Click “Exit” to return to the EXAM page.



12.4.3 Exam Mode Import and Export

Operations:

1. In the EXAM page, press “E” on the keyboard to open the window below.
2. Select a transducer and an USB drive.
3. Move the cursor to select corresponding exam mode in “Local Disc”.
4. Select an exam mode on the left window.



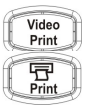
5. Select a transducer and an USB drive.
6. Select an exam mode on the left window.
   - Click > to export the select exam mode to the USB drive.
   - Click >> to export all exam mode of the selected transducer to the USB drive.
7. Select an exam mode on the right window (Assume there are exam mode data saved on USB drive.)
   - Click < to import a selected exam mode from the USB drive to local system.
   - Click << to import all exam mode from the USB drive to local system.

12.5 Print

Video printing, USB printing and DICOM printing are supported on this device. Connection through proper I/O port is necessary to use the printing function.

Video Print

Operations:



Press **Video Print** to print current screen using a video printer.

Press **Print** to print current screen using a printer.

Note

- For more information, please refer to the printer user manual.

Chapter 13

Transducers

This ultrasound system supports a wide range of probes which make the system remarkably versatile. This chapter provides the transducer information and the guidance for the use and maintenance of the transducers.

Warning!

Review to **Chapter 2**, especially **Section 2.3** and **Section 2.5**, for safe use of the transducers.

13.1 Transducer Information

13.1.1 Supported Transducers

The following transducers are supported by this ultrasound system:

C362, C344, L741, L742, L743, 6V1, 6V3, 2P1, 5P1, C611, VC6-2, 10L1, 10I2, 6V1A, C311, C354

Table 13.1: Supported transducers

Attention!

To avoid electric shock or damage the equipment:

1. Use only the supported transducers with this ultrasound system.
2. Do not use the SonoScape transducers on other ultrasound systems not manufactured by SonoScape.

13.1.2 Acoustic Output

The acoustic output powers for the supported transducers are listed in the **Acoustic Output Tables** in the companion CD-ROM of this manual.

13.2 Environmental Requirements

The transducers should be used with that the following environmental requirements has been satisfied.

	Operation	Storage and transport
Relative humidity	30%～75%, no condensation	20%～90%, no condensation
Ambient temperature	10℃～40℃	-20℃～55℃
Barometric pressure	700hPa～1060hPa	700hPa～1060hPa

13.3 Preparation and Usage of the Probe

13.3.1 Inspection

After each use, or before first use or after long-time storage of the probe, the probe must be examined for any damages listed in the table below. Stop using the probe if any damage is found. Contact your representative for servicing asap.

Possible damage types
Cracks on the probe handle (user section).
Cracks on the probe head (applied section).
Scratches on the probe head (acoustic window surface).
Swell of the acoustic window material.
Cracks or wear on the probe cable.
Cracks on the probe connector or any other kinds of visible damage.
Deformed pins or broken pins exist inside the probe connectors.

13.3.2 Probe Connection

Refer to **Section 4.1** for detailed information on probe connection.

13.3.3 Preparation for Scanning

Attention!

- An effective acoustic coupling does not require inordinate pressure, but it does require coupling gel and patient contact.
- Check the expiration date of the probe sheath and the coupling gel. Never use expired probe sheath and coupling gel.
- Latex or natural rubber contained inside medical equipments or accessories can cause severe allergic reactions in some individuals. It's suggested by FDA that the user should identify the latex-sensitive patients and be prepared to treat allergic reactions promptly.
- Only water-soluble coupling gel should be applied to the probe head surface. Avoid contact with the mineral oil.

13.3.3.1 For Surface Probes

Put an adequate amount of coupling gel either on the probe head (acoustic window) or the patient skin.
If disease transmission is a concern, use of the sterile probe sheath is highly recommended. Refer to instructions below to use the probe sheath as a barrier between the patient and the transducer surface.

13.3.3.2 For intracavitary probes

Note: *The probes are provided in non-sterile condition from the manufacturer.*

Intracavitary probes should be cleaned and disinfected both before and after usage.

1. To prevent disease transmission, wear sterile gloves.
2. Put an adequate amount of coupling gel on the probe head or into the probe sheath.
3. Insert the transducer into the probe sheath.

> ⚠ Use of sterile, legally marketed probe sheath is required for intracavitary operations. If lubricant is used, it must be water-soluble.Do not apply coupling gel directly on the patient skin.

4. Cover the probe with the probe sheath up to the user section (probe handle).
5. Examine the integrity of the probe sheath. If breakage occurs, repeat from step 1 to replace the sheath with another new one.

13.3.4 Scanning

Refer to **Chapter 4** to turn on the system and start an ultrasound diagnosis.

13.4 Probe Maintenance: Cleaning and Disinfection

Clean the transducer and the probe handle after each use.
For surface probes, disinfect the transducer periodically. For intracavitary probes, disinfecting the transducer after each use is required.
Keep a log of maintenance (inspection, cleaning and disinfection) and malfunction.

13.4.1 Probe immersion level

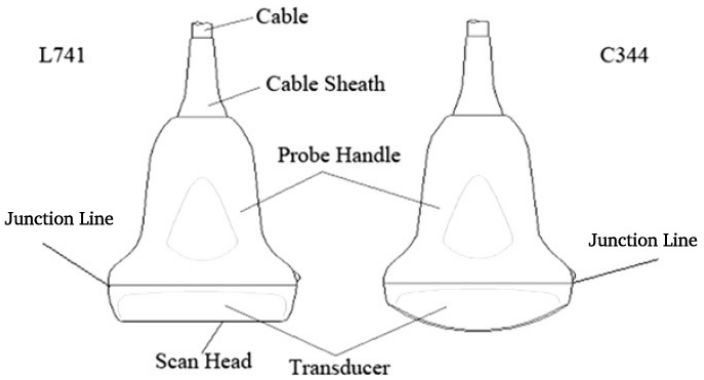


Figure 13.1: Surface probes

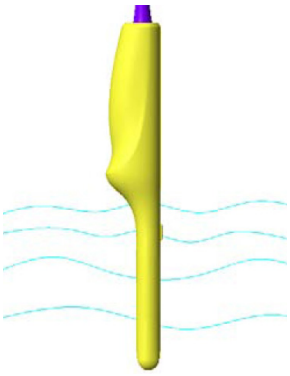


Figure 13.2: Intracavitary probe

For surface probes, do not immerse the probe beyond its binding line (refer to **Figure 13.1**).
For intracavitary probes, the allowed immersion level is shown in **Figure 13.2**.

⚠ Warning!

- DO NOT use solutions containing alcohol, mineral oil for cleaning or disinfecting probes.
- Wear medical sterile gloves to prevent potential disease transmission. Wear protective goggle if necessary.
- DO NOT apply solutions containing ethyl oxides on the probe.

13.4.2 Cleaning Instructions

1. Disconnect the probe from the ultrasound system. Remove the biopsy guide if it is attached to the probe.
2. Remove all the coupling gel and clean the probe with soft cloth and flowing potable water.
3. If the probe surface carries too much residue, remove all visible residue with wet cloth soaked in mild soap water. Use wet soft cloth to scrub the surface if dried residue exists. Remove all soap water residue with damp cloth soaked in potable water.
4. Air dry or dry with a soft cloth.

13.4.3 Disinfection Instructions

The level of disinfection is directly related to the duration of contact with the germicide. High level of disinfection[1] is recommended for surface probes and required for intracavitary probes. Legally marketed liquid chemical germicides (e.g. Cidex) are highly recommended. Prepare and use the germicides following the manufacturer's instructions.

⚠ Warning!

- DO NOT use high pressure steam to disinfect the probe.
- DO NOT use thermal disinfection! Temperatures higher than 66°C or 150°F will damage the probe.

1. Ensure that all visible residues have been removed.
2. Prepare the germicide solutions according to the manufacturer's instructions. Please also follow the manufacturer's instructions for storage and disposal of the germicide.
3. Immerse the probe head into t he germicide for a time interval specified by the germicide manufacturer. The immersion level should be kept below the binding line. High level disinfection is recommended for surface probes and required for intracavitary probes. Note that you may need to rotate and shake the transducer in order to remove the air bubbles between the transducer surface and the germicide solution.
4. After removing the probe from the germicide solution, rinse it thoroughly with clean, potable water to remove all visible germicide. Dry the probe with a soft cloth.

[1] Refer to the germicide manufacturer's instruction to perform high level disinfection.

Chapter 14

System Maintenance

We recommend the user to perform the following maintenance operations:

- Clean the probes and probe holders daily to remove coupling gel, dust, and etc.
- Clean the system (keyboard, monitor, and etc.) regularly.

Attention!

- Switch the system off before cleaning.
- Damp cloth soaked in mild soap water is allowed.
- Protect the system, especially the electric parts, from drip water.
- Do not apply acetone/alchohol or use abrasives on the system or the transducer surfaces.

14.1 Guidance for Service

In case of any malfunctions, turn off the system and disconnect the power supply. Contact your SonoScape representative for service. Mention the detailed phenomena of the malfunction to the service personnel to help the identification of cause.

Warning!

There are no user replaceable parts inside the system. Any kind of do-it-yourself repairs invalidate the warranty. Contact your representative for service instead.

14.2 Manufacturer Responsibility

The manufacturer assumes the responsibility with regard to safety, reliability and performance of this product only under the following conditions,

- all installation, hardware and software upgrades, modifications and repairs of this product are performed or instructed by authorized personnel;
- operation, transport and storage of this product are under the required environmental conditions;
- the product is operated in accordance with this operator's manual.

14.3 Contact Information

Any feedbacks or inquires concerning our product or service should be directed to the following address.

☎ **Contact Information:**
Address: Yizhe Building, Yuquan Road, NanShan, Shenzhen, P.R. China
Zip Code: 518051
Tel: 86–400–678–8019
Fax: 86–755–26722850
Website: http://www.sonoscape.net
E-mail: service@sonoscape.net

Appendix A

Description of Symbols

The following symbols are utilized in the user manual, on the product or the package thereof.

Symbol	Description
	Dangerous electric voltage
	Warning! Follow these instructions to avoid personal injury or system damage.
	Caution! Follow these instructions to avoid system damage.
	Off (Mains power switch OFF)
	On (Mains power switch ON)
	Icon for push-button power switch
	Protective earth/ground connection.
	Potential equilibrium connection
	AC
	Type BF Applied Part
IPN$_1$N$_2$	IP classification according to IEC 60529.
	Non-ionization radiation: Ultrasound scanner transmits acoustic waves.
	Manufacturer information according to EN 980.

Symbol	Description
	Date of manufacture according to EN 980.
	Consult operating instructions.
	Fragile.
	Keep dry.
	Maximum stacking limit of packages. Maximum of two layers allowed!
	Keep this way upward.
	Indicates the presence of hazardous substance(s) above the maximum concentration value(s) as set in SJ/T11364-2006. ąř20ąś indicates the number of years during which the hazardous substance(s) will not leak or mutate so that the use of this product will not result in any severe environmental pollution, bodily injury, or damage to any assets.
SN	Serial number

Appendix B

Acoutic Output Data

Please refer to enclosed CD disk to this user manual

Appendix C

Information of EU Representative

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http://www.sonomed.com