user
manual

Portable Ultrasound Diagnostic Scanner®

PE–12–025

1.01

ENG This user manual includes detailed usage instructions for Portable Ultrasound Diagnostic Scanner. Please read this manual before using equipment.

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1.01	Nov 2017

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CHAPTER 1

INTRODUCTION

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1.1   Overview

The Portable Ultrasound Diagnostic Scanner is a compact, high performance portable digital ultrasound imaging system. The system is based on the accumulated experience of the research department and clinical department of Beijing East Whale Imaging Technology Co., Ltd.

The Portable Ultrasound Diagnostic Scanner provides image generation in 2D (B) Mode, M-Mode, Anatomical M Mode (AMM), Color Doppler, Power Doppler, Elasticity Imaging (EI), Tissue Velocity Imaging (TVI), Strain Rate Imaging (SRI), Pulse Wave Doppler (PW), Continuous Wave Doppler (CW), and Tissue Doppler imaging (TVD) mode.

The Portable Ultrasound Diagnostic Scanner allows optimal usage of all scanning modes and probe types, throughout the full spectrum of operating frequencies and also provides users the flexibility of connecting to the Internet and network system.

1.2   Intended Use

The Portable Ultrasound Diagnostic Scanner is intended for use by, or under the direction of, a qualified physician or a clinician for ultrasound imaging and analysis of Abdomen; Small Parts; Obstetrics; Gynecology; Cardiology; Peripheral Vessels; Urology; Pediatrics; Neonate; Trans-cranial; Musculoskeletal; Fetal; Intra-operative; Transvaginal.

1.3   Contraindications

The Portable Ultrasound Diagnostic Scanner is not intended for ophthalmic use or any use that may result in acoustic beams passing thorough the eye.

1.4   Configuration

The type specification of Portable Ultrasound Diagnostic Scanner is P5/P7/P9, and the standard configuration is illustrated as below:

Table 1-1: Standard Configuration

Configuration	P5	P7	P9	Optional/Standard
Console	YES	YES	YES	Standard
Cart	YES	YES	YES	Optional
Adapter	YES	YES	YES	Standard
Probe (Model 1P4V)	No	No	YES	Standard
Probe (Model 2P4V)	YES	YES	YES	Standard

Table 1-1: Standard Configuration

Configuration	P5	P7	P9	Optional/Standard
Probe (Model 3P8V)	No	YES	YES	Standard
Probe (Model 2C5V)	YES	YES	YES	Standard
Probe (Model 4EC9V)	YES	YES	YES	Standard
Probe (Model 12L5V)	YES	YES	YES	Standard
ECG Lead	YES	YES	YES	Optional
Digital Graphic Printer (Printer A)	YES	YES	YES	Optional
Video Copy Processor (Printer B)	YES	YES	YES	Optional

1.5 Attention

Federal (USA) law restricts this device to sale by or on the order of a physician.

Only professional personnel are allowed to use this device.

> ⚠️ **WARNING** *To avoid the risk of electric shock, this equipment must be connected to a grounded power source..*

Electronic waste must not be discarded as unsorted municipal waste, and must be collected separately according to local regulations. Please contact an authorized representative of the manufacturer or an authorized waste management company for information concerning the decommissioning of equipment.

The MANUFACTURER will make available on request circuit diagrams, component part lists, descriptions, calibration instructions, or other information that will assist SERVICE PERSONNEL to repair those parts of ME EQUIPMENT that are designated by the MANUFACTURER as repairable by SERVICE PERSONNEL.

To ensure safe and correct operation, please read and understand all instructions in the User's Manual before attempting to use the Portable Ultrasound Diagnostic Scanner. Keep the manual with the equipment at all times. Periodically review the procedure for operation and safety precautions.

Never modify this product, including system components, software, cables, and so on. User modification may cause safety hazards and degradation in system performance. All modification must be accomplished by the Service Engineer from Whale or others authorized by Whale.

The equipment is not suitable for use in the presence of flammable anesthetic mixture with air or with Oxygen or Nitrous Oxide.

Devices that intrinsically transmit radio waves such as cellular phones, radio transceivers, mobile radio transmitters, radio-controlled toys, and so on, should not be used near the unit, it could cause the unit to malfunction.

1.6 Copyright

The contents of this system's hardware and related documents are protected under all intellectual proper rights.

Without the advanced written permission or agreement, any unit, individual or institution shall not in any form or means remove or copy any part of this manual.

This manual is exclusively for the operation, repair, and maintenance of the Portable Ultrasound Diagnostic Scanner. Beijing East Whale Imaging Technology Company owns the copyright of this non-publicly published manual, and has the right to use it as confidential data.

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CHAPTER 2

SAFETY

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2.1   Safety Introduction

This chapter describes the important safety measures which should be taken before operating the Portable Ultrasound Diagnostic Scanner. Procedures for simple care and maintenance of the unit are also described. The information contained in this chapter is intended to familiarize the user with the hazards associated with the use of unit, and to alert them to the extent to which injury and damage may occur if the precautions are not taken. Users are obligated to familiarize themselves with these safety considerations and to avoid conditions that could result in injury or damage.

2.2   Safety Hazard Alerts

Pay attention to all areas of this manual marked with this symbol ⚠️.

Table 2-1: Safety Hazard Alerts

Alert	Circumstances for Use
⚠️ **DANGER**	Indicates an imminently hazardous situation that, if not avoided, could result in serious injury or death.
⚠️ **WARNING**	Indicates a potentially hazardous situation that, if not avoided, could result in serious injury or death.
⚠️ **CAUTION**	Indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury, equipment damage or loss of data.
Notes	Indicates important information necessary for users to understand.

2.3   Owner Responsibility

It is the responsibility of the owner to ensure that anyone operating the system reads and understands this section of the manual. However, there is no implication that the act of reading this manual renders the reader qualified to operate, inspect, test, align, calibrate, troubleshoot, repair or modify the system. The owner should make certain to have only authorized and qualified Whale service personnel undertake the installation, maintenance, troubleshooting, calibration, and repair of the equipment.

The owner of the Portable Ultrasound Diagnostic Scanner should ensure that only properly trained, fully qualified personnel are authorized to operate the system. Before authorizing anyone to operate the system, it should be verified that the person has read, and fully understands, the operating in-

structions contained in this manual. It is advisable to maintain a list of authorized operators.

Should the system fail to operate correctly, or if the unit does not respond to the commands described in this manual, the operator should contact the nearest Whale Service Office.

2.4 Regulatory Information

AAMI/ANSI ES60601-1:2005/A2：2010/CAN/CSA-C22.2 No. 60601-1: 2008

EN60601-1：2006/AC: 2010

IEC 60601-1-2:2007

IEC 60601-2-37：2007/ EN 60601-2-37:2008

NEMA UD 2-2004 (R2009)

IEC 62359：2010

AAMI / ANSI / ISO 10993-5:2009/(R) 2014

AAMI / ANSI / ISO 10993-5:2009/(R) 2014

2.5 Safety Classification

Type of protection against electric shock

Class I Equipment

Degree of protection against electric shock

- Probes: BF applied parts
- ECG: BF applied parts

Continuous Operation

- System in Ordinary Equipment (IPX0)
- Probe (IPX7)

2.6 Safety - Power Supply

2.6.1 Adapter

Input Rated: 100-240V~, 50/60 Hz, 1.8 A

Output: 19V DC 7.89A

2.6.2   *Printer*

Digital Graphic Printer (Printer A)

Model: UPD897

Input: 100-240V~ 50/60Hz 1.5-0.8A

Video Copy Processor (Printer B)

Model: P93C

Input: 100-240V~ 50/60Hz 0.8A

> ⚠️
> **WARNING**
> *Connect the power supply of the printer to the respective power recep-
> tacle on the Cart. Do not power the printer from other power supply
> sources.*

2.6.3   *Cart*

Input Rated: 100-240V~, 50/60 Hz

2.7   *Acoustic Output*

2.7.1   *Acoustic Output Definition*

Mechanical Index (MI)

MI is the estimated likelihood of tissue damage due to cavitation. The abso-
lute maximum limit of the MI is 1.9 as set by the FDA 510(k) guidance of
1997.

Thermal Index (TI)

TI is an estimate of the temperature increase of soft tissue or bone. There are
three thermal index categories:

- TIS: soft tissue thermal index. The main TI category. Used for applica-
  tions that doesn't image bone.

- TIC: cranial bone thermal index (bone located close to the surface).
  Used for transcranial application.

- TIB: bone thermal index (bone located in a focal region). Used for fetal
  application.

2.7.2   Acoustic Output Display

In the top area of the Main User Interface, two fields are allocated for the display of TI &MI values is shown below:
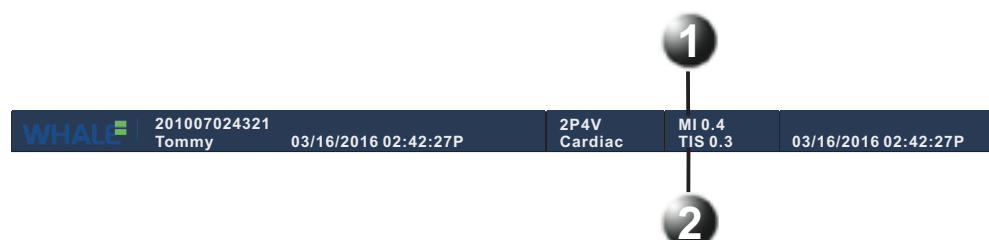
Figure 2-1: The display of MI and TI on the screen

1   MI   2   TI

The Portable Ultrasound Diagnostic Scanner chooses the correct category based on mode of operation and chosen application, and presents only one TI to the operator. It is therefore important that the operator chooses the right application.

2.7.3   As Low As Reasonably Achievable (ALARA)

Ultrasound procedures should be performed using output levels and exposure times as low as reasonably achievable while acquiring clinical information.

Training

During each ultrasound examination the user is expected to weigh the medical benefit of the diagnostic information that would be obtained against the risk of potential harmful effects. Once an optimal image is achieved, the need for increasing acoustic output or prolonging the exposure can't be justified. It is recommended that all users receive proper training in applications before performing them in a clinical setting. Contact the Whale Ultrasound sales representative for training assistance.

2.7.4   Safety Statement

Although no harmful biological effects have been demonstrated for ultrasound frequencies, intensities and exposure times used in examination with the Portable Ultrasound Diagnostic Scanner, it is recommended to use the lowest acoustic output settings that will produce diagnostically acceptable information.

2.7.5   System Controls Affecting Acoustic Output

The operation controls that directly affect the acoustic output are discussed in the Acoustic Output Data Tables in the Reference Manual. These tables show the highest possible acoustic intensity for a given mode, obtainable

only when the maximum combination of control settings is selected. Most settings result in a much lower output. It is important to note the following:

- The duration of an ultrasound examination is just as important as the acoustic output, since patient exposure is directly related to the exposure time.

- Better image quality yields faster clinical results, making it possible to complete the relevant ultrasound examination more rapidly. Therefore, any control that improves the quality of the examination can help reduce patient exposure, even though it may not directly affect acoustic output.

Probe Selection

As long as the appropriate application is available, any probe can be used with the knowledge that the intensities fall at, or below, those stated in the Acoustic Output Data Tables. The duration of patient exposure is most likely minimized with the use of a probe that is optimized to provide resolution and focal depth, appropriate to the examination.

Application Selection

Selecting the probe and application preset appropriate for a particular ultrasound examination automatically provides acoustic output limits within FDA guidelines for that application. Other parameters that optimize performance for the selected application are also set automatically and should assist in reducing the patient exposure time.

Changing Imaging modes

Acoustic output depends on the imaging mode selected, which determines whether the ultrasound beam is stationary or in motion. This greatly affects the energy absorbed by the tissue.

When operating in a combined mode, the total acoustic output comprises contributions from each individual mode. Depending on the modes in use, either or both output indices may be affected.

The user can override the default settings, but care should be taken to observe the displayed MI and TI values.

Power

It is possible to change the power in all operating modes so that the operator can adhere to the ALARA principle.

2.8   Probe Safety

This section includes information on hazards to both the user and the equipment.

Do not use the probe after a fall or collision until it is verified that it does not leak electricity.

Do not immerse the entire probe into liquid to wash. The probe is not water-proof. Immersing the whole probe in liquid will damage the probe.

Do not use the probe if the surface of probe is scratched which may cause electric shock. Please contact WHALE local representative immediately.

A damaged probe can also increase the risk of electrical shock if conductive solutions come in contact with internal parts. Inspect probes often for cracks or openings in the housing and holes in and around the acoustic lens or other damages that could allow liquid entry.

If the contact surface of the probe is scratched, stop using the probe and contact Whale sales office or representative.

The use of damaged probes can result in injury or increased risk of infection. Inspect probes for sharp edges, or rough surface that could cause injury or cut protective barriers (such as gloves and sleeves).

Do not bend or knot the cables. Cracks or damages of the probe shell and ruptures or exposures of the cables will influence the probe electrical safety.

Never use steam, heating or liquid disinfectant to disinfect the probe. Those methods will cause permanent damage to the probe.

Do not connect or disconnect the active probe while real time scanning. Those operations should be performed when the system is frozen or turned off.

2.8.1   Electrical Hazards

Probes are operated with electricity, which can injure the patient or user when exposed to contact with conductive solution.

> ⚠️ **WARNING**   *Do not immerse the probe into any liquid beyond the specified level. Never immerse the probe connector or adapters into any liquid.*

> ⚠️ **WARNING**   *Do not subject the probe to mechanical shock or impact, which may result in cracks or chips in the housing and degrade performance.*

> ⚠️ **WARNING**   *Inspect the probe before and after use, as described on Probe care and maintenance.*

> ⚠️ **WARNING** *Do not apply excessive force to the probe cable, to prevent insulation failure.*

2.8.2   Mechanical Hazards

Take precaution to avoid mechanical hazards.

> ⚠️ **WARNING** *Inspect probes for sharp edges or rough surfaces that could injure sensitive tissue.*

> ⚠️ **WARNING** *Do not bend or pull the cable forcefully, to avoid mechanical shock or impact to the probe.*

2.8.3   Biological Hazards

To minimize disease transmission, legally marketed and sterile pyrogen- free sheaths should be used for each probe recommended for intra-cavity procedures. Adequate cleaning and disinfection are essential to prevent disease transmission. It is the responsibility of the user to verify and maintain the effectiveness of the infection control procedures in use.

Intracavitary probe should be cleaned and disinfected after use even if a sterile pyrogen-free sheath is used.

An FDA cleared Gel should be used.

2.9   Patient Safety

> ⚠️ **WARNING** *The concerns listed below can seriously affect the safety of patient during a diagnostic ultrasound examination.*

2.9.1   Patient Identification

Always include proper identification with all patient data and verify the accuracy of this data. Ensure that the correct patient ID is provided on all recorded data and hard copy prints. Identification errors could result in an incorrect diagnosis.

2.9.2   Diagnostic Information

The images and calculations provided by the system are intended for use by competent users, as a diagnostic tool. They are explicitly not to be regarded as the sole, irrefutable basis for clinical diagnosis. Users are encouraged to study the literature and reach their own professional conclusions regarding the clinical utility of the system.

The user should be aware of the product specifications and of the system accuracy and stability limitations. These limitations must be considered before making any decision based on quantitative values. If in doubt, the nearest Whale Service Office should be consulted.

Equipment malfunction or incorrect settings can result in measurement errors or failure to detect details in the image. The user must become thoroughly familiar with the operation of the unit in order to optimize its performance and to recognize possible malfunctions. Training is available through Whale company sales representatives.

> ⚠ **CAUTION**   *Be certain to ensure the privacy of patient's information.*

2.10   Personnel And Equipment Safety

> ⚠ **DANGER**   *The hazards listed below in this section can seriously affect the safety of personnel and equipment during a diagnostic ultrasound examination.*

2.10.1   Explosion Hazards

Never operate the equipment in the presence of flammable or explosive liquids, vapors or gases. Malfunctions in the unit, or sparks generated by fan motors, can electrically ignite these substances. Operator should be aware of the following points to prevent such explosion hazards.

- If flammable substances are detected in the environment, do not plug in or turn on the system.
- If flammable substances are detected after the system has been turned on, do not attempt to turn off the unit, or to unplug it.
- If flammable substances are detected, evacuate and ventilate the area before turning off the unit.

2.10.2   *Electrical Hazards*

> ⚠️ **WARNING**   *The internal circuits of the unit use high voltages, capable of causing series injury or death by electrical shock.*

To Avoid Injury:

* Do not remove the unit's protective covers. No user-serviceable parts are inside. If servicing is required, contact qualified technical personnel.

* Connect the attachment plug to a hospital-grade ground outlet to ensure adequate grounding.

* Do not put liquids on or above the unit. Conductive fluids seeping into the active circuit components may cause short circuiting, which could result in an electrical fire.

* An electrical hazard may exist if any light, monitor or visual indicator remains on after the unit is turned off.

Fuses blown within 36 hours of being replaced may indicate a malfunctioning electrical circuit within the system. In this event, the unit must be checked by Whale Ultrasound service personnel, No attempt should be made to replace the fuse with another fuse of a higher rating.

2.10.3   *Biological Hazards*

To avoid the risk of disease transmission:

* Use protective barriers whenever necessary. Follow sterile procedures as required.

* Thoroughly clean probes and reusable accessories after each patient examination and disinfect to sterilize as needed.

* Follow all in-house infection control policies if they apply to personnel and equipment.

2.10.4   *Pacemaker Hazards*

The possibility of the system interfering with pacemakers is minimal. However, as the system generates high frequency electrical signals, the operator should be aware of the potential hazard this could cause.

2.11   *Electrical Safety*

Device Classification

The Portable Ultrasound Diagnostic Scanner is a Class I device, type BF.

1   The ultrasound system must use a separate, dedicated power outlet.

2   The connected power supply must be reliably grounded.

3   Connecting the optional hard-copy device (printer) incorrectly may reduce the electrical safety of the system.

4   Surgical equipment malfunction or probe lens damage may cause electrode-burning of patient when the system used with HF equipment such as electrode device. The system and probe must be checked before using HF equipment. When no imaging is needed, please power off.

5   The system is not water-proof. Please keep away from rain, high humidity. Do not put any container with liquid near the system.

6   The system use HF signals and pacemakers may interfere with such signals. Users should take not of this potential hazard. If pacemaker interference is found or suspected, the system should power off.

7   When the system used with HF equipment (such as Operation electrode device), the surgical equipment malfunction or damaged probe can lead electrode-burning of patient. So a thorough inspection of the system and probe before use of HF equipment is necessary. When not using imaging, the power must be off.

8   RF communication equipment may interfere with the ultrasonic system. Do not use those equipments near the system;

9   Keep a distance of at least five meters between the system and equipments that may interfere with the ultrasonic system.

Internally Connected Peripheral Devices

The unit, together with peripheral devices, such as printers and video tape recorders, meets IEC 60601-1 (2005) standards for electrical isolation and safety. These standards are applicable only when the specified peripheral devices are plugged into the AC outlets provided by the unit.

Internally Connected Battery

Remove the primary battery if the internal battery in not likely to be used for some time.

External Connection Of Other Peripheral Devices

Other external devices, such as laser cameras, printers, VCRs and external monitors, usually exceed allowable leakage limits and, when plugged into separate AC outlets that are then connected to the unit, are in violation of patient safety standards, Suitable electrical isolation of such external AC outlets may be required in order to meet IEC 60601-1 (2005) standards for electrical leakage.

> ⚠️ **CAUTION**   *External devices can be used only if Whale marked them to be in compliance with related standards (IEC 60601-1: 2005).*

> ⚠️ **CAUTION**   *External devices meeting IEC 60601-1: 2005 should be kept outside of the patient environment.*

2.12 Allergic Reaction

Due to reports of severe allergic reaction to medical devices containing latex, the FDA advises health-care professionals to identify latex-sensitive patients, and to be prepared to treat allergic reactions promptly. Latex is a component of many medical devices, including surgical and examination gloves, catheters, incubation tubes, anesthesia masks, and dental dams. Patients' reaction to latex ranged from contact urticaria, to systemic anaphylaxis.

For more details regarding allergic reaction to latex, refer to FDA Medical Alert MDA91-1, March 29.

2.13 Electromagnetic Compatibility (EMC)

2.13.1 Information on electromagnetic compatibility

Portable and mobile RF communications equipment can affect the Portable Ultrasound Diagnostic Scanner.

The use of ACCESSORIES, transducers and cables other than those specified, with the exception of transducers and cables sold by the manufacturer of the Portable Ultrasound Diagnostic Scanner as replacement parts for internal components, may result in increased EMISSIONS or decreased IMMUNITY of the Portable Ultrasound Diagnostic Scanner.

The Portable Ultrasound Diagnostic Scanner should not be used adjacent to or stacked with other equipment. If adjacent or stacked use is necessary, the

Portable Ultrasound Diagnostic Scanner should verify its normal operation in the configuration in which it will be used.

Note: *Beijing East Whale Imaging Technology Co.,Ltd. cannot guarantee that accessories, lines and transformers not delivered by Beijing East Whale Imaging Technology Co.,Ltd. will correspond with EMC requirements of EN 60601-1-2.*

Table 2-2: The Accessory Cable Length

Accessory part/name	Article number	Length/dimensions
ECG Electrode Lead wire	1	2900mm
Power supply cord (from power supply to cart)	1	1500mm
Power supply cord (from power supply to AC adapter)	1	1500mm
Power supply cord (from AC adapter to console)	1	1000mm
Probe cable (12L5V)	1	1900mm
Probe cable (2C5V)	1	1750mm
Probe cable (4EC9V)	1	1900mm
Probe cable (1P4V)	1	1950mm
Probe cable (2P4V)	1	1950mm
Probe cable (3P8V)	1	1950mm

Note: *The Portable Ultrasound Diagnostic Scanner is exclusively intended for use by medical professionals. In residential areas, the Portable Ultrasound Diagnostic Scanner may cause radio interference in certain circumstances so that it may be necessary to undertake suitable measures such as realigning, rearranging or screening the Portable Ultrasound Diagnostic Scanner, or filtering the connection with the public power supply.*

All types of electrical equipment may characteristically cause electromagnetic interference with other equipment, transmitted either through air or connecting cables. The term Electromagnetic Compatibility, indicates the capability of the equipment to curb electromagnetic influence from other equipment, while at the same time not affecting other equipment with similar electromagnetic radiation.

Radiated or conducted Electromagnetic Compatibility can cause distortion, degradation, or artifacts in the ultrasound image which could potentially obscure diagnostic information.

There is no guarantee that interference will not occur in a particular installation, if this equipment is found to cause or respond to interference, which may be determined by turning equipment on and off, qualified service per-

sonnel should attempt to correct the problem by one or more of the following measures:

- Re-orient or re-locate the affected device.

- Increase the separation between the unit and the affected device.

- Power the equipment from a source other than that of the affected device.

- Consult the service representative for further suggestions.

The manufacturer is not responsible for any interference or responses caused by interconnecting cables other than those recommended, or by unauthorized changes or modifications to this unit. Unauthorized changes or modifications could void the user's authority to operate the equipment.

To comply with the regulations on electromagnetic interference, all interconnection cables to peripheral devices must be shielded and properly grounded. Use of cables not properly shielded and grounded may result in the equipment causing or responding to radio frequency interference, in violation of the European Union Medical Device Directive and FCC regulations.

Do not use devices that intentionally transmit RF signals, for example, cellular phones, transceivers, or radio controlled products, in the vicinity of this equipment as it may cause performance outside the published specifications. Keep these types of devices turned off when near this equipment.

2.13.1.1   *Emitted electromagnetic interference*

The Portable Ultrasound Diagnostic Scanner is intended for use in the electromagnetic environment specified below. The customer or the user of the Portable Ultrasound Diagnostic Scanner should confirm that it is used in such an environment.

Table 2-3: Electromagnetic Environment specified

Emissions test	Compliance	Electromagnetic environment - guidance
RF emissions CISPR 11	Group 1, Class A	The Portable Ultrasound Diagnostic Scanner uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
Harmonic emissions IEC 61000-3-2	Class A	

Table 2-3: Electromagnetic Environment specified

Emissions test	Compliance	Electromagnetic environment - guidance
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

2.13.1.2   *Electromagnetic immunity*

Table 2-4: Electromagnetic Immunity Environment

Emissions test	Compliance	Electromagnetic environment - guidance
Electrostatic discharge (ESD) IEC 61000-4-2 6kV contact 8kV air	±2kV,±4kV, ±6kV contact ±2kV, ±4kV,±8kV air discharge	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/ burst IEC 61000-4-4 ±2kV for power supply lines	±2kV for power supply lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5 ±1kV Line to line ±2kV Line to earth	±1kV Line to line ±2kV Line to earth	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5% UT(>95% dip in UT) for 0,5 cycle 40% UT(60% dip in UT) for 5 cycles 70% UT (30% dip in UT) for 25 cycles <5% UT (>95% dip in UT) for 5 sec	Mains power quality should be that of a typical commercial or hospital environment. If the user of the Portable Ultrasound Diagnostic Scanner requires continued operation during power mains interruptions, it is recommended that the Portable Ultrasound Diagnostic Scanner be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.

Table 2-4: Electromagnetic Immunity Environment

Emissions test	Compliance	Electromagnetic environment - guidance
Conducted RF IEC 61000-4-6 3Vrms 150kHz to 80MHz	3Vrms 150kHz to 80MHz	Portable and mobile RF communications equipment should be used no closer to any part of the Portable Ultrasound Diagnostic Scanner, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2,5GHz	$$d = \left[\frac{3,5}{V_1}\right]\sqrt{P}$$ $$d = \left[\frac{3,5}{E_1}\right]\sqrt{P} \ \text{80MHz to 800MHz}$$ $$d = \left[\frac{7}{E_1}\right]\sqrt{P} \ \text{800MHz to 2.5GHz}$$ where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, a should be less than the compliance level in each frequency range B. Interference may occur in the vicinity of equipment marked with the following symbol:

Notes
- *At 80 MHz and 800 MHz, the higher frequency range applies.*
- *These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.*

Table 2-4: Electromagnetic Immunity Environment

Emissions test	Compliance	Electromagnetic environment - guidance
a) Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the Portable Ultrasound Diagnostic Scanner is used exceeds the applicable RF compliance level above, the Portable Ultrasound Diagnostic Scanner should confirm its normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the Portable Ultrasound Diagnostic Scanner.		
b) Over the frequency range 150kHz to 80MHz, field strengths should be less than 3 V/m.		

2.13.1.3   Recommended safe distance

The Portable Ultrasound Diagnostic Scanner is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the Portable Ultrasound Diagnostic Scanner can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the Portable Ultrasound Diagnostic Scanner as recommended below, according to the maximum output power of the communications equipment.

Table 2-5: Recommended Safe Distance

Rated maximum output power of transmitter W	Separation distance according to frequency of transmitter (m)		
	$d = \left[\dfrac{3,5}{V_1}\right]\sqrt{P}$	$d = \left[\dfrac{3,5}{E_1}\right]\sqrt{P}$ 80MHz to 800MHz	$d = \left[\dfrac{7}{E_1}\right]\sqrt{P}$ 800MHz to 2.5GHz
0.01	0.12	0.12	0.23
0.1	0.37	0.37	0.74
1	1.17	1.17	2.33
10	3.70	3.70	7.37
100	11.70	11.70	23.30

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

Notes

- *At 80 MHz and 800 MHz, the higher frequency range applies.*
- *These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.*

CHAPTER 3

SPECIFICATIONS

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3.1 Power Supply

The Portable Ultrasound Diagnostic Scanner is powered either by its internal battery or by a separate power supply adapter unit connected to a separate power outlet for any range of 100 – 240 VAC, 50–60 Hz.

The cart power supply requirement is 100~240V ~ 220VA 50/60 Hz

> ⚠️ **WARNING**
>
> *Operating the unit with the wrong voltage causes damages, voiding the factory warranty.*

3.2 Dimensions

3.2.1 Console

Figure 3-1: The unit size

The volume size and weight (does not include the optional accessories) of the Portable Ultrasound Diagnostic Scanner are illustrated as below:

Table 3-1: The volume size and weight

Standards	Metric Value
Length	385 mm
Width	314 mm
Height	68 mm
Weight	6.5 kg

3.3 Adapter

Input: 100~240 V ~ 220 VA 50/60 Hz

Output: DC 19 V, 7.89 A

3.4 Probe

3.4.1 Supported Probes

The Portable Ultrasound Diagnostic Scanner supports four types of probes:

1 Linear array probe

2 Convex array probe

3 Phased array probe

4 Intracavitary convex probe

The detailed description of the supported probes is illustrated as bellow.

Table 3-2: Probe Details

Type	Name and Icon	Technical Data	Supported Mode	Application
Linear array probe	12L5V	Center frequency:7.5MHz Pitch: 0.3 mm Number of elements: 128 Elevation Aperture: 4.5 mm Elevation Focus: 20 mm	2D mode M-Mode AMM-Mode Color Doppler Power Doppler EI Doppler PW Doppler Panoramic Imaging mode	Thyroid Carotid EM Breast P-Arterial Venous SMP MSK Vascular ABD Orthopedics Testicle

Table 3-2: Probe Details

Type	Name and Icon	Technical Data	Supported Mode	Application
Convex array probe	2C5V	Center frequency:3.5 MHz Pitch: 0.48 mm Number of elements: 128 Elevation Aperture: 12.5 mm Radius of curvature (Patient side of ceramic): 59.56 mm Angle of elements: 0.462° Elevation Focus: 80 mm	2D mode M-Mode AMM-Mode Color Doppler Power Doppler EI Doppler PW Doppler	ABD Renal GYN ABD_Large ABD_Small EM ABD-Vascular OB OB-1 OB-2/3 MSK Fetal Heart Urology Prostate Ped-ABD
Phased array probe	2P4V	Center frequency:3 MHz Pitch: 0.254 mm Number of elements: 64 Scan Plane Aperture (lateral): 20.32 mm Elevation Aperture: 12 mm Elevational Focal Depth: 55mm	2D mode M-Mode AMM-Mode Color Doppler Power Doppler SRI Doppler TVI mode PW Doppler CW Doppler TVD mode	Cardiac Cardiac_Large Cardiac_Small Ped-Cardiac ABD Renal OB TCD
Intracavitary convex probe	4EC9V	Center frequency: 6.5MHz Pitch: 0.205 mm Number of elements: 128 Elevation aperture: 5 mm Angle of elements: 1.175° Angle of view: 150.4° Radius of curvature: 10 mm Elevation Focus: 30 mm	2D mode M-Mode AMM-Mode Color Doppler Power Doppler EI Doppler PW Doppler	GYN OB-1 ABD Prostate

Table 3-2: Probe Details

Type	Name and Icon	Technical Data	Supported Mode	Application
Phased array probe	1P4V	Center frequency: 2.5MHz Pitch: 0.254 mm Number of elements: 64 Elevation Aperture: 12 mm Elevation Focus:70 mm	2D mode M-Mode AMM-Mode Color Doppler Power Doppler SRI Doppler TVI mode PW Doppler CW Doppler TVD mode	ABD Cardiac OB Ped-Cardiac Renal TCD Cardiac_Small Cardiac_Large
Pediatric heart probe	3P8V	Center frequency: 5.5MHz Pitch: 0.16 mm Number of elements: 96 Scan Plane Aperture (Lateral): 15.36 mm Elevation Aperture : 8 mm Elevational Focal Depth : 49 mm	2D mode M-Mode AMM-Mode Color Doppler Power Doppler SRI Doppler TVI mode PW Doppler CW Doppler TVD mode	Breast Carotid MSK Ped-ABD Ped-Cardiac Ped-Renal Thyroid Ped-Cardiac_S Ped-Cardiac_L

3.4.2   Probe Orientation

Each probe is provided with an orientation marker near its head, the orientation marking is a salient, which corresponds to the W mark on the scanning screen. The W mark indicates the orientation of the probe to scan.
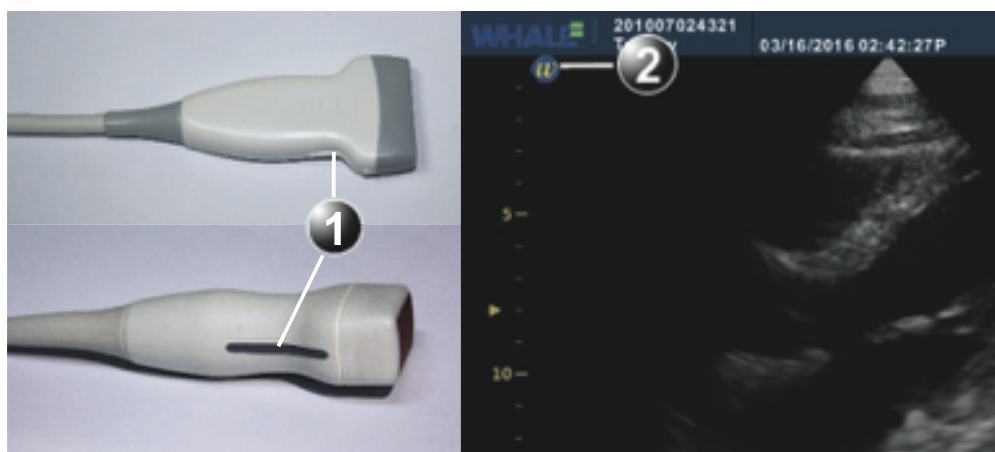
Figure 3-2: Orientation marking on probe and on scanning screen

1   Orientation Marker

2   W_mark: indicates the orientation of the probe to the scan

3.4.3   *Probe labeling*

Each probe is labeled with the following information:

1   Type of the probe

2   Name of the probe

3   Probe serial number

4   Center frequency

5   The degree of preventing into the liquid

The probe labeling displays as the following figure:

$$2P4V \quad SN \ XXXX \quad \boxed{\wedge} \ \textit{YYYY}{-}\textit{MM}$$

Figure 3-3: The Probe Labeling

3.4.4   *Probe Connection*

⚠️ **WARNING**   *The patient is not allowed to touch any of connectors on the ultrasound unit, including ultrasound probe connectors.*

⚠️ **CAUTION**   *Handle the probe gently while connecting or disconnecting.*

Connecting the probe

Probes can be connected or exchanged at any time, regardless of whether the unit is powered On/Off. The operation is executed with the following steps:

STEP 1   Put the probe carrying case on a stable surface and open the case.

STEP 2   Be careful to take out the probe and untied the probe cord. Do not hang the probe head freely. Any impact to the probe head could result in irreparable damage.

STEP 3   Press the probe connector locking lever (Refer to Figure 3-6) downwards.

STEP 4 Align the probe connector with the probe port and carefully put it into the port (Refer to Figure 3-5).

Figure 3-4: Probe Connection to the Unit

STEP 5 Lift the connector locking lever upwards to the absolute horizontal position to lock it in place (See Figure 3-6).
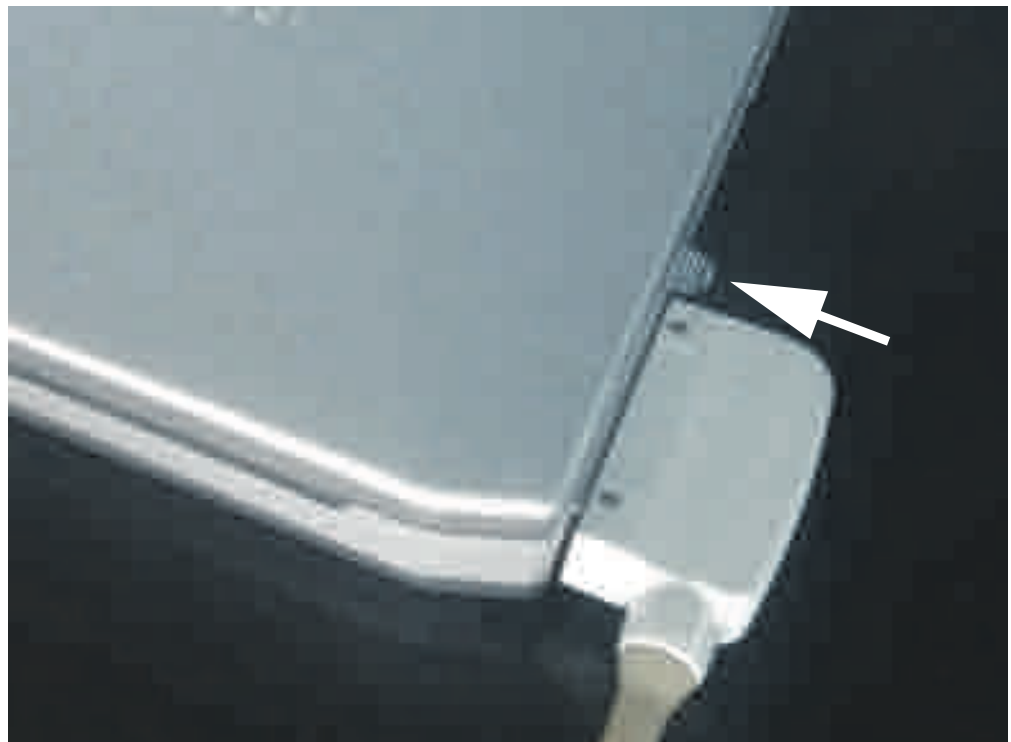
Figure 3-5: Probe Connection Locking lever

STEP 6 Carefully position the probe cord so that it can be free to move.

> ⚠️ **CAUTION** *Fault conditions can result in electric shock hazard. Do not touch the surface of probe connectors which are exposed when the probe is removed. Do not touch the patient with probe when connecting or disconnecting the probe.*

> ⚠️ **CAUTION** *Do not bend the probe cable acutely.*

When the probe is connected, it is automatically activated. User can deactivate the probe by pressing the **Freeze** key.

Disconnecting the probe

The probe can be disconnected at any time. It's recommended that the probe should be deactivated before disconnecting. The operation is executed with the following steps:

STEP 1 Freeze the image by pressing the **Freeze** key.

STEP 2 Press the connector locking lever down to unlock the connector.

STEP 3 Pull the probe and connector straight out of the probe port.

STEP 4 Carefully slide the probe and connector away from the probe port.

STEP 5 Ensure the probe cables are free.

STEP 6 Ensure the probe head is clean before putting it in its storage case.

3.5 Printers

Sony UP-D897

Mitsubishi P93

> ⚠️
> **CAUTION**
>
> *The printers can only be powered from the respective port provided on the cart. Do not connect the printer to other power sources.*

3.6 Replaceable Fuses

Table 3-3: Replaceable Fuses

Manufacturer	Model	Technical data
Littelfuse Inc	219XA	5*20mm, 6.3 A, 250V

> ⚠️
> **WARNING**
>
> *The same fuse model as specified should be used for fuse replacement to avoid risks.*

3.7 Operation Environment

The Portable Ultrasound Diagnostic Scanner must operate within the proper environment and keep consistent with the requirements described in this section. Before using the unit, ensure that all requirements are met.

This unit can operate optimally by implementing the following requirements:

3.7.1 Operate Room Condition

Ensure that there is sufficient air flow around the Portable Ultrasound Diagnostic Scanner when installing or operating.

3.7.2 Environment Requirements

The Portable Ultrasound Diagnostic Scanner requires consistent operational environment. Temperature and humidity requirements are displayed as below.

Table 3-4: Operation Environment

Requirements	Temperature	Humidity	Air Pressure
Operational	10℃~40℃ (50°F~104°F)	15%~70% (Non-condensing)	700—1060hPa

3.7.3 Electromagnetic Interference

Ensure that unit is protected from the electromagnetic interferences as follows:

- Keep the unit operation at least 4.6 meters away from the equipment which emits strong electromagnetic radiation.

- When operating it in the vicinity of radio broadcasting equipment, if necessary, please shield the unit.

- Put the device in the vicinity of wood, plastic composite wall, floor and ceiling to avoid electromagnetic interference.

3.8 Transport and Storage Environment

The Portable Ultrasound Diagnostic Scanner requires consistent storage and transport environments. Temperature and humidity requirements are displayed as below.

Table 3-5: Transport and Storage Environment

Requirements	Temperature	Humidity	Air Pressure
Storage	-20℃~55℃	10%~80% (Non-condensing)	700—1060hPa
Transport	-20℃~55℃	10%~80% (Non-condensing)	700—1060hPa

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CHAPTER 4

START-UP

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4.1   *Positioning the unit*

To move the unit on a cart, the following operating steps must be followed:

Preparation for the movement

STEP 1   Ensure the unit is shut down completely.

STEP 2   Ensure the LCD screen is folded to the fully closed position.

STEP 3   Ensure all cables are disconnected, and the power cables are on the cart.

STEP 4   Ensure all probes are put on the cart, and the probe cables are stored neatly. No protruding or tangling cables.

STEP 5   Ensure that no loose items are left on the unit.

Ensure the safety while moving the unit

STEP 1   Be careful when crossing the door or elevator thresholds.

STEP 2   Be careful when moving the unit on inclines.

STEP 3   Do not attempt to move the unit using cables or probe connectors.

STEP 4   Ensure that the unit doesn't strike walls or door frames.

STEP 5   Ensure that the path of travel is clear.

STEP 6   Move the unit slowly and carefully.

4.2   **Unit Connection**

Eligible personnels from Whale should perform the initial unit installation.

Before connecting the Portable Ultrasound Diagnostic Scanner, check the power adapter unit and cord, and ensure the voltage level conforms to electrical safety requirements.

Ensure that the power cords, cables and plugs are specially designed for Portable Ultrasound Diagnostic Scanner, and that they are intact.

This equipment should have its own dedicated grounded power connection, do not use extension cords or adapter plugs.

> ⚠️ **WARNING**   *Failure to provide a grounded circuit can cause electrical shock, resulting in serious injury.*

4.2.1   Check the voltage level

The power adapter specifications of the Portable Ultrasound Diagnostic Scanner is shown below:

Table 4-1: Power Adapter Specifications

Requirements	Specifications
Adapter Type	AHM150PS19
Input	100-240V~ 1.8A 50/ 60HZ
Output	Output: 19V DC 7.89A

Please check the label of the Portable Ultrasound Diagnostic Scanner power adapter which is displayed as bellow:

Figure 4-1: The Label

> ⚠️ **WARNING**   *If the voltage level is not within the range of electrical safety require-ments, please don't connect to the power source.*

4.2.2   Connect the unit to the electrical outlet

STEP 1   Connect the output of the AC power adapter to the proper socket on the rear side of the Portable Ultrasound Diagnostic Scanner.

> ⚠️ **CAUTION**   *Use the AC power adapter specially designed and approved by Whale for the Portable Ultrasound Diagnostic Scanner.*

> ⚠ **CAUTION**   *Ensure there is nothing is placed over AC adapter's power cable, and the cable is not located where it can be tripped over or stepped on.*

> ⚠ **CAUTION**   *Placed the AC adapter in a ventilated area before it is used to power the unit.*

STEP 2 Make sure the wall outlet matches with the power adapter plug.

STEP 3 Plug the power plug into the wall outlet.

> ⚠ **WARNING**   *Avoiding risk of fire, the unit's power must be supplied by a separate and appropriately rated outlet.*

> ⚠ **WARNING**   *The power cord should not be used for a configuration rated less than the specified current under any circumstance.*

> ⚠ **WARNING**   *Do not use extension cords or adapter plugs.*

4.2.3   Battery

The Portable Ultrasound Diagnostic Scanner can be powered by two different power sources in three different configurations:

- AC power adapter only (without the battery).

- AC power adapter and a battery (battery being charged in the system).

- Battery only (without power from the AC power adapter).

The battery can provide power when an AC power source is unavailable, and it can last 1.5 hours of battery life with a single fully charged battery. Wasted batteries need to be put into a chemical waste collection station.

> ⚠ **WARNING**   *When charging the battery, the ambient temperature must be between $0\,^\circ C \sim 45\,^\circ C$ ($32\,^\circ F \sim 113\,^\circ F$). When discharging the battery, the ambient temperature must be between $-20\,^\circ C \sim 60\,^\circ C$ ($-4\,^\circ F \sim 140\,^\circ F$).*

⚠ WARNING

Don't cause the battery to short circuit.

⚠ WARNING

Don't disassemble or change the battery safety system.

⚠ WARNING

Keep the battery away from the fire or other heat sources.

⚠ WARNING

Avoid piercing the battery with sharp objects.

⚠ WARNING

Don't use a damaged battery.

⚠ WARNING

Remove the battery if the unit is not used for more than two weeks.

⚠ WARNING

The battery should be charged immediately after use. Store the battery in a discharged state will permanently damage its capacity.

The battery should be charged as follows:

Long term (more than three months): 40% ~ 60%

⚠ CAUTION

To avoid the battery bursting, igniting, or fumes from the battery causing equipment damage, the following precautions are needed:

Avoid getting the battery wet.

If the battery leaks or emits an odor, remove it from all possible flammable sources.

The battery should stop operation and be removed immediately if the battery emits an odor or heat, is deformed or discolored, or in a way appear abnormal during use.

⚠️ **CAUTION**

The battery should be stored as below:

Short term (Less than one month): 0 ℃~50 ℃ (32 ℉~122 ℉)

Long term (More than three month): 10 ℃~35 ℃ (50 ℉~95 ℉)

Note: *Only use batteries authorized by Whale.*

The status of the power sources are indicated both by a graphic icon on the bottom of the display while the system is operating, and by a pair of LED lights which lights up even while system is shut down. The current power and battery status icons which display in the system Status Bar area (while the system is running) are illustrated as bellow:

Table 4-2: Battery Status Icons

Status Icon	Status Description
	AC power is On and no battery present.
	AC power is On and the battery is full (75%~100%).
	AC power is On and the battery is partially charged (50%~75%).
	AC power is On and the battery is partially charged (25%~50%).
	AC power is On and the battery is almost empty (0~25%).
	No AC power and the battery is in use. Full charged (75%~100%).
	No AC power and the battery is in use. Partially charged (50%~75%).
	No AC power and the battery is in use. Battery is discharged (25%~50%).

Table 4-2: Battery Status Icons

Status Icon	Status Description
	No AC power and the battery is in use. Battery is almost empty (0%~25%).

Users can click the status icon to check the power level of the battery.

4.2.4 Battery Replacement

To replace the battery:

STEP 1 Slide back the battery lock and hold.

STEP 2 Pull out the battery pack from the console.

STEP 3 Install the new battery.

Two types of rechargeable lithium-ion smart batteries are available:

• Battery 1: 14.4 V, 9000 mAh, 129.6 Wh

• Battery 2: 14.4 V, 10 Ah, 144 Wh

Note: *Two types of batteries are delivered randomly with the unit.*

Discharge Temperature Range: -20℃ ~ 60℃

Maximum Charging Voltage: 16.8 V

4.2.5 LED Lights

There are two LEDs to indicate the status of the system.

Table 4-3: LED Lights

LED Light	Function Description	Color
LED #1	Indicates the AC power status. The system power is On when this LED is lit.	Yellow-green
LED #2	Indicate the battery status.	Yellow- green and Red When the battery is charged, the LED is yellow-green. When the battery is low, the LED is Red.

4.2.6   Connect the peripheral/accessory

The peripherals/accessory connectors are located on the rear and side of the unit, and the peripherals/accessory can be properly connected using the connector panel. The details of the connector panel are illustrated as below:

Figure 4-2: Peripheral/Accessory Connector Panel

1   S-Video

2   Remote Control

3   Two interchangeable USB 3.0 ports (digital printer,CD-RW and other peripherals)

4   VGA Output(VCR option or External monitor)

5   Lan 10/100/1000 Base-TX Ethernet network connector

6   Port for DC IN(AC Power Adapter)

7   IO Expansion Port

8   ECG Cable Connector

Table 4-4: Contents of the Connector Panel

Socket	Signal type	Device type
ECG Cable Connector		
S-Video	NTSC/PAL S-Video	VCR or video monitor

Table 4-4: Contents of the Connector Panel

Socket	Signal type	Device type
Remote Control	Port for video printer	Video printer
USB 3.0	Universal serial bus x2	Foot Switch, USB drive, Digital printer
VGA Out	VGA output RGB high resolution video	Computer monitor
Ethernet	10/100/1000 Base-TX Ethernet IEEE 8023 Network device	Network device
AC Adapter Input	DC voltage from AC adapter unit	AC Power Adapter
IO Expansion Port	IO Expansion Port	

WARNING *Accessory equipment connected to the analogue and digital interfaces must be certified according to their respective IEC standards.*

WARNING *Don't touch the conductive parts of USB or Ethernet cables when connecting equipment to unit.*

CAUTION *Use peripherals and accessories that are approved by Whale.*

⚠️ **CAUTION** *Alternate connections will require verification of compatibility to avoid electric shock.*

4.2.7   Connect the digital printer

You can properly connect the digital printer to the unit using USB port 1 or 2.

4.2.8   Connect the video printer

You can properly connect the video printer to the unit using the Remote Control port.

4.2.9   Connect the ECG

Table 4-5: ECG Technical Specifications

Characteristic	Specifications
Size [mm]	144x44x16mm
Power consumption	5V
Current	50mA
A/D	14
De-fibrillation protection	internally installed
Patients with lead	3 Lead
CMMR	>100dB
The input insulation performance	>10Mohm
Snamic signal range	10mV(-5~+5mV)
Patients insulation	3750KV
Patient leakage current	<10uA
Frequency range (-3db)	0.05Hz-150Hz
Standard of security	IEC60601-1, EN60601-2, IEC60601-2-27
Operating temperature	0~85°C
Storage temperature	-65~125°C
Humidity	<80%

You can properly connect the ECG to the unit using the ECG cable connector port.

4.2.10   **Connect the external monitor**

You can properly connect the external monitor to the unit using the VGA port.

4.2.11   **Connect to the Wireless Local Area Networks**

The unit supports the connection of the Wireless Local Area Networks (WLAN) to access files from other computers, connect to a printer, etc.

To connect to the WLAN, follow these steps:

STEP 1   On the status bar, double click the network connection icon   .

STEP 2   On the network connection list, select the network that you want to connect to.

If you cannot find it on the list, click Refresh to update the list.

STEP 3   Click Connect.

The system will pop up the Connect to a network dialog asking for a security key (if the network is protected).

STEP 4   Type in the network security key, and then click OK.

If the connection to the network is successful, then the connection status on the network connection list will change to Connected.

If you want to display the characters of the security key, do not tick the Hide characters check box.

4.2.12 *Cart docking connection*

The cart is an optional device that facilitates clinical needs by offering more flexibilities such as connection to printers, additional probe ports, and easy mobility.

Figure 4-3: The Cart

Place the unit on the cart: when the display screen turns on or off, you can put the Portable Ultrasound Diagnostic Scanner on the cart.

> ⚠️ **WARNING**
> *Before placing the unit on the cart, you should be always put the battery or empty battery shell into the unit.*

> ⚠️ **WARNING**
> *When the unit has been turned on, please avoid trembling or shaking, otherwise this could cause harm to hard disk.*

STEP 1   Push up the locking lever of the cart.

Locking Lever

Figure 4-4: The Locking Lever

STEP 2 Grasp and hold the unit, let it slightly tilted towards your direction, and then put the unit flat on the cart guide, and ensure the front of the unit is closely to the baffle of the cart guide.
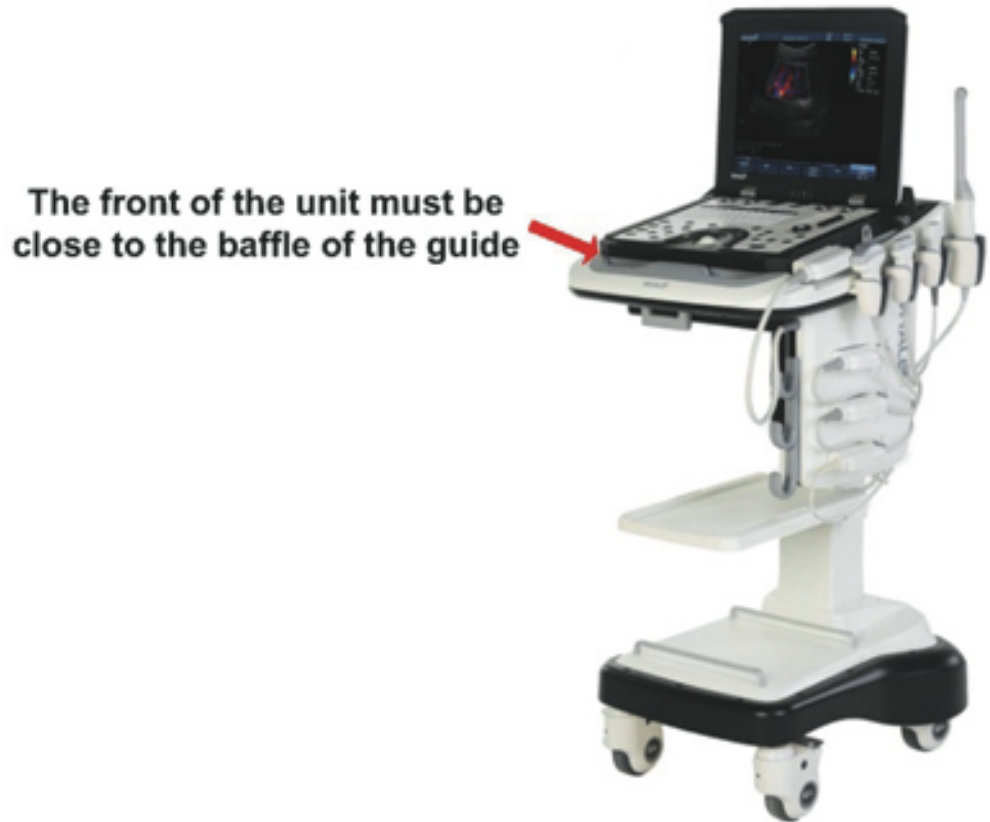
Figure 4-5: Position the unit

STEP 3 Push down the locking lever to lock the unit. Lifting the unit gently verifies its locked.

To loose the unit from the placing platform,

STEP 1 Raise the locking lever to unlock the unit.

STEP 2   Lift the unit from the cart guide.

Figure 4-6: The Cart Power Interface

- AC Adapter: Plug in the AC Adapter power cable

- Printer A: Plug in the power cable of Digital Graphic Printer

- Printer B: Plug in the power cable of Video Printer

> ⚠️ **CAUTION**   *Do not place the cart into a corner where it is difficult to reach the power switch.*

4.3   Switch on/off the unit

To switch the unit on

STEP 1   Make sure the unit has power.

STEP 2   Press **On/Off** button on the top right corner of control panel. After initialization the default scanning screen (2D Mode) is displayed, using the active probe. If the battery is too weak, the corresponding message will display on the screen. When using the AC power adapter, the system can be used regardless of the battery level and the battery will be automatically charged.

To switch off the unit

When the Portable Ultrasound Diagnostic Scanner is powered off, the unit will enter an automatic shutdown process.

- Full shutdown: the whole system is shut down. The operating process as below:

STEP 1 Press **On/Off** button on the top right corner of the control panel, the **Exit dialogue** pops up.

STEP 2 Select **Yes** option, the system enters the full shutdown sequence. The process will take a few seconds and is completed when all the lights of the control panel are turned off.

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CHAPTER 5

STORAGE AND TRANSPORTATION

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5.1   *Unit Transportation*

Extra care should be taken when transporting the unit by vehicle. In addition to the moving precautions (described in the 4.1section), follow the procedures described below.

- Disconnect all probes and secure them in their carrying case.

It's recommended that all probes should be stored in the carrying case when transporting or storing.

STEP 1   First put the probe connector into the carrying case.

STEP 2   Carefully wind the cable into the carrying case.

STEP 3   Carefully put the probe head into the carrying case.

> ⚠️
> **CAUTION**   *Do not use excessive force or bump the probe face.*

- Remove the unit from the cart and put it in the travel bag supplied by Whale.

5.2   Related Symbols

Table 5-1: The Related Symbols
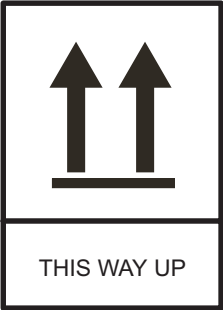
Symbols	Description
THIS WAY UP	Indicates that the transport package should be vertical during the transportation.
FRAGILE	Indicates that the package content is fragile, please handle with care.
KEEP AWAY FROM RAIN	Indicates that the package content is sensitive to wetness.
KEEP AWAY FROM SUNLIGHT	Indicates that the transport package should not be basked directly.

Table 5-1: The Related Symbols
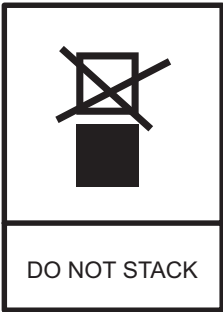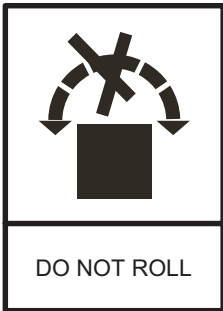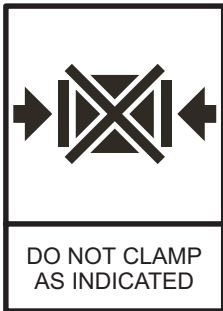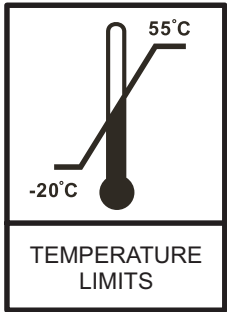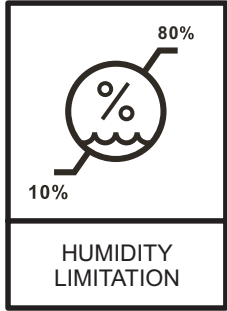
Symbols	Description
DO NOT STACK	Indicates that the transport package can't stack.
DO NOT ROLL	Indicates that the transport package can't turn over when transporting.
USE NO HAND HOOKS	Indicates that the transport package can't use the hook when handling or transporting.
DO NOT CLAMP AS INDICATED	Indicates the surface which can't be clamping when transporting the goods.

Table 5-1: The Related Symbols

Symbols	Description
55°C -20°C TEMPERATURE LIMITS	Indicates the temperature limits to which the medical device can be safely exposed.
80% % 10% HUMIDITY LIMITATION	Indicates the range of humidity to which the medical device can be safely exposed.
	Miscellaneous dangerous substances and articles

CHAPTER 6

SYSTEM DESCRIPTION

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6.1   Console

Figure 6-1: Console Overview

1	LCD display	2	Power indicator
3	On/Off button	4	Battery
5	Probe locking handle	6	Probe connector
7	Speakers	8	Monitor hinge
9	Main menu and Soft menu buttons	10	Alpha-numeric keyboard
11	Functional keyboard	12	Trackball
13	Rear connector Panel		

6.2   *Control Panel*

The layout of the Portable Ultrasound Diagnostic Scanner control panel is illustrated by the following picture. The control panel is divided into seven sections. The buttons and controls are grouped together for ease of use.

Figure 6-2:   Control Panel

Key Illumination

The keys on the control panel are illuminated according to their availability:

● Illumination green: the key function is currently active.

● Illumination white: the key function is available in the current state of the scanner.

● No illumination: the key function is not available in the current state of the scanner.

The detailed description of the buttons is provided in the following sections.

Menu Area
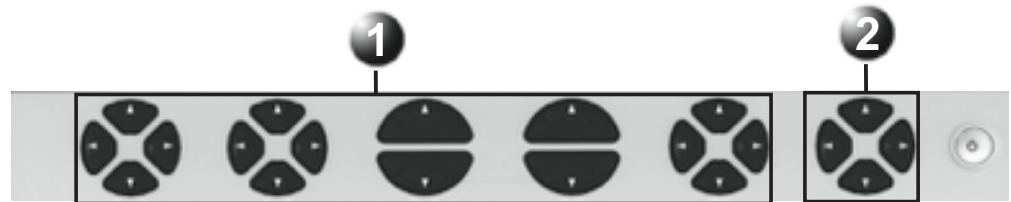
Figure 6-3: Menu Area Keys

1   *Main Menu keys*
2   *Soft Menu key*

- Main Menu Keys

Table 6-1: Main Menu keys

Key	Description
Four-way menu key	There are 4 four-way menu keys in main menu, whose mode-specific functions vary according to the imaging mode and position that is currently active. This four-way menu key is used to control the adjustment of parameters. The assigned functions are indicated above the key on the LCD display. Please refer to the chapter *"Imaging Mode" (p 119)* for the mode-specific functions of those buttons.
Two-way menu key	There are two two-way menu keys in main menu, whose mode-specific functions vary according to the imaging mode and position that is currently active. This two-way menu key is used as On/Off toggle for different controls on the main menu. The assigned functions are indicated above the key on the LCD display. Please refer to the chapter *"Imaging Mode" (p 119)* for the mode-specific functions of those buttons.

- Soft Menu Key

Table 6-2: Soft Menu keys

Key	Description
Four-way menu key	There is only one four-way knob for controlling the mode-specific soft menu. The vertical keys are used to select the menu options, and the horizontal keys are used to adjust the values. Please refer to the chapter *"Imaging Mode" (p 119)* for the mode-specific functions of the key.

Power Area

Table 6-3: Power Area Key

Key	Description
On/Off key	Turn the unit On/Off, or set the unit to Standby Mode.

Gain Area

Table 6-4: Gain Area keys

Key	Description
TGC Sliders	There are six sliding keys, which compensate for depth-related attenuation in an image. The bottom slider corresponds to the current largest depth. Slide to the right, the image will brighten, and slide to the left, the image will darken.
Multi-function knob	• Controls the total gain of the active mode. Clockwise rotation, the image will brighten. Counterclockwise rotation, the image will darken. • Rotates the direction of an arrow or a probe mark.
Mode	The inside button labeled MODE switches the imaging mode.

Freeze and Print Area

Table 6-5: Freeze and Print keys

Key	Description
iScan	• Optimizes the **Baseline** and **Scale** settings for the current image in PW/CW Mode. • Optimizes the Gain settings in 2D Mode.

Table 6-5: Freeze and Print keys

Key	Description
Print	This key is used to print the current imaging screen content to a selected printer.
Freeze	Stops or restarts the data acquisition.
	For future use.

PC Keyboard Area

- Keyboard Keys

  The functions of these keys are the same as those on the computer keyboard.

- Function Key

Table 6-6: Alphabetical Function keys
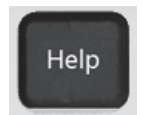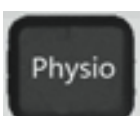
Key	Description
Help	Displays the on-line version of the user manual.
Config-Diag	Displays the Preset dialogue box, users are allowed to configure the various settings on the scanner.
Report	Displays the examination report.

Table 6-6: Alphabetical Function keys

Key	Description
Protocol	For future use
Biopsy	Gets into the biopsy function.
Body Mark	Displays the available body mark for the current examination.
Page Erase	Erases all texts, body marks and measured results on the current screen.
Physio	Provides access to controls for ECG trace. The ECG controls appear on the Main menu.
Arrow	Displays an arrow that can be used to point at a specific location in the image.
Text	Displays the available texts for the current examination. The text can be typed and selected from the text library.

Imaging and Measure Area

• Mode Selection Keys

Table 6-7: Mode Selection keys

Key	Description
2D	Displays the 2D live acquisition mode that is the default mode for the unit.
M	Displays the M-Mode examination screen and enables the M-Mode functions. Used for viewing motion patterns.
CFM	Display the examination screen in Color Doppler mode. Used to display color-coded flow information.
PW	Displays the examination screen in Pulsed Wave Doppler mode. Used for displaying the Doppler spectrum of blood flow at a selected part of the image.
CW	Displays the examination screen in Continuous Wave Doppler mode. Allows examination of blood flow data all along the Doppler CW cursor.
Cursor	Toggles the cursor display On/Off in 2D scanning mode.
1/2/4	Enables multiple image display windows, which two or four images can be displayed simultaneously.

Table 6-7: Mode Selection keys

Key	Description
Alt	Displays more Main menu controls.

●   Trackball and its surrounding keys

Table 6-8: Trackball and its surrounding keys

Key	Description
Trackball	Used for navigation and together with the surrounding keys, to move, select or activate objects on the screen.
Trackball	This key toggles between trackball and on screen cursor.
Set	This key activates all commands, synonymous with an ENTER key.
Update/Menu	In live mode, toggles between 2D imaging and live time-motion imaging (Doppler mode). In freeze mode, activates menu with additional options and controls not available from the assignable keys.
Zoom	Activates the Zoom mode. Controls the image magnification. Use the Trackball and Set key to toggle, pan or change zoom factor.

Table 6-8: Trackball and its surrounding keys

Key	Description
Store	Stores the current imaging window to disk. Stored images are displayed in the thumbnail area.

Table 6-9: Basic Operations List of Trackball

Operation item	Description
Click	Move the cursor by scrolling the trackball to a target, and then successively press and release **Set** once quickly.
Double Click	Move the cursor by scrolling the trackball to a target, and then successively press and release **Set** twice quickly.
Drag	Move the cursor by scrolling the trackball to a target, press and hold **Set**, and then scroll the trackball to drag the target to the specified location.

• Measure Key

Table 6-10: Measure key

Key	Description
Measure	Activates the measurement function, and displays all related measurements to the current mode and examination.
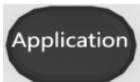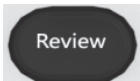
• Depth Key

Table 6-11: Depth key

Key	Description
Depth	Controls the displayed depth adjustment. Has no effect in freeze mode. The upper key increments, and the bottom key decrements.

Patient Management Area

Table 6-12: Patient Management Area keys

Key	Description
Patient	Displays the patient management window, user can create a new patient, search for the patient, view the examination list of the patient, edit the patient information, browse the image list and so on.
Application	Displays the Probe and Application window that enable users to select the aimed probe and application for the current examination.
Review	Displays the Review Screen window that enable users to select the images for analysis.
Worksheet	Displays the Worksheet window that enable users to view or edit measurements.

6.3   *Main User Interface*

Figure 6-4: Main User Interface

1	Logo	2	Patient ID
3	Patient Name	4	Hospital Name
5	Examination date & time	6	Probe Name
7	Application	8	MI Index
9	TIS/TIB/TIC Index	10	System date & time
11	Probe orientation	12	Gray scale /color bar
13	Parameter window-all modes	14	Focus marker
15	Depth scale	16	Clipboard
17	Loop icon	18	Clipboard image number
19	Main menu	20	Status bar
21	Soft menu		

The Main User Interface is divided into seven areas as follow:

Top Area

From the left:

1   Logo: displays the Whale company logo.

2   Patient information: displays the patient ID and name.

3   Hospital name: displays the institution or hospital name which configured in Preset window.

4   Examination date & time: displays the current examination date and time.

5   Probe and application: displays the currently selected probe and application or the probe and application that were used for retrieved images.

6   MI and TIS/TIC/TIB indexes: displays the values of MI and TIS/TIC/TIB indexes for the active image.

7   System date & time: displays the current date and time of the system.

Imaging Area

Displays the ultrasound image with relevant indicators such as depth, focus, probe orientation marker, sample cursor, ECG trace …etc.

Clipboard Area

This area displays the thumbnail images representing the acquired data during the current examination.

Status Bar

The status bar consists of five information fields as follows:

1   Connectivity status icon: displays the network status (Connected or disconnected).

2   Power & Battery icon: displays the amount of battery in charge, and if AC power adapter is connected.

3   Message field: displays the system message.

4   Trackball assignment field: displays the current assignment of the trackball.

5   Input method: display the current input method.

Main Menu

Displays the mode-specific controls corresponding to the four-way and two-way menu keys on the control panel

Parameter Window

This window displays mode-specific parameters for the current imaging mode.

Soft Menu

Displays the mode-specific controls corresponding to the four-way menu keys on the control panel.

6.4   *Cart*

The cart provides several features that facilitates clinical use, including console docking, better mobility, printing ability, more ports, more probes, etc.

6.4.1 Specifications
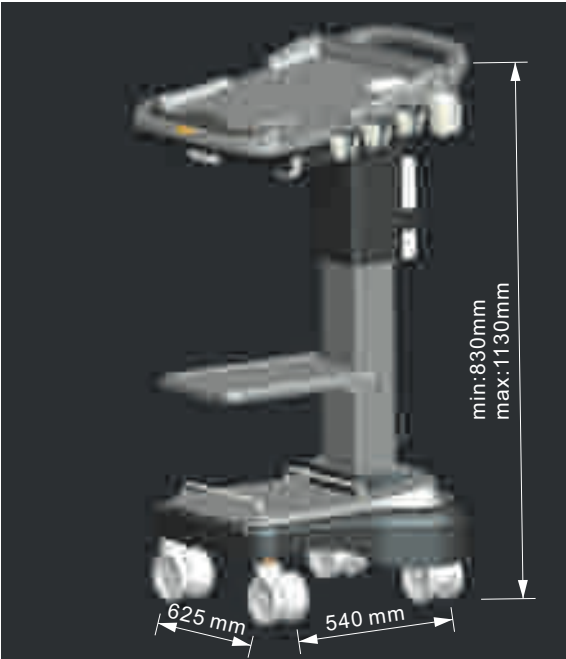
Figure 6-5: The Size of the Standard Cart
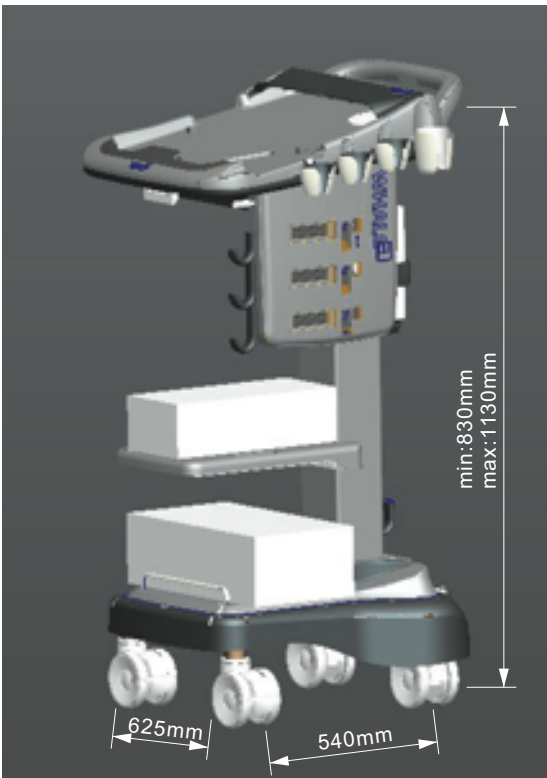
Figure 6-6: The Size of the Premium Cart

Table 6-13: Specifications of the Carts

Name	Model	Material	Weight
Standard Cart	PC10	Plastic	45Kg
Premium Cart	PC20	Plastic	55Kg

Note: *Premium Cart is equipped with MUX (Probe Connector) and removable CD-ROM, while Standard Cart not.*

6.4.2   *The Cart's Ports*
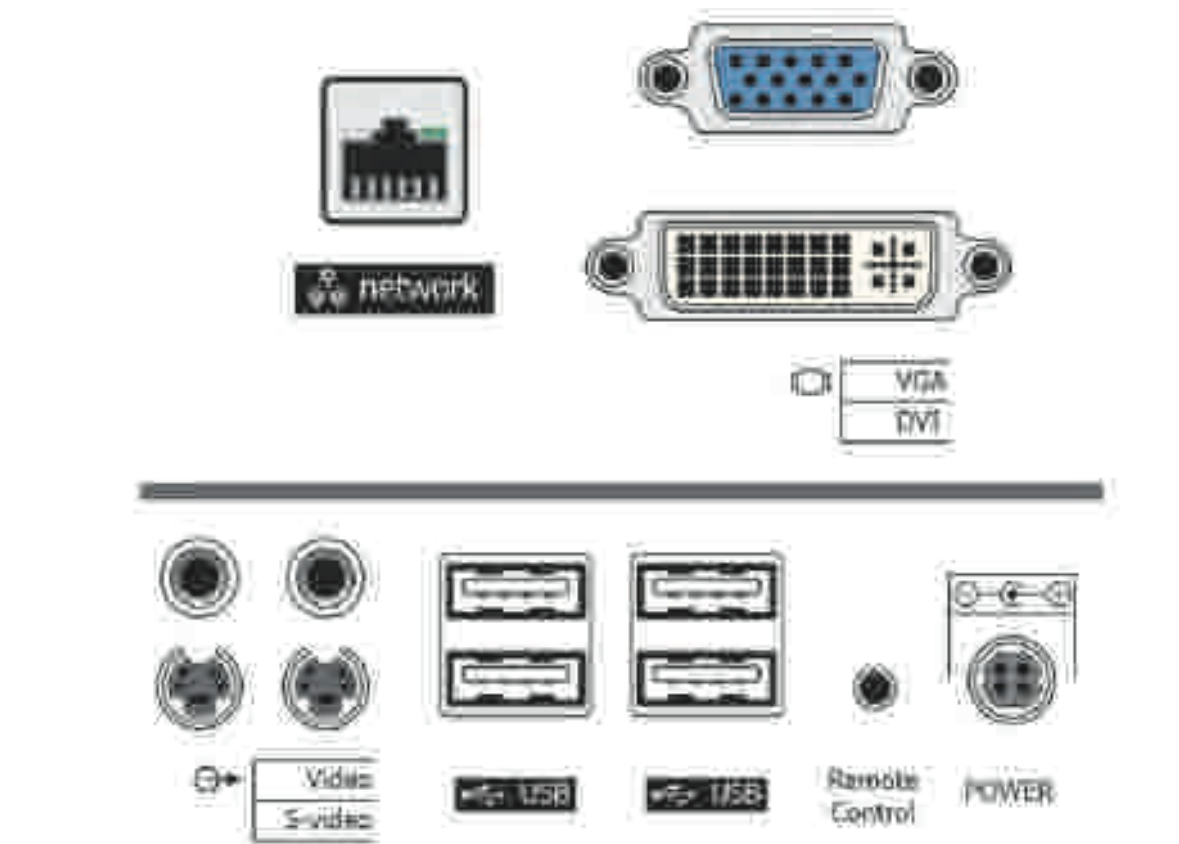
Figure 6-7: The Premium Cart's Ports

Note: *The Standard Cart doesn't have any ports.*

6.4.3   Locking wheels

The cart has four swivel wheels. Two frontal locking wheels have Wheel LOCKs, which can be pressed down to lock the wheels.
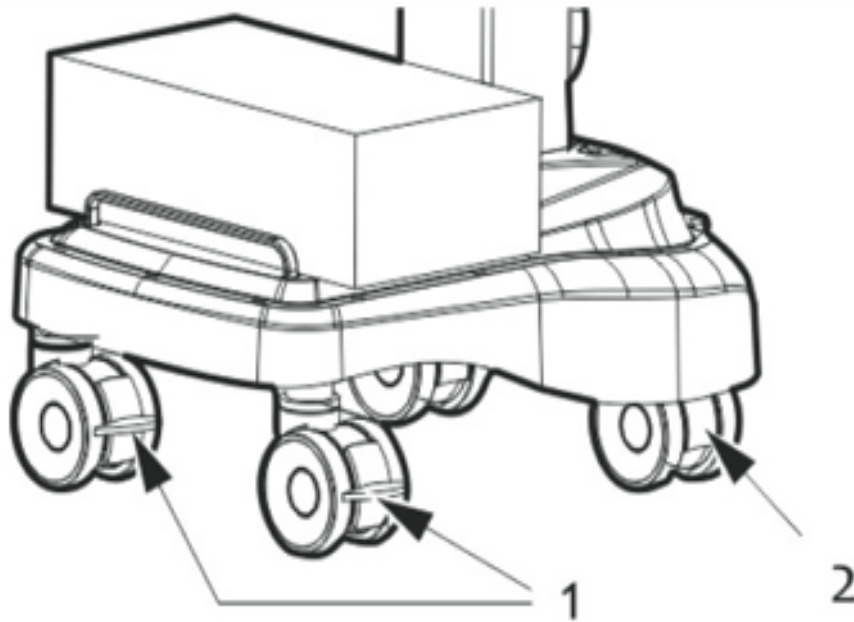
Figure 6-8: Locking the Wheels

1   Wheel LOCK   2   Swivel wheel

6.4.4   Cart Height Adjustment

The cart can be vertically adjusted by 200 mm(7.87 inch).

To increase the height of the cart, pull and hold the height adjustment handle outward (1), the cart will easily rise if no pressure is applied.

 To lower the cart, apply proper amount of pressure to the cart while pulling and holding the height adjustment handle.
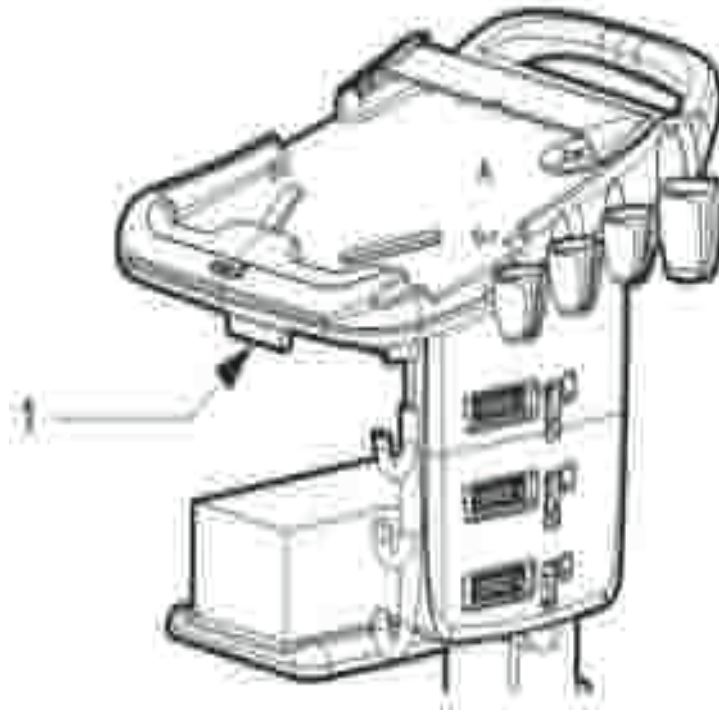
Figure 6-9: Adjust the Cart Height

1   Cart height adjustment handle

6.4.5   Portable Combination Lock
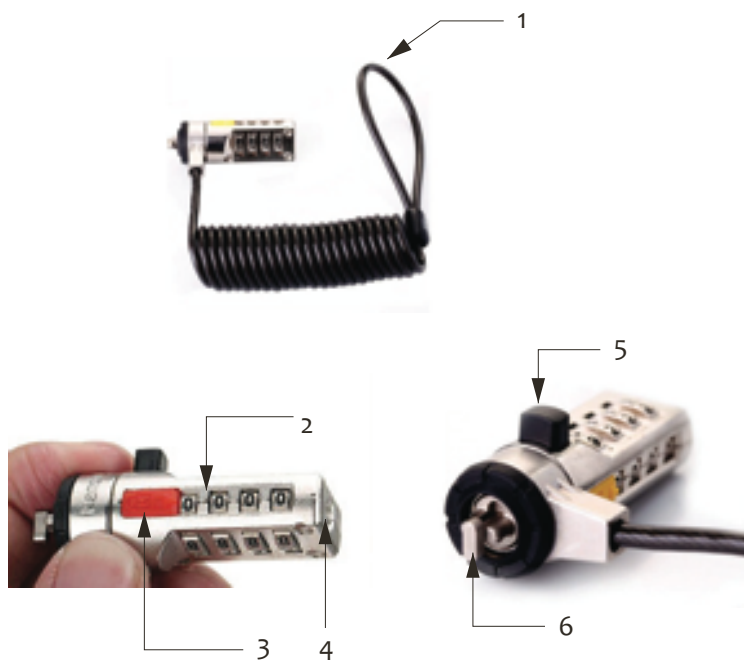
Figure 6-10: The Portable Combination Lock

1	*Coiling cable*	*2*	*Combination number*
3	*Combination number location*	*4*	*Screwhead*
5	*Push button*	*4*	*T-bar*

To install the combination lock:

STEP 1 Take out of the combination lock connected with the cart via the coiling cable (1 in *Figure 6-10*).

Figure 6-11: The combination cable lock

STEP 2 Rotate the combination number (2 in *Figure 6-10*) to the number previously set for the lock, for example, the initial combination 0000.

STEP 3 Press and hold the push button (5 in *Figure 6-10*).

The T-bar (6 in *Figure 6-10*) is automatically rotated 90°. If the combination number set in step *2* is wrong, the push button cannot be pressed and the T-bar will not be automatically rotated. When you release the push button, the T-bar will be automatically turned back to its original position.

STEP 4 Keep the push button pressed, and then align and insert the T-bar to the security slot (1 in *Figure 6-12*) of the Portable Ultrasound Diagnostic Scanner.
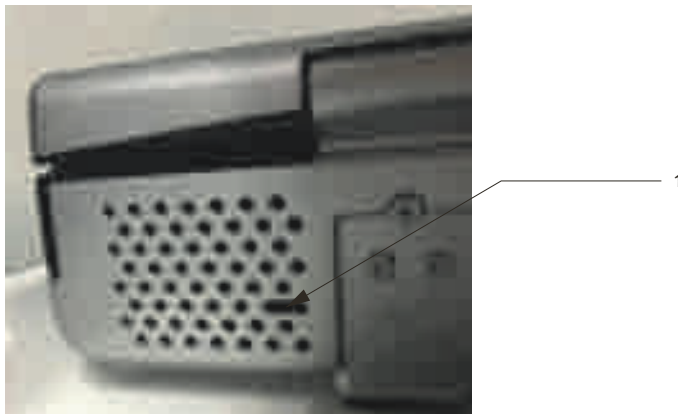
Figure 6-12: Back of the equipment

1   Security slot

STEP 5 Release the push button.

The unit will be locked to the cart by the combination lock.

STEP 6 Set the combination to a random number.

> ⚠️ **CAUTION**
>
> *For maximum security, be sure to set the combination to a random number after securing the lock to your equipment.*

1

2

3

4
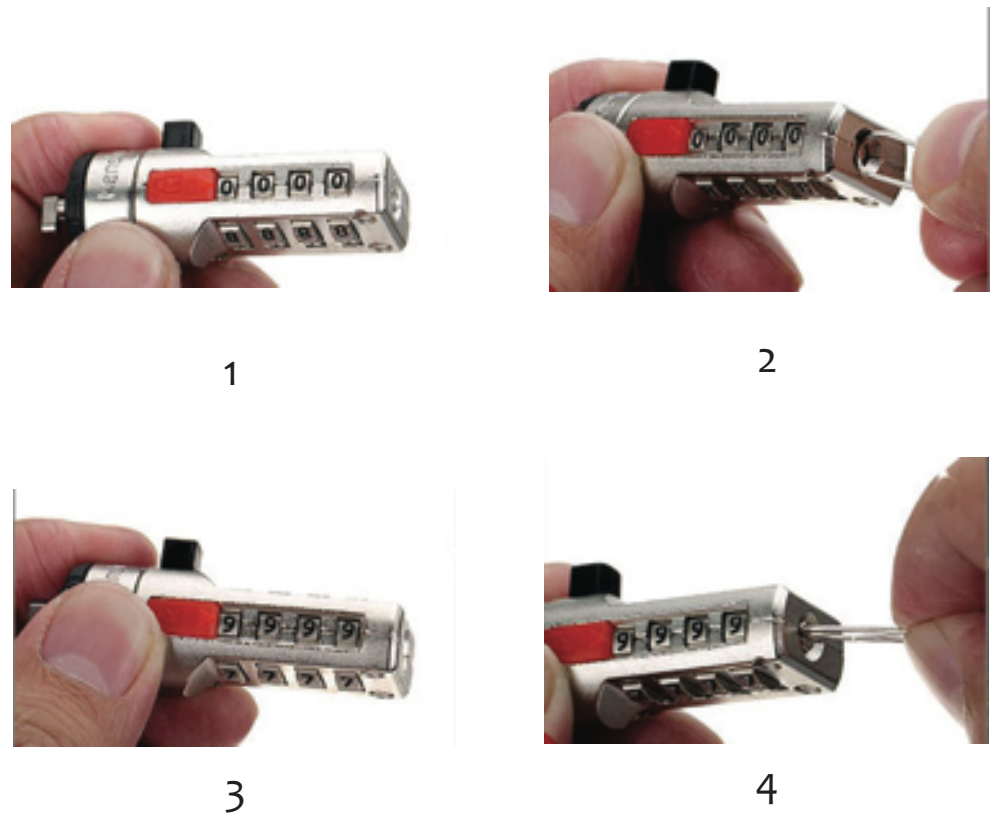
Figure 6-13: Reset the combination

To reset a combination:

STEP 1 Set the combination number to previous number, for example, the initial combination 0000.

STEP 2 Align the screwhead (4 in *Figure 6-10*) with a paper clip, and then use the paper clip as a screwdriver to rotate the screwhead 90° clockwise.

STEP 3 Set the combination number to a new number, for example,1234.

STEP 4 Rotate counter-clockwise the screwhead 90° to the initial position.

Note: *Please safeguard your personal combination code. If you lose your combination code, Beijing East Whale Imaging Technology Co., Ltd. will not be able to retrieve it for you.*

To unlock the combination lock

STEP 1 Set the combination number to previous number.

STEP 2 Press and hold the push button, and then pull the combination lock out from the equipment.

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CHAPTER 7

SYSTEM OPERATION

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7.1 Introduction

This chapter describes all operations related to the Portable Ultrasound Diagnostic Scanner.

To begin an examination with a Portable Ultrasound Diagnostic Scanner consists of three steps:

STEP 1 Create a new patient record or start a new examination from an existing patient record.

STEP 2 Select **Probe and Application**.

STEP 3 Start scanning.

According to the steps of an examination, this chapter will be divided into several sections to introduce all the possible operations which can be performed in an examination.

7.2 Patient Management

This section contains the following contents:

● Patient Information

● Review

● Report

7.2.1   Patient Information

Create a new patient record

STEP 1   Press **Patient** key on the control panel, the **Patient Main** window is displayed:
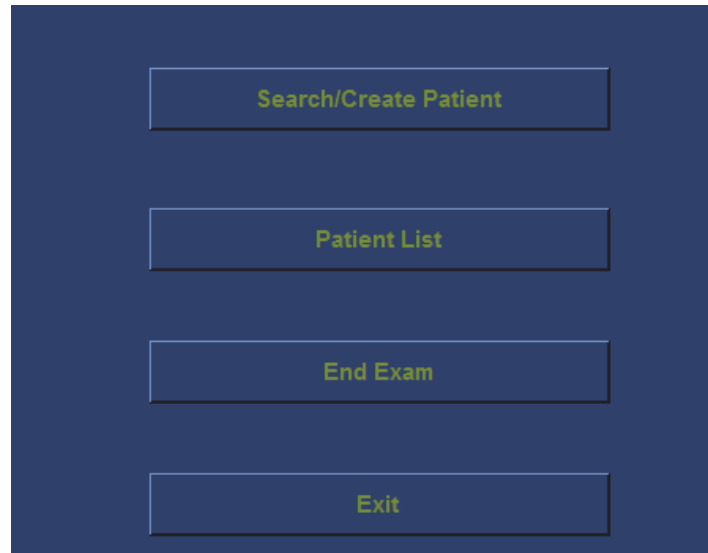
Figure 7-1: Patient Handling Screen

STEP 2 Click **Search/Create Patient** button, the **Search/Create Patient** window is displayed:
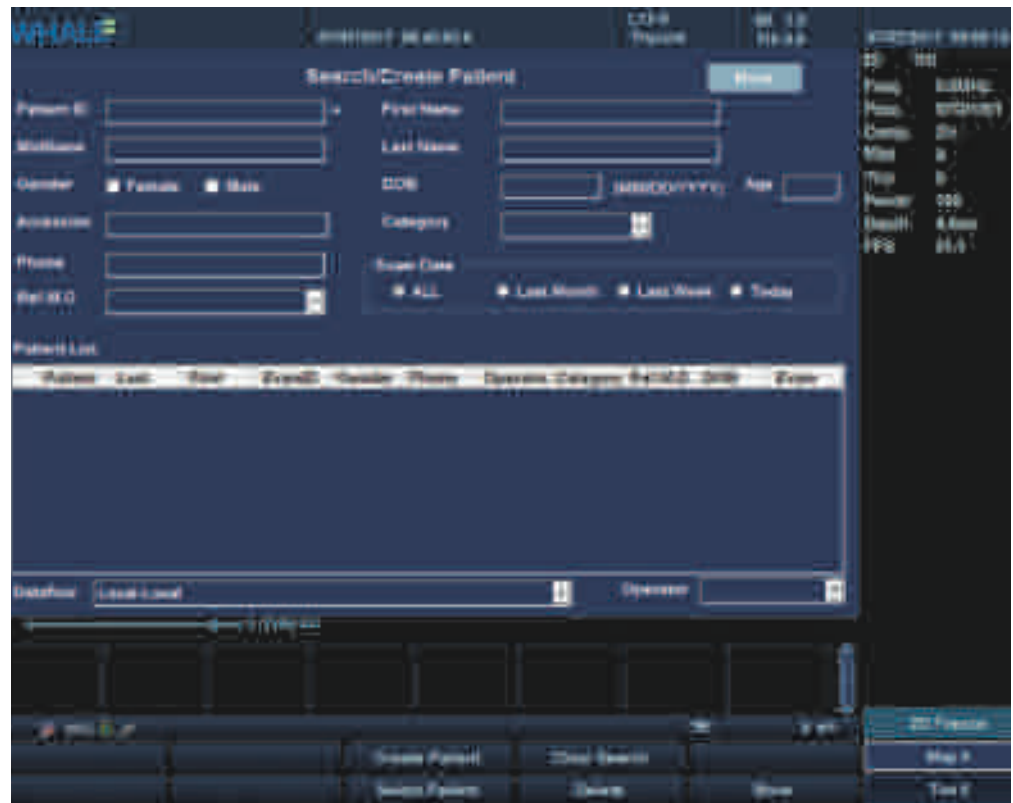
Figure 7-2: The Search/Create Patient window

STEP 3 Enter the Patient ID and other information. Patients in the database with matching information will be displayed in the Patient List field.

STEP 4 If the inputted information is not in the patient record list, select **Create Patient** on the main menu, the new patient and a new exam are created. The unit is now ready for scanning.

Start examination from existing patient record

STEP 1 Navigate to Search/Create Patient window and enter the patient's information until the desired patient information appears in the Patient List field.

STEP 2 Search and/or trackball to the desired patient information and double-click the **Set** key on the control panel (or press **Set** key once and then select the **Select Patient** in the main menu, or press [+] in front of the patient record and double-click the desired examination), the **Examination List** window is displayed (Refer to the Following figure), the recent examination or the desired examination is highlighted. The user can edit the text in the **Examination List** window.

STEP 3 This list displays the previous examinations and diagnosis information for the selected patient. In the main menu, select **Add Exam** to

create a new examination, and then select **Begin Exam** to start the new examination.
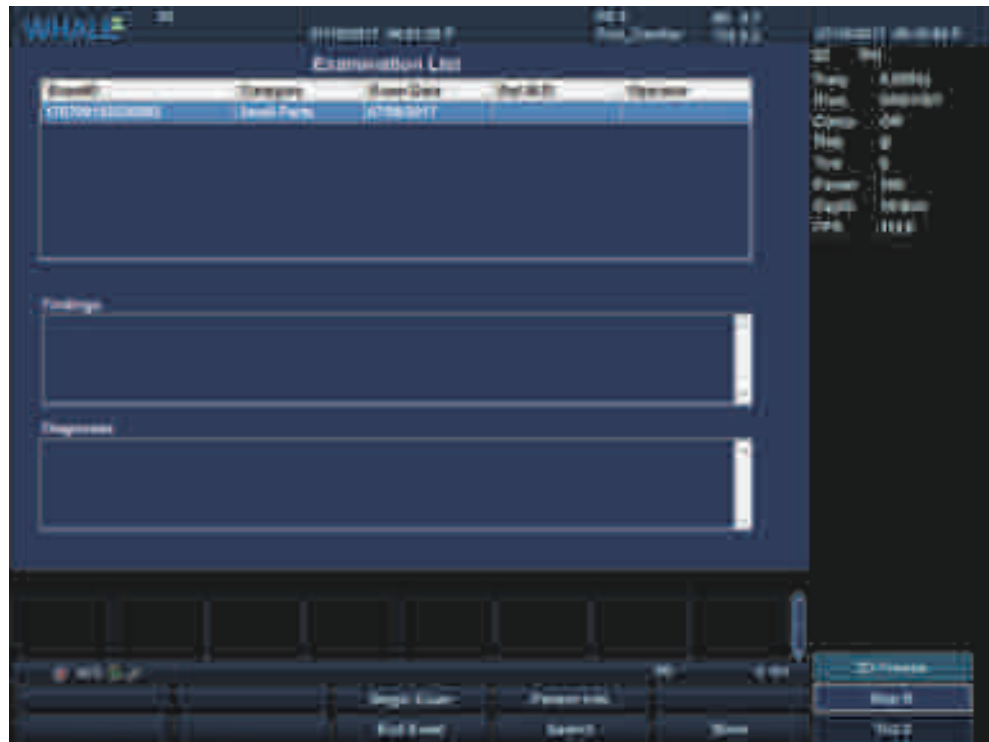
Figure 7-3: Examination List Window

In the scanning screen, the patient information is displayed on the left side of the Top Area.

Delete a patient/examination

- To delete a patient record:

  STEP 1   Enter the **Search/Create Patient** window.

  STEP 2   Trackball to the actual patient record, press **Set** key on the control panel to highlight the patient record to delete.

  STEP 3   In the main menu, select **More**, and then select **Delete**. Press [+] in front of the actual patient record and select the desired examination to delete, if this examination is the last one for the patient record, then this patient record is also deleted.

- To delete an examination:

  STEP 1   Enter the **Examination List** window.

  STEP 2   Trackball to the examination to delete, and press **Set** key on the control panel.

  STEP 3   Select **More** in the main menu, select **Del Exam** to delete the examination.

STEP 4 A warning message prompts user to confirm the action.

Edit Patient information

There are two methods get into the **Patient Information** window:

Alternative 1:

STEP 1 Press **Patient** key on the control panel, the **Patient Main** window is different compared to Figure 7-1 when an examination has already started.
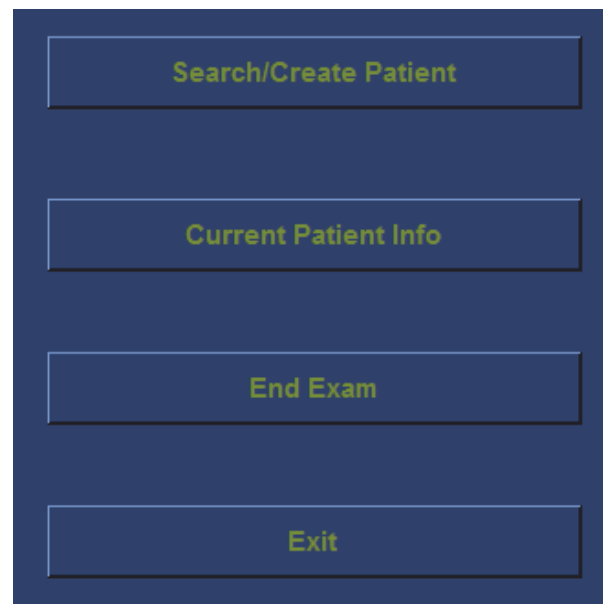
Figure 7-4: Patient Handing Screen

STEP 2 Click **Current Patient Info** button, the **Patient Information** window is displayed (See *"Patient Information Window" (s 7-5, p 100)*). User can edit patient information in this window.

Figure 7-5: Patient Information Window

Alternative 2:

STEP 1 Enter the **Examination List** window.

STEP 2 In the main menu, select **Patient Info** to display the Patient Information window.

Browse Images

Images and cine loops stored during a current examination are displayed as thumbnails on the clipboard. When an image is stored, all the displayed information is saved with it (i.e. probe and application selected, image setting…). A cine loop is a sequence of images recorded over a certain time frame. The time frame can be adjusted to cover one or more heart cycles. Cine loops can be stored at any time during the scanning session (see *"Cine Loop" (s 7.5, p 168)*).

To Browse Images and cine loops:

STEP 1 Enter the **Examination List** window/**Patient Information** window.

STEP 2 In the main menu, select **Image List** to enter the Image Browser screen.

Figure 7-6: Image Browser Screen

STEP 3 The images and cine loops of the selected patient are grouped according to the examinations.

STEP 4 Double click the image thumbnail to analyze.

End Exam

There are three ways to end an examination:

● Press **Patient** key on the control panel to show the **Patient Main** window, then click **End Exam** button. If there are unsaved images or measured data of a patient, a dialog box will pop-up (See *"Message Dialogue Box" (s 7-7, p 101)*).
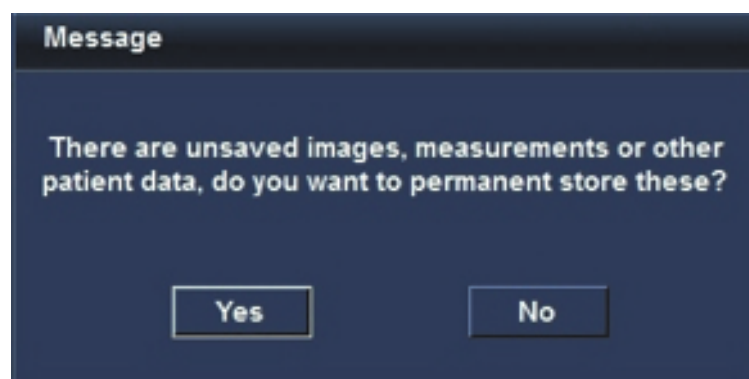
Figure 7-7: Message Dialogue Box

If the **Yes** button were selected, the **Search/Create Patient** window is displayed. Users can create a new patient or select an exist patient to save these information.

● Enter the **Patient Information** window, and select **End Exam** in the main menu to end the exam.

● Enter the **Examination List** window, and select **End Exam** in the main menu to end the exam.

Batch deletion of local patient data

STEP 1   Enter the **Search/Create Patient** window.

STEP 2   Select **More** on the Main Menu, then select the **Manage Local Data** to display the Manage Local Data window. The **Delete** radio button is default selected by default.
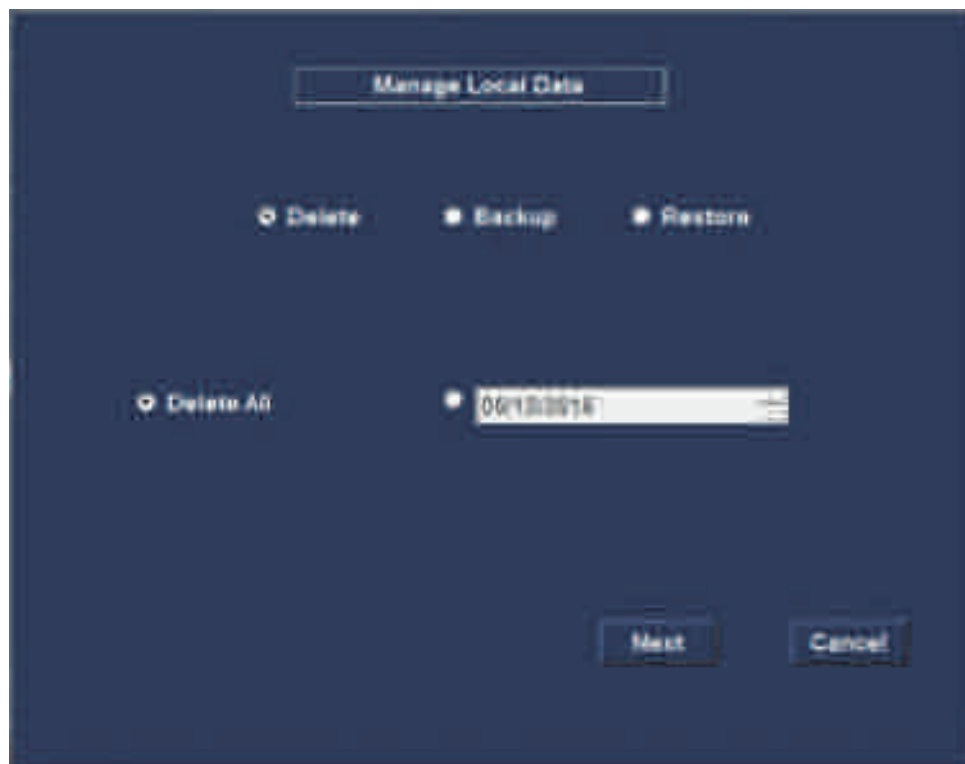
Figure 7-8:   Manage Local Data window

There are two methods to delete:

Delete All: delete all local patient data.

Delete by Date: delete local patient data before the selected date.

STEP 3 Select a method and click **Next** button. A message "Are you sure you want to delete?" will be displayed.
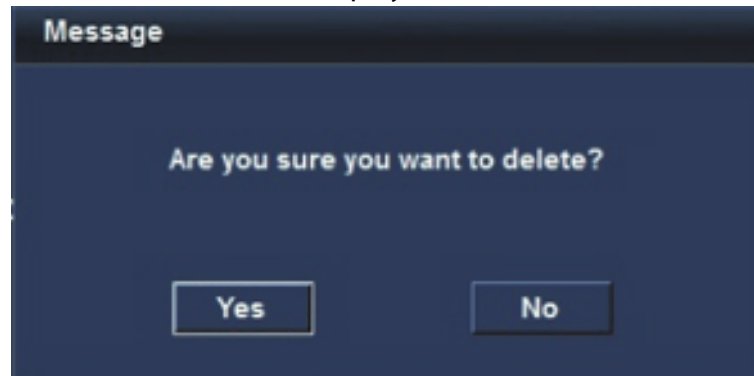
STEP 4 Click **Yes** button. "Deleting" will be displayed.

STEP 5 After a brief delay, "Delete complete" will be displayed, click **Yes** button to close.

Backup all local patient data to a removable disk

STEP 1 Insert a removable disk into the unit. If the removable disk already contains a patient data backup file, please delete it first.

STEP 2 Enter the **Search/Create Patient** window.

STEP 3 Select **More** on the Main Menu, select the **Manage Local Data** to display the **Manage Local Data** window.

STEP 4 Select the **Backup** radio button, **Destination Device** text box will display the file path to the removable disk.
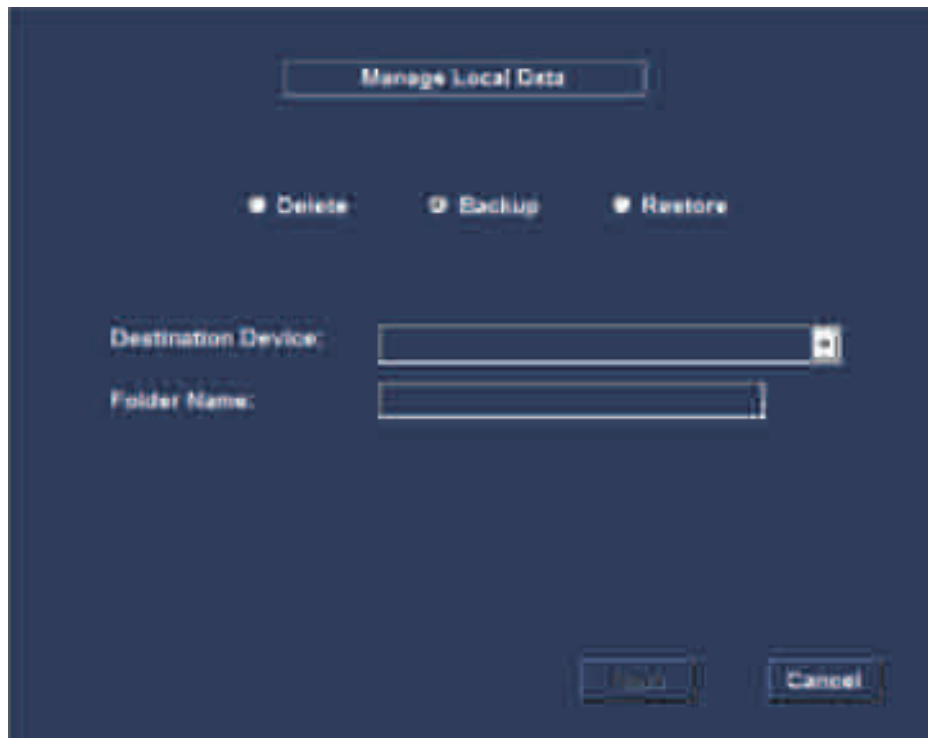
Figure 7-9:   Backup

STEP 5 Click **Next** button, "Are you sure you want to back up" will be displayed.
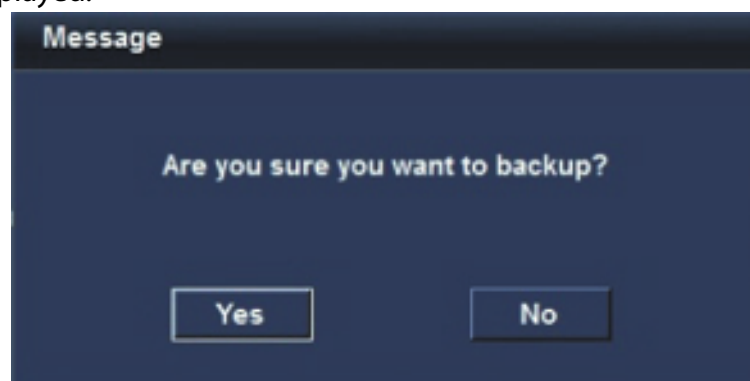
STEP 6 Click **Yes** button. "Backing up" will be displayed.

STEP 7 After a brief delay, "Backup complete" will be displayed, click **Yes** button to close.

Restore patient data from a removable disk

STEP 1 Insert the removable disk that contains a local patient data backup into the unit.

STEP 2 Enter the **Search/Create Patient** window.

STEP 3 Select **More** on the Main Menu, select the **Manage Local Data** to display the **Manage Local Data** window.

STEP 4 Select **Restore** radio button, the **Source Device** text box will display the file path to the removable disk.

STEP 5 Click **Next** button, the message "Restore will delete all local data, please make sure that the local data have a backup, are you sure to restore?" will be displayed.
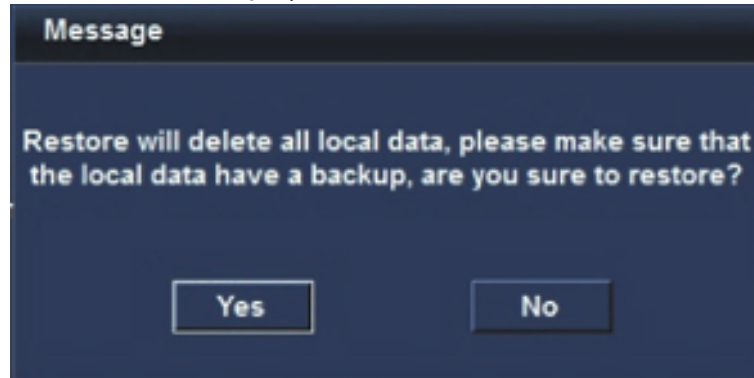
STEP 6 Click **Yes** button. "Restoring" will be displayed.

STEP 7 After a brief delay, a message "Restore complete" will be displayed, click **Yes** button.

7.2.2   *Review*

Review the images from a selected examination or a default examination.

Press **Review** key on the control panel, the stored images of the selected examination or default examination are displayed in the **Review** Screen.

Figure 7-10: Review Screen

1   Page number.
2   Selected image (blue border).
3   Export the imagas and cines to a removable disk.
4   Import the images and cines from a removable disk.
5   Save As the images and cines to a removable disk.
6   Selection tools.

To analyze

STEP 1   Press **Set** key from the control panel on the images.

STEP 2   Select **Analyze** in the main menu or double click the selected image. (If more than one image selected, only the first selected image is analyzed.)

To delete images

STEP 1   Use the trackball and **Set** key to select one or more images on the **Review** screen.

STEP 2   In the main menu, select **Delete**, and warning message will prompt the user to confirm their action. If select **Yes** button, the selected images will be deleted.

Import the images/cines from a removable disk

STEP 1   Insert a removable disk into the USB port of the unit.

STEP 2   Click **Import** button, the **Import** window is displayed.
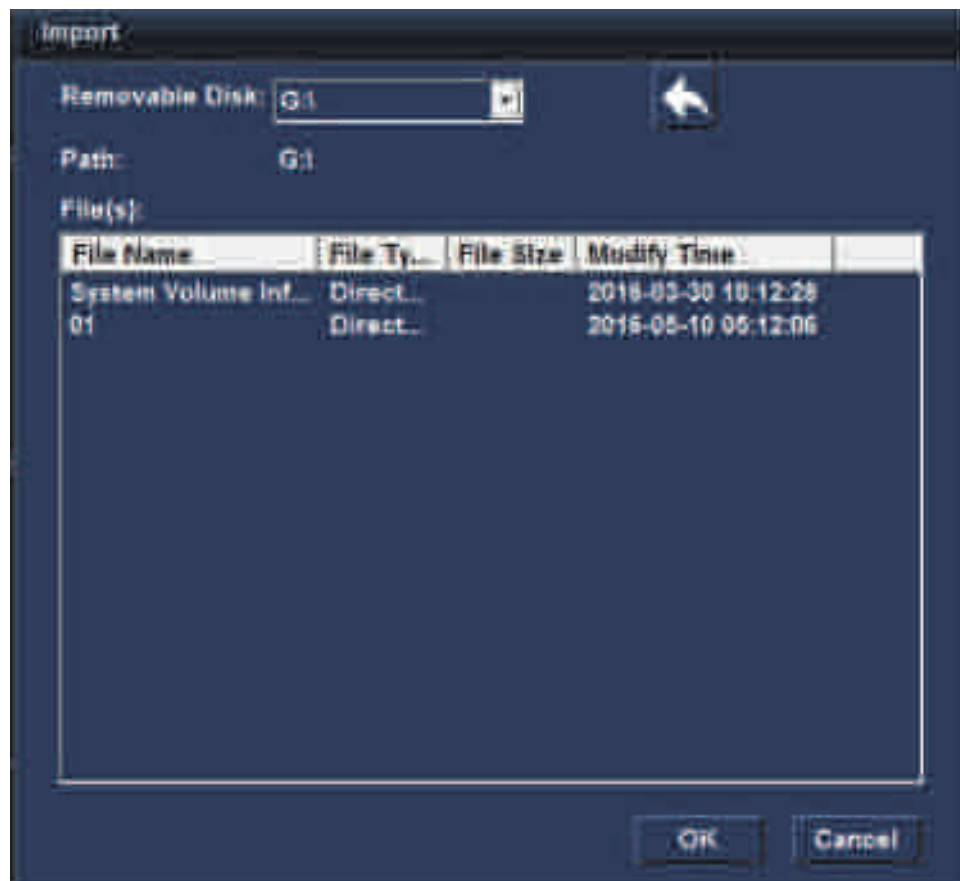
Figure 7-11:   Import window

STEP 3   Choose folder which you want to load. The folder must contain two directories: AVI and Images.
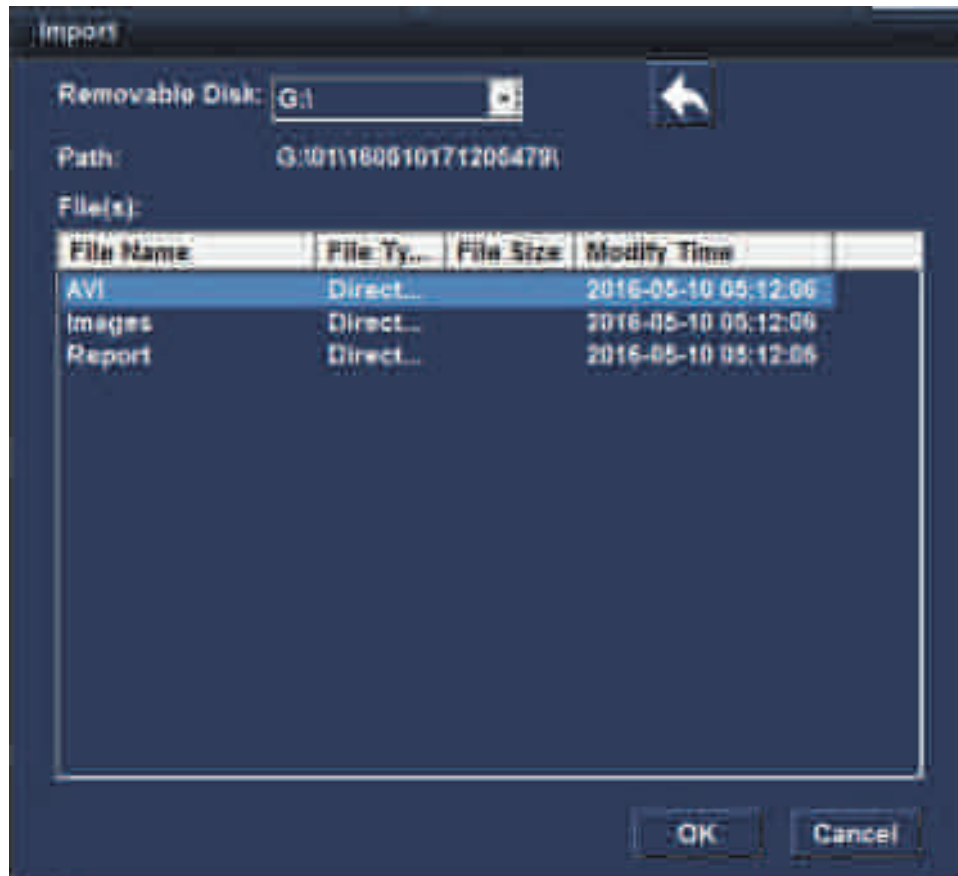
Figure 7-12:   Two Sub-level Folders

STEP 4   Select the **AVI** or **Images** folder and click **OK** button, then a **Loading** message is displayed.

STEP 5   After a few seconds, a **Complete** message will display, and the images and cines will be displayed at the **Review** screen. Click **Yes** button to close.

Export the images/cines to a removable disk

STEP 1   Insert a removable disk (such as USB disk) into the USB port of the unit.

STEP 2 Click **Export** button, the **Export** window is displayed.
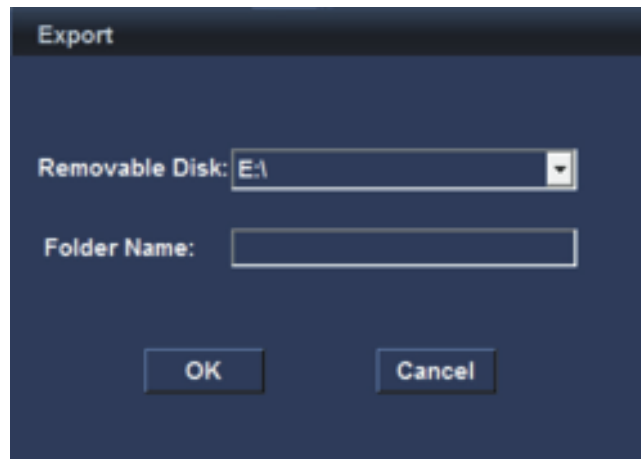
Figure 7-13:   Export window

STEP 3 Choose the **Removable Disk** path which you want to export and input a file name. Click **OK** button, then a message box pops up to display the exporting status.

STEP 4 Wait a few seconds, the **Saved successfully** message will display. Click **Yes** button to close.

Save As the images/cine to a removable disk

There are two methods to export the images/cines to a removable disk, the detail description as below:

Alternative 1:

STEP 1 Insert a removable disk into the USB port of the unit.

STEP 2 Press **Review** key on the control panel to display the **Review** screen.

STEP 3 Use the trackball and **Set** key to select one or more images on the **Review** screen.

STEP 4 Click **Save As** button, the **Save As** window is displayed.
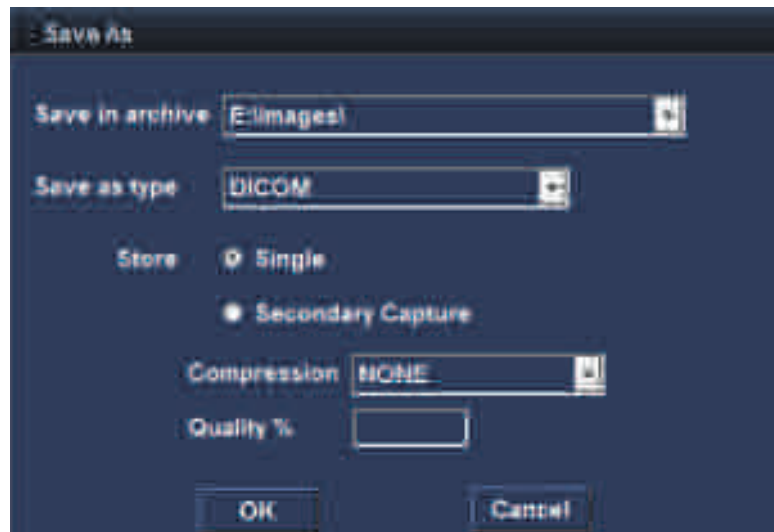
Figure 7-14: Save As Window

STEP 5 Modify the **Save as type**, there are three types: DICOM, AVI, JPG, MP4, BMP. If you select DICOM, you can also modify **Store** settings.

STEP 6 Click **OK** button, a message box pops up to display the export status. After some time, the **Save Successfully** message is displayed. Click **Yes** button to close the message box.

Alternative 2:

STEP 1 Insert a removable disk into the USB port of the unit.

STEP 2 Use the trackball and **Set** key to select a image/cine on the clipboard.

STEP 3 Press **Trackball** key to active the cursor. Press **Update/Menu** key to display the **System Menu** window.

STEP 4 Select **Save As** on the **System Menu** window. The **Save As** window is displayed.

STEP 5 Modify the **Save as type**, there are three types: DICOM, AVI, IMAGE. If you select DICOM, you can also modify **Store** settings.

STEP 6 Click **OK** button, a message box pops up to display the export status. After some time, the **Save Successfully** message is displayed. Click **Yes** button to close the message box.

7.2.3   Report

The Portable Ultrasound Diagnostic Scanner enables the creation of patient and examination reports containing patient information, images, measurements and analysis that were made during the examination. The layout of the report is defined by generic templates delivered with the system. Saved reports are read-only. Therefore it is recommended that the data be carefully

reviewed before the report is saved. Use the **Worksheet** window to adjust the measured data, use the **Examination List** window to edit comments and diagnosis, use **Patient Information** window to edit patient information. The final report can be printed on a regular laser printer.

Create a report

- To create a report

  Press **Report** key on the control panel, the default template for the current examination is displayed (Refer to the following figure). The information entered during the examination is automatically filled out (e.g. Diagnosis, Comments etc).
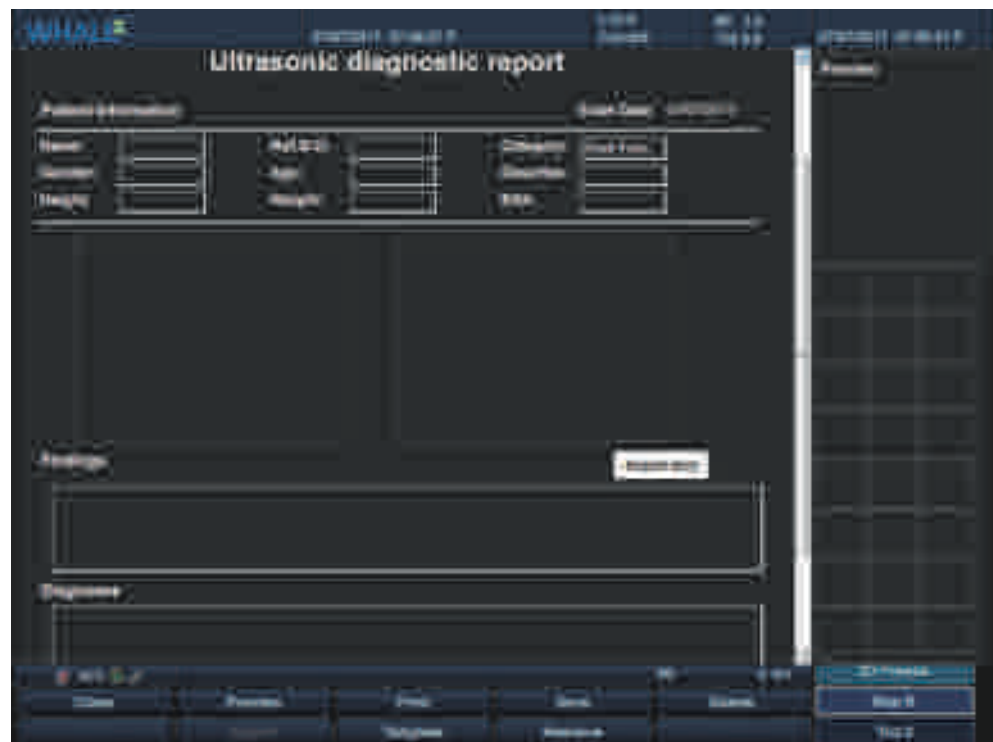
Figure 7-15: Report Screen

- To choose another report template

STEP 1   In **Report** screen, select **Template** in the **Main** menu. The **Template selection** menu is displayed showing the available report templates:
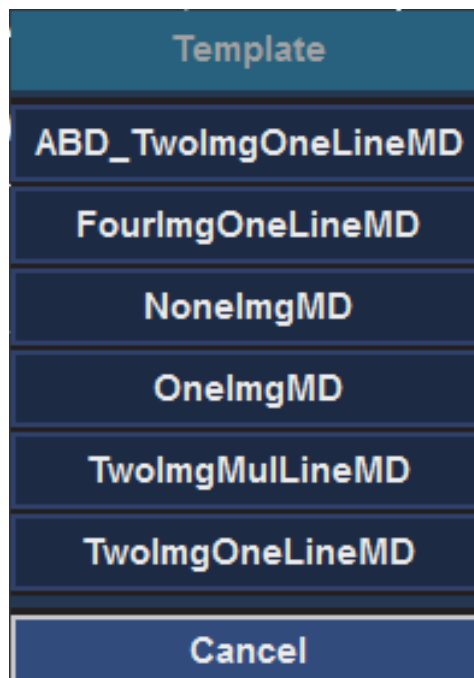
Figure 7-16: Template Selection Menu

STEP 2   Select a template from the template list (Select Cancel to return to the current template). Then the selected template is displayed on the screen.

* To edit patient information

STEP 1   Trackball to heading of the information to edit. The trackball marker is changed to a hand with pointing finger.

STEP 2   Press **Set** key on the control panel. The original location of the data is displayed.

STEP 3   Press **Report** key on the control panel when completed.

* To add an image to the report

STEP 1   Trackball to the image of interest in the image clipboard.

STEP 2   Press and hold down the **Set** key on the control panel, and using the trackball, drag the selected image to the **Images** area in the report. (If the **Images** area is empty, double click the image in the image clipboard, add the image to the empty **Images** area.)

STEP 3   To move an image between **Images** area, press and hold down the **Set** key on the control panel, and using the trackball, drag the selected image to the new location.

STEP 4 To remove an image from the report, press and hold down the **Set** key on the control panel, and using the trackball, drag the selected image out of the **Images** area.

- Add texts to the Findings and the Diagnoses text boxes

To add texts, perform either of the following operations:

Type texts

STEP 1 On the control panel, press Report.
The system will pop up the Report dialog.

STEP 2 In the Findings or the Diagnoses text boxes, type texts.

Select texts

STEP 1 On the control panel, press Report.

STEP 2 On the Report dialog, click Insert text.
The system will pop up the Insert text dialog that includes the Nodes list, the Findings list and the Diagnoses list (Users can customize pieces of information that is displayed on those lists, refer to 7.14.4 Insert text).

STEP 3 On the Node list, select the node that cannot be divided anymore.
Users can browse the text related to that node on the Findings and the Diagnoses lists.

STEP 4 Double click that node to add the text that is displayed on the Findings and Diagnoses lists to the corresponding text boxes, if necessary.

STEP 5 In the Findings or the Diagnoses text boxes, do one of the followings:

- Type, delete or modify the text.

- Click in red words, and then select other words from the dropdown list to replace earlier.

- To print a report
Select **Print** in the main menu, the report is printed on the default report printer (please refer to the section 7.13.5 for the details of the Report Printer configuration).

- To store a report

STEP 1 Select **Store** in the Main menu, the report is stored in the Report archive (Every examination can store its own reports). A confirmation window is displayed when completed.

STEP 2 Click **OK** button.

- To retrieve an archived report

  STEP 1 Select **Retrieve** in the main menu, a list of the available reports for the current examination is displayed. The default name for the report is formatted: <template type>_<store date>-<store time>. **CurEditReport** display the current report:
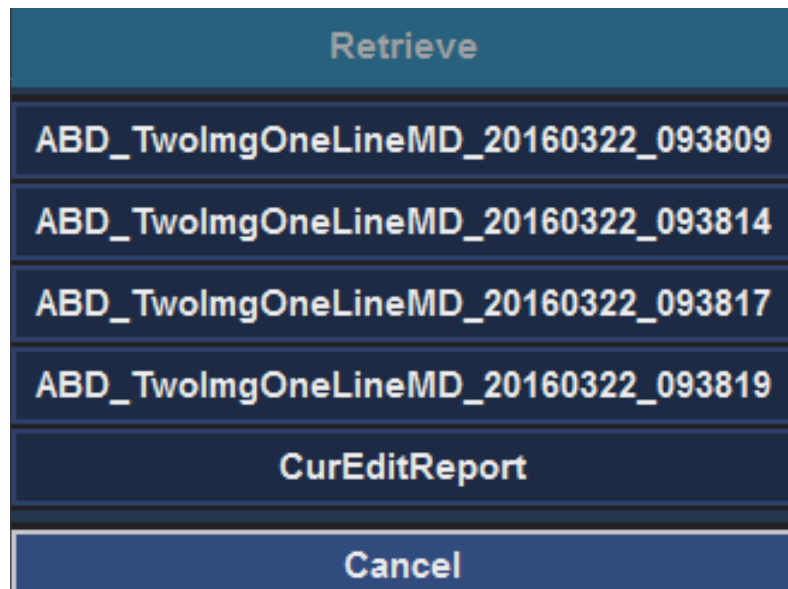
Figure 7-17: A List of the available reports

  STEP 2 Trackball to the report that need to be retrieved.

  STEP 3 Press **Set** key on the control panel.

- To delete an archived report

  STEP 1 Select **Delete** in the Main menu, a list of available reports for the current examination is displayed.

  STEP 2 Trackball to the report to be deleted.

  STEP 3 Press **Set** key on the control panel.

Export a report

To export a report, follow these steps:

STEP 1 In the USB port, insert a USB disk.

STEP 2 On the control panel, press **Report**.

STEP 3 On the Ultrasonic diagnostic report dialog, click **Export**.
The system will pop up the Export dialog.

STEP 4 On the Removable disk drop-down list, select an inserted removable disk, and then type a file name in the file name text box.

STEP 5 Click OK to save the changes and close the Export dialog.

>   ***Note:*** *The file is saved in the PDF format.*

7.3   *Probe/Application*

Probes and their related applications are selected from the Probes and applications pop-up menus as described below. Only probes currently connected are displayed in the Soft menu. Only applications appropriate for the type of probe selected are shown.

To select a probe and an application

STEP 1 Press **Application** key on the control panel. The **All Probes** window pops up. A list of the connected probes is displayed.

Figure 7-18: All Probes Window

STEP 2 Move the trackball to the desired probe.

STEP 3 Press **Set** key on the control panel. The **Applications** window for the selected probe is displayed.

STEP 4 Move the trackball to the desired application.

Figure 7-19: Applications Window

STEP 5 Press **Set** key on the control panel to launch the application.

Note: *Make sure that the probe and application names displayed on the screen correspond to the actual probe and application selection.*

To create an user-defined application

STEP 1 In the **Applications** window, trackball to the **Presets** option and press **Set** key on the control panel.

- If the current application is a custom application, the **Presets** window will be displayed directly.
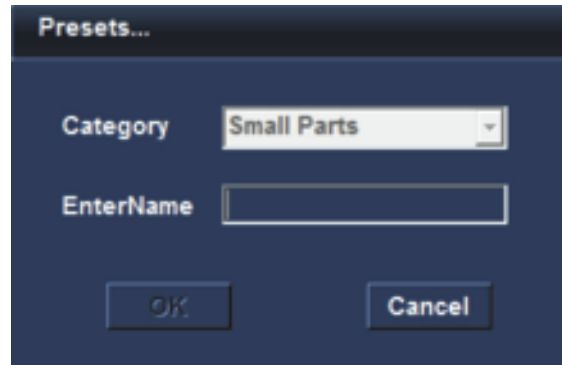
Figure 7-20: Presets window

- If the current application is an user-defined application, a message box will be displayed.
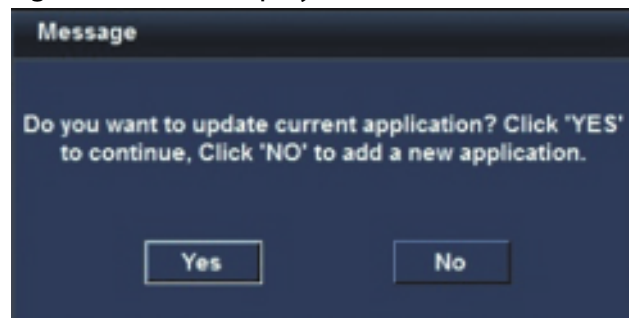
Click **Yes** button, the message box is closed and the imaging parameters of the current application will be updated.

Click **No** button, the message box is closed and the **Presets** window pops up.

STEP 2 In the **Presets** window, input a name on the **EnterName** text box.The **OK** button will be illuminated.

STEP 3 Click **OK** button, the **Presets** window is closed.

If the name has already exist in the system, a message "Name Exists" will be displayed on the Status Bar.

If the name is new, the current application will be switched to this new application automatically.

Note: *Only the current probe can be permitted to create the user-defined applications.*

To select an application from the More window

STEP 1   In the **Applications** window, trackball to the **More** option and press **Set** key on the control panel. The **More** window will be displayed.
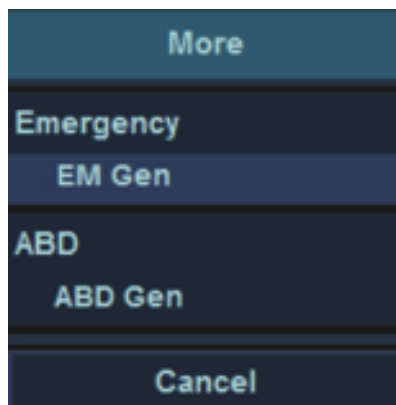
Figure 7-21: More window

STEP 2   In the **More** window, trackball to the desired application and press **Set** key on the control panel to launch it.

7.4   Imaging Mode

7.4.1   2D Mode

2D Mode Overview

The 2D mode displays a two-dimensional gray scale image of the tissue within the probe's field of view.
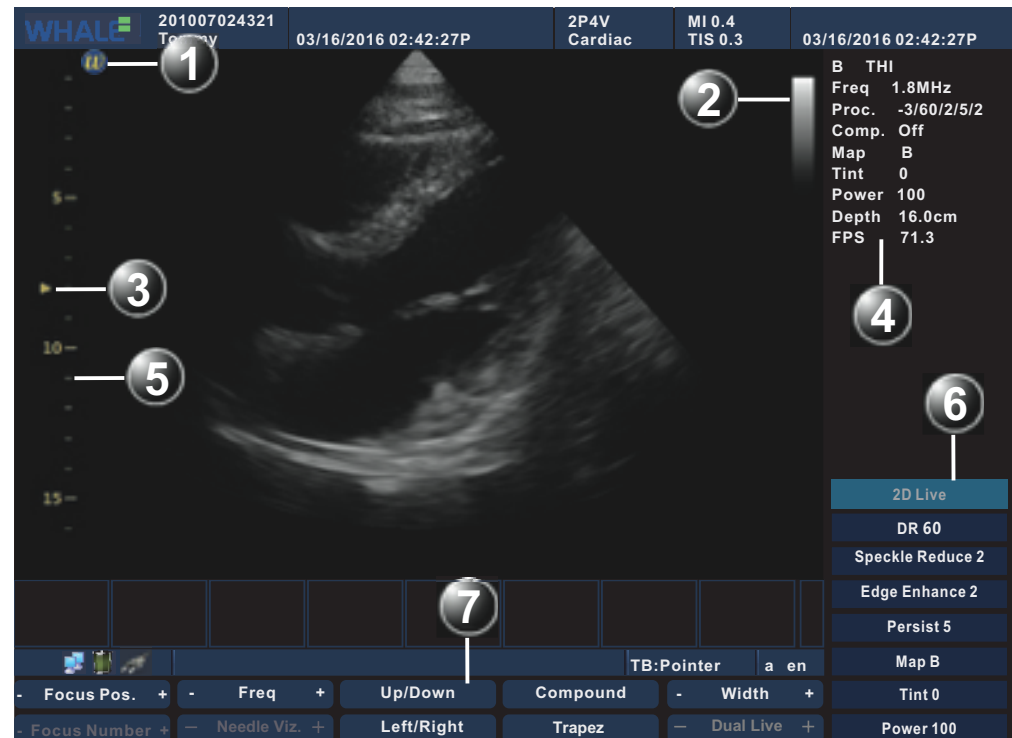
Figure 7-22: 2D Mode Screen

1	Probe orientation marker	2	GrayScale Bar
3	Focus marker	4	2D-Mode parameters windows
5	Depth scale	6	2D-Mode Soft menu
7	2D-Mode Main menu		

2D Mode Main Menu Controls

Table 7-1: 2D Mode Main Menu Controls

Parameter	Description
Focus Pos.	Use the Focus control to center the focal point(s) on the region of interest. The signal strength and the resolution of the focus position is the best on the whole depth. Moving the focus position will improve corresponding positional signal.
Focus Number	The number of control focus changes from 1 to 4, and the focal point of the triangle is changed accordingly.

Table 7-1: 2D Mode Main Menu Controls

Parameter	Description
Freq.	Adjusts the probe's operating frequency. The selected frequency is displayed in the status window. For some probes/applications the lowest frequency settings will be Octave imaging settings.
Needle Viz.	Adjusts the emission line to an angle that best fits the needle, which enhances the needle image without impacting the tissue image quality. The echo data of the needle will be merged with that of the tissue to form the final ultrasound image. This function applies only to the B mode with the linear probe installed.
Up/Down	Enable a mirror image of the 2D image to be created. The reference marker W moves correspondingly to the other side of the image. Up/Down is available in both Live and Freeze.
Left/Right	Flips the 2D image 180 degrees. Left/Right is available in both Live and Freeze.
Compound	Adjusts compound parameter in order to suppress noise.
Trapez	For linear array probe, Trapez imaging provides a greater range of vision.
Width	Controls the size or angular width of the 2D image area. A smaller width corresponds to a higher frame rate.
B Steer	Adjusts the angle of deflection to display more information related to the image without moving the probe. This function applies only to 2D Mode with the linear probe installed.
B Section Pos	Adjusts the angle of deflection to display more information related to the image without moving the probe.This function applies only to 2D Mode with the phased array probe installed.

2D Mode Soft Menu Controls

Table 7-2: 2D Mode Soft Menu Controls

Parameter	Description
DR	Enables control of the dynamic range or contrast of the image. When dynamic range is set high, the image is softer.
Speckle Reduce	Controls the speckle noise suppression of the image.
Edge Enhance	Controls the extent of the edge-enhancement processing applied to an image.
Persist	Controls the time-domain correlations to suppress image noise.
Map	Gray scale map can improve image contrast resolution, noise suppression, and display effects. Map is available in both Live and Freeze.

Table 7-2: 2D Mode Soft Menu Controls

Parameter	Description
Tint	Control and adjust the image tint. Tint is available in both Live and Freeze.
Power	Controls the amount of acoustic power applied in all modes. When power is set to maximum, it is equal to or less than the maximum acoustic power permitted by the FDA. When power is reduced, the signal-to-noise ratio decreases, resulting in potentially noisier image.

Other 2D Mode Controls

Table 7-3: Other 2D Mode Controls

Parameter	Description
Gain	Adjusted by the knob below the TGC on the control panel. When rotated clockwise, increases the overall gain applied to the received echo signals equally for all depth.
TGC	Compensates for depth-related attenuation in an image. The sliders nearest the operator affect the far field. TGC amplifies returning signals to compensate for the attenuation caused by tissue at increasing depths.
Depth	Adjusting the depth will influence diagram frame rate and resolution. Decreasing the depth may allow for higher frame rate and lower resolution. Increasing the depth will increase image resolution and decrease frame rate.
1/2/4	Enables multiple image display windows in which two or four images can be viewed simultaneously.
Alt	Display more Main menu controls: Pano (linear array probe), AMM, TVI (phased array probe), TDI (phased array probe), EI (linear array probe and the convex array probe), SRI (phased array probe).

Using 2D Mode

The 2D mode is the default mode of Portable Ultrasound Diagnostic Scanner.

In other modes, press 2D key on the control panel to activate 2D mode.

Optimizing 2D Mode

The following controls can be adjusted to optimize the 2D mode display:

- Use the **Gain** and **TGC** controls to optimize the overall image.

- Use the **Depth** control to adjust the range to be imaged.

- Use the **Focus Pos. /Focus Number** control to center the focal point(s) on the region of interest.

- Use the **Freq.** (increment frequency) increase resolution in image.

- Use the **Freq.** (decrement frequency) to increase penetration.
- Use the **Width** to provide a greater field of view.

7.4.2   Panoramic Imaging Mode

Panoramic Imaging Mode Overview

Panoramic Imaging mode generates a two-dimensional image by rendering and merging continuous data acquired by the linear movement of the probe. It is used to observe and measure the overall structure. Only the linear array probe has this mode.
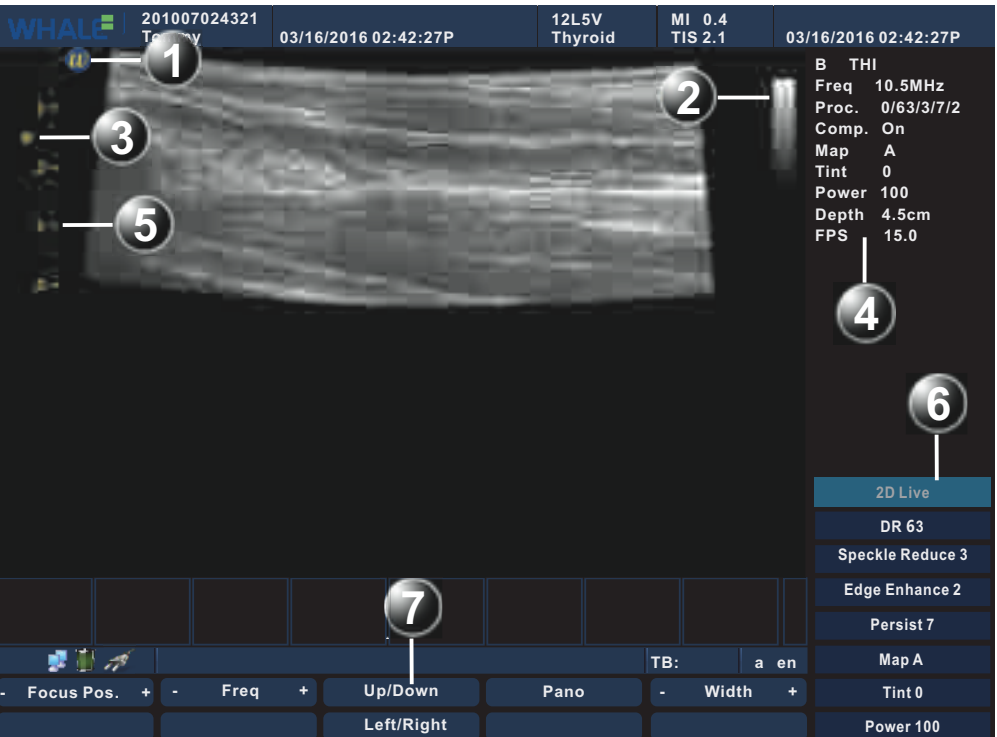
Figure 7-23: Panoramic Imaging Screen

1	Probe orientation marker	2	Gray bar
3	Focus marker	4	Panoramic Imaging Mode parameters window
5	Depth Scale	6	Panoramic Imaging Mode Soft menu
7	Panoramic Imaging Mode Main menu		

Panoramic Imaging Mode Main Menu Controls

Table 7-4: Panoramic Imaging Mode Main Menu Controls

Parameter	Description
Focus Pos.	Use the Focus control to center the focal point(s) on the region of interest. Along the entire depth, the focused position has the most optimal signal strength and resolution. Moving the focus position will improve corresponding positional signal.

Table 7-4: Panoramic Imaging Mode Main Menu Controls

Parameter	Description
Freq.	Enables the adjustment of the probe's operating frequency. The selected frequency is displayed in the status window. For some probes/applications the lowest frequency settings will be Octave imaging settings.
Up/Down	Enable a mirror image of the 2D image to be created. The reference marker W moves correspondingly to the other side of the image. Up/Down is available in both Live and Freeze.
Left/Right	Flips the 2D image 180 degree. Left/Right is available in both Live and Freeze.
Width	Controls the size or angular width of the 2D image sector. A small width corresponds to a higher frame rate.

Panoramic Imaging Mode Soft Menu Controls

Table 7-5: Panoramic Imaging Mode Soft Menu Controls

Parameter	Description
DR	Enables control of the dynamic range or contrast of the image. When dynamic range is set high, the image is softer.
Speckle Reduce	Controls the speckle noise suppression of the image.
Edge Enhance	Controls the extent of the edge-enhancement processing applied to an image.
Persist	Controls the time-domain correlations to suppress image noise.
Map	Gray scale map can improve image contrast resolution, noise suppression, and display effects. Map is available in both Live and Freeze.
Tint	Control and adjust the image tint. Tint is available in both Live and Freeze.
Power	Controls the amount of acoustic power applied in all modes. When power is set to maximum, it is equal to or less than the maximum acoustic power permitted by the FDA. When power is reduced, the signal-to-noise ratio decreases, resulting in potentially noisier image.

Other Panoramic Imaging Mode Controls

Table 7-6: Other Panoramic Imaging Mode Controls

Parameter	Description
Gain	Adjusted by the knob below the TGC on the control panel. When rotated clockwise, increases the overall gain applied to the received echo signals equally for all depth.

Table 7-6: Other Panoramic Imaging Mode Controls

Parameter	Description
TGC	Compensates for depth-related attenuation in an image. The sliders nearest the operator affect the far field. TGC amplifies returning signals to compensate for the attenuation caused by tissue at increasing depths.
Depth	Adjusting the depth will influence diagram frame rate and resolution. Decreasing the depth may allow for higher frame rate and lower resolution. Increasing the depth will increase image resolution and decrease frame rate.

Using Panoramic Imaging Mode

STEP 1 While in 2D mode press **Alt** key on the control panel.

STEP 2 Select the **Pano** parameter on the main menu to access Panoramic Imaging Mode.

Optimizing Panoramic Imaging Mode

- Use the **Gain** and **TGC** controls to optimize the overall image.

- Use the **Depth** control to adjust the range to be imaged.

- Use the **Focus pos.** control to center the focal point(s) on the region of interest.

- Use the **Freq.** (increment frequency) increase resolution in image.

- Use the **Freq.** (decrement frequency) to increase penetration.

- Use the **Width** to provide a greater field of view.

7.4.3   M Mode

M Mode Overview

Display a distance/time plot of a cursor line in the axial plane of the 2D image.
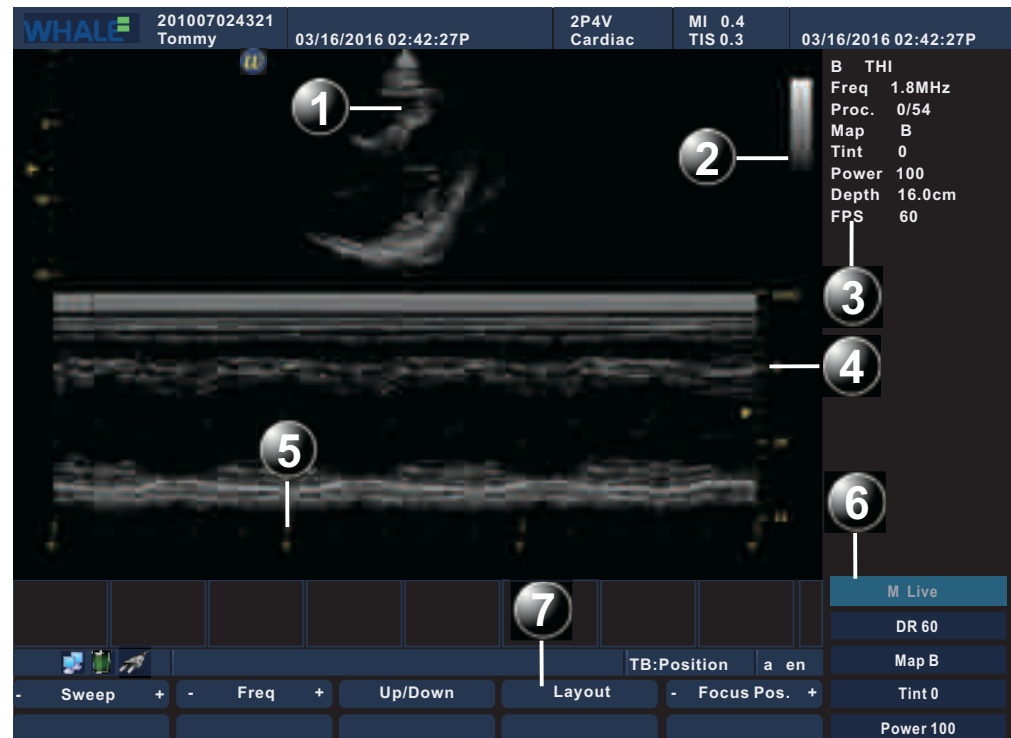
Figure 7-24: M Mode Screen

1   Time motion cursor conventional M-Mode
2   Gray bar
3   M-Mode parameters windows
4   Depth scale
5   Time scale
6   M-Mode Soft menu
7   M-Mode Main menu

M Mode Main Menu Controls

Table 7-7: M Mode Main Menu Controls

Parameter	Description
Freq.	Enables the adjustment of the probe's operating frequency. The selected frequency is displayed in the status window. For some probes/applications the lowest frequency settings will be Octave imaging settings.

Table 7-7: M Mode Main Menu Controls

Parameter	Description
Up/Down	Enable a mirror image of the 2D image to be created. The reference marker W moves correspondingly to the other side of the image. Up/Down is available in both Live and Freeze.
Sweep	Adjust the horizontal refresh rate of M-Mode area display. You can speed up or slow down the time line to observe how often an specific event occurs.
Layout	Toggles the display layout of the 2D area and M-mode area, either top/bottom or side by side.
Focus Pos.	Use the Focus control to center the focal point(s) on the region of interest. Along the entire depth, the focused position has the most optimal signal strength and resolution. Moving the focus position will improve corresponding positional signal.

M Mode Soft Menu Controls

Table 7-8: M Mode Soft Menu Controls

Parameter	Description
DR	Enables control of the dynamic range or contrast of the image. When dynamic range is set high, the image is softer.
Map	Gray scale map can improve image contrast resolution, noise suppression, and display effects. Map is available in both Live and Freeze.
Tint	Control and adjust the image tint. Tint is available in both Live and Freeze.
Power	Controls the amount of acoustic power applied in all modes. When power is set to maximum, it is equal to or less than the maximum acoustic power permitted by the FDA. When power is reduced, the signal-to-noise ratio decreases, resulting in potentially noisier image.

Other M Mode Controls

Table 7-9: Other M Mode Controls

Parameter	Description
Gain	Adjusted by the knob below the TGC on the control panel. When rotated clockwise, increases the overall gain applied to the received echo signals equally for all depth.
TGC	Compensates for depth-related attenuation in an image. The sliders nearest the operator affect the far field. TGC amplifies returning signals to compensate for the attenuation caused by tissue at increasing depths.

Table 7-9: Other M Mode Controls

Parameter	Description
Depth	Adjusting the depth will influence diagram frame rate and resolution, Decreasing the depth may allow for higher frame rate and lower resolution. Increasing the depth will increase image resolution and decrease frame rate.
Alt	Display more Main menu controls: AMM, TDI (phased array probe).

Using M Mode

In 2D mode press **M** key on the control panel, M mode will start to sweep.

Optimizing M Mode

Preset gives optimum performance with minimum adjustment. If necessary, the following controls can be adjusted to further optimize the M-Mode display:

- Select **Sweep** to optimize the display resolution.

- Select **Gain** and **TGC** controls to adjust the range to be imaged.

- Use the **Freq.** (increment frequency) to increase resolution in image.

- Use the **Freq.** (decrement frequency) to increase penetration.

- Select **Focus Pos.** to move the focal point(s) around the region of interest in the M-Mode display.

- Select **DR** to optimize Dynamic Range.

Note: *All the controls listed above will also affect the 2D image.*

7.4.4   Anatomical M-Mode

Anatomical M-Mode Overview

Displays a distance/time plot from a cursor line, which is independent from the axial plane. Anatomical M-Mode (AMM) is available in gray scale mode.
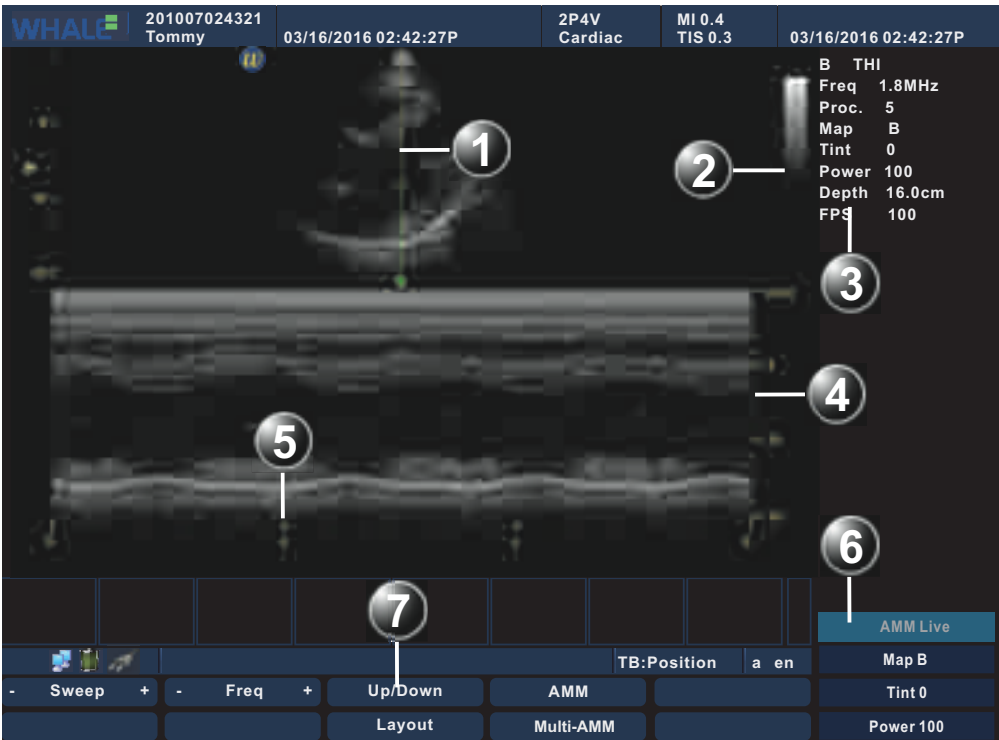
Figure 7-25: AMM Mode Screen

1   *Time motion cursor conventional M-Mode*
2   *Gray bar*
3   *M-Mode parameters windows*
4   *Depth scale*
5   *Time scale*
6   *M-Mode Soft menu*
7   *M-Mode Main menu*

AMM Mode Main Menu Controls

Table 7-10: AMM Mode Main Menu Controls

Parameter	Description
Freq.	Adjusts the probe's operating frequency. The selected frequency is displayed in the status window. For some probes/applications the lowest frequency settings will be Octave imaging settings.

Table 7-10: AMM Mode Main Menu Controls

Parameter	Description
Up/Down	Enable a mirror image of the 2D image to be created. The reference marker W moves correspondingly to the other side of the image. Up/Down is available in both Live and Freeze.
Sweep	Adjust the horizontal refresh rate of M-Mode area of the display. You can speed up or slow down the time line to conservative the events that the more or less took place several times In a period of time.
Layout	Toggles the display arrangement to define relative dimensions of the 2D area, M-mode area, and their position which is either top/bottom or side-by-side.
AMM	Quit AMM Mode.
Multi-AMM	Adds or delete cursors. The maximum number of cursors is three.

AMM Mode Soft Menu Controls

Table 7-11: AMM Mode Soft Menu Controls

Parameter	Description
Map	Gray scale map can improve image contrast resolution, noise suppression, and display effects. Map is available in both Live and Freeze.
Tint	Control and adjust the image tint. Tint is available in both Live and Freeze.
Power	Controls the amount of acoustic power applied in all modes. When power is set to maximum, it is equal to or less than the maximum acoustic power permitted by the FDA. When power is reduced, the signal-to-noise ratio decreases, resulting in potentially noisier image.

Other AMM Mode Controls

Table 7-12: Other AMM Mode Controls

Parameter	Description
Gain	Adjusted by the knob below the TGC on the control panel. When rotated clockwise, increases the overall gain applied to the received echo signals equally for all depth.
TGC	Compensates for depth-related attenuation in an image. The sliders nearest the operator affect the far field. TGC amplifies returning signals to compensate for the attenuation caused by tissue at increasing depths.
Depth	Adjusting the depth will influence diagram frame rate and resolution. Decreasing the depth may allow for higher frame rate and lower resolution. Increasing the depth will increase image resolution and decrease frame rate.

Table 7-12: Other AMM Mode Controls

Parameter	Description
Alt	Display more Main menu controls: AMM, TDI (phased array probe).

Using AMM Mode

STEP 1 From 2D Live, press **Alt** key on the control panel.

STEP 2 Select **AMM** to access **AMM** mode.

STEP 3 Use the trackball to position the cursor over the required area of the image.

STEP 4 Press **Set** key on the control panel to rotate the AMM sampling line. The sampling line has free rotation throughout the 2D image.

STEP 5 Rotate the AMM sampling line to the desired direction.

STEP 6 Press **Set** key on the control panel and scrolling the trackball to re-position the intersection point to the desired position along the sample line.

STEP 7 Repeat steps 4 and 5 to change the angle of the solid sample line if necessary.

Note: When there are multiple cursors, activate either cursor by pressing **Update/Menu** on the control panel.

Optimizing AMM Mode

Preset generally provides optimal performance with minimal adjustment. If necessary, the following controls can be adjusted to further optimize the AMM Mode display:

- Select **Sweep** to optimize the display resolution.

- Select **Gain** and **TGC** controls to adjust the range to be imaged.

- Use the **Freq**. (increase frequency) to increase resolution in image.

- Use the **Freq**. (decrease frequency) to increase penetration.

Note: All the controls listed above will also affect the 2D image.

7.4.5 CM Mode

In CM Mode, the monitor displays a live color image about blood flow, including the direction of blood flow and spectrum information. This function is available only when the phased array probe is being installed.
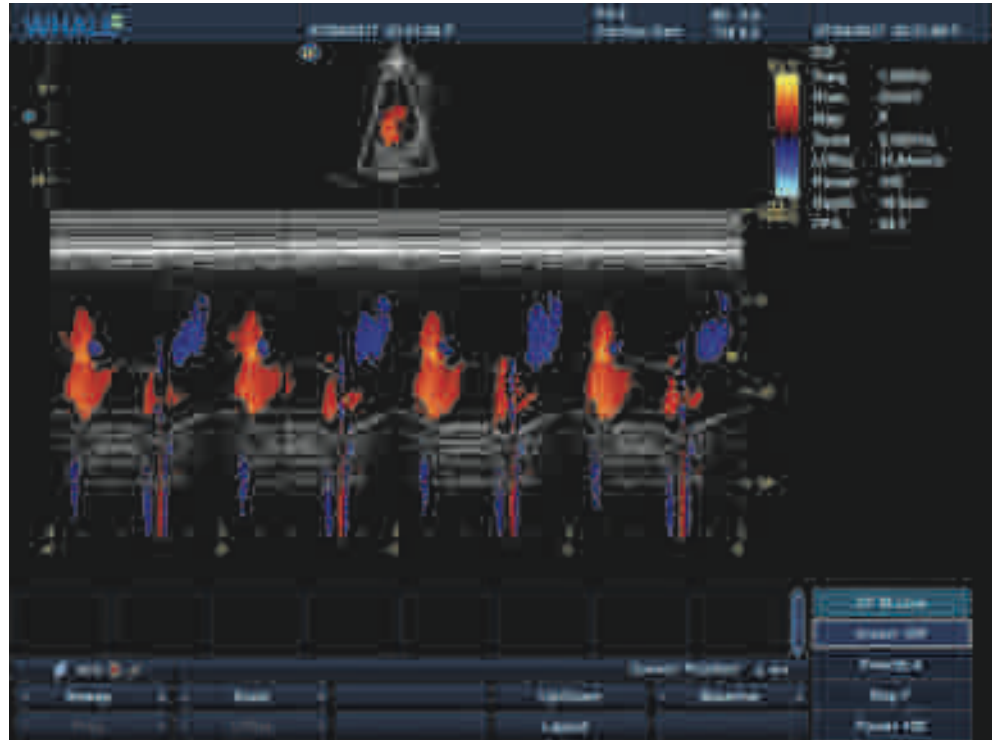
Figure 7-26: CM Mode

Activate CM Mode

To activate CM Mode,

STEP▶ Press successively **2D**, **CFM** and **M** on the control panel.

Optimize the image in CM Mode

You can optimize the image in CM Mode by adjusting any of the following controls.

The Main Menu Controls of CM Mode

Table 7-13: The Main Menu Controls of CM Mode

Parameter	Description
Sweep	Adjust the horizontal refresh rate of M-Mode area display. You can speed up or slow down the time line to observe how often an specific event occurs.

Table 7-13: The Main Menu Controls of CM Mode

Parameter	Description
Freq.	Adjusts the transmission frequency to control the sensitivity and the level of penetration. The selected frequency is displayed in the status window. Adjusting Frequency may affect Sample Volume and LVRej settings.
Scale	Adjusts the repetition rate of the Doppler pluses transmitted when acquiring the data for color flow mapping. The Scale (Nyquist limit) should be adjusted so that no aliasing occurs, while still having good resolution of velocities. The Nyquist limit should be somewhat above the maximum velocity found in the data.
LVRej	LVR, also called wall motion filter, adjusts the extent of low velocity removal.
Up/Down	Enable a mirror image of the 2D image to be created. The reference marker W moves correspondingly to the other side of the image. Up/Down is available in both Live and Freeze.
Layout	Toggles the display layout of the 2D area and M-mode area, either top/bottom or side by side.
Baseline	Adjusts the color map to emphasize flow either towards or away from probe. Baseline is available in both Live and Freeze.

The Soft Menu Controls of CM Mode

Table 7-14: The Soft Menu Controls of CM Mode

Parameter	Description
Invert	Inverts the color scheme for positive and negative velocities. Invert is available in Live and Freeze.
Priority	Prioritize colors in the Color mode.
Map	Displays a menu of color map options. Each color map is assigning different color hues for different velocities.
Power	Controls the amount of acoustic power applied in all modes. Acoustic power cannot be set above the amount permitted by the FDA. The Thermal index (TI) and the Mechanical index (MI) are displayed on the screen.

Other Controls of CM Mode

Table 7-15: Other Controls of CM Mode

Parameter	Description
Gain	Adjusted by the knob below the TGC on the control panel. When rotated clockwise, increases the overall gain applied to the received echo signals equally for all depth.

Table 7-15: Other Controls of CM Mode

Parameter	Description
TGC	Compensates for depth-related attenuation in an image. The sliders nearest the operator affect the far field. TGC amplifies returning signals to compensate for the attenuation caused by tissue at increasing depths.
Depth	Adjusting the depth will influence diagram frame rate and resolution. Decreasing the depth may allow for higher frame rate and lower resolution. Increasing the depth will increase image resolution and decrease frame rate.
1/2/4	Enables multiple image display windows in which two or four images can be viewed simultaneously.
Alt	Display more Main menu controls: Simultaneous, TVI (phased array probe), TDI (phased array probe), EI (linear array probe and convex array probe), SRI (phased array probe).

7.4.6   Color Mode

Color Mode Overview

The Color Doppler Mode allows the user to observe blood flow using Doppler multiple samples.
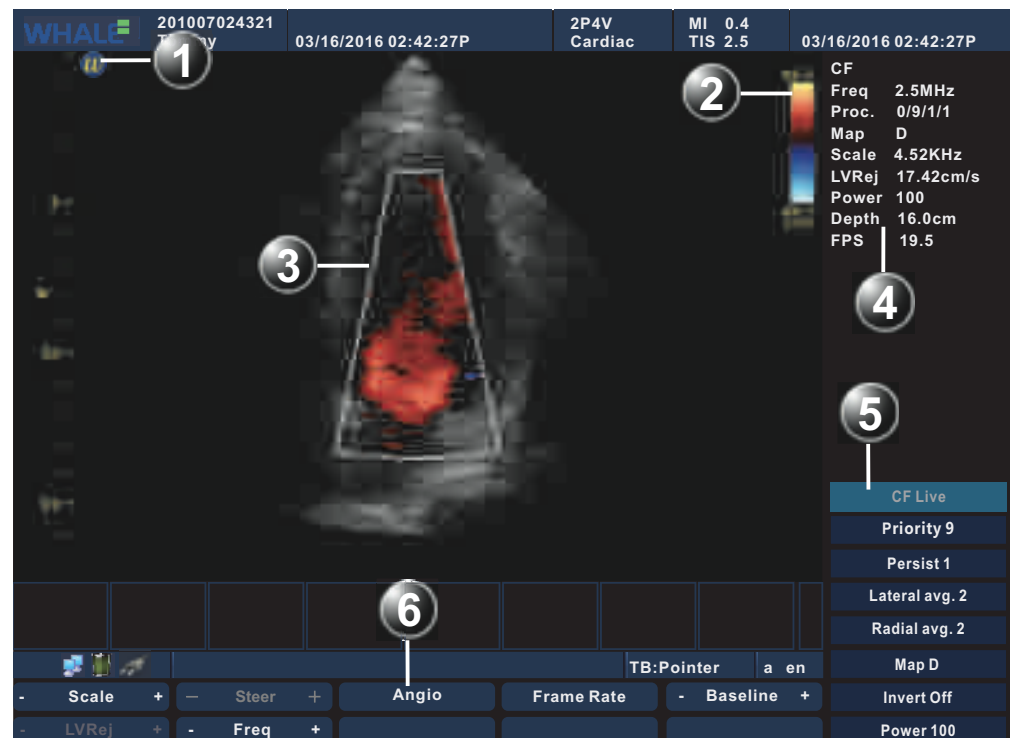
Figure 7-27: Color Mode Screen

1   Probe orientation marker
2   Color bar

3   Color ROI
4   Color Mode parameters window
5   Color Mode Soft menu
6   Color Mode Main menu

Color Mode Main Menu Controls

Table 7-16: Color Mode Main Menu Controls

Parameter	Description
Scale	Adjusts the repetition rate of the Doppler pluses transmitted when acquiring the data for color flow mapping. The Scale (Nyquist limit) should be adjusted so that no aliasing occurs, while still having good resolution of velocities. The Nyquist limit should be somewhat above the maximum velocity found in the data.
LVRej	LVR, also called wall motion filter, adjusts the extent of low velocity removal.
Steer	Control the angle of the color sample volume (Only for Liner Array Probe).
Freq.	Adjusts the transmission frequency to control the sensitivity and the level of penetration. The selected frequency is displayed in the status window. Adjusting Frequency may affect Sample Volume and LVRej settings.
Angio	Switch to Power Mode.
Frame Rate	Adjusts the Frame Rate.
Baseline	Adjusts the color map to emphasize flow either towards or away from probe. Baseline is available in both Live and Freeze.
BC SameWidth	Adjusts the BC SameWidth setting so that the image width of 2D Mode is the same as that of Color Mode.

Color Mode Soft Menu Controls

Table 7-17: Color Mode Soft Menu Controls

Parameter	Description
Priority	Prioritize colors in the Color mode.
Persist	Improve the sensitivity of the signal in time domain.
Lateral avg.	Smooths the image by averaging collected horizontal line. Increasing lateral averaging will reduce noise, but may also reduce lateral resolution.
Radial avg.	Smooths the image by averaging collected radial line. Increasing radial averaging will reduce noise, but may also reduce radial resolution.
Map	Displays a menu of color map options. Each color map is assigning different color hues for different velocities.

Table 7-17: Color Mode Soft Menu Controls

Parameter	Description
Invert	Inverts the color scheme for positive and negative velocities. Invert is available in Live and Freeze.
Power	Controls the amount of acoustic power applied in all modes. Acoustic power cannot be set above the amount permitted by the FDA. The Thermal index (TI) and the Mechanical index (MI) are displayed on the screen.

Other Color Mode Controls

Table 7-18: Other Color Mode Controls

Parameter	Description
Gain	Adjusted by the knob below the TGC on the control panel. When rotated clockwise, increases the overall gain applied to the received echo signals equally for all depth.
TGC	Compensates for depth-related attenuation in an image. The sliders nearest the operator affect the far field. TGC amplifies returning signals to compensate for the attenuation caused by tissue at increasing depths.
Depth	Adjusting the depth will influence diagram frame rate and resolution. Decreasing the depth may allow for higher frame rate and lower resolution. Increasing the depth will increase image resolution and decrease frame rate.
1/2/4	Enables multiple image display windows in which two or four images can be viewed simultaneously.
Alt	Display more Main menu controls: Simultaneous, TVI (phased array probe), TDI (phased array probe), EI (linear array probe and convex array probe), SRI (phased array probe).

Using Color Mode

STEP 1 While in 2D mode, press **CFM** key on the control panel.

STEP 2 Use the trackball to position the Color ROI over the area to be examined.

STEP 3 Rolling the trackball to adjust the position of the Color ROI.

STEP 4 To adjust the Color ROI size, press **Set** key and use the trackball.
To enlarge or narrow the Color ROI, roll the trackball to the left or right.
To lengthen or shorten the Color ROI, roll the trackball up or down.

STEP 5 Press **Set** key on the control panel when the desired size is obtained. Reposition the Color ROI as needed.

STEP 6 Press **Freeze** key on the control panel to stop imaging.

STEP 7 To quit Color Doppler imaging, please press **CFM** or **2D** key.

Optimizing Color Mode

Preset generally gives optimal performance with minimal adjustment. If necessary, the following controls can be used to further optimize the Color Mode display:

- Select **Gain** to adjust gain in the color flow area.
- Set **Scale** to the highest setting that provides adequate flow detection.
- Select **LVRej** to remove low velocity blood flow and tissue movement to improve image quality.
- Select **Freq**. to optimize the color flow display. Higher settings improve resolution. Lower settings improve depth penetration and sensitivity.
- Select **Frame Rate** to adjust the Frame Rate.
- Select **Power** to obtain an acceptable image while using the lowest setting possible.

Adjust the following settings to further optimize image display:

- Use **Invert** to reverse the color assignments in the color flow area of the display.
- Use **Priority** to emphasize either the color flow overlay, or the detail of the underlying gray scale tissue.
- Use **Persist** to enhance the sensitivity of the signal's correlation in the time domain.
- Use **Baseline** to emphasize flow either towards or away from the probe.
- Use **Radial Avg.** and **Lateral Avg.** to reduce noise in the color flow area.

> ⚠️
> **CAUTION**
> *Use all noise reduction controls with care. Excessive application may obscure low level diagnostic information.*

7.4.7   Power Mode

Power Mode Overview

Power Mode allows the observation of blood flow using backscatter intensity of ultrasound signal from blood cells.
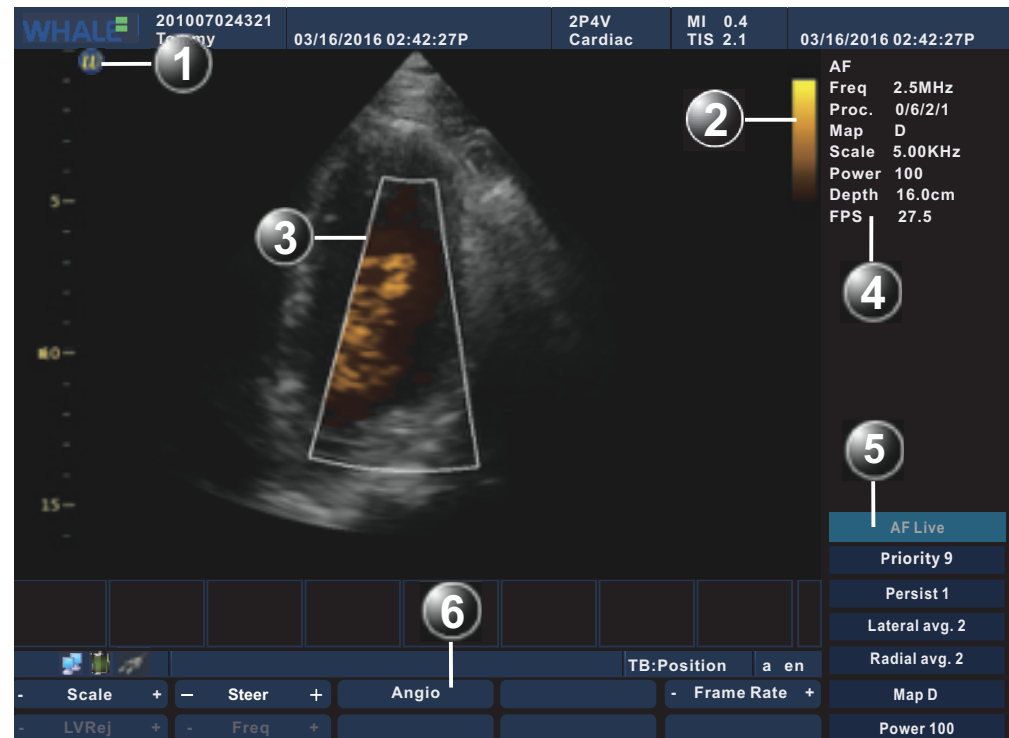
Figure 7-28: Power Mode Screen

1   *Probe orientation marker*
2   *Color bar*
3   *Color ROI*
4   *Power Mode parameters window*
5   *Power Mode Soft menu*
6   *Power Mode Main menu*

Power Mode Main Menu Controls

Table 7-19: Power Mode Main Menu Controls

Parameter	Description
Scale	Adjusts the repetition rate of the Doppler pluses transmitted when acquiring the data for color flow mapping. The Scale (Nyquist limit) should be adjusted so that no aliasing occurs, while still having good resolution of velocities. The Nyquist limit should be somewhat above the maximum velocity found in the data.
LVRej	LVR, also called Wall motion filter, adjusts the extent of low velocity removal.

Table 7-19: Power Mode Main Menu Controls

Parameter	Description
Steer	Controls the angle of the color sample volume (Only for Liner Array Probe).
Freq.	Adjusts the transmission frequency to control the sensitivity and the level of penetration. The selected frequency is displayed in the status window. Adjusting Frequency may affect Sample Volume and LVRej settings.
Angio	Switch to Color Mode.
Frame Rate	Adjusts the Frame Rate.
BC SameWidth	Adjusts the BC SameWidth setting so that the image width of 2D Mode is the same as that of Power Mode.

Power Mode Soft Menu Controls

Table 7-20: Power Mode Soft Menu Controls

Parameter	Description
Priority	Prioritizes the image with the information about blood flow of Power Mode.
Persist	Improve the sensitivity of the signal in time domain.
Lateral avg.	Smooths the image by averaging collected horizontal data. Increasing lateral averaging will reduce noise, but may also reduce lateral resolution.
Radial avg.	Smooths the image by averaging collected radial data. Increasing radial averaging will reduce noise, but may also reduce radial resolution.
Map	Displays a menu of color map options. Each color map is assigning different color hues for different velocities.
Power	Controls the amount of acoustic power applied in all modes. Acoustic power cannot be set above the amount permitted by the FDA. The Thermal index (TI) and the Mechanical index (MI) are displayed on the screen.

Other Power Mode Controls

Table 7-21: Other Power Mode Controls

Parameter	Description
Gain	Adjusted by the knob below the TGC on the control panel. When rotated clockwise, increases the overall gain applied to the received echo signals equally for all depth.
TGC	Compensates for depth-related attenuation in an image. The sliders nearest the operator affect the far field. TGC amplifies returning signals to compensate for the attenuation caused by tissue at increasing depths.

Table 7-21: Other Power Mode Controls

Parameter	Description
Depth	Adjusting the depth will influence diagram frame rate and resolution. Decreasing the depth may allow for higher frame rate and lower resolution. Increasing the depth will increase image resolution and decrease frame rate.
1/2/4	Enables multiple image display windows in which two or four images can be viewed simultaneously.
Alt	Displays Simultaneous parameter.

Using Power Mode

STEP 1 While in Color mode select **Angio** in the Main menu.

STEP 2 Use the trackball to position the Color ROI over the area to be examined.

STEP 3 Rolling the trackball to adjust the position of the Color ROI.

STEP 4 To adjust the Color ROI size, press **Set** key and use the trackball.

To enlarge or narrow the Color ROI, roll the trackball to the left or right.

To lengthen or shorten the Color ROI, roll the trackball up or down.

STEP 5 Press **Set** key on the control panel when the desired size is obtained. Reposition the Color ROI as needed.

STEP 6 Press **Freeze** key on the control panel to stop imaging.

STEP 7 To quit Power Doppler imaging, please press **CFM** or **2D** key.

Optimizing Power Mode

Preset generally gives optimal performance with minimal adjustment. If necessary, the following controls can be used to further optimize the Power Mode display:

●   Select **Gain** to adjust gain in the color flow area.

●   Set **Scale** to the highest setting that provides adequate flow detection.

●   Select **LVRej** to remove low velocity blood flow and tissue movement to improve image quality.

●   Select **Freq**. to optimize the color flow display. Higher settings improve resolution. Lower settings improve depth penetration and sensitivity.

●   Select **Frame Rate** to adjust the Frame Rate.

●   Select **Power** to obtain an acceptable image while using the lowest setting possible.

Adjust the following settings to further optimize image display:

- Use **Priority** to emphasize either the color flow overlay, or the detail of the underlying gray scale tissue.

- Use **Persist** to enhance the sensitivity of the signal's correlation in the time domain.

- Use **Radial Avg**. and **Lateral Avg**. to reduce noise in the color flow area.

7.4.8   DPDI Mode

In DPDI Mode, the monitor displays a live color image about blood flow, including the direction and the state of blood flow. This function is available only when the phased array probe is being installed.
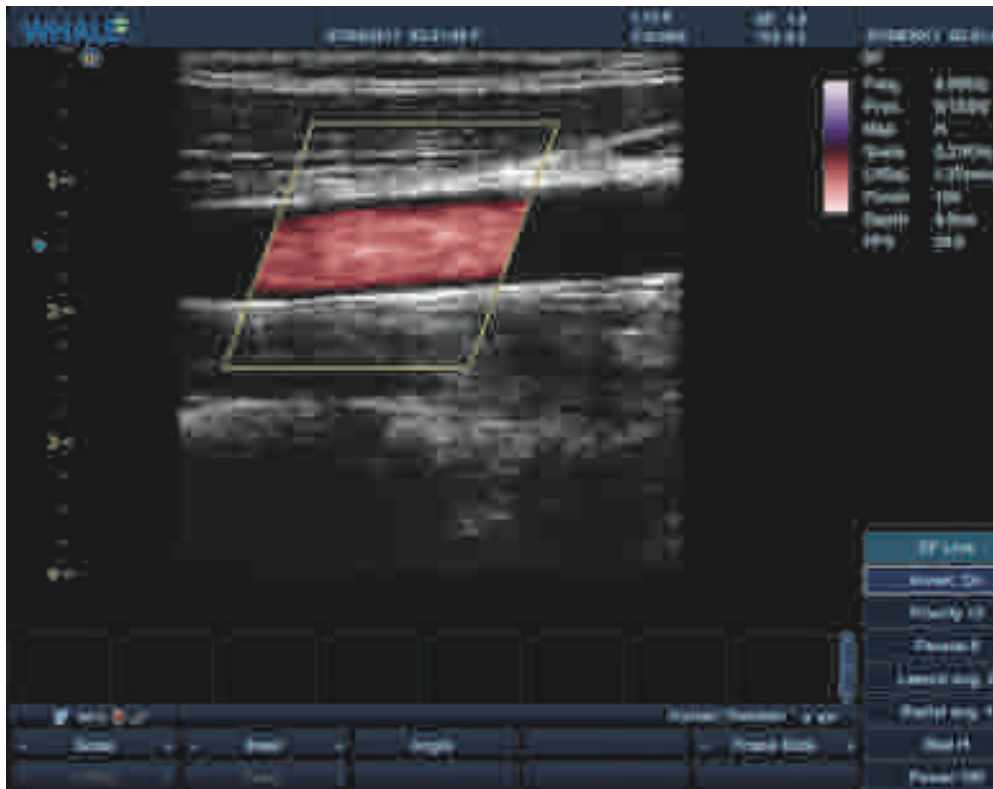
Figure 7-29: DPDI Mode

Activate DPDI Mode

To activate DPDI Mode,

STEP▶   Press successively **2D**, **CFM** and **Alt** on the control panel, and then click DPDI on the main menu.

Optimize the image in DPDI Mode

You can optimize the image in DPDI Mode by adjusting any of the following controls.

The Main Menu Controls of DPDI Mode

Table 7-22: The Main Menu Controls of DPDI Mode

Parameter	Description
Freq.	Adjusts the transmission frequency to control the sensitivity and the level of penetration. The selected frequency is displayed in the status window. Adjusting Frequency may affect Sample Volume and LVRej settings.
Scale	Adjusts the repetition rate of the Doppler pluses transmitted when acquiring the data for color flow mapping. The Scale (Nyquist limit) should be adjusted so that no aliasing occurs, while still having good resolution of velocities. The Nyquist limit should be somewhat above the maximum velocity found in the data.
LVRej	LVR, also called wall motion filter, adjusts the extent of low velocity removal.
BC SameWidth	Adjusts the BC SameWidth setting so that the image width of 2D Mode is the same as that of DPDI Mode.
Frame Rate	Adjusts the Frame Rate.
Angio	Switch to Power Mode.

The Soft Menu Controls of DPDI Mode

Table 7-23: The Soft Menu Controls of DPDI Mode

Parameter	Description
Invert	Inverts the color scheme for positive and negative velocities. Invert is available in Live and Freeze.
Priority	Prioritize the blood flow image of DPDI Mode.
Persist	Improve the sensitivity of the signal in time domain.
Lateral avg.	Smooths the image by averaging collected horizontal data. Increasing lateral averaging will reduce noise, but may also reduce lateral resolution.
Radial avg.	Smooths the image by averaging collected radial data. Increasing radial averaging will reduce noise, but may also reduce radial resolution.
Map	Displays a menu of color map options. Each color map is assigning different color hues for different velocities.
Power	Controls the amount of acoustic power applied in all modes. Acoustic power cannot be set above the amount permitted by the FDA. The Thermal index (TI) and the Mechanical index (MI) are displayed on the screen.

Other Controls of DPDI Mode

Table 7-24: Other controls of DPDI Mode

Parameter	Description
Gain	Adjusted by the knob below the TGC on the control panel. When rotated clockwise, increases the overall gain applied to the received echo signals equally for all depth.
TGC	Compensates for depth-related attenuation in an image. The sliders nearest the operator affect the far field. TGC amplifies returning signals to compensate for the attenuation caused by tissue at increasing depths.
Depth	Adjusting the depth will influence diagram frame rate and resolution. Decreasing the depth may allow for higher frame rate and lower resolution. Increasing the depth will increase image resolution and decrease frame rate.
1/2/4	Enables multiple image display windows in which two or four images can be viewed simultaneously.
Alt	Displays Simultaneous parameter.

7.4.9   Elastography Image Mode

Elastography Image Mode Overview

The Elastography Image Mode (EI) allows the observation of characteristics such as elasticity, density and shift in tissue.
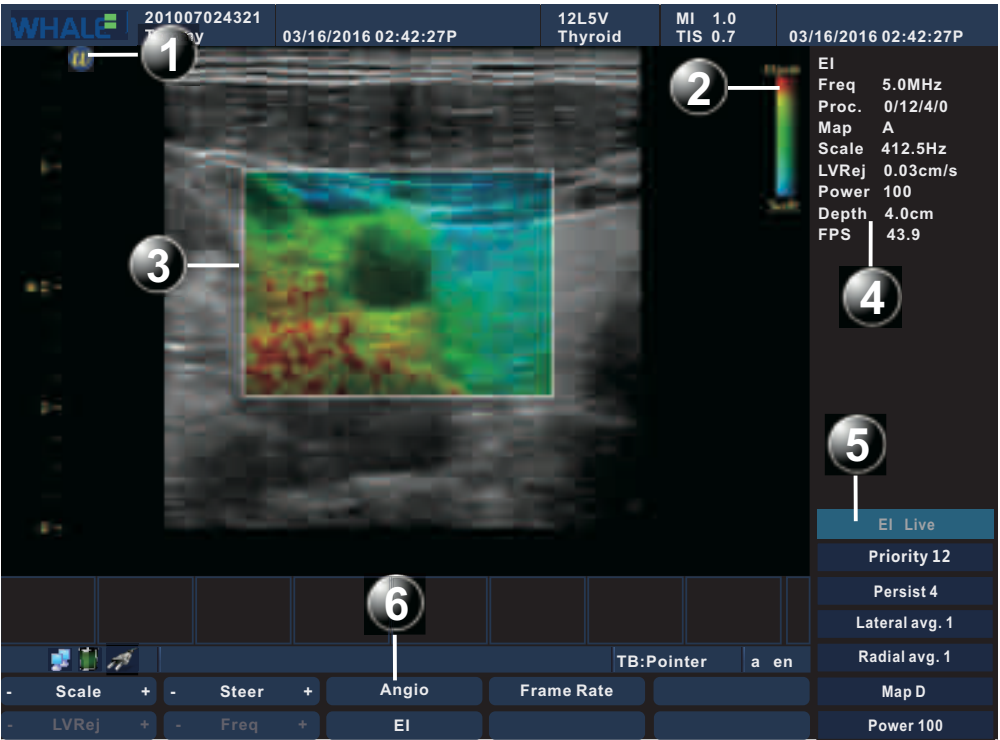
Figure 7-30: EI Mode Screen

1   *Probe orientation marker*   2   *Color bar*
3   *Color ROI*   4   *EI Mode parameters window*
5   *EI Mode Soft menu*   6   *EI Mode Main menu*

EI Mode Main Menu Controls

Table 7-25: EI Mode Main Menu Controls

Parameter	Description
Scale	Adjusts the repetition rate of the Doppler pluses transmitted when acquiring data for color flow mapping. The Scale (Nyquist limit) should be adjusted so that no aliasing occurs, while still having good resolution of velocities. The Nyquist limit should be somewhat above the maximum velocity found in the data.
LVRej	LVR, also called Wall motion filter, adjusts the extent of low velocity removal.
Steer	Controls the angle of the color sample volume (Only in Liner Array Probe).
Freq.	Adjusts the transmission frequency to control the sensitivity and the level of penetration. The selected frequency is displayed in the status window. Adjusting Frequency may affect Sample Volume and LVRej settings.
Angio	Switch to Power Mode.
EI	Switch to 2D Mode.
Frame Rate	Adjusts the Frame Rate.

EI Mode Soft Menu Controls

Table 7-26: EI Mode Soft Menu Controls

Parameter	Description
Priority	prioritize colors in Color mode.
Persist	Improve the sensitivity of the signal in time domain.
Lateral avg.	Smooths the image by averaging collected horizontal data. Increasing lateral averaging will reduce noise, but may also reduce lateral resolution.
Radial avg.	Smooths the image by averaging collected radial data. Increasing radial averaging will reduce noise, but may also reduce radial resolution.
Map	Displays a menu of color map options. Each color map is assigning different color hues for different velocities.
Power	Controls the amount of acoustic power applied in all modes. Acoustic power cannot be set above the amount permitted by the FDA. The Thermal index (TI) and the Mechanical index (MI) are displayed on the screen.

Other EI Mode Controls

Table 7-27: Other EI Mode Controls

Parameter	Description
Gain	Adjusted by the knob below the TGC on the control panel. When rotated clockwise, increases the overall gain applied to the received echo signals equally for all depth.
TGC	Compensates for depth-related attenuation in an image. The sliders nearest the operator affect the far field. TGC amplifies returning signals to compensate for the attenuation caused by tissue at increasing depths.
Depth	Adjusting the depth will influence diagram frame rate and resolution. Decreasing the depth may allow for higher frame rate and lower resolution.Increasing the depth will increase image resolution and decrease frame rate.
1/2/4	Enables multiple image display windows in which two or four images can be viewed simultaneously.
Alt	Display more Main menu controls: Simultaneous, EI (linear array probe and convex array probe).

Using EI Mode

STEP 1   While in **2D** mode, press **Alt** key on the control panel, then select **EI** parameter on the Main Menu.

STEP 2   Use the trackball to position the Color ROI over the area to be examined.

STEP 3   Rolling the trackball to adjust the position of the Color ROI.

STEP 4   To adjust the Color ROI size, press **Set** key on the control panel and use the trackball.

To enlarge or narrow the Color ROI, roll the trackball to the left or right.

To lengthen or shorten the Color ROI, roll the trackball up or down.

STEP 5   Press **Set** key on the control panel when the desired size is obtained. Reposition the Color ROI as needed.

STEP 6   Press **Freeze** key on the control panel to stop imaging.

STEP 7   To quit EI Mode, please press **CFM** or **2D** key.

Optimizing EI Mode

Preset generally gives optimal performance with minimal adjustment. If necessary, the following controls can be used to further optimize the EI Mode display:

- Select **Gain** to adjust gain in the color flow area.

- Set **Scale** to the highest setting that provides adequate flow detection.

- Select **LVRej** to remove low velocity blood flow and tissue movement to improve image quality.

- Select **Freq**. to optimize the color flow display. Higher settings improve resolution. Lower settings improve depth penetration and sensitivity.

- Select **Frame Rate** to adjust the Frame Rate.

- Select **Power** to obtain an acceptable image while using the lowest setting possible.

7.4.10   TVI Mode

TVI Mode Overview

TVI Mode allows the observation of tissue using Doppler signal.
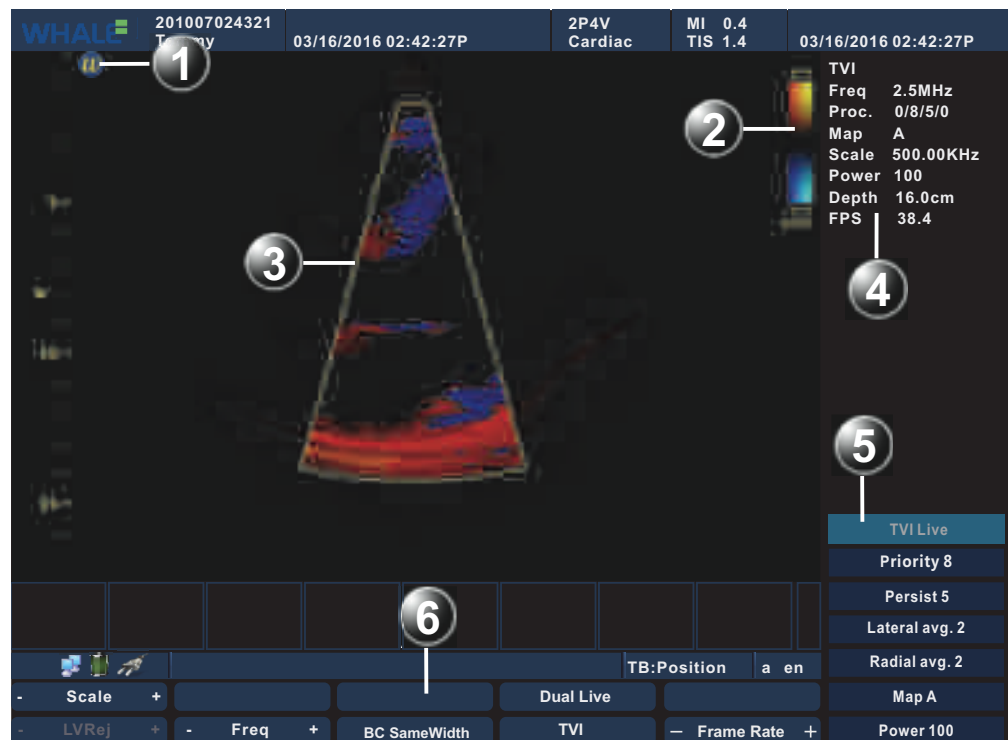
Figure 7-31: TVI Mode Screen

1	Probe orientation marker	2	Color bar
3	Color ROI	4	TVI Mode parameters window
5	TVI Mode Soft menu	6	TVI Mode Main menu

TVI Mode Main Menu Controls

Table 7-28: TVI Mode Main Menu Controls

Parameter	Description
Scale	Adjusts the repetition rate of the Doppler pluses transmitted when acquiring the data for color flow mapping. The Scale (Nyquist limit) should be adjusted so that no aliasing occurs, while still having good resolution of velocities. The Nyquist limit should be somewhat above the maximum velocity found in the data.
LVRej	LVR, also called Wall motion filter, adjusts the extent of low velocity removal.
Freq.	Adjusts the transmission frequency to control the sensitivity and the level of penetration. The selected frequency is displayed in the status window. Adjusting Frequency may affect Sample Volume and LVRej settings.
TVI	Switch to 2D Mode.
Frame Rate	Adjusts the adjustment of the Frame Rate.
BC SameWidth	Adjusts the BC SameWidth setting so that the image width of 2D Mode is the same as that of TVI Mode.

TVI Mode Soft Menu Controls

Table 7-29: TVI Mode Soft Menu Controls

Parameter	Description
Priority	prioritize colors in Color mode.
Persist	Improve the sensitivity of the signal in time domain.
Lateral avg.	Smooths the image by averaging collected horizontal data. Increasing lateral averaging will reduce noise, but may also reduce lateral resolution.
Radial avg.	Smooths the image by averaging collected radial data. Increasing radial averaging will reduce noise, but may also reduce radial resolution.
Map	Displays a menu of color map options. Each color map is assigning different color hues for different velocities.
Power	Controls the amount of acoustic power applied in all modes. Acoustic power cannot be set above the amount permitted by the FDA. The Thermal index (TI) and the Mechanical index (MI) are displayed on the screen.

Other TVI Mode Controls

Table 7-30: Other TVI Mode Controls

Parameter	Description
Gain	Adjusted by the knob below the TGC on the control panel. When rotated clockwise, increases the overall gain applied to the received echo signals equally for all depth.
TGC	Compensates for depth-related attenuation in an image. The sliders nearest the operator affect the far field. TGC amplifies returning signals to compensate for the attenuation caused by tissue at increasing depths.
Depth	Adjusting the depth will influence diagram frame rate and resolution. Decreasing the depth may allow for higher frame rate and lower resolution. Increasing the depth will increase image resolution and decrease frame rate.
1/2/4	Enables multiple image display windows in which two or four images can be viewed simultaneously.
Alt	Display more Main menu controls.

Using TVI Mode

STEP 1 While in Color Mode select **TVI** on the Main menu

STEP 2 Use the trackball to position the Color ROI over the area to be examined.

STEP 3 Rolling the trackball to adjust the position of the Color ROI.

STEP 4 To adjust the Color ROI size, press **Set** key on the control panel and use the trackball.

To enlarge or narrow the Color ROI, roll the Trackball to the left or right.

To lengthen or shorten the Color ROI, roll the Trackball up or down

STEP 5 Press **Set** key on the control panel when the desired size is obtained. Reposition the Color ROI as needed.

STEP 6 Press **Freeze** key on the control panel to stop imaging.

STEP 7 To quit TVI Mode, please press **CFM** or **2D** key on the control panel or select **TVI** in the Main Menu.

Optimizing TVI Mode

Preset generally gives optimal performance with minimal adjustment. If necessary, the following controls can be used to further optimize the TVI Mode display:

- Select **Gain** to adjust gain in the color flow area.

- Set **Scale** to the highest setting that provides adequate flow detection.

- Select **LVRej** to remove low velocity blood flow and tissue movement to improve image quality.

- Select **Freq**. to optimize the color flow display. Higher settings improve resolution. Lower settings improve depth penetration and sensitivity.

- Select **Power** to obtain an acceptable image using the lowest setting possible.

Adjust the following settings to further optimize image display:

- Use **Priority** to emphasize either the color flow overlay, or the detail of the underlying gray scale tissue.

- Use **Persist** to enhance the sensitivity of the signal's correlation in the time domain.

- Use **Radial Avg**. and **Lateral Avg**. to reduce noise in the color flow area.

7.4.11   *Strain Rate Imaging Mode*

Strain Rate Imaging Mode Overview

Strain Rate Imaging Mode (SRI for short) allows the observation of the speed and characteristics of tissue shift.
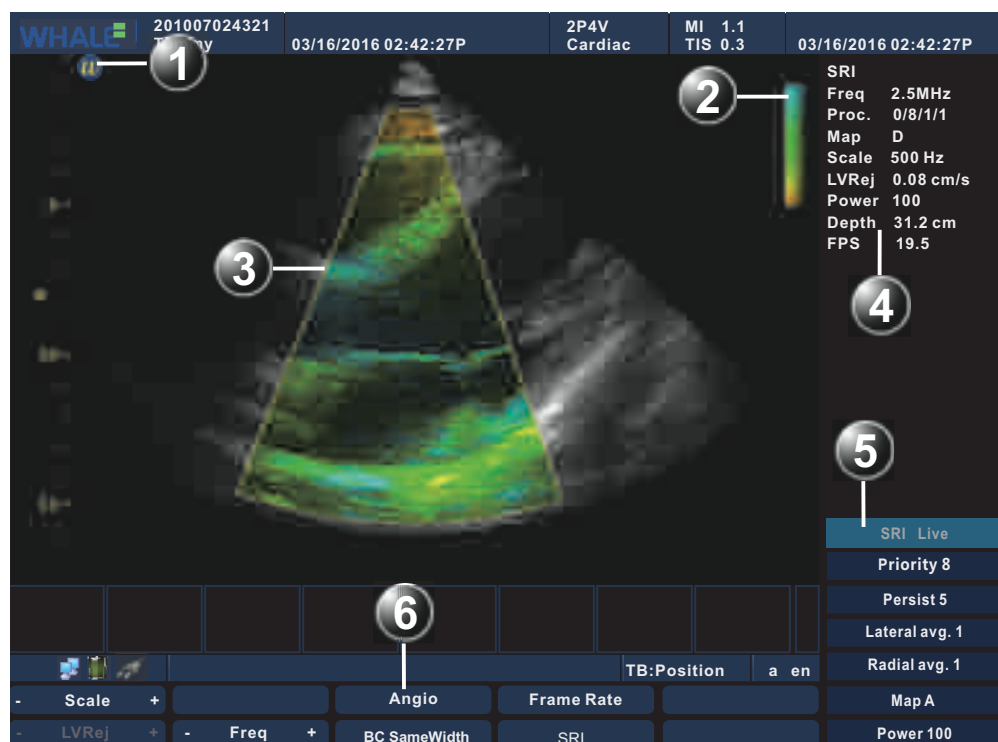
Figure 7-32: SRI Mode Screen

1	Probe orientation marker	2	Color bar
3	Color ROI	4	SRI Mode parameters window
5	SRI Mode Soft menu	6	SRI Mode Main menu

SRI Mode Main Menu Controls

Table 7-31: SRI Mode Main Menu Controls

Parameter	Description
Scale	Adjusts the repetition rate of the Doppler pluses transmitted when acquiring data for color flow mapping. The Scale (Nyquist limit) should be adjusted so that no aliasing occurs, while still having good resolution of velocities. The Nyquist limit should be somewhat above the maximum velocity found in the data.
LVRej	LVR, also called Wall motion filter, adjusts the extent of low velocity removal.
Freq.	Adjusts the transmission frequency to control the sensitivity and the level of penetration. The selected frequency is displayed in the status window. Adjusting Frequency may affect Sample Volume and LVRej settings.
Angio	Switch to Power Mode
SRI	Switch to the 2D Mode.
Frame Rate	Adjusts the Frame Rate.
BC SameWidth	Adjusts the BC SameWidth setting so that the image width of 2D Mode is the same as that of SRI Mode.

SRI Mode Soft Menu Controls

Table 7-32: SRI Mode Soft Menu Controls

Parameter	Description
Priority	prioritize colors in the Color mode.
Persist	Improve the sensitivity of the signal in time domain.
Lateral avg.	Smooths the image by averaging collected horizontal data. Increasing lateral averaging will reduce noise, but may also reduce lateral resolution.
Radial avg.	Smooths the image by averaging collected radial data. Increasing radial averaging will reduce noise, but may also reduce radial resolution.
Map	Displays a menu of color map options. Each color map is assigning different color hues for different velocities.
Power	Controls the amount of acoustic power applied in all modes. Acoustic power cannot be set above the amount permitted by the FDA. The Thermal index (TI) and the Mechanical index (MI) are displayed on the screen.

Other SRI Mode Controls

Table 7-33: Other SRI Mode Controls

Parameter	Description
Gain	Adjusted by the knob below the TGC on the control panel. When rotated clockwise, increases the overall gain applied to the received echo signals equally for all depth.
TGC	Compensates for depth-related attenuation in an image. The sliders nearest the operator affect the far field. TGC amplifies returning signals to compensate for the attenuation caused by tissue at increasing depths.
Depth	Adjusting the depth will influence diagram frame rate and resolution. Decreasing the depth may allow for higher frame rate and lower resolution. Increasing the depth will increase image resolution and decrease frame rate.
1/2/4	Enables multiple image display windows in which two or four images can be viewed simultaneously.
Alt	Display more Main menu controls.

Using SRI Mode

STEP 1   While in 2D Mode select **SRI** on the Main menu

STEP 2   Use the trackball to position the Color ROI over the area to be examined.

STEP 3   Rolling the trackball to adjust the position of the Color ROI.

STEP 4   To adjust Color ROI size, press **Set** key on the control panel and use the trackball.

 To enlarge or narrow the Color ROI, roll the trackball to the left or right.

 To lengthen or shorten the Color ROI, roll the trackball up or down

STEP 5   Press **Set** key on the control panel when the desired size is obtained. Reposition the Color ROI as needed.

STEP 6   Press **Freeze** key on the control panel to stop imaging.

STEP 7   To quit SRI Mode, please press **CFM** or **2D** key on the control panel or select **SRI** on the Main Menu.

Optimizing SRI Mode

Preset generally gives optimal performance with minimal adjustment. If necessary, the following controls can be used to further optimize the SRI Mode display:

- Select **Gain** to gain in the color flow area.

- Set **Scale** to the highest setting that provides adequate flow detection.

- Select **LVRej** to remove low velocity blood flow and tissue movement to improve image quality.

- Select **Freq**. to optimize the color flow display. Higher settings improve resolution. Lower settings improve depth penetration and sensitivity.

- Select **Power** to obtain an acceptable image while using the lowest setting possible.

7.4.12   Dual Live Mode

Dual Live Mode Overview
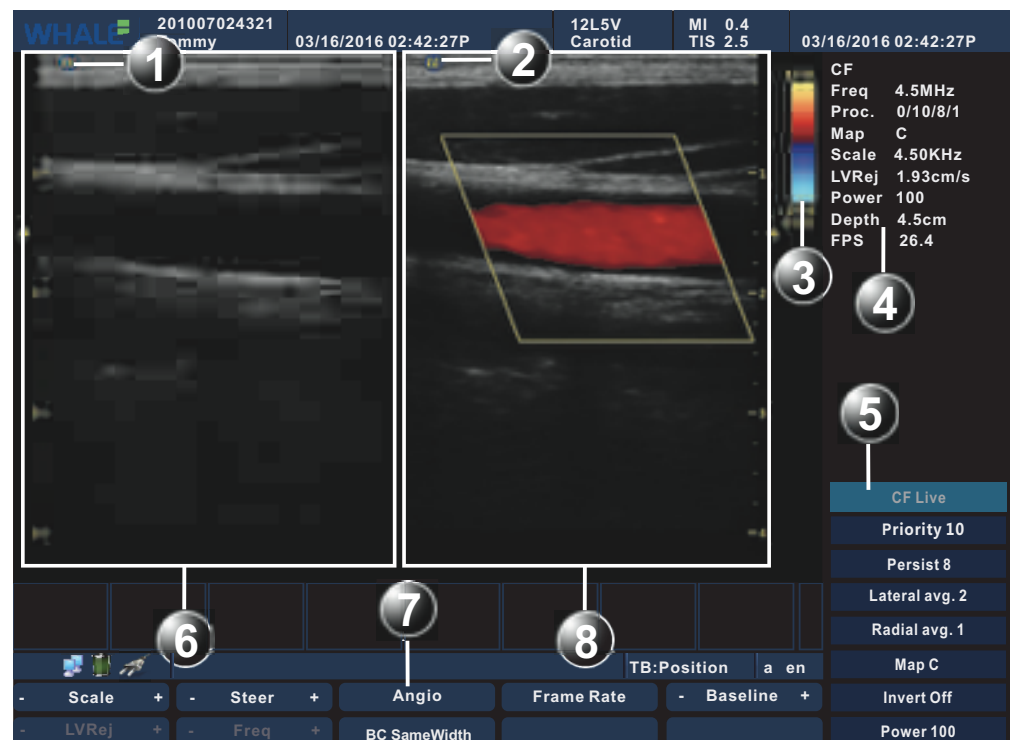
Figure 7-33: The Dual Live Mode Screen

1	Window 1 active marker	2	Window 2 active marker
3	Active window 2 color bar	4	Active window 2 parameter area
5	Active window 2 Soft menu	6	Active window 1 (Gray image)
7	Active window 2 Main menu	8	Active window 2 (Color image)

The Dual Live mode allows for multiple display windows to be viewed simultaneously. Two windows are shown by default. The left is gray scale image and the right is color image. Two images both active, and all the adjustable controls belong to the color image.

The Main Menu Controls of The Dual Live Mode

Determine the current imaging mode being one of Color, Power, DPDI, EI, TVI or SRI mode. The Main menu controls refer to the corresponding mode (Color Mode/Power Mode/DPDI Mode/EI Mode/TVI Mode/SRI Mode).

The Soft Menu Controls of The Dual Live Mode

Determine the current imaging mode being one of Color, Power, DPDI, EI, TVI or SRI mode. The Soft menu controls refer to the corresponding mode (Color Mode/Power Mode/DPDI Mode/EI Mode/TVI Mode/SRI Mode).

Other Controls of The Dual Live Mode

Determine the current imaging mode being one of Color, Power, DPDI, EI, TVI or SRI mode. The following controls are responsible for the regulating the corresponding mode.

Table 7-34: Other Controls of The Dual Live Mode

Parameter	Description
Gain	Adjusted by the knob below the TGC on the control panel. When rotated clockwise, increases the overall gain applied to the received echo signals equally for all depth.
TGC	Compensates for depth-related attenuation in an image. The sliders nearest the operator affect the far field. TGC amplifies returning signals to compensate for the attenuation caused by tissue at increasing depths.
Depth	Adjusting the depth will influence diagram frame rate and resolution. Decreasing the depth may allow for higher frame rate and lower resolution. Increasing the depth will increase image resolution and decrease frame rate.
1/2/4	Enables multiple image display windows in which two or four images can be viewed simultaneously.
Alt	Display more Main menu controls: Simultaneous, TVI (phased array probe), Angio, EI (linear array probe and convex array probe), SRI (phased array probe).

Using The Dual Live Mode

In Color/Power/EI/TVI/SRI mode, press **Alt** key on the control panel.

STEP 1 In Color/Power/EI/DPDI/TVI/SRI mode, press **Alt** key on the control panel to display more main menu control.

STEP 2 Select **Dual Live** to access the Dual Live mode.

Optimizing The Dual Live Mode

Determine the current imaging mode being one of Color, Power, DPDI, EI, TVI or SRI mode. The optimization refers to the corresponding mode (Color Mode/Power Mode/DPDI Mode/EI Mode/TVI Mode/SRI Mode).

7.4.13   PW Mode

PW Mode Overview

PW Mode allows the observation of the speed and characteristics of blood flow in the way of pulse wave Doppler single samples.
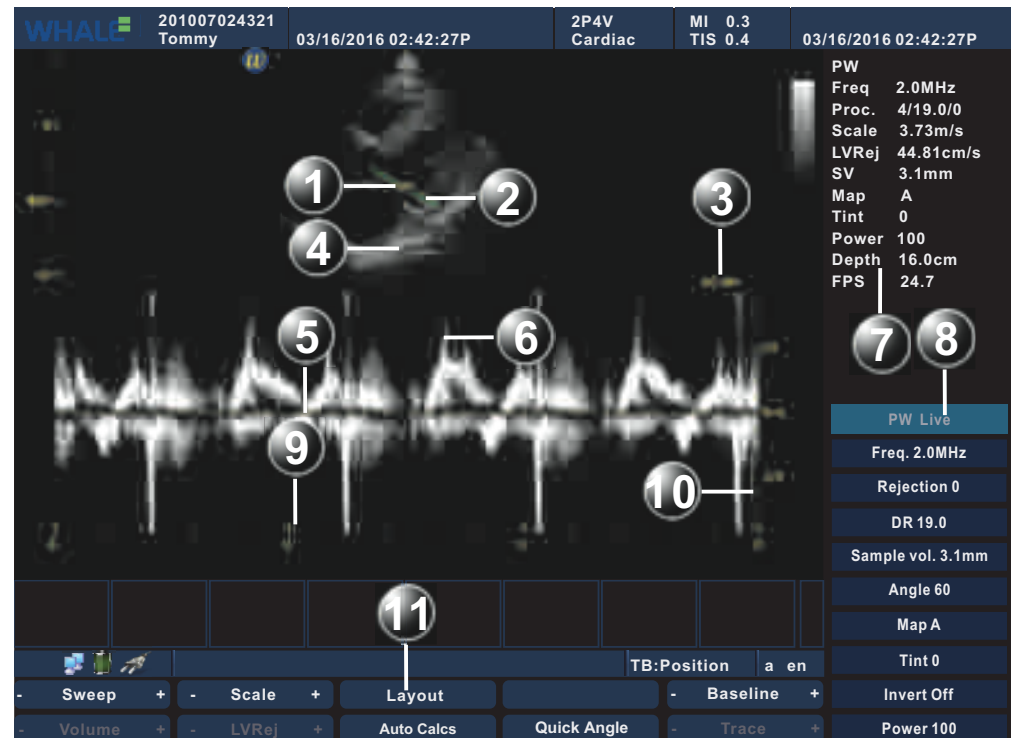
Figure 7-34: PW Mode Screen

1	*Sample Volume*	*2*	*Angle correction marker*
3	*Angle Value*	*4*	*PW cursor line*
5	*Doppler baseline*	*6*	*Frequency scale*
7	*PW Mode parameters window*	*8*	*PW Mode Soft menu*
9	*Time scale*	*10*	*Velocity scale*
11	*PW Mode Main menu*		

PW Mode Main Menu Controls

Table 7-35: PW Mode Main Menu Controls

Parameter	Description
Sweep	Adjusts the horizontal refresh rate of the Doppler area of the display. The selected sweep is correspondingly displayed in the time scale.
Volume	Regulates PW sound spectrum. When normal noise is low, the sound spectrum is more obvious. When PRF value is low, the noise is relatively low. When PRF value is high, the noise is brighter.

Table 7-35: PW Mode Main Menu Controls

Parameter	Description
Scale	Enables the low velocity portions of the spectrum to be filtered, since the Doppler spectrum and audio may contain strong wall-motion signals. The scale value may affect FPS and LVRej. The selected scale is displayed in the status window.
LVRej	Insulates the Doppler signal from excessive noise from vessel movement.
Layout	Toggles the display arrangement to define relative dimensions of the 2D area, PW-mode area, and their position which is top/bottom, side to side and Full PW. Layout is available in live and Freeze.
Auto Calcs	Calculates the relevant measurements of one heart cycle automatically.
Steer	Controls the angle of the PW cursor line (only available for the linear array probe).
Quick Angle	Corrects the Doppler velocity scale by defining the angle between the Doppler beam and investigated blood vessel or blood flow. A thin cross bar on the Doppler cursor will rotate as the control is adjusted. Quick angle adjusts the angle by 60 degrees.
Baseline	Adjusts the baseline to accommodate faster or slower blood flows to eliminate aliasing.
Trace	Traces maximum or average trajectory of the spectrum

PW Mode Soft Menu Controls

Table 7-36: PW Mode Soft Controls

Parameter	Description
Freq.	Adjust Doppler transmission frequency to control sensitivity and penetration. Adjusting Freq. may affect Scale and LVRej settings. The selected Freq. is displayed in the status window.
Rejection	Removes the undesirable background noise from the Doppler spectrum, resulting in a darker background. Rejection is available in Live and Freeze.
DR	Enables control of the dynamic range or contrast of the image. When dynamic range is set high, the image is softer and more low-level data is visible.
Sample vol.	Sets the longitudinal size of the region to be sampled for measurement.
Angle	Estimates the flow velocity in a direction at an angle to the Doppler vector by computing the angle between the Doppler vector and flow to be measured.
Map	Display different Doppler colorization maps. Map is available in Live and Freeze.

Table 7-36: PW Mode Soft Controls

Parameter	Description
Tint	Adjusts Doppler spectrum tint. Tint is available in live and Freeze.
Invert	Enables the Doppler spectrum to be flipped 180 degrees, so that negative velocities are displayed above the baseline and positive velocities below the baseline.
Power	Controls the amount of acoustic power applied in all modes. When power is set to maximum acoustic power permitted by the FDA. The Thermal index (TI) and the Mechanical index (MI) are displayed on the screen.

Other PW Mode Controls

Table 7-37: Other PW Mode Controls

Parameter	Description
Gain	Turn the gain knob to adjust the overall brightness of the image. Turn clockwise to make the image brighter, and turn counterclockwise to make darker.
TGC	(only available in 2D image activation) Use the TGC control sliders to adjust the brightness at the different depth. Move the slider left to decrease the brightness at the corresponding depth; Move the slider right to increase the brightness at the corresponding depth.
Depth	(only available in 2D image activation) Flip the Depth knob to adjust the range of scan depth. Flip the downwards to make the range of view larger; and flip the upwards to make the range of view smaller.
Update/Menu	Toggles between 2D imaging and live time-motion imaging.
Alt	Display more Main menu controls: AMM, TVI (phased array probe), TDI (phased array probe), EI (linear array probe and the convex array probe), SRI (phased array probe).

Using PW Mode

- Start PW mode

    STEP 1 Press **Cursor** key on the control panel, a cursor line is displayed on the 2D image.

    STEP 2 Use the trackball to position the Doppler cursor line and the sample volume location over the area of interest.

    STEP 3 Press **PW** key on the control panel, a scanning screen is displayed with a Doppler cursor on the 2D mode image and a Doppler spectrum in the lower part of the screen.

- Stop imaging by pressing **Freeze** key on the control panel.

- Optimize the image by adjusting the image controls describe in the previous section.

- In PW mode, user can start CW/TVD mode by pressing **CW** key or selecting **TDI** parameter of the Main menu.

Optimizing PW Doppler Mode

Preset generally gives optimal performance with minimal adjustment. If necessary, the following controls can be used to further optimize the PW mode display:

- Select **Gain** to gain in the spectral Doppler area.

- Select **LVRej** to reduce unwanted low velocity blood flow and tissue movement.

- Select **Sample vol**. to low setting for better resolution, or higher setting to more easily locate the disturbed flows.

- Select **Freq**. to optimize flow display. Higher setting will improve resolution and the lower setting will increase the depth penetration.

- Select **Power** to obtain an acceptable image while using the lowest setting possible. The Doppler Power setting affects only Doppler operating modes.

> ⚠️
> **CAUTION**
> *Use all noise reduction controls with care. Excessive application may obscure low level diagnostic information.*

- Use **Sweep** to optimize the sweep speed.

- Use **Invert** to reverse the vertical component of the spectral Doppler area of the display.

- Use **Angle** to steer the ultrasound beam to the blood flow to be measured.

7.4.14   CW Mode

CW Mode Overview

CW Mode allows observation of the highest speed and characteristics of blood flow using continuous wave Doppler signal.

Figure 7-35: CW Mode Screen

1	Angle correction marker	2	Sample Volume
3	CW cursor line	4	Invert marker
5	Angle Value	6	Doppler baseline
7	Time scale	8	Frequency scale
9	CW Mode parameters window	10	CW Mode Soft menu
11	Velocity scale	12	CW Mode Main menu

CW Mode Main Menu Controls

Table 7-38: CW Mode Main Menu Controls

Parameter	Description
Sweep	Adjusts the horizontal refresh rate of the Doppler area of the display. The selected sweep is correspondingly displayed in the time scale.
Volume	Regulates PW sound spectrum. When normal noise is low, the sound spectrum is more obvious. When PRF value is low, the noise is relatively low. When PRF value is high, the noise is brighter.

Table 7-38: CW Mode Main Menu Controls

Parameter	Description
Scale	Enables the low velocity portions of the spectrum to be filtered, since the Doppler spectrum and audio may contain strong wall-motion signals. The scale value may affect FPS and LVRej. The selected scale is displayed in the status window.
LVRej	Insulates the Doppler signal from excessive noise from vessel movement.
Layout	Toggles the display arrangement to define relative dimensions of the 2D area, CW-mode area, and their position which is top/bottom, side to side and Full PW. Layout is available in live and Freeze.
Auto Calcs	Calculates the relevant measurements of one heart cycle automatically.
Quick Angle	Corrects the Doppler velocity scale by defining the angle between the Doppler beam and investigated blood vessel or blood flow. A thin cross bar on the Doppler cursor will rotate as the control is adjusted. Quick angle adjusts the angle by 60 degrees.
Baseline	Adjusts the baseline to accommodate faster or slower blood flows to eliminate aliasing.
Trace	Traces maximum or average trajectory of the spectrum

CW Mode Soft Menu Controls

Table 7-39: CW Mode Soft Menu Controls

Parameter	Description
Freq.	Adjust Doppler transmission frequency to control sensitivity and penetration. Adjusting Freq. may affect Scale and LVRej settings. The selected Freq. is displayed in the status window.
Rejection	Removes the undesirable background noise from the Doppler spectrum, resulting in a darker background. Rejection is available in Live and Freeze.
DR	Enables control of the dynamic range or contrast of the image. When dynamic range is set high, the image is softer and more low-level data is visible.
Angle	Estimates the flow velocity in a direction at an angle to the Doppler vector by computing the angle between the Doppler vector and flow to be measured.
Map	Display different Doppler colorization maps. Map is available in Live and Freeze.
Tint	Adjusts Doppler spectrum tint. Tint is available in live and Freeze.

Table 7-39: CW Mode Soft Menu Controls

Parameter	Description
Invert	Enables the Doppler spectrum to be flipped 180 degrees, so that negative velocities are displayed above the base-line and positive velocities below the baseline.
Power	Controls the amount of acoustic power applied in all modes. When power is set to maximum acoustic power permitted by the FDA. The Thermal index (TI) and the Mechanical index (MI) are displayed on the screen.

Other CW Mode Controls

Table 7-40: Other CW Mode Controls

Parameter	Description
Gain	Turn the gain knob to adjust the overall brightness of the image. Turn clockwise to make the image brighter, and turn counterclockwise to make darker.
TGC	(only available in 2D image activation) Use the TGC control sliders to adjust the brightness at the different depth. Move the slider left to decrease the brightness at the corresponding depth; Move the slider right to increase the brightness at the corresponding depth.
Depth	(only available in 2D image activation) Flip the Depth knob to adjust the range of scan depth. Flip the downwards to make the range of view larger; and flip the upwards to make the range of view smaller.
Update/Menu	Toggles between 2D imaging and live time-motion imaging.
Alt	Display more Main menu controls: AMM, TDI (phased array probe).

Using CW Mode

- Start CW mode

    STEP 1 Press **Cursor** key on the control panel, a cursor line is displayed on the 2D image.

    STEP 2 Use the trackball to position the Doppler cursor line and the sample volume location over the area of interest.

    STEP 3 Press **CW** key on the control panel, a scanning screen is displayed with a Doppler cursor on the 2D mode image and a Doppler spectrum in the lower part of the screen.

- Stop imaging by pressing **Freeze** key on the control panel.

- Optimize the image by adjusting the image controls describe in the previous section.

- In CW mode, user can start PW/TVD mode by pressing **PW** key or selecting **TDI** parameter of the Main menu.

Optimizing CW Doppler Mode

Preset generally gives optimal performance with minimal adjustment. If necessary, the following controls can be used to further optimize the CW mode display:

- Select **Gain** to adjust gain in the spectral Doppler area.
- Set **LVRej** to reduce unwanted low velocity blood flow and tissue movement.
- Select **Freq.** to optimize flow display. Higher setting will improve resolution and the lower setting will increase the depth penetration.
- Select **Power** to obtain an acceptable image while using the lowest setting possible. The Doppler Power setting affects only Doppler operating modes.

> ⚠️
> **CAUTION**
> *Use all noise reduction controls with care. Excessive application may obscure low level diagnostic information.*

- Use the **Sweep** to optimize the sweep speed.
- Use **Invert** to reverse the vertical component of the spectral Doppler area of the display.
- Use **Angle** to steer the ultrasound beam to the blood flow to be measured.

7.4.15   TVD Mode

TVD Mode Overview

TVD Mode allows for observations on the speed and characteristics of tissue using pulse waved based tissue Doppler signal.
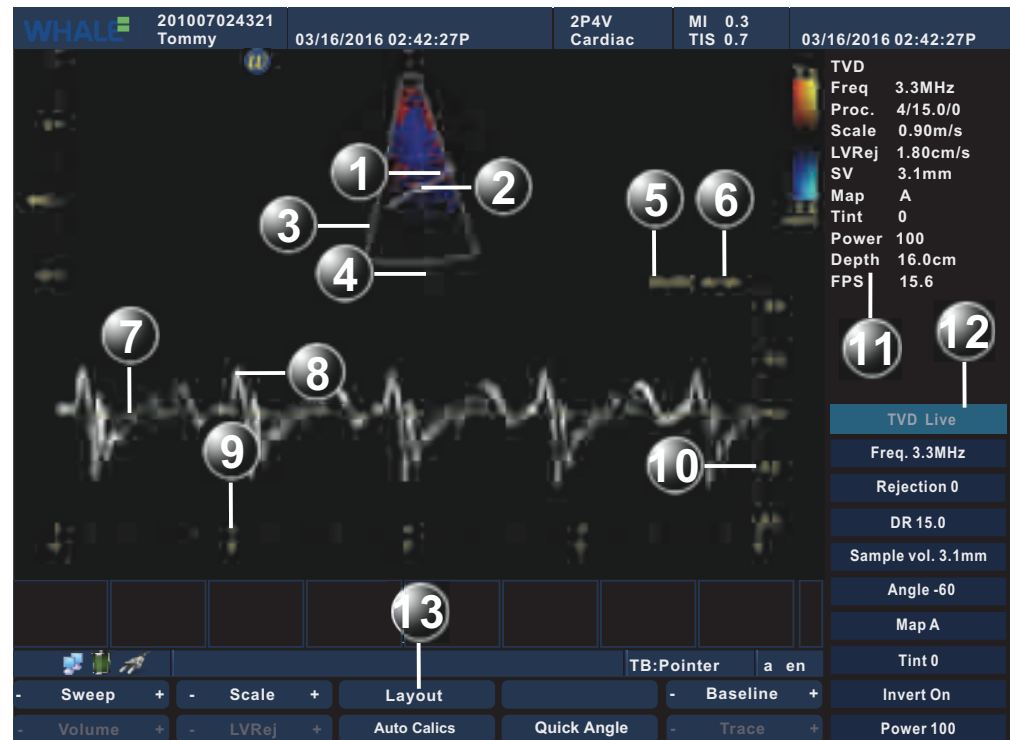
Figure 7-36: TVD Mode Screen

1	Angle correction marker	2	Sample Volume
3	Color ROI	4	TVD cursor line
5	Invert marker	6	Angle Value
7	Doppler baseline	8	Frequency scale
9	Time scale	10	Velocity scale
11	TVD Mode parameters window	12	TVD Mode Soft menu
13	TVD Mode Main menu		

TVD Mode Main Menu Controls

Table 7-41: TVD Mode Main Menu Controls

Parameter	Description
Sweep	Adjusts the horizontal refresh rate of the Doppler area of the display. The selected sweep is corresponding displayed in the time scale.
Volume	TVD spectrum sound regulation. Normal voice noise is low; The voice of the spectrum is more obvious. When PRF value is low, the noise sound is relatively low, high PRF, noise sound brighter;

Table 7-41: TVD Mode Main Menu Controls

Parameter	Description
Scale	Enables the low velocity portions of the spectrum to be filtered, since the Doppler spectrum and audio may contain strong wall-motion signals. The scale value may affect FPS and LVRej. The selected scale is displayed in the status window.
LVRej	Insulates the Doppler signal from excessive noise caused from vessel movement.
Layout	Toggles the display arrangement to define relative dimensions of the 2D area, TVD mode area, and their position which is top/bottom, side to side and Full PW. Layout is available in live and Freeze.
Auto Calcs	Calculates the relevant measurement of one heart cycle automatically.
Quick Angle	Enables correction of the Doppler velocity scale by defining the angle between the Doppler beam and investigated blood vessel or blood flow. A thin cross bar on the Doppler cursor will rotate as the control is adjusted. Quick angle adjusts the angle by 60 degrees.
Baseline	Adjusts the baseline to accommodate faster or slower blood flows to eliminate aliasing.
Trace	Tracings maximum or average trajectory of the spectrum

TVD Mode Soft Menu Controls

Table 7-42: TVD Mode Soft Menu Controls

Parameter	Description
Freq.	Adjusts the transmission frequency in Doppler to control sensitivity or level of penetration. Adjusting Freq. may affect Scale and LVRej settings. The selected Freq. is displayed in the status window.
Rejection	Enables undesirable background noise to be removed from the Doppler spectrum resulting in a darker background. Rejection is available in Live and Freeze.
DR	Enables control of the dynamic range or contrast of the image. When dynamic range is set high, the image is softer and more low-level data is visible.
Sample vol.	Sets the longitudinal size of the region to be sampled for measurement.
Angle	Estimates the flow velocity in a direction at an angle to the Doppler vector by computing the angle between the Doppler vector and flow to be measured.
Map	Display different Doppler colorization maps. Map is available in Live and Freeze.
Tint	Controls the adjustment of Doppler spectrum tint. Tint is available in live and Freeze.

Table 7-42: TVD Mode Soft Menu Controls

Parameter	Description
Invert	Enables the Doppler spectrum to be flipped 180 degrees, so that negative velocities are displayed above the baseline and positive velocities below the baseline.
Power	Controls the amount of acoustic power applied in all modes. When power is set to maximum acoustic power permitted by the FDA. The Thermal index (TI) and the Mechanical index (MI) are displayed on the screen.

Other TVD Mode Controls

Table 7-43: Other TVD Mode Controls

Parameter	Description
Gain	Turn the gain knob to adjust the overall brightness of the image. Turn clockwise to make the image brighter, and turn counterclockwise to make darker.
TGC	(only available in 2D image activation) Use the TGC control sliders to adjust the brightness at the different depth. Move the slider left to decrease the brightness at the corresponding depth; Move the slider right to increase the brightness at the corresponding depth.
Depth	(only available in 2D image activation) Flip the Depth knob to adjust the range of scan depth. Flip the downwards to make the range of view larger; and flip the upwards to make the range of view smaller.
Update/Menu	Toggles between 2D imaging and live time-motion imaging.
Alt	Display more Main menu controls: AMM, TVI (phased array probe), TDI (phased array probe).

Using TVD Mode

- Start TVD mode

    STEP 1 Press **Cursor** key on the control panel, a scanning screen with a Doppler cursor on the 2D image will appear.

    STEP 2 Use the trackball to position the Doppler cursor line and the sample volume location over the area of interest.

    STEP 3 Press **Alt** key on the control panel, and select **TDI** parameter on the main menu. A scanning screen is displayed with a Doppler cursor on the 2D mode image and a Doppler spectrum in the lower part of the screen.

- Stop imaging by pressing **Freeze** key on the control panel.

- Optimize the image by adjusting the image controls describe in the previous section.

- In TVD mode, user can start PW/CW mode by pressing **PW/CW** key.

Optimizing TVD Doppler Mode

Preset generally gives optimal performance with minimum adjustment. If necessary, the following controls can be adjusted to further optimize the TVD mode display:

- Select **Gain** to set the gain in the spectral Doppler area.

- Select **LVRej** to reduce unwanted low velocity blood flow and tissue movement.

- Select **Sample vol.** to low setting for better resolution, or higher setting to more easily locate the disturbed flows.

- Select **Freq**. to optimize flow display. Higher setting will improve resolution and the lower setting will increase the depth penetration.

- Select **Power** to obtain an acceptable image while using the lowest setting possible. The Doppler Power setting affects only Doppler operating modes.

> ⚠️
> **CAUTION**
> *Use all noise reduction controls with care. Excessive application may obscure low level diagnostic information.*

- Use the **Sweep** to optimize the sweep speed.
- Use **Invert** to reverse the vertical component of the spectral Doppler area of the display.
- Use **Angle** to steer the ultrasound beam to the blood flow to be measured.

7.4.16   The Split Screen

The Split Screen Overview
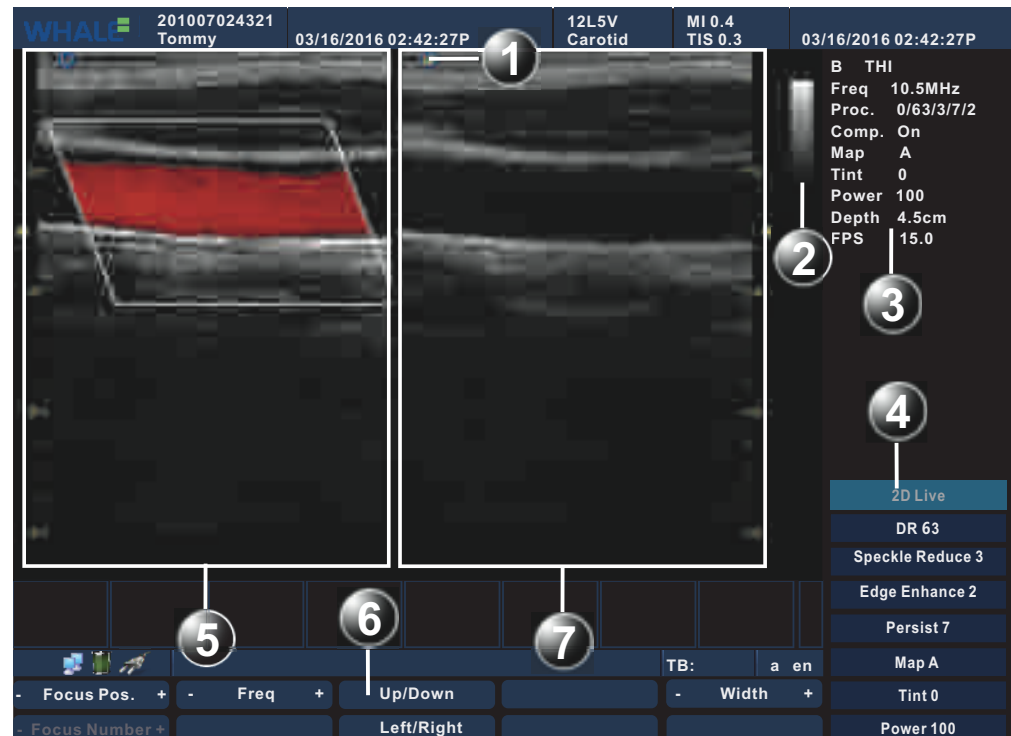
Figure 7-37: The Split Screen

1	Active window marker	2	Gray bar of the active window
3	Parameter window of the active window	4	Soft menu of the active window
5	Inactive window	6	Main menu of the active menu
7	Active window		

The Split Screen allows for multiple display windows to be viewed simultaneously. Two windows are shown by default. The images are either gray scale image or color image, and only one image is active. All the adjustable controls belong to the current activated image.

The Main Menu Controls on The Split Screen

Determine the current imaging mode being one of 2D or Color mode. The Main menu controls refer to the corresponding mode (2D Mode/Color Mode/Power Mode/DPDI Mode/TVI Mode/EI Mode/SRI Mode).

The Soft Menu Controls on The Split Screen

Determine the current imaging mode being one of 2D or Color mode. The Soft menu controls refer to the corresponding mode (2D Mode/Color Mode/Power Mode/DPDI Mode/TVI Mode/EI Mode/SRI Mode).

Other Controls on The Split Screen

Determine the current imaging mode being one of 2D or Color mode. The following controls are responsible for the regulating the corresponding mode.

Table 7-44: Other Controls on The Split Screen

Parameter	Description
Gain	Turn the gain knob to adjust the overall brightness of the image. Turn clockwise to make the image brighter, and turn counterclockwise to make darker.
TGC	Use the TGC control sliders to adjust the brightness at the different depth. Move the slider left to decrease the brightness at the corresponding depth; Move the slider right to increase the brightness at the corresponding depth.
Depth	Flip the Depth knob to adjust the range of scan depth. Flip the downwards to make the range of view larger; and flip the upwards to make the range of view smaller.
1/2/4	Enables multiple image display windows in which four images can be viewed simultaneously.
Update/Menu	Switches the active window.
Alt	Display more Main menu controls: DisFormatTwoB, TVI (phased array probe), EI (linear array probe and convex array probe), SRI (phased array probe).

Using The Split Screen

In 2D/Color/Power/DPDI/TVI//EI /SRI mode, press **1/2/4** key on the control panel to activate the Split Screen. Press **Update/Menu** key on the control panel to switch the active window.

Optimizing The Split Screen

Determine the current imaging mode being one of 2D or Color mode. The optimization refers to the corresponding mode (2D Mode/Color Mode/Power Mode/DPDI Mode/TVI Mode/EI Mode/SRI Mode).

7.4.17   The Quad Screen

The Quad Screen Overview
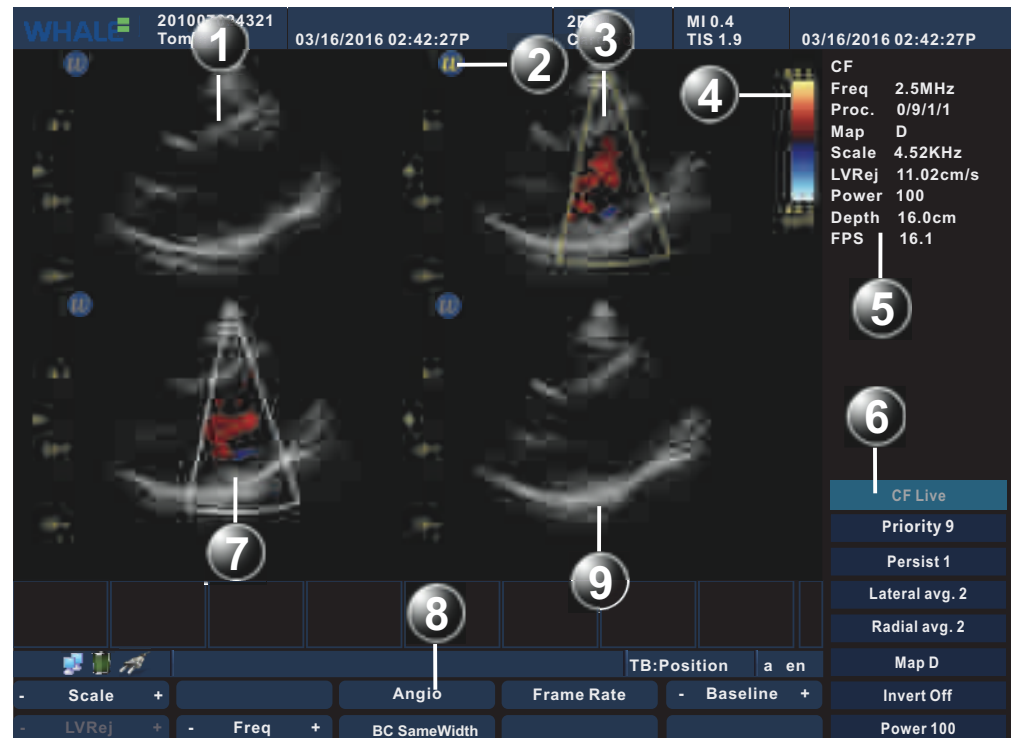
Figure 7-38: The Quad Screen

1	Inactive window(1)	2	Active window marker
3	Active window	4	Color bar of the active window
5	Parameter window of the active window	6	Soft menu of the active window
7	Inactive window(2)	8	Main menu of the active window
9	inactive window(3)		

The Quad Screen allows for multiple display windows to be viewed simultaneously. Four windows are shown by default. The images are either gray scale image or color image, and only one image is active. All the adjustable controls belong to the current activated image.

The Quad Screen Main Menu Controls

Determine the current imaging mode being one of 2D or Color mode. The Main menu controls refer to the corresponding mode (2D Mode/Color Mode/Power Mode/DPDI Mode/TVI Mode/EI Mode/SRI Mode).

The Quad Screen Soft Menu Controls

Determine the current imaging mode being one of 2D or Color mode. The Soft menu controls refer to the corresponding mode (2D Mode/Color Mode/Power Mode/DPDI Mode/TVI Mode/EI Mode/SRI Mode).

The Quad Screen Other Controls

Determine the current imaging mode being one of 2D or Color mode. The following controls are responsible for the regulating the corresponding mode.

Table 7-45: The Quad Screen Other Controls

Parameter	Description
Gain	Turn the gain knob to adjust the overall brightness of the image. Turn clockwise to make the image brighter, and turn counterclockwise to make darker.
TGC	Use the TGC control sliders to adjust the brightness at the different depth. Move the slider left to decrease the brightness at the corresponding depth; Move the slider right to increase the brightness at the corresponding depth.
Depth	Flip the Depth knob to adjust the range of scan depth. Flip the downwards to make the range of view larger; and flip the upwards to make the range of view smaller.
1/2/4	Enables multiple image display windows in which four images can be viewed simultaneously.
Update/Menu	Switches the active window.
Alt	Display more Main menu controls: TVI (the phased array probe has only), EI (the linear array probe and the convex array probe have), SRI (the phased array probe has only).

Using The Quad Screen

In the Split Screen, press **1/2/4** key on the control panel to activate the Quad Screen. Press **Update/Menu** key on the control panel to switch the active window.

Optimizing The Quad Screen

Determine the current imaging mode being one of 2D or Color mode. The optimization refers to the corresponding mode (2D Mode/Color Mode/Power Mode/DPDI Mode/TVI Mode/EI Mode/SRI Mode).

7.5   Cine Loop

Cine loop is an important part of the ultrasound. Cine loop is available for all imaging modes. It's also helpful towards doctor's review: select the appropriate image, print reports, and other important clinical operations. Cine loop consists of freeze playback, single- frame file playback and multi-frame file playback.

7.5.1   *Cine Storage Buffer*

You can view all the images stored in the cine buffer. When cine storage buffer is full, the earliest images will be replaced. The data coverage process is ongoing. Unfreezing system can delete the data stored in the Cine buffer, and restart collecting data.

Performing the following actions will clear the cine storage buffer, and the system starts to collect new data:

- Unfreeze image.
- Change the imaging mode.
- Change the inspection type.
- Shut down the system power supply.
- Create a new patient exam.

The changes of the following system settings will clear the Cine storage buffer:

- Depth
- Focus
- Width

7.5.2   Cine Loop Overview

The cine loop icon and main menu controls are displayed as the following figure:
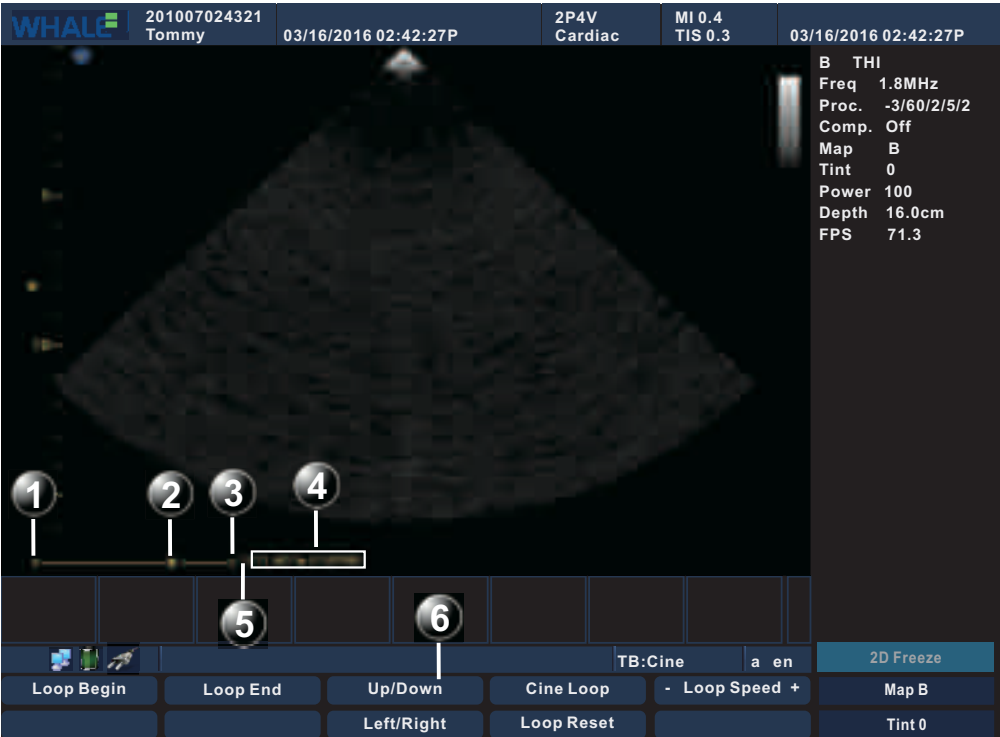
Figure 7-39: Cine Loop Screen

1	Left marker	2	Frame indicator
3	Right marker	4	Frame counter
5	Cineloop speed	6	Cineloop Main menu

7.5.3   Cine Loop Main Menu Controls

Table 7-46: Cine Loop Main Menu Controls

Controls	Description
Loop Begin	Controls the left marker position, used to edit the length of the cine data.
Loop End	Controls the right marker position, used to edit the length of the cine data.
Loop Reset	Resets the left and right marker to their initial position.
Cine Loop	Starts cine loop acquisition.
Loop Speed	Adjusts the speed of the automatic cine loop.

Note: *The end position of the cine data cannot be positioned in front of the starting position.*

7.5.4   Cine Loop Other Controls

The cine loop other controls on the control panel are displayed as the following figure:

Figure 7-40: Cine Loop Other Controls On the Control Panel

Table 7-47: Cine Loop Main Menu Other Controls

Controls	Description
Trackball	When the imaging mode is frozen, trackball to move the frame indicator and review the images.
Store	Stores a single frame file or multiple frame file.

7.5.5   View a cine loop

In real-time imaging, the system will automatically store the current image into the cine buffer. You can freeze the image to view the images stored in the cine storage area.

To view a cine loop frame by frame

STEP 1 Press **Freeze** key on the control panel to start the cine mode.

STEP 2 Use the trackball to scroll through the cine loop frame by frame.

To view a cine loop automatically

STEP 1   Press **Freeze** key on the control panel to start the Cine mode.

STEP 2   Cine icon shows the current total number of frames stored, Frame indicator stays in the last frame. Cine mode main menu appears; you can adjust the playback speed, starting and ending position and so on.

STEP 3   After selecting Cine Loop, Cine automatically playback from the first frame. At the same time **Frame indicator** continuous scrolls, indicating the location of the currently active frame, and the Frame counter will update the active frame number.

STEP 4   Select cine loop again, or scroll the trackball, or press **2D Freeze** key on the control panel will stop the automatic cine playback. And the **Frame indicator** stays on the current frame.

Exit cine loop mode

There are two ways to exit cine loop mode:

* Press **Freeze** key on the control to unfreeze the image, exit cine loop mode and return to the real-time imaging;

* Press the imaging mode keys (B, M, CFM, PW, CW, whether the key is valid or not depending on the imaging before freezing) on the control panel to get into the corresponding mode.

7.5.6   Store and view a cine file

Cine file storage can be divided into single-frame storage and multi-frame storage.

Images and cine-loops that are stored during a current examination are displayed as thumbnails on the clipboard. When an image is stored, all the additional information that is displayed is saved with it.

To store single-frame cine file

STEP 1   Press **Freeze** key on the control panel to start the cine loop mode or open a multi-frame Cine files in the thumbnail area.

STEP 2   Scroll the trackball to select a single image to be stored.

STEP 3   Press **Store** key on the control panel to save a single image.

STEP 4   The image is stored and a thumbnail is displayed on the clipboard. A serial number is assigned to each thumbnail, start from "1" in chronological order.

To view a single-frame cine file

STEP 1   Press **Trackball** key on the control panel to activate the mouse, and navigate the cursor to the single-frame cine file.

STEP 2   Use the **Set** key to double click the single -frame cine file. The image of this single -frame cine file will be displayed.

To store a multi-frame cine file

STEP 1   Enter real-time imaging condition or Cine automatic playback state.

STEP 2   Press **Store** key on the control panel to save the multi-frame image.

STEP 3   The cine loop is stored and a thumbnail is displayed on the clipboard. The "loop" icon on the thumbnail image indicates that the media is a cine. A serial number is assigned for each thumbnail, starting from "1" in chronological order.
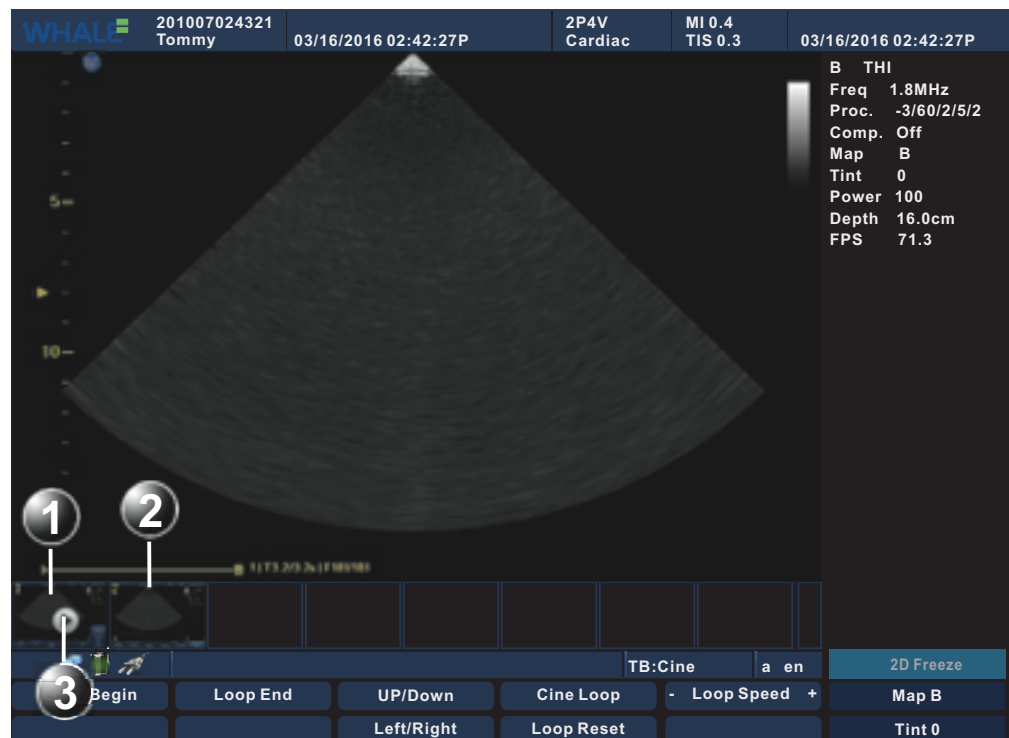

Figure 7-41: Cine File Display

1   *Multiple frame file*
2   *Single frame file*
3   *Loop marker*

To view a multi-frame cine file

STEP 1   Open a multi-frame Cine in the thumbnail area.

STEP 2   Operation will switch to automatic playback state.

STEP 3 You can stop or start automatic playback using the controls in the cine loop menu.

STEP 4 Automatic playback status can be changed to manual single-frame playback by scrolling the trackball.

Exit cine file playback

Press **Freeze** key on the control panel or scan mode key on the control panel to exit the cine file, reload the preset parameters, and return to the 2D real-time mode.

7.6   Zoom

The Portable Ultrasound Diagnostic Scanner supports zoom function. The Display zoom magnifies the image of interested area in live 2D, M-Mode and Doppler modes.

To magnify an image

STEP 1 Press **Zoom** key on the control panel. The magnified image appears in the acquisition window.

STEP 2 Scroll the trackball to put the zoom area over the area of interest.

STEP 3 Press the **Depth** key on the control panel to change the magnification.

STEP 4 To turn off the display zoom, press **Zoom** key again.
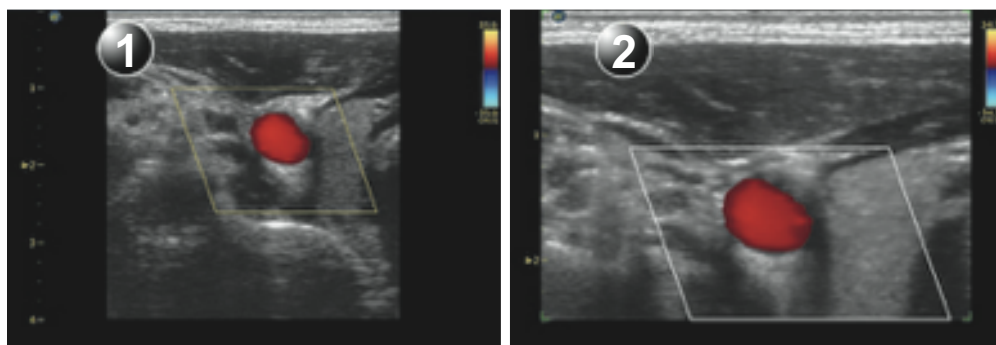

Figure 7-42: Zoom

1   Before zoom   2   After zoom

Note: *Zoom is only available in live.*

7.7   ECG

The physiological module consists of a single connector, which can accept either a set of electrodes cable or an External-ECG cable, capable of handing external ECG signals from other diagnostic ECG devices.

The ultrasound image displayed is synchronized with the ECG curve. In M-Mode or Doppler, the ECG curve is synchronized to that particular mode's sweep.

The operator can control the gain, the position and the sweep rate of the ECG curve using the Main menu keys on the control panel.

7.7.1   ECG Overview

ECG Cable

There are four colored electrode connectors at the end of the ECG cable. Each electrode cable connects to the corresponding viscous electrode through colored clamp connectors.

Table 7-48: The Colored Electrode Connectors

Electrode Connectors	Color
LA (Left Arm)	Black
LL (Left Leg)	Red
RA (Right Arm)	White
RL (Right Leg)	Green

Lead Placement

There are three kinds of lead placement as below:

Table 7-49: ECG Lead Placement

Lead	Combination
I	LA, RA
II	LL, RA
III	LL, LA

Note: *The unit use the DC lead off detection method, this method requires RL must be connected, otherwise the test results are fault.*

Active the ECG function

STEP 1   Connect the ECG cable to the ECG port of the unit.

STEP 2   Paste the electrode plates to the patient's body parts.

STEP 3   Depending on the selected lead placement, connect the colored electrode connectors to the electrode plate on the patient's body parts.

STEP 4   Press **Physio** key on the control panel to active ECG function.

7.7.2 ECG Controls

Press **Physic** key on the control panel to activate physiological ECG controls. The physiological ECG controls are displayed on the Main menu of the scanning screen.

Table 7-50: ECG Controls

Parameter	Description
Horizontal Sweep	Adjusts the refresh rate of the physiological curve. This control is active only in 2D and color modes. The sweep speed of the physiological curve in M-Mode and Doppler is identical to the M-Mode or Doppler horizontal sweep adjusted by the user.
Gain	Enables the user to change the amplitude of the physiological curve displayed on the screen.
Position	Enables the user to move the physiological curve on the screen.
ECG	Turns the ECG curve on and off.
Qrs Visible	Displays the Q wave.

7.7.3 Display the ECG curve

- Cardiac application: the ECG is turned on by default in all cardiac applications.

- Other applications:

    STEP 1 Press **Physic** key on the control panel to get access to the ECG controls.

    STEP 2 Press the assignable **ECG** to display the ECG curve.

7.7.4 Adjust the display of the ECG curve

Adjust the ECG curve sweep speed

STEP 1 Press **Physic** key on the control panel.

STEP 2 Select the assignable button **Horizontal Sweep** to change the sweep speed.

Adjust the ECG curve amplitude

STEP 1 Press **Physic** key on the control panel.

STEP 2   Select the assignable button **Gain** to adjust the amplitude of the ECG curve.

Note: *The ECG signal's amplitude may vary between patients due to different skin moisture and other physiological parameters.*

Adjust the ECG curve position

STEP 1   Press **Physic** key on the control panel.

STEP 2   Adjust the assignable button **Position** to move the ECG curve vertically.

7.8   Measurement

There are two types of measurements and calculations: general measurement and special measurement.

Note: *In order to guarantee the interested area from any miscalculation due to the measurement value in the measuring process, and therefore we adjust the parameters to get the best image quality for measurement.*

Note: *During the measurement of carotid artery, to obtain the accurate Doppler blood flow measurement, we should keep sampling angle at 60 degrees. Reading errors occur more often when the Doppler angle is below or above 60 degrees.*

Note: *If the image is not frozen or the measurement mode is changed in the measuring mode, the measurements and calculations data will disappear from the screen, and the General measurement data will not be saved (Special measurement data will be saved in the worksheet and the report).*

Note: *If the system is suddenly shut down in the measuring process, the measurement data will not be saved.*

Note: *In general, the user can carry out the functions of measurements and calculations in real-time, zoomed or frozen image, but in M mode and PW mode, the measurement function cannot be implemented in the real-time image, for which the image shall be frozen first.*

7.8.1   General Information

In this section, you can get a detailed understanding of parameters and tools that might be used during the measurement.

Figure 7-43: the measurement dialog

    1   *The Result Table*
    2   *The Image Area*
    3   *The Special Measurement Menu*
    4   *The General Measurement Menu*

- The Image Area

  This area displays the image that you want to measure and calipers.

- The Result Table

  This area displays the measurement results.

  Note: *If you want to move the result table to a desired place, drag the table.*

  Note: *The result table displays eight groups at most, otherwise a new group will overwrite the previous one.*

- The Special Measurement Menu

  This menu displays the current exam, measurement items and report.

  Note: *If you want to check more measurement items, click* ▶▶ .

- The General Measurement Menu

  This menu displays general measurement items.

Caliper Types

As a measuring tool, the caliper is used to mark positions of the measurement. According to different measurement methods, you might choose different calipers.

+ + or **✕ ✕**	Measures and calculates Distance, Tracing Length, Area, Angle, Volume, Stenosis Rate, A/B Rate in 2D Mode.
⋯⊹⋯	Measures and calculates Velocity, Resistance Index, Acceleration, Velocity Ratio in PW Mode and Distance, Slope, A/B Ratio in M Mode.

Methods and Units

The default measurement methods are different in different imaging mode. Some general measurements includes more than one methods.

The measurement units are different in different general measurement items.

Users could customize methods and units in the **Config/Diag** dialog (See **Section 7.14 Preset**).

To customize methods or units,

STEP 1 press the Config/Diag key on the control panel, and then click the **Meas/Text** button.
The **Meas/Text** dialog will pop up.

STEP 2 Click the **Meas Property** button, customize the default settings for methods on the **Meas Property** dialog.
If you want to customize units, click the **General Meas** button to set the default unit on the **General Meas** dialog.

7.8.2   General Measurement

The general measurement is to do some measurements in any exams, such as the depth, the distance, the area, and so on.

To do a general measurement,

STEP 1 On the control panel, press **Patient**, and then create or select a patient (See *"Patient Information" (p 96)*).

STEP 2 Press **Application**, and then select a probe that you want to activate from the All Probes menu.

STEP 3 On the Applications menu, select an exam.
If you cannot find the exam that you want to select, add it to the Applications menu by customizing the Applications list on the Applications dialog (See *"Exam" (p 237)*).

STEP 4 Activate an imaging mode (See *"Imaging Mode" (p 119)*), and then successively press **Freeze** and **Measure**.

A general measurement menu will pop up.

STEP 5 Press a four-way menu key or a two-way menu key to select a measurement from that menu.

A caliper will be displayed on the image.

STEP 6 Move the caliper to a position that you want to measure by scrolling the trackball and press **Set**.
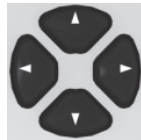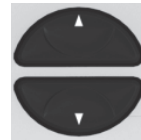
1. Four-way menu keys   ***2. Two-way menu keys***

1.   The keys in each directions separately correspond to buttons on the general measurement menu.
2.   The keys in both directions separately correspond to buttons on the general measurement menu.

The measurement results will be displayed on the result table.

This section introduces different measurements for each types of imaging modes.

2D Mode, Color Mode, Power Mode, DirPower Mode

Depth

Sectorial surface probe	Indicates the distance from the center of sector to the cursor.
Convex array or linear array probe	Indicates the distance from the transducer surface to the measuring cursor in the direction of ultrasonic wave.

To measure the depth,

STEP 1 On the general measurement menu, select **Distance**.

STEP 2 Move the cursor to the position that you want to measure.

The value of the depth will be displayed on the result table.

Distance

To measure the distance between two points on the image,

STEP 1 On the general measurement menu, select **Distance**.

STEP 2 Move the cursor to the start point that you want to measure, and then press **Set**.

STEP 3 Scroll the trackball to adjust the length of the caliper, and then press **Set** to fix the end point.

The value of distance will be displayed on the result table.

Trace Length

To measure the trace length,

STEP 1 On the general measurement menu, select **Trace Length**.

STEP 2 Move the cursor to the start point that you want to measure, and then press **Set**.

STEP 3 Scroll the trackball to adjust the length of the caliper, and then press **Set** to fix the end point.

The value of Trace Length will be displayed on the result table.

Note: *The Trace Length measurement applies to calculate non-linear distance.*

Area

To measure the area, two methods are available:

● Ellipse: Forming an ellipse by two equal-cut perpendicular axes.

To form an ellipse,

STEP 1 On the general measurement menu, select Area.

A sub-menu will pop up.

STEP 2 Select **Ellipse**.

STEP 3 Move the cursor to the start point of the first axis, and then press **Set**.

STEP 4 Move the cursor to the end point, and then press **Set**.

A circle with two orthogonal axes will be formed.

STEP 5 Scroll the trackball to adjust the length of the second axes, and then press **Set**.

An ellipse will be formed, and its area will be displayed on the result table.

● Trace: Forming a closed trace line by manual tracing.

To form a closed trace line,

STEP 1 On the general measurement menu, select Area.

A sub-menu will pop up.

STEP 2 Select **Trace**.

STEP 3 Move the cursor to the start point that you want to measure, and then press **Set**.

STEP 4 Move the cursor along the target to trace the outline of the target, and then press **Set**.

A closed trace line will be formed with a straight line connecting the start and end points, and its area will be displayed on the result table.

If you want to change the trace line, you could move the cursor back along the track.

Angle

To measure the angle between two intersecting planes on the ultrasonic plane,

STEP 1 On the general measurement menu, select **Angle**.

STEP 2 Move the cursor to the start point of the first line segment, and then press **Set**.

STEP 3 Move the cursor to the end point, and then press **Set**.

A line segment will be formed.

STEP 4 Successively do Step 2 and Step 3 again.

The other line segment will be formed.

The angles between those two line segments will be displayed on the result table.

Note: **α** *indicates the obtuse angle, and* **ß** *indicates the acute one.*

Diameter Stenosis Rate and Area Stenosis Rate

Diameter stenosis rate and area stenosis rate can be set in the Preset or through the soft menu; refer to distance measurement and ellipse area measurement for its measurement methods, which will not be repeated here.

Volume

To measure the volume, three methods are available:

- 3-Distance: Forming three axes of two images plane perpendicular each other and measuring their lengths. The calculation formula is as follow:

$$\boldsymbol{Volume}(\boldsymbol{cm^3}) \ = \ \frac{\pi}{6} \times \boldsymbol{D1}(\boldsymbol{cm}) \times \boldsymbol{D2}(\boldsymbol{cm}) \times \boldsymbol{D3}(\boldsymbol{cm})$$

Note: **D1**, **D2** *and* **D3** *indicate the length of three axes.*

STEP 1 On the general measurement menu, select **Volume**.

A sub-menu will pop up.

STEP 2 Select **3-Distance**.

STEP 3 Measure the length of three axes (See **Distance** for detailed procedures).

The value of the volume will be displayed on the result table.

- Ellipse: Measuring the horizontal section area. The calculation formula is as follow:

$$Volume(cm^3) = \frac{\pi}{6} \times a(cm) \times b^2(cm)$$

Note: a indicates the length of the first axis of the ellipse, and b indicates the second one.

STEP 1 On the general measurement menu, select **Volume**.
A sub-menu will pop up.

STEP 2 Select **1-Ellipse**.

STEP 3 Measure the horizontal section area (See **Area with Ellipse Method** for detailed procedures).
The value of the volume will be displayed on the result table.

- Ellipse + Distance: Measuring the area of the horizontal and vertical section. The calculation formula is as follow:

$$Volume(cm^3) = \frac{\pi}{6} \times a(cm) \times b(cm) \times m(cm)$$

Note: a, b and m indicate the length of three axes of the ellipse respectively.

STEP 1 On the general measurement menu, select **Volume**.
A sub-menu will pop up.

STEP 2 Select **Ellipse + Dist**.

STEP 3 Measure the vertical section area (See **Area with Ellipse Method** for detailed procedures).

STEP 4 Unfreeze the image, and then rescan a new image that is perpendicular to the previous one.

STEP 5 Measure the length of the third axis (See **Distance** for detailed procedures).
The value of the volume will be displayed on the result table.

Distance Ratio, Area Ratio and Volume Ratio

Distance ratio, area ratio and volume ratio calculate the ratio between two measurements. Users can set this method in the Preset, or select this method in the soft menu. Refer to the measurement methods of distance, area and volume for its measurement methods, which will not be repeated here.

M Mode

Distance

To measure the distance between two points on the image,

STEP 1 On the general measurement menu, select **Distance**.

STEP 2   Move the cursor to the start point that you want to measure, and then press **Set**.

STEP 3   Move the cursor to the end point, and then press **Set**.

Note: *The cursor can only be moved in the vertical direction.*

The value of distance will be displayed on the result table.

Time

To measure the time interval between two points,

STEP 1   On the general measurement menu, select **Time**.

STEP 2   Move the cursor to the start point that you want to measure, and then press **Set**.

STEP 3   Move the cursor to the end point, and then press **Set**.
The value of time will be displayed on the result table.

Note: *The cursor can only be moved in the horizontal direction.*

Slope

To measure the distance and time between two points on the image, and calculate the slope between the two points,

STEP 1   On the general measurement menu, select **Slope**.

STEP 2   Move the cursor to the start point that you want to measure, and then press **Set**.

STEP 3   Move the cursor to the end point, and then press **Set**.
The cross point is connected to the starting point by a dashed line.
The value of slope will be displayed on the result table.

HR (Heart Rate)

You could calculate the heart rate through measuring the time of n ($n \leq 8$) cardiac cycles.

Note: *User could customize the number of cardiac cycles in the **Config/diag > Meas/Text** dialog.*

To measure the time of cardiac cycles,

STEP 1   On the general measurement menu, select **HR.**

STEP 2   Select n cardiac cycles.
The value of HR will be displayed on the result table.

Distance Ratio and Time Ratio Measurements

Please refer to distance measurement and time measurement above for specific operating methods, and the results will be displayed in the Measurement result table.

Doppler Mode

Time

To measure the time interval between two points, See **Time** in M Mode.

HR (Heart Rate)

To measure the time interval between n (n ≤ 8) cardiac cycles and calculate the number of heart beats per minute (BPM), See **HR** in M Mode.

Velocity

To measure the velocity,

STEP 1 On the general measurement menu, select **Velocity**.

STEP 2 Move the cursor to the point that you want to measure, and then press **Set**.

The value of velocity will be displayed on the result table.

Velocity Ratio

To measure the velocities of two respective points (V1, V2) and calculate the velocity ratio (V1/V2, V2/V1, (V1-V2)/V1),

STEP 1 On the general measurement menu, select **Ratio (Vel)**.

STEP 2 Move the cursor to the first point that you want to measure, and then press **Set**.

STEP 3 Move the cursor to the second point, and then press **Set**.

The value of velocity ratio will be displayed on the result table.

Acceleration

To measure the velocities of two points and their time interval on the Doppler image, and calculate the acceleration,

STEP 1 On the general measurement menu, select **Acceleration**.

STEP 2 Move the cursor to the first point that you want to measure, and then press **Set**.

STEP 3 Move the cursor to the second point, and then press **Set**.

The value of acceleration will be displayed on the result table.

PI Auto

You could measure **Pulsatility Index** (PI) through auto tracing Doppler spectrum. The calculation formula is as follow:

$$PI(Nounit) = (PS(m/s) - ED(m/s))/((TAMAX)(m/s))$$

Peak Systolic Velocity (PS)	The highest velocity of the red blood cells crossing the sample volume.
End Diastolic Velocity (ED)	Measures the blood velocity at the end of the cardiac cycle.
Time Averaged Maximum Velocity (TAMAX)	$TAMAX((cm)/s) = \int_{Ta}^{Tb} V(t)dt/(T_b - T_a)$ **V(t)** indicates the maximum velocity.
S/D (PS/ED)	$S/(D(Nounit)) = (((PS)(m/s))/(ED))(m/s)$
Time Averaged Mean Velocity (TAMEAN)	$TAMEAN((cm)/s) = \int_{Ta}^{Tb} V(t)dt/(T_b - T_a)$ **V(t)** indicates the mean velocity.

To measure PI automatically,

STEP 1   On the general measurement menu, select **PI Auto**.

STEP 2   Move the cursor to the start point that you want to measure, and then press **Set**.

STEP 3   Move the cursor to the end point, and then press **Set**.

> **Note:** *The cursor can only be moved in the horizontal direction.*

The value of acceleration will be displayed on the result table.

PI Manual

You could measure **Pulsatility Index** (PI) through auto tracing Doppler spectrum.

To measure PI manually,

STEP 1   On the general measurement menu, select **PI Manual**.

STEP 2   Move the cursor to the start point that you want to measure, and then press **Set**.

STEP 3   Move the cursor to the end point, and then press **Set**.

The value of acceleration will be displayed on the result table.

RI (Resistive Index)

You could measure **Resistive Index** (RI) through measuring Peak Systolic Velocity (PS) and End Diastolic Velocity (ED) as well as their velocity rate. The calculation formula is as follow:

$$RI(Nounit) = ((PS(m/s) - ED(m/s))/(PS))(m/s)$$

For good measure, a few details of PS and ED are included in **PI Auto**.

To measure RI, see the velocity measurement in **Velocity**.

Diameter Flow

Diameter flow is an estimated value of the blood flow that is calculated based on the vascular diameter. The calculation formula is as follow:

$$VolFlow(A)((ml)/(min)) = VasTAMEAN((cm)/s) \times VasArea(cm^2) \times 60(s)$$

Vas Area	$VasArea = \pi \times ((VasDiam)(cm^2))/4$
Time Averaged Mean Velocity (Vas TAMEAN)	measures the trace of the vessel.

To measure the diameter flow,

STEP 1 On the general measurement menu, select **Flow (Diam)**.

STEP 2 On the image of Doppler Mode, move the cursor to the start point that you want to measure, and then press **Set**.

STEP 3 Move the cursor to the end point, and then press **Set**.

STEP 4 On the image of 2D Mode, Color Mode, Power Mode or DirPower Mode, measure the length of the diameter (See **Distance**).

The value of diameter flow will be displayed on the result table.

Area Flow

Area flow is an estimated value of the flow that is calculated based on the area. The calculation formula is as follow:

$$VolFlow(D)((ml)/(min) = VasTAMEAN((cm)/s) \times VasArea(cm^2) \times 60(s)$$

Vas Area	See **Area** in 2D Mode, Color Mode, Power Mode, DirPower Mode.
Time Averaged Mean Velocity (Vas TAMEAN)	measures the trace of the vessel.

To measure the area flow,

STEP 1 On the general measurement menu, select **Flow (Area)**.

STEP 2 On the image of Doppler Mode, move the cursor to the start point that you want to measure, and then press **Set**.

STEP 3 Move the cursor to the end point, and then press **Set**.

STEP 4 On the image of 2D Mode, Color Mode, Power Mode or DirPower Mode, measure the area (See **Area**).

The value of diameter flow will be displayed on the result table.

7.8.3   Special Measurement

The special measurements is to do measurements in some specified exams which include urology, cardiology, emergency, small parts, musculoskeletal, vascular, abdomen, and gynaecology and obstetrics, and the measurement results can be stored in the worksheet and the report.

To do a special measurement,

STEP 1   On the control panel, press **Patient**, and then create or select a patient (See *"Patient Information" (p 96)*).

STEP 2   Press **Application**, and then select a probe that you want to activate from the All Probes menu.

STEP 3   On the Applications menu, select an exam.

If you cannot find the exam that you want to select, add it to the Applications menu by customizing the Applications list on the Applications dialog (See *"Exam" (p 237)*).

STEP 4   Activate an imaging mode (See *"Imaging Mode" (p 119)*), and then successively press **Freeze** and **Measure**.

A special measurement menu will pop up.
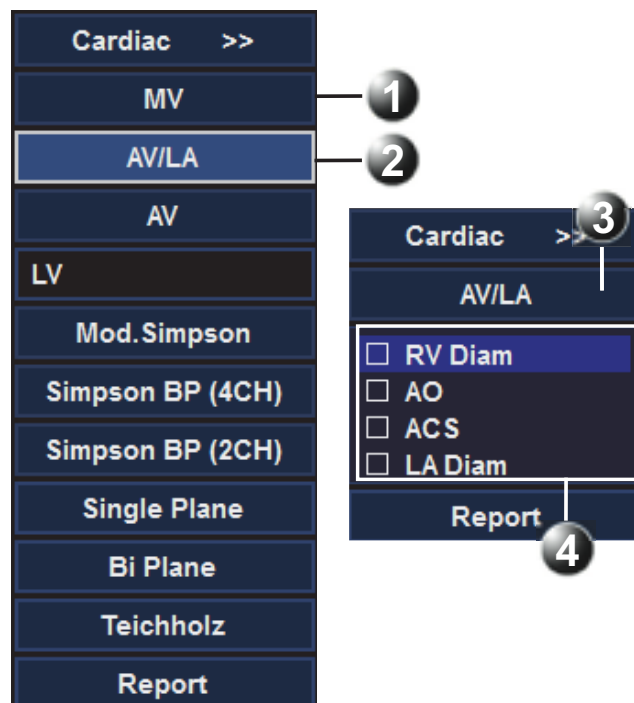
Figure 7-44: Special Measurement Soft Menu

1	Exam subjects	2	Selected Exam
3	Opened Exam	4	Measurements related to the Opened Exam

STEP 5   Select a parameter, and then select a general measurement.

If that parameter has some other options, select the one that you want from a sub-menu.

STEP 6   Move the caliper to a position that you want to measure by scrolling the trackball and press **Set**.

The measurement results will be displayed on the result table.

Note: *After completion, the check box of the parameter which you selected will be ticked.*

To toggle a special measurement manually,

STEP 1 Move the cursor to the special measurement menu, and then click the name of the current exam.

A menu listing types of exams will pop up.

STEP 2 Select the exam that you want, and then follow **Step 5** and **Step 6** in the procedure of doing a special measurement.

To toggle a special measurement automatically,

STEP 1 On the control panel, press **Config/Diag**.

STEP 2 Click **Meas/Text**, and then select Meas Parameters.

STEP 3 At the Measure Sequence, tick the **Next** check box.

STEP 4 Do a special measurement (See *"Special Measurement" (p 187)*).

After completion, the next parameter on the special measurement menu will be selected automatically.

In addition, in the worksheet, you could review, edit, delete or print the measurement results.

This section introduces different measurements for each types of exams.

7.8.3.1   Abdomen

Table 7-51: Abdomen in 2D Mode

Type	Tool	Description	Method or Formula
Measure-ment	R Liver Max	Right Liver maxi-mum	Distance in 2D General Measurements
	R Liver W	Right Liver Width	
	R Liver D	Right Liver Diame-ter	
	L Liver L	Left Liver Length	
	L Liver D	Left Liver Diameter	
	CHD	Common hepatic duct	
	CBD	Common bile duct	
	GB L	Gallbladder Length	
	GB W	Gallbladder Width	
	GB Wall Th	Gallbladder wall thickness	
	Pancr. Duct	Pancreatic duct	
	Pancr. Head	Pancreatic head	
	Pancr. Body	Pancreatic body	
	Pancr. Tail	Pancreatic tail	
	Spleen L	Spleen Length	
	Spleen D	Spleen Diameter	
	Spleen W	Spleen Width	
	Renal L	Renal Length	
	Renal D	Renal Diameter	
	Renal W	Renal Width	
	Cortical	Cortical	
Measure-ment	Adrenal L	Adrenal Length	Distance in 2D General Measurements
	Adrenal D	Adrenal Diameter	
	Adrenal W	Adrenal Width	

Table 7-51: Abdomen in 2D Mode (Continued)

Type	Tool	Description	Method or Formula
Calculation	Splenic Indexs	/	$Vol = 0.037 \times D_1(cm) \times D_2(cm) \times D_3(cm)$
	Renal Vol	Renal Volume	$Vol = \dfrac{\pi}{6} \times D_1(cm) \times D_2(cm) \times D_3(cm)$
	Adrenal Vol	Adrenal Volume	$Vol = \dfrac{\pi}{6} \times D_1(cm) \times D_2(cm) \times D_3(cm)$

Table 7-52: Abdomen in Doppler Mode

Type	Tool	Description	Method or formula
Measure-ment	Aorta	Abdominal aorta	D trace in General Doppler measurements
	Arcuate A	Arcuate Artery	
	Interlobar A	Interlobar Artery	
	C Hepatic A	Common Hepatic Artery	
	Celiac Axis	/	
	SMA	Superior Mesenteric Artery	
	Splenic A	Splenic Artery	
	Renal A	Renal Artery	
	IVC	Inferior Vena Cava	
Measure-ment	Portal V	Portal Vein	D velocity in General Doppler measurements
	Hepatic V	Hepatic Vein	
	SMV	Superior Mesenteric Vein	
	Splenic V	Splenic Vein	
	Renal V	Renal Vein	

7.8.3.2   Cardiac

Table 7-53: Cardiac in 2D Mode

Type	Tool	Description	Method or formula
Dimen-sions	LA/AO	LA Diam / Ao Diam	Ratio in 2D General Measurement

Table 7-53: Cardiac in 2D Mode (Continued)

Type	Tool	Description	Method or formula
Dimensions	RVAWd	Right Ventricular Anterior wall thickness at end-diastole	Distance in 2D General Measurements
	RVDd	Right Ventricular Diameter at end-diastole	
	IVSd	Interventricular Septal thickness at end-diastole	
	LVIDd	Left Ventricular Internal Diameter at end-diastole	
	LVPWd	Left Ventricular Posterior wall thickness at end-diastole	
	IVSs	Interventricular Septal thickness at end-systole	
	LVIDs	Left Ventricular Internal Diameter at end-systole	
	LVPWs	Left Ventricular Posterior wall thickness at end-systole	
	LV Major	Left Ventricular major Diameter	
	LV Minor	Left Ventricular minor Diameter	
	LA Major	Left Atrium major Diameter	
	LA Minor	Left Atrium minor Diameter	
	LA Diam	Left Atrium Diameter	
	RA Major	Right Atrium major Diameter	
	RA Minor	Right Atrium minor Diameter	
	RV Major	Right Ventricular major Diameter	
	RV Minor	Right Ventricular minor Diameter	

Table 7-53: Cardiac in 2D Mode (Continued)

Type	Tool	Description	Method or formula
Vessels	Ao Diam	Aorta Diameter	Distance in 2D General Measurements
	Ao Arch Diam	Aorta arch Diameter	
	Ao Asc Diam	Ascending Aorta Diameter	
	Ao Desc Diam	Descending Aorta Diameter	
	LVOT Diam	Left Ventricular Outflow Tract Diameter	
	MPA Diam	Main pulmonary Artery Diameter	
	RVOT Diam	Right Ventricular Outflow Tract Diameter	
Aortic Valve	AV Diam	Aortic Valve Diameter	Distance in 2D General Measurements
	ACS	Aortic Valve Cusp Separation	
	AVA	Aortic Valve Area	Area in 2D General Measurements
	AR Radius	Aortic Valve Stenosis Radius	Distance in 2D General Measurements
Mitral Valve	MV Diam	Mitral Valve diameter	Distance in 2D General Measurements
	MVA	Mitral Valve area	Area in 2D General Measurements
	MCS	Mitral Valve Cusp Separation	Distance in 2D General Measurements
	MV EPSS	Distance between point E and Interventricular Septum when mitral valve is fully open	
	MR Radius	Mitral Valve Stenosis Radius	
Tricuspid Valve	TV Diam	Tricuspid valve Diameter	Distance in 2D General Measurements
	TVA	Tricuspid Valve Area	Area in 2D General Measurements
Pulm. Valve	PV Diam	Pulmonary valve Diameter	Distance in 2D General Measurements
Calculation	LA/AO	Left Atrium Diameter/ Aorta Diameter	
	AO/LA	Aorta Diameter/Left Atrium Diameter	

Table 7-54: Cardiac in M Mode

Type	Tool	Description	Method or formula
Dimen-sions	LA/Ao	LA Diam / Ao Diam	Ratio in M General Measurement
	RV Diam	Right Ventricular Diameter	Distance in M General Measure-ments
	LA Diam	Left Atrium Diameter	
Vessels	Ao Diam	Aorta Diameter	Distance in M General Measure-ments
	Ao Arch Diam	Aorta arch Diameter	
	Ao Asc Diam	Ascending Aorta Diameter	
	Ao Desc Diam	Descending Aorta Diameter	
	LVOT Diam	Left Ventricular Outflow Tract Diameter	
	MPA Diam	Main pulmonary Artery Diam-eter	
	RVOT Diam	Right Ventricular Outflow Tract Diameter	
Aortic Valve	LVET	Left Ventricular ejection time	Time in M General Measurements
	LVPEP	Left Ventricular pre-ejection period	
	ACS	Aortic Valve Cusp Separation	Distance in M General Measure-ments
Mitral Valve	MV E Amp	Amplitude of the Mitral Valve E wave	Distance in M General Measure-ments
	MV A Amp	Amplitude of the Mitral Valve A wave	
	MV D-E Slope	Mitral Valve D-E slope	Slope in M General Measurements
	MV E-F Slope	Mitral Valve E-F slope	
	MV DE Amp	Amplitude of the Mitral Valve DE wave	Distance in M General Measure-ments
	MCS	Mitral Valve Cusp Separation	
	EPSS	Distance between point E and the interventricular septum	
Tricuspid Valve	TV E-F Slope	Tricuspid Valve E-F Slope	Slope in M General Measurements
	TAPSE	Tricuspid Annular Plane Sys-tolic Excursion	Distance in M General Measure-ments
Pulm. Valve	RVET	Right Ventricular ejection time	Time in M General Measurements
	RVPEP	Right Ventricular pre-ejection period	

Table 7-54: Cardiac in M Mode (Continued)

Type	Tool	Description	Method or formula
Calculation	LA/AO	Left Atrium Diameter/Aorta Diameter	
	AO/LA	Aorta Diameter/Left Atrium Diameter	

Table 7-55: Cardiac in Doppler Mode

Type	Tool	Description	Method or formula
Aortic Valve	AV Vmax	Aorta Valve Maximum Velocity	D Vel in Doppler General Measurements
	LVOT Vmax	Left Ventricular Outflow Tract Maximum Velocity	
	LVOT AccT	Left Ventricular Outflow Tract Acceleration Time	Acceleration in Doppler General Measurements
	AAo Vmax	Ascending Aorta Maximum Velocity	D Vel in Doppler General Measurements
	DAo Vmax	Descending Aorta Maximum Velocity	
	AV AccT	Aorta Valve Acceleration Time	Acceleration in Doppler General Measurements
	AV DecT	Aorta Valve Deceleration Time	
	VSD Vmax	Ventricular Septal Defect Maximum Velocity	D Vel in Doppler General Measurements
	ASD Vmax	Atrial Septal Defect Maximum Velocity	
Mitral Valve	MV E Vel	Mitral Valve E-Vel	D Vel in Doppler General Measurements
	MV A Vel	Mitral Valve A-Vel	
	MV Vmax	Mitral Valve Maximum Velocity	
	MV E Dur	Mitral Valve E-wave Duration	
	MV A Dur	Mitral Valve A-wave Duration	
	IVRT	Mitral Valve Isovolumic Relaxation Time	Time in Doppler General Measurements
Tricuspid Valve	TV Vmax	Tricuspid Valve Maximum Velocity	D Vel in Doppler General Measurements
	TV VTI	Tricuspid Valve Velocity-Time Integral	D Trace in Doppler General Measurements
	TV E Vel	Tricuspid Valve E-wave Flow Velocity	D Vel in Doppler General Measurements
	TV A Vel	Tricuspid Valve A-wave Flow Velocity	

Table 7-55: Cardiac in Doppler Mode (Continued)

Type	Tool	Description	Method or formula
Pulm. Valve	PVein S Vel	Pulmonary Vein S-wave Flow Velocity	D Vel in Doppler General Measurements
	PVein D Vel	Pulmonary Vein D-wave Flow Velocity	
	PVein A Vel	Pulmonary Vein A-wave Flow Velocity	
TDI	Med-S′ Vel	Medial Systolic motion	D Vel in Doppler General Measurements
	Med-E′ Vel	Medial Early diastolic motion	
	Med-A′ Vel	Medial Late diastolic motion	
	Lat-S′ Vel	Lateral Systolic motion	
	Lat-E′ Vel	Lateral Early diastolic motion	
	Lat-A′ Vel	Lateral Late diastolic motion	

Study Tool Operations

Left Ventricular Function

This group of studies is to estimates the Left Ventricular (LV) diastolic and systolic capabilities by a series of clinical indices measured on B or M image. Except for calculating left ventricular volume and end diastole and end systole, they may calculate the following indices (not all indices are calculated in every study, see Study Results table in each study for reference).

Result	Description	Formula
SV	Stroke Volume	$SV(ml) = EDV(ml) - ESV(ml)$
CO	Cardiac Output	$CO(l/(min)) = SV(ml) \times HR(bpm)/1000$
EF	Ejection Fraction	$EF(Nounit) = (SV(ml))/(EDV(ml))$
SI	Cardiac output	$CI(Nounit) = (CO(l/(min)))/(BodySurfaceArea(m^2))$
FS	Fractional Shortening	$FS(Nounit) = (LVIDd(cm) - LVIDs(cm))/(LVIDd(cm))$

Single Plane

Table 7-56: Study Items

Tool	Description	Operation
LVLd apical	Left Ventricular Long-axis Length at End-diastole in apical view	Distance in 2D General Measurements

Table 7-56: Study Items (Continued)

Tool	Description	Operation
LVAd apical	Left Ventricular Long-axis Area at End-diastole in apical view	Area in 2D General Measurements
LVLs apical	Left Ventricular Long-axis Length at End-systole in apical view	Distance in 2D General Measurements
LVAs apical	Left Ventricular Long-axis Area at end-systole in apical view	Area in 2D General Measurements
HR	Heart Rate	Obtained by M (D) Measurement or input directly

On a single plane, you can do any of the followings:

- In apical long-axis view at end-diastole, you can measure LVAd apical and LVLd apical, and then the value of EDV will be calculated.

- In apical long-axis view at end-systole, you can measure LVLs apical, and LVAs apical, and then the value of ESV, SV and EF will be calculated successively.

    If you have measured the value of the height and the weight, the value of SI will be calculated.

    If you have measured or typed the value of HR, the value of CO and CI will be calculated.

Table 7-57: Study Results

Tool	Description	Operation
EDV (SP)	End-diastolic Left Ventricular Volume	$EDV(SP)(ml) = \dfrac{8}{3\pi} \times \dfrac{LVAdapical(cm^2)^{'}}{LVLdapical(cm)}$
ESV (SP)	End-systolic Left Ventricular Volume	$ESV(SP)(ml) = \dfrac{8}{3\pi} \times \dfrac{LVAsapical(cm^2)^2}{LVLsapical(cm)}$
SV	Stroke Volume	$SV(ml) = EDV(ml) - ESV(ml)$
CO	Cardiac Output	$CO(l/(min)) = SV(ml) \times HR(bpm)/1000$
EF	Ejection Fraction	$EF(Nounit) = (SV(ml))/(EDV(ml))$

Bi Plane

Table 7-58: Study Items

Tool	Description	Operation
LVAd apical	Left Ventricular Long-axis Area at End-diastole in apical view	Area in 2D General Measurements
LVAd sax MV	Left Ventricular Area at Mitral Valve level at End-diastole in Short-axis view	
LVIDd	Left Ventricular Internal Diameter at End-diastole	Distance in 2D General Measurements
LVAs apical	Left Ventricular Long-axis Area at end-systole in apical view	Area in 2D General Measurements
LVAs sax MV	Left Ventricular Area at Mitral Valve level at End-systole in Short-axis view	
LVIDs	Left Ventricular Internal Diameter at End-systole	Distance in 2D General Measurements
HR	Heart Rate	Obtained by M(D) Measurement or input directly

Table 7-59: Study Results

Tool	Description	Operation
EDV (BP)	End-diastolic Left Ventricular Volume	$EDV(BP) = \dfrac{8/(3\pi) \times LVAdapical(cm^2) \times LVAdsaxMV(cm^2)}{LVIDd(cm)}$
ESV (BP)	End-systolic Left Ventricular Volume	$ESV(BP) = \dfrac{8/(3\pi) \times LVAsapical(cm^2) \times LVAssaxMV(cm^2)}{LVIDs(cm)}$
SV	Stroke Volume	$SV(ml) = EDV(ml) - ESV(ml)$
CO	Cardiac Output	$CO(l/(min)) = SV(ml) \times HR(bpm)/1000$
EF	Ejection Fraction	$EF(Nounit) = (SV(ml))/(EDV(ml))$
FS	Fractional Shortening	$FS(Nounit) = (LVIDd(cm) - LVIDs(cm))/(LVIDd(cm))$

Mod.Simpson

Table 7-60: Study Items

Tool	Description	Operation
LVAd sax PM	Left Ventricular Long-axis Area at End-diastole in apical view	Area in 2D General Measurements
LVAd sax MV	Left Ventricular Area at Mitral Valve level at End-diastole in Short-axis view	

Table 7-60: Study Items (Continued)

Tool	Description	Operation
LVLd apical	Left Ventricular Long-axis Length at End-diastole in apical view	Distance in 2D General Measurements
LVAs sax PM	Left Ventricular Long-axis Area at end-systole in apical view	Area in 2D General Measurements
LVAs sax MV	Left Ventricular Area at Mitral Valve level at End-systole in Short-axis view	
LVLs apical	Left Ventricular Long-axis Length at End-systole in apical view	Distance in 2D General Measurements
HR	Heart Rate	Obtained by M(D) Measurement or input directly

Table 7-61: Study Results

Tool	Description	Operation
EDV (BP)	End-diastolic Left Ventricular Volume	*1 (See the following for the details)
ESV (BP)	End-systolic Left Ventricular Volume	*2 (See the following for the details)
SV	Stroke Volume	$SV(ml) = EDV(ml) - ESV(ml)$
CO	Cardiac Output	$CO(l/(min)) = SV(ml) \times HR(bpm)/1000$
EF	Ejection Fraction	$EF(Nounit) = (SV(ml))/(EDV(ml))$
FS	Fractional Shortening	*3 (See the following for the details)

- *1:

$$EDV(ml) = \frac{LVLdapical(cm)}{9} \times \left(\frac{4 \times LVAdsaxMV(cm^2) + 2 \times LVAd}{saxPM(cm^2) + \sqrt{LVAdsaxMV(cm^2) \times LVAdsaxPM(cm^2)}} \right)$$

- *2:

$$ESV(ml) = \frac{LVLsapical(cm)}{9} \times \left(\frac{4 \times LVAssaxMV(cm^2) + 2 \times LVAs}{saxPM(cm^2) + \sqrt{LVAssaxMV(cm^2) \times LVAssaxPM(cm^2)}} \right)$$

- *3:

$$FS(Nounit) = (LVIDd(cm) - LVIDs(cm))/(LVIDd(cm))$$

Simpson BP

This method includes two studies: Simp BP (A4C) and Simp BP (A2C).

Table 7-62: Study Items

Tool	Description	Operation
EDV (A2C/A4C)	End-diastolic Left Ventricular Volume (apical 2-chamber/ 4-chamber)	Simpson measurement (Trace/ Spline/ Auto)
ESV (A2C/A4C)	End-systolic Left Ventricular Volume (apical 2-chamber/ 4-chamber)	
HR	Heart Rate	Obtained by M(D) Measurement or input directly

Table 7-63: Study Results

Tool	Description	Operation
EDV (Simpson BP)	End-diastolic Left Ventricular Volume	*1 (See the following for the details)
ESV (Simpson BP)	End-systolic Left Ventricular Volume	*2 (See the following for the details)
SV	Stroke Volume	$SV(ml) = EDV(ml) - ESV(ml)$
CO	Cardiac Output	$CO(l/(min)) = SV(ml) \times HR(bpm)/1000$
EF	Ejection Fraction	$EF(Nounit) = (SV(ml))/(EDV(ml))$
FS	Fractional Shortening	$FS(Nounit) = (LVIDd(cm) - LVIDs(cm))/(LVIDd(cm))$

- *1:

$$EDV(ml) = \pi \times \frac{LVLdapical(cm)}{20} \times \sum_{i=1}^{20} r_i^2(cm)$$

Note: *LVLd apical means the left ventricular long-axis length at end-diastole in apical view, i.e., the long-axis length obtained in measurement.*

Note: *r_i: Radiuses obtained from diastolic measurement.*

- *2:

$$ESV(ml) = \pi \times \frac{LVLsapical(cm)}{20} \times \sum_{i=1}^{20} r_i^2(cm)$$

Note: *LVLs apical means the left ventricular long-axis length at end-systole in apical view, i.e., the long-axis length obtained in measurement.*

Note: *r_i: Radiuses obtained from systolic measurement.*

Teichholz

Table 7-64: Study Items

Tool	Description	Operation
Diastole	End-diastolic Left Ventricular Measurement	Distance in 2D General Measurements Parallel method in M mode
Systole	End-systolic Left Ventricular Measurement	
LVIDd	Left Ventricular Internal Diameter at End-diastole	Distance in 2D/M General Measurements
LVIDs	Left Ventricular Internal Diameter at End-systole	
HR	Heart Rate	Obtained by M(D) Measurement or input directly

Table 7-65: Study Results

Tool	Description	Formula
IVSd	Interventricular Septal Thickness at End-diastole	
LVPWd	Left Ventricular Posterior Wall Thickness at End-diastole	
IVSs	Interventricular Septal Thickness at End-systole	⌉
LVPWs	Left Ventricular Posterior Wall Thickness at End-systole	
EDV (Tei)	End-diastolic Left Ventricular Volume	$EDV(ml) = \dfrac{(7 \times LVIDd(cm))^3}{2.4 + LVIDd(cm)}$
ESV (Tei)	End-systolic Left Ventricular Volume	$ESV(ml) = \dfrac{(7 \times LVIDs(cm))^3}{2.4 + LVIDs(cm)}$
SV (Tei)	Stroke Volume	
CO (Tei)	Cardiac Output	
EF (Tei)	Ejection Fraction	
FS (Tei)	Fractional Shortening	

LA Vol

The LA Vol (Left Atrium Volume) is used to estimate the size of left atrium.

The LA Vol (A-L) is used to estimates the Left Atrium Volume by means of area and length.

Tool	Description	Operation
LA Diam	Left Atrium Diameter	Distance in 2D General Measurements
LAA (A2C)	Left Atrium Area at apical 2-chamber view	Area in 2D General Measurements
LAA (A4C)	Left Atrium Volume Index	Area in 2D General Measurements

Table 7-66: Study Results

Tool	Description	Operation
LA Vol (A-L)	Left Atrium Area	$LAVol(A-L)(ml) = \left(\frac{8\pi}{3}LAA(A4C)(cm^2) \times LAA(A2C)(cm^2)/(LADiam)\right)(cm)$

LA Vol (Simp)

You can estimate the left atrium volume with the Simpson method at apical two-chamber view and apical four-chamber view.

Table 7-67: Study Items

Tool	Description	Operation
LA Vol (A2C)	Left Atrium Volume at apical 2-chamber view	Same as Simpson SP measurement
LA Vol (A4C)	Left Atrium Volume at apical 4-chamber view	

Mitral Valve Area (MVA)

There are two methods to calculate the Mitral Valve Area (MVA): Pressure Half Time (PHT) or Velocity-Time Integral (VTI).

MVA (PHT)

Table 7-68: Study Items

Tool	Description	Operation
MVA (PHT)	Mitral Valve Orifice Area (PHT)	$MVA(PHT)(cm^2) = (220/(MVPHT))(ms)$

MVA (VTI)

Table 7-69: Study Items

Tool	Description	Operation
LVOT Diam	Left Ventricular Outflow Tract Diameter	Distance in 2D General Measurements
LVOT VTI	Left Ventricular Outflow Tract Velocity-Time Integral	D trace in General D measurements
MV VTI	Mitral Valve Velocity-Time Integral	

Table 7-70: Study Results

Tool	Description	Operation
MVA (VTI)	Mitral Valve Area	$$MVA(VTI)(cm^2) = \frac{\pi \times |LVOTVTI(cm)| \times LVOTDiam(cm^2)^2}{4 \times |MVVTI(cm)|}$$

AVA (VTI)

Aortic Valve Area (AVA) can be calculated by velocity-time integral (VTI). Measurements should be performed on 2D and Doppler image.

Table 7-71: Study Items

Tool	Description	Operation
LVOT Diam	Left Ventricular Outflow Tract Diameter	Distance in 2D General Measurements
LVOT VTI	Left Ventricular Outflow Tract Velocity-Time Integral	D trace in General D measurements
AV VTI	Aortic Valve Velocity-Time Integral	

Table 7-72: Study Results

Tool	Description	Operation
AVA (VTI)	Aortic Valve Area	$$AVA(VTI)(cm^2) = \frac{\pi \times |LVOTVTI(cm)| \times LVOTDiam(cm^2)^2}{4 \times |AVVTI(cm)|}$$

LVIMP

LVIMP (Left Ventricular Index of Myocardial Performance) is used to analyze the integrative ventricular diastolic and systolic capabilities.

Table 7-73: Study Items

Tool	Description	Operation
MV C.O dur	Mitral Valve close-open Duration	Time in M/Doppler General Measurements
LVET	Left Ventricular Ejection Time	

Table 7-74: Study Results

Tool	Description	Operation
LVIMP	Left Ventricular Index of Myocardial Performance	$$LVIMP(Nounit) = \frac{MVC - Odur(s) - LVET(s)}{LVET(s)}$$

RVSP

RVSP measures the right ventricular systolic pressure.

Table 7-75: Study Items

Tool	Description	Operation
TR Vmax	Tricuspid Valve Regurgitation Maximum Velocity	D Vel in Doppler General Measurements
RAP	Right Atrium Pressure	Enter the pressure in the dialog box

Table 7-76: Study Results

Tool	Description	Operation
TR PGmax	Tricuspid Valve Regurgitation Pressure Gradient	$TRPGmax(mmHg) = 4 \times TRVmax(m/s)^2$
RVSP	Right Ventricular Systolic Pressure	$RVSP(mmHg) = RAP(mmHg) + 4 \times TRVmax(m/s)^2$

Qp/Qs

Flow ration of pulmonary circulation and systemic circulation.

Table 7-77: Study Items

Tool	Description	Operation
RVOT Diam	Right Ventricular Outflow Tract Diameter	Distance in 2D General Measurements
LVOT Diam	Left ventricular outflow tract diameter	
RVOT VTI	Right ventricular outflow tract velocity-time integral	D Trace in Doppler General Measurements
LVOT VTI	Left ventricular outflow tract velocity-time integral	

Table 7-78: Study Results

Tool	Description	Operation
Qp/Qs	Flow ration of Pulmonary circulation and Systemic circulation	$Qp(ml) = RVOTSV(ml) = \pi(((RVOTDiam)(cm))/2)^2 \times RVOTVTI(cm)$ $Qs(ml) = LVOTSV(ml) = \pi(((LVOTDiam)(cm))/2)^2 \times LVOTVTI(cm)$ $(Qp)/((Qs)(Nounit)) = \dfrac{RVOTSV(ml)}{LVOTSV(ml)}$
Qp-Qs	Flow difference of Pulmonary circulation and Systemic circulation	$Qp - Qs(Nounit) = RVOTSV(ml) - LVOTSV(ml)$

PISA

PISA (Proximal Isovelocity Surface Area) is used in quantitative analysis of the mitral valve regurgitation (PISA MR), aortic valve regurgitation (PISA AR).

PISA MR

Mitral valve regurgitation (PISA MR) needs to be measured in Color and Doppler mode.

Table 7-79: Study Items

Tool	Description	Operation
MR Rad	Mitral Valve Stenosis Radius	PISA measurement
MR VTI	Mitral Valve Regurgitation Velocity-Time Integral	D Trace in Doppler General Measurements
MR Als.Vel	Mitral Valve Regurgitation Aliasing Maximum Velocity	You can input the value directly.

Table 7-80: Study Results

Tool	Description	Formula
MR Vmax	Mitral Regurgitation Maximum Velocity	Obtained from MR VTI measurement
MR Flow	Mitral Regurgitation Flow	$MRFlow(ml) = \dfrac{2\pi MRRad(cm)^2 \times MRAlsVel((cm)/s)}{|MRVmax((cm)/s)|} \times |MRVTI(cm)|$
MR Flow Rate	Mitral Regurgitation Flow Rate	$MRFlowRate((ml)/s) = 2\pi MRRad(cm)^2 \times MRAlsVel((cm)/s)$
MR Fraction	Mitral Valve Regurgitation Fraction	$MRFraction(Nounit) = \dfrac{MRFlow(ml)}{MVSV(ml)}$
MR EROA	Mitral Valve Effective Regurgitant Orifice Area	$MREROA(cm)^2 = \dfrac{2\pi MRRad(cm)^2 \times MRAlsVel((cm)/s)}{|MRVmax((cm)/s)|}$

PISA AR

Aortic valve regurgitation (PISA AR) needs to be measured in Color and Doppler mode.

Table 7-81: Study Items

Tool	Description	Operation
AR Rad	Aortic Valve Stenosis Radius	PISA measurement

Table 7-81: Study Items (Continued)

Tool	Description	Operation
AR VTI	Aortic Valve Regurgitation Velocity-Time Integral	D Trace in Doppler General Measurements
AR Als.Vel	Aortic Valve Regurgitation Aliasing Maximum Velocity	You can input the value directly.

Table 7-82: Study Results

Tool	Description	Formula
AR Vmax	Aortic Regurgitation Maximum Velocity	Obtained from AR VTI measurement
AR Flow	Aortic Regurgitation Flow	$$ARFlow(ml) = \frac{2\pi ARRad(cm)^2 \times ARAlsVel((cm)/s)}{|ARVmax((cm)/s)|} \times |ARVTI(cm)|$$
AR Flow Rate	Aortic Regurgitation Flow Rate	$$ARFlowRate((ml)/s) = 2\pi ARRad(cm)^2 \times ARAlsVel((cm)/s)$$
AR Fraction	Aortic Valve Regurgitation Fraction	$$ARFraction(Nounit) = \frac{ARFlow(ml)}{AVSV(ml)}$$
AR EROA	Aortic Valve Effective Regurgitant Orifice Area	$$AREROA(cm)^2 = \frac{2\pi ARRad(cm)^2 \times ARAlsVel((cm)/s)}{|ARVmax((cm)/s)|}$$

7.8.3.3   Vascular

Vascular Measurement Tools

Vascular measurements are mainly used for carotid, cerebral, upper and lower extremities vessels. The system supports the following 2D and Doppler vascular measurements.

Table 7-83: Vascular in 2D Mode

Type	Tool	Description	Method or formula
Carotid	CCA	Common Carotid Artery	Stenosis Rate in 2D General Measurements
	ICA	Internal Carotid Artery	
	ECA	External Carotid Artery	
	Vert A	Vertebral Artery	
	Subclav A	Subclavian Artery	

Table 7-83: Vascular in 2D Mode (Continued)

Type	Tool	Description	Method or formula
UEA (Upper Extremity Artery)	Subc A	Subclavian Artery	Stenosis Rate in 2D General Measurements
	Axill A	Axillary Artery	
	Brachial A	Brachial Artery	
	Ulnar A	Ulnar Artery	
	Radial A	Radial Artery	
	Innom A	Innominate Artery	
LEA (Lower Extremity Artery)	CIA	Common iliac artery	Stenosis Rate in 2D General Measurements
	EIA	External iliac artery	
	CFA	Common Femoral Artery	
	DFA	Deep femoral artery	
	SFA	Superficial Femoral Artery	
	POPA	Popliteal Artery	
	TRUNK	Tibial Peroneal Trunk Artery	
	ATA	Anterior Tibial Artery	
	PTA	Posterior Tibial Artery	
	PERA	Peroneal Artery	
	DP-A	Dorsalis Pedis Artery	
UEV (Upper Extremity Vein)	Cephalic V	Cephalic Vein	Distance in 2D General Measurements
	Subc V	Subclavian Vein	
	Basilar V	Basilic Vein	
	Ulnar V	Ulnar Vein	
	Radial V	Radial Vein	
	Axill V	Axillary Vein	
	Brachial V	Brachial Vein	
	Innom V	Innominate Artery	

Table 7-83: Vascular in 2D Mode (Continued)

Type	Tool	Description	Method or formula
LEV (Lower Extremity Vein)	CIV	Common iliac Vein	Distance in 2D General Measurements
	EIV	External iliac Vein	
	CFV	Common Femoral Vein	
	GSV	Great Saphenous Vein	
	FV	Femoral Vein	
	SFV	Superficial Femoral Vein	
	DFV	Deep femoral artery	
	POPV	Popliteal Vein	
	SSV	Small saphenous vein	
	AT V	Anterior tibial vein	

Table 7-84: Cardiac in Doppler Mode

Type	Tool	Description	Method or formula
Carotid	CCA	Common Carotid Artery	Trace in Doppler General Measurements
	ICA	Internal Carotid Artery	
	ECA	External Carotid Artery	
	Vert A	Vertebral Artery	
	Subclav A	Subclavian Artery	
UEA (Upper Extremity Artery)	Subc A	Subclavian Artery	Trace in Doppler General Measurements
	Axill A	Axillary Artery	
	Brachial A	Brachial Artery	
	Ulnar A	Ulnar Artery	
	Radial A	Radial Artery	
	Innom A	Innominate Artery	

Table 7-84: Cardiac in Doppler Mode (Continued)

Type	Tool	Description	Method or formula
LEA (Lower Extremity Artery)	CIA	Common iliac artery	Trace in Doppler General Measurements
	EIA	External iliac artery	
	CFA	Common Femoral Artery	
	DFA	Deep femoral artery	
	SFA	Superficial Femoral Artery	
	POPA	Popliteal Artery	
	TRUNK	Tibial Peroneal Trunk Artery	
	ATA	Anterior Tibial Artery	
	PTA	Posterior Tibial Artery	
	PERA	Peroneal Artery	
	DP-A	Dorsalis Pedis Artery	
UEV (Upper Extremity Vein)	Cephalic V	Cephalic Vein	Velocity in Doppler General Measurements
	Subc V	Subclavian Vein	
	Basilar V	Basilic Vein	
	Ulnar V	Ulnar Vein	
	Radial V	Radial Vein	
	Axill V	Axillary Vein	
	Brachial V	Brachial Vein	
	Innom V	Innominate Artery	

Table 7-84: Cardiac in Doppler Mode (Continued)

Type	Tool	Description	Method or formula
LEV (Lower Extremity Vein)	CIV	Common iliac Vein	Velocity in Doppler General Measurements
	EIV	External iliac Vein	
	CFV	Common Femoral Vein	
	GSV	Great Saphenous Vein	
	FV	Femoral Vein	
	SFV	Superficial Femoral Vein	
	DFV	Deep femoral artery	
	POPV	Popliteal Vein	
	SSV	Small saphenous vein	
	AT V	Anterior tibial vein	

7.8.3.4   Gynecology

Table 7-85: GYN in 2D Mode

Type	Tool	Description	Method or formula
Uterus	UT L	Uterus Length	Distance measurement in 2D General Measurements
	UT D	Uterus Diameter	
	UT W	Uterus Width	
	Endo	Endometrium Thickness	
Cervix	Cervix L	Cervix Length	Distance measurement in 2D General Measurements
	Cervix D	Cervix Diameter	
	Cervix W	Cervix Width	
Ovary	Ovary L	Ovary Length	Distance measurement in 2D General Measurements
	Ovary D	Ovary Diameter	
	Ovary W	Ovary Width	
Follicle	#1~15	Follicle 1~15 Length	Same as Distance measurement in 2D General Measurements

Table 7-85: GYN in 2D Mode

Type	Tool	Description	Method or formula
Calculation	UT Vol	Uterine Volume	$UTVol = 0.5236 \times D_1(cm) \times D_2(cm) \times D_3(cm)$
	Cervix Vol	Cervix Volume	$CervixTVol = 0.5236 \times D_1(cm) \times D_2(cm) \times D_3(cm)$
	Ovary Vol	Ovary Volume	$OvaryVol = 0.5236 \times D_1(cm) \times D_2(cm) \times D_3(cm)$

7.8.3.5   Obstetrics

Obstetric measurements are used to estimate the GA and EDD, to calculate the growth indices, including the EFW.

Obstetric Measurement Tools

Table 7-86: Obstetric in 2D Mode

Type	Tool	Description	Method or formula
AFI	AF1	Amniotic Fluid 1	Distance in 2D General Measurements
	AF2	Amniotic Fluid 2	
	AF3	Amniotic Fluid 3	
	AF4	Amniotic Fluid 4	

Table 7-86: Obstetric in 2D Mode

Type	Tool	Description	Method or formula
Fetus	GS	Gestational Sac Diameter	Distance in 2D General Measurements
	Yolk Sac	/	
	CRL	Crown Rump Length	
	BPD	Biparietal Diameter	
	HC	Head Circumference	Area in 2D General Measurements
	AC	Abdominal Circumference	
	FL	Femur Length	Distance in 2D General Measurements
	NT	Neck transparent layer	
	OFD	Occipital Frontal Diameter	
	ASD	Atrial Septal defect Diameter	
	ATD	Abdominal diameter	
	FTA	Fetal Trunk Cross-sectional Area	Area in 2D General Measurements

Table 7-86: Obstetric in 2D Mode

Type	Tool	Description	Method or formula
Fetus	APTD	Anteroposterior trunk diameter	Distance in 2D General Measurements
	TTD	Transverse trunk diameter	
	HL	Humerus long	
	CLav	Clavicle Length	
	Ulna	Ulna Length	
	Tibia	Tibia Length	
	Radial	/	
	FIB	Fibula Length	
	FT	Foot Length	
	Ear	Ear Length	
	BN	Binocular distance	
	Placenta D	Placenta Diameter	
	TC	Thoracic circumference	Area in 2D General Measurements
	Heart C	Heart Circumference	
	Rt Renal L	Right Renal Length	Distance in 2D General Measurements
	Lt Renal L	Left Renal Length	
	Cervix Len	Cervical Length	
	TCD	Cerebellum diameter	
	HW	Hemisphere Width	
	Cist Magna	/	

Table 7-86: Obstetric in 2D Mode

Type	Tool	Description	Method or formula
Fetus	CTAR	Cardiac than Area rate	Rate in 2D General Measurements
	THD	Thoracic Diameter	Distance in 2D General Measurements
	LVW	Lateral Ventricle Width	
	OOD	Outer Orbital Diameter	
	IOD	Inter Orbital Diameter	
	Umb VD	Umbilical Vein Diameter	
Fetal Heart	AoD Arch	/	Distance in 2D General Measurements
	Asc AoD	/	
	Desc AoD	/	
	IVSd	Interventricular Septal Thickness at End-diastole	
	LVIDd	Left Ventricular Internal Diameter at End-diastole	
	LVPWd	Left Ventricular Posterior wall thickness at end-diastole	
	IVSs	Interventricular Septal thickness at end-systole	
	LVIDs	Left Ventricular Internal Diameter at end-systole	
	LVPWs	Left Ventricular Posterior wall thickness at end-systole	
	LVOT Diam	Left Ventricular outflow tract Diameter	
	PA	Pulmonary Artery	
	RVDd	Right Ventricular Diameter at end-diastole	
	RVOT Diam	Right Ventricular outflow tract Diameter	

Table 7-86: Obstetric in 2D Mode

Type	Tool	Description	Method or formula
Calculation	AFI		Measure the maximum AFs of the four amniotic fluid pockets of a pregnant woman. $$AFI = AF1 + AF2 + AF3 + AF4$$
	HC/AC	/	$(HC)/(AC)$
	FL/AC	/	$(FL)/(AC) \times 100$
	FL/BPD	/	FL / BPD ×100%
	LVW/HW	/	LVW / HW × 100%

Table 7-87: Obstetric in M Mode

Type	Tool	Description	Method or formula
Fetal Heart	FHR	Fetal heart rate	Time in M General Measurements
	AoD Arch	/	Distance in M General Measurements
	Asc AoD	/	
	Desc AoD	/	
	RVDd	See Obstetric in 2D Measurement	
	IVSd		
	LVIDd		
	LVPWd		
	IVSs		
	LVIDs		
	LVPWs		
	LVOT Diam		
	PA		
	RVOT Diam		

Table 7-88: Obstetric in Doppler Mode

Type	Tool	Description	Method or formula
	Umb A	Umbilical Artery	Trace in Doppler General Measurements
	MCA	Middle Cerebral Artery	
	FHR	Fetal heart rate	Time in Doppler General Measurements
	LVOT Vmax	Left Ventricle Outflow Tract Vmax	Velocity in Doppler General Measurements

Table 7-88: Obstetric in Doppler Mode

Type	Tool	Description	Method or formula
	LVET	Left Ventricular ejection time	Time in Doppler General Measurements
	Asc Ao Vmax	Ascending Aorta Maximum Velocity	Velocity in Doppler General Measurements
	Ao Arch Vmax	Aorta arch Maximum Velocity	
	Desc Ao Vmax	Descending Aorta Maximum Velocity	
	DA Vmax	Descending Aorta Maximum Velocity	
	RVOT Vmax	Right Ventricular Outflow Tract Maximum Velocity	
	RVET	Right Ventricular Ejection Time	Time in Doppler General Measurements
	PA	Pulmonary Artery	Velocity in Doppler General Measurements

7.8.3.6   Urology

Table 7-89: Urology in 2D Mode

Type	Tool	Description	Method or formula
Renal	Renal L	Renal Length	Distance in 2D General Measurements
	Renal D	Renal Diameter	
	Renal W	Renal Width	
	Cortical	/	
Adrenal	Adrenal L	Adrenal Length	Distance in 2D General Measurements
	Adrenal D	Adrenal Diameter	
	Adrenal W	Adrenal Width	
Bladder	Pre-BL Vol	Pre-void Bladder volume	Volume in 2D General Measurements
	Post-BL Vol	Post-void Bladder volume	

Table 7-89: Urology in 2D Mode

Type	Tool	Description	Method or formula
Prostate	Prostate L	Prostate Length	Distance in 2D General Measurements
	Prostate D	Prostate Diameter	
	Prostate W	Prostate Width	
	Mass1	/	Volume in 2D General Measurements
	Mass2	/	
	Mass3	/	
Calculation	Renal Vol	Renal Volume	$Vol = 0.7 \times D_1(cm) \times D_2(cm) \times D_3(cm)$ Or $Vol = \frac{\pi}{6} \times D_1(cm) \times D_2(cm) \times D_3(cm)$
	Adrenal Vol	Adrenal Volume	
	Prostate Vol	Prostate Volume	
Renal	Renal A	Renal Artery	Trace in Doppler General Measurements
	Renal V	Renal Vein	Velocity in Doppler General Measurements

7.8.3.7 Small Parts

Table 7-90: Small Parts in 2D Mode

Type	Tool	Description	Method or formula
Thyroid	Thyroid L	Thyroid Length	Distance in 2D General Measurements
	Thyroid D	Thyroid Diameter	
	Thyroid W	Thyroid Width	
	Isthmus H	Isthmus height	
	Mass1	/	Volume in 2D General Measurements
	Mass2	/	
	Mass3	/	
Breast	Breast-D	/	Distance in 2D General Measurements
	Mass1	/	Volume in 2D General Measurements
	Mass2	/	
	Mass3	/	
Testicle	Testicle L	Testicle Length	Distance in 2D General Measurements
	Testicle D	Testicle Diameter	
	Testicle W	Testicle Width	
	Mass1		Volume in 2D General Measurements
	Mass2		
	Mass3		

Table 7-90: Small Parts in 2D Mode

Type	Tool	Description	Method or formula
Epididymis	Epididymis L	Epididymis Length	Distance in 2D General Measurements
	Epididymis D	Epididymis Diameter	
	Epididymis W	Epididymis Width	
Seminal Vesicle	Seminal L	Seminal Length	Distance in 2D General Measurements
	Seminal D	Seminal Diameter	
	Seminal W	Seminal Width	
Scrotal	Scrotal Wall Thickness	/	Distance in 2D General Measurements
Calculation	Thyroid Vol	Thyroid Volume	See *1 (See the following for the details)
	Testicle Vol	Testicle Volume	See *2 (See the following for the details)

- *1:

$$ThyroidVol(cm^3) = k \times ThyroidL(cm) \times ThyroidH(cm) \times ThyroidW(cm)$$

  Note: k=0.479 or k=0.523

- *2:

$$TesticleVol(cm^3) = 0.523 \times TesticleL(cm) \times TesticleH(cm) \times TesticleW(cm)$$

Table 7-91: Small Part in Doppler Mode

Type	Tool	Description	Method or formula
Thyroid	STA	Superior Thyroid Artery	Trace in Doppler General Measurements
	ITA	Inferior Thyroid Artery	Velocity in Doppler General Measurements
Tessticle	Tessticle A	Tessticle Artery	Trace in Doppler General Measurements
	Tessticle V	Tessticle Vein	Velocity in Doppler General Measurements
Epididymis	Epididymis A	Epididymis Artery	Trace in Doppler General Measurements
	Epididymis V	Epididymis Vein	Velocity in Doppler General Measurements

7.8.4   Measurement Errors

Although the system has a very high accuracy in terms of scan and measurement, users should be aware of the errors arising from ultrasonic signal characteristics, scanning structure, tissue and physiological characteristics of liquids.

In order to ensure the best possible measurement accuracy, the image zoom proportion should be applied to the measurement.

In order to improve lateral resolution, select the proper probe according to the depth range of the measurement structure.

During the measuring process, the following measurement errors shall be taken into account:

- Distance measuring error: ± 3% or less;

- Circumference measuring error: ± 3% or less;

- Area measuring error: ± 6% or less;

- Volume measuring error: ± 9% or less;

When the ultrasonic beam axis is aligned with the blood flow, the measuring error of flow velocity should be within ±5%.

In the process of diagnosis, the measurement data of the ultrasonic systems must be used in combination with other clinical data, and no diagnosis should be made only in terms of measurement data. When the data are acquired by using the ultrasonic system, other factors should also be taken into account. Analysis of these factors has shown that the accuracy of measurement and further calculation largely depend on the quality image. In turn, the image quality depends on system design and skills of operators as well as their understandings of system features.

The ultrasound imaging algorithms are based on the sound traveling 1540m/s in tissue. However, in different tissue types, velocity of sound may be different. In soft tissue, the error is usually by 2%, and sometimes even reaches 5%, particularly when a lot of fat tissue occurs in the measured area.

In order to ensure the best measurement precision, align the probe carefully and keep the sound beam aligned with the direction of flow.

Note: *The calculation precision of blood flow parameters depends on: System design and signal processing algorithms used in the system;*

Quality of reflection signals, including signal-to-noise ratio and Doppler change.

Skills of the users, whether they can correctly adjust the probe in line with the direction of the exam item and select the system parameters.

All of these above will affect the quality of reflection signals and the suitability of processing algorithms.

Due to the above and other factors, the aggregate error of such an absolute measurement like flow velocity sometimes even reaches ± 50% or higher. Even in ideal laboratory environment, it is very difficult to achieve an error within ± (5-10)%.

Therefore, absolute measurement should be avoided, but give priority to the relative measurements such as resistance index and pulsatility index, etc, of which the errors are around 10%.

For the absolute measurement, angle between beam axis and flow direction is very important. If the angle exceeds 60°, the measurement error will increase dramatically.

Even if the angle is less than 60°, the operator should be aware that error also depends on the parallel positional accuracy between flow direction line and actual flow direction.

The calculation precision of the average velocity will be greatly affected by the relative position of sampling volume and blood vessel. The sampling volume must be large enough to be able to "ensonify" the entire sample volume. The sampling volume must be aligned with the blood vessel axis.

Users must receive trainings from skilled experts to ensure proper use of the Portable Ultrasound Diagnostic Scanner.

7.8.5   *Measurement Result Table*

The Measurement Result Table can be moved to prevent the table obscuring parts of the ultrasound image.

Figure 7-45: Measurement Result Table

Moving the Measurement Result Table

STEP 1   Trackball to the symbol on the heading of the **Measurement Result Table**.

STEP 2   Press **Set** key on the control panel to grab the table.

STEP 3   Trackball the **Measurement Result Table** to a new position.

STEP 4   Press **Set** to anchor the table.

7.8.6 Measurement Units

Table 7-92: Measurement Units

Calculation item	Unit	SI
Distance	cm	m
Trace	cm	m
Area	cm^2	m^2
Angle	rad	rad
Volume	cm^3	m^3
HR	bpm	bpm
Slope	cm/s	m/s
Time	ms	s
Velocity	cm/s	m/s
Acceleration	cm/s^2	m/s^2
Volume flow	cm^3/s	m^3/s
Ratio	%	%

7.9   Worksheet

Press **Worksheet** key on the control Panel, the **Worksheet** window will be displayed:
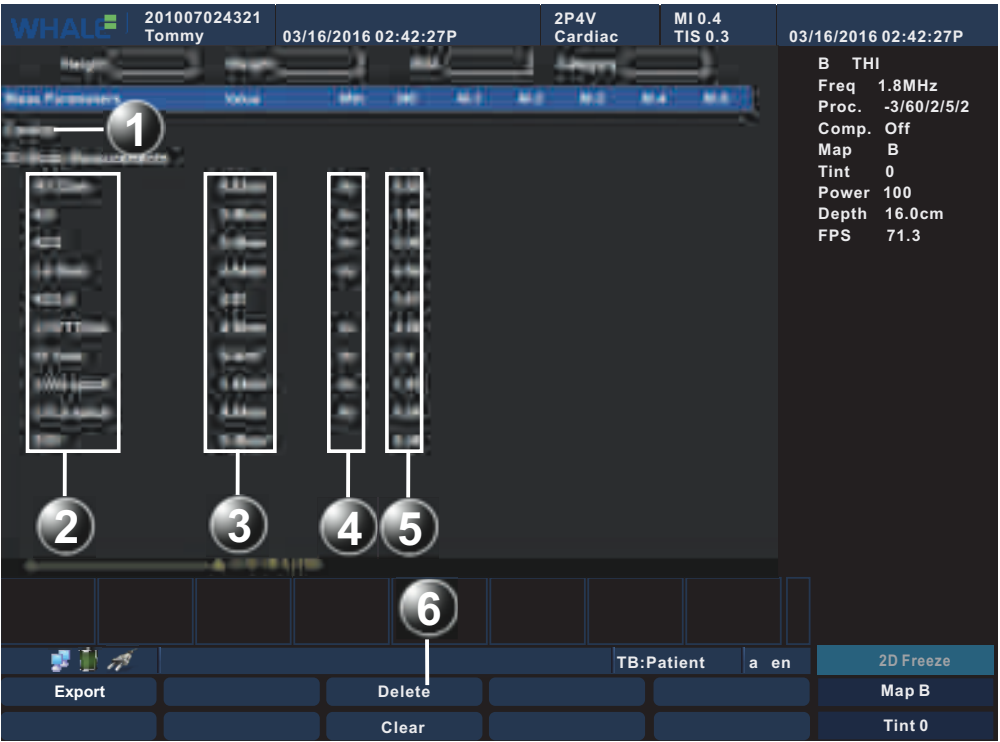
Figure 7-46: Worksheet Window

1	Measurement type	2	Measurement parameter
3	Value: Averaging, Max, Min or Last	4	Value type
5	Measured/ calculated values	6	Main menu

To select the type of value

Av: Average of the measurements taken

Mx: Maximum measurement

Mn: Minmum measurement

Lt: Last measurement that was taken

Figure 7-47: Type Of Value

STEP 1   Trackball to the relevant cell in the Method column.

STEP 2   Press **Set** key. A pop-up menu is displayed showing the different options available.

STEP 3   Trackball to the required option.

STEP 4   Press **Set** key. The value is updated accordingly.

To change a value manually

Individual measured values can be manually changed using the alphanumeric keyboard.

To manually change a value

STEP 1 Trackball to the value that is to be changed.

STEP 2 Press **Set** key.

STEP 3 Use the alphanumeric keyboard to enter the new value.

To restore automatic calculation

STEP 1 Trackball to the relevant cell in the Method column.

STEP 2 Press **Set** key. A pop-up menu is displayed showing the different calculation options available.

STEP 3 Press **Set** key. The value is re-calculated according the method selected.

To delete a value / parameter

STEP 1 Trackball to the measurement value to delete.

STEP 2 Select **Delete** in the main menu, and then the value is deleted.

STEP 3 Delete all values of the parameter, and then the parameter is deleted.

STEP 4 Select **Clear** in the main menu to delete all Parameters and their values.

Export a worksheet

To export a report, follow these steps:

STEP 1 In the USB port, insert a USB disk.

STEP 2 On the control panel, press Worksheet.

STEP 3 On the Worksheet dialog, click Export.
The system will pop up the Export dialog.

STEP 4 On the Removable disk drop-down list, select an inserted removable disk, and then type a file name in the file name text box.

STEP 5 Click OK to save the changes and close the Export dialog.

> **Note:** *The file is saved in the PDF format.*

7.10   Text

Text annotations may be inserted anywhere on the screen. The annotation can be a free text or a selected text from an application-specified library or a user-defined library.

7.10.1   Text Overview

Press **Text** key on the control panel to activate the Text function.

Figure 7-48: Text Function

1	Anchored text		2	Free text
3	Text Soft menu: displays a lirbary of application-specified text		4	Text Main menu

7.10.2   Insert a text

Free text

STEP 1 Press **Text** key on the control panel to activate the Text function.

STEP 2 Move the cursor by scrolling the trackball to the insertion position.

STEP 3 Type the required text.

STEP 4 Move the cursor to another position, the text turns white, completing the insert operation.

Word selection from the text library

STEP 1   Press **Text** key on the control panel to activate the Text function.

STEP 2   Move the cursor by scrolling the trackball to the first item of the text soft menu, and press **Set** key on the control panel. A list of the available text libraries pops up.

STEP 3   Move the cursor to the desired text library and press **Set** key on the control panel. A list of all text items of the text library will be displayed on the text soft menu.

STEP 4   Move the cursor to the required text item and press **Set** key on the control panel to select the text item.

STEP 5   Move the cursor to the required position and press **Set** key on the control panel to insert the text.

7.10.3   *Move a text*

STEP 1   Press **Text** key on the control panel to activate the Text function.

STEP 2   Move the cursor by scrolling the trackball to the text that you want to move.

STEP 3   Press **Set** key on the control panel to select the text. The text will be activated, and change to yellow.

STEP 4   Move the cursor to the desired position.

STEP 5   Press **Set** key on the control panel to confirm will be set, and change to white.

7.10.4   *Modify a text*

To modify a text,

STEP 1   On the control panel, press **Text** to activate the Text function.

STEP 2   Click in the text that you want to modify.

   Note: *The cursor's position is an insertion point.*

STEP 3   Edit the text with the keyboard.

STEP 4   Move away the cursor to save the modification.

7.10.5   *Delete a text*

Using text controls

STEP 1   Press **Text** key on the control panel to activate the Text function.

STEP 2   Move the cursor to the text to be deleted.

STEP 3   Select **Delete Text** in the main menu to delete the text.

Using Page Erase key

Press **Page Erase** key on the control panel. All texts on the screen can be deleted.

7.11   Arrow

7.11.1   Arrow Overview

Press **Arrow** key on the control panel to activate the Arrow function.

Figure 7-49: Arrow Function

1	*Anchored Arrow*	*2*	*Free Arrow*
3	*Arrow Main menu*	*4*	*Rotate Arrow*

7.11.2   Insert an arrow

STEP 1   Press **Arrow** key on the control panel to activate the Arrow function.

STEP 2   Move the arrow by scrolling the trackball to the insertion position.

STEP 3   Adjust the arrow direction by scrolling the trackball.

STEP 4   Press **Set** key on the control panel to anchor the arrow.

7.11.3   *Move an arrow*

STEP 1   Press **Arrow** key on the control panel to activate the Arrow function.

STEP 2   Select **Next** in the Arrow main menu to select the arrow to be moved.

STEP 3   Move the arrow by scrolling the trackball to the desired position.

STEP 4   Press **Set** key on the control panel to anchor the arrow.

7.11.4   *Delete an arrow*

To use Arrow controls

STEP 1   Press **Arrow** key on the control panel to activate the Arrow function.

STEP 2   Select **Next** in the Arrow main menu to select the arrow to be deleted.

STEP 3   Select **Delete** in the main menu to delete a single arrow. Select **Delete All** to delete all arrows.

To use Page Erase key

Press Page Erase on the control panel to delete all the arrows on the screen.

7.11.5   *Rotate an arrow*

To rotate an arrow, perform either of the following operations:

- Click Rotate Arrow on the main menu.
- Rotate the Multi-function knob on the control panel.

7.12   *Body Mark*

Body marks are small graphic images that represent the anatomy being examined. Body marks can indicate the position that the probe was in during the examination.

7.12.1   Body Mark Overview

Press **Body Mark** key on the control panel to activate the Body Mark function.
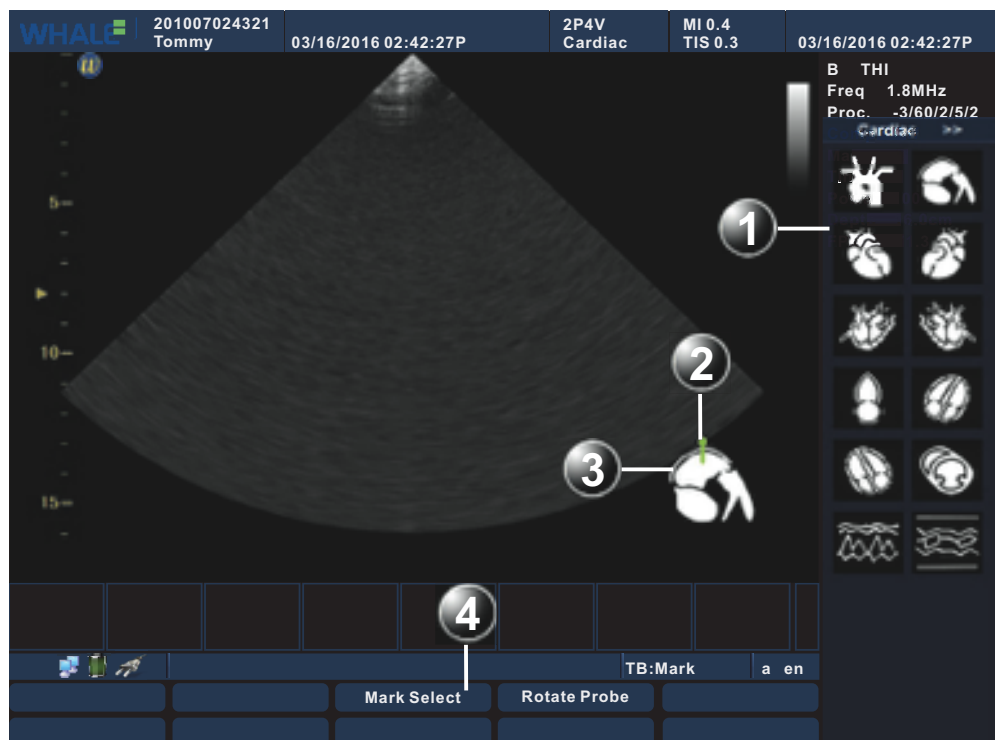
Figure 7-50: Body Mark Function

1   *Body mark Soft menu: displays the pre-defined body mark library*   2   *Probe marker*

3   *Body mark*   4   *Main menu*

Note:

7.12.2   Insert a body mark

STEP 1   Press **Body Mark** key on the control panel to activate the Body Mark function.

STEP 2   Move the cursor by scrolling the trackball to the first item of the Body Mark soft menu, and then press Set. A list of the available body mark libraries will pop up:
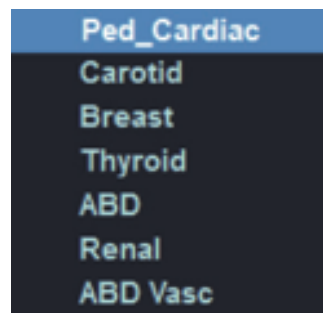
Figure 7-51: The list of available body mark libraries

STEP 3   Move the cursor to the desired body mark library and then press **Set** key on the control panel to select. All mark items of this selected body mark library will be displayed on the soft menu.

STEP 4   Move the cursor to the desired body mark and press **Set** key on the control panel. The body mark with a **Probe marker** is displayed on the right corner of the imaging area.

STEP 5   Adjust the position of the probe marker by scrolling the trackball and press **Set** key on the control panel.

STEP 6   Select **Rotate Probe** in the main menu to change the probe marker orientation and press **Set** key on the control panel.

7.12.3   Modify a body mark

STEP 1   Press **Body Mark** key on the control panel to activate the Body Mark function.

STEP 2   Using the trackball, adjust the position of the probe marker and press **Set** key on the control panel.

STEP 3   Select Rotate Probe in the main menu to select the probe marker orientation and press **Set** key on the control panel.

7.12.4   Delete a body mark

Press the **Page Erase** on the alphanumeric keyboard. The body mark on the screen can be deleted.

7.12.5   Rotate the probe mark

To rotate the probe mark, perform either of the following operations:

● Click Rotate Probe on the main menu.

● Rotate the Multi-function knob on the control panel.

7.13   Puncture Guide Line

To accurately pierce body cavity with the puncture needle, mark the point of puncture and identify the puncture path based on the puncture guide line in a real-time image.

• Press **Biopsy**, the puncture guide line will be displayed on the monitor.
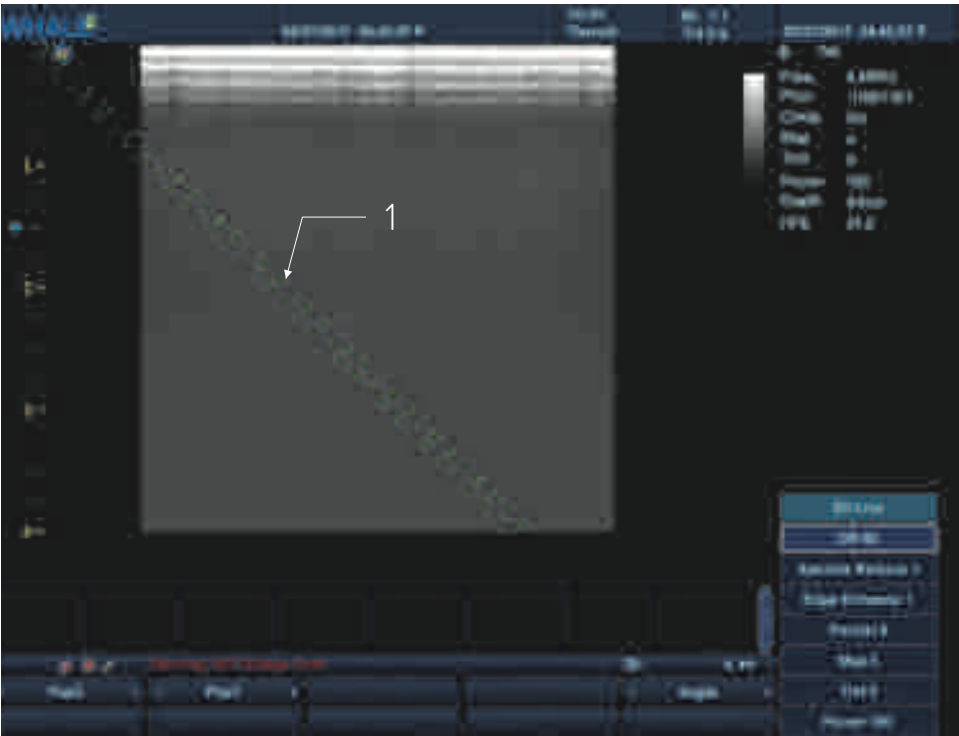
Figure 7-52: Puncture Guide Line

1   Puncture Guide Line

To change the puncture guide line's position, adjust main menu controls.

Table 7-93: Main menu controls

Parameter	Description
Angle	Adjust the rotation angle (0°~180°) of the puncture guide line.
PosX	Adjust the lateral displacement of the puncture guide line.
PosY	Adjust the longitudinal displacement of the puncture guide line.

7.14   Preset

This chapter describes the configuration management package of the Portable Ultrasound Diagnostic Scanner. This configuration package allows us-

ers to customize the global configuration for the unit and change application-specified settings.

The configuration management package consists of a **Preset dialogue** window divided in different setup categories with sub-levels.

The table below summarizes the contents and access rights of the different categories and sub-levels of the Portable Ultrasound Diagnostic Scanner configuration package:

Table 7-94: The contents and access rights of the preset

Category and sub-levels	Description	Access
System		
● Region	Configures the Hospital Information. Sets the Language and Time. Sets the H&W Format.	All
● General	Configures the Trackball Behavior. Configures the size and type of the stored image. Sets the Doppler audio volume. Configures the Screen Saver/Automatic Freeze. Configures the ECG LeadSelect.	All
Exam		
● Applications	Configures the Applications.	All
● Global	Configures the Freeze Response and Thermal Index Display. Configures the options related to the Doppler-Mode. Configures the End Exam Setup. Configures the options related to the Biopsy.	All
Meas/Text		
● Meas Property	Configures the caliper and result font. Sets the unit for the measurement item.	All
● General Meas	Sets the Default Measurement Method by Mode. Sets the Default Measurement Method.	All
● Meas Parameters	Sets the Measurement Parameters.	All
● Text Library	Creates pre-defined text libraries.	All
● Text Property	Sets the Text and Arrow property. Sets the options related to the Text function.	All

Table 7-94: The contents and access rights of the preset

Category and sub-levels	Description	Access
● Mark Library	Create pre-defined body mark libraries. Sets the body Mark Property.	All
Patient		
● DataFlow	Sets the default dataflow. Configures the DICOM server.	All
● Patient	Sets the options relate to the patient management function.	All
● Report	Configures the Report templates menu by selecting and ordering the templates to show in the menu.	All
● Insert text	Custom the diagnose information template.	All
Network		
● AdditionalOutput	Configures the Print and Alt + Print keys. Sets the printer for the report function.	All
● Local TCP/IP	Configures the Scanner's TCP/IP settings. Configures the DICOM.	All
Peripheral		
● Printer	Configures the printer.	All
● Output	Configures the output and screen settings.	All
● Device	Configures the Foot Switch Settings.	All
System Information	Display system information.	All

Press **Config-Diag** key on the control panel, the **Preset dialogue** window is displayed:

Figure 7-53: Preset Dialogue Window

1	*Sublevel tabs for the selected Preset category*	*2*	*Load Factory button*
3	*Selected Preset category*	*4*	*Preset categories*
5	*Save and exit button*	*6*	*Cancel (Exit without saving)*
7	*Apply button*		

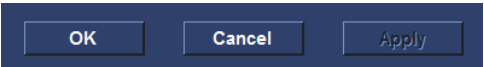|	
OK	Saves the changes press this button to save the settings and then exit the Preset dialogue window.
Cancel	press this button to exit the Preset dialogue window without saving the settings.
Apply	when this button is highlighted, press this button to save the settings.

7.14.1   System

Region

Figure 7-54: The Region Preset Sheet

Using the Region preset sheet, users can configure the hospital information, system language and time, and H&W format. The detail description of this sheet is illustrated below.

Table 7-95: The Region Configuration Items
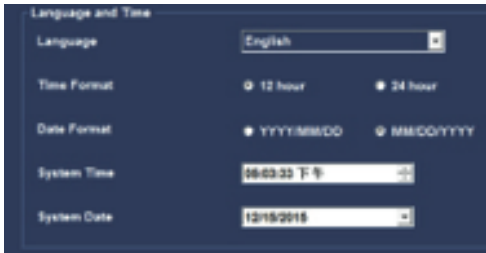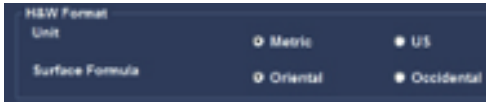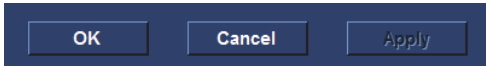
Item	Description
	Hospital Name: enter the hospital name. This information is displayed on the scanning screen's Top Area and on the image properties of all saved images. Load Logo: click Load button, select a picture and click Yes button. Then the picture will be loaded into the window pane. The Logo will be displayed into the report.

Table 7-95: The Region Configuration Items

Item	Description
	Language: select the desired language for the system from the pop-up menu. Time Format: select the desired format. Date Format: select the desired format. System Time: set the time. Press the arrow head buttons to set the time. System Date: set the date. Select the correct date from the pop-up window.
	Unit: select the desired unit of measurement. Surface Formula: select the desired surface.
	OK: press this button to save the settings and then exit the Preset dialogue window. Cancel: press this button to exit the Preset dialogue window without saving the settings. Apply: when this button is highlighted, press this button to save the settings.

General

Figure 7-55: The General Preset Sheet

Using the General preset sheet, users can configure the trackball behavior, volume, storage, screen saver/automatic freeze, and ECG lead select items. The detail description of this sheet is illustrated as below.

Table 7-96: The General Configuration Items

Field	Description
Trackball Travel Speed	Selects the speed of the trackball travel.
Audio Volume	Adjusts the volume of the Doppler audio.
Storage	Selects the size of images that you store.
Single Frame (Live Store)	Saves single frame images only.
Cine Storage Time	The maximum duration of a cine.
Type (Prospective)	Selects the method of the storage.
LeadSelect (ECG Lead)	Selects the type of the ECG lead.
Conn. Mode (ECG Lead)	Selects the connection mode of the ECG lead.

Table 7-96: The General Configuration Items

Field	Description
Enable Screen Saver (Screen Saver/Automatic Freeze)	Enables the screen saver.
Save Type (Screen Saver/Automatic Freeze)	Selects the type of the screen saver.
Wait (Screen Saver/Automatic Freeze)	Selects the time of inactivity before entering the screen saver.

7.14.2   Exam

Applications

Before doing a medical examination, first of all, you should select an exam from the Applications or the More menus.
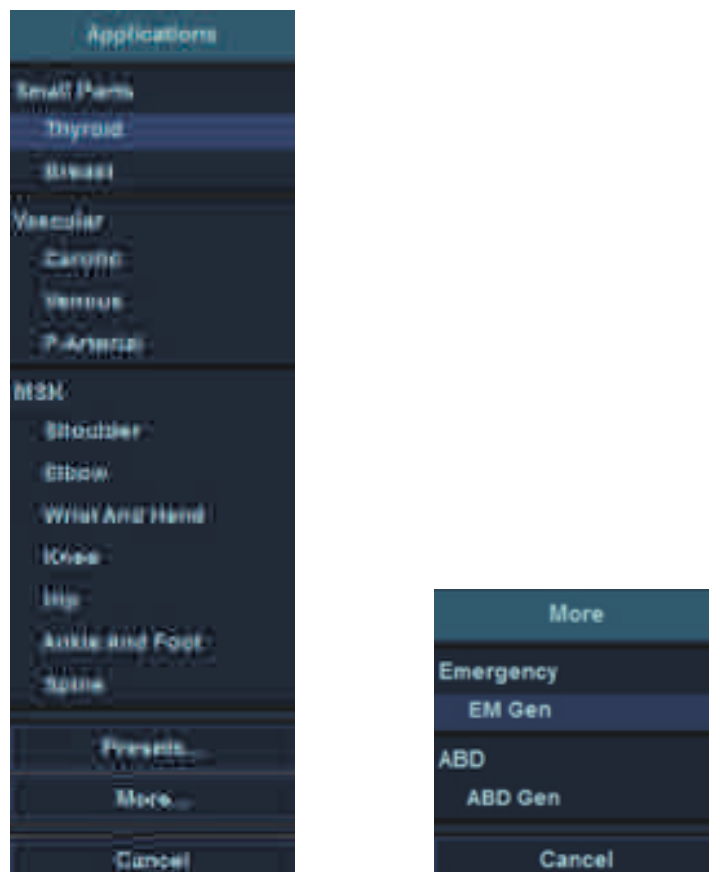
Figure 7-56: The Application and the More menu

The exam on those menus corresponds to the display on the Applications dialog.

Figure 7-57: the ApplicationMenu dialog

On the Applications dialog, all the exams of a body part are displayed on the All Applications list. The exams that appear on the Applications and the More lists are added from the All Application list.

Users can customize the exams listing on the Applications and the More menus by respectively adding or removing the exams from the Applications and the More lists.

● Add an exam

To add an exam to the Applications list,

STEP 1   Open the Applications dialog ("Config/Diag" > "Exam" > "Applications").

STEP 2   On the Category drop-down list, select a body part.

STEP 3   On the All Applications list, select the exam that you want to add to the Applications list, and then click the right arrow ➡.

STEP 4   Click **OK** to save the changes and close the Applications dialog.

To add an exam to the More list,

STEP 1 Open the Applications dialog ("Config/Diag" > "Exam" > "Applications").

STEP 2 On the Category drop-down list, select a body part.

STEP 3 On the All Applications list, select the exam that you want to add to the Applications list, and then click the right arrow .

STEP 4 On the Applications list, select the body part which has been selected at the second step, and then click the down arrow to add it to the More list.

> ***Note:*** *The exam cannot be directly added to the More list. Thus, if selecting the exam, you can only change its order in the Application list by clicking the down arrow* *or the up arrow* *.*

STEP 5 Click **OK** to save the changes and close the Applications dialog.

- Remove an exam

  To remove an exam from the Applications or the More lists,

  STEP 1 Open the Applications dialog ("Config/Diag" > "Exam" > "Applications").

  STEP 2 On the Applications or the More lists, select the exam that you want to remove, and then click **Remove**.

  > ***Note:*** *The default exam cannot be removed.*

  If the currently opened exam is removed, the default exam will become the currently opened exam instead.

  STEP 3 Click **OK** to save the changes and close the Applications dialog.

  If you customize an exam (See *"To create an user-defined application" (p 116)*), it will be deleted after starting the above steps.

  > ***Note:*** *Exams on the All Applications list cannot be removed.*

Besides, you can customize the default exam that can be selected automatically unless an alternative is specified before you start an exam.

- Customize a default exam

To customize a default exam,

STEP 1 Open the Applications dialog ("Config/Diag" > "Exam" > "Applications").

STEP 2 On the Applications list, select the exam that you want to set as default, and then click **Default**.

The system will highlight the exam with red.

STEP 3 Click **OK** to save the changes and close the Applications dialog.

Global

Figure 7-58: The Global Preset Sheet

Using the Global preset sheet, users can configure General, Doppler/M Mode and End Exam Setup items. The detail description of this sheet is illustrated below.

Table 7-97: The General Configuration Items
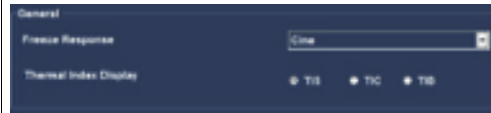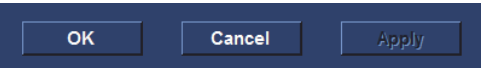
Item	Description
	Freeze Response: select the desired Freeze Response for the system from the pop-up menu. Thermal Index Display: select the form of the Thermal Index.

Table 7-97: The General Configuration Items

Item	Description
	Doppler Frequency/Velocity: set the unit of the velocity scale in Doppler mode.
	Status after End Exam: select the desired status after end exam for the system from the pop-up menu.
	Biopsy: set the Biopsy parameters.
	OK: press this button to save the settings and then exit the Preset dialogue window. Cancel: press this button to exit the Preset dialogue window without saving the settings. Apply: when this button is highlighted, press this button to save the settings.

7.14.3   Meas/Text

Meas Property

Figure 7-59: The Meas Property Preset Sheet

Using this Meas Property preset sheet, users can configure General Setup and Unit items. The detail description of this sheet is illustrated below.

Table 7-98: The Meas Property Configuration Items
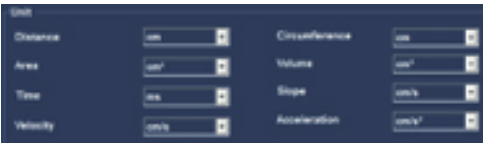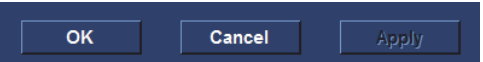
Item	Description
	Caliper Size: select the desired caliper size from the pop-up menu. Caliper Pattern: select the desired caliper pattern. Result Font Color (Active): select the desired color of the active result font from the pop-up menu. Result Font Size: select the desired size of the result font from the pop-up menu. Result Font Color: select the desired color of the Main result font from the pop-up menu.

Table 7-98: The Meas Property Configuration Items
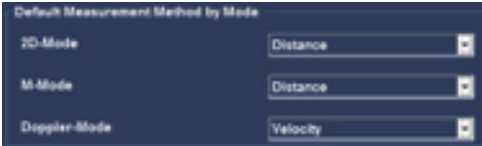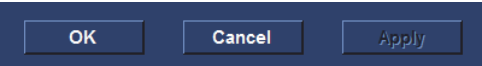
Item	Description
	Unit: set the unit of measurements method.
	OK: press this button to save the settings and then exit the Preset dialogue window. Cancel: press this button to exit the Preset dialogue window without saving the settings. Apply: when this button is highlighted, press this button to save the settings.

General Meas

Figure 7-60: The General Meas Preset Sheet

Using this General Meas preset sheet, users can configure the default measurement method by mode, and default measurement method. The detail description of this sheet is illustrated below.

Table 7-99: The Meas Property Configuration Items

Item	Description
Default Measurement Method by Mode 2D-Mode — Distance M-Mode — Distance Doppler-Mode — Velocity	Default Measurement Method by Mode: select the default Measurement Method for B/M/PW modes.
Default Measurement Method	Default Measurement Method: select the default Measurement method.
VTI	VTI: Selects a method of the VTI measurement.
D Trace	D Trace: Selects a method of the D Trace measurement.
OK Cancel Apply	OK: press this button to save the settings and then exit the Preset dialogue window. Cancel: press this button to exit the Preset dialogue window without saving the settings. Apply: when this button is highlighted, press this button to save the settings.

Meas Parameters

Figure 7-61: The Meas Parameters Preset Sheet

Using this Meas Parameters preset sheet, users can configure the Measurement and report parameters. The detail description of this sheet is illustrated as below.

Table 7-100: The Meas Parameters Configuration Items

Item	Description
	Heart Cycles Average: Select the number of heart cycles average from the pop-up menu. Measure Sequence: Select the desired measure sequence from the pop-up menu.
	OK: press this button to save the settings and then exit the Preset dialogue window. Cancel: press this button to exit the Preset dialogue window without saving the settings. Apply: when this button is highlighted, press this button to save the settings.

Text Library

Figure 7-62: The Text Library Preset Sheet

Using this Text Library preset sheet, users can create a pre-defined library, add a user-defined text into a library, modify the selected text phrase, and delete the selected text phrase or all the text phrases. User can easily select a pre-defined text from the pre-defined library using **Text** key.

Create a pre-defined text library

STEP 1 Press **Config- Diag** key on the control panel.

STEP 2 In the **Preset dialogue** window, select **Meas/Text**.

STEP 3 In the **Meas/Text** category, select **Text Library**. The **Text Library preset** sheet is displayed.

STEP 4 Select an option from the **Exam Mode** combo box, and the **Text Library** field displays the corresponding text library.

STEP 5 Select an option from the **Text Library** combo box.

STEP 6 From the **Library** combo box, select an option.

STEP 7 In the text items list of the selected Library, select a text phrase and click the **right single arrow** to add it into the text items list of the selected Text Library.

STEP 8 Repeat step 6 and 7 to populate the Text Library.

STEP 9 Click the **right double arrow**, all text phrases of the selected Available Texts Library will be added into the selected Text Library.

Reorder a text phrase inside the text items list of the selected Text Library.

STEP 1 Select a desired text phrase from the texts list of the selected Text Library.

STEP 2 Press the **up** arrow. The text phrase is moved one step up.

STEP 3 Press the **down** arrow. The text phrase is moved one step down.

Add a user-define text into the selected Text Library

STEP 1 Select a desired text phrase from the texts list of the selected Text Library. The selected text phrase is displayed on the Selected Texts Phrase field.

STEP 2 In the **Selected Texts Phrase** field, select the text phrase and input any character using the control panel. The **Add** and **Modify** buttons will be highlighted.

STEP 3 Click **Add** button, the entered text will be added to the last of the text items list for the selected Text Library.

Modify the selected text phrase

STEP 1 Select a desired text phrase from the texts list of the selected Text Library. The selected text phrase is displayed on the Selected Texts Phrase field.

STEP 2 In the **Selected Texts Phrase** field, select the text phrase and modify any character using the control panel. The Add and Modify buttons will be highlighted.

STEP 3 Click **Modify** button, the selected text phrase will be replaced by the entered text.

Remove a text item form the text items list of the selected Text Library.

STEP 1 Select the desired text from the texts list of the selected Text Library.

STEP 2 Click **Delete** button, to delete the selected text phrase from the list.

STEP 3 Click the **Delete All** button, the text items list of the selected Text Library is emptied.

Table 7-101: The Meas Parameters Configuration Items

Item	Description
OK **Cancel** **Apply**	OK: press this button to save the settings and then exit the Preset dialogue window. Cancel: press this button to exit the Preset dialogue window without saving the settings. Apply: when this button is highlighted, press this button to save the settings.
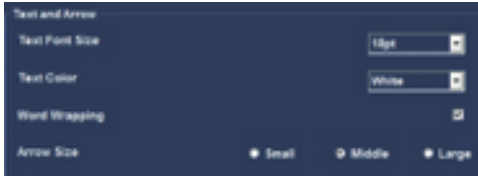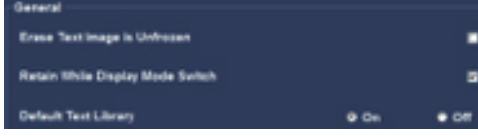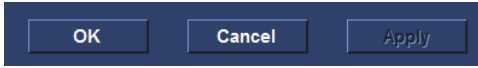
Text Property

Figure 7-63: The Text Property Meas Preset Sheet

Using this Text Property preset sheet, users can configure the Text/ Arrow property. The detail description of this sheet is illustrated as below:

Table 7-102: The Meas Parameters Configuration Items

Item	Description
	Text Font Size: configures the text font size. Text Color: sets the text color in the stable state. Word Wrapping: when checked, Text inputted can wrap. Arrow Size: sets the Arrow size.
	Erase Text Image is Unfrozen: when checked, the text information is erased after the image unfreezes. Retain while Display Mode Switch: when checked, the text information remains visible after executing mode switch. Default Text Library: sets default text library on/off.
	OK: press this button to save the settings and then exit the Preset dialogue window. Cancel: press this button to exit the Preset dialogue window without saving the settings. Apply: when this button is highlighted, press this button to save the settings.

Mark Library

Figure 7-64: The Mark Library Preset Sheet

Using this Mark Library preset sheet, users can create a pre-defined library, add a pre-defined mark into the library, and delete the selected mark. Users can easily select a pre-defined mark from the pre-defined library using **Body Mark** key.

Create a pre-defined mark library

STEP 1 Press **Config- Diag** key on the control panel.

STEP 2 In the **Preset** dialogue window, select Meas/Text.

STEP 3 In the **Meas/Text Category** select **Mark Library**. The **Mark Library** will be displayed.

STEP 4 Select an option from the **Exam Mode** combo box. The **Mark Library** field displays the corresponding mark library according to the Exam mode.

STEP 5 Select a mark form the available marks list.

STEP 6 Select the **right single arrow** in the desired section.

STEP 7 Repeat step 5 and 6 to populate the library.

STEP 8 Select the **right double arrow** to add all of the Available Marks.
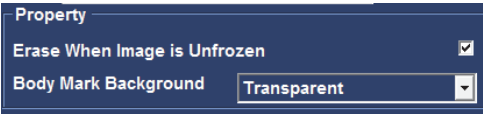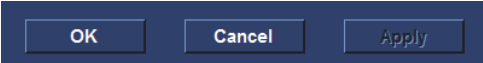
Remove a mark from the selected Mark Library

STEP 1 Select the desired Mark Library from the combo box.

STEP 2 Move the cursor to the marks list of the selected Mark Library. Click the mark and click **Delete** button.

Move a mark inside the marks list of the selected Mark Library

STEP 1 Select the desired mark from the marks list of the selected Mark Library.

STEP 2 Press the **up** arrow. The mark is moved one step up.

STEP 3 Press the **down** arrow. The mark is moved one step down.

Table 7-103: The Meas Parameters Configuration Items

Item	Description
☐ Put the First Mark as Default Mark	Put the First Mark as Default Mark: When checked, the first mark will be default display at the bottom right corner of the imaging area once the Body Mark is activated.
Property Erase When Image is Unfrozen ☑ Body Mark Background Transparent ▼	Erase when image is Unfrozen: when checked, erase Body Mark when image is Unfrozen. Body Mark Background: Select the background of the Body Mark from the pop-up menu.
OK Cancel Apply	OK: press this button to save the settings and then exit the Preset dialogue window. Cancel: press this button to exit the Preset dialogue window without saving the settings. Apply: when this button is highlighted, press this button to save the settings.

7.14.4 Patient

Patient

Figure 7-65: The Patient Preset Sheet

Using the Patient preset sheet, users can set the patient information, exam screen/report headings, some settings related to the patient windows, operator and Ref.M.D. The detail description of this sheet is illustrated below.

Table 7-104: The Patient Configuration Items

Item	Description
	Title bar: select patient information from the title bar line, two-line display the pop-up menu. Anonymous Patient: show or hide patient information.

Table 7-104: The Patient Configuration Items

Item	Description
Patient Information Titlebar Line1 Patient ID Titlebar Line2 First Name,MidName,l ☐ Anonymous Patient	Comments/Diagnoses/Referral Reasons: with this text box, user can enter text to change the text keywords?
☑ Use birthdate ☑ Examination List on Archive button ☑ Use extended patient dialog ☑ Automatic generation of patient ID ☑ Use extended search dialog ☑ Request acknowledge of End Exam action ☑ Auto search for patient ☑ Go directly to scanning from search	Birth date: whether the date of birth is need to create a patient. Use extended patient dialog: whether to show more information when creating a patient. Use extended search dialog: whether to use more information for a patient search. Auto search for patient: whether to automatically retrieve patients when searching. Examination List Archive button: open check directly into the checklist button. Automatic generation of patient ID: whether to generate a patient ID automatically. Request acknowledge of End Exam action: whether to display a query at the end of an exam. Go directly to scanning from search: whether to go directly to scanning after creating a patient.
OK Cancel Apply	OK: press this button to save the settings and then exit the Preset dialogue window. Cancel: press this button to exit the Preset dialogue window without saving the settings. Apply: when this button is highlighted, press this button to save the settings.

Add operator and Ref.M.D

STEP 1 Click **Add** button to enter the operator name in the text box (up to 10 characters).

STEP 2 Click **OK** button to complete the add operation and update patient information (select Cancel button to cancel the add operation).

STEP 3 Click **delete** button, and then click **Yes** button to confirm the deletion (or click No to cancel the delete operation).

Patient Information Table

Users can customize the heading row of the patient information table. The system will apply the custom settings to the patent list on the Search or Create Patient dialog.

Note: *There are eleven titles at most on the heading row.*

- Add a table title

  To add a table title, follow these steps:

  STEP 1 On the heading row, click the title that you want to add a new title behind it.
  The system will pop up the Operator menu.
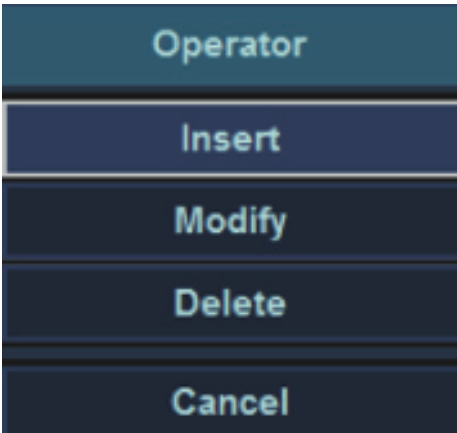
Figure 7-66: Operator Menu

  STEP 2 Click **Insert**.
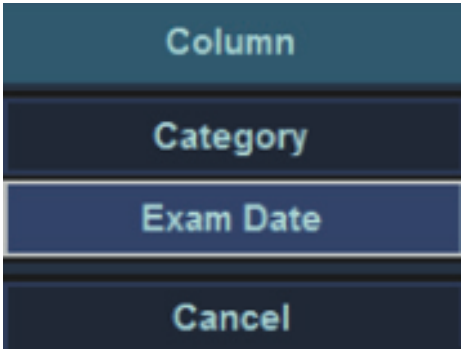
Figure 7-67: Column Sub-menu

  STEP 3 On the Column sub-menu, select the title that you want to add to the heading row.
  The title will be displayed on the heading row.

- Modify a table title

  To modify a table title, follow these steps:

  STEP 1 On the heading row, click the title that you want to modify.

The system will pop up the Operator menu.

STEP 2 Click **Modify**.

STEP 3 On the Column sub-menu, select the title that you want to add to the heading row.

This title will displace the one earlier.

● Remove a table title

To remove a table title, follow these steps:

STEP 1 On the heading row, click the title that you want to remove.

STEP 2 On the Operator menu, click Delete.

The title will be removed from the heading row to the Column sub-menu.

Note: *Patient ID and Exam ID cannot be removed.*

Report

Enables the configuration of the Template selection menu and the export/import of user-defined templates.

Figure 7-68: The Report Preset Sheet

Show Examination Categories report template

STEP 1 Press the **Config-Diag** key on the control panel.

STEP 2 In the **Preset dialogue** window, select **Patient**.

STEP 3 In the **Patient Category** select Report. The **Report** will be displayed.

STEP 4 Select examination category from the pop-up menu.

STEP 5 From the **Available Templates**, select an option.

STEP 6 In the list of the selected **Available Templates**, select a report template and click the **right single arrow** to add it to the report template menu.

STEP 7 Repeat step 5 and 6 to populate the **Report Template** Menu.

STEP 8 Select the **right double arrow** to add all of the Available Templates.

Change report template location

STEP 1 Select a report template.

STEP 2 Click the **up** arrow. The report template is moved one step up.

STEP 3 Click the **down** arrow. The report template is moved one step down.
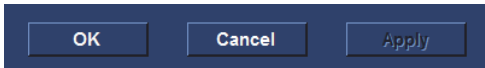
Delete a report template

STEP 1 Select a report template.

STEP 2 Click **Delete** button.

Select default report templates

When the box is checked, select the default template category of current examination report.

Table 7-105: The Patient Configuration Items

Item	Description
OK Cancel Apply	OK: press this button to save the settings and then exit the Preset dialogue window. Cancel: press this button to exit the Preset dialogue window without saving the settings. Apply: when this button is highlighted, press this button to save the settings.

Insert Text

When you fill out an Ultrasonic diagnostic report, always type diagnosis information.

Some diagnosis information usually applies to multiple patients' report. To reuse those information for efficiency, you can save them in the Insert Text dialog.

Related Topic: *For instructions on how to add texts to the Findings and Diagnoses text boxes, see "7.2.3 Report".*

Figure 7-69: Insert Text Dialog

- Add texts related to a root node

    To add texts related to a root node, follow these steps:

    STEP 1 Open the Insert Text dialog ("Config/Diag" > "Patient" > "Insert Text").

    STEP 2 Click Add Root.
    A root node will be added to the Node list.

    STEP 3 On the Node list, discontinuously click the added node twice, and then name it.

    STEP 4 In the Findings or Diagnoses text boxes, type texts.

    STEP 5 Click OK to save the changes and close the dialog.

- Add texts related to a child node

To add texts related to a child node, follow these steps:

STEP 1 Open the Insert Text dialog ("Config/Diag" > "Patient" > "Insert Text").

STEP 2 Click Add Root, and then click Add Child.

You can click Add Child repeatedly to add multiple child nodes.

STEP 3 On the Node list, discontinuously click the root node or the child node twice, and then name it.

STEP 4 In the Findings or Diagnoses text boxes, type texts.

Note: *Only can the text of a indivisible node be displayed in the text boxes.*

STEP 5 Click OK to save the changes and close the dialog.

● Delete a node

To delete a node,

STEP 1 Open the Insert Text dialog ("Config/Diag" > "Patient" > "Insert Text").

STEP 2 On the Node list, click the node that you want to delete.

STEP 3 Click Delete.

STEP 4 Click OK to save the changes and close the dialog.

7.14.5   Network

DICOM

Figure 7-70: The DICOM dialog

You can select an DICOM setting from the **Select DICOM Preset** drop-drown list. In addition, if you want to customize the DICOM settings, do any of the followings:

- To add an DICOM setting, click **Add Preset**, type a name in the Name text box, and then selects types of servers and modes of sending images.

- To modify an DICOM setting, select an DICOM setting that you want to modify, from the **Select DICOM Preset** drop-drown list, click **Modify Preset** and then selects types of servers and modes of sending images.

- To remove an DICOM setting, select an DICOM setting that you want to remove, from the **Select DICOM Preset** drop-drown list, and then click **Remove Preset**.

Table 7-106: Types of Servers

Field	Description
Storage Server	Sends single-frame or multi-frame images to the stor-ages server.
Worklist Server	Receives patient information from the Worklist server.
DICOM Print Server	Commands the DICOM printer server to print single-frame images.
SR Server	After finishing an exam, automatically sends informa-tion about clinical diagnosis in the form of Structure Report to the SR server.
MPPS Server	Sends the state of an exam to the MPPS server.

Table 7-107: Modes of Sending Images

Field	Description
Manual Mode	Sends images manually from the review dialog.
Batch Mode	Sends images automatically after finishing an exam.
Send as you go	Sends images as they are stored.

Table 7-108: The Server List

Field	Description
Name	Gives a name for the server.
IP Address	Types an IP address of the server.
AE Title	Types the Application Entity title of the server.
Port No	types the port number of the server.

To add a storage server to the server list,

STEP 1   Open the DICOM dialog ("Config/Diag" > "Network" > "DICOM").

STEP 2   Click **Add Storage**, and then type a name, an IP-address, an AE Title and the port number on the Dicom Storage Property dialog.

Figure 7-71: the DICOM storage property dialog

Table 7-109: Image Settings

Field	Description
Allow Multi-frame	Sends multi-frame images.
Hide Patient Info	Hides patient information.
Max Frame rate	Selects the maximum value of the frame rate.
Compression	Selects the type of the compression.
Quality%	Sets the quality (0~100%) of images.

Table 7-110: Retry Settings

Field	Description
Max #	Types the times that the unit automatically attempts the connection.
Interval	Types the time interval between two attempting connections.
Timeout	Types the duration of each attempting connection.

STEP 3   Click **Check**.

If the connection is successful, the word "Successful" will be displayed on the right of the **Check** button.

If the connection is failed, the word "Failed" will be displayed instead.

STEP 4 Click **OK** to save the changes and close the dialog.

The information about the server that you connected will be displayed on the Server List.

Note: *If you want to add a **Worklist**, a **Print** or a **MPPS**, see the above steps ("To add a storage server to the server list," (p 260)).*

Note: *The name of servers whose type is same cannot be repeated.*

To remove an server from the server list,

STEP 1 Open the DICOM dialog ("Config/Diag" > "Network" > "DICOM").

STEP 2 On the server list, select an server that you want to remove, and then click **Remove**.

To modify an server on the server list,

STEP 1 Open the DICOM dialog ("Config/Diag" > "Network" > "DICOM").

STEP 2 On the server list, select an server that you want to modify, and then click **Modify**.

An property dialog of the server you selected will pop up.

STEP 3 Modify the property settings, and then click **OK**.

Local TCP/IP

Figure 7-72: the TCP/IP dialog

Using this Local TCP/IP preset sheet, users can configure the TCP/IP settings and DICOM Local information.

Table 7-111: The TCP/IP Configuration Items

Item	Description
Host name	Host name: set the host name. Do not change the computer name.
	TCP/IP Configuration: set the host IP address.

Table 7-111: The TCP/IP Configuration Items

Item	Description
	AE Title: set the AE title. Port: set the port number. PDU: set the protocol data unit.

AdditionalOutput

The Additional outputs sheet deals with configuration of the Print and Alt+ Print keys on the control panel. Several outputs (e.g. Video Print, DICOM storage...etc.) can be associated to the keys (i.e. hitting Print can result in printing a Color video print and storage to a DICOM media). The Additional outputs sheet can also be used to setup the report printer.

Figure 7-73: the AdditionalOutput dialog

Configure the Print or Alt. Print key

STEP 1 In Button field select **Print** or **Alt. Print**.

STEP 2 Select the image frame between: **Single** (stores single frame only), **Multiple** (stores cine loop), **Secondary Capture** (screen shot).

STEP 3 Select an output device in the available outputs field and press the
Right arrow button to assign the service to the dataflow.

STEP 4 Press **Advanced**. The **Properties** window is displayed. Adjust the de-
vice specific parameters as desired. Some of the settings can be
changed directly in the Image to Produce field in the sub-level Ad-
ditional outputs.

STEP 5 Click the **OK** button to save.

7.14.6   *Peripheral*

Printer
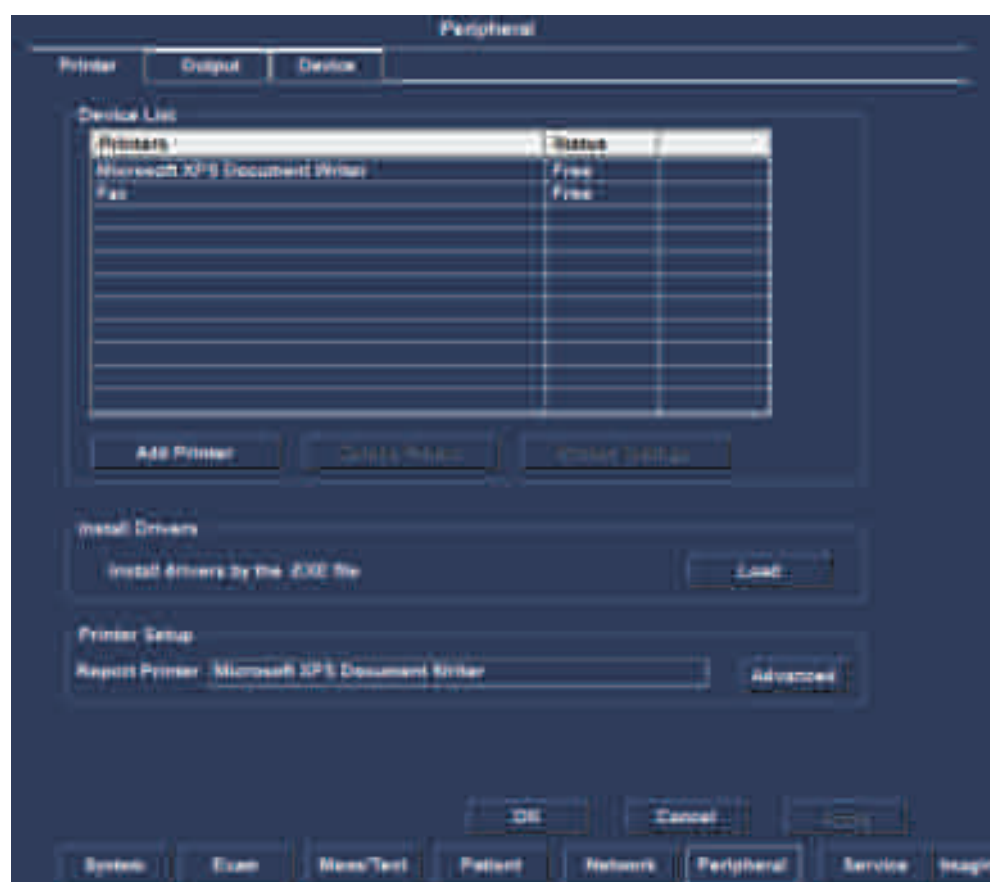
Figure 7-74: The Printer Preset Sheet

Using this Printer preset sheet, users can view all the printers and their work-
ing state in the Device list, add a printer, delete a printer and configure a
printer setting.

Add a printer

STEP 1 Store the printer's driver to a removable disk, and insert it into the
USB port of the machine.

STEP 2   Click **Add Printer** Button, according to the operation instructions to complete adding the printer.

Delete a printer

STEP 1   Click the printer name to be deleted in the Device list.

STEP 2   Click the **Delete Printer** button.

Configure the printer settings

STEP 1   Click the printer name to be configured in the Device list.

STEP 2   Click the **Printer Settings** to configure the selected printer settings.

Select a report printer

To select a report printer,

STEP 1   Open the Printer dialog ("Config/Diag" > "Peripheral" > "Printer").

STEP 2   Click Advanced.

STEP 3   On the Choose Printer dialog, select a printer from the drop-down list.

STEP 4   Click OK to save the changes and close the Choose Printer dialog.

Install a printer driver,

To install a printer driver,

STEP 1   In the USB port, insert a USB disk with the printer driver.

STEP 2   Open the Printer dialog ("Config/Diag" > "Peripheral" > "Printer").

STEP 3   Click Load.
             The system will pop up the Load dialog.

STEP 4   On the Removable Disk drop-down list, select an inserted removable disk, and then select a printer driver from the File (s) list.

             To cancel the selection, click the cancel button .

STEP 5   Click OK to save the changes and close the Load dialog.

Output

Figure 7-75: The Output Preset Sheet

Using the Output preset sheet, users can setup the video output size and format, and configure the screen settings.

Table 7-112: The Output Configuration Items
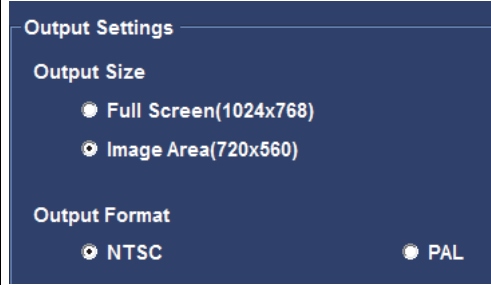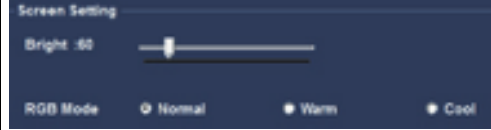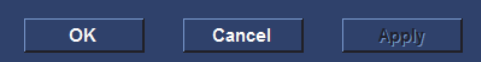
Item	Description
	Output Size: select the type of the output image. Output Format: select the type of the output format.
	Bright: set the screen brightness. RGB Mode: set the RGB mode.

Table 7-112: The Output Configuration Items

Item	Description
OK Cancel Apply	OK: press this button to save the settings and then exit the Preset dialogue window. Cancel: press this button to exit the Preset dialogue window without saving the settings. Apply: when this button is highlighted, press this button to save the settings.

Device

Figure 7-76: The Foot Switch Preset Sheet

Using this Foot Switch preset sheet, users can configure the Foot Switch settings.

Table 7-113: The Output Configuration Items
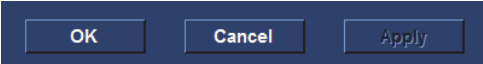
Item	Description
[Foot Switch Settings image]	Left Pedal: selects the operation for the left pedal of the Foot Switch. Middle Pedal: selects the operation for the middle pedal of the Foot Switch. Right Pedal: selects the operation for the right pedal of the Foot Switch.

Table 7-113: The Output Configuration Items

Item	Description
OK Cancel Apply	OK: press this button to save the settings and then exit the Preset dialogue window. Cancel: press this button to exit the Preset dialogue window without saving the settings. Apply: when this button is highlighted, press this button to save the settings.

7.14.7   Service

System Information

Figure 7-77: the system information dialog

This window displays the software and hardware Information.

The Service button is for service staff only.

Users

To protect the settings in the preset from being changed, you can sign in with a user name and password before opening the preset dialog.
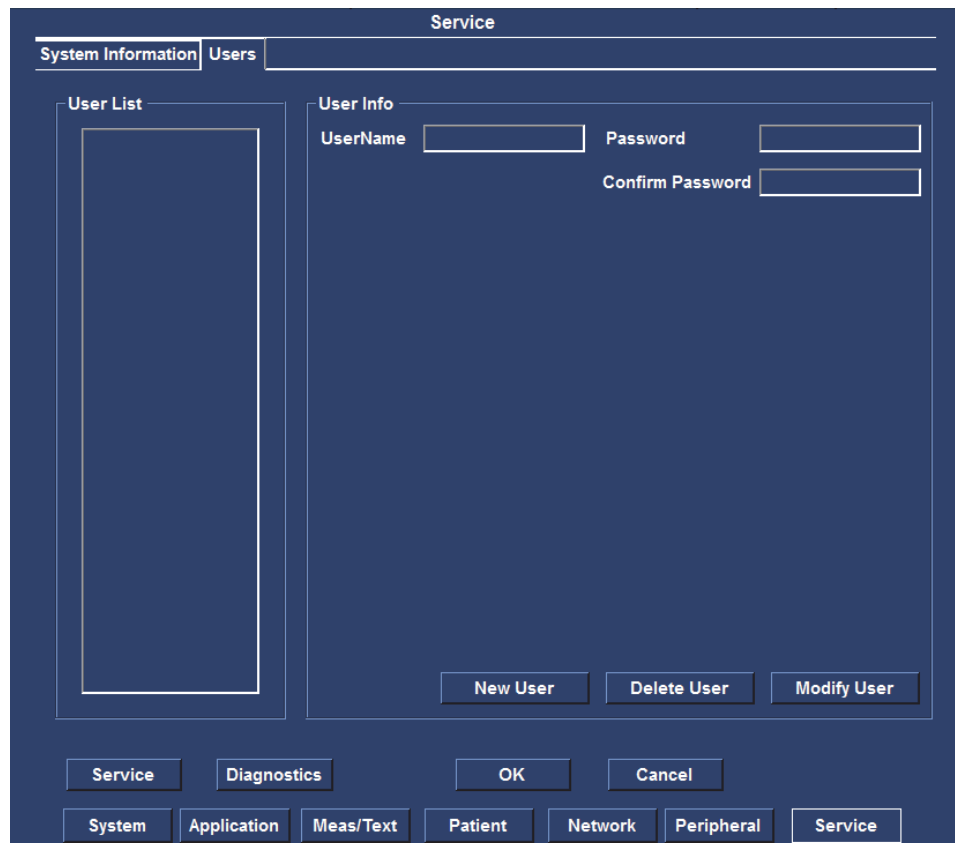
Figure 7-78: the user dialog

To create a user name and password,

STEP 1 Open the User dialog ("Config/Diag" > "Service" > "Users").

STEP 2 Click **New User**, and then type a user name and a password in the corresponding text boxes.
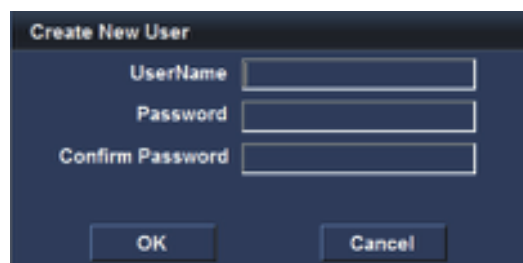
Figure 7-79: the Create New User dialog

STEP 3 Click **OK** to save the changes and close the dialog.

To delete a user name and password,

STEP 1 Open the User dialog ("Config/Diag" > "Service" > "Users").

STEP 2 Select a user name that you want to delete in the User list.

STEP 3 Click **Delete User**.
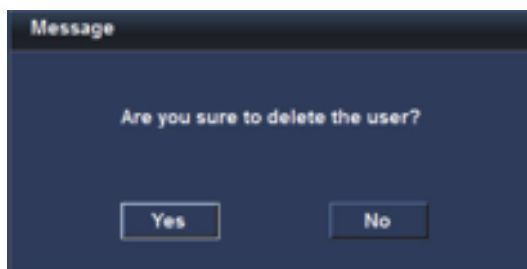
Figure 7-80: the Message dialog

STEP 4 Click **OK** to save the changes and close the dialog.

To change a user name and password,

STEP 1 Open the User dialog ("Config/Diag" > "Service" > "Users").

STEP 2 In the User Info dialog, type a new user name and password.

STEP 3 Click **Modify User**.

The Message dialog will pop up.
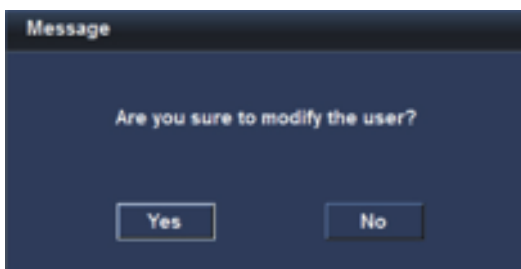
Figure 7-81: the Message dialog

STEP 4 Click **Yes** to save the changes and close the dialog.

7.15   DICOM

This section describes the communication and connection options for the Portable Ultrasound Diagnostic Scanner with other devices in the hospital information system. This sector covers the procedures to configure the optimal data management for the Portable Ultrasound Diagnostic Scanner in the following scenarios:

- A Portable Ultrasound Diagnostic Scanner and a DICOM Server in a network

- DICOM JOB SPOOLER

7.15.1   A ultrasound unit and a DICOM server in a network

In this scenario Portable Ultrasound Diagnostic Scanner is configured to work with a DICOM server in a network environment. Images are first saved on the local image buffer of the scanner. At the end of the examination the images are sent to the DICOM server via a DICOM Job Spooler.

This scenario requires the scanner to be configured to connect to the DICOM server as described below.

7.15.1.1   Portable Ultrasound Diagnostic Scanner's network connection configuration

STEP 1   Connect the unit to the network, press **Config-Diag** key on the control panel.

STEP 2   Select the **Network** category and **Local TCP/IP** subgroup. The **Local TCPIP preset** sheet is displayed as below.
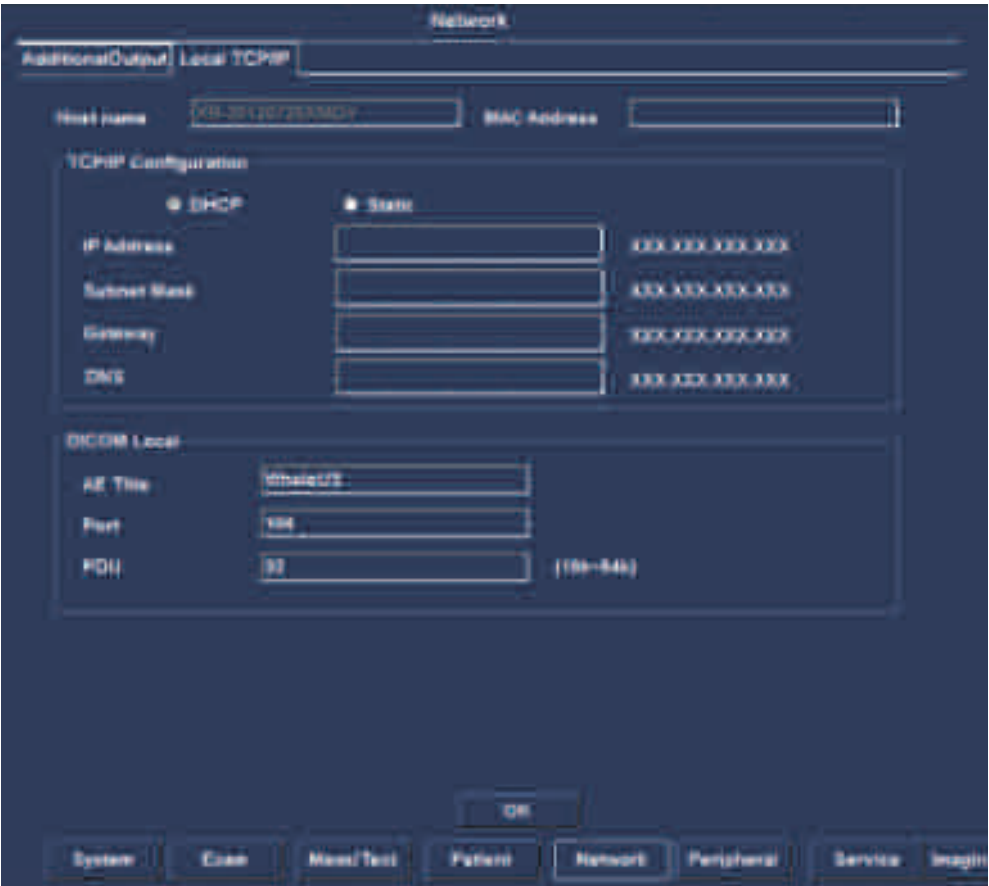
Figure 7-82: The Local TCP/IP Preset Sheet

STEP 3   In the **TCP/IP Config** area, select **DHCP** or **Static** option to configure the IP address, Subway Mask, Gateway and DNS.

STEP 4 In the DICOM Local area, type the AE Title, Port and PDU (In addition, to work with DICOM server the information has to be entered in the scanner).Click **OK** button to save.

7.15.1.2 Setup of the DICOM server in the scanner's Preset window

DICOM devices configuration

Depending on the DICOM dataflow selected, one or several DICOM devices may have to be configured.

STEP 1 Select a DICOM device in the **Selected devices** pane and click **Properties** button.

If the selected device is **Worklist**, the **Worklist Property** window will be displayed as below:
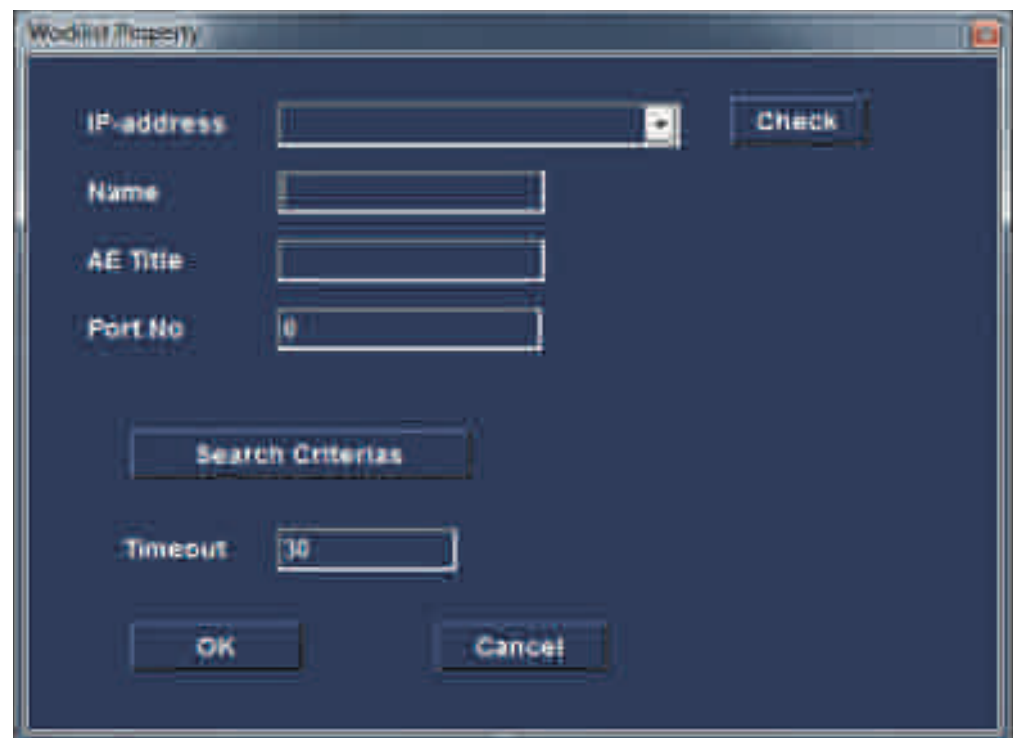
Figure 7-83: The Worklist Property Window

If the selected device is **Dicom Storage**, the **Dicom Storage Property** window will be displayed as below:

Figure 7-84: The Dicom Storage Property Window

STEP 2 Select the DICOM server from the IP-address pull-down menu. Follow the steps below if the IP address settings for the DICOM server need to be modified or created:

- Select **Modify** from the IP-address pull-down menu. The **IPs** window is displayed.

- Select the DICOM server and click **Modify** button in the **IPs** window (or click **Add** button if creating a new IP address).

●   Enter the name and/or IP address of the server and click **OK**
button to return to the **Properties** window.

Figure 7-85: Modifying/Creating the IP address

STEP 3   For each properties window, the user needs to set to the following
requirements.

Table 7-114: The different properties window configuration

Window	Item	Description
Worklist Window	Name	Input the destination device name.
	AE Title	Input the DICOM server AE title. This entry is case sensitive and must match exactly.
	Port	Input the DICOM server port.
	Timeout	Input the timeout.
Dicom Storage Window	Name	Input the destination device name.
	AE Title	Input the DICOM server AE title. This entry is case sensitive and must match exactly.

Table 7-114: The different properties window configuration

Window	Item	Description
	Port	Input the DICOM server port.
	Image settings	Whether to multi-frame or not, setup the Max Framerate.Compression and Quality.
	Retry	Setup the maximum number and interval for connection attempts.
	Timeout	Input the timeout.

Adjust the Search criteria

STEP 1 Press **Config-Diag** key on the control panel, open the **Preset** dialog window. Select the **Patient** category, then select the **DataFlow** sub-group tab. The **DataFlow** preset sheet will be displayed.

STEP 2 Select a **DICOM Worklist dataflow**.

STEP 3 Select the **Worklist** device in the **Selected devices** pane and click **Properties** button.

STEP 4 Click the **Search criteria** button. The **Search criteria** window will be displayed.
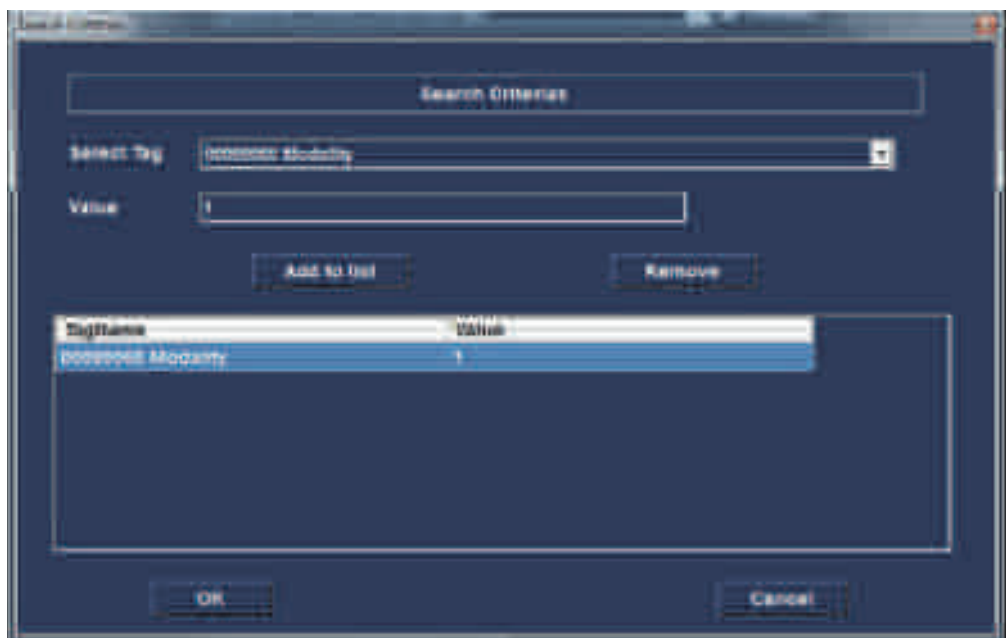
Figure 7-86: The Search Criteria Window

STEP 5 Select a search criteria from the **Select tag** pull-down menu.

STEP 6 Enter a value if required or leave blank if not to be used. This entry is case sensitive and must match exactly.

STEP 7 Click **Add** to list button.

STEP 8 Click **OK** button to close the **Search criteria** window.

Check the connection to the DICOM server

STEP 1 In the **Dataflow** sheet, select the DICOM device to verify the connection.

STEP 2 Click **Check** button. The verification process may takes several seconds. A green check mark is displayed in front of the DICOM device if the verification is successful. A red cross is displayed in front of the DICOM device if the verification failed.

Data Management

Scanner's dataflow configuration:

STEP 1 Press **Config-Diag** key on the control panel to open the **Preset dialog** window, select the **Patient** category, then select the **DataFlow** sub-group tab. The **DataFlow** preset sheet will be displayed.

STEP 2 Select the **DICOM** dataflow.

STEP 3 Click the **OK** button to save.

Performing a study

- A: Online Scanner

    STEP 1 Create a new patient and perform the examination. During the examination images are temporarily stored in the local buffer of the system.

    STEP 2 At the end of the study press **Patient** key on the Control panel, and select the **End Exam** button. The images are transferred to the server via the DICOM spooler.

    STEP 3 Press **ALT+S** to display the **DICOM JOB SPOOLER** window (DICOM Job Spooler details please refer to the section *"DICOM JOB SPOOLER" (p 278)*).

- B: Offline Scanner

    When working offline the images are stored in the DICOM spooler. Images can be sent to the DICOM server after re-connecting the system to the network.

    To save images acquired offline on the DICOM server:

    STEP 1 After the scanner reconnected, press **ALT+S** to display the **DICOM JOB SPOOLER** window.

    STEP 2 Select one or several studies in the **DICOM JOB SPOOLER** window.

STEP 3 Click **Resend** button. The images of the selected studies are transferred to the DICOM server.

7.15.2   *DICOM JOB SPOOLER*

DICOM JOB SPOOLER displays the current DICOM output jobs. The jobs may be Storage, Print, Modality Performed Procedure Step or Storage Commitment. The DICOM JOB SPOOLER is used for checking the current job's status when a job is saved or when the total spooler status on the right of the Archive windows displays an error.

From the DICOM JOB SPOOLER the user can also:

- Delete non-active jobs.
- Resend a job that failed or is in hold.
- Send a job that failed or is in hold, to a new destination.

The job's status displayed in the DICOM JOB SPOOLER window can be:

- **Pending**: the job is complete, waiting to be active.
- **Hold**: the job is incomplete, waiting for more images.
- **Append**: the job is connected to the destination device but is waiting for more images (Direct store function).
- **Active**: the job is complete and connected to the destination device.
- **Failed**: the job is complete but one or more images failed to transmit to the destination device.
- **Done**: the job is saved to the destination device. The jobs that are done are removed from the spooler after a while.

Start the DICOM JOB SPOOLER

On the alphanumeric keyboard, press and hold down the **ALT** key and press S key. The **DICOM JOB SPOOLER** window is displayed as below:
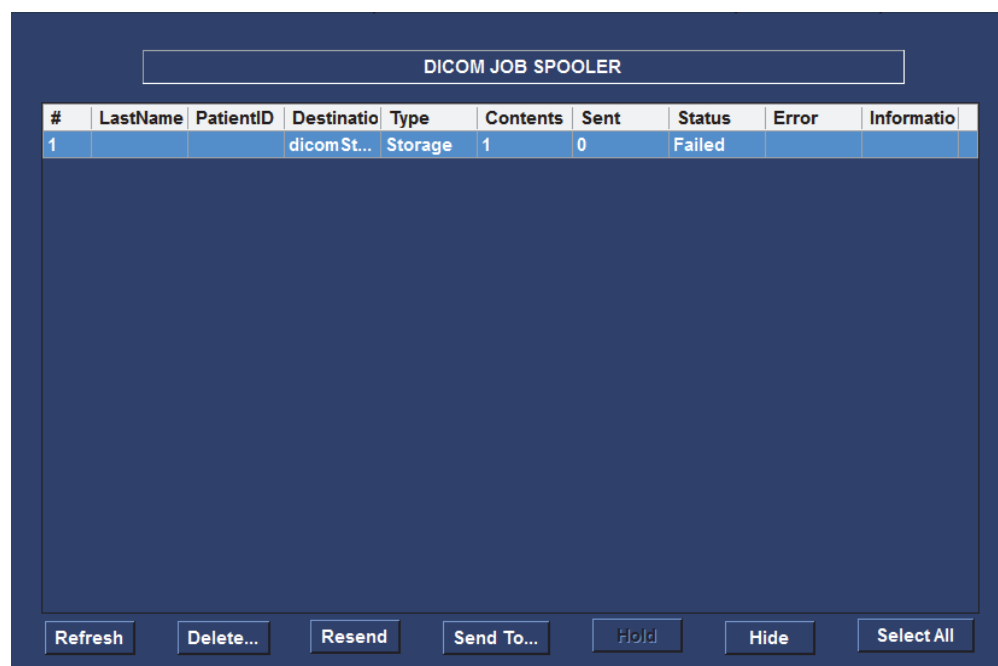
Figure 7-87: The DICOM JOB SPOOLER Window

The **DICOM JOB SPOOLER** window is automatically updated every minute. Click **Refresh** button to update the information displayed at any time.

Delete a job

STEP 1   Trackball to the job to delete in the **DICOM JOB SPOOLER** window.

STEP 2   Press **Set** key on the control panel.

STEP 3   Trackball to **Delete** button.

STEP 4   Press **Set** key on the control panel.

Only non-active jobs can be deleted.

Resend a job

STEP 1   Trackball to the job to re-send in the **DICOM JOB SPOOLER** window.

STEP 2   Press **Set** key on the control panel.

STEP 3   Trackball to **Resend** button.

STEP 4   Press **Set** key on the control panel.

Only jobs that failed or are on hold can be resent.

Send a job to a new destination

STEP 1 Trackball to the job to send in the **DICOM JOB SPOOLER** window.

STEP 2 Press **Set** key on the control panel.

STEP 3 Trackball to **Send** to button.
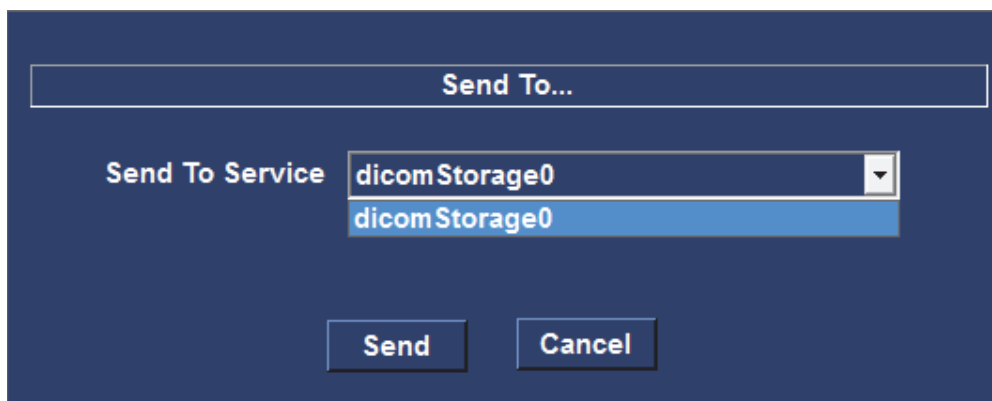
Figure 7-88: The Send To...Window

STEP 4 Press **Set** key on the control panel. A dialogue window is displayed.

STEP 5 Select the new destination from the **Destination** pop-up menu.

STEP 6 Trackball to **Send** button.

STEP 7 Press **Set** key on the control panel.

CHAPTER 8

USER MAINTENANCE

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8.1 System Care and Maintenance

This section covers:

- Planned maintenance

- System inspection

- Unit cleaning

- Prevention of the static electricity interference

8.1.1 Planned Maintenance

The user is responsible for ensuring that ultrasound system is safe for daily use. Every day before use, execute all steps of the Daily Checklist. All components of the system, including control panel, keyboard and probes, should be cleaned and disinfected when necessary.

Daily Checklist

- Check the appearance of all probes. Do not use a broken, punctured and discolored probe.

- Check the appearance of all power cables. If the power cable is worn, cracked or aged, do not turn the power on.

- Ensure the trackball, TGC sliders and other controls on the control panel clean without colloid or other dirt.

- After unit is powered on, check the screen display and brightness.

- Check the current date and time.

- Check the probe orientation marker and frequency.

> ⚠️ **CAUTION**
> *The user must ensure that safety inspections are performed at least every 12 months according to the requirements of the patient safety standard IEC 60601-1.*

> ⚠️ **CAUTION**
> *Only a trained personnel are allowed to perform the safety inspections mentioned above.*

8.1.2   *System Inspection*

To ensure the Portable Ultrasound Diagnostic Scanner consistently operates at maximum efficiency, it is recommended that the following procedures be taken as part of the user's routine internal maintenance program.

Examination On A Monthly Basis

Users examine the following on a monthly basis (or whenever there is a reason to assume that any issue may have occurred):

1   Cable Connectors for any mechanical defects.

2   Entire length of electrical and power cables, for cuts or abrasions.

3   Equipment, for loose or missing hardware.

4   Control panel for defects.

> ⚠️ **WARNING**   *To avoid electrical shock hazards, do not remove the panels or covers from the unit.*

> ⚠️ **CAUTION**   *If any defects are detected or malfunction occurred, do not operate the equipment, and inform a qualified service personnel.*

Virus Protection

The Portable Ultrasound Diagnostic Scanner is configured with a minimal set of open ports and with all the network service not actively used by the system closed down, in order to minimize virus vulnerability. This method significantly reduces the risk of a virus attack on the system. Whale Company is continuously addressing the need for additional actions to reduce vulnerability of equipment, including scanning vulnerability of the products and evaluating new security patches for the 3rd party technology used. Microsoft (and other) security patches that addresses serious issues with Portable Ultrasound Diagnostic Scanner will be made available to users after Whale Company's verification.

8.1.3   *Unit Cleaning*

Frequent and diligent cleaning of Portable Ultrasound Diagnostic Scanner can reduce the risk of infection spreading from person to person, and also help to maintain a clean working environment.

> ⚠️ **CAUTION**   *To avoid the risk of electric shock, please turn the system off before cleaning.*

> ⚠️ **CAUTION**   *To avoid static electricity impact and ultrasound system damage, do not use spray cleaners on the ultrasound system.*

> ⚠️ **CAUTION**   *Do not use any solution containing abrasive powder or strong chemicals such as acid or alkaline.*

> ⚠️ **CAUTION**   *Do not spray any liquid directly onto system covers, LCD display or keyboard.*

The General Cleaning of the Portable Ultrasound Diagnostic Scanner covers the following contents:

Cleaning The LCD Display Cover

STEP 1 Turn off the ultrasound system's power, and unplug the power cord from the wall outlet.

STEP 2 Moisten a soft, non-abrasive folded cloth or sponge with a mild, general-purpose, non-abrasive soap and water solution.

STEP 3 Squeeze excess liquid from the cloth/sponge, then wipe down the top, front, back and both sides of the unit

STEP 4 Rinse the cloth or sponge with clean water and wipe the unit surfaces again.

STEP 5 Use a dry, soft, lint-free cloth to dry the unit surfaces.

STEP 6 Wait for the unit surfaces to dry completely.

Note: *In the event that disinfection is required or any stubborn stains remain, remove them with a soft, dust-free cloth with a small quantity of isopropyl rubbing alcohol.*

Cleaning The LCD Display

STEP 1 Gently wipe the LCD display with a dry, soft, lint-free non-abrasive cloth.

> *Note:* *In the event of a scratch-like mark on the screen, this may be a stain transferred from the keyboard or trackball when the LCD display cover was pressed from the outside. Proceed with this operation: wipe or dust the stain gently with a dry, soft cloth. If the stains remains, moisten a soft, lint-free cloth with water or a 50-50 mixture of isopropyl rubbing alcohol and water that doesn't contain impurities. Wring out as much of the liquid as possible and wipe the LCD display again.*

> ⚠️ **CAUTION**   *Do not let any liquid drip into the unit.*

STEP 2 Be sure to dry the LCD display before closing the cover.

Cleaning The Control Panel And Keyboard

- Control Panel

  STEP 1 Moisten a soft, non-abrasive cloth or sponge with a mild, general-purpose, non-abrasive soap and water solution or with general purpose disinfectant. Squeeze excess liquid from the cloth or sponge, and then wipe the control panel.

  STEP 2 Rinse the cloth/sponge with clean water, and wipe the control panel again.

  STEP 3 Use a dry, soft, lint-free cloth to dry the control panel.

  STEP 4 Wait for the control panel surfaces to dry completely.

- Keyboard

  STEP 1 Moisten a soft, non-abrasive folded cloth or sponge with a mild, general purpose, non-abrasive soap or and water solution or general purpose disinfectant. Squeeze excess liquid from the cloth or sponge, and then wipe the keyboard.

  STEP 2 Rinse the cloth/sponge with clean running water, and wipe the keyboard again.

  STEP 3 Use a dry, soft, lint-free cloth to dry the keyboard.

  STEP 4 Wait for the keyboard surfaces to dry completely.

Note: *In the event that disinfection is required or any stubborn stains remain, remove them with a soft, dust-free cloth with a small quantity of isopropyl rub-*

bing alcohol. Wipe the surface of keycaps with cloth, and ensure that no liquid drips on or between the keys.

Cleaning The Peripherals

Clean the peripherals in accordance with the respective manufacturers' directions.

8.1.4 Static Electricity Interference Prevention

Interference from static electricity can damage the electric components in the system. The following steps can reduce the likelihood of electrostatic discharge:

- Wipe the alphanumeric keyboard and monitor with lint-free tissue or a soft cloth dampened with anti-static spray on a monthly basis.

- Spray carpets with anti-static spray. Constant walking on carpets in or near the scanning room may be a source of static electricity.

8.2 Probe Care And Maintenance

This section covers:

- Planned maintenance

- Probe inspection

- Probe cleaning

- Probe disinfecting

⚠️ CAUTION	*Improper handling can result in early probe failure and electric shock hazards.*

⚠️ CAUTION	*Follow the specific cleaning and disinfection procedures provided in the section and use the appropriate germicide in the manufacturer's instructions. Failure to do so will void probe warranty.*

8.2.1 Planned Maintenance

It's recommended to keep a maintenance log and note of all probe malfunctions. To ensure optimum operation and safety, please follow the maintenance schedule below:

After Each Use

1   Inspect the probe

2   Clean the probe

3   Disinfect the probe

Before Each Use

1   Inspect the probe.

8.2.2   Probe Inspection

After each use

1   Inspect the lens, the probe housing and the cable.

2   Look for damage that might allow liquid into the probe.

Before each use

1   Inspect the lens, the probe housing and the cable.

2   Look for damage that might allow liquid into the probe.

3   Test the functionality of the probe.

> ⚠️ **CAUTION**   *If any damage is found, do not use the probe until has been inspected and released for further use by a qualified service representative.*

> ⚠️ **CAUTION**   *If any corrosion or discoloration is found, do not use the probe.*

8.2.3   Probe Cleaning and Disinfecting

Table 8-1: Different probes cleaning and disinfecting requirements

Probe Model	Cleaning/Disinfection
1P4V	Cleaning+ Low-level disinfection
2P4V	Cleaning+ Low-level disinfection
3P8V	Cleaning+ Low-level disinfection
12L5V	Cleaning+ Low-level disinfection
2C5V	Cleaning+ Low-level disinfection

Table 8-1: Different probes cleaning and disinfecting requirements

Probe Model	Cleaning/Disinfection
4EC9V	Cleaning+ High-level disinfection

Probe Cleaning

STEP 1 Disconnect the probe from the unit.

STEP 2 Wipe the probe lens with a soft cloth to remove the coupling gel.

STEP 3 Wipe the probe and cable with a soft cloth dampened with the recommended cleaning solution for 9 minutes at 40℃.

STEP 4 Wipe off the cleaning solution with clean cloth, dampen with tap water after cleaning until no visible cleaning agent remains.

STEP 5 Wipe off with a dry cloth to remove residual moisture, and then left the probe to air dry.

Probe Disinfecting

Probe disinfection can protect patients and operators from disease transmission.

- Low-level disinfection (LLD)

  STEP 1 After thoroughly cleaning, wipe the probe and cable with a soft cloth dampened with the recommended LLD solution for 15 min.

  STEP 2 Wipe off the solution with a dry cloth after disinfection, then left the probe to air dry.

Use additional precautions when decontaminating an infected probe.

- High-level disinfection (HLD)

  High-level disinfection destroys vegetative bacteria, and the procedure is as the following:

  STEP 1 After thorough cleaning, wipe the probe and cable with a soft cloth dampened with the recommended HLD solution for 12 min at 20℃.

  STEP 2 Wipe off the disinfectant solution with a dry cloth after disinfection.

  STEP 3 Rinse thoroughly with water, then leave the probe to air dry.

⚠️
WARNING   *Use only the specified germicides for probe disinfection.*

⚠️ **WARNING**   *Do not steam autoclave or subject the probe to Ethylene Oxide.*

⚠️ **WARNING**   *Do not immerse the probe in liquid beyond the level specified for that probe.*

⚠️ **WARNING**   *Never immerse the probe connector in liquid.*

⚠️ **WARNING**   *The probe should not be exposed to the germicide longer than specified to achieve the desired effect.*

⚠️ **WARNING**   *Do not soak or saturate probes with solutions containing alcohol, bleach, ammonium chloride compounds.*

⚠️ **WARNING**   *Neurological use on patients must be avoided. If a probe becomes contaminated, there is no adequate means of disinfection.*

- List of cleaning agent and disinfections

  Clean Agent: 3M Epizyme multi enzyme cleaner (1:100 diluted by water)

  LLD Agent: 70% isopropanol

  HLD Agent: Cidex OPA

CHAPTER 9

COMPONENTS AND ACCESSORIES

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9.1   Components

Table 9-1: P5 Components

Configuration	P5	Optional/Standard
Console	Yes	Standard
Cart	Yes	Optional
Adapter	Yes	Standard
Probe (1P4V)	No	Standard
Probe (2P4V)	Yes	Standard
Probe (3P8V)	No	Standard
Probe (2C5V)	Yes	Standard
Probe (4EC9V)	Yes	Standard
Probe (12L5V)	Yes	Standard
3-ECG Lead	Yes	Optional
4-ECG Lead	Yes	Optional
5-ECG Lead	Yes	Optional
Digital Graphic Printer (Printer A)	Yes	Optional
Video Copy Processor (Printer B)	Yes	Optional

Table 9-2: P7 Components

Configuration	P7	Optional/Standard
Console	Yes	Standard
Cart	Yes	Optional
Adapter	Yes	Standard
Probe (1P4V)	No	Standard
Probe (2P4V)	Yes	Standard
Probe (3P8V)	Yes	Standard
Probe (2C5V)	Yes	Standard
Probe (4EC9V)	Yes	Standard
Probe (12L5V)	Yes	Standard
3 - ECG Lead	Yes	Optional
4 - ECG Lead	Yes	Optional
5 - ECG Lead	Yes	Optional
Digital Graphic Printer (Printer A)	Yes	Optional

Table 9-2: P7 Components

Configuration	P7	Optional/Standard
Video Copy Processor (Printer B)	Yes	Optional

Table 9-3: P9 Components

Configuration	P9	Optional/Standard
Console	Yes	Standard
Cart	Yes	Optional
Adapter	Yes	Standard
Probe (1P4V)	Yes	Standard
Probe (2P4V)	Yes	Standard
Probe (3P8V)	Yes	Standard
Probe (2C5V)	Yes	Standard
Probe (4EC9V)	Yes	Standard
Probe (12L5V)	Yes	Standard
ECG Lead	Yes	Optional
3 - ECG Lead	Yes	Optional
4 - ECG Lead	Yes	Optional
5 - ECG Lead	Yes	Optional
Digital Graphic Printer (Printer A)	Yes	Optional
Video Copy Processor (Printer B)	Yes	Optional

> ⚠️ **CAUTION** *The components and accessories described above must be replaced with those specified by the manufacturer, otherwise unacceptable risk may arise.*

For information on technical specifications, please refer to chapter 3.

APPENDIX I

LABELS AND NAMEPLATES

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i-1 Safety labels

The following table describes the purpose of safety labels:

Table I-1: Symbols used on equipment
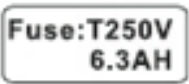
Symbols	Description	Location
	Warning: crushing hazard-foot	On the surface of the cart's rear wheel
	Warning: stepping prohibited	On the upper pallet of printer
	Grounded	Grounded terminal of cart
Fuse:T250V 6.3AH	Fuse rating	Power Port Plate of the Cart
Input: 100-240V~ 50/60Hz	Power supply inlet port	Power Port Plate of the Cart
ON⟷OFF	Power switch	Power Port Plate of the Cart
AC Adapter	Warning statement for MSO	
Printer A	Warning statement for MSO	
Printer B	Warning statement for MSO	

Table I-1: Symbols used on equipment
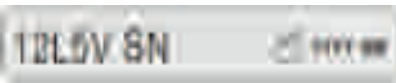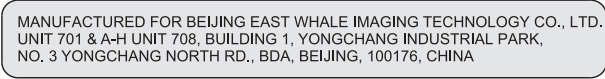
Symbols	Description	Location
⚠	Warning: dangerous voltage	Power output port of cart
1P4V SN	Probe label	On the surface of Transducer connector(1P4V)
2P4V SN	Probe label	On the surface of Transducer connector(2P4V)
2C5V SN	Probe label	On the surface of Transducer connector(3P8V)
3P8V SN	Probe label	On the surface of Transducer connector(2C5V)
4EC9V SN	Probe label	On the surface of Transducer connector(4EC9V)
12L5V SN	Probe label	On the surface of Transducer connector(12L5V)
MANUFACTURED FOR BEIJING EAST WHALE IMAGING TECHNOLOGY CO., LTD. UNIT 701 & A-H UNIT 708, BUILDING 1, YONGCHANG INDUSTRIAL PARK, NO. 3 YONGCHANG NORTH RD., BDA, BEIJING, 100176, CHINA	Probe label	On the surface of Transducer connector (1P4V, 2P8V, 3P8V, 2C5V, 4EC9V, 12L5V)

Table I-2: Nameplates

Nameplates	Location
	Located inside the groove of back cover of the scanner (The nameplate is identified by different electric current and applies to P5, P7 and P9).

Table I-2: Nameplates
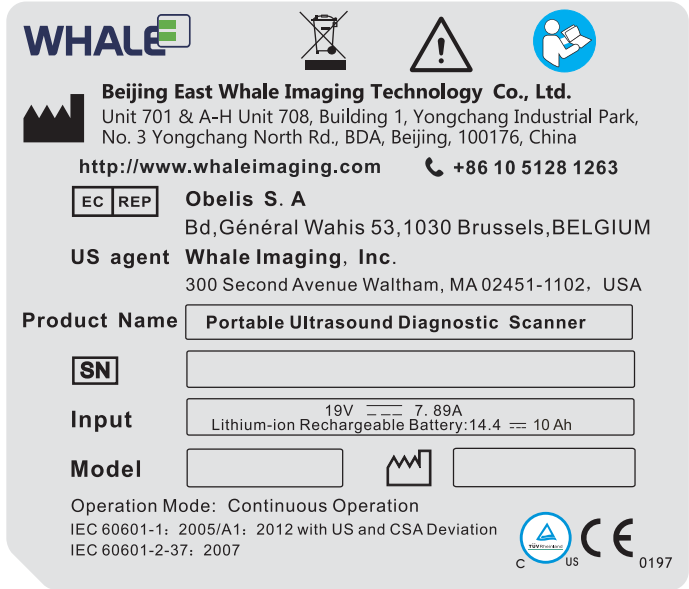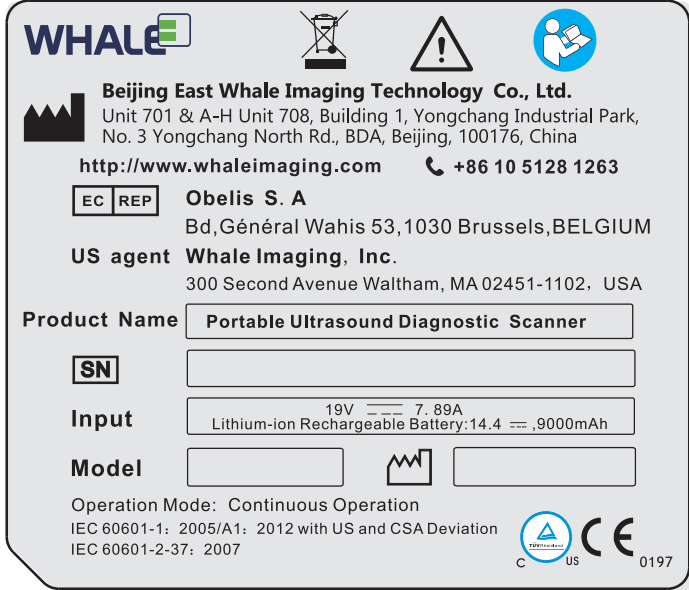
Nameplates	Location
WHALE **Beijing East Whale Imaging Technology Co., Ltd.** Unit 701 & A-H Unit 708, Building 1, Yongchang Industrial Park, No. 3 Yongchang North Rd., BDA, Beijing, 100176, China **Product Name** Standard Cart **Model** PC10 SN **Equipment Mass: 45 kg** **IEC 60601-1:2005/A1:2012 WITH US AND CSA DEVIATION**	Located on the back cover of the lifting column
WHALE **Beijing East Whale Imaging Technology Co., Ltd.** Unit 701 & A-H Unit 708, Building 1, Yongchang Industrial Park, No. 3 Yongchang North Rd., BDA, Beijing, 100176, China **Product Name** Premium Cart **Model** PC20 **Input** 100-240V~ 220VA 50/60Hz SN **Equipment Mass: 55 kg** **IEC60601-2-37: 2007; IEC 60601-1:2005 /A1:2012 WITH US AND CSA DEVIATION**	Located on the back cover of the lifting column

Table I-2: Nameplates
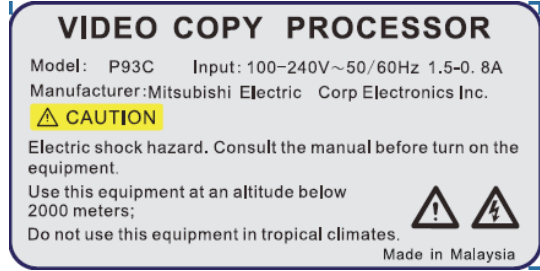
Nameplates	Location
DIGITAL GRAPHIC PRINTER Model: UPD897　　SN: Input: 100−240V ～ 50/60Hz 1.5−0.8A Manufacture:　Sony Electronics Inc. Do not use this equipment in tropical climates Use this equipment at an altitude below 2000 meters;　　　Made in Japan	Located on the enclosure of digital graphic printer
VIDEO COPY PROCESSOR Model: P93C　Input: 100−240V～50/60Hz 1.5-0.8A Manufacturer:Mitsubishi Electric　Corp Electronics Inc. ⚠ CAUTION Electric shock hazard. Consult the manual before turn on the equipment. Use this equipment at an altitude below 2000 meters; Do not use this equipment in tropical climates.　Made in Malaysia	Located on the enclosure of the video copy processor

Table I-2: Nameplates

Nameplates	Location
	Located On the packaging of the ECG electrode lead wire

Table I-3: Symbols used on nameplates

Symbols	Description	Location
	Caution	On the nameplates of the Portable Ultrasound Diagnostic Scanner
	Manufacturers	On the nameplates of the Portable Ultrasound Diagnostic Scanner
	Serial number	On the nameplates of the Portable Ultrasound Diagnostic Scanner
	Date of manufacture	On the nameplates of the Portable Ultrasound Diagnostic Scanner
	Electrical and electronic facility waste must not be disposed as unsorted municipal waste and must be collected separately. Use the return and collection systems according to local law	On the nameplates of the Portable Ultrasound Diagnostic Scanner
	Refer to instruction manual/booklet	On the nameplates of the Portable Ultrasound Diagnostic Scanner
	CE mark	On the nameplates of the Portable Ultrasound Diagnostic Scanner
	European Authorized Representative	On the nameplates of the Portable Ultrasound Diagnostic Scanner
	NRTL mark: TUV Rheinland of North America, Inc., indicating that the product meets both U.S. and Canadian standards.	Near the product nameplate

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APPENDIX II

ACOUSTIC OUTPUT REPORT TABLE

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ii-1 Acoustic Output Report Table

Besides this user's manual, the related document is shipped together with the product, as below:

Table II-1: Acoustic Output Report Table

Doc Number	P-12-025(1)
Version	1.0

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For support please contact

US Agent: Whale Imaging Inc.	EC REP Obelis s.a	◢◣ Beijing East Whale Imaging Technology Co., Ltd.
300 Second Avenue	Bd. Général Wahis 53	Unit 701 & A-H Unit 708, Building 1,
Waltham	1030 Brussels,	Yongchang Industrial Park,
MA 02451, USA	BELGIUM	No. 3 Yongchang North Rd., BDA,
		Beijing, 100176, China
	E-Mail: mail@obelis.net	Website: www.whaleimaging.com
Tel: +1 781 449 7200	Tel: +32 2732 5954	Tel: +86 10 5128 1263
Fax: +1 781 609 2164	Fax: +32 2732 6003	Fax: +86 10 6789 2105

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